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Polynucleotides and polypeptides useful for making alkaloid compounds

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(56) Related Art
WO 2015/081437 A1
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DATABASE GenBank Accession [O] 31 March 2008 (2008-03-31), FACCHINI, P. J., XP055451047, Database accession no. FE967184
ZULAK K et al., 'Gene transcript and metabolite profiling of elicitor-induced opium poppy cell cultures reveals the coordinate regulation of primary and secondary metabolism', PLANTA. (2007), vol. 225, no. 5, pages 1085-1106.



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(54) Title: POLYNUCLEOTIDES AND POLYPEPTIDES USEFUL FOR MAKING ALKALOID COMPOUNDS

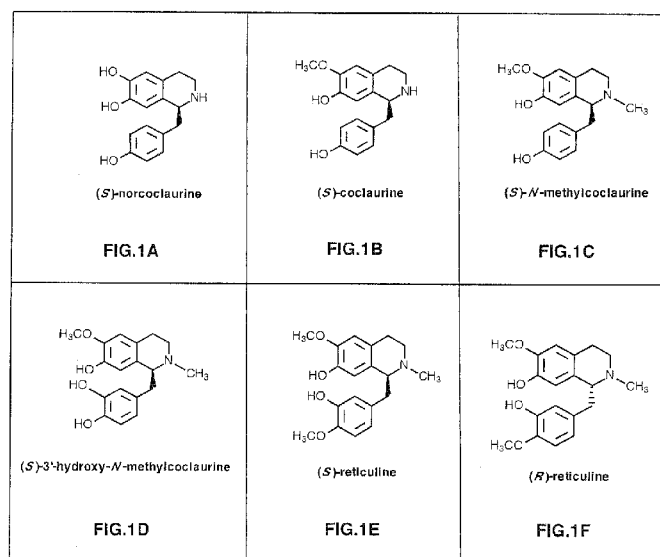


FIGURE 1

(57) Abstract: Polynucleotides and polypeptides useful in the manufacture of a class of chemical compounds known as alkaloids are provided. The polynucleotides and polypeptides may be used to synthesize alkaloids, including reticuline, thebaine and morphine, in vivo and in vitro. The polynucleotides further may be used to examine the presence of the polynucleotides in a cell or a cell extract, and to modulate expression thereof in living cells.



SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
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POLYNUCLEOTIDES AND POLYPEPTIDES USEFUL FOR
MAKING ALKALOID COMPOUNDS

RELATED APPLICATIONS

- 5 **[001]** This Patent Cooperation Treaty Application claims the benefit under 35 USC § 119 (e) from U.S. Provisional Patent Application Nos. 62/355,022, filed on June 27, 2016; 62/433,431; filed on December 13, 2016, and 62/514,104, filed on June 2, 2017, all of which are incorporated by reference herein in their entirety.

10 **FIELD OF THE DISCLOSURE**

[002] The compositions and methods disclosed herein relate to a class of chemical compounds known as alkaloids. More particularly, the present disclosure relates to polynucleotides and polypeptides useful for making alkaloid compounds, including reticuline, and opiate compounds including thebaine and morphine.

15 **BACKGROUND OF THE DISCLOSURE**

[003] The following paragraphs are provided by way of background to the present disclosure. They are not however an admission that anything discussed therein is prior art or part of the knowledge of persons skilled in the art.

- [004]** Plant derived alkaloids have long been recognized to be useful as
20 therapeutic agents, or as precursor compounds for use in the manufacture of therapeutic agents. Morphine, for example, is produced by plants belonging to the Papaveraceae and techniques for the extraction of morphine from opium poppy (*Papaver somniferum*) (Sertürner (1817), Ann. Phys: 56-90), as well as techniques for chemical *de novo* synthesis (Gates and Tschudi (1956), J. of the American
25 Chemical Society, 78 (7): 1380 -1393) have long been known to the art. Moreover techniques to obtain morphine preparations continue to evolve (see, for example, U.S. Patents 7,495,098 and 6,054,584).

- [005]** It is also known that alkaloids, including morphine, *in planta* are produced by polypeptide modulated chemical conversion reactions from
30 precursor compounds. In order for relatively complex alkaloid compounds to accumulate in plant tissues, it is required that a plethora of different chemical reactions is performed in concert within these plant tissues. Thus, in principle, it

is generally understood that plant polypeptides and the genes encoding these polypeptides, play an instrumental role in the *in planta* synthesis of plant alkaloids. However for many plant alkaloids, it is unknown which genes and polypeptides are pertinent, and whether and how these genes can be implemented to produce
5 certain plant alkaloids *ex planta*. There exists, therefore, a paucity of biosynthetic production methodologies for plant alkaloid compounds. On the other hand, the aforementioned synthetic manufacturing methods, as well as techniques for extraction of alkaloids from natural sources known to the art suffer from low alkaloid yields or are expensive.

10 **SUMMARY OF THE DISCLOSURE**

[006] The following paragraphs are intended to introduce the reader to the more detailed description that follows and not to define or limit the claimed subject matter of the present disclosure.

[007] In one aspect, the present disclosure relates to certain alkaloid
15 compounds.

[008] In another aspect, the present disclosure relates to polynucleotides and polypeptides useful for making alkaloid compounds including, without limitation, reticuline, thebaine, morphine and compounds related thereto.

[009] In accordance with one aspect, the present disclosure provides, in at
20 least one embodiment, a composition comprising an isolated polynucleotide comprising a nucleic acid sequence selected from the group consisting of:

(a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15,
25 SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO:
30 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90,

SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93; SEQ.ID NO: 113 to SEQ.ID NO: 505 or SEQ.ID. NO: 766;

(b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);

5 (c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;

(d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);

10 (e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID
15 NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID
20 NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;

25 (f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID
30 NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68,

SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO:
 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID
 NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101,
 SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID
 NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110,
 SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or
 SEQ.ID NO: 768 to SEQ.ID NO: 901; and

(g) a nucleic acid sequence that hybridizes under stringent conditions
 to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or
 (f).

[0010] In some embodiments, the present disclosure provides, a
 composition comprising at least two polynucleotides encoding at least two
 polypeptides, wherein the at least two polynucleotides independently have a
 nucleic acid sequence selected from the group consisting of

(a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO:
 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10,
 SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15,
 SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO:
 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID
 NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52,
 SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57,
 SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO:
 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID
 NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85,
 SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90,
 SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO:
 505 or SEQ.ID. NO: 766;

(b) a nucleic acid sequence of which at least one is substantially
 identical to any one of the nucleic acid sequences of (a);

(c) a nucleic acid sequence of which at least one is substantially
 identical to any one of the nucleic acid sequences of (a) but for the
 degeneration of the genetic code;

(d) a nucleic acid sequence of which at least one is complementary to any one of the nucleic acid sequences of (a);

(e) a nucleic acid sequence encoding any two polypeptides having the amino acid sequence set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;

(f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901; and

(g) at least one of which hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f).

[0011] In some embodiments, the at least two polynucleotides can be selected from a first polynucleotide comprising a first nucleic acid sequence comprising either SEQ.ID NO: 6 or SEQ.ID NO: 372 and a second polynucleotide comprising a second nucleic acid sequence comprising SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903.

[0012] In some embodiments, the first and second polynucleotide are not linked by another polynucleotide.

[0013] In some embodiments, the first and second nucleotide can be linked by another polynucleotide.

[0014] In some embodiments, the first and second polynucleotide can be linked by another polynucleotide not naturally linking the first and second polynucleotide.

[0015] In accordance with another aspect, the present disclosure provides, in at least one embodiment, an expression vector comprising a polynucleotide comprising at least one nucleic acid sequence selected from the group consisting of:

(a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 or SEQ.ID. NO: 766;

- (b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);
- (c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;
- (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);
- (e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID NO: 73, SEQ.ID NO: 74, SEQ.ID NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;
- (f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID NO: 73, SEQ.ID NO: 74, SEQ.ID NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID

NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901; and

(g) a nucleic acid sequence that hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f).

[0016] In some embodiments, the expression vector further can comprise a polynucleotide element capable of controlling expression of the polynucleotide in a cell.

[0017] In some embodiments, the expression vector can comprise a polynucleotide comprising a first nucleic acid sequence comprising either SEQ.ID NO: 6 or SEQ.ID NO: 372, and a second nucleic acid sequence comprising SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903.

[0018] In another aspect, the present disclosure provides in at least one embodiment, a composition comprising an isolated polypeptide having an amino acid sequence set forth in: SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901.

[0019] In some embodiments, the polypeptide can be a functional variant of any of the foregoing polypeptides.

[0020] In another aspect the present disclosure provides, in at least one embodiment, a host cell comprising a polynucleotide comprising a nucleic acid sequence selected from the group consisting of:

- (a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 or SEQ.ID. NO: 766;
- (b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);
- (c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;
- (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);
- (e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO:

73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;

(f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901; and

(g) a nucleic acid sequence that hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f).

25 **[0021]** In some embodiments, the host cell can comprise a second polynucleotide comprising a second nucleic acid sequence independently selected from the sequences set forth in (a), (b), (c), (d), (e), (f) or (g).

[0022] In some embodiments, the first and second polynucleotide are not linked by another polynucleotide.

30 **[0023]** In some embodiments, the first and second polypeptide can be linked by another polynucleotide.

- [0024] In some embodiments, the first and second polynucleotide can be integrated in a first and second expression vector.
- [0025] In some embodiments, the first and second polynucleotide can be integrated in a single expression vector.
- 5 [0026] In some embodiments, the first polynucleotide can comprise a first nucleic acid sequence comprising either SEQ.ID NO: 6 or SEQ.ID NO: 372, and the second polynucleotide can comprise a second nucleic acid sequence comprising SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903.
- [0027] In some embodiments, the host cell can be a cell not naturally
10 containing the first polynucleotide or the second polynucleotide.
- [0028] In some embodiments, the first polynucleotide can comprise a first nucleic acid sequence comprising either SEQ.ID NO: 6 or SEQ.ID NO: 372, and the second polynucleotide can comprise a second nucleic acid sequence comprising SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903.
- 15 [0029] In some embodiments, the host cell can be a cell not naturally containing the first polynucleotide or the second polynucleotide.
- [0030] In some embodiments, the host cell can be a yeast cell.
- [0031] In some embodiments, the host cell can be yeast cell selected from a *Saccharomyces cerevisiae* cell or a *Yarrowia lipolytica* cell.
- 20 [0032] In some embodiments, the host cell can be a plant cell.
- [0033] In some embodiments, the host cell can comprise modulated levels of an alkaloid.
- [0034] In some embodiments, the host cell can comprise modulated levels of thebaine.
- 25 [0035] In another aspect, the present disclosure provides in at least one embodiment, a use of a polynucleotide comprising at least one nucleic acid sequence selected from the group consisting of:
- (a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID
- 30

- NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 or SEQ.ID. NO: 766;
- (b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);
- (c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;
- (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);
- (e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;
- (f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25,

SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, or SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;

and

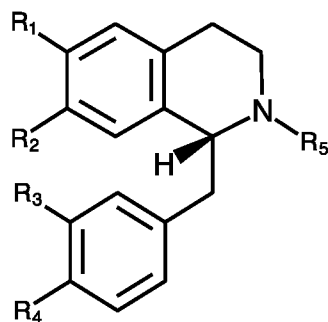
(g) a nucleic acid sequence that hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f); to make an alkaloid compound.

[0036] In some embodiments, the polynucleotide can comprise a first nucleic acid sequence comprising either SEQ.ID NO: 6 or SEQ.ID NO: 372, and second nucleic acid sequence comprising SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903.

[0037] In some embodiments, the alkaloid compound can be selected from the group consisting of (*S*)-norcoclaurine, (*S*)-coclaurine, (*S*)-*N*-methylococclaurine, (*S*)-3'-hydroxy-*N*-methylococclaurine, (*S*)-reticuline, (*R*)-reticuline, salutaridine, salutaridinol, thebaine, oripavine, morphinone, codeinone, codeine and morphine.

[0038] In some embodiments, the polynucleotide can comprise a first nucleic acid sequence comprising either SEQ.ID NO: 6 or SEQ.ID NO: 372, and second nucleic acid sequence comprising SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903, and the alkaloid compound is thebaine.

[0039] In some embodiments, the alkaloid compound can be (*R*)-reticuline or a (*R*)-reticuline pathway-precursor, wherein the (*R*)-reticuline precursor has the chemical formula (I):



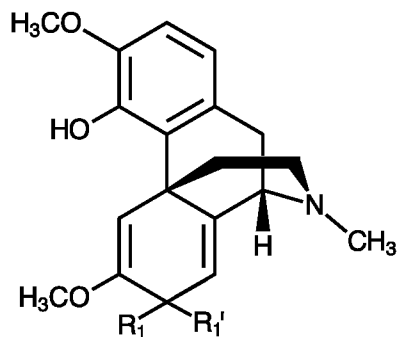
(I);

wherein R_1 is an hydroxyl or a methoxy group; R_2 is a hydroxyl group; R_3 is a hydroxyl group or a hydrogen atom; R_4 is a hydroxyl group or a methoxy group and R_5 is a methyl group or a hydrogen atom.

[0040] In some embodiments, the (*R*)-reticuline pathway precursor can be selected from (*S*)-norcoclaurine; (*S*)-coclaurine; (*S*)-*N*-methylococlaurine; (*S*)-3'-hydroxy-*N*-methylococlaurine; or (*S*)-reticuline.

[0041] In some embodiments, the alkaloid can be an opiate alkaloid.

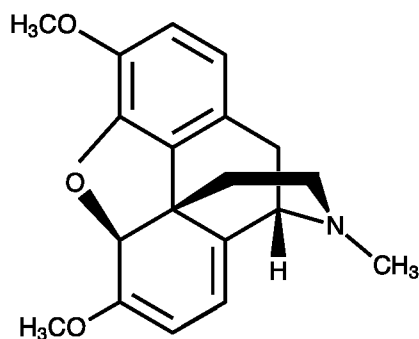
[0042] In some embodiments, the opiate alkaloid can have the chemical formula (II):



(II);

wherein R_1 is an hydroxyl group and R_1' is a hydrogen atom, or wherein R_1 and R_1' taken together are an oxo group.

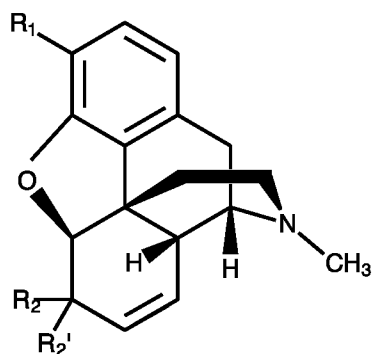
[0043] In some embodiments, the opiate alkaloid can have the chemical formula (III):



(III).

[0044] In some embodiments, the opiate alkaloid can have the chemical formula (IV):

5



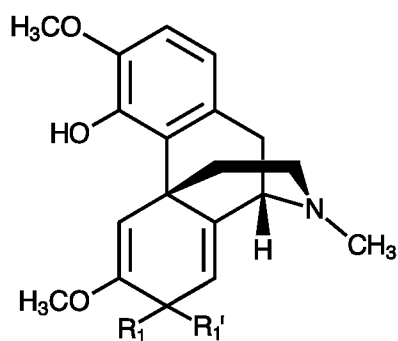
(IV),

wherein R_1 is an hydroxyl group or a methoxy group; and R_2 is a hydroxyl group and R_2' is a hydrogen atom; or R_2 and R_2' taken together are an oxo group.

10 **[0045]** In some embodiments, the opiate alkaloid can be selected from the group consisting of salutaridine; salutaridinol; thebaine; oripavine; morphinone; codeinone; codeine and morphine.

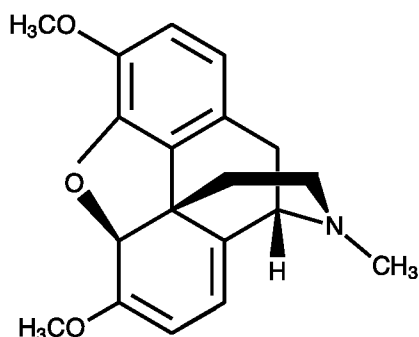
[0046] In some embodiments, the opiate alkaloid can have the chemical formula (II):

15



(II);

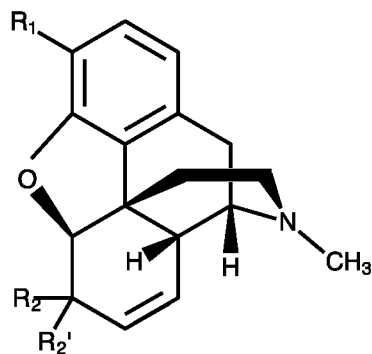
wherein R_1 is an hydroxyl group and R_1' is a hydrogen atom,
or wherein R_1 and R_1' taken together are an oxo group; or
an opiate alkaloid having the chemical formula (III):



(III).

5

[0047] In some embodiments, the opiate alkaloid can have the chemical formula (IV):



(IV),

10

wherein R_1 is an hydroxyl group or a methoxy group; and R_2
is a hydroxyl group and R_2' is a hydrogen atom; or R_2 and R_2' taken
together are an oxo group.

[0048] In some embodiments, the alkaloid can be thebaine.

[0049] In some embodiments, the present disclosure provides a use of a first polypeptide and a second polypeptide encoded by a first and second nucleic acid sequence (i) and (ii) selected from the group consisting of:

- 5 (a) (i) either SEQ.ID NO: 6 or SEQ.ID NO: 372, and (ii) SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903;
- (b) (i) a nucleic acid sequence substantially identical to either SEQ.ID NO: 6 or SEQ.ID NO: 372, and (ii) a nucleic acid sequence substantially identical to SEQ.ID NO: SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903;
- 10 (c) (i) a nucleic acid sequence substantially identical to either SEQ.ID NO: 6 or SEQ.ID NO: 372 but for the degeneration of the genetic code, and (ii) the a nucleic acid sequence substantially identical to SEQ.ID NO: SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903, but for the degeneration of the genetic code;
- 15 (d) (i) a nucleic acid sequence complementary to either SEQ.ID NO: 6 or SEQ.ID NO: 372, and (ii) a nucleic acid sequence complementary to SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903;
- (e) (i) a nucleic acid sequence encoding a polypeptide comprising SEQ.ID NO: 29 or SEQ.ID NO: 900, and (ii) a nucleic acid sequence encoding a polypeptide comprising SEQ.ID NO: 779 or SEQ.ID NO: 901;
- 20 (f) (i) a nucleic acid sequence encoding a polypeptide that is a functional variant of a polypeptide comprising SEQ.ID NO: 29 or SEQ.ID NO: 900, and (ii) a nucleic acid sequence encoding a polypeptide that is a functional variant of a polypeptide comprising SEQ.ID NO: 779 or SEQ.ID NO: 901; and
- 25 (g) (i) a nucleic acid sequence hybridizing to any of the nucleic acid sequences of (a)(i), (b)(i), (c)(i), (d)(i), (e)(i) or (f)(i), and (ii) a nucleic acid sequence hybridizing to any of the nucleic acid sequences of (a)(ii), (b)(ii), (c)(ii), (d)(ii), (e)(ii) or (f)(ii).

to make thebaine.

30 **[0050]** In some embodiments, the alkaloid can be made under *in vitro* conditions.

[0051] In some embodiments, the alkaloid can be made under *in vivo* conditions.

[0052] In another aspect, the present disclosure provides, in at least one embodiment, a polynucleotide comprising at least one nucleic acid sequence
5 selected from the group consisting of:

- (a) SEQ.ID NO: 384; SEQ.ID NO: 902 or SEQ.ID NO: 903;
- (b) a nucleic acid sequence of which at least one is substantially identical to any one of the nucleic acid sequences of (a);
- (c) a nucleic acid sequence of which at least one is substantially
10 identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;
- (d) a nucleic acid sequence of which at least one is complementary to any one of the nucleic acid sequences of (a);
- (e) a nucleic acid sequence encoding a polypeptide having the amino
15 acid sequence set forth in SEQ.ID NO: 779 or SEQ.ID NO: 901;
- (f) a nucleic acid sequence encoding a functional variant of a polypeptide having the amino acid sequence set forth in SEQ.ID NO: 770 or SEQ.ID NO: 901; and
- (g) a nucleic acid sequence that hybridizes under stringent conditions
20 to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f);

expressed in a heterologous host cell to facilitate transport of an alkaloid compound across a cellular membrane.

[0053] In some embodiments, the alkaloid compound is selected from (*S*)-
25 norcoclaurine, (*S*)-coclaurine, (*S*)-*N*-methylococlaurine, (*S*)-3'-hydroxy-*N*-methylococlaurine, (*S*)-reticuline, (*R*)-reticuline, salutaridine, salutaridinol, thebaine, oripavine, morphinone, codeinone, codeine and morphine.

[0054] In some embodiments, the heterologous host cell is a microbial host cell.

30 **[0055]** In some embodiments, the heterologous host cell is a *Saccharomyces cerevisiae* host cell or a *Yarrowia lipolytica* host cell.

[0056] In another aspect, the present disclosure provides, in at least one embodiment, a method for preparing an alkaloid, the method comprising

(A) providing a chimeric polynucleotide comprising as operably linked components:

5 (i) a first polynucleotide comprising a nucleic acid sequence selected from the group consisting of:

(a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 or SEQ.ID. NO: 766;

(b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);

(c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;

(d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);

(e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31,

SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35,
 SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39,
 SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43,
 SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61,
 5 SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65,
 SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69,
 SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73,
 SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96,
 SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100,
 10 SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO:
 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID.
 NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111,
 SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID
 NO: 768 to SEQ.ID NO: 901;

15 (f) a nucleic acid sequence that encodes a functional
 variant of any one of the amino acid sequences set forth in
 SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27,
 SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31,
 SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35,
 20 SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39,
 SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43,
 SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61,
 SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65,
 SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69,
 25 SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73,
 SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96,
 SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100,
 SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO:
 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID.
 30 NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111,
 SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID
 NO: 768 to SEQ.ID NO: 901; and

- (g) a nucleic acid sequence that hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f); and
- (ii) a second polynucleotide capable of controlling expression in a host cell;
- (B) introducing the chimeric polynucleotide into a host cell that endogenously produces or is exogenously supplied with a first alkaloid;
- (C) growing the host cell to produce a polypeptide expressed by the first polynucleotide and to further produce a second alkaloid by converting the first alkaloid into the second alkaloid in a reaction mediated by the polypeptide; and
- (D) recovering the second alkaloid from the cell.

[0057] In another aspect, the present disclosure provides, in at least one embodiment, a method for modulating expression of polynucleotide in a cell naturally expressing such polynucleotide, the method comprising:

- (1) providing a cell naturally expressing a polynucleotide;
- (2) mutagenizing the cell;
- (3) growing the cell to obtain a plurality of cells; and
- (4) determining if the plurality of cells comprises a cell comprising modulated levels of a polypeptide encoded by the polynucleotide; and

wherein the polynucleotide comprises a nucleic acid sequence selected from the group consisting of:

- (a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID

NO: 81, SEQ.ID NO: 82 SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 or SEQ.ID. NO: 766;

5 (b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);

(c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;

10 (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);

(e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, 15 SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, 20 SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, 25 SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;

(f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, 30 SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44,

SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901; and

(g) a nucleic acid sequence that hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f).

[0058] In some embodiments, the method further can comprise a step (5): selecting a cell comprising modulated levels of the polypeptide and growing such cell to obtain a plurality of cells.

[0059] In another aspect, the present disclosure further provides, in at least one embodiment, a method for producing a seed setting plant comprising modulated expression of a polynucleotide in a cell naturally expressing the polynucleotide, the method comprising:

- (a) providing a seed setting plant naturally expressing a polynucleotide;
- (b) mutagenizing seed of the plant to obtain mutagenized seed;
- (c) growing the mutagenized seed into the next generation mutagenized plants capable of setting the next generation seed; and
- (d) obtaining the next generation seed, or another portion of the mutagenized plants, and analyzing if the next generation plants or next generation seed exhibits modulated polynucleotide expression; and

wherein the polynucleotide comprises a nucleic acid sequence selected from the group consisting of:

- (a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10,

- SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 or SEQ.ID. NO: 766;
- (b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);
- (c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;
- (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);
- (e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110,

SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or
SEQ.ID NO: 768 to SEQ.ID NO: 901;

(f) a nucleic acid sequence that encodes a functional variant of any one
of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25,
5 SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30,
SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO:
35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID
NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44,
SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63,
10 SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68,
SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO:
73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID
NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101,
SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID
15 NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110,
SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or
SEQ.ID NO: 768 to SEQ.ID NO: 901; and

(g) a nucleic acid sequence that hybridizes under stringent conditions
to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or
20 (f).

[0060] In another aspect, the present disclosure further provides, in at least
one embodiment, a method of reducing the expression of a polynucleotide in a cell,
comprising:

- (a) providing a cell expressing a polynucleotide; and
- 25 (b) silencing expression of the polynucleotide in the cell; and

wherein the polynucleotide comprises a nucleic acid sequence selected from the
group consisting of:

- (a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO:
5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10,
30 SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15,
SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO:
20, SEQ.ID NO: 21, SEQ.ID NO: 22, SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO:

- 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 or SEQ.ID. NO: 766;
- (b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);
- (c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;
- (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);
- (e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;
- (f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25,

SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901; and

(g) a nucleic acid sequence that hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f).

[0060a] In some embodiments, there is also provided a yeast cell comprising a first polynucleotide comprising:

(a) a nucleic acid sequence selected from SEQ.ID NO: 6 or SEQ.ID NO: 372;
 (b) a nucleic acid sequence encoding a polypeptide having the amino acid sequence of SEQ.ID NO: 29 or 900; or

(c) a nucleic acid encoding a polypeptide having thebaine synthase activity comprising an amino acid sequence that is at least 85% identical to an amino acid sequence selected from the group consisting of: SEQ ID NO: 29 or SEQ ID NO: 900.

[0060b] In some embodiments, there is also provided a method of reducing the expression of a polynucleotide encoding a polypeptide having thebaine synthase activity comprising an amino acid sequence that is at least 85% identical to an amino acid sequence selected from the group consisting of: SEQ ID NO: 29 or SEQ ID NO: 900 in a cell expressing the polynucleotide, the method comprising silencing the expression of the polynucleotide in the cell, wherein the cell is a *Papaver somniferum* cell or the cell as described herein.

[0060c] In some embodiments, there is provided use of a polynucleotide comprising:

- (a) a nucleic acid sequence selected from SEQ ID NO: 6 or SEQ ID NO: 372; or
- (b) a nucleic acid sequence encoding a polypeptide having the amino acid sequences of SEQ ID NO: 29 or SEQ.ID NO: 900; or
- (c) a nucleic acid sequence that encodes a polypeptide that is at least 85%, identical to SEQ ID NO: 29 or SEQ ID NO: 900, to make thebaine.

[0060d] In some embodiments, there is provided use of a first polypeptide and a second polypeptide encoded by a first and second nucleic acid sequence (i) and (ii) selected from the group consisting of:

- (a) (i) either SEQ ID NO: 6 or SEQ ID NO: 372, and (ii) SEQ.ID NO: 384;
- (b) (i) a nucleic acid sequence encoding a polypeptide comprising SEQ ID NO: 29 or SEQ ID NO: 900, and (ii) a nucleic acid sequence encoding a polypeptide comprising SEQ.ID NO: 779; or
- (c) (i) a nucleic acid sequence encoding a polypeptide that is at least 85% identical to SEQ ID NO: 29 or 900, and (ii) a nucleic acid sequence encoding a polypeptide that is at least 90% identical to SEQ ID NO: 779, to make thebaine.

[0060e] In some embodiments, there is provided a composition comprising an isolated polypeptide having an amino acid sequence of SEQ.ID NO: 29 or 900 or that is at least 85% identical to SEQ.ID NO: 29 or 900, wherein the polypeptide has thebaine synthase activity.

[0060f] In some embodiments, there is provided use of a polypeptide having an amino acid sequence of SEQ.ID NO: 29 or 900, or that is at least 85% identical to SEQ.ID NO: 29 or 900, to make thebaine.

[0060g] In some embodiments, there is provided a yeast recombinant expression vector comprising as operably linked components:

a first polynucleotide comprising:

- (a) a nucleic acid sequence selected from SEQ ID NO: 6 or SEQ ID NO: 372; or

(b) a nucleic acid sequence encoding a polypeptide having the amino acid sequences of SEQ ID NO: 29 or SEQ.ID NO: 900; or

(c) a nucleic acid sequence encoding a polypeptide having thebaine synthase activity comprising an amino acid sequence that is at least 85%, identical to SEQ ID NO: 5 29 or SEQ ID NO: 900; and

a second polynucleotide capable of controlling expression in a yeast host cell.

[0061] Other features and advantages of the present disclosure will become apparent from the following detailed description. It should be understood, however, that the detailed description, while indicating preferred implementations of the disclosure, are 10 given by way of illustration only, since various changes and modifications within the spirit and scope of the disclosure will become apparent to those of skill in the art from the detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0062] The disclosure is in the hereinafter provided paragraphs described, by way 15 of example, in relation to the attached figures. The figures provided herein are provided for a better understanding of the example embodiments and to show more clearly how the various embodiments may be carried into effect. The figures are not intended to limit the present disclosure.

[0063] **FIG. 1** depicts the chemical structures of (S)-norcoclaurine (**FIG. 1A**); (S)-coclaurine (**FIG. 1B**); (S)-N-methylcoclaurine (**FIG. 1C**); (S)-3'-hydroxy-N-methylcoclaurine (**FIG. 1D**); (S) reticuline (**FIG. 1E**) and (R)-reticuline (**FIG. 1F**). 20

[0064] FIG. 2 depicts the chemical structures of certain opiates, notably salutaridine (FIG. 2A), salutaridinol (FIG. 2B), thebaine (FIG. 2C), codeinone (FIG. 2D), codeine (FIG. 2E) and morphine (FIG. 2F).

[0065] FIG. 3 depicts two prototype structures of an opiate, namely morphinan (FIG. 3A) and furanyl morphinan (FIG. 3B). Certain specific carbon and nitrogen atoms may be referred herein by reference to their position within the morphinan structure *e.g.* C₁, C₂, N₁₇ etc. The pertinent atom numbering is shown.

[0066] FIG. 4 depicts an alkaloid biosynthesis pathway for the synthesis of reticuline, thebaine and morphine and related alkaloid compounds.

[0067] FIG. 5 depicts a graph showing concentrations of thebaine (µg/l/OD) present in growth medium comprising salutaridine following growth of different yeast strains expressing Betv-1 alone (HA_BetV1M and BetViL_HA), or Betv-1 together with purine permease (HA_BetV1M-pp and BetV1L_HA-pp), as well as a control (EV).

[0068] FIG. 6 depicts a graph showing salutaridine (µg/l/OD) present in growth medium comprising salutaridine following growth of different yeast strains expressing Betv-1 alone (HA_BetV1M and BetViL_HA), or Betv-1 together with purine permease (HA_BetV1M-pp and BetV1L_HA-pp), as well as a control (EV).

[0069] FIG. 7 depicts a graph showing reticuline (µg/l/OD) present in a growth medium comprising either DOPA (A) or norlaudanosoline (NLDS) (B), following growth of yeast strains expressing DODC, MAO, NCS, 6OMT, CNMT and 4'OMT genes, and transformed with a gene expressing a first purine permease (PUP-L) or a second purine permease (PUP-N), each either alone or together with Betv-1.

[0070] FIG. 8 depicts a graph showing reticuline and thebaine (µg/l/OD) present in a growth medium comprising (S)-reticuline in a yeast expressing REPI, CPR and SalSyn (A) or REPI, CPR, SalSyn, SalAT and SalR (B), each yeast strain transformed with a first purine permease (PUP-L) or a second purine permease (PUP-N), each either alone or together with Betv-1.

[0071] FIG. 9 depicts a graph showing reticuline and thebaine (µg/l/OD) present in a growth medium comprising (R)-reticuline in a yeast expressing REPI,

CPR and SalSyn (A) or REPI, CPR, SalSyn, SalAT and SalR (B), each yeast strain transformed with a first purine permease (PUP-L) or a second purine permease (PUP-N), each either alone or together with Betv-1.

[0072] FIG. 10 depicts a graph showing thebaine ($\mu\text{g/l/OD}$) present in a growth medium comprising salutaridine in a yeast expressing SalR and SalAT (A) or REPI, CPR, SalSyn, SalAT and SalR (B), each yeast strain transformed with a first purine permease (PUP-L) or a second purine permease (PUP-N), each either alone or together with Betv-1.

[0073] FIG. 11 depicts the chemical structures of certain opiates, notably morphinone (FIG. 11 A) and oripavine (FIG. 11B).

[0074] The figures together with the following detailed description make apparent to those skilled in the art how the disclosure may be implemented in practice.

DETAILED DESCRIPTION OF THE DISCLOSURE

[0074a] Any discussion of documents, acts, materials, devices, articles or the like which has been included in the present specification is solely for the purpose of providing a context for the present disclosure. It is not to be taken as an admission that any or all of these matters form part of the prior art base or were common general knowledge in the field relevant to the present disclosure as it existed before the priority date of each claim of this application.

[0075] Various compositions, systems or processes will be described below to provide an example of an embodiment of each claimed subject matter. No embodiment described below limits any claimed subject matter and any claimed subject matter may cover processes, compositions or systems that differ from those described below. The claimed subject matter is not limited to compositions, processes or systems having all of the features of any one composition, system or process described below or to features common to multiple or all of the compositions, systems or processes described below. It is possible that a composition, system or process described below is not an embodiment of any claimed subject matter. Any subject matter disclosed in a composition, system or process described below that is not claimed in this document may be the subject matter

of another protective instrument, for example, a continuing patent application, and the applicant(s), inventor(s) or owner(s) do not intend to abandon, disclaim or dedicate to the public any such subject matter by its disclosure in this document.

- [0076] As used herein and in the claims, the singular forms, such "a", "an" and
5 "the" include the plural reference and vice versa unless the context clearly indicates otherwise. Throughout this specification, unless otherwise indicated,

"comprise," "comprises" and "comprising" are used inclusively rather than exclusively, so that a stated integer or group of integers may include one or more other non-stated integers or groups of integers.

[0077] The term "or" is inclusive unless modified, for example, by "either".

5 **[0078]** When ranges are used herein for physical properties, such as molecular weight, or chemical properties, such as chemical formulae, all combinations and sub-combinations of ranges and specific embodiments therein are intended to be included. Other than in the operating examples, or where otherwise indicated, all numbers expressing quantities of ingredients or reaction
10 conditions used herein should be understood as modified in all instances by the term "about." The term "about" when referring to a number or a numerical range means that the number or numerical range referred to is an approximation within experimental variability (or within statistical experimental error), and thus the number or numerical range may vary between 1% and 15% of the stated number
15 or numerical range, as will be readily recognized by context. Furthermore any range of values described herein is intended to specifically include the limiting values of the range, and any intermediate value or sub-range within the given range, and all such intermediate values and sub-ranges are individually and specifically disclosed (*e.g.* a range of 1 to 5 includes 1, 1.5, 2, 2.75, 3, 3.90, 4, and 5).
20 Similarly, other terms of degree such as "substantially" and "approximately" as used herein mean a reasonable amount of deviation of the modified term such that the end result is not significantly changed. These terms of degree should be construed as including a deviation of the modified term if this deviation would not negate the meaning of the term it modifies.

25 **[0079]** Unless otherwise defined, scientific and technical terms used in connection with the formulations described herein shall have the meanings that are commonly understood by those of ordinary skill in the art. The terminology used herein is for the purpose of describing particular embodiments only, and is not intended to limit the scope of the present invention, which is defined solely by
30 the claims.

[0080] All publications, patents and patent applications are herein incorporated by reference in their entirety to the same extent as if each individual

publication, patent or patent application was specifically and individually indicated to be incorporated by reference in its entirety.

Terms and Definitions

[0081] The term “polynucleotide”, as used herein, refers to a sequence of nucleoside or nucleotide monomers, consisting of naturally occurring bases, sugars and intersugar (backbone) linkages. The term also includes modified or substituted sequences comprising non-naturally occurring monomers or portions thereof. The polynucleotides of the present disclosure may be deoxyribonucleic polynucleotides (DNA) or ribonucleic acid polynucleotides (RNA) and may include naturally occurring bases including adenine, guanine, cytosine, thymidine and uracil. The polynucleotides may also contain modified bases. Examples of such modified bases include aza and deaza adenine, guanine, cytosine, thymidine and uracil, and xanthine and hypoxanthine. A sequence of nucleotide or nucleoside monomers may be referred to as a polynucleotide sequence, nucleic acid sequence, a nucleotide sequence or a nucleoside sequence.

[0082] The term “polypeptide”, as used herein, in conjunction with a reference SEQ.ID NO, refers to any and all polypeptides comprising a sequence of amino acid residues which is (i) substantially identical to the amino acid sequence constituting the polypeptide having such reference SEQ.ID NO, or (ii) encoded by a nucleic acid sequence capable of hybridizing under at least moderately stringent conditions to any nucleic acid sequence encoding the polypeptide having such reference SEQ.ID NO, but for the use of synonymous codons. A sequence of amino acid residues may be referred to as an amino acid sequence, or polypeptide sequence.

[0083] The term “nucleic acid sequence encoding a polypeptide”, as used herein, in conjunction with a reference SEQ.ID NO, refers to any and all nucleic acid sequences encoding a polypeptide having such reference SEQ.ID NO. Nucleic acid sequences encoding a polypeptide, in conjunction with a reference SEQ.ID NO, further include any and all nucleic acid sequences which (i) encode polypeptides that are substantially identical to the polypeptide having such reference SEQ.ID NO; or (ii) hybridize to any nucleic acid sequences encoding polypeptides having such reference SEQ.ID NO under at least moderately stringent hybridization

conditions or which would hybridize thereto under at least moderately stringent conditions but for the use of synonymous codons.

[0084] By the term “substantially identical” it is meant that two amino acid sequences preferably are at least 70% identical, and more preferably are at least 85% identical and most preferably at least 95% identical, for example 96%, 97%, 98% or 99% identical. In order to determine the percentage of identity between two amino acid sequences the amino acid sequences of such two sequences are aligned, using for example the alignment method of Needleman and Wunsch (J. Mol. Biol., 1970, 48: 443), as revised by Smith and Waterman (Adv. Appl. Math., 1981, 2: 482) so that the highest order match is obtained between the two sequences and the number of identical amino acids is determined between the two sequences. Methods to calculate the percentage identity between two amino acid sequences are generally art recognized and include, for example, those described by Carillo and Lipton (SIAM J. Applied Math., 1988, 48:1073) and those described in Computational Molecular Biology, Lesk, e.d. Oxford University Press, New York, 1988, Biocomputing: Informatics and Genomics Projects. Generally, computer programs will be employed for such calculations. Computer programs that may be used in this regard include, but are not limited to, GCG (Devereux *et al.*, Nucleic Acids Res., 1984, 12: 387) BLASTP, BLASTN and FASTA (Altschul *et al.*, J. Molec. Biol., 1990:215:403). A particularly preferred method for determining the percentage identity between two polypeptides involves the Clustal W algorithm (Thompson, J D, Higgins, D G and Gibson T J, 1994, Nucleic Acid Res 22(22): 4673-4680 together with the BLOSUM 62 scoring matrix (Henikoff S & Henikoff, J G, 1992, Proc. Natl. Acad. Sci. USA 89: 10915-10919 using a gap opening penalty of 10 and a gap extension penalty of 0.1, so that the highest order match obtained between two sequences wherein at least 50% of the total length of one of the two sequences is involved in the alignment.

[0085] By “at least moderately stringent hybridization conditions” it is meant that conditions are selected which promote selective hybridization between two complementary nucleic acid molecules in solution. Hybridization may occur to all or a portion of a nucleic acid sequence molecule. The hybridizing portion is typically at least 15 (*e.g.* 20, 25, 30, 40 or 50) nucleotides in length.

Those skilled in the art will recognize that the stability of a nucleic acid duplex, or hybrids, is determined by the T_m , which in sodium containing buffers is a function of the sodium ion concentration and temperature ($T_m = 81.5^\circ \text{C} - 16.6 (\log_{10} [\text{Na}^+]) + 0.41 (\% (\text{G} + \text{C}) - 600 / \text{l})$, or similar equation). Accordingly, the parameters in the wash conditions that determine hybrid stability are sodium ion concentration and temperature. In order to identify molecules that are similar, but not identical, to a known nucleic acid molecule a 1% mismatch may be assumed to result in about a 1°C . decrease in T_m , for example if nucleic acid molecules are sought that have a >95% identity, the final wash temperature will be reduced by about 5°C .

Based on these considerations those skilled in the art will be able to readily select appropriate hybridization conditions. In preferred embodiments, stringent hybridization conditions are selected. By way of example the following conditions may be employed to achieve stringent hybridization: hybridization at $5\times$ sodium chloride/sodium citrate (SSC)/ $5\times$ Denhardt's solution/1.0% SDS at T_m (based on the above equation) -5°C , followed by a wash of $0.2\times$ SSC/0.1% SDS at 60°C . Moderately stringent hybridization conditions include a washing step in $3\times$ SSC at 42°C . It is understood however that equivalent stringencies may be achieved using alternative buffers, salts and temperatures. Additional guidance regarding hybridization conditions may be found in: Current Protocols in Molecular Biology, John Wiley & Sons, N.Y., 1989, 6.3.1.-6.3.6 and in: Sambrook *et al.*, Molecular Cloning, a Laboratory Manual, Cold Spring Harbor Laboratory Press, 1989, Vol. 3.

[0086] The term “functional variant”, as used herein, in reference to polynucleotides or polypeptides refers to polynucleotides or polypeptides capable of performing the same function as a noted reference polynucleotide or polypeptide. Thus, for example, a functional variant of the polypeptide set forth in SEQ.ID NO: 46, refers to a polypeptide capable of performing the same function as the polypeptide set forth in SEQ.ID NO: 46. Functional variants include modified a polypeptide wherein, relative to a noted reference polypeptide, the modification includes a substitution, deletion or addition of one or more amino acids. In some embodiments, substitutions are those that result in a replacement of one amino acid with an amino acid having similar characteristics. Such substitutions include, without limitation (i) glutamic acid and aspartic acid; (i) alanine, serine, and

threonine; (iii) isoleucine, leucine and valine, (iv) asparagine and glutamine, and (v) tryptophan, tyrosine and phenylalanine. Functional variants further include polypeptides having retained or exhibiting an enhanced alkaloid biosynthetic bioactivity.

5 **[0087]** The term “chimeric”, as used herein in the context of polynucleotides, refers to at least two linked polynucleotides which are not naturally linked. Chimeric polynucleotides include linked polynucleotides of different natural origins. For example polynucleotide constituting a microbial promoter linked to a polynucleotide encoding a plant polypeptide is considered
10 chimeric. Chimeric polynucleotides also may comprise polynucleotides of the same natural origin, provided they are not naturally linked. For example a polynucleotide constituting a promoter obtained from a particular cell-type may be linked to a polynucleotide encoding a polypeptide obtained from that same cell-type, but not normally linked to the polynucleotide constituting the promoter.
15 Chimeric polynucleotides also include polynucleotides comprising any naturally occurring polynucleotides linked to any non-naturally occurring polynucleotides.

[0088] The term “(S)-norcoclaurine”, as used herein, refers to a chemical compound having the structure set forth in **FIG. 1A**.

20 **[0089]** The term “(S)-coclaurine”, as used herein, refers to a chemical compound having the structure set forth in **FIG. 1B**.

[0090] The term “(S)-N-methylcoclaurine”, as used herein, refers to a chemical compound having the structure set forth in **FIG. 1C**.

[0091] The term “(S)-3'-hydroxy-N-methylcoclaurine”, as used herein, refers to a chemical compound having the structure set forth in **FIG. 1D**.

25 **[0092]** The term “(S)-reticuline”, as used herein, refers to a chemical compound having the structure set forth in **FIG. 1E**.

[0093] The term “(R)-reticuline”, as used herein, refers to a chemical compound having the structure set forth in **FIG. 1F**.

30 **[0094]** The term “salutaridine”, as used herein, refers to a chemical compound having the structure set forth in **FIG. 2A**.

[0095] The term “salutaridinol”, as used herein, refers to a chemical compound having the structure set forth in **FIG. 2B**.

[0096] The term “thebaine”, as used herein, refers to a chemical compound having the structure set forth in **FIG. 2C** as well as a compound having the chemical formula (III).

[0097] The term “codeinone”, as used herein, refers to a chemical compound having the structure set forth in **FIG. 2D**.

[0098] The term “codeine”, as used herein, refers to a chemical compound having the structure set forth in **FIG. 2E**.

[0099] The term “morphine”, as used herein, refers to a chemical compound having the structure set forth in **FIG. 2F**.

10 [00100] The term “morphinone”, as used herein, refers to a chemical compound having the structure set forth in **FIG. 11A**.

[00101] The term “oripavine”, as used herein, refers to a chemical compound having the structure set forth in **FIG. 11B**.

15 [00102] The term “opiate” refers a chemical compound having the prototype chemical structure shown in **FIG. 3A**. (morphinan) or prototype chemical structure **FIG. 3B** (furanyl morphinan). Examples of opiates include, without limitation, salutaridine, salutaridinol, thebaine, oripavine, morphinone, codeinone and codeine.

20 [00103] The term “oxo group”, as used herein, means a group represented by “=O”.

[00104] The term (*R*)-reticuline pathway precursor, as used herein, refers to any one of (*S*)-norcoclaurine, (*S*)-coclaurine, (*S*)-*N*-methylococlaurine, (*S*)-3'-hydroxy-*N*-methylococlaurine or (*S*)-reticuline, and any derivatives thereof.

25 [00105] The term “*in vivo*” as used herein to describe methods of making alkaloids refers to contacting a first alkaloid with a polypeptide capable of mediating conversion of a first alkaloid within a cell, including, for example, a microbial cell or a plant cell, to form a second alkaloid.

30 [00106] The term “*in vitro*” as used herein to describe methods of making alkaloids refers to contacting a first alkaloid with a polypeptide capable of mediating a conversion of the first alkaloid in an environment outside a cell, including, without limitation, for example, in a microwell plate, a tube, a flask, a beaker, a tank, a reactor and the like, to form a second alkaloid.

[00107] The terms “substantially pure” and “isolated”, as may be used interchangeably herein describe a compound, *e.g.*, an alkaloid, polynucleotide or a polypeptide, which has been separated from components that naturally accompany it. Typically, a compound is substantially pure when at least 60%,
5 more preferably at least 75%, more preferably at least 90%, 95%, 96%, 97%, or 98%, and most preferably at least 99% of the total material (by volume, by wet or dry weight, or by mole percent or mole fraction) in a sample is the compound of interest. Purity can be measured by any appropriate method, *e.g.*, in the case of polypeptides, by chromatography, gel electrophoresis or HPLC analysis.

10 [00108] The term “recovered” as used herein in association with an alkaloid refers to a substantially pure form of the alkaloid.

General implementation

[00109] As hereinbefore mentioned, the present disclosure relates to alkaloids. The current disclosure further relates to certain polynucleotides and
15 polypeptides. The herein provide provided polynucleotides are yet further useful in that they facilitate a novel and efficient means of making certain alkaloids, including, in preferred embodiments, reticuline and opiate compounds including, without limitation, thebaine and morphine. Such use of the polynucleotides avoids chemical synthesis of the subject alkaloids and may be conducted at commercial
20 scale. The current disclosure further provides methodologies for the manufacture of certain alkaloids, using cells and organisms not normally capable of synthesizing such alkaloids. Such cells and organisms may be used as a source whence these alkaloids may economically be extracted. The alkaloids produced in accordance with the present disclosure are useful *inter alia* in the manufacture of
25 pharmaceutical compositions. The herein provided polynucleotides furthermore are useful in that may be employed to examine the presence of such polynucleotides in cells, for example, plant cells. The herein provided polynucleotides are further useful in that that they may be employed to modulate expression of such polynucleotides in cells.

30 [00110] Accordingly, the present disclosure provides, in at least one aspect, and in at least one embodiment, a composition comprising isolated polynucleotide

comprising a nucleic acid sequence selected from the nucleic acid sequences consisting of

- (a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 and SEQ.ID. NO: 766;
- (b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);
- (c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;
- (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);
- (e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, or SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO:

96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;

(f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901; and

(g) a nucleic acid sequence that hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f).

[00111] In some embodiments, a composition is provided comprising a first and second polynucleotide. In some embodiments, the first and second polynucleotides are naturally linked. In some embodiments, the first and second polynucleotides are not naturally linked. With the term “naturally linked”, it is meant that the polynucleotide comprises a first and second polynucleotide linked to one another via a linkage polynucleotide that is identical to the linking polynucleotide in a cell in which the first and second polynucleotide naturally occur. Conversely, the term “not naturally linked” refers to a polynucleotide comprising a first and second polynucleotide, which are linked via a linkage

polynucleotide that is not identical to the linkage polynucleotide in a cell in which the first and second polynucleotide naturally occur. This may mean that such first and second polynucleotide are not linked at all via a polynucleotide in a cell in which the constituent polynucleotides naturally occur, and thus the resultant
5 polynucleotide is a chimeric polynucleotide, or, if the first and second polynucleotide are naturally linked in a native cell, the linkage polynucleotide in a native cell differs from the polynucleotide linking the first and second polynucleotide. Thus, by way example, the native linkage polynucleotide between a first and second polynucleotide can include one or more polynucleotides
10 encoding polypeptides or regulatory elements, for example a native promoter element, whereas such polynucleotides may be entirely or in part absent in the polynucleotides provided by the present disclosure. In embodiments, wherein the first and second polynucleotides are not naturally linked, the linkage polynucleotide may comprise a non-native regulatory element. Thus, by way of
15 example only, a first and second polynucleotide may be linked via a linkage polynucleotide comprising a promoter element for expression in a yeast cell. In some embodiments, the compositions of the present disclosure comprise additional polynucleotides, *e.g.* a 3rd, 4th, 5th, 6th, 7th, 8th, 9th 10th etc. nucleic acid sequence, wherein such polynucleotides may be naturally linked or non-naturally
20 linked. Accordingly, the present disclosure provides in some embodiments, at least a composition comprising two polynucleotides encoding at least two polypeptides, wherein the at least polynucleotides have a nucleic acid sequence selected from the group consisting of

(a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO:
25 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52,
30 SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID

NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 and SEQ.ID. NO: 766;

5 (b) nucleic acid sequences of which at least one is substantially identical to any one of the nucleic acid sequences of (a);

(c) nucleic acid sequences of which at least one is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;

10 (d) nucleic acid sequences of which at least one is complementary to any one of the nucleic acid sequences of (a);

(e) a nucleic acid sequence encoding any two polypeptides having the amino acid sequence set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46,

SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;

25 (f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID

NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44,
 SEQ.ID NO: 45, SEQ.ID NO: 46,
 SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65,
 SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70,
 5 SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO:
 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID
 NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103,
 SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID.
 NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112,
 10 SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;
 and

(g) at least one of which hybridizes under stringent conditions to any
 one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f).

[00112] In some embodiments, the at least two polynucleotides comprises
 15 two nucleic acid sequences (i) and (ii) selected from the group consisting of

- (a) (i) either SEQ.ID NO: 6 or SEQ.ID NO: 372, and (ii) SEQ.ID NO: 384,
 SEQ.ID NO: 902 or SEQ.ID NO: 903;
- (b) (i) a nucleic acid sequence substantially identical to either SEQ.ID
 NO: 6 or SEQ.ID NO: 372, and (ii) a nucleic acid sequence substantially
 20 identical to SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903;
- (c) (i) a nucleic acid sequence substantially identical to either SEQ.ID
 NO: 6 or SEQ.ID NO: 372, but for the degeneration of the genetic code, and
 (ii) a nucleic acid sequence substantially identical to SEQ.ID NO: SEQ.ID NO:
 384, SEQ.ID NO: 902 or SEQ.ID NO: 903, but for the degeneration of the
 25 genetic code;
- (d) (i) a nucleic acid sequence complementary to either SEQ.ID NO: 6
 or SEQ.ID NO: 372, and (ii) a nucleic acid sequence complementary to
 SEQ.ID NO: SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903;
- (e) (i) a nucleic acid sequence encoding a polypeptide comprising
 30 either SEQ.ID NO: 29 or SEQ.ID NO: 900, and (ii) a nucleic acid sequence
 encoding a polypeptide comprising SEQ.ID NO: 779 or SEQ.ID NO: 901;

(f) (i) a nucleic acid sequence encoding a polypeptide that is a functional variant of a polypeptide comprising either SEQ.ID NO: 29, or SEQ.ID NO: 900, and (ii) a nucleic acid sequence encoding a polypeptide that is a functional variant of a polypeptide comprising SEQ.ID NO: 779 or SEQ.ID NO: 901; and

(g) (i) a nucleic acid sequence hybridizing to any of the nucleic acid sequences of (a)(i), (b)(i), (c)(i), (d)(i), (e)(i) or (f)(i), and a nucleic acid sequence hybridizing to any of the nucleic acid sequences of (a)(ii), (b)(ii), (c)(ii), (d)(ii), (e)(ii) or (f)(ii).

10 **[00113]** In accordance herewith, the polynucleotides of the present disclosure can be linked to other polynucleotides, including, in some embodiments, a polynucleotide capable of controlling expression of the polynucleotide in a host cell. Accordingly, the present disclosure further provides, in some embodiments, a polynucleotide capable of controlling expression in a host cell, linked to a polynucleotide comprising a nucleic acid sequence selected from the nucleic acid sequences consisting of

(a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 and SEQ.ID. NO: 766;

(b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);

(c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;

5 (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);

(e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, or SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, 15 SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 20 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;

(f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID

NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901; and

- (g) a nucleic acid sequence that hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f).

[00114] In some embodiments, the polynucleotide capable of controlling expression in a host cell is linked to a polynucleotide comprising two nucleic acid sequences (i) and (ii) selected from the group consisting of

- (a) (i) either SEQ.ID NO: 6 or SEQ.ID NO: 372, and (ii) SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903;
- (b) (i) a nucleic acid sequence substantially identical to either SEQ.ID NO: 6 or SEQ.ID NO: 372, and (ii) a nucleic acid sequence substantially identical to SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903;
- (c) (i) a nucleic acid sequence substantially identical to either SEQ.ID NO: 6 or SEQ.ID NO: 372, but for the degeneration of the genetic code, and (ii) a nucleic acid sequence substantially identical to SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903, but for the degeneration of the genetic code;
- (d) (i) a nucleic acid sequence complementary to either SEQ.ID NO: 6 or SEQ.ID NO: 372, and (ii) a nucleic acid sequence complementary to SEQ.ID NO: 384;
- (e) (i) a nucleic acid sequence encoding a polypeptide comprising either SEQ.ID NO: 29 or SEQ.ID NO: 900, and (ii) a nucleic acid sequence encoding a polypeptide comprising SEQ.ID NO: 779 or SEQ.ID NO: 901;
- (f) (i) a nucleic acid sequence encoding a polypeptide that is a functional variant of a polypeptide comprising either SEQ.ID NO: 29, or SEQ.ID NO: 900, and (ii) a nucleic acid sequence encoding a polypeptide that is a functional variant of a polypeptide comprising SEQ.ID NO: 779 or SEQ.ID NO: 901; and
- (g) (i) a nucleic acid sequence hybridizing to any of the nucleic acid sequences of (a)(i), (b)(i), (c)(i), (d)(i), (e)(i) or (f)(i), and a nucleic acid

sequence hybridizing to any of the nucleic acid sequences of (a)(ii), (b)(ii), (c)(ii), (d)(ii), (e)(ii) or (f)(ii).

[00115] Polynucleotides capable of controlling expression in a host cell that can be used herein include any transcriptional promoter capable of controlling expression of polypeptides in a host cell. Generally, polynucleotides capable of controlling expression in a host cell are selected to match the type of host cell in which the polynucleotide is introduced, as hereinafter described. Thus, for example, promoters obtained from bacterial cells can be used when a bacterial host is selected in accordance herewith, while a fungal promoter can be used when a fungal host is selected, a plant promoter can be used when a plant cell is selected, and so on. Furthermore, where it is desirable that enhanced expression is achieved in specific tissues, tissue specific promoters can be used, for example seed specific promoters, root specific promoters, floral specific promoters and fruit specific promoters (see, for example, Dutt *et al.*, Horticultural Research, 2014, 1, 1:47). Other promoters that can be used include promoters controllable by an exogenous agent, for example, promoters inducible by an exogenous chemical agent, including, for example the tobacco PR-1a promoter which can be induced by salicylic acid (Ohshima *et al.*, 1990, Plant Cell 2, 95-102), or promoters repressible by an exogenous chemical agent, for example a tetracycline repressible promoter (Pecota *et al.*, 2005, Biotechnol Bioeng. 92(2) 117-123). Further polynucleotides capable elements of controlling expression in a host cell include transcriptional terminators, enhancers and the like, all of which can be included in the polynucleotide molecules of the present disclosure. It will be understood by those of ordinary skill in the art that operable linkage of the polynucleotide can include linkage of promoters and sequences capable of controlling expression to coding sequences in the 5' to 3' direction of transcription. The polynucleotides of the present disclosure when linked to polynucleotides capable of controlling expression in a host cell can become chimeric polynucleotides.

[00116] In accordance with the present disclosure, the polynucleotide molecules of the present disclosure comprising a polynucleotide capable of controlling expression in a host cell can be integrated into a recombinant expression vector which ensures good expression in a host cell. Thus, in some

embodiments, the present disclosure provides, an expression vector comprising a polynucleotide comprising at least one nucleic acid sequence selected from the nucleic acid sequences consisting of

- (a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 and SEQ.ID. NO: 766;
- (b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);
- (c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;
- (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);
- (e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70,

- SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;
- (f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901; and
- (g) a nucleic acid sequence that hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f).
- 25 **[00117]** In some embodiments, the expression vector comprises a polynucleotide comprising 2, 3, 4, 5, 6, 7, 8, 9, 10 or more of the foregoing nucleic acid sequences.
- [00118]** In some embodiments, the expression vector comprises a polynucleotide comprising two nucleic acid sequences (i) and (ii), selected from
- 30 the group consisting of
- (a) (i) either SEQ.ID NO: 6 or SEQ.ID NO 372, and (ii) SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903;

- (b) (i) a nucleic acid sequence substantially identical to either SEQ.ID NO: 6 or SEQ.ID NO 372, and (ii) a nucleic acid sequence substantially identical to SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903;
- (c) (i) a nucleic acid sequence substantially identical to either SEQ.ID NO: 6 or SEQ.ID NO 372, and (ii) a nucleic acid sequence substantially identical to SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903, but for the degeneration of the genetic code;
- (d) (i) a nucleic acid sequence complementary to either SEQ.ID NO: 6 or SEQ.ID NO 372, and (ii) a nucleic acid sequence complementary to SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903;
- (e) (i) a nucleic acid sequence encoding a polypeptide comprising either SEQ.ID NO: 29 or SEQ.ID NO: 900, and (ii) a nucleic acid sequence encoding a polypeptide comprising SEQ.ID NO: 779 or SEQ.ID NO: 901;
- (f) (i) a nucleic acid sequence encoding a polypeptide that is a functional variant of a polypeptide comprising either SEQ.ID NO: 29 or SEQ.ID NO: 900, and (ii) a nucleic acid sequence encoding a polypeptide that is a functional variant of a polypeptide comprising SEQ.ID NO: 779 or SEQ.ID NO: 901; and
- (g) (i) a nucleic acid sequence hybridizing to any of the nucleic acid sequences of (a)(i), (b)(i), (c)(i), (d)(i), (e)(i) or (f)(i), and a nucleic acid sequence hybridizing to any of the nucleic acid sequences of (a)(ii), (b)(ii), (c)(ii), (d)(ii), (e)(ii) or (f)(ii).

[00119] In some embodiments, the expression vector further comprises polynucleotide elements capable of controlling expression of the polynucleotide in a cell, wherein the expression vector is suitable for expression in a host cell. The term “suitable for expression in a host cell” means that the recombinant expression vector comprises the polynucleotide of the present disclosure linked to genetic elements required to achieve expression in a host cell. Genetic elements that may be included in the expression vector in this regard include a transcriptional termination region, one or more nucleic acid sequences encoding marker genes, one or more origins of replication and the like.

[00120] Of particular interest are vectors suitable for expression in a plant cell. Recombinant vectors suitable for the introduction of nucleic acid sequences into plants include *Agrobacterium* and *Rhizobium* based vectors, such as the Ti and Ri plasmids, including for example pBIN19 (Bevan, 1984, Nucl. Acid. Res., 22: 8711-8721), pGKB5 (Bouchez *et al.*, 1993, C R Acad. Sci. Paris, Life Sciences, 316:1188-1193), the pCGN series of binary vectors (McBride and Summerfelt, 1990, Plant Mol. Biol., 14:269-276) and other binary vectors (*e.g.* U.S. Pat. No. 4,940,838). Further specific vectors and methodologies may be found in Guernieau *et al.*, 1993, Plant transformation and expression vectors In: Plant Molecular Biology Labfax (Croy RRD ed), Oxford, BIOS Scientific Publishers, pp 121 – 148.

[00121] In some embodiments, microbial vectors are used. For example, when *Escherichia coli* is used as a host cell, vectors such as pBR322, the pUC series of vectors, the M13 mp series of vectors, pBluescript etc. can be used.

[00122] Pursuant to the present disclosure the expression vector can further contain a marker gene. Marker genes that can be used in accordance with the present disclosure include all genes that allow the distinction of transformed cells from non-transformed cells, including all selectable and screenable marker genes. A marker gene can be a resistance marker such as an antibiotic resistance marker against, for example, kanamycin, ampicillin, or herbicide resistance markers such as, for example, hygromycin, phosphinotricin, gentamycin, spectinomycin and glyphosate. Screenable markers that can be employed to identify transformants through visual inspection include β -glucuronidase (GUS) (U.S. Pat. Nos. 5,268,463 and 5,599,670) and green fluorescent protein (GFP) (Niedz *et al.*, 1995, Plant Cell Rep., 14: 403).

[00123] The expression vectors of the present disclosure can be prepared in accordance with methodologies well known to those skilled in the art. Such preparation can involve the bacterial species *E. coli* as an intermediary cloning host. The preparation of the *E. coli* vectors as well as the plant transformation vectors can be accomplished using commonly known techniques such as restriction digestion, ligation, gel electrophoresis, DNA sequencing, the Polymerase Chain Reaction (PCR) and other methodologies.

[00124] In accordance herewith, the expression vectors of the present disclosure can be introduced in a host cell and the host cell can be propagated by growth and culture of the cells. Techniques to introduce a vector in a host cell can vary and include transformation and transfection of host cells. Specific methodologies are well known to the art and include, electroporation; chemically mediated techniques, for example CaCl_2 mediated polynucleotide uptake; particle bombardment (biolistics); the use of naturally infective polynucleotides, for example, in embodiments where plant cells are selected, virally derived polynucleotides, or *Agrobacterium* or *Rhizobium* derived polynucleotides; polyethylene glycol (PEG) mediated polynucleotide uptake; microinjection; and the use of silicone carbide whiskers. Further guidance on various techniques for the transformation of plant cells can, for example, be found in the following: biolistics (Sanford, 1988, Trends in Biotechn. 6:299-302); electroporation (Fromm *et al.*, 1985, Proc. Natl. Acad. Sci. USA., 82:5824-5828); PEG mediated DNA uptake (Potrykus *et al.*, 1985, Mol. Gen. Genetics, 199:169-177); microinjection (Reich *et al.*, 1986, Bio/Techn. 4:1001-1004); and silicone carbide whiskers (Kaeppeler *et al.*, 1990, Plant Cell Rep., 9:415-418) or *in planta* transformation using, for example, a flower dipping methodology (Clough and Bent, 1998, Plant J., 16:735-743). Methods for transforming *Papaver somniferum* are described, for example, by Yoshimatsu *et al.*, 1992, Plant Cell Reports; 11 (3): 132- 136.

[00125] Typically in embodiments where microbial cells, such as *E. coli* cells or yeast cells, are used, they are cultured using techniques generally known to a person of skill in the art. It will be further be appreciated by a person of skill in the art that such techniques generally will vary depending on the microbial host cell selected. In general, microbial host cells will be grown in a liquid medium comprising a carbon source, typically a sugar, oil or fat, a nitrogen source, typically in the form of an organic nitrogen source, such as a yeast extract, and/or a salt, such as an ammonium salt, trace elements, such as manganese, zinc, iron, and magnesium, and in some instances vitamins, all of which may be provided continuously or in batches. Growth conditions can further vary with respect to variety of growth parameters, including, for example, temperature, typically

between 10 °C and 90 °C, the presence or oxygen, pH, all of which may be kept constant or varied.

[00126] Where multicellular organisms, such as plants are used tissue culture techniques can be used to regenerate and grow mature plants comprising the polynucleotides of the present disclosure. Techniques can vary depending on the plant species selected. Following transformation, the plant cells can be grown and upon the emergence of differentiating tissue, such as shoots and roots, mature plants can be regenerated. Typically a plurality of plants is regenerated. Methodologies to regenerate plants are generally plant species and cell type dependent and will be known to those skilled in the art. Further guidance with respect to plant tissue culture can be found in, for example: Plant. Cell and Tissue Culture, 1994, Vasil and Thorpe Eds., Kluwer Academic Publishers; and in: Plant Cell Culture Protocols (Methods in Molecular Biology 111), 1999, Hall Eds, Humana Press.

[00127] Further, general guidance with respect to the preparation of recombinant vectors and propagation and growth of recombinant organisms in general can be found in, for example: Sambrook *et al.*, Molecular Cloning, a Laboratory Manual, Cold Spring Harbor Laboratory Press, 2001, Third Ed.

[00128] The host cells that can be used in accordance herewith include any host cells, including, without limitation any microbial cells, including, without limitation, any bacterial, yeast, or other fungal cells; any plant cells; any animal cells; or any synthetic cells.

[00129] In some embodiments, the host cell is a plant cell obtainable or obtained from a plant belonging to the family of Papaveraceae.

[00130] In some embodiments, the host cell is a plant cell obtainable or obtained from a plant belonging to the genus *Papaver*.

[00131] In some embodiments, the host cell is a plant cell obtainable or obtained from a plant belonging to the species *Papaver somniferum*, *Papaver bracteatum*, *Papaver nudicale*, *Papaver orientale* or *Papaver rhoeas*.

[00132] In some embodiments, the host cell is a microbial cell obtainable or obtained from a microbial organism belonging to the species *Saccharomyces cerevisiae* or *Yarrowia lipolytica*.

[00133] In some embodiments, the host cell is a microbial cell obtainable or obtained from a microbial organism belonging to the species *Escherichia coli*.

[00134] Further included in the present disclosure is a host cell wherein the host cell comprises a polynucleotide of the present disclosure. Accordingly the present disclosure further comprises a host cell comprising a polynucleotide
 5 comprising a nucleic acid sequence selected from the nucleic acid sequences consisting of

(a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, 10 SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, 15 SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92; SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 20 505 and SEQ.ID. NO: 766;

(b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);

(c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic
 25 code;

(d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);

(e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, 30 SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID

- NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46,
 SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70,
 5 SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112,
 10 SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;
 (f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or
 20 SEQ.ID NO: 768 to SEQ.ID NO: 901;
 25 (g) a nucleic acid sequence that hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f).

[00135] In some embodiments, the host cell comprises two nucleic acid sequences (i) and (ii) selected from the group of nucleic acid sequences consisting of

- (a) (i) either SEQ.ID NO: 6 or SEQ.ID NO: 372, and (ii) SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903;
- (b) (i) a nucleic acid sequence substantially identical to either SEQ.ID NO: 6 or SEQ.ID NO: 372, and (ii) a nucleic acid sequence substantially identical to SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903;
- (c) (i) a nucleic acid sequence substantially identical to either SEQ.ID NO: 6 or SEQ.ID NO: 372 but for the degeneration of the genetic code, and (ii) a nucleic acid sequence substantially identical to SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903, but for the degeneration of the genetic code;
- (d) (i) a nucleic acid sequence complementary to either SEQ.ID NO: 6 or SEQ.ID NO: 372, and (ii) a nucleic acid sequence complementary to SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903;
- (e) (i) a nucleic acid sequence encoding a polypeptide comprising SEQ.ID NO: 29 or SEQ.ID NO: 900, and (ii) a nucleic acid sequence encoding a polypeptide comprising SEQ.ID NO: 779 or SEQ.ID NO: 901;
- (f) (i) a nucleic acid sequence encoding a polypeptide that is a functional variant of a polypeptide comprising either SEQ.ID NO: 29 or SEQ.ID NO: 900, and (ii) a nucleic acid sequence encoding a polypeptide that is a functional variant of a polypeptide comprising SEQ.ID NO: 779 or SEQ.ID NO: 901; and
- (g) (i) a nucleic acid sequence hybridizing to any of the nucleic acid sequences of (a)(i), (b)(i), (c)(i), (d)(i), (e)(i) or (f)(i), and a nucleic acid sequence hybridizing to any of the nucleic acid sequences of (a)(ii), (b)(ii), (c)(ii), (d)(ii), (e)(ii) or (f)(ii).

[00136] In some embodiments, the nucleic acid sequences (i) and (ii) are linked via a polynucleotide. In other embodiments, the nucleic acid sequences (i) and (ii) are not linked via a polynucleotide.

[00137] In some embodiments, the host cell comprises two expression vectors, a first expression vector comprising nucleic acid sequence (i) and a second expression vector comprising nucleic acid (ii).

[00138] In some embodiments, the host cell does not naturally contain the polynucleotide. In other embodiments, the host cell naturally contains the polynucleotide, however the expression characteristics of the naturally present polynucleotide are suboptimal. For example, the levels of expression of a polypeptide encoded by the polynucleotide are undesirable, and thus the host cells of the present disclosure comprise levels of expression of a polypeptide encoded by a polynucleotide wherein the levels of expression of the polypeptide are modulated relative to the levels of expression of the polypeptide in natural host cells.

[00139] In some embodiments, the host cell is a microbial cell, including, without limitation, a bacterial, yeast, or other fungal cell; a plant cell; an animal cell; or a synthetic cell.

[00140] In some embodiments, the host cell is a plant cell obtainable or obtained from a plant belonging to the family of Papaveraceae.

[00141] In some embodiments, the host cell is a plant cell obtainable or obtained from a plant belonging to the genus *Papaver*.

[00142] In some embodiments, the host cell is a plant cell obtainable or obtained from a plant belonging to the species *Papaver somniferum*, *Papaver bracteatum*, *Papaver nudicale*, *Papaver orientale* or *Papaver rhoeas*.

[00143] In some embodiments, the host cell comprises modulated levels of an alkaloid when compared to a host cell not comprising the polynucleotide. In some embodiments, the host cell comprises a higher concentration of an alkaloid. In other embodiments, the host cell comprises a lower concentration of an alkaloid.

[00144] In some embodiments, the present disclosure provides a composition comprising a polypeptide expressed by a polynucleotide of the present disclosure. Accordingly, the present disclosure provides, in at least one embodiment, an isolated polypeptide having a amino acid sequence set forth in: SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28,

SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33,
 SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38,
 SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43,
 SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62,
 5 SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67,
 SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72,
 SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96,
 SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101,
 SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106,
 10 SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111,
 SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID
 NO: 901.

[00145] In one embodiment, the present disclosure provides a functional
 variant of a polypeptide having an amino acid sequence set forth in SEQ.ID NO: 24,
 15 SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29,
 SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34,
 SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39,
 SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44,
 SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63,
 20 SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68,
 SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73,
 SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97,
 SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102,
 SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107,
 25 SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112
 SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901.

Uses of the polynucleotides and polypeptides of the present disclosure

[00146] The polynucleotides and polypeptides of the present disclosure
 may be used in a variety of ways.

30 **[00147]** In one aspect the polynucleotides and polypeptides of the present
 disclosure may be used to produce an alkaloid. Hence, in a further embodiment,

the present disclosure provides, a use of a polypeptide encoded by a nucleic acid sequence selected from the nucleic acid sequences consisting of

- (a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 and SEQ.ID. NO: 766;
- (b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);
- (c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;
- (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);
- (e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID

NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or
 5 SEQ.ID NO: 768 to SEQ.ID NO: 901;

(f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, or SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, 10 SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;
 15 20

and

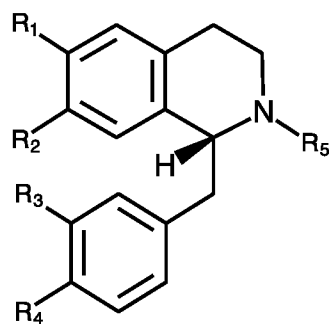
(g) a nucleic acid sequence that hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f);

25 to make an alkaloid compound.

[00148] In some embodiments, the alkaloid is selected from the group consisting of (*S*)-norcoclaurine, (*S*)-coclaurine, (*S*)-*N*-methylococlaurine, (*S*)-3'-hydroxy-*N*-methylococlaurine, (*S*)-reticuline, (*R*)-reticuline, salutaridine, salutaridinol, thebaine, oripavine, morphinone, codeinone, codeine and morphine.

30 **[00149]** In one embodiment, the present disclosure further provides, a use of a polypeptide encoded by a nucleic acid sequence selected from the nucleic acid sequences consisting of

- (a) SEQ.ID NO: 75, SEQ.ID NO: 76, SEQ.ID. NO: 77, SEQ.ID NO: 78, SEQ.ID NO: 79, SEQ.ID NO: 80, SEQ.ID. NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, and SEQ.ID NO: 84; SEQ.ID NO: 85, SEQ.ID NO: 86, SEQ.ID. NO: 87, SEQ.ID NO: 88, SEQ.ID NO: 89, SEQ.ID NO: 90, SEQ.ID. NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 and SEQ.ID. NO: 766;
- (b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);
- (c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;
- (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);
- (e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 94, SEQ.ID NO: 95, SEQ.ID. NO: 96, SEQ.ID NO: 97, SEQ.ID NO: 98, SEQ.ID NO: 99, SEQ.ID. NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID NO: 104, SEQ.ID NO: 105, SEQ.ID. NO: 106, SEQ.ID NO: 107, SEQ.ID NO: 108, SEQ.ID NO: 109, SEQ.ID. NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901.;
- (f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 94, SEQ.ID NO: 95, SEQ.ID. NO: 96, SEQ.ID NO: 97, SEQ.ID NO: 98, SEQ.ID NO: 99, SEQ.ID. NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID NO: 104, SEQ.ID NO: 105, SEQ.ID. NO: 106, SEQ.ID NO: 107, SEQ.ID NO: 108, SEQ.ID NO: 109, SEQ.ID. NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901; and
- (g) a nucleic acid sequence that hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f);
- to make (*R*)-reticuline or an (*R*)-reticuline pathway-precursor, wherein the (*R*)-reticuline precursor has the chemical formula (I):



(I);

wherein R₁ is an hydroxyl or a methoxy group; R₂ is a hydroxyl group; R₃ is a hydroxyl group or a hydrogen atom; R₄ is a hydroxyl group or a methoxy group and R₅ is a methyl group or a hydrogen atom.

- 5 **[00150]** In some embodiments, the (*R*)-reticuline pathway precursor is selected from (*S*)-norcoclaurine; (*S*)-coclaurine; (*S*)-*N*-methylococlaurine; (*S*)-3'-hydroxy-*N*-methylococlaurine; or (*S*)-reticuline.

- [00151]** In one embodiment, the present disclosure further provides, a use of a polypeptide encoded by a nucleic acid sequence selected from the nucleic acid sequences consisting of
- 10

- (a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, and SEQ.ID NO: 60;
- 15
- (b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);
- 20
- (c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;
- (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);
- 25
- (e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID

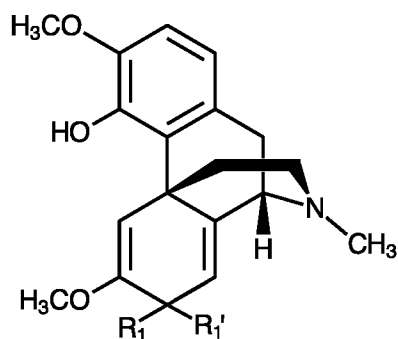
NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30,
 SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO:
 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID
 NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44,
 5 SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63,
 SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68,
 SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO:
 73, and SEQ.ID NO: 74;

(f) a nucleic acid sequence that encodes a functional variant of any one
 10 of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25,
 SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30,
 SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO:
 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID
 NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44,
 15 SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63,
 SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68,
 SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO:
 73, and SEQ.ID NO: 74; and

(g) a nucleic acid sequence that hybridizes under stringent conditions
 20 to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or
 (f);

to make an opiate alkaloid.

[00152] In some embodiments, the opiate alkaloid has the chemical formula
 (II):

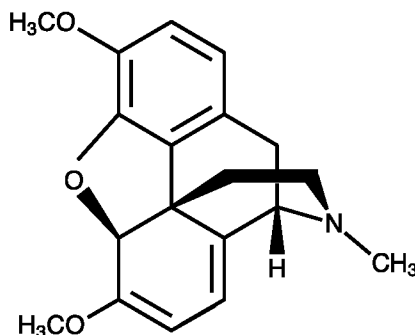


(II);

wherein R_1 is an hydroxyl group and R_1' is a hydrogen atom, or wherein R_1 and R_1' taken together are an oxo group.

[00153] In some embodiments, the opiate alkaloid has the chemical formula (III):

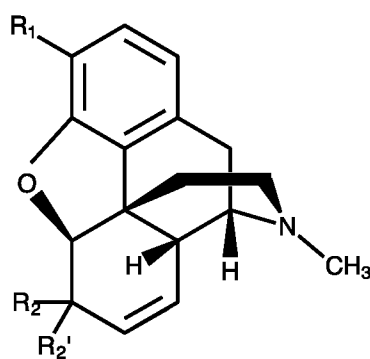
5



(III).

[00154] In some embodiments, the opiate alkaloid has the chemical formula (IV):

10



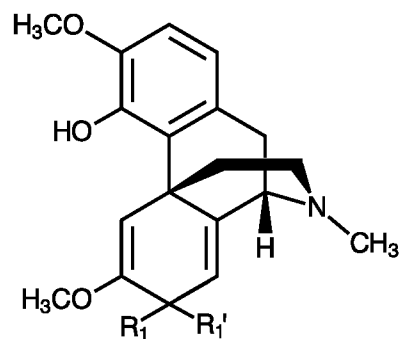
(IV),

wherein R_1 is an hydroxyl group or a methoxy group; and R_2 is a hydroxyl group and R_2' is a hydrogen atom; or R_2 and R_2' taken together are an oxo group.

[00155] In some embodiments, the opiate alkaloid is selected from the group consisting of salutaridine; salutaridinol; thebaine, oripavine, morphinone; codeinone; codeine and morphine.

[00156] In one embodiment, the present disclosure further provides, a use of a polypeptide encoded by a nucleic acid sequence selected from the nucleic acid sequences consisting of

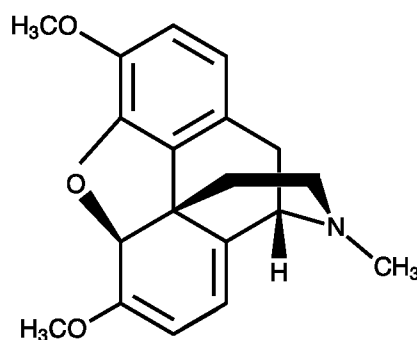
- (a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, SEQ.ID NO: 23,
- (b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);
- (c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;
- (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);
- (e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, and SEQ.ID NO: 46;
- (f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, and SEQ.ID NO: 46; and
- (g) a nucleic acid sequence that hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f);
- to make an opiate alkaloid having the chemical formula (II):



(II);

wherein R_1 is an hydroxyl group and R_1' is a hydrogen atom, or wherein R_1 and R_1' taken together are an oxo group; or
an opiate alkaloid having the chemical formula (III):

5



(III).

[00157] In one embodiment, the present disclosure further provides, a use of
10 a polypeptide encoded by a nucleic acid sequence selected from the nucleic acid
sequences consisting of

(a) SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID
NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55,
SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, and SEQ.ID
15 NO: 60;

(b) a nucleic acid sequence that is substantially identical to any one of
the nucleic acid sequences of (a);

(c) a nucleic acid sequence that is substantially identical to any one of
the nucleic acid sequences of (a) but for the degeneration of the genetic
20 code;

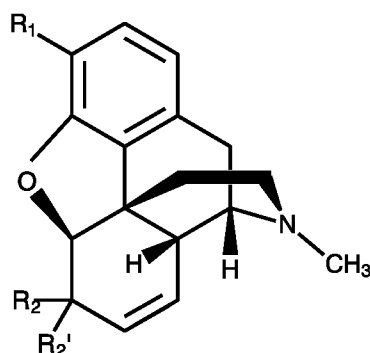
(d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);

(e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID NO: 73, and SEQ.ID NO: 74;

(f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID NO: 73, and SEQ.ID NO: 74, SEQ.ID NO: 75; and

(g) a nucleic acid sequence that hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f);

to make an opiate alkaloid wherein the opiate alkaloid the chemical formula (IV):



(IV),

wherein R_1 is an hydroxyl group or a methoxy group; and R_2 is a hydroxyl group and R_2' is a hydrogen atom; or R_2 and R_2' taken together are an oxo group.

In one embodiment, the present disclosure further provides, a use of a first polypeptide and a second polypeptide encoded by a first and second nucleic acid sequence (i) and (ii) selected from the group consisting of

(a) (i) either SEQ.ID NO: 6 or SEQ.ID NO: 372, and (ii) SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903;

- (b) (i) a nucleic acid sequence substantially identical to either SEQ.ID NO: 6 or SEQ.ID NO: 372, and (ii) a nucleic acid sequence substantially identical to SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903;
- (c) (i) a nucleic acid sequence substantially identical to either SEQ.ID NO: 6 or SEQ.ID NO: 372 but for the degeneration of the genetic code, and (ii) the a nucleic acid sequence substantially identical to SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903, but for the degeneration of the genetic code;
- (d) (i) a nucleic acid sequence complementary to either SEQ.ID NO: 6 or SEQ.ID NO: 372, and (ii) a nucleic acid sequence complementary to SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903;
- (e) (i) a nucleic acid sequence encoding a polypeptide comprising SEQ.ID NO: 29 or SEQ.ID NO: 900, and (ii) a nucleic acid sequence encoding a polypeptide comprising SEQ.ID NO: 779 or SEQ.ID NO: 901;
- (f) (i) a nucleic acid sequence encoding a polypeptide that is a functional variant of a polypeptide comprising SEQ.ID NO: 29 or SEQ.ID NO: 900, and (ii) a nucleic acid sequence encoding a polypeptide that is a functional variant of a polypeptide comprising SEQ.ID NO: 779 or SEQ.ID NO: 901; and
- (g) (i) a nucleic acid sequence hybridizing to any of the nucleic acid sequences of (a)(i), (b)(i), (c)(i), (d)(i), (e)(i) or (f)(i), and (ii) a nucleic acid sequence hybridizing to any of the nucleic acid sequences of (a)(ii), (b)(ii), (c)(ii), (d)(ii), (e)(ii) or (f)(ii).

to make thebaine.

[00158] In some embodiments, the polynucleotides of the present disclosure are used to examine the presence of the polynucleotides in a cell or cell extract.

[00159] In some embodiments, the polynucleotides of the present disclosure are used to modulate the expression of the polynucleotides in a cell.

[00160] In some embodiments, the polynucleotides and polypeptides are used for the *in vitro* production of alkaloids.

[00161] In some embodiments, the polynucleotides and polypeptides are used for the *in vivo* production of alkaloids.

[00162] In one embodiment, a polypeptide of the present disclosure is used to mediate a reaction in which a first alkaloid is converted to form a second alkaloid.

[00163] In one embodiment, a polypeptide of the present disclosure is an enzyme used to catalyze a reaction in which a first alkaloid is converted to form a second alkaloid.

[00164] In one embodiment, a polypeptide comprising or consisting of an amino acid sequence set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 11, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901 is used to mediate a reaction in which a first alkaloid is converted to form a second alkaloid.

[00165] In another embodiment, a polypeptide comprising or consisting of a functional variant of a polypeptide having an amino acid sequence set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101,

SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901 is used to mediate a reaction in which a first alkaloid is converted to form
5 a second alkaloid.

[00166] In one embodiment, the polypeptide is selected from at least one polypeptide having an amino acid sequence set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35,
10 SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, to SEQ.ID NO: 46 and the first alkaloid is (*R*)-Reticuline and the second alkaloid is selected from salutaridine, salutaridinol and thebaine.

[00167] In one embodiment, a first polypeptide is selected from SEQ.ID NO: 29 or SEQ.ID NO: 900, and a second polypeptide is SEQ ID NO: 779 or SEQ.ID NO: 901 and the first alkaloid is (*R*)-Reticuline and the second alkaloid is thebaine.
15

[00168] In one embodiment, the polypeptide is selected from at least one polypeptide having an amino acid sequence set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, and SEQ.ID NO: 46 and the first alkaloid is salutaridine and the second alkaloid is salutaridinol or thebaine.
20

[00169] In one embodiment, a first polypeptide is selected from SEQ.ID NO: 29 or SEQ.ID NO: 900, and a second polypeptide is SEQ ID NO: 779 or SEQ.ID NO: 901 and the first alkaloid is salutaridine and the second alkaloid is thebaine.
25

[00170] In one embodiment, the polypeptide is selected from at least one polypeptide having an amino acid sequence set forth in SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72,
30

SEQ.ID. NO: 73, or SEQ.ID NO: 74 and the first alkaloid is thebaine and the second alkaloid is selected from codeinone, codeine and morphine.

[00171] In one embodiment, the polypeptide is selected from at least one polypeptide having an amino acid sequence set forth in SEQ.ID NO: 61, SEQ.ID NO:
5 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74 and the first alkaloid is codeinone and the second alkaloid is codeine or morphine.

[00172] In one embodiment, the polypeptide is selected from at least one
10 polypeptide having an amino acid sequence set forth in SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74 and the first alkaloid is codeine and the second alkaloid is morphine.

[00173] In one embodiment, the polypeptide is selected from at least one
15 polypeptide having an amino acid sequence set forth in SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110,
20 SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901 and the first alkaloid is a mixture comprising dopamine and 4-hydroxy-phenylacetaldehyde and the second alkaloid is selected from (*S*)-norcoclaurine, (*S*)-coclaurine, (*S*)-*N*-methylococclaurine, (*S*)-3'-hydroxy-*N*-methylococclaurine, (*S*)-reticuline, and (*R*)-reticuline).

[00174] In one embodiment, the polypeptide is selected from at least one
25 polypeptide having an amino acid sequence set forth in SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110,
30 SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901 and the first alkaloid is (*S*)-norcoclaurine, and the second

alkaloid is selected from (*S*)-coclaurine, (*S*)-*N*-methylcoclaurine, (*S*)-3'-hydroxy-*N*-methylcoclaurine, (*S*)-reticuline, and (*R*)-reticuline).

[00175] In one embodiment, the polypeptide is selected from at least one polypeptide having an amino acid sequence set forth in SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901. and the first alkaloid is (*S*)-coclaurine, and the second alkaloid is selected from (*S*)-*N*-methylcoclaurine, (*S*)-3'-hydroxy-*N*-methylcoclaurine, (*S*)-reticuline, and (*R*)-reticuline).

[00176] In one embodiment, the polypeptide is selected from at least one polypeptide having an amino acid sequence set forth in SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901 and the first alkaloid is (*S*)-*N*-methylcoclaurine, and the second alkaloid is selected from (*S*)-3'-hydroxy-*N*-methylcoclaurine, (*S*)-reticuline, and (*R*)-reticuline.

[00177] In one embodiment, the polypeptide is selected from at least one polypeptide having an amino acid sequence set forth in SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901 and the first alkaloid is (*S*)-3'-hydroxy-*N*-methylcoclaurine and the second alkaloid is (*S*)-reticuline, or (*R*)-reticuline.

[00178] In one embodiment, the polypeptide is selected from at least one polypeptide having an amino acid sequence set forth in SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105,

SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901 and the first alkaloid is (*S*)-reticuline, and the second alkaloid is (*R*)-reticuline.

- 5 **[00179]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 1 encodes a polypeptide having reticuline epimerase activity.
- [00180]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 2 encodes a polypeptide having salutaridine synthase activity.
- [00181]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 3
- 10 encodes a polypeptide having O-methyl transferase activity.
- [00182]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 4 encodes a polypeptide having salutaridinol 7 acetyl transferase activity.
- [00183]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 5 encodes a polypeptide having salutaridine reductase activity.
- 15 **[00184]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 6 encodes a polypeptide having pathogenesis related protein activity.
- [00185]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 7 encodes a polypeptide having purine permease activity.
- [00186]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 9
- 20 encodes a polypeptide having cytochrome P450 or methylstylophine 14-hydroxylase activity.
- [00187]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 10 encodes a polypeptide having prohibitin related membrane protease subunit activity.
- 25 **[00188]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 11 encodes a polypeptide having starch synthase activity.
- [00189]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 12 encodes a polypeptide having transposase activity.
- [00190]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 14
- 30 encodes a polypeptide having protein kinase activity.
- [00191]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 15 encodes a polypeptide having retrotransposon reverse transcriptase activity.

- [00192] In one embodiment, a polynucleotide comprising SEQ.ID NO: 16 encodes a polypeptide having a defect in meristem silencing activity.
- [00193] In one embodiment, a polynucleotide comprising SEQ.ID NO: 17 encodes a polypeptide having retrovirus polyprotein activity.
- 5 [00194] In one embodiment, a polynucleotide comprising SEQ.ID NO: 18 encodes a polypeptide having disease resistance activity.
- [00195] In one embodiment, a polynucleotide comprising SEQ.ID NO: 19 encodes a polypeptide having polymerase transcriptional ii coactivator activity.
- [00196] In one embodiment, a polynucleotide comprising SEQ.ID NO: 22
10 encodes a polypeptide having glutamine synthetase activity.
- [00197] In one embodiment, a polynucleotide comprising SEQ.ID NO: 23 encodes a polypeptide having disease resistance activity.
- [00198] In one embodiment, a polynucleotide comprising SEQ.ID NO: 47 encodes a polypeptide having GDT1-like protein 3 activity.
- 15 [00199] In one embodiment, a polynucleotide comprising SEQ.ID NO: 48 encodes a polypeptide having thebaine 6-O-demethylase activity.
- [00200] In one embodiment, a polynucleotide comprising SEQ.ID NO: 49 encodes a polypeptide having dehydroshinganine reductase activity.
- [00201] In one embodiment, a polynucleotide comprising SEQ.ID NO: 50
20 encodes a polypeptide having carbon catabolite repressor activity.
- [00202] In one embodiment, a polynucleotide comprising SEQ.ID NO: 51 encodes a polypeptide having peptidyl-t-RNA hydrolase activity.
- [00203] In one embodiment, a polynucleotide comprising SEQ.ID NO: 52 encodes a polypeptide having NADPH-dependent codeinone reductase activity.
- 25 [00204] In one embodiment, a polynucleotide comprising SEQ.ID NO: 53 encodes a polypeptide having homeobox protein knotted-1-like activity.
- [00205] In one embodiment, a polynucleotide comprising SEQ.ID NO: 54 encodes a polypeptide having cytochrome b6 activity.
- [00206] In one embodiment, a polynucleotide comprising SEQ.ID NO: 55
30 encodes a polypeptide having aminoacylate hydrolase activity.
- [00207] In one embodiment, a polynucleotide comprising SEQ.ID NO: 56 encodes a polypeptide having pentatricopeptide repeat containing protein activity.

- [00208]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 57 encodes a polypeptide having vascular protein sorting associated protein activity.
- [00209]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 58 encodes a polypeptide having polyadenylate-binding protein interacting protein
5 activity.
- [00210]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 59 encodes a polypeptide having NADPH codeinone reductase activity.
- [00211]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 60 encodes a polypeptide having NADPH codeinone-O-demethylase activity.
- 10 **[00212]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 96 encodes a polypeptide having serine/threonine protein kinase activity.
- [00213]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 100 encodes a polypeptide having 6-O-methyltransferase activity.
- [00214]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 101
15 encodes a polypeptide having fimbrin activity.
- [00215]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 102 encodes a polypeptide having N-methyltransferase activity.
- [00216]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 104 encodes a polypeptide having cytosine-5-methyltransferase activity.
- 20 **[00217]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 106 encodes a polypeptide having pentatricopeptide activity.
- [00218]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 109 encodes a polypeptide having 4'-O-methyltransferase activity.
- [00219]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 110
25 encodes a polypeptide having 4'-O-methyltransferase activity.
- [00220]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 111 encodes a polypeptide having CYP80B3 activity.
- [00221]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 112 encodes a polypeptide having MACP1
- 30 **[00222]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 113 encodes a polypeptide having retrotransposable activity.

- [00223]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 114 encodes a polypeptide having ATP-dependent Clp protease ATP-binding subunit activity.
- [00224]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 116
5 encodes a polypeptide having UV-stimulated scaffold protein A activity.
- [00225]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 118 encodes a polypeptide having serine-tRNA ligase activity.
- [00226]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 120 encodes a polypeptide having receptor-like protein kinase activity.
- 10 **[00227]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 121 encodes a polypeptide having DNA polymerase V activity.
- [00228]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 122 encodes a polypeptide having oligopeptidase activity.
- [00229]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 127
15 encodes a polypeptide having heme-binding protein activity activity.
- [00230]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 133 encodes a polypeptide having GTP-binding nuclear protein activity.
- [00231]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 136 encodes a polypeptide having RNA pseudouridine synthase activity.
- 20 **[00232]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 138 encodes a polypeptide having cinnamyl alcohol dehydrogenase activity.
- [00233]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 142 encodes a polypeptide having Retrovirus-related Pol polyprotein activity.
- [00234]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 143
25 encodes a polypeptide having reticulon activity.
- [00235]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 144 encodes a polypeptide having oxidoreductase activity.
- [00236]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 148 encodes a polypeptide having mitotic-specific cyclin activity.
- 30 **[00237]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 149 encodes a polypeptide having epidermis-specific secreted glycoprotein activity.

- [00238]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 153 encodes a polypeptide having ribonuclease H protein activity.
- [00239]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 154 encodes a polypeptide having transporter MCH1 activity.
- 5 **[00240]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 155 encodes a polypeptide having RNA-binding protein activity.
- [00241]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 156 encodes a polypeptide having F-box/kelch-repeat protein activity.
- [00242]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 157
10 encodes a polypeptide having Gag-Pol polyprotein activity.
- [00243]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 158 encodes a polypeptide having Gag-Pol polyprotein activity.
- [00244]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 159 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- 15 **[00245]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 160 encodes a polypeptide having protease regulatory subunit 4 homolog activity.
- [00246]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 162 encodes a polypeptide having proteasome regulatory subunit 4 homolog B activity.
- [00247]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 164
20 encodes a polypeptide having glycosyltransferase activity.
- [00248]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 165 encodes a polypeptide having small nuclear ribonucleoprotein activity.
- [00249]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 167 encodes a polypeptide having endo-1,3-beta-glucosidase activity.
- 25 **[00250]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 169 encodes a polypeptide having eptidyl-prolyl cis-trans isomerase activity.
- [00251]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 170 encodes a polypeptide having F-box/kelch-repeat protein activity.
- [00252]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 171
30 encodes a polypeptide having nuclease activity.
- [00253]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 172 encodes a polypeptide having F-box/kelch-repeat protein activity.

- [00254]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 173 encodes a polypeptide having ankyrin repeat-containing protein activity.
- [00255]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 174 encodes a polypeptide having ribosomal protein activity.
- 5 **[00256]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 175 encodes a polypeptide having hypersensitive-induced response protein activity.
- [00257]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 176 encodes a polypeptide having FRIGIDA-like protein activity.
- [00258]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 177
10 encodes a polypeptide having polygalacturonase activity.
- [00259]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 178 encodes a polypeptide having sodium/hydrogen exchanger activity.
- [00260]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 179 encodes a polypeptide having RNA-binding protein activity.
- 15 **[00261]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 181 encodes a polypeptide having polyribonucleotide nucleotidyltransferase 2 activity.
- [00262]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 182 encodes a polypeptide having ribosomal protein activity.
- [00263]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 183
20 encodes a polypeptide having zinc finger BED domain-containing protein RICESLEEPER activity.
- [00264]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 184 encodes a polypeptide having translation initiation factor eIF-2B subunit alpha activity.
- 25 **[00265]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 187 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- [00266]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 188 encodes a polypeptide having respiratory burst oxidase homolog protein A activity.
- 30 **[00267]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 189 encodes a polypeptide having Respiratory burst oxidase homolog protein F activity.

- [00268]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 190 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- [00269]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 191 encodes a polypeptide having ribonuclease H protein activity.
- 5 **[00270]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 192 encodes a polypeptide having pentatricopeptide repeat-containing protein activity.
- [00271]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 194 encodes a polypeptide having Pentatricopeptide repeat-containing protein activity.
- [00272]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 199
10 encodes a polypeptide having transcription factor IBH1 activity.
- [00273]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 200 encodes a polypeptide having cytosolic Fe-S cluster assembly factor narfl activity.
- [00274]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 201 encodes a polypeptide having fimbrin-2 activity.
- 15 **[00275]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 202 encodes a polypeptide having Gag-Pol polyprotein activity.
- [00276]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 203 encodes a polypeptide having Gag-Pol polyprotein activity.
- [00277]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 204
20 encodes a polypeptide having tripeptidyl-peptidase activity.
- [00278]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 205 encodes a polypeptide having oxygen-independent coproporphyrinogen-III oxidase-like protein activity.
- [00279]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 206
25 encodes a polypeptide having Golgi apparatus membrane protein-like protein ECHIDNA activity.
- [00280]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 207 encodes a polypeptide having cytochrome P450 activity.
- [00281]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 208
30 encodes a polypeptide having RNA-binding protein activity.
- [00282]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 209 encodes a polypeptide having protein phosphatase 2C activity.

- [00283] In one embodiment, a polynucleotide comprising SEQ.ID NO: 210 encodes a polypeptide having ACT domain-containing protein ACR4 activity.
- [00284] In one embodiment, a polynucleotide comprising SEQ.ID NO: 211 encodes a polypeptide having shaggy-related protein kinase delta activity.
- 5 [00285] In one embodiment, a polynucleotide comprising SEQ.ID NO: 212 encodes a polypeptide having nuclear pore complex protein NUP35 activity.
- [00286] In one embodiment, a polynucleotide comprising SEQ.ID NO: 213 encodes a polypeptide having chaperone protein DnaJ activity.
- [00287] In one embodiment, a polynucleotide comprising SEQ.ID NO: 214
10 encodes a polypeptide having ribonuclease H protein activity.
- [00288] In one embodiment, a polynucleotide comprising SEQ.ID NO: 215 encodes a polypeptide having short chain dehydrogenase/reductase activity.
- [00289] In one embodiment, a polynucleotide comprising SEQ.ID NO: 216 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- 15 [00290] In one embodiment, a polynucleotide comprising SEQ.ID NO: 217 encodes a polypeptide having cytochrome b6-f complex iron-sulfur subunit 2 activity.
- [00291] In one embodiment, a polynucleotide comprising SEQ.ID NO: 218 encodes a polypeptide having protein trichome birefringence-like activity.
- 20 [00292] In one embodiment, a polynucleotide comprising SEQ.ID NO: 219 encodes a polypeptide having endochitinase activity.
- [00293] In one embodiment, a polynucleotide comprising SEQ.ID NO: 220 encodes a polypeptide having proteasome subunit beta type-4 activity.
- [00294] In one embodiment, a polynucleotide comprising SEQ.ID NO: 221
25 encodes a polypeptide having 1-deoxy-D-xylulose-5-phosphate synthase activity.
- [00295] In one embodiment, a polynucleotide comprising SEQ.ID NO: 222 encodes a polypeptide having phosphomethylpyrimidine synthase activity.
- [00296] In one embodiment, a polynucleotide comprising SEQ.ID NO: 224 encodes a polypeptide having Ribose-phosphate pyrophosphokinase 1 activity.
- 30 [00297] In one embodiment, a polynucleotide comprising SEQ.ID NO: 225 encodes a polypeptide having Gag-Pol polyprotein activity.

- [00298]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 227 encodes a polypeptide having nicotinamide mononucleotide adenylyltransferase activity.
- [00299]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 228
5 encodes a polypeptide having LRR receptor-like serine/threonine-protein kinase activity.
- [00300]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 230 encodes a polypeptide having AC transposase activity.
- [00301]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 231
10 encodes a polypeptide having serine/threonine-protein phosphatase 7 long form activity.
- [00302]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 232 encodes a polypeptide having bark storage protein A activity.
- [00303]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 233
15 encodes a polypeptide having subtilisin-like protease activity.
- [00304]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 234 encodes a polypeptide having retrotransposable element ORF2 protein activity.
- [00305]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 235 encodes a polypeptide having Gag-Pol polyprotein activity.
- [00306]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 236
20 encodes a polypeptide having Protein RCC2 activity.
- [00307]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 238 encodes a polypeptide having aquaporin NIP2-1 activity.
- [00308]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 239
25 encodes a polypeptide having ABC transporter C family member 8 activity.
- [00309]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 240 encodes a polypeptide having arabinosyltransferase ARAD1 activity.
- [00310]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 242 encodes a polypeptide having ABC transporter E family member 2 activity.
- [00311]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 243
30 encodes a polypeptide having Cytochrome b6-f complex iron-sulfur subunit 2 activity.

- [00312] In one embodiment, a polynucleotide comprising SEQ.ID NO: 244 encodes a polypeptide having Protein trichome birefringence-like 3 activity.
- [00313] In one embodiment, a polynucleotide comprising SEQ.ID NO: 245 encodes a polypeptide having copia protein activity.
- 5 [00314] In one embodiment, a polynucleotide comprising SEQ.ID NO: 246 encodes a polypeptide having CRAL-TRIO domain-containing protein activity.
- [00315] In one embodiment, a polynucleotide comprising SEQ.ID NO: 250 encodes a polypeptide having long chain acyl-CoA synthetase 8 activity.
- [00316] In one embodiment, a polynucleotide comprising SEQ.ID NO: 252
10 encodes a polypeptide having pseudouridine-5'-phosphate glycosidase activity.
- [00317] In one embodiment, a polynucleotide comprising SEQ.ID NO: 253 encodes a polypeptide having salutaridine reductase activity.
- [00318] In one embodiment, a polynucleotide comprising SEQ.ID NO: 254
15 encodes a polypeptide having transmembrane emp24 domain-containing protein activity.
- [00319] In one embodiment, a polynucleotide comprising SEQ.ID NO: 255 encodes a polypeptide having Chaperone protein DnaJ activity.
- [00320] In one embodiment, a polynucleotide comprising SEQ.ID NO: 256 encodes a polypeptide having Tyrosine/DOPA decarboxylase activity.
- 20 [00321] In one embodiment, a polynucleotide comprising SEQ.ID NO: 505 encodes a polypeptide having Indole-3-glycerol phosphate synthase activity.
- [00322] In one embodiment, a polynucleotide comprising SEQ.ID NO: 257 encodes a polypeptide having ubiquitin-activating enzyme activity.
- [00323] In one embodiment, a polynucleotide comprising SEQ.ID NO: 258
25 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- [00324] In one embodiment, a polynucleotide comprising SEQ.ID NO: 259 encodes a polypeptide having topoisomerase activity.
- [00325] In one embodiment, a polynucleotide comprising SEQ.ID NO: 260 encodes a polypeptide having disease resistance protein activity.
- 30 [00326] In one embodiment, a polynucleotide comprising SEQ.ID NO: 262 encodes a polypeptide having Gag-Pol polyprotein activity.

- [00327]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 263 encodes a polypeptide having endoplasmic reticulum-Golgi intermediate compartment protein activity.
- [00328]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 264
5 encodes a polypeptide having ribonuclease H protein activity.
- [00329]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 265 encodes a polypeptide having nicotinamide mononucleotide adenylyltransferase activity.
- [00330]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 270
10 encodes a polypeptide having DNA-directed RNA polymerase I subunit RPA1 activity.
- [00331]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 271 encodes a polypeptide having Tf2-9 polyprotein activity.
- [00332]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 272
15 encodes a polypeptide having Tf2-9 polyprotein activity.
- [00333]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 273 encodes a polypeptide having vesicle-associated membrane protein activity.
- [00334]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 274 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- [00335]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 276
20 encodes a polypeptide having Tf2-9 polyprotein activity.
- [00336]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 278 encodes a polypeptide having pentatricopeptide repeat-containing protein activity.
- [00337]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 281
25 encodes a polypeptide having Gag-Pol polyprotein activity.
- [00338]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 283 encodes a polypeptide having DNA (cytosine-5)-methyltransferase activity.
- [00339]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 290 encodes a polypeptide having ATPase activity.
- [00340]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 291
30 encodes a polypeptide having polygalacturonase activity.

- [00341]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 292 encodes a polypeptide having polygalacturonase activity.
- [00342]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 298 encodes a polypeptide having L-type lectin-domain containing receptor kinase
5 activity.
- [00343]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 303 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- [00344]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 305 encodes a polypeptide having F-box/kelch-repeat protein activity.
- 10 **[00345]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 306 encodes a polypeptide having UDP-glycosyltransferase activity.
- [00346]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 312 encodes a polypeptide having ribosomal protein activity.
- [00347]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 313
15 encodes a polypeptide having DNA (cytosine-5)-methyltransferase activity.
- [00348]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 316 encodes a polypeptide having Myb family transcription factor APL activity.
- [00349]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 317 encodes a polypeptide having Phytoene dehydrogenase activity.
- 20 **[00350]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 318 encodes a polypeptide having cis-phytoene desaturase activity.
- [00351]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 319 encodes a polypeptide having glucan endo-1,3-beta-glucosidase activity.
- [00352]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 320
25 encodes a polypeptide having ATPase activity.
- [00353]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 321 encodes a polypeptide having feruloyl esterase A activity.
- [00354]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 322 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- 30 **[00355]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 326 encodes a polypeptide having cytochrome b6-f complex iron-sulfur subunit activity.

- [00356]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 327 encodes a polypeptide having zinc finger BED domain-containing protein RICESLEEPER 2 activity.
- [00357]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 330
5 encodes a polypeptide having RNA polymerase I subunit activity.
- [00358]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 332 encodes a polypeptide having pentatricopeptide repeat-containing protein activity.
- [00359]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 334 encodes a polypeptide having casein kinase I isoform delta-like activity.
- 10 **[00360]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 336 encodes a polypeptide having ribosomal protein activity.
- [00361]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 337 encodes a polypeptide having ATP synthase subunit c activity.
- [00362]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 338
15 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- [00363]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 340 encodes a polypeptide having methyltransferase-like protein activity.
- [00364]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 341 encodes a polypeptide having pentatricopeptide repeat-containing protein activity.
- 20 **[00365]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 342 encodes a polypeptide having pentatricopeptide repeat-containing protein activity.
- [00366]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 343 encodes a polypeptide having pentatricopeptide repeat-containing protein activity.
- 25 **[00367]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 344 encodes a polypeptide having F-Box protein activity.
- [00368]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 346 encodes a polypeptide having polyadenylate-binding protein activity.
- [00369]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 347
30 encodes a polypeptide having ribosomal protein activity.
- [00370]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 348 encodes a polypeptide having transposase activity.

- [00371]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 349 encodes a polypeptide having disease resistance activity.
- [00372]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 350 encodes a polypeptide having disease resistance activity.
- 5 **[00373]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 351 encodes a polypeptide having disease resistance activity.
- [00374]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 352 encodes a polypeptide having ABC transporter C family member activity.
- [00375]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 353
10 encodes a polypeptide having ABC transporter C family member activity.
- [00376]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 354 encodes a polypeptide having vacuolar protein sorting-associated protein activity.
- [00377]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 355 encodes a polypeptide having omega-amidase activity.
- 15 **[00378]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 356 encodes a polypeptide having pentatricopeptide repeat-containing protein activity.
- [00379]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 357 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- [00380]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 358
20 encodes a polypeptide having methyltransferase, 4'OMT like activity.
- [00381]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 359 encodes a polypeptide having CYP82X1 activity.
- [00382]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 360 encodes a polypeptide having 3'-hydroxy-N-methyl-(S)-coclaurine 4'-O-
25 methyltransferase activity.
- [00383]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 361 encodes a polypeptide having 5'-3' exoribonuclease 3 activity.
- [00384]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 362 encodes a polypeptide having Splicing factor U2af small subunit A activity.
- 30 **[00385]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 363 encodes a polypeptide having pectinesterase activity.

- [00386]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 364 encodes a polypeptide having ribosomal protein activity.
- [00387]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 366 encodes a polypeptide having 1-deoxy-D-xylulose-5-phosphate synthase activity.
- 5 **[00388]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 368 encodes a polypeptide having MACPF domain-containing protein activity.
- [00389]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 369 encodes a polypeptide having Short-chain dehydrogenase activity.
- [00390]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 371
10 encodes a polypeptide having O-methyltransferase activity.
- [00391]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 372 encodes a polypeptide having major latex protein 146 activity.
- [00392]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 373 encodes a polypeptide having B2 Protein activity.
- 15 **[00393]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 374 encodes a polypeptide having starch synthase activity.
- [00394]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 375 encodes a polypeptide having protein IQ-DOMAIN 1 activity.
- [00395]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 376
20 encodes a polypeptide having F-box/kelch-repeat protein activity.
- [00396]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 377 encodes a polypeptide having disease resistance activity.
- [00397]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 378
25 encodes a polypeptide having RNA polymerase II transcriptional coactivator KERP activity.
- [00398]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 379 encodes a polypeptide having F-box protein SKIP8 activity.
- [00399]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 380 encodes a polypeptide having V-type proton ATPase subunit F activity.
- 30 **[00400]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 381 encodes a polypeptide having ubiquitin-protein ligase activity.

- [00401]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 382 encodes a polypeptide having ubiquitin-protein ligase activity.
- [00402]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 383 encodes a polypeptide having methyltetrahydroprotoberberine 14-monooxygenase activity.
- [00403]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 384 encodes a polypeptide having purine permease activity.
- [00404]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 385 encodes a polypeptide having serine/threonine-protein phosphatase activity.
- 10 **[00405]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 386 encodes a polypeptide having ribosomal protein activity.
- [00406]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 387 encodes a polypeptide having 3-methyl-2-oxobutanoate hydroxymethyltransferase activity.
- 15 **[00407]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 388 encodes a polypeptide having Tobamovirus multiplication protein activity.
- [00408]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 390 encodes a polypeptide having RNA-dependent RNA polymerase activity.
- [00409]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 391 encodes a polypeptide having SART-1 family protein DOT2 activity.
- 20 **[00410]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 392 encodes a polypeptide having Graves disease carrier protein activity.
- [00411]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 394 encodes a polypeptide having RNA-dependent RNA polymerase activity.
- 25 **[00412]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 395 encodes a polypeptide having leucine--tRNA ligase activity.
- [00413]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 396 encodes a polypeptide having oxidoreductase GLYR1 activity.
- [00414]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 397 encodes a polypeptide having RNA-dependent RNA polymerase 1 activity.
- 30 **[00415]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 400 encodes a polypeptide having Phosphate transporter PHO1 activity.

- [00416]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 401 encodes a polypeptide having AC transposase activity.
- [00417]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 402 encodes a polypeptide having cytochrome P450 activity.
- 5 **[00418]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 406 encodes a polypeptide having cytochrome P450 activity.
- [00419]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 407 encodes a polypeptide having polyadenylate-binding protein activity.
- [00420]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 408
10 encodes a polypeptide having disease resistance activity.
- [00421]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 409 encodes a polypeptide having disease resistance activity.
- [00422]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 410 encodes a polypeptide having cyclin activity.
- 15 **[00423]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 411 encodes a polypeptide having vacuolar protein sorting-associated protein activity.
- [00424]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 412 encodes a polypeptide having pentatricopeptide repeat-containing protein activity.
- [00425]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 413
20 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- [00426]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 414 encodes a polypeptide having pentatricopeptide repeat-containing protein activity.
- [00427]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 415 encodes a polypeptide having Surfeit locus protein activity.
- 25 **[00428]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 416 encodes a polypeptide having endoplasmic reticulum-Golgi intermediate compartment protein activity.
- [00429]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 417 encodes a polypeptide having aminoacylate hydrolase activity.
- 30 **[00430]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 418 encodes a polypeptide having ubiquitin-like activity.

- [00431] In one embodiment, a polynucleotide comprising SEQ.ID NO: 419 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- [00432] In one embodiment, a polynucleotide comprising SEQ.ID NO: 420 encodes a polypeptide having protein trichome birefringence-like activity.
- 5 [00433] In one embodiment, a polynucleotide comprising SEQ.ID NO: 421 encodes a polypeptide having cytochrome b6-f complex iron-sulfur subunit activity.
- [00434] In one embodiment, a polynucleotide comprising SEQ.ID NO: 422 encodes a polypeptide having zinc finger MYM-type protein activity.
- 10 [00435] In one embodiment, a polynucleotide comprising SEQ.ID NO: 423 encodes a polypeptide having cysteine-rich repeat secretory protein activity.
- [00436] In one embodiment, a polynucleotide comprising SEQ.ID NO: 424 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- [00437] In one embodiment, a polynucleotide comprising SEQ.ID NO: 426
- 15 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- [00438] In one embodiment, a polynucleotide comprising SEQ.ID NO: 427 encodes a polypeptide having Retrovirus-related Pol polyprotein activity.
- [00439] In one embodiment, a polynucleotide comprising SEQ.ID NO: 429 encodes a polypeptide having homeobox protein knotted-1-like activity.
- 20 [00440] In one embodiment, a polynucleotide comprising SEQ.ID NO: 430 encodes a polypeptide having aspartic proteinase nepenthesin activity.
- [00441] In one embodiment, a polynucleotide comprising SEQ.ID NO: 431 encodes a polypeptide having ATP synthase mitochondrial F1 complex assembly factor activity.
- 25 [00442] In one embodiment, a polynucleotide comprising SEQ.ID NO: 432 encodes a polypeptide having ribonuclease activity.
- [00443] In one embodiment, a polynucleotide comprising SEQ.ID NO: 433 encodes a polypeptide having fer-like iron deficiency-induced transcription factor activity.
- 30 [00444] In one embodiment, a polynucleotide comprising SEQ.ID NO: 434 encodes a polypeptide having superoxide dismutase activity.

- [00445] In one embodiment, a polynucleotide comprising SEQ.ID NO: 435 encodes a polypeptide having leucine zipper activity.
- [00446] In one embodiment, a polynucleotide comprising SEQ.ID NO: 436 encodes a polypeptide having AC transposase activity.
- 5 [00447] In one embodiment, a polynucleotide comprising SEQ.ID NO: 437 encodes a polypeptide having serine/threonine-protein phosphatase activity.
- [00448] In one embodiment, a polynucleotide comprising SEQ.ID NO: 438 encodes a polypeptide having mechanosensitive ion channel protein activity.
- [00449] In one embodiment, a polynucleotide comprising SEQ.ID NO: 439
10 encodes a polypeptide having serine/threonine-protein phosphatase activity.
- [00450] In one embodiment, a polynucleotide comprising SEQ.ID NO: 440 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- [00451] In one embodiment, a polynucleotide comprising SEQ.ID NO: 441 encodes a polypeptide having mechanosensitive ion channel protein activity.
- 15 [00452] In one embodiment, a polynucleotide comprising SEQ.ID NO: 442 encodes a polypeptide having norcoclaurine 6-O-methyltransferase activity.
- [00453] In one embodiment, a polynucleotide comprising SEQ.ID NO: 443 encodes a polypeptide having serine hydroxymethyltransferase activity.
- [00454] In one embodiment, a polynucleotide comprising SEQ.ID NO: 444
20 encodes a polypeptide having 3'-hydroxy-N-methyl-(S)-coclaurine 4'-O-methyltransferase activity.
- [00455] In one embodiment, a polynucleotide comprising SEQ.ID NO: 445 encodes a polypeptide having 12-oxophytodienoate reductase activity.
- [00456] In one embodiment, a polynucleotide comprising SEQ.ID NO: 446
25 encodes a polypeptide having methylcoclaurine 3'-hydroxylase isozyme activity.
- [00457] In one embodiment, a polynucleotide comprising SEQ.ID NO: 447 encodes a polypeptide having cytochrome P450 activity.
- [00458] In one embodiment, a polynucleotide comprising SEQ.ID NO: 448 encodes a polypeptide having cytochrome P450 activity.
- 30 [00459] In one embodiment, a polynucleotide comprising SEQ.ID NO: 449 encodes a polypeptide having O-methyltransferase activity.

- [00460]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 450 encodes a polypeptide having Glyceraldehyde-3-phosphate dehydrogenase activity.
- [00461]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 451
5 encodes a polypeptide having endoribonuclease Dicer activity.
- [00462]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 452 encodes a polypeptide having developmentally-regulated G-protein activity.
- [00463]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 453 encodes a polypeptide having telomere repeat-binding protein activity.
- 10 **[00464]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 454 encodes a polypeptide having serine/threonine-protein kinase activity.
- [00465]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 455 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- [00466]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 456
15 encodes a polypeptide having rho GTPase activity.
- [00467]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 457 encodes a polypeptide having chaperone protein DnaJ activity.
- [00468]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 458 encodes a polypeptide having methionine t-RNA ligase activity.
- 20 **[00469]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 459 encodes a polypeptide having cyclin activity.
- [00470]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 460 encodes a polypeptide having Rac-like GTP-binding protein activity.
- [00471]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 461
25 encodes a polypeptide having AC transposase activity.
- [00472]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 463 encodes a polypeptide having ribonuclease H activity.
- [00473]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 465 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- 30 **[00474]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 466 encodes a polypeptide having Ty3-G Gag-Pol polyprotein activity.

- [00475]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 467 encodes a polypeptide having purple acid phosphatase activity.
- [00476]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 469 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- 5 **[00477]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 470 encodes a polypeptide having MORC family CW-type zinc finger protein activity.
- [00478]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 471 encodes a polypeptide having Protein trichome birefringence activity.
- [00479]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 472
10 encodes a polypeptide having Inter-alpha-trypsin inhibitor heavy chain H2 activity.
- [00480]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 473 encodes a polypeptide having cullin-associated NEDD8-dissociated protein activity.
- 15 **[00481]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 474 encodes a polypeptide having chaperone protein DnaJ activity.
- [00482]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 475 encodes a polypeptide having B3 domain-containing protein activity.
- [00483]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 476
20 encodes a polypeptide having AC transposase activity.
- [00484]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 477 encodes a polypeptide having purine permease activity.
- [00485]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 478 encodes a polypeptide having purine permease activity.
- 25 **[00486]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 479 encodes a polypeptide having ribonuclease activity.
- [00487]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 480 encodes a polypeptide having polyubiquitin activity.
- [00488]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 481
30 encodes a polypeptide having polyubiquitin activity.
- [00489]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 482 encodes a polypeptide having metallophosphoesterase activity.

- [00490] In one embodiment, a polynucleotide comprising SEQ.ID NO: 483 encodes a polypeptide having retrovirus-related Pol polyprotei activity.
- [00491] In one embodiment, a polynucleotide comprising SEQ.ID NO: 484 encodes a polypeptide having oxoglutarate/Fe(II)-dependent dioxygenase
5 activity.
- [00492] In one embodiment, a polynucleotide comprising SEQ.ID NO: 485 encodes a polypeptide having gibberellin 2-beta-dioxygenase activity.
- [00493] In one embodiment, a polynucleotide comprising SEQ.ID NO: 486 encodes a polypeptide having oxoglutarate/Fe(II)-dependent dioxygenase activity.
- 10 [00494] In one embodiment, a polynucleotide comprising SEQ.ID NO: 487 encodes a polypeptide having ribosomal protein activity.
- [00495] In one embodiment, a polynucleotide comprising SEQ.ID NO: 488 encodes a polypeptide having AC transposase activity.
- [00496] In one embodiment, a polynucleotide comprising SEQ.ID NO: 489
15 encodes a polypeptide having zinc finger BED domain-containing protein RICESLEEPER activity.
- [00497] In one embodiment, a polynucleotide comprising SEQ.ID NO: 490 encodes a polypeptide having cytochrome b6-f complex iron-sulfur subunit activity.
- 20 [00498] In one embodiment, a polynucleotide comprising SEQ.ID NO: 491 encodes a polypeptide having retrovirus-related Pol polyprotein activity.
- [00499] In one embodiment, a polynucleotide comprising SEQ.ID NO: 492 encodes a polypeptide having phloem protein-like activity.
- [00500] In one embodiment, a polynucleotide comprising SEQ.ID NO: 493
25 encodes a polypeptide having beta glucosidase activity.
- [00501] In one embodiment, a polynucleotide comprising SEQ.ID NO: 494 encodes a polypeptide having transposon Ty3-G Gag-Pol polyprotein activity.
- [00502] In one embodiment, a polynucleotide comprising SEQ.ID NO: 496 encodes a polypeptide having retrotransposable element ORF2 protein activity.
- 30 [00503] In one embodiment, a polynucleotide comprising SEQ.ID NO: 497 encodes a polypeptide having retrotransposable element SLACS activity.

[00504] In one embodiment, a polynucleotide comprising SEQ.ID NO: 498 encodes a polypeptide having magnesium-transporting ATPase activity.

[00505] In one embodiment, a polynucleotide comprising SEQ.ID NO: 499 encodes a polypeptide having glucan 1,3-beta-glucosidase activity.

5 **[00506]** In one embodiment, a polynucleotide comprising SEQ.ID NO: 500 encodes a polypeptide having indole-3-acetic acid-amido synthetase activity.

[00507] In one embodiment, a polynucleotide comprising SEQ.ID NO: 501 encodes a polypeptide having transcription factor activity.

[00508] In one embodiment, a polynucleotide comprising SEQ.ID NO: 502
10 encodes a polypeptide having reverse transcriptase activity.

[00509] In one embodiment, a polynucleotide comprising SEQ.ID NO: 503 encodes a polypeptide having indole-3-acetic acid-amido synthetase activity.

[00510] In another aspect, the present disclosure provides, in at least one embodiment, a a polynucleotide comprising at least one nucleic acid sequence
15 selected from the nucleic acid sequences consisting of

(a) SEQ.ID NO: 384; SEQ.ID NO: 902 and SEQ.ID NO: 903;

(b) a nucleic acid sequence of which at least one is substantially identical to any one of the nucleic acid sequences of (a);

(c) a nucleic acid sequence of which at least one is substantially
20 identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;

(d) a nucleic acid sequence of which at least one is complementary to any one of the nucleic acid sequences of (a);

(e) a nucleic acid sequence encoding a polypeptide having the amino
25 acid sequence set forth in SEQ.ID NO: 779 or SEQ.ID NO: 901;

(f) a nucleic acid sequence encoding a functional variant of a polypeptide having the amino acid sequence set forth in SEQ.ID NO: 770 or SEQ.ID NO: 901; and

(g) a nucleic acid sequence that hybridizes under stringent conditions
30 to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f);

expressed in a heterologous host cell to facilitate transport of an alkaloid compound across a cellular membrane. In some embodiments, the alkaloid is exported from the cell. In some embodiments, the alkaloid is exported from the cell and secreted in a cell growth medium.

- 5 **[00511]** In some embodiments, the alkaloid compound is selected from (S)-norcoclaurine, (S)-coclaurine, (S)-N-methylcoclaurine, (S)-3'-hydroxy-N-methylcoclaurine, (S)-reticuline, (R)-reticuline, salutaridine, salutaridinol, thebaine, oripavine, morphinone, codeinone, codeine and morphine.

- 10 **[00512]** In some embodiments, the heterologous host cell is a microbial host cell.

[00513] In some embodiments, the heterologous host cell is a *Saccharomyces cerevisiae* host cell or a *Yarrowia lipolytica* host cell.

- 15 **[00514]** In one embodiment, a first alkaloid can be brought in contact with a polypeptide of the present disclosure under reaction conditions permitting chemical conversion of the first alkaloid under *in vitro* reaction conditions to form a second alkaloid. Under such *in vitro* reaction conditions, in certain embodiments, the initial reaction constituents can be provided in more or less pure form and can be mixed under conditions that permit the chemical reaction to substantially proceed. Thus a mixture comprising one of the polypeptides and a first alkaloid
- 20 may be provided and mixed under *in vitro* reaction conditions that permit the conversion of the first alkaloid to form a second alkaloid.

- [00515]** In another embodiment, a first alkaloid can be brought in contact with a polypeptide of the present disclosure under reaction conditions permitting a chemical conversion of a first alkaloid under *in vivo* reaction conditions. Under
- 25 such *in vivo* reaction conditions living cells are modified in such a manner that they produce the second alkaloid. Accordingly, provided herein further, is a method for preparing an alkaloid, the method comprising:

- (A) providing a chimeric polynucleotide comprising as operably linked components:
- 30 (i) a first polynucleotide comprising a nucleic acid sequence selected from the nucleic acid sequences consisting of

- 5 (a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 and SEQ.ID. NO: 766;
- 10 (b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);
- (c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;
- 15 (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);
- (e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in
- 20 SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69,
- 25
- 30

- SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73,
 SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96,
 SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100,
 SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO:
 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID.
 NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111,
 SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID
 NO: 768 to SEQ.ID NO: 901.;
- (f) a nucleic acid sequence that encodes a functional
 variant of any one of the amino acid sequences set forth in
 SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27,
 SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31,
 SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35,
 SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39,
 SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43,
 SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61,
 SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65,
 SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69,
 SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73,
 SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96,
 SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100,
 SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO:
 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID.
 NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111,
 SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID
 NO: 768 to SEQ.ID NO: 901; and
- (g) a nucleic acid sequence that hybridizes under
 stringent conditions to any one of the nucleic acid sequences
 set forth in (a), (b), (c), (d), (e) or (f); and
- (ii) a second polynucleotide capable of controlling expression in
 a host cell;

(B) introducing the chimeric polynucleotide into a host cell that endogenously produces or is exogenously supplied with a first alkaloid;

(C) growing the host cell to produce a polypeptide expressed by the first polynucleotide and to further produce a second alkaloid by converting the first alkaloid into the second alkaloid in a reaction mediated by the polypeptide; and

(D) recovering the second alkaloid from the cell.

[00516] In some embodiments, a first and second polynucleotide are selected.

10 **[00517]** In some embodiments, a first polynucleotide comprising either SEQ.ID NO: 6 or SEQ.ID NO: 372 is selected and a second polynucleotide comprising SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903 is selected.

[00518] In another aspect, the polynucleotides of the present disclosure may be used to produce a cell that exhibits modulated levels of expression of a polypeptide of the present disclosure. In some embodiments, such a cell is a plant cell naturally expressing the polynucleotides of the present disclosure.

[00519] Accordingly, the present disclosure further provides, in a further embodiment, a method for modulating expression of polynucleotide in a cell naturally expressing such polynucleotide, the method comprising:

- 20 (a) providing a cell naturally expressing a polynucleotide;
- (b) mutagenizing the cell;
- (c) growing the cell to obtain a plurality of cells; and
- (d) determining if the plurality of cells comprises a cell comprising modulated levels of a polypeptide encoded by the polynucleotide;
- 25 and

wherein, the polynucleotide comprises a nucleic acid sequence selected from the nucleic acid sequences consisting of

- (a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID

- NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 and SEQ.ID. NO: 766;
- (b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);
- (c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;
- (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);
- (e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;
- (f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25,

SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;

(g) a nucleic acid sequence that hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f).

In some embodiments, the method further comprises a step (e) as follows:

(e) selecting a cell comprising modulated levels of the polypeptide and growing such cell to obtain a plurality of cells.

[00520] In preferred embodiments, plant seed cells are used to perform the mutagenesis. Mutagenic agents that may be used are chemical agents, including without limitation, base analogues, deaminating agents, alkylating agents, intercalating agents, transposons, bromine, sodium azide, ethyl methanesulfonate (EMS) as well as physical agents, including, without limitation, radiation, such as ionizing radiation and UV radiation.

[00521] Thus the present disclosure further provides, in a further embodiment, a method for producing a seed setting plant comprising modulated expression of a polynucleotide in a cell naturally expressing the polynucleotide, the method comprising:

- (a) providing a seed setting plant naturally expressing a polynucleotide;
- (b) mutagenizing seed of the plant to obtain mutagenized seed;

- (c) growing the mutagenized seed into the next generation mutagenized plants capable of setting the next generation seed; and
- (d) obtaining the next generation seed, or another portion of the mutagenized plants, and analyzing if the next generation plants or next generation seed exhibits modulated polynucleotide expression; and

wherein the polynucleotide comprises a nucleic acid sequence selected from the nucleic acid sequences consisting of

- (a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 and SEQ.ID. NO: 766;
- (b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);
- (c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;
- (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);
- (e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID

- NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;
- (f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901.; and
- (g) a nucleic acid sequence that hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f).

[00522] In preferred embodiments, a plurality of generations of plants or seed may be obtained, and portions of plants or seed in any or all of such generations may be analyzed. Analysis is typically performed by comparing expression levels (*e.g.* RNA levels or protein levels) in non-mutagenized (wild type) plants or seed with expression in mutagenized plants or seed. In further preferred embodiments, the analysis in step (d) may be performed by analyzing heteroduplex formation between wildtype DNA and mutated DNA. Thus in preferred embodiments, the analysing in step (d) comprises

- i. extracting DNA from mutated plants;
- 10 ii. amplifying a portion of the DNA comprising a nucleic acid sequence encoding codeine isomerase or codeinone reductase to obtain amplified mutated DNA;
- iii. extracting DNA from wild type plants;
- iv. mixing the DNA from wild type plants with the amplified mutated DNA and form a heteroduplexed polynucleotide;
- 15 v. incubating the heteroduplexed polynucleotide with a single stranded restriction nuclease capable of restricting at a region of the heteroduplexed polynucleotide that is mismatched; and
- vi. determining the site of mismatch in the heteroduplex polynucleotide.
- 20

[00523] In further aspects, the polynucleotides of the present disclosure may be used to produce a cell that exhibits modulated levels of expression of a polynucleotide of the present disclosure by gene silencing the polynucleotide. Thus the present disclosure, in a further embodiment, includes a method of reducing the expression of a polynucleotide in a cell, comprising:

- (a) providing a cell expressing a polynucleotide; and
 - (b) silencing expression of the polynucleotide in the cell; and
- wherein the polynucleotide comprises a nucleic acid sequence selected from the nucleic acid sequences consisting of
- 30 (a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15,

- SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 and SEQ.ID. NO: 766;
- (b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);
- (c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;
- (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);
- (e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901;

- (f) a nucleic acid sequence that encodes a functional variant of any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, or SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901; and
- (g) a nucleic acid sequence that hybridizes under stringent conditions to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or (f).

[00524] In preferred embodiments, the cell is a plant cell.

- 20 **[00525]** In some embodiments, the plant belongs to the plant family of Papaveraceae.

- [00526]** In some embodiments, the plant belongs to the plant species *Papaver somniferum*, *Papaver bracteatum*, *Papaver nudicale*, *Papaver orientale* or *Papaver rhoeas*. A preferred methodology to silence the polynucleotide that is used is virus induced gene silencing (known to the art as VIGS). In general, in plants infected with unmodified viruses, the viral genome is targeted. However, when viral vectors have been modified to carry inserts derived from host genes (*e.g.* portions of sequences encoding codeine isomerase or codeinone reductase), the process is additionally targeted against the corresponding mRNAs. Thus the present disclosure further includes a method of producing a plant expressing reduced levels of the polynucleotide, the method comprising

- (h) providing a plant expressing a polynucleotide; and

- (i) reducing expression of the polynucleotide in the plant using virus induced gene silencing; and wherein polynucleotide comprising a nucleic acid sequence selected from the nucleic acid sequences consisting of
- 5 (a) SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16, SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID
- 10 NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85,
- 15 SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93, SEQ.ID NO: 113 to SEQ.ID NO: 505 and SEQ.ID. NO: 766;
- (b) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a);
- 20 (c) a nucleic acid sequence that is substantially identical to any one of the nucleic acid sequences of (a) but for the degeneration of the genetic code;
- (d) a nucleic acid sequence that is complementary to any one of the nucleic acid sequences of (a);
- 25 (e) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID
- 30 NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68,

SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO:
73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID
NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101,
SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID
5 NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110,
SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or
SEQ.ID NO: 768 to SEQ.ID NO: 901;

(f) a nucleic acid sequence that encodes a functional variant of any one
of the amino acid sequences set forth in SEQ.ID NO: 24, SEQ.ID NO: 25,
10 SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30,
SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO:
35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID
NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44,
SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63,
15 SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68,
SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO:
73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID
NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101,
SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID
20 NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110,
SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or
SEQ.ID NO: 768 to SEQ.ID NO: 901; and

(g) a nucleic acid sequence that hybridizes under stringent conditions
to any one of the nucleic acid sequences set forth in (a), (b), (c), (d), (e) or
25 (f).

[00527] The hereinbefore mentioned methods to modulate expression levels
of the polynucleotide may result in modulations in the levels of plant alkaloids,
including without limitation in the levels of morphine, thebaine and reticuline.
Thus the present disclosure includes the use of the methodologies to modify the
30 levels of plant alkaloids in a plant naturally capable of producing plant alkaloids.

[00528] Modulation of expression may be achieved in a variety of ways. In
one embodiment, Antisense or RNA interference approaches may be used to

down-regulate expression of the polynucleotides of the present disclosure, *e.g.*, as a further mechanism for modulating cellular phenotype. That is, antisense sequences of the polynucleotides of the present disclosure, or subsequences thereof, may be used to block expression of naturally occurring homologous polynucleotide sequences. A variety of sense and antisense technologies, *e.g.*, as set forth in Lichtenstein and Nellen (Antisense Technology: A Practical Approach IRL Press at Oxford University, Oxford, England, 1997), can be used.

[00529] In certain embodiments, sense or antisense polynucleotide are introduced into a cell, where they are transcribed. Such polynucleotides may include both simple oligonucleotide sequences and catalytic sequences such as ribozymes.

[00530] In certain embodiments, a reduction or elimination of expression (i.e., a "knock-out" or "knockdown") thebaine synthesis polypeptide in a transgenic cell or plant is produced by introduction of a construct which expresses an antisense of a thebaine synthesis polypeptide coding strand or fragment thereof. For antisense suppression, the thebaine synthesis polypeptide cDNA or fragment thereof is arranged in reverse orientation (with respect to the coding sequence) relative to the promoter sequence in the expression vector. In certain embodiments, the introduced sequence need not correspond to the full length cDNA or gene, and need not be identical to the cDNA or gene found in the cell or plant to be transformed.

[00531] In certain embodiments, the antisense sequence need only be capable of hybridizing to the target gene or RNA of interest. Thus, where the introduced polynucleotide sequence is of shorter length, a higher degree of homology to the endogenous transcription factor sequence will be needed for effective antisense suppression. While antisense sequences of various lengths can be utilized, in some embodiments, the introduced antisense polynucleotide sequence in the vector is at least 10, 20, 30, 40, 50, 100 or more nucleotides in length in certain embodiments. Transcription of an antisense construct as described results in the production of RNA molecules that comprise a sequence that is the reverse complement of the mRNA molecules transcribed from the endogenous gene to be repressed.

[00532] In certain embodiments, a reduction or elimination of expression (i.e., a "knock-out" or "knockdown") of thebaine synthesis polypeptide in a transgenic cell or plant is accomplished by introduction of a construct that expresses siRNA that targets thebaine synthesis polypeptide. In certain
5 embodiments, siRNAs are short (20 to 24-bp) double-stranded RNA (dsRNA) with phosphorylated 5' ends and hydroxylated 3' ends with two overhanging nucleotides.

[00533] Antisense and RNAi treatments represent one way of altering thebaine synthesis polypeptide activity in accordance with the invention. In
10 particular, constructs comprising a thebaine synthesis polypeptide coding sequence, including fragments thereof, in antisense orientation, or combinations of sense and antisense orientation, may be used to decrease or effectively eliminate the expression of thebaine synthesis polypeptide in a cell or plant and obtain an improvement in shelf life as is described herein. Accordingly, this may
15 be used to "knock-out" the thebaine synthesis polypeptide or homologous sequences thereof.

[00534] Techniques for RNAi are well known in the art and are described in, for example, Lavorgna *et al.*, 2004, Trends in Biochem Sci 29 (2) 88-94 and Downward, 2004, BMJ 328 (7450) 1245-1248. The technique is based on the fact
20 that double stranded RNA is capable of directing the degradation of messenger RNA with sequence complementary to one or the other strand. Therefore, by expression of a particular coding sequence in sense and antisense orientation, either as a fragment or longer portion of the corresponding coding sequence, the expression of that coding sequence can be down-regulated.

[00535] In one embodiment, a reduction or elimination of expression (i.e., a "knock-out") of a thebaine synthesis polypeptide in a transgenic plant can be obtained by insertion mutagenesis using the T-DNA of *Agrobacterium tumefaciens* or a selection marker cassette or any other non-sense DNA fragments. After generating the insertion mutants, the mutants can be screened to identify those
25 containing the insertion in the thebaine synthesis polypeptide gene. Plants
30 containing one or more transgene insertion events at the desired gene can be

crossed to generate homozygous plant for the mutation, as described in Koncz *et al.*, (Methods in Arabidopsis Research; World Scientific, 1992).

[00536] Suppression of gene expression may also be achieved using a ribozyme. Ribozymes are RNA molecules that possess highly specific
5 endoribonuclease activity. The production and use of ribozymes are disclosed in U.S. Pat. No. 4,987,071 and U.S. Pat. No. 5,543,508, which are incorporated by reference in their entirety. Synthetic ribozyme sequences including antisense RNAs can be used to confer RNA cleaving activity on the antisense RNA, such that
10 endogenous mRNA molecules that hybridize to the antisense RNA are cleaved, which in turn leads to an enhanced antisense inhibition of endogenous gene expression.

[00537] A cell or plant trait may also be modified by using the Cre-lox system (for example, as described in U.S. Pat. No. 5,658,772). A cellular or plant genome can be modified to include first and second lox sites that are then contacted with a
15 Cre recombinase. If the lox sites are in the same orientation, the intervening DNA sequence between the two sites is excised. If the lox sites are in the opposite orientation, the intervening sequence is inverted. In addition, silencing approach using short hairpin RNA (shRNA) system, and complementary mature CRISPR RNA (crRNA) by CRISPR/Cas system, and virus inducing gene silencing (VIGS)
20 system may also be used to make down regulated or knockout of synthase mutants. Dominant negative approaches may also be used to make down regulated or knockout of THCA synthase mutants.

[00538] The RNA-guided endonuclease can be derived from a clustered regularly interspersed short palindromic repeats (CRISPR)/CRISPR-associated
25 (Cas) system. The CRISPR/Cas system can be a type I, a type II, or a type III system. Non-limiting examples of suitable CRISPR/Cas proteins include Cas3, Cas4, Cas5, Cas5e (or CasD), Cas6, Cas6e, Cas6f, Cas7, Cas8a1, Cas8a2, Cas8b, Cas8c, Cas9, Cas10, Cas10d, CasF, CasG, CasH, Csy1, Csy2, Csy3, Cse1 (or CasA), Cse2 (or CasB), Cse3 (or CasE), Cse4 (or CasC), Cse1, Cse2, Csa5, Csn2, Csm2, Csm3, Csm4, Csm5,
30 Csm6, Cmr1, Cmr3, Cmr4, Cmr5, Cmr6, Csb1, Csb2, Csb3, Csx17, Csx14, Csx10, Csx16, CsaX, Csx3, Csz1, Csx15, Csf1, Csf2, Csf3, Csf4, and Cul966.

[00539] In general, CRISPR/Cas proteins comprise at least one RNA recognition or RNA binding domain. RNA recognition or RNA binding domains interact with guide RNAs. CRISPR/Cas proteins can also comprise nuclease domains (i.e., DNase or RNase domains), DNA binding domains, helicase domains, 5 RNase domains, protein-protein interaction domains, dimerization domains, as well as other domains.

[00540] The CRISPR/Cas-like protein can be a wild type CRISPR/Cas protein, a modified CRISPR/Cas protein, or a fragment of a wild type or modified CRISPR/Cas protein. The CRISPR/Cas-like protein can be modified to increase 10 nucleic acid binding affinity and/or specificity, alter an enzyme activity, or change another property of the protein. For example, nuclease (i.e., DNase, RNase) domains of the CRISPR/Cas-like protein can be modified, deleted, or inactivated. Alternatively, the CRISPR/Cas-like protein can be truncated to remove domains that are not essential for the function of the fusion protein. The CRISPR/Cas-like 15 protein can also be truncated or modified to optimize the activity of the effector domain of the fusion protein.

[00541] In some embodiments, the plant belongs to the plant family of Papaveraceae.

[00542] In some embodiments, the plant belongs to the plant species 20 *Papaver somniferum*, *Papaver bracteatum*, *Papaver nudicale*, *Papaver orientale* or *Papaver rhoeas*.

[00543] In another aspect of the present disclosure, the polynucleotides of the present disclosure may be used to examine the presence of the polynucleotide in a cell, or a cell extract, such as a polynucleotide containing extract. Accordingly, 25 in some embodiments, the polynucleotides of the present disclosure may be labeled and used as a probe to examine the presence of the polynucleotide in a cell, or a cell extract.

[00544] In another aspect of the present disclosure, the polynucleotides of the present disclosure may be used to genotype plants.

30 [00545] In some embodiments, the plant belongs to the plant family of Papaveraceae.

[00546] In some embodiments, the plant belongs to the species *Papaver somniferum*, *Papaver bracteatum*, *Papaver nudicale*, *Papaver orientale* or *Papaver rhoeas*.

[00547] In general, genotyping provides a means of distinguishing homologs
5 of a chromosome pair and can be used to identify segregants in subsequent generations of a plant population. Molecular marker methodologies can be used for phylogenetic studies, characterizing genetic relationships among plant varieties, identifying crosses or somatic hybrids, localizing chromosomal segments affecting monogenic traits, map based cloning, and the study of quantitative
10 inheritance. See, *e.g.*, Plant Molecular Biology: A Laboratory Manual, Chapter 7, Clark, Ed., Springer-Verlag, Berlin (1997). For molecular marker methodologies, see generally, The DNA Revolution by Andrew H. Paterson 1996 (Chapter 2) in: Genome Mapping in Plants (ed. Andrew H. Paterson) by Academic Press/R. G. Landis Company, Austin, Tex., pp.7-21. The particular method of genotyping in
15 accordance with the present disclosure may involve the employment of any molecular marker analytic technique including, but not limited to, restriction fragment length polymorphisms (RFLPs). RFLPs reflect allelic differences between DNA restriction fragments caused by nucleic acid sequence variability. As is known to those of skill in the art, RFLPs are typically detected by extraction of
20 plant genomic DNA and digestion of the genomic DNA with one or more restriction enzymes. Typically, the resulting fragments are separated according to size and hybridized with a nucleic acid probe. Restriction fragments from homologous chromosomes are revealed. Differences in fragment size among alleles represent an RFLP. Thus, the present disclosure further provides a means
25 to follow segregation of a portion or genomic DNA encoding a polynucleotide of the present disclosure, as well as chromosomal nucleic acid sequences genetically linked to these polynucleotides using such techniques as RFLP analysis. Linked chromosomal nucleic sequences are within 50 centiMorgans (cM), often within 40 or 30 cM, preferably within 20 or 10 cM, more preferably within 5, 3, 2, or 1 cM of
30 a genomic nucleic acid sequence encoding a polypeptide of the present disclosure. Thus, in accordance with the present disclosure the polynucleotides of the present disclosure may be used as markers to evaluate in a plant population

the segregation of polynucleotides genetically linked thereto. In some embodiments, the plant population comprises or consists of plants belonging to the plant families Papaveraceae. In other embodiments, the plant population comprises or consists of plants belonging to the plants species *Papaver* 5 *somniferum*, *Papaver bracteatum* *Papaver nudicale*, *Papaver orientale* or *Papaver rhoeas*.

[00548] In accordance with the present disclosure, the polynucleotide probes employed for molecular marker mapping of plant nuclear genomes selectively hybridize, under selective hybridization conditions, to a genomic 10 sequence encoding a polypeptide of the present disclosure, including, in specific embodiments, polypeptides comprising an amino acid sequence selected from SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, 15 SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, 20 SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901; and in other embodiments, a functional variant of a polypeptide having an amino acid 25 sequence set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, 30 SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95,

SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901.

[00549] Typically, these probes are cDNA probes. Typically these probes are at least 15 bases in length, more preferably at least 20, 25, 30, 35, 40, or 50 bases in length. Generally, however, the probes are less than about 1 kilobase in length. Preferably, the probes are single copy probes that hybridize to a unique locus in a haploid plant chromosome complement. Some exemplary restriction enzymes employed in RFLP mapping are EcoRI, EcoRV, and SstI. As used herein the term "restriction enzyme" includes reference to a composition that recognizes and, alone or in conjunction with another composition, cleaves a polynucleotide at a specific nucleic acid sequence.

[00550] Other methods of differentiating polymorphic (allelic) variants of the nucleic acid sequences of the present disclosure can be used by utilizing molecular marker techniques well known to those of skill in the art, including, without limitation: 1) single stranded conformation analysis (SSCP); 2) denaturing gradient gel electrophoresis (DGGE); 3) RNase protection assays; 4) allele-specific oligonucleotides (ASOs); 5) the use of proteins which recognize nucleotide mismatches, such as the *E. coli* mutS protein; and 6) allele-specific PCR. Other approaches based on the detection of mismatches between the two complementary DNA strands include, without limitation, clamped denaturing gel electrophoresis (CDGE); heteroduplex analysis (HA), and chemical mismatch cleavage (CMC).

[00551] Thus, the present disclosure further provides a method of genotyping comprising the steps of contacting, under stringent hybridization conditions, a sample suspected of comprising a nucleic acid encoding a polypeptide of the present disclosure, including, in specific embodiments, polypeptides comprising an amino acid sequence selected from SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34,

SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39,
 SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44,
 SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63,
 SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68,
 5 SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73,
 SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97,
 SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102,
 SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107,
 SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112,
 10 SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO: 768 to SEQ.ID NO: 901; and in
 other embodiments, a functional variant of a polypeptide having an amino acid
 sequence set forth in SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27,
 SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32,
 SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37,
 15 SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42,
 SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61,
 SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66,
 SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71,
 SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95,
 20 SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100,
 SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105,
 SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110,
 SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 or SEQ.ID NO:
 768 to SEQ.ID NO: 901 and with a nucleic acid probe capable of hybridizing to a
 25 polynucleotide sequence encoding the foregoing. Generally, the sample is a plant
 sample, and in some embodiments, a sample suspected of comprising a *Papaver
 somniferum* nucleic acid sequence encoding polynucleotides of the present
 disclosure. The polynucleotide probe selectively hybridizes, under stringent
 conditions, to a subsequence of the nucleic acid sequence encoding the
 30 polypeptide comprising a polymorphic marker. Selective hybridization of the
 polynucleotide probe to the polymorphic marker nucleic acid sequence yields a
 hybridization complex. Detection of the hybridization complex indicates the

presence of that polymorphic marker in the sample. In preferred embodiments, the polynucleotide probe comprises a portion of a nucleic acid sequence encoding polypeptide of the present disclosure.

[00552] The alkaloids obtained in accordance with the present disclosure
5 may be formulated for use as a pharmaceutical drug, therapeutic agent or medicinal agent. Thus the present disclosure further includes a pharmaceutical composition comprising an alkaloid compound prepared in accordance with the methods of the present disclosure. Pharmaceutical drug preparations comprising an alkaloid in accordance with the present disclosure preferably further comprise
10 vehicles, excipients and auxiliary substances, such as wetting or emulsifying agents, pH buffering substances and the like. These vehicles, excipients and auxiliary substances are generally pharmaceutical agents that may be administered without undue toxicity. Pharmaceutically acceptable excipients include, but are not limited to, liquids such as water, saline, polyethyleneglycol,
15 hyaluronic acid, glycerol and ethanol. Pharmaceutically acceptable salts can also be included therein, for example, mineral acid salts such as hydrochlorides, phosphates, sulfates, and the like; and the salts of organic acids such as acetates, propionates, benzoates, and the like. It is also preferred, although not required, that the preparation will contain a pharmaceutically acceptable excipient that
20 serves as a stabilizer. Examples of suitable carriers that also act as stabilizers for peptides include, without limitation, pharmaceutical grades of dextrose, sucrose, lactose, sorbitol, inositol, dextran, and the like. Other suitable carriers include, again without limitation, starch, cellulose, sodium or calcium phosphates, citric acid, glycine, polyethylene glycols (PEGs), and combinations thereof. The
25 pharmaceutical composition may be formulated for oral and intravenous administration and other routes of administration as desired. Dosing may vary and may be optimized using routine experimentation.

[00553] In further embodiments, the present disclosure provides an alkaloid for use as a precursor and raw material to form a second alkaloid compound
30 which may be formulated for use as a pharmaceutical drug, therapeutic agent or medicinal agent.

EXAMPLES

[00554] Hereinafter are provided examples of specific embodiments for performing the methods of the present disclosure, as well as embodiments representing the compositions of the present disclosure. The examples are provided for illustrative purposes only, and are not intended to limit the scope of the present disclosure in any way.

Example 1 – Identification of polynucleotides

[00555] *Plant genomic DNA extraction* – One gram of frozen *Papaver somniferum* seedlings at the cotyledonary stage was ground to a fine powder under liquid N₂. Pre-warmed (65°C) CTAB (cetyltrimethyl ammonium bromide) buffer (2% (w/v) CTAB, 100 mM Tris-HCl, pH 8.0, 2.0 M NaCl, 25 mM EDTA, pH 8.0, 1% (w/v) PVP, 2% (v/v) 2-mercaptoethanol, was added to the powdered tissue. The mixture was incubated at 65°C for 30 minutes with occasional vortex and extracted twice with an equal volume of chloroform:isoamyl alcohol (24:1, v/v). The upper aqueous phase was transferred to a clean tube. Genomic DNA was precipitated with the addition of equal volume of -20°C isopropanol. After incubation at 4°C for 30 minutes, the mixture was centrifuged at 13,000 *g* for 20 minutes at 4°C. The DNA pellet was dissolved in 2 mL of TE buffer and treated with 5 µL of RNaseA at 37°C for 20 minutes. The mixture was again extracted with equal volume of chloroform:isoamyl alcohol (24:1, v/v). Genomic DNA in the extracted upper aqueous phase was precipitated by the addition of sodium acetate (pH 5.3) at final concentration of 0.3 M and equal volume of -20°C isopropanol. After incubation at 4°C for 20 minutes, the mixture was centrifuged at 13,000 *g* for 20 minutes at 4°C. The DNA pellet was washed three times with 70% (v/v) ethanol, followed by speed vacuum drying. Finally, the DNA pellet was dissolved in TE buffer.

[00556] *Genomic DNA sequencing* – *Papaver somniferum* genomic DNA was subjected to (i) short-read sequencing, which generated between 30 to 210 million 100 bp Paired-End or Mate-Pair reads from the Illumina HiSeq 2000/2500 sequencer per readset. The read base quality was encoded in phred 33 and (ii) long-read sequencing, which generated between 20,000 to 200,000 sub-reads from PacBio RS II sequencer per readset. The average length of sub-reads varied

from 3 to 8 kb per readset. The analytical pipeline was executed on Compute Canada clusters via unix bash commands, perl scripts, python scripts and open source software. Paired-End reads were trimmed from the 3' end to have a phred score of at least 30. Illumina sequencing adapters were removed from the reads, and all reads were required to have a length of at least 50 bp. Trimming and clipping were done with the Trimmomatic software (Bolger, et al., 2014, *Bioinformatics* 30:2114-2120). The Illumina Nextera Mate Pair protocol employs a circularisation-based strategy that leaves behind 38 bp adapter sequences, which must be computationally removed from the data. The 3' ward portion of the read constitutes valuable sequence that can be retained to improve coverage and de novo assembly quality. Depending on where the adapter lies in the read, the paired sequences should be reinterpreted as a single read plus either a mate pair or a paired-end read, choosing between the latter two options so as to maximise the number of bases that are paired. The Mate Pair specific trimming was done using the Nxtrim software (O'Connell, et al., 2015, *Bioinformatics* 31:2035-2037). The filtered reads were assembled to create the first consensus sequence. The assembly was done using the information of every Paired-End readset through a deBruijn graph approach. The better assembly was achieved by exploring the set of kmer possibility ranging from 21 to 91 and selecting the one that provided the best set of contigs. In a second step, the information brought by the Mate-Pair readset was incorporated to scaffold the consensus sequence. The scaffolding involved use of large DNA fragment sequencing information (the mate-pair sample) to join the contigs into scaffolds. Scaffolds can be full length DNA sequence but can also contain unresolved ambiguous sequence inserted as long stretches of N's. The use of mate-pair allows an estimate of the distance between contigs in the organism genome. If a gap can be filled-up by one or more specific contigs, the scaffolds would represent full-length DNA sequences. Otherwise, the scaffolds will include a stretch of N's corresponding to estimate the distance between contigs. The assembly and scaffolding software used was SOAPdenovo (Luo, et al., 2012, *Gigascience* 1:18). Pacific Biosciences SMART analysis software was used to generate 'filtered sub-reads' from the instrument. The term 'sub-read' refers to the portion of a read from a single pass of the template. Filtering refers to

a process within the software to identify quality reads. Filtered sub-reads were generated following primary analysis where the SMART bell adaptors are separated from the long raw reads, and low quality bases reported by the instrument are removed. Once the scaffolding with Mate-Pair was completed, a scaffolding of the consensus sequence was performed with assembled Rnaseq data (EST) using SCUBAT pipeline. SCUBAT will align the transcripts to the genome and identify informative split transcripts mapped to more than one contig. It then will create scaffolds by orienting the contig based on the alignment information and adding 10 N's in-between the contigs. Once the scaffolding with EST was done, a scaffolding and gap filling of the consensus sequence was performed with filtered PacBio data using PBjelly (English, et al., 2012, *PLoS One* 7:e47768). PBjelly maps the long-reads to the reference with the PacBio data error model under consideration, though BLASR. Alignment information is parsed and serves to identify reads that fill gaps. After the gap-supporting sequence reads were identified, PBjelly assembled the reads for each gap to generate a high quality gap-filling consensus sequence. The final consensus sequence was then annotated by mapping assembled EST to the reference sequence using BLAT (Kent, 2002, *Genome Res* 12:656-664). This step generated a high level of noise due to partial mapping of protein domains. A filter was applied only to conserve the results of the most relevant hits. Only hits of more than 21 bp, which aligned to more than 80% of EST lengths, were retained. Duplicate hits with same start and end positions that another existing hit were removed. All existing EST and protein sequence corresponding to *Papaver somniferum* were downloaded from the NCBI website and used in combination with the assembled ESTs from the RNAseq data to perform an in-silico gene prediction using MAKER software (Cantarel, et al., 2008, *Genome Res* 18:188-196). MAKER identifies repeats, aligns ESTs and proteins to a genome, produces *ab-initio* gene predictions and automatically synthesizes these data into gene annotations having evidence-based quality values. During all the assembly process, summary statistics of the de Novo assemblies were computed to ensure a sufficient level of quality of the consensus sequence. The summary statistics are computed using the QUAST software (Gurevich, et al., 2013, *Bioinformatics* 29:1072-1075).

[00557] Polynucleotide sequences: SEQ.ID NO: 1 to SEQ.ID NO: 23 and SEQ.ID NO: 47 to SEQ.ID NO: 93 set forth herein were obtained using the foregoing methodology

5 **Example 2 – Identification of additional polynucleotides**

[00558] In order to further expand on the genomic sequences identified as described in Example 1, another sequencing methodology was used, namely the so called the “Chicago method” (Putnam, N.H. *et al.*, 2016, *Genome Res.* 26, 342 -350). In the performance of the Chicago method, the average scaffold length increased
10 from 0.08 megabases to 0.93 megabases, and additional polynucleotides SEQ.ID NO: 113 to 505 and SEQ.ID NO: 766 set forth herein were identified.

Example 3 – Expression of polynucleotides in engineered yeast

[00559] To exploit the physiological functions of novel genes, yeast platform
15 strains with chromosome-integrated BIA biosynthetic genes were constructed using a USER cloning system. USER (uracil-specific excision reaction)-based cloning have been used for the integration of multiple genes into the yeast genome owing to its relatively straightforward application and independence from the enzyme-based ligation of DNA fragments (Nour-Eldin et al., 2006, *Nucleic Acids*
20 *Research* 34:e122). A comprehensive review of USER-based cloning methods, including a one-step procedure for multi-part DNA-construct assembly termed ‘USER fusion’, is available (Nour-Eldin et al., 2010, *Methods Mol Biol* 643:185-200). Multiple PCR products of BIA biosynthetic genes and Gal1/Gal10 promoter regions were simultaneous cloned to the USER cloning vectors initially nicked
25 with *Asi*SI and *Nb.Bsm*I and then transformed into yeast cells using the LiAc/PEG/single-stranded carrier DNA (ssDNA) transformation method (Gietz and Schiestl, 2007, *Nature Protocols* 2:35-37). The high-copy number pESC-Ura (or, alternatively, pESC-Leu or pESC-His) vector was used to express gene candidates using the *Gal10* promoter. PCR-amplified candidate genes from cDNA
30 using primers flanked with *Spe*I and *Not*I restriction sites were ligated to the pESC-Ura vector to generate transient expressing constructs. Transient expression constructs were individually transformed to the platform yeast strains with

chromosome-integrated BIA biosynthetic genes using the LiAc/PEG/single-stranded carrier DNA (ssDNA) transformation method (Gietz and Schiestl, 2007). Each yeast strain transiently expressing a different candidate gene was incubated in SD-drop out medium overnight. The overnight culture were then diluted into a
5 SD-drop out medium containing 2% (w/v) galactose and 200 μ M of the BIA suitable for conversion by the baseline yeast strain or the transient expression construct. Yeast cultures were grown for 24 and 48 h, and cells were removed by centrifugation. Supernatant aliquots (5 μ L), which contained alkaloids secreted by the yeast cells into the culture medium, were subjected to high-resolution mass
10 spectrometry analysis.

Example 4 – Expression of Betv-1 in yeast expressing SalAT and SalR genes, and fed salutaridine, and co-expression of Betv-1 and purine permease in yeast expressing SalAT and SalR genes, and fed salutaridine.

15 **[00560]** A *Saccharomyces cerevisiae* strain CENPK102-5B expressing salutaridinol 7-O-acetyltransferase (SalAT) and salutaridine reductase (SalR) genes integrated into the yeast genome was transformed with a yeast expression vector pEV-1 harboring various polynucleotide constructs expressing Betv-1 and purine permease polypeptides as follows: (i) a nucleic acid sequence encoding Betv-1
20 alone (SEQ.ID NO: 29) (HA_BetV1M); (ii) a nucleic acid sequence encoding Betv-1 alone (SEQ.ID NO: 900) (BETV1L_HA); a nucleic acid sequence expressing Betv-1 (SEQ.ID NO: 29) and purine permease (SEQ.ID NO: 779) (HA_BetV1M-pp); and (iv) a nucleic acid sequence expressing Betv-1 (SEQ.ID NO: 900) and purine permease (SEQ.ID NO: 779) (BetV1L_HA-pp). The strains, as well as a control strain with
25 pEV-1 not comprising a nucleic acid sequences encoding Betv-1 or purine permease (EV) were separately cultivated in growth medium SD-Leu-His in the presence of 100 μ M salutaridine for 24 hrs. An aliquot of 5 μ L of culture medium was subjected to mass spectrometry analysis using an LTQ-Orbitrap XL high-resolution mass spectrometer. Thereafter the thebaine concentration in the
30 medium of each strain was determined according to a thebaine standard curve. The results are shown in **FIG. 5**. As can be seen in **FIG. 5**, thebaine production increased 6-fold (to approximately 600 μ g/L/OD) in the medium containing

strains transformed with only a Betv-1 (HA_BetV1M and BETV1L_HA) compared with strains expressing only SalAT and SalR. However, and surprisingly, in excess of 9,000 µg/L/OD thebaine was detected in the medium containing strains transformed with both Betv_1 and purine permease (HA_BetV1M-pp and BetV1L_HA-pp), thus, generating an additional 16-fold increase compared with strains with only a Betv-1 (HA_BetV1M and BETV1L_HA). The production of thebaine increased approximately 100-fold in strains transformed with both Betv_1 and purine permease (HA_BetV1M-pp and BetV1L_HA-pp) compared with strains expressing only SalAT and SalR.

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Example 5 – Expression of Betv-1 in yeast and co-expression of Betv-1 and purine permease in yeast, fed salutaridine.

[00561] A *Saccharomyces cerevisiae* strain CENPK102-5B was transformed with a yeast expression vector pEV-1 harboring various polynucleotide constructs expressing Betv-1 and purine permease polypeptides as follows: (i) a nucleic acid sequence encoding Betv-1 alone (SEQ.ID NO: 29) (HA_BetV1M); (ii) a nucleic acid sequence encoding Betv-1 alone (SEQ.ID NO: 900) (BETV1L_HA); a nucleic acid sequence expressing Betv-1 (SEQ.ID NO: 29) and purine permease (SEQ.ID NO: 779) (HA_BetV1M-pp); and (iv) a nucleic acid sequence expressing Betv-1 (SEQ.ID NO: 900) and purine permease (SEQ.ID NO: 779) (BetV1L_HA-pp). The strains, as well as a control strain with pEV-1 not comprising a nucleic acid sequences encoding Betv-1 or purine permease (EV) were separately cultivated in growth medium SD-Leu-His in the presence of 100 µM salutaridine for 24 hrs. Yeast cells were collected by centrifugation, extracted in 500 µL of methanol, of which 5 µL was subjected to mass spectrometry analysis using an LTQ-Orbitrap XL high-resolution mass spectrometer. Thereafter the salutaridine concentration in the cells of each strain was determined according to a salutaridine standard curve. The results are shown in **FIG. 6**. As can be seen in **FIG. 6**, salutaridine accumulation increased 8-fold (to approximately 132 µg/L/OD) in the cells of strains transformed with a Betv-1 (HA_BetV1M and BETV1L_HA) and a purine permease (HA_BetV1M-pp and HA_BetV1L-pp). Compared with the empty vector

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(EV) control, salutaridine accumulation did not increase in cells transformed only with a Betv-1 (HA_BetV1M and BETV1L_HA).

Example 6 – Expression of purine permeases (PUP-L) and (PUP-N) in yeast expressing DODC, MAO, NCS, 6OMT, CNMT and 4'OMT genes, and fed either L-DOPA or norlaudanosoline (NLDS), and co-expression of PUP-L and PUP-N with a Betv1 in yeast expressing DODC, MAO, NCS, 6OMT, CNMT and 4'OMT genes, and fed either DOPA or norlaudanosoline (NLDS).

A *Saccharomyces cerevisiae* strain CENPK102-5B expressing dopa decarboxylase (DODC), monoamine oxidase (MAO), norcoclaurine synthase (NCS), norcoclaurine 6-O-methyltransferase (6OMT), coclaurine N-methyltransferase (CNMT), and 3'hydroxy-N-methyltransferase 4'-O-methyltransferase (4'OMT) genes integrated into the yeast genome was transformed with a yeast expression vector pEV-1 harboring various polynucleotide constructs expressing purine permease and Betv1 polypeptides as follows: (i) a nucleic acid sequence encoding a purine permease containing a C-terminal extension absent in a purine permease linked to a cluster of 10 noscapine biosynthetic genes (Winzer, T., Gazda, V., He Z., Kaminski F., Kern M., Larson T.R., Li Y., Meade F., Teodor R., Vaistij F.E., Walker C., Bowser T.A., Graham, I.A. (2012) A *Papaver somniferum* 10-gene cluster for synthesis of the anticancer alkaloid noscapine. *Science* 336(6089): 1704-1708) alone (SEQ.ID NO: 779) (PUP-L); (ii) a nucleic acid sequence encoding a purine permease linked to a cluster of 10 noscapine biosynthetic genes (Winzer *et al.*, 2012) alone (SEQ.ID NO: 901) (PUP-N) (nucleic acid sequence SEQ.ID NO: 902 was codon optimized and C-terminally myc-tagged to obtain nucleic acid sequence SEQ.ID NO: 903 (myc-tag sequence SEQ.ID NO: 904)); (iii) a nucleic acid sequence expressing PUP-L (SEQ.ID NO: 779) and a Betv1 (SEQ.ID NO: 29) (Betv1-PUP-L); and (iv) a nucleic acid sequence expressing PUP-N (SEQ.ID NO: 901) and a Betv1 (SEQ.ID NO: 29) (Betv1-PUP-N). The strains, as well as a control strain with pEV-1 not comprising a nucleic acid sequences encoding Betv-1 or purine permease (EV) were separately cultivated in growth medium SD-Leu-His in the presence of either 100 μ M L-DOPA or 100 μ M norlaudanosoline (NLDS) for 24 hrs. An aliquot of 5 μ L of culture medium was subjected to mass spectrometry analysis using an LTQ-

Orbitrap XL high-resolution mass spectrometer. Thereafter the reticuline concentration in the medium of each strain was determined according to a reticuline standard curve. The results are shown in **FIG. 7**. As can be seen in **FIG. 7**, reticuline production was not affected in the medium of strains transformed with only a purine permease (PUP-L or PUP-N) or a purine permease and a Betv1 (Betv1_PUP-L and Betv1_PUP-N) compared with strains expressing only DODC, MAO, NCS, 6OMT, CNMT and 4'OMT. However, and surprisingly, reticuline production increased 25-fold to more than 1,000 µg/L/OD in the medium containing strains transformed with both PUP-L and PUP-L and Betv1. Neither PUP-N nor Betv1 alone affected the production of reticuline compared with empty vector controls.

Example 7 – Expression of purine permeases (PUP-L) and (PUP-N) in yeast expressing REPI, CPR, and SalSyn genes or REPI, CPR, SalSyn, SalR and SalAT genes, and fed (*S*)-reticuline, and co-expression of PUP-L and PUP-N with a Betv1.

[00562] A *Saccharomyces cerevisiae* strain CENPK102-5B expressing reticuline epimerase (REPI), cytochrome P450 reductase (CPR) and salutarine synthase (SalSyn) genes integrated into the yeast genome was transformed with a yeast expression vector pEV-1 harboring various polynucleotide constructs expressing purine permease and Betv1 polypeptides as follows: (i) a nucleic acid sequence encoding a purine permease containing a C-terminal extension absent in a purine permease linked to a cluster of 10 noscapine biosynthetic genes (Winzer *et al.*, 2012) alone (SEQ.ID NO: 779) (PUP-L); (ii) a nucleic acid sequence encoding a purine permease linked to a cluster of 10 noscapine biosynthetic genes (Winzer *et al.*, 2012) alone (SEQ.ID NO: 901) (PUP-N); (iii) a nucleic acid sequence expressing PUP-L (SEQ.ID NO: 779) and a Betv1 (SEQ.ID NO: 29) (Betv1-PUP-L); and (iv) a nucleic acid sequence expressing PUP-N (SEQ.ID NO: 901) and a Betv1 (SEQ.ID NO: 29) (Betv1-PUP-N). The strains, as well as a control strain with pEV-1 not comprising a nucleic acid sequences encoding Betv-1 or purine permease (EV) were separately cultivated in growth medium SD-Leu-His in the presence of 100 µM (*S*)-reticuline for 24 hrs. An aliquot of 5 µL of culture medium was subjected to

mass spectrometry analysis using an LTQ-Orbitrap XL high-resolution mass spectrometer. Thereafter the salutaridine and thebaine concentrations in the medium of each strain were determined according to salutaridine and thebaine standard curves, respectively. The results are shown in **FIG. 8A**. As can be seen in

5 **FIG. 8A**, salutaridine production was not affected in the medium of strains transformed with PUP-N, or PUP-N and a Betv1 (Betv1_PUP-N) compared with strains expressing only REPI, CPR, and SalSyn. However, and surprisingly, salutaridine production increased 3-fold compared with the empty vector (EV) control to more than 150 µg/L/OD in the medium containing strains transformed

10 with either PUP-L alone or PUP-L and a Betv1 (Betv1_PUP-L). **B**, A *Saccharomyces cerevisiae* strain CENPK102-5B expressing reticuline epimerase (REPI), cytochrome P450 reductase (CPR), salutarine synthase (SalSyn), salutaridine reductase (SalR), and salutaridine acetyltransferase (SalAT) genes integrated into the yeast genome was transformed with a yeast expression vector pEV-1

15 harboring various polynucleotide constructs expressing purine permease and Betv1 polypeptides as follows: (i) a nucleic acid sequence encoding a purine permease containing a C-terminal extension absent in a purine permease linked to a cluster of 10 noscapine biosynthetic genes (Winzer *et al.*, 2012) alone (SEQ.ID NO: 779) (PUP-L); (ii) a nucleic acid sequence encoding a purine permease linked

20 to a cluster of 10 noscapine biosynthetic genes (Winzer *et al.*, 2012) alone (SEQ.ID NO: 901) (PUP-N); (iii) a nucleic acid sequence expressing PUP-L (SEQ.ID NO: 779) and a Betv1 (SEQ.ID NO: 29) (Betv1-PUP-L); and (iv) a nucleic acid sequence expressing PUP-N (SEQ.ID NO: 901) and a Betv1 (SEQ.ID NO: 29) (Betv1-PUP-N). The strains, as well as a control strain with pEV-1 not comprising a nucleic acid

25 sequences encoding Betv-1 or purine permease (EV) were separately cultivated in growth medium SD-Leu-His in the presence of 100 µM (*S*)-reticuline for 24 hrs. An aliquot of 5 µL of culture medium was subjected to mass spectrometry analysis using an LTQ-Orbitrap XL high-resolution mass spectrometer. Thereafter the salutaridine and thebaine concentrations in the medium of each strain were

30 determined according to salutaridine and thebaine standard curves, respectively. The results are shown in **FIG. 8B**. As can be seen in **FIG. 8B**, salutaridine and thebaine production was not affected in the medium of strains transformed with

PUP-N compared with strains expressing only REPI, CPR, SalSyn, SalR and SalAT. However, and surprisingly, salutaridine production increased 2-fold compared with the empty vector (EV) control to approximately 150 µg/L/OD in the medium containing strains transformed with either PUP-L alone or PUP-L and a Betv1 (Betv1_PUP-L). Thebaine production increased 4-fold compared with the empty vector (EV) control in the medium containing strains transformed with PUP-L alone. Thebaine production increased almost 20-fold compared with the empty vector (EV) control to approximately 95 µg/L/OD in the medium containing strains transformed with PUP-L and a Betv1 (Betv1_PUP-L). Thebaine production increased approximately 2-fold compared with the empty vector (EV) control to approximately 12 µg/L/OD in the medium containing strains transformed with PUP-N and a Betv1 (Betv1_PUP-L) owing to the thebaine-forming activity of Betv1.

Example 8 – Expression of a purine permeases (PUP-L) and (PUP-N) in yeast expressing REPI, CPR, and SalSyn genes or REPI, CPR, SalSyn, SalR and SalAT genes, and fed (*R*)-reticuline, and co-expression of PUP-L and PUP-N with Betv1.

[00563] A *Saccharomyces cerevisiae* strain CENPK102-5B expressing reticuline epimerase (REPI), cytochrome P450 reductase (CPR) and salutarine synthase (SalSyn) genes integrated into the yeast genome was transformed with a yeast expression vector pEV-1 harboring various polynucleotide constructs expressing purine permease and Betv1 polypeptides as follows: (i) a nucleic acid sequence encoding a purine permease containing a C-terminal extension absent in a purine permease linked to a cluster of 10 noscapine biosynthetic genes (Winzer *et al.*, 2012) alone (SEQ.ID NO: 779) (PUP-L); (ii) a nucleic acid sequence encoding a purine permease linked to a cluster of 10 noscapine biosynthetic genes (Winzer *et al.*, 2012) alone (SEQ.ID NO: 901) (PUP-N); (iii) a nucleic acid sequence expressing PUP-L (SEQ.ID NO: 779) and a Betv1 (SEQ.ID NO: 29) (Betv1-PUP-L); and (iv) a nucleic acid sequence expressing PUP-N (SEQ.ID NO: 901) and a Betv1 (SEQ.ID NO: 29) (Betv1-PUP-N). The strains, as well as a control strain with pEV-1 not comprising a nucleic acid sequences encoding Betv-1 or purine permease (EV) were separately cultivated in growth medium SD-Leu-His in the presence of 100

5 μM (*R*)-reticuline for 24 hrs. An aliquot of 5 μL of culture medium was subjected to mass spectrometry analysis using an LTQ-Orbitrap XL high-resolution mass spectrometer. Thereafter the salutaridine and thebaine concentrations in the medium of each strain were determined according to salutaridine and thebaine standard curves, respectively. The results are shown in **FIG. 9A**. As can be seen in **FIG. 9A**, salutaridine production was not affected in the medium of strains transformed with PUP-N, or PUP-N and a Betv1 (Betv1_PUP-N) compared with strains expressing only REPI, CPR, and SalSyn. However, and surprisingly, salutaridine production increased 3-fold compared with the empty vector (EV) control to more than 150 $\mu\text{g/L/OD}$ in the medium containing strains transformed with either PUP-L alone or PUP-L and a Betv1 (Betv1_PUP-L). **B**, A *Saccharomyces cerevisiae* strain CENPK102-5B expressing reticuline epimerase (REPI), cytochrome P450 reductase (CPR), salutarine synthase (SalSyn), salutaridine reductase (SalR), and salutaridine acetyltransferase (SalAT) genes integrated into the yeast genome was transformed with a yeast expression vector pEV-1 harboring various polynucleotide constructs expressing purine permease and Betv1 polypeptides as follows: (i) a nucleic acid sequence encoding a purine permease containing a C-terminal extension absent in a purine permease linked to a cluster of 10 noscapine biosynthetic genes (Winzer *et al.*, 2012) alone (SEQ.ID NO: 779) (PUP-L); (ii) a nucleic acid sequence encoding a purine permease linked to a cluster of 10 noscapine biosynthetic genes (Winzer *et al.*, 2012) alone (SEQ.ID NO: 901) (PUP-N); (iii) a nucleic acid sequence expressing PUP-L (SEQ.ID NO: 779) and a Betv1 (SEQ.ID NO: 29) (Betv1-PUP-L); and (iv) a nucleic acid sequence expressing PUP-N (SEQ.ID NO: 901) and a Betv1 (SEQ.ID NO: 29) (Betv1-PUP-N). The strains, as well as a control strain with pEV-1 not comprising a nucleic acid sequences encoding Betv-1 or purine permease (EV) were separately cultivated in growth medium SD-Leu-His in the presence of 100 μM (*R*)-reticuline for 24 hrs. An aliquot of 5 μL of culture medium was subjected to mass spectrometry analysis using an LTQ-Orbitrap XL high-resolution mass spectrometer. Thereafter the salutaridine and thebaine concentrations in the medium of each strain were determined according to salutaridine and thebaine standard curves, respectively. The results are shown in **FIG. 9B**. As can be seen in **FIG. 9B**, salutaridine and

thebaine production was not affected in the medium of strains transformed with PUP-N compared with strains expressing only REPI, CPR, SalSyn, SalR and SalAT. However, and surprisingly, salutaridine production increased 2-fold compared with the empty vector (EV) control to approximately 150 µg/L/OD in the medium containing strains transformed with either PUP-L alone or PUP-L and a Betv1 (Betv1_PUP-L). Thebaine production increased 4-fold compared with the empty vector (EV) control in the medium containing strains transformed with PUP-L alone. Thebaine production increased almost 20-fold compared with the empty vector (EV) control to approximately 95 µg/L/OD in the medium containing strains transformed with PUP-L and a Betv1 (Betv1_PUP-L). Thebaine production increased approximately 2-fold compared with the empty vector (EV) control to approximately 12 µg/L/OD in the medium containing strains transformed with PUP-N and a Betv1 (Betv1_PUP-N) owing to the thebaine-forming activity of Betv1.

Example 9 –Expression of purine permeases (PUP-L) and (PUP-N) in yeast expressing SalAT and SalR genes or REPI, CPR, SalSyn, SalR and SalAT genes, and fed salutaridine and co-expression of PUP-L and PUP-N with a Betv1.

[00564] A *Saccharomyces cerevisiae* strain CENPK102-5B expressing salutaridine reductase (SalR) and salutaridine acetyltransferase (SalAT) genes integrated into the yeast genome was transformed with a yeast expression vector pEV-1 harboring various polynucleotide constructs expressing purine permease and Betv1 polypeptides as follows: (i) a nucleic acid sequence encoding a purine permease containing a C-terminal extension absent in a purine permease linked to a cluster of 10 noscapine biosynthetic genes (Winzer et al., 2012) alone (SEQ.ID NO: 779) (PUP-L); (ii) a nucleic acid sequence encoding a purine permease linked to a cluster of 10 noscapine biosynthetic genes (Winzer *et al.*, 2012) alone (SEQ.ID NO: 901) (PUP-N); (iii) a nucleic acid sequence expressing PUP-L (SEQ.ID NO: 779) and a Betv1 (SEQ.ID NO: 29) (Betv1-PUP-L); and (iv) a nucleic acid sequence expressing PUP-N (SEQ.ID NO: 901) and a Betv1 (SEQ.ID NO: 29) (Betv1-PUP-N). The strains, as well as a control strain with pEV-1 not comprising a nucleic acid sequences encoding Betv-1 or purine permease (EV) were separately cultivated in growth medium SD-Leu-His in the presence of 100 µM salutaridine for 24 hrs. An

aliquot of 5 μ L of culture medium was subjected to mass spectrometry analysis using an LTQ-Orbitrap XL high-resolution mass spectrometer. Thereafter the thebaine concentration in the medium of each strain was determined according to a thebaine standard curve. The results are shown in **FIG. 10A**. As can be seen in **FIG. 10A**, thebaine production was not affected in the medium of strains transformed with PUP-N compared with strains expressing only SalR and SalAT. However, and surprisingly, thebaine production increased 27-fold and 60-fold compared with the empty vector (EV) control to more than 1600 and 3500 μ g/L/OD in the medium containing strains transformed with either PUP-L alone or PUP-L and a Betv1 (Betv1_PUP-L), respectively. Thebaine production increased approximately 4-fold compared with the empty vector (EV) control to approximately 250 μ g/L/OD in the medium containing strains transformed with PUP-N and a Betv1 (Betv1_PUP-N) owing to the thebaine-forming activity of Betv1.

B, A *Saccharomyces cerevisiae* strain CENPK102-5B expressing reticuline epimerase (REPI), cytochrome P450 reductase (CPR), salutarine synthase (SalSyn), salutaridine reductase (SalR), and salutaridine acetyltransferase (SalAT) genes integrated into the yeast genome was transformed with a yeast expression vector pEV-1 harboring various polynucleotide constructs expressing purine permease and Betv1 polypeptides as follows: (i) a nucleic acid sequence encoding a purine permease containing a C-terminal extension absent in a purine permease linked to a cluster of 10 noscapine biosynthetic genes (Winzer *et al.*, 2012) alone (SEQ.ID NO: 779) (PUP-L); (ii) a nucleic acid sequence encoding a purine permease linked to a cluster of 10 noscapine biosynthetic genes (Winzer *et al.*, 2012) alone (SEQ.ID NO: 901) (PUP-N); (iii) a nucleic acid sequence expressing PUP-L (SEQ.ID NO: 779) and a Betv1 (SEQ.ID NO: 29) (Betv1-PUP-L); and (iv) a nucleic acid sequence expressing PUP-N (SEQ.ID NO: 901) and a Betv1 (SEQ.ID NO: 29) (Betv1-PUP-N). The strains, as well as a control strain with pEV-1 not comprising a nucleic acid sequences encoding Betv-1 or purine permease (EV) were separately cultivated in growth medium SD-Leu-His in the presence of 100 μ M salutaridine for 24 hrs. An aliquot of 5 μ L of culture medium was subjected to mass spectrometry analysis using an LTQ-Orbitrap XL high-resolution mass spectrometer. Thereafter the thebaine concentration in the medium of each strain was determined according to

a thebaine standard curve. The results are shown in **FIG. 10B**. As can be seen in **FIG. 10B**, thebaine production was not affected in the medium of strains transformed with PUP-N compared with strains expressing only REPI, CPR, SalSyn, SalR and SalAT. However, and surprisingly, thebaine production increased 10-fold and 25-fold compared with the empty vector (EV) control to approximately 1000 and 2500 µg/L/OD in the medium containing strains transformed with either PUP-L alone or PUP-L and a Betv1 (Betv1_PUP-L), respectively. Thebaine production increased approximately 2-fold compared with the empty vector (EV) control to approximately 200 µg/L/OD in the medium containing strains transformed with PUP-N and a Betv1 (Betv1_PUP-N) owing to the thebaine-forming activity of Betv1.

CLAIMS

1. A yeast cell comprising a first polynucleotide comprising:
 - (a) a nucleic acid sequence selected from SEQ.ID NO: 6 or SEQ.ID NO: 372;
 - (b) a nucleic acid sequence encoding a polypeptide having the amino acid sequence of SEQ.ID NO: 29 or 900; or
 - (c) a nucleic acid encoding a polypeptide having thebaine synthase activity comprising an amino acid sequence that is at least 85% identical to an amino acid sequence selected from the group consisting of: SEQ ID NO: 29 or SEQ ID NO: 900.
2. The yeast cell of claim 1, wherein the first polynucleotide comprises a nucleic acid encoding a polypeptide comprising an amino acid sequence that is at least 90% identical to SEQ ID NO: 29 or SEQ ID NO: 900.
3. The yeast cell of claim 1 or 2, wherein the first polynucleotide comprises a nucleic acid encoding a polypeptide comprising an amino acid sequences that is at least 95% identical to SEQ ID NO: 29 or SEQ ID NO: 900.
4. The yeast cell of any one of claims 1 to 3, wherein the first polynucleotide comprises a nucleic acid sequence capable of hybridizing under at least moderately stringent hybridization conditions with the nucleic acid sequence of SEQ ID NO: 6 or SEQ ID NO: 372,

wherein the nucleic acid sequence encodes a polypeptide having thebaine synthase activity.
5. The yeast cell of any one of claims 1 to 4, further comprising a second polynucleotide comprising:
 - (a) a second nucleic acid sequence selected from the group consisting of SEQ.ID NO: 1, SEQ.ID NO: 2, SEQ.ID NO: 3, SEQ.ID. NO: 4, SEQ.ID NO: 5, SEQ.ID NO: 6, SEQ.ID NO: 7, SEQ.ID. NO: 8, SEQ.ID NO: 9, SEQ.ID NO: 10, SEQ.ID NO: 11, SEQ.ID. NO: 12, SEQ.ID NO: 13, SEQ.ID NO: 14, SEQ.ID NO: 15, SEQ.ID. NO: 16,

SEQ.ID NO: 17, SEQ.ID NO: 18, SEQ.ID NO: 19, SEQ.ID. NO: 20, SEQ.ID NO: 21, SEQ.ID NO: 22, and SEQ.ID NO: 23, SEQ.ID NO: 47, SEQ.ID NO: 48, SEQ.ID NO: 49, SEQ.ID. NO: 50, SEQ.ID NO: 51, SEQ.ID NO: 52, SEQ.ID NO: 53, SEQ.ID. NO: 54, SEQ.ID NO: 55, SEQ.ID NO: 56, SEQ.ID NO: 57, SEQ.ID. NO: 58, SEQ.ID NO: 59, SEQ.ID NO: 60, SEQ.ID. NO: 75, SEQ.ID NO: 76, SEQ.ID NO: 77, SEQ.ID NO: 78, SEQ.ID. NO: 79, SEQ.ID NO: 80, SEQ.ID NO: 81, SEQ.ID NO: 82, SEQ.ID NO: 83, SEQ.ID NO: 84, SEQ.ID. NO: 85, SEQ.ID NO: 86, SEQ.ID NO: 87, SEQ.ID NO: 88, SEQ.ID. NO: 89, SEQ.ID NO: 90, SEQ.ID NO: 91, SEQ.ID NO: 92, SEQ.ID NO: 93; SEQ.ID NO: 113 to SEQ.ID NO: 505 or SEQ.ID. NO: 766;

(b) a nucleic acid sequence encoding a polypeptide having any one of the amino acid sequence selected from the group consisting of: SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63, SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 and SEQ.ID NO: 768 to SEQ.ID NO: 901; or

(c) a nucleic acid sequence encoding a polypeptide that is at least 85% identical at an amino acid sequence selected from the group consisting of: SEQ.ID NO: 24, SEQ.ID NO: 25, SEQ.ID NO: 26, SEQ.ID. NO: 27, SEQ.ID NO: 28, SEQ.ID NO: 29, SEQ.ID NO: 30, SEQ.ID. NO: 31, SEQ.ID NO: 32, SEQ.ID NO: 33, SEQ.ID NO: 34, SEQ.ID. NO: 35, SEQ.ID NO: 36, SEQ.ID NO: 37, SEQ.ID NO: 38, SEQ.ID. NO: 39, SEQ.ID NO: 40, SEQ.ID NO: 41, SEQ.ID NO: 42, SEQ.ID. NO: 43, SEQ.ID NO: 44, SEQ.ID NO: 45, SEQ.ID NO: 46, SEQ.ID NO: 61, SEQ.ID NO: 62, SEQ.ID NO: 63,

SEQ.ID NO: 64, SEQ.ID. NO: 65, SEQ.ID NO: 66, SEQ.ID NO: 67, SEQ.ID NO: 68, SEQ.ID. NO: 69, SEQ.ID NO: 70, SEQ.ID NO: 71, SEQ.ID NO: 72, SEQ.ID. NO: 73, SEQ.ID NO: 74, SEQ.ID. NO: 94, SEQ.ID NO: 95, SEQ.ID NO: 96, SEQ.ID NO: 97, SEQ.ID. NO: 98, SEQ.ID NO: 99, SEQ.ID NO: 100, SEQ.ID NO: 101, SEQ.ID NO: 102, SEQ.ID NO: 103, SEQ.ID. NO: 104, SEQ.ID NO: 105, SEQ.ID NO: 106, SEQ.ID NO: 107, SEQ.ID. NO: 108, SEQ.ID NO: 109, SEQ.ID NO: 110, SEQ.ID NO: 111, SEQ.ID NO: 112, SEQ.ID NO: 506 to SEQ.ID NO: 765 and SEQ.ID NO: 768 to SEQ.ID NO: 901.

6. The yeast cell of any one of claims 1 to 5, wherein the second polynucleotide comprises a nucleic acid sequence encoding a polypeptide having purine permease activity comprising an amino acid sequence that is at least 85% identical to an amino acid sequence selected from the group consisting of: SEQ ID NO: 779 or SEQ ID NO: 901.

7. The yeast cell of claim 6, wherein the second polynucleotide comprises a nucleic acid sequence encoding a polypeptide comprising an amino acid sequence that is at least 90% identical to SEQ ID NO: 779 or SEQ ID NO: 901.

8. The yeast cell according to claim 6 or claim 7, wherein the first polynucleotide comprises a first nucleic acid sequence comprising either SEQ.ID NO: 6 or SEQ.ID NO: 372, and the second polynucleotide comprises a second nucleic acid sequence comprising SEQ.ID NO: 384, SEQ.ID NO: 902 or SEQ.ID NO: 903.

9. The yeast cell of any one of claims 4 to 8, wherein:
(i) the first and second polynucleotides, which are not linked by another polynucleotide, are integrated, respectively, into first and second expression vectors; or
(ii) the first and second polynucleotides, which are linked by another polynucleotide, are integrated into a single expression vector.

10. Use of the yeast cell of any one of claims 1 to 9 for producing thebaine.

11. A method of reducing the expression of a polynucleotide encoding a polypeptide having thebaine synthase activity comprising an amino acid sequence that is at least 85% identical to an amino acid sequence selected from the group consisting of: SEQ ID NO: 29 or SEQ ID NO: 900 in a cell expressing the polynucleotide, the method comprising silencing the expression of the polynucleotide in the cell,

wherein the cell is a *Papaver somniferum* cell or the cell of any one of claims 1 to 10.

12. Use of a polynucleotide comprising:

(a) a nucleic acid sequence selected from SEQ ID NO: 6 or SEQ ID NO: 372; or

(b) a nucleic acid sequence encoding a polypeptide having the amino acid sequences of SEQ ID NO: 29 or SEQ ID NO: 900; or

(c) a nucleic acid sequence that encodes a polypeptide that is at least 85%, identical to SEQ ID NO: 29 or SEQ ID NO: 900,

to make thebaine.

13. The use according to claim 12, wherein the polynucleotide comprises a first nucleic acid sequence comprising either SEQ ID NO: 6 or SEQ ID NO: 372, and a second nucleic acid sequence comprising SEQ ID NO: 384, SEQ ID NO: 902 or SEQ ID NO: 903.

14. The use according to claim 12, wherein a first polypeptide and a second polypeptide encoded by a first and second nucleic acid sequence (i) and (ii) are selected from the group consisting of

(a) (i) SEQ ID NO: 6 or SEQ ID NO: 372, and (ii) SEQ ID NO: 384, SEQ ID NO: 902 or SEQ ID NO: 903;

(b) (i) a nucleic acid sequence encoding a polypeptide comprising SEQ ID NO: 29 or SEQ ID NO: 900, and (ii) a nucleic acid sequence encoding a polypeptide comprising SEQ ID NO: 779 or SEQ ID NO: 901; or

(c) (i) a nucleic acid sequence encoding a polypeptide that is at least 85% identical to SEQ.ID NO: 29 or SEQ.ID NO: 900, and (ii) a nucleic acid sequence encoding a polypeptide that is at least 85% identical to SEQ.ID NO: 779 or SEQ.ID NO: 901.

15. Use of a first polypeptide and a second polypeptide encoded by a first and second nucleic acid sequence (i) and (ii) selected from the group consisting of:

(a) (i) either SEQ ID NO: 6 or SEQ ID NO: 372, and (ii) SEQ.ID NO: 384;

(b) (i) a nucleic acid sequence encoding a polypeptide comprising SEQ ID NO: 29 or SEQ ID NO: 900, and (ii) a nucleic acid sequence encoding a polypeptide comprising SEQ.ID NO: 779; or

(c) (i) a nucleic acid sequence encoding a polypeptide that is at least 85% identical to SEQ ID NO: 29 or 900, and (ii) a nucleic acid sequence encoding a polypeptide that is at least 85% identical to SEQ ID NO: 779, to make thebaine.

16. The use according to any one of claims 12 to 15, wherein thebaine is made under *in vitro* conditions, or under *in vivo* conditions in a yeast cell.

17. A composition comprising an isolated polypeptide having an amino acid sequence of SEQ.ID NO: 29 or 900 or that is at least 85% identical to SEQ.ID NO: 29 or 900, wherein the polypeptide has thebaine synthase activity.

18. Use of a polypeptide having an amino acid sequence of SEQ.ID NO: 29 or 900, or that is at least 85% identical to SEQ.ID NO: 29 or 900, to make thebaine.

19. A yeast recombinant expression vector comprising as operably linked components:

a first polynucleotide comprising:

- (a) a nucleic acid sequence selected from SEQ ID NO: 6 or SEQ ID NO: 372; or
 - (b) a nucleic acid sequence encoding a polypeptide having the amino acid sequences of SEQ ID NO: 29 or SEQ.ID NO: 900; or
 - (c) a nucleic acid sequence encoding a polypeptide having thebaine synthase activity comprising an amino acid sequence that is at least 85% identical to SEQ ID NO: 29 or SEQ ID NO: 900; and
- a second polynucleotide capable of controlling expression in a yeast host cell.

20. The composition of claim 17 or the use of claim 18 or the recombinant expression vector, wherein the polypeptide has an amino acid sequence that is at least 90% identical to SEQ.ID NO: 29 or 900.
21. A method for preparing thebaine, the method comprising culturing the yeast cell of any one of claims 1 to 10.
22. The yeast cell of any one of claims 1 to 10, the use of claim 16, or the method of claim 21, wherein the yeast cell is a *Saccharomyces cerevisiae* cell or a *Yarrowta lipolytica* cell.

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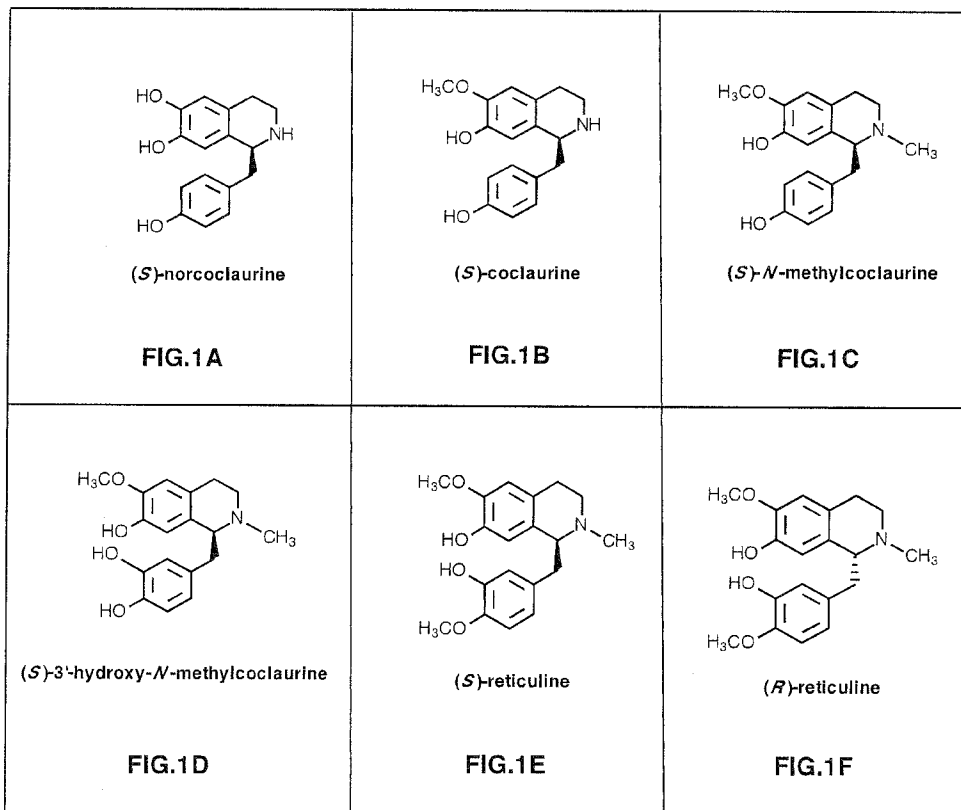


FIGURE 1

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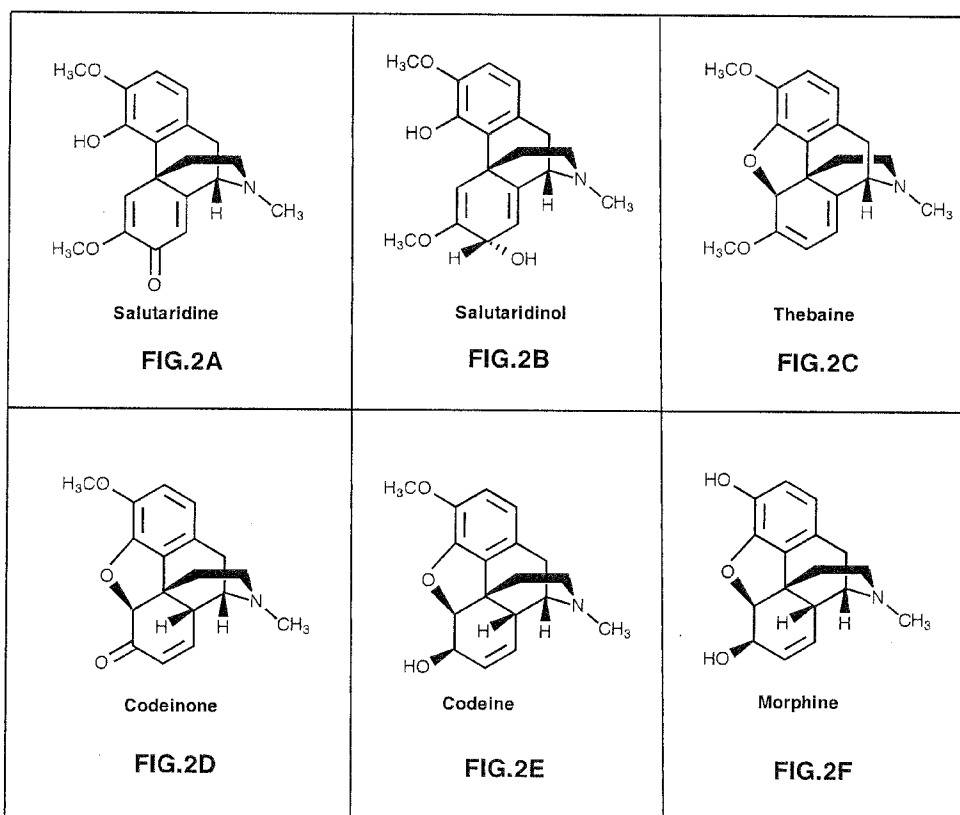


FIGURE 2

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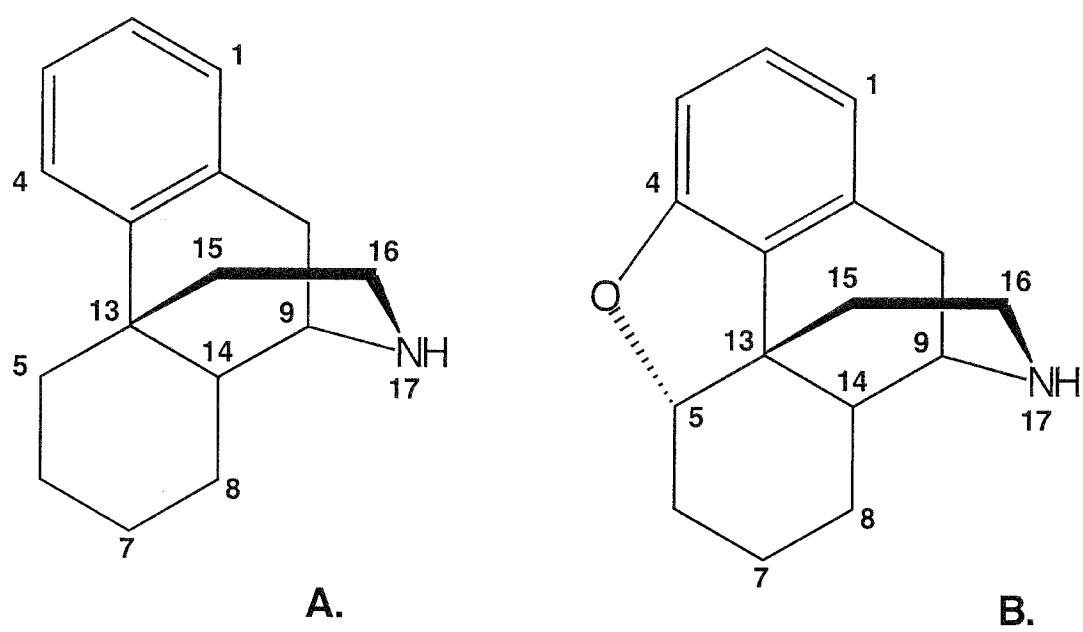


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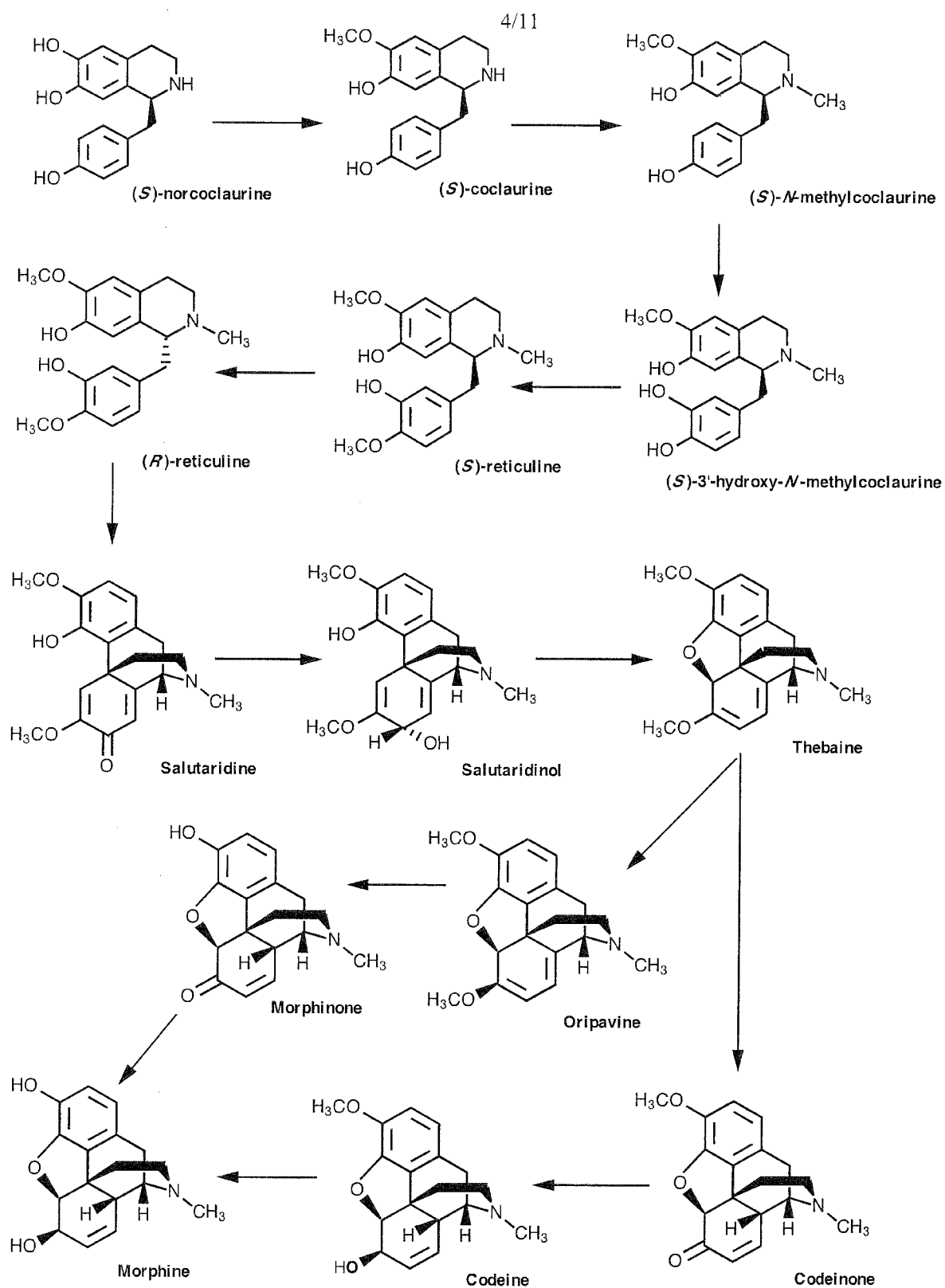


FIGURE 4

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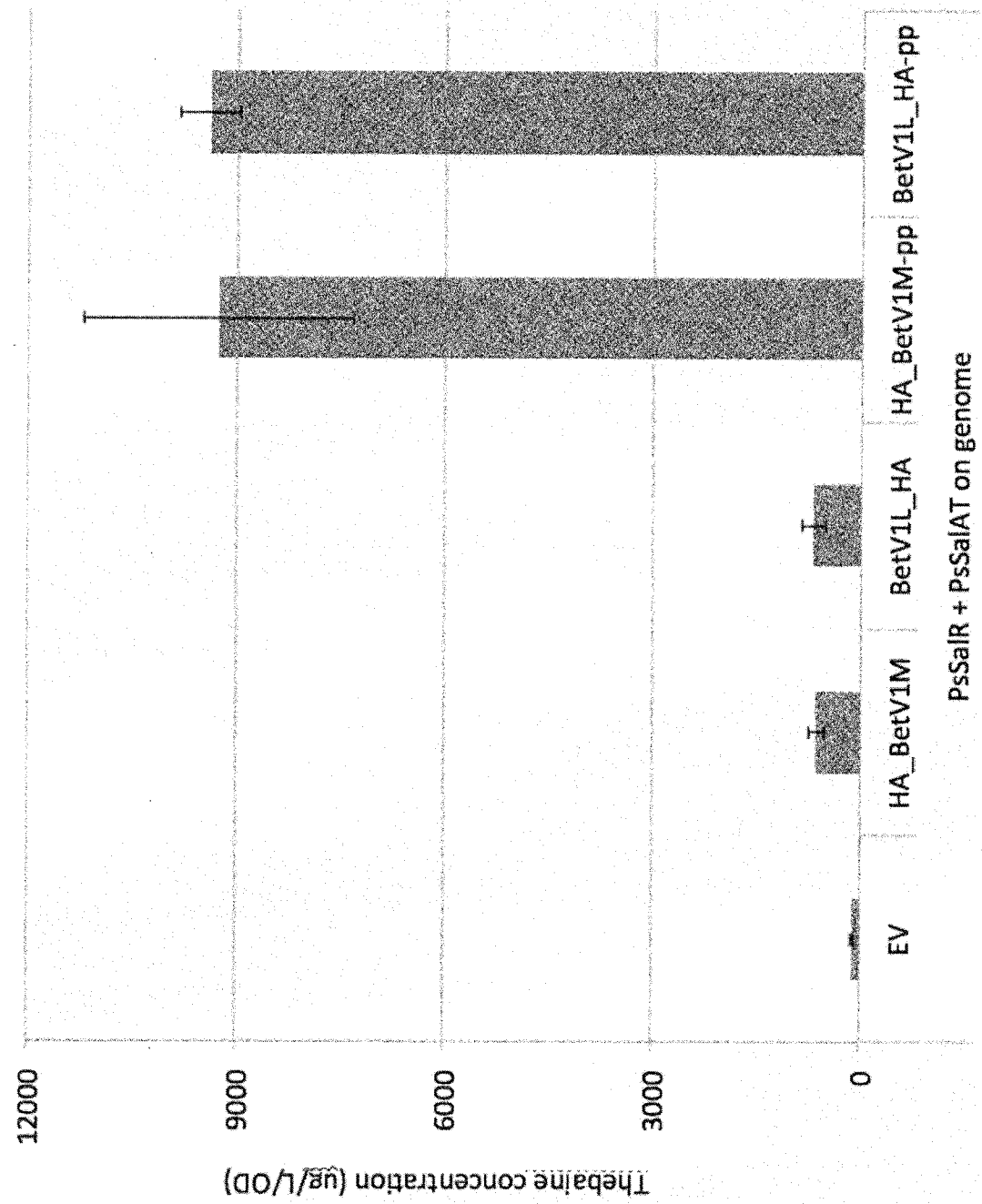


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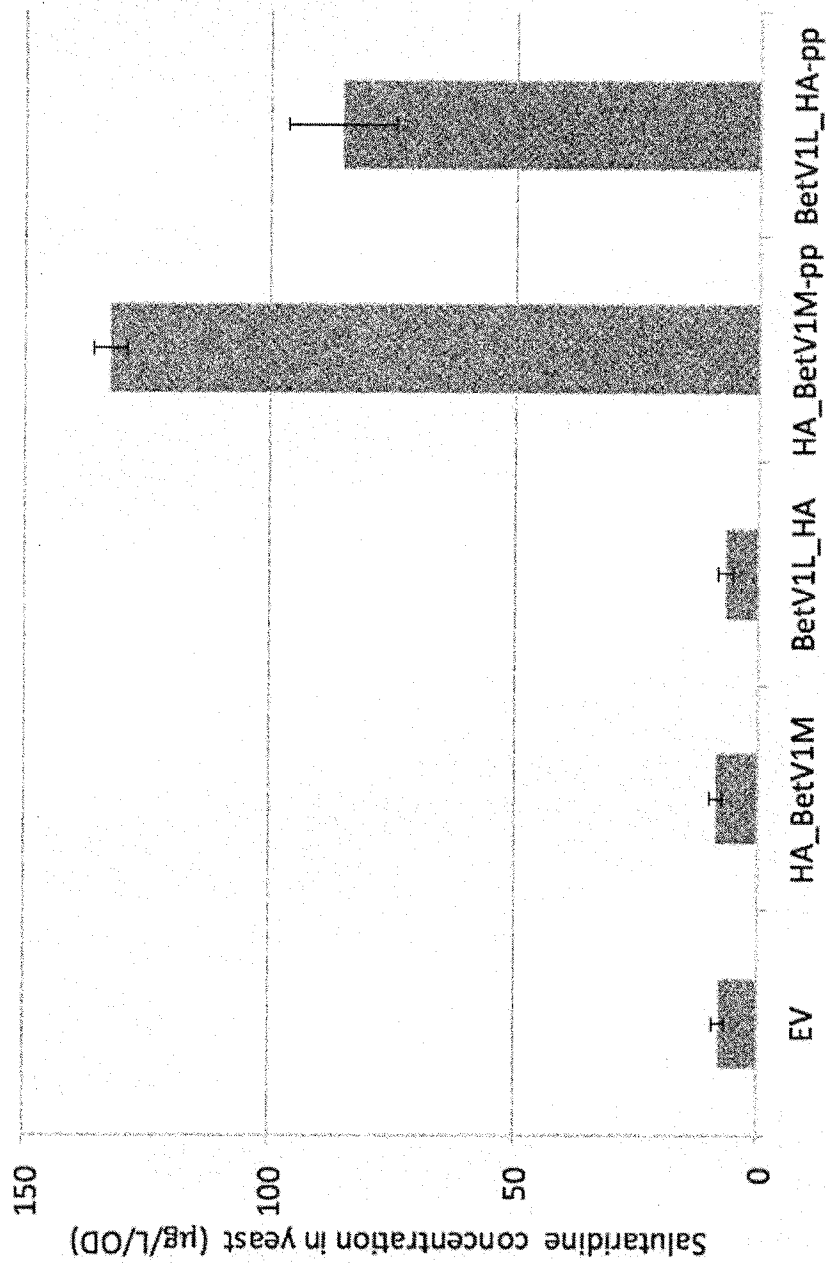


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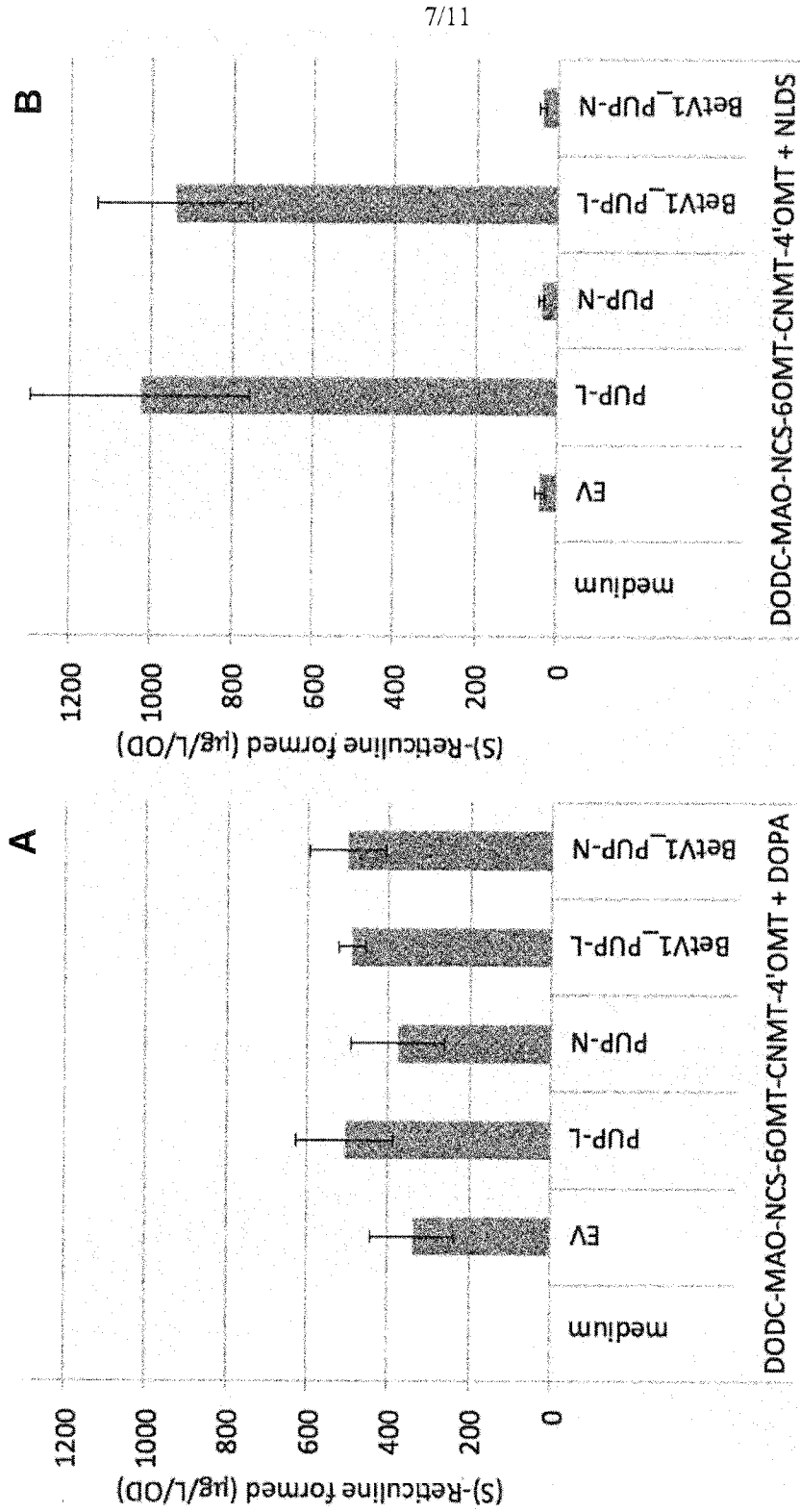


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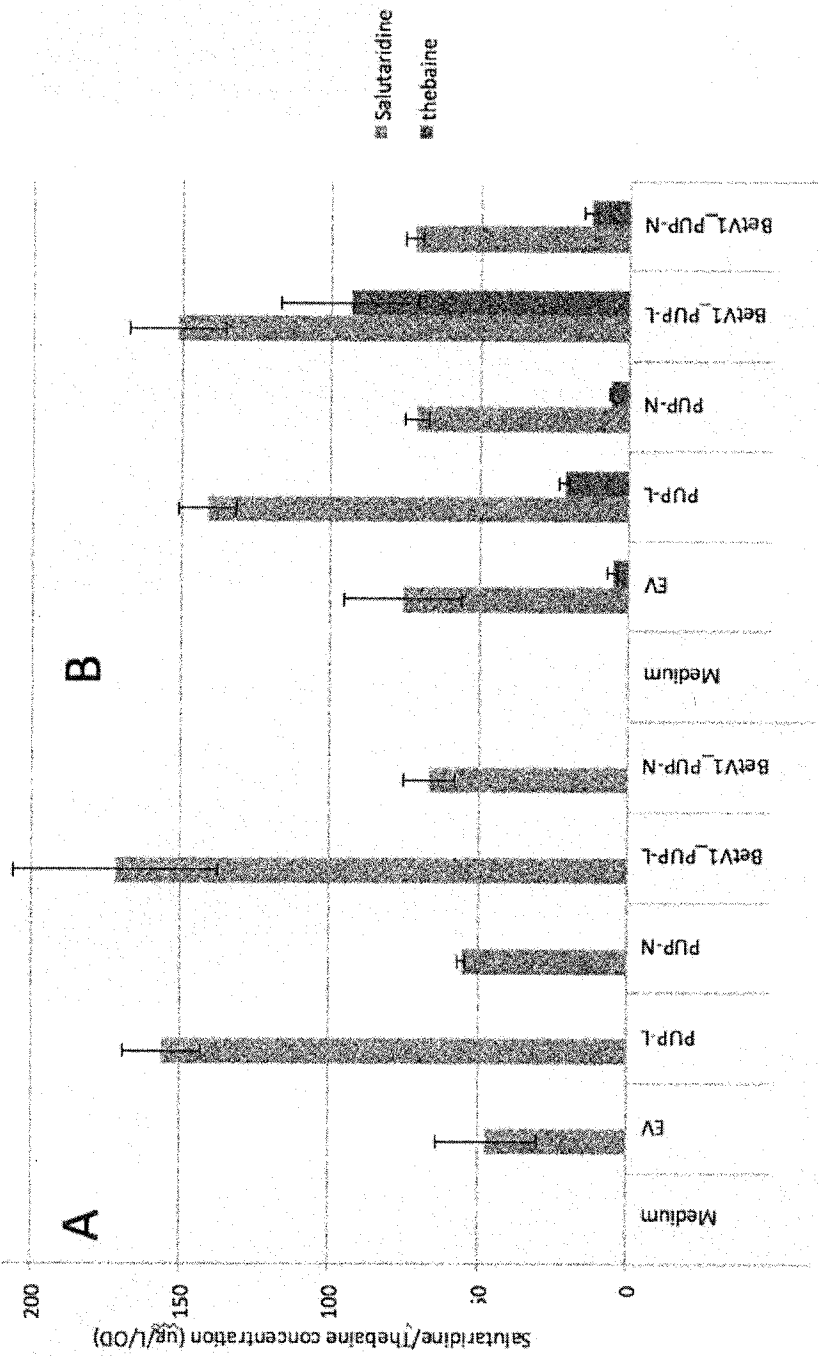


FIGURE 8

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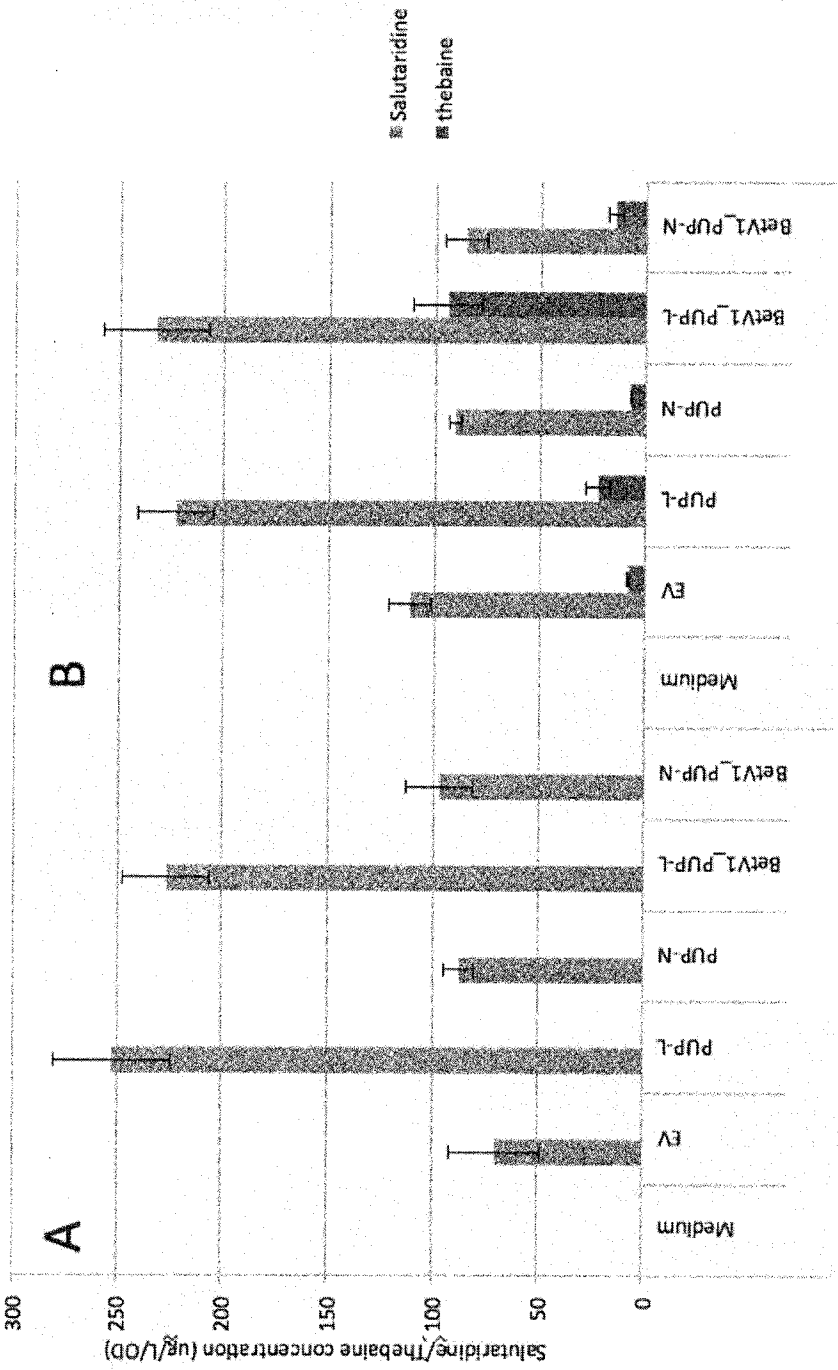


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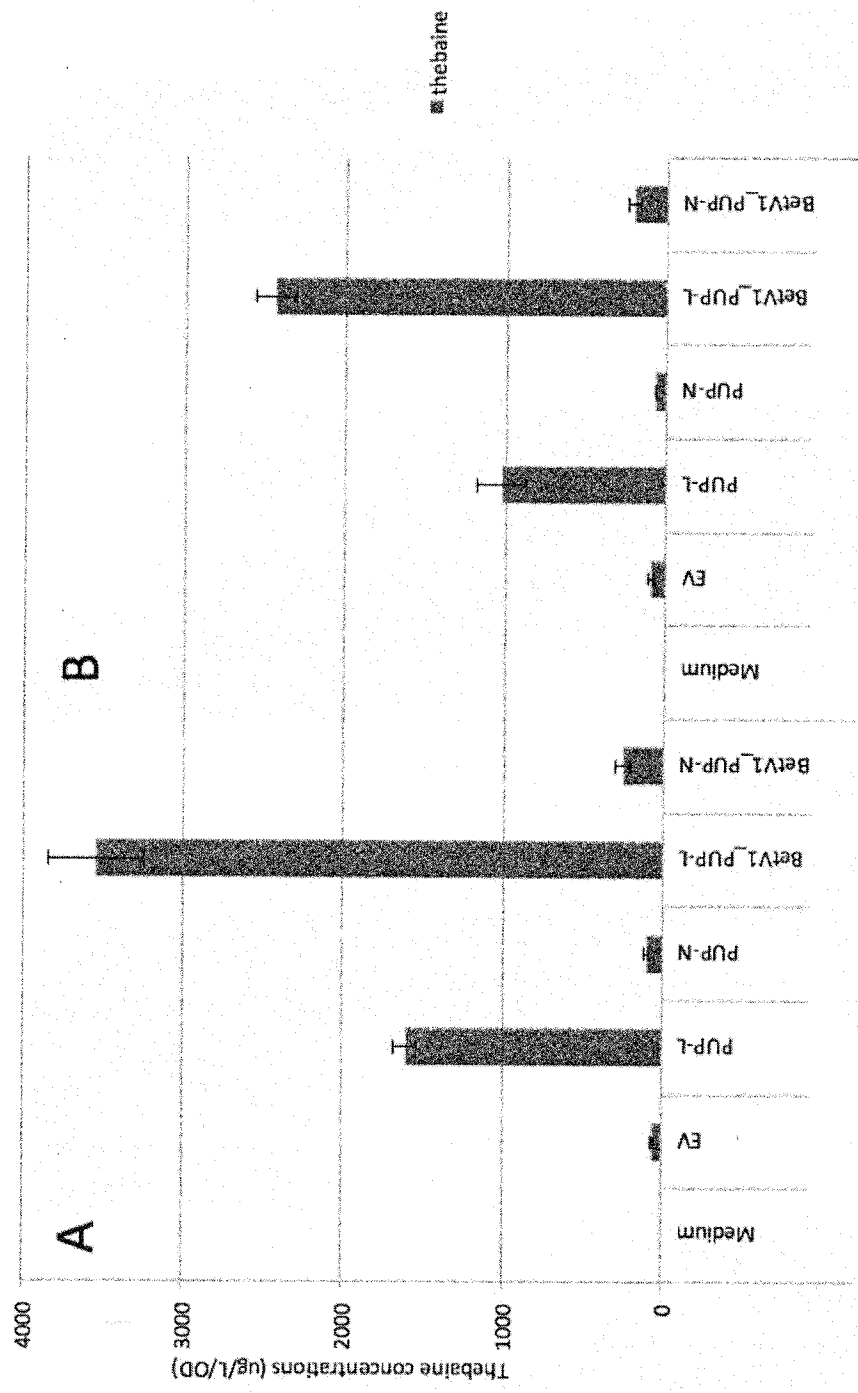
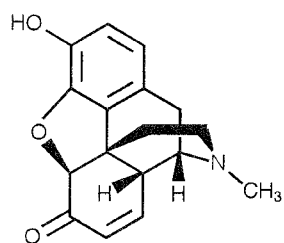


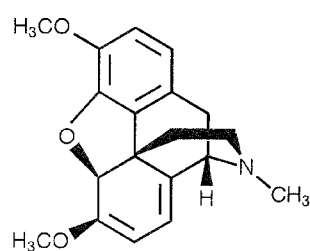
FIGURE 10

11/11



Morphinone

FIG.11A



Oripavine

FIG.11B

FIGURE 11

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pctca2017050779-seql.txt

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 aaaaaatttc gcagggcctt ttataagggt aacgcaaatg ataactctta a 2811

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 gcattggtat caataaggga atactatgaa aaagatggaa aggagcttcc ttctactaaa 360
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<210> 22
 <211> 546
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 <213> Papaver somniferum

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pctca2017050779-seq1.txt

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pctca2017050779-seql.txt

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<210> 24
<211> 900
<212> PRT
<213> Papaver somniferum

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<400> 24

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Met Glu Leu Gln Tyr Ile Ser Tyr Phe Gln Pro Thr Ser Ser Val Val
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Ala Leu Leu Leu Ala Leu Val Ser Ile Leu Ser Ser Val Val Val Leu
20          25          30

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Arg Lys Thr Phe Leu Asn Asn Tyr Ser Ser Ser Pro Ala Ser Ser Thr
35          40          45

```

```

Lys Thr Ala Val Leu Ser His Gln Arg Gln Gln Ser Cys Ala Leu Pro
50          55          60

```

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Ile Ser Gly Leu Leu His Ile Phe Met Asn Lys Asn Gly Leu Ile His
65          70          75          80

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Val Thr Leu Gly Asn Met Ala Asp Lys Tyr Gly Pro Ile Phe Ser Phe
85          90          95

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Pro Thr Gly Ser His Arg Thr Leu Val Val Ser Ser Trp Glu Met Val
100         105         110

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pctca2017050779-seql.txt

Lys Glu Cys Phe Thr Gly Asn Asn Asp Thr Ala Phe Ser Asn Arg Pro
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 Ile Pro Leu Ala Phe Lys Thr Ile Phe Tyr Ala Cys Gly Gly Ile Asp
 130 135 140
 Ser Tyr Gly Leu Ser Ser Val Pro Tyr Gly Lys Tyr Trp Arg Glu Leu
 145 150 155 160
 Arg Lys Val Cys Val His Asn Leu Leu Ser Asn Gln Gln Leu Leu Lys
 165 170 175
 Phe Arg His Leu Ile Ile Ser Gln Val Asp Thr Ser Phe Asn Lys Leu
 180 185 190
 Tyr Glu Leu Cys Lys Asn Ser Glu Asp Asn Gln Gly Asn Tyr Pro Thr
 195 200 205
 Thr Thr Thr Ala Ala Gly Met Val Arg Ile Asp Asp Trp Leu Ala Glu
 210 215 220
 Leu Ser Phe Asn Val Ile Gly Arg Ile Val Cys Gly Phe Gln Ser Gly
 225 230 235 240
 Pro Lys Thr Gly Ala Pro Ser Arg Val Glu Gln Phe Lys Glu Ala Ile
 245 250 255
 Asn Glu Ala Ser Tyr Phe Met Ser Thr Ser Pro Val Ser Asp Asn Val
 260 265 270
 Pro Met Leu Gly Trp Ile Asp Gln Leu Thr Gly Leu Thr Arg Asn Met
 275 280 285
 Lys His Cys Gly Lys Lys Leu Asp Leu Val Val Glu Ser Ile Ile Asn
 290 295 300
 Asp His Arg Gln Lys Arg Arg Phe Ser Arg Thr Lys Gly Gly Asp Glu
 305 310 315 320
 Lys Asp Asp Glu Gln Asp Asp Phe Ile Asp Ile Cys Leu Ser Ile Met
 325 330 335
 Glu Gln Pro Gln Leu Pro Gly Asn Asn Asn Pro Ser Gln Ile Pro Ile
 340 345 350
 Lys Ser Ile Val Leu Asp Met Ile Gly Gly Gly Thr Asp Thr Thr Lys
 355 360 365

pctca2017050779-seql.txt

Leu Thr Thr Ile Trp Thr Leu Ser Leu Leu Leu Asn Asn Pro His Val
 370 375 380
 Leu Asp Lys Ala Lys Gln Glu Val Asp Ala His Phe Arg Thr Lys Arg
 385 390 395 400
 Arg Ser Thr Asn Asp Ala Ala Ala Ala Val Val Asp Phe Asp Asp Ile
 405 410 415
 Arg Asn Leu Val Tyr Ile Gln Ala Ile Ile Lys Glu Ser Met Arg Leu
 420 425 430
 Tyr Pro Ala Ser Pro Val Val Glu Arg Leu Ser Gly Glu Asp Cys Val
 435 440 445
 Val Gly Gly Phe His Val Pro Ala Gly Thr Arg Leu Trp Ala Asn Val
 450 455 460
 Trp Lys Met Gln Arg Asp Pro Lys Val Trp Asp Asp Pro Leu Val Phe
 465 470 475 480
 Arg Pro Asp Arg Phe Leu Ser Asp Glu Gln Lys Met Val Asp Val Arg
 485 490 495
 Gly Gln Asn Tyr Glu Leu Leu Pro Phe Gly Ala Gly Arg Arg Val Cys
 500 505 510
 Pro Gly Val Ser Phe Ser Leu Asp Leu Met Gln Leu Val Leu Thr Arg
 515 520 525
 Leu Ile Leu Glu Phe Glu Met Lys Ser Pro Ser Gly Lys Val Asp Met
 530 535 540
 Thr Ala Thr Pro Gly Leu Met Ser Tyr Lys Val Ile Pro Leu Asp Ile
 545 550 555 560
 Leu Leu Thr His Arg Arg Ile Lys Pro Cys Val Gln Ser Ala Ala Ser
 565 570 575
 Glu Arg Asp Met Glu Ser Ser Gly Val Pro Val Ile Thr Leu Gly Ser
 580 585 590
 Gly Lys Val Met Pro Val Leu Gly Met Gly Thr Phe Glu Lys Val Gly
 595 600 605
 Lys Gly Ser Glu Arg Glu Arg Leu Ala Ile Leu Lys Ala Ile Glu Val
 610 615 620

pctca2017050779-seql.txt

Gly Tyr Arg Tyr Phe Asp Thr Ala Ala Ala Tyr Glu Thr Glu Glu Val
625 630 635 640

Leu Gly Glu Ala Ile Ala Glu Ala Leu Gln Leu Gly Leu Val Lys Ser
645 650 655

Arg Asp Glu Leu Phe Ile Ser Ser Met Leu Trp Cys Thr Asp Ala His
660 665 670

Ala Asp Arg Val Leu Leu Ala Leu Gln Asn Ser Leu Arg Asn Leu Lys
675 680 685

Leu Glu Tyr Val Asp Leu Tyr Met Leu Pro Phe Pro Ala Ser Leu Lys
690 695 700

Pro Gly Lys Ile Thr Met Asp Ile Pro Glu Glu Asp Ile Cys Arg Met
705 710 715 720

Asp Tyr Arg Ser Val Trp Ala Ala Met Glu Glu Cys Gln Asn Leu Gly
725 730 735

Phe Thr Lys Ser Ile Gly Val Ser Asn Phe Ser Cys Lys Lys Leu Gln
740 745 750

Glu Leu Met Ala Thr Ala Asn Ile Pro Pro Ala Val Asn Gln Val Glu
755 760 765

Met Ser Pro Ala Phe Gln Gln Lys Lys Leu Arg Glu Tyr Cys Asn Ala
770 775 780

Asn Asn Ile Leu Val Ser Ala Ile Ser Val Leu Gly Ser Asn Gly Thr
785 790 795 800

Pro Trp Gly Ser Asn Ala Val Leu Gly Ser Glu Val Leu Lys Lys Ile
805 810 815

Ala Met Ala Lys Gly Lys Ser Val Ala Gln Val Ser Met Arg Trp Val
820 825 830

Tyr Glu Gln Gly Ala Ser Leu Val Val Lys Ser Phe Ser Glu Glu Arg
835 840 845

Leu Arg Glu Asn Leu Asn Ile Phe Asp Trp Glu Leu Thr Lys Glu Asp
850 855 860

His Glu Lys Ile Gly Glu Ile Pro Gln Cys Arg Ile Leu Ser Ala Tyr

865 870 875 880

Phe Leu Val Ser Pro Asn Gly Pro Phe Lys Ser Gln Glu Glu Leu Trp
 885 890 895

Asp Asp Glu Ala
 900

<210> 25
 <211> 505
 <212> PRT
 <213> Papaver somniferum

<400> 25

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Ser Phe Tyr Gln Ser Ala Asn Thr Thr Glu Trp Pro Ala Gly Pro Lys
 35 40 45

Thr Leu Pro Ile Ile Gly Asn Leu His Gln Leu Gly Gly Gly Val Pro
 50 55 60

Leu Gln Val Ala Leu Ala Asn Leu Ala Lys Val Tyr Gly Gly Ala Phe
 65 70 75 80

Thr Ile Trp Ile Gly Ser Trp Val Pro Met Ile Val Ile Ser Asp Ile
 85 90 95

Asp Asn Ala Arg Glu Val Leu Val Asn Lys Ser Ala Asp Tyr Ser Ala
 100 105 110

Arg Asp Val Pro Asp Ile Leu Lys Ile Ile Thr Ala Asn Gly Lys Asn
 115 120 125

Ile Ala Asp Cys Asp Ser Gly Pro Phe Trp His Asn Leu Lys Lys Gly
 130 135 140

Leu Gln Ser Cys Ile Asn Pro Ser Asn Val Met Ser Leu Ser Arg Leu
 145 150 155 160

Gln Glu Lys Asp Met Gln Asn Leu Ile Lys Ser Met Gln Glu Arg Ala
 165 170 175

Ser Gln His Asn Gly Ile Ile Lys Pro Leu Asp His Ala Lys Glu Ala

pctca2017050779-seql.txt

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Glu Asp Leu Val Ile Gly Val Lys Asp Ala Leu Asp Glu Met Val Arg
    210                               215                               220
Ile Ser Gly Leu Ala Ser Leu Ala Asp Ala Phe Lys Ile Ala Lys Tyr
    225                               230                               235
Leu Pro Ser Gln Arg Lys Asn Ile Arg Asp Met Tyr Ala Thr Arg Asp
    245                               250                               255
Arg Val Tyr Asn Leu Ile Gln Pro His Ile Val Pro Asn Leu Pro Ala
    260                               265                               270
Asn Ser Phe Leu Tyr Phe Leu Thr Ser Gln Asp Tyr Ser Asp Glu Ile
    275                               280                               285
Ile Tyr Ser Met Val Leu Glu Ile Phe Gly Leu Gly Val Asp Ser Thr
    290                               295                               300
Ala Ala Thr Ala Val Trp Ala Leu Ser Phe Leu Val Gly Glu Gln Glu
    305                               310                               315
Ile Gln Glu Lys Leu Tyr Arg Glu Ile Asn Asn Arg Thr Gly Gly Gln
    325                               330                               335
Arg Pro Val Lys Val Val Asp Leu Lys Glu Leu Pro Tyr Leu Gln Ala
    340                               345                               350
Val Met Lys Glu Thr Leu Arg Met Lys Pro Ile Ala Pro Leu Ala Val
    355                               360                               365
Pro His Val Ala Ala Lys Asp Thr Thr Phe Lys Gly Arg Arg Ile Val
    370                               375                               380
Lys Gly Thr Lys Val Met Val Asn Leu Tyr Ala Ile His His Asp Pro
    385                               390                               395
Asn Val Phe Pro Ala Pro Tyr Lys Phe Met Pro Glu Arg Phe Leu Lys
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Asp Val Asn Ser Asp Gly Arg Phe Gly Asp Ile Asn Thr Met Glu Ser
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pctca2017050779-seql.txt

Ser Leu Ile Pro Phe Gly Ala Gly Met Arg Ile Cys Gly Gly Val Glu
435 440 445

Leu Ala Lys Gln Met Val Ala Phe Ala Leu Ala Ser Met Val Asn Glu
450 455 460

Phe Lys Trp Asp Cys Val Ser Glu Gly Lys Leu Pro Asp Leu Ser Glu
465 470 475 480

Ala Ile Ser Phe Ile Leu Tyr Met Lys Asn Pro Leu Glu Ala Lys Ile
485 490 495

Thr Pro Arg Thr Lys Pro Phe Arg Gln
500 505

<210> 26
<211> 358
<212> PRT
<213> Papaver somniferum

<400> 26

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His Val Trp Asn Met Ile Cys Gly Ser Val Asn Ser Ser Val Leu Lys
20 25 30

Cys Thr Ile Val Leu Gly Leu Phe Asp Thr Ile His Asn Ser Ser Lys
35 40 45

Pro Met Thr Leu Ser Ser Leu Ser Ser Ala Ser Pro Ser Leu Ser Pro
50 55 60

Leu Lys Thr Glu Asn Leu Tyr Arg Leu Leu Arg Tyr Leu Ser His Met
65 70 75 80

Asn Leu Ile Val Ile Asn Ser Ile Gln Gly Ser Asp Asp Thr Phe Ser
85 90 95

Leu Thr Asp Thr Ser Lys Leu Leu Leu Ser Asn Gln Glu Arg Ser Leu
100 105 110

Lys Asp Trp Val Leu Gly Ile Asp Asp Pro Leu Ala Ile Asn Gly Trp
115 120 125

His Glu Leu Thr Asp Tyr Cys Leu Ser Pro Val Asp Ala Pro Val Pro
130 135 140

pctca2017050779-seql.txt

Phe Val Lys Met His Gly Lys Thr Met Trp Glu Phe Ala Ala Asp Ile
145 150 155 160

Pro Glu Val Asn Glu Leu Ile Asn Asn Ser Met Ala Cys Asp Thr Lys
165 170 175

Leu Val Met Pro Ala Phe Leu Gln Gly Cys Arg Gly Ile Leu Asn Lys
180 185 190

Gly Ile Val Lys Lys Met Val Asp Ile Gly Gly Gly Thr Gly Ala Ala
195 200 205

Met Ser Tyr Val Val Lys Ala Phe Pro Asp Ile Lys Cys Met Val Phe
210 215 220

Asp Leu Pro His Val Val Ala Asn Ala Pro Glu Ile Glu Gly Val Glu
225 230 235 240

Leu Val Gly Gly Asp Met Phe Glu Phe Ile Pro Pro Ala Asp Ala Leu
245 250 255

Leu Leu Lys Phe Ile Leu His Asn Trp Asp Asp Val Gly Cys Ile Gln
260 265 270

Leu Leu Lys Lys Cys Lys Glu Thr Ile Ser Ala Glu His Gly Lys Val
275 280 285

Ile Ile Ile Glu Met Val Leu Glu Glu Asp Asp Gln Asp Asn Asp Ala
290 295 300

Leu Ala Gln Ala Arg Leu Ser Leu Asp Leu Asp Met Met Val Cys Ser
305 310 315 320

Gly Gly Arg Glu Arg Thr Lys Asp Glu Trp Arg Ile Leu Val Glu Glu
325 330 335

Ala Gly Phe Ser Lys Ile Glu Phe Ile Ser Ile Phe Ala Ile Gln Ser
340 345 350

Val Ile Val Ala Tyr Pro
355

<210> 27
<211> 474
<212> PRT
<213> Papaver somniferum

<400> 27

pctca2017050779-seql.txt

Met Ala Thr Met Tyr Ser Ala Ala Val Glu Val Ile Ser Lys Glu Thr
1 5 10 15

Ile Lys Pro Thr Thr Pro Thr Pro Ser Gln Leu Lys Asn Phe Asn Leu
20 25 30

Ser Leu Leu Asp Gln Cys Phe Pro Leu Tyr Tyr Tyr Val Pro Ile Ile
35 40 45

Leu Phe Tyr Pro Ala Thr Ala Ala Asn Ser Thr Gly Ser Ser Asn His
50 55 60

His Asp Asp Leu Asp Leu Leu Lys Ser Ser Leu Ser Lys Thr Leu Val
65 70 75 80

His Phe Tyr Pro Met Ala Gly Arg Met Ile Asp Asn Ile Leu Val Asp
85 90 95

Cys His Asp Gln Gly Ile Asn Phe Tyr Lys Val Lys Ile Arg Gly Lys
100 105 110

Met Cys Glu Phe Met Ser Gln Pro Asp Val Pro Leu Ser Gln Leu Leu
115 120 125

Pro Ser Glu Val Val Ser Ala Ser Val Pro Lys Glu Ala Leu Val Ile
130 135 140

Val Gln Val Asn Met Phe Asp Cys Gly Gly Thr Ala Ile Cys Ser Ser
145 150 155 160

Val Ser His Lys Ile Ala Asp Ala Ala Thr Met Ser Thr Phe Ile Arg
165 170 175

Ser Trp Ala Ser Thr Thr Lys Thr Ser Arg Ser Gly Gly Ser Thr Ala
180 185 190

Ala Val Thr Asp Gln Lys Leu Ile Pro Ser Phe Asp Ser Ala Ser Leu
195 200 205

Phe Pro Pro Ser Glu Arg Leu Thr Ser Pro Ser Gly Met Ser Glu Ile
210 215 220

Pro Phe Ser Ser Thr Pro Glu Asp Thr Glu Asp Asp Lys Thr Val Ser
225 230 235 240

Lys Arg Phe Val Phe Asp Phe Ala Lys Ile Thr Ser Val Arg Glu Lys
245 250 255

pctca2017050779-seql.txt

Leu Gln Val Leu Met His Asp Asn Tyr Lys Ser Arg Arg Gln Thr Arg
260 265 270

Val Glu Val Val Thr Ser Leu Ile Trp Lys Ser Val Met Lys Ser Thr
275 280 285

Pro Ala Gly Phe Leu Pro Val Val His His Ala Val Asn Leu Arg Lys
290 295 300

Lys Met Asp Pro Pro Leu Gln Asp Val Ser Phe Gly Asn Leu Ser Val
305 310 315 320

Thr Val Ser Ala Phe Leu Pro Ala Thr Thr Thr Thr Thr Thr Asn Ala
325 330 335

Val Asn Lys Thr Ile Asn Ser Thr Ser Ser Glu Ser Gln Val Val Leu
340 345 350

His Glu Leu His Asp Phe Ile Ala Gln Met Arg Ser Glu Ile Asp Lys
355 360 365

Val Lys Gly Asp Lys Gly Ser Leu Glu Lys Val Ile Gln Asn Phe Ala
370 375 380

Ser Gly His Asp Ala Ser Ile Lys Lys Ile Asn Asp Val Glu Val Ile
385 390 395 400

Asn Phe Trp Ile Ser Ser Trp Cys Arg Met Gly Leu Tyr Glu Ile Asp
405 410 415

Phe Gly Trp Gly Lys Pro Ile Trp Val Thr Val Asp Pro Asn Ile Lys
420 425 430

Pro Asn Lys Asn Cys Phe Phe Met Asn Asp Thr Lys Cys Gly Glu Gly
435 440 445

Ile Glu Val Trp Ala Ser Phe Leu Glu Asp Asp Met Ala Lys Phe Glu
450 455 460

Leu His Leu Ser Glu Ile Leu Glu Leu Ile
465 470

<210> 28

<211> 474

<212> PRT

<213> Papaver somniferum

<400> 28

pctca2017050779-seql.txt

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Met Ala Thr Met Tyr Ser Ala Ala Val Glu Val Ile Ser Lys Glu Thr
1      5      10      15

Ile Lys Pro Thr Thr Pro Thr Pro Ser Gln Leu Lys Asn Phe Asn Leu
20      25      30

Ser Leu Leu Asp Gln Cys Phe Pro Leu Tyr Tyr Tyr Val Pro Ile Ile
35      40      45

Leu Phe Tyr Pro Ala Thr Ala Ala Asn Ser Thr Gly Ser Ser Asn His
50      55      60

His Asp Asp Leu Asp Leu Leu Lys Ser Ser Leu Ser Lys Thr Leu Val
65      70      75      80

His Phe Tyr Pro Met Ala Gly Arg Met Ile Asp Asn Ile Leu Val Asp
85      90      95

Cys His Asp Gln Gly Ile Asn Phe Tyr Lys Val Lys Ile Arg Gly Lys
100     105     110

Met Cys Glu Phe Met Ser Gln Pro Asp Val Pro Leu Ser Gln Leu Leu
115     120     125

Pro Ser Glu Val Val Ser Ala Ser Val Pro Lys Glu Ala Leu Val Ile
130     135     140

Val Gln Val Asn Met Phe Asp Cys Gly Gly Thr Ala Ile Cys Ser Ser
145     150     155     160

Val Ser His Lys Ile Ala Asp Ala Ala Thr Met Ser Thr Phe Ile Arg
165     170     175

Ser Trp Ala Ser Thr Thr Lys Thr Ser Arg Ser Gly Gly Ser Thr Ala
180     185     190

Ala Val Thr Asp Gln Lys Leu Ile Pro Ser Phe Asp Ser Ala Ser Leu
195     200     205

Phe Pro Pro Ser Glu Arg Leu Thr Ser Pro Ser Gly Met Ser Glu Ile
210     215     220

Pro Phe Ser Ser Thr Pro Glu Asp Thr Glu Asp Asp Lys Thr Val Ser
225     230     235     240

Lys Arg Phe Val Phe Asp Phe Ala Lys Ile Thr Ser Val Arg Glu Lys
245     250     255

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pctca2017050779-seql.txt

Leu Gln Val Leu Met His Asp Asn Tyr Lys Ser Arg Arg Gln Thr Arg
260 265 270

Val Glu Val Val Thr Ser Leu Ile Trp Lys Ser Val Met Lys Ser Thr
275 280 285

Pro Ala Gly Phe Leu Pro Val Val His His Ala Val Asn Leu Arg Lys
290 295 300

Lys Met Asp Pro Pro Leu Gln Asp Val Ser Phe Gly Asn Leu Ser Val
305 310 315 320

Thr Val Ser Ala Phe Leu Pro Ala Thr Thr Thr Thr Thr Asn Ala
325 330 335

Val Asn Lys Thr Ile Asn Ser Thr Ser Ser Glu Ser Gln Val Val Leu
340 345 350

His Glu Leu His Asp Phe Ile Ala Gln Met Arg Ser Glu Ile Asp Lys
355 360 365

Val Lys Gly Asp Lys Gly Ser Leu Glu Lys Val Ile Gln Asn Phe Ala
370 375 380

Ser Gly His Asp Ala Ser Ile Lys Lys Ile Asn Asp Val Glu Val Ile
385 390 395 400

Asn Phe Trp Ile Ser Ser Trp Cys Arg Met Gly Leu Tyr Glu Ile Asp
405 410 415

Phe Gly Trp Gly Lys Pro Ile Trp Val Thr Val Asp Pro Asn Ile Lys
420 425 430

Pro Asn Lys Asn Cys Phe Phe Met Asn Asp Thr Lys Cys Gly Glu Gly
435 440 445

Ile Glu Val Trp Ala Ser Phe Leu Glu Asp Asp Met Ala Lys Phe Glu
450 455 460

Leu His Leu Ser Glu Ile Leu Glu Leu Ile
465 470

<210> 29
<211> 160
<212> PRT
<213> Papaver somniferum

pctca2017050779-seql.txt

<400> 29

Met Ala Pro Leu Gly Val Ser Gly Leu Val Gly Lys Leu Ser Thr Glu
1 5 10 15

Leu Glu Val Asp Cys Asp Ala Glu Lys Tyr Tyr Asn Met Tyr Lys His
20 25 30

Gly Glu Asp Val Lys Lys Ala Val Pro His Leu Cys Val Asp Val Lys
35 40 45

Ile Ile Ser Gly Asp Pro Thr Ser Ser Gly Cys Ile Lys Glu Trp Asn
50 55 60

Val Asn Ile Asp Gly Lys Thr Ile Arg Ser Val Glu Glu Thr Thr His
65 70 75 80

Asp Asp Glu Thr Lys Thr Leu Arg His Arg Val Phe Glu Gly Asp Val
85 90 95

Met Lys Asp Phe Lys Lys Phe Asp Thr Ile Met Val Val Asn Pro Lys
100 105 110

Pro Asp Gly Asn Gly Cys Val Val Thr Arg Ser Ile Glu Tyr Glu Lys
115 120 125

Thr Asn Glu Asn Ser Pro Thr Pro Phe Asp Tyr Leu Gln Phe Gly His
130 135 140

Gln Ala Ile Glu Asp Met Asn Lys Tyr Leu Arg Asp Ser Glu Ser Asn
145 150 155 160

<210> 30

<211> 387

<212> PRT

<213> Papaver somniferum

<400> 30

Met Val Thr Ser Ala Met Asp Ile Glu Lys Leu Glu Ile Leu Gly Thr
1 5 10 15

Thr His Asn Gly Asn Ser Asn Thr Arg Ile Glu Lys Pro Lys Lys Thr
20 25 30

Lys Asn Trp Leu Leu Val Ile Ile Asn Cys Ala Ile Val Phe Val Gly
35 40 45

Ala Ile Gly Ser Pro Leu Leu Met Arg Leu Tyr Tyr Leu His Gly Gly
50 55 60

pctca2017050779-seql.txt

Ser His Ile Trp Leu Ser Ser Phe Ile Ala Ser Ala Gly Phe Pro Ile
65 70 75 80

Leu Ile Ile Pro Leu Met Phe Leu Phe Ile Arg Ser Arg Ser Ser Ala
85 90 95

Asp Lys Ile Ser Ser Ser Phe Trp Met Glu His Lys Leu Phe Leu Trp
100 105 110

Gly Ala Ile Leu Gly Val Leu Tyr Gly Leu Val Thr Phe Met Tyr Ala
115 120 125

Leu Gly Leu Ser Tyr Leu Pro Val Ser Thr Ser Thr Ile Leu Phe Ala
130 135 140

Thr Gln Leu Cys Phe Thr Ala Ile Phe Ala Trp Leu Ile Val Lys Gln
145 150 155 160

Lys Phe Thr Ala Phe Ile Ile Asn Ala Val Ile Val Met Thr Leu Gly
165 170 175

Ser Ile Leu Leu Gly Ile Asn Thr Asn Gly Asp Arg Pro Ile Gly Val
180 185 190

Ser Lys Thr Gln Tyr Leu Ile Gly Phe Leu Met Thr Leu Ala Ala Ala
195 200 205

Ala Leu Thr Gly Leu Gly Thr Pro Phe Val Glu Leu Ser Phe Ile Lys
210 215 220

Ala Thr Arg Asn Ile Thr Tyr Pro Thr Leu Leu Gln Phe Gln Val Ile
225 230 235 240

Leu Cys Leu Phe Gly Thr Cys Leu Asn Val Ile Gly Met Leu Ile Asn
245 250 255

Lys Asp Phe Gln Ala Ile Pro Arg Glu Ala Asp Met Phe Glu Leu Gly
260 265 270

Lys Ser Lys Tyr Tyr Met Ile Ile Cys Leu Thr Ala Leu Thr Trp Gln
275 280 285

Leu Ser Gly Ile Gly Leu Val Gly Leu Ile Leu Tyr Thr Asn Ala Leu
290 295 300

Phe Asn Gly Ile Tyr Val Ser Val Leu Val Pro Phe Thr Glu Val Ala

pctca2017050779-seq1.txt

petca2017050719_seq1.txt

Ala Val Ile Phe Phe His Glu Lys Phe Thr Gly Leu Lys Gly Met Ala
325 330 335

Leu Ala Leu Cys Leu Trp Gly Phe Ser Ser Tyr Phe Tyr Gly Glu Tyr
340 345 350

Lys Met Met Asn Lys Val Gly Asp Asn Glu Thr His Glu Lys Ile Glu
355 360 365

Glu Ala Glu Ser Glu Pro Lys Arg Leu Glu Asp Gln Gln Ala Pro Tyr
370 375 380

Ser Thr Val
385

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<210> 31
<211> 195
<212> PRT
<213> Papaver somniferum

<400> 31
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Met Ala Ser Val Asn Ser Phe Thr Thr Gln Arg Phe Leu Pro Ile Thr
1 5 10 15

Asn Pro Ile Thr Asn Arg Glu Ser Lys Ser Leu Lys Phe Ser Val Lys
20 25 30

Gly Leu Ser Gly Ser Ser Ser Leu Gln Lys Asn Phe His Asn Lys Ser
35 40 45

Thr Asn Leu Ile Thr Arg Leu Lys Gln Lys Lys Ile Asp Cys Val Val
50 55 60

Val Lys Ser Ser Val Thr Asp Val Lys Ser Ser Asp Ser Leu Asp Gln
65 70 75 80

Lys Glu Gly Val Ile Ile Ala His Gln Ile Glu Ile Glu Tyr Glu Asn
85 90 95

Ser Leu Ser Asn Asn Asp Asn Pro Val Gly Glu Leu Ser Asn Glu Gly
100 105 110

Arg Val Leu Ser Phe Glu Val Ala Gly Glu Leu Lys Gly Ile Ser Ser
115 120 125

Ser Ser Thr Thr Thr Thr Ser Ser Ser Phe Gly Leu Ile Ser Ile Leu
Page 33

130

135

140

Phe Ile Asn Thr Asn Glu Ile Glu Asp Leu Ser Lys Lys Ser Ile Asn
 145 150 155 160

Asn Ile Ser Ser Ser Leu Phe Ser Ser Ser Thr Pro Ala Glu Thr Lys
 165 170 175

Ile His Gln Leu Phe Ser Met Leu Ile Ile Asn Lys Ile His Gln Gln
 180 185 190

Ile Ser Ser
 195

<210> 32
 <211> 526
 <212> PRT
 <213> Papaver somniferum

<400> 32

Met Arg Thr Glu Ser Ile Lys Thr Asn Arg Pro Met Asp Leu Leu Leu
 1 5 10 15

Gln Tyr Leu Gln Pro Ile Ser Val Ala Leu Val Val Ile Ala Leu Val
 20 25 30

Trp Asn Tyr Gly Arg Arg Asn Pro Thr Lys Lys Leu Ala Pro Glu Ala
 35 40 45

Ser Gly Gly Arg Pro Ile Met Gly His Leu His Leu Phe Asn Asp Gly
 50 55 60

Glu Leu Thr His Arg Lys Leu Gly Ala Met Ala Asp Thr Tyr Gly Pro
 65 70 75 80

Val Phe Asn Ile Arg Phe Gly Ser His Lys Thr Leu Val Val Ser Asp
 85 90 95

Trp Glu Ile Val Lys Glu Cys Phe Thr Thr Asn Asp Lys Leu Phe Ser
 100 105 110

Asn Arg Pro Gly Thr Leu Gly Ile Lys Leu Met Phe Tyr Asp Ala Asp
 115 120 125

Ser Val Gly Tyr Ala Pro Tyr Gly Ala Tyr Trp Arg Asp Leu Arg Lys
 130 135 140

Ile Ser Thr Leu Lys Leu Leu Ser Asn His Arg Ile Asp Thr Ile Lys

145		150		155		160
His	Leu	Arg	Ser	Ser	Glu	Val
			165			
				Glu	Val	Glu
				Ser	Cys	Phe
				170		
					Glu	Ser
					Leu	Tyr
					175	Ser
Gln	Trp	Gly	Asn	Gly	Glu	Lys
		180				Ser
				Gly	185	
				Glu	Phe	Ala
				Pro	Val	Arg
				190		Met
Asp	Ser	Trp	Leu	Gly	Asp	Leu
	195				200	
				Thr	Phe	Asn
				Val	Val	Ala
				205		Arg
					Ile	Val
Ala	Gly	Lys	Lys	Asn	Phe	Ser
	210				215	
				Ala	Asn	Gly
				Asp	Val	Gly
				220		Ala
					Gln	Arg
Tyr	Lys	Ala	Ala	Met	Asp	Glu
	225			230		Ala
				Met	Arg	Leu
				235		Met
					Arg	Phe
					Phe	Ala
					240	
Phe	Ser	Asp	Val	Ile	Pro	Ser
			245			Leu
				Ser	Leu	Ser
				Trp	Leu	Asp
				250		Asn
					Leu	Arg
					255	Gly
Leu	Val	Arg	Glu	Met	Lys	Lys
		260			Cys	Ala
				265		Ser
				Glu	Ile	Asp
				Ser	Ile	Met
				270		
Ala	Thr	Trp	Val	Glu	Glu	His
	275				Arg	Val
				Lys	Arg	Asn
				Ser	Gly	Gly
				285		Asn
Ser	Gln	Leu	Glu	His	Asp	Phe
	290				295	
				Ile	Asp	Val
				Cys	Leu	Asp
				300		Ile
					Met	Glu
His	Ser	Ser	Leu	Pro	Gly	Asp
	305				310	
				Asp	Pro	Asp
				Leu	Val	Val
				315		Lys
					Ser	Thr
					320	
Cys	Leu	Asp	Met	Ile	Leu	Gly
			325			Gly
				Ser	Asp	Thr
				330		Thr
					Thr	Val
					335	Thr
						Leu
Thr	Trp	Ala	Met	Ser	Leu	Leu
		340				Leu
				Asn	His	Pro
				345		Gln
					Val	Leu
					350	Gln
						Lys
Ala	Lys	Glu	Glu	Leu	Glu	Thr
	355				Gln	Val
				Gly	Lys	Asn
				Arg	Gln	Val
				365		Asp
Asp	Ser	Asp	Ile	Pro	Asn	Leu
	370				375	
				Phe	Ile	Gln
				Ala	Ile	Ile
				380		Lys
					Glu	
Thr	Met	Arg	Leu	Tyr	Pro	Ala
	385				390	
				Gly	Pro	Leu
				Ile	Glu	Arg
				395		Arg
					Thr	Met
					400	

pctca2017050779-seql.txt

Glu Asp Cys Glu Val Ala Gly Tyr Gln Val Pro Ala Gly Thr Arg Leu
405 410 415

Leu Val Asn Val Trp Lys Met Gln Arg Asp Gly Asn Val Tyr Lys Gly
420 425 430

Asp Pro Leu Glu Phe Arg Pro Asp Arg Phe Leu Thr Ser Asn Ala Asp
435 440 445

Val Asp Leu Lys Gly Gln His Tyr Glu Leu Ile Pro Phe Gly Ala Gly
450 455 460

Arg Arg Ile Cys Pro Gly Val Ser Phe Ala Val Gln Leu Met His Leu
465 470 475 480

Val Leu Ala Arg Leu Leu His Glu Phe Glu Ile Thr Thr Val Glu Pro
485 490 495

Glu Thr Lys Val Asp Met Ala Glu Ser Gly Gly Leu Leu Cys Tyr Lys
500 505 510

Ile Met Pro Leu Glu Val Leu Ile Lys Pro Arg Leu Glu Ile
515 520 525

<210> 33
<211> 359
<212> PRT
<213> Papaver somniferum

<400> 33

Met Asp Ser Gln Arg Pro Gly Gly Ala Pro Arg Pro Pro Gln Gly Gly
1 5 10 15

Gly Ala Asp Pro Gly Asp Ala Ser Phe Ile Leu Thr Val Leu Ile Ala
20 25 30

Leu Val Ala Ile Ala Ala Leu Ile Leu Ile Pro Ala Ser Leu Ser Ala
35 40 45

Ser Asn Ser Thr Phe Ser Ser Leu His Gln Val Pro Glu Gly His Val
50 55 60

Gly Val Tyr Trp Arg Gly Gly Ala Leu Leu Lys Thr Ile Thr Asp Pro
65 70 75 80

Gly Phe His Val Lys Met Pro Leu Ile Thr Gln Phe Glu Pro Ile Gln
85 90 95

pctca2017050779-seql.txt

Val Thr Leu Gln Thr Asp Gln Val Lys Asp Ile Pro Cys Gly Thr Lys
100 105 110

Gly Gly Val Met Ile His Phe Glu Lys Ile Glu Val Val Asn Arg Leu
115 120 125

Arg Lys Asp Tyr Val Tyr Glu Thr Leu Leu Asn Tyr Gly Val Gln Tyr
130 135 140

Asp Lys Thr Trp Ile Tyr Asp Lys Ile His His Glu Ile Asn Gln Phe
145 150 155 160

Cys Ser Ala Gln Ser Leu Gln Gln Val Tyr Ile Asp Lys Phe Asp Gln
165 170 175

Ile Asp Glu Arg Met Lys Glu Ala Leu Gln Gly Asp Cys Thr Gln Tyr
180 185 190

Ala Pro Gly Ile Glu Ile Leu Ser Val Arg Val Thr Lys Pro Thr Ile
195 200 205

Pro Gln Ser Ile Arg Arg Asn Phe Glu Gln Met Glu Glu Glu His Thr
210 215 220

Lys Val Leu Ile Ala Val Glu Lys Gln Lys Val Ala Glu Lys Glu Ala
225 230 235 240

Glu Thr Gln Lys Lys Ile Ala Leu Ala Asp Ala Glu Lys Asn Ser Gln
245 250 255

Val Ser Lys Ile Arg Met Glu Gln Met Leu Thr Glu Lys Thr Ser Ala
260 265 270

Met Lys Gln Glu Glu Ile Asp Asn His Met Tyr Leu Ala Arg Glu Lys
275 280 285

Ser Leu Ala Asp Ala Asp Tyr Tyr Lys Val Ile Lys Glu Ala Glu Ala
290 295 300

Asn Lys Leu Lys Leu Thr Pro Glu Phe Leu Glu Leu Lys Phe Ile Gln
305 310 315 320

Ala Ile Ala Asn Asn Ser Lys Ile Phe Phe Gly Asp Lys Val Pro Asn
325 330 335

Met Ile Leu Asp Gln Arg Leu Leu Gly Asn Phe Leu Asn Asn Ala Gly
340 345 350

pctca2017050779-seql.txt

Asn Arg Gln Met Ala Asp Ile
355

<210> 34
<211> 636
<212> PRT
<213> Papaver somniferum

<400> 34

Met Glu Ala Leu Gln Ile Ser Cys Thr Val Val Thr Cys Lys Ser Ser
1 5 10 15

Pro Thr Thr Thr Ala Phe Lys Pro Arg Ser Thr Thr Ser Leu Lys Lys
20 25 30

Ser Asn Ile Phe Gly Ile Thr Asn Ser Ser Ser Gly Ile Leu Leu Ser
35 40 45

Leu Lys Thr Ser Ile Thr Asp Arg Glu Ile Arg Phe Arg Cys Tyr Gln
50 55 60

Asp Gly Phe Ser Ile Ser Asp Ala Glu Glu Ile Asp Ala Lys Asp Lys
65 70 75 80

Asp Gly Ile Phe Met Thr Tyr Lys Lys Lys Thr Asp Pro Gly Val Ser
85 90 95

Lys Ile Gly Glu Val Ile Ala Glu Ser Val Ala Asp Val Gly Glu Ala
100 105 110

Ile Glu Glu Val Val Lys Pro Lys Ala Ala Gly Glu Thr Tyr Ser Ile
115 120 125

Val Val Val Ser Ser Glu Ala Val Pro Tyr Ser Lys Thr Gly Gly Leu
130 135 140

Gly Asp Val Cys Gly Ser Leu Pro Ile Ala Leu Ala Ala Arg Gly His
145 150 155 160

Arg Val Met Val Val Ser Pro Arg Tyr Val Asn Gly Ser Ala Ser Asp
165 170 175

Lys Ile Tyr Lys Gly Ala Leu Asp Ala Gln Cys Arg Ile Lys Ile Pro
180 185 190

Cys Phe Glu Ala Glu His Glu Val Ala Phe Phe His Glu Tyr Arg Ala
195 200 205

pctca2017050779-seql.txt

Gly Val Asp Trp Val Phe Val Asp His Pro Ser Tyr His Arg Pro Gly
210 215 220

Asn Pro Tyr Gly Asp Gln Phe Gly Ala Tyr Gly Asp Asn Gln Phe Arg
225 230 235 240

Phe Thr Leu Leu Ser His Ala Ala Cys Glu Ala Pro Leu Val Leu Pro
245 250 255

Leu Gly Gly Phe Thr Tyr Gly Glu Lys Cys Met Phe Leu Val Asn Asp
260 265 270

Trp His Ala Ser Leu Val Pro Val Leu Leu Ala Ser Lys Tyr Arg Pro
275 280 285

Tyr Gly Val Tyr Lys Asp Ala Arg Ser Ile Leu Ala Ile His Asn Leu
290 295 300

Ala His Gln Gly Val Glu Pro Ala Ala Thr Tyr Lys Asn Phe Gly Leu
305 310 315 320

Pro Ala Glu Trp His Gly Ala Leu Glu Trp Val Phe Pro Thr Trp Ala
325 330 335

Arg Thr His Ala Leu Asp Thr Gly Glu Ala Val Asn Ile Met Lys Gly
340 345 350

Ala Ile Val Thr Ala Asp Arg Ile Leu Thr Val Ser Lys Gly Tyr Ala
355 360 365

Trp Glu Ile Thr Thr Val Glu Gly Gly Tyr Gly Leu Asp Gly Leu Ile
370 375 380

Ser Ser Arg Glu Ser Val Leu Asp Gly Ile Thr Asn Gly Ile Asp Ile
385 390 395 400

Asp Glu Trp Asn Pro Ser Ser Asp Val His Ile Pro Phe His Tyr Ser
405 410 415

Ile Asp Asp Leu Ser Gly Lys Gln Glu Cys Lys Ala Ala Leu Gln Lys
420 425 430

Glu Leu Gly Leu Pro Val Arg Pro Asp Val Pro Leu Ile Gly Phe Ile
435 440 445

Gly Arg Leu Asp Tyr Gln Lys Gly Ile Asp Met Ile Glu Ala Ala Met
450 455 460

pctca2017050779-seql.txt

Pro Glu Leu Met Met Asp Asp Val Gln Phe Ile Met Leu Gly Ser Gly
465 470 475 480

Asn Ala Arg Met Glu Asp Trp Met Lys Ala Thr Glu Ala Ala Tyr Lys
485 490 495

Asp Lys Tyr Arg Gly Trp Val Gly Phe Asn Val Pro Ile Ser His Arg
500 505 510

Ile Thr Ala Gly Ala Asp Ile Leu Leu Met Pro Ser Arg Phe Glu Pro
515 520 525

Cys Gly Leu Asn Gln Leu Tyr Ala Met Arg Tyr Gly Thr Ile Pro Val
530 535 540

Val His Cys Thr Gly Gly Leu Arg Asp Thr Val Glu Asn Phe Asp Pro
545 550 555 560

Phe Ala Asn Glu Gly Ser Gly Lys Gly Thr Gly Trp Thr Phe Ser Pro
565 570 575

Leu Ala Lys Asp Pro Met Leu Gly Val Leu Arg Ile Ala Met Asp Thr
580 585 590

Tyr Arg Lys His Lys Asp Ser Trp Lys Gly Leu Met Lys Arg Gly Met
595 600 605

Glu Gln Asp Phe Thr Trp Asp Lys Ala Ala Ala Gln Tyr Glu Gln Val
610 615 620

Phe Lys Trp Ala Phe Met Asp Pro Pro Tyr Val Lys
625 630 635

<210> 35
<211> 532
<212> PRT
<213> Papaver somniferum

<400> 35

Met Leu Lys Val Lys Lys Tyr Tyr Ser Ser His His Cys Gly Val Gly
1 5 10 15

Cys Gln Arg Leu Phe His Arg Leu Ser Ser Lys Phe Val Ser Thr Leu
20 25 30

Ile Lys Asp Glu Ile Arg Ser Asp Pro Ser Phe Lys Ala Ser Asp Leu
35 40 45

pctca2017050779-seql.txt

Ala Lys Phe Phe Lys Thr Ser Tyr Gly Ile Asn Val Lys Tyr Tyr Gln
50 55 60

Ala Tyr Asn Gly Arg Glu Lys Val Tyr Glu Asp Ile Phe Gly Asp Glu
65 70 75 80

Ala Met Ser Tyr Ser His Leu Ser Trp Tyr Val Asp Ser Ile Arg Ser
85 90 95

Thr Asn Pro Gly Ser Trp Ile Asp Phe Gln Val Gln Thr Asp Glu Pro
100 105 110

Glu Ala Asn Glu Asp Ser Ser Ala Glu Leu Glu Asp Glu Ala Pro Ser
115 120 125

Asn Lys Phe Val Arg Leu Phe Ile Ala Phe Glu Ala Cys Ile His Gly
130 135 140

Tyr Arg Tyr Leu Arg Pro Met Val Tyr Val Asp Ala Thr Phe Leu Thr
145 150 155 160

Gly Thr Tyr Arg Gly Cys Leu Met Ala Ala Thr Ala Ile Asn Ala Glu
165 170 175

Asn Gly Phe Phe Pro Leu Ala Met Ala Leu Val Pro Gly Glu Asp Asn
180 185 190

Asp Asn Trp Glu Trp Phe Met Arg Asn Leu Ser Asn Val Leu Asp His
195 200 205

Asp Gln Arg Pro Ile Thr Phe Leu Ser Asp Arg Ala Glu Gly Leu Lys
210 215 220

Arg Ala Ile Pro Phe Tyr Phe Pro Gly Ala Phe His Ser Phe Cys Tyr
225 230 235 240

Tyr His Leu Lys Met Asn Leu Pro Ile Asn Ala Ser Asp Glu Arg Tyr
245 250 255

Gly Ala Val Ile Asp Ser Phe Gln Ala Val Ala Tyr Ala Leu Ser Arg
260 265 270

Glu Gly Phe Gln Thr Ala Ile Ala Thr Ile Arg Gly Leu Gly Cys Gly
275 280 285

Trp Val Ala Asp Tyr Ile Glu Asp Ile Pro Pro Glu Lys Trp Ser Asn

pctca2017050779-seql.txt

290

295

300

Ala Phe Phe Gln Gly Cys Arg Tyr Gly Arg Thr Ser Ser Thr Leu Ala
 305 310 315 320

Glu Ser Phe Asn Ser Trp Met Lys Val His Lys Lys Leu Pro Ala Asn
 325 330 335

Ala Leu Leu Asp Gln Ile Arg Lys Asp Val Met Ser Met Met Ser Glu
 340 345 350

Arg Arg Asn Thr Gly Asn Ser Phe Ile Thr Ile Leu Thr Pro Lys Asn
 355 360 365

Glu Asn Lys Met Lys Ala Leu Ile Asp Gly Gly Leu Thr Trp Leu Val
 370 375 380

Ile Gln Ser Asp Thr His Val Tyr Glu Val Glu Gly Gly Asp Ser Ser
 385 390 395 400

His Ser Val Asn Leu Glu Ala Arg Thr Cys Thr Cys Gln Arg Trp Arg
 405 410 415

Val Tyr Gly Phe Pro Cys Val His Ala Phe Ala Ser Ile Thr Met Ser
 420 425 430

Gly Ser Asn Pro Tyr Asp Phe Val Glu Pro Tyr Phe Thr Thr Ser Tyr
 435 440 445

Phe Asn Asn Ala Tyr Ser His Ala Ile His Pro Ile Pro Asn Tyr Asn
 450 455 460

Arg Pro Glu Val Tyr Glu Gly Asn Asp Ile Ile Asp Val Pro Asp Val
 465 470 475 480

Arg Arg Pro Pro Gly Arg Pro Gln Ala Asn Arg His Leu Ser Arg Tyr
 485 490 495

Glu Lys Pro Pro Arg Arg Ala Met Arg Cys Gly Asn Cys Phe Glu Leu
 500 505 510

Gly His His Asn Lys Gln Thr Cys Thr Asn Pro Thr Cys Tyr Lys Lys
 515 520 525

Pro Pro Lys Gln
 530

pctca2017050779-seql.txt

<210> 36

<211> 472

<212> PRT

<213> Papaver somniferum

<400> 36

Met Met Gly Met Ser Lys Lys Lys Lys Thr Ala Lys Asn Trp Phe Thr
1 5 10 15

Ser Val Lys Asn Ala Phe Lys Ser Ser Ala Pro Ile Ser Ser Ser Pro
20 25 30

Ser Ser Lys Asp Tyr Ser Leu Ala Asn Lys Ile Ile Glu Glu Gly His
35 40 45

Glu Ile Pro Glu Ile Val Ser Leu Glu His Tyr Pro Val Cys Asp Thr
50 55 60

Ser Ser Leu Thr Thr Thr Ile Asp Glu Asn Asn Ala Glu Ala Val Leu
65 70 75 80

Glu Met Arg Asp Glu Asp Arg Arg Arg Ser Asn His Ala Ile Ala Met
85 90 95

Ala Val Val Ala Ala Glu Ala Ala Val Leu Ala Ala His Glu Ala Thr
100 105 110

Lys Val Ser Arg Phe Ser Ser Tyr Asn Arg Arg Arg Phe Tyr Gly Tyr
115 120 125

Ser Lys Glu Glu Arg Ala Ala Thr Lys Ile Gln Ser His Tyr Lys Gly
130 135 140

Tyr Leu Ala Arg Arg Ala Leu Arg Ala Leu Arg Gly Leu Val Lys Leu
145 150 155 160

Gln Ala Leu Val Arg Gly His Asn Val Arg Lys Gln Ala Glu Met Thr
165 170 175

Met Arg Cys Met Gln Ala Ile Val Arg Val Gln Ala Arg Thr Lys Ala
180 185 190

Asp Arg Leu Arg Leu Gln Gly Ala Thr Ser Arg Asp Asn Glu Lys Asn
195 200 205

Lys Gly Lys Lys Arg Ala Thr Glu Thr Trp Asn Asn Ser Arg Gly Arg
210 215 220

pctca2017050779-seql.txt

Gln Gln Gln Ala Arg Asn Ser Phe Ser Phe Glu Asn Glu Tyr Ala Ser
 225 230 235 240
 Gln Lys Ile Asn Lys Glu Glu His Tyr Leu Ser Ser Asn Ser Met Thr
 245 250 255
 Ile Gln Asn Glu Arg Ala Leu Ala Tyr Ala Tyr Pro Tyr Gln Asp Ser
 260 265 270
 Val Ser Asn Arg Gln Asn Ser Val Asp Ser Tyr Ser Asp Glu Lys Thr
 275 280 285
 Asn Gln Gly Gly Trp Asn Leu Leu Asp Arg Trp Ile Asp Ser Gln Pro
 290 295 300
 Trp His Arg Asp Lys His Val Ala Ala Ile Pro Glu Ser Ser Tyr Thr
 305 310 315 320
 Ser Arg Thr Tyr Asn Thr Asp Asp Asp Asn Ala Ser Glu Arg Thr Ala
 325 330 335
 Asp Thr Asp Leu Val Ser Leu Ser Pro Ser Tyr Gln Leu Arg Phe Asn
 340 345 350
 Pro Ile Ser Asn Leu Ser Lys Leu Gly Ile Asn Ser Ala Gly Ser Val
 355 360 365
 Pro Ile Arg Gln Arg Lys Gln Arg Val Met Val Ser Val Glu Thr Glu
 370 375 380
 Asn Val Asn Thr Pro Ser Tyr Met Ala Thr Thr Gln Ser Ala Lys Ala
 385 390 395 400
 Lys Ala Lys Ser Ala Gln Asn Ser Leu Leu Ser Ser Ser Ser Ser Thr
 405 410 415
 Arg Arg Ile Phe Leu Asn Asp Leu Ser Met Ser Ser Ser Thr Asp Gly
 420 425 430
 Ile Gly Thr Gly Glu Val Arg Thr Met Asn Gln Leu Gly Pro Ile Asn
 435 440 445
 Ser Pro Ser Pro Thr Ser Ser Gln Lys Met Met Arg Leu Leu Lys Met
 450 455 460
 Gly Lys Pro Ile Lys Gly Val Arg
 465 470

pctca2017050779-seql.txt

<210> 37
 <211> 470
 <212> PRT
 <213> Papaver somniferum

<400> 37

Met Asp Thr Phe Gln Phe Pro Lys Leu Leu Lys Asn Ser Ile Leu Ile
 1 5 10 15

Ile Phe Phe Leu Gln Ile Ser Phe Ser Leu Ser Trp Gly Phe Phe Ile
 20 25 30

Pro Val Asp Asn Tyr Leu Val His Cys Gly Ser Val Glu Asn Thr Val
 35 40 45

Leu Asn Asn Arg Ile Phe Val Ser Asp Ser Ser Gly Cys Gly Ser Ser
 50 55 60

Leu Trp Ser Ala Ala Arg Thr Thr Ser Leu Lys Asp Glu Asn Pro Leu
 65 70 75 80

Glu Gly Ser Ser Pro Leu Tyr His Thr Ala Arg Val Phe Thr Lys Leu
 85 90 95

Ser Asn Tyr Glu Phe Glu Ile Lys Glu Lys Gly Thr His Phe Val Arg
 100 105 110

Leu His Phe Phe Pro Phe Asp Ser Thr Lys Leu Asn Leu Ser Asp Ser
 115 120 125

Leu Phe His Val Ser Val Asn Gly Val Leu Leu Leu Ser Asn Phe Thr
 130 135 140

Gly Gln Glu Glu Glu Ser Arg Asn Phe Lys Asn Pro Val Leu Lys Glu
 145 150 155 160

Tyr Leu Ile Trp Val Glu Ser Gly Asp Lys Leu Val Leu Ser Phe Ile
 165 170 175

Pro Ser Lys Glu Ser Ser Phe Ala Phe Val Asn Ala Ile Glu Val Ile
 180 185 190

Ser Ala Pro Lys Asp Leu Ile Ala Asp Thr Ala Gln His Val Thr Ser
 195 200 205

Glu Arg Val Glu Lys Tyr Asn Gly Leu Thr Lys Glu Ala Leu Glu Thr
 210 215 220

pctca2017050779-seql.txt

Ile Tyr Arg Ile Asn Ile Gly Gly Pro Lys Val Thr Pro Phe Asn Asp
225 230 235 240

Thr Leu Trp Arg Thr Trp Ile Pro Ala Asp Gly Phe Leu Lys Leu Val
245 250 255

Ala Ala Ser Lys Ala Ile Ser Phe Ser Gly Arg Ile Lys Tyr His Ala
260 265 270

Gly Gly Ala Ser Arg Glu Val Ala Pro Asp Asn Val Tyr Ser Ser Ala
275 280 285

Arg Ile Met Ser Tyr Pro Asn Val Ser Met Pro Asp Phe Asn Ile Thr
290 295 300

Trp Val Phe Pro Val Lys Ser Gly Tyr Ser Tyr Leu Ala Arg Met His
305 310 315 320

Phe Cys Asp Ile Ala Ser Met Ala Leu Asn Glu Leu Tyr Phe Asp Ile
325 330 335

Tyr Ile Asn Gly Tyr Ala Ala Tyr Lys Asp Phe Asp Met Ser Glu Leu
340 345 350

Ser Gly Gln Met Leu Ala Ala Pro Tyr Tyr Ala Asp Phe Val Ile Asp
355 360 365

Ala His Thr Ala Lys Glu Leu Thr Ile Ser Ile Gly Pro Ser Ser Leu
370 375 380

Ser Ser Pro Glu Arg Ile Asn Ala Ile Leu Asn Gly Leu Glu Ile Met
385 390 395 400

Lys Met Asn Asn Ser Met Gly Ser Leu Asp Gly Glu Ile Ser Val Asp
405 410 415

Ser Ile Met Gln Ser Ser Pro Arg Arg His Met Gly Ile Ser Ala Pro
420 425 430

Ser Val Val Val Leu Ser Leu Leu Leu Ala Ala Phe Val Leu His Lys
435 440 445

Arg Arg Thr Gly Lys Lys Asp Ser Met Gly Trp Ser Pro Leu Pro Val
450 455 460

Asp Val Pro Glu Gly Lys
465 470

pctca2017050779-seql.txt

<210> 38
 <211> 241
 <212> PRT
 <213> Papaver somniferum

<400> 38

Met Leu Thr Gly Glu Ser Ser Leu Pro Asn Val Gly Leu Tyr Arg Thr
 1 5 10 15

Thr Ile Glu Glu Ser Asn Glu Ile Lys Lys Gln Val Gln Glu Leu Leu
 20 25 30

Glu Leu Gly Met Ile Val Pro Ser Ala Ser Pro Tyr Gly Ser Ala Val
 35 40 45

Leu Leu Val Pro Lys Lys Asp Gly Gly Trp Arg Met Cys Ile Asp Tyr
 50 55 60

Arg Ala Leu Asn Lys Ile Thr Ile Lys Asn Arg Tyr Pro Leu Pro Arg
 65 70 75 80

Ile Asp Asp Met Met Asp Gln Leu Glu Lys Val Arg Val Phe Thr Lys
 85 90 95

Leu Asp Phe Lys Phe Arg Tyr His His Met Arg Val Gln Glu Asp Asp
 100 105 110

Thr Trp Lys Thr Ala Phe Lys Thr Lys Gln Gly Leu Phe Glu Trp Leu
 115 120 125

Val Met Pro Phe Gly Leu Cys Asn Ala Ser Ala Thr Phe Met Cys Leu
 130 135 140

Met Asn Asp Leu Ile Arg Pro Phe Ile Glu Tyr Phe Ala Ile Val Tyr
 145 150 155 160

Leu Asp Asp Ile Leu Ile Tyr Asp Arg Thr Trp Glu Glu His Leu Val
 165 170 175

His Ala Glu Lys Val Phe Lys Val Leu His Glu Gly Gln Leu Lys Leu
 180 185 190

Asn Val Lys Met Cys Glu Phe Gly Lys Glu Glu Leu Val Tyr Leu Gly
 195 200 205

Phe Ile Val Gly Gly Gly Gln Arg Lys Ile Asp Pro Lys Lys Val Glu
 210 215 220

pctca2017050779-seql.txt

Val Ile Thr Lys Trp Ala Arg Pro Ser Thr Val Thr Glu Ile Arg Ser
225 230 235 240

Ser

<210> 39
<211> 248
<212> PRT
<213> Papaver somniferum

<400> 39

Met Ala Ile Val Cys Met Thr Tyr Glu Gly Val Lys Ser Ile Glu Ser
1 5 10 15

Tyr Glu Lys Glu Gly Lys Ile Ser Lys Gly Ser Gly Ile His Gly Leu
20 25 30

Gly Ala Ser Ile Ala Lys Pro Val Asp Gly Arg Phe Glu Val Ile Cys
35 40 45

Leu Glu Gly Leu Arg Pro Tyr Val Gly Asp Ile Val Ser Asp Asp Pro
50 55 60

Gln Arg Lys Leu Ala Leu Met Lys Pro Arg Leu Pro Asn Gly Glu Cys
65 70 75 80

Pro Pro Gly Phe Leu Gly Phe Ala Val Asn Met Ile Asn Leu Asp His
85 90 95

Ser Tyr Leu Ser Tyr Val Thr Ala Thr Gly His Gly Leu Arg Glu Thr
100 105 110

Leu Phe Tyr Ser Leu Phe Ser Arg Leu Gln Val Tyr Arg Thr Arg Ala
115 120 125

Glu Met Leu Leu Ala Leu Pro Phe Ile Cys Asp Gly Ala Met Ser Leu
130 135 140

Asp Gly Gly Met Ile Arg Ser Ala Gly Met Leu Val Leu Gly Asp Arg
145 150 155 160

Lys Asp Val Glu Val Arg Phe Pro Leu Thr Ser Pro Thr Lys Lys Met
165 170 175

Ala Leu Asn Tyr Leu Asp Thr Glu Glu Lys Leu Lys Leu Lys Lys Trp
180 185 190

pctca2017050779-seql.txt

Glu Lys Glu Arg Ile Leu Asp Asp Val Gln Arg Glu Gln Gln Leu Leu
195 200 205

Phe His Val Lys Gln Ser Phe Glu Ser Lys Arg Gln Glu Phe Val Lys
210 215 220

Asn Leu Ala Glu Ser Ser Ser Tyr Ile Thr Gln Gln Gln Phe Gln Ser
225 230 235 240

Gly Ser Arg Ser Ser Thr Pro Arg
245

<210> 40
<211> 127
<212> PRT
<213> Papaver somniferum

<400> 40

Met Ser Ala Lys Glu Ile Arg Val Thr Gln Pro Met Leu Gln Gly Tyr
1 5 10 15

Phe Asn Pro Ser Leu Tyr Ile Pro Asp Gln Pro Trp Lys His Ile Thr
20 25 30

Met Gly Phe Ile Glu Gly Leu Thr Val Ser Asn Lys Lys Ile Val Ile
35 40 45

Pro Val Ile Val Asp Arg Leu Thr Lys Tyr Ala His Phe Phe Ala Leu
50 55 60

Gln His Pro Tyr Thr Ala Ala Ser Val Ser His Thr Phe Leu Asn Glu
65 70 75 80

Val Phe Lys Leu His Gly Leu Pro Ser Ser Ile Val Ser Asp Arg Asp
85 90 95

Lys Val Phe Thr Arg Lys Phe Trp Gln Asp Leu Phe Lys Ala Leu Gly
100 105 110

Thr Asn Leu Asn Leu Ser Thr Ala Tyr His Pro Gln Thr Asp Gly
115 120 125

<210> 41
<211> 936
<212> PRT
<213> Papaver somniferum

<400> 41

pctca2017050779-seql.txt

Met Val Tyr Ala Ser Ala Asp His Phe Gln Ile Lys Met Trp Val Ser
1 5 10 15

Val Ser Arg Lys Ser Asn Asn Arg Glu Ile Phe Gly Asp Leu Leu Glu
20 25 30

Pro Asn Val Asn Arg Gln Ser Ser Leu Asn Val Ile Gln Asp Cys Leu
35 40 45

Lys Glu Lys Leu Met Val Gly Lys Cys Leu Ile Val Leu Asp Asp Val
50 55 60

Trp Ile Asn His Gly Ile Asp Val Asp Glu Leu Leu Lys Asp Leu Leu
65 70 75 80

Ser Met Ser Phe Gln Gly Ser Lys Ile Leu Met Thr Met Arg Ser Ala
85 90 95

Glu Asp Ile Pro Pro Met Lys Asp His Arg Tyr Ile Ile Tyr Gln Leu
100 105 110

Gln Gly Leu Pro Glu Asp Asp Cys Trp Ser Ile Ile Lys Asp Ile Ala
115 120 125

Phe Gly His Gly Gly Ala Lys Glu Thr Pro Asn Leu Ile Asn Thr Gly
130 135 140

Lys Gln Ile Ala Ile Lys Cys Gly Gly Leu Pro Leu Ala Ala Lys Thr
145 150 155 160

Leu Gly Gly Leu Leu Tyr Ser Arg Asn Asp Gln Glu Glu Trp Leu Ser
165 170 175

Asn Leu Asn Thr Gln Ser Trp Glu Leu Pro Thr Gly Glu Ser Lys Ile
180 185 190

Val Ser Leu Leu Lys Phe Ser Tyr Asp His Leu Ser Pro Tyr Val Lys
195 200 205

Cys Phe Ser Tyr Cys Ser Ile Phe Pro Lys Gly His Val Phe Ser Lys
210 215 220

Asn Glu Val Ile Arg Met Trp Met Ala Glu Gly Phe Leu Ile Ser Pro
225 230 235 240

Trp Gln Ala Asn Glu Ser Pro Glu Ile Val Gly Asn Gly Tyr Phe Lys
245 250 255

pctca2017050779-seql.txt

Ile Leu Leu Leu Asn Ser Phe Phe Gln Asp Glu Arg Arg Asn Ile Trp
260 265 270

Gly Asp Ile Lys Ser Phe Arg Met His Asp Leu Val His Asp Leu Ser
275 280 285

Val Ser Ile Thr Gly Cys Glu Ser Leu Asn Ile Thr Ile Asp Asp Ile
290 295 300

Pro Lys Ile Asp Gln Ser Phe Thr Phe Arg Arg Leu Gly Leu Gln Val
305 310 315 320

Leu His Ser Gly Val Ser Thr Ala Ile Pro Ser Glu Ile Tyr Lys Ala
325 330 335

Phe Lys Lys Leu His Thr Phe Val Tyr Ser Gly Leu His Asp Gly Glu
340 345 350

Asp Val Trp Ala Arg Arg Val Cys Thr Phe Gly Phe Ile Arg Val Leu
355 360 365

Lys Leu Ser His Thr Gly Ile Glu Glu Leu Pro Lys Ser Ile Cys Lys
370 375 380

Leu Lys His Leu Arg Tyr Leu Asp Val Lys Arg Cys Asn Arg Leu Lys
385 390 395 400

Glu Leu Pro Gln Asp Ile Arg Lys Leu Ile Gly Leu Glu Tyr Leu Ile
405 410 415

Phe Arg Asn Lys Tyr Thr Leu Ser Ala Lys Met Pro Arg Lys Val Ser
420 425 430

Arg Leu Ser Ala Leu Lys Lys Leu Ser Val Phe Ile Val Gly Glu Glu
435 440 445

Gly Lys Gly Ser Gly Ile Glu Glu Leu Lys Asp Leu Asn Leu Leu Gly
450 455 460

Gly Lys Leu Ser Ile Glu Asp Leu Gly Asn Val Thr Asp Gly Thr Gln
465 470 475 480

Ala Asn Leu Met Gly Lys Lys Asn Ile Arg His Leu Glu Leu Ser Trp
485 490 495

Asp Ser Arg Gly Cys Asn Asp Pro Asp Arg Ile Ile Lys Asp Val Glu

500

Val Ile Asn Asp Leu Gln Pro His Leu Asn Leu Lys Lys Leu Gly Val
515 520 525

Ser His Phe Gly Gly Ser Glu Ile Pro Thr Trp Leu Arg Ser Ala Ser
530 535 540

Val His Leu Pro Lys Leu Val Ser Ile Thr Leu Tyr Arg Cys Asn Glu
545 550 555 560

Cys Glu His Phe Pro Ala Leu Gly Gly Leu Gln His Leu Lys Tyr Leu
565 570 575

Phe Met Asp Gly Phe Gly Gly Val Lys Arg Ile Gly Asn Glu Phe Cys
580 585 590

Pro Ser Asn Glu Glu Ala Val Ser Phe Pro Ser Leu Val Leu Leu Tyr
595 600 605

Ile Tyr His Tyr Thr Asn Ser Val Asn Ser Asp Arg Ser Ser Arg Ala
610 615 620

Ser Thr Phe Ser Trp Ser Glu Asp Leu Glu Asn Gln Asn Gly Ser Thr
625 630 635 640

Leu Ser Thr Thr Pro Thr Glu Phe Pro Phe Leu Arg Lys Leu Tyr Phe
645 650 655

His Ile Glu Arg Gln Val Asp Ala Asn Leu Lys Ser Leu Ser Pro Lys
660 665 670

Leu Leu Trp Gly Val Leu Gln Thr Leu Leu Val Ala Gly Cys Asn Glu
675 680 685

Phe Val Gly Phe Glu Gln Gln His Arg His Gln Leu Asp His Leu Ser
690 695 700

Tyr Ser His Leu Arg Arg Leu Glu Val Phe Lys Cys Pro Ser Leu Thr
705 710 715 720

Val Leu Pro Ala Asp Phe Ser Gly Leu Asn Ser Leu Thr Tyr Leu Ala
725 730 735

Ile Glu Glu Cys Ser Ser Leu His Ser Leu Pro Asp Gly Ile Gln Tyr
740 745 750

pctca2017050779-seql.txt

Leu Pro Ala Leu Glu Thr Leu Ile Ile Gly Gly Phe Ser Glu Asp Leu
755 760 765

Thr Ser Phe Pro Phe Pro Ala Ala Ser Gly Ser Asp Gly Glu Lys Tyr
770 775 780

Phe Val Ser Leu Arg Val Leu Lys Ile Cys Gly Trp Pro Thr Leu Ser
785 790 795 800

Ala Glu Leu Pro Asp Gln Leu Gln Leu Leu Thr Cys Leu Gln Cys Phe
805 810 815

Thr Ile Arg Gly Phe Pro Cys Leu Ser Ser Leu Pro Glu Trp Phe Arg
820 825 830

Glu Leu Ser Ser Leu Gln Asn Leu Tyr Phe Leu Asn Cys Ser Arg Leu
835 840 845

Gln Tyr Leu Pro Ser Asp Glu Gln Met Gln Arg Leu Thr Ser Leu Lys
850 855 860

Thr Ile Tyr Ile Trp Asn Cys Pro Leu Leu Leu Glu Arg Cys Ser Gly
865 870 875 880

Asn Glu Glu Gly His Lys Ile Ala Arg Arg Lys Gln Gly Phe Ser Arg
885 890 895

Leu Ser Phe Pro Arg Phe Asn Ile Leu Leu Pro Glu Thr Glu Pro Val
900 905 910

Leu Ser Leu Glu Gly Pro Cys Ala Lys Lys Phe Arg Arg Ala Phe Tyr
915 920 925

Lys Val Asn Ala Asn Asp Asn Ser
930 935

<210> 42
<211> 151
<212> PRT
<213> Papaver somniferum

<400> 42

Met Thr Glu Ser Lys Ile Arg Lys Leu Ala Gly Glu Lys Leu Gly Phe
1 5 10 15

Asp Leu Ser Gly Lys Gln Glu Lys Lys Phe Ile Arg Glu Ile Val Asn
20 25 30

pctca2017050779-seql.txt

Glu Phe Leu Val Gln Lys Glu Glu Glu Val Gln Glu Lys Gly Lys Gln
35 40 45

Gln Val Glu Asp Glu Glu Glu Lys Glu Glu Glu Glu Glu Lys Lys
50 55 60

Arg Lys Arg Pro Gly Val Ser Val Lys Glu Tyr Glu Asp Asn Gly Asp
65 70 75 80

Leu Ile Ile Cys Gln Leu Ser Ser Arg Arg Lys Val Thr Ile Gln Glu
85 90 95

Phe Lys Gly Lys Ala Leu Val Ser Ile Arg Glu Tyr Tyr Glu Lys Asp
100 105 110

Gly Lys Glu Leu Pro Ser Thr Lys Gly Ile Ser Leu Thr Ala Glu Gln
115 120 125

Trp Phe Thr Phe Ser Lys Ser Val Pro Gly Ile Glu Gln Ala Ile Lys
130 135 140

Lys Met Gln Thr Arg Ser Arg
145 150

<210> 43
<211> 285
<212> PRT
<213> Papaver somniferum

<400> 43

Met Asp Asp His Thr Lys Pro Phe Ile Leu Thr Ser Ile Ser Phe Gln
1 5 10 15

Val Ile Ala Cys Phe Phe Thr Ile Phe Cys Ile Leu Phe Gly Phe Phe
20 25 30

Trp Phe Asn Lys Glu Lys Thr Lys Lys Lys Lys Cys Cys Asp Cys Asp
35 40 45

Cys Ser Lys Lys Ile Ser Glu Glu Glu Glu Gly Tyr Lys Gly Tyr Leu
50 55 60

Asn Gly Gly Gly Glu Met Pro Val Arg Val Thr Glu Gly Gly Gly Gly
65 70 75 80

Gly Gly Ser Val Ser Met Met Glu Gln Leu Val Pro Glu Ile Thr Thr
85 90 95

pctca2017050779-seq1.txt

His Ala Leu Ser Tyr Leu Asp Tyr Pro Ser Leu Cys Arg Leu Ser Met
100 105 110

Thr Asn Ser Ser Met Arg Lys Ala Ala Asn Asp Asp Ser Ala Trp Lys
115 120 125

Met Leu Tyr His Lys Asp Phe Thr Ala Glu Gln Asp Ser Val Met Pro
130 135 140

Val Asn Gly Trp Lys Ala Tyr Tyr Ala Ala Thr Arg Ala Ile Met Asn
145 150 155 160

Ile Asn Ala Glu Phe Phe Asn Ile Ile Arg Asp Arg Ser Val Pro Gly
165 170 175

Met Gly Ala Phe Trp Leu Asn Ala Asp Tyr Val Lys Cys Ile His Thr
180 185 190

Ser Gly Glu Val Phe Ser Gly Tyr Asp Ala Val Met Glu Ser Trp Gln
195 200 205

Leu Thr Phe Asn Trp Gly Gln Gly Val Ala Phe Gln Ile Arg Asp Val
210 215 220

Lys Thr Arg Val Phe Thr Asp Ile Ala Trp Val Thr Met Lys Thr Tyr
225 230 235 240

Val Asp Asp Pro Asn Ser Gly Pro Phe Asn Val Thr Asn Val Tyr Glu
245 250 255

Phe His Lys Gly Gln Trp Tyr Leu Val His His His Cys Ser Val Ile
260 265 270

Leu Ile Gly Ala Glu Ala Asp Gln Gln Asn Val Phe Gly
275 280 285

<210> 44
<211> 141
<212> PRT
<213> Papaver somniferum

<400> 44

Met Cys His Leu Leu Ser Ser Glu Thr Lys Pro Lys Tyr Phe Arg Lys
1 5 10 15

Leu Glu Ser Thr His Leu Leu Gln Asn Asp His Tyr Ser Asp Cys Gly
20 25 30

pctca2017050779-seq1.txt

Gln Leu Cys Lys Ser Tyr Leu Ile Asp Leu Glu Asp Pro Lys Leu Phe
35 40 45

Arg Leu Phe Cys Asp Ser Arg Phe Leu Ser Glu Phe Phe Gln Thr Leu
50 55 60

Gly Pro Asn Asn Leu Asp Pro Thr Tyr Glu Glu Met His Pro Arg Lys
65 70 75 80

Ile Val Tyr Leu Asp Pro Phe Ile Glu Pro Glu Pro Glu Pro Gln Leu
85 90 95

Ala Ile Val Ile Gln Lys Leu Gly Lys Gly Met Leu Val Leu Tyr Ile
100 105 110

Phe Leu Val His Cys Asn Phe Leu Leu Ser Ala Leu Phe Gly Phe Lys
115 120 125

Asp Pro Gln Leu Phe Arg Leu Leu Leu Tyr Gly Ser Ser
130 135 140

<210> 45
<211> 181
<212> PRT
<213> Papaver somniferum

<400> 45

Met Ala Thr Ile Leu Val Gly Trp Ser Ala Pro Asn Thr Asn Trp Ile
1 5 10 15

Lys Ile Asn Thr Asp Gly Ala Ala Arg Gly His Pro Gly Phe Ala Gly
20 25 30

Val Gly Phe Val Cys Arg Asp Ser Asp Ala Arg Thr Ile Ile Ala Leu
35 40 45

Ala Gln Pro Leu Gly Ile Thr Thr Ala Leu Thr Ala Glu Thr Trp Ala
50 55 60

Phe Leu Leu Ala Ser Arg Thr Thr Thr Glu Arg Gln Trp Pro Arg Ile
65 70 75 80

Leu Phe Glu Thr Asp Ser Glu Asn Leu Met Arg Leu Ile Thr Thr Thr
85 90 95

Thr Thr Pro Pro Trp Tyr Ile Ala Glu Met Ile Lys Glu Ile Lys Asn
100 105 110

pctca2017050779-seql.txt

Arg Leu Arg Gln Ile Pro Gln Val Val Val Gln His Asn Tyr Arg Glu
115 120 125

Gly Asn Gln Ala Ala Asp Gly Leu Ala Asn His Ala Thr Asp Gly Ser
130 135 140

Gln Thr Gly Asn Tyr Ser Thr Lys Ile Trp Asp Gln Ala Ile Ser Ser
145 150 155 160

Phe Ile Ser His Ile Leu Phe Gln Asp Tyr Val Gly Thr Lys Tyr Pro
165 170 175

Arg Gln Ala Val Asn
180

<210> 46
<211> 936
<212> PRT
<213> Papaver somniferum

<400> 46

Met Val Tyr Ala Ser Ala Asp His Phe Gln Ile Lys Met Trp Val Ser
1 5 10 15

Val Ser Arg Lys Ser Asn Asn Arg Glu Ile Phe Gly Asp Leu Leu Glu
20 25 30

Pro Asn Val Asn Arg Gln Ser Ser Leu Asn Val Ile Gln Asp Cys Leu
35 40 45

Lys Glu Lys Leu Met Val Gly Lys Cys Leu Ile Val Leu Asp Asp Val
50 55 60

Trp Ile Asn His Gly Ile Asp Val Asp Glu Leu Leu Lys Asp Leu Leu
65 70 75 80

Ser Met Ser Phe Gln Gly Ser Lys Ile Leu Met Thr Met Arg Ser Ala
85 90 95

Glu Asp Ile Pro Pro Met Lys Asp His Arg Tyr Ile Ile Tyr Gln Leu
100 105 110

Gln Gly Leu Pro Glu Asp Asp Cys Trp Ser Ile Ile Lys Asp Ile Ala
115 120 125

Phe Gly His Gly Gly Ala Lys Glu Thr Pro Asn Leu Ile Asn Thr Gly
130 135 140

pctca2017050779-seq1.txt

Lys Gln Ile Ala Ile Lys Cys Gly Gly Leu Pro Leu Ala Ala Lys Thr
 145 150 155 160
 Leu Gly Gly Leu Leu Tyr Ser Arg Asn Asp Gln Glu Glu Trp Leu Ser
 165 170 175
 Asn Leu Asn Thr Gln Ser Trp Glu Leu Pro Thr Gly Glu Ser Lys Ile
 180 185 190
 Val Ser Leu Leu Lys Phe Ser Tyr Asp His Leu Ser Pro Tyr Val Lys
 195 200 205
 Cys Phe Ser Tyr Cys Ser Ile Phe Pro Lys Gly His Val Phe Ser Lys
 210 215 220
 Asn Glu Val Ile Arg Met Trp Met Ala Glu Gly Phe Leu Ile Ser Pro
 225 230 235 240
 Trp Gln Ala Asn Glu Ser Pro Glu Ile Val Gly Asn Gly Tyr Phe Lys
 245 250 255
 Ile Leu Leu Leu Asn Ser Phe Phe Gln Asp Glu Arg Arg Asn Ile Trp
 260 265 270
 Gly Asp Ile Lys Ser Phe Arg Met His Asp Leu Val His Asp Leu Ser
 275 280 285
 Val Ser Ile Thr Gly Cys Glu Ser Leu Asn Ile Thr Ile Asp Asp Ile
 290 295 300
 Pro Lys Ile Asp Gln Ser Phe Thr Phe Arg Arg Leu Gly Leu Gln Val
 305 310 315 320
 Leu His Ser Gly Val Ser Thr Ala Ile Pro Ser Glu Ile Tyr Lys Ala
 325 330 335
 Phe Lys Lys Leu His Thr Phe Val Tyr Ser Gly Leu His Asp Gly Glu
 340 345 350
 Asp Val Trp Ala Arg Arg Val Cys Thr Phe Gly Phe Ile Arg Val Leu
 355 360 365
 Lys Leu Ser His Thr Gly Ile Glu Glu Leu Pro Lys Ser Ile Cys Lys
 370 375 380
 Leu Lys His Leu Arg Tyr Leu Asp Val Lys Arg Cys Asn Arg Leu Lys
 385 390 395 400

pctca2017050779-seql.txt

Glu Leu Pro Gln Asp Ile Arg Lys Leu Ile Gly Leu Glu Tyr Leu Ile
 405 410 415
 Phe Arg Asn Lys Tyr Thr Leu Ser Ala Lys Met Pro Arg Lys Val Ser
 420 425 430
 Arg Leu Ser Ala Leu Lys Lys Leu Ser Val Phe Ile Val Gly Glu Glu
 435 440 445
 Gly Lys Gly Ser Gly Ile Glu Glu Leu Lys Asp Leu Asn Leu Leu Gly
 450 455 460
 Gly Lys Leu Ser Ile Glu Asp Leu Gly Asn Val Thr Asp Gly Thr Gln
 465 470 475 480
 Ala Asn Leu Met Gly Lys Lys Asn Ile Arg His Leu Glu Leu Ser Trp
 485 490 495
 Asp Ser Arg Gly Cys Asn Asp Pro Asp Arg Ile Ile Lys Asp Val Glu
 500 505 510
 Val Ile Asn Asp Leu Gln Pro His Leu Asn Leu Lys Lys Leu Gly Val
 515 520 525
 Ser His Phe Gly Gly Ser Glu Ile Pro Thr Trp Leu Arg Ser Ala Ser
 530 535 540
 Val His Leu Pro Lys Leu Val Ser Ile Thr Leu Tyr Arg Cys Asn Glu
 545 550 555 560
 Cys Glu His Phe Pro Ala Leu Gly Gly Leu Gln His Leu Lys Tyr Leu
 565 570 575
 Phe Met Asp Gly Phe Gly Gly Val Lys Arg Ile Gly Asn Glu Phe Cys
 580 585 590
 Pro Ser Asn Glu Glu Ala Val Ser Phe Pro Ser Leu Val Leu Leu Tyr
 595 600 605
 Ile Tyr His Tyr Thr Asn Ser Val Asn Ser Asp Arg Ser Ser Arg Ala
 610 615 620
 Ser Thr Phe Ser Trp Ser Glu Asp Leu Glu Asn Gln Asn Gly Ser Thr
 625 630 635 640
 Leu Ser Thr Thr Pro Thr Glu Phe Pro Phe Leu Arg Lys Leu Tyr Phe
 645 650 655

pctca2017050779-seql.txt

His Ile Glu Arg Gln Val Asp Ala Asn Leu Lys Ser Leu Ser Pro Lys
660 665 670

Leu Leu Trp Gly Val Leu Gln Thr Leu Leu Val Ala Gly Cys Asn Glu
675 680 685

Phe Val Gly Phe Glu Gln Gln His Arg His Gln Leu Asp His Leu Ser
690 695 700

Tyr Ser His Leu Arg Arg Leu Glu Val Phe Lys Cys Pro Ser Leu Thr
705 710 715 720

Val Leu Pro Ala Asp Phe Ser Gly Leu Asn Ser Leu Thr Tyr Leu Ala
725 730 735

Ile Glu Glu Cys Ser Ser Leu His Ser Leu Pro Asp Gly Ile Gln Tyr
740 745 750

Leu Pro Ala Leu Glu Thr Leu Ile Ile Gly Gly Phe Ser Glu Asp Leu
755 760 765

Thr Ser Phe Pro Phe Pro Ala Ala Ser Gly Ser Asp Gly Glu Lys Tyr
770 775 780

Phe Val Ser Leu Arg Val Leu Lys Ile Cys Gly Trp Pro Thr Leu Ser
785 790 795 800

Ala Glu Leu Pro Asp Gln Leu Gln Leu Leu Thr Cys Leu Gln Cys Phe
805 810 815

Thr Ile Arg Gly Phe Pro Cys Leu Ser Ser Leu Pro Glu Trp Phe Arg
820 825 830

Glu Leu Ser Ser Leu Gln Asn Leu Tyr Phe Leu Asn Cys Ser Arg Leu
835 840 845

Gln Tyr Leu Pro Ser Asp Glu Gln Met Gln Arg Leu Thr Ser Leu Lys
850 855 860

Thr Ile Tyr Ile Trp Asn Cys Pro Leu Leu Leu Glu Arg Cys Ser Gly
865 870 875 880

Asn Glu Glu Gly His Lys Ile Ala Arg Arg Lys Gln Gly Phe Ser Arg
885 890 895

Leu Ser Phe Pro Arg Phe Asn Ile Leu Leu Pro Glu Thr Glu Pro Val

900

Leu Ser Leu Glu Gly Pro Cys Ala Lys Lys Phe Arg Arg Ala Phe Tyr
915 920 925

Lys Val Asn Ala Asn Asp Asn Ser
930 935

<210> 47
<211> 831
<212> DNA
<213> Papaver somniferum

<400> 47
ctgactcgtg agaaattaga acagaaagta agaaaggaaa gagagaagaa ttatagaaat 60
aatcttcaat ctatctcttc ttcttcttct ttccagtcta gggttttgtt tgtttctcac 120
tcaggtcaga cttttgcaaa catgacttca tcggtaatac agggttttac taaatcgctt 180
gcgatgacag ttctatctga gatcggagat aagaccttct ttgcagctgc aatcttggca 240
atgcgtcatc caaggagact tgtttttagct ggttgcttag gagctttaat tgtaatgacg 300
attctctctg ctctagtagg ttgggctgcc ccaaatttga ttcctcgtgt atggactcac 360
catgtaacca caattttatt ctttggcttt gggctatgga cattgtggga gggattttca 420
gacaaggggg atgaagatga tttggctgaa gttgaggcaa aattggattc tgatatgaag 480
acaactgctg caaaagccac aaaaggatct aaggatgatg acttgaaaaa gcagaagaga 540
ccattcctca catccctctt ctcccccatc ttgttgaagg cattttccat tacattcttt 600
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<212> DNA
<213> Papaver somniferum

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 <212> DNA
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<212> DNA
<213> Papaver somniferum

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actgatggta aacctaaacc atgggtattc gttggctctg gcaaccctgg aaagtatat      240
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gagcgcgaag agctggattt cactttccaa aatggatatg acgcgttaag gatacttttg     720
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<210> 52
<211> 966
<212> DNA

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<213> Papaver somniferum

<400> 52

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<210> 53

<211> 2376

<212> DNA

<213> Papaver somniferum

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atttgtcaag attttgatct tgttctatct aatgccatta ctggacaaga gtttgaagat	180
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<212> DNA

<213> Papaver somniferum

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<210> 55

<211> 795

<212> DNA

<213> Papaver somniferum

<400> 55

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<210> 56
<211> 1632
<212> DNA
<213> Papaver somniferum

<400> 56
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<211> 684
<212> DNA
<213> Papaver somniferum

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<212> DNA
<213> Papaver somniferum

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<210> 59
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 <212> DNA
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aaagcgatag aggtcgggta cagacacttc gatacagctg ctgcatacca aactgaagag	180
tgtcttggtg aagctatagc tgaagcactt caacttggtt taataaaaatc tcgagatgaa	240
ctcttcatca cttccaagct ctggtgcgct gatgctcacg ctgatcttgt cctccctgct	300
cttcagaatt ctctgaggaa tctcaaattg gactatcttg atctatatat gatacaccat	360
ccggtaaagct tgaagccagg gaagtttgtt aacgaaatac caaaggatca tatccttcca	420
atggactaca aatctgtatg ggcagccatg gaagagtgtc agaccgttgg cttcactagg	480

pctca2017050779-seql.txt

gcaatcgggtg tcagtaatth ctcatgcaaa aagcttcaag agttgatggc agcagccaag	540
atccctccag ttgtgaatca agtggagatg agcccgactt tacatcaaaa aaatctgagg	600
gaatattgca aggccaataa tatcatgata actgcacact cggttttggg agccataggt	660
gctccatggg gcagcaatgc agttatggat tctaagggtc ttcaccagat tgctgtggcc	720
agaggaaaaat ctgttgccca ggtagtatg agatgggttt accagcaagg cgcgagtctt	780
gtggtgaaaa gtttcaatga agggaggatg aaggaaaacc ttaagatatt tgattgggaa	840
ctaacggcag aagatatgga aaagatcagt gagattccgc aatctagaac aagctctgct	900
gatttcttgt tatcaccgac tggacctttc aaaactgaag aagagttctg ggatgagaag	960
gattga	966

<210> 60
 <211> 1083
 <212> DNA
 <213> Papaver somniferum

<400> 60	
atggagacac caatacttat caagctaggc aatggtttgt caataccaag tgttcaggaa	60
ttggcctaaac tcacgcttgc agaaattcca tctcgataca catgcaccgg tgaaagcccg	120
ttgaataata ttggtgctgc tgtaacagat gatgaaacag ttcctgtcat cgatttgcaa	180
aatttactat ctccagaacc cgtagtggga aagttagaat tggataagct tcattctgct	240
tgcaaagaat ggggttttctt tcagctgggtt aaccatggag tcgacgcttt actgatggac	300
aatataaaaat cagaaaattaa aggtttcttt aaccttccaa tgaatgagaa aactaaatac	360
ggacagcaag atggagattt tgaaggattt ggacaaccct atattgaatc ggaggaccaa	420
agacttgatt ggactgaagt gtttagcatg ttaagtcttc ctctccattt aaggaagcct	480
catttgtttc cagaactccc tctgcctttc agggagacac tggaatccta cctatcaaaa	540
atgaaaaaac tatcaacggt tgtctttgag atgttgghaa aatctctaca attagttag	600
attaaaggta tgacagactt atttgaagat gggttgcaaa caatgaggat gaactattat	660
cctccttgct ctcgaccaga gcttgactt ggtcttacgt cacactcgga ttttagcgg	720
ttgacaattc tccttcaact taatgaagt gaaggattac aaataagaaa agaagagagg	780
tggatttcaa tcaaacctct acctgatgcg ttcatagtga atgttggha cattttggag	840
ataatgacta atgggattta ccgtagcgtc gagcaccggg cagtagtaaa ctcaacaaa	900
gagaggctct caatcgcgac atttcatgac tctaaactag agtcagaaat aggcccaatt	960
tcgagcttgg tcacaccaga gacacctgct ttgttcaaaa gaggtaggta tgaggatatt	1020
ttgaaggaaa atctttcaag gaagcttgat ggaaaaatcat ttctcgacta catgaggatg	1080
tga	1083

pctca2017050779-seql.txt

<210> 61
 <211> 276
 <212> PRT
 <213> Papaver somniferum

<400> 61

Met Thr Arg Glu Lys Leu Glu Gln Lys Val Arg Lys Glu Arg Glu Lys
 1 5 10 15

Asn Tyr Arg Asn Asn Leu Gln Ser Ile Ser Ser Ser Ser Ser Phe Gln
 20 25 30

Ser Arg Val Leu Phe Val Ser His Ser Gly Gln Thr Phe Ala Asn Met
 35 40 45

Thr Ser Ser Val Ile Gln Gly Phe Thr Lys Ser Leu Ala Met Thr Val
 50 55 60

Leu Ser Glu Ile Gly Asp Lys Thr Phe Phe Ala Ala Ile Leu Ala
 65 70 75 80

Met Arg His Pro Arg Arg Leu Val Leu Ala Gly Cys Leu Gly Ala Leu
 85 90 95

Ile Val Met Thr Ile Leu Ser Ala Leu Val Gly Trp Ala Ala Pro Asn
 100 105 110

Leu Ile Pro Arg Val Trp Thr His His Val Thr Thr Ile Leu Phe Phe
 115 120 125

Gly Phe Gly Leu Trp Thr Leu Trp Glu Gly Phe Ser Asp Lys Gly Asp
 130 135 140

Glu Asp Asp Leu Ala Glu Val Glu Ala Lys Leu Asp Ser Asp Met Lys
 145 150 155 160

Thr Thr Ala Ala Lys Ala Thr Lys Gly Ser Lys Asp Asp Asp Leu Lys
 165 170 175

Lys Gln Lys Arg Pro Phe Leu Thr Ser Leu Phe Ser Pro Ile Leu Leu
 180 185 190

Lys Ala Phe Ser Ile Thr Phe Phe Gly Glu Trp Gly Asp Lys Ser Gln
 195 200 205

Leu Ala Thr Ile Gly Leu Ala Ala Asp Glu Asn Pro Tyr Gly Val Val
 210 215 220

pctca2017050779-seql.txt

Leu Gly Gly Ile Leu Gly Gln Ala Leu Cys Thr Thr Ala Ala Val Leu
225 230 235 240

Gly Gly Lys Ser Leu Ala Ser Asn Ile Ser Glu Lys Met Val Ala Ile
245 250 255

Ser Gly Gly Ile Leu Phe Leu Ile Phe Gly Met Gln Ser Phe Leu Ser
260 265 270

Thr Val Glu Pro
275

<210> 62
<211> 364
<212> PRT
<213> Papaver somniferum

<400> 62

Met Glu Thr Ala Lys Leu Met Lys Leu Gly Asn Gly Met Ser Ile Pro
1 5 10 15

Ser Val Gln Glu Leu Ala Lys Leu Thr Leu Ala Glu Ile Pro Ser Arg
20 25 30

Tyr Ile Cys Thr Val Glu Asn Leu Gln Leu Pro Val Gly Ala Ser Val
35 40 45

Ile Asp Asp His Glu Thr Val Pro Val Ile Asp Ile Glu Asn Leu Ile
50 55 60

Ser Ser Glu Pro Val Thr Glu Lys Leu Glu Leu Asp Arg Leu His Ser
65 70 75 80

Ala Cys Lys Glu Trp Gly Phe Phe Gln Val Val Asn His Gly Val Asp
85 90 95

Ala Ser Leu Val Asp Ser Val Lys Ser Glu Ile Gln Gly Phe Phe Asn
100 105 110

Leu Ser Met Asp Glu Lys Thr Lys Tyr Glu Gln Glu Asp Gly Asp Val
115 120 125

Glu Gly Phe Gly Gln Gly Phe Ile Ala Ser Glu Asp Gln Thr Leu Asp
130 135 140

Trp Ala Asp Ile Phe Met Met Phe Thr Leu Pro Leu His Leu Arg Lys
145 150 155 160

pctca2017050779-seql.txt

Pro His Leu Phe Ser Lys Leu Pro Val Pro Leu Arg Glu Thr Ile Glu
165 170 175

Ser Tyr Ser Ser Glu Met Lys Asn Leu Ser Met Val Leu Phe Asn Lys
180 185 190

Met Glu Lys Ala Leu Gln Val Gln Ala Ala Glu Ile Lys Gly Met Ser
195 200 205

Glu Val Phe Lys Asp Gly Thr Gln Ala Met Arg Met Asn Tyr Tyr Pro
210 215 220

Pro Cys Pro Gln Pro Asn Leu Ala Ile Gly Leu Thr Ser His Ser Asp
225 230 235 240

Phe Gly Gly Leu Thr Ile Leu Leu Gln Ile Asn Glu Val Glu Gly Leu
245 250 255

Gln Ile Lys Arg Glu Gly Thr Trp Ile Ala Val Lys Pro Leu Pro Asn
260 265 270

Ala Phe Val Val Asn Val Gly Asp Ile Leu Glu Ile Met Thr Asn Gly
275 280 285

Ile Tyr His Ser Val Asp His Arg Ala Val Val Asn Ser Thr Asn Glu
290 295 300

Arg Leu Ser Ile Ala Thr Phe His Asp Pro Ser Leu Glu Ser Val Ile
305 310 315 320

Gly Pro Ile Ser Ser Leu Ile Thr Pro Glu Thr Pro Ala Leu Phe Lys
325 330 335

Ser Gly Ser Thr Tyr Gly Asp Leu Val Glu Glu Cys Lys Thr Arg Lys
340 345 350

Leu Asp Gly Lys Ser Phe Leu Asp Ser Met Arg Met
355 360

<210> 63
<211> 211
<212> PRT
<213> Papaver somniferum

<400> 63

Met Ile Cys Asn Gln Gly Val Phe Ile Pro Glu Glu Phe Asp Lys Gln
1 5 10 15

pctca2017050779-seql.txt

Glu Val Asp Thr Ile Lys Phe Met Met Asp Val Asn Leu Met Gly Thr
20 25 30

Phe His Leu Ile Lys Ala Val Leu Pro Ser Met Lys Ser Arg Lys Asp
35 40 45

Arg Gly Pro Cys Ser Ile Ala Leu Met Ser Ser Gln Ala Gly Gln Val
50 55 60

Gly Ile Tyr Gly Tyr Ala Ala Tyr Ala Ala Ser Lys Phe Gly Leu Arg
65 70 75 80

Gly Leu Ala Glu Ser Leu Gln Gln Glu Val Ile Ser Asp Asn Ile His
85 90 95

Ile Ser Leu Ile Phe Pro Pro Asp Thr Glu Thr Pro Gly Leu Ala Glu
100 105 110

Glu Asn Lys Thr Lys Pro Glu Ile Thr Ser Ile Ile Ala Ala Ser Ser
115 120 125

Gly Ala Lys Lys Ala Asp Glu Val Ala Ile Thr Ala Leu Asn Gly Ile
130 135 140

Lys Ser Gly Ser Phe Ile Ile Pro Cys Asn Phe Asp Gly Leu Met Leu
145 150 155 160

Ser Leu Ala Thr Ala Gly Met Ser Pro Gln Arg Ser Pro Ala Met Ala
165 170 175

Leu Leu Glu Val Ala Thr Thr Ser Leu Leu Arg Phe Val Gly Phe Phe
180 185 190

Tyr Leu Trp Asn Trp Tyr Ala Ser Ile Glu Lys Trp Asn Ala Gln Lys
195 200 205

Ile Arg Thr
210

<210> 64
<211> 238
<212> PRT
<213> Papaver somniferum

<400> 64

Met Cys Asn Ala Asp Thr Ser Arg Ile Leu Val Gly Asn Ile His Val
1 5 10 15

pctca2017050779-seql.txt

Leu Phe Asn Gln Asn Arg Gly Asp Met Lys Leu Gly Gln Ile Arg Leu
20 25 30

Leu Leu Ser Lys Ala His Ala Leu Ser Glu Lys Trp Gly Asn Ile Pro
35 40 45

Met Val Leu Ala Gly Asp Phe Asn Ile Thr Pro Gln Ser Ala Val Tyr
50 55 60

Lys Phe Leu Ser Ser Ser Glu Leu Asn Ile Thr Leu His Asp Arg Lys
65 70 75 80

Asp Leu Ser Gly Gln Lys Ser Arg His Pro Ala Gln Phe Thr Gly Gly
85 90 95

Lys Leu Lys Pro Gly Ile Leu Lys Asp Ser Asp Phe Glu Tyr Cys Trp
100 105 110

Thr Asp Glu Glu Ile Glu Tyr Ala Thr Gly Asp Ser Ser Lys Thr Val
115 120 125

Leu Glu Asn Pro Leu Lys Leu Arg Ser Ser Tyr Ala Thr Val Lys Gly
130 135 140

Thr Ala Arg Asp Ser Leu Gly Glu Pro Ser Ala Thr Ser Tyr His Ser
145 150 155 160

Met Phe Leu Gly Thr Val Asp Tyr Ile Trp Tyr Ser Asn Asp Leu Val
165 170 175

Pro Thr Arg Val Leu Asp Thr Pro Ser Ile Asn Leu Leu Leu Lys Thr
180 185 190

Arg Gly Leu Pro Asn Lys His Leu Gly Ser Asp His Leu Ala Leu Gly
195 200 205

Ser Glu Phe Ser Phe Thr Asp Cys Asn Lys Glu Asp Lys Asn Gly Ser
210 215 220

Thr Thr Thr Ala Ala Ser Thr Ala Ala Thr Glu Ile Val Glu
225 230 235

<210> 65

<211> 270

<212> PRT

<213> Papaver somniferum

<400> 65

pctca2017050779-seql.txt

Met Ile Leu Pro Ala Ile Ser Ser Ser Ser Pro Ala Ile Thr Val Arg
1 5 10 15

Ile Pro Cys Arg Leu Thr Ile Gly Phe Leu Ser Arg Arg Lys Lys Met
20 25 30

Ala Val Ser Gln Phe Ser Ser Ser Ser Pro Ser Thr Leu Ile Ser Cys
35 40 45

Ala Ser Ala Ser Thr Thr Thr Ser Thr Thr Thr Ala Thr Asp Gly Lys
50 55 60

Pro Lys Pro Trp Leu Phe Val Gly Leu Gly Asn Pro Gly Lys Leu Tyr
65 70 75 80

Asn Gly Thr Arg His Asn Val Gly Phe Glu Leu Val Asp Ala Ile Ala
85 90 95

Glu Ala Glu Gly Ile Ser Met Ser Ser Val Ser Phe Lys Ala Leu Ser
100 105 110

Gly Lys Gly His Ile Gly Asp Val Pro Val Met Leu Ala Lys Pro Gln
115 120 125

Thr Phe Met Asn Leu Ser Gly Gln Ser Val Gly Ser Ile Val Ser Tyr
130 135 140

Tyr Lys Ile Pro Leu Lys Gln Val Val Val Ile Phe Asp Asp Met Asp
145 150 155 160

Leu Pro Phe Gly Ala Leu Arg Leu Leu Pro Lys Gly Gly His Gly Gly
165 170 175

His Asn Gly Met Arg Ser Val Ile Asp His Phe Lys Gly Ser Arg Asp
180 185 190

Phe Pro Arg Leu Arg Ile Gly Ile Gly Arg Pro Thr Gly Lys Met Asp
195 200 205

Gly Ala Ser Phe Val Leu Arg Pro Phe Asn Lys Gln Glu Arg Glu Glu
210 215 220

Leu Asp Phe Thr Phe Gln Asn Gly Tyr Asp Ala Leu Arg Ile Leu Leu
225 230 235 240

Leu Glu Gly Phe Asp Lys Ser Ala Ala Phe Thr Asn Ser Ala Ser Lys
245 250 255

pctca2017050779-seql.txt

Ser Ala Ser Lys Ser Glu Ser Lys Ser Met Lys Gln Leu Gly
260 265 270

<210> 66
<211> 321
<212> PRT
<213> Papaver somniferum

<400> 66

Met Glu Ser Asn Gly Val Pro Met Ile Thr Leu Ser Ser Gly Ile Arg
1 5 10 15

Met Pro Ala Leu Gly Met Gly Thr Val Glu Thr Met Glu Lys Gly Thr
20 25 30

Glu Arg Glu Lys Leu Ala Phe Leu Lys Ala Ile Glu Val Gly Tyr Arg
35 40 45

His Phe Asp Thr Ala Ala Ala Tyr Gln Thr Glu Glu Cys Leu Gly Glu
50 55 60

Ala Ile Ala Glu Ala Leu Gln Leu Gly Leu Ile Lys Ser Arg Asp Glu
65 70 75 80

Leu Phe Ile Thr Ser Lys Leu Trp Cys Ala Asp Ala His Ala Asp Leu
85 90 95

Val Leu Pro Ala Leu Gln Asn Ser Leu Arg Asn Leu Lys Leu Asp Tyr
100 105 110

Leu Asp Leu Tyr Leu Ile His His Pro Val Ser Leu Lys Pro Gly Lys
115 120 125

Phe Val Asn Glu Ile Pro Lys Asp His Ile Leu Pro Met Asp Tyr Lys
130 135 140

Ser Val Trp Ala Ala Met Glu Glu Cys Gln Thr Leu Gly Phe Thr Arg
145 150 155 160

Ala Ile Gly Val Cys Asn Phe Ser Cys Lys Lys Leu Gln Glu Leu Met
165 170 175

Ala Thr Ala Asn Ser Pro Pro Val Val Asn Gln Val Glu Met Ser Pro
180 185 190

Thr Leu His Gln Lys Asn Leu Arg Glu Tyr Cys Lys Ala Asn Asn Ile
195 200 205

pctca2017050779-seql.txt

Met Ile Thr Ala His Ser Val Leu Gly Ala Val Gly Ala Ala Trp Gly
210 215 220

Thr Asn Ala Val Met His Ser Lys Val Leu His Gln Ile Ala Val Ala
225 230 235 240

Arg Gly Lys Ser Val Ala Gln Val Ser Met Arg Trp Val Tyr Gln Gln
245 250 255

Gly Ala Ser Leu Val Val Lys Ser Phe Asn Glu Ala Arg Met Lys Glu
260 265 270

Asn Leu Lys Ile Phe Asp Trp Glu Leu Thr Ala Glu Asp Met Glu Lys
275 280 285

Ile Ser Glu Ile Pro Gln Ser Arg Thr Ser Ser Ala Ala Phe Leu Leu
290 295 300

Ser Pro Thr Gly Pro Phe Lys Thr Glu Glu Glu Phe Trp Asp Glu Lys
305 310 315 320

Asp

<210> 67
<211> 791
<212> PRT
<213> Papaver somniferum

<400> 67

Met Ser Ile Lys Phe Lys Phe Arg Ser Ser Val Asn Phe Asp Ser Ile
1 5 10 15

Asp Leu Glu Asp Ser Pro Ser Val Ser Val Arg Asp Leu Lys Ser Arg
20 25 30

Ile Ile Asn Gln Ser Lys Leu Lys Ile Cys Gln Asp Phe Asp Leu Val
35 40 45

Leu Ser Asn Ala Ile Thr Gly Gln Glu Phe Glu Asp Glu Glu Phe Leu
50 55 60

Val Glu Ser Gly Ser Ser Val Ile Ile Lys Arg Val Pro Val Asp Arg
65 70 75 80

Asp Ala Asn Ser Val Arg Pro Ala Val Glu Asn Met Ala Lys Lys His
85 90 95

pctca2017050779-seql.txt

Tyr Pro Ser Val His Thr Asn Glu Pro Thr Leu Pro Ala Val Cys Gly
 100 105 110
 Lys Asn Val Glu Val Glu Asn Phe Asp Asp Phe Gly Ile Asp Leu Tyr
 115 120 125
 Pro Ala Pro Glu Thr Pro Leu Leu Asp Ser Asp Leu Asp Asp Asp Lys
 130 135 140
 Val Asn Cys Thr Ser Ser Val His Ala Asp Lys Glu Ile Pro Arg Cys
 145 150 155 160
 Ser Gly Ser Gly Pro Ser Gly Val Lys His Gln Asn Ile Glu Lys Ser
 165 170 175
 Asp Pro Ser Glu Gly Ile Pro Lys Val Gln Val Met Leu Lys Ser Lys
 180 185 190
 Met Glu Glu His Lys Lys Leu Asn Glu Val Val Asp Glu Arg Ser Leu
 195 200 205
 Ala Ile Pro Lys Ala Asp Leu Pro Ser Glu Leu Arg Cys Ser Leu Cys
 210 215 220
 Asn Ser Ile Phe Lys Glu Ala Val Met Ile Pro Cys Cys Gln His Ser
 225 230 235 240
 Phe Cys Asp Lys Cys Ile Arg Ser Val Leu Asp Glu Lys Ala Arg Cys
 245 250 255
 Pro Lys Cys Ser Ser Thr Lys Cys Lys Val Glu Asp Leu Leu Pro Asn
 260 265 270
 Ile Ser Leu Arg Gln Ala Ile Glu His Phe Leu Glu Ser Gln Gly Leu
 275 280 285
 Met Ser Gly Ser Asp Asn Ile Phe Gln Lys Tyr Ala Pro Asp Glu Ala
 290 295 300
 Ser Gly Ile Gln Ala Lys Glu Phe Gly Cys Val Val Ser Ile His Gln
 305 310 315 320
 Arg Asp Ser Gln Leu Pro His Ser Pro Ser Ala Thr Gly Lys Gly Ser
 325 330 335
 Asn Gln Val Met Thr Glu Ser Val Tyr Glu Ser Thr Phe Arg Asn Asn

340

345

350

Gly Ser Ala Ala Gly Lys Arg Ser Ala Ser Ser Leu Lys Ala Val Pro
 355 360 365

Glu Asn Phe Thr Pro Leu Ala Glu Tyr Glu Gly Glu Asn Gln Pro Leu
 370 375 380

Lys Val Pro Ala Asn His Leu Gln Asn Glu Glu Ala Arg Arg Lys Lys
 385 390 395 400

Met Trp His Asn Pro Ala Asp Gly Ser Gly Asn Phe Thr Ser Thr Gly
 405 410 415

Lys Tyr Arg Lys Gly Asp Arg Thr Cys Tyr Met Cys Gly Ser Pro Asp
 420 425 430

His Phe Ile Lys Asp Cys Pro Val Ser Ser Asn Gln Tyr Pro Met Leu
 435 440 445

Gln Thr Gly Asn Ala Val Tyr Gln Gly Gly Met Pro Ala Tyr Gly Pro
 450 455 460

Pro Pro Tyr Trp Asn Gly Pro Gln Phe Arg Pro Phe Pro Asn Val Tyr
 465 470 475 480

Ala Thr Pro Gly Met Met Pro Tyr Gly Ser Asn Met Val Pro Val Asn
 485 490 495

Pro Tyr Ala Val His Ser Tyr Met Pro Ser Met Tyr Ala Gly Met Gln
 500 505 510

Ala Pro Tyr Gly Val Met Gly Met Gly Gly Leu Ala Pro Pro Met Val
 515 520 525

Ser Gly Pro Thr Gly Arg Glu His His Leu Met Arg Pro Asp Tyr Met
 530 535 540

Glu Phe Gln Ile Asn Glu Gln Lys Asn Arg Leu Val Lys Glu His Leu
 545 550 555 560

Glu Arg Glu Glu Ala His Gly Gly Asp Tyr Tyr Pro Asp Asp Gly Tyr
 565 570 575

Pro Ala Ile Lys Pro Gln Leu Ser His Glu Tyr Lys Pro Gln Ser Glu
 580 585 590

pctca2017050779-seql.txt

Lys Glu Asn His Tyr Ser Tyr Ser Asp Glu Asp Ile Asp Val Gln Arg
595 600 605

Ser Gln Arg Lys His Ile Arg Asp Arg Arg Leu Asp Gln Glu Gly Ser
610 615 620

Leu Ile Glu Gln Arg His Glu Lys Val Ser Arg Thr Pro Ala Ser Gly
625 630 635 640

Arg Asp His Trp Val Arg Asn Phe Glu Glu Ser Ser Pro Asp Ile His
645 650 655

Glu Thr Ser Asn Asn Ser Val Arg His Asn Lys Asp Ser Lys His Lys
660 665 670

His His Gln Arg Asn Ser Lys Thr Glu Arg Arg Gly Asp Cys Val Ser
675 680 685

Asp Ser Gly Arg Lys Ser His His His Glu Ser Ser Lys Glu Val Ala
690 695 700

Thr Asn Arg Lys Arg Ser Glu Ala Asp Ala Lys Arg Tyr Ser Arg Lys
705 710 715 720

His His Ser His Thr Asn Ser Asp Gln Glu Pro Ser Ser Ser Gly Ser
725 730 735

Ser Lys Arg His Arg Arg Glu Lys Asp Ser Ala His Ser Ser Lys Gln
740 745 750

Pro Arg His Leu Lys Ser Lys Asn Asp Asn Glu Arg Trp Glu Met Val
755 760 765

Asp Gly Leu Glu Glu Asp Cys Arg Glu Asp His His His Arg Leu His
770 775 780

His Lys Gly Lys Arg Val His
785 790

<210> 68
<211> 265
<212> PRT
<213> Papaver somniferum

<400> 68

Met Gly Glu Trp Glu Asn Met Lys Pro Ser Asp Gln Thr Ser Gln Leu
1 5 10 15

pctca2017050779-seq1.txt

Val Phe Lys Pro Leu Met Ile Ser Met Val Gly Ile Ala Phe Thr Ala
 20 25 30
 Leu Ala Ile Val Thr Tyr Gln Phe Ile Ile Thr Lys Tyr Cys Val Arg
 35 40 45
 Arg Arg Glu Ser Met Ile Glu Arg Asn Glu Leu Arg Ser His Gln Ala
 50 55 60
 Met Val Asn Arg Gly Val Asp Glu Asn Val Leu Lys Ala Ile Pro Ile
 65 70 75 80
 Ile Thr Tyr His His Gln Gln Gln Gln Gln Ser Arg Asp Glu Glu Glu
 85 90 95
 Glu Val Phe Cys Val Asp Gln Thr Glu Cys Ser Val Cys Leu Gly Asp
 100 105 110
 Leu Gln Glu Gly Asp Met Leu Arg Leu Leu Pro Asn Cys Lys His Val
 115 120 125
 Phe His Val Pro Cys Ile Asp Gln Trp Trp Leu Thr His Ser Thr Cys
 130 135 140
 Pro Ile Cys Arg Ser Pro Val Thr Gly Arg Asn Asp Asp Ser Val Cys
 145 150 155 160
 Leu Gln Ile Gln Ala Glu Gly Asp Glu Glu Gly Leu Val Ser His Gln
 165 170 175
 His His Gln Glu Gln Gln Tyr Asn Cys Ser Glu Gly Ser Asn Asn Asn
 180 185 190
 Glu Gly Gly Asn Ser Ser Ile Met Val Gly Ser Lys Leu Arg His Cys
 195 200 205
 Val Ser Leu Ile Trp Pro Ala Asn Tyr Glu Asp Glu Val Arg Lys Gln
 210 215 220
 Gln Ser Lys Thr Val Leu Leu Lys Arg Ser Met Ser Val Asp Cys Ser
 225 230 235 240
 Phe Val Cys Ile Lys Ile Gln Pro Arg Thr Asp Ser Ser Ser Ser Ser
 245 250 255
 Ser Ser Thr Trp Lys Thr Thr Ser Lys
 260 265

pctca2017050779-seql.txt

<210> 69
 <211> 264
 <212> PRT
 <213> Papaver somniferum

<400> 69

Met Ala Thr Ser Ser Ser Trp Phe Ser Leu Val Ser Met Tyr Glu Ser
 1 5 10 15

His Leu Arg Asn Thr Phe Thr Ser Ser Gly Leu Thr Pro Lys Ser Ile
 20 25 30

Asn Ile Asp Ser Asp Thr Asn Ile His Tyr Trp Ser Pro Ile His Pro
 35 40 45

Leu Thr Leu Pro Thr Leu Val Leu Leu His Gly Phe Gly Gly Asn Cys
 50 55 60

Leu Trp Gln Trp Ser Lys Gln Val Gln His Leu Ser Thr His Phe Thr
 65 70 75 80

Leu Tyr Val Pro Asp Leu Ile Tyr Phe Gly Lys Ser Val Thr Lys Ser
 85 90 95

Ser Glu Arg Ser Glu Asn Phe Gln Ala Val Ser Val Gly Lys Leu Leu
 100 105 110

Glu Leu Leu Gly Val Thr Thr Tyr Ser Val Met Gly Thr Ser Tyr Gly
 115 120 125

Gly Phe Val Ala Tyr His Met Ala Arg Leu Trp Pro Asp Arg Val Glu
 130 135 140

Lys Val Val Ile Ala Asn Ser Ala Leu Asn Ile Thr Ser Lys Asp Val
 145 150 155 160

Glu Glu Leu Leu Lys Glu Ala Asn Ile Glu Asn Ile Glu Ser Val Phe
 165 170 175

Met Pro Ser Ser Pro Ala Glu Leu Leu Thr Cys Ile Arg Leu Ile His
 180 185 190

Lys Gln Leu Pro Thr Tyr Val Pro Glu Phe Phe Leu Asn Asp Phe Leu
 195 200 205

Asp Asn Leu Cys Asn Glu Asn Arg Lys Glu Lys Leu Glu Leu Leu Lys
 210 215 220

pctca2017050779-seql.txt

Gly Thr Thr Val Gly Lys Glu Asp Thr Ile Ser Ile Leu Pro Leu Gln
225 230 235 240

Gln Glu Val Leu Leu Ile Trp Gly Glu Asn Asp Ala Ile Phe Pro Leu
245 250 255

Glu Lys Gly Tyr Glu Leu Lys Glu
260

<210> 70
<211> 543
<212> PRT
<213> Papaver somniferum

<400> 70

Met Lys Thr Ser Gln Lys Ala Leu Glu Phe Phe Lys Phe Cys Ser Asp
1 5 10 15

Glu Ile Pro Gly Phe Lys His Asp Cys Phe Thr Tyr Asn Arg Ile Leu
20 25 30

Thr Ile Leu Ser Lys Ser Asn Ser Leu Glu Ile Val Lys Ser Val Val
35 40 45

Asp Glu Met Glu Lys Cys Gly Ile Lys Gly Asn Ile Ser Thr Val Asn
50 55 60

Ile Leu Ile Gly Ile Phe Asp Gly Val Leu Glu Leu Glu Lys Cys Val
65 70 75 80

Gly Leu Val Lys Lys Trp Gly Leu Leu Phe Asn Cys Tyr Thr Tyr Lys
85 90 95

Cys Leu Leu Gln Ala Tyr Leu Arg Cys Asn Glu Val Ser Lys Ala Phe
100 105 110

His Val Tyr Ile Glu Met Arg Arg Lys Gly Tyr Val Leu Asp Ile Phe
115 120 125

Ala Tyr Asn Met Leu Leu Asp Ala Leu Ala Lys Asp Asp Lys Ala Glu
130 135 140

Gln Ala Ser Lys Val Phe Ala Asp Met Lys Arg Lys His Cys Glu Pro
145 150 155 160

Asp Gly Tyr Thr Tyr Thr Ile Met Ile Arg Met Asn Gly Lys Ile Gly
165 170 175

pctca2017050779-seql.txt

Lys Ala Glu Glu Cys Leu Ser Leu Phe Gln Asp Met Ile Thr Lys Gly
 180 185 190
 Cys Ser Pro Asn Leu Ile Ala Tyr Asn Thr Met Ile Gln Ala Leu Ala
 195 200 205
 Arg Asn His Met Val Asp Lys Met Val Phe Leu Phe Ser Lys Met Val
 210 215 220
 Glu Lys Gly Cys Gln Pro Asn Glu Phe Thr Tyr Ser Val Ile Leu Asp
 225 230 235 240
 Gly Leu Ala Ala Glu Gly Gln Leu Thr Arg Leu Asp Glu Val Val Glu
 245 250 255
 Met Ser Lys Lys Tyr Met His Lys Gly Ile Tyr Ser Tyr Leu Val Lys
 260 265 270
 Thr Leu Ser Lys Ser Gly His Ala Ser Glu Ala His Arg Leu Phe Cys
 275 280 285
 Asn Met Trp Asn Phe Asn Asp Gly Gly Asp Arg Asp Ala Tyr Met Ser
 290 295 300
 Met Leu Glu Ser Leu Cys His Ser Gly Lys Thr Ala Glu Ala Leu Asp
 305 310 315 320
 Leu Leu Asn Lys Ile His Glu Lys Gly Ile Met Thr Asp Thr Val Met
 325 330 335
 Tyr Asn Met Val Phe Ser Ala Leu Gly Lys Leu Lys Gln Ile Ser Gln
 340 345 350
 Ile His Asp Leu Tyr Glu His Met Lys Ile Asn Gly Pro Ser Pro Asn
 355 360 365
 Ile Phe Thr Tyr Asn Ile Leu Leu Ala Gly Tyr Gly Arg Ala Gly Gly
 370 375 380
 Val Asp Asp Ala Val Lys Leu Phe Glu Glu Met Glu Asn Gly Asp Cys
 385 390 395 400
 Arg Pro Asp Ile Ile Thr Tyr Asn Ser Leu Ile Asn Cys Leu Gly Lys
 405 410 415
 Asn Gly Asp Leu Asp Glu Ala His Met Lys Phe Lys Glu Met Gln Glu
 420 425 430

pctca2017050779-seql.txt

Lys Gly Leu Asn Pro Asp Val Val Thr Tyr Ser Asn Leu Ile Glu Cys
435 440 445

Phe Gly Lys Lys Asn Arg Val Glu Met Ala Leu Thr Leu Phe His Glu
450 455 460

Met Arg Ala Glu Thr Cys Tyr Pro Asn Ile Val Thr Tyr Asn Ile Leu
465 470 475 480

Leu Asp Cys Leu Glu Lys Cys Gly Lys Arg Ser Glu Ala Leu Glu Leu
485 490 495

Tyr Ala Lys Leu Lys Gln Gln Gly Leu Thr Pro Asp Thr Ile Thr Tyr
500 505 510

Ala Val Leu Asp Arg Leu Gln Ser Lys Ser His Lys Thr Val Arg Ile
515 520 525

Arg Arg Gln Ser Pro Ile Ser Gly Trp Val Phe Ser Pro Ile Gly
530 535 540

<210> 71
<211> 227
<212> PRT
<213> Papaver somniferum

<400> 71

Met Ser Phe Leu Phe Gly Lys Arg Lys Thr Pro Ala Glu Leu Leu Arg
1 5 10 15

Glu Asn Lys Arg Met Leu Asp Lys Ser Ile Arg Glu Ile Glu Arg Glu
20 25 30

Arg Gln Gly Leu Gln Ala Gln Glu Lys Lys Leu Ile Val Glu Ile Lys
35 40 45

Lys Ser Ala Lys Gln Gly Gln Met Gly Ala Val Lys Val Met Ala Lys
50 55 60

Asp Leu Ile Arg Thr Arg His Gln Val Glu Lys Phe Tyr Lys Leu Lys
65 70 75 80

Ser Gln Leu Gln Gly Val Ser Leu Arg Ile Gln Thr Leu Lys Ser Thr
85 90 95

Gln Ala Met Gly Glu Ala Met Lys Gly Val Thr Lys Ala Met Gly Gln
100 105 110

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Met Asn Arg Gln Met Asn Leu Pro Ser Leu Gln Lys Ile Met Met Glu
115 120 125

Phe Glu Arg Gln Asn Glu Lys Met Glu Met Thr Ser Glu Val Met Ala
130 135 140

Asp Ala Ile Asp Asp Ala Leu Glu Gly Asp Glu Glu Glu Gln Glu Thr
145 150 155 160

Glu Asp Leu Val Asn Gln Val Leu Asp Glu Ile Gly Ile Asp Ile Asn
165 170 175

Ser Glu Leu Met Asn Ala Pro Ala Thr Ala Val Ala Ala Pro Ala Ala
180 185 190

Thr Thr Lys Val Ala Gln Ala Glu Gln Pro Ala Ala Ala Gly Gly Asn
195 200 205

Asp Asp Gly Gly Ile Asp Met Asp Leu Gln Ala Arg Leu Asp Asn Leu
210 215 220

Arg Arg Met
225

<210> 72
<211> 588
<212> PRT
<213> Papaver somniferum

<400> 72

Met Ser Leu Gln Gln Ala Gly Gln Pro Arg Pro Thr Ala Asn Gly Thr
1 5 10 15

Gly Arg Arg Arg Gly Glu Arg Glu Thr Gly Phe Arg Ser Gly Ser Asn
20 25 30

Phe Pro Thr Glu Lys Pro Asn His Gly Met Ala Ile Val Gly Gly Ile
35 40 45

Leu Asn Gly Ser Ile Glu Gly Gly Leu Glu Gly Pro Ser Arg Asp Arg
50 55 60

Leu Ile Tyr Leu Ala Ala Cys Leu Ile Gly His Arg Val Glu Val Gln
65 70 75 80

Val Lys Asn Gly Ser Ile Phe Ser Gly Ile Leu His Ala Met Asn Ala
85 90 95

pctca2017050779-seql.txt

Glu Asn Asp Phe Gly Ile Val Leu Lys Met Ala Ser Leu Thr Lys Asp
 100 105 110
 Gly Leu Ser Lys Gly His Lys Pro Gly Ser Asp Ser Ile Ser Lys Ala
 115 120 125
 Pro Ser Lys Thr Leu Ile Val Pro Ala Lys Glu Leu Val Gln Val Ile
 130 135 140
 Ala Lys Asp Val Ser Val Thr Gly Ser Gly Val Lys Asn Asp Gly His
 145 150 155 160
 His Glu Gly Arg Gln Asp Leu Met Ile Asp Ser Tyr Ile Ser Lys Ser
 165 170 175
 Gln Phe Val Asp Ala Gly Arg Glu Leu Ala Pro Trp Ala Pro Asp Glu
 180 185 190
 Asp Asp Leu Gln Cys Pro Glu Leu Asp Asn Ile Phe Asp Gly Pro Trp
 195 200 205
 Asn Ser Arg Lys Trp Asp Gln Phe Glu Thr Asn Glu Ala Leu Phe Gly
 210 215 220
 Val Lys Ser Thr Phe Asp Glu Glu Leu Tyr Thr Thr Lys Leu Asp Arg
 225 230 235 240
 Gly Pro Gln Met Arg Glu Arg Glu Arg Glu Ala Ser Arg Ile Ala Arg
 245 250 255
 Glu Ile Glu Gly Glu Asp Thr Lys Asp Met His Leu Ala Glu Glu Arg
 260 265 270
 Gly Arg His Phe Asp Leu Asp Val Asp Glu Glu Thr Arg Phe Ser Ser
 275 280 285
 Val Leu Arg Thr Val Asp Asp Ser Gly Tyr Asp Glu Asp Glu Asp Ile
 290 295 300
 Val Leu Asp Thr His Asn Met Glu Thr Phe Gly Asp Ser Ser Gly Ala
 305 310 315 320
 Ala Ser Lys Arg Ser Phe Ser Asp Val Ala Arg Gly Lys Thr Asp Asn
 325 330 335
 Leu Gly Pro Ser Pro Ser Ser Ser Ser Val Ala Asp Glu Ala His Ser

340

Arg Phe Asn Ala Gly Arg Asp His Phe Ser Ala Ser Gly Asp Arg Ala
355 360 365

Arg Gln Ile Asp Ser Glu Ser Thr Gln Ser Arg Val Tyr Glu Asn Lys
370 375 380

Phe Lys Glu Leu Asp Gly Arg Lys Asn Gly Ala Lys Glu Leu Val Glu
385 390 395 400

Arg Lys Pro Val Asn Glu Ala Gln Thr Gln Asn Leu Glu Gly Ser Arg
405 410 415

Lys Ser Gln Val Thr Thr Gln His Val His Pro Arg Gly Arg Pro Gly
420 425 430

Ser Ser Ala Ser Ser Thr Ala Glu Ser Ala Gln Ser Gly Val Ala Pro
435 440 445

Thr Leu Gly Arg Pro Gly Leu Ser Pro Ser Ser Ser Met Gly Ser Leu
450 455 460

Ser Ser Glu Lys Ser Thr Leu Asn Pro Phe Ala Lys Glu Phe Lys Leu
465 470 475 480

Asn Pro Asn Ala Lys Ser Phe Thr Pro Ser Pro Ala Pro Ile Arg Pro
485 490 495

Pro Ser Pro Val Ser Asp Ser Ser Tyr Tyr Tyr Pro Asn Asn Val Ser
500 505 510

Pro Val Gln His Met His Gly Leu Pro Val Gly Val Gly Met Gly Thr
515 520 525

Ser Tyr Gly Gly Pro Gln Pro Val Met Tyr Thr Pro Gln Val Ala Pro
530 535 540

Ile Gln Pro Ala Gln Thr Phe Leu His Pro Asn Gly Gln Leu Tyr Gly
545 550 555 560

Gln Gln Met Ile Val Gly His Pro Arg Gln Val Leu Tyr Met Pro Ser
565 570 575

Tyr Pro Pro Asp Met Pro Tyr Lys Gly Arg Asp Phe
580 585

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<210> 73

<211> 321

<212> PRT

<213> Papaver somniferum

<400> 73

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Met Pro Ala Leu Gly Met Gly Thr Val Glu Thr Met Glu Lys Gly Thr
20 25 30

Glu Arg Glu Lys Leu Ala Phe Leu Lys Ala Ile Glu Val Gly Tyr Arg
35 40 45

His Phe Asp Thr Ala Ala Ala Tyr Gln Thr Glu Glu Cys Leu Gly Glu
50 55 60

Ala Ile Ala Glu Ala Leu Gln Leu Gly Leu Ile Lys Ser Arg Asp Glu
65 70 75 80

Leu Phe Ile Thr Ser Lys Leu Trp Cys Ala Asp Ala His Ala Asp Leu
85 90 95

Val Leu Pro Ala Leu Gln Asn Ser Leu Arg Asn Leu Lys Leu Asp Tyr
100 105 110

Leu Asp Leu Tyr Leu Ile His His Pro Val Ser Leu Lys Pro Gly Lys
115 120 125

Phe Val Asn Glu Ile Pro Lys Asp His Ile Leu Pro Met Asp Tyr Lys
130 135 140

Ser Val Trp Ala Ala Met Glu Glu Cys Gln Thr Val Gly Phe Thr Arg
145 150 155 160

Ala Ile Gly Val Ser Asn Phe Ser Cys Lys Lys Leu Gln Glu Leu Met
165 170 175

Ala Ala Ala Lys Ile Pro Pro Val Val Asn Gln Val Glu Met Ser Pro
180 185 190

Thr Leu His Gln Lys Asn Leu Arg Glu Tyr Cys Lys Ala Asn Asn Ile
195 200 205

Met Ile Thr Ala His Ser Val Leu Gly Ala Ile Gly Ala Pro Trp Gly
210 215 220

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Ser Asn Ala Val Met Asp Ser Lys Val Leu His Gln Ile Ala Val Ala
225 230 235 240

Arg Gly Lys Ser Val Ala Gln Val Ser Met Arg Trp Val Tyr Gln Gln
245 250 255

Gly Ala Ser Leu Val Val Lys Ser Phe Asn Glu Gly Arg Met Lys Glu
260 265 270

Asn Leu Lys Ile Phe Asp Trp Glu Leu Thr Ala Glu Asp Met Glu Lys
275 280 285

Ile Ser Glu Ile Pro Gln Ser Arg Thr Ser Ser Ala Asp Phe Leu Leu
290 295 300

Ser Pro Thr Gly Pro Phe Lys Thr Glu Glu Glu Phe Trp Asp Glu Lys
305 310 315 320

Asp

<210> 74
<211> 360
<212> PRT
<213> Papaver somniferum

<400> 74

Met Glu Thr Pro Ile Leu Ile Lys Leu Gly Asn Gly Leu Ser Ile Pro
1 5 10 15

Ser Val Gln Glu Leu Ala Lys Leu Thr Leu Ala Glu Ile Pro Ser Arg
20 25 30

Tyr Thr Cys Thr Gly Glu Ser Pro Leu Asn Asn Ile Gly Ala Ser Val
35 40 45

Thr Asp Asp Glu Thr Val Pro Val Ile Asp Leu Gln Asn Leu Leu Ser
50 55 60

Pro Glu Pro Val Val Gly Lys Leu Glu Leu Asp Lys Leu His Ser Ala
65 70 75 80

Cys Lys Glu Trp Gly Phe Phe Gln Leu Val Asn His Gly Val Asp Ala
85 90 95

Leu Leu Met Asp Asn Ile Lys Ser Glu Ile Lys Gly Phe Phe Asn Leu
100 105 110

pctca2017050779-seql.txt

Pro Met Asn Glu Lys Thr Lys Tyr Gly Gln Gln Asp Gly Asp Phe Glu
115 120 125

Gly Phe Gly Gln Pro Tyr Ile Glu Ser Glu Asp Gln Arg Leu Asp Trp
130 135 140

Thr Glu Val Phe Ser Met Leu Ser Leu Pro Leu His Leu Arg Lys Pro
145 150 155 160

His Leu Phe Pro Glu Leu Pro Leu Pro Phe Arg Glu Thr Leu Glu Ser
165 170 175

Tyr Leu Ser Lys Met Lys Lys Leu Ser Thr Val Val Phe Glu Met Leu
180 185 190

Glu Lys Ser Leu Gln Leu Val Glu Ile Lys Gly Met Thr Asp Leu Phe
195 200 205

Glu Asp Gly Leu Gln Thr Met Arg Met Asn Tyr Tyr Pro Pro Cys Pro
210 215 220

Arg Pro Glu Leu Val Leu Gly Leu Thr Ser His Ser Asp Phe Ser Gly
225 230 235 240

Leu Thr Ile Leu Leu Gln Leu Asn Glu Val Glu Gly Leu Gln Ile Arg
245 250 255

Lys Glu Glu Arg Trp Ile Ser Ile Lys Pro Leu Pro Asp Ala Phe Ile
260 265 270

Val Asn Val Gly Asp Ile Leu Glu Ile Met Thr Asn Gly Ile Tyr Arg
275 280 285

Ser Val Glu His Arg Ala Val Val Asn Ser Thr Lys Glu Arg Leu Ser
290 295 300

Ile Ala Thr Phe His Asp Ser Lys Leu Glu Ser Glu Ile Gly Pro Ile
305 310 315 320

Ser Ser Leu Val Thr Pro Glu Thr Pro Ala Leu Phe Lys Arg Gly Arg
325 330 335

Tyr Glu Asp Ile Leu Lys Glu Asn Leu Ser Arg Lys Leu Asp Gly Lys
340 345 350

Ser Phe Leu Asp Tyr Met Arg Met
355 360

pctca2017050779-seql.txt

<210> 75
 <211> 1605
 <212> DNA
 <213> Papaver somniferum

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<400> 75
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gcagtttaca gttcgccgga tatccctaga cttctcagag atgttctact tcccgggtgtc      120
tttgagaagt tagacgtcat tgaaggaaat ggcggcgtcg gtacagttct tgacattggt      180
tttcctccag gtgcggttcc tcgaagttac aaagagaaat tcgtaaacad cgatcgcgaa      240
aagcgattga aagagggtat catgatcgaa ggaggatacc gggacatggg atgcacattt      300
tacttggaca ggatccatgt ggtggagaaa accccgagct catgcgttat tgaatcttct      360
attgtttatg aagtgaaga agagtatgct gatgccgtgt ctaaattaat cacaactgaa      420
ccattgaagt cgatggcgga agtcattctt aattacgtta tacagaaaga atcagtttcg      480
ccaagaatta atattctcga caagcaatct caagtgaaga aggagattcg atacgacctg      540
gaggtagcaa cctcggctga ttctatctgg tcagtttaca gctgccctga tatccctcgg      600
cttcttagag atgttctact tcccgggtgtg ttcgagaaat tggatgtcat tgaaggaaac      660
ggtggcgttg ggactgttct tgatattggt ttccctccag gtgcggtacc acgtagttac      720
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gaagggtact tagacatggg gtgcacatct tacctggata ggatccatgt agttgaaaaa      840
acctctaaat cttgtatcat taaatcatct gtggtttatg aagtgaaacg agagtgtgct      900
gatgccatgt ctaagttaat cacgacagaa ccattgaagt cgatggcaga agtcattctt      960
aattacgcta tcaagcaaca atcagcttct gagagaaaca ttccctaagaa gcaatctgct     1020
ctaattagga aagaaaattaa ttacgaaacg gaggtgcaaa cctcagctga ttcgatttgg     1080
aacgtctaca gttcccctga catccatcga ctacttagag atgttctgct tcctgggtgtt     1140
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ttccctctag gtgcagttcc gcggagggtat aaggagaaat ttgtgaagat taaccatgag     1260
aagcgactga aagaagtggg tatgatcgaa ggaggatacc tagacatggg ttgcacattc     1320
tacatggaca ggatccatgt ctttgagaaa accccaaaact catgtgttat cgaatcctcg     1380
atcattttacg aagttaaaga agagtatgct ggtaaaatgg ctaagctaata cacaacagaa     1440
ccattggaat ccatggcaga agtcattctt ggttatgttc ttaagaaacg gctccaggta     1500
ttcggattcg agattaagcc aaaattaaga ttcaatcttt tgctatgttt gattatctgt     1560
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<210> 76

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<211> 210
 <212> DNA
 <213> Papaver somniferum

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 gctagcttca gcttcagtaa acggatagta cctggatttg actatcagca acagcaatat 180
 gaagagaaga aagttaatca taaacagtaa 210

<210> 77
 <211> 201
 <212> DNA
 <213> Papaver somniferum

<400> 77
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 actaaccctc attgggcatc tctaatacgag agttcctggc acagtgaccc aaaatgccgg 120
 ccaacattta aggaactgct tgaaagggtg aaagatctgc agagacatta tttcatttca 180
 aagccaaga gaactatcta g 201

<210> 78
 <211> 510
 <212> DNA
 <213> Papaver somniferum

<400> 78
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 aactacaaga aaccagcaga tacttgtaag caaacagtga gaaattcctt gatctcaaat 120
 gaagcctcct catctgcac aaattcatca gtaggggtta gaatactcat tcacaacat 180
 tctacctctc ctcaagaatc aaagaacaca gtcttagtca aacacacttt caaactgagt 240
 cttctagcct caacatattc tcaagaatca agttttttga gatcatgttg tctgtgcaag 300
 aaaaagttaa gtcctgaaaa gaatgtgtac atgtacatgg gtgatcaagg cttttgcagc 360
 gtcgactgcc ggtctaggca gattgtgaag gatgaaataa gagaaatcga aatatcaacc 420
 aagaaaatat tgtcatcatc tccttggttg cccaagaatg taagaattca tcttccatct 480
 catcggaatc gaattccagt tgcagcatag 510

<210> 79
 <211> 447
 <212> DNA
 <213> Papaver somniferum

<400> 79
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 aaagagaatt ctatatcttc tcaagattca aacaacaaac ccactttcaa attgagcgaa 120

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caaggatcat	tcgaaacatc	atcaccaaag	atgtcttcaa	tcttttctca	agaatcatca	180
aactttttga	aagcatgtgg	tctgtgcaga	aaaaaattaa	ctccacaaaa	gaatatttac	240
atgtatagag	gtgaccaagc	ctttttagtag	gacgattgcc	ggtgccggaa	aattttgata	300
gaggaattat	tgatggaaga	aacagaagag	aagacgacga	tggaattagt	tacaaaaaaa	360
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cgaaatcatg	ttcgagctgc	agcttaa				447

<210> 80
 <211> 1842
 <212> DNA
 <213> Papaver somniferum

<400> 80						
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tttgagaagt	tagacgtcat	tgaaggaaat	ggcggcgctc	gtacagttct	tgacattggt	180
tttctccag	gtgcggttcc	tcgaagttac	aaagagaaat	tcgtaaacad	cgatcgcgaa	240
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tacttggata	ggatccatgt	agtggagaaa	accaagagct	catgcgttat	tgaatcgtct	360
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ccattgaagt	ccatggcgga	agtcatttct	aattacgtta	ttcagaaaga	atcattttct	480
gccagaaaca	ttctaagcaa	gcaatctgta	gtgaagaagg	agattcgata	cgacctggag	540
gtaccaatct	cagctgattc	tatctgggtca	gtttacagct	gccctgatat	ccctcggtt	600
cttagagatg	ttctacttcc	tggtgtgttc	gagaaattgg	atgtcattga	aggggatggt	660
gggtgtggga	ctgttcttga	cattgtcttc	cctccagggtg	cagttcctcg	aagttacaaa	720
gagaaattcg	ttaacattga	ccgcgagaag	cgattgaaag	aggttatcat	gatcgaagga	780
ggatacttgg	acatgggatg	cacgttttac	ttggacagga	tccatgtagt	ggagaaaagc	840
ctgagctcgt	gtgttatcga	atcgtctatt	gtttatgaag	taaaagaaga	gtatgttgat	900
gccatgtcta	aattaatcac	aactgaacca	ttgaagtcga	tggcggaagt	catctctaata	960
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tacagctgcc	cggatattcc	tcggcttctt	agagatgttt	tacttcccgg	tgtgttccag	1140
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ccagggtcgg	tacctcgtag	ttacaaggag	aaatttgtga	acatcaacca	cgaaaagcga	1260
ttaaaagaag	tgattatgat	cgaaggagga	tatttagaca	tgggatgcac	atcttacctg	1320

pctca2017050779-seql.txt

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aagtcgatgg cagaagttat ctctaattac gctatgaagc aacaatctgt ttctgagaga	1500
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ttgcatttta ctatttgtgt tattgtgtta ggagtaattc aactaacctt ccgcagtgag	1800
ccagggcaat tgactccact tgcccatagc cttaccgact ga	1842

<210> 81
 <211> 1041
 <212> DNA
 <213> Papaver somniferum

<400> 81	
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cacaacaatg tcaaaccat gtctttatcc gaattggcat cgaaacttcc cgttgctcaa	180
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aaaatagatg ctaccacgca gaaatactca ttagctccac cagctaagta tttgttgaga	300
ggctgggaga aatcaatggt tgattcaatt ttatgcataa atgataagga tttcttagct	360
ccatggcacc atttaggcga cggtttgacc ggtaactgtg acgcttttga gaaagcgttg	420
gggaagagta tttgggtgta tatgagtga aatcctgaaa agaatacaatt gttaaatgca	480
gcaatggctt gtgatactag attggttact tctgcattgg ctaatgagtg caaaagtatt	540
ttcagtgatg gaatcagtac actggttgat gtcggcgggtg gtacgggtac tgcagtga	600
gccatatcta aagcttttcc ggatattaag tgcactatct atgatcttcc tcatgtcata	660
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attcaaatct tgaagagatg caaagaagca ttaccaaaag ttggcaaagt tattatcgtg	840
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tttgatgccg ctggttttgc tagccacaaa gtcactcaga tatctgctgt ccaatctgta	1020
attgaggctt acccttatta a	1041

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<210> 82
<211> 1638
<212> DNA
<213> Papaver somniferum

<400> 82
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gtaacgtag aagatttacc atcaatgatg tcgaaactaa agattgttgg agaaaaatctg      180
actgatgaag agagaagttc ttttttgggt gaatcaaatg ggagtttgag tgaagaagtt      240
gattttgaag gatttcttaa ggtgtatctg aaaatgcaag ctcatacaaa tgctaaacca      300
ggtggtggtg gtggtgcaaa ggactcatct gcgtttctaa aggctgctac tactacgtta      360
ctgcatacaa tcagtgaatc tgaaaagtca tcatatgttg ctcatattaa caattacctt      420
ggagaagatc cattttttaa gaaatgcctt cctatagatc cattgtctaa tgatctcttt      480
gaagttgtaa aggatggagt tcttctatgt aaacttatca atgtggcagt ccctgggact      540
atcgatgaac gggcaatcaa tactaaaagg atacttaacc cttgggaaaag gaatgaaaat      600
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caggatttta ttgaaggaag gcgtcatctg gtgcttggag tgatttctca aattatcaag      720
atacaactac tggcagacct taacttgaag aaaacacctc agcttctaga gttggttgaa      780
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ccatctatat ttaccttaaa agattttcta gagagagcca gactaattct tcaacatgcy      1020
gaccgaatgg gttgcaagag atacttgaca gcaaaagaca tagtcgaggg gtcgccaaat      1080
ctaaacttag catttggtgc acatgttttc cagcacagga atggtctcaa atcacaaacg      1140
aaggaaaatat cttttattga aacttctcca gatgagttcc agatttccag agaagaaaaa      1200
gcttttcgcc tttggatcaa tagtttgggt aattcgacat atattgacaa tgtttttgaa      1260
gatgttcgaa atggatgggt ccttttagag gccttagaca aggtttctcc tggatatagt      1320
aattggaaga ttgcaagcaa acctccaata aaaatgccgt tcaggaaaagt agaaaactgc      1380
aaccaagtag tgaagatcgg taaacagtta aagttttccc tagtcaatgt tgctgggaat      1440
gatattgtgc agggcaataa gaagcttata ttggctttct tgtggcaatt gatgcgttgc      1500
aacattatcc agctccttaa aaacttgaga tctcactctc atgacaagga gataacagat      1560
gctgacattc tgaactgggc taatgttaaa gtgaagaatg cagggaaaac cagtcagatg      1620
aaaagtttta aggtatag                                     1638

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pctca2017050779-seql.txt

<210> 83

<211> 917

<212> DNA

<213> Papaver somniferum

<400> 83

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gaaacccatg aagaacagct ttctcagctt cttgacttgg ttcactcttt gaaaggatg      180
aaaatggcaa ctgagatgga gaatttggat ttaaaactat acgaagcacc tatggaattc      240
ttaaagatcc aacatggaag caacatgaaa caaagtgcgg gttactacac tgatgaatca      300
acaacgttgg acgaagctga gatagcgatg ctggatttgt atatggagag ggcacagatc      360
aaagatggtc agagtgtact tgatttaggg tgtggattgg gtgctgtagc tcttttcggg      420
gcaaacaaat ttaagaaatg tcaatttact ggagttacaa gttctgtgga acaaaaagat      480
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<211> 639

<212> DNA

<213> Papaver somniferum

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 <212> DNA
 <213> Papaver somniferum

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<210> 88
 <211> 306
 <212> DNA
 <213> Papaver somniferum

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<210> 89
 <211> 1746
 <212> DNA
 <213> Papaver somniferum

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 <213> Papaver somniferum

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<210> 92
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 <212> DNA
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<210> 93
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<212> DNA
<213> Papaver somniferum

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<210> 94
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Arg Asp Val Leu Leu Pro Gly Val Phe Glu Lys Leu Asp Val Ile Glu
 35 40 45

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Ala Val Pro Arg Ser Tyr Lys Glu Lys Phe Val Asn Ile Asp Arg Glu
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Lys Arg Leu Lys Glu Val Ile Met Ile Glu Gly Gly Tyr Arg Asp Met
85 90 95

Gly Cys Thr Phe Tyr Leu Asp Arg Ile His Val Val Glu Lys Thr Pro
100 105 110

Ser Ser Cys Val Ile Glu Ser Ser Ile Val Tyr Glu Val Lys Glu Glu
115 120 125

Tyr Ala Asp Ala Val Ser Lys Leu Ile Thr Thr Glu Pro Leu Lys Ser
130 135 140

Met Ala Glu Val Ile Ser Asn Tyr Val Ile Gln Lys Glu Ser Val Ser
145 150 155 160

Pro Arg Ile Asn Ile Leu Asp Lys Gln Ser Gln Val Lys Lys Glu Ile
165 170 175

Arg Tyr Asp Leu Glu Val Pro Thr Ser Ala Asp Ser Ile Trp Ser Val
180 185 190

Tyr Ser Cys Pro Asp Ile Pro Arg Leu Leu Arg Asp Val Leu Leu Pro
195 200 205

Gly Val Phe Glu Lys Leu Asp Val Ile Glu Gly Asn Gly Gly Val Gly
210 215 220

Thr Val Leu Asp Ile Val Phe Pro Pro Gly Ala Val Pro Arg Ser Tyr
225 230 235 240

Lys Glu Lys Phe Val Asn Ile Asn His Glu Lys Arg Leu Lys Glu Val
245 250 255

Ile Met Ile Glu Glu Gly Tyr Leu Asp Met Gly Cys Thr Ser Tyr Leu
260 265 270

Asp Arg Ile His Val Val Glu Lys Thr Ser Lys Ser Cys Ile Ile Lys
275 280 285

Ser Ser Val Val Tyr Glu Val Lys Arg Glu Cys Ala Asp Ala Met Ser

290

295

300

Lys Leu Ile Thr Thr Glu Pro Leu Lys Ser Met Ala Glu Val Ile Ser
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Asn Tyr Ala Ile Lys Gln Gln Ser Ala Ser Glu Arg Asn Ile Pro Lys
 325 330 335

Lys Gln Ser Ala Leu Ile Arg Lys Glu Ile Asn Tyr Glu Thr Glu Val
 340 345 350

Gln Thr Ser Ala Asp Ser Ile Trp Asn Val Tyr Ser Ser Pro Asp Ile
 355 360 365

His Arg Leu Leu Arg Asp Val Leu Leu Pro Gly Val Phe Glu Lys Leu
 370 375 380

Asp Val Ile Ala Gly Asn Gly Gly Val Gly Thr Val Leu Asp Ile Ala
 385 390 395 400

Phe Pro Leu Gly Ala Val Pro Arg Arg Tyr Lys Glu Lys Phe Val Lys
 405 410 415

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 420 425 430

Tyr Leu Asp Met Gly Cys Thr Phe Tyr Met Asp Arg Ile His Val Phe
 435 440 445

Glu Lys Thr Pro Asn Ser Cys Val Ile Glu Ser Ser Ile Ile Tyr Glu
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Val Lys Glu Glu Tyr Ala Gly Lys Met Ala Lys Leu Ile Thr Thr Glu
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Pro Leu Glu Ser Met Ala Glu Val Ile Ser Gly Tyr Val Leu Lys Lys
 485 490 495

Arg Leu Gln Val Phe Gly Phe Glu Ile Lys Pro Lys Leu Arg Phe Asn
 500 505 510

Leu Leu Leu Cys Leu Ile Ile Cys Leu Ala Val Ala Gly Gly Met Phe
 515 520 525

Val Ala Gly Phe Pro Leu
 530

pctca2017050779-seql.txt

<210> 95
 <211> 69
 <212> PRT
 <213> Papaver somniferum

<400> 95

Met Arg Cys Leu Arg Arg Asp Asn Trp Thr Val Val Ser Ser Val Cys
 1 5 10 15

Leu Phe Gln Asn Gly Leu His Tyr Ala Pro Ala Ala Arg Val Pro Ala
 20 25 30

Ser Gly Leu Val Ser His Glu Leu Ala Ser Phe Ser Phe Ser Lys Arg
 35 40 45

Ile Val Pro Gly Phe Asp Tyr Gln Gln Gln Gln Tyr Glu Glu Lys Lys
 50 55 60

Val Asn His Lys Gln
 65

<210> 96
 <211> 66
 <212> PRT
 <213> Papaver somniferum

<400> 96

Met Gly Trp Pro Glu Pro Asp Ala Gly Phe Met Asp Gln Arg Asn Glu
 1 5 10 15

Ile Pro Asn Asp Thr Asn Pro His Trp Ala Ser Leu Ile Glu Ser Ser
 20 25 30

Trp His Ser Asp Pro Lys Cys Arg Pro Thr Phe Lys Glu Leu Leu Glu
 35 40 45

Arg Leu Lys Asp Leu Gln Arg His Tyr Phe Ile Ser Lys Pro Lys Arg
 50 55 60

Thr Ile
 65

<210> 97
 <211> 169
 <212> PRT
 <213> Papaver somniferum

<400> 97

Met Leu Ile Arg Arg Ser Lys Thr Thr Phe Phe Leu Asp Met Asp Asp
 1 5 10 15

pctca2017050779-seql.txt

Asp Gln Asp Phe Asn Tyr Lys Lys Pro Ala Asp Thr Cys Lys Gln Thr
20 25 30

Val Arg Asn Ser Leu Ile Ser Asn Glu Ala Ser Ser Ser Ala Ser Asn
35 40 45

Ser Ser Val Gly Leu Arg Ile Leu Ile His Asn His Ser Thr Ser Pro
50 55 60

Gln Glu Ser Lys Asn Thr Val Leu Val Lys His Thr Phe Lys Leu Ser
65 70 75 80

Leu Leu Ala Ser Thr Tyr Ser Gln Glu Ser Ser Phe Leu Arg Ser Cys
85 90 95

Cys Leu Cys Lys Lys Lys Leu Ser Pro Glu Lys Asn Val Tyr Met Tyr
100 105 110

Met Gly Asp Gln Gly Phe Cys Ser Val Asp Cys Arg Ser Arg Gln Ile
115 120 125

Val Lys Asp Glu Ile Arg Glu Ile Glu Ile Ser Thr Lys Lys Ile Leu
130 135 140

Ser Ser Ser Pro Cys Cys Pro Lys Asn Val Arg Ile His Leu Pro Ser
145 150 155 160

His Arg Asn Arg Ile Pro Val Ala Ala
165

<210> 98
<211> 148
<212> PRT
<213> Papaver somniferum

<400> 98

Met Leu Arg Arg Thr Lys Ser Thr Leu Val Leu Gln Asp Ser Phe Ser
1 5 10 15

Ser Ser Leu Thr Lys Glu Asn Ser Ile Phe Ser Gln Asp Ser Asn Asn
20 25 30

Lys Pro Thr Phe Lys Leu Ser Glu Gln Gly Ser Phe Glu Thr Ser Ser
35 40 45

Pro Lys Met Ser Ser Ile Phe Ser Gln Glu Ser Ser Asn Phe Leu Lys
50 55 60

pctca2017050779-seql.txt

Ala Cys Gly Leu Cys Arg Lys Lys Leu Thr Pro Gln Lys Asn Ile Tyr
65 70 75 80

Met Tyr Arg Gly Asp Gln Ala Phe Cys Ser Asp Asp Cys Arg Cys Arg
85 90 95

Lys Ile Leu Ile Glu Glu Leu Leu Met Glu Glu Thr Glu Glu Lys Thr
100 105 110

Thr Met Glu Leu Val Thr Lys Lys Glu Ile Ala Pro Ser Ser Val His
115 120 125

Phe Gly Arg Ser Leu Gly Asn Gly Leu Gln Pro Arg Arg Asn His Val
130 135 140

Arg Ala Ala Ala
145

<210> 99
<211> 613
<212> PRT
<213> Papaver somniferum

<400> 99

Met Met Lys Lys Val Ile Lys Tyr Asp Met Glu Val Ala Thr Ser Ala
1 5 10 15

Asp Ser Val Trp Ala Val Tyr Ser Ser Pro Asp Ile Pro Arg Leu Leu
20 25 30

Arg Asp Val Leu Leu Pro Gly Val Phe Glu Lys Leu Asp Val Ile Glu
35 40 45

Gly Asn Gly Gly Val Gly Thr Val Leu Asp Ile Val Phe Pro Pro Gly
50 55 60

Ala Val Pro Arg Ser Tyr Lys Glu Lys Phe Val Asn Ile Asp Arg Glu
65 70 75 80

Lys Arg Leu Lys Glu Val Ile Met Ile Glu Gly Gly Tyr Arg Asp Met
85 90 95

Gly Cys Thr Phe Tyr Leu Asp Arg Ile His Val Val Glu Lys Thr Lys
100 105 110

Ser Ser Cys Val Ile Glu Ser Ser Ile Val Tyr Asp Val Lys Glu Glu
115 120 125

pctca2017050779-seql.txt

Cys Ala Asp Ala Met Ser Lys Leu Ile Thr Thr Glu Pro Leu Lys Ser
 130 135 140
 Met Ala Glu Val Ile Ser Asn Tyr Val Ile Gln Lys Glu Ser Phe Ser
 145 150 155 160
 Ala Arg Asn Ile Leu Ser Lys Gln Ser Val Val Lys Lys Glu Ile Arg
 165 170 175
 Tyr Asp Leu Glu Val Pro Ile Ser Ala Asp Ser Ile Trp Ser Val Tyr
 180 185 190
 Ser Cys Pro Asp Ile Pro Arg Leu Leu Arg Asp Val Leu Leu Pro Gly
 195 200 205
 Val Phe Glu Lys Leu Asp Val Ile Glu Gly Asp Gly Gly Val Gly Thr
 210 215 220
 Val Leu Asp Ile Val Phe Pro Pro Gly Ala Val Pro Arg Ser Tyr Lys
 225 230 235 240
 Glu Lys Phe Val Asn Ile Asp Arg Glu Lys Arg Leu Lys Glu Val Ile
 245 250 255
 Met Ile Glu Gly Gly Tyr Leu Asp Met Gly Cys Thr Phe Tyr Leu Asp
 260 265 270
 Arg Ile His Val Val Glu Lys Ser Leu Ser Ser Cys Val Ile Glu Ser
 275 280 285
 Ser Ile Val Tyr Glu Val Lys Glu Glu Tyr Val Asp Ala Met Ser Lys
 290 295 300
 Leu Ile Thr Thr Glu Pro Leu Lys Ser Met Ala Glu Val Ile Ser Asn
 305 310 315 320
 Tyr Val Ile Gln Arg Glu Ser Phe Ser Ala Arg Asn Ile Leu Asn Lys
 325 330 335
 Asn Ser Leu Val Lys Lys Glu Ile Arg Tyr Asp Leu Glu Val Pro Thr
 340 345 350
 Ser Ala Asp Ser Ile Trp Ser Val Tyr Ser Cys Pro Asp Ile Pro Arg
 355 360 365
 Leu Leu Arg Asp Val Leu Leu Pro Gly Val Phe Gln Lys Leu Asp Val

370

375

380

Ile Glu Gly Asn Gly Gly Val Gly Thr Val Leu Asp Ile Val Phe Pro
 385 390 395 400

Pro Gly Ala Val Pro Arg Ser Tyr Lys Glu Lys Phe Val Asn Ile Asn
 405 410 415

His Glu Lys Arg Leu Lys Glu Val Ile Met Ile Glu Gly Gly Tyr Leu
 420 425 430

Asp Met Gly Cys Thr Ser Tyr Leu Asp Arg Ile His Val Val Glu Lys
 435 440 445

Thr Ser Lys Ser Cys Ile Ile Lys Ser Ser Val Val Tyr Glu Val Lys
 450 455 460

Gln Glu Cys Val Glu Ala Met Ser Lys Leu Ile Thr Thr Glu Pro Leu
 465 470 475 480

Lys Ser Met Ala Glu Val Ile Ser Asn Tyr Ala Met Lys Gln Gln Ser
 485 490 495

Val Ser Glu Arg Asn Ile Pro Lys Lys Gln Ser Leu Leu Arg Lys Glu
 500 505 510

Ile Thr Tyr Glu Thr Glu Val Gln Thr Ser Ala Asp Ser Ile Trp Asn
 515 520 525

Val Tyr Ser Ser Pro Asp Ile Pro Arg Leu Leu Arg Asp Val Leu Leu
 530 535 540

Pro Gly Val Phe Glu Lys Leu Asp Val Ile Ala Gly Asn Gly Gly Val
 545 550 555 560

Gly Thr Val Leu Asp Ile Ala Phe Pro Leu Gly Ile Leu Thr Thr Ile
 565 570 575

Asn His Cys Ile Leu His Phe Thr Ile Cys Val Ile Val Leu Gly Val
 580 585 590

Ile Gln Leu Thr Phe Arg Ser Glu Pro Gly Gln Leu Thr Pro Leu Ala
 595 600 605

His Ser Leu Thr Asp
 610

pctca2017050779-seql.txt

<210> 100

<211> 346

<212> PRT

<213> Papaver somniferum

<400> 100

Met Glu Thr Val Ser Lys Ile Asp Gln Gln Asn Gln Ala Lys Ile Trp
1 5 10 15

Lys Gln Ile Tyr Gly Phe Ala Glu Ser Leu Val Leu Lys Cys Ala Val
20 25 30

Gln Leu Glu Ile Ala Glu Thr Leu His Asn Asn Val Lys Pro Met Ser
35 40 45

Leu Ser Glu Leu Ala Ser Lys Leu Pro Val Ala Gln Pro Val Asn Glu
50 55 60

Asp Arg Leu Phe Arg Ile Met Arg Tyr Leu Val His Met Glu Leu Phe
65 70 75 80

Lys Ile Asp Ala Thr Thr Gln Lys Tyr Ser Leu Ala Pro Pro Ala Lys
85 90 95

Tyr Leu Leu Arg Gly Trp Glu Lys Ser Met Val Asp Ser Ile Leu Cys
100 105 110

Ile Asn Asp Lys Asp Phe Leu Ala Pro Trp His His Leu Gly Asp Gly
115 120 125

Leu Thr Gly Asn Cys Asp Ala Phe Glu Lys Ala Leu Gly Lys Ser Ile
130 135 140

Trp Val Tyr Met Ser Glu Asn Pro Glu Lys Asn Gln Leu Phe Asn Ala
145 150 155 160

Ala Met Ala Cys Asp Thr Arg Leu Val Thr Ser Ala Leu Ala Asn Glu
165 170 175

Cys Lys Ser Ile Phe Ser Asp Gly Ile Ser Thr Leu Val Asp Val Gly
180 185 190

Gly Gly Thr Gly Thr Ala Val Lys Ala Ile Ser Lys Ala Phe Pro Asp
195 200 205

Ile Lys Cys Thr Ile Tyr Asp Leu Pro His Val Ile Ala Asp Ser Pro
210 215 220

pctca2017050779-seql.txt

Glu Ile Pro Asn Ile Thr Lys Ile Ser Gly Asp Met Phe Lys Ser Ile
225 230 235 240

Pro Ser Ala Asp Ala Ile Phe Met Lys Cys Ile Leu His Asp Trp Asn
245 250 255

Asp Asp Glu Cys Ile Gln Ile Leu Lys Arg Cys Lys Glu Ala Leu Pro
260 265 270

Lys Val Gly Lys Val Ile Ile Val Asp Val Val Ile Asp Met Asp Ser
275 280 285

Thr His Pro Tyr Ala Lys Ile Arg Leu Thr Leu Asp Leu Asp Met Met
290 295 300

Leu Asn Thr Gly Gly Lys Glu Arg Thr Lys Glu Glu Trp Lys Thr Leu
305 310 315 320

Phe Asp Ala Ala Gly Phe Ala Ser His Lys Val Thr Gln Ile Ser Ala
325 330 335

Val Gln Ser Val Ile Glu Ala Tyr Pro Tyr
340 345

<210> 101
<211> 545
<212> PRT
<213> Papaver somniferum
<400> 101

Met Ala Ala Gly Tyr Ala Gly Val Leu Val Ser Asp Pro Trp Leu Gln
1 5 10 15

Asn Gln Phe Thr Gln Val Glu Leu Arg Ser Leu Lys Ser His Phe Leu
20 25 30

Ser Met Arg Arg Glu Leu Gly Ser Val Thr Leu Glu Asp Leu Pro Ser
35 40 45

Met Met Ser Lys Leu Lys Ile Val Gly Glu Asn Leu Thr Asp Glu Glu
50 55 60

Arg Ser Ser Phe Leu Val Glu Ser Asn Gly Ser Leu Ser Glu Glu Val
65 70 75 80

Asp Phe Glu Gly Phe Leu Lys Val Tyr Leu Lys Met Gln Ala His Thr
85 90 95

pctca2017050779-seq1.txt

Asn Ala Lys Pro Gly Gly Gly Gly Gly Ala Lys Asp Ser Ser Ala Phe
100 105 110

Leu Lys Ala Ala Thr Thr Thr Leu Leu His Thr Ile Ser Glu Ser Glu
115 120 125

Lys Ser Ser Tyr Val Ala His Ile Asn Asn Tyr Leu Gly Glu Asp Pro
130 135 140

Phe Leu Lys Lys Cys Leu Pro Ile Asp Pro Leu Ser Asn Asp Leu Phe
145 150 155 160

Glu Val Val Lys Asp Gly Val Leu Leu Cys Lys Leu Ile Asn Val Ala
165 170 175

Val Pro Gly Thr Ile Asp Glu Arg Ala Ile Asn Thr Lys Arg Ile Leu
180 185 190

Asn Pro Trp Glu Arg Asn Glu Asn His Thr Leu Cys Leu Asn Ser Ala
195 200 205

Lys Ala Ile Gly Cys Thr Val Val Asn Ile Gly Thr Gln Asp Phe Ile
210 215 220

Glu Gly Arg Arg His Leu Val Leu Gly Val Ile Ser Gln Ile Ile Lys
225 230 235 240

Ile Gln Leu Leu Ala Asp Leu Asn Leu Lys Lys Thr Pro Gln Leu Leu
245 250 255

Glu Leu Val Glu Asp Ser Lys Asp Met Glu Glu Leu Met Gly Leu Ala
260 265 270

Pro Glu Lys Ile Leu Leu Arg Trp Met Asn Phe His Leu Lys Lys Thr
275 280 285

Ser Tyr Lys Lys Thr Val Thr Asn Phe Ser Ser Asp Val Lys Asp Gly
290 295 300

Leu Ala Tyr Ala His Leu Leu Asn Val Leu Ala Pro Glu His Gly Asn
305 310 315 320

Pro Ser Ile Phe Thr Leu Lys Asp Phe Leu Glu Arg Ala Arg Leu Ile
325 330 335

Leu Gln His Ala Asp Arg Met Gly Cys Lys Arg Tyr Leu Thr Ala Lys
340 345 350

pctca2017050779-seql.txt

Asp Ile Val Glu Gly Ser Pro Asn Leu Asn Leu Ala Phe Val Ala His
355 360 365

Val Phe Gln His Arg Asn Gly Leu Lys Ser Gln Thr Lys Glu Ile Ser
370 375 380

Phe Ile Glu Thr Ser Pro Asp Glu Ser Gln Ile Ser Arg Glu Glu Lys
385 390 395 400

Ala Phe Arg Leu Trp Ile Asn Ser Leu Gly Asn Ser Thr Tyr Ile Asp
405 410 415

Asn Val Phe Glu Asp Val Arg Asn Gly Trp Val Leu Leu Glu Ala Leu
420 425 430

Asp Lys Val Ser Pro Gly Ile Val Asn Trp Lys Ile Ala Ser Lys Pro
435 440 445

Pro Ile Lys Met Pro Phe Arg Lys Val Glu Asn Cys Asn Gln Val Val
450 455 460

Lys Ile Gly Lys Gln Leu Lys Phe Ser Leu Val Asn Val Ala Gly Asn
465 470 475 480

Asp Ile Val Gln Gly Asn Lys Lys Leu Ile Leu Ala Phe Leu Trp Gln
485 490 495

Leu Met Arg Cys Asn Ile Ile Gln Leu Leu Lys Asn Leu Arg Ser His
500 505 510

Ser His Asp Lys Glu Ile Thr Asp Ala Asp Ile Leu Asn Trp Ala Asn
515 520 525

Val Lys Val Lys Asn Ala Gly Lys Thr Ser Gln Met Lys Ser Phe Lys
530 535 540

Val
545

<210> 102
<211> 305
<212> PRT
<213> Papaver somniferum

<400> 102

Met Gln Leu Lys Glu Lys Glu Glu Leu Leu Arg Asn Met Glu Leu Gly
1 5 10 15

pctca2017050779-seql.txt

Leu Ile Pro Asp Gln Glu Ile Arg Gln Arg Ile Arg Ile Glu Leu Glu
 20 25 30
 Lys Arg Leu Gln Trp Gly Tyr Lys Glu Thr His Glu Glu Gln Leu Ser
 35 40 45
 Gln Leu Leu Asp Leu Val His Ser Leu Lys Gly Met Lys Met Ala Thr
 50 55 60
 Glu Met Glu Asn Leu Asp Leu Lys Leu Tyr Glu Ala Pro Met Glu Phe
 65 70 75 80
 Leu Lys Ile Gln His Gly Ser Asn Met Lys Gln Ser Ala Gly Tyr Tyr
 85 90 95
 Thr Asp Glu Ser Thr Thr Leu Asp Glu Ala Glu Ile Ala Met Leu Asp
 100 105 110
 Leu Tyr Met Glu Arg Ala Gln Ile Lys Asp Gly Gln Ser Val Leu Asp
 115 120 125
 Leu Gly Cys Gly Leu Gly Ala Val Ala Leu Phe Gly Ala Asn Lys Phe
 130 135 140
 Lys Lys Cys Gln Phe Thr Gly Val Thr Ser Ser Val Glu Gln Lys Asp
 145 150 155 160
 Tyr Ile Glu Gly Lys Cys Lys Glu Leu Lys Leu Thr Asn Val Lys Val
 165 170 175
 Leu Leu Ala Asp Ile Thr Thr Tyr Glu Thr Glu Glu Arg Phe Asp Arg
 180 185 190
 Ile Phe Ala Val Glu Leu Ile Glu His Met Lys Asn Tyr Gln Leu Leu
 195 200 205
 Leu Lys Lys Ile Ser Glu Trp Met Lys Asp Asp Gly Leu Leu Phe Val
 210 215 220
 Glu His Val Cys His Lys Thr Leu Ala Tyr His Tyr Glu Pro Val Asp
 225 230 235 240
 Ala Glu Asp Trp Tyr Thr Asn Tyr Ile Phe Pro Ala Gly Thr Leu Thr
 245 250 255
 Leu Ser Ser Ala Ser Met Leu Leu Tyr Phe Gln Asp Asp Val Ser Val
 260 265 270

pctca2017050779-seql.txt

Val Asn Gln Trp Thr Leu Ser Gly Lys His Tyr Ser Arg Ser His Glu
275 280 285

Glu Trp Leu Lys Asn Met Asp Lys Asn Ile Val Glu Phe Lys Glu Ile
290 295 300

Met
305

<210> 103
<211> 212
<212> PRT
<213> Papaver somniferum

<400> 103

Met Val Lys Lys Lys Thr Lys Glu Leu Gln Leu Arg Ser Ser Thr Pro
1 5 10 15

Lys Lys Leu Ala Lys Thr Pro Pro Glu Pro Thr Ile Thr Leu Arg Lys
20 25 30

Ser Pro Arg Leu Ile Ala Lys Ala Lys Asn Asn Leu Asn Ser Ile Ser
35 40 45

Ile Lys Val Val Leu Asp Phe Asp Asn Asp Pro Lys Pro Thr Gln Pro
50 55 60

Thr Gln Ala Ser Val Gly Asp Asn Leu His Val Gly Gly Ser Gln Gly
65 70 75 80

Ile Val Asp Leu Glu Asn Asp Glu Glu Gln Ala Pro Phe Cys Thr Lys
85 90 95

Ala Ser Thr Lys Val Thr Asn Leu Glu Glu Ala Phe Lys Ala Met Gln
100 105 110

Glu Ser Val Cys Asn Leu Asp Asn Trp Gly Glu Asp Glu Cys His Pro
115 120 125

Glu Asp Ala Pro Trp Thr Gln Pro Leu Leu Tyr Ser Glu Asp Glu Asp
130 135 140

Ala Thr Glu Trp Ser Glu Phe Cys Asn Asn Phe Lys Glu Val Gly Pro
145 150 155 160

Gly Gly Pro Ser Val Arg Gly Gly Arg Ser Asp Asn Gly Asp Gln Glu
165 170 175

pctca2017050779-seql.txt

Gly Asn Ser Glu Asp Asp Gly Tyr Glu Gln Leu Leu Glu Thr Asp Asp
180 185 190

Glu Ala Glu Ala Asn His Cys Asp Gln Cys Ser Asp Thr His Glu Glu
195 200 205

Thr Gly Lys Ala
210

<210> 104
<211> 260
<212> PRT
<213> Papaver somniferum
<400> 104

Met Asp Ile Val Lys Phe Leu Gln Pro Lys Phe Thr Leu Met Glu Asn
1 5 10 15

Val Val Asp Ile Met Arg Phe Leu Gly Gly Thr Leu Gly Arg Tyr Ala
20 25 30

Met Gly Arg Leu Val Ala Met Gln Tyr Gln Val Arg Leu Gly Leu Leu
35 40 45

Ile Ala Gly Ser Tyr Gly Leu Pro Gln Phe Arg Met Arg Thr Phe Leu
50 55 60

Trp Gly Ala Lys Met Thr Glu Gln Asn Val Val Lys Gly Asp Glu Glu
65 70 75 80

Tyr Thr Leu Lys Leu Lys Asp Ala Leu Ile Leu Lys Asp Ala Ile Phe
85 90 95

Asp Leu Pro Lys Ile Thr Thr His Glu Val Arg Asp Glu Met Asp Tyr
100 105 110

Gly Asn Arg Ile Pro Lys Thr Asp Phe Gln Lys Met Ile Arg Leu Pro
115 120 125

Asn His Lys Leu Met Gly Ser Ala Cys Pro Glu Glu Ser Ala Thr Leu
130 135 140

Lys Leu Phe Asp His Arg Pro Leu Lys Leu Ser Glu Asp Asp Asn Leu
145 150 155 160

Arg Val Ser Lys Ile Pro Arg Glu Lys Gly Ala Asn Phe Arg Asn Leu
165 170 175

pctca2017050779-seql.txt

Pro Gly Val Ile Val Asp Glu Lys Asn Lys Ala Ser Arg Asp Pro Lys
180 185 190

Met Ala Lys Val Met Ile Gly Lys Ser Gly Lys Pro Leu Val Pro Glu
195 200 205

Tyr Ala Ile Lys Phe Val Arg Gly Ala Tyr Lys Lys Pro Leu Gly Arg
210 215 220

Leu Trp Trp Asp Glu Ile Val Ser Thr Val Val Thr Arg Ala Glu Pro
225 230 235 240

His Asn Gln Trp Met Val Tyr Val Asn Ile Asn Phe Leu Thr Phe Gly
245 250 255

Val Phe Val Lys
260

<210> 105
<211> 272
<212> PRT
<213> Papaver somniferum

<400> 105

Met Lys Ala Ala Arg Leu Ile Val Phe Pro Ile Lys Gly Arg Asn Trp
1 5 10 15

Cys Phe Ser Arg Ser Ile Glu Gln Thr Val Gln Glu Ser Glu Ser Ala
20 25 30

Lys Pro Ser Pro Lys Phe Lys Asp Leu Tyr Lys Lys Ile Thr Ser Lys
35 40 45

Gly Lys Pro Met Asn Gln Asn Val Glu Ile Ile Thr Glu Phe Phe Ser
50 55 60

Thr Lys Met Asn Lys Ala Trp Ala Gly Leu Gly Glu Ala Pro Glu Gly
65 70 75 80

Ser Ile Lys Asn Lys Ile His Gly Leu Gly Val Lys Leu Leu Ala Arg
85 90 95

Val Lys Pro Ser Glu Ile Phe Leu Lys Ser Ile Ser Lys Asp Val Thr
100 105 110

Asn Val Glu Ile Thr Tyr Pro Thr Ser Leu Asn Pro Arg Leu Val Arg
115 120 125

pctca2017050779-seql.txt

Arg Arg Leu Arg His Ile Ala Phe Arg Gly Ser Val Ile His Arg Arg
130 135 140

Tyr Phe Tyr Gly Ser Val Ser Leu Leu Pro Leu Thr Ala Ala Cys Ala
145 150 155 160

Ile Leu Pro Leu Pro Asn Ile Pro Phe Phe Trp Thr Leu Phe Arg Thr
165 170 175

Tyr Ser His Trp Arg Ala Leu Gln Gly Ser Glu Arg Leu Leu Val Leu
180 185 190

Val Ser Asp Gly Ser Thr Thr Val Lys Glu Gln Lys Arg Asp Ser Asp
195 200 205

Asp Glu Asp Glu Gln Glu His Lys Ser Leu Asn Ala Pro Ile Pro Gln
210 215 220

Trp Val Leu His Pro Ser Glu Asp Leu Asp Lys Tyr Leu Gln Asp Leu
225 230 235 240

Asp Glu Lys Asp Gly Leu Ser Lys Ser Val Val Ser Lys Ile Cys Lys
245 250 255

Ala Tyr His Leu Asp Thr Gln Glu Val Asp Lys Tyr Arg Cys Ser Met
260 265 270

<210> 106
<211> 457
<212> PRT
<213> Papaver somniferum
<400> 106

Met Leu Lys Leu Gly Phe Thr Leu Thr Ser Phe Thr Tyr Ser Arg Phe
1 5 10 15

Ile Ser Phe Leu Cys Lys Val Lys Asn Phe Ser Phe Ile Glu Arg Leu
20 25 30

Leu Glu Asp Met Asp Arg Tyr Gly Ala Ile Pro Asp Met Trp Ser Tyr
35 40 45

Asn Ile Tyr Val Asn Leu Leu Cys Lys Glu Asn Glu Leu Asp Lys Ala
50 55 60

Leu Glu Val Met Gln Thr Met Leu Gln Lys Gly Ser Asp Pro Asp Val
65 70 75 80

pctca2017050779-seql.txt

Val Thr Tyr Thr Thr Val Leu Lys Gly Leu Cys Ser Asp Gly Arg Tyr
85 90 95

Glu Leu Ala Val Lys Leu Trp Arg Glu Met Ile Gly Arg Gly Leu Leu
100 105 110

Pro Asp Gly Ile Thr Cys Gly Val Leu Val Phe Gly Leu Cys Lys Arg
115 120 125

Gly Glu Val Asp Leu Ala Tyr Asp Leu Thr Val Asp Ser Met Lys Gly
130 135 140

Lys Thr Pro Leu Ser Val Ser Val Tyr Asn Ala Leu Ile His Gly Tyr
145 150 155 160

Cys Gln Lys Gly Glu Val Lys Lys Ala Gln Ala Ile Glu Glu Phe Met
165 170 175

Arg Lys Asn Gly Cys Ala Pro Asp Met Val Thr Tyr Asn Ile Glu Leu
180 185 190

Asn Tyr Cys Cys Asn Asn Gly Met Leu Glu Glu Ala Ala Lys Leu Leu
195 200 205

Lys Lys Met Glu Arg Ser Gln Thr Lys Pro Asp Thr Tyr Ser Tyr Asn
210 215 220

Gln Phe Leu Lys Ala Leu Cys Lys Ala Asn Arg Met Asp Ser Ala Tyr
225 230 235 240

Asn Leu Leu Val Lys Thr Met Glu Lys Arg Gly Leu Cys Asp Thr Val
245 250 255

Ser Tyr Asn Thr Met Ile Arg Ala Tyr Cys Trp Ala Arg Glu Thr Gln
260 265 270

Lys Ala Tyr Arg Met Phe Glu Glu Met Ser Gly Lys Gly Phe Glu Pro
275 280 285

Asp Val Val Thr Phe Thr Ile Leu Ile Asn Ala Phe Phe Lys Lys Gly
290 295 300

Arg Ala Asp Leu Ala Glu Asp Leu Leu Asp Arg Met Ser Gln Lys Gly
305 310 315 320

Leu Phe Pro Asp Arg Val Leu Tyr Thr Thr Met Ile Asp His Leu Cys

325

330

335

Lys Ser Gly Arg Val Asp Gln Ala Gln Asn Phe Phe Arg Asp Met Glu
 340 345 350

Arg Leu Arg Ile Thr Pro Asp Val Ile Cys Tyr Asn Ala Leu Ile Asn
 355 360 365

Gly Leu Phe Lys Ala Phe Arg Val Ala Glu Gly Met Gln Phe Tyr Glu
 370 375 380

Asp Met Gln Arg Asn Gly Cys His Pro Asp Glu Val Thr Tyr Lys Leu
 385 390 395 400

Ile Ile Gly Gly Leu Ile Arg Glu Lys Lys Leu Thr Ile Ala Cys Lys
 405 410 415

Val Trp Asp Gln Met Met Glu Asn Gly Phe Thr Leu Asp Ala Ala Leu
 420 425 430

Ser Lys Thr Leu Thr Asn Ala Ile Gln Ser Lys Asp Ala Ser Val Met
 435 440 445

Asn Met Ser Thr Gly Thr Asn Leu Leu
 450 455

<210> 107

<211> 102

<212> PRT

<213> Papaver somniferum

<400> 107

Met Lys Trp Val Ala Ser Lys Arg Leu Asp Leu Cys Asn Ile Met Val
 1 5 10 15

Val Arg Phe Ser Lys Leu Ser Ser Leu Tyr Cys Phe Phe Ser Ser Asn
 20 25 30

Thr Cys Thr Phe Lys Pro Lys Leu Arg Phe Phe Thr Ser Arg Lys Asn
 35 40 45

Ser Asn Asn Arg Asn Met Lys Ser Ser Asn Phe Ser Ser Val Cys Ser
 50 55 60

Gln Asn Gly Val Ser Lys Lys Thr Gln Val Ala Asn Gln Leu Glu Thr
 65 70 75 80

Arg Lys Arg Ser Ser Gly Ser Phe Glu Cys Ala Leu Arg Met Arg Lys

85

90

95

Leu Leu Asn Gln Tyr Glu
100

<210> 108

<211> 581

<212> PRT

<213> Papaver somniferum

<400> 108

Met Pro Leu Leu Asp Ile Ala Thr Ser Gln Pro Thr Phe Gly Asn His
1 5 10 15

Phe Cys Thr Ser Ser Arg Tyr Gln Thr Leu Leu His Gly Asn Thr Thr
20 25 30

Ser Val Lys Leu Val Asn Phe Gly Lys Glu Lys Arg Leu Phe Ser Thr
35 40 45

Trp Glu Val Ser Ile Gln Leu Pro Thr Lys Val Arg Phe Asp Met Gly
50 55 60

Gly Asn Arg Arg Gly Arg Ala Leu Leu Ile Lys Ala Val Ala Thr Leu
65 70 75 80

Glu Pro Lys Tyr Leu Val Gln Ser Glu Asp Arg Ser Ala Asn Leu Glu
85 90 95

Leu Gly Ser Glu Ala Ala Ser Ser Gln Tyr Pro Gly Glu Glu Asp Glu
100 105 110

Ala Glu Val Asp Glu Arg Glu Arg Leu Arg Arg Leu Arg Ile Ser Lys
115 120 125

Ala Asn Lys Gly Asn Val Pro Trp Asn Lys Gly Arg Lys His Ser Ala
130 135 140

Glu Thr Leu Arg Arg Ile Arg Glu Arg Thr Lys Ile Ala Met Gln Asn
145 150 155 160

Pro Lys Val Lys Met Lys Leu Val Asn Leu Gly His Ala Gln Ser Glu
165 170 175

Glu Thr Arg Asn Lys Ile Gly Val Gly Val Arg Met Gly Trp Gln Arg
180 185 190

Arg Arg Glu Lys Leu Met Val Gln Glu Thr Cys Cys Phe Glu Trp Gln

195

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Asn Leu Ile Ala Asp Ala Ser Arg Arg Gly Tyr Ala Gly Glu Ala Glu
 210          215          220

Leu Gln Trp Glu Ser Tyr Glu Val Leu Asp Glu Gln Leu Lys Arg Glu
 225          230          235          240

Trp Leu Glu Ser Ile Glu Gln Arg Arg Met Ala Pro Arg Pro Lys Gly
          245          250          255

Ser Lys Arg Ala Pro Lys Ser Leu Glu Gln Arg Arg Lys Ile Ser Glu
          260          265          270

Ala Ile Ser Ala Lys Trp Ala Asp Pro Ser Tyr Arg Glu Arg Val Cys
          275          280          285

Asp Ala Leu Asn Lys Tyr His Gly Ile Pro Glu Gly Arg Glu Arg Lys
 290          295          300

Pro Arg Arg Lys Pro Ser Gly Asp Arg Asn Ala Ala Arg Lys Lys Ala
 305          310          315          320

Tyr Ser Glu Ala Glu Thr Asp Ala Lys Arg Arg Ala Lys Pro Lys Ile
          325          330          335

Arg Lys Ser Arg Ala Ala Pro Tyr Lys Asp Pro Leu Ala Asp Ser Lys
          340          345          350

Leu Glu Met Ile Arg Asn Ile Arg Ala Gln Arg Ala Val Thr Glu Thr
 355          360          365

Lys Lys Thr Glu Ala Val Glu Arg Ala Lys Leu Leu Ile Ala Glu Ala
 370          375          380

Glu Lys Ala Ala Lys Ala Leu Glu Val Ala Ala Thr Lys Ser Pro Leu
 385          390          395          400

Ala Leu Ala Ser Leu Met Glu Thr Arg Lys Leu Ile Ala Glu Ala Thr
          405          410          415

Arg Ser Ile Gln Ala Ala Glu Ser Gly Gln Ile Ser Tyr Leu Gly Asn
          420          425          430

Lys Lys Asp Ser Ser Pro Phe Asp Leu Asn Glu Asp Leu Leu Glu Asp
 435          440          445

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pctca2017050779-seql.txt

Glu Thr Gly Glu Lys Asp Glu Asn Met Pro Ser Pro Asp Gln Lys Glu
450 455 460

Val Asn Gly Thr His Val Tyr Ser Asp Ala Ile Ser Asp Phe Glu Phe
465 470 475 480

Gly Asn Phe Asp Leu Glu Gly Leu Leu Asp Asp Asp Glu Leu Leu Glu
485 490 495

Met Glu Gly Leu Asp Asp Asp Asp Asp Asp Phe Val Pro Ala Gln
500 505 510

Val Glu Val Asn Gly Tyr Ser His Lys Leu Asp Pro Lys Ser Glu Leu
515 520 525

Ala Val Pro Val Glu Glu Met Gln Glu Ala Ile Lys Ser Gln Ser Thr
530 535 540

Ala Gln Glu Val Pro Val Ser Asn Lys Ala Glu Lys Thr Ser Val Arg
545 550 555 560

Ser Asn Asn Thr Thr Val Lys Lys Lys Trp Ile Arg Gly Arg Leu Val
565 570 575

Glu Val Glu Glu Asp
580

<210> 109
<211> 357
<212> PRT
<213> Papaver somniferum

<400> 109

Met Gly Ser Leu Asp Ala Lys Pro Ala Ala Ala Thr Gln Glu Val Ser
1 5 10 15

Ile Lys Asp Gln Ala Gln Leu Trp Asn Ile Ile Tyr Gly Phe Ala Asp
20 25 30

Ser Leu Val Leu Arg Cys Ala Val Glu Ile Gly Ile Ala Asp Ile Ile
35 40 45

Lys Asn Asn Asp Gly Ala Ile Thr Leu Ala Gln Leu Ala Ala Lys Leu
50 55 60

Pro Ile Thr Asn Val Ser Ser Asp Tyr Leu Tyr Arg Met Val Arg Tyr
65 70 75 80

pctca2017050779-seql.txt

Leu Val His Leu Asn Ile Ile Glu Gln Glu Thr Cys Asn Gly Gly Val
 85 90 95
 Glu Lys Val Tyr Ser Leu Lys Pro Val Gly Thr Leu Leu Leu Arg Asp
 100 105 110
 Ala Glu Arg Ser Met Val Pro Met Ile Leu Gly Met Thr Gln Lys Asp
 115 120 125
 Phe Met Val Ser Trp His Phe Met Lys Glu Gly Leu Gly Asn Gly Ser
 130 135 140
 Thr Thr Ala Phe Glu Lys Gly Met Gly Met Asp Ile Trp Lys Tyr Leu
 145 150 155 160
 Glu Gly Asn Pro Asp Gln Ser Gln Leu Phe Asn Glu Gly Met Ala Gly
 165 170 175
 Glu Thr Arg Leu Leu Thr Lys Thr Leu Ile Glu Asp Cys Arg Asp Thr
 180 185 190
 Phe Gln Gly Leu Asp Ser Leu Val Asp Ile Gly Gly Gly Asn Gly Thr
 195 200 205
 Thr Ile Lys Ala Ile Tyr Glu Ala Phe Pro His Ile Lys Cys Thr Leu
 210 215 220
 Tyr Asp Leu Pro His Val Val Ala Asn Ser His Asp Leu Pro Asn Ile
 225 230 235 240
 Glu Lys Val Pro Gly Asp Met Phe Lys Ser Val Pro Ser Ala Gln Ala
 245 250 255
 Ile Leu Leu Lys Leu Ile Leu His Asp Trp Thr Asp Glu Glu Cys Val
 260 265 270
 Asn Ile Leu Lys Lys Cys Lys Glu Ala Ile Pro Lys Glu Thr Gly Lys
 275 280 285
 Val Ile Ile Val Asp Val Ala Leu Glu Glu Glu Ser Asn His Glu Leu
 290 295 300
 Thr Lys Thr Arg Leu Ile Leu Asp Ile Asp Met Leu Val Asn Thr Gly
 305 310 315 320
 Gly Arg Glu Arg Thr Ala Asp Asp Trp Glu Asn Leu Leu Lys Arg Ala
 325 330 335

pctca2017050779-seql.txt

Gly Phe Arg Ser His Arg Ile Arg Pro Ile Arg Ala Ile Gln Ser Val
 340 345 350

Ile Glu Ala Phe Pro
 355

<210> 110
 <211> 302
 <212> PRT
 <213> Papaver somniferum

<400> 110

Met Gly Thr Leu Asp Ala Lys Pro Ala Ala Glu Thr Gln Glu Val Ser
 1 5 10 15

Ile Lys Asp Gln Ala Gln Leu Trp Asn Ile Ile Tyr Gly Phe Ala Asp
 20 25 30

Ser Leu Val Leu Arg Cys Ala Val Glu Ile Gly Ile Ala Asp Ile Ile
 35 40 45

Lys Asn Asn Asp Gly Ala Ile Thr Leu Ala Gln Leu Ala Ser Lys Leu
 50 55 60

Pro Ile Thr Asn Val Ser Ser Asp Tyr Leu Tyr Arg Ile Val Arg Tyr
 65 70 75 80

Leu Val His Leu Asn Ile Leu Glu Gln Glu Thr Cys Asn Gly Gly Val
 85 90 95

Glu Lys Val Tyr Ser Leu Lys Pro Val Gly Thr Leu Leu Leu Arg Asp
 100 105 110

Ala Glu Arg Ser Met Val Pro Met Ile Leu Gly Met Thr Gln Lys Asp
 115 120 125

Phe Met Val Ser Trp His Phe Met Lys Glu Gly Leu Gly Asn Gly Ser
 130 135 140

Thr Thr Ala Phe Glu Lys Gly Met Gly Met Asp Ile Trp Lys Tyr Leu
 145 150 155 160

Glu Gly Asn Pro Asp Gln Ser Gln Leu Phe Asn Glu Gly Met Ala Gly
 165 170 175

Glu Thr Arg Leu Leu Thr Lys Thr Leu Ile Glu Asp Cys Arg Asp Thr
 180 185 190

pctca2017050779-seql.txt

Phe Gln Gly Leu Asp Ser Leu Val Asp Ile Gly Gly Gly Asn Gly Thr
195 200 205

Thr Ile Lys Ala Ile Tyr Glu Ala Phe Pro His Ile Lys Cys Thr Leu
210 215 220

Tyr Asp Leu Pro His Val Val Ala Asn Ser His Asp Leu Pro Asn Ile
225 230 235 240

Glu Lys Val Pro Gly Asp Met Phe Lys Ser Val Pro Ser Ala Gln Ala
245 250 255

Ile Leu Leu Lys Leu Ile Leu His Asp Trp Thr Asn Glu Glu Cys Val
260 265 270

Asn Ile Leu Lys Lys Cys Lys Glu Ala Ile Pro Lys Glu Thr Gly Lys
275 280 285

Val Ile Ile Val Asp Val Ala Leu Glu Glu Glu Ser Asn His
290 295 300

<210> 111
<211> 491
<212> PRT
<213> Papaver somniferum

<400> 111

Met Arg Glu Asn Met Glu Ile Val Thr Val Ser Leu Val Ala Val Val
1 5 10 15

Ile Thr Thr Phe Leu Tyr Leu Ile Phe Arg Asp Ser Ser Pro Lys Gly
20 25 30

Leu Pro Pro Gly Pro Lys Pro Trp Pro Ile Val Gly Asn Leu Leu Gln
35 40 45

Leu Gly Glu Lys Pro His Ser Gln Phe Ala Gln Leu Ala Glu Thr Tyr
50 55 60

Gly Asp Leu Phe Ser Leu Lys Leu Gly Ser Glu Thr Val Val Val Ala
65 70 75 80

Ser Thr Pro Leu Ala Ala Ser Glu Ile Leu Lys Thr His Asp Arg Val
85 90 95

Leu Ser Gly Arg Tyr Val Phe Gln Ser Phe Arg Val Lys Glu His Val
100 105 110

pctca2017050779-seql.txt

Glu Asn Ser Ile Val Trp Ser Glu Cys Asn Glu Thr Trp Lys Lys Leu
 115 120 125
 Arg Lys Val Cys Arg Thr Glu Leu Phe Thr Gln Lys Met Ile Glu Ser
 130 135 140
 Gln Ala Glu Val Arg Glu Ser Lys Ala Met Glu Met Val Glu Tyr Leu
 145 150 155 160
 Lys Lys Asn Val Gly Asn Glu Val Lys Ile Ala Glu Val Val Phe Gly
 165 170 175
 Thr Leu Val Asn Ile Phe Gly Asn Leu Ile Phe Ser Gln Asn Ile Phe
 180 185 190
 Lys Leu Gly Asp Glu Ser Ser Gly Ser Val Glu Met Lys Glu His Leu
 195 200 205
 Trp Arg Met Leu Glu Leu Gly Asn Ser Thr Asn Pro Ala Asp Tyr Phe
 210 215 220
 Pro Phe Leu Gly Lys Phe Asp Leu Phe Gly Gln Arg Lys Asp Val Ala
 225 230 235 240
 Asp Cys Leu Gln Gly Ile Tyr Ser Val Trp Gly Ala Met Leu Lys Glu
 245 250 255
 Arg Lys Ile Ala Lys Gln His Asn Asn Ser Lys Lys Asn Asp Phe Val
 260 265 270
 Glu Ile Leu Leu Asp Ser Gly Leu Asp Asp Gln Gln Ile Asn Ala Leu
 275 280 285
 Leu Met Glu Ile Phe Gly Ala Gly Thr Glu Thr Ser Ala Ser Thr Ile
 290 295 300
 Glu Trp Ala Leu Ser Glu Leu Thr Lys Asn Pro Gln Val Thr Ala Asn
 305 310 315 320
 Met Arg Leu Glu Leu Leu Ser Val Val Gly Lys Arg Pro Val Lys Glu
 325 330 335
 Ser Asp Ile Pro Asn Met Pro Tyr Leu Gln Ala Phe Val Lys Glu Thr
 340 345 350
 Leu Arg Leu His Pro Ala Thr Pro Leu Leu Leu Pro Arg Arg Ala Leu
 355 360 365

pctca2017050779-seql.txt

Glu Thr Cys Lys Val Leu Asn Tyr Thr Ile Pro Lys Glu Cys Gln Ile
370 375 380

Met Val Asn Ala Trp Gly Ile Gly Arg Asp Pro Lys Arg Trp Thr Asp
385 390 395 400

Pro Leu Lys Phe Ser Pro Glu Arg Phe Leu Asn Ser Ser Ile Asp Phe
405 410 415

Lys Gly Asn Asp Phe Glu Leu Ile Pro Phe Gly Ala Gly Arg Arg Ile
420 425 430

Cys Pro Gly Val Pro Leu Ala Thr Gln Phe Ile Ser Leu Ile Val Pro
435 440 445

Thr Leu Val Gln Asn Phe Asp Trp Gly Leu Pro Lys Gly Met Asp Pro
450 455 460

Ser Gln Leu Ile Met Glu Glu Lys Phe Gly Leu Thr Leu Gln Lys Glu
465 470 475 480

Pro Pro Leu Tyr Ile Val Pro Lys Thr Arg Asp
485 490

<210> 112
<211> 629
<212> PRT
<213> Papaver somniferum

<400> 112

Met Ile Leu Phe Val Asp Phe Val Ile Leu Leu Leu Leu Phe Phe
1 5 10 15

Leu Met Glu Glu Glu Glu Gln Pro Ile Glu Ile Arg Ala Leu Lys Ser
20 25 30

Leu Gly Leu Gly Phe Asp Leu Thr Ser Asp Phe Arg Leu Lys Phe Ala
35 40 45

Lys Lys Gly Asn Lys Gly Glu Asp Asp Gly Ile Gly Arg Leu Ile Val
50 55 60

Leu Asp Glu Glu Asp Gln Arg Asp Val Val Leu Pro Gly Gly Lys Ile
65 70 75 80

Ile Ser Gly Val Ser Arg Asp Ile Lys Cys Asp Lys Gly Asp Arg Ile
85 90 95

pctca2017050779-seql.txt

Arg Phe Lys Ser Asp Val Val Glu Phe Asn Gln Met Ser Glu Leu Leu
100 105 110

Asn Gln Lys Ser Thr Val Gln Gly Lys Ile Pro Ser Gly Tyr Phe Asn
115 120 125

Ser Ile Phe Asp Phe Ser Gly Leu Trp Met Ala Asp Ala Thr Asp Thr
130 135 140

Lys Tyr Leu Ala Phe Asp Gly Tyr Phe Ile Ser Leu Tyr Tyr Leu His
145 150 155 160

Leu Thr Thr Ser Pro Leu Val Leu Gln Gly Arg Ile Lys Lys Ala Val
165 170 175

Pro Ser Asn Trp Asp Pro Ala Ser Leu Ser Arg Phe Ile Arg Thr Phe
180 185 190

Gly Thr His Ile Ile Val Gly Leu Ala Ile Gly Gly Gln Asp Val Val
195 200 205

Cys Val Arg Gln Lys His Ser Ser Ser Ile Pro Pro Ala Asp Leu Lys
210 215 220

Gln Tyr Leu Glu Asp Leu Gly Asp Ser Trp Phe Ser Asp Gly Gly Ser
225 230 235 240

Thr Ser Pro Phe Arg Arg Thr Gly Asp Ala Lys Arg Lys Val Pro Glu
245 250 255

Val Phe Gln Arg Val Leu Gln Ser Asn Arg Met Gln Leu Asn Arg Ile
260 265 270

Thr Glu Thr Ser Ser Lys Asp Gly Leu Thr Val Val Cys Ser Lys Arg
275 280 285

Gly Gly Asp Ala Tyr Leu His Thr His His Lys Trp Leu Gln Thr Val
290 295 300

Ala Ser Asn Pro Asp Ala Ile Leu Phe Lys Phe Val Pro Ile Thr Ser
305 310 315 320

Leu Leu Ser Gly Ile Pro Gly Ser Gly Tyr Leu Ser His Ala Ile Asn
325 330 335

Leu Tyr Leu Arg Tyr Lys Pro Asp Pro Lys Asp Leu Gln Tyr Phe Leu

340

Glu Phe Gln Val Pro Arg Gln Trp Ala Pro Met Phe Asn Glu Leu Pro
355 360 365

Leu Gly His Gln Arg Arg Ala Ser Cys Pro Ser Leu Gln Phe Ser Phe
370 375 380

Met Gly Ser Lys Leu His Val Asn Ser Thr Gln Val Ser Ser Gly Arg
385 390 395 400

Thr Pro Ala Val Gly Leu Arg Leu Tyr Leu Glu Gly Lys Ala Cys Asn
405 410 415

Arg Leu Ala Ile His Val Gln His Leu Ser Asn Leu Pro Arg Leu Leu
420 425 430

Glu Ser Ser Trp Ala Gly Pro Thr Thr Leu Lys Gln Cys Gln Trp Arg
435 440 445

Gly Ser Asp Glu Ser Ser Val Pro Tyr Leu Glu Pro Ile Lys Trp Lys
450 455 460

Arg Tyr Ser Asn Ile Cys Thr Ser Val Val Lys His Asp Pro Gly Trp
465 470 475 480

Leu His Gly Glu Ser Pro Gly Val Phe Ile Val Thr Gly Ala Gln Leu
485 490 495

Met Thr Lys Gly Lys Trp Pro Lys His Ile Leu His Leu Arg Leu Leu
500 505 510

Tyr Thr His Ile Pro Gly Phe Ser Ile Gln Lys Thr Glu Trp Ala Val
515 520 525

Ala Pro Ala Ser Ser Gln Lys Ser Ser Phe Leu Thr Asn Phe Ser Thr
530 535 540

Thr Phe Thr Thr Ser Gly Pro Ser Lys Ala Ala Pro Val Val Ala Ile
545 550 555 560

Asn Ser Gly Val Tyr Ser Asp Gly Pro Pro Arg Pro Val His Ser Gln
565 570 575

Lys Leu Leu Lys Tyr Val Glu Thr Ser Glu Ile Val Arg Gly Pro His
580 585 590

Asp Ile Pro Gly His Trp Met Val Ile Ala Ala Lys Leu Val Thr Glu
 595 600 605

Gly Gly Lys Ile Gly Leu Leu Val Lys Phe Ala Leu Leu Asp Tyr Ser
 610 615 620

Ser Pro Thr Ser Glu
 625

<210> 113
 <211> 1200
 <212> DNA
 <213> Papaver somniferum

<400> 113
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 ttagttgata gatcaacgct tattagagaa ggtagacatc gttgtccgag tattgccagt 120
 tggattgagt tttgttattc tagtccggct agactctatt ataacgatgt tgttctttca 180
 tctgccaag gagttcaaca gggtgaccca ctgggtccgc tgttatttgc cctagccttg 240
 cacccaattg cagagaatat taccacacag tgctcattag atctccatgc ttggtactta 300
 gacgatggta ctatcgtagg cgacactatg gaggtatcta aggctcttaa aatcattcag 360
 acaaatggtc ctgctcgagg tttacatgtg aacgttacca agactgaagt tttttggccc 420
 tcattggatc tcagaagaga ccttgaagat gtattccctg tcaatatagg taaatcctca 480
 cgtgggtgta agctattagg gggacctgtc agtcttgata tgcagtattg tagtgaggtt 540
 gttcagggaa gagttgataa aactttgcac ctttgggaga aagttcagaa gctgtatgac 600
 cctcaaagtg agttgttact cttgcgcagt tgcagtgggtg tttccaagct ttactttacg 660
 cttcaaacca ccgccccctt ggatatacag tcttctgcta ttcactatga ttcacaactc 720
 atgttatact tgcgtcaact tgtagtgggg gatagtgtg gttttggctt gcttcaacga 780
 cgtctagcca cactgccaat aaaagatgga ggttttggaa tatatacttt gaatgacaca 840
 tgctcagtact gtttcctagc ctcttggtgcc cagaaccagc atctacaaca atctatcttg 900
 aaacagtcac cagtcctaga ccctagcttc agatttaaac atgctttgca gtcttttacc 960
 caagtttgtg gtctatctgt ctccgggttc agcatcaatg acgctgcccc tcaatacatg 1020
 aagaccctgg cagtcactta ctttgggtgcc gttaaagaga ggataccaac caacttttct 1080
 cttacagacc gggatctgac cttatggcat tgcaaccgca ctcctcatgc aatggacttt 1140
 ctaaaaagcca ttcctataca tgggataaat caagctattg ctcctagaca gtttcgataa 1200

<210> 114
 <211> 1446
 <212> DNA
 <213> Papaver somniferum

pctca2017050779-seql.txt

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<400> 114
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cgggtcaagg actttgtatt tgatcatata cataagattg gtggaatata aaatattcat      120
tacaccacta gaagaaaaca gtgggtagat tatttggcca aaacgtttta ctgtttaaat      180
tcattttaa atcggttctct taaagctgaa ttcattgata agggtaatat tattagtacc      240
agtaatgtta aagttaatac agataatcga gaagttgggt catcagattg tgatgagaat      300
cgtgttaagc aaagtgagtt tttgggcgaa ttttggctct atagttagcc tcctgaaatt      360
tggcagccca acggtgaagg taatgtagtt cattgggtac cccctaattg gaaacatgga      420
gggtgtagtg gtggagggtg aggaccagat tgtggaggtc agatgggctc gaattcaaaa      480
aatgggtgtt ggggtggagc aaatatgggt aaggagatac cttcacctaa agagatttgt      540
aaaggctctg ataagtttgt gattgggcaa cagcatgcaa agaagggtgct ctctgtggca      600
gtatacaacc actacaaaag gatataattgt gaatcttccc aaacacgaat ctggagtgat      660
aggtctgcaa gagattcagg cgatgaagct gatgagacag attttgattc tgtggatctt      720
gaaaaaagca acgttctttt attgggtcca acaggctccg ggaagacatt acttgcaaaa      780
accttggcac gctttgtgaa tgttcccttt gtaattgctg atgcaactac ttttaactcag      840
gcaggatatg taggggaaga tgtggaatcc atattgcaca agcttttagt agttgctgac      900
tataatgttg cggccgcccc acagggcatt gtctacattg atgaagttga taagatcact      960
aaaaaggctg agagccttaa caatagcagg gatgtttctg ggggaagggt tcaacaggcg     1020
ctgctgaaaa tgctggaagg aacgatcatc aatgtacctg agaaaggagc tcgaaagcat     1080
cctcgagggtg ataatatcca gattgacacg aaagatatct ttttcatatg tgggggcgca     1140
tttactggcc tagagaagac aatttccgaa agacaacacg attcctctat tggatttggg     1200
gaaccagtac gtgctaacat gaggagtggg ggggtaatag atgctaccgt cacatcacat     1260
ttgcttgaaa cagttgaaa tagtgatctt gttgcatatg gtttgatacc ggagtttgtt     1320
ggacgggttc cagttcttgt tagtttgtcg gctctgaatg aggatcaact tattcaggtc     1380
ctcacagagc caaaaaaatg ccctaggaaa gcaatacaaa aagatgtttc aaatgaacaa     1440
tgtaa                                             1446

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<210> 115
<211> 1362
<212> DNA
<213> Papaver somniferum

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<400> 115
atgaatgcaa gcgagtgttc gttgtcaact agggttttgt atcctcaatg caacataaac      60
cggccaagaa caaatataag ttcaatttca tttccaaatc aatcaaaaaca gtttcatttc     120

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pctca2017050779-seq1.txt

attagaagaa aacatcctct tttgcttcgt tcattcgggtg ttattcgtaa tgcaagctca	180
gaaacacctt ctgaatctga tactactagt aaacctagtg gggacgattt tataactagg	240
gttttgaaaag aaaaccctag cttagtagaa cccaagtatt tagtagggaa taaactttat	300
actttgagag aaaaagaaat attgagtaat aaagttccta atgaaaggat tttggaaatt	360
gcaaaacagt tttgtgtgaa attaggattt aaaaaagatg aaatgggtga tgggaaccaa	420
caattttctg attctgtgta tttaaaagat ttattaaggg aatataaagg gaaactttat	480
gttcctgaag atgtttttca tgagaattta tctgaagaag aggagttcaa aagggattta	540
gagaatttgc cgcaaatgag ttttgaagaa tttcaaaagg tttttaagac tggtaaagt	600
aagctactga cttcaaaggc tgattcagga atttcgtata agtatgcata taaagatttt	660
attgtggact tgaaggaaat tccgggtgat aaaaatttgc agagaacaag atgggcaatg	720
aggttaaacg agaatgaagc gaaatctgtc tttgagcaat tcaaaggccc acaatatgaa	780
attgagcagc atttgacatc atacacagga aggtaccgg agtaccctca ccctgtagcc	840
tcttccatat ctagcagaat gatggtggag ctagggatgc taacagctgt catggctact	900
gcggcgacta ttgttggagg cttcctggca tcagctgtat ttgccgtcac gagttttcta	960
tttttcatgg ctgtatatgt tctctggccc ctagcaaaac caattctaaa actttccata	1020
ggcctcatat ctgccgttgg agaaagaatc tgggataatg ttattgatac tgttagtga	1080
ggagggattt tctcaaaaatt atctgaattc tatacttttg gcggcctgtc ttccagtcct	1140
gaaatgatga aaccaatctc attggtcttt ttgaccatgg ctcttcttat ccgctttact	1200
ctctcacgga gaccaaagaa cttcaaaaaa tgggatatat ggcaaggaat tgaatttgga	1260
caatccaaac cacaggctcg tgttgatggg tcaacaggag tcagttttaa tgatgtagcg	1320
gggatcgaag aagcagtaga ggaactccaa gaggtacact aa	1362

<210> 116
 <211> 1968
 <212> DNA
 <213> Papaver somniferum

<400> 116	
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aattcagtag aaccagaagt caatcctcga cttgtgaaag ctattaaatt tgtcgttcgt	120
tcttcagact ccgaaattaa actagcagtt gaaaccctaa tggaaaaatat gaaaaaaaaat	180
cactctcagg tgaggatattt agcgcttttc atagttgacg aattgttcat gcggtcgaag	240
ctgttcagat ctctctttgt tgtgaaattt gatctatttt tgagtttgag tattggcttc	300
agaagagatc tgccacttcc tgctcctgca cctattgcta cccgtttacg ctctaaagct	360
actgagttcc tggagaagtg gaacacttct tttgggcttc attacagaca aattcgattg	420

pctca2017050779-seql.txt

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gggttttgatt atttaaaaaa caccctgaac tttcagttcc ctaatcttca ggcaaatgca      480
gctcggatac agcaagagag aagggaaaga gagatcagat caaaagagat tttgttgaag      540
aagtttgaaa ctttaagtca aaatctctca tcgattaagg atgagattca aataactgtt      600
gaagagataa ggcagtgttt agacattctt cgtacgaatg aagctgatga catcatgctg      660
gatacccccg aagaggatga ggttgaggat ttcagggtgct cctccttaat ggagattcgc      720
ctcgagtcct tgagagaaaag tgaaaagcta cgtgagacca gcgagaataa ggtgatattt      780
gatgcattaa gggaattgta caagctccta ataacaaaac acttggtttc ggtgcaagag      840
tggatatctg ttcttattag agttgaacca gaagacacca gtttcagaga ttccatgtta      900
agagaattca tagatttaca aaatcatctc aagtcggtga gaaagacatg cgaaaattct      960
ggttgtgctc ttacggattc aaaaaacgac aaggaagagg atttctggga ggagggtaag     1020
gtagaagtat gcggttatgg aagtagcagc acgcctgcaa aggcaaaca agatgctgcc     1080
tgcattgctg ctgtcattac aaagtcaaat ataacccta gacagattac tgattctaatt     1140
gccagcaaga ggtagatgg agaaggtgaa gactctgagt caaaccctt aaggagaaaag     1200
cttctgtctg aagctccagt ggtaaattgg ggatcttcct tgtctaactg gggatcaaac     1260
tgggatgttt tggctaacca aagaggatta gagcttgagg gtcattgggg tagggtagat     1320
tatgatgcgg ttattccagc ggaaaaaatt gcggagttga atgttcaagc aagtgtatac     1380
aaggaagagc atgttgatat ccaaccgtgc cttgctcctc tgagaaaagg aggagtctgt     1440
caaagaagag atttaaagat atgccattt catggaccg ttatacctag agatgctgaa     1500
ggaaacccaa taaatcaagt ttcattggca gaaaaggaaa ttacaaaaat ggaaactgaa     1560
gaggttattg ctcgacaatt agcagaacag gcagtgaaga atgttaggga aagagagaaa     1620
gatgaagtaa agaagagagt gactgatagg aagttgttga gccgtgcgaa acttgccaag     1680
gtgcgtgaac acaatgaagt tgttctacgt gatgctgcag ttgcgtcaac ctcacgctct     1740
gcatttgttg gacaagatgg ggaaacacaa catcagacta caagatcttc tataaagggt     1800
aaaaaaccgt cactagcgtc tatgctgcgt aagaaagtaa cctcaaaaga tagattgtca     1860
cagagacttt taaatacacg tgctacagat gctacagtaa ggcagttaac cgttggtgaa     1920
gattccaagt acagagaggc ctatccaaat caatggaaga gaacatga      1968

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<210> 117

<211> 507

<212> DNA

<213> Papaver somniferum

<400> 117

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atggatcaga tgggctatat tgatcaagga ttcagaggag acccgttcac ctggacaaaa      60
aaccaacaag gtcatgacaa catccaacaa agacttgata gagcagtaac aaatcaacat     120

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pctca2017050779-seql.txt

tggagaacaa ccaacccccca tgctggaatc acacacctgc cacgaatagc ctcagatcat	180
gctcctatcc tgcttcaaac gaaagccttg gactggcaag gaagtaagaa ttataaattt	240
gagcatctat ggctatctca ccttcaactt catcaagtgg ttacctcggc atgggataaa	300
ctacatgact cagatccacc tttgaacctc cagctcaaac tcatctcagc cagtgaaaact	360
ctaacagaat ggaataagat taactttggc catctaccca ctttaatcaa aaagtcaacc	420
gcaaaaatta aagcttccca acatcaatgt gctacgcaaa ctggagctgc gctggaaaac	480
tggattcaac aagaaaagca actctga	507

<210> 118
 <211> 1563
 <212> DNA
 <213> Papaver somniferum

<400> 118

atggcttttct cgtataacttg tttaggaggt gcaacactca gaaccctaaa attttcgtca	60
tgttcttcaa ttttaagacc ttctttacct cttttatctc caccagccaa aaccctaact	120
ttacattctc ttcatcactt gacaaaaact cataaattcc ctcttttct tacgagagca	180
gtttcagttc cagcgggtca aactctagac aaggaagaaa ctgccaaacc ttatcaatgg	240
aaagctacaa ttgatttcaa atggattcgt gataataaag atgcagttgc ttccaatatt	300
aagactcgaa attcggttgc tgatttggac cttgttcttg atttgtacga gagatcactc	360
aatcttcaaa aggaagttca acggctccga ggggaaagaa atgttggtgc taataaaatg	420
aaagggaaat tagaaccgtc ggaacgccag gaactcatag aagaaggaaa aattctgaag	480
gaaggacttt tgacattgga agaaaatctt cttaaaactta cagagaagct tcagaaggaa	540
gcacaatgta taccaaatat ggcacatcca gatgttccta taggaggaga agattgttgt	600
ggactacgaa aaacggttgg tagtccacgc cagtttgatt ttcctgttaa ggatcatgta	660
caacttggga aagagctaga tttgtttgat tttgacgcag cctctgaggt cagcgggtca	720
aaattttact atctaaagaa tgaagcagta atgctggaga tgggcctgac aaactgggca	780
attgctgaaa ccatgaaaag gggttttaca cctctaacta ccccagagat tgtacgctcg	840
tctcttgtcg aaaaatgtgg ctttcaacct cgtggatcaa atacacaggt ttattctatc	900
gaggacagtg atcaatgcct tatcggaact gcagagattc cagttggggg tattcatatg	960
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cgtactgagg ctggtgcagc tggttctgcc acaaggggtc tttatcgggt gcatcaattc	1080
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taa	843

<210> 120
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 <212> DNA
 <213> Papaver somniferum

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<210> 122

<211> 972

<212> DNA

<213> Papaver somniferum

<400> 122

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acaacatcca tccctatata atcgtcttcc cttcatctt cttctatgat acgatttcaa	180
aaaccacttt ctcaattacg tcgctctatt aaattccatt atcctcttat ttctcctaaa	240
catcttacta aatcccctacc ttgtcctctc tggctcttct ctttctcttt ctgtcttcaa	300
caactccaca catcatcacc atcttcctta tctcgttcat ctttttccgc tgctgctcct	360
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gtgcaacagg agttagaaaa gttatcccag aagtttgagg aaaacgtttt ggatgccaca 960
aaaaaagttt ga 972

<210> 123
<211> 579
<212> DNA
<213> Papaver somniferum

<400> 123
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<210> 124
<211> 531
<212> DNA
<213> Papaver somniferum

<400> 124
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<210> 125
<211> 1422

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<212> DNA

<213> Papaver somniferum

<400> 125

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<210> 126

<211> 525

<212> DNA

<213> Papaver somniferum

<400> 126

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<210> 127
 <211> 654
 <212> DNA
 <213> Papaver somniferum

<400> 127	
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<210> 128
 <211> 312
 <212> DNA
 <213> Papaver somniferum

<400> 128	
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<210> 129

<211> 732

<212> DNA

<213> Papaver somniferum

<400> 129

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gtcaaactctg cacacgggtgt ctctgtttgg aaaacaatag caactacagc ctatttgggtg    180
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cgtaatctct cgggttcaga agctaactct tttgcagaat tgttgatgat gattggaaac      420
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<210> 130

<211> 2723

<212> DNA

<213> Papaver somniferum

<400> 130

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gatgaccgat atatgattgg aaataacaaa cctgattata gctatgacct tgagggtgtct    600
aagatgagac gtgatcctaa ttactgcggt attcagatat ctaccgatgc acaacgaata    660
ggatctcaag tgcggacccc ataccatgta gagcagcggc agagaaggaa ttctactact    720

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pctca2017050779-seq1.txt

caaaatgata atcaggggat tgcacctgtt ggagcacaga tgagcactcc atacgatttc	780
cagttgctct ttccaaagaa gccagttggt gaaaaaccag ctaaacaatgt aaatggaagt	840
gatcagcgaa agaggaatgt tgagaaagaa gataaagggtg tttgtggcga aacagtaatt	900
gagaaatcaa aaggagtata tgtaggtgta caagatgata taatgagtga ctcgggcagt	960
ggtggtgaag atgatgggct tggtgatatt tggacggaga tgaatctcgc attagaatgt	1020
tccaaggatg cttcttcggc tctgggtact gctatggaac acattgcaga agaggaggag	1080
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tgtgggggtga ttgaaaaaag cattgaacag atatttgact tccagtgggg aaaggaacc	1200
aagactacca gaactagtta catgtctcaa tatcgtacaa cgaaggactg cgaacgagtt	1260
gaaggatctc agtttactat tgctaattgca tcggatcaag attttgggtg cgctgagata	1320
tcagtgcacg cgaggcacat gaagcaaagt aagcctcacc aaattgaagg tttcaatttc	1380
ttgcttagga acttagtggt cgacagtcca ggtggttgca ttttggcaca tgccccaggg	1440
tctggaaaga cctttatgat cataagtttt atgcaaagct tcctggcaaa atatccgaat	1500
gccagaccac ttgtagtggt gcctaaagga atcctgggta cttggaagag ggagtttgaa	1560
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gttcaccctc agttgaaaga acacgcagag agttccgcca caggagagaa aggacacatt	2340
cacgaggcca agattgatga gcttcttaac aaagtagaac tcaatgatgg tgtgaaaaca	2400
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agtcaatatc tcctcccact gaagttttta gagaggctag tggtgaaaac tagaggctgg	2520
agcctgggga aggaaatatt tgtcatatcg ggggactcaa gccaggacca gagggaaata	2580
tcaatggaac gttttaataa ttccaaggat gcaaaaagtct tctttggttc gataaaggca	2640

pctca2017050779-seql.txt

tgtggggaag gaatatctct agtgggggca tctcgcttac tgattttaga tattcatctc	2700
aatccctcgg ttacccgaca ggc	2723

<210> 131
 <211> 434
 <212> DNA
 <213> Papaver somniferum

<400> 131	
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gctagtgcct cactcacaca atcatctctt gtggatcaat tagaagctcg aatcgagct	120
ttagaaatgc aatcacatga ggaatctgtc acatctaatt ttcttaggca acctgaaatc	180
tatgcatgtc ccgcatgtgg tagtttagac caccctgttg agcattgtca tattttgcat	240
aatttttaggc aatctagaga aaatccaagg tatgaaatgc ccataaattg tgagaatggt	300
agtcattggg accataatca atcctttgag ggttgcgac aatcttttat aaacccta	360
gaccatgcac acatgtacca ttcaccacaa tttgaacatg aagaattttg tactcccagg	420
aatttagact ccac	434

<210> 132
 <211> 549
 <212> DNA
 <213> Papaver somniferum

<400> 132	
atgaacccta atgactattc acacatgcat catttgccac aacgtgaaaa tgaacatttt	60
gctaatagcct cactcacaca atcatctctt gtggatcaat tagaagctcg aatcgagct	120
ttagaaatgc aatcacatga ggaatctgtc acatctaatt ttcttaggca acctgaaatc	180
tatgcatgtc ccgcatgtgg tagtttagac caccctgttg agaattgtca tattttgcat	240
aatttttaggc aatctagaga aaatccaagg tatgaaatgc ccataaattg tgagaatggt	300
agtcattggg accataatca atcctttgag ggttgcgac aatattttgt aaacccta	360
gaccatgcac gcatgtacca ttcaccacaa tttgaacatg aagaattttg tactcccatg	420
aatttagact ccaccacaga agctttaaga ctgagtaagc aaaaatttga tagatctaca	480
tcacgaattc atgcatattt agatcagatt ttgcttcacc tacaaaagga ggaaattcat	540
gaggaaatg	549

<210> 133
 <211> 744
 <212> DNA
 <213> Papaver somniferum

<400> 133	
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pctca2017050779-seql.txt

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aatcttagat tcacatgcta cgaaacagac aacaatgtta aagacacttg tgaatatgat      120
gggtttattg ttgttttcga tcgaactaaa ctgtcatcct acaagtatgc caaaaaatatt      180
tgccaccagc ttgcagctag gctggtagga tataaaccag ttgttttggt ggccaataaa      240
atcgatcgct ttcaagagag caggaaggca tatgaaatcg ctgctgatca agaattcggc      300
cacccatcgt gttttatatc agcaatgaat aataactaatg ttgagaagcc gtgtctttct      360
cttgcaagat tgctaactaa tgtacctagg ttaatttttc tacatgacat gccattgct      420
ggtaagggtc ctggtggaaa cattgaagac ccaccattc ctgttgatat tcctatcgcc      480
ccatcattgt cgactgtgct catgttaggt tcatctgcat atgatcaagt ccctgcacaa      540
ccatctcaac agattcagac caccttgaaa gttcttggtg atactcctga tgccccatta      600
ccatcgactg tccggcactt ggatcgaacc cctgaagtat catcccgaca gtctcgaaaa      660
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cgctcaaagt gctgttactg ttag                                           744

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<210> 134
<211> 534
<212> DNA
<213> Papaver somniferum

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<400> 134
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cttcatcttc ttctcctact tacctcaaca gaagctcgac accttaagca ccgcgattct      120
aattccacag gaaatgttca agaagcactt ctgaatggag atattaaagt gtcaggccct      180
agccctgggtg gtgaagggtca cagtttcaaa aatgttggtc aaaccatggg aggaaataag      240
gtggctgggtc cgagtcgtgg gggggaaggc cacaagttta aaactcagca gctccgaaca      300
tttgggagga ttaagggtgc aggccctagc cctgggtcaag gccacaagtt caaaacacag      360
cagctccaaa caattgggag gattaagggtg tcaggaccta gccctggaga aggtcacaat      420
ttcaaaaatg ttgttcaaac catgggagga aataagggtg ctggctcctag tccacgaggc      480
ggcggtggtc atcacaatag cgtgactaaa attcacaaat ccaagcgaga ttaa           534

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<210> 135
<211> 413
<212> DNA
<213> Papaver somniferum

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<400> 135
atgcaatttc taaagctcat ccacagggca gagaagaagt tggagtcgat aattgggggt      60
atagaagcaa acaggattga gggagaaaatt accagcaaaa actcgtcaat tcaatcagaa      120
aaggaagatg aatctctgga tgagtttatt attccttctt ttttattcta tgaagaaaat      180

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pctca2017050779-seql.txt

gatgatactc aaattatttc caaaactgaa gtgattgatt tcgacagaga gaatcatgtt 240
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 agtgaattaa attgtaagga tttctttact cttctttttg attttgctcg ttcattattc 360
 gatagaggaa aaaagatcga gctcagttta gagaattctt gttttactga ttg 413

<210> 136
 <211> 456
 <212> DNA
 <213> Papaver somniferum

<400> 136
 atgccatctc agcatgctat cacggagtat cgcctcgttc aatcttcagt tcaaggctta 60
 acatggatag aattgtcccc gctcaccggt agaaagcacc agcttcgcgt tcaactgtgcc 120
 gaggtcttgg ggacaccaat agttggagac tacaaatacg gttggcaagc tcacaagaat 180
 tggaaaggtc ttccttggac caacccaaaag gagagatccg ctgagaagct tcccaagatg 240
 cctctcttcg ttcttgattc taagagtggg agcatctcag agaaggaacc tcatttacac 300
 cttcactgca ggcagatgat ttttccggat gtgcatatgg ccctgcaaca tgttcactcg 360
 gattctgatc ttgatctgtc gacgctggag agcctcgatt ttgttgctcc tttgcctgca 420
 cacatgcaaa gaagctggga catcttgaac tcatag 456

<210> 137
 <211> 744
 <212> DNA
 <213> Papaver somniferum

<400> 137
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 caataacctga gaagaattgt caagtggcga caaatggata ttgaatatac gttttggcaa 120
 atgctgaatc tatgcacttc tccaaaagtt gtatatcagc aactaagta tcacaaacaa 180
 acaaagaacc aatgggcacg agacgatcca gcattcattg ttatttgag cctccttttg 240
 attgttgcaa cttcggctta ctgtgctgcg ttcagccata gcgtgggaca tgctattagc 300
 acagttcttt cagtattgat ttttcatttc ttaataactg gagcgattct ggcaacatgt 360
 tgctgggttc ttacaaattc atatcttcgc gaggagtctc ctaacagtca tgtggttgaa 420
 caacgtgtgg aatggcttta tgcatttgat gttcactgca actctttctt cccaatgttc 480
 gttctgctac atgtgattca ctacttttta tcacctctct tgattgcaca cggtttcatc 540
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 tttctaggat atgatgtatt acccttcttg gaaagaacca cattcttttt gtacccgatc 660
 ggtattgtca tcatcctttc acccctcatg attctgagtg gcttcaaccc aacaagatac 720
 atgatgagca tgtatttcag ctag 744

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<210> 138
 <211> 1074
 <212> DNA
 <213> Papaver somniferum

<400> 138
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 gttacatact gtggagtctg tcacactgat attcatcaag tcaagaatga tcttggcatg 180
 tctaactacc ccatgggtccc tgggcatgaa acagtaggag aagtaattga ggtaggaaaa 240
 gatgtgacaa aattcaaagc tggtgatagt gttggagtgt gattaatcat tgggaagttgc 300
 agagaatgtt catcatgtac ctcaaacatt gaacaatact gtaacaagaa gatctggaat 360
 tacaatgatg tctatactga tggtaaacca actcaaggag gttttgcttc tacaatgggtt 420
 attgatcaga aattttagt gaagatacca gaaggattag caccagaaca agcagcacca 480
 ctcttatgtg cagggttgac agtttatagt ccgtaagaa aatttgattt aacaacaagt 540
 ggattaaaag ctgggattct aggacttggg ggtgttgac atatgggtgt taaaattgca 600
 aaagcaatgg gccatcatgt gactgtaata agttcatcta acaagaaaca agaagaagcg 660
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 gcagttgata ctctagatta tattatggat accattcctg ttgttcatcc acttgaacct 780
 taccttcctt tattgaaagt cgatggtaga tttattatca tgggtgtcat tgctcaacct 840
 ctacaattta tcaactcccat gataatgctc gggaggaaat cgattacggg gacgtttatc 900
 gggagcgtgg aagaatcggc ggaaatgctc gacttctgca aagaaaaagg tgtaacctct 960
 tctattgaat tggtgaaaat ggattacatt aacaaagcta tggaaagggt ggagaagaat 1020
 gatgttagat acaggtttgt cgtcgatgtg gccggcagca aaatcgatct ctga 1074

<210> 139
 <211> 1800
 <212> DNA
 <213> Papaver somniferum

<400> 139
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 atatatgacc acttaatccc aataaggctt acatgtaatg atgatgatgc tgaatatcat 180
 gcatttcgtc atgaagaaga acatgatcat cattatgccg gccaaaaaag agaatatggt 240
 catggattct ttagttttga tctgctcatg gagcagaaaag aggatcattt ggtggctgat 300
 atcattcatg gtggagaatc cctcttattt atacctttcc agagtcccaa gaaagaacag 360

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gtcgcgcccg	aggactctac	gtcatatcat	aatgaagacc	caacaagtga	tgatgatcaa	540
gaggaaaatta	ttatcatgga	agaagaacat	tctccagact	atttttctcc	acctgaagaa	600
tccgatgatac	aagctagtga	actagatgta	gcggtggatg	ttcttcacca	agacgaagag	660
ctatcattac	taaaagatag	tgatgcta	tctgcaacaa	cgacaatggg	gttcatcagt	720
actgatccta	gtgaaaatgg	ttacatcgct	ccggtacaaa	tcgatctcaa	taatagtgg	780
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aaagcaacat	atagtagcga	aaatgatcct	ggttgtcctg	gtcagattgc	gcaacaattt	1440
cagcaatttc	aagttttatt	acaacgattt	attgagaatg	aaccatatga	acatggtcga	1500
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tcgatcaagt	tttcaagagt	aatggaagac	gccattcgaa	ctttcatgaa	atttttaaag	1680
gaggataaag	aaaaaccatg	tgatatcttt	aaagcatttt	tcaaaaagaaa	cagtagtcaa	1740
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<210> 140

<211> 420

<212> DNA

<213> Papaver somniferum

<400> 140

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gaagttttta	aggctattga	gggcagctgt	ttgggcataa	gaggcttgat	ccttgtacgg	120
cggcctactg	attctgggtc	ttcgagtga	attgacggtg	atgaatatgg	tggtgccgtg	180
gttgctagt	ctgtcaaatc	atgcttaaga	atcaagcccc	ggaatgccaa	gatgagtacg	240

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attaaaaatg agtatatgac tgagtttagg attggcagcg actatcttcg gaaaatcaag	300
caggggtcaag gtcctcaagg actattggaa gctactaaaa agtattcaaa tatgggttca	360
gtgtttgggg atatcctcca gatgacttgt tgtatggttg tatgtttgag gcatcattag	420

<210> 141
 <211> 783
 <212> DNA
 <213> Papaver somniferum

<400> 141	
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aacctcccca tgatggaagt tgtgaaaaag gagatactca agcttttgga agtgggtgtt	120
atctacccca tatccgatag caagtgggtg agcccgatac aagtagtacc aaataaatca	180
ggtgtaacag tgggtggagaa tgataagaac gaacttgtcc caactcgtgt gcaaaccggt	240
tggaggggtt gtattgatta cagaaaattg aatgccacca ctaggaagga tcattttcca	300
ttgcctttta ttgatcaaat gcttgaacgt ttagctggac actcttacta ttgcttcctt	360
gatggctatt caggttacia tcagattatg atagcgccgg aggatcaaga gaaaaccact	420
ttcacttgtc ctttcggtac ttttgcttat agaaggatgc cttttggctt gtgcaatgct	480
ccagctacct ttcaaagggtg tatggtaagt attttttcag aatatgttga aaacataatc	540
gaagtgttta tggatgactt tagtgtcttt ggtgattcat ttgaccttg cttgcacaac	600
ttgtcattaa tccttgaacg atgtgttgaa acaaactctg tgctgaattg ggaaaagtgt	660
cattttatgg taactcatgg catcgtttta ggccatataa tatcttctaa aggcctggaa	720
gttgataaat ctagattgac cttattcgtg ctccaacccc tcccactacg gcgagggaga	780
tac	783

<210> 142
 <211> 516
 <212> DNA
 <213> Papaver somniferum

<400> 142	
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gcagcactaa ggtacctact cataaagaag gaagctaaac caaggctcat tcgctggata	180
ttgcttttgc aagaatttga catagagatt aaagataaga aaggcattga taacacagtt	240
gcagatcact tgagtcattc tactgtagac gaagaaacta tccggttgcg tgaaagtttt	300
ccagacgagc aattgttctc actacagggt gtggagccat ggtatgctga tattgtcaat	360
tatttggttt ctaaaaaagt cccgaagaac ttgtctcgtg ctgagagaga caaacttaag	420
agattagctt atcaatacat atgtgatgat ccatataggt gctggaagtt ttcacctgta	480

cattcaaata gttggtctaa aggcattgagt ttttaa 516

<210> 143
 <211> 660
 <212> DNA
 <213> Papaver somniferum

<400> 143
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 ctgttatgga aaaaccaagc taccagtggg attctgctag tatcctcaag tatcatttgg 180
 tttctttttg agatagctgg atataatccg ctactgttct tctcaaattt tctgctgatt 240
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 aattatcaag atcacatcga cgataagcta ttgacgac acgaagtggg atcggcacia 600
 ctccgaaagt tcaaattgaa catgttaacc attcaaagtg aagagaagaa gcttcactag 660

<210> 144
 <211> 531
 <212> DNA
 <213> Papaver somniferum

<400> 144
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<210> 145
 <211> 594
 <212> DNA
 <213> Papaver somniferum

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<400> 145
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gtcgagtaca aaaaagcaaa tccaaaagat gcagacgagg atattgaaat caagcttaga      180
aggattctgg aacaagttcc tgttcgtgtt agcaatacgt ctggtagttc tgctggttct      240
ggctctgggtg actttcatca gtaccggcaa atgaggcgga aagaacaaga ccgacttgca      300
agaatgcbag tggactacga taaacgaaaa gagctatctg attttatgat tagaaaagaa      360
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gacgaatctt cggaggacga ggataaatca gatgatgatg ctggagagcc agaaattcca      540
aaacatatat ttgttccagc tgggaacagg gggaaggagg caatcatctt gtga          594

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<210> 146
<211> 1134
<212> DNA
<213> Papaver somniferum

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<400> 146
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cctccatgta atgacaatga atttgttggg gatgcagcat gtcactgccc ttacaagcac      180
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agtattgtta taaaagggtcc atttaacggg agaagtgtg atttcctttt atatggtgtt      480
gacaaacctc cttccgctac atgtgacacc aataccaact tggacatacc tacaagtagt      540
gttgataatt ctttgtgtct ttctgttaat ttgctggact tgggtgttca gaaacagatt      600
gctgctatat caagcattcc accactatgc aggtcaact tttctagaac tttaaaggct      660
tctcttgata aagttttgtt ccaacctaat gatttagatt catggttgca gttgcttctg      720
cttcccatat gcacctcaa tatttatgta ccaaaaagct ctatggagga gagatcaggc      780
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aatggatgca tcacattggg acaacaatta ttggagacta acaaggagat tcagagtagc      900
aggaaactta gcaagaagaa gcaaaagcct gacattgaag attgcaaaaa gaaactcagg      960
tatgggcact ataaagctgc aattaggatc ctctcttcta atggtgtggc accatataat      1020
cctgacacac tacatgagct tcaactgaaa cacccttatg ctctctctcc cataatacct      1080

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pctca2017050779-seql.txt

ccagatatataa tattgatggtt gcacctgtgt ttgttgatgt caaagctggt ttga 1134

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 <211> 627
 <212> DNA
 <213> Papaver somniferum

<400> 147
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 atcagctttg gatatcctct ggattttcaa tcagggttta ttcttgatct attttcaacc 180
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 gaaggctctg ggtttcagat aaaaattaaa acttgttcta gggtcgtgga tcatgtctca 480
 acgatccaag ctcttccgta tatatgcggg tggtactgtt actactatta tgggtctctc 540
 ctgtgtttaa tcaggattac tgctaccgat agagtcattc gtcagccgaa tggattagct 600
 cggcttttga tatgtcgcag tcgatga 627

<210> 148
 <211> 364
 <212> DNA
 <213> Papaver somniferum

<400> 148
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 aactccatga ctgccaccaa gagtgctaga aaaacaaaaa tcatatactt cgcaaatgaa 180
 gattatgaag aaaaaaaaaca taaaaacatg aacaatatga tctgtataca aaaaatttcc 240
 atccatacat ataaacttgc cactcatatg gaggaccata atcgcaacct ttactgcttc 300
 tatgaacaaa ttttaaagcc acctctacgg ccccaaacct ttgctctttc actacctcct 360
 gaca 364

<210> 149
 <211> 1140
 <212> DNA
 <213> Papaver somniferum

<400> 149
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 ttcattatct tcttctgttg ttgcagtgtc ttagttcaat ctcaagttcc aaaaaacaaa 120

pctca2017050779-seql.txt

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aataccactt tcaatgcata tgttcttggga attggtggtg gtagtcctta tcaaaacatg      300
atgttaagaa ccgataacca aattcattgg gtttgggatg ctaatcgcaa cgaccagtt      360
cgagaaaagg ctactctcac tttcagtaga aatggtaact tagtccttgc tgatgtcgat      420
ggtcgtatag ttggcacaac ttacacagcc aacaaagggtg ttaccggaat tatcatgaga      480
aaatatggga atttagtact tcatgacaaa aatgggaggt ttgtttggca gagtttccag      540
catccaactg atacccttgt tgcagggtcaa tcacttcagc tcaagggtaa tagtataaaa      600
ctcgttagtc gtacatcaaa ccgcaacagt tgtgatggtc gttatagtat tgtgatcgat      660
gacaaacacg gattgacgat gtataaaaac acttcgggta aacttgttcg atatgcaggt      720
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caaccagaac cgagtttcga agaaaagggt aacacaagtt atttcctatc tctaggtttc      840
tctgtgggta agaaagcaaa aactcactct aaaagagtta tactcaaaat aatggcgact      900
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tactctttac gacaaaatth tccagaggaa agttcttggga aaaaagatta tgcattcttc     1020
ggagataccg tgaaagaatg tgcattaaga tctaaatgtg gaacatctgg gaagtgcgat     1080
gggagactgt gtagtgcttg ccctcgtaac cgttcgtcag gttgcatgat cacttcatga     1140

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<210> 150
<211> 483
<212> DNA
<213> Papaver somniferum

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<400> 150
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cacacaataa ggcgacggca gcttgctagg gagaaacttg gctgtaatcc taatgattca     180
agagttacac ccggttcac tccatccaga ggacttttcg caacgataag taacaaagct     240
tttcctttca tgagcaacaa aaaaagtggg gatcagcacg gagacaatta tgaaatcggt     300
ggtgatgggtg gtgtatggca aagaggaata ttgatgggtg gaaaatgtca accacctgat     360
ttttccggtg ttatttacta cgacgttgct ggtagacagc tctctgaaat accgagatca     420
cctcgtgcta gtccgtttcc gtctagcttc tcatttccag ctgcaaaaga tggaaacttt     480
tag                                                                 483

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<210> 151
<211> 411

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pctca2017050779-seql.txt

<212> DNA

<213> Papaver somniferum

<400> 151

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atgaaaaaga agtcagtatc tgccttatct tccaatttca tgctacaatc atgcatagta      60
aaaaaaaaagg tatatttgggt atacactagt atattcacca agggccaggc tcaccccaaaa    120
ggcccatggg gtgaaaaaaaa ggaagaaaga aaagtgaaac aacctattac ctatccaaaa      180
atgtatgatc aattacaaag attattgatc tatcaaatcc caaaagaaaa taccgcaatg      240
gatctgtgct gcggctctag ttcgcaaaat ggatttatgc tgctactgga atacgatccc      300
gatgagacgg tagacgaatt cgaacgtttt tgggacagta cggagacgat gacaatattc      360
ttttggttga tgcttcaatt tctctcatct cgtccttcac aatctgctta g                411

```

<210> 152

<211> 465

<212> DNA

<213> Papaver somniferum

<400> 152

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atgcttaaga gaaccaaag caccttagtt ttgcaggatt ctttctcttc ttccctggcc      60
aaaaaaaaatt ctatcttttc tcaagaatca aacaataaca acaacttaac agtaggcaaaa    120
cccactttca aactgagcga agaaggttta ttcgaaccat catcaaagat gtcctcaatt      180
ttttctcagg aatcatcaaa ctttttgaaa gcatgtggtc tgtgcagaaa aaaattaact      240
ccacaaaaga atattttacat gtataggggt gaccaagcct tttgcagtga cgattgccgg      300
tgccggaaaaa ttttgataga ggaattactg atggaagaag tagaagagga gacgacaatg      360
gaattagtta caaaaagaca gatatcatca tcttctgcac atttgggaac aaatattgga      420
aatggtctac aaccacggcg aaatcatggt cgagctgcag cttaa                465

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<210> 153

<211> 1245

<212> DNA

<213> Papaver somniferum

<400> 153

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aaggcaagat tagcctcttg gaagcgaaga attctcacta gggctggttg gaggaatggt      120
tgtaaaccga taaatattgg tggcttgggt attagaagtt taaagcatct aaactgctct      180
cttctccaaa aatggtggtg gagacttggg aatgaaccta aagctctatg gtcaagagtt      240
gttaaagaca aacatggtcc ggtagacttg ggatggagaa ctcacaagcc taaggggaag      300
catggcatca gtttgtggag gaatatctac tcaactgccg aagatttctt caagctctgc      360
caatttaaga ttggttaagg cgatagagta cgtttagggg aagataaatg gtgcattcaa      420
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pctca2017050779-seql.txt

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tcgattgtct ttctacctaa tgaagaggat cagttggttt ggttgggtga caagaaagga	660
atgtttactg tcaaggcggc gtatgcacat ctttctcaag gtacaaaccc tcctatttct	720
tttccctagct ctaaagtgtg gtccagggct tggccacatc gtgttggttt ctttctttgg	780
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cactctccca gtctatgtta tttgtgtggc attgccgaag aaaccgaaga ccatttactc	900
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accttgcttc aaacggtgaa agatgtcatt gtgggttgga aaaacttccc cttttctgct	1020
caaggcttc aactgtggaa aagactccct gcagccattc cgtgggcttt atggaaagct	1080
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aaaatggatg ctttcaattg gtctaggggt ttagattgtt ttaagggtat taatacctct	1200
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<210> 154
 <211> 1770
 <212> DNA
 <213> Papaver somniferum

<400> 154	
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ggtgctggtg caacttatgc atttggcatt tactcaaagg agattaaaag aacccttggg	180
tttgatcaag aaactctcaa ttacttgggt tttttcaaag atcttgggtc tagtgttgg	240
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cccaaagtct ggcaaatgtg tatgtacatt tgtataggty ctaattcaca gaattttgct	420
aatactgggt cattagtacc atgtgtgaag aattttccgg aaagccgcgg aatcatggtg	480
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tcactctttt ttgtctacac aattagaccc atgaaagtgg taaaacaaac gaatgaacgg	660
aaaatgtttt acaaatactt gttcatatcg cttgcactag cgttattcgt aatgggtata	720
accataatcc agaaacaaaa ggcttttctt catgggtggat acattgctac tgcaactgtt	780
gtttgcattt tgctcttcat tccttttagga gttgccatca atgaggagct tgctatttgg	840
aagcaaaaaca aacaagttca gaattcaact cctacttctg taacaattga aacccaccca	900

pctca2017050779-seql.txt

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gcaattgttg cccaaactgt tgacgcaaag aacccccgtac cggaatcgtc ttggtattca      960
aacattttca gtccaccgaa aagaggcgaa gattacacga tattgcaagc gttactaagc      1020
ttagacatgt tactagtatt catttcagtt ttcagtggac ttggtacaag tttaagtgca      1080
attgataatt taggacagat tggagaatct cttggctacc catctcttac aattagcaca      1140
tttgtatctt tagtcagtat atggaaactac tttggcagag tttgtgcagg ttttatctct      1200
gaaatccttc tatcaaaatg gggttttcca agaacattag taatgacagt agtcttagtc      1260
ttatcatgta tcggcgacat tctcattgcy tttgcatttc cgggttctct ttacgtttct      1320
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gaactcttcg gtctcaagta ttactcgacg ttattcaact gcggtgtttt gggcagtcct      1440
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<210> 155
<211> 873
<212> DNA
<213> Papaver somniferum

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tttgtaactt ttgctgatct acgtggaatg gatgatgcca tcagagagat gcatggcagg      180
gaacttggtg aacgtgttat atcagtcaac aaagcccagc ctaggagtgg tgggtggagga      240
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gacagggtacc cagctgctgg gggagatcga tttggaggta gtgatcggtta tggagcttcg      660
gatcgggtacc ctcagaatgg ctatagcaaa gacagggcat atgatagaga tgcagcccca      720
aggactgggtt ttggcgctgc tgggtgctggt agcgataggt atggaagtgg agggccaaca      780

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pctca2017050779-seql.txt

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<210> 156
<211> 2325
<212> DNA
<213> Papaver somniferum

<400> 156
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tctataaggc caattgaggt acctgacacc atcttatgga caacagtagg aggaatagaa 720
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gctaataatt	tttatgatac	agagggttgg	tatacaaact	gtacctggat	tgaaccaa	2280
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<210> 157

<211> 1287

<212> DNA

<213> Papaver somniferum

<400> 157

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tttcaagttc	ttgctgacaa	ctctttatat	gttaatttga	agaagtgtac	cttcatggct	180
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catggtttgg	cttcttgcta	tcgaagattt	gtgaagaact	ttagctctat	ttctgcacct	360
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pctca2017050779-seql.txt

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ttacgtttac atcttatgcy agaattacat ggcagtggtc ttggtgggtca ttttgggaga	1080
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atacttggtt tacctcgtae tgcttga	1287

<210> 158
 <211> 2372
 <212> DNA
 <213> Papaver somniferum

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agagatacca agcttgaaac catgcagaat caaatTTtga aggttgcaaa acatataaat	180
ctagatttgg aaatgcctga gctttagac ttagaaggaa aaaataaaga agatataactt	240
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ccgtatgaag gtttcatagg tcattcaaag aagaagatag tttctcctgc acttgacaat	360
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aaaactgggc acaaccctta cagttcttta ccagaatata aactaaaagc taatattccc	480
aacttctctg gaaattttcg tattgaagaa ctaactgata ggttctttga ggtagaagct	540
tttttcgaat tcatggaagt cctgaagat tctaagggtta aacttgtagac atacaaactc	600
aaaggaggag ctgcagcttg gtgggataag atctgtgatg atcgtagaaa cgctaacaaa	660
ccgaaaatac gtacttggaac acgtatgaaa actttgatca ggtataagtt cttacctaga	720
gactttatgc agcaactttt catcaaatta caaaacattc agcagggggc acgaaccgtt	780
gaagaatatg tgtcagattt ttataatttg gtcgcacgaa atcaactcaa agaactctgaa	840
gaacagttag ttgcaagatt cattgaggga ctgaatagat taatacaaaa tggatgact	900
cattcagttt ttactatggt cgaagttgtg cagcaagcta ttaagataga aaatcgtctt	960
attcgttctt ctaggattta tccatccaga caagggcggt atcaaaatac ttacaggggt	1020
accaattcat ctcaaaactt ttctccagat actgttttga atattcccag gcctccttat	1080
gatgatgtta gccattcaca tcgacaacct agccatattg tgacttatac tccacctctg	1140
gctacaccta tcttagccaa ttcagtcgat cttcagccgg gtcagcagtc tcaactctctg	1200
caaccaactc ctctactac aggggaatcgg tttcataaca ggcaacaaca atttccaccg	1260

pctca2017050779-seql.txt

caacaacgag ctaataatgc ttgtacaaaa tttcgtggag ataagtgcaa taaatgtcag	1320
caatcggggc acacttctag tgattgtcgg aaattcaatg ctttgattgg tgaacctcag	1380
ttcattaatg aagtcactgg tgcgcttaat gagttcgaat atgaagactc acctggtgat	1440
gacgacgagt ttgttgggat gattcgtcca ttatttctta ctcaacaatg caagtctcag	1500
agacacaata tttttaaatc aagatgttat attgggggta aaatctgcaa gatgataatt	1560
gatagtggca gtgtgcataa ttgtattgct gatcacgtag ttaagaagct tgaactacca	1620
gtaacttctc atccagaacc ttacactgta ggatgggtta atgcctctag cacacagaag	1680
attactcttc agtgttatgt gtcattctct tttgagggtt atgaagacac agttctatgt	1740
gatgtcatta atatgacggc aacccatctt cttcttggaa gaccttggca atacgatctt	1800
caagcgggtc acaatggatt cgagaatact tacacttttg ttcataatgg gaaaaccaag	1860
gttcttagtc catccaattc cacttcaaac tcttgtgcgc agactgatgc tgtcgtagcc	1920
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caggtaaatg atttgcttaa aaagggtttg atacgacctg gcaacagacc ttgtgccagt	2160
cctgccttct tggtagtaa aaaagacaat ggatggagga tgtgtatcga ttgcagagca	2220
ttaaatcgca tcaccattcc ttatagattt ccgatcccg gatttgatga tatgattgat	2280
ttactttcgg gctctattat ttttactaag ttggatttac gcagtgggta ccaccaaata	2340
cgcattcgag gtggagatga gtggaaaaca ac	2372

<210> 159
 <211> 378
 <212> DNA
 <213> Papaver somniferum

<400> 159	
atgaaagatc tcggtaaagc aaggaaaatt ttgggcatgg aaattgagag agataggaga	60
tcagacacta ttaatctttc tcaaaaatct tatttgaaaa agctattcaa gcgttttggt	120
ttagatgaca aggctaaacc agtaacacaa cctctagctc gacacttta gttgaatgct	180
gaacagtcac caaaaacagt ggaggagcag aggttaatgg ctgaaatacc gtacacaagt	240
gctgctggaa gccttatgta tgctatggta tgcactaggc ctgatatttc acaagctgtt	300
agtgtgggta gtagatatat gcataatcca gggaaggaac actggcagga tgtgaagtgg	360
attttgcggt atatttaa	378

<210> 160
 <211> 399

pctca2017050779-seql.txt

<212> DNA

<213> Papaver somniferum

<400> 160

atggttgaac tgctgaacca gttggatggt tttgattcaa gaggagacgt caaagttatt	60
cttgctacaa acagaattga aagtctcgat cctgctttgc taagacctgg acgaatagat	120
aggaaaatcg aattccctct tcctgacacc aaaacaagga gacgcatttt ccagatccac	180
acttcaagga tgacattggc agatgatggt aacctagaag aatttgtgat gactaaagat	240
gagttctctg gagctgatat taaggctata tgtactgaag ccggtttgct tgccttaaga	300
gaacgccgta tgaaggtagc gcatctggac ttttaagaagg caaaggagaa ggttatgtac	360
aagaagaaag agggagtgcc tgaaggactt tacatgtaa	399

<210> 161

<211> 423

<212> DNA

<213> Papaver somniferum

<400> 161

atggagaggg cagagaagga gaagagtgtg agactaatta aggaattgga ggatctgaaa	60
tgtgctaaga agagatctga tgatgaagtt gaagagttga aggtgaagtg cagagatttg	120
gagacccaag aaggtagatt gagaaatcag attaggattc ttgaggaggg gaatggaaaa	180
aagatggaaa tggatcaaaa gaagaagaag gtctgtgttg agataaatag ggaggaggag	240
ttgaagattg aagatgatcc tgagattgga gttgttgtag agaggaaatg catggaattg	300
gaagttcaaa aaacagtaaa tacagtaata ttacccatag atgtgattga gattgatagc	360
gataatgaaa ttattgagat tgatgataat tcagatgata aaattcaagg aggaggtata	420
taa	423

<210> 162

<211> 341

<212> DNA

<213> Papaver somniferum

<400> 162

atgggtcaag gaacaccagg cggactgaac aaacagggag gaggtgcacc aggaggaaac	60
gatggtgata acaacaagaa agagaagaag ttcgaaccac cacctccacc aacaagaatc	120
ggtcgtaaag agcgaaagca aagaggatcg gaaacagcag cagcaagatt acctgcagt	180
aaaccattaa ctaaattgaa acttaggtta ttaaaacttg aaaggatata agattgtttg	240
ttaatggaag aagaatttgt gtctaataca gagatattga aaccacatga agataagaac	300
caagaagata gatctaaagt tgatgattta agagggtcac c	341

<210> 163

<211> 717

pctca2017050779-seql.txt

<212> DNA

<213> Papaver somniferum

<400> 163

atggattttg acgaggagct gggagatgaa aagtttggag tttcaccaac gagctacgaa	60
tcatctcgac caacaaaaat ggtggcaacc ggagaagtag tagcagtgtc tacacgtaaa	120
tcagcttgta gatacaggga gtgtttaaag aatcatgcag taaatatagg aggacacgca	180
gtagatggat gtggagaatt tatggcagca ggtgaagaag gttcactaga tgcactgaag	240
tgtgcagctt gcggttgtca taggaatfff catagaaaag aaattgaagg cgaaggtttt	300
catcaccatc caagctttac accttacagt agttatcgtg caccgggtca tggatgtagc	360
ggtacttact tacacgtacc cgctcgtcca ttagctttac catcaacatc tgggtggtgga	420
gggaataaca ctagtagaga tgatcaagat gaagataact cacaccctac aagtagtggt	480
ggattatcat caaggaaaag attcagaacg aaatttagtc aagaacaaaa agataagatg	540
ttgagttttg ctgagaaaatt aggttggaga atacaaaaac atgatgaagc tgctgttcaa	600
cagttttgta atgaaacttg tgtaaagaga catgtcctta aagtttggat gcataacaac	660
aagcacactc ttgctaaagg gtgcatgatg atgatgatga tcaagcgaag gagctag	717

<210> 164

<211> 1509

<212> DNA

<213> Papaver somniferum

<400> 164

atggcttttac aagagcataa tcaactccac tttgttttat ttcctccaat ggcacagggt	60
cacctgatcc ccactataga catggctaga ctctttgctg agagaggat taccgtcacc	120
ataatcacca ctcttttgaa caccttcagg ttcaaaaaca tcatagatcg tgctgttgat	180
tctggctttt caatcagact tctgcaactc aggttccctt ctgtagaagc aggattgccg	240
gaaggggtgtg agaattgtgga ctctcttcct tcacgtgaaa tggtagtaaa tttctttaaa	300
gccacgtctg tgttacaaga accacttgaa cagttgcttg gagtgctgaa acctgttcca	360
agctgcataa tttcggccat cgctttccca tggactgcgg agacagctcg taaactgcaa	420
attccgagac ttgttttcca tggtagtgtg tgtttttctt tgttgtgttg ccataacata	480
ctagaataca aggttgctga tagcatcaca agcgagtcgg agtcgtttgt aataccgggt	540
ttgcctgata gaattgagat aatcaaagca atgctcccag gaaaccttcc tcaaagctca	600
ggtgacctga agaatttccg tgaccaaatt aacgcggctg agctgactgc gcatggtgta	660
gtggtaaaca gttttaacga attggagcct atgtatgcgg aagagtatct gaaagcgaag	720
ttcggaaaag tttggtgtac tggccagta tctctgtgta acaaagagac attagacaat	780
gccgagagag gtaataaagc ctcggtggat gaaagccaat gtctgaaatg gcttgacttg	840

pctca2017050779-seq1.txt

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aaagacccccg gatcggttct ttatgtttgt ctgggaagtc tatgtcgatt aacaacttca      900
gaaatgatcg agcttgggtt gggctctagaa gcatcaaagc atccctttat atgggtgatc      960
agaggcagag ataagtacct agatttagaa aaatgggttac ttgaagagaa attcgaggaa     1020
agaaacaaaag atagagggtct cgtaatcaag ggctgggcac cacaaatact aattttgtcg     1080
cacaaagcaa taggaggatt cttaacgcat tgtggttga attcagtact tgaggagatt     1140
tgtgcgggtg ttccgatgat aacatggcct atgggtgaag aacaattctt taatgagaaa     1200
ttggttggtc aagttttggg aattggagtg aagataagag gagatgatat tcatgctagt     1260
gatgctacga aaccaatgga acttatggaa gaacacagga agtttgaag tgatgaaaat     1320
aagaggggag aggtggagaa ggctgtgaac agagtaatgg atggagggtg agaaggagaa     1380
gagagaagaa gaaaagtgag agaacttgga gagagagcaa agaaggccat ggaagggtgg     1440
ggatcatctc aactcaatat gacactattc attcaagata tacagcagca aggacaaaaa     1500
caaggataa                                     1509

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```

<210> 165
<211> 540
<212> DNA
<213> Papaver somniferum

```

```

<400> 165
ccccaccgc ccgccgaaa agaaaagggg agtatttcta gagaaaaaga agaagagatg      60
agcagtagag gaggaggagg ttcaagtagt agtagtagac agaatgtaaa ttcagtgttt     120
tatgcagaat cgtatcatcc aattcaagct ggtagtattg atggaataga cattcttcct     180
catgataatg ctgtttacag agctctcctt tgttcttcag ctggactcta tgaccattt     240
ggtgacccta aggttaccgg agacccttat tgcagtttgt ttgttgggcg tctatctcac     300
ctcactactg aagattcact tcataaggca atgagtaggt atgggagagt caagagtttg     360
cgattagttc gtgacattgt aactgggtgct tctcggggtt atgcatttgt tgaatatgaa     420
aacgatagag agatgaggcg cgcatatgag gaagctcacc attctagagt tgacgattgt     480
gaaattttag tagattataa ccgacagcag ttgatgccag gtggatacca caaagattag     540

```

```

<210> 166
<211> 747
<212> DNA
<213> Papaver somniferum

```

```

<400> 166
atggttccccg taaacaaaaa tctaaatcaa aatcaatcga agaaagagac gaaccctaatt     60
caaccgagca cgagttcgga tacagaagat cgaagtaacc ctaaccctaa taacaacca     120
gcagtgacag tggaatcgac atcaagtgt tctccattag tgatagaagg ggatgaagaa     180
gatacaatct tgaagaaaatc agagtatttg actagagaag aagttattag gaggagatta     240

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pctca2017050779-seql.txt

agaaggggta gacaaatgga gaagctttat aaagatcatt attggtcttt aatggaagaa	300
cttaggggta aatatagaga gtattatttg gaatatggga agagtccttt taaggaagaa	360
gaaactagag aaaggggggg aaatcatcat aacaataacg gtaatggggg tttggcaa	420
ggtaggggtg ttgttggtga aggaagtggg gataatcata ataagtcaa tggtaggtgt	480
ggtaggcggcg gtgtagtggt tagtggtggg gctaaattag ggtagtgaa tgggggagaa	540
gataataatg atgggaaata taaaagatgt gtttttggtg gatgtaaatc taaacctatg	600
gcacttgcta accattgtca tcaacatatt attttggatt caagacagac actctacaaa	660
acttgcaatt atgtcactaa aaggtttgat ttttgttccc ttttgtcttt tgattcttgt	720
ttattttttt ggggattttg ggggttaa	747

<210> 167
 <211> 1653
 <212> DNA
 <213> Papaver somniferum

<400> 167	
atgctctgtt ctacaaagaa gcagggcatt gaacgcctta ttgttgtatg tttatgtgtt	60
tcactcctct caatctttgc tcttgctgat ccaggagcag ttggagttaa ttatggaaga	120
atagcaaacg acttaccatc agcagtaaaa acagtagagc ttctaaaatc acaaggaatt	180
gataaagtta agatatatga tactgattcc gcagttctaa aggctctatc aggttcaagc	240
atcaaagtta ttgtttcatt accaaatgaa aatctaacag ctgcagcaaa atacctatct	300
tttgctctct catgggtaca aaaaaacatt gttccatact acccattaac ccaaattccat	360
gccattgcag taggaaatga agtttttgta gatccaaata acacaacaga tgtcttagta	420
cccgtatga aaaacgttca atcagctctt gttttttaca aactagattc tggtagttaa	480
atttcatcac catttgcttt gagtgcattg caatcttcat tcccagcttc atcaggctca	540
ttcaaaaactg aattaatcga gccagttatt aaacccatgt tcaatttcct tcgagaaaact	600
aaatcttacc tcatgttaaa tgcttacctt ttctttgctt actcagctaa tgctgatgtt	660
atatctttag attatgctct gttccgtgaa aaccagggtg tagttgattc aggaaatggg	720
ttaaaatata ctaatctttt tgatgctcaa gtggatgctg tttatgctgc catcaaagct	780
ttgaaatatg atgatgttga tatcggtgtt actgaaactg gttggccgtc taatggtgat	840
aaagaagaaa tcggtgctaa tccagaaaat gcacaagctt ataacggaaa cctagtga	900
agagtactaa ctggtggtgg aactccattg aaatcagaaa caaagcttgt tgtttatttg	960
tttgctctgt ataagtga caagaaattt ggtccaactt cagagcgaaa ttacggtctt	1020
ttctatccca gtgaagaaaa agtttacgag ataccattta cattggaaca agtcaagaca	1080
tggaagttaa agccagccag tgatcgtaaa gctcaatctc aggcacctgc aaagcctgtt	1140

pctca2017050779-seql.txt

```

tacagtgggtg agtctgccgg aagtaatgga acaagtgggg tttcgaattc gtcctctgca      1200
aaggggccat tttgtgttgc gaatgtgaaa tcagggaagg aaagattaca gaaggcttta      1260
gattatgctt gcggtgctga aggtggcgct gattgtcggt cgattcaacc tggagctgca      1320
tgttatgatc ctaacacact ggggtgcacat gccacgatag ctttcgactc gtattatcag      1380
aacaaaggac gtgctaattc agcttggttat ttcgggtgggt ctgcttacgt tgttactgta      1440
cctccaaagt taggcaagtg tgatctgact atggatagtg aagaagataa cggtagcaaa      1500
ggagctggga aattgttcgt gcagaccaat aataaagaga acgccgaggc tgttgaagtg      1560
agcttatcaa gccctagatt agtgacattg ttaggtagtg gtacttttga tattagtgtg      1620
gtattgttag ttttaatgta tttatcgttt taa                                  1653

```

```

<210> 168
<211> 393
<212> DNA
<213> Papaver somniferum

```

```

<400> 168
gattcattgg ttttggttta tctctcttat tgtttcctta attttgtgcc gcaagaatta      60
atgggtctac tgtttaatgg aaaaatggaa agcattctga gaaagataaa tccatggccg      120
tggttgccca gaccaaacc cttttctgaa catgtgcctg aatttttagg gagacgaatc      180
agtaaccttg ggctctcaat cgttctctac agctacccta aatcctctac cctggaattc      240
ttctacttcc tgccttcaag gaagaacctt actgaaacct taaaaatttc aggaaagatc      300
gtgaagtctc cattatctac cattgtgagt tacccaagac cttcattatt tttaggtaat      360
cagtcccatc acaaaaataaa aaaacaaaga tag                                  393

```

```

<210> 169
<211> 360
<212> DNA
<213> Papaver somniferum

```

```

<400> 169
atgaaaactt tgatgcagtt tatgaacttg cgacgcac tgaaaactggg aaaatataaa      60
ggtaatctca ttctttccac taggctttta tccgattttg atttgtcatc gggtaatatt      120
tttagtgcaa ccaagaaaat ggcgacgagt aaatccatac tcgaaattgc attaaggact      180
ctgtaccttc tcatatgtgt ctttcaaaaag atttttcatg aacttctcac tttgtgtcaa      240
tttttacatc tctgcaggat ctatcagggt gaaattggat tgattaatct tccggagaat      300
gtagtgggtt ctttgtactt ttttttttta ttttatataa tccatgtttt ttctttttga      360

```

```

<210> 170
<211> 789
<212> DNA

```

<213> Papaver somniferum

<400> 170

atgattttgga atccgtttac aaaagattac aggaaaattat caacaccacc caaaccagat	60
ttggatccaa gttatgtata tgacttctat tcctattcta agtatgggtt cggttatgat	120
tcgaaaacag atgattataa gtttgcaagg atggtgaaat gtccgggaag ttctactgaa	180
atcagtgtct attcactgaa actaaatttg tggaagacat atcgagacat cccttttcta	240
ttgccttttta atggtggcct agtgcttttt caaggaattt ttcatgggtt gggagacaga	300
tcaagaaata tcgagatata tcgcgacttc cctcgggggt ttaaactccc taaaatcatt	360
ggctgttttg atactggtag cgagacattc aaagaaattc cactaccaca acattttgca	420
gagttatttg ggatatttgt ttgtgttttg ggaggtttcc ttacataat tggttttcgg	480
tatgtgaaca ttggtagcga ggcgtggatg atgaaagatt atggtgtgca cgagtcttgg	540
acaaaaatgt tcaatatccg tgaaacaagt agtaaccttg ttggagctgg gtgtttgaat	600
ctgaagcatt acttcaagag tgggtgtgatt ttggtacagg tggataacgg tcgttgttta	660
ttgtttgatc taaaaataa aaagcttacg aaacttgaga tcagtgacca tacattgttc	720
tacacatggg cttttttggg gagtttagtt tcacctaata atttggatac atgtttgggg	780
atgcagtag	789

<210> 171

<211> 1299

<212> DNA

<213> Papaver somniferum

<400> 171

atgtctgatt tggatttatc tactgatagt gaagatgaag cctttgatac agaagaagaa	60
agcagtgatg atgaagaggt aagcagcaat aatgaatttg aactatccat atttttgaat	120
atactttcag cggtgcattc atggttgatg gatataatca agcaattgca atacatacaa	180
agtcagcgta ttgaaaagacc aatgagacgc ccggttactt tgtttggata taactatata	240
aggagagttt tgcgtcaaga cccagaagac tttcgaagaa gttataggat gtaccctgat	300
atttttctaa aactatgttg tatcattaga gaaagtacat cattatgtga tacaagatgt	360
gtttctattg aagaaatgct tgggtacattt ttactcgttg ttggccaaag ttcacgatat	420
tgcacaatac gtgacacatt tggtcgctct cggtggacag ttagtaaaaa cttcaacagg	480
atgttgcgag ctttaaattc tatagctccg aggatgatgg ctaagccaac aagtgcaact	540
ccatttataaa ttcgtgagag tacacgattt tatccttact ttaaggattg cattggagct	600
atggacggca cacatatccc agcaatggta gagaaaagaa atgcagccgt ttatcggaat	660
cgacatggaa ttacatctca aaatgtgtta gcggtttgca acttcgactt ggagttcata	720
tacgtgctca gtggatggga agggctctgct catgattcga aaatacttaa cgacgcaatg	780

pctca2017050779-seql.txt

```

acaaaaagaa atggaatgaa aataccgcaa ggtaaattatt acttggggga tgggtgggttt      840
gcaaacccgac gatattgttt aacaccattt cgtggccaac gttatcattt gaaagaattt      900
tctggtacgg gtaatcatgc gaaaaaggct gaagaattat ttaacatgcg tcatgcttct      960
ttgaggaatg tagttgaaag attgttcggt gttgtgaagt ctcgtttctt gatctttaag     1020
tctcaacctc catttccgta tcagggtgcaa gcggagataa tgacagcttg tgcaggccta     1080
cacaacttct tacgaaaaga atgccgttca gatgagtttc cggtcgagga agaggaaaat     1140
agccatccat caacgcttgt aaatgacgac gaaattttga cacaacaaac tcaagaacaa     1200
caacgtcaag aagctaatgc atggagaaaag agtatagcgg atgatatgtg ggaaaaatgtt     1260
cgtgaacaaa gggagttaga attgtatgga gaccgttaa                               1299

```

```

<210> 172
<211> 382
<212> DNA
<213> Papaver somniferum

```

```

<400> 172
catgtcttat ataagtacgg gttcggttat gatttaaaaa cagaagatta taaagttgcc      60
cgaatagcaa acatcagggg taagtatagc gaaatcgctg tttattcatt aaaattaaat     120
ttgtggaaga tgtatgggga catccctgtt cgatctccat acgaagattt agtgcttttt     180
gaaggaattt ttcactgggt ggaattgccc ccctcggggg ctcaacgtcc tagaatgatt     240
ttctcttttg atactggtag ccagatactc aatagaattc cactgccaca gcatttctca     300
gacaagttta acatgataca tgtgctgtct ttgggagggt gtctttacct aattggtagt     360
ctgtatatga catgtagcga gg                                              382

```

```

<210> 173
<211> 1743
<212> DNA
<213> Papaver somniferum

```

```

<400> 173
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atggagaagc aatcgagttt tcgtggggta atggagaaac aatcgagttt ccgcggtgta     120
atggagagac aaaagagcat tagagaagcg ttggagaagc agttgagttt tagagacaag     180
aaaaagggtca aggagtcgcc ggggaagaga ggtgatacac cacttcattt ggctttagg      240
ggagggaatt tgattaaggt taaagagatt ttgcaagatt gtgatagttt aaaagatgtg     300
ttgacgaagc agaacaagga tggagagact gcgttatatg cagcgtcgga gtatggtaat     360
gctgtaattg ttagtgagct tttgaagcat atggattccg aatctgcttc aatcccggca     420
aagaatgggt atgattcatt tcatgttgca gcaaagcaag gccatctaga ggttttgaag     480

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pctca2017050779-seql.txt

gagcttctgc gctctttgcc tgatctggcg cttacgacag attcatcgaa ctctactgca 540
 ctgcatacag ctgcaatgca aggtcatatt gatgttgtca atcttctttt ggagaccaat 600
 gttgacctag ctaaaattgc acgaagcaat ggtaagactg tacttcactc tgcggcaagg 660
 atgggacatt tggaagtggc aaaatccata ttacgtaagg atccagggtg tggttttaga 720
 aaagataaca agggacaagc agcattgcat atggcagtga aagggcataa tgtagaaatt 780
 gtgcttgaaa tgggttaaacc tgataagtca gttatcaact tggaagataa gaatggaaat 840
 acggcattgc atattgcaac gaagaaaaggc cgaacgcagg taatgcgtgg tttgttatca 900
 gttgaaggca tcagcatcaa cgctataaac aaagcagggtg aaaccgcact tgacattgcc 960
 gccaaagtcag aaaatcctga aatcgctcc attttaaaag aagttgggtg caccagtgtc 1020
 aaagactctg caaacctcc taatccagca aagcaactaa agcaaactgt tagcgacata 1080
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 tcttacatag tagttggcgg tcatgcgcgg tggctagcca tttatgtgac agtaatcggg 1560
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 gaggaatcaa gtatgaggaa tataagaaga gcctctggga gtcattctcg ttctttctct 1680
 gtttcgggaa tttcggatac tgagatactg aacaacgaat ataagaggat gtatgcagtg 1740
 taa 1743

<210> 174
 <211> 828
 <212> DNA
 <213> Papaver somniferum

<400> 174
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 caatgttgta gtccgccact cagtttacca agtgctcgta taaatgcctc ttttacttta 120
 ggtcaatttt gttatctaca cagaacatca aacacatctc cgacaaacat tctcaggcct 180
 cttcaccagt atctgaagca atcgggaatt tcttcttcaa ggaagttgct ttcagaagca 240
 tcctctgacc agacgcctgt agcaaatcca ctgtcgtcac ctgttttgca aatagggtgac 300
 gggacaactg aaacccaagc cgtggtcctt aaacgtgccg gcgttcaggc agtgttgaag 360

pctca2017050779-seql.txt

gacataaaaac agagtcccaa aaagggttaat ctggtggctg cattggttcg tggaatgcga	420
gtggaagatg ctctattgca actgcagctt acagtaaagc gagcatcaaa gactgtttat	480
caggttatac actcagcacg tgccaatgca acccataatc atgggttgga taaagaccgt	540
ctcctagttg ccgaggcatt tgtaggaaaa gggttattca aaaagagagt ttcatatcac	600
gcaaagggaa gatctggagt gaaagtacga gcagagtgtg ggtaactgt cgttgtagg	660
gagatgaccc ctgaagaaga ggctgagata gccagactaa gagtacacaa tttccgcaag	720
ctctcaaaga gggagaggcg attggttcca cataagctca tcgagactac ccctgtgtgg	780
ggccgcaaaa gcaagcctag caactcagag aagagttcca tggcttga	828

<210> 175
 <211> 864
 <212> DNA
 <213> Papaver somniferum

<400> 175	
atgggtaatc tattgtgctg tgtacaagtt gaccaatcga aagttgctat caaggaaaaga	60
ttcggcaagt ttgaggaagt tcttgacca ggatgtcatt gcttaccgtg gtttcttggt	120
agtcaaattg ctggtcatct caccctaagg gttcaacagc tggatgtcaa atgcgagact	180
aagacaaaagg ataatgtatt tgtcaatgtt gttgcatcta tacaatatcg agctttagca	240
gagaaggcaa gtgatgcatt ctacaaactg agcaatacga ggggccaat ccaagcctat	300
gtttttgatg taatcagagc tagtgttcca aagctcattht tggatgatgt tttcgagcaa	360
aagaacgata ttgctagagc agttgaagaa gaacttgaaa aggctatgtc tgcttatgga	420
tatgagattg ttcaaaccct tattgttgat atagaaccgg atgtgaacgt gaaacgggca	480
atgaatgaaa tcaatgctgc tgcaaggcta cggttggcag caacagacaa ggcagaggct	540
gagaagatat tacagattaa gagagcagag ggtgaggctg aatctaaata cctcgctgga	600
ctgggtattg ctaggcagcg tcaagccatt gttgatggc tcagagacag tgtagtaggg	660
ttctcaacta atgttcctgg gacctctgca aaggatgtta tggacatggg tctagtaaca	720
caatactttg acacgatgaa ggaaattggg gcaaaactcaa aaacatctgc agtgtttatc	780
cctcatgggc cagggtgctgt tcgtgacgtg gtaactcaga ttcgtgatgg acttcttcag	840
ggatcttctg ctcacatgac ataa	864

<210> 176
 <211> 1851
 <212> DNA
 <213> Papaver somniferum

<400> 176	
tctaaaacag agtcttactg tctaaagtgg atttgtaata aaaagtctga attcccctca	60
aacttcattc tcttcttttt atcatgttgt tgtctgctgg ttactatac tctccttctc	120

pctca2017050779-seql.txt

cttctccttc	ttcctcttaa	tccccacagt	tcgccgccat	ctccaccacc	accaccacca	180
ccaaattctt	cacaaactgg	attctacacc	atggaagatg	ctcaatcagt	tgccacgctt	240
atagattcca	caacaactaa	aatacaacag	cttcaacaag	catttgcaga	gcttgaaaac	300
caccgagctg	tatccttaaa	ccttaaattg	aaagagctcg	aggcacattt	ccatgggctt	360
gagaggctct	tgaagagaag	gtttgatgat	ttgggagacc	aggaaaagga	gtttaagaac	420
aaggcatctg	aggcgcgga	attactggag	aagaagaagg	ctgcagtga	ggccaaggaa	480
cacgcttcat	tggagaagct	ccaacagaag	agagatgctg	ccctctttgt	tatcggggat	540
gcttttaaga	aatacaagac	gtcatctgta	aaacctgtgg	ttgttaaagt	tgaggatagc	600
tgtgagtctg	atttgactgt	ggaagagaaa	ccccctgaca	tgaaggttgc	ttccgttgat	660
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gatgggaaga	gagactctgg	actcttgggt	ctccgacgaa	cttgtattat	gttgatggaa	960
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tctcgtcgcc	gtcagacagc	tgatctttgc	cgtctactag	gtttgtcaca	caaaatgcc	1260
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gttcccgata	ggtatcctcc	ctacaactac	gaaaacatgc	actatgtata	tccaggacac	1740
accaacaatc	atcccacacc	ggtcttgggt	gctgcagcct	acaacatccc	acccaacat	1800
ggtagctatt	tcggaaatgg	gtatgcttac	caagcccat	atctacacta	a	1851

<210> 177
 <211> 1215
 <212> DNA

<213> Papaver somniferum

<400> 177

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atggttaaca taatcatctt attttctctt aaactcgttg taattttcca tatcatattt      60
ccattatcag caactgcagt tacttataat gttctaaact ttggagcaga accagataaa      120
ggaacggatt cgactgaagc tttcttgcaa gcatggtctt tagcttgagc ttctatagca      180
cctgcgatga tgtttatacc ccgtggaact tatttgggtca acacaatagt ttttagtggt      240
ccttgtaaaa gtgcaagagt cacagttcga attgatggta aaattcaggc gcctcctagc      300
agttattggg aaattgggaa ttatgggact tggattttgt ttcaaggcat caatggctta      360
accattaacg gtgggattct agatgcacgc ggatctccgt tttggatttg taggagagct      420
agtgccttatt gcccgcgaagg cgctacgtcg ctgtcgttca acaatgttaa aaacggcata      480
gtcagtggtg tcgtatcttt tgatagccaa aaggctcaca tggctatcaa tggttgcaaa      540
agcatgaaga ttagaaaaagt gactcttatt gcacctgtct aaagcccaa tactgatggt      600
atagacatac aatcatcaac tggataaaaa atccttgatt caagcatcag aacaggatgat      660
gattgtattg caatagggtcc tggcacaaaa agtttattgg ttcagcgtgt agtatgtgga      720
cctggacacg gaattagcat tggaagcttg gctagaagtc caaatgaagc aggggtggaa      780
ggaattaaag taaaggatgt aaccttcact ggatcggata atggattacg gattaaaaca      840
tggccgaaac caagtgatag tttcgtaaag aacgttcttt atcaaaatat cattatgaat      900
aatgttcgga atcctatcat tattgatcag atttactgcc ccggtaccaa tggttgctct      960
gaccagaatt ctggactcaa gatcagtggt gtaacgtact taaatgtaag tggaacatca     1020
gcaacaccaa ttgccattag ctccattgt agtgcaacta ccccgtcga tggaatcaaa     1080
ttatccaatg ttaatctcac ttattcaaag caacctgcc agtccttttg tttcagcgcc     1140
ctcggaacat catcagcggg acaactcgga acatcgttat cagtaggacg acccactcct     1200
ggaagttgct tctag                                           1215

```

<210> 178

<211> 627

<212> DNA

<213> Papaver somniferum

<400> 178

```

atgatggagg aggtgataat gatgtcaatg atatctcctt cagcatcaaa ttcgacttca      60
ccacctggtg gtggtggtgg tggaggagca aaggaacaac aagcagctgg agtaggaata     120
ctattgcaga taatgatgct tgttttatca ttcgtattag gtcacttctt tcgtcgtcat     180
aaattttatt ttgttcccga agctagtgtc tcccttttga tcggtttgat tgttgggtgga     240
cttgctaacg tttcaaatac agaagcaagc atcaggcctt ggttcaattt tcacgaggaa     300
ttcttctttt tgttcttgtt gccgccaatt atatttcagt caggattcag tttagcacca     360

```

pctca2017050779-seql.txt

```

aaaccattct tttctaactt tggagccatt gttacatttg caattctggg aacatttatt      420
tcttctatcg ttactggagt tctagtatat cttggtgggtg tgttgctgct catgtataaa      480
cttccttttg ttgaatgctt aatgtttggt gcacttatct ccgcaacaga tctgtcact      540
gtgctatcca tattccagga acttgggact gacatgaacc tatacgccct ggtgtttggc      600
gaatctgttc tgaatgatgc agtatga                                           627

```

```

<210> 179
<211> 432
<212> DNA
<213> Papaver somniferum

```

```

<400> 179
atgcgcaaca cacctgcaga tgggtcccgtg agtacaaatg aaccattgga atgggatatg      60
aaggaccttc cgattgatga actcatagat gaagatgttt catcagattc aacaacaaag      120
gaggacaaa tgcatacaga accaggggaag atttttgtgg gtggaatgtc atgggatacc      180
gatgaagcta ctttgaaaga tcattttaac aagtttggtg aagtgggtgga gactaatatt      240
ctgatagaca ggactacagg ttgttcaaga ggttttgggt ttgttcgctt ctcagataaa      300
tctgtagctg ataaagtctt tttagaaaaa catgtcattc ttggaaaaaa ggtagatgtg      360
ggaaaagtag tgctaaagca taataatcct tacgatcgaa agggttttaa taagagtaat      420
ggtaataatg gc                                                             432

```

```

<210> 180
<211> 413
<212> DNA
<213> Papaver somniferum

```

```

<400> 180
actagaaaagg tgcgttccct aagagatatt tataatgtat ctaattgtgc ttttatagca      60
ctagaacctc aaaaatatga ggaagcggca aaagaagaaa aatggagaaa cgccatggac      120
gaagaaatgc gagtaattga gaaaaataag acatgggagc tcgtcaatca gccagttgat      180
aaagaaataa ttggtctgaa atgggtctac aagataaaat ataatgaaga tgggtcaatt      240
caaaagcaca aagcaaggct agttgcaaaa ggatattccc agcaaccagg aattgactac      300
aacgagacat tcgcccagc cgctcgcagc gaaacaattc ggatgggtgtt agctttggca      360
gctcaactca aaatgaaagt ctaccaatta gacgtaaaagt cggcgttcct aaa           413

```

```

<210> 181
<211> 1101
<212> DNA
<213> Papaver somniferum

```

```

<400> 181
atgggtgaca tgctaaaaaa aaaggctttc cacagggtgga ttagtgagaa ggatcttaga      60

```

pctca2017050779-seql.txt

```

gttgatggga ggcgtcttga caatgtagg cggttaaaat gtgaatattc taaagtctca 120
gaactggagg gatcatcaca atttgcttgt gggctgactc aggttacatg cacagtgaca 180
caaagaagac caacaaagga tgaagctaaa aatatgggtg gaaatcatcc cttctccgt 240
ttccctagat ttttgtacaa tagtccaccc ttcagagttg atggaaactg gaaattaggt 300
gattgcaata gttatgatgc acgggacggc gattttgtgg agaaaagcttt ggttgtgctg 360
ctacctgtag aatataactt tccatatgtt gtttgtgtcg actcagaagc tatacattct 420
gatggttcag tctctacagc cactatttgt ggggggagtg ttgctttaat ggcttctggt 480
gtcccctctaa agaaacatgt ggctgggtgt tccagtgggca ccgtcagtga agtttatccc 540
actgatggaa agatgaacaa ttaccgaata ctgacagatc tatcaagttt agaggagcat 600
ctagtggaca tgaacttcaa agttgcaggc tcgcgagatg gaattacagc aattcgattg 660
gatttaaatg tagctgggtg tcttttaggt atcatctgtg gctgcttagg acctgcatta 720
aaaggttgcc ttgaagtcct tgatacgatg gacaaaaaga tcagtaatcc tatttattgt 780
acttcagatg attgggggtg gaggacgcg acagtagttg catataggct tcccactaag 840
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aggctacatg aagacgaggc aaccctaattg aagagctacg tggaaatatc agctgagcag 1080
gttgaaaagag catatatgta g 1101

```

```

<210> 182
<211> 342
<212> DNA
<213> Papaver somniferum

```

```

<400> 182
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gtcacaaatc cgataagctt tgatccattg gactcagtga taacctgat gctaccttca 120
agagtttctg caagaccaac ccaagctcta ttcatgcac gtcttatctt caaccatta 180
tctctgacag aaagatatca ctaccatcac caccagcaat ttcttcaaaa cacgtattta 240
gcaccaccaa tagttcctga tttccttatt gacaagaact cgaatatagt tggttcattc 300
atgttattcc atattccatc aacatcacgt acaatctctt ga 342

```

```

<210> 183
<211> 351
<212> DNA
<213> Papaver somniferum

```

```
<400> 183
```

pctca2017050779-seql.txt

```

atggcatatg aaatgacaga gaagtttgaa gagtattggg ttgtgatcaa tggagtaatg      60
gccgtagaaa ttatgttaga tccaagggtt aagatgaaat tgattgagtt ttattttcca      120
caactttatg gtcaagcttt tccaaaaatc aaaattgatc gagtacgcaa tttatgcggt      180
gatatggcga cggagtatga actgaaagta aaatttgctg aaacatctgt tagccaaaat      240
gatttgtctt tcacttcgga gatgcatggg tttaacgatg atgtagatcc tttggaaaag      300
tttgatatgt ttgtctttag tactgctcct actagtactg ttaagtcata a                351

```

```

<210> 184
<211> 1161
<212> DNA
<213> Papaver somniferum

```

```

<400> 184
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ttagatcctt catcatcatc aaatcaaatg gctgctgaga aaaactcaaa aatctcagca      120
tattatcaaa caagatcagc gcatcatgct gttgttacga gtgattgggt agctcaatca      180
caagaagctg cgattgaatt tgatccatct actaatgatt atcttaaadc aagtactggg      240
aattctgggg agaaaccctt tagtgtgatt gatgaattta atcattggag acaattacct      300
gaattagctg aagctgttgc tgcaatatta gctttggcct ctgttattcg gtttagtaaa      360
gcttccacta ttatggaact tgagagggaa ctcaaaactg cttctgattc tctaaagtca      420
tgggatacga cttccatctc tttgacagct ggatgtgact tgttcatgcg atatgtaacc      480
agaacttcag ccttgaggta tgaggacttc gatgctgcaa agttgcgctt aattgagcgt      540
gctgagaaat tcggtgaaat atctcgcaag gcacgaagaa ccattgctat gctcagtcaa      600
gactttatct tcgacgggtg tacaatcttg gtgcatggat attctagagt ttagttgaa      660
gttctgaagt tagctgcaca aaataagaaa ctgtttcgag ttttatgcac agaggggaaga      720
cctgaccgaa caggggttgc gttctcaaat gagctagcaa agctggatgt tcctgtaaag      780
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gctgatggag tggtagaaaag tggaggtata atcaacatga tgggaacata ccaaattgca      900
ttggtggctc acagcatgaa caagccagtt tatgttgctg ctgaaagtta caagtttgca      960
cgtctctatc ctttggacca gaaagatctc acccctgctt tgcgtccaat tgattttggg     1020
gttcctatcc cgtctggggg ggaagtcgaa acttctgcca gggattatac accacctcag     1080
tacttgacgc ttctgttcac agatcttggg gttctaacac catctgtagt cagtgcagag     1140
ctcattcagc tgtacttgta g                1161

```

```

<210> 185
<211> 510
<212> DNA

```

<213> Papaver somniferum

<400> 185

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aactacaaga aaccagcaga tacttgtaag caaacagtga gaaattcctt gatctcaa	120
gaagcctcct catctgcatc aaattcatca gtaggggttaa gaatactcat tcacaac	180
tctacctctc ctcaagaatc aaagaacaca gtcttagtca aacacacttt caaactgag	240
cttctagcct caacatattc tcaagaatca agttttttga gatcatgttg tctgtgca	300
aaaaagttaa gtcctgaaaa gaatgtgtac atgtacatgg gtgatcaagg cttttgcag	360
gtcgactgcc ggtctaggca gattgtgaag gatgaaataa gagaaatcga aatatcaac	420
aagaaaatat tgtcatcatc tccttggtgt cccaagaatg taagaattca tcttccat	480
catcggaatc gaattccagt tgcagcatag	510

<210> 186

<211> 1543

<212> DNA

<213> Papaver somniferum

<400> 186

atggatgcga ttgagtttcc ttaccaaagg gatgtctcgg tttcgaagaa tttgatgggt	60
aaaggatttg gtagagagcg tatgttagaa ggggatcgat cagaatccat cagtgttggt	120
tcagttcctc gtagctccgg tcttattgga tgcagcacta gtggtagtat taaagataaa	180
gctcgggagcag tgaaacaaaa acatggctta gacggtaaac ggagtgcag gaacaaagtt	240
aaaccaccta tgaagactaa actggattca ttcttttcga agaattgggat aacaagcaat	300
aactcatcct caggaggaaa caacattctt gggatatatg gtctgaaatc agatattcat	360
gctgttaciaa gtcatgtgga tgagctgtct ctgaatgaaa tccttgatgg cagttataaa	420
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cactcgggttc ggaagggtgt ctctatcctt caaccccaga gagcacctga accatcacag	540
aaagatgttg acctagacag tgggtcaata aagatggagg cttgcatatc tgataccggt	600
ttctgttcgt ctaaaagaga agaaaatgat aaagaagatg gggacttgca cggagaaact	660
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cctaattgta ttctggagcg cttagcattt caaccagtaa aggatttggga ttcactctta	780
catgatacag ccaagcctgg ggtgtctgtt agtcctgata tacgagcagt caagggaaca	840
tctcagagat atagattgcc gcctttctat tggtcacatt cttttactgg ctcatgtaaa	900
actaatgttg aaggagacaa gttgacaatt aggagtagcg cgttccaaag tagatgggtg	960
agaatagaga gcaccgcctc cactcaaggg gatagtactg gttgtttttc agacctggac	1020
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pctca2017050779-seql.txt

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gatcctctca ctggcttccc acataaatcc gataattatt taggtgctca gtcaaagttt	1200
ggttttaaca tgaacattgt taaagatggg agaaaaatag aaaacagtta tggtaagaa	1260
aaatatttaa ggtttgaaga aaacaaagat aatgggtgtg gtggagaacc aagtaagaga	1320
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 <212> DNA
 <213> Papaver somniferum

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<210> 191

<211> 669

<212> DNA

<213> Papaver somniferum

<400> 191

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<210> 194

<211> 507

<212> DNA

<213> Papaver somniferum

<400> 194

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 <211> 405
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 <213> Papaver somniferum

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 <211> 1028
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 <213> Papaver somniferum

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 <213> Papaver somniferum

<400> 197						
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 <211> 534
 <212> DNA
 <213> Papaver somniferum

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 <211> 1434
 <212> DNA
 <213> Papaver somniferum

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tctctctctc cgcagtctag ggcttcattg gctacacact ttggcctttc tccatctcag	360
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 <212> DNA
 <213> Papaver somniferum

<400> 201						
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<210> 202
<211> 381
<212> DNA
<213> Papaver somniferum

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ccgtgcgagt cactctatca gacgatgggt catgtctatc gtgctatatt ggagaatctg     300
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ccagtttcgc tgaagcagta a                                     381

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<210> 203
<211> 327
<212> DNA
<213> Papaver somniferum

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 <211> 336
 <212> DNA
 <213> Papaver somniferum

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gttggttat ccaaattaca ctccacttct ttttaa	336

<210> 205
 <211> 1416
 <212> DNA
 <213> Papaver somniferum

<400> 205	
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 <211> 546
 <212> DNA
 <213> Papaver somniferum

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<210> 207
 <211> 1311
 <212> DNA
 <213> Papaver somniferum

<400> 207	
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<210> 208
 <211> 411
 <212> DNA
 <213> Papaver somniferum

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<210> 209
 <211> 550
 <212> DNA
 <213> Papaver somniferum

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<210> 210
<211> 315
<212> DNA
<213> Papaver somniferum

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<210> 211
<211> 639
<212> DNA
<213> Papaver somniferum

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<210> 212
 <211> 792
 <212> DNA
 <213> Papaver somniferum

<400> 212						
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ttttcgagta	catttagagg	attgaaggta	cttacatgca	tgatctgtga	gaaagagtgc	720
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<210> 213
 <211> 957
 <212> DNA
 <213> Papaver somniferum

<400> 213						
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gtacttagtg	atcctgtgca	gcgaatgggt	tatgatgaga	tccatggata	tgcatgtgca	420
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tggaatgacc tttggggaaa gcctgcaacc tatgaaactt caggatttaa gaataaaaca      900
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<210> 214
<211> 441
<212> DNA
<213> Papaver somniferum

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cttatcgatg atgcaggaat tttctatgga gcatggtgca tcctaggagt agctgaaaat      240
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tctcaaaagt tgcatatgga gggagactgt cttaatgttg ttttggctat aaatagtaat      360
ctaggatctg ttagatggac taataacccc attatcatgg attgtaagga aatgttagga      420
agtttcagta gtttgggtata a      441

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<210> 215
<211> 921
<212> DNA
<213> Papaver somniferum

```

```

<400> 215
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aaaggaatag gactagagat atgtcgtcag ctcgctatta atggtatcac cgttatacta      120
accgcaagag atgagaccag gggaactcga tctgttgaag ctcttaaagg gtcaggactt      180
gctggtgtga tttttcatca gcttgatgta aacgatgcaa ctagtggttac ttcattggct      240
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gagaatgatg agattgccaa gttgttggag gaatccattg aggagacata cgagagggta      420
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gagaaactgg acgagcttat gcagaagttc ttaaaggatt ttaaggatgg gatgttgagg	660
actaatggat ggcctgtatt agtttctgcg tataaagtct cgaaagctgc tatcaatgcc	720
tacactcgaa ttcttgcgag gaagttccca acttttcgtg ttaatgctgt tcatcctggg	780
ttggttaaaa cagatatgtc attccaacaa ggtaacttaa caccggatga aggagctaaa	840
gcaccggtta tgggtggcatt gttgccttct gatggccctt ctggtttcta ctttgaccag	900
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<210> 216
 <211> 327
 <212> DNA
 <213> Papaver somniferum

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aaatactgta ttaccttttg ttttatttat gaaaggatc ttgttgcct tgagggactt	180
tgtgatgcaa actggatagt tgactcagag gagtctaagt ctacgagtgg atatgttttc	240
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<210> 217
 <211> 798
 <212> DNA
 <213> Papaver somniferum

<400> 217	
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attataacca agtactgtgt acgaagacgc gaatcgatga tagaaagaaa tgaattaaga	180
agtcacaaag ctatggttaa tcgcggtgtt gacgaaaacg tacttaaagc tattccaatt	240
ataacttatc atcatcaaca acaacaacaa agtagagatg aagaagaaga agtcttttgt	300
gtggatcaaa ctgagtgttc tgtttgttta ggtgatttac aagaaggatga tatgctaaga	360
ttattaccta actgtaaaca tgtttttcat gttccttgta ttgatcaatg gtggttaact	420
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caacaatata attgcagcga agggagtaac aataatgaag gtggcaattc ttcaataatg	600
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gtagaaaaac agcagtctaa aactgttttg ttaaagagat ccatgtctgt ggattgttct	720
tttgtttgca ttaaaataca accaagaacg gattcatctt cttcatcatc gtcaacttgg	780
aagacaactt caaagtag	798

<210> 218
 <211> 903
 <212> DNA
 <213> Papaver somniferum

<400> 218	
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gcttttggtg gtttattcca caatgatgaa aactcaaggt tactctctcc cacttcgtt	120
ttcaagctta gcaattcttg ttcaagtcag gaaaccaaag taagtcattc gggtagccct	180
gcgaaaaaga aaacaagaag taatcttacc agcaagggtt cttctaaagt tactgaagta	240
gaggaaatct acaaaaccga taatgaagac gaagattttc ttgaaaacaa gtgtgacatt	300
actaaaggga aatgggtatt caacaatttg tctcagccat tgtactcgga ccaatcttgc	360
ccgtacatcg acaaaacaagt ttcttgtgta aagaacggtc gaacggattc tgattaccgt	420
cactgggaat ggcaaccaga tgattgtgtt ttgccaaggt ttgatcctaa ggctgttctt	480
aataagctga gaaacaaaag actcatgttt gtaggagatt cactacagaa aaatcaatgg	540
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gcgccatttc tcatcgagtc aaatacagac ctcgatatca ttgcggatcc aaggaagaga	720
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<210> 219
 <211> 816
 <212> DNA
 <213> Papaver somniferum

<400> 219	
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ggcttttgtg gtccagcagg agatcctgca tactgtggct cgggatgtcg agagggctct	180
tgacgcctc ctaccgacgt taacgtagcc gatatcgtga caccagagtt ttttaatgga	240
atccttaatc aaggcgattg cccaggtaag aatttctatt cgcgtggcgc ttttcttgat	300

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gcaggccaag gtttcggtgc gacgatccaa gctatcaatg gtgctctcga atgcggcaat	720
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<210> 220
 <211> 720
 <212> DNA
 <213> Papaver somniferum

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gatatgggag gttcttatgg ttcaactctg cgctacaaga acgtggaacg agttaaacca	180
gttggaatac atactcttgt cggtgccagt ggagaaataa gtgatttcca ggagatcatg	240
cgttatcttg atgaacttat cttgtacgac aacatgtggg acgatgacaa ttctttgggc	300
ccaaaagaga ttcacaacta tttaactcgg gtgatgtata ataggcgtaa caagtttgat	360
ccactttgga attcacttgt catcgggtgga gtaaaaaatg gcaagaaata tcttggcacg	420
gtcagtatgc taggagtgc ttttgaagac gatcacatag caaccggctt tgggaatcat	480
ctggctcggc cgatcctccg tgctgaacat agtaatgaca tgagctttga agatgctgtt	540
aagttactgg agaagtgtat gcttgtactt ctttaccgtg atagatctgc aatcaacaag	600
cttcagatct ctaacattac tgaagaagg gtcacaattt cacagcctta ctctctgaaa	660
actttctggg gtttgtccgc cttcaaagat ccaaccaagg gtgccaagg ttcattgtag	720

<210> 221
 <211> 549
 <212> DNA
 <213> Papaver somniferum

<400> 221	
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agattcaatc tttgctcaac cgatagtact cgcaagggat gtattgggag agtaagtgt	180
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atccgttcag agttatcttt tataacgtcg aagatgcctc gatactttaa agccattcta	360
gcaacagtgg agctgaccgt tgtgttacat catgtttttg attctctaac ggataagata	420
ttgtgggatg tggttcaaca ggaaaccgag gttacgttca tctcgaaccg acatgcttct	480
gtagaagtca attccatgaa acatcctact ttagataact tagctcgaat ccatctctta	540
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<210> 222
 <211> 255
 <212> DNA
 <213> Papaver somniferum

<400> 222	
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cttttgacac aagaagagtt accacttcga gcgtgggaga aggacgtaca ggtgatgaac	180
gaaggacctg ggcataattcc acttcataag atccctgaaa acatggaaaa caagtctaca	240
aggcagaaaa tatag	255

<210> 223
 <211> 306
 <212> DNA
 <213> Papaver somniferum

<400> 223	
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gagaatttca tccctagtaa tgggagccac caaattagtt gcatacagaat cactcaccac	120
cttagcaaat tgaataaatt cagcatcaga gttattaata ccagaagaac cagcaccagt	180
aacaaactag aaaagaagga agtacactca agagcaattt ctttatcttc atccaacatc	240
acccgattag aattctttta ggataaaata ttgtttctac atctcctttc cttaacagag	300
ctatga	306

<210> 224
 <211> 561
 <212> DNA
 <213> Papaver somniferum

<400> 224	
atgggttact ttgatattcc agtggatcat gtatatgggc agcctgtagt tctcgactac	60
ctagccagca aaaatatattg ttctgatgat ttggtagtgg ttccacctga tgttggagga	120
gttgctagag cacgtgcatt tgccaagaag ttatcagatg cgccattagc cattgttgat	180
aaaaggcgtc atgggcacaa tgttgctgag gtgatgaatc tgatcggaga tgtaaaggg	240

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aaagttgcag tgatggtgga tgacatgata gatactgccg gtactatctc aaaaggtgca	300
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agtcctcctg cgatagagag gctatccagc ggtctctttc aagaagtgat catcacgaac	420
accataccag tgttggagaa gaattacttt ccacaactta cagttctgtc ggtagctaac	480
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<210> 225
 <211> 2372
 <212> DNA
 <213> Papaver somniferum

<400> 225	
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attttggcaa aaaacattac tgaagctctt gagaagtcca tggaggacaa attaggggta	120
agagatacca agcttgaaac catgcagaat caaattttga aggttgcaaa acatataaat	180
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cagtttttac agaattgatga agtacctgaa gatgtattgc gtactttaaa cattaagaaa	300
ccgtatgaag gtttcatagg tcattcaaag aagaagatag tttctcctgc acttgacaat	360
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<210> 226
 <211> 528
 <212> DNA
 <213> Papaver somniferum

<400> 226						
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ccaaaatcaa	accctaagaa	acccaatact	cttctgtccg	attcaattac	atcaattttt	120
gcaattgggt	tatcattatc	gagaatcttt	caaggggttt	taaacaaggc	accagaattg	180
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aatataattc	caccgatttt	tgatacattg	gatgttagtc	cgttgcttgc	ttttgctgtt	480
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pctca2017050779-seql.txt

<210> 227

<211> 789

<212> DNA

<213> Papaver somniferum

<400> 227

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tttgaactgg caagagatgc attaaattca gatggatttt gtgttattgg aggttacatg      180
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<210> 228

<211> 279

<212> DNA

<213> Papaver somniferum

<400> 228

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aacgagacca atgagttagg acagaaagag cgtcctgcta gtatcaatga tcatctcaca      120
ccagctgaga ggcgctatat tgagcaaagg gaaagaatcg atgtccgcag gctggcaaag      180
acttcaaaca aatctcaccg tgatcgcatt caagatttca atcagtatct ggcaaacatg      240
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<210> 229

<211> 1095

<212> DNA

<213> Papaver somniferum

<400> 229

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tgtagtacta gcaaaggagg aggaatgggt tgtactctgt tgatttatga atatatggag	660
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 <213> Papaver somniferum

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cttgattttc aaccggctag gctaggagga gaaggaaaat tggttgcagc aactttta	660
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<212> DNA
<213> Papaver somniferum

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tggaataatt tagacaatca cacattagat gtgtccaagt taacaccttt acttgatgat     600
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<400> 232

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gacagaatca atcggaaaagg accttatatc ggggtggtga tggcttactc tactgaagaa	240
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 <213> Papaver somniferum

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<211> 747

<212> DNA

<213> Papaver somniferum

<400> 234

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tccaacatta tttcacctac acaaactgct tatgttcctg gtagacatat ccataagaat	240
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 <211> 299
 <212> DNA
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ggttcatggc gtatgtgtgt ggatagtagg gaaatcaata gaatcacatt gaagtaccga	180
tttccaattc ctcgtttgga tgacttactg gatcaattaa gtggagcatg tgtttttagc	240
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 <212> DNA
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 <212> DNA
 <213> Papaver somniferum

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<210> 239
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 <212> DNA
 <213> Papaver somniferum

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<210> 240
 <211> 1500
 <212> DNA

<213> Papaver somniferum

<400> 240

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<210> 241

<211> 612

<212> DNA

<213> Papaver somniferum

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 <213> Papaver somniferum

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<212> DNA

<213> Papaver somniferum

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 <213> Papaver somniferum

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 <213> Papaver somniferum

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 <212> DNA
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<210> 253
 <211> 921
 <212> DNA
 <213> Papaver somniferum

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<211> 957
<212> DNA
<213> Papaver somniferum

<400> 255
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gaagatgaaa tgcgcctggg tgaaagagta actgttgcac tgatgcttgc tggaatggga 720
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 <212> DNA
 <213> Papaver somniferum

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 <211> 224
 <212> DNA
 <213> Papaver somniferum

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<210> 258
 <211> 955
 <212> DNA
 <213> Papaver somniferum

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 agtgttgata tgaacatgca ttttcaacat cttcgagaag tgcttccaac tctacgtcgg 180
 gaaaaattat ttgcagccat caagaagtgt tcattcatga ctgaccaaatt tctatttctc 240
 ggctatgtcg taaccaagga tggaataaag gtagattatt ccaaggttga agctgtaaga 300
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 taccggcgtt ttattcatca cttcagcacc attatggcac ccattactga atgcatgaaa 420
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 cagaatcaag ttgctgatgc ttttaagccgt cgaagtatgt tactcaacac catgcgaact 900
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<210> 259
 <211> 232
 <212> DNA
 <213> Papaver somniferum

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<400> 259
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cagctagaac acattctctt acgtcctgat acatatattg gttcgattga gaaacacaca 180
cagagtttat ggggtttttga aggaggtcag atggttttaca gaccggtgag tt 232

<210> 260
<211> 510
<212> DNA
<213> Papaver somniferum

<400> 260
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aagggtgccg taacagtcac gccaaactatc tttccgaata tgaaaaaact gcattttaat 120
gatatcaatg gcagtgcagt aagttcaatt ttgaccaacc tgacttctct tgctcatctt 180
agtataacag aagttccaga gctctttatc caacaaggat tatttggtta caacaatctt 240
cttgaaagct tatcagtcag acgctgcacc gattttcaag gtttttggtc acttgaggaa 300
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<210> 261
<211> 1206
<212> DNA
<213> Papaver somniferum

<400> 261
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agtttggaag atactgatgt aaaagaattg ccagagtcct tgagtagcag catttgtaaa 180
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gatttgagat gcatgcgtaa gtctaacagg tttgctgac agtatcaagt gatgcctaca 300
ggaattgaaa tgctaactcg cctggaggtc ttagattcct acgtgggttag gaatgaaaag 360
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tcctgtctag aatttcttga tgaactgagt aggggtaatt ttatagattt taatgatcct     1140
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<210> 262

<400> 262
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<210> 263

<211> 1161

<212> DNA

<213> Papaver somniferum

<400> 263

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ttgcttttca tttctgaact cagattatat atcaattcaa tgactcatac ggaacttggt     180
gtagacacat ctagaggaga aactcttcgt atcaattttg atgtcacttt tccagccctt     240
ccgtgttcga ttctcagtct tgatgcatg gatattagcg gggaacaaca tcttgatgtg     300
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cacaatgaga catattgtgg ttcatgttat ggcgacagaaa caacggacgc agattgttgt     480
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gaaggatgca atatttatgg attcttagag gtgaataagg tggctggaaa ttttcatttt     660
gcgcctggga agagtttcca gcagtcaaat gttcatgtac acgatgtgac ggcttttcag     720
aaggattcct ttaatataag tcacaaaatc aataaattat cttttggaga atctttccct     780
gggtgttgta atccgcttga tcgggtacag tggacgcaaa agactcctac tgggatgttt     840
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catgtgtcat tcttacattt tctaacaaat atttgtgcaa tagttggagg tatgttcaca	1080
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gaaataggaa agtttagtta g	1161

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 <212> DNA
 <213> Papaver somniferum

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<210> 265
 <211> 789
 <212> DNA
 <213> Papaver somniferum

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tttgaactgg caagagatgc attaaattca gatggatttt gtgttattgg aggttacatg	180

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tatggaattg tttgtattcg caggaaggt actgacattg agaagattat ttcaggggat	540
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attagtctt caagaatgag ggaatgtatt tcaagaggat tatcaataaa gtatctgacg	660
gtagatgaag tgattgatta tatcagacaa cacaatttgt acctgaattt ggatttaact	720
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<210> 266
 <211> 485
 <212> DNA
 <213> Papaver somniferum

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<210> 267
 <211> 460
 <212> DNA
 <213> Papaver somniferum

<400> 267	
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gatgaacctt tggaaaatat tgataatgat agtgctacta actcaactca tgatcataat	120
gatcattctc ctattcaaaa ggaagaagtc gagtctagaa aactacaat tattgatggt	180
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gaaaccaatg aatgtcttgc caagagtttg actgagaatg atgatacttg tgatgtgaga	420
atggaagtgt ccagcagtgc cgaggacctc gaaatacaag	460

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 <211> 539
 <212> DNA
 <213> Papaver somniferum

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gattcaccac gaagcaatca cctcagtaaa aagaaaatcg acgaaatgat tgaagaagcg	420
ttgtcacata aacagtccaa ggatgagaga caacaaatct tatcaatgaa gagatcgatg	480
gattcaccgt ttactaacag gataaagcag ttctgaccac ctctgaattt catcctgcc	539

<210> 269
 <211> 1161
 <212> DNA
 <213> Papaver somniferum

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gggcacaata ccgagtcttg tcgaactctg gcaacagaag ttcagaaaat gatcgacgaa	660
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atgtacaagg tacgtcgagt tctagtcgat actggaagtt caattagcgt catattctcc	1020
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ggaggaaaaa cggttatgta a	1161

<210> 270
 <211> 375
 <212> DNA
 <213> Papaver somniferum

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gaagaagcag atggcatctc tacaactcag gaaaaggact ttttaaagtt aatgaagctc	180
aagtacttta taagtcttgc tcagccagga gaacttggtg gtgttcttgc tgctgagtcc	240
gtagtagagc catctagcaa gatgacgtca gatacatttc ttattttttc ctttttcttt	300
atttatcatc atgtacgtgc atttctagta gatcgcgaga tggcaaagtc gtccggagtt	360
gaatatatta cttag	375

<210> 271
 <211> 954
 <212> DNA
 <213> Papaver somniferum

<400> 271	
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tacctgcggt gtgtaactcg tgatgagggg atgaaattgt tagctgagac gcatgaaggt	120
tgttggtggca atcattctgg aggcaggagt ttggcacata ggttgctttc tcaaggatac	180
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<211> 903

<212> DNA

<213> Papaver somniferum

<400> 272

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<211> 666

<212> DNA

<213> Papaver somniferum

<400> 273

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 <213> Papaver somniferum

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aaccaaataga atgctaccat taaaacggt	389

<210> 275
 <211> 1268
 <212> DNA
 <213> Papaver somniferum

<400> 275	
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<210> 276

<211> 885

<212> DNA

<213> Papaver somniferum

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<210> 278
 <211> 1374
 <212> DNA
 <213> Papaver somniferum

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<210> 279

<211> 1740

<212> DNA

<213> Papaver somniferum

<400> 279

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<210> 280

<211> 664

<212> DNA

<213> Papaver somniferum

<400> 280

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<210> 281
<211> 2372
<212> DNA
<213> Papaver somniferum

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<210> 282
<211> 453
<212> DNA
<213> Papaver somniferum

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<400> 282
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<210> 283
<211> 1038
<212> DNA
<213> Papaver somniferum

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<400> 283
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pctca2017050779-seq1.txt

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 acgacagact tgacagactt tcagaagatg attcgcttgc caaagcaciaa gttgatgggg 480
 tcagcttacc cagaggaatc agggacttta aagctTTTTg atcacaggcc tctgaaacta 540
 agcgaagatg ataatcttcg ggTTTctaag atccccaggg aaaagggcgc gaacttcaga 600
 aacctccctg gagtgattgt tgatgggaac aaggcatgtc gtgatccaaa gatggccaaa 660
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 ggaacttcca aaaagccatt tggaagactc tggTgggatg aaatcgtgtc taccgttgtc 780
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 aagcagaggt acatgcaagt tggtaacgcc gtggctgtac cggtaggaaa agctctagga 960
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<210> 284
 <211> 315
 <212> DNA
 <213> Papaver somniferum

<400> 284
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 tttcataacc atttcaaaat catctcacca aaccatact tcttgaaca tctattcat 180
 tcaggccatc ccataacacc tacagtTtca tctacacaaa caacaccacc attctctagc 240
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 attacctcaa gataa 315

<210> 285
 <211> 2013
 <212> DNA
 <213> Papaver somniferum

<400> 285
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 tggctTTTga tatctaacc tgcTagtact cctgtTaatg gttcttcttt atttagcatt 180
 agtaataatt caactaaatc tggTttcgat tgcTgcctt tggtaggtct tgacaataac 240
 aatgagactg ttactttgct tactcagaaa ccaccttcag atagtgttga tgatgagaaa 300
 ttaccctcga ttagttctga taagatagat tcagatgcaa gtggTgagat taaagaaaag 360

pctca2017050779-seql.txt

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gggtgttgaag caggaccaat tgataacaaa tcacctgatg tttcttctga taagccagag 420
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acttctaaca ttccagagga gattccagtt ccatcacctc cattatctga tgtaactagt 540
aaaattgatt caggagaaaa gggtgttgaa gcgggaggcg atgacaagat aactgattct 600
gaatttcctt cgactacaaa aaaggaaaatt acagttcctt ctctccatt gtcgaaggat 660
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ccaaacaaga aaacaaaacg tggcccaaat ggagagccgc cgccacagga ttgcttgac 1920
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```

```

<210> 286
<211> 525
<212> DNA
<213> Papaver somniferum

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pctca2017050779-seql.txt

<400> 286
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 ctccccatttc catactcaaa tcactgttca atatccaaat ttcacgaaca tcaattacat 180
 ccatgcttca acaaatataa cagccttaaa tcaagtaaca agatattacc tcaaaaacaa 240
 acacaaaagt cttcttcttc gtctaattac gcatcattag tatcatctct tccatcagca 300
 atccaaaccc atgaacctca aaactctgtt ttatcaagaa ccctaaattc aatcaccatc 360
 attggatttc atcctctaaa acttatcttc atctgtaatg tcaactcaaa tcctcaattc 420
 actcattacc caactcgaat caacctctta gaacatcgat ttcacctttc aatagtttcc 480
 ctgaatttta acgaaaccct aactctccaa ctcaacactg aataa 525

<210> 287
 <211> 1257
 <212> DNA
 <213> Papaver somniferum

<400> 287
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 ccggattcca tctaccattt acggctagga tttgcatcct tagcctcaaa accatatatg 180
 agagaagcta acaacaaaca ctatttcatc atcaaatgga ttctatggcc attgacattt 240
 ttgtggagcg tattgtttca aaggatgttg agtcacacat ttgtactcga aagaaacatt 300
 tttgatgatc accaagtgc caagaagcta ctccaagtac agacatgggc aatacctaga 360
 tattcttatc aatacaaaaag gttgacaagg caaagaggaa caataaatag tttgattgag 420
 aaagccatac ttgatgctga taaagctggt gccaaagtga taagcttagg cctcttaaatt 480
 cagggagaag aaatgaacag aaatggtgaa gtttatatac aaaagcatcc aaacttgaag 540
 attaagattg tggatgggag tagcttagct gcagcaatcg tgcttaacag catcactaat 600
 cttaagacgc agcagcaagt agttgttatg atgagaggga gacttacaaa gctggcttgt 660
 tacattgcct tggctttgtg ccaaagagga attcaagttg tggttaagtt gcagagcacc 720
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 tcatctctcg agaattgca ctcttgtag aactggttgc caagaagggt aatgagtgca 1080
 tggagagtcg cgggaatgtt gcacgcactg gaggattggg aaggacatga atgtgggaat 1140

pctca2017050779-seql.txt

tggtttatca aggagaatga caacatgatc gataaagtat gggctgctgg tttgcgccat	1200
ggtttccgcc cttattatctt acctgttccc tgcaccagcg ctgtcattgc tgcttaa	1257

<210> 288
 <211> 547
 <212> DNA
 <213> Papaver somniferum

<400> 288	
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atgctaagga agatgaataa gactaatctt tgtttgatac caaacatcca gttaccacag	180
gcaccaggtg actacatgcc aatagattta tgtaacacca catataagct gatcacaaaag	240
attatggcaa tgaggctgaa acctttgatg aataagctaa tttcaccaat gcaggcatca	300
tatgtcccag ggagacaaat aggagacaat atcactcttg cacatgaatt aatccattgg	360
atgaaaagaa agaagacaaa aatgggatac atggaatcga agttagacat gttcaatgca	420
tttgatcaag tggaatggtc tttcttgccc aaagtcattg aaacttttgg ttttgctgat	480
cattttttgtg acttgataca tgaatgcac agcactaaaa agattcagat tatgctaaat	540
ggttcac	547

<210> 289
 <211> 336
 <212> DNA
 <213> Papaver somniferum

<400> 289	
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gtttttgtaa ggtattttcc gatggcaatg tcaaagagta gaatcctcac acagtgtgca	180
gcaaaaacta ttcgacgcaa gctgaagtgg atacacaagt ttgttggttac agtcaccttt	240
ctctttgcaa ttttaaagta tatttctcat atttggaattc gattgttcat ggttgaggta	300
catttctcat atgtgtctgt gtacaagtac aactag	336

<210> 290
 <211> 1950
 <212> DNA
 <213> Papaver somniferum

<400> 290	
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cagaagggtc ttacttccat tgggaatttc tgcatttgct cgatagcggg gggactgatc	120
attgagatca tcgttatgtt tcctatccag catcgaccgt accgaaccgg aatcaacaac	180

pctca2017050779-seql.txt

cttcttggtc	tcttaattgg	agggataccc	atagctatgc	ccaccgtggt	atccgttacg	240
cttgcaattg	gctctcatcg	cctctcacia	caggggtgcta	ttacaaaacg	gatgactgcg	300
atagaagaaa	tggcaggaat	ggatgtcctc	tgcagtgaca	aaactggaac	cctgacactg	360
aatcgccctc	cggtcgaccg	aagccttatt	gaggttttta	acaaaaacat	ggacaaaagac	420
actgttggtg	tgcttgacgc	tagagcctca	agacttgaaa	atcaggacgc	catcgacacg	480
gccattgtta	acatgcttgc	tgatccgaag	gaggcacgcg	aaaacatcac	accagttcat	540
tttctaccct	tcaatcctgt	agaaaagcgg	actgcaatta	catacatcga	tgccgaggga	600
aactggcata	gggctagtaa	aggagctcca	gaacagattc	tcaacttatg	ccaagaaaaa	660
gaacagatag	ctgggaaaagt	acatgccatc	attgacaagt	ttgctgaaaag	gggattgacg	720
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ggttgggctg	gcgcaatatg	gttctacagc	ttgctcttag	cggcggagcc	tggaatctgt	1860
tgtttgatag	aaagacggct	ttcacttcta	agaaagatta	cgggaaggaa	gatagagaag	1920
caaagtgggt	tctttctcaa	agattactag				1950

<210> 291

pctca2017050779-seql.txt

<211> 399

<212> DNA

<213> Papaver somniferum

<400> 291

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tgcgatgaac aggaatcggc tgttcaaatt agcgatgtaa tataacaagaa cataacagga    120
actagcgctt cagaagttgc tgtatatattt gattgcagca agaattatcc atgtcaagac    180
atagttttgc aagatataaa tctagtgaga gatgaagatg gaaaagcagc tacatcttcg    240
tgcaagaatg tcaaattgac tcaagtcgga aaagtttcgc ctggttgtag tagggttcaa    300
ctcaaagaat ggtttcttaa gaggatagaa gaggaagaag aaaaagaaga agatattttc    360
catggccatg accaagttgt ctattacact gatcattaa                             399

```

<210> 292

<211> 891

<212> DNA

<213> Papaver somniferum

<400> 292

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atggctccac aaaaaaatgt attctcaaatt attctgtttt cgatagtatt aatcttcatt      60
ctttgtaaca actcgtactg ttgtcgtggg ggtgctactc ttacttcact agacctacat    120
cccacagatg aacaacctag tgatagtaat aatgaacaag gagaaatcct caggttccgt    180
ggcattaaca atggccacat aaaggtttca gctaaaagga tgatgagtgt tgctgacttt    240
ggagctaaag gtgacggtaa gacagatgat tctaaggctt tttttaaggc ttggaagaaa    300
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aaacccgcta catttaaagg tccatgcaaa tccaatatta caattaagat agatggagcc    420
atcgaagctt ctgcagatcg atcagattat aaacgggatg tcagacattg gattatcttc    480
aagaagattc aaaatctcgt agttgaagggt gatggaacaa ttgatggaaa aggagatatt    540
tggtggaaga attcatgtaa aattaataaaa tctcgtccct gtacacatgc gccgacggct    600
ttaaccttca aagagtgcaa taatctaact gtggaaaaca taaccataaa agatgggcag    660
caaatgcac taagttttca aaaatgtatg aaagttgaag ctcacaattt actgataact    720
gcaccagaaa aaagcccga tacagatggg attcatgtca cgcgaaactca aaatatcact    780
attatcaact ctgttattgg tacaggatgat gactgcatct ctatagttaa tgggtctcga    840
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```

<210> 293

<211> 519

<212> DNA

<213> Papaver somniferum

<400> 293

pctca2017050779-seq1.txt

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aaaagagagt tcctctcgaa atttcacagt cctgtcagaa gggcactttt ggtaattaca	120
caaatcattt ctccacttaa aatcagaaat tgtaaaaccc taatcagtc tagtccgcct	180
tcaattttca gatttccaca atttcagatc ttatctcaag ttttgcagat cgatccatgc	240
aataaatttc cccacaagtt tcaattccta tttctcattt ttgatcttcc cccaaatcaa	300
aacccaata agtggagtat tcattttgtt atatgggatt ttgggtggagg gatcgggaaca	360
cacaaagaca accatagcat gatgatattt cctctcaaaa cagagcctta tgaattcatg	420
gaggccggta taaggatcaa ggcattttgc tgctgcagga attcctcaag gaagttatgc	480
ttgattgatt ttattaatca agtaagtaat tgtgaataa	519

<210> 294
 <211> 576
 <212> DNA
 <213> Papaver somniferum

<400> 294	
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gaaatctctg agctagccat gttgaagcgg gcaagaattg aacgtatgag agcacataag	480
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gttatgttct gcctcgtcat aattgtccaa gtttga	576

<210> 295
 <211> 1779
 <212> DNA
 <213> Papaver somniferum

<400> 295	
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tttgatgatg atttttgtca gtacatgaag ggtgagcatg atgtagatct tttccctgaa	120
gaagaagttt ttactccagt agatcctagc aaaaatggagg taaaaactag atttgcaaat	180
aaggaagcat ttaagaaaca tctcaggggt tattgtgttc ttaataagtg tcaatatatt	240
ttggatagaa gtgctccctc tagaattaag gctgagtgtg ggtttaaaac agaacatgat	300
tgtccttgggt ttgtgtatgc tagcaagaaa gagggtgaga agacttttgt tcttaggaaa	360

pctca2017050779-seql.txt

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gtgaatttgg aacataagtg tgaaggggat ccccaaaata ggaatagatc tgctgaccc 420
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gacccttata aaatcaagga agacttctta gctgaaaaga gagtaaata accatatcag 540
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tacaatgaag taccagcatt ctgcaagatg tttacaaaat gcaatgatgg gtctgttgct 660
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gcaatgaggg gttggcgaaa agcatgcagg ggagttatag ggcttgatgc ctgccatcta 780
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gtaatgttag gaattatggt atgcagagct gaaacaaaagg aaaattggat catttttttg 900
aagcatttga aggatgcaat attagcacat ccagtgaag tggctttcat ttcagatagg 960
caaaaagggtt tattggaagc tgttgggtata gtgttccctg gccatcacca cagatactgt 1020
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```

<210> 296

<211> 498

<212> DNA

<213> Papaver somniferum

<400> 296

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agtattatct ctttctttga tcattctgtg aactccagaa tgtgtttgcg agaatttgtt 180
gaaagctgtg atcaagcact agaaaagaatt tacatttagag aacgggatga agattacgag 240

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pctca2017050779-seql.txt

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cggtcggaag caattgaggc tgatggtgat gaagaaactt atagagtgtg ctcgttcaat	420
gatgaagtac cgacggaaca gtttctagta aagattaata aggtaacgaa caaagggtga	480
tgtggttgcc aagaatag	498

<210> 297
 <211> 315
 <212> DNA
 <213> Papaver somniferum

<400> 297	
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<212> DNA

<213> Papaver somniferum

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acaggcatct ttactgcccata tatcgtaacc aggtcacat atgatgcagc tgcgcccattg	300
cattggccag tggacatccc cccacagccg gcatacatat caagaagcgt cataacctca	360
gaaccacacg ctaaggaacg cgtcttggat gatgatgaag cagcttcctt gaccacttct	420
gagctacctt caccagaaat catagatgat gatgaagcag cggcatcctg tccattttct	480
atgctgcaagt tttcgaatgt gcaaaaactca tctgagtatg acatcataaa agaaatcaca	540
ttcagggaca tttgtggacg cttgagcaac tgtcactttt tgaacaataa aattcagtgg	600
attggcatct ttagagtccg aagaaaatac acgttcacgt ttcggttcaa ttttaccaga	660
atgctcttta attactattc tgccaatata atcaagctgg ccttcttccg cctctcttat	720
tgccgtcacc tcaacatggg cattaggatc agtatgcttc aaaaccatgt tgtggcatct	780

pctca2017050779-seql.txt

```

caaaactact ttattattgc gaacaacgac tgcaccgaaa gggcctccat ctccattatc      840
cactcctttg tatgcttctt caactgcttt tgttacgaat tcatggtcct tgtcttgtac      900
agcttcttgg taaccagaaa atgcagtggc aacagatata gttccatcct tggcttcgac      960
aacttttagct tcttccatgg tgggattgag aaattggaat gggattcagt gatcagacag     1020
atttcggaga gaaatagcta ttcagaattc agaacaatgt taaactggaa gaatctggat     1080
tctagatag                                     1089

```

```

<210> 314
<211> 537
<212> DNA
<213> Papaver somniferum

```

```

<400> 314
atgcttagtg agcttgacct tgccacaaag aatcgctcct gtaccttcac tccagatatg      60
tttcgttggt ctcagcagat actggagggt gtggatctga aacatatgct ggagtttgcc     120
ggccacaagg aagaagtatt gtcgacgaga cgagctaaaa agattatgga agaggttcag     180
attccggaat taagcgacca catagatggt cgcaaccacag agctcgttat ggagcagttc     240
aaggggttac aggaaaaagt aaaaaacgcc tcaagtgaga ttggtgacaa tttaaatggt     300
taccttggct ccctgccagt attgaaagct gttaagcgtg tattgttacg actagagcgt     360
atatgtttat tgaagtctgt aaattctaag cgtatgtggt tatggaatcc tgatgatgac     420
atcaagttac tcgagaaaag ccatgatgct gctcagaaag cgatgaaagc aggacaaagt     480
ggcaaaacat ccaacagatt taaggagggt aactctgcta ccttgcttat tctttaa       537

```

```

<210> 315
<211> 328
<212> DNA
<213> Papaver somniferum

```

```

<400> 315
atgtcagttg aagaagacca tgacgatgtc atgagtgaag aggatatcac agtagtagag      60
tcgatgacaa gtcaagagca tgcttcaaag aaaaggaaat ttacatcaaa agtatggaat     120
gattttgatt ggtcacgaga caaagatggt aaagaaaagg ctacgtgcaa gcattgtagg     180
aaggaatatg cttatgacag tcagaaagga ggaacatcaa ctatgtcaag gtatttaaag     240
aagttcccta gactgaagat gcaagatgtg gggcaacttt tgttatctac aaataatgga     300
gaacaggcta ctcgtgcacg caaaatag                                     328

```

```

<210> 316
<211> 906
<212> DNA
<213> Papaver somniferum

```

pctca2017050779-seql.txt

```

<400> 316
atgaattttg gaactaacca aggtgtaa at ggcggtttca gtattacacg agaaacatca      60
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gttgacaatt atgggaat ttt tatgactcca agcagcaagg atctcagcct acttccca at      180
agggtaactc ctacttcac tatttctata tcgccaaatt ttgcagaacc aatacaaa ac      240
atgtgcccc aatcctcaac attttgtacc agcttacacg tatcaccatc ggcaacctta      300
aaccctcaga tgcagtttct tcaacctggt agcttatcgt caaccgagta tatgatgcct      360
caaactgctc agaccatgtt acctgttcaa ctgcaagggtg aaaatttagt agcttatcag      420
cggtagcagg gccagcagat tatgaatggt ggacacactg aattgcttgg agatgttatt      480
ggagctggca ccttcgattg ggccactggc cgtacctttg atgttgccag gactgacaac      540
attatatctc aacaaaagg gttgcaatta caatcgaaac gcgttgactt tatcatgaac      600
catgacaatc agaatgctca gatggatgaa atttttacag caactgaaca ttcccaaatt      660
catggtaatc acagccaggc gaatagaagt tttacatttt cccttgaaga tgagacaa at      720
tcttccatct ctagcattga tgctctccac aagcctcgaa tgcgctggac gcagaagcta      780
cacgactgct ttgttcaagc aattaatgat ttaggtggag ctgataaagc aactccaaaa      840
agtgtacaga tgaaaatggg tgtcgaagga ttaaccatat accatgtgaa aagccacttg      900
cagaaa                                           906

```

```

<210> 317
<211> 807
<212> DNA
<213> Papaver somniferum

```

```

<400> 317
atggcctttt tagatggtaa tcctcccgag agactttgca agccggctcgt ggatcatata      60
gagtcacttg gcggtgaagt ccgtctcaat tccaggatta aaaagattga gcttaaaaaa      120
gatggtaccg tgaaacgtct aatgctcacc aacggtgatg caatagaagg agatgcttat      180
gtcattgcaa cccagtgga catcctaaag ctgcttatac ccgaggagt gaaagaagtt      240
gggtacttta aaagattgga taaattagtt ggagttcctg tgattaacgt ccatatatgg      300
tttgacaaga aattgaaaaa tacatatgat catcttctct tcagcagaag tcccctctta      360
agcgtatacg ctgacatgtc agtgacatgc aaggaatatt atgacccaaa caaatccatg      420
cttgagttgg tatttgcacc cgctgaggaa tggatctcgc gcagtgactc tgaaattatt      480
gaagctacta tgcaggagct tgcgaaaactc tttcctgacg aaattgccgc agaccagagc      540
aaagcaaaaa tattgaaata ccacattgtt aaaacaccaa ggtctgttta taaaaccatt      600
cctgattgtg agccggcacg tccattacaa agatctccca tagagggttt ctatttggct      660
ggggactaca cgaagcaaaa gtatttggca tcaatggaag gtgcagtttt atctggaaag      720

```

pctca2017050779-seql.txt

ctctgtgcg aagctattgt gaaggattgt gagatgcttg ctgctcgggt agaagaaaaa 780
actacagcag aagcaactgt tgcttaa 807

<210> 318
<211> 945
<212> DNA
<213> Papaver somniferum

<400> 318
atgagtgacc aaaccgtatc cgtttcttcg ctagatgaca aactcaaca ccactctctc 60
tgtgatttca attcaatctc ttcttcttct tcctgcttct cctccttccc ctttcagtta 120
aatttagagt tgagggtcaat aataatttct tacctaattt tgattttgat tttgactcca 180
attctccctc tgaacgacaa caacgagaag aagaagaaga tgacgagcac tactgctagt 240
acagtttctt cggttatcaa caggatttgg aattctaact cttctaattc aacatcaaca 300
accagagggc gtactaatca tctactatct gggggatttc gagggagtat tgctactagt 360
agtagctcta tgctgctgcc tcggtcttta aaatctcatc aaacacctac tgctaggacg 420
accaacaaga agaagaacaa ttctcctcga agacctaat tacaggttgt gtgtatggat 480
tatccaagac ctgaactcga caacactgtt aattacttgg aagctgctta tttttcatct 540
tccttactg tttctccaag acctaataag cctttgattg ttgtcattgc tgggtgcaggc 600
ttggctgggt tgtcaactgc aaaataacct gcagatgcag ggcacaaacc catactcctg 660
gaagcaagag atgttctcgg tggaaaggta gctgcttggg aggatgatga tggagactgg 720
tatgaaaccg gactacacat attttttggg gcttaccxaa acgtgcagaa tttgtttgga 780
gaacttggta ttagtgatcg actgcagtgg aaggaacatt ctatgatttt tgcaatgcct 840
agcaagccag gggaattcag ccgattcgat ttccctgacg ttcttctgc acccttaa 900
ggaatctggg caatcttaag aaacaatgaa atgcttacat ggcct 945

<210> 319
<211> 1542
<212> DNA
<213> Papaver somniferum

<400> 319
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tgcacgtttc tcctcctcct tatcaccxaa ggctccacgg ttgaggggtt tggctgtaac 120
tgggggacgc gcgcaacaca tccactgcca gctgacattg tcgttaagct attgcaagac 180
aatggattcg acaagggtgaa gctcttcgaa cccgatcctc acgctttaac agctcttgca 240
acttctggga ttcaagttat gttggggata cctaataaat tcctagcagc gcttgcttct 300
agtgttcgag tcgccgaaaa ctgggtgcag cagaatgtgt ccgcttacat cagagacggc 360

pctca2017050779-seq1.txt

gtcgatatac ggtatgtagc tgtggggaat gaaccatttt tgaagacata tggacaagct	420
tacctacaga cgacattccc agctctaaag aacattcaag ctgcactcat caaagccggg	480
ttaggcaagc aaatcaaagt caccgtcccc ctcaacgccg acgtctacca aacggatacc	540
gatttgcctt ccggtggtga ttttcggcca gatatacatt ccctcatgat ctccatcgtc	600
aaattcttaa gcgagagcag ttaccctctt accattaaca tctatccttt ccttagtcta	660
tacgccgatt cgcacttccc ggtcgattac gctttcttct ctgggactgc tacacctgtt	720
gtggacggac ctatttctta ctcaaatgtc tttgaagcga attacgatac tctcatttgg	780
gctctcgaga agaattggatt cccgtcggtt ccggtgatta tcggggaagt tggttggccg	840
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aaccgcattt ttcaaggcca aggtacgccg aaaaggaaga gcgcgccgga gacatacgta	960
ttcggactga ttgacgaaga tgcaaagagc atagaccagc ggaattttga gagacactgg	1020
gggatgttca actatgacgg gactttgaaa tactcgttac agttgggtaa taatagaaag	1080
ctagtccccg caaagggggt caagtatttg gaaaaacaat ggtgtgtaat gtcgccacaa	1140
gcaagcactt ccgatcccat cttcgtagag agcgtgacat acgcctgcac tcacgctgat	1200
tgtaccagcc ttagttacgg gtcgtcttgt ggtgatttgg acgcagccag caatgcttcg	1260
tatgcattta acaggtttta ccagactgca aatcaacaga gagggagtgt taatttcaac	1320
aacttagctg ttgtcaccac cacaaatcct aatactcaag atcctaaatg caagtttgat	1380
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gcattctctc ctggtcttgt gcaacaaaac tccttgtcgt cttggatgat tagtaccgtg	1500
tttgaaccc tagttttgat tgtagtagt agtttgggtgt aa	1542

<210> 320
 <211> 1815
 <212> DNA
 <213> Papaver somniferum

<400> 320	
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attggaggga tacccatagc tatgcccacc gtgttatccg ttacgcttgc aattggctct	120
catcgctctt cacaacaggg tgctattaca aaacggatga ctgcgataga agaaatggca	180
ggaatggatg tcctctgcag tgacaaaact ggaaccctga cactgaatcg cctcacggtc	240
gaccgaagcc ttattgaggt ttttaacaaa aacatggaca aagacactgt tgtgttgctt	300
gcagctagag cctcaagact tgaaaatcag gacgccatcg acacggccat tgtaaacatg	360
cttgctgac cgaaggaggc acgcgaaaac atcacaccag ttcattttct acccttcaat	420
cctgtagaaa agcggactgc aattacatac atcgatgccg agggaaactg gcatagggct	480

pctca2017050779-seq1.txt

```

agtaaaggag ctccagaaca gatttctcaac ttatgccaaag aaaaagaaca gatagctggg 540
aaagtacatg ccatcattga caagtttgct gaaaggggat tgcggtctct tggggttgct 600
tgtcaggaag ttccagagaa atctgaagct agtccaggag gtccatggac attttgggg 660
ttgttaccat tatttgatcc acctagacat gacagtgcag agaccattcg gagagcactt 720
caccttgggg tttgtgtcaa gatgattaca ggtgaccagt tggcaattgc aaaagagaca 780
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ggtgtattcc ccgaacacaa gtatgaaatt gtgaaaatgc tacaagagaa gaagcacata 960
tgtggaatga ccggggacgg ggtgaacgat gcgcctgctc tgaagaaggc agatattggg 1020
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aacgatggta ccattatgac gatatccaaa gaccgtgtga agccatctcc caaaccggac 1320
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gttaccgtct tattttactg gatagtgacc gcgacaactt tcattcagac ccacttccat 1440
ttgaggactc taagcttaac taacggggag gtatcatctg cggtatatct acatgtcagc 1500
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ccaggaattc tattgatgtg tgcatttgtg gtggcacaat tggttgctac cgtaatagca 1620
gtctatgcaa atgtcagctt cgcacatcaat catggcattg gatgggggtt ggctggcgca 1680
atatggttct acagcttgct cttagcggcg gagcctggaa tctgttgttt gatagaaaga 1740
cggctttcac ttctaagaaa gattacggga aggaagatag agaagcaaag tgggttcttt 1800
ctcaaagatt actag 1815

```

<210> 321

<211> 1821

<212> DNA

<213> Papaver somniferum

<400> 321

```

atggcaataa ccaatgatgt cggagaagaa gaaatagaga tgatgatgaa atacttgatt 60
gttcgtccgg agaaaggcgg catattcaat atgtctagat acttgctcag atacgatgct 120
gctaatacatg atttcattga gaccagtaac aatcattatt ctaatgatgg atatggtgat 180
gagttggtaa cagtgagtcg aggaatatca tcagtatctg atggtggcgg cggacaagat 240
gatcatagac tagtgataat agtatcaatc atagtgagga aaatcatagg ggtttttaggt 300

```

pctca2017050779-seq1.txt

```

aaaccaatgg aatggatggg ttatctgggtg gagttcttac tcaatcttct gtctctcaat 360
ggcggatcta tcttctcttt gctcaccgta cttctcaacg ggaaagtagt gcggccacag 420
aggaattccg aaacatttat aagtgccatt gggcatttgg atggaagaat tgatttatac 480
aacaagcaga tgccttcac tactcatgat gatccgttat tatctagtag tgatgctaata 540
ggtaatggag agatgattgt gaatgataaa aaaaccagca acatctttga cttgggagat 600
gaccgatgcc ttatggatct ttgcatgatg gcttccaagt tagcttatga aaatgccaaa 660
gtcgttcgga atattgttgt tcatcattgg aagatgcatt ttgtggaatt cttcaacggt 720
tggaacgatt tccagaaaga gaaatctacc caagttttca tcctttgtga taagcccgtg 780
gatgccaaact taatattgat aagcttcaga ggtaccgaac catttgatgc ggatgactgg 840
agcactgatt tcgactattc ctggtatgat atcccaaaat tgggtaaagt ccacatgggt 900
ttcttggagg ccttgggttt gggcaacaga gatcaagtta ccaccttcca taatcacctt 960
caagccgtag gaggaagaga tgggtacaat tcaaagacca gttttcctga tgaggatgcg 1020
aaatcagatg ccacgagaaa gaagagattg ctcccggaat tggctgagtt gactgcatat 1080
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catgaagaga tggagatgat gaataggcta ttgtgtgtct acacattcgg acaaccaagg 1260
attggtgata gacagttggg aagatacatg gaacctcatc tcaactatcc aactccgcga 1320
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ttcttgttca agcatttttg accgtgcttg tactataata gcttgtacat tgaaacggaa 1440
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aatgcagctt gggagttagc gaggagctta acaatgggat acactcatgg acctgagtac 1560
aaggaggggt ggttttgcac cttgctaagg cttatgggat tagcactccc tggcatttca 1620
gctcactgcc ccacagacta cgtaagtct gtcaggctcg ggagaatgtc atcatcctcg 1680
tattcttctc catctagata tccctccaga agatcaaaat atgtgtctgc tataattcta 1740
aatgaagaat taaacttgca gtgtccttac ttcagatctg gaacgtgggt gtcaagcttt 1800
acaggatcca gttctagatg a 1821

```

<210> 322

<211> 609

<212> DNA

<213> Papaver somniferum

<400> 322

```

atgtgtgtgt catcgaatgt ttggcatggt agacttgggtc atgtaaatta caaatcaatg 60
cataaactgg ctagcgtagg ctgcatactc aaattcactt tagataaaaag tcataagtgt 120

```


pctca2017050779-seq1.txt

gagatttgcg tagaatctaa gcatgctaag aaatcattca ggaagaatgt ccagagaaac 180
 actaaaccct tagaattgat tcattcagac gtagttgaca tgaagtcagt tcaaactaga 240
 ggtggttaaga aatggtttgt cacttttata gatgattgta cgaggtagtg tcaggattat 300
 ttgcttagag ggaaggacga tgccttagaa gcctttaaga tatataaacg tgaagttgaa 360
 aaccaattga atgctaccat taaaacgttt aggtctgacc gtggtggtga gtatctaatt 420
 cctattggag atttctgtga agaacatggc ataatacatg aaactacagc cccttattca 480
 cctcaatcca atggtgtagc tgaacgaaaag aaccgtaccc ttaaggatat gatgaatgcc 540
 atgttgatta gttcaggatt acctgcggac ttgtgggggg aggcagtcct cttactagt 600
 atttcctga 609

<210> 323
 <211> 938
 <212> DNA
 <213> Papaver somniferum

<400> 323
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 tgggcaactc ttggaaggtt caagtacatt ttgttggctc cttttgtgtt ggatagcctg 120
 tctccattgt tcttcgaatc agataccagg aaatgggact tgagttactc cctcacgttt 180
 ccatttctct tgtggagagt gattcacaac cagatatgga taagcttttc tcgttttaga 240
 acttccaaat ccaaaaacag gatactcgac aaatctatcg agtttgaaca agtcgacaga 300
 gaaagcaact gggatgataa tatcatattg caaggactga tgttttatct gggacaaaaa 360
 tatctggagg gcggttcaca ctttcccttg tggagaactg atggtgttgt catgactatt 420
 ctacttcata ccggtcctgt cgagttcctc tactattggc ttcacagatc tttgcatcac 480
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 ttgttaaata tggttttcac cgggactggg tcgatatagtag ctttcgctgc gtatatcact 660
 tatattgatt ttatgaacaa catgggccac tgcaatttcg aatttataacc gtcttctctc 720
 ttcacaacat ttccattcct caagtgcatt ttctacactg catcgatatca ttcacttcat 780
 cacaccaat tcagaacaaa ttatgcattg ttcatgcaa tgtacgatta catatacggg 840
 acagtggaca agtccagtga cgaactttac gaaacctcgc tgaaaagggc ggaagaatca 900
 ccggacgtcg ttcacctaac tcatccaact acaccgga 938

<210> 324
 <211> 1221
 <212> DNA
 <213> Papaver somniferum

pctca2017050779-seql.txt

<400> 324

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atgccaatgt acgattacat atacggtaca atggacaagt ccagtgcga tctttacgaa      60
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ccggattcca tctaccatit acggctagga tttgcatcct tagcctcaaa accatatatg      180
agagaagcta acaacaaca ctatttcac atcaaatgga ttctatggcc attgacattt      240
ttgtggagcg tattgtttca aaggatgttg agtcacacat ttgtactcga aagaaacatt      300
tttgatgac accaagtgc caagaagcta ctccaagtac agacatgggc aatacctaga      360
tattcttata aatacaaaag gttgacaagg caaagaggaa caataaatag tttgattgag      420
aaagccatac ttgatgctga taaagctggg gccaaagtga taagcttagg cctcttaaat      480
cagggagaag aaatgaacag aaatggtgaa gtttatatac aaaagcatcc aaacttgaag      540
attaagattg tggatgggag tagcttagct gcagcaatcg tgcttaacag catcactaat      600
cttaagacgc agcagcaagt agttgttatg atgagaggga gacttacaaa gctggcctgt      660
tacattgcct tggctttgtg ccaaagagga attcaagttg tggtaagtt gcagagcacc      720
gatgattttg agaagctcag gtcacggttt ttcagcactt cgtcagcatc acaggcgtcg      780
ttattggcag caaataatit gattccctcc acaaaaatata gtgctcatgg aaaccgtcag      840
gtgtggctag tggacgacga atttagtagc gaggagcata tgagtgcacc aaaagaaacc      900
atcttcattc catattcaca gattcctcct tggcttaatt ttaagaagaa tccgaaaggg      960
gcagctaata ttcttcgcaa ggattgtgtt tactatagta caccagccat gatgatccct     1020
tcattctctg agaatgtgca ctcttgtag aactggttgc caagaagggg aatgagtgca     1080
tggcatgtag cgggagttgt gcatgcattg gaaggatggg attcacatga gtgcggagac     1140
aagttactcg atgtggagaa agtatggagt gctgctgttc gtcattggatt ccgacttcct     1200
attgtggttc acagttctta a                                     1221

```

<210> 325

<211> 411

<212> DNA

<213> *Papaver somniferum*

<400> 325

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tttcttcatt gctcttttgt tgggcagatt tgggaacaat ttttacatca gctgggtatt      120
ggttgggttc atcctacgac agttatggaa ttcctttgga agtggaaatt gaagttttct      180
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ttagaaagga acgacatctt aatagcgcag aaacaaggaa gaaaaacctt aacttctctt      300
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tatctgcaaa	ataaccaatt	660
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gattctaacg	gagatgggaa	900
gtagcacttt	tggttgttgg	960
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<211> 1281

<212> DNA

<213> Papaver somniferum

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gatgccaagt atgtcattaa tgtcaagcag attgcaaagt ttgttgttgg cttggggggac	360
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<211> 1746

<212> DNA

<213> Papaver somniferum

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<210> 334
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<212> DNA
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 <213> Papaver somniferum

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 <212> DNA
 <213> Papaver somniferum

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gttgtgttc ttgtttcttt agtaccttta gtggttccta tacctgtcat gttccttgga	360
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tgtgatgcaa actggatagt tgactcagag gagtctaagt ctacgagtgg atatgttttc	240
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<212> DNA
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<210> 341
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<212> DNA
<213> Papaver somniferum

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 <213> Papaver somniferum

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gttgtgactt aactgcaat gatagatgga tttgggaaaag tgggtgatat caacatgtgc	660
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<212> DNA
<213> Papaver somniferum

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 <212> DNA
 <213> Papaver somniferum

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<212> DNA

<213> Papaver somniferum

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 <211> 1101
 <212> DNA
 <213> Papaver somniferum

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ttagtgatac tcgtaagcct ccctgaaggg attctcaacc caagtattgc agggctagct	180
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 tgcttcaaaa acctggaggt tcgttatgct gaacatcttc cgtctatcct caaaaacata 420
 aactgcaaga ttccgggaag aaagaaaagt ggtgtttag gaaggacagg aagcggcaaa 480
 tccactctca tacaggctct ctttaggaca gtagaaccta gagatggatg cattttaatt 540
 gatgacatta atatttgcaa cattggtcta catgacttga gatccagact cagcatcata 600
 cctcaagacc caacaatgtt tgagggaaca gtcagagcaa acctcgatcc actagcacia 660
 ttctccgaca aagaaatatg ggaggctctg cataaatgtc aattagggtga tcttgtagcg 720
 aataaggaag ggaagtggga ttcaacagt ggcgacaatg gagagaattg gagcgtaggt 780
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<210> 354
 <211> 684
 <212> DNA
 <213> Papaver somniferum

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 aagaaactta ttgtggagat taagaaaagc gctaagcaag ggcagatggg agctgtgaaa 180
 gttatggcga aagatctaata cagaacaaga caccaagtcg aaaagttcta taaactcaaa 240
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 gaggccatga aaggtgtaac caaggcaatg ggacagatga ataggcagat gaatttgcca 360
 tcattgcaga agataatgat ggagtttgag aggcaaaatg agaagatgga aatgacaagt 420
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<210> 355

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<211> 897

<212> DNA

<213> Papaver somniferum

<400> 355

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atgatcaaaag atgcagcaaa aatagggtgca aagcttattg ttttgccctga aatgtggaat      180
tgcccctatg caaatgagaa tttccctata tatgctgaag attttgacaa tagagagttg      240
tcgccatcat tcatgatgtt gtcggaagtt gcatgtagcg aaggagttac ggtagttggt      300
gggtcgataa cagaacgatg tggatgatcag ttgtataata cttgttgtgt atttggaagc      360
accggagatt tgattgctaa acataggaag attcatctct ttgatctgac aggagatgtt      420
tgcttcaaag aatctgaaac ctttgagcc ggaaatcgac ctaccattgt tgatacagat      480
gttggtcgta ttggaatagg aatctgccat gatctacgct tccccgaact tgcaatgttg      540
tacagagaaa gaggtgctga tctaatatgc tatcccgggg cggtcaacat gagtaccggt      600
aacttgtttt gggagcttgt acaaagagca agggctgttg acaatcagtt gtttgtggcc      660
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gaaatagatt attctgtgtg tcaacttcga agagaaaatc ttccacttga gaaacaaaag      840
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<210> 356

<211> 363

<212> DNA

<213> Papaver somniferum

<400> 356

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atccaactca aacaaaccca tgctagatta ctcaaaacct taatccattc aagccatcag      180
cttcatcatc ttctaacaca gctactaaag ttaccttcca aaaagttgag ttatgcacgt      240
aacttgttcg atcaaaatacc tcagagagga tgcatgagat ggggtgtttg gcaagtgggt      300
ttacgttttc gtctgtgctt aatgcttgtg cgaggatacc ggctgttcgt gaaggtaaaa      360
tga                                                                 363

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<210> 357

<211> 1308

<212> DNA

<213> Papaver somniferum

<400> 357

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ccaaacccaa ggtatgctct gaattatcta ttacttacgg atggagttga acctgaagat	180
attaaagaag cactagcggc tgatgattca ggcaagtggc aacttgctat ggaagatgag	240
ataaattcac ttgaggagga tggcacttgg gtgttagtaa aattaccaag aggtaagaag	300
gcgttgcata acaagtgggt ttatcggatg aagtctgaag caaatggaga tattcgctat	360
aaggagaggt tggttgtcaa aggtttccaa caaaaaccta gtgttgatta caacgagata	420
ttttctccag ttgtgaagat gactactatt cgagtagtgt taagtctagt ggcttctgaa	480
gatctctacc ttgaacagtt ggatgtaaag acaacgtttc ttcacggtaa cctagatgaa	540
gaaatttaca tgaagcatcc agaaggattc atagtaaaag gcaaggaaga gatggtgtgc	600
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gataacttca tgcatagagg tggttactca cgggtgaatg cagatcattg ttgttacttc	720
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gtgagtagat atgcaagcaa cccaggaaaa caacattggg aagctgtgaa gtggattctc	1200
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<210> 358

<211> 798

<212> DNA

<213> Papaver somniferum

<400> 358

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gtagagcttg gcattccaga tattatcaaa aacaataacy ggccaatcac acttgcacaa	180
ctttcatcaa aactcccaat tccgaatgtc aactcggatc acttgtacag aattgtaaga	240
tatttaataa acctgaatat cttacaacaa gaaatttgtc gtaatgttaa ggtctactca	300
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ttaggcaata cacagaaaga tttcttggtt ccatggcatt tcgtgaaaga aggtttagta	420
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<210> 359
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 <212> DNA
 <213> Papaver somniferum

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aagaggaaga aagcaccaaa tgctgcaggg gcatggccgt taatagggtca tctccgtcta	180
ttgatgaacg acaaggaacc gttgtataga gcactaggga gcatggctga taagtacgga	240
cctgcattca acgttcgatt aggtagccaa catatcctag ttctgagtaa ttcggatatg	300
gtaaaagaat gttttggtgt tcaaaatcat gataagttat tttcgaatcg tacaacttca	360
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tattggagag aaatgcgaaa gataacagcg cagcagttac tctctaaaca atgtttagaa	480
tcatggagac atttgagaat caaagaaata gatgcctcat tcagtagact taacgactta	540
tgctgcaaca acggtactgg aacaactact ccaatcagaa tggacaattg gattgctgat	600
ctgacgtata acgtgttcgc aagtgttggtc ttcgggtacc aaagtggagg aagggcggca	660
gtaacagggtg atacggcctc catctccgag aaatacaaga aactatgat agaagctttt	720
gttgttctta cgacaagctt tgcagtttca gacgtattcc catgtctaga gtgggtagat	780
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aatgatgatg ataataaggt ggatatggat ttcaaagctc aaaaatatga actcttccca	1440
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gtgctggccc gtcttattca ctgctttgat atgaaagcag caagtgccaa tgggaaaatt	1560
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 <211> 1065
 <212> DNA
 <213> Papaver somniferum

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ctgtcacaaa aagatttctt gtttgatgg aatttcgtga aagaaggatt aggcactgga	420
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aaagagacag ggaaagtgat catagtggat gtagcacttg aagaagaatc tgaacatgaa	900
cttacaaaagg caagattgat tcttgatatt gatatgttgg tgaatacagg tggtagagag	960
agaactgcag aggattggga aaatttgctc aaacgtgcag gctttcggtc tcataagatc	1020
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<210> 361
 <211> 528
 <212> DNA

<213> Papaver somniferum

<400> 361

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gaatacgaag gctgggagcc tccccgagac agatcgcaga ttatccagag cgaatgtaaa      180
caagtaacca atgctaagag gtctgtgcct gaactgaatg ataatgaggc atggagagga      240
gctggcactg gtttcagtgc tggaaggggg aaaacaattc aaaagacatc atgtccagat      300
actaatatcc agccgtctac tgcgggaggt ggactgaaca atgggaaggg ccgcagatct      360
tatcctaaca gaggaaaagc ttttacgcaa cgagtgtctt cttacgacag ctacaacact      420
cgtagccgct ttcaaccctc tcccgtgct aatgactctt caagtgggcc ctcatatgtg      480
gcacgtagtc cgtcttatgt ggcacaacgt tggagtgggtg aaccatga      528

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<210> 362

<211> 231

<212> DNA

<213> Papaver somniferum

<400> 362

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atgtttctca atccgtatga gcatcccaaa tgcaatctca accgtcaaga tcttttctta      60
atccgtatga gtggatcaaa cgaaacctgg tccgtcgatt cttttggttg tatcaccaaa      120
ccctccctca aactcagaa ctctaattcc tatctatttt ttctctttct tcctctccgt      180
ctcttttctt tctcagcctg cgccataaag agttctaattg agtattcata a      231

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<210> 363

<211> 1185

<212> DNA

<213> Papaver somniferum

<400> 363

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gattacgaga aatgggtatc atggaatgtc gaaaaccata agaaaaagat tagtactact      180
tgggaaacaa accaaggcat ggttacggct ggtcaccgga aaagaagcgg tagaagtgtt      240
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agaagaacca ttttggatat caaaccaggt ctatacaggg agaaaattgt tgtccctcta      420
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gacactgcat caacgatagg agatgacgga aggccattga caacatttca tagtgctacg      540
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 gggagagtgc agtgggcaag attgttgagc gaccatgagg caaagccgtt catcggagca 1140
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<210> 364

<211> 627

<212> DNA

<213> Papaver somniferum

<400> 364

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 gattatgttg gtgttgctgc taggcatgca acatatgtcc cacacacagc tggtaggtac 180
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<210> 365

<211> 1227

<212> DNA

<213> Papaver somniferum

<400> 365

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 aaaaatggtg tccatttacg agatgttaag agatgggtat cagaattgag aggaaaagat 180
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ttagcgaaaag cagagacaat tacttcaatt gaagagatta aatcaaaaat cccagatagc	420
aaaagtagta atggaggaga atcccaattt gatggtgaag attcaggacc gttagattca	480
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aaacagagga gtattgttcc cattactgag attaaagaat taaatgatga aactgagaat	600
tctttacaaa agaattgataa aaatgaaatt acagagaaac agaatccgtc atcatcatca	660
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agtaagagtt attcgagtgg tggagctact aatgtgtttc gaagtctact gagttgtcgt	780
gcaacagata taaacgattc agctttgatg atgatccgta gaagttcttg ttcttcttct	840
tcagagattt gcaaatttga gaatttgggt gggctcgaca cgaataactag tggaatatta	900
tggaatcaac atcaatcaag gagaagtatc agtaaaccat catcatcatc atcttcagag	960
aacagtacat caaagaagtc aaatgaattc ggtggtagcc tgaaaaaagt ctctgctgct	1020
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ttacactcac acatgaagtc ctgtagagga ttgaaaagcc tgagcaagaa tcgcaatagt	1140
gctacagctg ggtatgattt tgagactgag cagaagttca caacattagg atcttttaaa	1200
gaaagaaacc aacaggggatg ttttttaa	1227

<210> 366

<211> 549

<212> DNA

<213> Papaver somniferum

<400> 366

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agattcaatc tttgctcaac cgatagtact cgcaagggat gtattgggag agtaagtgtc	180
gtaccagaag atgaagattt tttttgggag aaagcgtaa cgactttact tgatatggtt	240
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atccgttcag agttatcttt tataacgtcg aagatgcctc gatactttta agccattcta	360
gcaacagtgg agctgaccgt tgtgttacat catgtttttg attctctaac ggataagata	420
ttgtgggatg tggttcaaca ggaaaccgag gttacgttca tctcgaaccg acatgcttct	480
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catcttttag	549

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<210> 367
 <211> 363
 <212> DNA
 <213> Papaver somniferum

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 aatccagttg agaagaagat agtcatgagt atagatgtca catttatgag atgtctatgg 360
 taa 363

<210> 368
 <211> 1839
 <212> DNA
 <213> Papaver somniferum

 <400> 368
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pctca2017050779-seql.txt

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<210> 369
 <211> 564
 <212> DNA
 <213> Papaver somniferum

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<210> 370
 <211> 597
 <212> DNA
 <213> Papaver somniferum

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pctca2017050779-seql.txt

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ttctttttat taacttgggtg ggatttaata tacctgatgg tggaaggatga caagggtgtgg 540
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<210> 371
<211> 1074
<212> DNA
<213> Papaver somniferum

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<211> 549

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pctca2017050779-seql.txt

<212> DNA

<213> Papaver somniferum

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gcagttcctc atctttgcgt tgacgtcaaa attatcagtg gagatccgac cagttcaggt	240
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gttgtgacaa ggtcaattga gtatgaaaaa accaacgaga attctccaac tccctttgat	480
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<210> 373

<211> 1014

<212> DNA

<213> Papaver somniferum

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gaagactcat tcaggccagt ccttcacat tacgacggac ccaaattccg tcttgaactc	960

aacataccag aggcattagc tctcttggac atattttccg agaacagtcc ttga 1014

<210> 374

<211> 1911

<212> DNA

<213> Papaver somniferum

<400> 374

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cgatgttatc aagatgggat ttcaatttct gatgcagaag aaattgatgc aaaagataaa 240
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<211> 1428

<212> DNA

<213> Papaver somniferum

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<211> 552
<212> DNA
<213> Papaver somniferum

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gaagacttaa	catcttttcc	atttccagcg	gcaagcggat	ctgatgggtga	aaaatacttc	3000
gtttccctcc	gtgtattaaa	gatatgcggg	tggcctactc	taagtgccga	gttgccggac	3060
caacttcaac	tcctcacttg	tttacagtgt	ttcactataa	gaggttttcc	ttgtctatcg	3120
agtttgcctg	agtggtttcg	agaattatct	tccctccaga	atttgtactt	tctaaattgc	3180
agcaggctgc	agtatcttcc	ttctgacgaa	cagatgcaac	gcctaacgtc	cctgaaaacc	3240
atatacatTT	ggaattgtcc	actgttgctt	gaaagatgtt	ctggcaatga	agaagggcat	3300
aagattgcac	gccgcaaaca	agttattgga	tcatctccct	cactgcttga	ccacattcca	3360
cgggatgcag	acatgaacct	agagcttctt	gcacgtagga	cgtctgggat	attctcaaAT	3420
caaaacaaaag	agaaacgctg	gattgatagt	tgtggtcgca	agtgcttcat	gttttttcca	3480
acgagtttct	atatcgcatg	gggggacgac	acacgctact	ggacatggct	ttcagtaaca	3540
gagccatcag	cagcaagtaa	caatgcagag	attgaagtgc	ccgagcttat	aaaagtatgt	3600
tggcttgacg	tgcattgggac	actggacatg	tcaaaaactca	ctcctggagt	aaattatgag	3660
gttgtatttta	tagttatgct	tcgtgaacga	agttacggat	ggggcaaacc	cgatgaacctt	3720
tgccatgtac	tcccagatgg	acaaagacta	gaccagacac	tggctctaga	aactatgcct	3780
aaatcaacgt	ggatcgagat	tcacgttgga	gattttccaaa	caccagaaca	acagcctggg	3840
gatcaagaaa	aacaagtcaa	atttaatctg	tctgaacagg	aaacgttggt	ctggaaaagc	3900
ggacttggtta	tcgaaggagc	catcgttcga	cctaaaaaaaa	gtagctctta	a	3951

<210> 378

<211> 351

<212> DNA

<213> Papaver somniferum

<400> 378

ggaaaacaac	aggtagaaga	agaagagcaa	gaagaaaagg	aggtagaaga	agaagaagaa	60
aaggagggaag	aagaagaaga	gaagaaaagg	aaaaggccag	gggtttctgt	taaagaatat	120
gaagataatg	gtgatcttat	tatttgtcag	ctatcaagtc	gaaggaagg	gacaattcaa	180
gagtttaaag	ggaaggcatt	ggtatcaata	aggaataact	atgaaaaaga	tggaaaggag	240
cttcttctta	ctaaaggaat	aagcttgaca	gcggaacaat	ggtttacttt	cagtaaattct	300
gtccctggga	ttgagcaagc	cattaagaag	atgcagacaa	ggtctcgggtg	a	351

<210> 379

pctca2017050779-seql.txt

<211> 378

<212> DNA

<213> Papaver somniferum

<400> 379

```

gcatgttggtg tcctgtatct ggttggacgt aatctttatg ctttcttgca aaaacttttg      60
gaagtcctga gatgtactct gttcatcatt gttgatcttg cggttttctg cttcagatat      120
gacgctgtta tggaaaagctg gcaacttaca ttcaactggg gccaaaggggt tgccttccag      180
atcaggggatg tgaagacgcg ggtattcaca gacatagctt gggttaccat gaaaacttat      240
gttgacgatc ctaatagtgg gccattcaat gtgaccaatg tttacgagtt tcacaaaggg      300
cagtgggtact tgggtcacca tcaactgctct gtgatactaa ttggcgcaga ggctgatcag      360
caaaacgtat ttggatag                                     378

```

<210> 380

<211> 390

<212> DNA

<213> Papaver somniferum

<400> 380

```

atggcaaaca gaggaactgc ttctaataac tcggcactca tttctatgat tgctgatgag      60
gacactataa ccggattcct gctggctgga gtgggaaacg ttgatttgcg caggaacaca      120
aactacttaa ttgtcgactc aaaaacaact gtaaaagcaa ttgaagatgc attcaaagat      180
tttatctcaa gggaggatat tgctatcgct ttgattagtc aatatgtcgc aaacatgata      240
aggtttctag ttgatagcta caacaagccc gtccccgcaa tccttgaaat tccatccaag      300
gaccatccat atgatgcaca acacgattcg gttctttcac gagtcaagta cctcttttct      360
tctgaatcag tggctggaga caggcggtag                                     390

```

<210> 381

<211> 933

<212> DNA

<213> Papaver somniferum

<400> 381

```

atggaaatgg ataatttga atgtgtatca tcaattgaag aaggaggaga agatattcat      60
caacatcatc aatttggttc ttcaaacct ttaattaata atttgatttc tcctgtaca      120
agtgtttatg aattgcttga atgtcctgtt tgtactaatt ctatgtaccc acctattcat      180
cagtgtcaca acgggcacac gctatgttca acatgtaaaa caagggtaca taaccggtgt      240
cccacttgta gacaagagct tggagatatc aggtgttttag cgtagagaa ggttgccgaa      300
tcccttcaac ttccctgtag gtatggctcg ctagggtgtc ctgatataatt tccgtattac      360
agtaagctca agcatgaggc tatgtgcaac tttagaccat acaactgccc ctatgctgga      420
tcagagtgtg caattgttgg cgacattccg tcactagtca cccatcttag agatgatcat      480

```

pctca2017050779-seq1.txt

```

aaggtagata tgcacactgg atgtacgttc aaccatcgat atgtaaaagtc taatcctcgt      540
gaagttgaaa atgctacatg gatgttgact gtcttcaact gttttgggtca gtacttctgc      600
ctacactttg aagccttcca actcgggaatg gcccctgttt acatggcatt cctgcgcttc      660
atgggagacg aaactgatgc caggaactac tgctacagtt tggaagtagg agcaaatggt      720
aggaaactga tttttgaagg tacaccacgg agcattcgtg acagtcaccg taaagtcaga      780
gacagccacg atggactcat tatccagcga aacatggctc tctttttctc aggtggagat      840
aggaaagagc tgaaaacttag ggttacggga aggatatgga aggaacaaca gaaccaagaa      900
gccggggcgt gcatcccaaa cctttgtagt tga                                  933

```

```

<210> 382
<211> 963
<212> DNA
<213> Papaver somniferum

```

```

<400> 382
atggagatgg ataatttga atgtgtatct tcatcagatg gtggaggagg gatggaagaa      60
gaagatataa gaaccataa tcataatcat aataatcaat ttcatcatc aaaagggtta      120
aataataatg ggatttctcc tgctgctaca agtgttcatg aattgcttga atgtcctgtt      180
tgtactaatt ctatgtaccc acctattcat cagtgccaca atgggcacac actgtgctcg      240
acatgtaaaa caagggtaca caaccgctgt cctacttgta gacaggagct tggagatatac      300
aggtgttttag cattggagaa agtagctgaa tcccttgagc ttccctgcaa gtatggctcc      360
ctgggatgcc cagagatatt tccctactac agtaagctca agcatgaggc tctgtgtaac      420
ttcagacctt ataactgtcc ttacgctgga tcagagtgtg ctgttggttg tgatattccg      480
tttctgggtca cccatctgcg agatgatcat aaagtagaca tgcacactgg atgtacattc      540
aaccatcgat atgtgaagtc taatccccgt gaagttgaaa atgctacctg gatgttgact      600
gtcttcaact gtttcgggtca gtacttctgc ctgcattttg aagcgttcca actcgggaatg      660
gcccctgttt acatggcatt ccttcgcttc atgggagacg aaaacgacgc gaggaactac      720
agttacagtt tggaagtagg agcaaacgga agaaaaactca tttgggaagg tacaccacgg      780
agcattcgcg atagtcacag gaaagtcaga gacagccacg acggactcat aatccagcga      840
aatatggcac tatttttctc cggcggggac aggaaagagc tgaagcttag ggtgacaggg      900
aggatatgga aggaacaaca aaaccaagaa gctggggtgt gcataccaaa cctttgtagt      960
tga                                  963

```

```

<210> 383
<211> 1581
<212> DNA
<213> Papaver somniferum

```

pctca2017050779-seql.txt

```

<400> 383
atgcgaaccg aatcaatcaa aacaaacaga ccgatggatc tacttctcca gtacttgcaa      60
ccgatttccg ttgcacttgt tgtgattgca ctggtttgga actatggaag aagaaacccc      120
accaaaaaaac tagcacctga agcctcagga gggagaccta taatgggtca ctgcatctt      180
ttcaacgacg gtgagttaac tcatcggaaa ctcggtgcaa tggcggatac ttatggtcct      240
gttttcaata tccgattcgg ttcgcataaa acactagtgt ttagtgattg ggaaattggt      300
aaagaatggt ttacgacgaa tgacaagctc ttctcgaatc ggccgggtac gttagggtatt      360
aaactcatgt ttacgacgc cgattccgtt ggttatgcgc cgtatggtgc ttactggaga      420
gattttacgaa agatttctac cttaaaaactt ctctcgaatc atcgtatcga tacgataaaaa      480
catctgagga gttctgaagt tgagtcgtgt ttcgagtcgc tttatagtca gtggggaaac      540
ggggaaaaga gtggcgaatt cgctccggtg agaatggata gttggtagg cgatttgacg      600
tttaatgttg ttgccagaat tgttgcggtt aagaagaatt tctcggccaa cggtgacgtt      660
ggggctcaga gatataaagc agcaatggat gaagctatga gattaatgag atttttcgca      720
ttttcggatg taattccctc gctaagctgg ttagacaatc taagagggtt ggtgcgagaa      780
atgaaaaaat gtgcatctga aattgattca attatggcta cttgggttga agaacatcgc      840
gtgaaaagaa attcaggagg taattctcaa ctcgaacatg attttattga tgtttgcttg      900
gatattatgg agcattcttc gttaccggtc gatgatcccg acctcgtcgt caaatctacg      960
tgtctggaca tgatattggg tgggagtgc acgacgacag ttaccctaac atgggctatg     1020
tctttactct tgaaccatcc ccaagtactg caaaaagcaa aagaagaact agagacacaa     1080
gtaggaaaga accggcaagt cgacgactcg gacatcccg atctccatt catccaagcg     1140
atcatcaaag agacgatgag gctgtaccgg gctggaccat tgatcgagcg gaggacgatg     1200
gaggactgcg aagtagccgg gtaccaagtt ccagccggca cgcgcttatt ggtaacgctc     1260
tggaagatgc aaagagatgg gaacgtatac aaaggcgatc cgttggagt tagaccgac     1320
aggtttttaa ctagcaatgc ggatgtggat ctaaagggtc agcattatga attgatacca     1380
tttggagctg gtagaaggat atgcccggga gtatcgtttg cgttcaatt gatgcatttg     1440
gttcttgccc gattacttca tgaattcgaa atcacgactg tggagccaga aaccaagggtg     1500
gatatggctg aaagtgggtg tttgctttgt tataagataa tgccattgga agtactgatc     1560
aaacctcgac tcgagatatg a                                         1581

```

```

<210> 384
<211> 1155
<212> DNA
<213> Papaver somniferum

```

```

<400> 384
atgatcatcg aaacactaga tatcctggga ccaaatacaga atggcaattc aggaacccat      60

```

pctca2017050779-seql.txt

```

actcaaaaac caatcaaaaac cagaaactgg ctgctgatca ttattaactg cgccttagtt      120
ttttgtggtg ttataggtgg tcctctctta atgagactgt actatcttca tggtggttagt      180
cgtaaagtgc ttagtagttt tctgcaaact gctgggtttcc cagttctcat atttctcttc      240
atttttctct acattaaacc gaaattgtca acacaaaaca acgatcaaag ttcttccttt      300
tttatggaac caaagtgtgt tctttggagt gccatagttg gaatcgtgtt tgggtgtttct      360
aatttcatgt acgcattggg tttatcttat cttccagtat caacttcgac aattctcttt      420
gcaactcaac tgtgtttcac agcaattttt gcatgggtta ttgtgaaaca aaaatttaca      480
gcatttatta taaatgcagt gattgtaatg acactaggat cgatcttatt ggggtattaat      540
accaatggtg atagaccaat tggggatatca aaaactcagt acttaatagg gtttcttatg      600
acgttagctg ctgctgctct aactggcctc gggacgcctt ttgttgagct ttctttcatt      660
aaagccacca gaaatattac ttatccaact ttgttacagt ttcaagtcac tctttgtctg      720
tttggaacct gcctcaacgt cattgggatg ctaataaata aggattttca ggctataccc      780
agagaagcag acatgttcga gcttgggaaa agcaagtatt atatgataat atgcttgact      840
gcattgacat ggcaattatc aggaattgga ctcgtaggcc taattttgta cacaaatgct      900
cttttcaacg gtatatacgt atccgttctt gttccgttca cagaagttgc agcggtcata      960
tttttccatg agaagtttac gggattaaag ggaatggcat tggcattatg tctttgggggt     1020
ttctcttcct atttctatgg agaatacaag atgatgaata aagtgggtga taatgaaaca     1080
catgagaaaa tcgaggaagc cgaaaagcgag cccaaaagat tagaggatca acaagcacca     1140
tacagtactg tatga                                     1155

```

```

<210> 385
<211> 318
<212> DNA
<213> Papaver somniferum

```

```

<400> 385
atgcttgaga agaaggatgg tcgtctaagc agaaagttta atctgaagaa gttgaggggac      60
acattttgtg acaccaagaa aatctttgat aaggaaggaa ggggtgaaccg ggtgcgaatc     120
aatgctaccg cgtcagggtta tttgctatat gtcctgggca aatgtatctt ccccgacagt     180
tccggaagct tgggtcgacgc cagttatatg caactattgg atcccttaga taagatgcat     240
gagtattctt ggggtactgc gatggtcgcc ttcttgaaca atgagttgac aaaggggttct     300
agggcactca ctgcgtaa                                     318

```

```

<210> 386
<211> 441
<212> DNA
<213> Papaver somniferum

```


pctca2017050779-seql.txt

```
<400> 386
atgaagttca atcccagagt ttcacatca aggaggaaga accgcaaggc tcatttcaca      60
gcaccatcaa gtgttcgtag agttcttatg agtccccccc tttcatctga actccgcagc      120
aaatacaatg taagatctgt tccagttcgc aaagacgatg aagttcaggt tgtaagagga      180
actttcaagg gccgtgaagg aaaggttatt caagtttata gcaagaaatg gggtattcat      240
gttgagagaa ttacaagaga gaaagtgaat ggatctactg ttaatgttgg cgtaaatcca      300
tcaaagtgtg ttattactaa gctcagactt gataaggata ggaagtcgct cttggatcgt      360
aaggccaaaag gtagagctgc tgctgataaa gataagggta ccaagtttac tactgatgat      420
gttatgaaga acgttgattg a                                     441
```

```
<210> 387
<211> 405
<212> DNA
<213> Papaver somniferum
```

```
<400> 387
atggcgatac atttatacaa aacttctact ccgagcacac gcaatggggc cgtagacagt      60
caagtgaat ccaattcacg aaataatttg atctctggac agcagcgta ttgtggtaaa      120
ggtcgtaatg ccagaggcat cattaccgca aggcataagag ggggaggta taagcgtcta      180
taccgtaaaa tagattttcg acgaaatgaa aaagacatat ctggtagaat cgtaaccata      240
gaatacgacc ccaaccgaaa tgcatacatt tgtctcatat actatgggga tggtgagaag      300
agatatatatt tacatcccag aggggctata attggagata ccattgtttc tggtagagaa      360
gttcctatct caatgggaaa tgccctacct ttgagtgcgg tttga                               405
```

```
<210> 388
<211> 300
<212> DNA
<213> Papaver somniferum
```

```
<400> 388
atgactcttt tgtttccctt tgatgtgggt atatacgag gtactagaac agatgcctcg      60
agtcatttca gcgctggatg cccatatgga aagtggacta cagagcggtc ctcatttgaa      120
gactgtgaca cagttactgt caaccatgga aagcaccag cttcagcaat cccttcgtgt      180
gcatcagcct caaaatgtat gattccatct aaccttatac tcaaggtagt caatatcggt      240
tgtttcggcc gatattatag gtttttatcg tgtatcggaa aaaaactgta cgatatctaa      300
```

```
<210> 389
<211> 384
<212> DNA
<213> Papaver somniferum
```

```
<400> 389
```

pctca2017050779-seql.txt

atgtcacctt atcgtttagt gtttggcaag gcatgtcacc tgcctgttga gatagagcat	60
cgagcctatt gggctattaa gaacttaaac ttttcacttg acaaggaagg agctcaaaga	120
aagctccagt tcaatgagtt ggacgagatt cttagagatg catacgatag tgctaaggag	180
tataagaaca aaatgaaact tgtgcatgat aggaatattt tacgaaagtc attttctcca	240
ggcaaaaaag ttcttctgta tgacactcgt ttgcatctat tctccgggaa gttgcgctct	300
cggtaggaccg gtccttttgt ggtccgtact gtttttcctc atggcgctgt tgagattgag	360
acaccagatg gtagtagttc ttag	384

<210> 390

<211> 1797

<212> DNA

<213> Papaver somniferum

<400> 390

atgggaagga caattcaagt ctacggtttc ctttcttatg tgaatgcaga aatggtaaaa	60
gaattccttg agaactacac tggcaaggga actgtgtatg cactagatat tccgaagtcc	120
aaaaataagg ggctaaatcc tagagttttt gcaaatgtgc aattcataag caaacaagat	180
gccagactta tatcttcttt gataaatcaa cggctctatt atggcaagtc atatttaaaa	240
gtaggggatt tggcgctgta tgttgtacca aagccaaggg tttcaatgtt tcatttgcag	300
gcccctgctc tgcatttttg gtgccagggt tctgatgatt gttttcacgt aatttggag	360
ggactcgatg tgatagcgga tttcgagttc gggtttcgta aattaagttt tcttttatct	420
tatcgtgatg tgaactataa gcttgaactt tcttacgaga gcatttggga aatccagttg	480
cgccgaccga agaacttaag ctcaacaatt ctcataattc agatgaatgc tgctcctaga	540
gtttatgtgg aaccactctc ctcgtagga aatccaggca gggatttaca atattttatg	600
catacathtt atgatcagtg ggtaagaact actgatttca ctgaatcgtt ttctattggg	660
cagtcctccg caatgtgttt gaaaattcca tatggctgta agcttccaaa cttccgtgaa	720
aatttccatt attatacgga agatgagggg ttgttcacaa tgcagcccg ttcgccagtt	780
tctcgaagct tggatctagt tccttttgtt gagcctcctg atggacataa gctgcgatat	840
gatattctgt ttaagggtta ttccttgggt cagactgggt gcctttctgg tccaacgctt	900
gacgcaaat ttttccgtat ggttgaccct ttctctcact ctgtcaacta cataatatgt	960
gccctggaga aactgtttca cttgaaagac tgttggtatg aacctgttaa ctggctttct	1020
gggcagtact tggagtacag cttatcagca aaccctccta gatcaacttc gatttccttg	1080
tctgatgggc tggatatatg tcgcagggtg caagtaacac ccttgaaagt atacttcctg	1140
ggtccagaga ttaatgtttc caacagagtt ttacgctatt atagtgaaca catcgataat	1200
tttatccgta tttcttttgt tgatgaagac tcagagaaaa tccgttcaac tgatttatct	1260

pctca2017050779-seql.txt

gcgcgtgcaa caatgaatga cgagaaaaag cacactttgc tttatgaaag gatactctct	1320
actttgcata atggcgtagt tattggtgat aagaagtttg aatttcttgc cttctcagca	1380
agtcagctac gtgataattc tgcattggatg tttgcttcaa aaggttcgct aacagcagct	1440
agtatcaggg actggatggg tgattttcgc aagattagaa atgtggcaaa atatgcagcc	1500
agactaggac aatcttttgg ttcctcaaca gaaacattaa gtgtttctag ggatgaaatt	1560
gaaaagatag atgatgtcga gattgaaagt aatggaactg tatacacatt ttctgatggg	1620
attggaaaga tttcttctga atttgcacat aaggtgacaa gtaagtgtgg tttgaaatgt	1680
acgccgtctg cctttcaaat taggtatggg ggatacaaag gtgttgctgc ttagatcca	1740
agaacagtga aaaagttata tttgagacca agcatgcgta gttcaagtca aaggtaa	1797

<210> 391
 <211> 327
 <212> DNA
 <213> Papaver somniferum

<400> 391	
atgactacta cttcctatag tgtaagtaaa cagactcaac atgaatacct acagttcagc	60
acgtcctata caggttactt aacgaggaca atgatgatat atgaccagct gcggccttcc	120
atgaagctgc agttggtaaa ggtttatcag gtgtaccatg taacacttga ggaactgtcg	180
aactgggtga caggaacatg gacaagaaga aaaataagca gctgggtatt tgcagtaaca	240
gggggtcaaaa ggaaattcag attgacagga gacatgagtt ggccgaatta tgaccccaaa	300
agaagcatac cgggtttgaa gtcataa	327

<210> 392
 <211> 1020
 <212> DNA
 <213> Papaver somniferum

<400> 392	
atgggttctt ctcaaggatc tactactttg agtgtcaagg aattgaaaag agaagtttat	60
ttcattgatt ctttacctgt ttatgttaaa gaattgattg ctggtggata tgctggagct	120
tttgcaaaaa ctgcagttgc tccattagaa aggattaaga tactgttgca gactagaacc	180
gaaggatatac attcgattgg agtttggcga tcgttgaaga agttactaaa acaagaaggt	240
gttcgaggat tctacaaagg aaatggtgct agcgttcttc ggattgttcc ctatgcggca	300
ttgcacttta tgacttatga gcaatatcga tgttgatct tgaataacta ctctgcatta	360
ggaacaggac ctatcgttga tctggttgct ggttcagtag ctggaggggac agcagtctta	420
gtaacctacc ctctagattt agctcgaaca aaacttgctt accaggttct gggtagaaga	480
ggtggtagtt ttggaaatgg tatgagcagt tccaatcgc tgccagcata tagtgggata	540
agagatgtct ttaagagtgt ctacagggaa ggtggggctc gttctttgta ccgtggaata	600

pctca2017050779-seql.txt

```

ggccaacac tcattggaat ccttccatat gctggtttga agttctacgt atacgaggaa 660
cttaagaggc atgtccctga agaacaacag aaatctgtta tgatgcgtct ctcttggtgg 720
gcttttagcag gactatttgg tcaaaccctc acatacccgc tagatgttgt taggagacag 780
atgcagggtc aaactatgca accgtcaaata catctaggta atcccaggta caggaccaca 840
atgcaaggac ttacctccat cattcgcgat caaggatgta aacagttatt tgctggatta 900
agcatcaatt atgtgaagat tgttccatcg gtcgctattg gtttcacggc atatgacatg 960
atgaaatcgt atttacgggt accacctcgg caaaaagctc cgtctgcgtc cgctggatga 1020

```

```

<210> 393
<211> 1020
<212> DNA
<213> Papaver somniferum

```

```

<400> 393
atgtctcgcg gaagagaaaa acatctagat acagtatata aagcccgcac tgtagttgca 60
gaggacaccg tggtaaaaca agatcactac aatgtttctt ctcatggaag accggaagtt 120
gttccacaga gagacaacga acaactttgg tctcgtagaa gacgagatca cactgctgat 180
gtggaaaaag agagagggtca tgaggtagca gataagggtct ctgcggttaa ggaaaaagag 240
aaagatcgtg aggtggcaga aacggcgaaa ccacaataca aggcttttgc ccctcctcct 300
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<210> 394
<211> 509
<212> DNA
<213> Papaver somniferum

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<400> 394

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pctca2017050779-seq1.txt

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ctcaagggtc caactctgca ttttggatgc caggtttcaa atgattgttt ttataactctt	360
tgcaagacta aggacgtttc agtggatttt gggtttggat tccgtaaatt gtgctgtctc	420
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<210> 395
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 <213> Papaver somniferum

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ccatttttaa agttcaagaa ggatgaggca ctttcagttg ggattcaggc cttggatttg	3240
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<210> 396
 <211> 3045
 <212> DNA
 <213> Papaver somniferum

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atttctacta tttccatgga ttcttcaaca acatcatcat cagttactac taccactacc	180
acaatcacc aaatttctgt ttctgaaaaa ctccaaatta ctgatgaaca agttaggggtt	240
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gagaagcaag atcttgttgt agatgatgaa aaaatggtgt gtgaaaatgt aaatggagga	660
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<210> 397

pctca2017050779-seql.txt

<211> 891

<212> DNA

<213> Papaver somniferum

<400> 397

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accgcctttg ctgataagga gcagctgaag gcagagagta aggaatgcat agaactcgcc      180
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catccaagtt acttcggaaa ctaccgtcaa gagaagagtc gggaacattt ccttagtttc      780
ccctgggtgtg tttatgacaa actgattcac atcaagaaga acaatagcat gagaaggaaa      840
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<210> 398

<211> 366

<212> DNA

<213> Papaver somniferum

<400> 398

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aaacatcata tagaaactca tgggacaagt gatgatattg atgaaaacac aaaacctgag      180
gaaatcaaag gtcctagtgt ttttcaaaga gctaaagaag aaattgaagc actagttgaa      240
gcaattcatc caaagaaaga atcatcatca tctgatgacc attcaaagaa ggatgggtgt      300
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<210> 399

<211> 311

<212> DNA

<213> Papaver somniferum

<400> 399

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aaagatgagc tgggtgagtt gacaccgtac acacaagagc gacatcttgc agaaaccgat	240
ttggagcttc cagttattga agcaagattc attgaagatg ttgatgctgt cttgaagcaa	300
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 <212> DNA
 <213> Papaver somniferum

<400> 400	
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<210> 401
 <211> 354
 <212> DNA
 <213> Papaver somniferum

pctca2017050779-seql.txt

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gataatgtat tatttgctga catggctggg tggatgggtc ttaaatatga aaagtattgg    300
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<210> 402
<211> 573
<212> DNA
<213> Papaver somniferum

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ctagtaacta aggaggcaat gagacaccac cctccagcac catttctagt tccacgagaa    180
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gctgcaaaag caattggaat ggacccaaaa atttgggaaa acccatctgc attccaacca    300
gaaagattct tatataacga catagatgtc aaaggacaag acttcgagtt gatacccttt    360
gggggtgggc ggaggggggtg ccctagtgtt aacttctcgg tagtgctagt cgagctcacc    420
caggcaaatt tccttcacg tggttaactgg aaattgccct ctgggatgaa accagaggaa    480
gtagatatag acgaagcgga tggcttcaca atgcacaaga agattcctct ttgcctccta    540
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<210> 403
<211> 519
<212> DNA
<213> Papaver somniferum

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<400> 403
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acgaatcatt caaagttcac aggtaaatgt ggtgtagcga ggtgcacaga ttgtcacatt    180
aaccggggga ataagtcgaa agataaggcc aaaggaactc aaaagcttaa atcatgtagt    240
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tgtcaagccg aagaagatgt aggttgggtgt gttttgtga 519

<210> 404
 <211> 2201
 <212> DNA
 <213> Papaver somniferum

<400> 404
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 tttaatgggc cccattttca gattgcacca atttcaactg ggaggcgtaa cccatttgat 180
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 <213> Papaver somniferum

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cgagtgcaaa aagaccctag tcagggaatt agcctcacta gagataatat caaaggaatt	360

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 <212> DNA
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caagttgcac ctatacaacc agctcagaca tttttgcacc ctaatggaca actgtatgga	1680
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 <211> 525
 <212> DNA
 <213> Papaver somniferum

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gtaaaaaact gtataacttt aagagtctta catacagatg tgggaacatt gacacgattt	360
aggtgcctgg atttgtcagt tactaagatc aaagtattac ccaagtcctg catcaacaac	420
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 ttagttgcgg cagtaatgct aaatgttatt gatgaggttg aaactgaaaa cccaatggaa 180
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<210> 411
 <211> 684
 <212> DNA
 <213> Papaver somniferum

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 <211> 711
 <212> DNA
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 <212> DNA
 <213> Papaver somniferum

<400> 413

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 <213> Papaver somniferum

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 <212> DNA
 <213> Papaver somniferum

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<210> 416
 <211> 894
 <212> DNA

<213> Papaver somniferum

<400> 416

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<210> 417

<211> 795

<212> DNA

<213> Papaver somniferum

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cattattggt caccaataca cccattaaca ctaccaacac tagtcctgct ccacggtttt	180
ggaggaaact gtctttggca atggagtaag caagttcaac atctctctac ccatttcact	240
ttgtatgtcc ctgaccttat atatttcggc aagtctgtaa caaaatcttc agagcggtcg	300
gaaaattttc aagcggtttc agttggaaaa ttacttgagt tgttgggtgt tacaacgtat	360
tcggttatgg gtacaagtta tgggtggttt gttgcttadc atatggctag actatggcct	420
gacagagtcg agaaagtcgt tatagccaat tcggctttaa atatcacgtc aaaagatgtt	480
gaagagttgc tgaaggaagc aaatattgag aatattgaaa gtgtgtttat gccgtcatcg	540
cctgctgagt tactaacttg tatccgatta attcataagc agttaccgac ttatgtacca	600
gagttttttc tgaatgattt tcttgataat ttgtgtaatg aaaacaggaa ggaaaagtta	660
gagcttctca agggaaccac agttgggaaa gaggatacaa tatccattct gcctcttcaa	720

pctca2017050779-seql.txt

caggaggtgt tactaatatg gggggagaat gacgcaatat ttccattgga gaagggttat 780
gagcttaaaag agtaa 795

<210> 418
<211> 285
<212> DNA
<213> Papaver somniferum

<400> 418
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gatgctccaa tacttaaaaca agcgaagttc aagatagcag gaactgataa gtttgcgaaa 120
gtaattgctt ttcttcgtag acaacttcac cgtgatacgc tatttgtgta tgtaaatagt 180
gctttctcgc ctaaccctga tgaattagtg aatgaccttt acaataattt tgggtttgat 240
ggaaaactgg tgggtgaacta tgcttgctca atggcctggg gctaa 285

<210> 419
<211> 327
<212> DNA
<213> Papaver somniferum

<400> 419
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aaatactgta ttaccttttg ttttatattat gaaaggtatc ttgttgcct tgagggactt 180
tgtgatgcaa actggatagt tgactcagag gagtctaagt ctacgagtgg atatgttttc 240
actctagcaa gagggtttgt ttctggaagt ttttcagaca aacatatatt gctcaattca 300
ttatggaatc tgagagtatt gcgtag 327

<210> 420
<211> 255
<212> DNA
<213> Papaver somniferum

<400> 420
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caagtgaagt cattcattat aatgctaaac cagaatatca tgtgtcacgc ccaaataatt 180
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<210> 421
<211> 798
<212> DNA
<213> Papaver somniferum

pctca2017050779-seql.txt

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<400> 421
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attataacca agtactgtgt acgaagacgc gaatcgatga tagaaagaaa tgaattaaga      180
agtcatacaag ctatggttaa tcgcggtgtt gacgaaaacg tacttaaagc tattccaatt      240
ataacttatac atcatcaaca acaacaacaa agtagagatg aagaagaaga agtcttttgt      300
gtggatcaaaa ctgagtgttc tgtttgttta ggtgatttac aagaaggatga tatgctaaga      360
ttattacctta actgtaaaca tgtttttcat gttccttgta ttgatcaatg gtggttaact      420
cattctactt gtccgatatg tcgttcccct gtcacgggac ggaacgatga ctccgtgtgt      480
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caacaatata attgcagcga agggagtaac aataatgaag gtggcaattc ttcaataatg      600
gtagggttcaa aacttagaca ctgtgtgtcg cttatatggc cggctaatta tgaagatgag      660
gtagaaaaac agcagtctaa aactgttttg ttaaagagat ccatgtctgt ggattgttct      720
tttgtttgca ttaaaatata accaagaacg gattcatctt cttcatcatc gtcaacttgg      780
aagacaactt caaagtag                                         798

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<210> 422
<211> 519
<212> DNA
<213> Papaver somniferum

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<400> 422
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aagaattttg aattttttct tggcatggtt atttggtatg accttttatac ggtcgtcaac      180
tccgttagca aatcactaca agcaaaagat atgcatatgg gagatgctat tgaacatata      240
aaaatgcttg ttcatTTTTT caaagagtac agagacaatg gcttccaagc tgcactagtt      300
gaagctaaac aaattgctgt tgacatgggt attagtccta aatttcagga acaacgtgtt      360
agaaagcgga agaagcattt cgatgatgat gctagcgagg agacagttcc tgactcagat      420
attgatggga gagatctgta cactgaatta aagattatga aaaggacact gccggccgag      480
ataaagaaac caattgagaa agaagtttct ccaaactga                                         519

```

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<210> 423
<211> 663
<212> DNA
<213> Papaver somniferum

```

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<400> 423
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pctca2017050779-seql.txt

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aaagaagagt tcaaaaaatc tcttggtggg tctcttgaaa aatatgtggt aagaacaagt 120
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cgtacagttg agagcaatac ttgtgaaaat gttgatcaaa atttaaatga gataaacaga 240
gatggtaatg atgcacatgt tgccggaaat gttgatactg tggcaggtgg gggagatgta 300
aatgaattaa atgagaataa taacagtgtg aatgttaatg aagaggtaaa tgacatggat 360
ggttgacttg cgactgagtt taacatggaa gaaccgaatc aagatatattt tgatccaaag 420
aattggggta aaatcgatca aaaattgatt gatttttttag ttgagaacgg tccaagaagg 480
gttgaagatt atgactttcc ttatgataaa tttggtaaac gtttttctag aaagcattat 540
acccgtaaga tggcaaacag ggagaagcaa gataggagat ggcttgataa ttcagtttct 600
ttagacaaag tattttgttt ctgttgcaag ttgttcaaaa aagatgattc aacacaatta 660
gct 663

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```

<210> 424
<211> 1308
<212> DNA
<213> Papaver somniferum

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<400> 424
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ccaaacccaa ggtatgctct gaattatcta ttacttacgg atggagtga acctgaagat 180
attaaagaag cactagcggc tgatgattca ggcaagtggc aacttgctat ggaagatgag 240
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gcgttgcata acaagtgggt ttatcggatg aagtctgaag caaatggaga tattcgctat 360
aaggagaggt tggttgtaa aggtttccaa caaaaaccta gtgttgatta caacgagata 420
ttttctccag ttgtgaagat gactactatt cgagtagtgt taagtctagt ggcttctgaa 480
gatctctacc ttgaacagtt ggatgtaaag acaacgtttc ttcacggtaa cctagatgaa 540
gaaatttaca tgaagcatcc agaaggattc atagtaaaag gcaaggaaga gatggtgtgc 600
aagctaaaga agagtttgta tggtttaaaa caagcccgga gacagtggta caagaagttt 660
gataacttca tgcatagagg tggttactca cggtgtaatg cagatcattg ttgttacttc 720
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ggtgtactta tgcttagtca ggctgattat attgaacgag tgttgaaaag gttcaatatg 960
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pctca2017050779-seql.txt

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gtgagtagat atgcaagcaa cccaggaaaa caacattggg aagctgtgaa gtggattctc	1200
aggtatttga gaggtaacac aaacgtatca ttgtgttatg gaaaaggtagg ttctatcttg	1260
aggggttatg tggatgcaga cttcaaagga gatgtagata aaaggtaga	1308

<210> 425
 <211> 354
 <212> DNA
 <213> Papaver somniferum

<400> 425	
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tttcacaaga atttcattca agttcagagt ttattagatc aaaacagggtt acttattaat	120
gagattaatc gaaaccatga gtctaataata cctcatgac tcaataggaa tgtgggtttg	180
attagagaat tgaataataa tattagaaga gttgtgcttc tttatgcaga tctttcaagc	240
tcattggttt cttatgaagg tgggtggtgg gatttttagtg gtgggtggtagg tcgtagtggt	300
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<210> 426
 <211> 2004
 <212> DNA
 <213> Papaver somniferum

<400> 426	
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tgtaagcaaaa agaactctgat tttaaactgg gaaaaatgcc acttcatggt gaactccggc	180
atagttctag gacacatcgt atcggaaaaa agaattgaag tagataaagc taaagtgcac	240
ctcattcagc aattacctca accccactct gtgaagggga ttcgatcatt tttaggtcac	300
gctgggttct accggcgatt catcaaaaac tttagccaaa tctcaagacc cttgtgtaac	360
ctacttgcca aagatgttgt ctttaacttc gatgcttctt gtgtgaaggc atgggaagaa	420
ctcaagactc tcctcaccac cgctcctata gtccgaccac cagattggaa actgccgttc	480
gagctcatgt gtgatgcctc tgattatgcc gttggcgctg ttctagggca acgtgttgat	540
agactaccat atgtgatata ctatgctagt aaaactctta atgatgctca actcaactat	600
tcgactaccg agaaggagtt acttgccgtg gttttcgcac tagacaagtt tagatcttat	660
ctgatagggt ctaagatcat catatacaca gaccatgcgg ctttgaagta tcttctttcc	720
aagaaggatg ctaaagctcg ccttattcga tggatactct tattacagga attcgatctt	780

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aggagaaaca tgatgccatt gaacccatt ttgattgtgg agatttttga tgtttggggg	1320
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gattacgttt ctaagtgggt agaagccata gcaaccagaa caaacgacca caaggtggta	1440
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tactgggcaa tcaaggagct aaacttttct ctggacgaag ctggaattca aaggaaactt	1860
caactcaacg agttggaaga attgaggaat gaggcttatg acagtgccaa gctgtacaag	1920
cagaagatga agatgtttca tgacaagcgt attctgcgca aatccttcac tcctggtcag	1980
aaagtcttgc tgtatgactc ctga	2004

<210> 427

<211> 789

<212> DNA

<213> Papaver somniferum

<400> 427

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aagctatcag agatagcctc aaaagctgcg tcaattggac aatccattga tgaagataaa	120
ctggtaaaga agtttctcaa tagtttacca agatccaagt atattcatat catagcttct	180
ctcgaacaag tcttagattt aaagaagact agctatgaag atataattgg aagattgaaa	240
gcataatgaag agagaatcct tgatgaagaa aacaatggag aaactcaagg aaaactcttg	300
tacacaaaact cttaccaaca aaactctgcg acaagaggaa gaggtcgtgg aagaggtggg	360
agagtaaaca gaggccgagg aagggggagga aggtttaact cacaagatag aacaacaagt	420

pctca2017050779-seql.txt

cagaatgatc aaaaccaagg gaaagaaaaag aaggatagat caaacattat ttgttacaga 480
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 tgggtatttag ataatggagc cagcaatcac atgactggga agagacacta cttttctgaa 720
 ctcaatgaga aaatcaaagg acaagtgaag tttgggggatg gatcttctgt agaaattgaa 780
 gggaaatga 789

<210> 428
 <211> 738
 <212> DNA
 <213> Papaver somniferum

<400> 428
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 atgagactgc aagatcagac atggaagtgg catgcaagat taggacacat aagttccaga 180
 accttaaaaa ctatgtctca aaacaagatg gttcgagggc taccacaaaa aaacggagtg 240
 gtggagagga gaaaaaggac tctaattggag atgacaagaa gttctttaaa ggatatgcag 300
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 gatgaaaaag caaactggaa ctggaaaagaa actaatgatg gaccaagtag ggatccagga 660
 atgtttcaca tgagatgggg tcaagtaatt gaaacaatga tcatcaatac caatggaaac 720
 aatgatgtta atcaataa 738

<210> 429
 <211> 561
 <212> DNA
 <213> Papaver somniferum

<400> 429
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 atttgtcaag attttgatct tgttctatct aatgccatta ctggacaaga gtttgaagat 180
 gaggaatttc ttgttgaaag cggttcaagt gttataatta agagagtacc agttgataga 240
 gatgctaatt ctgttcggcc agcggttgag aatatggcaa aaaaacacta tccttctgtt 300

pctca2017050779-seql.txt

cataactaatg aaccgactct tccggcagtg tgtggcaaga acgttgaagt cgaaaacttc	360
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<210> 430
 <211> 222
 <212> DNA
 <213> Papaver somniferum

<400> 430	
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gttgacagtg attgctcaag gatggccggc tgttgggtgct tcagagattt ttgttgcagc	180
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<210> 431
 <211> 768
 <212> DNA
 <213> Papaver somniferum

<400> 431	
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ttctatctca atgatgccag gtacaaactg gttgaacaat ttaacaagca gactcacgat	720
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<210> 432
 <211> 1902
 <212> DNA

<213> Papaver somniferum

<400> 432

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tctgatccaa ttgaatttac ttggactcca ccaaactctg gtgaaattat gatctgttgt	1800

gatggtgcat cacttggttaa cccgggacag gctggttctg gtgttgtctt ccgtgattct 1860
aactcggtag tcttgggagt tttgtgcgtt ggtctgggct ga 1902

<210> 433
<211> 1245
<212> DNA
<213> Papaver somniferum

<400> 433
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<213> Papaver somniferum

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<211> 924

<212> DNA

<213> Papaver somniferum

<400> 435

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aaaagaaatg cacatagaag atctgcaagt gattcaataa catttcttga agcgccattt	240
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<211> 678

<212> DNA

<213> Papaver somniferum

<400> 437

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<211> 2361

<212> DNA

<213> Papaver somniferum

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<210> 440
 <211> 327
 <212> DNA
 <213> Papaver somniferum

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 <212> DNA
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 <212> DNA
 <213> Papaver somniferum

<400> 443	
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caagttaggt ttaatccagt gaagacttgt aaagcggcct cttcttcaat cgaagggagc	180
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attatgggtt tggatcttcc tcatggaggt cacttgtcac atggatttat gactcctaaa	660
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 <211> 795
 <212> DNA
 <213> Papaver somniferum

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gtagagcttg gcattccaga tattatcaaa aacaataacg ggccaatcac acttgcacaa	180
ctttcatcaa aactcccaat tccgaatgtc aactcggatc acttgtacag aattgtaaga	240
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<210> 445
<211> 558
<212> DNA
<213> Papaver somniferum

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ggccttttca tggctgaatc attaaacaaa tatgaaatct tgtatctcca tatgatagag 240
atgatgaagg ttgacgaaga tacctctgta acaccataca acagcttacc gatgaggaga 300
gcttttaaaag ggacttttat ttctgccgga ggttatgaga aagaagatgg aaacaaaatg 360
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ttgcctaaac gtttcgccgt tgatgcgcct cttaacaagt atattagtga tacattttgc 480
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actaattgca gttaaataa 558

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<212> DNA
<213> Papaver somniferum

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ccaggccaa aaccctggcc gatagtcgga aaccttcttc aacttgggtga gaaaccgcat 180
tccaatttg cccaacttgc tgaaacctat ggagatctct ttacactcaa actaggaact 240
caaacagtcg ttgtagcttc aacaccatta gcagccagtg aggttctaaa agcacatgat 300

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 ggaaattcag caaatccagg cgattatgtt ccacttttgg gtagtttaga cttgtttgga 720
 caaagaaaag atgttgctga ttgtcttcaa ggggtttatg gtgtttgggg tgctatgctt 780
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 <212> DNA
 <213> Papaver somniferum

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aagaagagga aagcacctaa tgcacaggg ggatggccat tgataggcca tttccatcta	180
tttataagtg gtaaggaaat agtgtataga acactgggaa ccatggctga taagtacgga	240
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<210> 449
 <211> 348
 <212> DNA
 <213> Papaver somniferum

<400> 449	
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atcgcagata ttatcaaaaa caataatggg tcaatcacac tttcagagct tgtatcgaaa	180
ctaccacttt caaatgtgaa ttctgataat ttgtacagaa ttctaagata cttagtacac	240
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<210> 450
 <211> 204
 <212> DNA
 <213> Papaver somniferum

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 gcagaacaag gaaggaatcc ctag 204

<210> 451
 <211> 5886
 <212> DNA
 <213> Papaver somniferum

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 <211> 324
 <212> DNA
 <213> Papaver somniferum

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gaactccgta	cttctatttt
ctattgcctc	gcgatataaa
gagcattaca	gccaggatta
caggttctac	ttgttcaaca
aactcagagt	acattttgcc
caaaaacctg	atcataaatt
tcattttctc	ggcttgccta
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ggggggcttt	cttttgtctg
tcagatattc	tggcaggagc
attagaatgt	gacttgaacc
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ggcgggtgcag gaatattcgg ccgcaaaata gtaggcggag taggaaaaag ccacaaagta	720
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ggtttcttgt ag	792

<210> 454
 <211> 546
 <212> DNA
 <213> Papaver somniferum

<400> 454	
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atcgagcact gttggacttc agcttcagag aaaaggccag aattttggca gattgtgtac	180
acacacttgg atcatctggt cgtggacatg tgcacttcaa atggctacat gaaagtggat	240
tcgtatattc atgccgcctt tctccaagcg tggctgtggg agcacttcga aaggtatgct	300
ccaaaaccgt tggccttact tcccagtcct tgggggtggct ctagaatact ccgctggtcg	360
aataggcgcc caaagattgg ttcgaaactg attggattcc ttgacaactc gcacacgatc	420
aatttccgtc catgggctcc gatgcatgcy tccataactc aaatcaatac ctttgtcct	480
gttccgagca tgtctttgtc ttctgataaa gaggatacga gtgttggaga gatggtgttc	540
atgtga	546

<210> 455
 <211> 1032
 <212> DNA
 <213> Papaver somniferum

<400> 455	
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ttcaacggga agaataattt tacatcatgg caaattgatg ttaaagatac tcttgtagt	120
atgaaacaaa tcaaagcgat caaggacaaa ccagcagcgt taccaaagga atggagcgat	180
gagaagtggg atgaccttgt tttggaggcg tgttcaacta ttcggttatg tttgtcaagg	240
gagatcactc ataatttttc gagtgaaacc tctgcaacgg tgttgtggga taagttaaag	300
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pctca2017050779-seq1.txt

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tttcggatgg cttcaggtaa gcctatgggt gatcatatta acgatttttaa taagatctgt 420
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agtaataaga agcagaagtc gaagaatcgt ttcaagaaga acgatattga gtgttattat 720
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aatgatgggt ggatgcttga ttctgggtgt tcgtatcata tgtgtccttc aaaggattgt 960
ttcaatactt atagagaggt gaatgggtgt acttttatga tgggaaattc taatgcctgc 1020
aaaacagttt ga 1032

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<210> 456
<211> 957
<212> DNA
<213> Papaver somniferum

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<400> 456
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tccttttcta gtgatgcaat tgcagatgat tattatgccg ttttaggact gctaccagat 240
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gcagtaaatc ctttcttggg tgacactagt gttaaggatc atgcttttgt ggatgagttt 480
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pctca2017050779-seql.txt

<210> 457
 <211> 1377
 <212> DNA
 <213> Papaver somniferum

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 ccacagaatg ttcctcctgt tctaccaccc actcgtttac ctgctgattt ttatcctgat 180
 cgcgttcctg tcacaatcat tgatacttcc tctagtatgg agcatcgac taaacttgct 240
 caagaattaa agctagcaga tgctgttgta ttaacttatg catgtgatac acctgcgact 300
 cttgatcgtt taagtacgtt ctggttacca gaacttcgca gattagaggt gaaggtacca 360
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 gtgatgtctc cgataatgca acaatttagg gagattgaga cttgtatcga atgctcggcg 480
 cgtagcctta ttcaggttcc agaagttttc tattatgctc agaaggcagt tcttcaccct 540
 acagcaccat tgtttgatca ggaaacacag actttaaacg ctcggtgtgt gagggcttta 600
 aagcggatat ttatttctctg cgatgaagat agagatgggt ctctcagtga tagagagtta 660
 aatgactttc aggttaagtg tttcaacgct ccactccagc cttctgaaat agtcggtgtt 720
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 tcagatagaa atgttttcca gtacttcatg tttggaccta aaagggtgtg ggaagtcac 1320
 atttatcaac tctttactcg gaaggatatg tacttgttga agttattgat aaaataa 1377

<210> 458
 <211> 501
 <212> DNA
 <213> Papaver somniferum

<400> 458
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 atgattacta gcgcattacc ttatgttaat aacgttcctc accttggaaa tatcattgg 120

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tgtgttttga gtgctgatgt cttcgctcgt tattgccgtc tcagaggtta taacacgatt	180
tatatgtgtg gtacagatga atatggaaca gccactgaaa ccaaagctat ggaagaagga	240
tgtacaccta aggagatttg tgataagtat catgcgattc acagagatgt ttacaactgg	300
tttgacataa gttttgatga gtttagacgc ctttctagtc cccaacagat tgaagtttgc	360
caagcaatth tcaaaaaact gatggagaac aactggcttt ctgaaaatac aatgcagcag	420
gtcgtgcatt tacaggtcag tggtccttca aagccattga gtgagcttga tgatccagct	480
tggcgactag cgtttgggta g	501

<210> 459
 <211> 300
 <212> DNA
 <213> Papaver somniferum

<400> 459	
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ccgaagctga gacaagaact tgaagaactt caggttcact ccatgctaca cacactaagg	120
cacgatggga aatcaaaaact agcgctttca agattcagta gatgcataat gctgggtggct	180
tatggagcct atctcgtttt ccagctgttc agtcacaagc acttatacga ggttggactc	240
tttaatgctt tcagaattat ttttttcttc atactgtggc agttttgggtt atccttataa	300

<210> 460
 <211> 495
 <212> DNA
 <213> Papaver somniferum

<400> 460	
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aaaacatgtc ttcttatttc ctacactagc aacactttcc caacagatta tgttccgact	120
gttttcgata acttcagcgc aagtgttctt gttgatgcc aaattgttag ccttggcctt	180
tgggatactg ctggtcaaga agattacaac agacttagac ctctaagta cagaggaact	240
gatgttttcc tgcttgcttt ctcaactgac agtagacca gctttgagaa cattaccaag	300
aaatggattc ccgagctacg acattatgca ccatcggttc ctattgttct cgttggcact	360
aaactagact tgagagaaga caaacagttc cacatcgatt accctggagc atatactata	420
tctacggcac aggggtgagga actgaagaaa cagattgggtg cattagcata tgtagaatat	480
atttctaaga actaa	495

<210> 461
 <211> 495
 <212> DNA
 <213> Papaver somniferum

pctca2017050779-seql.txt

<400> 461
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gatattgcac gcagggcctc taaatccatg gatgctgtta ttagaaacca cgaagagtct 180
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caataccttg gtcctttcca ccagatcaca agcagcatat gcacaaccaa agaccagct 300
gtcggactgg tattatctct catggatgat gttgttaaga tggttgcttc ttgtgacacc 360
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ggattaaggg tgagtacatc cctgaaaatc tctactcaga aagccatctg gaagaggcaa 480
ggaactattt tatga 495

<210> 462
<211> 285
<212> DNA
<213> Papaver somniferum

<400> 462
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cctaagggtt ttgaaaaccc tgatttcca gatcatatgc taaaactcaa aaaggcattg 120
tatgggttga aacaagcacc tagatcttgg ttgaaaaac ttaccacttc tatcattaga 180
aaaggttttt caagaggcgg agctgataaa actttgttta caaaatggag tggaaaagat 240
gtggctattt ctcaaactta tgtagatgat atcatctatg gataa 285

<210> 463
<211> 234
<212> DNA
<213> Papaver somniferum

<400> 463
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aaccagccgg ataaaaataac ccggcccttc aaaaaatcag aaaaatacat gacgccttca 120
ggatacaaat gcctaacaga catttcagat caattgcagc ataaccacc accccctcca 180
accaacttcc tatggacact cccatgtcca caaaagtac aacttttctt gtga 234

<210> 464
<211> 222
<212> DNA
<213> Papaver somniferum

<400> 464
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gagaaatacc ttaaacaatca accaatcctc caaaacatcc ctctcctcc ctcgtccaca 120
atcccccttt ggaggaatct ggcttccctc ataccaaccc taaaaaaaca tctctttcac 180

pctca2017050779-seql.txt

cagataggaa acggctccac caccccaatc caagcaaact ag 222

<210> 465
 <211> 261
 <212> DNA
 <213> Papaver somniferum

<400> 465
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 accattcgag aaaatagtct acctcatcct cattctacac aatcatcatc ctcagctata 120
 actgctgggt ctgaaccgcg caactttaaa gaagccatga agcatccagg gtggaggaaa 180
 ccatggaagc aaaaatccga gctttggaag aacaaggtag ctgggaattg caagaattac 240
 caccgggcaa gagagcacta g 261

<210> 466
 <211> 345
 <212> DNA
 <213> Papaver somniferum

<400> 466
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 tctaacaatga cacgtgggtt atatttacca ttaccagtag catcaagacc ttgggagagt 120
 atttctatgg attttcttgg tgggttaccg aagaccaagt ctgggtcatga ttatttggtc 180
 gttgtggtcg accgattaag caagatgatt gcattaattc catgtacaaa gacggtaatg 240
 ggagccgacg caggaaaagct cttctttaag cacgtgtgga agcatttttg tttacctact 300
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<210> 467
 <211> 258
 <212> DNA
 <213> Papaver somniferum

<400> 467
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 catttggcat ttacagacta tgaagatgaa atgaggggta tgttcataac tgaagatgga 120
 aaacacaatt atgtcaagta tggaacagat ggaggtgaca tgaataaggc tgtgaagaca 180
 ttagtcagca ggtatgaaag ggaagatatg tgtgatgctc ctgctaata tagtattgga 240
 tggagagatc ctggtttt 258

<210> 468
 <211> 258
 <212> DNA
 <213> Papaver somniferum

<400> 468

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atcagatcat gtaacatgat agagagaatg gtgtaccag tgactagcaa caacttctct	120
tttactccca ttcaatctct tcgtatccca aatttccaac cttttcaatt attagaaggt	180
gccagtttgg tttctttggc ttcttttgcg caattccgta caaatcacia aacaaaaactc	240
attaaaagga acatgtag	258

<210> 469
 <211> 327
 <212> DNA
 <213> Papaver somniferum

<400> 469	
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aaatactgta ttaccttttg ttttatttat gaaaggatc ttgttgcct tgagggactt	180
tgtgatgcaa actggatagt tgactcagag gagtctaagt ctacgagtgg atatgttttc	240
actctagcaa gagggtttgt ttctggaagt ttttcagaca aacatatatt gctcaattca	300
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<210> 470
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 <212> DNA
 <213> Papaver somniferum

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gttcaagtaa ttgatcttga tagcagtagt ggtggttctg attcagatga cgacgacgat	180
aatgaagata gtgatggaga tgctcacatg tctaaagatt ctagggttgg tgggtggtgg	240
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aaagatggca gtgagatgct gctggtggaa gatgacggcg gaggaatgga tccggataaa	780
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acattcttaa ggggcacagg caaggaagat attgtggttc cgatgcttga ctatgaaaaa	1020
gagggccgag aatggaagga attgattcga tcgtcttcaa gtgattggag tagaaatgta	1080
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gaacaggaag ccttcattga tatatttgcc gaggagagat gccggcgaga gaaagaggag	2460
gaaaacttga ggagcaaatt aaaggatgct tctaatacca tacaagagtt gctcgataaa	2520
gttcggcagc ttgagaagtc cgacggcaga acttaa	2556

<210> 471
 <211> 255
 <212> DNA

<213> Papaver somniferum

<400> 471

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actaaactcc ctttcacaaa aatgcgtgct tgtgtgcacg ccaatgtaac aaagataata	120
caagtgaagt cattcattat aatgctaaac cagaatatca tgtgtcacgc ccaaataatt	180
gattatctaa atttactggc aagcaaatat agctgtcaca tccatcattg tggaacaaca	240
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<210> 472

<211> 2256

<212> DNA

<213> Papaver somniferum

<400> 472

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caacaatatt tgccggcatc tccgatgatg tatggtgtaa tttctgatcc atccattgtt	180
gataatcctg atatacctag ttatcaaccg catgtacatg ggagatgtga tccgccggct	240
ttgattccgt tacagatgaa tagtattgaa atggagggtga atgtgtgggt ggatactgtt	300
tctgtaagta tggttggatc ttggcgtgtt cattgtgtga tggggagtcg gagttgtgat	360
tgtcggattg ctattcctat gggaaatcag ggttcaattc taggtgttga ggttgaagtc	420
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gatgctgggtc agttcactgt gaatatacca tttagttttc cagaatatgt aactcctgca	660
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gaagttttat gcaagacatc tagccatcct ctgaaggaaa taagacgcca agcaggaaaa	780
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aaggttttca gaaggaaagt ggtatttgtt attgatacaa gtgcaagtat gaaaggaaag	1020
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gcttcaaact gttgtagcag tcttgacgat ttgtgttgtt gcatgaactg catcaggtgt	2160
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<210> 473
 <211> 234
 <212> DNA
 <213> Papaver somniferum

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cctgtaaaga tgagagcctc gatcttcaag tttgaggtag aagattgggtc ctttaatgct	180
tttgcaattt cggaaacaag agtcccaatc gatgtctgca aggcagtcac gtag	234

<210> 474
 <211> 957
 <212> DNA
 <213> Papaver somniferum

<400> 474	
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caattcttca gttcaattaa accatggcga atgttaacaa agatcaatag caaccatttg	120
ataacaacat ttagtggttc aaaacggcgt gactctagaa ttagagctgt tgctgaagaa	180
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gcaacaccag agcaataaaa gaaagcttat tatacttgca tgaaagcttg ccatccagat 300
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 tggaatgacc tttggggaaa gcctgcaacc tatgaaactt cagggtattaa gaataaaaca 900
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<210> 475
 <211> 246
 <212> DNA
 <213> Papaver somniferum

<400> 475
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 aattctttca attctccctt gccttccttc cggatctcta taaagccttc caacatgttc 120
 ggtagtagaa tataccgggt aaatttgcaa gagaacatat tccgacaaaag tgttggaaaag 180
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 ggtag 246

<210> 476
 <211> 354
 <212> DNA
 <213> Papaver somniferum

<400> 476
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 caattcctaa tgtatggccc gttgcttctg attgggaaac atctcgtgca tttgttagat 120
 tgcaaaaaaa aattctatga tgctacattg aaattttctg gatcaaccta tgtcacgttt 180
 aatttattcc tcgatgaagt aatttgtatt aatgacgtat tgcaagaatg ggtaagaat 240
 gataatgtat tatttgctga catggctggg ttgatgggtc ttaaatatga aaagtattgg 300
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<210> 477
 <211> 1071

pctca2017050779-seql.txt

<212> DNA

<213> Papaver somniferum

<400> 477

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ctttcgagtg cgctaggtag tgcaggttgg ccgattttaa tcttccctct ctgcgtttca      180
tacatcttca agcgtggcgg tggtagcgaa aatggcagag tcaaattttt caccatcaca      240
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gcttctgtga tcagtggatt gttgttccca ttggcggagt tgatgtatat taaagctatg      600
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gagagtttca aatcggaaaa gggatttgcc ttattcctct cattttgggg tctcatctct      960
tacttgtagc gtgactacag agaaaacatt aaattgaaga aggccgcgca gaagcagagt     1020
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<210> 478

<211> 221

<212> DNA

<213> Papaver somniferum

<400> 478

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gatcatgtaa acccaggggt tcttctcaca cgtaaactct tcatttggag tgttattgtg      120
gggattatta ctggtttaga tagttttctg tttgctgttg gttacagtta tctacctgtt      180
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<210> 479

<211> 474

<212> DNA

<213> Papaver somniferum

<400> 479

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pctca2017050779-seql.txt

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cttcatcatg gggaagacaa aatgatctgg tgtggtaatt ccaagggat attttctgtt	240
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tggagctctt atgtgcatcc tacagttgcc agcaatgtat ggaagattgt tagaggggct	360
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<210> 480
 <211> 465
 <212> DNA
 <213> Papaver somniferum

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cagagggttga tatttgctgg aaagcaattg gaagatggtc gtactcttgc agactataac	180
atccaaaagg aatccactct ccatttgggt cttcgactca gaggtggat gcagatcttt	240
gtgaaaaccc ttactggaaa gacaattacc ttggaagttg agagttcaga taccattgac	300
aatgtaaaag ccaagattca ggacaaggaa ggtattcctc cggaccagca gcgtttgatc	360
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<210> 481
 <211> 562
 <212> DNA
 <213> Papaver somniferum

<400> 481 atgcagattt ttgttaaaac attaacaggg aaaacaatta cacttgaggt tgagagctct	60
gacaccatcg acaatgtgaa ggccaagatt caagacaagg agggaattcc tccagaccag	120
cagagggttaa tttttgctgg gaaacagctt gaagatggtc gaaccctagc tgattacaat	180
atccaaaagg aatccaccct gcacctgggt cttcgtctga ggggagggat gcaaatcttt	240
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aatgtgaaag ccaagattca agacaaggag ggaattcctc cagaccagca gaggttaatt	360
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tccaccctgc acctggttct tcgtctgagg ggagggatgc aaatctttgt caagactctt	480
acaggcaaaa ctatcaccct tgagggtgag agctctgaca ccatcgacaa tgtgaaggcc	540

aagatccaag acaaggaggg aa

562

<210> 482

<211> 216

<212> DNA

<213> Papaver somniferum

<400> 482

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tttacagcaa ggctgctacg atgtgcatat gttgatagat taaatccgcc aaatggcgac 120

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ggagtacttg gagatatgtt tcaagaggtg atatga 216

<210> 483

<211> 1308

<212> DNA

<213> Papaver somniferum

<400> 483

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ccaaacccaa ggtatgctct gaattatcta ttacttacgg atggagtga acctgaagat 180

attaaagaag cactagcggc tgatgattca ggcaagtggc aacttgctat ggaagatgag 240

ataaattcac ttgaggagga tggcacttgg gtgttagtaa aattaccaag aggtaagaag 300

gcgttgcata acaagtgggt ttatcggatg aagtctgaag caaatggaga tattcgctat 360

aaggagaggt tggttgtcaa aggtttccaa caaaaaccta gtgttgatta caacgagata 420

ttttctccag ttgtgaagat gactactatt cgagtagtgt taagtctagt ggcttctgaa 480

gatctctacc ttgaacagtt ggatgtaaag acaacgtttc ttcacggtaa ctagatgaa 540

gaaatttaca tgaagcatcc agaaggattc atagtaaaag gcaaggaaga gatggtgtgc 600

aagctaaaga agagtgtgta tggtttaaaa caagcccgga gacagtggta caagaagttt 660

gataacttca tgcatagagg tggttactca cgggtgtaatg cagatcattg ttgttacttc 720

aaaagggtgca gttctgacta catcatatta ttactgtatg tggatgatat gttggtttcc 780

ggaacatctc tacaagaagt tgagaatttg aagaaacaat tatcaagtga gtttgctgtg 840

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ggtgtactta tgcttagtca ggctgattat attgaacgag tgttgaaaag gttcaatatg 960

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<210> 484
 <211> 633
 <212> DNA
 <213> Papaver somniferum

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ccgatcagat gtggaaccag ttttaatact tcagttgaga atgtttactt ttggagagat	180
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atatcagaga gtttagggct tcaaggagat tatattgaga aggcataga aaccaaactt	360
ggtttacaaa tcctgattgt aaatctttat cctccttgcc cacagccaga acttgctatg	420
ggatgcctc cacattctga tcatggactt ctcacacttc ttgctcaaaa cgaaatcggt	480
ggattgcaaa tcaaacacaa agggaaatgg atcgttgcaa atgctttacc aaactctttt	540
atggttaaca ttggtgatca catggaggta cgcacatttt ctcacttaat gccccatttg	600
tgtgattttt tcattaactg catattttgt tga	633

<210> 485
 <211> 228
 <212> DNA
 <213> Papaver somniferum

<400> 485	
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gattatcacc tcctcacatc cggttctcca gatcaacggt cacaaatcat cgaaaacctc	180
cgtattgcat gtctcgattg gggtttcttc atggtaatca aatattga	228

<210> 486
 <211> 489
 <212> DNA
 <213> Papaver somniferum

<400> 486	
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caagttgctc taccataat tgatttctca ctctcactt cgggttcccc agaccagcgg	180
tctaagatag tcgaagagct tcgaaatgca tgtctgcatt ggggattctt catggtgggt	240

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ttggacccaa ttatatgtgg aaccaatttt aaccctgcct ctaagagtgt ctccttttgg	420
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<210> 487
 <211> 204
 <212> DNA
 <213> Papaver somniferum

<400> 487	
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gaagctcttt ctcgtgattc ttctgggtgct gttcaatcca acttctcttt gattactcct	180
acttctgggtg tcttccaggt ttga	204

<210> 488
 <211> 690
 <212> DNA
 <213> Papaver somniferum

<400> 488	
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<210> 489
 <211> 531
 <212> DNA
 <213> Papaver somniferum

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<400> 489
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 aatgttgagg ggaactga gttggagtta tatttagagg agaaacgtga accgagaatt 180
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<210> 490
 <211> 798
 <212> DNA
 <213> Papaver somniferum

<400> 490
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 tttgtttgca ttaaaaataca accaagaacg gattcatctt cttcatcatc gtcaacttgg 780
 aagacaactt caaagtag 798

<210> 491
 <211> 602
 <212> DNA
 <213> Papaver somniferum

<400> 491
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<210> 492
<211> 249
<212> DNA
<213> Papaver somniferum

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aattcagctt acggatggga aaaaccagtt aacctcagac ttgtacactc aggctcccaa 180
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gattgggtga 249

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<210> 493
<211> 1164
<212> DNA
<213> Papaver somniferum

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gccactctct ttcttccgtg ctactatttc tctctctata tatttcaaac caaagtttct 180
gaagaaaata caaccagtag tggaagagga ggaaaacttc tgaatctctc tgatagtatt 240
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pctca2017050779-seql.txt

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<212> DNA
<213> Papaver somniferum

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 <213> Papaver somniferum

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 <213> Papaver somniferum

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<212> DNA
<213> Papaver somniferum

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gaaatggatc gtgtactaag aatcgatggg attgacctta ttgggattaa caaccgaaac 900
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gaaataatcc gccaaaagga tattattgtg gttggggaat ctggattgtt tactccagat 1020
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<210> 506
<211> 399
<212> PRT
<213> Papaver somniferum

<400> 506

Met Lys Gly His Asp Asn Ser Met Thr Met Leu Leu Val Asp Phe Ser
1 5 10 15

Asn Ala Phe Asn Leu Val Asp Arg Ser Thr Leu Ile Arg Glu Gly Arg
20 25 30

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His Arg Cys Pro Ser Ile Ala Ser Trp Ile Glu Phe Cys Tyr Ser Ser
35 40 45

Pro Ala Arg Leu Tyr Tyr Asn Asp Val Val Leu Ser Ser Ala Gln Gly
50 55 60

Val Gln Gln Gly Asp Pro Leu Gly Pro Leu Leu Phe Ala Leu Ala Leu
65 70 75 80

His Pro Ile Ala Glu Asn Ile Thr Thr Gln Cys Ser Leu Asp Leu His
85 90 95

Ala Trp Tyr Leu Asp Asp Gly Thr Ile Val Gly Asp Thr Met Glu Val
100 105 110

Ser Lys Ala Leu Lys Ile Ile Gln Thr Asn Gly Pro Ala Arg Gly Leu
115 120 125

His Val Asn Val Thr Lys Thr Glu Val Phe Trp Pro Ser Leu Asp Leu
130 135 140

Arg Arg Asp Leu Glu Asp Val Phe Pro Val Asn Ile Gly Lys Ser Ser
145 150 155 160

Arg Gly Val Lys Leu Leu Gly Gly Pro Val Ser Leu Asp Met Gln Tyr
165 170 175

Cys Ser Glu Val Val Gln Gly Arg Val Asp Lys Thr Leu His Leu Trp
180 185 190

Glu Lys Val Gln Lys Leu Tyr Asp Pro Gln Ser Glu Leu Leu Leu Leu
195 200 205

Arg Ser Cys Ser Gly Val Ser Lys Leu Tyr Phe Thr Leu Gln Thr Thr
210 215 220

Ala Pro Leu Asp Ile Gln Ser Ser Ala Ile His Tyr Asp Ser Gln Leu
225 230 235 240

Met Leu Tyr Leu Arg Gln Leu Val Val Gly Asp Ser Ala Gly Phe Gly
245 250 255

Leu Leu Gln Arg Arg Leu Ala Thr Leu Pro Ile Lys Asp Gly Gly Phe
260 265 270

Gly Ile Tyr Thr Leu Asn Asp Thr Cys Gln Tyr Cys Phe Leu Ala Ser

275

Cys Ala Gln Asn Gln His Leu Gln Gln Ser Ile Leu Lys Gln Ser Ser
290 295 300

Val Leu Asp Pro Ser Phe Arg Phe Lys His Ala Leu Gln Ser Phe Thr
305 310 315 320

Gln Val Cys Gly Leu Ser Val Ser Gly Phe Ser Ile Asn Asp Ala Ala
325 330 335

Pro Gln Tyr Met Lys Thr Leu Ala Val Ile Tyr Phe Gly Ala Val Lys
340 345 350

Glu Arg Ile Pro Thr Asn Phe Ser Leu Thr Asp Arg Asp Leu Thr Leu
355 360 365

Trp His Cys Asn Arg Thr Pro His Ala Met Asp Phe Leu Lys Ala Ile
370 375 380

Pro Ile His Gly Ile Asn Gln Ala Ile Ala Pro Arg Gln Phe Arg
385 390 395

<210> 507
<211> 481
<212> PRT
<213> Papaver somniferum

<400> 507

Met Ala Val Ala Leu Arg Ser Lys Ser Ile Lys Glu Ala Thr Leu Arg
1 5 10 15

Thr Ile Val Thr Arg Ser Arg Tyr Phe Val Phe Asp His Ile His Lys
20 25 30

Ile Gly Gly Ile Ser Asn Ile His Tyr Thr Thr Arg Arg Lys Gln Trp
35 40 45

Val Asp Tyr Leu Ala Lys Thr Phe Tyr Cys Leu Asn Ser Phe Lys Ser
50 55 60

Ala Ser Leu Lys Ala Glu Phe Ile Asp Lys Gly Asn Ile Ile Ser Thr
65 70 75 80

Ser Asn Val Lys Val Asn Thr Asp Asn Arg Glu Val Gly Ser Ser Asp
85 90 95

Cys Asp Glu Asn Arg Val Lys Gln Ser Glu Phe Leu Gly Glu Phe Trp
Page 373

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100                               105                               110
Ser Tyr Ser Glu Pro Pro Glu Ile Trp Gln Pro Asn Gly Glu Gly Asn
    115                               120                               125

Val Val His Trp Val Pro Pro Asn Gly Lys His Gly Gly Gly Ser Gly
    130                               135                               140

Gly Gly Gly Gly Pro Asp Cys Gly Gly Gln Met Gly Ser Asn Ser Lys
145                               150                               155                               160

Asn Gly Cys Trp Gly Gly Ala Asn Met Gly Lys Glu Ile Pro Ser Pro
    165                               170                               175

Lys Glu Ile Cys Lys Gly Leu Asp Lys Phe Val Ile Gly Gln Gln His
    180                               185                               190

Ala Lys Lys Val Leu Ser Val Ala Val Tyr Asn His Tyr Lys Arg Ile
    195                               200                               205

Tyr Cys Glu Ser Ser Gln Thr Arg Ile Trp Ser Asp Arg Ser Ala Arg
    210                               215                               220

Asp Ser Gly Asp Glu Ala Asp Glu Thr Asp Phe Asp Ser Val Asp Leu
225                               230                               235                               240

Glu Lys Ser Asn Val Leu Leu Leu Gly Pro Thr Gly Ser Gly Lys Thr
    245                               250                               255

Leu Leu Ala Lys Thr Leu Ala Arg Phe Val Asn Val Pro Phe Val Ile
    260                               265                               270

Ala Asp Ala Thr Thr Leu Thr Gln Ala Gly Tyr Val Gly Glu Asp Val
    275                               280                               285

Glu Ser Ile Leu His Lys Leu Leu Val Val Ala Asp Tyr Asn Val Ala
    290                               295                               300

Ala Ala Gln Gln Gly Ile Val Tyr Ile Asp Glu Val Asp Lys Ile Thr
305                               310                               315                               320

Lys Lys Ala Glu Ser Leu Asn Asn Ser Arg Asp Val Ser Gly Glu Gly
    325                               330                               335

Val Gln Gln Ala Leu Leu Lys Met Leu Glu Gly Thr Ile Ile Asn Val
    340                               345                               350

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pctca2017050779-seql.txt

Pro Glu Lys Gly Ala Arg Lys His Pro Arg Gly Asp Asn Ile Gln Ile
355 360 365

Asp Thr Lys Asp Ile Leu Phe Ile Cys Gly Gly Ala Phe Thr Gly Leu
370 375 380

Glu Lys Thr Ile Ser Glu Arg Gln His Asp Ser Ser Ile Gly Phe Gly
385 390 395 400

Glu Pro Val Arg Ala Asn Met Arg Ser Gly Gly Val Ile Asp Ala Thr
405 410 415

Val Thr Ser His Leu Leu Glu Thr Val Glu Ser Ser Asp Leu Val Ala
420 425 430

Tyr Gly Leu Ile Pro Glu Phe Val Gly Arg Phe Pro Val Leu Val Ser
435 440 445

Leu Ser Ala Leu Asn Glu Asp Gln Leu Ile Gln Val Leu Thr Glu Pro
450 455 460

Lys Lys Cys Pro Arg Lys Ala Ile Gln Lys Asp Val Ser Asn Glu Gln
465 470 475 480

Cys

<210> 508
<211> 453
<212> PRT
<213> Papaver somniferum

<400> 508

Met Asn Ala Ser Glu Cys Ser Leu Ser Thr Arg Val Leu Tyr Pro Gln
1 5 10 15

Cys Asn Ile Asn Arg Pro Arg Thr Asn Ile Ser Ser Ile Ser Phe Pro
20 25 30

Asn Gln Ser Lys Gln Phe His Phe Ile Arg Arg Lys His Pro Leu Leu
35 40 45

Leu Arg Ser Phe Gly Val Ile Arg Asn Ala Ser Ser Glu Thr Pro Ser
50 55 60

Glu Ser Asp Thr Thr Ser Lys Pro Ser Gly Asp Asp Phe Ile Thr Arg
65 70 75 80

pctca2017050779-seql.txt

Val Leu Lys Glu Asn Pro Ser Leu Val Glu Pro Lys Tyr Leu Val Gly
 85 90 95
 Asn Lys Leu Tyr Thr Leu Arg Glu Lys Glu Ile Leu Ser Asn Lys Val
 100 105 110
 Pro Asn Glu Arg Ile Leu Glu Ile Ala Lys Gln Phe Cys Val Lys Leu
 115 120 125
 Gly Phe Lys Lys Asp Glu Met Gly Asp Gly Asn Gln Gln Phe Ser Asp
 130 135 140
 Ser Val Tyr Leu Lys Asp Leu Leu Arg Glu Tyr Lys Gly Lys Leu Tyr
 145 150 155 160
 Val Pro Glu Asp Val Phe His Glu Asn Leu Ser Glu Glu Glu Glu Phe
 165 170 175
 Lys Arg Asp Leu Glu Asn Leu Pro Gln Met Ser Phe Glu Glu Phe Gln
 180 185 190
 Lys Val Phe Lys Thr Gly Lys Val Lys Leu Leu Thr Ser Lys Ala Asp
 195 200 205
 Ser Gly Ile Ser Tyr Lys Tyr Ala Tyr Lys Asp Phe Ile Val Asp Leu
 210 215 220
 Lys Glu Ile Pro Gly Asp Lys Asn Leu Gln Arg Thr Arg Trp Ala Met
 225 230 235 240
 Arg Leu Asn Glu Asn Glu Ala Lys Ser Val Phe Glu Gln Phe Lys Gly
 245 250 255
 Pro Gln Tyr Glu Ile Glu Gln His Leu Thr Ser Tyr Thr Gly Arg Leu
 260 265 270
 Pro Glu Tyr Pro His Pro Val Ala Ser Ser Ile Ser Ser Arg Met Met
 275 280 285
 Val Glu Leu Gly Met Leu Thr Ala Val Met Ala Thr Ala Ala Thr Ile
 290 295 300
 Val Gly Gly Phe Leu Ala Ser Ala Val Phe Ala Val Thr Ser Phe Leu
 305 310 315 320
 Phe Phe Met Ala Val Tyr Val Leu Trp Pro Leu Ala Lys Pro Ile Leu
 325 330 335

pctca2017050779-seql.txt

Lys Leu Ser Ile Gly Leu Ile Ser Ala Val Gly Glu Arg Ile Trp Asp
340 345 350

Asn Val Ile Asp Thr Val Ser Glu Gly Gly Ile Phe Ser Lys Leu Ser
355 360 365

Glu Phe Tyr Thr Phe Gly Gly Leu Ser Ser Ser Leu Glu Met Met Lys
370 375 380

Pro Ile Ser Leu Val Phe Leu Thr Met Ala Leu Leu Ile Arg Phe Thr
385 390 395 400

Leu Ser Arg Arg Pro Lys Asn Phe Lys Lys Trp Asp Ile Trp Gln Gly
405 410 415

Ile Glu Phe Gly Gln Ser Lys Pro Gln Ala Arg Val Asp Gly Ser Thr
420 425 430

Gly Val Ser Phe Asn Asp Val Ala Gly Ile Glu Glu Ala Val Glu Glu
435 440 445

Leu Gln Glu Val His
450

<210> 509

<211> 655

<212> PRT

<213> Papaver somniferum

<400> 509

Met Glu Glu Asp Ser Asp Gly Arg Ser Gly Lys Ala Arg Met Leu Ile
1 5 10 15

Glu Lys Ala Thr Asn Ser Val Glu Pro Glu Val Asn Pro Arg Leu Val
20 25 30

Lys Ala Ile Lys Phe Val Val Arg Ser Ser Asp Ser Glu Ile Lys Leu
35 40 45

Ala Val Glu Thr Leu Met Glu Asn Met Lys Lys Asn His Ser Gln Val
50 55 60

Arg Tyr Leu Ala Leu Phe Ile Val Asp Glu Leu Phe Met Arg Ser Lys
65 70 75 80

Leu Phe Arg Ser Leu Phe Val Val Lys Phe Asp Leu Phe Leu Ser Leu
85 90 95

pctca2017050779-seql.txt

Ser Ile Gly Phe Arg Arg Asp Leu Pro Leu Pro Ala Pro Ala Pro Ile
100 105 110

Ala Thr Arg Leu Arg Ser Lys Ala Thr Glu Phe Leu Glu Lys Trp Asn
115 120 125

Thr Ser Phe Gly Leu His Tyr Arg Gln Ile Arg Leu Gly Phe Asp Tyr
130 135 140

Leu Lys Asn Thr Leu Asn Phe Gln Phe Pro Asn Leu Gln Ala Asn Ala
145 150 155 160

Ala Arg Ile Gln Gln Glu Arg Arg Glu Arg Glu Ile Arg Ser Lys Glu
165 170 175

Ile Leu Leu Lys Lys Phe Glu Thr Leu Ser Gln Asn Leu Ser Ser Ile
180 185 190

Lys Asp Glu Ile Gln Ile Thr Val Glu Glu Ile Arg Gln Cys Leu Asp
195 200 205

Ile Leu Arg Thr Asn Glu Ala Asp Asp Ile Met Leu Asp Thr Pro Glu
210 215 220

Glu Asp Glu Val Glu Asp Phe Arg Cys Ser Ser Leu Met Glu Ile Arg
225 230 235 240

Leu Glu Ser Leu Arg Glu Ser Glu Lys Leu Arg Glu Thr Ser Glu Asn
245 250 255

Lys Val Ile Phe Asp Ala Leu Arg Glu Leu Tyr Lys Leu Leu Ile Thr
260 265 270

Lys His Leu Val Ser Val Gln Glu Trp Ile Ser Val Leu Ile Arg Val
275 280 285

Glu Pro Glu Asp Thr Ser Phe Arg Asp Ser Met Leu Arg Glu Phe Ile
290 295 300

Asp Leu Gln Asn His Leu Lys Ser Val Arg Lys Thr Cys Glu Asn Ser
305 310 315 320

Gly Cys Ala Leu Thr Asp Ser Lys Asn Asp Lys Glu Glu Asp Phe Trp
325 330 335

Glu Glu Gly Lys Val Glu Val Cys Gly Tyr Gly Ser Ser Ser Thr Pro
340 345 350

pctca2017050779-seql.txt

Ala Lys Ala Asn Lys Asp Ala Ala Cys Met Ser Ala Val Ile Thr Lys
355 360 365

Ser Asn Ile Thr Pro Arg Gln Ile Thr Asp Ser Asn Ala Ser Lys Arg
370 375 380

Leu Asp Gly Glu Gly Glu Asp Ser Glu Ser Asn Pro Leu Arg Arg Lys
385 390 395 400

Leu Leu Ser Glu Ala Pro Val Val Asn Trp Gly Ser Ser Leu Ser Asn
405 410 415

Trp Gly Ser Asn Trp Asp Val Leu Ala Asn Gln Arg Gly Leu Glu Leu
420 425 430

Glu Gly His Trp Gly Arg Val Asp Tyr Asp Ala Val Ile Pro Ala Glu
435 440 445

Lys Ile Ala Glu Leu Asn Val Gln Ala Ser Val Tyr Lys Glu Glu His
450 455 460

Val Asp Ile Gln Pro Cys Leu Ala Pro Leu Arg Lys Gly Gly Val Cys
465 470 475 480

Gln Arg Arg Asp Leu Lys Ile Cys Pro Phe His Gly Pro Val Ile Pro
485 490 495

Arg Asp Ala Glu Gly Asn Pro Ile Asn Gln Val Ser Leu Ala Glu Lys
500 505 510

Glu Ile Thr Lys Met Glu Thr Glu Glu Val Ile Ala Arg Gln Leu Ala
515 520 525

Glu Gln Ala Val Lys Asn Val Arg Glu Arg Glu Lys Asp Glu Val Lys
530 535 540

Lys Arg Val Thr Asp Arg Lys Leu Leu Ser Arg Ala Lys Leu Ala Lys
545 550 555 560

Val Arg Glu His Asn Glu Val Val Leu Arg Asp Ala Ala Val Ala Ser
565 570 575

Thr Ser Arg Ser Ala Phe Val Gly Gln Asp Gly Glu Thr Gln His Gln
580 585 590

Thr Thr Arg Ser Ser Ile Lys Gly Lys Lys Pro Ser Leu Ala Ser Met

595

Leu Arg Lys Lys Val Thr Ser Lys Asp Arg Leu Ser Gln Arg Leu Leu
610 615 620

Asn Thr Arg Ala Thr Asp Ala Thr Val Arg Gln Leu Thr Val Gly Glu
625 630 635 640

Asp Ser Lys Tyr Arg Glu Ala Tyr Pro Asn Gln Trp Lys Arg Thr
645 650 655

<210> 510
<211> 168
<212> PRT
<213> Papaver somniferum
<400> 510

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Thr Trp Thr Lys Asn Gln Gln Gly His Asp Asn Ile Gln Gln Arg Leu
20 25 30

Asp Arg Ala Val Thr Asn Gln His Trp Arg Thr Thr Asn Pro His Ala
35 40 45

Gly Ile Thr His Leu Pro Arg Ile Ala Ser Asp His Ala Pro Ile Leu
50 55 60

Leu Gln Thr Lys Ala Leu Asp Trp Gln Gly Ser Lys Asn Tyr Lys Phe
65 70 75 80

Glu His Leu Trp Leu Ser His Pro Gln Leu His Gln Val Val Thr Ser
85 90 95

Ala Trp Asp Lys Leu His Asp Ser Asp Pro Pro Leu Asn Leu Gln Leu
100 105 110

Lys Leu Ile Ser Ala Ser Glu Thr Leu Thr Glu Trp Asn Lys Ile Asn
115 120 125

Phe Gly His Leu Pro Thr Leu Ile Lys Lys Ser Thr Ala Lys Ile Lys
130 135 140

Ala Ser Gln His Gln Cys Ala Thr Gln Thr Gly Ala Ala Leu Glu Asn
145 150 155 160

Trp Ile Gln Gln Glu Lys Gln Leu

<210> 511
 <211> 520
 <212> PRT
 <213> Papaver somniferum

<400> 511

Met Ala Phe Ser Tyr Thr Cys Leu Gly Gly Ala Thr Leu Arg Thr Leu
 1 5 10 15

Lys Phe Ser Ser Cys Ser Ser Ile Leu Arg Pro Ser Leu Pro Leu Leu
 20 25 30

Ser Pro Pro Ala Lys Thr Leu Thr Leu His Ser Leu His His Leu Thr
 35 40 45

Lys Thr His Lys Phe Pro Pro Phe Leu Thr Arg Ala Val Ser Val Pro
 50 55 60

Ala Gly Gln Thr Leu Asp Lys Glu Glu Thr Ala Lys Pro Tyr Gln Trp
 65 70 75 80

Lys Ala Thr Ile Asp Phe Lys Trp Ile Arg Asp Asn Lys Asp Ala Val
 85 90 95

Ala Ser Asn Ile Lys Thr Arg Asn Ser Val Ala Asp Leu Asp Leu Val
 100 105 110

Leu Asp Leu Tyr Glu Arg Ser Leu Asn Leu Gln Lys Glu Val Gln Arg
 115 120 125

Leu Arg Gly Glu Arg Asn Val Val Ala Asn Lys Met Lys Gly Lys Leu
 130 135 140

Glu Pro Ser Glu Arg Gln Glu Leu Ile Glu Glu Gly Lys Ile Leu Lys
 145 150 155 160

Glu Gly Leu Leu Thr Leu Glu Glu Asn Leu Leu Lys Leu Thr Glu Lys
 165 170 175

Leu Gln Lys Glu Ala Gln Cys Ile Pro Asn Met Ala His Pro Asp Val
 180 185 190

Pro Ile Gly Gly Glu Asp Cys Cys Gly Leu Arg Lys Thr Val Gly Ser
 195 200 205

Pro Arg Gln Phe Asp Phe Pro Val Lys Asp His Val Gln Leu Gly Lys

pctca2017050779-seq1.txt

210					215					220					
Glu 225	Leu	Asp	Leu	Phe	Asp 230	Phe	Asp	Ala	Ala	Ser 235	Glu	Val	Ser	Gly	Ser 240
Lys	Phe	Tyr	Tyr	Leu 245	Lys	Asn	Glu	Ala	Val 250	Met	Leu	Glu	Met	Gly 255	Leu
Thr	Asn	Trp	Ala 260	Ile	Ala	Glu	Thr	Met 265	Lys	Arg	Gly	Phe	Thr 270	Pro	Leu
Thr	Thr	Pro 275	Glu	Ile	Val	Arg	Ser 280	Ser	Leu	Val	Glu	Lys 285	Cys	Gly	Phe
Gln	Pro 290	Arg	Gly	Ser	Asn	Thr 295	Gln	Val	Tyr	Ser	Ile 300	Glu	Asp	Ser	Asp
Gln 305	Cys	Leu	Ile	Gly	Thr 310	Ala	Glu	Ile	Pro	Val 315	Gly	Gly	Ile	His	Met 320
Asp	Ser	Ile	Leu	Ala 325	Asp	Ser	Gln	Leu	Pro 330	Leu	Lys	Tyr	Val	Ala 335	Tyr
Ser	His	Cys	Phe 340	Arg	Thr	Glu	Ala	Gly 345	Ala	Ala	Gly	Ser	Ala 350	Thr	Arg
Gly	Leu	Tyr 355	Arg	Val	His	Gln	Phe 360	Ser	Lys	Val	Glu	Met 365	Phe	Ile	Leu
Cys	Arg 370	Pro	Glu	Asp	Ser	Asp 375	Ser	Phe	His	Gln	Glu 380	Leu	Ile	Glu	Ile
Glu 385	Glu	Asp	Leu	Phe	Ser 390	Ser	Leu	Gly	Leu	His 395	Phe	Lys	Thr	Leu	Asp 400
Met	Ala	Thr	Gly	Asp 405	Leu	Gly	Ala	Pro	Ala 410	Tyr	Arg	Lys	Phe	Asp 415	Val
Glu	Ala	Trp	Met 420	Pro	Gly	Leu	Gly	Arg 425	Tyr	Gly	Glu	Ile	Ser 430	Ser	Ala
Ser	Asn	Cys 435	Thr	Asp	Tyr	Gln	Ser 440	Arg	Arg	Leu	Gly	Ile 445	Arg	Phe	Arg
Pro	Ser 450	Thr	Glu	Gln	Thr	Ser 455	Ser	Asn	Ser	Lys	Lys 460	Gly	Lys	Ala	Asn

pctca2017050779-seq1.txt

Val Gly Thr Thr Gln Phe Val His Thr Leu Asn Ala Thr Ala Cys Ala
465 470 475 480

Val Pro Arg Met Ile Val Cys Leu Leu Glu Asn Phe Gln Gln Glu Asp
485 490 495

Gly Ser Val Val Ile Pro Glu Pro Leu Arg Pro Phe Met Gly Gly Leu
500 505 510

Asp Gln Ile Arg Pro Lys Gly Gln
515 520

<210> 512

<211> 281

<212> PRT

<213> Papaver somniferum

<400> 512

Met Ala Asn Ser Leu Leu Gln Ser Ser Ser Val Leu Leu Ser Lys Phe
1 5 10 15

Ser Ser Ser Ser Pro Ser Ser Thr Ser Ser Cys Ser Ala Ser Leu Pro
20 25 30

Cys Ile Asn Ile Pro Ser Lys Ser Ser Ile Val Gln Arg Lys Arg Ser
35 40 45

Val Val Leu Arg Ala Ala Ser Ile Glu Lys Ala Leu Asn Asp Leu Pro
50 55 60

Ala Asp Val Asp Lys Val Ile Asp Gly Val Glu Lys Ala Leu Thr Pro
65 70 75 80

Thr Ser Glu Ile Lys Val Lys Leu Leu Ser Ile Val Ala Gly Leu Asn
85 90 95

Lys Gly Leu Ala Ala Asn Gly Glu Asp Met Glu Lys Ala Asp Ala Ala
100 105 110

Ala Lys Glu Leu Glu Ala Ala Gly Gly Thr Val Asp Ile Ser Glu Asp
115 120 125

Gln Glu Lys Leu Gln Gly Arg Trp Lys Leu Val Tyr Ser Ser Gly Phe
130 135 140

Ser Ser Arg Thr Leu Gly Gly Ser Arg Pro Gly Pro Pro Ile Gly Arg
145 150 155 160

pctca2017050779-seql.txt

Leu Leu Pro Ile Thr Leu Gly Gln Val Phe Gln Arg Ile Asp Val Phe
165 170 175

Ser Lys Asp Phe Asp Asn Ile Val Glu Leu Gln Leu Gly Ala Pro Trp
180 185 190

Pro Leu Pro Pro Ile Glu Ala Thr Ala Thr Leu Glu His Lys Phe Glu
195 200 205

Leu Thr Gly Ser Asn Lys Leu Lys Ile Val Phe Glu Arg Thr Thr Val
210 215 220

Lys Thr Thr Gly Asn Leu Ala Gln Leu Pro Leu Leu Glu Val Pro Arg
225 230 235 240

Ile Pro Asp Ala Phe Arg Pro Ser Ser Arg Thr Gly Ser Gly Glu Phe
245 250 255

Glu Ile Thr Tyr Leu Asp Ala Asp Thr Arg Ile Thr Arg Gly Asp Arg
260 265 270

Gly Glu Leu Arg Val Phe Val Lys Ala
275 280

<210> 513
<211> 920
<212> PRT
<213> Papaver somniferum

<400> 513

Ala Asn Leu Glu Ile Val Leu Leu Ser Ser Asn Gln Phe Ile Gly Ser
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Ile Ser Lys Asn Ile Gly Asn Met Thr Asn Leu Ser Ser Leu Trp Leu
20 25 30

Asn Ser Asn Lys Leu Ser Gly Ser Val Pro Tyr Ser Val Gly Ser Cys
35 40 45

Thr Lys Leu Thr Glu Ile Tyr Leu Lys Asp Asn Asn Phe Thr Gly Val
50 55 60

Leu Pro Lys Ser Leu Ser Asn Leu Lys Leu Leu Asn Val Phe Asp Val
65 70 75 80

Gly Ser Asn Ser Leu Glu Gly Gly Ile Ser Glu Gly Phe Gly Gly Ser
85 90 95

pctca2017050779-seql.txt

Asn Cys Lys Thr Leu Ser Thr Leu Asp Leu Ser Ser Asn Arg Phe Asp
100 105 110

Gly Glu Ile Pro Asn Gln Leu Gly Asn Cys Thr Ser Leu Gln Val Phe
115 120 125

Ser Val Ala Asp Asn Lys Leu Thr Gly Gly Ile Pro Ser Ser Ile Gly
130 135 140

Leu Met Thr Glu Leu Thr Glu Leu Tyr Leu Ser Val Asn Asn Leu Ser
145 150 155 160

Gly Lys Ile Pro Thr Glu Ile Gly Lys Cys Arg Ser Leu Thr Val Phe
165 170 175

Glu Ala Ser Tyr Asn Gln Leu Glu Gly Glu Ile Pro Ser Glu Leu Gly
180 185 190

Leu Cys Ser Lys Leu Gln Thr Leu Phe Leu Tyr Val Asn Met Leu Thr
195 200 205

Gly Glu Ile Pro Leu Ser Ile Trp Arg Ile Gln Thr Leu Glu Asn Val
210 215 220

Ile Val Tyr Ser Asn Ser Leu Ser Gly Glu Leu Pro Val Val Met Thr
225 230 235 240

Glu Leu Leu His Leu Lys Asn Ile Ser Leu Phe Asn Asn His Phe Ser
245 250 255

Gly Ile Ile Pro Glu Lys Leu Gly Ile Asn Ser Ser Leu Leu Glu Leu
260 265 270

Asp Phe Val Asn Asn Ser Phe Ser Gly Glu Ile Pro Pro Asn Leu Cys
275 280 285

Phe Gly Arg Gln Leu Gln Ile Leu Asn Leu Gly Leu Asn Gln Leu His
290 295 300

Gly Tyr Ile Pro Ser Asp Val Gly Ser Cys Ser Thr Leu Asp Arg Leu
305 310 315 320

Asn Leu Lys Gln Asn Asn Leu Thr Gly Leu Leu Pro Asp Phe Val Glu
325 330 335

Asn Ser Ser Leu Ser Phe Met Asp Ile Arg Gly Asn Asn Phe Ser Gly
340 345 350

pctca2017050779-seql.txt

Lys Leu Pro Ser Ser Leu Gly Asn Leu Ile Lys Leu Gln Val Leu Asp
 355 360 365
 Leu Ser Gly Asn Asn Leu Gln Gly Ser Leu Arg Gln Gln Ile Ser Lys
 370 375 380
 Cys Thr Lys Leu Tyr Tyr Leu Asp Val Gly Phe Asn Lys Leu Ser Gly
 385 390 395 400
 Pro Ile Pro Ser Gly Leu Arg Ser Leu Thr Leu Leu Ser Asn Leu Lys
 405 410 415
 Leu Gln Glu Asn Gln Leu Asn Gly Glu Ile Pro Asp Phe Phe Pro Glu
 420 425 430
 Phe Glu His Leu Leu Glu Leu Gln Leu Gly Gly Asn Leu Phe Gly Gly
 435 440 445
 Ser Ile Pro Arg Ser Phe Gly Arg Leu His Asp Ser Val Tyr Ala Leu
 450 455 460
 Asn Leu Cys Arg Asn Ala Leu Thr Gly Lys Ile Pro Val Glu Leu Gly
 465 470 475 480
 Lys Leu Arg Lys Leu Gln Lys Leu Asp Ile Ser Val Asn Asn Met Thr
 485 490 495
 Gly Ser Val Ala Pro Ile Gly Glu Leu Leu Ser Leu Ile Glu Leu Asn
 500 505 510
 Val Ser Tyr Asn Ser Phe Ser Gly Gln Ile Ser Gln Thr Leu Met Lys
 515 520 525
 Phe Leu Asn Ser Ser Pro Thr Ser Phe Leu Gly Asn Pro Gly Leu Cys
 530 535 540
 Val Pro Cys Pro Leu Gly Ser Gly Val Ala Cys Thr Glu Ser Asn Asn
 545 550 555 560
 Ser Leu Gly Ile Cys Asp Asp Arg Ser Arg Ser Arg Asn Asn Leu Ser
 565 570 575
 Lys Val Arg Ile Val Ile Ile Ala Ile Ser Ser Val Phe Val Val Ile
 580 585 590
 Val Val Val Leu Val Leu Gly Cys Met Phe Leu Ser Lys Arg Lys Gln
 595 600 605

pctca2017050779-seql.txt

Glu Met Lys Asp Glu Val Ser Asp Glu Asp Asp Gln Ser Pro Leu Ile
 610 615 620
 Ser Lys Ile Met Lys Ala Thr Glu Asn Leu Ser Glu Arg Phe Val Ile
 625 630 635 640
 Gly Arg Gly Ala His Gly Ile Val Tyr Lys Ala Ser Ile Ser Glu Glu
 645 650 655
 Asn His Tyr Ala Val Lys Lys Leu Asp Phe Val Gly Leu Lys Gly Ala
 660 665 670
 Ser Ala Ser Met Ile Arg Glu Ile Glu Thr Val Gly Gln Ile Arg His
 675 680 685
 Arg Asn Leu Val Arg Leu Glu Glu Ile Cys Met Arg Lys Asp Tyr Gly
 690 695 700
 Leu Ile Leu Tyr Arg Tyr Met Gln Asn Gly Ser Leu Tyr Asp Val Leu
 705 710 715 720
 His Glu Ile Ser Pro Thr Pro Asp Ile Thr Trp Asp Ile Arg Tyr Lys
 725 730 735
 Ile Ala Leu Gly Thr Ala Glu Gly Leu Cys Tyr Leu His Gln Asp Cys
 740 745 750
 His Pro Ala Ile Val His Arg Asp Ile Lys Pro Asn Asn Ile Leu Leu
 755 760 765
 Asp Ser Glu Met Glu Ala His Ile Ser Asp Phe Gly Ile Ala Lys Leu
 770 775 780
 Met Asp Gln Ser Ser Ala Ser Ile Gln Ser Ile Ser Ile Ala Gly Thr
 785 790 795 800
 Thr Gly Tyr Ile Ala Pro Glu Ser Ala Tyr Thr Met Ile Arg Lys Pro
 805 810 815
 Glu Ser Asp Val Tyr Ser Tyr Gly Val Val Leu Leu Glu Leu Ile Ser
 820 825 830
 Arg Lys Lys Ala Leu Asp Ala Ser Phe Pro Glu Gly Ile Asp Ile Val
 835 840 845
 Arg Trp Val Asn Ser Thr Trp Ser Ser Gln Lys Ser Ile Asp Ile Ile

850

855

860

Val Asp Ser Ser Leu Leu Asp Glu Ile Val Val Ser Ser Leu Thr Glu
 865 870 875 880

Glu Val Thr Lys Val Leu Leu Leu Ala Leu Gln Cys Thr Arg Thr Asp
 885 890 895

Pro Asn Glu Arg Pro Thr Met Arg Glu Val Val Lys Gln Leu Glu Asp
 900 905 910

Ala Asn Thr Arg Trp Glu Thr Lys
 915 920

<210> 514

<211> 620

<212> PRT

<213> Papaver somniferum

<400> 514

Met Gly Ser Lys Lys Arg Ser Ser Glu Ser Ser Ser Asp Asp Glu Ile
 1 5 10 15

Met Glu Glu Ser Glu Asp Leu Ile Leu Thr Ser Asp Asp Asp Asp Ser
 20 25 30

Gly Asp Glu Gln Glu Glu Pro Lys Ser Ile Thr Pro Lys Pro Lys Lys
 35 40 45

Lys Ser Leu Glu Thr Lys Glu Asp Val Ala Glu Pro Ser Pro Ala Ala
 50 55 60

Pro Val Ser Val Lys Pro Met Glu Arg Arg Lys Lys Arg Lys Gln Met
 65 70 75 80

Asp Lys Glu Arg His Lys Thr Glu Glu Lys Lys Val Lys Val Pro Lys
 85 90 95

Val Gln Ala Asn Thr Asp Ala Ala Val Ala Ser Ser Ser Ser Ser Lys
 100 105 110

Pro Val Phe His Ile Ser Val Phe Asn Asp Leu Ala Ser Val Gly Ser
 115 120 125

Ser Ile Arg Glu Ala Ala Thr Glu Thr Leu Val Lys Glu Leu Arg Asp
 130 135 140

Val Gln Lys Glu Tyr Asn Leu Val Glu Lys Lys Gly Gly Asp Asp Gly

145		150		155		160
Ser	Gln	Leu	Glu	Ala	Glu	Lys
				165		
					Lys	Asp
					Gly	Leu
					170	
						Asn
						Cys
						Ala
						175
Ser	Leu	Arg	Tyr	Ala	Ile	Arg
			180			
						Arg
						Leu
						185
						Ile
						Arg
						Gly
						Val
						Ser
						190
						Ser
						Ser
Arg	Glu	Cys	Ala	Arg	Gln	Gly
		195				
						Phe
						200
						Ala
						Leu
						Gly
						Leu
						Thr
						205
						Val
						Val
						Leu
Lys	Thr	Ile	Pro	Asp	Val	Lys
	210					215
						Leu
						Asp
						Ala
						Leu
						Met
						220
						Lys
						Leu
						Ile
						Thr
Asp	Ile	Leu	Glu	Val	Asn	Ser
					230	
						Ser
						Met
						Lys
						Gly
						235
						Gln
						Glu
						Ala
						Lys
						Asp
						240
Cys	Leu	Leu	Gly	Arg	Leu	Phe
				245		
						Ala
						Tyr
						Gly
						250
						Ala
						Val
						Thr
						Arg
						Ser
						255
						Gly
Arg	Val	Ala	Glu	Glu	Trp	Ile
			260			
						Ser
						Asn
						265
						Asn
						Asp
						Thr
						Pro
						Cys
						270
						Val
						Lys
Glu	Phe	Thr	Ser	Leu	Val	Ile
		275				
						Ala
						280
						Leu
						Ala
						Ser
						Lys
						Lys
						285
						Arg
						Tyr
						Leu
Arg	Glu	Pro	Ala	Val	Ser	Leu
	290					295
						Ile
						Leu
						Asp
						Leu
						Ala
						300
						Glu
						Lys
						Leu
						Pro
Val	Val	Ala	Leu	Ser	Ser	His
					310	
						Val
						Val
						Glu
						Ala
						315
						Pro
						Gly
						Met
						Met
						Glu
						320
Trp	Phe	Lys	His	Ala	Met	Glu
				325		
						Val
						Gly
						Asn
						330
						Pro
						Glu
						Ala
						Leu
						Leu
						335
Ala	Leu	Lys	Leu	Arg	Glu	Lys
			340			
						Ile
						Ser
						345
						Ser
						Asp
						Ile
						Asp
						Val
						350
						Phe
						Gly
Gly	Leu	Leu	Pro	Gln	Pro	Phe
		355				360
						Asn
						Lys
						Met
						Phe
						365
						Thr
						Ala
						Glu
His	Leu	Asn	Ser	Leu	Val	Pro
						375
						Cys
						Phe
						Lys
						Glu
						Ser
						380
						Thr
						Phe
						Cys
						Gln
Pro	Arg	Ile	His	Ser	Leu	Trp
					390	
						Ser
						Val
						Leu
						Ile
						395
						Asn
						Val
						Leu
						Leu
						Pro
						400

pctca2017050779-seql.txt

Asp Thr Leu Thr Gln Glu Glu Asp Val Thr Ser Ser Ser Ser Ser Ser
405 410 415

Lys Lys His Lys Lys Ser Arg Lys Ser Ser Ser Ser Ser Glu Glu Glu Val
420 425 430

Val Lys Asn Leu Arg Cys Phe Cys Glu Ile Val Ile Glu Gly Ser Leu
435 440 445

Leu Leu Ser Ser His Asp Arg Lys Asn Leu Ala Phe Ser Ile Val Leu
450 455 460

Leu Leu Leu Pro Arg Leu Pro Ala Ser Cys Ile Gln Ile Val Phe Ser
465 470 475 480

His Lys Leu Val His Cys Leu Met Asp Ile Leu Ser Thr Gln Gly Ser
485 490 495

Trp Leu Tyr Lys Ser Ala Gln Cys Phe Leu Lys Glu Ile Ala Asp Trp
500 505 510

Val Lys Asn Asp Asp Asp Arg Arg Ile Ala Val Ile Val Ala Leu Gln
515 520 525

Lys His Ser Asn Gly Arg Phe Asp Cys Ile Thr Arg Thr Arg Thr Val
530 535 540

Lys Asp Leu Val Gly Glu Phe Asn Ser Glu Ser Gly Cys Met Val Phe
545 550 555 560

Val Gln Asn Leu Val Ser Met Phe Val Asp Glu Gly Ala Ala Ser Glu
565 570 575

Glu Pro Ser Asp Gln Ser Gln Thr Thr Asp Asp Asn Ser Asp Met Gly
580 585 590

Ser Ile Glu Asp Arg Asp Ser Ala Leu Met Gly Asp Gln Asp Ser Leu
595 600 605

Lys Ser Trp Val Val Asp Ser Leu Pro Arg Val Ile
610 615 620

<210> 515

<211> 323

<212> PRT

<213> Papaver somniferum

<400> 515

pctca2017050779-seql.txt

Met Phe Thr Lys Thr Lys Lys Cys Cys Ser Pro His Glu Lys Ser Tyr
 1 5 10 15
 Pro Gln Asn Asn Gln Ala Val Gly Ala Thr Ile Leu Ile Leu Ile Thr
 20 25 30
 Met Leu Phe Ile Ala Thr Ser Ala Thr Thr Ser Ile Pro Ile Ser Ser
 35 40 45
 Ser Ser Pro Ser Ser Ser Ser Met Ile Arg Phe Gln Lys Pro Leu Ser
 50 55 60
 Gln Leu Arg Arg Ser Ile Lys Phe His Tyr Pro Leu Ile Ser Pro Lys
 65 70 75 80
 His Leu Thr Lys Ser Leu Pro Cys Pro Leu Trp Ser Ser Ser Phe Ser
 85 90 95
 Phe Cys Leu Gln Gln Leu His Thr Ser Ser Pro Ser Ser Leu Ser Arg
 100 105 110
 Ser Ser Phe Ser Ala Ala Ala Pro Phe Cys Thr Phe Ser Pro Leu Met
 115 120 125
 Asp Ser Gln Asn Pro Ser Pro Val Val Ser Ser Pro Gln Glu Glu Val
 130 135 140
 Val Glu Leu Lys Asp Asn Pro Leu Leu Lys Asp Phe Asp Phe Pro Pro
 145 150 155 160
 Phe Asp Val Val Glu Ala Lys His Val Arg Pro Ala Ile Arg Ala Ile
 165 170 175
 Leu Ser Glu Leu Glu Thr Glu Leu Val Glu Leu Glu Lys Ser Val Glu
 180 185 190
 Pro Thr Trp Pro Lys Leu Val Asp Pro Leu Glu Lys Leu Val Asp Arg
 195 200 205
 Leu Gln Val Val Trp Gly Val Val Asn His Leu Lys Ser Val Lys Asp
 210 215 220
 Ser Ala Asp Leu Arg Ser Ala Ile Glu Glu Val Gln Pro Glu Lys Val
 225 230 235 240
 Lys Phe Asn Leu Arg Leu Gly Gln Ser Lys Pro Ile Tyr Asn Ala Phe
 245 250 255

pctca2017050779-seql.txt

Lys Ala Ile Arg Glu Ser Ser Asp Trp Gln Thr Leu Ser Asp Ala Arg
260 265 270

Lys Arg Ile Val Glu Gly Gln Leu Lys Glu Ala Val Leu Asn Gly Val
275 280 285

Ser Leu Glu Asp Asp Lys Arg Glu Gln Phe Asn Lys Val Gln Gln Glu
290 295 300

Leu Glu Lys Leu Ser Gln Lys Phe Glu Glu Asn Val Leu Asp Ala Thr
305 310 315 320

Lys Lys Val

<210> 516
<211> 192
<212> PRT
<213> Papaver somniferum

<400> 516

Gly Val Leu Tyr His Gln Asn Pro Asp Gly Ser Leu Ser Arg Cys Leu
1 5 10 15

Gly Asp Glu Glu Ala Gln Leu Gln Leu Ser Arg Ile His Asn Glu Ile
20 25 30

Cys Gly Gln Thr Leu Val Val Thr Leu Tyr Arg Arg Leu Gln Arg Leu
35 40 45

Gly Phe Tyr Trp Pro Asp Met Glu Thr Gln Tyr Arg Ser Leu Gln Gly
50 55 60

Tyr Tyr Ser Asn Cys Gln Ile Pro Pro His Gln Leu Glu Val Phe Asn
65 70 75 80

Val Asn His Thr Gly Asp Trp Arg Lys Pro Tyr Val Asn Tyr Leu Arg
85 90 95

Asp Gly Val Leu Leu Ala Ser Lys Lys Asp Ala Ala Lys Met Lys Gln
100 105 110

Arg Ala Lys Arg Phe Val Phe His Gly Gly Ile Gln Tyr Arg Lys Ser
115 120 125

Phe Gly Gly Asp Leu Leu Arg Cys Leu Ala Glu Val Glu Ile Pro Ile
130 135 140

pctca2017050779-seql.txt

Leu Met Lys Glu Met His Glu Gly Glu His Arg Gly Arg Lys Lys Leu
145 150 155 160

Phe Leu Glu Asp Asp Thr Ala Ala Phe Phe Lys Asp Ala Thr Asn Val
165 170 175

Lys Cys Thr Glu Ile Leu Phe Met His Phe Leu Leu Leu Tyr Thr Arg
180 185 190

<210> 517
<211> 176
<212> PRT
<213> Papaver somniferum

<400> 517

Met Arg Thr Gly Val Thr Ile Ile His Arg Ser Leu Ser Thr Ser Ser
1 5 10 15

Ser Ala Gln Ser Leu Ser Pro Ser Ile Ala Ala Ala Pro Ile His Ser
20 25 30

Pro Trp His Ser Pro Ile Pro Tyr Leu Phe Gly Gly Leu Ala Ala Met
35 40 45

Leu Gly Leu Ile Ala Phe Ala Leu Leu Ile Leu Ala Cys Ser Tyr Trp
50 55 60

Lys Leu Ser Ala Phe Leu Asp Asn Asp Ser Glu Arg Ser Arg Asn Asp
65 70 75 80

Leu Glu Asn Gly Asp Gly Asp Asp Lys Ser Thr Asp Gln Glu Asn Ile
85 90 95

Lys Val His Val Val Tyr Glu Glu Lys Ile Val Val Ile Met Ala Gly
100 105 110

Asp Val Lys Pro Thr Tyr Leu Ala Thr Pro Ile Asp Tyr Pro Lys Pro
115 120 125

Asn Thr Thr Ser Glu Asn Ser Lys Asn Glu Asp Glu Met Met Asn Ser
130 135 140

Leu Asp Glu Lys Thr Lys Glu Glu Glu Ser Asp Val Arg Val Glu Thr
145 150 155 160

Glu Ser Arg Glu Ala Ile Gln Asn Pro His Gln His His Gln Asn His
165 170 175

pctca2017050779-seql.txt

<210> 518
 <211> 473
 <212> PRT
 <213> Papaver somniferum

<400> 518

Gln Asp Leu Asn Glu Asn Glu Arg Val Ser Val Glu Gly Ile Leu Asp
 1 5 10 15

Asn Ala Val Thr Gln Leu Lys Met Val Gln Ser His Met Lys Lys Thr
 20 25 30

Leu Ala Glu Ser Thr Ser Ala Pro Ser Leu Asn Phe Gly Ala Lys Gln
 35 40 45

Gln Asp Gly Lys Met Glu Asp Ile Val Cys Arg Lys Cys Gly Lys Phe
 50 55 60

Lys Lys Leu Lys Thr Val Gly Ala Val Val Ile Thr Glu Leu Asp Val
 65 70 75 80

Ile Arg Arg Leu Lys Ala Gly Cys Asn Thr Gly Gly Asn Gln Val Leu
 85 90 95

Ser Gln Asp Arg Asp Glu Ile Leu Ser Arg Ala Val Trp Arg Lys Phe
 100 105 110

Gln Thr His Gln Arg Thr Thr Ser Pro Pro Leu Leu Val Pro Lys Val
 115 120 125

Gly Phe Gly Gly Ser Glu Glu Met Ile Ser Cys Pro Arg Arg Glu Gln
 130 135 140

Lys Tyr Arg Pro Thr Asp Gly Val Met Gln Pro Thr Leu Met Lys Phe
 145 150 155 160

Gly Pro Ser Gly Val Glu Ala Tyr Pro Asp Gln Asp Arg Thr Ala Asn
 165 170 175

Ser Arg Ser His Arg Asn Ile Glu Ser Thr Gly Tyr Ser Ala Thr Ser
 180 185 190

Glu Ala Ser Phe Ser Ser Ala Asp Tyr Ser Glu Ser Tyr Ser Ser Ser
 195 200 205

Glu Glu Ser Asp Ser Pro Pro Gln His Ala Met His Leu Asp Arg Arg
 210 215 220

pctca2017050779-seql.txt

Arg Arg Asp Arg Ser Ile Ser Arg Ser Arg Ser Pro Gln Ser Arg Tyr
225 230 235 240

Ser Gly Ser Ser Arg Ser Tyr Thr Ser Tyr Asp Ala Tyr Asp Ser Tyr
245 250 255

Pro Glu Glu Glu Tyr Pro Val Ala Tyr Asn Tyr Asp Ser Tyr Asp Ser
260 265 270

Ser Pro Glu Glu Tyr Pro Val Ala Arg Gly Asn Arg Ser Tyr Thr Ser
275 280 285

Tyr Asp Ser Tyr Asn Ser Ser Pro Glu Glu Glu Tyr Pro Val Ala Arg
290 295 300

Arg Ser Arg Phe Pro Lys Asn Asp Pro Pro Gln Lys Lys Met Gly His
305 310 315 320

Val Arg Arg Leu Thr Thr Lys Leu Gly Gly Met Leu Arg Arg Asp His
325 330 335

His Gly Asp Ser Ser Lys Asp Asp Lys Asn Ala Arg Asp His His Pro
340 345 350

Ser Val Gln Lys Pro Val Gly Asn Gly Lys Leu His His Glu Ile Lys
355 360 365

Gly Lys His Met Pro Ile Gln Thr Arg Arg Thr Ala Lys Val Glu Glu
370 375 380

Lys Ala Ser His Gln Gln Gly Phe Leu Thr Leu Ala Lys Arg Val Arg
385 390 395 400

Gly His Val Phe Gly Ser Lys Lys Ser Lys Pro Ser Ser Ser Gly Val
405 410 415

Arg Arg Leu Glu Arg Ala Val Thr Gly Lys Glu Lys Val Thr Ala Lys
420 425 430

Lys Arg His Trp Trp His Lys Leu Arg Arg Gln Gly Leu Pro Asn Lys
435 440 445

Arg Gly Lys Ala Pro Leu Lys Leu Gly Phe Glu Asn Lys His Thr Gln
450 455 460

Leu Lys Gly Gln His Arg His Arg Lys
465 470

pctca2017050779-seql.txt

<210> 519
 <211> 174
 <212> PRT
 <213> Papaver somniferum

<400> 519

Met Phe Ala Thr Ile Cys Asn Asn Asn Tyr Glu Ser Leu Val Leu Gly
 1 5 10 15

Glu Asp Ile Asn His Phe Ala Gly Leu Arg Thr Ile Arg Leu Arg Arg
 20 25 30

Arg Phe Tyr Ile Ser Leu Leu Pro Gln Gln Leu Val His Ile Pro Ser
 35 40 45

Ser Ala Ser Val Pro Ser Gly Pro Ser Pro His Ser Tyr Leu Leu Arg
 50 55 60

Arg Val Phe Ser Leu Pro Thr Arg Asp Asp Cys Glu Glu Ile Leu
 65 70 75 80

Gly Ser Tyr Leu Arg Arg Val Leu Arg Leu Pro Thr Arg Asp Gly Lys
 85 90 95

Leu Ser Glu Leu Leu Arg Ser Lys Thr Trp Leu Leu Leu Trp Val Val
 100 105 110

Phe Gln Gly Glu Leu Val Thr Leu Ala Phe Thr Phe Tyr His Ser Arg
 115 120 125

Lys Ser Val Leu Pro His Leu Gln Gln Ala Ala Asp Ala Gly Phe Lys
 130 135 140

Thr Lys Leu Gly Gly Gln Tyr Asn Gln Ala Val Ser His His Gln Gln
 145 150 155 160

Thr Thr Glu Pro Pro Asn Gln Val Val Gln Arg Val Thr Met
 165 170

<210> 520
 <211> 217
 <212> PRT
 <213> Papaver somniferum

<400> 520

Met Gly Met Val Phe Gly Lys Ile Ser Val Glu Thr Ala Lys Tyr Glu
 1 5 10 15

pctca2017050779-seql.txt

Val Val Gln Ser Ser Glu Asp Tyr Glu Ile Arg Lys Tyr Thr Pro Cys
20 25 30

Val Val Ala Glu Val Ala Tyr Asp Pro Ser Lys Phe Gly Gly Asp Arg
35 40 45

Asp Gly Gly Phe Met Val Leu Ala Asn Tyr Ile Gly Ala Ala Gly Asn
50 55 60

Pro Gln Asn Thr Lys Pro Glu Lys Ile Ala Met Thr Ala Pro Val Ile
65 70 75 80

Thr Thr Gln Lys Ala Ser Glu Lys Ile Ala Met Thr Ala Pro Val Ile
85 90 95

Thr Thr Gln Arg Thr Pro Glu Thr Val Asp Thr His Gln Glu Lys Thr
100 105 110

Thr Pro Thr Ser Met Val Met Gln Phe Val Leu Pro Thr Ser Lys Tyr
115 120 125

Thr Ser Val Glu Gln Ala Pro Lys Pro Thr Asp Glu Arg Val Val Ile
130 135 140

Arg Glu Glu Gly Glu Arg Lys Tyr Ala Val Val Lys Phe Ser Gly Leu
145 150 155 160

Thr Thr Asp Gln Leu Val Glu Glu Lys Val Lys Lys Leu Met Glu Ser
165 170 175

Leu Glu Arg Asp Gly Cys Lys Val Ile Thr Arg Glu Asn Glu Asp Lys
180 185 190

Phe Leu Leu Ala Arg Tyr Asn Pro Pro Trp Thr Leu Pro Met Phe Arg
195 200 205

Thr Asn Glu Ile Met Ile Pro Val Glu
210 215

<210> 521

<211> 103

<212> PRT

<213> Papaver somniferum

<400> 521

Thr Ser Ile Ile Asp Ser Asn Gln Met Lys Pro Phe Glu His Ile Leu
1 5 10 15

pctca2017050779-seql.txt

Ser Ser Tyr Phe Ser Asp His Gln Leu His His His Lys His Thr Ile
20 25 30

Cys Asn Phe Asn Ile Thr Ile Pro Asp Asn Ile Asn Ser Met Phe Met
35 40 45

Phe Leu Lys Cys Ser Thr Thr Arg Thr Ser Ser His Thr Asn Thr Ser
50 55 60

Ser Ile Ser Ile Ser Arg Pro Thr Arg Cys Ser Leu Thr Asp Gly Ile
65 70 75 80

Asn Ser Ile Cys Ile Phe Phe Leu Thr Pro Leu Arg Phe Leu Tyr Leu
85 90 95

Val Gln Arg Phe Gln Phe Phe
100

<210> 522
<211> 243
<212> PRT
<213> Papaver somniferum

<400> 522

Met Asn Leu Ala Met Leu Ala Asn Trp Cys Trp Arg Phe Gly Gln Glu
1 5 10 15

Lys Asn Arg Leu Trp Tyr Arg Ile Ile Val Asp Lys Tyr Gly Asp Asn
20 25 30

Phe Ser Ile Trp Ile Pro Asn Gln Val Lys Ser Ala His Gly Val Ser
35 40 45

Cys Trp Lys Thr Ile Ala Thr Thr Ala Tyr Leu Val Ser Thr Asn Ser
50 55 60

Arg Leu Ile Ile His Ser Gly Ala Thr Met Ser Phe Trp Asn Asp Ile
65 70 75 80

Trp Arg Gly Asn Ser Ser Ile Ser Ser Ser Phe Pro Ala Leu Tyr Lys
85 90 95

Ile Ser Thr Asn Arg Asp Ala Lys Met Val Glu Met Ile Ser Met Asp
100 105 110

Gly Ser Trp Met Phe Ser Phe Lys Arg Asn Leu Ser Gly Ser Glu Ala
115 120 125

pctca2017050779-seql.txt

Asn Ser Phe Ala Glu Leu Leu Met Met Ile Gly Asn Asn Pro Pro Ala
130 135 140

Leu Asp Asp Leu Pro Asp Thr Arg Arg Trp Ser Leu Arg Asn Ser Gly
145 150 155 160

Ile Phe Thr Val Lys Ser Leu Tyr Ser Lys Leu Ile Ala Asp Tyr Gly
165 170 175

Val His Asp Phe Pro His Asn Phe Val Trp Lys Lys Leu Ile Pro Pro
180 185 190

Lys Ile Asn Phe Leu Val Trp Cys Leu Ile His Glu Lys Leu Asn Thr
195 200 205

Ile Asp Met Met Gln Ile Lys Gly Ile Asp Ile Tyr Asn Ser Cys Val
210 215 220

Leu Cys Gly Asp Asp Ile Glu Ser Gly Ser His Leu Pro Ala Leu Gln
225 230 235 240

Asn Ser Ser

<210> 523
<211> 907
<212> PRT
<213> Papaver somniferum

<400> 523

Met Glu Gln Leu Arg Pro Asn Pro Leu Ile Arg Arg Phe Asp His Ser
1 5 10 15

Thr Ser Asn Asn Phe Tyr Ser Pro Arg Asn Val Arg Arg Lys Thr Phe
20 25 30

Asn Glu Arg Val Asp Asn Thr Glu Ala Leu Phe Thr Ser Lys Ser Leu
35 40 45

Thr Glu Gly Lys Tyr Arg Tyr Arg Arg Gly Asp Val Ser Asp Ile Ile
50 55 60

Asp Tyr Ser Val Pro Ser Met Thr Glu Gln Leu Asp Gly Asp Ser Met
65 70 75 80

Tyr Gly Ser Val Thr Lys Val Ile Gln Ala Leu Ser Ala Lys Arg Cys
85 90 95

pctca2017050779-seql.txt

Glu Ile Leu Asn Ser Leu Arg Glu Leu Tyr Pro Ser Leu Leu Ser His
 100 105 110
 Leu Val Phe Ser Val Gly Thr Pro Pro Arg Gly Ser Arg Gly Thr Ser
 115 120 125
 Asn Val Val Ser Gln Gly Val Ile Asp Leu Asp Gly Glu Asp Glu Ile
 130 135 140
 His Asp Leu Gly Pro Val Ser Asp Glu Arg Met Glu Thr Pro Ala Gly
 145 150 155 160
 Gln Ile Val Leu His Thr Pro Gly Cys Asn Asn Ala Met Val Met Ala
 165 170 175
 Gly Ser Glu Ser Asp Asp Arg Tyr Met Ile Gly Asn Asn Lys Pro Asp
 180 185 190
 Tyr Ser Tyr Asp Leu Glu Val Ser Lys Met Arg Arg Asp Pro Asn Tyr
 195 200 205
 Cys Gly Ile Gln Ile Ser Thr Asp Ala Gln Arg Ile Gly Ser Gln Val
 210 215 220
 Arg Thr Pro Tyr His Val Glu Gln Arg Gln Arg Arg Asn Ser Thr Thr
 225 230 235 240
 Gln Asn Asp Asn Gln Gly Ile Ala Pro Val Gly Ala Gln Met Ser Thr
 245 250 255
 Pro Tyr Asp Phe Gln Leu Leu Phe Pro Lys Lys Pro Val Gly Glu Lys
 260 265 270
 Pro Ala Lys His Val Asn Gly Ser Asp Gln Arg Lys Arg Asn Val Glu
 275 280 285
 Lys Glu Asp Lys Gly Val Cys Gly Glu Thr Val Ile Glu Lys Ser Lys
 290 295 300
 Gly Val Tyr Val Gly Val Gln Asp Asp Ile Met Ser Asp Ser Gly Ser
 305 310 315 320
 Gly Gly Glu Asp Asp Gly Leu Gly Asp Ile Trp Thr Glu Met Asn Leu
 325 330 335
 Ala Leu Glu Cys Ser Lys Asp Ala Ser Ser Ala Leu Gly Thr Ala Met
 340 345 350

pctca2017050779-seql.txt

Glu His Ile Ala Glu Glu Glu Glu Glu Asp Glu Cys Glu His Ser Phe
 355 360 365
 Val Leu Lys Asp Asp Leu Gly Tyr Val Cys Arg Ile Cys Gly Val Ile
 370 375 380
 Glu Lys Ser Ile Glu Gln Ile Phe Asp Phe Gln Trp Gly Lys Gly Thr
 385 390 395 400
 Lys Thr Thr Arg Thr Ser Tyr Met Ser Gln Tyr Arg Thr Thr Lys Asp
 405 410 415
 Cys Glu Arg Val Glu Gly Ser Gln Phe Thr Ile Ala Asn Ala Ser Asp
 420 425 430
 Gln Asp Phe Gly Val Ala Glu Ile Ser Val His Pro Arg His Met Lys
 435 440 445
 Gln Met Lys Pro His Gln Ile Glu Gly Phe Asn Phe Leu Leu Arg Asn
 450 455 460
 Leu Val Cys Asp Ser Pro Gly Gly Cys Ile Leu Ala His Ala Pro Gly
 465 470 475 480
 Ser Gly Lys Thr Phe Met Ile Ile Ser Phe Met Gln Ser Phe Leu Ala
 485 490 495
 Lys Tyr Pro Asn Ala Arg Pro Leu Val Val Leu Pro Lys Gly Ile Leu
 500 505 510
 Gly Thr Trp Lys Arg Glu Phe Glu Arg Trp Gln Val Glu Glu Ile Pro
 515 520 525
 Leu Tyr Asp Leu Tyr Thr Ser Lys Ala Asp Ser Arg Ala Gln Gln Leu
 530 535 540
 Asp Val Leu Lys Gln Trp Val Glu His Lys Gly Ile Leu Phe Leu Gly
 545 550 555 560
 Tyr Lys Gln Phe Ala Ser Ile Val Ser Asn Ser Thr Ser Ser Ile Ala
 565 570 575
 Ala Ala Ala Cys His Asp Ile Leu Leu Lys Val Pro Thr Ile Leu Ile
 580 585 590
 Leu Asp Glu Gly His Thr Pro Arg Asn Glu Thr Thr Asp Val Leu Tyr

595

Ser Leu Ser Gln Val Gln Thr Pro Arg Lys Val Val Leu Ser Gly Thr
610 615 620

Leu Phe Gln Asn His Val Lys Glu Val Phe Asn Ile Leu Asn Leu Val
625 630 635 640

Arg Pro Lys Phe Leu Lys Leu Asp Thr Ser Lys Ala Val Val Arg Arg
645 650 655

Val Met Ser Arg Val Gln Ile Ala Val Arg Lys Gln Val Lys Asn Ser
660 665 670

Gly Gly Asp Thr Met Phe Tyr Asp Leu Val Glu Glu Thr Leu Gln Asn
675 680 685

Asp Gln Asp Phe Arg Arg Lys Val Thr Val Ile Gln Asp Leu Arg Glu
690 695 700

Met Thr Gly Lys Val Leu His Tyr Tyr Lys Gly Asp Phe Leu Asp Glu
705 710 715 720

Leu Pro Gly Leu Ile Asp Leu Thr Val Leu Leu Thr Leu Asn Pro Lys
725 730 735

Gln Lys His Ala Val Glu Lys Leu Arg Lys Leu Asp Lys Phe Lys Arg
740 745 750

Ser Ser Met Gly Ser Ala Val Tyr Val His Pro Gln Leu Lys Glu His
755 760 765

Ala Glu Ser Ser Ala Thr Gly Glu Lys Gly His Ile His Glu Ala Lys
770 775 780

Ile Asp Glu Leu Leu Asn Lys Val Glu Leu Asn Asp Gly Val Lys Thr
785 790 795 800

Lys Phe Phe Leu Thr Leu Leu Ala Leu Cys Glu Ser Ala Gly Glu Lys
805 810 815

Met Leu Val Phe Ser Gln Tyr Leu Leu Pro Leu Lys Phe Leu Glu Arg
820 825 830

Leu Val Val Lys Thr Arg Gly Trp Ser Leu Gly Lys Glu Ile Phe Val
835 840 845

pctca2017050779-seql.txt

Ile Ser Gly Asp Ser Ser Gln Asp Gln Arg Glu Ile Ser Met Glu Arg
 850 855 860

Phe Asn Asn Ser Lys Asp Ala Lys Val Phe Phe Gly Ser Ile Lys Ala
 865 870 875 880

Cys Gly Glu Gly Ile Ser Leu Val Gly Ala Ser Arg Leu Leu Ile Leu
 885 890 895

Asp Ile His Leu Asn Pro Ser Val Thr Arg Gln
 900 905

<210> 524

<211> 144

<212> PRT

<213> Papaver somniferum

<400> 524

Met Asn Pro Asp Asp Tyr Ser Tyr Met His His Ser Pro Gln Arg Glu
 1 5 10 15

Asn Glu His Phe Ala Ser Ala Ser Leu Thr Gln Ser Ser Leu Val Asp
 20 25 30

Gln Leu Glu Ala Arg Ile Ala Ala Leu Glu Met Gln Ser His Glu Glu
 35 40 45

Ser Val Thr Ser Asn Phe Leu Arg Gln Pro Glu Ile Tyr Ala Cys Pro
 50 55 60

Ala Cys Gly Ser Leu Asp His Pro Val Glu His Cys His Ile Leu His
 65 70 75 80

Asn Phe Arg Gln Ser Arg Glu Asn Pro Arg Tyr Glu Met Pro Ile Asn
 85 90 95

Cys Glu Asn Gly Ser His Trp Asp His Asn Gln Ser Phe Glu Gly Cys
 100 105 110

Asp Gln Ser Phe Ile Asn Pro Asn Asp His Ala His Met Tyr His Ser
 115 120 125

Pro Gln Phe Glu His Glu Glu Phe Cys Thr Pro Arg Asn Leu Asp Ser
 130 135 140

<210> 525

<211> 183

<212> PRT

<213> Papaver somniferum

pctca2017050779-seql.txt

<400> 525

Met Asn Pro Asn Asp Tyr Ser His Met His His Leu Pro Gln Arg Glu
1 5 10 15

Asn Glu His Phe Ala Asn Ala Ser Leu Thr Gln Ser Ser Leu Val Asp
20 25 30

Gln Leu Glu Ala Arg Ile Ala Ala Leu Glu Met Gln Ser His Glu Glu
35 40 45

Ser Val Thr Ser Asn Phe Leu Arg Gln Pro Glu Ile Tyr Ala Cys Pro
50 55 60

Ala Cys Gly Ser Leu Asp His Pro Val Glu Asn Cys His Ile Leu His
65 70 75 80

Asn Phe Arg Gln Ser Arg Glu Asn Pro Arg Tyr Glu Met Pro Ile Asn
85 90 95

Cys Glu Asn Gly Ser His Trp Asp His Asn Gln Ser Phe Glu Gly Cys
100 105 110

Asp Gln Tyr Phe Val Asn Pro Asn Asp His Ala Arg Met Tyr His Ser
115 120 125

Pro Gln Phe Glu His Glu Glu Phe Cys Thr Pro Met Asn Leu Asp Ser
130 135 140

Thr Thr Glu Ala Leu Arg Leu Ser Lys Gln Lys Phe Asp Arg Ser Thr
145 150 155 160

Ser Arg Ile His Ala Tyr Leu Asp Gln Ile Leu Leu His Leu Gln Lys
165 170 175

Glu Glu Ile His Glu Glu Met
180

<210> 526

<211> 247

<212> PRT

<213> Papaver somniferum

<400> 526

Met Val Asn Trp Met Leu Ile Ile Pro Cys Thr Ile Asp Ser Thr Thr
1 5 10 15

Ser Glu Asn Arg Asn Leu Arg Phe Thr Cys Tyr Glu Thr Asp Asn Asn

20

Val Lys Asp Thr Cys Glu Tyr Asp Gly Phe Ile Val Val Phe Asp Arg
35 40 45

Thr Lys Leu Ser Ser Tyr Lys Tyr Ala Lys Asn Ile Cys His Gln Leu
50 55 60

Ala Ala Arg Leu Val Gly Tyr Lys Pro Val Val Leu Val Ala Asn Lys
65 70 75 80

Ile Asp Arg Phe Gln Glu Ser Arg Lys Ala Tyr Glu Ile Ala Ala Asp
85 90 95

Gln Glu Phe Gly His Pro Ser Cys Phe Ile Ser Ala Met Asn Asn Thr
100 105 110

Asn Val Glu Lys Pro Cys Leu Ser Leu Ala Arg Leu Leu Thr Asn Val
115 120 125

Pro Arg Leu Ile Phe Leu His Asp Met Pro Ile Ala Gly Lys Val Pro
130 135 140

Gly Gly Asn Ile Glu Asp Pro Pro Ile Pro Val Asp Ile Pro Ile Ala
145 150 155 160

Pro Ser Leu Ser Thr Val Leu Met Leu Gly Ser Ser Ala Tyr Asp Gln
165 170 175

Val Pro Ala Gln Pro Ser Gln Gln Ile Gln Thr Thr Leu Lys Val Leu
180 185 190

Gly Asp Thr Pro Asp Ala Pro Leu Pro Ser Thr Val Arg His Leu Asp
195 200 205

Arg Thr Pro Glu Val Ser Ser Arg Gln Ser Arg Lys Ser Thr Leu Arg
210 215 220

Ile Asn Gly Val Asp Cys Ala Ser Val Ser Glu Ile Leu Glu Asp Gln
225 230 235 240

Arg Ser Lys Cys Cys Tyr Cys
245

<210> 527
<211> 177
<212> PRT
<213> Papaver somniferum

pctca2017050779-seql.txt

<400> 527

Met Ala Ser Ser Gln Lys Ser Val Cys Ile Ile Asn Ser Ser Leu Leu
1 5 10 15

Val Pro Phe Phe Leu His Leu Leu Leu Leu Thr Ser Thr Glu Ala
20 25 30

Arg His Leu Lys His Arg Asp Ser Asn Ser Thr Gly Asn Val Gln Glu
35 40 45

Ala Leu Leu Asn Gly Asp Ile Lys Val Ser Gly Pro Ser Pro Gly Gly
50 55 60

Glu Gly His Ser Phe Lys Asn Val Val Gln Thr Met Gly Gly Asn Lys
65 70 75 80

Val Ala Gly Pro Ser Arg Gly Gly Glu Gly His Lys Phe Lys Thr Gln
85 90 95

Gln Leu Arg Thr Phe Gly Arg Ile Lys Val Ser Gly Pro Ser Pro Gly
100 105 110

Gln Gly His Lys Phe Lys Thr Gln Gln Leu Gln Thr Ile Gly Arg Ile
115 120 125

Lys Val Ser Gly Pro Ser Pro Gly Glu Gly His Asn Phe Lys Asn Val
130 135 140

Val Gln Thr Met Gly Gly Asn Lys Val Ser Gly Pro Ser Pro Arg Gly
145 150 155 160

Gly Gly Gly His His Asn Ser Val Thr Lys Ile His Lys Ser Lys Arg
165 170 175

Asp

<210> 528

<211> 137

<212> PRT

<213> Papaver somniferum

<400> 528

Met Gln Phe Leu Lys Leu Ile His Arg Ala Glu Lys Lys Leu Glu Ser
1 5 10 15

Ile Ile Gly Val Ile Glu Ala Asn Arg Ile Glu Gly Glu Ile Thr Ser

20

Lys Asn Ser Ser Ile Gln Ser Glu Lys Glu Asp Glu Ser Leu Asp Glu
35 40 45

Phe Ile Ile Pro Ser Phe Leu Phe Tyr Glu Glu Asn Asp Asp Thr Gln
50 55 60

Ile Ile Ser Lys Thr Glu Val Ile Asp Phe Asp Arg Glu Asn His Val
65 70 75 80

Gln Met Val Glu Val Ser Tyr Glu Asn Leu Glu Ser Ile Arg Glu Leu
85 90 95

Ile Ile Ile His Ser Glu Leu Asn Cys Lys Asp Phe Phe Thr Leu Leu
100 105 110

Phe Asp Phe Ala Arg Ser Leu Phe Asp Arg Gly Lys Lys Ile Glu Leu
115 120 125

Ser Leu Glu Asn Ser Cys Phe Thr Asp
130 135

<210> 529
<211> 151
<212> PRT
<213> Papaver somniferum

<400> 529

Met Pro Ser Gln His Ala Ile Thr Glu Tyr Arg Leu Val Gln Ser Ser
1 5 10 15

Val Gln Gly Leu Thr Trp Ile Glu Leu Ser Pro Leu Thr Gly Arg Lys
20 25 30

His Gln Leu Arg Val His Cys Ala Glu Val Leu Gly Thr Pro Ile Val
35 40 45

Gly Asp Tyr Lys Tyr Gly Trp Gln Ala His Lys Asn Trp Lys Gly Leu
50 55 60

Pro Trp Thr Asn Pro Lys Glu Arg Ser Ala Glu Lys Leu Pro Lys Met
65 70 75 80

Pro Leu Phe Val Leu Asp Ser Lys Ser Gly Ser Ile Ser Glu Lys Glu
85 90 95

Pro His Leu His Leu His Cys Arg Gln Met Ile Phe Pro Asp Val His

100

Met Ala Leu Gln His Val His Ser Asp Ser Asp Leu Asp Leu Ser Thr
115 120 125

Leu Glu Ser Leu Asp Phe Val Ala Pro Leu Pro Ala His Met Gln Arg
130 135 140

Ser Trp Asp Ile Leu Asn Ser
145 150

<210> 530
<211> 247
<212> PRT
<213> Papaver somniferum
<400> 530

Met Leu Pro Thr Thr Ser Lys Gly Arg Ala Ser Asn Val Arg Pro Asn
1 5 10 15

Pro Val Phe Pro Gln Tyr Leu Arg Arg Ile Val Lys Trp Arg Gln Met
20 25 30

Asp Ile Glu Tyr Thr Phe Trp Gln Met Leu Asn Leu Cys Thr Ser Pro
35 40 45

Lys Val Val Tyr Gln His Thr Lys Tyr His Lys Gln Thr Lys Asn Gln
50 55 60

Trp Ala Arg Asp Asp Pro Ala Phe Ile Val Ile Cys Ser Leu Leu Leu
65 70 75 80

Ile Val Ala Thr Ser Ala Tyr Cys Ala Ala Phe Ser His Ser Val Gly
85 90 95

His Ala Ile Ser Thr Val Leu Ser Val Leu Ile Phe His Phe Leu Ile
100 105 110

Thr Gly Ala Ile Leu Ala Thr Cys Cys Trp Phe Leu Thr Asn Ser Tyr
115 120 125

Leu Arg Glu Glu Ser Pro Asn Ser His Val Val Glu Gln Arg Val Glu
130 135 140

Trp Leu Tyr Ala Phe Asp Val His Cys Asn Ser Phe Phe Pro Met Phe
145 150 155 160

Val Leu Leu His Val Ile His Tyr Phe Leu Ser Pro Leu Leu Ile Ala

165

170

175

His Gly Phe Ile Pro Val Leu Leu Ser Asn Leu Leu Phe Met Val Ala
 180 185 190

Val Ser Tyr Tyr His Tyr Leu Asn Phe Leu Gly Tyr Asp Val Leu Pro
 195 200 205

Phe Leu Glu Arg Thr Thr Phe Phe Leu Tyr Pro Ile Gly Ile Val Ile
 210 215 220

Ile Leu Ser Pro Leu Met Ile Leu Ser Gly Phe Asn Pro Thr Arg Tyr
 225 230 235 240

Met Met Ser Met Tyr Phe Ser
 245

<210> 531

<211> 357

<212> PRT

<213> Papaver somniferum

<400> 531

Met Gly Ser Val Gly Ser Glu Arg Thr Thr Thr Gly Trp Ala Ala Thr
 1 5 10 15

Asp Pro Ser Gly Ile Leu Ser Pro Tyr Thr Phe Ala Leu Arg Glu Thr
 20 25 30

Gly Pro Glu Asp Val Tyr Ile Lys Val Thr Tyr Cys Gly Val Cys His
 35 40 45

Thr Asp Ile His Gln Val Lys Asn Asp Leu Gly Met Ser Asn Tyr Pro
 50 55 60

Met Val Pro Gly His Glu Thr Val Gly Glu Val Ile Glu Val Gly Lys
 65 70 75 80

Asp Val Thr Lys Phe Lys Ala Gly Asp Ser Val Gly Val Gly Leu Ile
 85 90 95

Ile Gly Ser Cys Arg Glu Cys Ser Ser Cys Thr Ser Asn Ile Glu Gln
 100 105 110

Tyr Cys Asn Lys Lys Ile Trp Asn Tyr Asn Asp Val Tyr Thr Asp Gly
 115 120 125

Lys Pro Thr Gln Gly Gly Phe Ala Ser Thr Met Val Ile Asp Gln Lys

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130

135

140

Phe Val Val Lys Ile Pro Glu Gly Leu Ala Pro Glu Gln Ala Ala Pro
 145 150 155 160

Leu Leu Cys Ala Gly Leu Thr Val Tyr Ser Pro Leu Arg Lys Phe Asp
 165 170 175

Leu Thr Thr Ser Gly Leu Lys Ala Gly Ile Leu Gly Leu Gly Gly Val
 180 185 190

Gly His Met Gly Val Lys Ile Ala Lys Ala Met Gly His His Val Thr
 195 200 205

Val Ile Ser Ser Ser Asn Lys Lys Gln Glu Glu Ala Met Asp His Leu
 210 215 220

Gly Ala Asp Asp Tyr Ile Val Ser Ser Glu Pro Glu Gln Met Gly Arg
 225 230 235 240

Ala Val Asp Thr Leu Asp Tyr Ile Met Asp Thr Ile Pro Val Val His
 245 250 255

Pro Leu Glu Pro Tyr Leu Pro Leu Leu Lys Val Asp Gly Arg Phe Ile
 260 265 270

Ile Met Gly Val Ile Ala Gln Pro Leu Gln Phe Ile Thr Pro Met Ile
 275 280 285

Met Leu Gly Arg Lys Ser Ile Thr Gly Thr Phe Ile Gly Ser Val Glu
 290 295 300

Glu Ser Ala Glu Met Leu Asp Phe Cys Lys Glu Lys Gly Val Thr Ser
 305 310 315 320

Ser Ile Glu Leu Val Lys Met Asp Tyr Ile Asn Lys Ala Met Glu Arg
 325 330 335

Leu Glu Lys Asn Asp Val Arg Tyr Arg Phe Val Val Asp Val Ala Gly
 340 345 350

Ser Lys Ile Asp Leu
 355

<210> 532

<211> 599

<212> PRT

<213> Papaver somniferum

pctca2017050779-seql.txt

<400> 532

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Met Lys Gly Asp Ser Lys Glu Thr Leu Ile Leu Leu Phe Phe Asn Ala
1      5      10
Pro Ile Ser Phe His Leu Leu Phe Ser Phe Phe Asn Val Ser Ser Thr
      20      25      30
Leu Leu Ala Asn Phe Phe Phe Ser Ile Tyr Asp His Leu Ile Pro Ile
      35      40      45
Arg Ser Thr Cys Asn Asp Asp Ala Glu Tyr His Ala Phe Arg His
      50      55      60
Glu Glu Glu His Asp His His Tyr Ala Gly Gln Lys Arg Glu Tyr Gly
65      70      75      80
His Gly Phe Phe Ser Phe Asp Leu Leu Met Glu Gln Lys Glu Asp His
      85      90      95
Leu Val Ala Asp Ile Ile His Gly Gly Glu Ser Leu Leu Phe Ile Pro
      100      105      110
Phe Gln Ser Pro Lys Lys Glu Gln Val Val Phe Tyr Glu Gly Ile Gly
      115      120      125
Cys Gln Glu Lys Ile Ile Leu Gln Glu Asn Gly Ala Asp Glu Val Glu
      130      135      140
Glu His His Ile His Asp Tyr Thr Val Lys Glu Asp Thr Glu Glu Asp
145      150      155      160
Val Ala Ala Glu Asp Ser Thr Ser Tyr His Asn Glu Asp Pro Thr Ser
      165      170      175
Asp Asp Asp Gln Glu Glu Ile Ile Ile Met Glu Glu Glu His Ser Pro
      180      185      190
Asp Tyr Phe Ser Pro Pro Glu Glu Ser Asp Asp Gln Ala Ser Glu Leu
      195      200      205
Asp Val Ala Val Asp Val Leu His Gln Asp Glu Glu Leu Ser Leu Leu
      210      215      220
Lys Asp Ser Asp Ala Asn Ser Ala Thr Thr Thr Met Val Phe Ile Ser
225      230      235      240

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pctca2017050779-seql.txt

Thr Asp Pro Ser Glu Asn Gly Tyr Ile Ala Pro Val Gln Ile Asp Leu
 245 250 255
 Asn Asn Ser Gly Pro Val Pro Asn Asp Asp Thr Ser Ser Glu Glu Glu
 260 265 270
 Arg Asp Gly Lys Glu Ser Lys Asp Val Lys Ile Thr Met Glu Thr Lys
 275 280 285
 Met Leu Glu Asp Gly Lys Phe Phe Val Leu Gln Thr Lys Lys Ile Gln
 290 295 300
 Lys Asn Val Val Glu Asp Asp Met Phe Glu Asp Ser Phe Ser Lys Lys
 305 310 315 320
 Asn Asp Met Phe Gly Asp Ser Val Thr Glu Gly Ser Thr Ser Lys Ser
 325 330 335
 Ser Ser Glu Trp Arg Asn Ser Val Asn Tyr Arg Asp Ser Gly Thr Gly
 340 345 350
 Asp Asp Pro Phe Ser Thr Ser Ser Arg Arg Ser Cys Pro Thr Trp Glu
 355 360 365
 Ser Tyr Thr Val Phe Arg Lys Tyr Asp Glu Glu Met Leu Phe Leu Asp
 370 375 380
 Arg Ile Ser Ala Gln Lys Leu Ser Glu Thr Glu Ser Leu Arg Ala Ile
 385 390 395 400
 Glu Ala Cys Pro Arg Ser Ile Ser Gln Arg Ile Val His Arg Leu Thr
 405 410 415
 Thr Lys Asn Lys Pro Lys Tyr His Gln Phe Gly Arg Cys Asn Pro Tyr
 420 425 430
 Gln Glu Leu Glu Thr Ala Tyr Val Ala Gln Ile Cys Leu Thr Trp Glu
 435 440 445
 Ala Leu Asn Trp Asn Tyr Lys Asn Tyr Gln Arg Leu Lys Ala Thr Tyr
 450 455 460
 Ser Ser Glu Asn Asp Pro Gly Cys Pro Gly Gln Ile Ala Gln Gln Phe
 465 470 475 480
 Gln Gln Phe Gln Val Leu Leu Gln Arg Phe Ile Glu Asn Glu Pro Tyr
 485 490 495

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Glu His Gly Arg Arg Pro Glu Ile Tyr Ala Arg Ile Arg Asn Ser Ala
500 505 510

Pro Lys Leu Leu Gln Val Pro Glu Phe Arg Glu Ser Glu Glu Asp Asn
515 520 525

Asn Lys Lys Ala Gly Phe Ile Asn Met Thr Val Ser Ser Ile Lys Phe
530 535 540

Ser Arg Val Met Glu Asp Ala Ile Arg Thr Phe Met Lys Phe Leu Lys
545 550 555 560

Glu Asp Lys Glu Lys Pro Cys Asp Ile Phe Lys Ala Phe Phe Lys Arg
565 570 575

Asn Ser Ser Gln Thr Val Asp Pro Thr Tyr Leu His Leu Met Arg Lys
580 585 590

Ser Asn Lys Arg Val Ser Thr
595

<210> 533
<211> 139
<212> PRT
<213> Papaver somniferum

<400> 533

Met Glu Lys Leu Ser Val Phe Leu Ile Thr Pro Leu Ala Tyr Glu Glu
1 5 10 15

Gly Cys Val Gly Glu Val Leu Lys Ala Ile Glu Gly Ser Cys Leu Gly
20 25 30

Ile Arg Gly Leu Ile Leu Val Arg Arg Pro Thr Asp Ser Gly Ser Ser
35 40 45

Ser Glu Ile Asp Gly Asp Glu Tyr Gly Val Ala Val Val Ala Ser Ala
50 55 60

Val Lys Ser Cys Leu Arg Ile Lys Pro Gly Asn Ala Lys Met Ser Thr
65 70 75 80

Ile Lys Asn Glu Tyr Met Thr Glu Phe Arg Ile Gly Ser Asp Tyr Leu
85 90 95

Arg Lys Ile Lys Gln Gly Gln Gly Pro Gln Gly Leu Leu Glu Ala Thr
100 105 110

pctca2017050779-seql.txt

Lys Lys Tyr Ser Asn Met Val Ser Val Phe Gly Asp Ile Leu Gln Met
115 120 125

Thr Cys Cys Met Val Val Cys Leu Arg His His
130 135

<210> 534
<211> 261
<212> PRT
<213> Papaver somniferum

<400> 534

Met His Lys Ile Arg Leu Glu Asp Asp Ala Lys Pro Thr Arg Glu Ala
1 5 10 15

Gln Arg Arg Leu Asn Pro Pro Met Met Glu Val Val Lys Lys Glu Ile
20 25 30

Leu Lys Leu Leu Glu Val Gly Val Ile Tyr Pro Ile Ser Asp Ser Lys
35 40 45

Trp Val Ser Pro Ile Gln Val Val Pro Asn Lys Ser Gly Val Thr Val
50 55 60

Val Glu Asn Asp Lys Asn Glu Leu Val Pro Thr Arg Val Gln Thr Gly
65 70 75 80

Trp Arg Val Cys Ile Asp Tyr Arg Lys Leu Asn Ala Thr Thr Arg Lys
85 90 95

Asp His Phe Pro Leu Pro Phe Ile Asp Gln Met Leu Glu Arg Leu Ala
100 105 110

Gly His Ser Tyr Tyr Cys Phe Leu Asp Gly Tyr Ser Gly Tyr Asn Gln
115 120 125

Ile Met Ile Ala Pro Glu Asp Gln Glu Lys Thr Thr Phe Thr Cys Pro
130 135 140

Phe Gly Thr Phe Ala Tyr Arg Arg Met Pro Phe Gly Leu Cys Asn Ala
145 150 155 160

Pro Ala Thr Phe Gln Arg Cys Met Val Ser Ile Phe Ser Glu Tyr Val
165 170 175

Glu Asn Ile Ile Glu Val Phe Met Asp Asp Phe Ser Val Phe Gly Asp
180 185 190

pctca2017050779-seql.txt

Ser Phe Asp Leu Cys Leu His Asn Leu Ser Leu Ile Leu Glu Arg Cys
195 200 205

Val Glu Thr Asn Leu Val Leu Asn Trp Glu Lys Cys His Phe Met Val
210 215 220

Thr His Gly Ile Val Leu Gly His Ile Ile Ser Ser Lys Gly Leu Glu
225 230 235 240

Val Asp Lys Ser Arg Leu Thr Leu Phe Val Leu Gln Pro Leu Pro Leu
245 250 255

Arg Arg Gly Arg Tyr
260

<210> 535
<211> 171
<212> PRT
<213> Papaver somniferum

<400> 535

Leu Asn Asp Ala Gln Gln Asn Tyr Thr Thr Thr Glu Lys Glu Leu Leu
1 5 10 15

Glu Ile Val Phe Ala Leu Glu Lys Phe His Ser Tyr Leu Leu Gly Thr
20 25 30

Lys Val Val Val Phe Ser Asp His Ala Ala Leu Arg Tyr Leu Leu Ile
35 40 45

Lys Lys Glu Ala Lys Pro Arg Leu Ile Arg Trp Ile Leu Leu Leu Gln
50 55 60

Glu Phe Asp Ile Glu Ile Lys Asp Lys Lys Gly Ile Asp Asn Thr Val
65 70 75 80

Ala Asp His Leu Ser His Leu Thr Val Asp Glu Glu Thr Ile Arg Leu
85 90 95

Arg Glu Ser Phe Pro Asp Glu Gln Leu Phe Ser Leu Gln Val Val Glu
100 105 110

Pro Trp Tyr Ala Asp Ile Val Asn Tyr Leu Val Ser Lys Lys Val Pro
115 120 125

Lys Asn Leu Ser Arg Ala Glu Arg Asp Lys Leu Lys Arg Leu Ala Tyr
130 135 140

pctca2017050779-seql.txt

Gln Tyr Ile Cys Asp Asp Pro Tyr Arg Cys Trp Lys Phe Ser Pro Val
145 150 155 160

His Ser Asn Ser Trp Ser Lys Gly Met Ser Phe
165 170

<210> 536
<211> 219
<212> PRT
<213> Papaver somniferum

<400> 536

Met Asp Ala Ser Thr Pro Ala His Ala Ser Ala Ala Glu Lys Asp Leu
1 5 10 15

Leu Val Ser Ser Arg Ser His Cys Arg Lys Ser Val Gln Gln Phe Leu
20 25 30

Gly Glu Gly Ser Val Ala Asp Val Leu Leu Trp Lys Asn Gln Ala Thr
35 40 45

Ser Gly Ile Leu Leu Val Ser Ser Ser Ile Ile Trp Phe Leu Phe Glu
50 55 60

Ile Ala Gly Tyr Asn Pro Leu Leu Phe Phe Ser Asn Phe Leu Leu Ile
65 70 75 80

Leu Val Val Thr Leu Phe Phe Trp Gly Lys Leu Ala Tyr Phe Leu Asn
85 90 95

Trp Pro Pro Pro Ser Leu Pro Asn Leu Gln Ile Ser Asp Asp Ser Ile
100 105 110

Leu Lys Ile Ser Ser Asp Val His Val Leu Ile Asn Arg Val Leu Glu
115 120 125

Thr Gly His Ala Ile Ile Val Gly Gly Asn Val Lys Leu Leu Leu Lys
130 135 140

Val Ile Val Ser Ile Trp Ile Val Ala Phe Val Gly Gly Leu Phe Asn
145 150 155 160

Phe Ile Thr Leu Val Tyr Ile Gly Val Val Leu Ser Leu Thr Val Pro
165 170 175

Ala Leu Tyr Asn Asn Tyr Gln Asp His Ile Asp Asp Lys Leu Phe Ala
180 185 190

pctca2017050779-seql.txt

Ala His Glu Val Val Ser Ala Gln Leu Arg Lys Phe Lys Leu Asn Met
195 200 205

Leu Thr Ile Gln Ser Glu Glu Lys Lys Leu His
210 215

<210> 537

<211> 176

<212> PRT

<213> Papaver somniferum

<400> 537

Met Ile Ser Ser Leu Phe Asn Val Ser Ala Leu Lys Ala His Ser Ile
1 5 10 15

Val Leu Ile Pro Lys Asp Pro Thr Ala Val Thr Pro His Ala Leu Phe
20 25 30

Leu Thr Tyr Lys Ala Ala Asn Gly Gly Glu Pro Met Asp Pro Glu Val
35 40 45

Tyr Pro Arg Pro Thr Gly Glu Val Tyr Val Cys Gly Met Ser Ala Lys
50 55 60

Gly Glu Val Pro Asp Asn Pro Glu Glu Ile Met Gly Asp Pro Glu Ser
65 70 75 80

Ile Lys Val Leu Lys Arg Val Ala Gly Thr Val Ser Ser His Leu Lys
85 90 95

Glu Gly Glu Val Glu Val Lys Ala Glu Gln Ala Cys Phe Leu Pro Leu
100 105 110

Thr Asp Asp Asp Lys Pro Val Ile Gly Glu Met Pro Asn Val Lys Gly
115 120 125

Cys Tyr Val Ala Thr Gly His Ser Cys Trp Gly Ile Leu Asn Gly Pro
130 135 140

Ala Thr Gly Ala Ala Met Ala Glu Leu Val Leu Asp Gly Val Ser Ser
145 150 155 160

Ile Val Asp Leu Thr Pro Phe Ser Pro Ala Arg Phe Val Lys Lys Tyr
165 170 175

<210> 538

<211> 197

<212> PRT

<213> Papaver somniferum

<400> 538

Met Ser Ser Gly Asp Gly Pro Ser Val Glu Gly Asn Thr Gln Ile Val
 1 5 10 15

Thr Val Pro Glu Arg Pro Lys His Ser Leu Pro Ala Leu Pro Leu Ala
 20 25 30

Pro Ser Asn Val Gly Asn Ala Ile Val Glu Tyr Lys Lys Ala Asn Pro
 35 40 45

Lys Asp Ala Asp Glu Asp Ile Glu Ile Lys Leu Arg Arg Ile Leu Glu
 50 55 60

Gln Val Pro Val Arg Val Ser Asn Thr Ser Gly Ser Ser Ala Gly Ser
 65 70 75 80

Gly Ser Gly Asp Phe His Gln Tyr Arg Gln Met Arg Arg Lys Glu Gln
 85 90 95

Asp Arg Leu Ala Arg Met Arg Val Asp Tyr Asp Lys Arg Lys Glu Leu
 100 105 110

Ser Asp Phe Met Ile Arg Lys Glu Glu Arg Met Lys Ala Ala Glu Glu
 115 120 125

Arg Thr Ala Lys Lys Arg Leu Lys Arg Gln Lys Lys Lys Met Lys Lys
 130 135 140

Gln Ser Lys Lys Ser Arg Leu Asn Pro Asp Ala Gly Glu Gln Gln Lys
 145 150 155 160

Asp Glu Ser Ser Glu Asp Glu Asp Lys Ser Asp Asp Asp Ala Gly Glu
 165 170 175

Pro Glu Ile Pro Lys His Ile Phe Val Pro Ala Gly Asn Arg Gly Lys
 180 185 190

Gly Ala Ile Ile Leu
 195

<210> 539

<211> 377

<212> PRT

<213> Papaver somniferum

<400> 539

pctca2017050779-seql.txt

Met Pro Thr Thr Arg Ser Ser Ser Gly Ser Ile Thr Pro Ser Ala Ser
 1 5 10 15
 Met Pro Asn Tyr Ser Gly Val Gly Ser Leu Asp Ser Ser Ser Thr Glu
 20 25 30
 Ala Ser Ala Ser Pro Tyr Val Gln Pro Pro Cys Asn Asp Asn Glu Phe
 35 40 45
 Val Gly Asp Ala Ala Cys His Cys Pro Tyr Lys His Phe Glu Asp Cys
 50 55 60
 Gln Asp Gly Leu Ser Gly Arg Gly Tyr Ala Lys Thr Ser Ile Leu Lys
 65 70 75 80
 His Ile Lys Asp Arg His Leu Ser Ile Glu Asn Gly Ile Ser Ile Cys
 85 90 95
 Arg Glu Arg Ile His Ala Met Ala Tyr Val Tyr Arg Ser Trp Glu Arg
 100 105 110
 Phe Leu Lys Gln Leu Gln Met Trp Leu Cys Phe Pro Cys Met Arg Trp
 115 120 125
 Tyr Ser Trp Lys Arg Pro Cys Arg Asp His Gly Gly Ser Ile Val Ile
 130 135 140
 Lys Gly Pro Phe Asn Gly Arg Ser Ala Asp Phe Leu Leu Tyr Gly Val
 145 150 155 160
 Asp Lys Pro Thr Ser Ala Thr Cys Asp Thr Asn Thr Asn Leu Asp Ile
 165 170 175
 Pro Thr Ser Ser Val Asp Asn Ser Leu Cys Leu Ser Val Asn Leu Leu
 180 185 190
 Asp Leu Val Phe Gln Lys Gln Ile Ala Ala Ile Ser Ser Ile Pro Pro
 195 200 205
 Leu Cys Arg Leu Asn Phe Ser Arg Thr Leu Lys Ala Ser Leu Asp Lys
 210 215 220
 Val Leu Phe Gln Pro Asn Asp Leu Asp Ser Trp Leu Gln Leu Leu Leu
 225 230 235 240
 Leu Pro Thr Cys Thr Leu Asn Ile Tyr Val Pro Lys Ser Ser Met Glu
 245 250 255

pctca2017050779-seql.txt

Glu Arg Ser Gly Thr Arg Arg Arg Leu Gln Thr Ser Ser Ile Asn Gln
260 265 270

Ala Leu Ala Lys Trp Arg Glu Pro Asn Gly Cys Ile Thr Leu Val Gln
275 280 285

Gln Leu Leu Glu Thr Asn Lys Glu Ile Gln Ser Ser Arg Lys Leu Ser
290 295 300

Lys Lys Lys Gln Lys Pro Asp Ile Glu Asp Cys Lys Lys Lys Leu Arg
305 310 315 320

Tyr Gly His Tyr Lys Ala Ala Ile Arg Ile Leu Ser Ser Asn Gly Val
325 330 335

Ala Pro Tyr Asn Pro Asp Thr Leu His Glu Leu Gln Leu Lys His Pro
340 345 350

Tyr Ala Pro Pro Pro Ile Ile Pro Pro Asp Ile Ile Leu Met Leu His
355 360 365

Leu Cys Leu Leu Met Ser Lys Leu Phe
370 375

<210> 540

<211> 208

<212> PRT

<213> Papaver somniferum

<400> 540

Met Ile Gly Val Leu Met Lys Lys Arg Asp Leu Arg Leu Ala Ser Phe
1 5 10 15

Ser Thr Pro Thr Tyr Arg Lys Ser Ala Val Ser Ala Ser Thr Pro Ala
20 25 30

Ala Leu Leu Ile Ser Ala Leu Phe Ile Ser Phe Gly Tyr Pro Leu Asp
35 40 45

Phe Gln Ser Gly Phe Ile Leu Asp Leu Phe Ser Thr Arg Ser Ile Phe
50 55 60

Ile Ser Ala Val Arg Thr Ser Ser Arg Cys Phe Arg Ser Ala Met Val
65 70 75 80

Val Ser Leu Met Ala Tyr Val Leu Ile Phe Val Met Arg Phe Ser Cys
85 90 95

pctca2017050779-seql.txt

Ser Gly His Tyr Val Phe Asp Ile Ser Pro Lys Cys Gly Lys Asp Leu
100 105 110

Cys Arg Lys Glu Gln Gln Leu His Arg Leu Phe Arg Arg Val Pro Tyr
115 120 125

Val Pro Ala Ser Lys Val Ser Val Lys Ser Tyr Leu Glu Gly Leu Gly
130 135 140

Phe Gln Ile Lys Ile Lys Thr Cys Ser Arg Val Val Asp His Val Ser
145 150 155 160

Thr Ile Gln Ala Leu Pro Tyr Ile Cys Gly Cys Tyr Cys Tyr Tyr Tyr
165 170 175

Tyr Gly Ser Leu Leu Cys Leu Ile Arg Ile Thr Ala Thr Asp Arg Val
180 185 190

Ile Arg Gln Pro Asn Gly Leu Ala Arg Leu Leu Ile Cys Arg Ser Arg
195 200 205

<210> 541

<211> 121

<212> PRT

<213> Papaver somniferum

<400> 541

Met Trp Leu Ile Ile Ile Thr Leu Leu Leu Ser Phe Thr Leu Asp Cys
1 5 10 15

Ala Leu Glu Ser Ser Cys Leu Gln Asn Pro Leu Val Thr Gly Arg Leu
20 25 30

Asn Cys Phe Ile Val Tyr Ser Arg Asn Ser Met Thr Ala Thr Lys Ser
35 40 45

Ala Arg Lys Thr Lys Ile Ile Tyr Phe Ala Asn Glu Asp Tyr Glu Glu
50 55 60

Lys Lys His Lys Asn Met Asn Asn Met Ile Cys Ile Gln Lys Ile Ser
65 70 75 80

Ile His Thr Tyr Lys Leu Ala Thr His Met Glu Asp His Asn Arg Asn
85 90 95

Leu Tyr Cys Phe Tyr Glu Gln Ile Leu Lys Pro Pro Leu Arg Pro Gln
100 105 110

pctca2017050779-seql.txt

Thr Phe Ala Leu Ser Leu Pro Pro Asp
115 120

<210> 542
<211> 379
<212> PRT
<213> Papaver somniferum

<400> 542

Met Asn His His Gln Asn Met Ala Gly Gly Gln Val Asn Thr His Phe
1 5 10 15

Tyr Val Val Phe Phe Ile Ile Phe Phe Cys Cys Cys Ser Val Leu Val
20 25 30

Gln Ser Gln Val Pro Lys Asn Lys Thr Phe Arg Ile Ile Asn Gln Gly
35 40 45

Asp Tyr Gln Asn Val Val Ser Glu Tyr Gly Ser Thr Phe Arg Phe Ala
50 55 60

Lys Pro Asn Ala Asn Phe Asn Met Asp Pro Phe Gly Leu Tyr Phe Tyr
65 70 75 80

Asn Thr Thr Phe Asn Ala Tyr Val Leu Gly Ile Gly Gly Gly Ser Pro
85 90 95

Tyr Gln Asn Met Met Leu Arg Thr Asp Asn Gln Ile His Trp Val Trp
100 105 110

Asp Ala Asn Arg Asn Asp Pro Val Arg Glu Lys Ala Thr Leu Thr Phe
115 120 125

Ser Arg Asn Gly Asn Leu Val Leu Ala Asp Val Asp Gly Arg Ile Val
130 135 140

Trp Gln Thr Tyr Thr Ala Asn Lys Gly Val Thr Gly Ile Ile Met Arg
145 150 155 160

Lys Tyr Gly Asn Leu Val Leu His Asp Lys Asn Gly Arg Phe Val Trp
165 170 175

Gln Ser Phe Gln His Pro Thr Asp Thr Leu Val Ala Gly Gln Ser Leu
180 185 190

Gln Leu Lys Gly Asn Ser Ile Lys Leu Val Ser Arg Thr Ser Asn Arg
195 200 205

pctca2017050779-seql.txt

Asn Ser Cys Asp Gly Arg Tyr Ser Ile Val Ile Asp Asp Lys His Gly
210 215 220

Leu Thr Met Tyr Lys Asn Thr Ser Gly Lys Leu Val Arg Tyr Ala Gly
225 230 235 240

Trp Glu Ala Lys Gly Val Ser Asn Val Thr Phe His Ser Val Thr Arg
245 250 255

Ile Asp Pro Val Gln Pro Glu Pro Ser Phe Glu Glu Lys Gly Asn Thr
260 265 270

Ser Tyr Phe Leu Ser Leu Gly Phe Ser Val Gly Lys Lys Ala Lys Thr
275 280 285

His Ser Lys Arg Val Ile Leu Lys Ile Met Ala Thr Thr Phe Gly His
290 295 300

Tyr Ser His Leu Arg Leu Glu Ser Asp Gly Asn Leu Lys Val Tyr Ser
305 310 315 320

Tyr Ser Leu Arg Gln Asn Phe Pro Glu Glu Ser Ser Trp Lys Lys Asp
325 330 335

Tyr Ala Phe Phe Gly Asp Thr Val Lys Glu Cys Ala Leu Arg Ser Lys
340 345 350

Cys Gly Thr Ser Gly Lys Cys Tyr Gly Arg Leu Cys Ser Ala Cys Pro
355 360 365

Arg Asn Arg Ser Ser Gly Cys Met Ile Thr Ser
370 375

<210> 543

<211> 160

<212> PRT

<213> Papaver somniferum

<400> 543

Met Val Arg Gln Leu Thr Val His His His Ala Gly Gly Cys Phe Ser
1 5 10 15

Thr Val Asn Val Pro Val Val Ala Val Ala Leu Phe Val Ser Val Thr
20 25 30

Val Leu Val Gly Leu Cys Ala Lys His Thr Ile Arg Arg Arg Gln Leu
35 40 45

pctca2017050779-seql.txt

Ala Arg Glu Lys Leu Gly Cys Asn Pro Asn Asp Ser Arg Val Thr Pro
50 55 60

Gly Ser Ser Pro Ser Arg Gly Leu Phe Ala Thr Ile Ser Asn Lys Ala
65 70 75 80

Phe Pro Phe Met Ser Asn Lys Lys Ser Gly Asp Gln His Gly Asp Asn
85 90 95

Tyr Glu Ile Val Gly Asp Gly Gly Val Trp Gln Arg Gly Ile Leu Met
100 105 110

Gly Gly Lys Cys Gln Pro Pro Asp Phe Ser Gly Val Ile Tyr Tyr Asp
115 120 125

Val Ala Gly Arg Gln Leu Ser Glu Ile Pro Arg Ser Pro Arg Ala Ser
130 135 140

Pro Phe Pro Ser Ser Phe Ser Phe Pro Ala Ala Lys Asp Gly Asn Phe
145 150 155 160

<210> 544

<211> 136

<212> PRT

<213> Papaver somniferum

<400> 544

Met Lys Lys Lys Ser Val Ser Ala Leu Ser Ser Asn Phe Met Leu Gln
1 5 10 15

Ser Cys Ile Val Lys Lys Lys Val Tyr Leu Val Tyr Thr Ser Ile Phe
20 25 30

Thr Lys Gly Gln Ala His Pro Lys Gly Pro Trp Gly Glu Lys Lys Glu
35 40 45

Glu Arg Lys Val Lys Gln Pro Ile Thr Tyr Pro Lys Met Tyr Asp Gln
50 55 60

Leu Gln Arg Leu Leu Ile Tyr Gln Ile Pro Lys Glu Asn Thr Ala Met
65 70 75 80

Asp Leu Cys Cys Gly Ser Ser Ser Gln Asn Gly Phe Met Leu Leu Leu
85 90 95

Glu Tyr Asp Pro Asp Glu Thr Val Asp Glu Phe Glu Arg Phe Trp Asp
100 105 110

pctca2017050779-seql.txt

Ser Thr Glu Thr Met Thr Ile Phe Phe Trp Leu Met Leu Gln Phe Leu
115 120 125

Ser Ser Arg Pro Ser Gln Ser Ala
130 135

<210> 545
<211> 151
<212> PRT
<213> Papaver somniferum

<400> 545

Met Leu Arg Arg Ala Arg Ser Thr Leu Gly Leu Gln Glu Ser Thr Ser
1 5 10 15

Leu Leu Ile Lys Lys Gln Asp Ser Met Ile Ser Ser Gln Glu Ser Asn
20 25 30

Ser Asn Ile Ile Ala Val Lys Pro Thr Phe Lys Leu Ser Gly Gly Ser
35 40 45

Leu Lys Thr Ser Ser Asn Gly Ile Phe Ser Ser Val Ser Glu Ser Asn
50 55 60

Phe Met Lys Ala Cys Ser Leu Cys Arg Lys Lys Leu Ser Pro Leu Lys
65 70 75 80

Asn Ile Tyr Met Tyr Lys Gly Asp Gln Ser Phe Cys Ser Asp Val Cys
85 90 95

Arg Cys Arg Lys Ile Leu Ile Glu Glu Leu Leu Met Glu Glu Ile Glu
100 105 110

Glu Glu Glu Thr Thr Met Glu Val Pro Thr Lys Asp Ile Val Ser Ser
115 120 125

Ser Ile Cys Phe Ala Thr Asn Leu Gly Asn Gly Leu Pro Pro Arg Arg
130 135 140

Asn His Val Gln Ala Ala Ala
145 150

<210> 546
<211> 414
<212> PRT
<213> Papaver somniferum

<400> 546

pctca2017050779-seq1.txt

Met Pro Leu Gly Asp Lys Ala Asn Ser Ala Ala Lys Trp Asp Arg Ile
 1 5 10 15
 Val Glu Leu Cys Lys Ala Arg Leu Ala Ser Trp Lys Arg Arg Ile Leu
 20 25 30
 Thr Arg Ala Gly Trp Arg Asn Val Cys Lys Pro Ile Asn Ile Gly Gly
 35 40 45
 Leu Gly Ile Arg Ser Leu Lys His Leu Asn Cys Ser Leu Leu Gln Lys
 50 55 60
 Trp Trp Trp Arg Leu Gly Asn Glu Pro Lys Ala Leu Trp Ser Arg Val
 65 70 75 80
 Val Lys Asp Lys His Gly Pro Val Asp Leu Gly Trp Arg Thr His Lys
 85 90 95
 Pro Lys Gly Lys His Gly Ile Ser Leu Trp Arg Asn Ile Tyr Ser Thr
 100 105 110
 Ala Glu Asp Phe Phe Lys Leu Cys Gln Phe Lys Ile Gly Lys Gly Asp
 115 120 125
 Arg Val Arg Leu Gly Glu Asp Lys Trp Cys Ile Gln Gly Pro Leu Tyr
 130 135 140
 Ala Leu Phe Pro Ser Leu Tyr Asn Ile Ser Ser Thr Lys Asn Thr Cys
 145 150 155 160
 Ile Phe Ala Ala Tyr His Asp Ser Ala Asn Gly Phe Tyr Trp Ile Leu
 165 170 175
 Gly Leu Ser His Arg Arg Arg Leu Tyr Asp Asn Glu Ile Ser Glu Leu
 180 185 190
 Ser Val Met Leu Pro Leu Leu Glu Ser Ile Val Phe Leu Pro Asn Glu
 195 200 205
 Glu Asp Gln Leu Val Trp Leu Gly Asp Lys Lys Gly Met Phe Thr Val
 210 215 220
 Lys Ala Ala Tyr Ala His Leu Ser Gln Gly Thr Asn Pro Pro Ile Ser
 225 230 235 240
 Phe Pro Ser Ser Lys Val Trp Ser Arg Ala Trp Pro His Arg Val Gly
 245 250 255

pctca2017050779-seql.txt

Phe Phe Leu Trp Lys Val Cys Leu Asn Arg Leu Pro Thr Leu Ser Asn
260 265 270

Leu His His Arg Arg Thr Ala Leu His Ser Pro Ser Leu Cys Tyr Leu
275 280 285

Cys Gly Ile Ala Glu Glu Thr Glu Asp His Leu Leu Leu Gln Cys Pro
290 295 300

Phe Ser Leu Arg Val Trp Asn Tyr Phe Ile Gly Leu Ala Gly Gly Gly
305 310 315 320

Thr Leu Leu Gln Thr Val Lys Asp Val Ile Val Gly Trp Lys Asn Phe
325 330 335

Pro Phe Ser Ala Gln Gly Leu Gln Leu Trp Lys Arg Leu Pro Ala Ala
340 345 350

Ile Pro Trp Ala Leu Trp Lys Ala Arg Asn Asp Ile Ala Phe Glu Arg
355 360 365

Lys Pro Phe Lys Val Asn Asp Val Ile Arg Asn Ile Lys Met Asp Ala
370 375 380

Phe Asn Trp Ser Arg Gly Leu Asp Cys Phe Lys Gly Ile Asn Thr Ser
385 390 395 400

Thr Val Ile Val Gly Trp Ala His Phe Phe Leu Asn Pro Pro
405 410

<210> 547

<211> 589

<212> PRT

<213> Papaver somniferum

<400> 547

Met Val Glu Thr Leu Ile Gly Asn Asn Ser Met Thr Thr Ser Arg Glu
1 5 10 15

Met Phe Arg Phe Thr Lys Gln Leu Leu Lys Gly Arg Trp Phe Met Leu
20 25 30

Phe Ala Ala Phe Leu Ile Met Ser Gly Ala Gly Ala Thr Tyr Ala Phe
35 40 45

Gly Ile Tyr Ser Lys Glu Ile Lys Arg Thr Leu Gly Phe Asp Gln Glu
50 55 60

pctca2017050779-seql.txt

Thr Leu Asn Leu Leu Gly Phe Phe Lys Asp Leu Gly Ala Ser Val Gly
 65 70 75 80
 Val Phe Ser Gly Leu Ile Ala Glu Val Thr Pro Thr Trp Phe Val Leu
 85 90 95
 Leu Val Gly Ala Ala Leu Asn Phe Phe Gly Tyr Phe Met Ile Trp Leu
 100 105 110
 Ala Val Ala Gly His Ile Ala Lys Pro Lys Val Trp Gln Met Cys Met
 115 120 125
 Tyr Ile Cys Ile Gly Ala Asn Ser Gln Asn Phe Ala Asn Thr Gly Ser
 130 135 140
 Leu Val Pro Cys Val Lys Asn Phe Pro Glu Ser Arg Gly Ile Met Val
 145 150 155 160
 Gly Leu Leu Lys Gly Phe Thr Gly Leu Ser Gly Ala Val Met Asn Gln
 165 170 175
 Leu Tyr Leu Ala Ile Tyr Gly Asn Asn Pro Lys Ala Leu Ile Leu Leu
 180 185 190
 Ile Gly Trp Leu Pro Ala Val Val Ser Leu Phe Phe Val Tyr Thr Ile
 195 200 205
 Arg Pro Met Lys Val Val Lys Gln Thr Asn Glu Arg Lys Met Phe Tyr
 210 215 220
 Lys Tyr Leu Phe Ile Ser Leu Ala Leu Ala Leu Phe Val Met Val Ile
 225 230 235 240
 Thr Ile Ile Gln Lys Gln Lys Ala Phe Ser His Gly Gly Tyr Ile Ala
 245 250 255
 Thr Ala Thr Val Val Cys Ile Leu Leu Phe Ile Pro Leu Gly Val Ala
 260 265 270
 Ile Asn Glu Glu Leu Ala Ile Trp Lys Gln Asn Lys Gln Val Gln Asn
 275 280 285
 Ser Thr Pro Thr Ser Val Thr Ile Glu Thr Pro Pro Ala Ile Val Ala
 290 295 300
 Gln Thr Val Asp Ala Lys Asn Pro Val Pro Glu Ser Ser Trp Tyr Ser
 305 310 315 320

pctca2017050779-seql.txt

Asn Ile Phe Ser Pro Pro Lys Arg Gly Glu Asp Tyr Thr Ile Leu Gln
325 330 335

Ala Leu Leu Ser Leu Asp Met Leu Leu Val Phe Ile Ser Val Phe Ser
340 345 350

Gly Leu Gly Thr Ser Leu Ser Ala Ile Asp Asn Leu Gly Gln Ile Gly
355 360 365

Glu Ser Leu Gly Tyr Pro Ser Leu Thr Ile Ser Thr Phe Val Ser Leu
370 375 380

Val Ser Ile Trp Asn Tyr Phe Gly Arg Val Cys Ala Gly Phe Ile Ser
385 390 395 400

Glu Ile Leu Leu Ser Lys Trp Gly Phe Pro Arg Thr Leu Val Met Thr
405 410 415

Val Val Leu Val Leu Ser Cys Ile Gly Asp Ile Leu Ile Ala Phe Ala
420 425 430

Phe Pro Gly Ser Leu Tyr Val Ser Ser Val Leu Ile Gly Phe Ser Tyr
435 440 445

Gly Ala Gln Leu Thr Leu Val Tyr Thr Ile Ile Ser Glu Leu Phe Gly
450 455 460

Leu Lys Tyr Tyr Ser Thr Leu Phe Asn Cys Gly Val Leu Gly Ser Pro
465 470 475 480

Leu Gly Ser Tyr Val Phe Asn Val Arg Val Leu Gly Ile Leu Tyr Asp
485 490 495

Arg Glu Ala Leu Lys Gln Leu Lys Phe Lys Gly Leu Cys Arg Asp Ser
500 505 510

Val Lys Glu Leu Thr Cys Ile Gly Lys Glu Cys Tyr Arg Met Ser Phe
515 520 525

Ile Ile Met Ala Gly Val Ser Leu Val Gly Ala Leu Cys Ser Leu Val
530 535 540

Leu Val Met Arg Thr Arg Asp Phe Tyr Gln Gly Asp Ile Tyr Lys Lys
545 550 555 560

Phe Arg Glu Gln Ala Ser Gly Asn Lys Ser Glu Glu Ser Glu Met Gly

565

570

575

Leu Ala Val Ser Ser Val Asp Asp Arg Lys Thr Leu Lys
 580 585

<210> 548

<211> 290

<212> PRT

<213> Papaver somniferum

<400> 548

Met Cys Asn Ser Ala Glu Ile Val Val Leu Ser Lys Asn Thr His Tyr
 1 5 10 15

Cys Phe Asn Asp Leu Ile Ala Phe Tyr Leu Ile Met Leu Asp Arg Asp
 20 25 30

Thr Asn Arg Pro Arg Gly Phe Gly Phe Val Thr Phe Ala Asp Leu Arg
 35 40 45

Gly Met Asp Asp Ala Ile Arg Glu Met His Gly Arg Glu Leu Gly Glu
 50 55 60

Arg Val Ile Ser Val Asn Lys Ala Gln Pro Arg Ser Gly Gly Gly Gly
 65 70 75 80

Gly Gly Gly Arg Asp Asp Tyr Gly Gly Gly Tyr Ser Ser Gly Gly Arg
 85 90 95

Gly Gly Ser Phe Gly Gly Asp Arg Arg Gly Pro Gly Gly Ser Asp Cys
 100 105 110

Phe Lys Cys Gly Arg Pro Gly His Trp Ala Arg Glu Cys Pro Ser Ala
 115 120 125

Gly Gly Gly Gly Ala Gly Gly Gly Ala Ala Arg Ser Arg Phe Ser
 130 135 140

Gly Ser Gly Gly Gly Arg Gly Asp Arg Phe Gly Gly Asp Arg Phe Gly
 145 150 155 160

Gly Asp Arg Tyr Gly Asp Arg Tyr Met Asp Asp Arg Tyr Asp Gly Gly
 165 170 175

Arg Tyr Gly Asp Arg Asp Arg Val Asp Ser Arg Asp Ile Lys Tyr Gly
 180 185 190

Gly Arg Asp Arg Tyr Ala Gly Gly Asp Arg Tyr Pro Ala Ala Gly Gly

195

Asp Arg Phe Gly Gly Ser Asp Arg Tyr Gly Ala Ser Asp Arg Tyr Pro
210 215 220

Gln Asn Gly Tyr Ser Lys Asp Arg Ala Tyr Asp Arg Asp Ala Ala Pro
225 230 235 240

Arg Thr Gly Phe Gly Ala Ala Gly Ala Gly Ser Asp Arg Tyr Gly Ser
245 250 255

Gly Gly Pro Thr Arg Tyr Glu Gly Gly Ser Tyr Arg Asp Arg Ala Gly
260 265 270

Pro Tyr Asp Arg Pro Ser Arg Gly Ala Arg Pro Ser Ser Tyr Glu Asp
275 280 285

Arg Tyr
290

<210> 549
<211> 774
<212> PRT
<213> Papaver somniferum

<400> 549

Met Gly Glu Ser Gly Asp Val Ala Ala Ala Leu Ser Val Asp Arg Arg
1 5 10 15

Ser Glu Leu Lys Ser Pro Pro Pro Ser Lys Val Ala Pro Trp Leu Val
20 25 30

Ile Pro Tyr Gly Glu Glu Gly Met Thr Glu Asn Gln Ala Phe Tyr Asn
35 40 45

Ile Cys Glu Pro Asn Lys Lys Thr Leu Arg Lys Cys Ile Pro Glu Leu
50 55 60

Ser Gly Lys Thr Phe Lys Gln Lys Thr Ser His Gln Gly Trp Cys Ile
65 70 75 80

Ile Val Cys Asp Asp Pro Asp Val Asp Tyr Ala Pro Asp Trp Asn Phe
85 90 95

Gly Asp Cys Phe Leu Trp Asn Pro Ala Thr Leu Gln Thr Ile Glu Leu
100 105 110

Pro Ser Leu Leu Phe Tyr Ile Asp Asn Asp Lys Glu Phe His His Lys

115

Asp Cys Val Leu Ser Ser Pro Pro Ser Gly Glu Asp Thr Asp Asn Asp
130 135 140

Ser Met Val Leu Phe Leu Phe Glu Arg Lys Asp Lys Arg Tyr Asp His
145 150 155 160

Val Leu Ile Tyr Cys Phe Pro Gly Asp Lys Gln Trp Arg Thr His Thr
165 170 175

Val Ala Arg Asp Met Val Asp Phe Glu Asp Val Thr Ser Val Cys Tyr
180 185 190

Phe Lys Asp Lys Phe Tyr Val Met Cys Val Gly Asp Arg His Ile Glu
195 200 205

Ile Glu Met Gln Lys Leu Gly Asp Ile Val Ser Phe Ser Ile Arg Pro
210 215 220

Ile Glu Val Pro Asp Thr Ile Leu Trp Thr Thr Val Gly Gly Ile Glu
225 230 235 240

Thr Thr Val Thr Gly Thr His Phe Val Glu Cys Gly Asp Glu Leu Phe
245 250 255

Arg Ile Glu Ile Thr Tyr Pro Ala Arg Arg Gly Ser Pro Arg Val Asp
260 265 270

Ile Ala Ile Tyr Val Ala Lys Tyr Asp Phe Ser Val Met Glu Leu Lys
275 280 285

Glu Val Thr Ser Phe Gly Asp His Val Leu Phe Leu Ser Asn Asn Thr
290 295 300

Ser Phe Ser Cys Ser Ala Ala Glu Leu Gly Leu Ser Lys Gly Trp Leu
305 310 315 320

Phe Tyr Thr Leu Glu Gln Asp Gln Ser Leu His Lys Tyr Glu Val Glu
325 330 335

Ser Asn Gly Thr Thr Val Ile Leu Pro Cys Leu Lys Leu Pro Arg Pro
340 345 350

Trp Tyr Thr Ser Ser Trp Ile Met Val His Asp Lys His His Thr Lys
355 360 365

pctca2017050779-seql.txt

Glu Lys Met Phe Gly Arg Asp Glu Glu Leu Lys Ala Val Leu Asp Asn
 370 375 380
 Lys Thr Ser Thr Thr Gly Ser Asp Ser Asn Glu Asp Gln Arg Glu Thr
 385 390 395 400
 Asn Gly Arg Arg Glu Leu Gln Glu Ala Ile Pro Trp Asp Ile Leu Tyr
 405 410 415
 Glu Asp Met Val Arg Leu Ile Ala Asn Tyr Leu His Arg Leu Asp Tyr
 420 425 430
 Ile His Phe Arg Leu Ala Ser Lys Ala Asn Arg Val Leu Met Pro Met
 435 440 445
 Val Lys Leu Ala Ser Thr Cys Thr Thr Arg Cys Thr Asp Leu Ser Pro
 450 455 460
 Trp Leu Val Phe Ser Arg Asp Lys Cys Gln Glu Val Tyr Asn Phe Val
 465 470 475 480
 Asn Pro Met His Asn Asn Glu Asn Tyr Leu Met Asn Phe Ser Asp Leu
 485 490 495
 Val Gly Ala Thr Ile Arg Phe Gln Lys Gly Gly Trp Leu Leu Met Ser
 500 505 510
 Lys Gly Ser Ala Ser Ile Phe Phe Tyr Asn Pro Phe Thr Lys Glu Ile
 515 520 525
 Ile Asn Leu Pro Asp Leu Pro Val Asp Thr Phe Ser Gly Ile Ser Phe
 530 535 540
 Ser Ser Ser Pro Thr Ser Ser Asp Cys Ile Val Phe Ala Ile Gln Gln
 545 550 555 560
 Met Arg Val Ser Asp Gly Met Ser Asn Glu Ile Ser Ile Tyr Leu Ile
 565 570 575
 Lys Arg Gly Ala Thr Ser Trp Ser Ser Cys Asp Phe Gln Asn Lys Asn
 580 585 590
 Val Glu Lys Phe Met Pro Leu Leu Asn Thr Pro Val Phe Tyr Asn Gly
 595 600 605
 Val Phe Tyr Cys Val Asp Tyr Asn Gly Thr Leu Gly Val Phe Asn Leu
 610 615 620

pctca2017050779-seql.txt

Glu Asp His Asn Trp Lys Ile Leu Glu Lys Pro Leu Gln Gln Phe Ser
625 630 635 640

Gly Ile Tyr Pro Ser Phe Leu Val Glu Cys Ala Gly Gln Ile Leu Leu
645 650 655

Val Ser Leu Gly His Leu Gly Ala Ser Val Arg Val Phe Arg Leu Asp
660 665 670

Phe Ser Lys Met Val Trp Asp Glu Val Arg Asp Leu Gly Lys His Met
675 680 685

Leu Phe Ile Ser Tyr Thr Ser Cys Ile Ser Ala Ile Ala Leu Asn Arg
690 695 700

Arg Met Glu Asn Lys Thr Tyr Phe Pro Arg Leu Cys Leu Asn Gly Glu
705 710 715 720

Gly Val Leu Phe Tyr Ser Leu Glu Thr Gly Asn Tyr His Ser Phe Gly
725 730 735

Thr Arg His Ser Ala Asn Asn Phe Tyr Asp Thr Glu Gly Trp Tyr Thr
740 745 750

Asn Cys Thr Trp Ile Glu Pro Asn Trp Ser Lys Ala Gln Glu Leu Asp
755 760 765

Trp Leu Lys Pro Leu Leu
770

<210> 550
<211> 428
<212> PRT
<213> Papaver somniferum

<400> 550

Met Arg Leu Met Asn Gln Val Leu Gln Pro Phe Leu Ser Lys Phe Val
1 5 10 15

Ile Val Tyr Phe Asp Asp Ile Leu Ile Phe Ser Arg Ser Glu Pro Glu
20 25 30

His Leu Gln His Leu Ser Gln Val Phe Gln Val Leu Ala Asp Asn Ser
35 40 45

Leu Tyr Val Asn Leu Lys Lys Cys Thr Phe Met Ala Ser Ser Val Thr
50 55 60

pctca2017050779-seql.txt

Phe Leu Gly Tyr Val Ile Ser Thr Asp Gly Ile His Val Asp Pro Ser
 65 70 75 80
 Lys Val Gln Ala Ile Glu Asp Trp Pro Val Pro Thr Ser Ile Arg Asp
 85 90 95
 Val Arg Ser Phe His Gly Leu Ala Ser Cys Tyr Arg Arg Phe Val Lys
 100 105 110
 Asn Phe Ser Ser Ile Ser Ala Pro Leu Thr Asp Cys Leu Lys Lys Glu
 115 120 125
 Lys Phe Glu Trp Thr Glu Ala Met Asp Lys Ser Phe Ile Leu Leu Lys
 130 135 140
 Glu Lys Leu Phe Thr Thr Pro Ile Leu Ala Leu Pro Asn Phe Asn Lys
 145 150 155 160
 Pro Phe Glu Ile Asp Cys Asp Ala Phe Val Val Gly Ile Gly Ala Val
 165 170 175
 Leu Ser Gln Glu Gly His Pro Ile Ala Tyr Tyr Ser Glu Lys Asn Ser
 180 185 190
 Asp Ala Gln Lys Lys Trp Ser Thr Tyr Glu Leu Glu Leu Leu Ala Leu
 195 200 205
 Val Gln Ser Leu Lys Gln Trp His Thr Tyr Leu Ile His Arg Glu Phe
 210 215 220
 Val Val Asn Thr Asp Asn His Ala Leu Lys Phe Leu Asn Thr Ser Ala
 225 230 235 240
 Lys Val Asn Arg Met His Asp Arg Trp Leu Ser Thr Leu Asn Lys Tyr
 245 250 255
 Thr Phe Ser Val Arg His Lys Ser Gly Lys Leu Asn Gln Val Ala Asp
 260 265 270
 Ala Leu Ser Arg Arg Ser His Leu Leu Thr Thr Ile Arg Asn Glu Ser
 275 280 285
 Tyr Ala Phe Asp Tyr Ile Lys Asp Ile Tyr Pro Glu Asp Glu Asp Phe
 290 295 300
 Gly Lys Leu Trp Asp Gln Cys Ser Ser Gln Thr His Gly Val Asp Asp
 305 310 315 320

pctca2017050779-seql.txt

Phe Leu Ile Gln Glu Gly Phe Leu Phe Lys Gly Asn Arg Leu Cys Ile
325 330 335

Pro Gln Gly Ser Leu Arg Leu His Leu Met Arg Glu Leu His Gly Ser
340 345 350

Gly Leu Gly Gly His Phe Gly Arg Asp Lys Thr Ile Ala Leu Ile Glu
355 360 365

Glu Arg Tyr Phe Trp Pro Ser Leu Lys Arg Asp Val Gln Lys Phe Val
370 375 380

Gln Lys Cys Met Val Cys Gln Arg Ala Lys Gly Thr Ile Gln Asn Thr
385 390 395 400

Gly Leu Tyr Thr Pro Leu Pro Val Pro Asp Ala Pro Trp Val Asp Ile
405 410 415

Ser Met Asp Phe Ile Leu Gly Leu Pro Arg Thr Ala
420 425

<210> 551

<211> 790

<212> PRT

<213> Papaver somniferum

<400> 551

Met Thr Ala Gln Pro Val Thr Leu Ala Ala Ile Lys Ala Leu Ile Lys
1 5 10 15

Ser His Thr Glu Ile Leu Ala Lys Asn Ile Thr Glu Ala Leu Glu Lys
20 25 30

Ser Met Glu Asp Lys Leu Gly Leu Arg Asp Thr Lys Leu Glu Thr Met
35 40 45

Gln Asn Gln Ile Leu Lys Val Ala Lys His Ile Asn Leu Asp Leu Glu
50 55 60

Met Pro Glu Leu Val Asp Leu Glu Gly Lys Asn Lys Glu Asp Ile Leu
65 70 75 80

Gln Phe Leu Gln Asn Asp Glu Val Pro Glu Asp Val Leu Arg Thr Leu
85 90 95

Asn Ile Lys Lys Pro Tyr Glu Gly Phe Ile Gly His Ser Lys Lys Lys
100 105 110

pctca2017050779-seql.txt

Ile Val Ser Pro Ala Leu Asp Asn Asp Asp Glu Asp Glu Arg Glu Asn
115 120 125

Asp Leu Glu Lys Asn Trp Thr Glu Glu Arg Arg Leu Lys Thr Gly His
130 135 140

Asn Pro Tyr Ser Ser Leu Pro Glu Tyr Lys Leu Lys Ala Asn Ile Pro
145 150 155 160

Asn Phe Ser Gly Asn Phe Arg Ile Glu Glu Leu Thr Asp Arg Phe Phe
165 170 175

Glu Val Glu Ala Phe Phe Glu Phe Met Glu Val Pro Glu Asp Ser Lys
180 185 190

Val Lys Leu Val Thr Tyr Lys Leu Lys Gly Gly Ala Ala Ala Trp Trp
195 200 205

Asp Lys Ile Cys Asp Asp Arg Arg Asn Ala Asn Lys Pro Lys Ile Arg
210 215 220

Thr Trp Lys Arg Met Lys Thr Leu Ile Arg Tyr Lys Phe Leu Pro Arg
225 230 235 240

Asp Phe Met Gln Gln Leu Phe Ile Lys Leu Gln Asn Ile Gln Gln Gly
245 250 255

Ala Arg Thr Val Glu Glu Tyr Val Ser Asp Phe Tyr Asn Leu Val Ala
260 265 270

Arg Asn Gln Leu Lys Glu Ser Glu Glu Gln Leu Val Ala Arg Phe Ile
275 280 285

Glu Gly Leu Asn Arg Leu Ile Gln Asn Gly Met Thr His Ser Val Phe
290 295 300

Thr Met Val Glu Val Val Gln Gln Ala Ile Lys Ile Glu Asn Arg Leu
305 310 315 320

Ile Arg Ser Ser Arg Ile Tyr Pro Ser Arg Gln Gly Arg Tyr Gln Asn
325 330 335

Thr Tyr Arg Gly Thr Asn Ser Ser Gln Asn Phe Ser Pro Asp Thr Val
340 345 350

Leu Asn Ile Pro Arg Pro Pro Tyr Asp Asp Val Ser His Ser His Arg

355

Gln Pro Ser His Ile Val Thr Tyr Thr Pro Pro Leu Ala Thr Pro Ile
370 375 380

Leu Ala Asn Ser Val Asp Leu Gln Pro Gly Gln Gln Ser His Ser Leu
385 390 395 400

Gln Pro Thr Pro Pro Thr Thr Gly Asn Arg Phe His Asn Arg Gln Gln
405 410 415

Gln Phe Pro Pro Gln Gln Arg Ala Asn Asn Ala Cys Thr Lys Phe Arg
420 425 430

Gly Asp Lys Cys Asn Lys Cys Gln Gln Ser Gly His Thr Ser Ser Asp
435 440 445

Cys Arg Lys Phe Asn Ala Leu Ile Gly Glu Pro Gln Phe Ile Asn Glu
450 455 460

Val Thr Gly Ala Leu Asn Glu Phe Glu Tyr Glu Asp Ser Pro Gly Asp
465 470 475 480

Asp Asp Glu Phe Val Gly Met Ile Arg Pro Leu Phe Leu Thr Gln Gln
485 490 495

Cys Lys Ser Gln Arg His Asn Ile Phe Lys Ser Arg Cys Tyr Ile Gly
500 505 510

Gly Lys Ile Cys Lys Met Ile Ile Asp Ser Gly Ser Val His Asn Cys
515 520 525

Ile Ala Asp His Val Val Lys Lys Leu Glu Leu Pro Val Thr Ser His
530 535 540

Pro Glu Pro Tyr Thr Val Gly Trp Val Asn Ala Ser Ser Thr Gln Lys
545 550 555 560

Ile Thr Leu Gln Cys Tyr Val Ser Phe Ser Phe Glu Gly Tyr Glu Asp
565 570 575

Thr Val Leu Cys Asp Val Ile Asn Met Thr Ala Thr His Leu Leu Leu
580 585 590

Gly Arg Pro Trp Gln Tyr Asp Leu Gln Ala Val His Asn Gly Phe Glu
595 600 605

pctca2017050779-seql.txt

Asn Thr Tyr Thr Phe Val His Asn Gly Lys Thr Lys Val Leu Ser Pro
610 615 620

Ser Asn Ser Thr Ser Asn Ser Cys Ala Gln Thr Asp Ala Val Val Ala
625 630 635 640

Thr Val Ile Arg Ser Leu His Pro Gln His Ser Leu His Ser His Glu
645 650 655

Asp Ser Lys Pro Met Ile Glu Phe Pro Pro Leu Arg Asn Ile Gln His
660 665 670

Tyr Ile Asp Phe Ile Pro Gly Ala Ser Leu Pro Asn Gln Ala His Tyr
675 680 685

Leu Leu Ser Pro Ala Glu His Glu Ile Leu Gln Gly Gln Val Asn Asp
690 695 700

Leu Leu Lys Lys Gly Leu Ile Arg Pro Ser Asn Arg Pro Cys Ala Ser
705 710 715 720

Pro Ala Phe Leu Val Ser Lys Lys Asp Asn Gly Trp Arg Met Cys Ile
725 730 735

Asp Cys Arg Ala Leu Asn Arg Ile Thr Ile Pro Tyr Arg Phe Pro Ile
740 745 750

Pro Arg Ile Asp Asp Met Ile Asp Leu Leu Ser Gly Ser Ile Ile Phe
755 760 765

Thr Lys Leu Asp Leu Arg Ser Gly Tyr His Gln Ile Arg Ile Arg Gly
770 775 780

Gly Asp Glu Trp Lys Thr
785 790

<210> 552
<211> 125
<212> PRT
<213> Papaver somniferum

<400> 552

Met Lys Asp Leu Gly Lys Ala Arg Lys Ile Leu Gly Met Glu Ile Glu
1 5 10 15

Arg Asp Arg Arg Ser Asp Thr Ile Asn Leu Ser Gln Lys Ser Tyr Leu
20 25 30

pctca2017050779-seq1.txt

Lys Lys Leu Phe Lys Arg Phe Gly Leu Asp Asp Lys Ala Lys Pro Val
35 40 45

Thr Gln Pro Leu Ala Arg His Phe Lys Leu Asn Ala Glu Gln Ser Pro
50 55 60

Lys Thr Val Glu Glu Gln Arg Leu Met Ala Glu Ile Pro Tyr Thr Ser
65 70 75 80

Ala Ala Gly Ser Leu Met Tyr Ala Met Val Cys Thr Arg Pro Asp Ile
85 90 95

Ser Gln Ala Val Ser Val Val Ser Arg Tyr Met His Asn Pro Gly Lys
100 105 110

Glu His Trp Gln Asp Val Lys Trp Ile Leu Arg Tyr Ile
115 120 125

<210> 553
<211> 132
<212> PRT
<213> Papaver somniferum

<400> 553

Met Leu Glu Leu Leu Asn Gln Leu Asp Gly Phe Asp Ser Arg Gly Asp
1 5 10 15

Val Lys Val Ile Leu Ala Thr Asn Arg Ile Glu Ser Leu Asp Pro Ala
20 25 30

Leu Leu Arg Pro Gly Arg Ile Asp Arg Lys Ile Glu Phe Pro Leu Pro
35 40 45

Asp Thr Lys Thr Arg Arg Arg Ile Phe Gln Ile His Thr Ser Arg Met
50 55 60

Thr Leu Ala Asp Asp Val Asn Leu Glu Glu Phe Val Met Thr Lys Asp
65 70 75 80

Glu Phe Ser Gly Ala Asp Ile Lys Ala Ile Cys Thr Glu Ala Gly Leu
85 90 95

Leu Ala Leu Arg Glu Arg Arg Met Lys Val Thr His Leu Asp Phe Lys
100 105 110

Lys Ala Lys Glu Lys Val Met Tyr Lys Lys Lys Glu Gly Val Pro Glu
115 120 125

Gly Leu Tyr Met
130

<210> 554
<211> 140
<212> PRT
<213> Papaver somniferum

<400> 554

Met Glu Arg Ala Glu Lys Glu Lys Ser Val Arg Leu Ile Lys Glu Leu
1 5 10 15

Glu Asp Leu Lys Cys Ala Lys Lys Arg Ser Asp Asp Glu Val Glu Glu
20 25 30

Leu Lys Val Lys Cys Arg Asp Leu Glu Thr Gln Glu Gly Arg Leu Arg
35 40 45

Asn Gln Ile Arg Ile Leu Glu Glu Gly Asn Gly Lys Lys Met Glu Met
50 55 60

Asp Gln Lys Lys Lys Lys Val Cys Val Glu Ile Asn Arg Glu Glu Glu
65 70 75 80

Leu Lys Ile Glu Asp Asp Pro Glu Ile Gly Val Val Ala Glu Arg Lys
85 90 95

Cys Met Glu Leu Glu Val Gln Lys Thr Val Asn Thr Val Ile Leu Pro
100 105 110

Ile Asp Val Ile Glu Ile Asp Ser Asp Asn Glu Ile Ile Glu Ile Asp
115 120 125

Asp Asn Ser Asp Asp Lys Ile Gln Gly Gly Gly Ile
130 135 140

<210> 555
<211> 113
<212> PRT
<213> Papaver somniferum

<400> 555

Met Gly Gln Gly Thr Pro Gly Gly Leu Asn Lys Gln Gly Gly Ala
1 5 10 15

Pro Gly Gly Asn Asp Gly Asp Asn Asn Lys Lys Glu Lys Lys Phe Glu
20 25 30

Pro Pro Pro Pro Pro Thr Arg Ile Gly Arg Lys Gln Arg Lys Gln Arg

35

Gly Ser Glu Thr Ala Ala Ala Arg Leu Pro Ala Val Lys Pro Leu Thr
50 55 60

Lys Cys Lys Leu Arg Leu Leu Lys Leu Glu Arg Ile Gln Asp Cys Leu
65 70 75 80

Leu Met Glu Glu Glu Phe Val Ser Asn Gln Glu Ile Leu Lys Pro His
85 90 95

Glu Asp Lys Asn Gln Glu Asp Arg Ser Lys Val Asp Asp Leu Arg Gly
100 105 110

Ser

<210> 556
<211> 238
<212> PRT
<213> Papaver somniferum
<400> 556

Met Asp Phe Asp Glu Glu Leu Gly Asp Glu Lys Phe Gly Val Ser Pro
1 5 10 15

Thr Ser Tyr Glu Ser Ser Arg Pro Thr Lys Met Val Ala Thr Gly Glu
20 25 30

Val Val Ala Val Ser Thr Arg Lys Ser Ala Cys Arg Tyr Arg Glu Cys
35 40 45

Leu Lys Asn His Ala Val Asn Ile Gly Gly His Ala Val Asp Gly Cys
50 55 60

Gly Glu Phe Met Ala Ala Gly Glu Glu Gly Ser Leu Asp Ala Leu Lys
65 70 75 80

Cys Ala Ala Cys Gly Cys His Arg Asn Phe His Arg Lys Glu Ile Glu
85 90 95

Gly Glu Gly Phe His His His Pro Ser Phe Thr Pro Tyr Ser Ser Tyr
100 105 110

Arg Ala Pro Gly His Gly Asp Ser Gly Thr Tyr Leu His Val Pro Ala
115 120 125

Arg Pro Leu Ala Leu Pro Ser Thr Ser Gly Gly Gly Gly Asn Asn Thr

130

135

140

Ser Arg Asp Asp Gln Asp Glu Asp Asn Ser His Pro Thr Ser Ser Gly
 145 150 155 160

Gly Leu Ser Ser Arg Lys Arg Phe Arg Thr Lys Phe Ser Gln Glu Gln
 165 170 175

Lys Asp Lys Met Leu Ser Phe Ala Glu Lys Leu Gly Trp Arg Ile Gln
 180 185 190

Lys His Asp Glu Ala Ala Val Gln Gln Phe Cys Asn Glu Thr Cys Val
 195 200 205

Lys Arg His Val Leu Lys Val Trp Met His Asn Asn Lys His Thr Leu
 210 215 220

Ala Lys Gly Cys Met Met Met Met Met Ile Lys Arg Arg Ser
 225 230 235

<210> 557

<211> 502

<212> PRT

<213> Papaver somniferum

<400> 557

Met Ala Leu Gln Glu His Asn Gln Leu His Phe Val Leu Phe Pro Pro
 1 5 10 15

Met Ala Gln Gly His Leu Ile Pro Thr Ile Asp Met Ala Arg Leu Phe
 20 25 30

Ala Glu Arg Gly Ile Thr Val Thr Ile Ile Thr Thr Pro Leu Asn Thr
 35 40 45

Phe Arg Phe Lys Thr Ile Ile Asp Arg Ala Val Asp Ser Gly Phe Ser
 50 55 60

Ile Arg Leu Leu Gln Leu Arg Phe Pro Ser Val Glu Ala Gly Leu Pro
 65 70 75 80

Glu Gly Cys Glu Asn Val Asp Ser Leu Pro Ser Arg Glu Met Val Ser
 85 90 95

Asn Phe Phe Lys Ala Thr Ser Val Leu Gln Glu Pro Leu Glu Gln Leu
 100 105 110

Leu Gly Val Leu Lys Pro Val Pro Ser Cys Ile Ile Ser Ala Ile Ala

115

Phe Pro Trp Thr Ala Glu Thr Ala Arg Lys Leu Gln Ile Pro Arg Leu
130 135 140

Val Phe His Gly Thr Cys Cys Phe Ser Leu Leu Cys Cys His Asn Ile
145 150 155 160

Leu Glu Tyr Lys Val Ala Asp Ser Ile Thr Ser Glu Ser Glu Ser Phe
165 170 175

Val Ile Pro Gly Leu Pro Asp Arg Ile Glu Ile Ile Lys Ala Met Leu
180 185 190

Pro Gly Asn Leu Pro Gln Ser Ser Gly Asp Leu Lys Asn Phe Arg Asp
195 200 205

Gln Ile Asn Ala Ala Glu Leu Thr Ala His Gly Val Val Val Asn Ser
210 215 220

Phe Asn Glu Leu Glu Pro Met Tyr Ala Glu Glu Tyr Leu Lys Ala Lys
225 230 235 240

Phe Gly Lys Val Trp Cys Thr Gly Pro Val Ser Leu Cys Asn Lys Glu
245 250 255

Thr Leu Asp Asn Ala Glu Arg Gly Asn Lys Ala Ser Val Asp Glu Ser
260 265 270

Gln Cys Leu Lys Trp Leu Asp Leu Lys Asp Pro Gly Ser Val Leu Tyr
275 280 285

Val Cys Leu Gly Ser Leu Cys Arg Leu Thr Thr Ser Glu Met Ile Glu
290 295 300

Leu Gly Leu Gly Leu Glu Ala Ser Lys His Pro Phe Ile Trp Val Ile
305 310 315 320

Arg Gly Arg Asp Lys Tyr Leu Asp Leu Glu Lys Trp Leu Leu Glu Glu
325 330 335

Lys Phe Glu Glu Arg Asn Lys Asp Arg Gly Leu Val Ile Lys Gly Trp
340 345 350

Ala Pro Gln Ile Leu Ile Leu Ser His Lys Ala Ile Gly Gly Phe Leu
355 360 365

pctca2017050779-seql.txt

Thr His Cys Gly Trp Asn Ser Val Leu Glu Gly Val Cys Ala Gly Val
370 375 380

Pro Met Ile Thr Trp Pro Met Gly Glu Glu Gln Phe Phe Asn Glu Lys
385 390 395 400

Leu Val Val Gln Val Leu Gly Ile Gly Val Lys Ile Arg Gly Asp Asp
405 410 415

Ile His Ala Ser Asp Ala Thr Lys Pro Met Glu Leu Met Glu Glu His
420 425 430

Arg Lys Phe Gly Ser Asp Glu Asn Lys Arg Glu Glu Val Glu Lys Ala
435 440 445

Val Asn Arg Val Met Asp Gly Gly Gly Glu Gly Glu Glu Arg Arg Arg
450 455 460

Lys Val Arg Glu Leu Gly Glu Arg Ala Lys Lys Ala Met Glu Gly Gly
465 470 475 480

Gly Ser Ser Gln Leu Asn Met Thr Leu Phe Ile Gln Asp Ile Gln Gln
485 490 495

Gln Gly Pro Lys Gln Gly
500

<210> 558
<211> 179
<212> PRT
<213> Papaver somniferum

<400> 558

Pro Pro Pro Pro Ala Gly Lys Glu Lys Gly Ser Ile Ser Arg Glu Lys
1 5 10 15

Glu Glu Glu Met Ser Ser Arg Gly Gly Gly Gly Ser Ser Ser Ser Ser
20 25 30

Arg Gln Asn Val Asn Ser Val Phe Tyr Ala Glu Ser Tyr His Pro Ile
35 40 45

Gln Ala Gly Ser Ile Asp Gly Ile Asp Ile Leu Pro His Asp Asn Ala
50 55 60

Val Tyr Arg Ala Leu Leu Cys Ser Ser Ala Gly Leu Tyr Asp Pro Phe
65 70 75 80

pctca2017050779-seql.txt

Gly Asp Pro Lys Val Thr Gly Asp Pro Tyr Cys Ser Leu Phe Val Gly
85 90 95

Arg Leu Ser His Leu Thr Thr Glu Asp Ser Leu His Lys Ala Met Ser
100 105 110

Arg Tyr Gly Arg Val Lys Ser Leu Arg Leu Val Arg Asp Ile Val Thr
115 120 125

Gly Ala Ser Arg Gly Tyr Ala Phe Val Glu Tyr Glu Asn Asp Arg Glu
130 135 140

Met Arg Arg Ala Tyr Glu Glu Ala His His Ser Arg Val Asp Asp Cys
145 150 155 160

Glu Ile Leu Val Asp Tyr Asn Arg Gln Gln Leu Met Pro Gly Gly Tyr
165 170 175

His Lys Asp

<210> 559
<211> 248
<212> PRT
<213> Papaver somniferum

<400> 559

Met Val Pro Val Asn Lys Asn Leu Asn Gln Asn Gln Ser Lys Lys Glu
1 5 10 15

Thr Asn Pro Asn Gln Pro Ser Thr Ser Ser Asp Thr Glu Asp Arg Ser
20 25 30

Asn Pro Asn Pro Asn Asn Asn Pro Ala Val Thr Val Glu Ser Thr Ser
35 40 45

Ser Val Ser Pro Leu Val Ile Glu Gly Asp Glu Glu Asp Thr Ile Leu
50 55 60

Lys Lys Ser Glu Tyr Leu Thr Arg Glu Glu Val Ile Arg Arg Arg Leu
65 70 75 80

Arg Arg Val Arg Gln Met Glu Lys Leu Tyr Lys Asp His Tyr Trp Ser
85 90 95

Leu Met Glu Glu Leu Arg Val Lys Tyr Arg Glu Tyr Tyr Trp Glu Tyr
100 105 110

pctca2017050779-seq1.txt

Gly Lys Ser Pro Phe Lys Glu Glu Glu Thr Arg Glu Arg Gly Gly Asn
115 120 125

His His Asn Asn Asn Gly Asn Gly Gly Leu Ala Asn Gly Gly Gly Val
130 135 140

Val Val Glu Gly Ser Gly Asp Asn His Asn Val Asn Gly Gly Val
145 150 155 160

Gly Gly Gly Gly Gly Ser Gly Ser Gly Gly Ala Lys Leu Gly Leu Val
165 170 175

Asn Gly Gly Glu Asp Asn Asn Asp Gly Lys Tyr Lys Arg Cys Val Phe
180 185 190

Val Gly Cys Lys Ser Lys Pro Met Ala Leu Ala Asn His Cys His Gln
195 200 205

His Ile Ile Leu Asp Ser Arg Gln Thr Leu Tyr Lys Thr Cys Asn Tyr
210 215 220

Val Thr Lys Arg Phe Asp Phe Cys Ser Leu Leu Ser Phe Asp Ser Cys
225 230 235 240

Leu Phe Phe Trp Gly Phe Trp Gly
245

<210> 560
<211> 550
<212> PRT
<213> Papaver somniferum

<400> 560

Met Leu Cys Ser Thr Lys Lys Gln Gly Met Glu Arg Leu Ile Val Val
1 5 10 15

Cys Leu Cys Val Ser Leu Leu Ser Ile Phe Ala Leu Ala Asp Pro Gly
20 25 30

Ala Val Gly Val Asn Tyr Gly Arg Ile Ala Asn Asp Leu Pro Ser Ala
35 40 45

Val Lys Thr Val Glu Leu Leu Lys Ser Gln Gly Ile Asp Lys Val Lys
50 55 60

Ile Tyr Asp Thr Asp Ser Ala Val Leu Lys Ala Leu Ser Gly Ser Ser
65 70 75 80

pctca2017050779-seql.txt

Ile Lys Val Ile Val Ser Leu Pro Asn Glu Asn Leu Thr Ala Ala Ala
 85 90 95
 Lys Tyr Pro Ser Phe Ala Leu Ser Trp Val Gln Lys Asn Ile Val Pro
 100 105 110
 Tyr Tyr Pro Leu Thr Gln Ile His Ala Ile Ala Val Gly Asn Glu Val
 115 120 125
 Phe Val Asp Pro Asn Asn Thr Thr Asp Val Leu Val Pro Ala Met Lys
 130 135 140
 Asn Val Gln Ser Ala Leu Val Phe Tyr Lys Leu Asp Ser Gly Ile Lys
 145 150 155 160
 Ile Ser Ser Pro Phe Ala Leu Ser Ala Leu Gln Ser Ser Phe Pro Ala
 165 170 175
 Ser Ser Gly Ser Phe Lys Thr Glu Leu Ile Glu Pro Val Ile Lys Pro
 180 185 190
 Met Phe Asn Phe Leu Arg Glu Thr Lys Ser Tyr Leu Met Leu Asn Ala
 195 200 205
 Tyr Pro Phe Phe Ala Tyr Ser Ala Asn Ala Asp Val Ile Ser Leu Asp
 210 215 220
 Tyr Ala Leu Phe Arg Glu Asn Pro Gly Val Val Asp Ser Gly Asn Gly
 225 230 235 240
 Leu Lys Tyr Thr Asn Leu Phe Asp Ala Gln Val Asp Ala Val Tyr Ala
 245 250 255
 Ala Ile Lys Ala Leu Lys Tyr Asp Asp Val Asp Ile Val Val Thr Glu
 260 265 270
 Thr Gly Trp Pro Ser Asn Gly Asp Lys Glu Glu Ile Gly Ala Asn Pro
 275 280 285
 Glu Asn Ala Gln Ala Tyr Asn Gly Asn Leu Val Lys Arg Val Leu Thr
 290 295 300
 Gly Gly Gly Thr Pro Leu Lys Ser Glu Thr Lys Leu Val Val Tyr Leu
 305 310 315 320
 Phe Ala Leu Tyr Asn Glu Asn Lys Lys Phe Gly Pro Thr Ser Glu Arg
 325 330 335

pctca2017050779-seql.txt

Asn Tyr Gly Leu Phe Tyr Pro Ser Glu Glu Lys Val Tyr Glu Ile Pro
340 345 350

Phe Thr Leu Glu Gln Val Lys Thr Trp Lys Leu Lys Pro Ala Ser Asp
355 360 365

Arg Lys Ala Gln Ser Gln Ala Pro Ala Lys Pro Val Tyr Ser Gly Glu
370 375 380

Ser Ala Gly Ser Asn Gly Thr Ser Gly Val Ser Asn Ser Ser Ser Ala
385 390 395 400

Lys Gly Pro Phe Cys Val Ala Asn Val Lys Ser Gly Lys Glu Arg Leu
405 410 415

Gln Lys Ala Leu Asp Tyr Ala Cys Gly Ala Glu Gly Gly Ala Asp Cys
420 425 430

Arg Ser Ile Gln Pro Gly Ala Ala Cys Tyr Asp Pro Asn Thr Leu Gly
435 440 445

Ala His Ala Thr Ile Ala Phe Asp Ser Tyr Tyr Gln Asn Lys Gly Arg
450 455 460

Ala Asn Ser Ala Cys Tyr Phe Gly Gly Ala Ala Tyr Val Val Thr Val
465 470 475 480

Pro Pro Lys Leu Gly Lys Cys Asp Leu Thr Met Asp Ser Glu Glu Asp
485 490 495

Asn Gly Thr Lys Gly Ala Gly Lys Leu Phe Val Gln Thr Asn Asn Lys
500 505 510

Glu Asn Ala Glu Ala Val Glu Val Ser Leu Ser Ser Pro Arg Leu Val
515 520 525

Thr Leu Leu Gly Ser Gly Thr Phe Asp Ile Ser Trp Val Leu Leu Val
530 535 540

Leu Met Tyr Leu Ser Phe
545 550

<210> 561
<211> 130
<212> PRT
<213> Papaver somniferum

<400> 561

pctca2017050779-seql.txt

Asp Ser Leu Val Leu Val Tyr Leu Ser Tyr Cys Phe Leu Asn Phe Val
1 5 10 15

Pro Gln Glu Leu Met Gly Leu Leu Phe Asn Gly Lys Met Glu Ser Ile
20 25 30

Leu Arg Lys Ile Asn Pro Trp Pro Trp Leu Pro Arg Pro Asn Pro Phe
35 40 45

Ser Glu His Val Pro Glu Phe Leu Gly Arg Arg Ile Ser Asn Leu Gly
50 55 60

Leu Ser Ile Val Leu Tyr Ser Tyr Pro Lys Ser Ser Thr Leu Glu Phe
65 70 75 80

Phe Tyr Phe Leu Pro Ser Arg Lys Asn Leu Thr Glu Thr Leu Lys Ile
85 90 95

Ser Gly Lys Ile Val Lys Ser Pro Leu Ser Thr Ile Val Ser Tyr Pro
100 105 110

Arg Pro Ser Leu Phe Leu Gly Asn Gln Ser His His Lys Ile Lys Lys
115 120 125

Gln Arg
130

<210> 562
<211> 119
<212> PRT
<213> Papaver somniferum

<400> 562

Met Lys Thr Leu Met Gln Phe Met Asn Leu Arg Thr His Leu Lys Leu
1 5 10 15

Gly Lys Tyr Lys Gly Asn Leu Ile Leu Ser Thr Arg Leu Leu Ser Asp
20 25 30

Phe Asp Leu Ser Ser Gly Asn Ile Phe Ser Ala Thr Lys Lys Met Ala
35 40 45

Thr Ser Lys Ser Ile Leu Glu Ile Ala Leu Arg Thr Leu Tyr Leu Leu
50 55 60

Ile Cys Val Phe Gln Lys Ile Phe His Glu Leu Leu Thr Leu Cys Gln
65 70 75 80

pctca2017050779-seql.txt

Phe Leu His Leu Cys Arg Ile Tyr Gln Val Glu Ile Gly Leu Ile Asn
85 90 95

Leu Pro Glu Asn Val Val Gly Ser Leu Tyr Phe Phe Phe Leu Phe Tyr
100 105 110

Ile Ile His Val Phe Ser Phe
115

<210> 563
<211> 262
<212> PRT
<213> Papaver somniferum

<400> 563

Met Ile Trp Asn Pro Phe Thr Lys Asp Tyr Arg Lys Leu Ser Thr Pro
1 5 10 15

Pro Lys Pro Asp Leu Asp Pro Ser Tyr Val Tyr Asp Phe Tyr Ser Tyr
20 25 30

Ser Lys Tyr Gly Phe Gly Tyr Asp Ser Lys Thr Asp Asp Tyr Lys Phe
35 40 45

Ala Arg Met Val Lys Cys Pro Gly Ser Ser Thr Glu Ile Ser Val Tyr
50 55 60

Ser Leu Lys Leu Asn Leu Trp Lys Thr Tyr Arg Asp Ile Pro Phe Leu
65 70 75 80

Leu Pro Phe Asn Gly Gly Leu Val Leu Phe Gln Gly Ile Phe His Trp
85 90 95

Val Gly Asp Arg Ser Arg Asn Ile Glu Ile Ser Arg Asp Phe Pro Arg
100 105 110

Gly Phe Lys Leu Pro Lys Ile Ile Gly Cys Leu Asp Thr Gly Ser Glu
115 120 125

Thr Phe Lys Glu Ile Pro Leu Pro Gln His Phe Ala Glu Leu Phe Gly
130 135 140

Ile Phe Val Cys Val Leu Gly Gly Phe Leu Tyr Ile Ile Gly Phe Arg
145 150 155 160

Tyr Val Asn Ile Gly Ser Glu Ala Trp Met Met Lys Asp Tyr Gly Val
165 170 175

pctca2017050779-seql.txt

His Glu Ser Trp Thr Lys Met Phe Asn Ile Arg Glu Thr Ser Ser Asn
180 185 190

Leu Val Gly Ala Gly Cys Leu Asn Leu Lys His Tyr Phe Lys Ser Gly
195 200 205

Val Ile Leu Val Gln Val Asp Asn Gly Arg Cys Leu Leu Phe Asp Leu
210 215 220

Lys Asn Lys Lys Leu Thr Lys Leu Glu Ile Ser Asp His Thr Leu Phe
225 230 235 240

Tyr Thr Trp Ala Phe Leu Gly Ser Leu Val Ser Pro Asn Asn Leu Asp
245 250 255

Thr Cys Leu Gly Met Gln
260

<210> 564
<211> 432
<212> PRT
<213> Papaver somniferum

<400> 564

Met Ser Asp Leu Asp Leu Ser Thr Asp Ser Glu Asp Glu Ala Phe Asp
1 5 10 15

Thr Glu Glu Glu Ser Ser Asp Asp Glu Glu Val Ser Ser Asn Asn Glu
20 25 30

Phe Glu Leu Ser Ile Phe Leu Asn Ile Leu Ser Ala Val His Ser Trp
35 40 45

Leu Met Asp Ile Ile Lys Gln Leu Gln Tyr Ile Gln Ser Gln Arg Ile
50 55 60

Glu Arg Pro Met Arg Arg Pro Val Thr Leu Phe Gly Tyr Asn Tyr Ile
65 70 75 80

Arg Arg Val Leu Arg Gln Asp Pro Glu Asp Phe Arg Arg Ser Tyr Arg
85 90 95

Met Tyr Pro Asp Ile Phe Leu Lys Leu Cys Cys Ile Ile Arg Glu Ser
100 105 110

Thr Ser Leu Cys Asp Thr Arg Cys Val Ser Ile Glu Glu Met Leu Gly
115 120 125

pctca2017050779-seql.txt

Thr Phe Leu Leu Val Val Gly Gln Ser Ser Arg Tyr Cys Thr Ile Arg
 130 135 140
 Asp Thr Phe Gly Arg Ser Arg Trp Thr Val Ser Lys Asn Phe Asn Arg
 145 150 155 160
 Met Leu Arg Ala Leu Asn Ser Ile Ala Pro Arg Met Met Ala Lys Pro
 165 170 175
 Thr Ser Ala Thr Pro Phe Lys Ile Arg Glu Ser Thr Arg Phe Tyr Pro
 180 185 190
 Tyr Phe Lys Asp Cys Ile Gly Ala Met Asp Gly Thr His Ile Pro Ala
 195 200 205
 Met Val Glu Lys Arg Asn Ala Ala Val Tyr Arg Asn Arg His Gly Ile
 210 215 220
 Thr Ser Gln Asn Val Leu Ala Val Cys Asn Phe Asp Leu Glu Phe Ile
 225 230 235 240
 Tyr Val Leu Ser Gly Trp Glu Gly Ser Ala His Asp Ser Lys Ile Leu
 245 250 255
 Asn Asp Ala Met Thr Lys Arg Asn Gly Met Lys Ile Pro Gln Gly Lys
 260 265 270
 Tyr Tyr Leu Gly Asp Gly Gly Phe Ala Asn Arg Arg Tyr Cys Leu Thr
 275 280 285
 Pro Phe Arg Gly Gln Arg Tyr His Leu Lys Glu Phe Ser Gly Thr Gly
 290 295 300
 Asn His Ala Lys Lys Ala Glu Glu Leu Phe Asn Met Arg His Ala Ser
 305 310 315 320
 Leu Arg Asn Val Val Glu Arg Leu Phe Gly Val Val Lys Ser Arg Phe
 325 330 335
 Leu Ile Phe Lys Ser Gln Pro Pro Phe Pro Tyr Gln Val Gln Ala Glu
 340 345 350
 Ile Met Thr Ala Cys Ala Gly Leu His Asn Phe Leu Arg Lys Glu Cys
 355 360 365
 Arg Ser Asp Glu Phe Pro Val Glu Glu Glu Glu Asn Ser His Pro Ser
 370 375 380

pctca2017050779-seql.txt

Thr Leu Val Asn Asp Asp Glu Ile Leu Thr Gln Gln Thr Gln Glu Gln
385 390 395 400

Gln Arg Gln Glu Ala Asn Ala Trp Arg Lys Ser Ile Ala Asp Asp Met
405 410 415

Trp Glu Asn Val Arg Glu Gln Arg Glu Leu Glu Leu Tyr Gly Asp Arg
420 425 430

<210> 565
<211> 127
<212> PRT
<213> Papaver somniferum

<400> 565

His Val Leu Tyr Lys Tyr Gly Phe Gly Tyr Asp Leu Lys Thr Glu Asp
1 5 10 15

Tyr Lys Val Ala Arg Ile Ala Asn Ile Arg Asp Lys Tyr Ser Glu Ile
20 25 30

Ala Val Tyr Ser Leu Lys Leu Asn Leu Trp Lys Met Tyr Gly Asp Ile
35 40 45

Pro Val Arg Ser Pro Tyr Glu Asp Leu Val Leu Phe Glu Gly Ile Phe
50 55 60

His Trp Val Glu Leu Pro Pro Ser Gly Ser Gln Arg Pro Arg Met Ile
65 70 75 80

Phe Ser Phe Asp Thr Gly Ser Gln Ile Leu Asn Arg Ile Pro Leu Pro
85 90 95

Gln His Phe Ser Asp Lys Phe Asn Met Ile His Val Arg Leu Leu Gly
100 105 110

Gly Cys Leu Tyr Leu Ile Gly Ser Leu Tyr Met Thr Cys Ser Glu
115 120 125

<210> 566
<211> 580
<212> PRT
<213> Papaver somniferum

<400> 566

Met Glu Lys Gln Lys Ser Phe Arg Arg Gly Met Glu Lys Gln Lys Ser
1 5 10 15

pctca2017050779-seql.txt

Phe Arg Gly Ala Met Glu Lys Gln Ser Ser Phe Arg Gly Val Met Glu
 20 25 30
 Lys Gln Ser Ser Phe Arg Gly Val Met Glu Arg Gln Lys Ser Ile Arg
 35 40 45
 Glu Ala Leu Glu Lys Gln Leu Ser Phe Arg Asp Lys Lys Lys Val Lys
 50 55 60
 Glu Ser Pro Gly Lys Arg Gly Asp Thr Pro Leu His Leu Ala Cys Arg
 65 70 75 80
 Gly Gly Asn Leu Ile Lys Val Lys Glu Ile Leu Gln Asp Cys Asp Ser
 85 90 95
 Leu Lys Asp Val Leu Thr Lys Gln Asn Lys Asp Gly Glu Thr Ala Leu
 100 105 110
 Tyr Ala Ala Ser Glu Tyr Gly Asn Ala Val Ile Val Ser Glu Leu Leu
 115 120 125
 Lys His Met Asp Ser Glu Ser Ala Ser Ile Pro Ala Lys Asn Gly Tyr
 130 135 140
 Asp Ser Phe His Val Ala Ala Lys Gln Gly His Leu Glu Val Leu Lys
 145 150 155 160
 Glu Leu Leu Arg Ser Leu Pro Asp Leu Ala Leu Thr Thr Asp Ser Ser
 165 170 175
 Asn Ser Thr Ala Leu His Thr Ala Ala Met Gln Gly His Ile Asp Val
 180 185 190
 Val Asn Leu Leu Leu Glu Thr Asn Val Asp Leu Ala Lys Ile Ala Arg
 195 200 205
 Ser Asn Gly Lys Thr Val Leu His Ser Ala Ala Arg Met Gly His Leu
 210 215 220
 Glu Val Val Lys Ser Ile Leu Arg Lys Asp Pro Gly Val Gly Phe Arg
 225 230 235 240
 Lys Asp Asn Lys Gly Gln Ala Ala Leu His Met Ala Val Lys Gly His
 245 250 255
 Asn Val Glu Ile Val Leu Glu Met Val Lys Pro Asp Lys Ser Val Ile
 260 265 270

pctca2017050779-seql.txt

Asn Leu Glu Asp Lys Asn Gly Asn Thr Ala Leu His Ile Ala Thr Lys
 275 280 285
 Lys Gly Arg Thr Gln Val Met Arg Gly Leu Leu Ser Val Glu Gly Ile
 290 295 300
 Ser Ile Asn Ala Ile Asn Lys Ala Gly Glu Thr Ala Leu Asp Ile Ala
 305 310 315 320
 Ala Lys Ser Glu Asn Pro Glu Ile Ala Ser Ile Leu Lys Glu Val Gly
 325 330 335
 Ala Thr Ser Ala Lys Asp Ser Ala Asn Pro Pro Asn Pro Ala Lys Gln
 340 345 350
 Leu Lys Gln Thr Val Ser Asp Ile Lys His Asp Val Glu Ser Gln Leu
 355 360 365
 His Gln Thr Arg Gln Thr Gly Val Arg Val Gln Lys Ile Ala Lys Arg
 370 375 380
 Leu Lys Lys Leu His Ile Ser Gly Leu Asn Asn Ala Ile Asn Ser Ala
 385 390 395 400
 Thr Val Val Ala Val Leu Ile Ala Thr Ile Ala Phe Ala Ala Ile Phe
 405 410 415
 Thr Val Pro Gly Gln Tyr Val Glu Val Lys Ser Asp Gly Phe Thr Leu
 420 425 430
 Gly Gln Ala Tyr Ile Ala Lys Asn Ala Ala Phe Ile Ile Phe Phe Val
 435 440 445
 Phe Asp Ser Leu Ala Leu Phe Ile Ser Leu Ala Val Val Val Val Gln
 450 455 460
 Thr Ser Val Val Val Ile Glu Gln Lys Ala Lys Lys Gln Leu Met Phe
 465 470 475 480
 Val Ile Asn Lys Leu Met Trp Leu Ala Cys Leu Phe Ile Ser Ile Ser
 485 490 495
 Phe Ile Ser Leu Ser Tyr Ile Val Val Gly Arg His Ala Arg Trp Leu
 500 505 510
 Ala Ile Tyr Val Thr Val Ile Gly Ala Leu Ile Met Leu Thr Thr Leu

515

Gly Ala Met Cys Tyr Cys Val Val Met His Arg Met Glu Glu Ser Ser
530 535 540

Met Arg Asn Ile Arg Arg Ala Ser Gly Ser His Ser Arg Ser Phe Ser
545 550 555 560

Val Ser Gly Ile Ser Asp Thr Glu Ile Leu Asn Asn Glu Tyr Lys Arg
565 570 575

Met Tyr Ala Val
580

<210> 567
<211> 275
<212> PRT
<213> Papaver somniferum
<400> 567

Met Gly Gly Trp Gln Arg His Ile Gln Ser Ile Ile Arg His Ala Gly
1 5 10 15

Lys Arg Leu Glu Gln Cys Cys Ser Pro Pro Leu Ser Leu Pro Ser Ala
20 25 30

Arg Ile Asn Ala Ser Phe Thr Leu Gly Gln Phe Cys Tyr Leu His Arg
35 40 45

Thr Ser Asn Thr Ser Pro Thr Asn Ile Leu Arg Pro Leu His Gln Tyr
50 55 60

Leu Lys Gln Ser Gly Ile Ser Ser Ser Arg Lys Leu Leu Ser Glu Ala
65 70 75 80

Ser Ser Asp Gln Thr Pro Val Ala Asn Pro Leu Ser Ser Pro Val Leu
85 90 95

Gln Ile Gly Asp Gly Thr Thr Glu Thr Gln Ala Val Val Pro Lys Arg
100 105 110

Ala Ser Val Gln Ala Val Leu Lys Asp Ile Lys Gln Ser Pro Lys Lys
115 120 125

Val Asn Leu Val Ala Ala Leu Val Arg Gly Met Arg Val Glu Asp Ala
130 135 140

Leu Leu Gln Leu Gln Leu Thr Val Lys Arg Ala Ser Lys Thr Val Tyr

Ile Gln Ala Tyr Val Phe Asp Val Ile Arg Ala Ser Val Pro Lys Leu
 100 105 110

Ile Leu Asp Asp Val Phe Glu Gln Lys Asn Asp Ile Ala Arg Ala Val
 115 120 125

Glu Glu Glu Leu Glu Lys Ala Met Ser Ala Tyr Gly Tyr Glu Ile Val
 130 135 140

Gln Thr Leu Ile Val Asp Ile Glu Pro Asp Val Asn Val Lys Arg Ala
 145 150 155 160

Met Asn Glu Ile Asn Ala Ala Ala Arg Leu Arg Leu Ala Ala Thr Asp
 165 170 175

Lys Ala Glu Ala Glu Lys Ile Leu Gln Ile Lys Arg Ala Glu Gly Glu
 180 185 190

Ala Glu Ser Lys Tyr Leu Ala Gly Leu Gly Ile Ala Arg Gln Arg Gln
 195 200 205

Ala Ile Val Asp Gly Leu Arg Asp Ser Val Val Gly Phe Ser Thr Asn
 210 215 220

Val Pro Gly Thr Ser Ala Lys Asp Val Met Asp Met Val Leu Val Thr
 225 230 235 240

Gln Tyr Phe Asp Thr Met Lys Glu Ile Gly Ala Asn Ser Lys Thr Ser
 245 250 255

Ala Val Phe Ile Pro His Gly Pro Gly Ala Val Arg Asp Val Val Thr
 260 265 270

Gln Ile Arg Asp Gly Leu Leu Gln Gly Ser Ser Ala His Met Thr
 275 280 285

<210> 569

<211> 616

<212> PRT

<213> Papaver somniferum

<400> 569

Ser Lys Thr Glu Ser Tyr Cys Leu Lys Trp Ile Cys Asn Lys Lys Ser
 1 5 10 15

Glu Phe Pro Ser Asn Phe Ile Leu Phe Phe Leu Ser Cys Cys Cys Leu

20

Leu Val Tyr Tyr Thr Leu Leu Leu Leu Leu Leu Pro Leu Asn Pro
35 40 45

His Ser Ser Pro Pro Ser Pro Pro Pro Pro Pro Pro Pro Asn Ser Ser
50 55 60

Gln Thr Gly Phe Tyr Thr Met Glu Asp Ala Gln Ser Val Ala Thr Leu
65 70 75 80

Ile Asp Ser Thr Thr Thr Lys Ile Gln Gln Leu Gln Gln Ala Phe Ala
85 90 95

Glu Leu Glu Asn His Arg Ala Val Ser Leu Asn Leu Lys Trp Lys Glu
100 105 110

Leu Glu Ala His Phe His Gly Leu Glu Arg Ser Leu Lys Arg Arg Phe
115 120 125

Asp Asp Leu Gly Asp Gln Glu Lys Glu Phe Lys Asn Lys Ala Ser Glu
130 135 140

Ala Arg Glu Leu Leu Glu Lys Lys Lys Ala Ala Val Lys Ala Lys Glu
145 150 155 160

His Ala Ser Leu Glu Lys Leu Gln Gln Lys Arg Asp Ala Ala Leu Phe
165 170 175

Val Ile Gly Asp Ala Phe Lys Lys Tyr Lys Thr Ser Ser Val Lys Pro
180 185 190

Val Val Val Lys Val Glu Asp Ser Cys Glu Ser Asp Leu Thr Val Glu
195 200 205

Glu Lys Pro Pro Asp Met Lys Val Ala Ser Val Asp Pro Asp Glu Val
210 215 220

Asn Lys Ile Ser Asp Asn Glu Thr Met Asp Val Lys Pro Arg Pro Glu
225 230 235 240

Leu Ala Lys Leu Cys Glu Glu Met Asp Ser Lys Gly Leu His Lys Tyr
245 250 255

Ile Ser Asp Asn Arg Lys Asn Leu Ala Thr Ile Arg Glu Glu Ile Pro
260 265 270

pctca2017050779-seql.txt

Phe Ala Leu Met Ile Ser Ala Asp Pro Ala Arg Leu Val Leu Asp Ser
 275 280 285
 Leu Glu Asp Phe Tyr Arg Ile Glu Ala Pro Thr Ser Asp Gly Lys Arg
 290 295 300
 Asp Ser Gly Leu Leu Gly Leu Arg Arg Thr Cys Ile Met Leu Met Glu
 305 310 315 320
 Cys Leu Ala Gln Ser Leu Ala Asp Thr Gly Arg Val Cys Phe Ser Asp
 325 330 335
 Val Ile Asn His Asp Ile Lys Glu His Ala Lys Ala Ile Ala Glu Glu
 340 345 350
 Trp Lys Pro Lys Leu Asp Asp Leu Asp Val Asp Ala Ser Ser Gly Asn
 355 360 365
 Ser Leu Glu Ala His Ala Phe Leu Gln Leu Leu Ala Thr Phe Asp Ile
 370 375 380
 Ala Gly Asp Phe Asp Glu Glu Glu Ile Leu Lys Leu Ile Pro Thr Val
 385 390 395 400
 Ser Arg Arg Arg Gln Thr Ala Asp Leu Cys Arg Leu Leu Gly Leu Ser
 405 410 415
 His Lys Met Pro Gly Val Ile Glu Val Leu Val Asn Thr Gly Arg Gln
 420 425 430
 Ile Asp Ala Val Asn Leu Ala Tyr Ala Phe Glu Leu Thr Glu Gln Phe
 435 440 445
 Ser Pro Val Val Leu Leu Lys Ser His Leu Lys Glu Ala Arg Lys Ala
 450 455 460
 Ser Ser Pro Thr Lys Pro Gly Asn Ala Ser Pro Thr Ala Glu Asn Glu
 465 470 475 480
 Val Asn Asp Arg Glu Leu Thr Ser Leu Lys Ala Val Val Lys Cys Ile
 485 490 495
 Glu Glu His Lys Leu Glu Gly Gln Tyr Pro Val Asp Pro Leu Gln Lys
 500 505 510
 Arg Ile Ser Gln Leu Glu Lys Ala Lys Ala Asp Lys Lys Arg Val Ala
 515 520 525

pctca2017050779-seql.txt

Glu Ala Ala Lys Pro Gln Pro Lys Arg Pro Arg Ala Asn Gly Gly Gly
530 535 540

Phe Ala Pro Arg Val Ser Asn Ile Asn Asp Lys Ser Phe Tyr Ala Thr
545 550 555 560

Val Pro Asp Arg Tyr Pro Pro Tyr Asn Tyr Glu Asn Met His Tyr Val
565 570 575

Tyr Pro Gly His Thr Asn Asn His Pro Thr Pro Val Leu Gly Ala Ala
580 585 590

Ala Tyr Asn Ile Pro Pro Asn His Gly Ser Tyr Phe Gly Asn Gly Tyr
595 600 605

Ala Tyr Gln Ala Pro Tyr Leu His
610 615

<210> 570

<211> 404

<212> PRT

<213> Papaver somniferum

<400> 570

Met Val Asn Ile Ile Ile Leu Phe Ser Leu Lys Leu Val Val Ile Phe
1 5 10 15

His Ile Ile Phe Pro Leu Ser Ala Thr Ala Val Thr Tyr Asn Val Leu
20 25 30

Asn Phe Gly Ala Glu Pro Asp Lys Gly Thr Asp Ser Thr Glu Ala Phe
35 40 45

Leu Gln Ala Trp Ser Leu Ala Cys Ser Ser Ile Ala Pro Ala Met Met
50 55 60

Phe Ile Pro Arg Gly Thr Tyr Leu Val Asn Thr Ile Val Phe Ser Gly
65 70 75 80

Pro Cys Lys Ser Ala Arg Val Thr Val Arg Ile Asp Gly Lys Ile Gln
85 90 95

Ala Pro Pro Ser Ser Tyr Trp Glu Ile Gly Asn Tyr Gly Thr Trp Ile
100 105 110

Leu Phe Gln Gly Ile Asn Gly Leu Thr Ile Asn Gly Gly Ile Leu Asp
115 120 125

pctca2017050779-seql.txt

Ala Arg Gly Ser Pro Phe Trp Ile Cys Arg Arg Ala Ser Ala Tyr Cys
130 135 140

Pro Gln Gly Ala Thr Ser Leu Ser Phe Asn Asn Val Lys Asn Gly Ile
145 150 155 160

Val Ser Gly Ile Val Ser Phe Asp Ser Gln Lys Ala His Met Ala Ile
165 170 175

Asn Gly Cys Lys Ser Met Lys Ile Arg Lys Val Thr Leu Ile Ala Pro
180 185 190

Ala Gln Ser Pro Asn Thr Asp Gly Ile Asp Ile Gln Ser Ser Thr Gly
195 200 205

Ile Lys Ile Leu Asp Ser Ser Ile Arg Thr Gly Asp Asp Cys Ile Ala
210 215 220

Ile Gly Pro Gly Thr Lys Ser Leu Leu Val Gln Arg Val Val Cys Gly
225 230 235 240

Pro Gly His Gly Ile Ser Ile Gly Ser Leu Ala Arg Ser Pro Asn Glu
245 250 255

Ala Gly Val Glu Gly Ile Lys Val Lys Asp Val Thr Phe Thr Gly Ser
260 265 270

Asp Asn Gly Leu Arg Ile Lys Thr Trp Pro Lys Pro Ser Asp Ser Phe
275 280 285

Val Lys Asn Val Leu Tyr Gln Asn Ile Ile Met Asn Asn Val Arg Asn
290 295 300

Pro Ile Ile Ile Asp Gln Ile Tyr Cys Pro Gly Thr Asn Gly Cys Ser
305 310 315 320

Asp Gln Asn Ser Gly Leu Lys Ile Ser Gly Val Thr Tyr Leu Asn Val
325 330 335

Ser Gly Thr Ser Ala Thr Pro Ile Ala Ile Ser Phe His Cys Ser Ala
340 345 350

Thr Thr Pro Cys Asp Gly Ile Lys Leu Ser Asn Val Asn Leu Thr Tyr
355 360 365

Ser Lys Gln Pro Ala Lys Ser Phe Cys Phe Ser Ala Leu Gly Thr Ser
370 375 380

pctca2017050779-seql.txt

Ser Ala Gly Gln Leu Gly Thr Ser Leu Ser Val Gly Arg Pro Thr Pro
385 390 395 400

Gly Ser Cys Phe

<210> 571
<211> 208
<212> PRT
<213> Papaver somniferum

<400> 571

Met Met Glu Glu Val Ile Met Met Ser Met Ile Ser Pro Ser Ala Ser
1 5 10 15

Asn Ser Thr Ser Pro Pro Gly Gly Gly Gly Gly Gly Ala Lys Glu
20 25 30

Gln Gln Ala Ala Gly Val Gly Ile Leu Leu Gln Ile Met Met Leu Val
35 40 45

Leu Ser Phe Val Leu Gly His Leu Leu Arg Arg His Lys Phe Tyr Phe
50 55 60

Val Pro Glu Ala Ser Ala Ser Leu Leu Ile Gly Leu Ile Val Gly Gly
65 70 75 80

Leu Ala Asn Val Ser Asn Thr Glu Ala Ser Ile Arg Pro Trp Phe Asn
85 90 95

Phe His Glu Glu Phe Phe Phe Leu Phe Leu Leu Pro Pro Ile Ile Phe
100 105 110

Gln Ser Gly Phe Ser Leu Ala Pro Lys Pro Phe Phe Ser Asn Phe Gly
115 120 125

Ala Ile Val Thr Phe Ala Ile Leu Gly Thr Phe Ile Ser Ser Ile Val
130 135 140

Thr Gly Val Leu Val Tyr Leu Gly Gly Val Leu Leu Leu Met Tyr Lys
145 150 155 160

Leu Pro Phe Val Glu Cys Leu Met Phe Gly Ala Leu Ile Ser Ala Thr
165 170 175

Asp Pro Val Thr Val Leu Ser Ile Phe Gln Glu Leu Gly Thr Asp Met
180 185 190

pctca2017050779-seql.txt

Asn Leu Tyr Ala Leu Val Phe Gly Glu Ser Val Leu Asn Asp Ala Val
195 200 205

<210> 572
<211> 144
<212> PRT
<213> Papaver somniferum

<400> 572

Met Arg Asn Thr Pro Ala Asp Gly Pro Val Ser Thr Asn Glu Pro Leu
1 5 10 15

Glu Trp Asp Met Lys Asp Leu Pro Ile Asp Glu Leu Ile Asp Glu Asp
20 25 30

Val Ser Ser Asp Ser Thr Thr Lys Glu Asp Gln Met His Thr Glu Pro
35 40 45

Gly Lys Ile Phe Val Gly Gly Met Ser Trp Asp Thr Asp Glu Ala Thr
50 55 60

Leu Lys Asp His Phe Asn Lys Phe Gly Glu Val Val Glu Thr Asn Ile
65 70 75 80

Leu Ile Asp Arg Thr Thr Gly Cys Ser Arg Gly Phe Gly Phe Val Arg
85 90 95

Phe Ser Asp Lys Ser Val Ala Asp Lys Val Leu Leu Glu Lys His Val
100 105 110

Ile Leu Gly Lys Lys Val Asp Val Gly Lys Val Val Leu Lys His Asn
115 120 125

Asn Pro Tyr Asp Arg Lys Gly Phe Asn Lys Ser Asn Gly Asn Asn Gly
130 135 140

<210> 573
<211> 137
<212> PRT
<213> Papaver somniferum

<400> 573

Thr Arg Lys Val Arg Ser Leu Arg Asp Ile Tyr Asn Val Ser Asn Cys
1 5 10 15

Ala Phe Ile Ala Leu Glu Pro Gln Lys Tyr Glu Glu Ala Ala Lys Glu
20 25 30

pctca2017050779-seql.txt

Glu Lys Trp Arg Asn Ala Met Asp Glu Glu Met Arg Val Ile Glu Lys
35 40 45

Asn Lys Thr Trp Glu Leu Val Asn Gln Pro Val Asp Lys Glu Ile Ile
50 55 60

Gly Leu Lys Trp Val Tyr Lys Ile Lys Tyr Asn Glu Asp Gly Ser Ile
65 70 75 80

Gln Lys His Lys Ala Arg Leu Val Ala Lys Gly Tyr Ser Gln Gln Pro
85 90 95

Gly Ile Asp Tyr Asn Glu Thr Phe Ala Pro Val Ala Arg Met Glu Thr
100 105 110

Ile Arg Met Val Leu Ala Leu Ala Ala Gln Leu Lys Met Lys Val Tyr
115 120 125

Gln Leu Asp Val Lys Ser Ala Phe Leu
130 135

<210> 574
<211> 366
<212> PRT
<213> Papaver somniferum

<400> 574

Met Val Asp Met Leu Lys Lys Lys Ala Phe His Arg Trp Ile Ser Glu
1 5 10 15

Lys Asp Leu Arg Val Asp Gly Arg Arg Leu Asp Asn Val Arg Arg Leu
20 25 30

Lys Cys Glu Tyr Ser Lys Val Ser Glu Leu Glu Gly Ser Ser Gln Phe
35 40 45

Ala Cys Gly Leu Thr Gln Val Thr Cys Thr Val Thr Gln Arg Arg Pro
50 55 60

Thr Lys Asp Glu Ala Lys Asn Met Gly Gly Asn His Pro Leu Leu Arg
65 70 75 80

Phe Pro Arg Phe Leu Tyr Asn Ser Pro Pro Phe Arg Val Asp Gly Asn
85 90 95

Trp Lys Leu Gly Asp Cys Asn Ser Tyr Asp Ala Arg Asp Gly Asp Phe
100 105 110

pctca2017050779-seql.txt

Val Glu Lys Ala Leu Val Val Leu Leu Pro Val Glu Tyr Asn Phe Pro
115 120 125

Tyr Val Val Cys Val Asp Ser Glu Ala Ile His Ser Asp Gly Ser Val
130 135 140

Ser Thr Ala Thr Ile Cys Gly Gly Ser Val Ala Leu Met Ala Ser Gly
145 150 155 160

Val Pro Leu Lys Lys His Val Ala Gly Val Ser Val Gly Thr Val Ser
165 170 175

Glu Val Tyr Pro Thr Asp Gly Lys Met Asn Asn Tyr Arg Ile Leu Thr
180 185 190

Asp Leu Ser Ser Leu Glu Glu His Leu Val Asp Met Asn Phe Lys Val
195 200 205

Ala Gly Ser Arg Asp Gly Ile Thr Ala Ile Arg Leu Asp Leu Asn Val
210 215 220

Ala Gly Val Pro Leu Gly Ile Ile Cys Gly Cys Leu Gly Pro Ala Leu
225 230 235 240

Lys Gly Cys Leu Glu Val Leu Asp Thr Met Asp Gln Lys Ile Ser Asn
245 250 255

Pro Ile Tyr Cys Thr Ser Asp Asp Trp Gly Trp Ser Asp Ala Thr Val
260 265 270

Val Ala Tyr Arg Leu Pro Thr Lys Ser Ile Glu Arg Leu Thr Val Ser
275 280 285

Asn Gly Ala Trp Gln Arg Asp Phe Glu Arg Lys Thr Gly Thr Arg Ile
290 295 300

Ser Leu Thr Lys Asn Gly Ala Val Thr Ile Ala Ala Lys Asn Glu Thr
305 310 315 320

Ser His Leu Leu Ala Arg Gln Lys Val Glu Asn Ile Ile Ala His Glu
325 330 335

Val Glu Phe Gly Arg Leu His Glu Asp Glu Ala Thr Leu Met Lys Ser
340 345 350

Tyr Val Glu Ile Ser Ala Glu Gln Val Glu Arg Ala Tyr Met
355 360 365

pctca2017050779-seql.txt

<210> 575
 <211> 113
 <212> PRT
 <213> Papaver somniferum

<400> 575

Met Ile Thr Gly Ser Ile Ala Pro Ser Ser Leu His Gly Leu Gly Cys
 1 5 10 15

Ser Leu Leu Gly Val Thr Asn Pro Ile Ser Phe Asp Pro Leu Asp Ser
 20 25 30

Val Ile Thr Met Met Leu Pro Ser Arg Val Ser Ala Arg Pro Thr Gln
 35 40 45

Ala Leu Phe Met His Arg Leu Ile Phe Asn Pro Leu Ser Leu Thr Glu
 50 55 60

Arg Tyr His Tyr His His His Gln Gln Phe Leu Gln Asn Thr Tyr Leu
 65 70 75 80

Ala Pro Pro Ile Val Pro Asp Phe Leu Ile Asp Lys Asn Ser Asn Ile
 85 90 95

Val Gly Ser Phe Met Leu Phe His Ile Pro Ser Thr Ser Arg Thr Ile
 100 105 110

Ser

<210> 576
 <211> 116
 <212> PRT
 <213> Papaver somniferum

<400> 576

Met Ala Tyr Glu Met Thr Glu Lys Phe Glu Glu Tyr Trp Phe Val Ile
 1 5 10 15

Asn Gly Val Met Ala Val Glu Ile Met Leu Asp Pro Arg Phe Lys Met
 20 25 30

Lys Leu Ile Glu Phe Tyr Phe Pro Gln Leu Tyr Gly Gln Ala Phe Pro
 35 40 45

Lys Ile Lys Ile Asp Arg Val Arg Asn Leu Cys Val Asp Met Ala Thr
 50 55 60

pctca2017050779-seql.txt

Glu Tyr Glu Leu Lys Val Lys Phe Ala Glu Thr Ser Val Ser Gln Asn
65 70 75 80

Asp Leu Ser Phe Thr Ser Glu Met His Gly Phe Asn Asp Asp Val Asp
85 90 95

Pro Leu Glu Lys Phe Asp Met Phe Val Phe Ser Thr Ala Pro Thr Ser
100 105 110

Thr Val Lys Ser
115

<210> 577
<211> 386
<212> PRT
<213> Papaver somniferum

<400> 577

Met Trp Lys Arg Ser Ala Ser Phe Ile Leu Asp Gln Arg His Glu Asn
1 5 10 15

Asn Lys Pro Pro Leu Asp Pro Ser Ser Ser Ser Asn Gln Met Ala Ala
20 25 30

Glu Lys Asn Ser Lys Ile Ser Ala Tyr Tyr Gln Thr Arg Ser Ala His
35 40 45

His Ala Val Val Thr Ser Asp Trp Leu Ala Gln Ser Gln Glu Ala Ala
50 55 60

Ile Glu Phe Asp Pro Ser Thr Asn Asp Tyr Leu Lys Ser Ser Thr Gly
65 70 75 80

Asn Ser Gly Glu Lys Pro Phe Ser Val Ile Asp Glu Phe Asn His Trp
85 90 95

Arg Gln Leu Pro Glu Leu Ala Glu Ala Val Ala Ala Ile Leu Ala Leu
100 105 110

Ala Ser Val Ile Arg Phe Ser Lys Ala Ser Thr Ile Met Glu Leu Glu
115 120 125

Arg Glu Leu Lys Thr Ala Ser Asp Ser Leu Lys Ser Trp Asp Thr Thr
130 135 140

Ser Ile Ser Leu Thr Ala Gly Cys Asp Leu Phe Met Arg Tyr Val Thr
145 150 155 160

pctca2017050779-seql.txt

Arg Thr Ser Ala Leu Glu Tyr Glu Asp Phe Asp Ala Ala Lys Leu Arg
165 170 175

Leu Ile Glu Arg Ala Glu Lys Phe Gly Glu Ile Ser Arg Lys Ala Arg
180 185 190

Arg Thr Ile Ala Met Leu Ser Gln Asp Phe Ile Phe Asp Gly Cys Thr
195 200 205

Ile Leu Val His Gly Tyr Ser Arg Val Val Val Glu Val Leu Lys Leu
210 215 220

Ala Ala Gln Asn Lys Lys Leu Phe Arg Val Leu Cys Thr Glu Gly Arg
225 230 235 240

Pro Asp Arg Thr Gly Leu Arg Phe Ser Asn Glu Leu Ala Lys Leu Asp
245 250 255

Val Pro Val Lys Leu Leu Ile Asp Ser Ala Val Ala Tyr Thr Met Asp
260 265 270

Glu Val Asp Met Val Phe Val Gly Ala Asp Gly Val Val Glu Ser Gly
275 280 285

Gly Ile Ile Asn Met Met Gly Thr Tyr Gln Ile Ala Leu Val Ala His
290 295 300

Ser Met Asn Lys Pro Val Tyr Val Ala Ala Glu Ser Tyr Lys Phe Ala
305 310 315 320

Arg Leu Tyr Pro Leu Asp Gln Lys Asp Leu Thr Pro Ala Leu Arg Pro
325 330 335

Ile Asp Phe Gly Val Pro Ile Pro Ser Gly Val Glu Val Glu Thr Ser
340 345 350

Ala Arg Asp Tyr Thr Pro Pro Gln Tyr Leu Thr Leu Leu Phe Thr Asp
355 360 365

Leu Gly Val Leu Thr Pro Ser Val Val Ser Asp Glu Leu Ile Gln Leu
370 375 380

Tyr Leu
385

<210> 578
<211> 169

pctca2017050779-seql.txt

<212> PRT

<213> Papaver somniferum

<400> 578

Met Leu Ile Arg Arg Ser Lys Thr Thr Phe Phe Leu Asp Met Asp Asp
 1 5 10 15

Asp Gln Asp Phe Asn Tyr Lys Lys Pro Ala Asp Thr Cys Lys Gln Thr
 20 25 30

Val Arg Asn Ser Leu Ile Ser Asn Glu Ala Ser Ser Ser Ala Ser Asn
 35 40 45

Ser Ser Val Gly Leu Arg Ile Leu Ile His Asn His Ser Thr Ser Pro
 50 55 60

Gln Glu Ser Lys Asn Thr Val Leu Val Lys His Thr Phe Lys Leu Ser
 65 70 75 80

Leu Leu Ala Ser Thr Tyr Ser Gln Glu Ser Ser Phe Leu Arg Ser Cys
 85 90 95

Cys Leu Cys Lys Lys Lys Leu Ser Pro Glu Lys Asn Val Tyr Met Tyr
 100 105 110

Met Gly Asp Gln Gly Phe Cys Ser Val Asp Cys Arg Ser Arg Gln Ile
 115 120 125

Val Lys Asp Glu Ile Arg Glu Ile Glu Ile Ser Thr Lys Lys Ile Leu
 130 135 140

Ser Ser Ser Pro Cys Cys Pro Lys Asn Val Arg Ile His Leu Pro Ser
 145 150 155 160

His Arg Asn Arg Ile Pro Val Ala Ala
 165

<210> 579

<211> 514

<212> PRT

<213> Papaver somniferum

<400> 579

Met Asp Ala Ile Glu Phe Pro Tyr Gln Arg Asp Val Ser Val Ser Lys
 1 5 10 15

Asn Leu Met Gly Lys Gly Phe Gly Arg Glu Arg Met Leu Glu Gly Asp
 20 25 30

pctca2017050779-seql.txt

Arg Ser Glu Ser Ile Ser Val Gly Ser Val Pro Arg Ser Ser Gly Leu
35 40 45

Ile Gly Cys Ser Thr Ser Gly Ser Ile Lys Asp Lys Ala Arg Ala Val
50 55 60

Lys Gln Lys His Gly Leu Asp Gly Lys Arg Ser Asp Arg Asn Lys Val
65 70 75 80

Lys Pro Pro Met Lys Thr Lys Leu Asp Ser Phe Phe Ser Lys Asn Gly
85 90 95

Ile Thr Ser Asn Asn Ser Ser Ser Gly Gly Asn Asn Ile Leu Gly Ile
100 105 110

Tyr Gly Leu Lys Ser Asp Ile His Ala Val Thr Ser His Val Asp Glu
115 120 125

Leu Ser Leu Asn Glu Ile Leu Asp Gly Ser Tyr Lys Cys Pro Ile Leu
130 135 140

Ser Gln Ser Lys Gly Arg Lys Ser Ala Asn Thr Thr Asp Asn Ile Leu
145 150 155 160

His Ser Val Arg Lys Val Cys Ser Ile Leu Gln Pro Gln Arg Ala Pro
165 170 175

Glu Pro Ser Gln Lys Asp Val Asp Leu Asp Ser Gly Ser Ile Lys Met
180 185 190

Glu Ala Cys Ile Ser Asp Thr Gly Phe Cys Ser Ser Lys Arg Glu Glu
195 200 205

Asn Asp Lys Glu Asp Gly Asp Leu His Gly Glu Thr Ser Ser Cys Lys
210 215 220

Ile Glu Asp Ser His Lys Lys Phe Leu Asp Ala Lys Leu Leu His Gln
225 230 235 240

Pro Asn Val Ile Leu Glu Arg Leu Ala Phe Gln Pro Val Lys Asp Leu
245 250 255

Asp Ser Leu Leu His Asp Thr Ala Lys Pro Gly Val Ser Val Ser Pro
260 265 270

Asp Ile Arg Ala Val Lys Gly Thr Ser Gln Arg Tyr Arg Leu Pro Pro
275 280 285

pctca2017050779-seql.txt

Phe Tyr Trp Ser His Ser Phe Thr Gly Ser Cys Lys Thr Asn Val Glu
 290 295 300
 Gly Ser Lys Leu Thr Ile Arg Ser Ser Ala Phe Gln Ser Arg Trp Val
 305 310 315 320
 Arg Ile Glu Ser Thr Ala Ser Thr Gln Gly Asp Ser Thr Gly Cys Phe
 325 330 335
 Ser Asp Leu Asp Ser Phe Ala Cys Asp Tyr Asn Leu Asn Thr Leu Lys
 340 345 350
 His Leu Asn Val Gly Leu Ser Glu Lys Glu Pro Thr Ser Ala Ser Ile
 355 360 365
 Ser Phe His Lys Gln Val Leu Leu Ser Thr Ser Lys Asp Pro Leu Thr
 370 375 380
 Gly Phe Pro His Lys Ser Asp Asn Tyr Leu Gly Ala Gln Ser Lys Phe
 385 390 395 400
 Gly Phe Asn Met Asn Ile Val Lys Asp Gly Arg Lys Ile Glu Asn Ser
 405 410 415
 Tyr Gly Gln Glu Lys Tyr Leu Arg Phe Glu Glu Asn Lys Asp Asn Gly
 420 425 430
 Val Gly Gly Glu Pro Ser Lys Arg Arg Lys Gly Ala Cys Ser Thr Glu
 435 440 445
 Asp Gly Ser Cys Tyr Ser Met Phe Lys Ser Ser Val Thr Gly Tyr Pro
 450 455 460
 Asn Phe Pro Leu His Ile His Asp Pro Asp Asp Thr Lys His Asp Ala
 465 470 475 480
 His Ser Pro Arg Leu Leu Ala Ala Ala Gln Ile Leu Asn Glu Ile Ser
 485 490 495
 Arg Leu Ser Arg Thr Gln Asn Gln Asn Arg Gly Lys Asn Arg Trp Pro
 500 505 510
 Lys Lys

<210> 580

pctca2017050779-seql.txt

<211> 178

<212> PRT

<213> Papaver somniferum

<400> 580

Met Pro Phe Gly Leu Cys Asn Ala Pro Ala Thr Phe Gln His Cys Met
1 5 10 15

Met Ser Ile Phe Ser Asp Met Val Glu Arg Phe Leu Glu Val Phe Met
20 25 30

Asp Asp Phe Ser Val Phe Gly Ser Ser Phe Asp Glu Cys Leu His His
35 40 45

Leu Ser Leu Val Leu Thr Arg Cys Lys Glu Lys Asn Leu Val Leu Asn
50 55 60

Trp Glu Lys Cys His Phe Met Val Arg Ser Gly Ile Val Leu Gly His
65 70 75 80

Ile Val Ser Ser Lys Gly Ile Glu Val Asp Arg Ala Lys Val Asp Leu
85 90 95

Ile Lys Thr Leu Pro Val Pro Lys Thr Val Arg Asp Ile Arg Ser Phe
100 105 110

Leu Gly His Ala Gly Phe Tyr Arg Arg Phe Ile Lys Asp Phe Ser Leu
115 120 125

Ile Ser Arg Pro Leu Cys Asn Leu Leu Ala Lys Asp Val Lys Phe Val
130 135 140

Phe Asp Glu Ala Cys Leu Glu Ala Phe Glu Lys Leu Lys Thr Leu Leu
145 150 155 160

Thr Thr Ala Pro Ile Val Gln Ala Pro Asn Trp Asn Leu Pro Phe Glu
165 170 175

Ile Met

<210> 581

<211> 349

<212> PRT

<213> Papaver somniferum

<400> 581

Met Tyr Ile Ala Val Pro Val Val Leu Tyr Ala Cys Glu Arg Ile Val
1 5 10 15

pctca2017050779-seql.txt

Arg Phe Phe Arg Ser Gly Phe Tyr Ser Val Arg Leu Arg Lys Val Ala
20 25 30

Ile Tyr Pro Gly Asn Val Leu Thr Leu Gln Met Ser Lys Pro Pro Asn
35 40 45

Phe Lys Tyr Lys Ser Gly Gln Tyr Met Phe Val Gln Cys Pro Ala Val
50 55 60

Ser Pro Phe Glu Trp His Pro Phe Ser Ile Thr Ser Ala Pro Gly Asp
65 70 75 80

Asp Tyr Leu Ser Ile His Ile Arg Gln Leu Gly Asp Trp Thr Gln Glu
85 90 95

Leu Lys Arg Val Phe Ser Glu Ala Cys Glu Leu Pro Leu Ala Gly Arg
100 105 110

Ser Gly Leu Leu Arg Ala Asp Glu Thr Thr Lys Lys Ser Leu Pro Lys
115 120 125

Leu Leu Ile Asp Gly Pro Tyr Gly Ala Pro Ala Gln Asp Tyr Lys Asn
130 135 140

Tyr Asp Val Leu Leu Leu Val Gly Leu Gly Ile Gly Ala Thr Pro Phe
145 150 155 160

Ile Ser Ile Leu Lys Asp Leu Leu Asn Asn Ile Ile Arg Met Glu Glu
165 170 175

Leu Ala Asp Ser Ile Ser Asp Thr Ser Arg Thr Thr Asp Gln Ser Val
180 185 190

Gly Thr Ser Ser Asp Ser Ser Val Ser Lys Phe Ser Pro Lys Arg Lys
195 200 205

Lys Pro Leu Lys Thr Thr Asn Ala Tyr Phe Tyr Trp Val Thr Arg Glu
210 215 220

Gln Gly Ser Phe Asp Trp Phe Lys Gly Ile Met Asn Glu Ile Ala Asp
225 230 235 240

Leu Asp His Arg Gly Val Ile Glu Met His Asn Tyr Leu Thr Ser Val
245 250 255

Tyr Glu Glu Gly Asp Ala Arg Ser Ala Leu Ile Thr Met Val Gln Ala

260

Leu Asn His Ala Lys Asn Gly Val Asp Ile Val Ser Gly Thr Thr Val
275 280 285

Arg Thr His Phe Ala Arg Pro Asn Trp Lys Lys Val Phe Ser Lys Thr
290 295 300

Cys Ser Lys His Pro Asn Ala Lys Ile Gly Val Phe Tyr Cys Gly Ala
305 310 315 320

Pro Val Leu Ala Gln Glu Leu Gly Lys Leu Cys His Glu Phe Asn Gln
325 330 335

Lys Gly Ser Thr Lys Phe Glu Phe His Lys Glu His Phe
340 345

<210> 582
<211> 632
<212> PRT
<213> Papaver somniferum
<400> 582

Met Arg Gly Phe Pro Lys His Glu Arg Arg Trp Ala Ser Asp Thr Val
1 5 10 15

Ser Ser Gly Lys Phe Ala Ser Gly Ser Ser Ser Pro Val Asn Asn Glu
20 25 30

Thr Ser Gly Ala Met Asp Gln Glu Phe Val Gln Val Thr Leu Asp Phe
35 40 45

Gln Asp Asp Asp Thr Ile Val Leu Arg Ser Val Glu Pro Ala Thr Ile
50 55 60

Ile Asp Leu Asp Gln Glu Ile Val Ile Ser Gly Ser Gly Gly Gly Gly
65 70 75 80

Gly Gly Ser Glu Thr Ser Leu Ser Ser Ala Ala Ser Arg Ser Pro Thr
85 90 95

Ile Lys Arg Ser Ser Ser His Lys Phe Arg Gln Phe Ser Gln Glu Leu
100 105 110

Lys Lys Glu Thr Val Ala Lys Ala Lys Ala Phe Ser Gln Glu Phe Lys
115 120 125

Ala Glu Leu Asn Arg Arg Phe Ser Trp Ser His Asn Gln Ser Ser Lys
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130                               135                               140
Thr  Leu  Ser  Ser  Ser  Thr  Ala  Val  Ala  Asn  Asp  Asn  Asn  Ala  Gly  Thr
145                               150                               155                               160

Ser  Asp  Ser  Ala  Leu  Ala  Ala  Arg  Ala  Leu  Arg  Lys  Gln  Arg  Ala  Gln
                               165                               170                               175

Leu  Asp  Arg  Thr  Arg  Ser  Gly  Ala  His  Lys  Ala  Leu  Arg  Gly  Leu  Arg
                               180                               185                               190

Phe  Ile  Ser  Asn  Ser  Asn  Ser  Asn  Ser  Ser  Ser  His  Arg  Asn  Asn  Ile
                               195                               200                               205

Asn  Ser  Val  Asp  Ala  Trp  Asn  Glu  Val  Gln  Ser  Asn  Phe  Asp  Gly  Leu
                               210                               215                               220

Ala  Lys  Asp  Gly  Phe  Leu  Phe  Arg  Ala  Asp  Phe  Gly  Gln  Cys  Ile  Gly
225                               230                               235                               240

Met  Lys  Asp  Ser  Lys  Glu  Phe  Ala  Leu  Glu  Leu  Phe  Asp  Ala  Leu  Ser
                               245                               250                               255

Arg  Arg  Arg  Arg  Leu  Lys  Ile  Asp  Lys  Ile  Ser  Lys  Glu  Glu  Leu  Tyr
                               260                               265                               270

Glu  Phe  Trp  Ser  Gln  Ile  Thr  Asp  Gln  Ser  Phe  Asp  Ser  Arg  Leu  Gln
                               275                               280                               285

Ile  Phe  Phe  Asp  Met  Val  Asp  Lys  Asn  Glu  Asp  Gly  Arg  Ile  Thr  Glu
                               290                               295                               300

Ser  Glu  Val  Lys  Glu  Ile  Ile  Met  Leu  Ser  Ala  Ser  Ala  Asn  Lys  Leu
305                               310                               315                               320

Ala  Arg  Leu  Lys  Glu  Gln  Ala  Glu  Glu  Tyr  Ala  Ala  Leu  Ile  Met  Glu
                               325                               330                               335

Glu  Leu  Asp  Pro  Glu  Arg  Leu  Gly  Tyr  Ile  Glu  Leu  Trp  Gln  Leu  Glu
                               340                               345                               350

Thr  Leu  Leu  Leu  Gln  Lys  Asp  Thr  Tyr  Leu  Asn  Tyr  Ser  Gln  Ala  Leu
                               355                               360                               365

Ser  Tyr  Thr  Ser  Gln  Ala  Leu  Ser  Gln  Asn  Leu  Gln  Gly  Leu  Arg  Ser
                               370                               375                               380

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pctca2017050779-seq1.txt

Arg Ser Ser Ile Arg Lys Val Ser Arg Asn Ile Ile Tyr Tyr Ile Glu
 385 390 395 400
 Asp Asn Trp Lys Arg Leu Trp Val Met Ala Leu Trp Ile Gly Ile Met
 405 410 415
 Leu Gly Leu Phe Phe Trp Lys Phe Phe Gln Tyr Lys Asn Arg Tyr Pro
 420 425 430
 Phe Lys Val Met Gly Tyr Cys Leu Val Thr Ala Lys Gly Ala Ala Glu
 435 440 445
 Thr Leu Lys Phe Asn Met Ala Leu Ile Leu Leu Pro Val Ser Arg Asn
 450 455 460
 Thr Ile Thr Trp Leu Arg Ser Thr Arg Leu Ala Ser Val Ile Pro Phe
 465 470 475 480
 Asp Asp Asn Ile Asn Phe His Lys Thr Ile Ala Gly Ala Ile Val Val
 485 490 495
 Gly Val Ile Leu His Ala Gly Asn His Leu Ala Cys Asp Phe Pro Arg
 500 505 510
 Leu Ile Lys Ser Ser Asn Asp Val Phe Glu Pro Leu Lys His Asp Phe
 515 520 525
 Pro Gly Asp His Lys Pro Thr Tyr Ala Ala Leu Leu Arg Gly Pro Glu
 530 535 540
 Gly Val Thr Gly Ile Leu Met Val Ile Phe Met Val Val Ala Phe Thr
 545 550 555 560
 Leu Ala Thr Arg Trp Phe Arg Arg Ser Leu Val Lys Leu Pro Lys Pro
 565 570 575
 Phe Asp Lys Leu Thr Gly Phe Asn Ala Phe Trp Tyr Ser His His Leu
 580 585 590
 Phe Val Leu Val Tyr Ile Leu Leu Ile Ile His Gly Phe Tyr Leu Tyr
 595 600 605
 Leu Val His Gln Trp Tyr Gln Lys Thr Thr Trp Met Tyr Ile Ala Val
 610 615 620
 Pro Val Val Leu Tyr Ala Cys Glu
 625 630

pctca2017050779-seql.txt

<210> 583
 <211> 657
 <212> PRT
 <213> Papaver somniferum

<400> 583

Met Leu Val Asp Ala Thr Ser Gly Tyr Gly Met Phe Ser Phe Met Asp
 1 5 10 15

Asp Tyr Ser Gly Tyr Asn Gln Ile Lys Met Tyr Glu His Asp Ala Asn
 20 25 30

Lys Thr Val Phe Arg Thr Pro Ile Gly Asn Phe His Tyr Thr Val Met
 35 40 45

Pro Phe Gly Leu Lys Asn Ala Gly Ala Thr Tyr Gln Arg Ala Met Thr
 50 55 60

Ala Ile Phe His Asp Met Met His Lys Gln Val Glu Asp Tyr Val Asp
 65 70 75 80

Asp Val Val Val Lys Ser Lys Thr Arg Ala Ser His Leu Glu Val Leu
 85 90 95

Arg Gln Val Phe Glu Arg Cys Arg Glu Tyr Lys Leu Lys Met Asn Pro
 100 105 110

Met Lys Cys Ala Phe Gly Val Ser Tyr Gly Lys Phe Leu Gly Phe Leu
 115 120 125

Val Thr Val Glu Gly Ile Lys Val Asp Pro Asp Lys Thr Lys Ala Ile
 130 135 140

Thr Thr Met Pro Leu Pro Cys Thr Val Lys Glu Phe Gln Ser Phe Met
 145 150 155 160

Gly Lys Val Asn Tyr Ile Phe Asp Ala Ser Phe Ile Pro Leu Leu Lys
 165 170 175

Lys Gly Ala Ser Leu Thr Trp Thr Thr Val Gln Gln Glu Ala Phe Gln
 180 185 190

Lys Ile Gln Gln Ile Leu Phe Ser Pro Ala Val Val Lys Ser Pro Val
 195 200 205

Gln Gly Arg Pro Leu Ile Leu Tyr Lys Ala Ser Ser Asp Val Ser Ile
 210 215 220

pctca2017050779-seql.txt

Gly Ala Ile Leu Ser Gln Glu Asp Glu Glu Arg Ile Glu Arg Leu Ile
 225 230 235 240
 Tyr Tyr Phe Ser Arg Thr Met Arg Asp Ala Gln Leu Arg Tyr Pro Lys
 245 250 255
 Ala Glu Arg Ala Cys Leu Ala Leu Val His Ala Ile Gln Lys Phe Arg
 260 265 270
 His Tyr Leu Leu Ser Asn Arg Val Met Leu Val Ser Lys Ala Asp Pro
 275 280 285
 Leu Lys Phe Leu Leu Ser Lys Pro Ser Leu Ile Glu Arg Pro Ala Lys
 290 295 300
 Trp Leu Leu Gln Met Ser Glu Phe Asp Ile Ala Cys Val Leu Pro Arg
 305 310 315 320
 Glu Phe Lys Gly Gln Ala Val Ser Asp Leu Leu Ala Ala Phe Pro Gly
 325 330 335
 Glu Asp Thr Thr Lys Leu His Glu Asp Val Pro Gly Glu Phe Pro Glu
 340 345 350
 Ile Leu Val Ile Lys Glu Glu Thr Trp Leu Leu Tyr Phe Asp Gly Ser
 355 360 365
 Pro Thr Pro Arg Asn Asp Thr Glu Gly Ala Gly Val Val Leu Val Ser
 370 375 380
 Pro Ser Gly Lys Val Phe Ser Arg Leu Phe Lys Leu Asp Phe His Cys
 385 390 395 400
 Thr Asn Asn Ser Thr Glu Tyr Glu Ala Phe Leu Leu Gly Leu Ser Leu
 405 410 415
 Ala Lys Gln Ala Gly Ala Ala His Leu Glu Ile Arg Gly Asp Ser Lys
 420 425 430
 Leu Leu Val Asn Gln Met Asn Gly Glu Tyr Ser Leu Lys Glu Ile Thr
 435 440 445
 Leu Ala Pro Phe Arg Thr Glu Ala Gln Arg Ile Leu Thr His Phe Ala
 450 455 460
 Gly Ala Thr Ile Ile His Thr Gly Arg Thr Asn Asn Met His Ala Asp
 465 470 475 480

pctca2017050779-seql.txt

Cys Leu Glu Thr Leu Ala Ser Lys Leu Gln Phe Glu Gly Ala Lys Lys
485 490 495

Thr Ile Thr Val Lys Trp Arg Ala Val Leu Ser Thr Trp Leu Ala Gln
500 505 510

Val Glu Asp Ile Gln Thr Asn Asp Trp Arg Ala Pro Ile Ile His Glu
515 520 525

Leu Ser Asn Ser Leu Ser Glu Gly Lys Val Ser Leu Lys Glu Leu Lys
530 535 540

Asn Tyr Phe Leu Leu His Gly Ala Leu Tyr Tyr Arg Asn Pro Asp Gly
545 550 555 560

Ser Leu Leu Arg Cys Leu Gly Asn Asp Glu Ala Gly Glu Lys Leu Lys
565 570 575

Arg Ile His Glu Glu Thr Cys Gly His Thr Leu Val Val Thr Leu Tyr
580 585 590

Arg Arg Leu Gln Arg Met Gly Tyr Tyr Trp Pro Ser Met Glu Ala Gln
595 600 605

Ser Arg Asn Leu Gln Arg Ser Cys Pro Asn Cys Gln Thr Pro Pro His
610 615 620

His Leu Glu Ala Leu Thr Val Arg His Thr Glu Asp Trp Arg Glu Pro
625 630 635 640

Tyr Ile Lys Tyr Leu Arg Asp Asn Glu Leu Pro Leu Glu Lys Gly Arg
645 650 655

Gln

<210> 584
<211> 222
<212> PRT
<213> Papaver somniferum

<400> 584

Met Ala Ile Asn Leu Ser Leu Gly Gly Lys Leu Thr Leu Ile Leu Ser
1 5 10 15

Val Leu Met Ser Leu Pro Ile Tyr Leu Phe Ser Leu Phe Phe Ala Pro
20 25 30

pctca2017050779-seql.txt

Ile Asn Val Ile Lys Lys Leu Glu Ile Ile Ile Arg Asn Phe Leu Trp
35 40 45

Asp Gly Gly Val Asp Arg Lys Lys Tyr His His Val Ala Trp Asp Ile
50 55 60

Val Leu Lys Pro Lys Asn Leu Gly Gly Leu Gly Val Lys Asp Leu His
65 70 75 80

Leu Met Asn Ile Ala Leu Leu Met Lys Trp Leu Trp Lys Phe Gly Glu
85 90 95

Asp Asp Asn Pro Leu Trp Lys Asn Leu Val Ser Gln Lys Tyr Gly Ile
100 105 110

Glu Glu His Gly Trp Tyr Ala Arg Asn Pro Lys Gln Ala Tyr Gly Cys
115 120 125

Ser Val Trp Arg Gly Ile Gln Asn His Leu Val Asp Phe Lys Ala Asn
130 135 140

Cys Lys Phe Ile Val Gly Asn Gly Glu Arg Ile Gln Phe Trp Lys Asp
145 150 155 160

Ile Trp Leu Gly Asn Thr Pro Leu Ala Glu Gln Phe Pro Tyr Ser Phe
165 170 175

Gly Ala Ser Ser His Lys Asp Leu Thr Ile Ala Gln Met Tyr Asn Thr
180 185 190

Ser Glu Asn Ser Trp Ser Leu Gly Ile Thr Arg Arg Ile Tyr Asp His
195 200 205

Val Ile Val Cys Phe Ala Gly Leu Leu His Ala Leu Asp Glu
210 215 220

<210> 585
<211> 809
<212> PRT
<213> Papaver somniferum

<400> 585

Met Lys Asn Phe Ile Thr Ile Thr Ser Ser Ser Pro Pro Leu Ser Ile
1 5 10 15

Leu Leu His Gln Thr Asp Val Arg Ala Ile Ala Asn Arg Tyr Ala Ala
20 25 30

pctca2017050779-seql.txt

Gln Leu Gln Phe Cys Cys Ala Gln Asn Pro Ile Ser His Ser Leu Ala
35 40 45

Gln Ser Val His Ala Asn Ile Ile Thr Ser Gly Phe Lys Pro Arg Gly
50 55 60

His Ile Leu Asn Arg Leu Ile Asp Ile Tyr Cys Lys Ser Asn Asn Ile
65 70 75 80

Val Tyr Ala Arg Tyr Leu Phe Asp Lys Ile Pro Lys Pro Asp Ile Val
85 90 95

Ser Arg Thr Thr Leu Ile Ser Ala Tyr Ser Glu Leu Gly Asn Val Asn
100 105 110

Phe Ala Lys Tyr Ile Phe Asp Glu Ala Pro Leu Ser Ile Arg Asp Thr
115 120 125

Val Ser Tyr Asn Ala Met Ile Thr Gly Phe Ser His Asn Asn Asp Gly
130 135 140

Tyr Asn Ala Ile Lys Leu Phe Asn Glu Met Arg Lys Tyr Gly Phe Lys
145 150 155 160

Pro Asp Asn Leu Thr Phe Ala Ser Leu Leu Ser Ala Ala Ala Leu Val
165 170 175

Ala His Asp Glu Arg Glu Cys Lys Gln Leu His Cys Asn Val Val Lys
180 185 190

Ala Gly Ala Asp Leu Phe Val Ser Val Leu Asn Ala Leu Ile Ser Leu
195 200 205

Tyr Val Lys Cys Gly Phe Ser Leu Ser Ser Pro Met Ser Asp Ala Arg
210 215 220

Lys Leu Phe Asp Gln Met Glu Lys Arg Asp Glu Leu Ser Trp Met Asn
225 230 235 240

Met Ile Thr Gly Tyr Val Arg Asn Gly Glu Ile Glu Ser Ala Arg Glu
245 250 255

Leu Phe Asp Gly Met Asn Glu Asn Leu Gln Val Ala Tyr Asn Ala Met
260 265 270

Ile Ser Gly Tyr Val Gln His Gly Phe Met Leu Lys Ala Leu Glu Met

275

Phe Lys Ser Met His Leu Glu Gly Ile Glu Leu Asp Glu Phe Thr Tyr
290 295 300

Thr Ser Val Ile Ser Gly Cys Ala Asn Ser Gly Leu Phe Leu Ile Gly
305 310 315 320

Lys Gln Val His Gly Ser Ile Leu Arg Thr Gly Trp Arg Pro Ala Ser
325 330 335

Lys Leu Ala Leu Pro Val Asn Asn Ala Leu Val Thr Leu Tyr Cys Lys
340 345 350

Cys Gly Lys Val Asp Gln Ala Arg Gln Ile Phe Asp Ser Met Leu Glu
355 360 365

Lys Asp His Val Ser Trp Asn Ala Ile Leu Ser Gly Tyr Val Ser Val
370 375 380

Gly Arg Ile Asp Gly Ala Lys Asn Val Phe Asn Ala Met Pro Glu Lys
385 390 395 400

Asp Leu Leu Thr Trp Met Val Met Ile Ser Gly Phe Ala Gln Asn Gly
405 410 415

Tyr Gly Glu Asp Ala Leu Lys Leu Phe Asp Arg Met Arg Thr Glu Asp
420 425 430

Leu Ala Pro Cys Asp Tyr Ser Phe Ala Gly Ala Ile Thr Ala Cys Ala
435 440 445

Ser Leu Gly Ala Leu Glu His Gly Arg Gln Leu His Ala Gln Leu Ile
450 455 460

Gln Leu Gly Phe Asn Ser Ser Leu Ser Ala Gly Asn Ala Leu Ile Thr
465 470 475 480

Met Tyr Ala Arg Cys Gly Val Val Glu Ala Ala His Val Val Phe His
485 490 495

Thr Met Pro Tyr Ile Asp Ser Val Ser Trp Asn Ser Met Ile Thr Ala
500 505 510

Leu Gly Gln His Gly His Gly Leu Gln Ala Leu Lys Val Phe Asp Leu
515 520 525

pctca2017050779-seql.txt

Met Leu Gln Glu Asn Ile Lys Pro Asp Arg Ile Thr Phe Leu Ile Val
 530 535 540
 Leu Thr Ala Cys Ser His Ser Gly Leu Val Lys Glu Gly Cys Lys Tyr
 545 550 555 560
 Phe Glu Ser Met Asp Asn Val Tyr Gly Ile Thr Pro Asp Glu Asp His
 565 570 575
 Tyr Ala Arg Phe Ile Asp Leu Leu Cys Arg Ala Gly Lys Ile Ser Glu
 580 585 590
 Ala Asn Asp Leu Ile Gln Asn Leu Pro Phe Lys Pro Gly Ala Pro Ile
 595 600 605
 Trp Glu Ala Leu Leu Asn Gly Cys Arg Ile His Gly Asn Met Glu Val
 610 615 620
 Gly Ile Gln Ala Ala Asp Gln Leu Phe Gln Leu Thr Pro Gln His Asp
 625 630 635 640
 Gly Thr Tyr Ile Leu Leu Ala Asn Met Tyr Ala Asp Ala Gly Arg Arg
 645 650 655
 Glu Asp Met Ala Lys Val Arg Met Met Met Arg Glu Arg Gly Val Lys
 660 665 670
 Lys Glu Pro Gly Cys Ser Trp Leu Glu Val Ala Asn Lys Val His Val
 675 680 685
 Phe Leu Val Asp Asp Thr Ser His Pro Gln Val His Glu Val Tyr Thr
 690 695 700
 Tyr Leu Arg Glu Leu Gly Val Lys Met Arg Lys Leu Gly Tyr Val Pro
 705 710 715 720
 Asp Thr Lys Tyr Val Leu His Asp Met Glu Ser Glu Gln Lys Glu Tyr
 725 730 735
 Ala Leu Ser Thr His Ser Glu Arg Leu Ala Val Gly Phe Gly Leu Leu
 740 745 750
 Lys Leu Pro Arg Gly Ala Thr Val Arg Val Leu Lys Asn Leu Arg Met
 755 760 765
 Cys Gly Asp Cys His Thr Ala Phe Lys Phe Ile Ser Lys Leu Val Glu
 770 775 780

pctca2017050779-seql.txt

Arg Glu Ile Val Val Arg Asp Gly Arg Arg Phe His His Phe Arg Asn
785 790 795 800

Gly Glu Cys Ser Cys Gly Asn Tyr Trp
805

<210> 586
<211> 643
<212> PRT
<213> Papaver somniferum

<400> 586

Met Met Trp Asn Ser Leu Ala Asn Ile Lys Glu Asn Leu Asn Gln Ile
1 5 10 15

Val Leu Glu Val Gln Asp Ala Thr Asp Gly Glu Glu Phe Glu Ile Tyr
20 25 30

Arg Ser Asn Ser Asn Ser Ala Ala Glu Asp Ser Pro Ile Phe Asn Arg
35 40 45

Arg Ile Ser His Arg Phe Ala Gln Ser Asn Asn Ser Pro Leu Arg Ser
50 55 60

Pro Ile Ser Ser Gly Gly Asp Ser Ala Leu Lys Ser Glu Ile Glu Lys
65 70 75 80

Tyr Lys Thr Glu Ile Gln Lys Phe Gln Ala Ser Glu Ala Glu Ile Lys
85 90 95

Ala Leu Ser Val Asn Tyr Val Ala Leu Leu Lys Glu Lys Glu Glu Lys
100 105 110

Leu Ser Arg Leu His Gly Glu Asn Glu Met Leu Arg Lys Asn Leu Glu
115 120 125

Ala Ala Asn Ala Ser Gln His Ala Ser Lys Asn Glu Thr Phe Asn Lys
130 135 140

Arg Asn Val His Lys Gly Val Gly Glu Gln Ser Pro Asn Arg Gln His
145 150 155 160

Lys Leu Thr Ala His Val Asn Asn His Ser Ile Gly Asn His Thr His
165 170 175

Lys Ser Val Ile Lys His Asp Thr Phe Ser Asn Gly Asn Ala Asp Thr
180 185 190

pctca2017050779-seql.txt

Leu Arg Ser Val Glu Asn Leu Pro Arg Asn Glu Asn Glu Leu Ala Asp
 195 200 205
 Leu Leu Glu Glu Lys Asn Arg Ser Leu Val Ala Ile Gln Ala Asn Tyr
 210 215 220
 Asp Ser Glu Ile Lys Lys Leu Lys Met Glu Leu Gly Arg Glu Arg Glu
 225 230 235 240
 Ser Ser Ala Asn Ile His Ser Lys Phe Thr Glu Glu Gln Lys Leu Asn
 245 250 255
 Glu Ser Phe Gln Lys Glu Leu Leu Ala Leu Lys Thr Gln Lys Asn Arg
 260 265 270
 Asp Met Thr Glu Met Lys Gln Leu Gln Asn Gln Leu Asn Asp Lys Leu
 275 280 285
 Ser Glu Ile Arg Arg Leu Gln Ser Glu Leu Thr Arg Arg Asp Asn Glu
 290 295 300
 Glu Glu Thr Asn Glu Ile Ile Glu Arg Leu Lys Gly Val Ile Ala Thr
 305 310 315 320
 Leu Glu Gln Glu Asn Thr Asn Leu Lys Ile Glu Lys Ala Glu Leu Gln
 325 330 335
 Ala Val Val Glu Arg Ser Pro Lys Ser Leu Arg Ala Asp Gly Asp Ala
 340 345 350
 Asp Asn Pro Asp Ser Ser Asp Ser Arg Pro Thr Lys Leu Asn Glu Ala
 355 360 365
 His Ser Ser Val Gln Phe Pro Gln Lys Glu Glu Met Glu Leu Ser Met
 370 375 380
 Gln Lys Leu Glu Lys Asp Leu Lys Glu Ala Cys Arg Ala Arg Asp Lys
 385 390 395 400
 Val Leu Gln Glu Leu Thr Arg Leu Lys Gln His Leu Leu Asp Lys Glu
 405 410 415
 Leu Glu Glu Ser Asp Lys Met Asp Glu Asp Ser Lys Ile Ile Glu Glu
 420 425 430
 Leu Arg Ala Ser Cys Asp Tyr Gln Ser Ser Lys Ile Leu Ser Leu Glu
 435 440 445

pctca2017050779-seql.txt

Lys Ala Leu Gln Gln Ala Ile Thr Asp Gln Glu Glu Val Lys Lys Asn
450 455 460

Asn Asn Asp Glu Leu Gln Lys Ser Lys Glu Met Val Asn Asp Leu Lys
465 470 475 480

Glu Lys Leu Ser Ser Cys Met Arg Thr Ile Asp Ala Lys Asn Val Glu
485 490 495

Leu Met Asn Leu Gln Gly Ala Leu Gly Gln Tyr Tyr Ala Glu Ser Glu
500 505 510

Ala Arg Asp Arg Leu Glu Gly Asp Leu Ala Leu Val Arg Glu Glu Leu
515 520 525

Ala Arg Leu Ser Glu Leu Leu Lys Asp Ala Asn Gln Arg Ile Asp Ile
530 535 540

Ala Lys His Glu Lys Asp Glu Thr Leu Glu Lys Leu Ser Gln Thr Glu
545 550 555 560

Met Leu Leu Leu Glu Gly Lys Ser Arg Val His Lys Leu Glu Glu Asp
565 570 575

Asn Met Lys Leu Arg Arg Ala Leu Glu Gln Ser Met Thr Arg Leu Asn
580 585 590

Arg Met Ser Val Asp Ser Asp Phe Phe Val Asp Arg Arg Ile Val Ile
595 600 605

Lys Leu Leu Val Thr Tyr Phe His Arg Asn His Ser Lys Glu Ile Asp
610 615 620

Arg Phe Trp Thr Leu Trp Phe Ala Cys Trp Ala Ser Leu Lys Met Ile
625 630 635 640

Ser Lys Glu

<210> 587
<211> 168
<212> PRT
<213> Papaver somniferum

<400> 587

Met Lys Met Ile Lys Pro Leu Tyr Val Ser Val Ser Lys Arg Tyr Gly
1 5 10 15

pctca2017050779-seql.txt

Asp Lys Ser Arg Phe Tyr Asn Gly Ser Val Thr Thr Ser Pro Leu Gln
20 25 30

Arg Ser Ser Pro Lys Lys Tyr Lys Lys Glu Cys Glu Asp Lys Phe Glu
35 40 45

Thr Ser Ser Lys Ser Pro Lys Gln Gly Asn Leu Pro Ser Gly Leu Arg
50 55 60

Val Val Cys Lys His Leu Gly Lys Ser Arg Ser Ser Ser Asn Phe Ala
65 70 75 80

Ala Val Ser Pro Val Thr Phe Pro Ser Gln Arg Gln Asp Asp Ser Met
85 90 95

Phe Gln Gln Glu Asp Gly Ile Gln Asn Ala Ile Leu His Cys Lys Lys
100 105 110

Ser Phe Asn Ser Arg Phe Glu Ser Ser Thr Leu Phe Ser Asn Ser Asp
115 120 125

Ser Ser Leu Leu Ser Arg Ser Ile Ser Asp Pro Ser His Glu Lys Ser
130 135 140

Ile Asp Phe Leu Ser Glu Lys Met Lys Leu Phe Asp Gln Asp Glu Ala
145 150 155 160

Glu Asn Glu Glu Tyr Phe Asp Leu
165

<210> 588

<211> 134

<212> PRT

<213> Papaver somniferum

<400> 588

Met Phe Leu Val Gly Val Val Phe Asn Leu Phe Lys Tyr Gln Thr Leu
1 5 10 15

Asp Lys Gly Thr Cys Asn Gly Ser Val Ser Asn Ile Ile Pro Ile Ile
20 25 30

Gly Thr Thr Ser Met Phe Ile Ile Val Ala Ser Lys Tyr Lys Met Val
35 40 45

Leu Pro Thr Arg Ser Leu Trp Arg Cys Met Lys Ser Pro Val Thr Thr
50 55 60

pctca2017050779-seql.txt

Met Phe Phe Ile Lys Thr Leu His Arg Ile Ser Thr Leu Ile Thr Phe
65 70 75 80

His Asn Ala Asn Leu Ser Thr Lys Lys Val Ile Ile Leu Leu Tyr Cys
85 90 95

Lys Ala Asn Phe Ile Thr Ser Thr His Asp Ser Trp Pro Thr Pro Val
100 105 110

Thr Thr Asn Ser His Ser Ala Asp Leu Leu Pro Phe Leu Val Ser Thr
115 120 125

Ile Leu Leu Tyr Ala Arg
130

<210> 589
<211> 342
<212> PRT
<213> Papaver somniferum

<400> 589

Met Glu Asn Met Gln Tyr Ala Glu Glu Leu Ile Arg Gln Phe Leu Val
1 5 10 15

Phe Arg Gly Phe Thr Asn Thr Leu Gln Thr Phe Glu Thr Glu Leu Ser
20 25 30

Thr Asp Ile Ala Lys Gly Phe Gln Val Asp Lys Ile Leu Glu Leu Ile
35 40 45

Phe Ser Val Tyr Val Pro Lys Phe Gln Ile Glu Lys Leu Val Cys Leu
50 55 60

Leu Ser Phe Phe Lys Gln Cys Phe Ser Thr Ser Thr Glu Thr Val Leu
65 70 75 80

Val Ser Thr Leu Ser Lys Leu Glu Ala Ser Val Leu Arg Tyr Tyr Val
85 90 95

Val His Ala Ile Lys Ser Gly Lys Arg Asp Lys Val Ile Asp Phe Phe
100 105 110

Gly Ala Tyr Gly Asn Asp Leu Leu Gln Arg Ser Gln Asp Trp Gly Pro
115 120 125

Trp Phe Ala Ile Pro Tyr Leu Lys Asn Pro Ser Leu Glu Pro Gln Phe
130 135 140

pctca2017050779-seql.txt

Arg Ile Tyr Phe Ser Lys Glu Trp Phe Asp Ala Leu Gln Leu Ser Leu
145 150 155 160

Arg Asn Phe Leu Ser Glu Ile Phe Asn Asp Thr Arg Ile Pro Gly Leu
165 170 175

Leu Lys Ile Ser Ala Asp Asn Asn Thr Val Lys His Leu Lys Arg Asp
180 185 190

Asn Lys Gln Leu Asn Leu Lys Leu Ser Gln Leu Gln Ala Leu Leu Glu
195 200 205

Glu Lys Glu Ala Arg Ile Tyr Gln Leu Lys Ser Asn Ser Ser Thr Ala
210 215 220

Glu Val Asn Met Leu Gln Lys Asn Asn Pro Thr Tyr Ser Glu Ser Gly
225 230 235 240

Ala Ala Gly Glu Cys Ala Thr Gln Ser Asn Tyr Leu Ser Ser Arg Val
245 250 255

Met Ser Glu Ser Ser Thr Ser Arg Ser Thr Ser Ser Arg Asp Asp Lys
260 265 270

Lys Glu Pro Glu Phe Gln Asp Leu Asp Ser Ala Glu Arg Ala Lys Arg
275 280 285

Ser Glu Asn Leu Thr Gln Ser Gly Ser Glu Ile Asp Ser Ser Cys Leu
290 295 300

His Glu Leu Pro Thr Arg Asp Glu Asn Gly Ala Glu Met Gln Arg Gln
305 310 315 320

Glu Asp Phe Pro Glu Val Lys Ala Glu Phe Gln Glu Thr Phe Leu Gly
325 330 335

His Thr Ser Pro Ile Ser
340

<210> 590
<211> 299
<212> PRT
<213> Papaver somniferum

<400> 590

Met Gln Gln Phe Asp Ser Glu Asp Ser Ala Met Thr Phe Asp Glu Ala
1 5 10 15

pctca2017050779-seql.txt

Ser Met Glu Arg Ser Lys Asn Phe Val Lys Ala Leu Gln Glu Leu Lys
20 25 30

Asn Ile Arg Pro Gln Leu Tyr Ser Ala Ala Asp Tyr Cys Glu Lys Ser
35 40 45

Tyr Gln His Ser Asp Gln Lys Gln Met Val Leu Asp Asn Leu Lys Asp
50 55 60

Tyr Ala Val Arg Ala Leu Val Asn Ala Val Asp His Leu Gly Thr Val
65 70 75 80

Ala Tyr Lys Leu Thr Asp Leu Phe Glu Gln Gln Thr Leu Asp Val Ser
85 90 95

Thr Met Glu Ile Asn Ile Ser Cys Leu Asn Gln Lys Leu Asn Thr Cys
100 105 110

Gln Thr Tyr Ser Lys Glu Glu Gly Leu Arg Gln His Gln Leu Tyr Thr
115 120 125

Thr Val Pro Arg His His Lys His Tyr Ile Leu Pro Asn Ala Val Asn
130 135 140

Lys Lys Val Gln Phe Ser Thr Gln Ile Gln Thr Asp Ala Val Gln Lys
145 150 155 160

Asn Ile Ala Ala Arg Pro Arg Val His Leu Ser Gly Thr Asn Ala Ser
165 170 175

Gln Thr Leu Ser Trp Arg Leu Ala Ser Glu Thr Asp Ser Thr Leu Asn
180 185 190

Gly Ser Lys His Ala Val Met Gln Tyr Pro Lys Gly Ser Asn Val Ser
195 200 205

Gly Thr Ala Cys Gly Ala Phe Asn Leu Phe Asp Ala Glu Glu Ala Ala
210 215 220

Ser Ser Lys Ser Ser Ser Ala Gln Leu His Ala Gly Gly Arg Ser Pro
225 230 235 240

Ala Tyr Ser Pro Leu Arg Thr Phe Gly Val Lys Trp Lys Asp Ser Ser
245 250 255

Glu Ala Ser Lys Pro Leu Ser Pro Phe Arg Ser Phe Asp Asn Val Gly

260

Arg Gln Glu Arg Gly Arg Ser Pro Ser Arg Ser Lys Ser Met Leu Ser
275 280 285

Ser Phe Phe Ala Lys Arg Lys Thr Ser Lys Ile
290 295

<210> 591
<211> 267
<212> PRT
<213> Papaver somniferum

<400> 591

Met Gln Arg Gln Glu Asp Phe Pro Glu Val Lys Ala Glu Phe Gln Glu
1 5 10 15

Thr Phe Leu Gly His Thr Ser Pro Ile Ser Arg Cys Arg Phe Ser Ala
20 25 30

Ser Gly Asn Asn Ile Ala Ser Ala Ser Val Asp Gly Thr Val Arg Ile
35 40 45

Trp Thr Tyr Asp Ser Ser Ser Pro Thr Thr Arg Asn Ala Thr Ile Tyr
50 55 60

Cys Gly Ser Glu Ile Met Ser Leu Asp Trp Glu Cys Lys Ser Asp Arg
65 70 75 80

Leu Leu Leu Ile Gly Thr Ala Asp Gly Gly Ile Lys Ala Trp Asn Val
85 90 95

Asp Ala Lys Arg Val Val Cys Asp Leu Ser Thr Ser Ala Ser Phe Pro
100 105 110

Ser Val Leu Asp Leu Lys Cys Ser Pro Val Glu Pro Ile Phe Val Ser
115 120 125

Ala Ala Ala Ser Arg Gly His Gly Ser Ser Asn Leu Asp Arg Met Gly
130 135 140

Phe Ala Ser Leu Thr Val Trp Asn Met Lys Thr Trp Lys Ala Met Ser
145 150 155 160

Val Leu Pro Leu Gly Glu Asp Pro Pro Ala Ile Thr Ser Leu Cys Phe
165 170 175

Asn His Asn Gly Lys Ile Leu Ala Ala Ser Ala Thr Asp Gly Met Ile

pctca2017050779-seql.txt

180

185

190

His Met Phe Gly Ile Leu Asp Cys Leu Ser Tyr Phe Cys Val Ser Gly
 195 200 205

Asn Lys Phe Asn Leu Ile Leu Cys Ser Arg Met Val Cys Leu Phe
 210 215 220

Leu Asn Trp Ser Asp Gln Tyr Asn Trp Lys Phe Ala Ser Phe Val Val
 225 230 235 240

Tyr Gly Leu Arg His Met Asn Leu Tyr Leu Thr Cys Cys Arg Tyr Gly
 245 250 255

Cys Gly Ser Ser Asn Tyr Arg Leu Ala Cys Pro
 260 265

<210> 592

<211> 177

<212> PRT

<213> Papaver somniferum

<400> 592

Met Met Asn Gln Gln Ser Met Ser Leu Ser Leu Asn Arg Asn Ser Ser
 1 5 10 15

Ser Arg Lys Phe Ala Ile Arg Phe Val Arg Ala Leu Thr Arg Ile Lys
 20 25 30

Met Ala Thr Pro Ile Val Ser Ser Val Gln Ser Arg Lys Lys Cys Ser
 35 40 45

Arg Arg Ile Lys Cys Ala Ala Asp Thr Ser Met Ala Ala Thr Ile Gly
 50 55 60

Ser Arg Arg Ala Trp Gly Arg Ala Ile Leu Leu Lys His Arg Asn Gln
 65 70 75 80

Val Arg Lys Arg Val Leu Met Arg Gln Lys Val Val Gly Asn Asn Lys
 85 90 95

Gly Asn Lys Thr Arg Lys Ile Lys Val Met Asn Lys Glu Lys Lys Gln
 100 105 110

Ile Asn Lys Ala Arg Lys Ile Asp His Ile Lys Gly Val Gln Gly Ser
 115 120 125

Val Asn Arg Ala Asn Lys Leu Arg Lys Leu Val Pro Gly Gly Asp Ala

130

135

140

Met Asp Phe Cys Ser Leu Leu Glu Glu Thr Ala His Tyr Ile Lys Ser
 145 150 155 160

Leu Asn Thr Gln Val Gln Leu Met Gln Lys Ile Ala Asp Ile Tyr Glu
 165 170 175

Thr

<210> 593

<211> 477

<212> PRT

<213> Papaver somniferum

<400> 593

Met Ser Ala Lys Phe Ser Pro Thr Leu Gln Ile Ser Asp Leu Asn Asp
 1 5 10 15

Tyr Ile Ala Pro Ser Gln Ala Cys Ile Val Ser Leu Lys Gly Thr Thr
 20 25 30

Thr Ala Lys Lys Gln Glu Thr Ala Gln Asn Gln Val Val Ile Ala Pro
 35 40 45

Ser Val Lys Gln Leu Asn Thr Glu Pro Val Thr Ile Ser Leu Lys Asp
 50 55 60

Cys Leu Ala Cys Ser Gly Cys Ile Thr Ser Ala Glu Thr Val Met Leu
 65 70 75 80

Glu Lys Gln Ser Leu Glu Glu Phe Leu Thr Asn Ile Lys Asp Gly Lys
 85 90 95

Asp Val Ile Val Ser Leu Ser Pro Gln Ser Arg Ala Ser Leu Ala Thr
 100 105 110

His Phe Gly Leu Ser Pro Ser Gln Val Phe Gly Lys Leu Thr Thr Phe
 115 120 125

Leu Lys Ser Leu Gly Val Lys Ala Val Phe Asp Thr Ser Cys Ser Arg
 130 135 140

Asp Leu Ser Leu Ile Glu Ser Cys Asn Glu Phe Val Ala Arg Tyr Lys
 145 150 155 160

Gln Gln Gln Ser Leu Pro Met Ile Ser Ser Ala Cys Pro Gly Trp Val

165

170

175

Cys Tyr Ala Glu Lys Thr Leu Gly Ser Tyr Ile Leu Pro His Ile Ser
 180 185 190

Ser Val Lys Ser Pro Gln Gln Thr Met Gly Ala Thr Ile Lys Asn His
 195 200 205

Ile Cys Gln Arg Met Gly Phe Arg Pro Glu Asn Val Tyr His Val Thr
 210 215 220

Val Met Met Cys Tyr Asp Lys Lys Leu Glu Ala Ser Arg Asp Asp Phe
 225 230 235 240

Leu Phe Pro Leu Asp Ser Asn Gly Glu Thr Arg Asn Asp Ala Glu Asn
 245 250 255

Pro Met Val Ala Glu Val Asp Ser Val Leu Thr Ser Gly Glu Val Leu
 260 265 270

Glu Leu Leu Gln Arg Asn Ser Val Asp Phe Lys Thr Leu Ala Gly Ser
 275 280 285

Pro Leu Asp Arg Leu Leu Thr Asn Val Asp Glu Asp Gly Arg Leu Tyr
 290 295 300

Gly Val Ser Gly Gly Ser Gly Gly Tyr Ala Asp Thr Ile Tyr Arg His
 305 310 315 320

Ala Ala Glu Val Leu Ala Gly Lys Glu Ile Glu Gly Pro Leu His Phe
 325 330 335

Glu Pro Lys Arg Lys Asn Ser Asp Phe Arg Glu Leu Asn Leu Asp Val
 340 345 350

Glu Val Glu Gly Glu Lys Arg Val Leu Lys Phe Ala Leu Cys Tyr Gly
 355 360 365

Phe Arg Asn Leu Gln Asn Val Val Arg Gln Ile Lys Thr Gly Lys Cys
 370 375 380

Asp Tyr His Tyr Leu Glu Ile Met Ala Cys Pro Ser Gly Cys Leu Asn
 385 390 395 400

Gly Gly Gly Gln Ile Lys Pro Lys Glu Gly Gln Ser Ala Lys Glu Leu
 405 410 415

pctca2017050779-seql.txt

Ile Gln Thr Leu Glu Ser Ala Tyr Met Glu Asp Val Val Val Ala Asn
420 425 430

Pro Phe Glu Asn Leu Leu Val Lys Gly Leu Tyr Asp Glu Trp Leu Glu
435 440 445

Gln Pro Gly Ser Glu Lys Ala Lys Lys His Met Tyr Thr Gln Tyr His
450 455 460

Pro Met Val Lys Asn Ile Thr Ser Gln Leu His Asn Trp
465 470 475

<210> 594

<211> 545

<212> PRT

<213> Papaver somniferum

<400> 594

Met Ala Ala Gly Tyr Ala Gly Val Leu Val Ser Asp Pro Trp Leu Gln
1 5 10 15

Asn Gln Phe Thr Gln Val Glu Leu Arg Ser Leu Lys Ser His Phe Leu
20 25 30

Ser Met Arg Arg Glu Leu Gly Ser Val Thr Leu Glu Asp Leu Pro Ser
35 40 45

Met Met Ser Lys Leu Lys Ile Val Gly Glu Asn Leu Thr Asp Glu Glu
50 55 60

Arg Ser Ser Phe Leu Val Glu Ser Asn Gly Ser Leu Ser Glu Glu Val
65 70 75 80

Asp Phe Glu Gly Phe Leu Lys Val Tyr Leu Lys Met Gln Ala His Thr
85 90 95

Asn Ala Lys Pro Gly Gly Gly Gly Gly Ala Lys Asp Ser Ser Ala Phe
100 105 110

Leu Lys Ala Ala Thr Thr Thr Leu Leu His Thr Ile Ser Glu Ser Glu
115 120 125

Lys Ser Ser Tyr Val Ala His Ile Asn Asn Tyr Leu Gly Glu Asp Pro
130 135 140

Phe Leu Lys Lys Cys Leu Pro Ile Asp Pro Leu Ser Asn Asp Leu Phe
145 150 155 160

pctca2017050779-seql.txt

Glu Val Val Lys Asp Gly Val Leu Leu Cys Lys Leu Ile Asn Val Ala
 165 170 175
 Val Pro Gly Thr Ile Asp Glu Arg Ala Ile Asn Thr Lys Arg Ile Leu
 180 185 190
 Asn Pro Trp Glu Arg Asn Glu Asn His Thr Leu Cys Leu Asn Ser Ala
 195 200 205
 Lys Ala Ile Gly Cys Thr Val Val Asn Ile Gly Thr Gln Asp Phe Ile
 210 215 220
 Glu Gly Arg Arg His Leu Val Leu Gly Val Ile Ser Gln Ile Ile Lys
 225 230 235 240
 Ile Gln Leu Leu Ala Asp Leu Asn Leu Lys Lys Thr Pro Gln Leu Leu
 245 250 255
 Glu Leu Val Glu Asp Ser Lys Asp Met Glu Glu Leu Met Gly Leu Ala
 260 265 270
 Pro Glu Lys Ile Leu Leu Arg Trp Met Asn Phe His Leu Lys Lys Thr
 275 280 285
 Ser Tyr Lys Lys Thr Val Thr Asn Phe Ser Ser Asp Val Lys Asp Gly
 290 295 300
 Leu Ala Tyr Ala His Leu Leu Asn Val Leu Ala Pro Glu His Gly Asn
 305 310 315 320
 Pro Ser Ile Phe Thr Leu Lys Asp Phe Leu Glu Arg Ala Arg Leu Ile
 325 330 335
 Leu Gln His Ala Asp Arg Met Gly Cys Lys Arg Tyr Leu Thr Ala Lys
 340 345 350
 Asp Ile Val Glu Gly Ser Pro Asn Leu Asn Leu Ala Phe Val Ala His
 355 360 365
 Val Phe Gln His Arg Asn Gly Leu Lys Ser Gln Thr Lys Glu Ile Ser
 370 375 380
 Phe Ile Glu Thr Ser Pro Asp Glu Ser Gln Ile Ser Arg Glu Glu Lys
 385 390 395 400
 Ala Phe Arg Leu Trp Ile Asn Ser Leu Gly Asn Ser Thr Tyr Ile Asp
 405 410 415

pctca2017050779-seql.txt

Asn Val Phe Glu Asp Val Arg Asn Gly Trp Val Leu Leu Glu Ala Leu
420 425 430

Asp Lys Val Ser Pro Gly Ile Val Asn Trp Lys Ile Ala Ser Lys Pro
435 440 445

Pro Ile Lys Met Pro Phe Arg Lys Val Glu Asn Cys Asn Gln Val Val
450 455 460

Lys Ile Gly Lys Gln Leu Lys Phe Ser Leu Val Asn Val Ala Gly Asn
465 470 475 480

Asp Ile Val Gln Gly Asn Lys Lys Leu Ile Leu Ala Phe Leu Trp Gln
485 490 495

Leu Met Arg Cys Asn Ile Ile Gln Leu Leu Lys Asn Leu Arg Ser His
500 505 510

Ser His Asp Lys Glu Ile Thr Asp Ala Asp Ile Leu Asn Trp Ala Asn
515 520 525

Val Lys Val Lys Asn Ala Gly Lys Thr Ser Gln Met Lys Ser Phe Lys
530 535 540

Val
545

<210> 595
<211> 126
<212> PRT
<213> Papaver somniferum

<400> 595

Met Asp Leu Asn Arg Cys Cys Pro Lys Asn Asp Ser Pro Leu Pro Asn
1 5 10 15

Ile Asp Met Leu Val Asp Ala Thr Ser Gly His Gly Met Phe Ser Ser
20 25 30

Met Asp Gly Cys Ser Gly Tyr Asn Gln Ile Arg Met Tyr Glu His Asp
35 40 45

Ala Thr Leu Tyr Asp Gly Asn Leu Pro Leu Glu Pro Ile Pro Gln Gly
50 55 60

Ser Ser Leu Lys Lys Ile Thr Met Pro Thr Arg Tyr Val Glu Lys Asp
65 70 75 80

pctca2017050779-seql.txt

Pro Cys Glu Ser Leu Tyr Gln Thr Met Val His Val Tyr Arg Ala Ile
85 90 95

Leu Glu Asn Leu Arg Phe Trp Leu Ser Ser Gly Ala Val Glu Arg Ser
100 105 110

Ser Ala Thr Ala Ser Ala Leu Leu Pro Val Ser Leu Lys Gln
115 120 125

<210> 596
<211> 108
<212> PRT
<213> Papaver somniferum

<400> 596

Met Gln Asp Asp Val Ala Lys Leu Val Arg Gly Cys Lys Leu Cys Ser
1 5 10 15

Thr Ser Lys Pro Ser Asn Arg Lys Cys Gly Leu Tyr Leu Pro Leu Pro
20 25 30

Val Pro Ser Arg Pro Trp Glu Ser Ile Ser Met Asp Phe Leu Gly Gly
35 40 45

Leu Pro Asn Thr Lys Ser Gly Tyr Asp Tyr Leu Phe Val Val Val Asp
50 55 60

Arg Phe Ser Lys Met Ile Ala Leu Ile Pro Cys Thr Lys Thr Val Thr
65 70 75 80

Gly Ala Gly Ala Thr Lys Leu Phe Phe Glu His Val Arg Lys His Phe
85 90 95

Gly Leu Arg Thr Ser Ile Ile Ser Asp Arg Asp Ser
100 105

<210> 597
<211> 111
<212> PRT
<213> Papaver somniferum

<400> 597

Met Tyr Ala Asp Arg Val Val Ala Glu Thr Asn Lys Arg Ser Val Lys
1 5 10 15

Glu Arg Leu Asn Gly Asp Ser Asp Glu Glu Tyr Gly Arg Gly Arg Thr
20 25 30

pctca2017050779-seq1.txt

Ser Phe Ser Lys Arg Gln Arg Gln Asn Asp Asn Lys Trp Lys His Asp
35 40 45

Leu Tyr Asp Asp Glu Asp Lys Pro Arg Val Ser Thr Arg Arg Val Ala
50 55 60

Ala Asn Asp Leu Arg Leu Lys Leu Gln Lys Lys Gly Leu Lys Lys Thr
65 70 75 80

Tyr Gln Lys Gly Lys Gly Ser Leu Ala Gly Gly Val Gln Asp Leu Trp
85 90 95

Val Lys Leu Ser Val Gly Leu Ser Lys Leu His Ser Thr Ser Phe
100 105 110

<210> 598

<211> 471

<212> PRT

<213> Papaver somniferum

<400> 598

Met Leu Lys Ser Ser Leu Ala Pro Ile Leu Ser Ile Ile Pro Met Lys
1 5 10 15

Pro Pro Lys Tyr Pro Val Ala Cys Leu Ser Leu Phe Arg Pro Ser Ala
20 25 30

Val Arg Asp Asn Val Ser Ala Asn Ala Val Glu Pro Pro Pro Gln Ser
35 40 45

Tyr Pro Thr Ser Ala Tyr Ile His Leu Pro Phe Cys Arg Lys Arg Cys
50 55 60

His Tyr Cys Asp Phe Pro Ile Val Ala Leu Gly Ser Ser Ser Ala Asn
65 70 75 80

Leu Pro Asp Asp Ile Asp Asp Pro Arg Ile Leu Asn Tyr Val Gln Leu
85 90 95

Leu Cys Arg Glu Ile Glu Ala Thr Lys Val Leu Lys Ser Asp Asn His
100 105 110

Ser Pro Leu Lys Thr Val Phe Phe Gly Gly Gly Thr Pro Ser Leu Val
115 120 125

Pro Pro Arg Leu Val Ser Lys Ile Leu Glu Thr Leu Asn Ser Lys Phe
130 135 140

pctca2017050779-seql.txt

Gly Val Asn Ser Asn Ala Glu Ile Ser Ile Glu Met Asp Pro Gly Thr
 145 150 155 160
 Phe Asp Ala Gln Lys Leu Ser Asp Leu Leu Asn Leu Gly Val Asn Arg
 165 170 175
 Val Ser Leu Gly Val Gln Ala Phe Gln Glu Glu Leu Leu Lys Ala Cys
 180 185 190
 Gly Arg Ala His Ser Leu Lys Gln Val Tyr Glu Ala Ile Glu Ile Ile
 195 200 205
 Gly Ser Cys Gly Ala Ser Asn Trp Ser Leu Asp Leu Ile Ser Ser Leu
 210 215 220
 Pro His Gln Thr Ser Glu Met Trp Lys Glu Ser Leu Glu Arg Ala Ile
 225 230 235 240
 Lys Ala Glu Pro Thr His Val Ser Val Tyr Asp Leu Gln Val Glu Lys
 245 250 255
 Gly Thr Lys Phe Gly Leu Leu Tyr Lys Pro Gly Glu Phe Pro Leu Pro
 260 265 270
 Asp Asp Thr Leu Ser Ala Glu Phe Tyr Lys Met Ala Ser Lys Thr Leu
 275 280 285
 Cys Asn Thr Gly Tyr Asn His Tyr Glu Ile Ser Ser Tyr Cys Lys Lys
 290 295 300
 Gly Tyr Glu Cys Gln His Asn Leu Thr Tyr Trp Lys Asn Gly Tyr Tyr
 305 310 315 320
 Tyr Ala Phe Gly Leu Gly Ser Ala Ser His Leu Asp Gly Val Arg Phe
 325 330 335
 Ser Arg Pro Arg Lys Met Lys Glu Tyr Thr Ser Tyr Val Gln Asn Leu
 340 345 350
 Glu Asp Gly Ala Leu Ile Gln His Glu Asn Gly Gln Lys Asp Ala Lys
 355 360 365
 Asp Leu Glu Met Asp Val Val Met Leu Ser Leu Arg Thr Ser Lys Gly
 370 375 380
 Leu Asp Leu Thr Ser Phe Arg Glu Cys Phe Gly Ser Gly Leu Val Leu
 385 390 395 400

pctca2017050779-seql.txt

Ser Leu Cys Lys Thr Phe Arg Pro Tyr Ile Glu Ser Gly His Val Leu
405 410 415

Leu Leu Asp Asp Lys Arg Arg Val Leu Val Ala Glu Glu Phe Trp Ser
420 425 430

Val Leu Ser Asn Glu Ser Lys Ile Glu Glu Glu Val Ala Phe Ile Arg
435 440 445

Leu Ser Asp Pro Asp Gly Phe Leu Leu Ser Asn Glu Leu Ile Ser Ile
450 455 460

Ala Phe Gly Cys Ile Ser Pro
465 470

<210> 599

<211> 181

<212> PRT

<213> Papaver somniferum

<400> 599

Met Asp Gln Pro Ala Val Glu Asn Tyr Ala Asn Pro Lys Thr Cys Phe
1 5 10 15

Phe His Val Leu Phe Lys Ala Gly Ala Leu Ala Phe Tyr Ile Leu Ser
20 25 30

Ala Leu Phe Phe Asn Ser Phe Val Ile Ile Phe Val Val Thr Val Leu
35 40 45

Leu Ala Ala Leu Asp Phe Trp Val Val Lys Asn Val Ser Gly Arg Ile
50 55 60

Leu Val Gly Leu Arg Trp Trp Asn Glu Ile Asn Asp Leu Gly Glu Ser
65 70 75 80

Val Trp Lys Phe Glu Cys Leu Asp Gln Glu Ser Leu Ser Arg Met Asn
85 90 95

Lys Lys Asp Ser Trp Leu Phe Trp Trp Thr Leu Tyr Leu Thr Ala Val
100 105 110

Ala Trp Ile Phe Leu Gly Ile Phe Ser Val Ile Arg Phe Gln Pro Asp
115 120 125

Tyr Val Leu Val Val Gly Val Cys Leu Thr Leu Ser Ile Ala Asn Ile
130 135 140

pctca2017050779-seql.txt

Val Gly Phe Thr Lys Cys Arg Lys Asp Ala Lys Lys Gln Ile Gln Ala
145 150 155 160

Phe Ala Ser Gln Thr Ile Ala Asn Arg Phe Ser Ser Thr Ile Gln Ser
165 170 175

Ala Phe Ser Val Val
180

<210> 600
<211> 436
<212> PRT
<213> Papaver somniferum

<400> 600

Met Leu Leu Gln Leu Gly Ser Ile Pro Thr Leu Val Ile Thr Ser Ala
1 5 10 15

Glu Ala Ala Glu Gln Val Leu Lys Thr His Asp Leu Asp Phe Cys Asn
20 25 30

Arg Pro Pro Leu Ala Gly Pro Lys Arg Leu Thr Tyr Asn Tyr Leu Asp
35 40 45

Ile Ile Phe Cys Pro Tyr Ser Glu Tyr Trp Ile Glu Met Arg Lys Ile
50 55 60

Cys Ala Leu Gln Leu Phe Ser Val Lys Arg Val Gln Ser Phe Ala Val
65 70 75 80

Ile Arg Glu Glu Glu Val Ser Val Ile Met Asp Ser Ile Ser Asn Ala
85 90 95

Thr Asp Pro Ile Asp Ile Tyr Lys Leu Leu Ile Ser Leu Ile Asp Lys
100 105 110

Ile Leu Ser Arg Val Val Phe Gly Lys Thr Phe Gln Ser Arg Asp Gln
115 120 125

Ser Ser Asp Gly Thr Leu Gln Asp Ile Leu Leu Glu Thr Met Ala Ile
130 135 140

Ile Ser Gly Phe Ser Ala Ser Asp Tyr Phe Pro Thr Val Gly Trp Ile
145 150 155 160

Phe Asp Arg Ile Thr Gly Phe His Arg Ser Ile Glu Lys Cys Phe His
165 170 175

pctca2017050779-seql.txt

Glu Phe Asp Asp Phe Phe Gln Gln Ile Met Asp Met His Leu Asn Pro
 180 185 190
 Glu Arg Gln Lys Ser Ser His Glu Asp Leu Ile Asp Val Leu Leu Lys
 195 200 205
 Ile Lys Gln Asp Gly Ser Ser Thr Val Arg Leu Thr Asn Asp His Ile
 210 215 220
 Lys Ala Ile Leu Trp Asp Val Leu Ile Gly Gly Ile Asp Thr Ser Ala
 225 230 235 240
 Val Thr Met Ser Trp Ala Met Thr Glu Leu Met Lys Asn Pro Glu Ala
 245 250 255
 Met Lys Lys Val Gln Glu Glu Ile Arg Ser His Asp Leu Gly Val Lys
 260 265 270
 Arg Met Val Gln Glu Ser Asp Leu Asp His Phe Leu Tyr Leu Lys Met
 275 280 285
 Val Val Lys Glu Thr Leu Arg Leu His Pro Pro Ala Ala Leu Leu Ile
 290 295 300
 Pro Arg Glu Asn Thr Lys His His Val Ile Gln Gly Tyr Asp Val Tyr
 305 310 315 320
 Pro Asn Thr Arg Ile Leu Ile Asn Ala Trp Ala Ile Met Arg Asn Pro
 325 330 335
 Lys Tyr Trp Asp Lys Pro Asp Glu Phe Ile Pro Glu Arg Phe Glu Asn
 340 345 350
 Arg Tyr Ala Asp Tyr Thr Gly Gly Gln Asn Phe Asp Phe Ile Pro Phe
 355 360 365
 Gly Gly Gly Arg Arg Ser Cys Pro Gly Met Asn Met Ala Leu Ile Ser
 370 375 380
 Ile Glu Leu Ile Leu Ala Asn Leu Leu Tyr Cys Phe Asn Trp Glu Leu
 385 390 395 400
 Pro Asn Gly Met Lys Lys Glu Asp Ile Asn Met Glu Glu Ser Ser Gly
 405 410 415
 Leu Ser Val His Lys Lys Tyr Pro Leu Glu Leu Ile Leu Thr Lys Tyr
 420 425 430

pctca2017050779-seql.txt

Leu Val Lys Val
435

<210> 601
<211> 136
<212> PRT
<213> Papaver somniferum

<400> 601

Met Ala Phe Ala Ala Arg Ile Gly Ser Leu Leu Lys Gln Ser Ile Ser
1 5 10 15

Gln Asn Ile Ile Ala Ser Asn Gly His Gly Ser Leu Pro Ser Met Tyr
20 25 30

Asn Ser Leu Arg Cys Met Ser Gly Gly Ser Asn Leu Phe Val Gly Ser
35 40 45

Leu Ser Tyr Ser Thr Asp Asp Tyr Ser Leu Lys Glu Ala Phe Ser Thr
50 55 60

Phe Gly Glu Val Leu Glu Ala Lys Val Ile Thr Asp Arg Glu Asn Gly
65 70 75 80

Lys Ser Arg Gly Phe Gly Phe Val Asn Tyr Ser Ser Glu Glu Ser Ala
85 90 95

Ser Ala Ala Ile Thr Gly Met Asp Gly Lys Glu Leu Ala Gly Arg Ile
100 105 110

Ile His Val Ser Tyr Ala Asn Gln Arg Pro Pro Arg Gly Gly Gly Gly
115 120 125

Tyr Gly Gly Gly Gly Gly Ser Trp
130 135

<210> 602
<211> 183
<212> PRT
<213> Papaver somniferum

<400> 602

Met Gln Ile Ser Arg Cys Ile Gly Asp Leu Tyr Leu Lys Asp Asn Lys
1 5 10 15

Tyr Asn Thr Glu Gln Ile Leu Gly Lys Phe Arg Leu Leu Glu Pro Met
20 25 30

pctca2017050779-seql.txt

Leu Lys Pro Val Leu Ser Ala Asp Pro Ala Val Met Ser Phe Pro Leu
35 40 45

Gln Pro Asn Asp Leu Phe Leu Ile Phe Ala Ser Asp Gly Leu Trp Glu
50 55 60

His Leu Ser Asn Glu Gln Ala Val Glu Ile Val His Arg Asn Pro Arg
65 70 75 80

Ala Gly Ser Ala Arg Ile Leu Leu Lys Ala Ala Leu Gln Glu Val Ala
85 90 95

Arg Lys Arg Glu Met Arg Tyr Glu Asp Leu Arg Arg Ile Asp Lys Lys
100 105 110

Phe Pro Thr Gly Phe Gln Arg Ala Ser Asn Cys Ile Gln Val Ser Ala
115 120 125

Gly Ser Gln Lys Ala Arg Val Gln Asp Lys Glu Asp Ile Cys Arg Ile
130 135 140

Glu Glu Asn Gly Met Arg Asp Tyr His Asp Asp Ile Cys Arg Thr Lys
145 150 155 160

Lys Ile Ser Thr Gly Val Ala Ala Ile Glu Leu Ser Ser Gly Arg Asn
165 170 175

Ala Asn Met Glu Glu Val Arg
180

<210> 603
<211> 434
<212> PRT
<213> Papaver somniferum

<400> 603

Met Glu Asp Glu Tyr Ala Lys Phe Ile Arg Arg Met Asn Pro Pro Arg
1 5 10 15

Val Val Ile Asp Asn Asp Ala Cys Glu Glu Ala Thr Leu Ile Gln Val
20 25 30

Asp Ser Met Lys Lys His Gly Ile Leu Leu Glu Val Val Gln Val Leu
35 40 45

Thr Asp Leu Asn Leu Leu Ile Thr Lys Ala Tyr Ile Ser Ser Asp Gly
50 55 60

pctca2017050779-seql.txt

Gly Trp Phe Met Asp Val Phe Asn Val Thr Asp Gln Asp Gly Asn Lys
 65 70 75 80
 Leu Lys Asp Glu Gly Val Ile Asn Tyr Ile Lys Met Thr Leu Glu Ala
 85 90 95
 Asn Asp Cys Phe Leu Pro Ser Leu Arg Asp Thr Val Gly Val Met Pro
 100 105 110
 Ser Glu Asp His Thr Ser Ile Glu Leu Thr Gly Thr Asp Arg Pro Gly
 115 120 125
 Leu Leu Ser Glu Ile Cys Ser Val Leu Ala Asp Leu Arg Cys Asn Val
 130 135 140
 Val Asn Ala Glu Ile Trp Thr His Asn Ala Arg Ala Ala Ala Val Val
 145 150 155 160
 His Val Thr Asp Gln Tyr Thr Gly Cys Ala Ile Glu Asp Ala Lys Gln
 165 170 175
 Leu Ser Thr Ile Lys Glu Leu Leu Cys Tyr Val Leu Lys Gly Asn Asn
 180 185 190
 Asp Ile Arg Thr Ala Lys Met Met Val Ala Ala Pro Gly Val Thr His
 195 200 205
 Arg Glu Arg Arg Leu His Gln Met Met Phe Asp Asp Arg Asp Tyr Asp
 210 215 220
 Lys Gly Asn Met Val Arg Met Arg Arg Ala Asp Asp Gln Asp Asn Lys
 225 230 235 240
 Leu Ser Pro Glu Val Thr Leu Leu Asp Cys Val Ala Lys Asp Tyr Thr
 245 250 255
 Val Val Thr Met Arg Ser Lys Asp Arg Pro Lys Leu Leu Phe Asp Thr
 260 265 270
 Leu Cys Thr Leu Thr Asp Met Gln Tyr Val Val Phe His Gly Thr Val
 275 280 285
 Lys Thr Ser Arg Met Glu Ala His Gln Glu Tyr Tyr Ile Arg His Ile
 290 295 300
 Asp Gly Leu Pro Ile Ser Ser Glu Ala Glu Arg Gln Arg Val Ser Gln
 305 310 315 320

pctca2017050779-seql.txt

Cys Leu Glu Ala Ala Ile Glu Arg Arg Val Ser Glu Gly Leu Glu Leu
325 330 335

Glu Leu Cys Thr Glu Asp Arg Val Gly Leu Leu Ser Asp Ile Thr Arg
340 345 350

Ile Phe Arg Glu Asn Ser Leu Cys Ile Lys Arg Ala Glu Ile Ser Thr
355 360 365

Lys Gly Gly Lys Ala Lys Asp Thr Phe Phe Val Thr Asp Val Ser Gly
370 375 380

Asn Ala Val Asp Pro Lys Leu Val Asp Ser Ile Cys His Gln Ile Gly
385 390 395 400

Val Thr Val Leu Arg Val Lys Arg Asn Ser Thr Leu Cys Pro Lys Ser
405 410 415

Pro Pro Glu Thr Thr Gly Ile Ser Leu Lys Leu Ala Arg Phe Lys Ile
420 425 430

Ser Gly

<210> 604
<211> 212
<212> PRT
<213> Papaver somniferum

<400> 604

Met Gly Ser Thr Gly Leu Ser His Gly Gly Ile Gly Ser Ser Arg Thr
1 5 10 15

Thr Thr Ser Phe Lys Ser Ser Ser Ser Ser Val Asp Trp Leu Gly Arg
20 25 30

Glu Met Leu Asp Met Asn Ile Arg Asp Lys Thr Leu Glu Glu Asp Asp
35 40 45

Asp Lys Asp Ser Glu Pro Glu Val Ile Asp Ser Val Gly Ala Glu Ala
50 55 60

Gly His Val Ile Ala Thr Thr Val Gly Gly Arg Asn Gly Gln Ser Arg
65 70 75 80

Gln Asn Ile Ser Tyr Ile Ala Glu His Val Val Gly Thr Gly Ser Phe
85 90 95

pctca2017050779-seql.txt

Gly Val Val Phe Gln Ala Lys Cys Arg Glu Thr Gly Glu Ile Val Ala
100 105 110

Ile Lys Lys Val Leu Gln Asp Lys Arg Tyr Lys Asn Arg Glu Leu Gln
115 120 125

Ile Met Gln Met Leu Asp His Pro Asn Ile Val Ala Leu Lys His Asn
130 135 140

Phe Phe Ser Ile Thr Gly Lys Glu Glu Pro Tyr Leu Asn Ile Val Leu
145 150 155 160

Glu Phe Val Pro Asn Thr Val Tyr Gly Val Ala Lys His Tyr Ser Arg
165 170 175

Val Asn Gln Arg Met Pro Leu Ile Tyr Val Asn Leu His Thr Tyr Gln
180 185 190

Val Cys Glu Val Leu Asp Ile Phe Ser Met Tyr Phe Leu Thr Trp Ser
195 200 205

Arg Ser Trp Val
210

<210> 605
<211> 457
<212> PRT
<213> Papaver somniferum

<400> 605

Met Asn Lys Leu Asn Phe Lys Gln Ala Gln Gln Lys Leu Gly Phe Thr
1 5 10 15

Ile Asn Gly Ile Lys Lys Ser Asp Pro Lys Ala Thr Ser Glu Gly Thr
20 25 30

Arg Lys Pro Leu Lys Arg Asn Cys Lys Pro Ile Ile Phe Arg Gln Val
35 40 45

His Gln Pro Glu Pro Gly Ile Ser Ile Thr Pro Asn Lys Lys Leu Asp
50 55 60

Pro Lys Ala Thr Ser Glu Ser Thr Ser Lys Pro Leu Lys Arg Cys Leu
65 70 75 80

Lys Glu Ile Thr Ser Ser Thr Ala Pro Pro Pro Ala Ala Lys Glu Gln
85 90 95

pctca2017050779-seql.txt

Lys Leu Asp Gly Ile Cys Arg Val Ser Tyr Ala Glu Thr Ser Phe Ser
 100 105 110
 Ser Asp Ser Asp Asn Val Asp Asp Lys Glu Glu Glu Glu Glu Leu Ala
 115 120 125
 Lys Lys Arg Lys Glu Lys Glu Glu Glu Leu Thr Arg Lys Arg Lys Lys
 130 135 140
 Glu Glu Glu Leu Ala Lys Lys Arg Lys Glu Glu Lys Glu Trp Val Thr
 145 150 155 160
 Val Tyr Gly Phe Asn Pro Arg Asp Ala Asp Leu Val Leu Arg Glu Leu
 165 170 175
 Arg Ser Cys Gly Val Ile Leu Lys His Val Arg Asp Leu Asp Asp Gly
 180 185 190
 Asn Trp Met His Ile Leu Phe Lys Arg Arg Ser Asp Ala Gln Lys Ala
 195 200 205
 Leu Gly Lys Ser Trp Met Lys Ile Asn Gly Gly Leu Ile Val Gly Val
 210 215 220
 Lys Pro Leu Asp Pro Val Asp Lys His Lys Leu Asn Glu Asp Asp Leu
 225 230 235 240
 Asn Lys Gln Asp Asp Leu Asp Leu Arg Leu Leu His Arg Ser Ala Ala
 245 250 255
 Tyr Phe Phe Ile Leu Gly Ser Thr Gly Asn Val Tyr Thr Val Arg Leu
 260 265 270
 Ser Arg Ile Pro Thr Cys Asn Cys Pro Asp Ser Ala Phe Pro Cys Lys
 275 280 285
 His Ile Leu Phe Val Tyr Thr Arg Val Leu Asn Leu Pro Tyr Arg Gly
 290 295 300
 Gly Asp Cys Thr Ala Ser Leu Leu Thr Ala Val Ile Asn Thr Lys Ala
 305 310 315 320
 Ser Ala Pro Glu Thr Leu Ala Ser Ala Arg Leu Arg Asn Arg Phe His
 325 330 335
 His Leu Phe Leu Met Ser Lys Val Gly Pro Gln Val Gly Pro Ser Pro

340

Pro Met Val Lys Leu Gly Asp Asp Ala Thr Cys Ser Phe Asp Gly Cys
 355 360 365

Ile Val Pro Phe Met Val Asn Gly Asn Gln Ser Asp Ser Glu Ala Thr
 370 375 380

Glu Asp Glu Asp Ala Asp Glu Asp Asn Gln Asp Trp Gly Ile Val Gln
 385 390 400

Cys Gly Thr Cys Arg Thr Val Gly His Lys Glu Cys Leu Ala Phe Ser
 405 410 415

Ser Thr Phe Arg Gly Leu Lys Val Leu Thr Cys Met Ile Cys Glu Lys
 420 425 430

Glu Cys Trp Met Gly Arg Ser Val Leu Asp Ser Tyr Pro Asn Leu Thr
 435 440 445

Ala Asn Leu Ser Asp Asp Glu Gly Asp
 450 455

<210> 606
 <211> 318
 <212> PRT
 <213> Papaver somniferum

<400> 606

Met Ala Gln Leu Leu Ser Pro Val Cys Thr Asp Leu Leu Lys Phe Gln
 1 5 10 15

Asn Pro Asn Asn Gln Phe Phe Ser Ser Ile Lys Pro Trp Arg Met Leu
 20 25 30

Thr Lys Ile Asn Ser Asn His Leu Ile Thr Thr Phe Ser Gly Ser Lys
 35 40 45

Arg Arg Asp Ser Arg Ile Arg Ala Val Ala Glu Glu Ser Phe Ser Ser
 50 55 60

Asp Ala Ile Ala Asp Asp Tyr Tyr Ala Val Leu Gly Leu Leu Pro Asp
 65 70 75 80

Ala Thr Pro Glu Gln Ile Lys Lys Ala Tyr Tyr Thr Cys Met Lys Ala
 85 90 95

Cys His Pro Asp Leu Ser Gly Asn Asp Pro Glu Thr Thr Asn Phe Cys

pctca2017050779-seql.txt

100

105

110

Met Phe Ile Asn Glu Val Tyr Thr Val Leu Ser Asp Pro Val Gln Arg
 115 120 125

Met Val Tyr Asp Glu Ile His Gly Tyr Ala Leu Ser Ala Val Asn Pro
 130 135 140

Phe Leu Asp Asp Thr Ser Val Lys Asp His Ala Phe Val Asp Glu Phe
 145 150 155 160

Ser Cys Ile Gly Cys Lys Asn Cys Ala Asn Val Ala Pro Asp Val Phe
 165 170 175

Asn Ile Glu Glu Glu Phe Gly Arg Ala Arg Val Cys Asn Gln Ser Gly
 180 185 190

Asn Ile Asp Leu Val Asn Gln Ala Ile Glu Ser Cys Pro Val Asp Cys
 195 200 205

Ile His Trp Thr Ser Ala Ala Gln Val Ser Leu Leu Glu Asp Glu Met
 210 215 220

Arg Leu Val Glu Arg Val Thr Val Ala Leu Met Leu Ala Gly Met Gly
 225 230 235 240

Thr Ser Ser Asp Val Phe Arg Met Ala Asn Asn Arg Trp Glu Lys Arg
 245 250 255

Gln Ser Lys Val Leu Glu Lys Ala Arg Ile Arg Met Met Gln Gln Lys
 260 265 270

Asp Ala Asn Lys Ser Glu Thr Tyr Trp Asn Asp Leu Trp Gly Lys Pro
 275 280 285

Ala Thr Tyr Glu Thr Ser Gly Ile Lys Asn Lys Thr His Gln Ile Leu
 290 295 300

Phe Phe Glu Val Phe Ser Leu Pro Ser Phe Ile Ser Phe Thr
 305 310 315

<210> 607

<211> 146

<212> PRT

<213> Papaver somniferum

<400> 607

Met Val Asn Lys Asp Ile Ser Glu Trp Asn Glu His Leu Arg Lys Asn

pctca2017050779-seql.txt

```

1           5           10           15
Thr Ser Gly Asp Leu His Ala Cys Arg Val Arg Glu Pro Ser Arg Trp
      20      25      30
Asn Pro Leu His Cys Asp Phe Ile Lys Ile Asn Phe Asp Ala Ala Phe
      35      40      45
Gln Lys Glu Asn Lys Thr Met Gly Ser Gly Leu Ile Leu Ile Asp Asp
      50      55      60
Ala Gly Ile Phe Tyr Gly Ala Trp Cys Ile Leu Gly Val Ala Glu Asn
      65      70      75      80
Glu Glu His Ala Glu Ala Ile Ala Ser Trp Glu Ala Ile Lys Trp Ala
      85      90      95
Lys Arg Asn Asn Ser Gln Lys Leu His Met Glu Gly Asp Cys Leu Asn
      100      105      110
Val Val Leu Ala Ile Asn Ser Asn Leu Gly Ser Val Arg Trp Thr Asn
      115      120      125
Asn Pro Ile Ile Met Asp Cys Lys Glu Met Leu Gly Ser Phe Ser Ser
      130      135      140
Leu Val
145

```

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<210> 608
<211> 306
<212> PRT
<213> Papaver somniferum
<400> 608

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```

Met Glu Glu Thr Ile Ser Thr Thr Ala Glu Lys Arg Cys Ala Val Val
1      5      10      15
Thr Gly Ala Asn Lys Gly Ile Gly Leu Glu Ile Cys Arg Gln Leu Ala
      20      25      30
Ile Asn Gly Ile Thr Val Ile Leu Thr Ala Arg Asp Glu Thr Arg Gly
      35      40      45
Thr Arg Ser Val Glu Ala Leu Lys Gly Ser Gly Leu Ala Gly Val Ile
      50      55      60
Phe His Gln Leu Asp Val Asn Asp Ala Thr Ser Val Thr Ser Leu Ala

```

pctca2017050779-seql.txt

```

65          70          75          80
Gly Phe Ile Arg Thr Arg Tyr Gly Lys Leu Asp Ile Leu Val Asn Asn
      85          90          95
Ala Gly Asp Asn Gly Val Arg Leu Gln Ile Ser Glu Glu Ala Met Lys
      100         105         110
Asp Met Asn Phe Arg Tyr Gly Asp Glu Asn Asp Glu Ile Ala Lys Leu
      115         120         125
Leu Glu Glu Ser Ile Glu Glu Thr Tyr Glu Arg Val Lys Gln Ser Ile
      130         135         140
Glu Thr Asn Tyr Tyr Gly Thr Ile Arg Ile Thr Glu Ala Leu Leu Pro
      145         150         155         160
Leu Leu Gln Leu Ser Asn Ser Ala Arg Ile Val Asn Val Ser Ser Val
      165         170         175
Tyr Gly Gln Leu Lys Phe Ile Ser Ser Glu Thr Ile Lys Glu Glu Leu
      180         185         190
Arg Asn Val Asp Cys Leu Thr Val Glu Lys Leu Asp Glu Leu Met Gln
      195         200         205
Lys Phe Leu Lys Asp Phe Lys Asp Gly Met Leu Glu Thr Asn Gly Trp
      210         215         220
Pro Val Leu Val Ser Ala Tyr Lys Val Ser Lys Ala Ala Ile Asn Ala
      225         230         235         240
Tyr Thr Arg Ile Leu Ala Arg Lys Phe Pro Thr Phe Arg Val Asn Ala
      245         250         255
Val His Pro Gly Leu Val Lys Thr Asp Ile Ala Phe Gln Gln Gly Asn
      260         265         270
Leu Thr Pro Asp Glu Gly Ala Lys Ala Pro Val Met Val Ala Leu Leu
      275         280         285
Pro Ser Asp Gly Pro Ser Gly Phe Tyr Phe Asp Gln Met Glu Ile Ser
      290         295         300
Thr Phe
      305

```

pctca2017050779-seql.txt

<210> 609
 <211> 108
 <212> PRT
 <213> Papaver somniferum

<400> 609

Met Asn Leu Met Asn Cys Lys Ser Pro Asp Ile Ala Tyr Ile Val Ser
 1 5 10 15

Lys Leu Ser Gly Tyr Asn Cys Ser Pro Glu Gln Glu Asn Ser Asp Ala
 20 25 30

Leu Ser Arg Val Leu Trp Tyr Leu Lys Tyr Cys Ile Thr Phe Cys Phe
 35 40 45

Ile Tyr Glu Arg Tyr Leu Val Val Leu Glu Gly Leu Cys Asp Ala Asn
 50 55 60

Trp Ile Val Asp Ser Glu Glu Ser Lys Ser Thr Ser Gly Tyr Val Phe
 65 70 75 80

Thr Leu Ala Arg Gly Phe Val Ser Gly Ser Phe Ser Asp Lys His Ile
 85 90 95

Leu Leu Asn Ser Leu Trp Asn Leu Arg Val Leu Arg
 100 105

<210> 610
 <211> 265
 <212> PRT
 <213> Papaver somniferum

<400> 610

Met Gly Glu Trp Glu Asn Met Lys Pro Ser Asp Gln Thr Ser Gln Leu
 1 5 10 15

Val Phe Lys Pro Leu Met Ile Ser Met Val Gly Ile Ala Phe Thr Ala
 20 25 30

Leu Ala Ile Val Thr Tyr Gln Phe Ile Ile Thr Lys Tyr Cys Val Arg
 35 40 45

Arg Arg Glu Ser Met Ile Glu Arg Asn Glu Leu Arg Ser His Gln Ala
 50 55 60

Met Val Asn Arg Gly Val Asp Glu Asn Val Leu Lys Ala Ile Pro Ile
 65 70 75 80

Ile Thr Tyr His His Gln Gln Gln Gln Gln Ser Arg Asp Glu Glu Glu

Glu Val Phe Cys Val Asp Gln Thr Glu Cys Ser Val Cys Leu Gly Asp
 100 105 110

Leu Gln Glu Gly Asp Met Leu Arg Leu Leu Pro Asn Cys Lys His Val
 115 120 125

Phe His Val Pro Cys Ile Asp Gln Trp Trp Leu Thr His Ser Thr Cys
 130 135 140

Pro Ile Cys Arg Ser Pro Val Thr Gly Arg Asn Asp Asp Ser Val Cys
 145 150 155 160

Leu Gln Ile Gln Ala Glu Gly Asp Glu Glu Gly Leu Val Ser His Gln
 165 170 175

His His Gln Glu Gln Gln Tyr Asn Cys Ser Glu Gly Ser Asn Asn Asn
 180 185 190

Glu Gly Gly Asn Ser Ser Ile Met Val Gly Ser Lys Leu Arg His Cys
 195 200 205

Val Ser Leu Ile Trp Pro Ala Asn Tyr Glu Asp Glu Val Arg Lys Gln
 210 215 220

Gln Ser Lys Thr Val Leu Leu Lys Arg Ser Met Ser Val Asp Cys Ser
 225 230 235 240

Phe Val Cys Ile Lys Ile Gln Pro Arg Thr Asp Ser Ser Ser Ser Ser
 245 250 255

Ser Ser Thr Trp Lys Thr Thr Ser Lys
 260 265

<210> 611

<211> 300

<212> PRT

<213> Papaver somniferum

<400> 611

Met Lys His Ala Pro Val Lys Ile Pro Leu Phe Val Ile Ala Ile Val
 1 5 10 15

Phe Leu Val Phe Ala Phe Val Gly Leu Phe His Asn Asp Glu Asn Ser
 20 25 30

Arg Leu Leu Ser Pro Thr Ser Phe Phe Lys Leu Ser Asn Ser Cys Ser

35

Ser Gln Glu Thr Lys Val Ser His Ser Gly Thr Pro Ala Lys Lys Lys
50 55 60

Thr Arg Ser Asn Leu Thr Ser Lys Gly Ser Ser Lys Val Thr Glu Val
65 70 75 80

Glu Glu Ile Tyr Lys Thr Asp Asn Glu Asp Glu Asp Phe Leu Glu Asn
85 90 95

Lys Cys Asp Ile Thr Lys Gly Lys Trp Val Phe Asn Asn Leu Ser Gln
100 105 110

Pro Leu Tyr Ser Asp Gln Ser Cys Pro Tyr Ile Asp Lys Gln Val Ser
115 120 125

Cys Val Lys Asn Gly Arg Thr Asp Ser Asp Tyr Arg His Trp Glu Trp
130 135 140

Gln Pro Asp Asp Cys Val Leu Pro Arg Phe Asp Pro Lys Ala Val Leu
145 150 155 160

Asn Lys Leu Arg Asn Lys Arg Leu Met Phe Val Gly Asp Ser Leu Gln
165 170 175

Lys Asn Gln Trp Gln Ser Phe Val Cys Gln Val Gln Ser Ile Ile Pro
180 185 190

Ala Glu Gln Lys Ser Met Gln Arg Gly Arg Pro His Ser Ile Phe Thr
195 200 205

Ala Lys Glu Tyr Asn Ser Thr Ile Glu Phe Tyr Trp Ala Pro Phe Leu
210 215 220

Ile Glu Ser Asn Thr Asp Leu Asp Ile Ile Ala Asp Pro Arg Lys Arg
225 230 235 240

Ile Leu Lys Val Asp Ser Val Thr Lys His Ala Gln Tyr Trp Met Gly
245 250 255

Val Asp Ile Leu Val Phe Asn Thr Tyr Ile Trp Trp Met Asn Gly Ile
260 265 270

Lys Ile Lys Ser Leu Trp Gly Ser Ser Gln Thr Glu Thr Thr Gly Leu
275 280 285

pctca2017050779-seql.txt

Lys Ser Trp Met Gln Lys Leu Leu Ile Glu Leu Val
 290 295 300

<210> 612

<211> 271

<212> PRT

<213> Papaver somniferum

<400> 612

Met Ala Val Leu Asn Ile Ile Lys Leu Ile Phe Val Thr Gly Val Ile
 1 5 10 15

Ser Gly Ile Phe Thr Glu Leu Thr Ala Gly Gln Asn Cys Gly Cys Ala
 20 25 30

Ala Asn Glu Cys Cys Ser Glu Phe Gly Phe Cys Gly Pro Ala Gly Asp
 35 40 45

Pro Ala Tyr Cys Gly Ser Gly Cys Arg Glu Gly Pro Cys Thr Pro Pro
 50 55 60

Thr Asp Val Asn Val Ala Asp Ile Val Thr Pro Glu Phe Phe Asn Gly
 65 70 75 80

Ile Leu Asn Gln Gly Asp Cys Pro Gly Lys Asn Phe Tyr Ser Arg Gly
 85 90 95

Ala Phe Leu Asp Ala Leu Ser Ser Tyr Asp Arg Phe Gly Arg Ala Gly
 100 105 110

Thr Gln Asp Asp Ser Lys Arg Glu Ile Ala Ala Phe Phe Ala His Ala
 115 120 125

Ser His Glu Thr Glu Arg Phe Cys Phe Thr Glu Glu Lys Asp Gly Ala
 130 135 140

Thr Lys Asn Tyr Cys Asn Glu Thr Asp Ile Gln Tyr Pro Cys Ala Pro
 145 150 155 160

Gly Lys Leu Tyr Tyr Gly Arg Gly Pro Leu Gln Leu Thr Trp Asn Tyr
 165 170 175

Asn Tyr Gly Pro Ala Gly Gln Glu Asn Asn Phe Asp Gly Leu Asn Asn
 180 185 190

Pro Glu Ile Val Ala Asn Asp Pro Ala Val Ser Phe Arg Thr Ala Leu
 195 200 205

pctca2017050779-seql.txt

Trp Tyr Trp Met Arg Ser Val His Arg Ile Ile Ile Ala Gly Gln Gly
210 215 220

Phe Gly Ala Thr Ile Gln Ala Ile Asn Gly Ala Leu Glu Cys Gly Asn
225 230 235 240

Pro Ala Glu Ser Gly Lys Val Asp Ser Arg Val Asn Tyr Tyr Thr Asn
245 250 255

Tyr Cys Thr Gln Leu Gly Val Ala Pro Gly Asp Asn Leu Arg Cys
260 265 270

<210> 613

<211> 239

<212> PRT

<213> Papaver somniferum

<400> 613

Met Glu Arg Ile Glu Gly Leu Leu Gly Pro Glu Asp Asn Lys Ser Arg
1 5 10 15

Thr Leu Ser Pro Tyr Val Thr Gly Thr Ser Val Leu Gly Ile Lys Tyr
20 25 30

Lys Asp Gly Val Leu Met Ala Ala Asp Met Gly Gly Ser Tyr Gly Ser
35 40 45

Thr Leu Arg Tyr Lys Asn Val Glu Arg Val Lys Pro Val Gly Lys His
50 55 60

Thr Leu Val Gly Ala Ser Gly Glu Ile Ser Asp Phe Gln Glu Ile Met
65 70 75 80

Arg Tyr Leu Asp Glu Leu Ile Leu Tyr Asp Asn Met Trp Asp Asp Asp
85 90 95

Asn Ser Leu Gly Pro Lys Glu Ile His Asn Tyr Leu Thr Arg Val Met
100 105 110

Tyr Asn Arg Arg Asn Lys Phe Asp Pro Leu Trp Asn Ser Leu Val Ile
115 120 125

Gly Gly Val Lys Asn Gly Lys Lys Tyr Leu Gly Thr Val Ser Met Leu
130 135 140

Gly Val His Phe Glu Asp Asp His Ile Ala Thr Gly Phe Gly Asn His
145 150 155 160

pctca2017050779-seql.txt

Leu Ala Arg Pro Ile Leu Arg Ala Glu His Ser Asn Asp Met Ser Phe
165 170 175

Glu Asp Ala Val Lys Leu Leu Glu Lys Cys Met Leu Val Leu Leu Tyr
180 185 190

Arg Asp Arg Ser Ala Ile Asn Lys Leu Gln Ile Ser Asn Ile Thr Glu
195 200 205

Glu Gly Val Thr Ile Ser Gln Pro Tyr Ser Leu Lys Thr Phe Trp Gly
210 215 220

Leu Ser Ala Phe Lys Asp Pro Thr Lys Gly Ala Gln Gly Ser Trp
225 230 235

<210> 614
<211> 182
<212> PRT
<213> Papaver somniferum

<400> 614

Met Ser Thr Thr Gly Thr Val Ser Val Gln Phe His Pro Ile Val Lys
1 5 10 15

Ile Cys Gly Ser Glu Asn Asp Lys Phe Ser Val Ile His Pro Lys Leu
20 25 30

Glu Phe Pro Arg Ser Lys Phe Leu Arg Phe Asn Leu Cys Ser Thr Asp
35 40 45

Ser Thr Arg Lys Gly Cys Ile Gly Arg Val Ser Ala Val Pro Glu Asp
50 55 60

Glu Asp Phe Phe Trp Glu Lys Ala Leu Thr Thr Leu Leu Asp Met Val
65 70 75 80

Glu Thr Pro Thr His Met Lys Asn Leu Ser Ile Lys Glu Leu Lys Gln
85 90 95

Leu Ala Asp Glu Ile Arg Ser Glu Leu Ser Phe Ile Thr Ser Lys Met
100 105 110

Pro Arg Tyr Phe Lys Ala Ile Leu Ala Thr Val Glu Leu Thr Val Val
115 120 125

Leu His His Val Phe Asp Ser Leu Thr Asp Lys Ile Leu Trp Asp Val
130 135 140

pctca2017050779-seql.txt

Val Gln Gln Glu Thr Glu Val Thr Phe Ile Ser Asn Arg His Ala Ser
145 150 155 160

Val Glu Val Asn Ser Met Lys His Pro Thr Leu Asp Asn Leu Ala Arg
165 170 175

Ile His Leu Leu His Leu
180

<210> 615
<211> 84
<212> PRT
<213> Papaver somniferum

<400> 615

Met Ser Thr Gly Met Ile Ser Ser Thr Ser Ile Ile Asn Ile Glu Val
1 5 10 15

Ala Leu Ser Ile Gly Asp Gly Leu Arg Pro Gly Ser Ile Tyr Asp Ala
20 25 30

Asn Asp Thr Ala Gln Phe Ala Glu Leu Leu Thr Gln Glu Glu Leu Pro
35 40 45

Leu Arg Ala Trp Glu Lys Asp Val Gln Val Met Asn Glu Gly Pro Gly
50 55 60

His Ile Pro Leu His Lys Ile Pro Glu Asn Met Glu Asn Lys Ser Thr
65 70 75 80

Arg Gln Lys Ile

<210> 616
<211> 101
<212> PRT
<213> Papaver somniferum

<400> 616

Met Ile Cys Lys Ala Ile Trp Ala Arg Ser Phe Thr Gly Thr Asn Thr
1 5 10 15

Arg Lys Arg Ile Glu Asn Phe Ile Pro Ser Asn Gly Ser His Gln Ile
20 25 30

Ser Cys Ile Arg Ile Thr His His Leu Ser Lys Leu Asn Lys Phe Ser
35 40 45

Ile Arg Val Ile Asn Thr Arg Arg Thr Ser Thr Ser Asn Lys Leu Glu

50

55

60

Lys Lys Glu Val His Ser Arg Ala Ile Ser Leu Ser Ser Ser Asn Ile
 65 70 75 80

Thr Arg Leu Glu Phe Phe Lys Asp Lys Ile Leu Phe Leu His Leu Leu
 85 90 95

Ser Leu Thr Glu Leu
 100

<210> 617

<211> 186

<212> PRT

<213> Papaver somniferum

<400> 617

Met Gly Tyr Phe Asp Ile Pro Val Asp His Val Tyr Gly Gln Pro Val
 1 5 10 15

Val Leu Asp Tyr Leu Ala Ser Lys Asn Ile Cys Ser Asp Asp Leu Val
 20 25 30

Val Val Ser Pro Asp Val Gly Gly Val Ala Arg Ala Arg Ala Phe Ala
 35 40 45

Lys Lys Leu Ser Asp Ala Pro Leu Ala Ile Val Asp Lys Arg Arg His
 50 55 60

Gly His Asn Val Ala Glu Val Met Asn Leu Ile Gly Asp Val Lys Gly
 65 70 75 80

Lys Val Ala Val Met Val Asp Asp Met Ile Asp Thr Ala Gly Thr Ile
 85 90 95

Ser Lys Gly Ala Ala Leu Leu His Gln Glu Gly Ala Arg Glu Val Tyr
 100 105 110

Ala Cys Ser Thr His Ala Val Phe Ser Pro Pro Ala Ile Glu Arg Leu
 115 120 125

Ser Ser Gly Leu Phe Gln Glu Val Ile Ile Thr Asn Thr Ile Pro Val
 130 135 140

Leu Glu Lys Asn Tyr Phe Pro Gln Leu Thr Val Leu Ser Val Ala Asn
 145 150 155 160

Leu Leu Gly Glu Thr Ile Trp Arg Val His Asp Asp Cys Ser Gly Thr

165

170

175

Ser Glu Pro Tyr Ser Ser Leu Gly Ile Asp
 180 185

<210> 618

<211> 790

<212> PRT

<213> Papaver somniferum

<400> 618

Met Thr Ala Gln Pro Val Thr Leu Ala Ala Ile Lys Ala Leu Ile Lys
 1 5 10 15

Ser His Thr Glu Ile Leu Ala Lys Asn Ile Thr Glu Ala Leu Glu Lys
 20 25 30

Ser Met Glu Asp Lys Leu Gly Leu Arg Asp Thr Lys Leu Glu Thr Met
 35 40 45

Gln Asn Gln Ile Leu Lys Val Ala Lys His Ile Asn Leu Asp Leu Glu
 50 55 60

Met Pro Glu Leu Val Asp Leu Glu Gly Lys Asn Lys Glu Asp Ile Leu
 65 70 75 80

Gln Phe Leu Gln Asn Asp Glu Val Pro Glu Asp Val Leu Arg Thr Leu
 85 90 95

Asn Ile Lys Lys Pro Tyr Glu Gly Phe Ile Gly His Ser Lys Lys Lys
 100 105 110

Ile Val Ser Pro Ala Leu Asp Asn Asp Asp Glu Asp Glu Arg Glu Asn
 115 120 125

Asp Leu Glu Lys Asn Trp Thr Glu Glu Arg Arg Leu Lys Thr Gly His
 130 135 140

Asn Pro Tyr Ser Ser Leu Pro Glu Tyr Lys Leu Lys Ala Asn Ile Pro
 145 150 155 160

Asn Phe Ser Gly Asn Phe Arg Ile Glu Glu Leu Thr Asp Arg Phe Phe
 165 170 175

Glu Val Glu Ala Phe Phe Glu Phe Met Glu Val Pro Glu Asp Ser Lys
 180 185 190

Val Lys Leu Val Thr Tyr Lys Leu Lys Gly Gly Ala Ala Ala Trp Trp

195

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Asp Lys Ile Cys Asp Asp Arg Arg Asn Ala Asn Lys Pro Lys Ile Arg
   210                               215   220
Thr Trp Lys Arg Met Lys Thr Leu Ile Arg Tyr Lys Phe Leu Pro Arg
   225                               230   235   240
Asp Phe Met Gln Gln Leu Phe Ile Lys Leu Gln Asn Ile Gln Gln Gly
                               245   250   255
Ala Arg Thr Val Glu Glu Tyr Val Ser Asp Phe Tyr Asn Leu Val Ala
                               260   265   270
Arg Asn Gln Leu Lys Glu Ser Glu Glu Gln Leu Val Ala Arg Phe Ile
                               275   280   285
Glu Gly Leu Asn Arg Leu Ile Gln Asn Gly Met Thr His Ser Val Phe
   290                               295   300
Thr Met Val Glu Val Val Gln Gln Ala Ile Lys Ile Glu Asn Arg Leu
   305                               310   315   320
Ile Arg Ser Ser Arg Ile Tyr Pro Ser Arg Gln Gly Arg Tyr Gln Asn
                               325   330   335
Thr Tyr Arg Gly Thr Asn Ser Ser Gln Asn Phe Ser Pro Asp Thr Val
   340                               345   350
Leu Asn Ile Pro Arg Pro Pro Tyr Asp Asp Val Ser His Ser His Arg
   355                               360   365
Gln Pro Ser His Ile Val Thr Tyr Thr Pro Pro Leu Ala Thr Pro Ile
   370                               375   380
Leu Ala Asn Ser Val Asp Leu Gln Pro Gly Gln Gln Ser His Ser Leu
   385                               390   395   400
Gln Pro Thr Pro Pro Thr Thr Gly Asn Arg Phe His Asn Arg Gln Gln
                               405   410   415
Gln Phe Pro Pro Gln Gln Arg Ala Asn Asn Ala Cys Thr Lys Phe Arg
                               420   425   430
Gly Asp Lys Cys Asn Lys Cys Gln Gln Ser Gly His Thr Ser Ser Asp
   435                               440   445

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pctca2017050779-seql.txt

Cys Arg Lys Phe Asn Ala Leu Ile Gly Glu Pro Gln Phe Ile Asn Glu
 450 455 460
 Val Thr Gly Ala Leu Asn Glu Phe Glu Tyr Glu Asp Ser Pro Gly Asp
 465 470 475 480
 Asp Asp Glu Phe Val Gly Met Ile Arg Pro Leu Phe Leu Thr Gln Gln
 485 490 495
 Cys Lys Ser Gln Arg His Asn Ile Phe Lys Ser Arg Cys Tyr Ile Gly
 500 505 510
 Gly Lys Ile Cys Lys Met Ile Ile Asp Ser Gly Ser Val His Asn Cys
 515 520 525
 Ile Ala Asp His Val Val Lys Lys Leu Glu Leu Pro Val Thr Ser His
 530 535 540
 Pro Glu Pro Tyr Thr Val Gly Trp Val Asn Ala Ser Ser Thr Gln Lys
 545 550 555 560
 Ile Thr Leu Gln Cys Tyr Val Ser Phe Ser Phe Glu Gly Tyr Glu Asp
 565 570 575
 Thr Val Leu Cys Asp Val Ile Asn Met Thr Ala Thr His Leu Leu Leu
 580 585 590
 Gly Arg Pro Trp Gln Tyr Asp Leu Gln Ala Val His Asn Gly Phe Glu
 595 600 605
 Asn Thr Tyr Thr Phe Val His Asn Gly Lys Thr Lys Val Leu Ser Pro
 610 615 620
 Ser Asn Ser Thr Ser Asn Ser Cys Ala Gln Thr Asp Ala Val Val Ala
 625 630 635 640
 Thr Val Ile Arg Ser Leu His Pro Gln His Ser Leu His Ser His Glu
 645 650 655
 Asp Ser Lys Pro Met Ile Glu Phe Pro Pro Leu Arg Asn Ile Gln His
 660 665 670
 Tyr Ile Asp Phe Ile Pro Gly Ala Ser Leu Pro Asn Gln Ala His Tyr
 675 680 685
 Leu Leu Ser Pro Ala Glu His Glu Ile Leu Gln Gly Gln Val Asn Asp
 690 695 700

pctca2017050779-seql.txt

Leu Leu Lys Lys Gly Leu Ile Arg Pro Ser Asn Arg Pro Cys Ala Ser
705 710 715 720

Pro Ala Phe Leu Val Ser Lys Lys Asp Asn Gly Trp Arg Met Cys Ile
725 730 735

Asp Cys Arg Ala Leu Asn Arg Ile Thr Ile Pro Tyr Arg Phe Pro Ile
740 745 750

Pro Arg Ile Asp Asp Met Ile Asp Leu Leu Ser Gly Ser Ile Ile Phe
755 760 765

Thr Lys Leu Asp Leu Arg Ser Gly Tyr His Gln Ile Arg Ile Arg Gly
770 775 780

Gly Asp Glu Trp Lys Thr
785 790

<210> 619
<211> 175
<212> PRT
<213> Papaver somniferum

<400> 619

Ile Pro Lys Phe Arg Val Ser Ala Ser Ser Ser Ser Thr Ala Ser
1 5 10 15

Pro Pro Ile Val Pro Lys Ser Asn Pro Lys Lys Pro Asn Thr Leu Leu
20 25 30

Ser Asp Ser Ile Thr Ser Ile Phe Ala Ile Gly Leu Ser Leu Ser Arg
35 40 45

Ile Phe Gln Gly Val Leu Asn Lys Ala Pro Glu Leu Gly Gly Asn Leu
50 55 60

Val Asn Thr Ala Gly Pro Leu Phe Phe Ala Ala Ile Arg Glu Arg Pro
65 70 75 80

Lys Gly Tyr Leu Asn Thr Pro Leu Thr Val Val Ala Ser Gly Met Ser
85 90 95

Lys Trp Leu Asp Ile Tyr Ser Gly Val Leu Met Val Arg Val Leu Leu
100 105 110

Ser Trp Phe Pro Asn Ile Pro Trp Asp Arg Gln Pro Leu Ser Ala Ile
115 120 125

pctca2017050779-seql.txt

Arg Asp Leu Cys Asp Pro Tyr Leu Asn Leu Phe Arg Asn Ile Ile Pro
130 135 140

Pro Ile Phe Asp Thr Leu Asp Val Ser Pro Leu Leu Ala Phe Ala Val
145 150 155 160

Leu Gly Val Leu Gly Ser Ile Leu Asn Asn Ser Arg Gly Met Tyr
165 170 175

<210> 620

<211> 262

<212> PRT

<213> Papaver somniferum

<400> 620

Met Asp Val Glu Leu Pro Leu Asp Lys Leu Ser Leu Lys Pro Ile Asp
1 5 10 15

Asp Gly Lys Phe Val Val Val Leu Val Ala Asn Gly Ser Phe Asn Pro
20 25 30

Pro Thr Phe Met His Leu Arg Met Phe Glu Leu Ala Arg Asp Ala Leu
35 40 45

Asn Ser Asp Gly Phe Cys Val Ile Gly Gly Tyr Met Ser Pro Val Asn
50 55 60

Asp Ala Tyr Lys Lys Lys Gly Leu Ile Ser Ala Glu His Arg Leu Gln
65 70 75 80

Leu Cys Glu Leu Ala Cys Arg Ser Ser Ser Phe Val Met Val Asp Pro
85 90 95

Trp Glu Ala Lys Gln Ser Ser Tyr Gln Arg Thr Leu Thr Val Leu Gly
100 105 110

Arg Val Gln Ser Cys Leu Cys Asp Ser Gly Leu Val Arg Arg Glu Ser
115 120 125

Leu Lys Val Met Leu Leu Cys Gly Ser Asp Leu Val Glu Ser Phe Cys
130 135 140

Val Pro Gly Val Trp Ile Pro Glu Gln Ile Arg Ala Leu Cys Arg Asp
145 150 155 160

Tyr Gly Ile Val Cys Ile Arg Arg Glu Gly Thr Lys Ile Glu Lys Ile
165 170 175

pctca2017050779-seql.txt

Val Ser Gly Asp Glu Ile Leu Asn Ala Tyr Lys Asn Asn Ile Arg Val
180 185 190

Val Asp Glu Leu Ile Pro Asn Gln Ile Ser Ser Ser Arg Met Arg Glu
195 200 205

Cys Ile Ser Arg Gly Leu Ser Val Lys Tyr Leu Thr Val Asp Glu Val
210 215 220

Ile Asp Tyr Ile Arg Gln His Asn Leu Tyr Leu Asn Ser Glu Ala Asn
225 230 235 240

Glu Lys Lys His Leu Gln Glu Gly Lys Asp Glu Lys Met Met Leu Lys
245 250 255

Lys Lys Glu Ile Ser Asp
260

<210> 621
<211> 92
<212> PRT
<213> Papaver somniferum

<400> 621

Met Val Met Leu Gly Ser Gly Gly Thr Gly Leu Ser Ala Asp Ala Val
1 5 10 15

Glu Glu Asp Ala Asn Glu Thr Asn Glu Leu Gly Gln Lys Glu Arg Pro
20 25 30

Ala Ser Ile Asn Asp His Leu Thr Pro Ala Glu Arg Arg Tyr Ile Glu
35 40 45

Gln Arg Glu Arg Ile Asp Val Arg Arg Leu Ala Lys Thr Ser Asn Lys
50 55 60

Ser His Arg Asp Arg Ile Gln Asp Phe Asn Gln Tyr Leu Ala Asn Met
65 70 75 80

Ser Glu His Tyr Asp Ile Pro Lys Val Gly Pro Gly
85 90

<210> 622
<211> 364
<212> PRT
<213> Papaver somniferum

<400> 622

pctca2017050779-seql.txt

Met Ser Ser Leu Gly Arg Leu Asp Leu Ser Tyr Asn Asn Leu Gln Gly
 1 5 10 15
 Glu Leu Asp Glu Gln Leu Ser His Trp Pro Ala Asp Val Phe Ala Gly
 20 25 30
 Asn Phe Lys Leu Cys Gly Arg Pro Leu Val Thr Gln Cys Asn Thr Glu
 35 40 45
 Asp Thr Glu His Val Arg Ser Arg Leu Ser Thr Ser Ser Val Val Ala
 50 55 60
 Ile Thr Ala Thr Leu Thr Leu Ala Gly Val Val Ile Leu Leu Leu Val
 65 70 75 80
 Gly Leu Ile Leu Val Ser Arg Arg Lys His Gln Tyr Leu Arg Arg Glu
 85 90 95
 Asp Val Asp Gly Asn Asn Ala Tyr Ser Ser Ser Ser Ser Val Gln Arg
 100 105 110
 Arg Leu Leu Phe His Asn Ala Ser Thr Ala Arg Glu Phe Arg Trp Glu
 115 120 125
 Asp Ile Met Glu Ala Thr His Asp Leu Ser Asp Glu Tyr Ile Ile Gly
 130 135 140
 Ser Gly Gly Ser Gly Thr Asn Tyr Lys Ala Glu Leu Pro Ser Gly Glu
 145 150 155 160
 Ile Val Ala Val Lys Lys Ile Leu Arg Lys Asp Asp Leu Phe Met Asp
 165 170 175
 Arg Ser Phe Ala Arg Glu Ile Gln Thr Leu Gly Arg Ile Arg His Arg
 180 185 190
 His Leu Val Lys Leu Met Gly Cys Cys Ser Thr Ser Lys Gly Gly Gly
 195 200 205
 Met Gly Cys Thr Leu Leu Ile Tyr Glu Tyr Met Glu Asn Gly Ser Leu
 210 215 220
 Trp Asp Trp Leu His Arg Pro Met Thr Gln Glu Ser Thr Thr Lys Lys
 225 230 235 240
 Val Gly Ile Asn Leu Asp Trp Glu Ile Arg Leu Lys Ile Ala Val Gly
 245 250 255

pctca2017050779-seql.txt

Leu Ala Gln Gly Val Glu Tyr Leu His His Asp Cys Val Pro Lys Ile
260 265 270

Ile His Arg Asp Ile Lys Ser Ser Asn Leu Leu Leu Asp Ser Asp Met
275 280 285

Glu Ala His Leu Gly Asp Phe Gly Leu Ala Lys Val Leu Leu Asp Asp
290 295 300

Gln Asp Ser Tyr Leu Val Cys Trp Ile Leu Trp Leu His Ser Ser Arg
305 310 315 320

Val Cys Leu Tyr Thr Glu Ser Asn Gly Glu Glu Arg Cys Leu Gln Tyr
325 330 335

Gly Asn Ser Thr Asn Gly Thr Cys Asn Arg Glu Asn Ala Asn Cys Trp
340 345 350

Asn Phe Trp Ser Glu Tyr Arg His Gly Glu Met Gly
355 360

<210> 623
<211> 474
<212> PRT
<213> Papaver somniferum

<400> 623

Met Gln Arg Val Arg Ile Ile Leu Arg Phe Val Ile Leu Asn Ile Phe
1 5 10 15

Val Ile Thr Pro Tyr Asn Gln Lys Leu Gly Phe Cys Leu Asn Val Trp
20 25 30

Phe Lys Leu Asn Val Trp Phe Ile Thr Leu Gln Thr Cys Leu Leu Thr
35 40 45

Met Arg Gly Gly Ser Ser Ser Thr Pro Thr Ala Ser Val Ser Ser Asn
50 55 60

Lys Arg Pro Pro Arg Pro Pro Pro Asn Ala Ser Ser Asp Gly Gly Ala
65 70 75 80

Asn Ser Ala Gly Gly Ala Ser Ala Ala Lys Asp Ala Ser Val Ala Gly
85 90 95

Asp Ala Ser Ala Asp Gly Asp Ala Thr Glu Ala Val Ile Lys Val Thr
100 105 110

pctca2017050779-seql.txt

Glu Thr His Ser Asn Lys Arg Lys Thr Pro Glu Asp Ala Thr Glu Asp
 115 120 125
 Asp Thr Glu Val Ser Gln Val Thr Glu Pro Lys Gly Lys Lys Arg Ser
 130 135 140
 Asp Val Trp Asn His Phe Asp Met Asp Pro Lys Pro Ser Lys Tyr Ala
 145 150 155 160
 Lys Cys Arg His Cys Lys Thr Lys Ile Ala Ala Gln Gly Thr Lys Tyr
 165 170 175
 Gly Thr Gly Gly Met Asn Asn His Leu Lys Ile Cys Lys Lys Lys Pro
 180 185 190
 Lys Glu Glu Lys Gly Gln Gln Thr Leu Asp Phe Gln Pro Ala Arg Leu
 195 200 205
 Gly Gly Glu Gly Lys Leu Val Ala Ala Thr Phe Asn Gln Asp Ala Cys
 210 215 220
 Thr Lys Ala Val Ile Leu Phe Val Ile Leu Asp Glu Gln Pro Phe Arg
 225 230 235 240
 Val Val Glu Gly Glu Gly Phe Lys Glu Leu Cys Arg Val Leu Glu Ser
 245 250 255
 Arg Phe Lys Ile Pro Ser Arg Met Thr Ile Ser Arg Gly Val Leu Asn
 260 265 270
 Leu Tyr Glu Ala Glu Lys Glu Lys Met Lys Asn Tyr Phe Lys Glu Asn
 275 280 285
 Asn Val Arg Val Cys Leu Thr Thr Asp Thr Trp Thr Ser Asn Ala Gln
 290 295 300
 Asn Lys Ser Tyr Met Val Val Thr Ala His Phe Ile Asp Lys Asp Trp
 305 310 315 320
 Lys Leu His Lys Leu Val Ile Asn Phe Phe Gln Ile Leu Gly His Ser
 325 330 335
 Gly Glu Val Ile Gly Lys Met Leu Glu Glu Cys Leu Leu Asp Trp Glu
 340 345 350
 Leu Pro Gly Val Phe Thr Ile Thr Leu Asp Asn Val Ser Ala Asn Asp
 355 360 365

pctca2017050779-seql.txt

Leu Ala Ile Asp Tyr Leu Arg Glu Asp Gly His Leu Lys Glu Gln Val
370 375 380

Ile Ser Ser Lys Gly Val Leu Asn Thr Lys Phe Met Gln Val Arg Cys
385 390 395 400

Ala Ala His Val Leu Ala Leu Val Val Asn Ala Gly Leu Gly Glu Tyr
405 410 415

His Met Ala Ile Lys Arg Val Arg Ala Val Val Lys His Val Met Ser
420 425 430

Ser Pro Ala Arg Leu Ser Lys Phe Met Asp Cys Ala Lys Gln Glu Lys
435 440 445

Ile Asp Cys Lys Lys Arg Phe Ser Phe Arg Cys Gly Tyr Lys Met Glu
450 455 460

Phe His Leu His Asp Val Gly Ser Cys Leu
465 470

<210> 624
<211> 225
<212> PRT
<213> Papaver somniferum

<400> 624

Met Ala Thr Leu Ala Tyr Leu Leu Asp Gln Leu Ala Thr Ala Ser Arg
1 5 10 15

Leu Thr Ser Thr Asn Ile Gly Gly Asn Phe Thr Leu Leu Gln Val Trp
20 25 30

Ile Tyr Asp His Phe Pro Ile Leu Asn Leu Ala Lys Val Phe Asp Lys
35 40 45

Asp Val Asp Tyr Val Asp Thr Glu Pro Thr Ala Ala Arg Tyr Ala Tyr
50 55 60

Glu Asp Ser Lys Lys Arg Asn Lys Lys Lys Leu Val Glu Ser Leu Arg
65 70 75 80

Glu Thr Leu Asp Cys Leu Gly Val Asp Asp Val Ala Phe Gln Pro Tyr
85 90 95

Glu Asn Glu Asp Glu Glu Asp Glu Val Val Glu Asp Glu Asp Met Pro
100 105 110

pctca2017050779-seql.txt

Val Gly Met Tyr His Gly Pro Leu Trp Tyr Pro Gly Gly Tyr Val Ile
115 120 125

Tyr Asp Pro Arg Arg Val Leu Arg Gln Leu Gly Cys Val Gln Lys Val
130 135 140

Pro Leu Phe Asp Glu Lys Phe Arg Leu Leu Pro Lys Ser Gly Lys Gly
145 150 155 160

Thr Lys Ile Thr Thr Ser Ser Trp Glu Pro Lys Tyr Asp Pro Asp Pro
165 170 175

Thr Val Glu Phe Trp Asn Asn Leu Asp Asn His Thr Leu Asp Val Ser
180 185 190

Lys Leu Thr Pro Leu Leu Asp Asp Pro Cys Glu Glu Asp Pro Gly Tyr
195 200 205

Met Asp Trp Tyr Asn Gln Ile Ser His Pro Phe Ile Ile Asn Lys Lys
210 215 220

Arg
225

<210> 625
<211> 359
<212> PRT
<213> Papaver somniferum

<400> 625

Met Asn Thr His Gln Ser Val Leu Thr Pro Val Lys Arg Ser Trp Cys
1 5 10 15

Asn Gly Met Thr Ile Leu Asn Ile Met Val Val Val Ile Ile Leu Val
20 25 30

Val Gln Ile Ser Ser Thr Cys Cys Leu Ala Ser Ser Gln His Gln Asn
35 40 45

Leu Val Arg Trp Asn His Pro Lys Arg Glu Leu Leu Asp Arg Ile Asn
50 55 60

Arg Lys Gly Pro Tyr Ile Gly Val Val Met Ala Tyr Ser Thr Glu Glu
65 70 75 80

Met Ala Leu Gln Ala Ser Gly Val Phe Ile Pro Asn Cys His Asn Pro
85 90 95

pctca2017050779-seql.txt

Ser Val Asp Leu Ser Gly Arg Lys Phe Asn Ile Gly Ser Ile Lys Gly
100 105 110

Thr Lys Val Ile Tyr Val Met Ser Gly Gln Arg Arg Leu Asn Ala Gly
115 120 125

Ile Thr Val Gln Ile Leu Leu Asp Val Phe Asp Ile Arg Gly Ile Val
130 135 140

His Tyr Gly Ile Ala Gly Ser Ala Asn Asn Ser Leu Ser Tyr Gly Asp
145 150 155 160

Val Ser Ile Pro Lys Tyr Val Ala Phe Thr Gly Ser Trp Asn Trp Glu
165 170 175

Asn Leu Gly Ser Lys Asn Val Asp Lys Phe Thr Glu Met Lys Ile Gly
180 185 190

Asn Tyr Asn Leu Pro Lys Glu Gly Gln Asn Leu Leu Gly Glu Ile Ala
195 200 205

Phe Lys Pro Glu Glu Phe Phe Ser Val Gly Gln Pro Met Lys Glu Val
210 215 220

Phe Trp Leu Glu Val Asp Lys Thr Trp Phe Asn Leu Ala Ala Gln Leu
225 230 235 240

Lys Cys Leu Glu Phe Gln Arg Cys Glu Asn Ala Thr Ser Cys Leu Pro
245 250 255

Arg Val Pro Lys Val Glu Tyr Gly Leu Arg Gly Ala Thr Ala Asp Ile
260 265 270

Phe Leu Asp Asn Ala Ala Tyr Arg Asn Phe Leu Phe Lys Glu Phe Gln
275 280 285

Val Ser Thr Val Asp Glu Glu Ser Ser Ala Ile Val Met Thr Ala Met
290 295 300

Ser Ser Asn Val Pro Ser Ile Val Ile Arg Gly Val Ser Asp Leu Ala
305 310 315 320

Gly Gly Glu Gly Thr Pro Val Ser Thr Phe Leu Ser Ser Leu Ala Ala
325 330 335

Val Asn Thr Leu Asn Val Thr Ile Lys Phe Ile Glu Leu Ile Gly Ala

340

Ser Arg Asn Thr Leu Ala Lys
 355

<210> 626
 <211> 855
 <212> PRT
 <213> Papaver somniferum
 <400> 626

Met Gly Gly Thr Ser Ile Asn Leu Val Val Val Val Val Glu Leu Ala
 1 5 10 15

Val Val Val Ser Leu Leu Ser Met Arg Met Gly Phe Cys Gln Glu Asp
 20 25 30

Glu Asn Ser Thr Thr Ser Ile Tyr Ile Val Ser Leu Lys Gln Thr Pro
 35 40 45

Thr Val Leu Leu Asn Phe Asn Asn Gln Gly Leu Asn Leu Glu Lys Arg
 50 55 60

Thr Lys Gly Phe Met His Arg Asn Gly Ser Tyr Ser Arg Leu Ile Thr
 65 70 75 80

Lys His His Arg Pro Arg Asn Tyr Ser Arg Ser Asp Arg Arg Tyr Ala
 85 90 95

Ala His Ile Ser Arg Val His Asp Ser Leu Leu Lys Arg Ala Leu Arg
 100 105 110

Gly Glu Asn Tyr Leu Lys Leu Tyr Ser Tyr His Tyr Leu Ile Asn Gly
 115 120 125

Phe Ala Val Leu Val Thr Pro Glu Gln Ala Glu Lys Leu Ser Ser Arg
 130 135 140

Glu Glu Val Ala Asn Val Ile Leu Asp Tyr Arg Val Arg Thr Glu Thr
 145 150 155 160

Thr His Thr Pro Gln Phe Leu Gly Leu Pro Gln Gly Ala Trp Val Gln
 165 170 175

Glu Gly Gly Pro Glu Ser Ala Gly Glu Gly Ile Val Ile Gly Leu Val
 180 185 190

Asp Thr Gly Ile Asp Pro Thr His Pro Ser Phe Ser Asp Asn Leu Ser
 Page 536

195

Gly Asn Arg Phe Ser Val Pro Thr His Phe Thr Gly Met Cys Glu Val
210 215 220

Thr Met Asp Phe Pro Ser Gly Ser Cys Asn Arg Lys Leu Ile Gly Ala
225 230 235 240

Arg His Phe Ala Ala Ser Ala Ile Thr Arg Gly Ile Phe Asn Ala Ser
245 250 255

Gln Asp Tyr Ala Ser Pro Phe Asp Ala Asp Gly His Gly Thr His Thr
260 265 270

Ala Ser Ile Ala Ala Gly Asn His Gly Ile Pro Val Ile Val Ala Gly
275 280 285

His His Phe Gly Asn Ala Ser Gly Met Ala Pro Arg Ala His Ile Ser
290 295 300

Val Tyr Lys Ala Leu Tyr Lys Ser Phe Gly Gly Phe Ala Ala Asp Val
305 310 315 320

Val Ala Ala Ile Asp Gln Ala Ala Gln Asp Gly Val Asp Ile Ile Ser
325 330 335

Leu Ser Ile Thr Pro Asn Arg Arg Pro Pro Gly Ile Ala Thr Phe Phe
340 345 350

Asn Pro Ile Asp Met Ala Leu Leu Ser Ala Val Lys Ala Gly Ile Phe
355 360 365

Val Val Gln Ala Ala Gly Asn Thr Gly Pro Ser Pro Lys Ser Met Ser
370 375 380

Ser Phe Ser Pro Trp Ile Phe Thr Val Gly Ala Ala Ala His Asp Arg
385 390 395 400

Thr Tyr Ser Asn Ser Leu Val Leu Gly Asn Asn Val Thr Ile Thr Gly
405 410 415

Val Gly Leu Ala Pro Gly Thr Asp Glu Ser Thr Met Tyr Thr Leu Val
420 425 430

Ser Ala Leu His Ala Leu Asn Asn Asp Thr Lys Asp Ala Thr Asn Met
435 440 445

pctca2017050779-seq1.txt

Tyr Val Ser Glu Cys Gln Asp Pro Ser Ser Leu Ser Thr Asp Val Val
 450 455 460
 Gln Gly Asn Leu Leu Leu Cys Ser Tyr Ser Ile Arg Phe Val Leu Gly
 465 470 475 480
 Leu Ser Thr Ile Lys Gln Ala Leu Glu Thr Ala Lys Asn Leu Thr Ala
 485 490 495
 Val Gly Val Val Phe Tyr Met Asp Pro Tyr Val Ile Gly Phe Gln Leu
 500 505 510
 Asn Pro Thr Pro Met Asp Met Pro Gly Val Ile Ile Pro Ser Ala Ser
 515 520 525
 Asp Ser Lys Ile Leu Leu Lys Tyr Tyr Asn Ser Ser Leu Glu Gln Asp
 530 535 540
 Pro Leu Ala Asp Lys Phe Lys Phe Gly Ala Thr Ala Thr Ile Leu Gly
 545 550 555 560
 Gly Leu Lys Ala Asn Tyr Ser Asn Ser Ala Pro Lys Val Met Tyr Tyr
 565 570 575
 Ser Ala Arg Gly Pro Asp Pro Glu Asp Ser Phe Leu Asp Asp Ala Asp
 580 585 590
 Ile Leu Lys Pro Asn Leu Ile Ala Pro Gly Asn Phe Ile Trp Gly Ala
 595 600 605
 Trp Ser Ser Val Gly Thr Asp Ser Leu Glu Phe Gln Asp Glu Ser Phe
 610 615 620
 Ala Met Met Ser Gly Thr Ser Met Ala Ala Pro His Val Ala Gly Leu
 625 630 635 640
 Ala Ala Leu Val Lys Gln Lys Phe Pro Ser Phe Ser Pro Ser Ala Ile
 645 650 655
 Gly Ser Ala Leu Ser Thr Thr Ala Ser Met His Asn Lys Lys Gly Glu
 660 665 670
 Pro Ile Met Ala Gln Arg Ala Tyr Ala Asn Pro Asp Leu Asn Gln Ser
 675 680 685
 Pro Ala Thr Pro Phe Asp Met Gly Ser Gly Phe Val Asp Val Thr Ser
 690 695 700

pctca2017050779-seql.txt

Ala Leu Asp Pro Gly Leu Ile Phe Asp Ser Ser Phe Asp Asp Tyr Phe
705 710 715 720

Ser Phe Leu Cys Gly Ile Asn Gly Ser Gly Pro Val Val Leu Asn Tyr
725 730 735

Thr Asn Gln Asn Cys Gly Asn Ser Thr Ile Asn Cys Arg Asp Leu Asn
740 745 750

Leu Pro Ser Ile Thr Ile Ala Lys Leu Asn Gln Thr Thr Thr Val Glu
755 760 765

Arg Val Val Thr Asn Thr Ala Gly Asn Glu Thr Tyr Asn Leu Ser Trp
770 775 780

Phe Ala Pro Tyr Gly Val Ser Val Leu Val Thr Pro Lys Arg Phe Phe
785 790 795 800

Ile Glu Ser Gly Gln Lys Gln Val Ile Thr Val Thr Leu Asn Ala Thr
805 810 815

Met Asn Ser Ser Ala Ala Ser Phe Gly Arg Ile Ser Leu Tyr Gly Ser
820 825 830

Gln Arg His Ile Ile Ser Val Pro Leu Ser Val Ile Tyr Lys Ile Ser
835 840 845

Tyr Asn Val Thr Glu Asn Ser
850 855

<210> 627
<211> 248
<212> PRT
<213> Papaver somniferum

<400> 627

Met Val Gln Tyr Phe Phe Thr Asn His His Met Leu Lys Glu Ile Tyr
1 5 10 15

His Thr Tyr Gln Val Leu Ile Gln Lys Ile Thr His Pro Gln Thr Pro
20 25 30

Val Glu Tyr Arg Pro Ile Ser Leu Cys Asn Val Ser Tyr Lys Ile Ile
35 40 45

Ser Lys Ile Leu Ala Asn Arg Leu Lys Pro Phe Leu Ser Asn Ile Ile
50 55 60

pctca2017050779-seql.txt

Ser Pro Thr Gln Thr Ala Tyr Val Pro Gly Arg His Ile His Lys Asn
65 70 75 80

Val Ile Ile Ala Gln Glu Leu Leu His Thr Met Lys Thr Arg Arg Ser
85 90 95

Lys Asp Ala Leu Val Gly Leu Lys Leu Asp Met Ser Lys Ala Phe Asp
100 105 110

Arg Leu Glu Trp Ser Phe Leu Leu Ser Ile Phe Arg Asn Ile Gly Phe
115 120 125

Tyr Asn Asp Trp Ile Ala Met Ile Asp Gln Cys Ile Tyr Thr Lys Asn
130 135 140

Thr Ser Leu Leu Ile Asn Gly Ser Pro Thr Ala Thr Phe Thr Pro Ser
145 150 155 160

Arg Gly Ile Arg Gln Arg Asp Ser Leu Leu Ser Tyr Leu Phe Met Phe
165 170 175

Ile Met Glu Ala Phe Ser Ser Leu Leu Gln Ser Gln Ile Asp Ile Gly
180 185 190

His Leu Thr Gly Ile Lys Val Ala Lys His Ser Pro Thr Ile Asn His
195 200 205

Leu Phe Phe Thr Asp Asp Cys Leu Leu Ile Phe Gln Ala Asn Asn Ser
210 215 220

His Met His His Leu His Lys Leu Leu Gln Ser Phe Gly Gln Ala Ser
225 230 235 240

Gly Gln Val Ile Asn Met Gln Lys
245

<210> 628

<211> 99

<212> PRT

<213> Papaver somniferum

<400> 628

Met Ser Pro Lys Glu His Glu Glu Leu Arg Arg Gln Val Glu Glu Leu
1 5 10 15

Ile Ala Lys Gly Phe Ile Arg Pro Ser Leu Ile Pro Cys Ala Val Pro
20 25 30

pctca2017050779-seql.txt

Ala Leu Leu Val Pro Lys Lys Asp Gly Ser Trp Arg Met Cys Val Asp
35 40 45

Ser Arg Glu Ile Asn Arg Ile Thr Leu Lys Tyr Arg Phe Pro Ile Pro
50 55 60

Arg Leu Asp Asp Leu Leu Asp Gln Leu Ser Gly Ala Cys Val Phe Ser
65 70 75 80

Lys Leu Asp Phe Lys Met Asp Ile Ile Lys Phe Val Ser Arg Trp Glu
85 90 95

Met Asn Gly

<210> 629

<211> 347

<212> PRT

<213> Papaver somniferum

<400> 629

Met Trp Val Phe Ser Glu Ala Asp Asp Lys Val Val Lys Leu Gln Asp
1 5 10 15

Asn Asn Lys Ile Glu Glu Lys Ile Ile Lys Glu Glu Glu Asp Glu Val
20 25 30

Glu Lys Ser Gly Glu Val Leu Phe Cys Gly Gly His Thr Asp Gly Asn
35 40 45

Leu Ser Ser Pro Thr Arg Leu Arg Pro Leu Ile Gly Val Asn Ile Arg
50 55 60

Tyr Val Ala Ala Gly Cys Val Ser Phe His Cys Val Ala Leu Asp Val
65 70 75 80

Glu Gly Arg Val Tyr Thr Trp Gly Lys Asn Lys Arg Gly Gln Leu Gly
85 90 95

His Gly Asp Met Ile Asn Arg Asp Arg Pro Thr Ile Val Ser Gly Leu
100 105 110

Leu Gly His Lys Ile Ile Lys Ala Gly Ala Gly Arg Ala His Thr Val
115 120 125

Val Val Thr Asp Asp Gly Lys Ser Phe Ala Phe Gly Trp Asn Lys His
130 135 140

pctca2017050779-seql.txt

Gly Gln Cys Gly Thr Gly Ser Ala Arg Thr Glu Phe Gln Arg Ser Pro
145 150 155 160

Val Ser Ser Gln Val Ser Glu Val Thr Asn Val Val Cys Gly Gly Asp
165 170 175

Phe Thr Val Trp Leu Ser Pro Val Glu Gly Ser Ser Ile Leu Thr Ala
180 185 190

Gly Leu Pro Gln Tyr Gly Gln Leu Gly His Gly Ala Asp Asn Glu Tyr
195 200 205

Asn Ile Lys Ser Cys Ser Val Lys Leu Ala Tyr Glu Ala Gln Pro Arg
210 215 220

Pro Lys Thr Ile Ala Ala Phe Ala Gly Lys Thr Val Val Lys Val Ala
225 230 235 240

Cys Gly Ile Asn His Thr Val Ala Val Glu Ser Lys Gly Phe Val Tyr
245 250 255

Thr Trp Gly Tyr Gly Gly Tyr Gly Arg Leu Gly His Arg Glu Gln Lys
260 265 270

Asp Glu Trp Thr Pro Arg Val Val Ala Val Phe Gln Arg Lys Asn Val
275 280 285

Leu Pro Pro Asn Ala Ile Val Ala Ala Gly Ala His Asn Cys Ala Val
290 295 300

Thr Ala Gly Gly Gly Gln Leu Tyr Met Trp Gly Lys Val Lys Val Asn
305 310 315 320

Ser Glu Asp Trp Met Tyr Pro Gln Pro Leu Leu Gly Leu Arg Phe Cys
325 330 335

Asp Gly Pro Tyr Met Phe Ser Ser Gly Ser Val
340 345

<210> 630

<211> 205

<212> PRT

<213> Papaver somniferum

<400> 630

Met Ala Glu Val Val Ser Glu Ile Pro Gln Glu Thr Met Glu Val Glu
1 5 10 15

pctca2017050779-seql.txt

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Thr Pro Gln Asn Gly Ser Glu Thr Asn Gly Asp Ser Lys Arg Ser Arg
      20              25              30

Glu Asn Asn Gly Val Glu Glu Asn Glu Ala Ala Lys Lys Gln Lys Val
      35              40              45

Glu Glu Gly Gly Asp Asp Glu Thr Glu Gly Glu Glu Lys Lys Ser Glu
      50              55              60

Pro Val Gln Leu Gly Pro Lys Thr Phe Asn Thr Ser Val Glu Met Phe
      65              70              75              80

Asp Tyr Phe Tyr Lys Phe Leu His Tyr Trp Pro Pro Asn Leu Asp Val
      85              90              95

Asn Lys Tyr Glu Cys Met Val Leu Leu Asp Leu Ile Lys Lys Gly His
      100             105             110

Ser Glu Ser Asp Lys Lys Val Gly Ala Gly Val Lys Ala Phe Gln Val
      115             120             125

Arg Tyr His Pro Met Trp Lys Ser Arg Cys Tyr Phe Leu Ile Arg Glu
      130             135             140

Asp Glu Ser Val Asp Asp Phe Ser Phe Arg Lys Cys Val Asp His Ile
      145             150             155             160

Leu Pro Leu Pro Glu Asn Met Lys Leu Lys Pro Glu Ala Asn Lys Ala
      165             170             175

Leu Gly Gly Arg Gly Gly Gly Gly Arg Gly Gly Gly Gly Arg Gly Arg
      180             185             190

Gly Gly Arg Gly Arg Gly Arg Gly Asn Trp Asn Arg Asn
      195             200             205

<210> 631
<211> 259
<212> PRT
<213> Papaver somniferum

<400> 631

Met Ile Leu Ser Phe Phe Phe Phe Val Ser Phe Phe Ile His Ile Leu
  1              5              10             15

Phe Cys Ser Leu Gly Ser Val Tyr Phe Leu Glu Leu Gln Tyr Asn Ser
      20              25              30

```

pctca2017050779-seql.txt

Ser Met Ala His Asn Thr Glu Glu Ser Phe Ser Asn Asn Thr Asn Asn
35 40 45

His Gln Ala Tyr Asn Met Met Asn Ile Thr Ser Ser Ser Ser Val Asp
50 55 60

Asn Ser Pro Thr Pro Thr Thr Thr Lys Val Pro Ser Ser Lys Phe Asp
65 70 75 80

Phe Val Lys Lys Leu Tyr Glu Glu His Cys Pro Pro Gly Phe Leu Lys
85 90 95

Lys Val Ile Ala Glu Ile Ile Ala Thr Phe Leu Leu Val Phe Val Thr
100 105 110

Cys Gly Ser Ala Ala Leu Ser Asn Thr Glu Asp His Lys Ala Ser Lys
115 120 125

Leu Gly Ala Ser Val Ala Gly Gly Leu Ile Val Thr Val Met Ile Tyr
130 135 140

Ala Val Gly His Ile Ser Gly Ala His Met Asn Pro Ala Val Thr Cys
145 150 155 160

Ala Phe Ala Ala Val Arg His Phe Pro Trp Lys Gln Val Pro Phe Tyr
165 170 175

Ala Ala Ala Gln Leu Thr Gly Ala Leu Val Ala Ser Phe Thr Leu Gly
180 185 190

Val Val Leu His Pro Thr Gln Asn Ile Gly Thr Thr Ser Pro Thr Gly
195 200 205

Thr Asp Leu Gln Ala Leu Ala Met Glu Ile Ile Val Thr Phe Ser Met
210 215 220

Met Phe Val Thr Ser Ala Val Ala Thr Asp Thr Lys Ala Val Leu Ile
225 230 235 240

Pro Pro Ile Phe Ser Arg Lys Lys Asn Phe Lys Lys Lys Lys Ser Leu
245 250 255

Asn Leu Leu

<210> 632
<211> 415

pctca2017050779-seql.txt

<212> PRT

<213> Papaver somniferum

<400> 632

Met Lys Gly Tyr Tyr Gln Ala Ser Ala Arg Glu Leu Ile Arg Ile Asn
 1 5 10 15

Gly Thr Thr Lys Ala Pro Val Met Asn Tyr Ala Ala Glu Thr Ser Leu
 20 25 30

Gly Val Val Thr Val Arg Ala Phe Ser Leu Thr Gly Arg Phe Phe Asp
 35 40 45

Ser Tyr Gln Lys Leu Ile Asp Thr Asp Ala Lys Leu Phe Phe His Ser
 50 55 60

Asn Ala Ala Met Glu Trp Leu Val Val Arg Val Glu Ala Leu Gln Asn
 65 70 75 80

Leu Thr Leu Phe Thr Ala Ala Leu Leu Leu Val Leu Leu Pro Gln Gly
 85 90 95

Thr Val Asn Pro Gly Phe Val Gly Leu Ser Leu Ser Tyr Ala Leu Ala
 100 105 110

Leu Thr Gly Thr Gln Val Phe Leu Ala Arg Trp Tyr Cys Asn Phe Ser
 115 120 125

Asn Tyr Ile Ile Ser Val Glu Arg Ile Lys Gln Phe Met His Ile Pro
 130 135 140

Ser Glu Pro Pro Ala Ile Val Asp Asp Gln Arg Pro Pro Pro Ser Trp
 145 150 155 160

Pro Ser Asn Gly Arg Ile Asp Leu Glu Asn Leu Lys Ile Lys Tyr Arg
 165 170 175

Pro Asn Ser Pro Leu Val Ile Lys Gly Val Thr Cys Ala Phe Lys Glu
 180 185 190

Gly Thr Arg Val Gly Val Val Gly Arg Thr Gly Ser Gly Lys Thr Thr
 195 200 205

Leu Ile Ser Ala Leu Phe Arg Leu Val Glu Pro Thr Ser Gly Lys Ile
 210 215 220

Leu Ile Asp Gly Ile Asp Ile Cys Ser Met Gly Leu Lys Asp Leu Arg
 225 230 235 240

pctca2017050779-seql.txt

Val Lys Leu Ser Ile Ile Pro Gln Glu Ala Thr Leu Phe Arg Gly Thr
245 250 255

Val Arg Thr Asn Leu Asp Pro Leu Gly Leu Tyr Thr Asp Glu Glu Ile
260 265 270

Trp Asn Ala Leu Glu Lys Cys Gln Leu Lys Ala Thr Ile Ser Gly Leu
275 280 285

Pro Asn His Leu Asp Ala Ser Val Ser Asp Asp Gly Asp Asn Trp Ser
290 295 300

Ala Gly Gln Arg Gln Leu Phe Cys Leu Gly Arg Val Leu Leu Lys Arg
305 310 315 320

Asn Lys Ile Leu Val Leu Asp Glu Ala Thr Ala Ser Ile Asp Ser Ala
325 330 335

Thr Asp Ala Ile Leu Gln Arg Val Ile Arg Gln Glu Phe Lys Asn Cys
340 345 350

Thr Val Ile Thr Ile Ala His Arg Val Pro Thr Val Thr Asp Ser Asp
355 360 365

Met Val Met Val Leu Ser Tyr Gly Asn Leu Ile Glu Tyr Asp Glu Pro
370 375 380

Ser Lys Leu Met Glu Ser Asn Ser Tyr Phe Ser Lys Leu Val Gly Glu
385 390 395 400

Tyr Trp Ser Ser Cys Arg Arg Ser Ser Leu Gln Asn Leu Gln His
405 410 415

<210> 633

<211> 499

<212> PRT

<213> Papaver somniferum

<400> 633

Met Ile Ser Ser Met Ser Glu Lys Asn Met Gln Pro Ser Lys Leu Leu
1 5 10 15

Phe Tyr Leu Ile Phe Thr Ser Met Phe Phe Leu Ile Leu Ser Ser Ile
20 25 30

Ile Leu Leu Gln Ser Ser Ser Asn Ser Phe Met Pro Arg Ser Val Phe
35 40 45

pctca2017050779-seql.txt

Arg Leu Ile Val Val Asn Thr Thr Ser Ser Glu Tyr Phe Arg Arg Asn
50 55 60

Val Asn Ser Tyr Ser Lys Asp Thr Phe Asp Arg Ser Ser Leu Pro Ser
65 70 75 80

Ser Ile Asp Thr Arg Ile Thr Glu Phe Glu Ser Ser Ser Ser His Gly
85 90 95

Ile Gly Val Leu Gly Gln Glu Asn Ala Lys Val Cys Lys Cys Asn Gln
100 105 110

Ser Leu Leu Lys Val Tyr Met Tyr Asp Leu Pro Pro Glu Phe His Phe
115 120 125

Gly Leu Leu Gly Trp Lys Gly Glu Gly Asn Gln Val Trp Pro Asp Val
130 135 140

Ser Thr Leu Asp Gln Ile Pro Arg Tyr Pro Gly Gly Leu Asn Leu Gln
145 150 155 160

His Ser Ile Glu Tyr Trp Leu Ala Leu Asp Leu Leu Ala Ser Thr Thr
165 170 175

Pro Asn Val Ala Arg Pro Cys Ser Ala Val Arg Val Gln Asn Ser Ser
180 185 190

Leu Ala Asp Val Ile Phe Val Pro Phe Phe Ser Ser Leu Ser Tyr Asn
195 200 205

Arg Gln Ser Lys Leu His Gly Lys Lys Glu Lys Val Ser Val Asn Arg
210 215 220

Gln Leu Gln Asp Lys Leu Val Glu Phe Leu Met Ser Arg Pro Glu Trp
225 230 235 240

Lys Lys Glu Gly Gly Lys Asn His Leu Ile Val Ala His His Pro Asn
245 250 255

Ser Met Leu Gly Val Arg Arg Lys Leu Gly Ser Ala Met Phe Val Leu
260 265 270

Ala Asp Phe Gly Arg Tyr Pro Ala Glu Val Ala Asn Leu Asp Lys Asp
275 280 285

Ile Ile Ala Pro Tyr Lys His Ile Val Arg Met Ile Gly Val Asn Asn

290

295

300

Ser Ala Pro Phe Glu Lys Arg Pro Ile Leu Ala Tyr Phe Gln Gly Ala
 305 310 315 320

Ile Tyr Arg Lys Asp Val Gly Val Ile Arg Gln Glu Leu Tyr Tyr Leu
 325 330 335

Leu Lys Asp Glu Lys Asp Val His Phe Ala Phe Gly Thr Val Arg Gly
 340 345 350

Asn Gly Val His Lys Ala Ser Glu Gly Met Ala Ser Ser Lys Phe Cys
 355 360 365

Leu Asn Ile Ala Gly Asp Thr Pro Ser Ser Asn Arg Leu Phe Asp Ala
 370 375 380

Ile Val Ser His Cys Val Pro Val Ile Ile Ser Asp Glu Ile Glu Leu
 385 390 395 400

Pro Phe Glu Asp Val Leu Asp Tyr Ser Gly Phe Cys Ile Phe Val Gln
 405 410 415

Thr Ser Asp Ala Val Lys Thr Gly Tyr Leu Val Asn Leu Leu Arg Gly
 420 425 430

Ile Lys Arg Lys Lys Trp Thr Lys Met Trp Asn Arg Leu Lys Glu Val
 435 440 445

Ala Pro His Phe Glu Tyr Gln Tyr Pro Ser Val Ser Gly Asp Ala Val
 450 455 460

Glu Met Ile Trp Glu Ala Ala Ser Arg Lys Met His Ser Ala Arg Leu
 465 470 475 480

Arg Leu His Lys Thr Asn Arg Tyr Lys Arg Tyr Gln Leu Met Gly Met
 485 490 495

Val Lys Lys

<210> 634

<211> 203

<212> PRT

<213> Papaver somniferum

<400> 634

Met Ala Glu Val Val Ser Glu Ile Pro Gln Glu Thr Met Glu Val Glu

pctca2017050779-seql.txt

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1              5              10              15
Thr Pro Gln Asn Gly Ser Glu Thr Asn Gly Asp Ser Lys Arg Ser Arg
          20          25          30
Glu Asn Asn Gly Val Glu Asp Asn Glu Ala Ala Lys Lys Gln Lys Val
          35          40          45
Glu Glu Asp Glu Thr Glu Gly Gly Glu Glu Lys Lys Ser Glu Pro Val
          50          55          60
Gln Leu Gly Pro Lys Thr Phe Asn Thr Ser Val Glu Met Phe Asp Tyr
          65          70          75          80
Phe Tyr Lys Phe Leu His Tyr Trp Pro Pro Asn Leu Asp Val Asn Lys
          85          90          95
Tyr Glu Cys Met Val Leu Leu Asp Leu Ile Lys Lys Gly His Ser Glu
          100          105          110
Ser Asp Lys Lys Val Gly Ala Gly Val Lys Ala Phe Gln Val Arg Tyr
          115          120          125
His Pro Met Trp Lys Ser Arg Cys Tyr Phe Leu Ile Arg Glu Asp Glu
          130          135          140
Ser Val Asp Asp Phe Ser Phe Arg Lys Cys Val Asp His Ile Leu Pro
          145          150          155          160
Leu Pro Glu Asn Met Lys Leu Lys Pro Glu Ala Asn Lys Ala Leu Gly
          165          170          175
Gly Arg Gly Gly Gly Gly Arg Gly Gly Gly Arg Gly Arg Gly Gly
          180          185          190
Arg Gly Arg Gly Arg Gly Asn Trp Asn Arg Asn
          195          200

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<210> 635
<211> 405
<212> PRT
<213> Papaver somniferum
<400> 635

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Met Pro Asp Arg Leu Ser Arg Ile Ala Val Leu Asn Pro Asp Arg Cys
1              5              10              15

```

```

Lys Pro Asn Lys Cys Arg Gln Glu Cys Lys Lys Ser Cys Pro Val Val
Page 549

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Lys Thr Gly Lys Leu Cys Ile Glu Val Thr Ser Ser Ser Lys Leu Ala
35 40 45

Ser Ile Ser Glu Glu Leu Cys Ile Gly Cys Gly Ile Cys Val Lys Lys
50 55 60

Cys Pro Phe Glu Ala Ile Asp Ile Ile Asn Leu Pro Arg Asp Leu Asp
65 70 75 80

Lys Glu Thr Thr His Arg Tyr Gly Pro Asn Thr Phe Lys Leu His Arg
85 90 95

Leu Pro Val Pro Arg Pro Gly Gln Val Leu Gly Leu Val Gly Thr Asn
100 105 110

Gly Ile Gly Lys Ser Thr Ala Leu Lys Val Leu Ser Gly Lys Leu Ile
115 120 125

Pro Asn Leu Gly Lys Phe Asp Asn Pro Pro Ser Trp Gln Gln Ile Leu
130 135 140

Asp Tyr Phe Arg Gly Asn Glu Leu Gln Asn Tyr Phe Thr Arg Met Arg
145 150 155 160

Asn Glu Lys Leu Lys Ala Lys Cys Lys Arg Gln Tyr Leu Asp Asp Ile
165 170 175

Pro Arg Met Val Lys Gly Asn Val Gly Gln Val Leu Glu Gln Asn Asp
180 185 190

Glu Arg Asn Val Lys Glu Glu Leu Cys Leu Asp Leu Glu Leu Asn Gln
195 200 205

Val Thr Asp Arg Asn Val Gly Asp Leu Ser Gly Gly Glu Leu Gln Arg
210 215 220

Phe Ala Ile Ala Ala Val Ala Met Gln Ser Ala Asp Ile Tyr Met Phe
225 230 235 240

Asp Glu Pro Ser Ser Phe Leu Asp Val Lys Gln Arg Leu Lys Ala Ala
245 250 255

Gln Val Ile Arg Thr Leu Leu Arg Pro Asn Ser Tyr Val Ile Val Val
260 265 270

pctca2017050779-seql.txt

Glu His Asp Leu Ser Val Leu Asp Tyr Leu Ser Asp Phe Ile Cys Cys
 275 280 285

Leu Tyr Gly Lys Pro Gly Ala Tyr Gly Val Val Thr Leu Pro Phe Ser
 290 295 300

Val Arg Glu Gly Ile Asn Ile Phe Leu Ala Gly Phe Val Pro Thr Glu
 305 310 315 320

Asn Leu Arg Phe Arg Asp Glu Ser Leu Thr Phe Lys Val Ala Glu Thr
 325 330 335

Pro Glu Glu Ser Ala Glu Glu Ile Gln Ser Tyr Ala Arg Tyr Lys Tyr
 340 345 350

Pro Thr Met Ser Lys Thr Gln Gly Asn Phe Lys Leu Gln Ile Met Glu
 355 360 365

Gly Glu Phe Thr Asp Ser Gln Val Val Val Met Leu Gly Glu Asn Gly
 370 375 380

Thr Gly Lys Thr Thr Phe Met Ile Tyr Pro Gln Ala Ser Met Pro Ser
 385 390 395 400

Arg Ser Phe Ile Leu
 405

<210> 636

<211> 265

<212> PRT

<213> Papaver somniferum

<400> 636

Met Gly Glu Trp Glu Asn Met Lys Pro Ser Asp Gln Thr Ser Gln Leu
 1 5 10 15

Val Phe Lys Pro Leu Met Ile Ser Met Val Gly Ile Ala Phe Thr Ala
 20 25 30

Leu Ala Ile Val Thr Tyr Gln Phe Ile Ile Thr Lys Tyr Cys Val Arg
 35 40 45

Arg Arg Glu Ser Met Ile Glu Arg Asn Glu Leu Arg Ser His Gln Ala
 50 55 60

Met Val Asn Arg Gly Val Asp Glu Asn Val Leu Lys Ala Ile Pro Ile
 65 70 75 80

pctca2017050779-seql.txt

Ile Thr Tyr His His Gln Gln Gln Gln Gln Ser Arg Asp Glu Glu Glu
85 90 95

Glu Val Phe Cys Val Asp Gln Thr Glu Cys Ser Val Cys Leu Gly Asp
100 105 110

Leu Gln Glu Gly Asp Met Leu Arg Leu Leu Pro Asn Cys Lys His Val
115 120 125

Phe His Val Pro Cys Ile Asp Gln Trp Trp Leu Thr His Ser Thr Cys
130 135 140

Pro Ile Cys Arg Ser Pro Val Thr Gly Arg Asn Asp Asp Ser Val Cys
145 150 155 160

Leu Gln Ile Gln Ala Glu Gly Asp Glu Glu Gly Leu Val Ser His Gln
165 170 175

His His Gln Glu Gln Gln Tyr Asn Cys Ser Glu Gly Ser Asn Asn Asn
180 185 190

Glu Gly Gly Asn Ser Ser Ile Met Val Gly Ser Lys Leu Arg His Cys
195 200 205

Val Ser Leu Ile Trp Pro Ala Asn Tyr Glu Asp Glu Val Arg Lys Gln
210 215 220

Gln Ser Lys Thr Val Leu Leu Lys Arg Ser Met Ser Val Asp Cys Ser
225 230 235 240

Phe Val Cys Ile Lys Ile Gln Pro Arg Thr Asp Ser Ser Ser Ser Ser
245 250 255

Ser Ser Thr Trp Lys Thr Thr Ser Lys
260 265

<210> 637
<211> 300
<212> PRT
<213> Papaver somniferum

<400> 637

Met Lys His Ala Pro Val Lys Ile Pro Leu Phe Val Ile Ala Ile Val
1 5 10 15

Phe Leu Val Phe Ala Phe Val Gly Leu Phe His Asn Asp Glu Asn Ser
20 25 30

pctca2017050779-seq1.txt

Arg Leu Leu Ser Pro Thr Ser Phe Phe Lys Leu Ser Asn Ser Cys Ser
 35 40 45
 Ser Gln Glu Thr Lys Val Ser His Ser Gly Thr Pro Ala Lys Lys Lys
 50 55 60
 Thr Arg Ser Asn Leu Thr Ser Lys Gly Ser Ser Lys Val Thr Glu Val
 65 70 75 80
 Glu Glu Ile Tyr Lys Thr Asp Asn Glu Asp Glu Asp Phe Leu Glu Asn
 85 90 95
 Lys Cys Asp Ile Thr Lys Gly Lys Trp Val Phe Asn Asn Leu Ser Gln
 100 105 110
 Pro Leu Tyr Ser Asp Gln Ser Cys Pro Tyr Ile Asp Lys Gln Val Ser
 115 120 125
 Cys Val Lys Asn Gly Arg Thr Asp Ser Asp Tyr Arg His Trp Glu Trp
 130 135 140
 Gln Pro Asp Asp Cys Val Leu Pro Arg Phe Asp Pro Lys Ala Val Leu
 145 150 155 160
 Asn Lys Leu Arg Asn Lys Arg Leu Met Phe Val Gly Asp Ser Leu Gln
 165 170 175
 Lys Asn Gln Trp Gln Ser Phe Val Cys Gln Val Gln Ser Ile Ile Pro
 180 185 190
 Ala Glu Gln Lys Ser Met Gln Arg Gly Arg Pro His Ser Ile Phe Thr
 195 200 205
 Ala Lys Glu Tyr Asn Ser Thr Ile Glu Phe Tyr Trp Ala Pro Phe Leu
 210 215 220
 Ile Glu Ser Asn Thr Asp Leu Asp Ile Ile Ala Asp Pro Arg Lys Arg
 225 230 235 240
 Ile Leu Lys Val Asp Ser Val Thr Lys His Ala Gln Tyr Trp Met Gly
 245 250 255
 Val Asp Ile Leu Val Phe Asn Thr Tyr Ile Trp Trp Met Asn Gly Ile
 260 265 270
 Lys Ile Lys Ser Leu Trp Gly Ser Ser Gln Thr Glu Thr Thr Gly Leu
 275 280 285

pctca2017050779-seql.txt

Lys Ser Trp Met Gln Lys Leu Leu Ile Glu Leu Val
290 295 300

<210> 638
<211> 77
<212> PRT
<213> Papaver somniferum

<400> 638

Met Leu Ala Asp Tyr Gly Ile Asp Thr Gly Ile Met Lys Ile Phe Cys
1 5 10 15

Asp Asn Ser Ser Thr Ile Arg Ile Thr Glu Asn His Val Glu His Ser
20 25 30

Arg Thr Lys His Ile Asp Ile Arg Asn His Phe Ile Arg Asp Leu Tyr
35 40 45

Glu Asn Gly Ile Ile Asn Met Glu Phe Val Pro Ser Glu Gln Gln Leu
50 55 60

Thr Asn Ile Leu Thr Lys Pro Leu Asp Thr Ala Thr Phe
65 70 75

<210> 639
<211> 328
<212> PRT
<213> Papaver somniferum

<400> 639

Met Thr Met Val Ser Gln Glu Ala Ile Glu Lys Leu Leu Asp Leu Met
1 5 10 15

Glu Glu Val Glu Glu Pro Leu Lys Lys Ser Phe Gln Asn Met His Gln
20 25 30

Gly Tyr Pro Asn Glu Ser Leu Val Arg Phe Leu Lys Ala Arg Asp Gly
35 40 45

Asn Val Tyr Lys Ala His Lys Met Leu Ile Asp Cys Leu Thr Trp Arg
50 55 60

Val Glu Asn Glu Ile Asp Lys Ile Leu Thr Lys Pro Ile Val Pro Thr
65 70 75 80

Asp Leu Tyr Arg Gly Val Arg Asp Ser Gln Leu Leu Gly Leu Ser Gly
85 90 95

pctca2017050779-seql.txt

Tyr Ser Lys Gly Gly Leu Pro Val Phe Ala Ile Gly Val Gly Gln Ser
100 105 110

Thr Phe Asp Lys Ala Leu Val His Tyr Tyr Val Gln Ser His Ile Gln
115 120 125

Ile Asn Glu Tyr Arg Asp Arg Val Val Leu Pro His Ala Thr Lys Lys
130 135 140

Cys Glu Arg Tyr Ile Gly Thr Cys Leu Lys Val Leu Asp Met Thr Gly
145 150 155 160

Leu Lys Leu Ser Ala Leu Ser His Ile Lys Leu Leu Thr Val Ile Ser
165 170 175

Thr Val Asp Glu Leu Asn Tyr Pro Glu Lys Thr Asp Val Tyr Tyr Ile
180 185 190

Val Asn Ala Pro Tyr Ile Phe Ser Ser Cys Trp Lys Ile Val Lys Pro
195 200 205

Leu Leu Gln Glu Arg Thr Arg Lys Lys Ile Gln Val Leu Gln Gly Ser
210 215 220

Gly Lys Glu Glu Leu Leu Lys Val Met Asp Lys Glu Ser Leu Pro His
225 230 235 240

Phe Cys Arg Arg Glu Gly Ser Ser Leu Arg Ser Asn Pro Ser Asn Cys
245 250 255

Phe Ser Met Asp His Ala Phe His Gln Gln Leu Tyr His Tyr Ile Lys
260 265 270

Gln Gln Ser Met Arg Ser Pro Thr Lys Gln Arg Pro Phe His Val Thr
275 280 285

Leu Pro Glu Pro Asn Ser Glu Glu Lys Tyr Ile Ala Lys Thr Ile Glu
290 295 300

His Glu Phe His Asn Phe Gly Lys Arg Asn Gly Leu Ser His Ser Phe
305 310 315 320

Glu Gly Leu Glu Ile Asn Val Glu
325

<210> 640
<211> 437
<212> PRT

<213> Papaver somniferum

<400> 640

Met Ala Ser Ser Ser Asn Arg Asp Glu Pro Leu Ser Phe Met Asn Pro
 1 5 10 15

Ser Ser Ser Ser Ser Pro Ile Gln Val Ser Asp Tyr Leu Gly Val Glu
 20 25 30

Gly Leu Asn Ser Gln Ile Gly Ser Ala Ser Gly Ser Phe Gln Asn Glu
 35 40 45

Gly Phe Leu Thr Thr Gly Gly Gly Asp Ala Gly Ser Gly Ser Asn Ser
 50 55 60

Asp Ile Glu Phe Gly Phe Leu Arg Pro Glu Phe Gly Gln Thr Ser Leu
 65 70 75 80

Val Gly Ser Val Gln Ile Tyr Asp Arg His Val Phe Leu Cys Tyr Lys
 85 90 95

Asn Pro Gln Val Trp Pro Pro His Val Glu Ala Ala Glu Phe Asp Arg
 100 105 110

Leu Pro Arg Leu Leu Cys Ala Ser Leu Leu Ala Arg Lys Ala Glu Met
 115 120 125

Lys Lys Gln Thr Arg Leu Thr Ile Cys Glu Gly His Asp Gly Thr Glu
 130 135 140

Thr Ser Asn Gly Asp Ile Leu Ile Phe Pro Asp Met Ile Arg Tyr Arg
 145 150 155 160

Arg Leu Thr His Phe Asp Val Asp Thr Phe Val Glu Glu Val Leu Val
 165 170 175

Lys Asp Asn Glu Trp Leu Pro Gly Thr Pro Glu Ala Leu Ser Gly Thr
 180 185 190

Tyr Val Phe Val Cys Ser His Gly Ser Arg Asp Arg Arg Cys Gly Val
 195 200 205

Cys Gly Pro Ala Leu Ile Ala Arg Phe Lys Glu Glu Ile Asp Leu Arg
 210 215 220

Gly Val Gln Gly Val Ser Val Ser Pro Cys Ser His Ile Gly Gly His
 225 230 235 240

pctca2017050779-seql.txt

Lys Tyr Ala Gly Asn Val Ile Ile Phe Ser Arg Asn Ser Asp Gly Met
245 250 255

Val Ser Gly Gln Trp Tyr Gly Tyr Val Ala Pro Asp Asp Val Pro Leu
260 265 270

Leu Leu Glu Gln His Ile Gly Asn Gly Glu Ile Ile Asp Arg Leu Trp
275 280 285

Arg Gly Gln Met Gly Leu Ser Val Asn Asp Gln Lys Arg Asp Gln Glu
290 295 300

Leu Arg Leu Gln Leu Asn Asn Lys Ala Asn Tyr Glu Asn Ile Ile Arg
305 310 315 320

Glu Pro Val Asp Asp Tyr Glu Val Glu Pro Asn Gly Thr Ser Tyr Glu
325 330 335

Thr Ala Gly Cys Cys Gln Gly Asn Glu Ser Ser Ser Cys Cys Gln Val
340 345 350

Pro Glu Arg Ile Glu Arg Asn Asn His Val Val Asn Glu Glu Val Lys
355 360 365

Phe Pro Lys Glu Lys Lys Ile Lys Lys Gly Thr Asp Lys Lys Leu Leu
370 375 380

Arg Thr Ser Ser Gly Lys Gly Thr Thr Ser Thr Arg Lys Val Cys Ala
385 390 395 400

Met Pro Thr Trp Phe Glu Ser Trp Glu Arg Glu Asp Thr Tyr Ala Ala
405 410 415

Leu Ala Val Val Gly Ala Phe Val Ser Val Ala Ile Ala Tyr Ser Ser
420 425 430

Tyr Lys Gln Leu Arg
435

<210> 641

<211> 671

<212> PRT

<213> Papaver somniferum

<400> 641

Met Gly Lys Lys Thr Tyr Asp Ser Pro Lys Asp Ser Pro Arg Met Glu
1 5 10 15

pctca2017050779-seq1.txt

Val Gly Glu Ile Asp Thr Arg Ala Pro Phe Ala Ser Val Lys Ala Ala
20 25 30

Val Ser Leu Phe Gly Glu Ala Ala Phe Ser Gly Ser Gly Glu Lys Pro
35 40 45

Val Ile Lys Lys Ser Lys Leu Pro Ser Thr Glu Arg Val Leu Val Lys
50 55 60

Glu Thr Gln Leu His Leu Ala Gln Lys Glu Leu Asn Lys Phe Lys Glu
65 70 75 80

Gln Leu Lys Asn Ala Glu Thr Thr Lys Ala Gln Ala Leu Asn Glu Leu
85 90 95

Glu Lys Ala Lys Arg Thr Val Asp Asp Leu Thr Gln Lys Leu Lys Thr
100 105 110

Ile Asn Glu Ser Lys Glu Ser Ala Ile Lys Ala Thr Glu Ala Ala Arg
115 120 125

Asn Gln Ala Lys Gln Leu Glu Glu Ala Thr Ala Gly Asn Ser Leu Gln
130 135 140

Ser Asn Ala Ala Trp Glu His Asp Leu Asp Ser Ala Arg Glu Gln Tyr
145 150 155 160

Thr Leu Ala Leu Ser Glu Leu Asn Val Ala Lys Gln Glu Leu Thr Lys
165 170 175

Ile Arg Gln Asp Tyr Glu Val Ser Met Glu Ala Lys Ala Ala Phe
180 185 190

Lys Gln Ala Ala Glu Ala Glu Asn Ser Ala Lys Ala Asn Thr Glu Arg
195 200 205

Ala Ser Glu Ile Ser Lys Glu Ile Ser Ala Ala Glu Glu Ser Leu Val
210 215 220

Asp Val Lys His Ala Ala Met Gln Ala Gln Gln Glu Arg Val Asn Ile
225 230 235 240

Leu Ser Gly Lys Glu Ala Gln Arg Gln Ser Tyr Ala Ser Ala Leu Lys
245 250 255

Glu Ala Glu Asn Lys Leu Glu Ser Phe Lys Lys Gly Phe Asp Pro Thr
260 265 270

pctca2017050779-seql.txt

Leu Pro Gly Ser Leu Glu Ala Lys Leu Ala Glu Thr Asp Ala Glu Ile
 275 280 285
 Gly Ala Leu Lys Lys Glu Met Glu Asn Ala Lys Ala Ser Asp Leu Asp
 290 295 300
 Ser Val Lys Phe Val Thr Leu Glu Leu Asp Asp Ala Lys Glu Ser Leu
 305 310 315 320
 Gln Lys Val Ala Glu Glu Glu Asn Ser Leu Arg Ser Leu Val Glu Ser
 325 330 335
 Cys Lys Thr Glu Leu Glu Lys Val Lys Lys Glu His Ser Glu Leu Lys
 340 345 350
 Glu Lys Glu Ala Val Thr Glu Ser Ile Ala Gly Ser Leu His Val Gln
 355 360 365
 Leu Arg Ile Cys Lys Ala Glu Leu Glu Ala Ala Leu Ala Glu Glu Ser
 370 375 380
 Lys Ala Lys Asp Ala Ser Asp Glu Leu Val Thr Thr Ile Gln Gln Leu
 385 390 395 400
 Ser Leu Glu Ser Glu Asn Ala Arg Thr Glu Ala Glu Gln Met Lys Lys
 405 410 415
 Asn Val Glu Asp Leu Lys Lys Glu Ala Glu Glu Thr Arg His Ala Leu
 420 425 430
 Glu Glu Ala Lys Lys Lys Leu Glu Thr Ala Leu Asn Glu Ala Glu Glu
 435 440 445
 Ala Lys Ala Ala Glu Thr Lys Ala Leu Gly Gln Ile Lys Val Leu Ser
 450 455 460
 Glu Arg Thr Asn Ala Ala Arg Ala Ser Thr Ser Glu Ser Gly Ala Lys
 465 470 475 480
 Ile Thr Leu Ser Thr Glu Glu Phe Glu Ser Leu Asn Arg Lys Val Glu
 485 490 495
 Glu Ser Asp Val Leu Ala Glu Met Lys Ile Ala Ala Ala Ile Ala Gln
 500 505 510
 Val Glu Ala Ile Lys Glu Ser Glu Lys Glu Ala Gln Arg Lys Leu Glu

515

Thr Asn Trp Lys Glu Ile Glu Glu Ile Lys Val Ala Thr Glu Glu Ala
530 535 540

Thr Lys Arg Ala Glu Met Ala Glu Met Ala Lys Lys Ala Ile Glu Gly
545 550 555 560

Glu Leu Arg Arg Trp Arg Glu Arg Glu Gln Lys Arg Ala Ala Glu Ala
565 570 575

Ala Ser Arg Ile Leu Ala Glu Thr Glu Ala Ala Ser Ser Pro Asp Ser
580 585 590

Ser Pro Ala Pro Pro Phe Gln Pro Lys Leu Met Lys Lys Gln Pro Ser
595 600 605

Glu Lys Lys Ser Ser Pro Val Asn Glu Lys Phe Gln Lys Ala Phe Ser
610 615 620

Glu Lys Ile Ser Lys Ser Arg Lys Phe Asp Lys Asn Asn Gly Ser Lys
625 630 635 640

Lys Leu Leu Pro Ser Leu Ser Gly Ile Phe His Lys Lys Lys Asn Gln
645 650 655

Val Glu Gly Gly Ser Pro Ser Tyr Leu Pro Gly Glu Asn Pro Val
660 665 670

<210> 642
<211> 115
<212> PRT
<213> Papaver somniferum
<400> 642

Ala Ile Pro Thr Leu Asp Glu Val Lys Glu Ala Val Phe Asp Leu Gly
1 5 10 15

Ala Asp Ser Ala Pro Gly Pro Asp Gly Phe Thr Gly Ser Phe Phe Arg
20 25 30

Ile Cys Trp Asn Ile Ile Ser Arg Asp Leu Phe Asn Ala Ile Ala Asn
35 40 45

Cys Trp Ala Met Ser Lys Ile Pro Asn Gly Ile Asn Ser Ser Phe Ile
50 55 60

Val Leu Ile Pro Lys Thr Asn Lys Ser Asp Ala Ile Lys Asp Tyr Arg
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65          70          75          80
Pro Ile Gly Leu Ser Asn Phe Phe Phe Lys Ile Ile Thr Lys Ile Met
      85          90          95

Ala Thr Arg Leu Gly Thr Val Leu Asn Lys Leu Ile Ser Glu Glu Gln
      100         105         110

Val Ala Phe
      115

<210> 643
<211> 142
<212> PRT
<213> Papaver somniferum

<400> 643

Met Ser Phe Ser Ser Thr Cys Cys Ser Gln Met Asn Cys Arg Phe Gly
1      5      10      15

Thr Ser Glu Leu Phe Ser Pro Cys Phe Ala Leu Gly Arg Phe Pro Phe
      20      25      30

Leu Ser Cys Met Leu Ser Arg Glu Leu Ala Ser Trp Phe Cys Leu Leu
      35      40      45

Glu Leu His Leu Pro Asn Lys Glu Ile Leu Leu Asp Asp Asn Lys Leu
      50      55      60

Lys Asp Asn Lys Thr Ser Met Asp Thr Lys Phe Ser Asn Tyr Phe Val
65      70      75      80

Pro Val Leu Pro Ser Val Thr Glu Cys Asn Ile Ile Met Gln Gly Val
      85      90      95

Met Met Thr His Gly Asn Ile Val Ser Thr Ala Ala Ala Val Met Thr
      100     105     110

Val Ile Pro Glu Ile Gly Arg Lys Asp Val Tyr Leu Ala Tyr Leu Pro
      115     120     125

Leu Ala His Val Phe Glu Leu Glu Ala Glu Val Leu Thr Cys
      130     135     140

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<210> 644
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pctca2017050779-seql.txt

<400> 644

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Glu Phe Asp Ser Leu Asp Glu Ser Tyr Phe Tyr Tyr Asn Glu Tyr Ala
 20 25 30

Arg Ala Val Gly Phe Ser Ile Arg Arg Ala Lys Asn Arg Arg Ser Asn
 35 40 45

Ile Asp Gly Ala Leu Ile Phe Gln Arg Phe Cys Cys Ser Lys Glu Gly
 50 55 60

His Arg Arg Lys Arg Arg Asp Asn Asp Asp Glu Glu Pro Lys Lys Met
 65 70 75 80

Lys Asp Gly Val Leu Val Lys Val Arg Arg Arg Asn Val Arg Ser Ile
 85 90 95

Arg Val Gly Cys Ser Ala Lys Leu Asp Val Lys Arg Val Thr Asp Gly
 100 105 110

Lys Trp Val Val Arg Lys Phe Asp Glu Glu His Asn His Glu Cys Ala
 115 120 125

Asn Ser Gly Glu Lys His Met Leu Arg Ser Gln Arg Arg Ile Gln Ser
 130 135 140

Ile Gln Val Asp Met Ser Met Ser Asp Cys Lys Ile Lys Lys Pro Glu
 145 150 155 160

Lys Gly Asp Val Arg Ala Leu Leu Asn Tyr Phe Arg Glu Met Gln Thr
 165 170 175

Glu Ser Pro Ser Phe Phe Tyr Ala Ile Gln Gly Gly Lys Asp Asp Arg
 180 185 190

Met Leu Asn Phe Phe Trp Val Asp Thr Arg Ser Arg Met Asp Tyr Gly
 195 200 205

Tyr Phe Gly Asp Val Val Tyr Phe Lys Ser Asn Tyr Gly Ile Asn Lys
 210 215 220

Tyr Gly Arg Ala Phe Ser Pro Ile Leu Gly Ile Asn His His Leu Gln
 225 230 235 240

Thr Val Leu Phe Gly Cys Ala Ile Leu Leu Asn Glu Asn Glu Glu Ser

245

250

255

Leu Thr Trp Leu₂₆₀ Leu Glu Thr Phe Leu₂₆₅ Lys Ala Met Ser Gly₂₇₀ Arg Arg

Pro Val Ala Ile Val Ile Asp Gly₂₈₀ Asp Ala Ala Met Met₂₈₅ Lys Ala Ile

Glu Gln Val Leu Pro Gly Thr₂₉₅ Arg Gln Ser Leu Cys₃₀₀ Leu Gly Glu Ile

Leu Val Asp Ala Ser Asn₃₁₀ His Phe Ser His Leu₃₁₅ Glu Asn Met Arg Asp₃₂₀

Ala Phe Ile Thr Asp₃₂₅ Leu Lys Lys Cys Ile₃₃₀ Tyr Asp Thr Gln Trp Cys₃₃₅

Asp Glu Phe Glu₃₄₀ Ser Ser Trp Val Leu₃₄₅ Leu His Glu Lys Tyr Lys Leu

His Glu Asn₃₅₅ Glu Trp Leu Asp Asn₃₆₀ Leu Tyr Lys Lys Arg₃₆₅ His Met Trp

Ala Pro Val Tyr Ser Arg His₃₇₅ Val Phe His Ala Asn₃₈₀ Met Met Thr Ile

Gln Cys Ile Glu Ser Ile₃₉₀ Asn Ser Tyr Phe Asp₃₉₅ Gly Phe Val Asn Glu₄₀₀

Pro Leu Pro Leu Tyr₄₀₅ Glu Phe Leu Lys Gln₄₁₀ Tyr Asp Lys Ala Leu Asp₄₁₅

His Arg Arg Asp₄₂₀ Glu Glu Ile Ser Glu₄₂₅ Asp Phe Gln Ser Leu Glu Thr₄₃₀

Arg Pro Val₄₃₅ Leu Lys Leu Asp Val₄₄₀ Pro Met Glu Gln Gln₄₄₅ Ala Ala Asp

Leu Tyr Thr Arg Ser Val Phe₄₅₅ Lys Glu Phe His Lys₄₆₀ Glu Phe Cys Glu

Ser Phe Ser Tyr Ile Ala₄₇₀ Glu Glu Thr Ala Arg Val Gly Thr Asn Trp₄₈₀

Thr Tyr Ala Val Ser₄₈₅ Arg Trp Gly Gln Asn₄₉₀ Arg Ser Cys Leu Val Ser₄₉₅

pctca2017050779-seql.txt

Phe Ser Ser Cys Asn Asn Asp Ile Arg Val Asn Cys Asp Cys Gln Asn
500 505 510

Phe Glu Phe Thr Gly Ile Leu Cys Lys His Ile Phe Lys Val Phe Thr
515 520 525

Val Arg Asn Ile Met Leu Val Pro Asp Val Tyr Ile Arg Lys Arg Trp
530 535 540

Thr Lys Lys Ala Lys Val Gly Val Phe Leu Gly Glu Gly Cys Arg Lys
545 550 555 560

Ala Leu Glu Asp Cys Gln Lys Ser Gln Ala Phe Arg Phe Asn Asp Leu
565 570 575

Cys Gln Leu Thr Phe Asn Leu Cys Ala Lys Ser Ala Ile Ser Ile Asn
580 585 590

Ala Tyr Gln Thr Ala Lys Ser Thr Met Glu Met Ile Ile Gly Glu Leu
595 600 605

Asp Lys Glu Ala Glu Glu Glu Val Ser Ile Thr Gln Pro Asn Ile Asp
610 615 620

His Val Ser Asn Leu His Tyr Pro Ile Asp Ala Val Asn Gly Ile Gly
625 630 635 640

Ser Ser Asp His Leu Met Gly Glu Asp Asn Gln Thr Leu Thr Ser Gly
645 650 655

Asn His Val Thr Met Gln Asn Pro Gln Arg Val Gly Asp Thr Arg Thr
660 665 670

Gly Phe Trp Leu Arg Leu
675

<210> 645

<211> 168

<212> PRT

<213> Papaver somniferum

<400> 645

Met Asp Ile Ser Ser Asp Leu Thr Glu Leu Gly Arg Ser Pro Val Ala
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Val Ile Ser Ala Gly Ile Lys Ser Ile Leu Asp Ile Pro Arg Thr Leu
20 25 30

pctca2017050779-seq1.txt

Glu Tyr Leu Glu Thr Gln Gly Val Thr Val Ala Ser Tyr Lys Thr His
35 40 45

Glu Phe Pro Ala Phe Phe Thr Glu Thr Ser Gly Cys Gln Val Pro Cys
50 55 60

Arg Val Asp Ser Pro Glu Asp Cys Ala Arg Leu Ile Asp Ala Asn Leu
65 70 75 80

Lys Leu Gly Leu Gly Ser Gly Ile Leu Ile Gly Val Pro Ile Pro Lys
85 90 95

Glu His Ala Ala Ser Gly Arg Met Ile Glu Ser Ala Ile Gln Thr Ala
100 105 110

Leu Lys Glu Ala Arg Asp Lys Asn Val Ser Gly Asn Ala Glu Thr Pro
115 120 125

Phe Leu Leu Ala Lys Val Asn Glu Leu Thr Lys Gly Ala Ser Leu Ala
130 135 140

Ser Asn Ile Ala Leu Val Lys Asn Asn Ala Leu Val Gly Gly Ser Ile
145 150 155 160

Ala Ala Ala Leu Ser Lys Leu Arg
165

<210> 646
<211> 306
<212> PRT
<213> Papaver somniferum

<400> 646

Met Glu Glu Thr Ile Ser Thr Thr Ala Glu Lys Arg Cys Ala Val Val
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Thr Gly Ala Asn Lys Gly Ile Gly Leu Glu Ile Cys Arg Gln Leu Ala
20 25 30

Ile Asn Gly Ile Thr Val Ile Leu Thr Ala Arg Asp Glu Thr Arg Gly
35 40 45

Thr Arg Ser Val Glu Ala Leu Lys Gly Ser Gly Leu Ala Gly Val Ile
50 55 60

Phe His Gln Leu Asp Val Asn Asp Ala Thr Ser Val Thr Ser Leu Ala
65 70 75 80

pctca2017050779-seql.txt

Gly Phe Ile Arg Thr Arg Tyr Gly Lys Leu Asp Ile Leu Val Asn Asn
85 90 95

Ala Gly Asp Asn Gly Val Arg Leu Gln Ile Ser Glu Glu Ala Met Lys
100 105 110

Asp Met Asn Phe Arg Tyr Gly Asp Glu Asn Asp Glu Ile Ala Lys Leu
115 120 125

Leu Glu Glu Ser Ile Glu Glu Thr Tyr Glu Arg Val Lys Gln Ser Ile
130 135 140

Glu Thr Asn Tyr Tyr Gly Thr Ile Arg Ile Thr Glu Ala Leu Leu Pro
145 150 155 160

Leu Leu Gln Leu Ser Asn Ser Ala Arg Ile Val Asn Val Ser Ser Val
165 170 175

Tyr Gly Gln Leu Lys Phe Ile Ser Ser Glu Thr Ile Lys Glu Glu Leu
180 185 190

Arg Asn Val Asp Cys Leu Thr Val Glu Lys Leu Asp Glu Leu Met Gln
195 200 205

Lys Phe Leu Lys Asp Phe Lys Asp Gly Met Leu Glu Thr Asn Gly Trp
210 215 220

Pro Val Leu Val Ser Ala Tyr Lys Val Ser Lys Ala Ala Ile Asn Ala
225 230 235 240

Tyr Thr Arg Ile Leu Ala Arg Lys Phe Pro Thr Phe Arg Val Asn Ala
245 250 255

Val His Pro Gly Leu Val Lys Thr Asp Ile Ala Phe Gln Gln Gly Asn
260 265 270

Leu Thr Pro Asp Glu Gly Ala Lys Ala Pro Val Met Val Ala Leu Leu
275 280 285

Pro Ser Asp Gly Pro Ser Gly Phe Tyr Phe Asp Gln Met Glu Ile Ser
290 295 300

Thr Phe
305

<210> 647
<211> 211
<212> PRT

<213> Papaver somniferum

<400> 647

Met Glu Cys Leu Ser Ser Lys Phe Ile Pro Phe Ala Leu Leu Ala Ile
 1 5 10 15

Leu Ser Leu Leu Gln Val Ala Val Gly Ile Arg Phe Val Ile Asp Arg
 20 25 30

Glu Glu Cys Phe Ser His Ser Val Pro Tyr Glu Gly Asp Thr Val His
 35 40 45

Val Ser Phe Val Val Ile Lys Ala Glu Gly Trp His Tyr Gly Asp Asp
 50 55 60

Gly Val Asp Leu Val Val Lys Gly Pro Thr Glu Glu Gln Ile His Asp
 65 70 75 80

Ala Arg Asp Lys Thr Ser Glu Lys Phe Glu Phe Val Ala His Lys Lys
 85 90 95

Gly Val His Lys Phe Cys Phe Thr Asn Lys Ser Pro Tyr His Glu Thr
 100 105 110

Leu Asp Phe Asp Ile His Val Gly His Phe Thr Tyr Phe Glu Gln His
 115 120 125

Ala Lys Asp Glu His Phe Asn Pro Leu Leu Glu Gln Ile Ser Lys Leu
 130 135 140

Glu Glu Ala Leu Tyr Asn Ile Gln Phe Glu Gln His Trp Leu Glu Ala
 145 150 155 160

Thr Thr Asp Arg Gln Ala Leu Val Asn Glu Gly Met Ser Arg Arg Ala
 165 170 175

Ile His Lys Ala Ile Phe Glu Ser Ala Ala Leu Val Gly Ala Ser Ile
 180 185 190

Leu Gln Val Tyr Leu Leu Arg Arg Leu Phe Glu Arg Lys Leu Gly Thr
 195 200 205

Ser Arg Val
 210

<210> 648

<211> 318

<212> PRT

<213> Papaver somniferum

<400> 648

Met Ala Gln Leu Leu Ser Pro Val Cys Thr Asp Leu Leu Lys Phe Gln
 1 5 10 15

Asn Pro Asn Asn Gln Phe Phe Ser Ser Ile Lys Pro Trp Arg Met Leu
 20 25 30

Thr Lys Ile Asn Ser Asn His Leu Ile Thr Thr Phe Ser Gly Ser Lys
 35 40 45

Arg Arg Asp Ser Arg Ile Arg Ala Val Ala Glu Glu Ser Phe Ser Ser
 50 55 60

Asp Ala Ile Ala Asp Asp Tyr Tyr Ala Val Leu Gly Leu Leu Pro Asp
 65 70 75 80

Ala Thr Pro Glu Gln Ile Lys Lys Ala Tyr Tyr Thr Cys Met Lys Ala
 85 90 95

Cys His Pro Asp Leu Ser Gly Asn Asp Pro Glu Thr Thr Asn Phe Cys
 100 105 110

Met Phe Ile Asn Glu Val Tyr Thr Val Leu Ser Asp Pro Val Gln Arg
 115 120 125

Met Val Tyr Asp Glu Ile His Gly Tyr Ala Leu Ser Ala Val Asn Pro
 130 135 140

Phe Leu Asp Asp Thr Ser Val Lys Asp His Ala Phe Val Asp Glu Phe
 145 150 155 160

Ser Cys Ile Gly Cys Lys Asn Cys Ala Asn Val Ala Pro Asp Val Phe
 165 170 175

Asn Ile Glu Glu Glu Phe Gly Arg Ala Arg Val Cys Asn Gln Ser Gly
 180 185 190

Asn Ile Asp Leu Val Asn Gln Ala Ile Glu Ser Cys Pro Val Asp Cys
 195 200 205

Ile His Trp Thr Ser Ala Ala Gln Val Ser Leu Leu Glu Asp Glu Met
 210 215 220

Arg Leu Val Glu Arg Val Thr Val Ala Leu Met Leu Ala Gly Met Gly
 225 230 235 240

pctca2017050779-seql.txt

Thr Ser Ser Asp Val Phe Arg Met Ala Asn Asn Arg Trp Glu Lys Arg
245 250 255

Gln Ser Lys Val Leu Glu Lys Ala Arg Ile Arg Met Met Gln Gln Lys
260 265 270

Asp Ala Asn Lys Ser Glu Thr Tyr Trp Asn Asp Leu Trp Gly Lys Pro
275 280 285

Ala Thr Tyr Glu Thr Ser Gly Ile Lys Asn Lys Thr His Gln Ile Leu
290 295 300

Phe Phe Glu Val Phe Ser Leu Pro Ser Phe Ile Ser Phe Thr
305 310 315

<210> 649
<211> 524
<212> PRT
<213> Papaver somniferum

<400> 649

Met Gly Ser Leu Pro Thr Asp Asn Pro Glu Ser Met Ser Ile Cys Leu
1 5 10 15

Gln Asn Pro Leu Asp Pro Asp Glu Phe Arg Arg Gln Gly His Met Ile
20 25 30

Ile Asp Phe Leu Ala Asp Tyr Tyr Lys Asn Val Glu Asn Tyr Pro Val
35 40 45

Arg Ser Gln Val Glu Leu Gly Tyr Leu Arg Lys Arg Leu Pro Glu Ser
50 55 60

Ala Pro Asn Asp Pro Glu Ser Ile Glu Thr Ile Leu Gln Asp Val Thr
65 70 75 80

Asn Asp Ile Ile Pro Gly Leu Thr His Trp Gln Ser Pro Asn Tyr Phe
85 90 95

Ala Tyr Phe Pro Ser Ser Gly Ser Val Ala Gly Phe Leu Gly Glu Met
100 105 110

Leu Ser Thr Gly Phe Asn Val Val Gly Phe Asn Trp Met Ser Ser Pro
115 120 125

Ala Ala Thr Glu Leu Glu Ser Ile Val Met Asn Trp Leu Gly Gln Met
130 135 140

pctca2017050779-seql.txt

Leu Thr Leu Pro Lys Ser Phe Leu Phe Ser Ser Asp Gly Ser Ser Gly
 145 150 155 160
 Gly Gly Gly Val Leu Gln Gly Thr Thr Cys Glu Ala Ile Leu Cys Thr
 165 170 175
 Leu Ser Ala Ala Arg Asp Lys Met Leu Asn Lys Thr Gly Arg Glu Asn
 180 185 190
 Ile Asn Lys Leu Val Val Tyr Ala Ser Asp Gln Thr His Cys Ala Leu
 195 200 205
 Gln Lys Ala Ala Gln Ile Ala Gly Ile Asn Pro Lys Asn Phe Arg Ala
 210 215 220
 Ile Ser Thr Ser Lys Ala Thr Asn Phe Gly Leu Ser Pro Asn Ser Leu
 225 230 235 240
 Gln Ser Thr Ile Leu Ala Asp Ile Glu Thr Gly Leu Val Pro Leu Phe
 245 250 255
 Leu Cys Ala Thr Val Gly Thr Thr Ser Ser Thr Ala Val Asp Pro Ile
 260 265 270
 Gly Pro Leu Cys Glu Val Ala Lys Leu Tyr Gly Ile Trp Val His Val
 275 280 285
 Asp Ala Ala Tyr Ala Gly Ser Ala Cys Ile Cys Pro Glu Phe Arg His
 290 295 300
 Phe Ile Ala Gly Val Glu Glu Ala Asp Ser Phe Ser Leu Asn Ala His
 305 310 315 320
 Lys Trp Phe Phe Thr Thr Leu Asp Cys Cys Cys Leu Trp Val Lys Asp
 325 330 335
 Ser Ser Ala Leu Val Lys Ala Leu Ser Thr Asn Pro Glu Tyr Leu Lys
 340 345 350
 Asn Lys Ala Thr Glu Ser Lys Gln Val Ile Asp Tyr Lys Asp Trp Gln
 355 360 365
 Ile Ala Leu Ser Arg Arg Phe Arg Ser Met Lys Leu Trp Leu Val Leu
 370 375 380
 Arg Ser Tyr Gly Met Ala Asn Leu Arg Thr Phe Leu Arg Ser His Val
 385 390 395 400

pctca2017050779-seql.txt

Lys Met Ala Lys His Phe Gln Gly Leu Ile Gly Met Asp Asn Arg Phe
405 410 415

Glu Ile Val Val Pro Arg Thr Phe Ala Met Val Cys Phe Arg Leu Lys
420 425 430

Pro Thr Ala Ile Phe Lys Gln Thr Leu Val Glu Asn Asp Tyr Ile Glu
435 440 445

Ala Ala Ser Asn Glu Ile Asn Gly Lys Leu Leu Glu Ser Val Asn Ala
450 455 460

Ser Gly Arg Ile Tyr Met Thr His Ala Val Val Gly Gly Val Tyr Met
465 470 475 480

Ile Arg Phe Ala Val Gly Ala Thr Leu Thr Glu Glu Arg His Val Thr
485 490 495

Gly Ala Trp Lys Val Val Gln Glu His Thr Asn Tyr Ile Leu Gly Ala
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Leu Asp Gly His Thr Thr Asn His Gln Ile Val Ala
515 520

<210> 650

<211> 379

<212> PRT

<213> Papaver somniferum

<400> 650

Met Glu Gly Thr Ser Val Gly Thr Pro Ser Arg Val Ser Leu Leu Asn
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Ala Ser Ala Leu Lys Cys Arg Asn Asn Phe Met Val Thr Arg Ser Ile
20 25 30

Pro Gly Tyr Leu Phe Glu Asn Thr Arg Arg Arg Asn Asp Ser Ile Lys
35 40 45

Arg Val Leu Ser Gln Glu Ser Glu Gly Gly Ala Ser Val Ala Ser Ser
50 55 60

Ser Ser Ser Ser Ser Val Asp Asp Gln Gly Ile Lys Ile Arg Arg Arg
65 70 75 80

Pro Thr Ser Gly Pro Pro Ser His Ala Val Gly Pro Phe Glu Phe Arg
85 90 95

pctca2017050779-seql.txt

Leu Gln Asn Asp Gly Asn Thr Pro Arg Asn Ile Leu Glu Glu Ile Ile
 100 105 110
 Trp Asn Lys Asp Val Glu Ile Thr Gln Leu Lys Glu Lys Lys Pro Leu
 115 120 125
 Tyr Ser Leu Lys Lys Ala Leu Asp Ser Ala Pro Pro Val Arg Asp Phe
 130 135 140
 Val Gly Ala Leu Arg Ser Ala Tyr Leu Arg Thr Gly Ala Pro Ala Leu
 145 150 155 160
 Ile Ala Glu Val Lys Lys Ala Ser Pro Ser Arg Gly Val Leu Arg Glu
 165 170 175
 Asp Phe His Pro Val Asn Ile Ala Gln Ala Tyr Glu Asn Gly Gly Ala
 180 185 190
 Ala Cys Leu Ser Val Leu Thr Asp Glu Lys Tyr Phe Gln Gly Ser Phe
 195 200 205
 Glu Asn Leu Ala Ala Ile Arg Arg Ser Gly Ile Lys Cys Pro Leu Leu
 210 215 220
 Cys Lys Glu Phe Ile Ile Asp Ala Trp Gln Ile Tyr Tyr Ala Arg Thr
 225 230 235 240
 Lys Gly Ala Asp Ala Ile Leu Leu Ile Ala Ser Ile Leu Pro Asp Ala
 245 250 255
 Asp Ile Asn Tyr Met Ser Lys Ile Ala Lys Lys Phe Gly Leu Ser Thr
 260 265 270
 Leu Val Glu Val His Asn Glu Ser Glu Met Asp Arg Val Leu Arg Ile
 275 280 285
 Asp Gly Ile Asp Leu Ile Gly Ile Asn Asn Arg Asn Leu Glu Thr Phe
 290 295 300
 Glu Val Asp Ile Ser Asn Thr Lys Lys Leu Leu Glu Gly Lys Arg Gly
 305 310 315 320
 Glu Ile Ile Arg Gln Lys Asp Ile Ile Val Val Gly Glu Ser Gly Leu
 325 330 335
 Phe Thr Pro Asp Asp Ile Ala Tyr Val Gln Glu Ala Gly Val Lys Ala

340

Val Leu Val Gly Glu Ser Leu Val Lys Gln Ser Asp Pro Gly Arg Gly
355 360 365

Ile Ala Asp Leu Tyr Gly Arg Asn Ile Ser Ser
370 375

<210> 651
<211> 74
<212> PRT
<213> Papaver somniferum

<400> 651

Met Pro Ala Asp Tyr Ser Ser Ile Ser Ser Leu Ile Lys Lys Ser Arg
1 5 10 15

Asn Asp Glu Glu Asn Gln Thr Arg Val Ser Val Ala Thr Met Ser Leu
20 25 30

Gly Asp Glu Asn Ser His Glu Ile Asp Gly Asp Leu His Ser Arg Gln
35 40 45

Leu Val Val Tyr Gly Arg Glu Thr Met Arg Arg Leu Phe Ala Ser Asn
50 55 60

Ile Leu Val Ser Gly Met Gln Gly Ile Gly
65 70

<210> 652
<211> 318
<212> PRT
<213> Papaver somniferum

<400> 652

Met Val Met Pro Phe Gly Leu Ser Asn Ala Pro Ser Thr Phe Met Arg
1 5 10 15

Ile Met Asn Gln Val Leu Arg Pro Leu Ile Gly Thr Phe Val Val Val
20 25 30

Tyr Phe Asp Asp Ile Leu Ile Tyr Ser Val Asp Met Asn Met His Phe
35 40 45

Gln His Leu Arg Glu Val Leu Pro Thr Leu Arg Arg Glu Lys Leu Phe
50 55 60

Ala Ala Ile Lys Lys Cys Ser Phe Met Thr Asp Gln Ile Leu Phe Leu
65 70 75 80

pctca2017050779-seql.txt

Gly Tyr Val Val Thr Lys Asp Gly Ile Lys Val Asp Tyr Ser Lys Val
85 90 95

Glu Ala Val Arg Asn Trp Thr Thr Pro Thr Thr Leu His Glu Val Arg
100 105 110

Ser Phe His Gly Phe Ala Ser Phe Tyr Arg Arg Phe Ile His His Phe
115 120 125

Ser Thr Ile Met Ala Pro Ile Thr Glu Cys Met Lys Val Gly Lys Phe
130 135 140

Ser Trp Ser Glu Glu Ala Asp Lys Ala Phe Glu Ala Val Lys Thr Lys
145 150 155 160

Leu Ile Thr Ala Pro Leu Leu Val Leu Pro Asp Phe Ser Lys Pro Phe
165 170 175

Glu Leu His Cys Asp Ala Ser Lys Val Gly Ile Gly Ala Val Leu Ser
180 185 190

Gln Glu Gly Arg Pro Val Ala Tyr Phe Ser Glu Lys Leu Asn Gly Ala
195 200 205

Lys Thr Asn Tyr Ser Thr Tyr Asp Val Glu Phe Tyr Ala Ile Val Gln
210 215 220

Ala Leu Lys His Trp Arg His Tyr Leu Ile His Asn Glu Phe Ile Met
225 230 235 240

Phe Ser Asp His Asp Ser Leu Arg His Ile Asn Arg Gln Glu Lys Leu
245 250 255

Ser Ser Arg His Gly Lys Trp Ala Ser Tyr Leu Gln Glu Phe Thr Phe
260 265 270

Ile Leu Lys His Lys Ala Gly Ser Gln Asn Gln Val Ala Asp Ala Leu
275 280 285

Ser Arg Arg Ser Met Leu Leu Asn Thr Met Arg Thr Glu Val Ile Asp
290 295 300

Phe Asp Ser Tyr Ser Glu His Ile Leu Thr Asn Pro His Phe
305 310 315

<210> 653

pctca2017050779-seql.txt

<211> 77

<212> PRT

<213> Papaver somniferum

<400> 653

Met Thr Ile Asp Lys Thr Leu Pro Leu Gln Thr Ser Thr Asn Asn Thr
1 5 10 15

Asn Val Pro Lys Asn Pro Ala Ser Ile Asn Gln Lys Gly Lys Thr Ile
20 25 30

Glu Glu Met Tyr Gln Lys Lys Ser Gln Leu Glu His Ile Leu Leu Arg
35 40 45

Pro Asp Thr Tyr Ile Gly Ser Ile Glu Lys His Thr Gln Ser Leu Trp
50 55 60

Val Phe Glu Gly Gly Gln Met Val Tyr Arg Pro Val Ser
65 70 75

<210> 654

<211> 169

<212> PRT

<213> Papaver somniferum

<400> 654

Met Ser Gly Ile Glu Glu Ser Val Ala Pro Pro Pro Pro Gln Asp Val
1 5 10 15

Ser Ser Phe Ser Lys Gly Ala Val Thr Val Thr Pro Thr Ile Phe Pro
20 25 30

Asn Met Lys Lys Leu His Leu Asn Asp Ile Asn Gly Ser Ala Val Ser
35 40 45

Ser Ile Leu Thr Asn Leu Thr Ser Leu Ala His Leu Ser Ile Thr Glu
50 55 60

Val Pro Glu Leu Phe Ile Gln Gln Gly Leu Phe Gly Asn Asn Asn Leu
65 70 75 80

Leu Glu Ser Leu Ser Val Arg Arg Cys Thr Asp Phe Gln Gly Phe Cys
85 90 95

Ser Leu Glu Glu Glu Lys Glu Pro Ile Ser Thr Phe His Leu Asn Asn
100 105 110

Asn Ser Leu Lys Glu Leu Glu Phe Ile Asp Cys Pro Asp Leu Thr Phe
115 120 125

pctca2017050779-seql.txt

Leu Leu Asp Ile Arg Gly Cys Thr Ser Leu Gln Lys Ile Thr Ile Asn
130 135 140

Gly Cys Lys Glu Leu Lys Phe Glu Tyr Asp Leu Arg Thr Cys Leu Ser
145 150 155 160

Phe Ile Pro Glu Leu Asp Ile Pro Phe
165

<210> 655
<211> 401
<212> PRT
<213> Papaver somniferum

<400> 655

Met Tyr Val Leu Ala Thr Asp Ile Gly Ser Leu Gln Asn Leu Val Ser
1 5 10 15

Val Arg Phe Gln His Thr Ser Ile Lys Glu Leu Pro Asn Ser Phe Gly
20 25 30

Glu Leu Thr Lys Leu Arg Ser Leu Ser Leu Glu Asp Thr Asp Val Lys
35 40 45

Glu Leu Pro Glu Ser Leu Ser Ser Ser Ile Cys Lys Leu Glu Phe Val
50 55 60

Asn Phe Gly Arg Val Cys Lys Phe Pro Lys Asp Ile Lys Lys Trp Val
65 70 75 80

Asp Leu Arg Cys Met Arg Lys Ser Asn Arg Phe Ala Asp Gln Tyr Gln
85 90 95

Val Met Pro Thr Gly Ile Glu Met Leu Thr Arg Leu Glu Val Leu Asp
100 105 110

Ser Tyr Val Val Arg Asn Glu Lys Asp Tyr Ile Gly Gly Tyr Tyr Asp
115 120 125

Ser Ser Arg Ile Glu Glu Leu Ala Gly Leu Asn Thr Leu Arg Glu Leu
130 135 140

Thr Ile Thr His Leu His Asn Val Ile Gly Lys Met Asp Ala Glu Gly
145 150 155 160

Ala Lys Leu Lys Asp Lys Met Ile Ile Lys Lys Leu Tyr Leu Lys Trp
165 170 175

pctca2017050779-seql.txt

Val Gln Lys Arg Lys Glu Glu Glu Glu Val Ala Asp Ser Ser Phe Met
180 185 190

Val Leu Glu Gly Leu Lys Pro His Ser Asn Leu Glu Leu Leu Ser Ile
195 200 205

Glu Tyr Phe Gly Gly Val Lys Leu Pro Lys Trp Met Ser Ser Ser Tyr
210 215 220

Cys Leu Pro Asn Leu Val Lys Leu Phe Phe Lys Asp Cys Lys Ser Cys
225 230 235 240

Glu Lys Leu Gln Ser Leu Gly Met Leu Arg Cys Leu Cys Ile Leu His
245 250 255

Met Ile Gly Met Ser Ser Val Lys Cys Leu Gly Val Glu Phe Tyr Tyr
260 265 270

Gln Gln Gly Glu Glu Glu Glu Ser Ser Met Thr Thr Leu Phe Pro Ser
275 280 285

Leu Ile Glu Leu Arg Ile His Tyr Leu Asn Asp Leu Glu Glu Trp Val
290 295 300

Ala Pro Pro Pro Pro Tyr Ser Ser Phe Pro Val Leu Glu Tyr Leu Ser
305 310 315 320

Ile Gln Arg Cys Pro Lys Leu Lys Ser Ile Pro Asp Leu Gly Leu Arg
325 330 335

Thr Ser Leu Gln Arg Lys Ile Leu Glu Cys Asn Lys Leu Glu Glu Ser
340 345 350

Met Pro Cys Asp Pro Lys Asn Pro Ser Cys Leu Glu Phe Leu Asp Glu
355 360 365

Leu Ser Arg Gly Asn Phe Ile Asp Phe Asn Asp Pro Lys Asn Gly Val
370 375 380

Pro Ser Asp Leu Glu Lys Arg Lys Glu Val Gly Asp Arg Cys Ala Pro
385 390 395 400

Met

<210> 656

pctca2017050779-seql.txt

<211> 790

<212> PRT

<213> Papaver somniferum

<400> 656

Met Thr Ala Gln Pro Val Thr Leu Ala Ala Ile Lys Ala Leu Ile Lys
1 5 10 15

Ser His Thr Glu Ile Leu Ala Lys Asn Ile Thr Glu Ala Leu Glu Lys
20 25 30

Ser Met Glu Asp Lys Leu Gly Leu Arg Asp Thr Lys Leu Glu Thr Met
35 40 45

Gln Asn Gln Ile Leu Lys Val Ala Lys His Ile Asn Leu Asp Leu Glu
50 55 60

Met Pro Glu Leu Val Asp Leu Glu Gly Lys Asn Lys Glu Asp Ile Leu
65 70 75 80

Gln Phe Leu Gln Asn Asp Glu Val Pro Glu Asp Val Leu Arg Thr Leu
85 90 95

Asn Ile Lys Lys Pro Tyr Glu Gly Phe Ile Gly His Ser Lys Lys Lys
100 105 110

Ile Val Ser Pro Ala Leu Asp Asn Asp Asp Glu Asp Glu Arg Glu Asn
115 120 125

Asp Leu Glu Lys Asn Trp Thr Glu Glu Arg Arg Leu Lys Thr Gly His
130 135 140

Asn Pro Tyr Ser Ser Leu Pro Glu Tyr Lys Leu Lys Ala Asn Ile Pro
145 150 155 160

Asn Phe Ser Gly Asn Phe Arg Ile Glu Glu Leu Thr Asp Arg Phe Phe
165 170 175

Glu Val Glu Ala Phe Phe Glu Phe Met Glu Val Pro Glu Asp Ser Lys
180 185 190

Val Lys Leu Val Thr Tyr Lys Leu Lys Gly Gly Ala Ala Ala Trp Trp
195 200 205

Asp Lys Ile Cys Asp Asp Arg Arg Asn Ala Asn Lys Pro Lys Ile Arg
210 215 220

Thr Trp Lys Arg Met Lys Thr Leu Ile Arg Tyr Lys Phe Leu Pro Arg

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225                230                235                240
Asp Phe Met Gln Gln Leu Phe Ile Lys Leu Gln Asn Ile Gln Gln Gly
                245                250                255
Ala Arg Thr Val Glu Glu Tyr Val Ser Asp Phe Tyr Asn Leu Val Ala
                260                265                270
Arg Asn Gln Leu Lys Glu Ser Glu Glu Gln Leu Val Ala Arg Phe Ile
                275                280                285
Glu Gly Leu Asn Arg Leu Ile Gln Asn Gly Met Thr His Ser Val Phe
                290                295                300
Thr Met Val Glu Val Val Gln Gln Ala Ile Lys Ile Glu Asn Arg Leu
305                310                315
Ile Arg Ser Ser Arg Ile Tyr Pro Ser Arg Gln Gly Arg Tyr Gln Asn
                325                330                335
Thr Tyr Arg Gly Thr Asn Ser Ser Gln Asn Phe Ser Pro Asp Thr Val
                340                345                350
Leu Asn Ile Pro Arg Pro Pro Tyr Asp Asp Val Ser His Ser His Arg
                355                360                365
Gln Pro Ser His Ile Val Thr Tyr Thr Pro Pro Leu Ala Thr Pro Ile
                370                375                380
Leu Ala Asn Ser Val Asp Leu Gln Pro Gly Gln Gln Ser His Ser Leu
385                390                395
Gln Pro Thr Pro Pro Thr Thr Gly Asn Arg Phe His Asn Arg Gln Gln
                405                410                415
Gln Phe Pro Pro Gln Gln Arg Ala Asn Asn Ala Cys Thr Lys Phe Arg
                420                425                430
Gly Asp Lys Cys Asn Lys Cys Gln Gln Ser Gly His Thr Ser Ser Asp
                435                440                445
Cys Arg Lys Phe Asn Ala Leu Ile Gly Glu Pro Gln Phe Ile Asn Glu
                450                455                460
Val Thr Gly Ala Leu Asn Glu Phe Glu Tyr Glu Asp Ser Pro Gly Asp
465                470                475                480

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Asp Asp Glu Phe Val Gly Met Ile Arg Pro Leu Phe Leu Thr Gln Gln
 485 490 495
 Cys Lys Ser Gln Arg His Asn Ile Phe Lys Ser Arg Cys Tyr Ile Gly
 500 505 510
 Gly Lys Ile Cys Lys Met Ile Ile Asp Ser Gly Ser Val His Asn Cys
 515 520 525
 Ile Ala Asp His Val Val Lys Lys Leu Glu Leu Pro Val Thr Ser His
 530 535 540
 Pro Glu Pro Tyr Thr Val Gly Trp Val Asn Ala Ser Ser Thr Gln Lys
 545 550 555 560
 Ile Thr Leu Gln Cys Tyr Val Ser Phe Ser Phe Glu Gly Tyr Glu Asp
 565 570 575
 Thr Val Leu Cys Asp Val Ile Asn Met Thr Ala Thr His Leu Leu Leu
 580 585 590
 Gly Arg Pro Trp Gln Tyr Asp Leu Gln Ala Val His Asn Gly Phe Glu
 595 600 605
 Asn Thr Tyr Thr Phe Val His Asn Gly Lys Thr Lys Val Leu Ser Pro
 610 615 620
 Ser Asn Ser Thr Ser Asn Ser Cys Ala Gln Thr Asp Ala Val Val Ala
 625 630 635 640
 Thr Val Ile Arg Ser Leu His Pro Gln His Ser Leu His Ser His Glu
 645 650 655
 Asp Ser Lys Pro Met Ile Glu Phe Pro Pro Leu Arg Asn Ile Gln His
 660 665 670
 Tyr Ile Asp Phe Ile Pro Gly Ala Ser Leu Pro Asn Gln Ala His Tyr
 675 680 685
 Leu Leu Ser Pro Ala Glu His Glu Ile Leu Gln Gly Gln Val Asn Asp
 690 695 700
 Leu Leu Lys Lys Gly Leu Ile Arg Pro Ser Asn Arg Pro Cys Ala Ser
 705 710 715 720
 Pro Ala Phe Leu Val Ser Lys Lys Asp Asn Gly Trp Arg Met Cys Ile
 725 730 735

pctca2017050779-seql.txt

Asp Cys Arg Ala Leu Asn Arg Ile Thr Ile Pro Tyr Arg Phe Pro Ile
740 745 750

Pro Arg Ile Asp Asp Met Ile Asp Leu Leu Ser Gly Ser Ile Ile Phe
755 760 765

Thr Lys Leu Asp Leu Arg Ser Gly Tyr His Gln Ile Arg Ile Arg Gly
770 775 780

Gly Asp Glu Trp Lys Thr
785 790

<210> 657
<211> 386
<212> PRT
<213> Papaver somniferum

<400> 657

Met Asn Asn Ile Phe Ala Lys Leu Arg Asn Leu Asp Ala Tyr Pro Lys
1 5 10 15

Ile Asn Glu Asp Phe Tyr Ser Arg Thr Leu Ser Gly Gly Val Ile Thr
20 25 30

Val Ile Ser Ser Ile Leu Met Ile Leu Leu Phe Ile Ser Glu Leu Arg
35 40 45

Leu Tyr Ile Asn Ser Met Thr His Thr Glu Leu Val Val Asp Thr Ser
50 55 60

Arg Gly Glu Thr Leu Arg Ile Asn Phe Asp Val Thr Phe Pro Ala Leu
65 70 75 80

Pro Cys Ser Ile Leu Ser Leu Asp Ala Met Asp Ile Ser Gly Glu Gln
85 90 95

His Leu Asp Val Lys His Asp Val Ile Lys Asn Arg Ile Asp Ala Asn
100 105 110

Gly Asn Ile Ile Glu Thr Lys Lys Asp Gly Val Gly Val His Lys Met
115 120 125

Glu Lys Pro Leu Gln Lys His Gly Gly Arg Leu Glu His Asn Glu Thr
130 135 140

Tyr Cys Gly Ser Cys Tyr Gly Ala Glu Thr Thr Asp Ala Asp Cys Cys
145 150 155 160

pctca2017050779-seql.txt

Asn Ser Cys Glu Glu Val Arg Glu Ala Tyr Arg Lys Lys Gly Trp Gly
165 170 175

Met Ser Asn Pro Asp Glu Ile Asp Gln Cys Lys Arg Glu Gly Phe Leu
180 185 190

Gln Lys Ile Lys Asp Glu Glu Gly Glu Gly Cys Asn Ile Tyr Gly Phe
195 200 205

Leu Glu Val Asn Lys Val Ala Gly Asn Phe His Phe Ala Pro Gly Lys
210 215 220

Ser Phe Gln Gln Ser Asn Val His Val His Asp Val Thr Ala Phe Gln
225 230 235 240

Lys Asp Ser Phe Asn Ile Ser His Lys Ile Asn Lys Leu Ser Phe Gly
245 250 255

Glu Ser Phe Pro Gly Val Val Asn Pro Leu Asp Arg Val Gln Trp Thr
260 265 270

Gln Lys Thr Pro Thr Gly Met Phe Gln Tyr Phe Val Lys Val Val Pro
275 280 285

Thr Val Tyr Thr Asp Ile Asn Asn His Thr Ile Gln Ser Asn Gln Phe
290 295 300

Ser Val Thr Glu His Phe Arg His Ala Ile Val Gly Gln Pro His Ser
305 310 315 320

Val Pro Gly Val Phe Phe Phe Tyr Asp Leu Ser Pro Ile Lys Val Thr
325 330 335

Phe Thr Glu Gln His Val Ser Phe Leu His Phe Leu Thr Asn Ile Cys
340 345 350

Ala Ile Val Gly Gly Met Phe Thr Val Ser Gly Ile Leu Asp Ser Phe
355 360 365

Ile Tyr His Gly Gln Lys Val Ile Arg Lys Lys Met Glu Ile Gly Lys
370 375 380

Phe Ser
385

<210> 658
<211> 324

pctca2017050779-seql.txt

<212> PRT

<213> Papaver somniferum

<400> 658

Met Ala Pro Lys Pro Ser Lys Ala Glu Lys Lys Ile Ala Tyr Asp Lys
1 5 10 15

Lys Leu Cys Lys Phe Leu Asp Glu Tyr Gly Gln Ile Leu Val Val Ala
20 25 30

Ala Asp Asn Val Gly Ser Asn Gln Leu Gln Asn Ile Arg Lys Gly Leu
35 40 45

Arg Gly Asp Ser Val Val Leu Met Gly Lys Asn Thr Met Met Lys Arg
50 55 60

Thr Val Arg Leu His Ala Glu Lys Thr Gly Asn Asn Asp Phe Leu Asn
65 70 75 80

Leu Ile Pro Leu Leu Val Gly Asn Val Gly Leu Ile Phe Thr Lys Gly
85 90 95

Asp Leu Lys Glu Val Ser Glu Glu Val Ser Lys Tyr Lys Val Gly Ala
100 105 110

Pro Ala Arg Val Gly Leu Val Ala Pro Ile Asp Val Ile Val Pro Pro
115 120 125

Gly Asn Thr Gly Leu Asp Pro Ser Gln Thr Ser Phe Phe Gln Val Leu
130 135 140

Asn Ile Pro Thr Lys Ile Asn Lys Gly Thr Val Glu Ile Thr Ile Pro
145 150 155 160

Val Glu Leu Ile Lys Lys Gly Asp Lys Val Gly Ser Ser Glu Ala Ala
165 170 175

Leu Leu Ser Lys Leu Gly Ile Arg Pro Phe Ser Tyr Gly Leu Val Val
180 185 190

Leu Ser Val Tyr Asp Asn Gly Ser Val Phe Asn Pro Glu Val Leu Asp
195 200 205

Leu Thr Asp Asp Asp Leu Val Glu Lys Phe Tyr Ala Gly Val Ser Met
210 215 220

Val Thr Ser Leu Ser Leu Ala Leu Ser Tyr Pro Thr Leu Ala Ala Val
225 230 235 240

pctca2017050779-seql.txt

Pro His Met Phe Val Asn Gly Tyr Lys Asn Val Leu Ser Val Ala Val
245 250 255

Ala Ser Glu Tyr Ser Phe Ser Tyr Ala Asp Lys Val Lys Glu Tyr Leu
260 265 270

Lys Asp Pro Ser Lys Phe Ala Val Ala Ala Ala Pro Val Ala Ala Ala
275 280 285

Ala Ala Ser Gly Gly Ala Pro Ala Ala Ala Ser Lys Ala Glu Glu Lys
290 295 300

Lys Pro Glu Pro Glu Glu Glu Ser Asp Glu Asp Ile Gly Gly Leu Phe
305 310 315 320

Gly Asp Asp Asp

<210> 659
<211> 262
<212> PRT
<213> Papaver somniferum

<400> 659

Met Asp Val Glu Leu Pro Leu Glu Lys Leu Phe Lys Glu Pro Ile Asp
1 5 10 15

Asp Gly Lys Gly Val Val Val Leu Val Ala Asn Gly Ser Phe Asn Pro
20 25 30

Pro Thr Phe Met His Leu Arg Met Phe Glu Leu Ala Arg Asp Ala Leu
35 40 45

Asn Ser Asp Gly Phe Cys Val Ile Gly Gly Tyr Met Ser Pro Val Asn
50 55 60

Asp Ala Tyr Lys Lys Lys Gly Leu Ile Ser Ala Glu His Arg Leu Gln
65 70 75 80

Leu Cys Glu Leu Ala Cys Arg Ser Ser Ser Phe Val Met Val Asp Pro
85 90 95

Trp Glu Ala Lys Gln Ser Ser Tyr Gln Arg Thr Leu Thr Val Leu Asp
100 105 110

Arg Val Gln Ser Cys Leu Cys Asp Ser Gly Leu Val Arg Arg Glu Ser
115 120 125

pctca2017050779-seql.txt

Leu Lys Val Met Leu Leu Cys Gly Ser Asp Leu Val Glu Ser Phe Cys
130 135 140

Val Pro Gly Val Trp Ile Pro Glu Gln Ile Arg Ala Leu Cys Arg Asp
145 150 155 160

Tyr Gly Ile Val Cys Ile Arg Arg Glu Gly Thr Asp Ile Glu Lys Ile
165 170 175

Ile Ser Gly Asp Glu Ile Leu Asn Ala Tyr Lys Asn Asn Ile Arg Val
180 185 190

Val Asp Glu Leu Ile Pro Asn Gln Ile Ser Ser Ser Arg Met Arg Glu
195 200 205

Cys Ile Ser Arg Gly Leu Ser Ile Lys Tyr Leu Thr Val Asp Glu Val
210 215 220

Ile Asp Tyr Ile Arg Gln His Asn Leu Tyr Leu Asn Leu Asp Leu Thr
225 230 235 240

Glu Lys Lys His Leu Gln Glu Gly Lys Asp Glu Lys Leu Met Leu Lys
245 250 255

Lys Lys Glu Thr Ser Asp
260

<210> 660
<211> 161
<212> PRT
<213> Papaver somniferum
<400> 660

Met Cys Val Leu Gln Ser Glu Asp Gly His Ile Met Asp Ala Pro Trp
1 5 10 15

Lys Ser Gln Ile Asp Ser Phe Pro Ala Leu Asn Ile Asn Leu Thr Gln
20 25 30

Thr Tyr Ile Pro Ile His Ser Gln Ala Leu Asn His Thr Leu Ile His
35 40 45

Asp Cys Thr Ser Ser Phe Asn Lys Ile His Gly Ser Asn Ile Phe Phe
50 55 60

Phe Thr Thr Asp Leu Ala Ile Lys Asn Gln Pro Lys Leu Ser Gln Ile
65 70 75 80

pctca2017050779-seql.txt

Arg Ile Pro Leu Lys Pro Asn Ser Tyr Phe Phe Leu Thr Leu Asn Pro
85 90 95

Ser Leu Gln Ile Leu Ser Ile His Leu Leu Phe His Phe Cys Ser Ser
100 105 110

Ser Asn Ser Trp Gln Tyr Ile Ala Gly Asn Glu Gln Phe Asp Gln Ser
115 120 125

Ile Thr Ser Pro Asp Pro Trp Gln Met Ser Leu Glu Gln Trp Leu Ala
130 135 140

Gly Val Glu Tyr Gly Cys Ser Ala Asp Thr Leu Val Val Arg Lys Lys
145 150 155 160

Ser

<210> 661
<211> 108
<212> PRT
<213> Papaver somniferum

<400> 661

Met Ser Ser Trp Lys Lys Arg Gln Arg Lys Arg Leu Phe Lys Gln Phe
1 5 10 15

Leu Gly Pro Tyr Ile Trp Arg Leu Thr Val Val Leu Ile Met Glu Lys
20 25 30

Ser Pro Lys Lys Lys Ile Pro Arg Met Met Asn Leu Trp Lys Ile Leu
35 40 45

Ile Met Ile Val Leu Leu Thr Gln Leu Met Ile Ile Met Ile Ile Leu
50 55 60

Leu Phe Lys Arg Lys Lys Ser Ser Leu Glu Thr Leu Gln Leu Leu Met
65 70 75 80

Val Arg Leu Met Leu Cys Met Arg Ala Met Met Ile Met Thr Ser Leu
85 90 95

Cys Ser Leu Pro Gln Ile Gln Lys Ser Ser Ile Leu
100 105

<210> 662
<211> 179

pctca2017050779-seql.txt

<212> PRT

<213> Papaver somniferum

<400> 662

Met Ser Asn His Arg Thr Thr Arg Glu Arg Gly Ile Pro His Gly Arg
1 5 10 15

Asp Glu Val Leu Asp Glu Gln Arg Pro Gly Arg Ser Asn Ser Arg Arg
20 25 30

Ala Glu Asp Ala Arg Asp Asp His Gln Ser His Asp His His Asn Gly
35 40 45

Ser Tyr Tyr Asp Arg Tyr Val Pro Glu Asp Asp Asp Tyr Tyr Leu Ile
50 55 60

Asp Gln Asp Arg Arg Ala Arg Pro Ser His Lys Arg His Asp Gly His
65 70 75 80

Arg His Arg Val Gly His Asp Asp Asn Asp Tyr Ser Lys Lys Thr Arg
85 90 95

Arg Glu Arg Asp Tyr Arg Glu Arg Arg Thr Glu Leu Val Arg Asn Glu
100 105 110

Arg Ile Arg Arg Glu Thr Asp Gly Asp Ser Pro Arg Ser Asn His Leu
115 120 125

Ser Lys Lys Lys Ile Asp Glu Met Ile Glu Glu Ala Leu Ser His Lys
130 135 140

Gln Ser Lys Asp Glu Arg Gln Gln Ile Leu Ser Met Lys Arg Ser Met
145 150 155 160

Asp Ser Pro Phe Thr Asn Arg Ile Lys Gln Phe Arg Pro Pro Leu Asn
165 170 175

Phe Ile Leu

<210> 663

<211> 386

<212> PRT

<213> Papaver somniferum

<400> 663

Met Leu Ser Asp Ala Phe Phe Glu Gln Tyr Lys Ile Asn Leu Gly Asn
1 5 10 15

pctca2017050779-seql.txt

Lys Lys Gly Arg Ser His Phe Phe Leu Leu His Arg Glu Ala Gly Glu
 20 25 30
 Ser Leu Ile Asp Phe Thr Arg Arg Phe Arg Gln Glu Val Ser Glu Val
 35 40 45
 Gly Lys Val Asp Ala Gly Leu Val Ile Glu Ala Tyr Lys Asn Ala Leu
 50 55 60
 Asp Tyr Asp Glu Leu Glu Ile Tyr Asn Ser Val Thr Val Gln Pro Val
 65 70 75 80
 Gly Thr Leu Lys Glu Leu Tyr Asp Arg Ala Asp Arg Tyr Gly Gly Ala
 85 90 95
 Glu Lys Glu Lys Arg Ala Lys Leu Ser Arg Met Thr Lys Ala Pro Cys
 100 105 110
 Ala Glu Gly His Gly Lys Gln Lys Gln His Leu Glu Ser Ser Ser Lys
 115 120 125
 Lys Lys Asn His Asp Asp Pro Arg Ser Arg Ala Gly Asp Gly Glu Glu
 130 135 140
 Leu Arg Lys Ala Gln Gly Lys Val Lys Ile Arg Phe Pro Ser Leu Asn
 145 150 155 160
 Ile Gly Leu Gly Glu Leu Phe Lys Lys Ile Lys Asp Ser Leu Pro Val
 165 170 175
 Pro Lys Pro Met Ser Glu Gln Ile Lys Asp Lys Arg Asp Lys Ser Ile
 180 185 190
 Tyr Tyr Ala His His Arg Asp His Gly His Asn Thr Glu Ser Cys Arg
 195 200 205
 Thr Leu Ala Thr Glu Val Gln Lys Met Ile Asp Glu Gly Lys Leu Gln
 210 215 220
 Gln Tyr Val Lys Lys Asn Pro Ser Gln Val Asn Thr Leu Asp Leu Arg
 225 230 235 240
 Glu Ile Arg Val Ser His Ala Arg Val Asn Ser Thr Ser Arg Lys Ala
 245 250 255
 His Glu Asn Ala Thr Arg Leu Lys Leu Arg His Ile Gln Asp Trp Arg
 260 265 270

pctca2017050779-seql.txt

Ile Ser Asn Lys Val Asp Tyr Ala Asn Leu Ile Gly Thr Glu Thr Leu
275 280 285

Glu Lys Gly Lys Ile Glu Ile Cys Phe Ser Val Ala Asp Leu Ala Gly
290 295 300

Val Tyr Gln Pro His Asn Asp Ala Ile Val Ile Leu Ala Leu Ile Gly
305 310 315 320

Met Tyr Lys Val Arg Arg Val Leu Val Asp Thr Gly Ser Ser Ile Ser
325 330 335

Val Ile Phe Ser Gly Ala Tyr Thr Ser Met Ser Leu Asn Glu Ser Gln
340 345 350

Val Glu Ala Asp Asp Asn Pro Ile Ile Gly Phe Ser Gly Glu Ile Met
355 360 365

Thr Thr Ile Gly Arg Val Ser Leu Pro Ile Thr Gly Gly Gly Lys Thr
370 375 380

Val Met
385

<210> 664
<211> 124
<212> PRT
<213> Papaver somniferum

<400> 664

Met Thr Arg Thr Thr His Val Asp Ser Trp Trp Trp Leu Arg Arg Cys
1 5 10 15

Pro Pro Asn Glu Ile Gln Tyr Leu Leu Arg Thr Cys Gln Ser Leu Leu
20 25 30

Lys Gly Lys Tyr Ile Lys Phe Val Glu Glu Ala Asp Gly Ile Ser Thr
35 40 45

Thr Gln Glu Lys Asp Phe Leu Lys Leu Met Lys Leu Lys Tyr Phe Ile
50 55 60

Ser Leu Ala Gln Pro Gly Glu Leu Val Gly Val Leu Ala Ala Glu Ser
65 70 75 80

Val Val Glu Pro Ser Ser Lys Met Thr Ser Asp Thr Phe Leu Ile Phe
85 90 95

pctca2017050779-seql.txt

Ser Phe Phe Phe Ile Tyr His His Val Arg Ala Phe Leu Val Asp Arg
100 105 110

Glu Met Ala Lys Ser Ser Gly Val Glu Tyr Ile Thr
115 120

<210> 665
<211> 317
<212> PRT
<213> Papaver somniferum

<400> 665

Met Asp Ile Asp Asp Met Asp Asn Gly Gln Ser Glu Asp Trp Arg Gln
1 5 10 15

Ser Tyr Val Arg Tyr Leu Arg Cys Val Thr Arg Asp Glu Gly Met Lys
20 25 30

Leu Leu Ala Glu Thr His Glu Gly Cys Cys Gly Asn His Ser Gly Gly
35 40 45

Arg Ser Leu Ala His Arg Leu Leu Ser Gln Gly Tyr Phe Trp Pro Tyr
50 55 60

Met Gln Asn Asp Ala Lys Glu Tyr Thr Asn Lys Cys Val Ser Tyr Gln
65 70 75 80

Met His Gly Pro Leu Ile Lys Arg Pro Ala Asn Glu Leu His Pro Val
85 90 95

Met Ser Ala Trp Pro Phe Ser Lys Trp Gly Leu Asp Thr Val Gly Pro
100 105 110

Phe Pro Ala Ala Pro Gly Gly Val Lys Tyr Leu Leu Val Ala Thr Asn
115 120 125

Tyr Phe Thr Lys Trp Ile Glu Ala Val Ala Leu Val Lys Ile Glu Ala
130 135 140

Val His Val Arg Arg Phe Asn Trp Glu Asn Ile Val Cys Arg Phe Gly
145 150 155 160

Ile Pro Ala Thr Ile Val Ser Asp Asn Val Lys Gln Phe Asp Ser Gly
165 170 175

Val Leu Trp Ala Tyr Arg Thr Thr Pro Arg Arg Ser Thr Gly Phe Ser
180 185 190

pctca2017050779-seql.txt

Pro Phe Thr Leu Ala Tyr Glu Thr Lys Ala Val Leu Pro Val Glu Leu
195 200 205

Leu Val Pro Thr Thr Lys Ser Leu Ala Glu Arg Ser Gly Leu Asn Ser
210 215 220

Gly Ile Leu Ser Lys Asp Arg Glu Leu Leu Asp Glu Val Arg Asp Glu
225 230 235 240

Ala Ser Arg Arg Leu Ala Ile Tyr Gln Gln Ser Met Lys Gln Gln Tyr
245 250 255

Asn Lys Lys Val Arg Glu Arg Ser Phe Leu Pro Gly Glu Gln Val Leu
260 265 270

Val Glu Lys Leu Ala Ser Cys Gly Ala Tyr Trp Leu Arg Asn Met Ser
275 280 285

Gly Lys Met Glu Pro Lys Pro Trp Asn Ser Phe Asn Gln Leu Ala Glu
290 295 300

Met Leu Ala Ile Glu Thr Pro Ser Phe Trp Lys Tyr Asn
305 310 315

<210> 666
<211> 300
<212> PRT
<213> Papaver somniferum

<400> 666

Met Leu Glu Ala Arg Ile Ile Lys Pro Val Arg Tyr Pro Lys Trp Leu
1 5 10 15

Ala Asn Ile Val Ala Val Pro Lys Asn Asn Gly Lys Ile Arg Val Cys
20 25 30

Ile Asp Phe Thr Asn Leu Asn Lys Ala Cys Ser Ser Asp Pro Tyr Pro
35 40 45

Met Leu Arg Ile Val Asp Leu Val Asp Ser Thr Ser Gly Tyr Gly Arg
50 55 60

Leu Ser Phe Met Asp Gly Phe Ser Gly Tyr Asn Gln Ile Pro Leu Phe
65 70 75 80

Gly Asp Asp Gln Glu His Thr Ser Phe Ile Thr Asp Lys Gly Val Tyr
85 90 95

pctca2017050779-seql.txt

Cys Tyr Leu Val Met Pro Phe Gly Leu Lys Asn Ala Gly Ala Thr Tyr
100 105 110

Gln Arg Leu Val Asn Glu Met Phe Lys Asp Met Ile Gly Lys Thr Val
115 120 125

Glu Val Tyr Ile Asp Asp Met Val Val Lys Ser Lys Gln Lys Glu Ser
130 135 140

His Leu Ser Asp Leu Lys Arg Thr Phe Glu Arg Leu Arg Gln Tyr Gly
145 150 155 160

Met Lys Leu Asn Pro Ala Lys Cys Ser Phe Gly Leu Thr Ser Gly Lys
165 170 175

Phe Leu Gly Tyr Met Met Thr Gln Arg Gly Ile Glu Ala Asn Pro Glu
180 185 190

Gln Ile Arg Ala Ile Gln Glu Met Pro Ser Pro Arg Ser Val Lys Glu
195 200 205

Val Gln Arg Leu Thr Gly Arg Leu Ala Ala Leu Ser Arg Phe Ile Ser
210 215 220

Arg Ala Ser Asp Lys Phe Arg Ser Phe Phe Gln Ile Leu Arg Lys Ala
225 230 235 240

Glu Lys Phe Gly Trp Ser Asp Asp Cys Glu Arg Ala Leu Asn Glu Ile
245 250 255

Lys Arg Tyr Leu Thr Ser Pro Pro Val Leu Thr Ile Pro Lys Thr Gly
260 265 270

Gln Thr Ile Tyr Ile Tyr Leu Ala Ser Ser Glu Phe Asp Val Ser Ala
275 280 285

Val Leu Phe Val Arg Glu Pro Trp Arg Ile His His
290 295 300

<210> 667
<211> 221
<212> PRT
<213> Papaver somniferum

<400> 667

Met Ser Gln Glu Ser Phe Ile Tyr Ser Phe Val Ala Arg Gly Thr Met
1 5 10 15

pctca2017050779-seql.txt

Ile Leu Ala Glu Tyr Thr Glu Phe Thr Gly Asn Phe Pro Ala Ile Ala
20 25 30

Thr Gln Cys Leu Gln Lys Leu Pro Ser Thr Asn Asn Lys Phe Thr Tyr
35 40 45

Asn Cys Asp His His Thr Phe Asn Phe Leu Val Glu Asp Gly Tyr Ala
50 55 60

Tyr Cys Val Val Ala Lys Glu Thr Val Gly Lys His Val Ser Ile Ala
65 70 75 80

Phe Leu Glu Arg Val Arg Ala Asp Phe Lys Lys Arg Tyr Gly Gly Gly
85 90 95

Lys Ala Asp Thr Ala Ile Ala Lys Ser Leu Asn Lys Glu Phe Gly Pro
100 105 110

Ala Met Lys Glu His Met Cys Tyr Ile Ile Glu His Ala Asp Glu Ile
115 120 125

Gly Lys Leu Ser Lys Val Gln Ala Gln Val Ser Glu Val Lys Ser Ile
130 135 140

Met Ile Glu Asn Ile Asp Lys Val Val Asp Arg Gly Glu Lys Ile Asp
145 150 155 160

Ile Leu Ser Glu Lys Ala Ala Asp Leu Asn Ser Asn Ala Gln Glu Tyr
165 170 175

Lys Lys Lys Gly Thr Gln Leu Arg Arg Lys Leu Trp Tyr Gln Asn Met
180 185 190

Lys Ile Lys Leu Val Val Leu Ala Val Leu Leu Ile Leu Val Leu Ile
195 200 205

Ile Trp Leu Ser Val Cys Lys Gly Phe Asp Cys Thr Asn
210 215 220

<210> 668

<211> 129

<212> PRT

<213> Papaver somniferum

<400> 668

Met Cys Val Ser Ser Asn Val Trp His Gly Arg Leu Gly His Val Asn
1 5 10 15

pctca2017050779-seql.txt

Tyr Lys Ser Met His Lys Leu Ala Ser Val Gly Cys Ile Leu Lys Phe
20 25 30

Thr Leu Asp Lys Ser His Lys Cys Glu Ile Cys Val Glu Ser Lys His
35 40 45

Ala Lys Lys Ser Phe Arg Lys Asn Val Gln Arg Asn Thr Lys Pro Leu
50 55 60

Glu Leu Ile His Ser Asp Val Val Asp Met Lys Ser Val Gln Thr Arg
65 70 75 80

Gly Gly Lys Lys Trp Phe Val Thr Phe Ile Asp Asp Cys Thr Arg Tyr
85 90 95

Cys Gln Asp Tyr Leu Leu Arg Gly Lys Asp Asp Ala Leu Glu Ala Phe
100 105 110

Lys Ile Tyr Lys Arg Glu Val Glu Asn Gln Met Asn Ala Thr Ile Lys
115 120 125

Thr

<210> 669
<211> 422
<212> PRT
<213> Papaver somniferum

<400> 669

Met Gly Lys Asn Asp Val Glu Arg Pro Gln Lys Phe Asn Gly Lys Asp
1 5 10 15

Phe Lys Arg Trp Gln Ser Lys Met Leu Phe Tyr Leu Ser His His Glu
20 25 30

Leu Asp Tyr Val Leu Val Pro His Ala Glu Leu Met Asn Ala Glu Gly
35 40 45

Leu Thr Glu Glu Ala Ile Glu Tyr Asn Lys Arg Cys Asn Phe Leu Ala
50 55 60

Lys Asn His Ile Met Asn Gly Leu Glu Asp Ala Met Tyr Asp Phe Tyr
65 70 75 80

Asn Ala Lys Glu Asn Phe Ser Ala Tyr Asp Leu Trp Thr Ala Leu Glu
85 90 95

pctca2017050779-seql.txt

Ala Lys Tyr Gln Ala Glu Thr Ala Gly Ser Lys Lys Phe Leu Val Ala
100 105 110

Lys Phe Met Asp Phe Lys Met Thr Asn Asp Lys Pro Val Val Asp Gln
115 120 125

Phe Leu Glu Phe Gln Gln Ile Ile Asn Glu Ile Leu Ala Glu Gly Met
130 135 140

Val Ile Asp Glu Thr Phe Gln Val Ser Ala Val Ile Glu Lys Leu Pro
145 150 155 160

Ser Ser Trp Ser Glu Tyr Lys Lys Lys Leu Arg His Glu Thr Gly Glu
165 170 175

Ile Asn Met Val Glu Leu Gly Lys Lys Ile Gln Val Glu Glu Met Leu
180 185 190

Cys Thr Lys Asp Lys Asn Val Ser Ser Ala Arg Asp Met Ser Asn Lys
195 200 205

Ala His Met Thr Glu His Arg Ser Ser Lys Ala Gly Lys Gly Glu Ser
210 215 220

Asn Asn Arg Asn Ser Lys Arg Gly Pro Pro Lys Lys Gly Met Phe Arg
225 230 235 240

Lys Pro Glu Ser Ser Ile Thr Lys Ile Lys Gly Ala Cys Tyr Ala Cys
245 250 255

Gly Val Thr Gly His Met Ala Val His Cys Arg His Arg Lys Asp Lys
260 265 270

Lys Asp Ser Ala Asn Leu Val Glu Lys Asn Lys Asp Glu Phe Ser Ala
275 280 285

Val Val Ser Glu Val Asn Leu Val Thr Asn Val Met Asp Trp Trp Val
290 295 300

Asp Ser Gly Ala Thr Lys His Val Cys Gly Asn Arg Asp Leu Phe Thr
305 310 315 320

Ser Tyr Gln Arg Val Gly Glu Gly Glu Lys Leu Tyr Met Gly Asn Ser
325 330 335

Ser Ala Ser Glu Val Ala Gly Lys Gly Lys Val Gly Leu Lys Leu Thr

340

Ser Gly Lys Thr Leu Thr Leu Asn Glu Val Leu His Val Pro Asp Ile
 355 360 365

Cys Lys Asn Leu Val Ser Cys Ser Val Leu Asp Asp Lys Gly Phe Lys
 370 375 380

Val Ser Ile Glu Ser Gly Lys Leu Ile Val Thr Lys Gly Asn Asp Tyr
 385 390 395 400

Val Gly Lys Gly Tyr Lys Thr Gly Gly Leu Tyr Lys Leu Asn Val Thr
 405 410 415

Cys Pro Glu Val Lys Leu
 420

<210> 670
 <211> 294
 <212> PRT
 <213> Papaver somniferum
 <400> 670

Met Thr Lys Thr Arg Met Thr Cys Gly Glu Lys Pro Cys Ser Ile Leu
 1 5 10 15

Phe Ser Met Ala Pro Ala Gly His Ala Lys Asp Ile Pro Ile Leu Ile
 20 25 30

Ser Asp Asp Asp Glu Met Glu His Asp Ser Pro Ser Tyr Ser Pro Ala
 35 40 45

Thr His Ser Asn Tyr His Phe Asp Ala Asn Gln Met Thr Gln Gln Pro
 50 55 60

Met Thr Ala Thr Ser Leu Asn His Pro Thr Ile Asp Asp Pro Leu Asn
 65 70 75 80

Gly Ala Ile Lys Ala Asn Gly Ser Val Thr Ala Thr Gln Ser Asn Asp
 85 90 95

Tyr Cys Asn Ala Asn Pro Pro Ile Asn Ala Thr Glu Glu Lys Tyr Pro
 100 105 110

Phe Asn Ala Asp Ile Phe Ile Pro Ile Pro Ile Lys Arg Asn Asp Asn
 115 120 125

Pro Met Thr His Glu Asp Ser Ala Ile Leu Asp Pro Phe Val Ala Arg

pctca2017050779-seql.txt

130

135

140

Gly Leu Ile Asp Thr Ser Met Leu Pro Val Asp Arg Gly Leu Phe Asp
 145 150 155 160

Trp Ile Asp Asp Thr Cys Val Val Leu Asp Lys Val Lys Gln Cys Ser
 165 170 175

Phe Glu Met Gln Ala Leu Leu Arg Arg Ser Gln Ile Leu His Met Gln
 180 185 190

Glu Val Thr Gly Lys Asp Ala Arg Ile Ala Gly Leu Cys Ala Thr Ile
 195 200 205

Ala Glu Lys Asn Ala Arg Ile Thr Lys Leu Arg Asp Thr Leu Val Asp
 210 215 220

Arg Asn Leu Glu Leu Tyr Gln Lys Glu Gln Trp Leu Phe Glu Glu Tyr
 225 230 235 240

Thr Arg Asn Glu Lys Leu Glu Met Glu Ser Lys Asp Val Val Gly Ile
 245 250 255

Glu Glu Glu Leu Arg Ile Thr Lys Glu Lys Leu Lys Glu Ala Ala Glu
 260 265 270

Phe Ala Tyr Asn Tyr Asp Pro Glu Asp Asp Asp Tyr Glu Pro Glu Glu
 275 280 285

Ile Ser Ser Lys Gln Glu
 290

<210> 671

<211> 272

<212> PRT

<213> Papaver somniferum

<400> 671

Met Lys Ala Ala Arg Leu Ile Val Phe Pro Ile Lys Gly Arg Asn Trp
 1 5 10 15

Cys Phe Ser Arg Ser Ile Glu Gln Thr Val Gln Glu Ser Glu Ala Thr
 20 25 30

Lys Pro Ser Pro Lys Phe Lys Asp Leu Tyr Lys Lys Ile Thr Ser Lys
 35 40 45

Gly Lys Pro Met Asn Gln Asn Val Glu Ile Ile Thr Glu Phe Phe Ser

50

55

60

Thr Lys Met Asn Lys Ala Trp Ala Gly Leu Gly Glu Ala Pro Glu Gly
 65 70 75 80

Ser Ile Lys Asn Lys Ile His Gly Leu Gly Val Lys Leu Leu Ala Arg
 85 90 95

Val Lys Pro Ser Glu Ile Phe Leu Lys Ser Ile Ser Lys Asp Val Thr
 100 105 110

Asn Val Glu Ile Thr Tyr Pro Thr Ser Leu Asn Pro Arg Leu Val Arg
 115 120 125

Arg Arg Leu Arg His Ile Ala Phe Arg Gly Ser Val Ile His Arg Arg
 130 135 140

Tyr Phe Tyr Gly Ser Val Ser Leu Leu Pro Leu Thr Ala Ala Cys Ala
 145 150 155 160

Ile Leu Pro Leu Pro Asn Ile Pro Phe Phe Trp Thr Leu Phe Arg Thr
 165 170 175

Tyr Ser His Trp Arg Ala Leu Gln Gly Ser Glu Arg Leu Leu Val Leu
 180 185 190

Val Ser Asp Gly Ser Thr Thr Val Lys Glu Gln Lys Arg Asp Ser Asp
 195 200 205

Asp Glu Asp Glu Gln Glu His Lys Ser Leu Asn Ala Pro Ile Pro Gln
 210 215 220

Trp Val Leu His Pro Ser Glu Asp Leu Asp Lys Tyr Leu Gln Asp Leu
 225 230 235 240

Asp Glu Lys Asp Gly Leu Ser Lys Ser Val Val Ser Lys Ile Cys Lys
 245 250 255

Ala Tyr His Leu Asp Thr Gln Glu Val Asp Lys Tyr Arg Cys Ser Val
 260 265 270

<210> 672

<211> 457

<212> PRT

<213> Papaver somniferum

<400> 672

Met Leu Lys Leu Gly Phe Thr Leu Thr Ser Phe Thr Tyr Ser Arg Phe

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1              5              10              15
Ile Ser Phe Leu Cys Lys Val Lys Asn Phe Ser Phe Ile Glu Arg Leu
           20           25           30
Leu Glu Asp Met Asp Arg Tyr Gly Ala Ile Pro Asp Met Trp Ser Tyr
           35           40           45
Asn Ile Tyr Val Asn Leu Leu Cys Lys Glu Asn Glu Leu Asp Lys Ala
           50           55           60
Leu Glu Val Met Gln Thr Met Leu Gln Lys Gly Ser Asp Pro Asp Val
           65           70           75           80
Val Thr Tyr Thr Thr Val Leu Lys Gly Leu Cys Ser Asp Gly Arg Tyr
           85           90           95
Glu Leu Ala Val Lys Leu Trp Arg Glu Met Ile Gly Arg Gly Leu Leu
           100          105          110
Pro Asp Gly Ile Thr Cys Gly Val Leu Val Phe Gly Leu Cys Lys Arg
           115          120          125
Gly Glu Val Asp Leu Ala Tyr Asp Leu Thr Val Asp Ser Met Lys Gly
           130          135          140
Lys Thr Pro Leu Ser Val Ser Val Tyr Asn Ala Leu Ile His Gly Tyr
           145          150          155          160
Cys Gln Lys Gly Glu Val Lys Lys Ala Gln Ala Ile Glu Glu Phe Met
           165          170          175
Arg Lys Asn Gly Cys Ala Pro Asp Met Val Thr Tyr Asn Ile Glu Leu
           180          185          190
Asn Tyr Cys Cys Asn Asn Gly Met Leu Glu Glu Ala Ala Lys Leu Leu
           195          200          205
Lys Lys Met Glu Arg Ser Gln Thr Lys Pro Asp Thr Tyr Ser Tyr Asn
           210          215          220
Gln Phe Leu Lys Ala Leu Cys Lys Ala Asn Arg Met Asp Ser Ala Tyr
           225          230          235          240
Asn Leu Leu Val Lys Thr Met Glu Lys Arg Gly Leu Cys Asp Thr Val
           245          250          255

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pctca2017050779-seql.txt

Ser Tyr Asn Thr Met Ile Arg Ala Tyr Cys Trp Ala Arg Glu Thr Gln
260 265 270

Lys Ala Tyr Arg Met Phe Glu Glu Met Ser Gly Lys Gly Phe Glu Pro
275 280 285

Asp Val Val Thr Phe Thr Ile Leu Ile Asn Ala Phe Phe Lys Lys Gly
290 295 300

Arg Ala Asp Leu Ala Glu Asp Leu Leu Asp Arg Met Ser Gln Lys Gly
305 310 315 320

Leu Phe Pro Asp Arg Val Leu Tyr Thr Thr Met Ile Asp His Leu Cys
325 330 335

Lys Ser Gly Arg Val Asp Gln Ala Gln Asn Phe Phe Arg Asp Met Glu
340 345 350

Arg Leu Arg Ile Thr Pro Asp Val Ile Cys Tyr Asn Ala Leu Ile Asn
355 360 365

Gly Leu Phe Lys Ala Phe Arg Val Ala Glu Gly Met Gln Phe Tyr Glu
370 375 380

Asp Met Gln Arg Asn Gly Cys His Pro Asp Glu Val Thr Tyr Lys Leu
385 390 395 400

Ile Ile Gly Gly Leu Ile Arg Glu Lys Lys Leu Thr Ile Ala Cys Lys
405 410 415

Val Trp Asp Gln Met Met Glu Asn Gly Phe Thr Leu Asp Ala Ala Leu
420 425 430

Ser Lys Thr Leu Thr Asn Ala Ile Gln Ser Lys Asp Ala Ser Val Met
435 440 445

Asn Met Ser Thr Gly Thr Asn Leu Leu
450 455

<210> 673

<211> 579

<212> PRT

<213> Papaver somniferum

<400> 673

Met Pro Leu Leu Asp Ile Ala Thr Ser Gln Pro Thr Phe Gly Asn His
1 5 10 15

pctca2017050779-seql.txt

Phe Cys Thr Ser Ser Arg Tyr Gln Thr Leu Leu His Gly Asn Thr Thr
 20 25 30
 Ser Val Lys Leu Val Asn Phe Gly Lys Glu Lys Arg Leu Phe Ser Thr
 35 40 45
 Trp Glu Val Ser Ile Gln Met Pro Thr Lys Ile Arg Phe Asp Met Gly
 50 55 60
 Gly Asn Arg Arg Gly Arg Ala Leu Leu Ile Lys Ala Val Ala Thr Leu
 65 70 75 80
 Glu Pro Lys Tyr Leu Val Gln Ser Ala Glu Asp Arg Ser Ala Asn Leu
 85 90 95
 Glu Leu Gly Ser Glu Ala Ala Ser Ser Gln Tyr Pro Gly Glu Glu Asp
 100 105 110
 Glu Ala Glu Val Asp Glu Arg Glu Arg Leu Arg Arg Leu Arg Ile Ser
 115 120 125
 Lys Ala Asn Lys Gly Asn Val Pro Trp Asn Lys Gly Arg Lys His Ser
 130 135 140
 Ala Glu Thr Leu Arg Arg Ile Arg Glu Arg Thr Lys Ile Ala Met Gln
 145 150 155 160
 Asn Pro Lys Val Lys Met Lys Leu Val Asn Leu Gly His Ala Gln Ser
 165 170 175
 Glu Glu Thr Arg Asn Lys Ile Gly Val Gly Val Arg Met Gly Trp Gln
 180 185 190
 Arg Arg Arg Glu Lys Leu Met Val Gln Glu Thr Cys Cys Phe Glu Trp
 195 200 205
 Gln Asn Leu Ile Ala Asp Ala Ser Arg Arg Gly Tyr Ala Gly Glu Ala
 210 215 220
 Glu Leu Gln Trp Glu Ser Tyr Glu Val Leu Asp Glu Gln Leu Lys Arg
 225 230 235 240
 Glu Trp Leu Glu Ser Ile Glu Gln Arg Arg Met Ala Pro Arg Pro Lys
 245 250 255
 Gly Ser Lys Arg Ala Pro Lys Ser Leu Glu Gln Arg Arg Lys Ile Ser
 260 265 270

pctca2017050779-seql.txt

Glu Ala Ile Ser Ala Lys Trp Ala Asp Pro Ser Tyr Arg Glu Arg Val
 275 280 285
 Cys Asp Ala Leu Asn Lys Tyr His Gly Ile Pro Glu Gly Arg Glu Arg
 290 295 300
 Lys Pro Arg Arg Lys Pro Ser Gly Asp Arg Asn Ala Ala Arg Arg Lys
 305 310 315 320
 Ala Tyr Ser Glu Ala Glu Ser Asp Ala Lys Ser Arg Ala Lys Pro Lys
 325 330 335
 Lys Ser Arg Ala Ala Pro Tyr Lys Asp Pro Leu Ala Asp Ser Lys Leu
 340 345 350
 Glu Met Ile Arg Asn Ile Arg Ala Gln Arg Ala Val Thr Glu Thr Lys
 355 360 365
 Lys Thr Glu Ala Val Glu Arg Ala Lys Leu Leu Ile Ala Glu Ala Glu
 370 375 380
 Lys Ala Ala Lys Ala Leu Glu Val Ala Ala Thr Lys Ser Pro Leu Ala
 385 390 395 400
 Leu Ala Ser Leu Met Glu Thr Arg Lys Leu Ile Ala Glu Ala Thr Arg
 405 410 415
 Ser Ile Gln Ala Ala Glu Ser Gly Gln Ile Ser Tyr Val Gly Asn Lys
 420 425 430
 Lys Asp Ser Ser Pro Phe Asp Leu Asn Glu Asp Leu Val Gly Asp Glu
 435 440 445
 Thr Gly Glu Gln Asp Gly Thr Val Pro Ser Pro Asp Gln Lys Glu Val
 450 455 460
 Asn Gly Thr His Val Tyr Ser Asp Ala Ile Ser Asp Phe Glu Phe Gly
 465 470 475 480
 Asn Phe Asp Leu Glu Gly Met Leu Asp Asp Asp Glu Leu Leu Glu Met
 485 490 495
 Glu Gly Leu Asp Asp Asp Asp Asp Asp Phe Val Pro Ala Gln Val Glu
 500 505 510
 Val Asn Gly Tyr Ser His Lys Leu Asp Pro Lys Ser Glu Leu Ala Val
 515 520 525

pctca2017050779-seql.txt

Pro Val Glu Glu Met Gln Glu Ala Ile Lys Ser Gln Ile Thr Thr Gln
530 535 540

Glu Val Pro Val Ser Asn Lys Ala Glu Lys Thr Ser Val Arg Ser Asn
545 550 555 560

Asn Thr Thr Val Lys Lys Lys Trp Ile Arg Gly Arg Leu Val Glu Val
565 570 575

Glu Glu Asp

<210> 674
<211> 221
<212> PRT
<213> Papaver somniferum

<400> 674

Phe Lys Ser Arg Cys Tyr Ile Gly Gly Lys Ile Cys Lys Met Ile Ile
1 5 10 15

Asp Ser Gly Ser Val Asp Asn Tyr Ile Ala Asp His Val Val Lys Lys
20 25 30

Leu Glu Leu Pro Val Thr Ser His Pro Glu Pro Tyr Thr Val Gly Trp
35 40 45

Val Asn Ala Ser Ser Thr Gln Asn Ile Thr Leu Gln Cys Tyr Val Ser
50 55 60

Phe Ser Phe Glu Gly Tyr Glu Asp Thr Val Leu Cys Asp Val Ile Asn
65 70 75 80

Met Thr Thr Thr His Leu Leu Leu Gly Arg Pro Trp Gln Tyr Asp Leu
85 90 95

His Ala Val His Asn Gly Phe Glu Asn Thr Tyr Thr Phe Val His Asn
100 105 110

Gly Lys Thr Lys Val Leu Arg Pro Ser Asn Ser Thr Ser Asn Ser Cys
115 120 125

Ala Gln Thr Asp Ala Val Val Ala Thr Val Ile Arg Ser Leu His Pro
130 135 140

Gln His Ser Leu His Ser His Glu Asp Ser Lys Pro Met Ile Glu Leu
145 150 155 160

pctca2017050779-seql.txt

Pro Ala Lys Val Lys Pro Leu Leu Phe Gln Tyr Asn Val Leu Phe Pro
165 170 175

Asp Glu Leu Pro Thr Ala Leu Pro Pro Leu Arg Asn Ile Gln His Cys
180 185 190

Ile Asp Phe Ile Pro Gly Ala Ser Leu Pro Asn Gln Ala His Tyr Arg
195 200 205

Leu Ser Pro Ala Glu His Glu Ile Leu Gln Gly Gln Val
210 215 220

<210> 675

<211> 790

<212> PRT

<213> Papaver somniferum

<400> 675

Met Thr Ala Gln Pro Val Thr Leu Ala Ala Ile Lys Ala Leu Ile Lys
1 5 10 15

Ser His Thr Glu Ile Leu Ala Lys Asn Ile Thr Glu Ala Leu Glu Lys
20 25 30

Ser Met Glu Asp Lys Leu Gly Leu Arg Asp Thr Lys Leu Glu Thr Met
35 40 45

Gln Asn Gln Ile Leu Lys Val Ala Lys His Ile Asn Leu Asp Leu Glu
50 55 60

Met Pro Glu Leu Val Asp Leu Glu Gly Lys Asn Lys Glu Asp Ile Leu
65 70 75 80

Gln Phe Leu Gln Asn Asp Glu Val Pro Glu Asp Val Leu Arg Thr Leu
85 90 95

Asn Ile Lys Lys Pro Tyr Glu Gly Phe Ile Gly His Ser Lys Lys Lys
100 105 110

Ile Val Ser Pro Ala Leu Asp Asn Asp Asp Glu Asp Glu Arg Glu Asn
115 120 125

Asp Leu Glu Lys Asn Trp Thr Glu Glu Arg Arg Leu Lys Thr Gly His
130 135 140

Asn Pro Tyr Ser Ser Leu Pro Glu Tyr Lys Leu Lys Ala Asn Ile Pro
145 150 155 160

pctca2017050779-seql.txt

Asn Phe Ser Gly Asn Phe Arg Ile Glu Glu Leu Thr Asp Arg Phe Phe
165 170 175

Glu Val Glu Ala Phe Phe Glu Phe Met Glu Val Pro Glu Asp Ser Lys
180 185 190

Val Lys Leu Val Thr Tyr Lys Leu Lys Gly Gly Ala Ala Ala Trp Trp
195 200 205

Asp Lys Ile Cys Asp Asp Arg Arg Asn Ala Asn Lys Pro Lys Ile Arg
210 215 220

Thr Trp Lys Arg Met Lys Thr Leu Ile Arg Tyr Lys Phe Leu Pro Arg
225 230 235 240

Asp Phe Met Gln Gln Leu Phe Ile Lys Leu Gln Asn Ile Gln Gln Gly
245 250 255

Ala Arg Thr Val Glu Glu Tyr Val Ser Asp Phe Tyr Asn Leu Val Ala
260 265 270

Arg Asn Gln Leu Lys Glu Ser Glu Glu Gln Leu Val Ala Arg Phe Ile
275 280 285

Glu Gly Leu Asn Arg Leu Ile Gln Asn Gly Met Thr His Ser Val Phe
290 295 300

Thr Met Val Glu Val Val Gln Gln Ala Ile Lys Ile Glu Asn Arg Leu
305 310 315 320

Ile Arg Ser Ser Arg Ile Tyr Pro Ser Arg Gln Gly Arg Tyr Gln Asn
325 330 335

Thr Tyr Arg Gly Thr Asn Ser Ser Gln Asn Phe Ser Pro Asp Thr Val
340 345 350

Leu Asn Ile Pro Arg Pro Pro Tyr Asp Asp Val Ser His Ser His Arg
355 360 365

Gln Pro Ser His Ile Val Thr Tyr Thr Pro Pro Leu Ala Thr Pro Ile
370 375 380

Leu Ala Asn Ser Val Asp Leu Gln Pro Gly Gln Gln Ser His Ser Leu
385 390 395 400

Gln Pro Thr Pro Pro Thr Thr Gly Asn Arg Phe His Asn Arg Gln Gln

405

410

415

Gln Phe Pro Pro Gln Gln Arg Ala Asn Asn Ala Cys Thr Lys Phe Arg
 420 425 430

Gly Asp Lys Cys Asn Lys Cys Gln Gln Ser Gly His Thr Ser Ser Asp
 435 440 445

Cys Arg Lys Phe Asn Ala Leu Ile Gly Glu Pro Gln Phe Ile Asn Glu
 450 455 460

Val Thr Gly Ala Leu Asn Glu Phe Glu Tyr Glu Asp Ser Pro Gly Asp
 465 470 475 480

Asp Asp Glu Phe Val Gly Met Ile Arg Pro Leu Phe Leu Thr Gln Gln
 485 490 495

Cys Lys Ser Gln Arg His Asn Ile Phe Lys Ser Arg Cys Tyr Ile Gly
 500 505 510

Gly Lys Ile Cys Lys Met Ile Ile Asp Ser Gly Ser Val His Asn Cys
 515 520 525

Ile Ala Asp His Val Val Lys Lys Leu Glu Leu Pro Val Thr Ser His
 530 535 540

Pro Glu Pro Tyr Thr Val Gly Trp Val Asn Ala Ser Ser Thr Gln Lys
 545 550 555 560

Ile Thr Leu Gln Cys Tyr Val Ser Phe Ser Phe Glu Gly Tyr Glu Asp
 565 570 575

Thr Val Leu Cys Asp Val Ile Asn Met Thr Ala Thr His Leu Leu Leu
 580 585 590

Gly Arg Pro Trp Gln Tyr Asp Leu Gln Ala Val His Asn Gly Phe Glu
 595 600 605

Asn Thr Tyr Thr Phe Val His Asn Gly Lys Thr Lys Val Leu Ser Pro
 610 615 620

Ser Asn Ser Thr Ser Asn Ser Cys Ala Gln Thr Asp Ala Val Val Ala
 625 630 635 640

Thr Val Ile Arg Ser Leu His Pro Gln His Ser Leu His Ser His Glu
 645 650 655

pctca2017050779-seql.txt

Asp Ser Lys Pro Met Ile Glu Phe Pro Pro Leu Arg Asn Ile Gln His
660 665 670

Tyr Ile Asp Phe Ile Pro Gly Ala Ser Leu Pro Asn Gln Ala His Tyr
675 680 685

Leu Leu Ser Pro Ala Glu His Glu Ile Leu Gln Gly Gln Val Asn Asp
690 695 700

Leu Leu Lys Lys Gly Leu Ile Arg Pro Ser Asn Arg Pro Cys Ala Ser
705 710 715 720

Pro Ala Phe Leu Val Ser Lys Lys Asp Asn Gly Trp Arg Met Cys Ile
725 730 735

Asp Cys Arg Ala Leu Asn Arg Ile Thr Ile Pro Tyr Arg Phe Pro Ile
740 745 750

Pro Arg Ile Asp Asp Met Ile Asp Leu Leu Ser Gly Ser Ile Ile Phe
755 760 765

Thr Lys Leu Asp Leu Arg Ser Gly Tyr His Gln Ile Arg Ile Arg Gly
770 775 780

Gly Asp Glu Trp Lys Thr
785 790

<210> 676
<211> 151
<212> PRT
<213> Papaver somniferum

<400> 676

Ala Glu Pro Ser Ser Ala Val Asp Leu Glu Thr Lys Ser Thr Val Ala
1 5 10 15

Lys Thr Ala Lys Gly Lys Gly Lys Ala Val Ala Val Asp Val Thr Glu
20 25 30

Lys Arg Arg Lys Ser Lys Ser Asn Ser Glu Ala Lys Ser Gln Ile Arg
35 40 45

Arg Pro Arg Lys Arg Thr Asp Gly Pro Leu Lys Lys Leu Lys Ser Val
50 55 60

Ile Ser Lys Gly Lys Lys Lys Val Gly Val Lys Glu Glu Asp Asp Glu
65 70 75 80

pctca2017050779-seql.txt

Glu Val Ala Asp Leu Val Ile Asp Asn Pro Glu Glu Ala Val Asp Glu
85 90 95

Glu Glu Glu Ile Glu Asp Val Leu Val Glu Lys Lys Lys Arg Lys Ile
100 105 110

Asn Lys Ser Glu Lys Gln Lys Glu Asp Cys Arg Leu Ile Gly Glu Pro
115 120 125

Val Pro Val Glu Glu Ala Arg Gln Arg Trp Pro His Arg Tyr Asp Ala
130 135 140

Gln Lys Ile Arg Glu Glu Ile
145 150

<210> 677
<211> 345
<212> PRT
<213> Papaver somniferum

<400> 677

Met Asp Ile Val Lys Phe Leu Gln Pro Lys Phe Thr Leu Met Glu Asn
1 5 10 15

Val Val Asp Ile Met Arg Phe Leu Gly Gly Thr Leu Gly Arg Tyr Ala
20 25 30

Met Gly Arg Leu Val Ala Met Gln Tyr Gln Val Arg Leu Gly Leu Leu
35 40 45

Ile Ala Gly Ser Tyr Gly Leu Pro Gln Phe Arg Met Arg Thr Phe Leu
50 55 60

Trp Gly Ala Lys Met Thr Glu Lys Leu Pro Gln Phe Pro Leu Pro Thr
65 70 75 80

His Lys Val Ile Ala Arg Gly Phe Ser Pro Lys Glu Phe Glu Arg Asn
85 90 95

Val Val Lys Gly Asn Glu Glu Ser Thr Leu Gln Leu Lys Asp Ala Leu
100 105 110

Val Leu Lys Asp Ala Ile Phe Asp Leu Pro Glu Ile Thr Thr His Glu
115 120 125

Ile Gln Asp Glu Arg Asp Tyr Gly Asn Asp Ile His Thr Thr Asp Leu
130 135 140

pctca2017050779-seql.txt

Thr Asp Phe Gln Lys Met Ile Arg Leu Pro Lys His Lys Leu Met Gly
145 150 155 160

Ser Ala Tyr Pro Glu Glu Ser Gly Thr Leu Lys Leu Phe Asp His Arg
165 170 175

Pro Leu Lys Leu Ser Glu Asp Asp Asn Leu Arg Val Ser Lys Ile Pro
180 185 190

Arg Glu Lys Gly Ala Asn Phe Arg Asn Leu Pro Gly Val Ile Val Asp
195 200 205

Gly Asn Lys Ala Cys Arg Asp Pro Lys Met Ala Lys Val Met Ile Glu
210 215 220

Lys Ser Lys Lys Pro Leu Val Pro Glu Tyr Ala Ile Lys Phe Val Arg
225 230 235 240

Gly Thr Ser Lys Lys Pro Phe Gly Arg Leu Trp Trp Asp Glu Ile Val
245 250 255

Ser Thr Val Val Thr Arg Ala Glu Pro His Asn Gln Ile Ile Leu His
260 265 270

Pro Glu Gln Asp Arg Val Leu Ser Ile Arg Glu Asn Ala Arg Leu Gln
275 280 285

Gly Phe Pro Asp Phe Tyr Arg Leu Phe Gly Thr Val Lys Gln Arg Tyr
290 295 300

Met Gln Val Gly Asn Ala Val Ala Val Pro Val Gly Lys Ala Leu Gly
305 310 315 320

Phe Ser Leu Ala Lys Ala Val Asn Asn Thr Ser Gly Ser Gly Gln Val
325 330 335

Phe Glu Leu Pro Pro Ser Phe Ser Arg
340 345

<210> 678

<211> 104

<212> PRT

<213> Papaver somniferum

<400> 678

Met Ser Met Gln Ser Leu Lys Asp Trp Pro Asp Thr Ser Val Ala Ala
1 5 10 15

pctca2017050779-seql.txt

Glu Pro Gly Ile Cys Met Pro Tyr Thr Asn Gln Tyr Ile Gln Phe Gln
20 25 30

Ile His Ile Leu Val His Ser Gln Phe His Asn His Phe Lys Ile Ile
35 40 45

Ser Pro Asn Pro Tyr Phe Leu Gln His Leu Ile His Ser Gly His Pro
50 55 60

Ile Thr Pro Thr Val Ser Ser Thr Gln Thr Thr Pro Pro Phe Ser Ser
65 70 75 80

Tyr Gln His His Gln Tyr Thr Val His Ala Ser His Thr Ile Leu Ser
85 90 95

Leu Arg Arg Thr Ile Thr Ser Arg
100

<210> 679
<211> 670
<212> PRT
<213> Papaver somniferum

<400> 679

Met Met Asn Phe Gly Val Thr Gln Lys Gly Gly Gly Ser Gly Phe Pro
1 5 10 15

Val Ile Pro Lys Ser Leu Ala Ser Ile Val Val Ser Val Gly Gly Leu
20 25 30

Ala Leu Phe Val Ile Phe Ala Ser Trp Leu Leu Ile Ser Asn Pro Ala
35 40 45

Ser Thr Pro Val Asn Gly Ser Ser Leu Phe Ser Ile Ser Asn Asn Ser
50 55 60

Thr Lys Ser Gly Phe Asp Ser Ser Pro Leu Val Gly Leu Asp Asn Asn
65 70 75 80

Asn Glu Thr Val Thr Leu Leu Thr Gln Lys Pro Pro Ser Asp Ser Val
85 90 95

Asp Asp Glu Lys Leu Pro Ser Ile Ser Ser Asp Lys Ile Asp Ser Asp
100 105 110

Ala Ser Gly Glu Ile Lys Glu Lys Gly Val Glu Thr Gly Pro Ile Asp
115 120 125

pctca2017050779-seql.txt

Asn Lys Ser Pro Asp Val Ser Ser Asp Lys Pro Glu Glu Ile Leu Pro
 130 135 140
 Lys Asp Ser Asp Lys Ile Asp Leu Gly Glu Lys Gly Lys Gln Glu Ile
 145 150 155 160
 Thr Ser Asn Ile Pro Glu Glu Ile Pro Val Pro Ser Pro Pro Leu Ser
 165 170 175
 Asp Val Thr Ser Lys Ile Asp Ser Gly Glu Lys Gly Val Glu Ala Gly
 180 185 190
 Gly Asp Asp Lys Ile Thr Asp Ser Glu Phe Pro Ser Thr Thr Lys Lys
 195 200 205
 Glu Ile Thr Val Pro Ser Pro Pro Leu Ser Lys Asp Leu Gly Glu Glu
 210 215 220
 Gly Val Lys Gln Glu Leu Ser Asp Ser Thr Ser His Thr Pro Glu Glu
 225 230 235 240
 Ile Ser Val Pro Ser Pro Pro Val Ser Ile Leu Ser Asn Glu Thr Asp
 245 250 255
 Thr Gly Lys Lys Gly Phe Glu Thr Glu Thr Asp Thr Gly Asn Lys Gly
 260 265 270
 Phe Glu Thr Glu Asp Asn Gly Gly Val Ser Gly Ser Glu Ser Pro Ser
 275 280 285
 Lys Thr Glu Glu Glu Ile Pro Thr Pro Ser Pro Pro Leu Ser Lys Asp
 290 295 300
 Ser Ser Lys Thr Ala Ser Gly Asp Cys Asp Leu Phe His Gly Lys Trp
 305 310 315 320
 Phe Tyr Asp Pro Glu Gly Pro Leu Tyr Thr Asn Asn Ser Cys Pro Val
 325 330 335
 Ile Thr Gln Met Gln Asn Cys Gln Gly Asn Gly Arg Pro Asp Lys Glu
 340 345 350
 Tyr Glu Ser Trp Arg Trp Lys Pro Ser Gln Cys Asp Leu Pro Arg Phe
 355 360 365
 Asp Gly Lys Lys Phe Leu Glu Leu Met Arg Gly Lys Thr Leu Ala Phe
 370 375 380

pctca2017050779-seql.txt

Ile Gly Asp Ser Val Ala Arg Asn Gln Met Glu Ser Met Leu Cys Leu
385 390 395 400

Leu Trp Gln Val Glu Val Pro Lys Asn Arg Gly Asn Lys His Met Gln
405 410 415

Arg Trp Tyr Phe Arg Ser Thr Ser Val Met Ile Val Arg Ile Trp Ser
420 425 430

Ser Trp Leu Val Gly Arg Ser Ala Glu Pro Val Asp Val Ala Pro Ala
435 440 445

Ser Val Val Lys Leu His Leu Asp Ser Pro Asp Glu Asp Phe Phe Gln
450 455 460

Tyr Leu Pro Ser Phe Asp Val Val Val Leu Ser Ser Gly His Trp Phe
465 470 475 480

Ala Lys Gln Ser Val Tyr Met Leu Asn Asn Glu Val Val Gly Gly Gln
485 490 495

Leu Trp Trp Pro Asp Lys Arg Arg Pro Met Lys Val Asn Asn Ile Glu
500 505 510

Ala Phe Gly Ile Ser Thr Glu Thr Ile Leu Thr Ala Met Ser Thr Tyr
515 520 525

Pro Asn Tyr Thr Gly Leu Thr Ile Val Arg Ala Phe Ser Pro Asp His
530 535 540

Tyr Glu Gly Gly Ala Trp Asn Thr Gly Gly Ser Cys Thr Gly Lys Val
545 550 555 560

Lys Pro Ala Thr Glu Leu Val Glu Asn Gly Phe Thr Asn Ile Met His
565 570 575

Glu Lys Gln Val Thr Gly Phe Lys Arg Ala Val Glu Lys Ser Lys Asn
580 585 590

Gly Ser Lys Leu Arg Leu Met Asp Ile Thr Glu Ala Phe Gly Tyr Arg
595 600 605

His Asp Gly His Pro Gly Pro Tyr Arg Ser Pro Asp Pro Asn Lys Lys
610 615 620

Thr Lys Arg Gly Pro Asn Gly Glu Pro Pro Pro Gln Asp Cys Leu His
625 630 635 640

pctca2017050779-seql.txt

Trp Cys Met Pro Gly Pro Val Asp Thr Trp Asn Glu Ile Val Leu Glu
645 650 655

Ile Ile Arg Arg Glu Phe Glu Asp Asn Val Thr Ser Pro Ala
660 665 670

<210> 680

<211> 149

<212> PRT

<213> Papaver somniferum

<400> 680

Met Glu Cys Tyr His Phe His His Asn His Thr Ile Thr Ser Leu Leu
1 5 10 15

Pro Phe Pro Tyr Ser Asn His Cys Ser Ile Ser Lys Phe His Lys His
20 25 30

Gln Leu His Pro Cys Phe Asn Lys Tyr Asn Ile Leu Lys Ser Ser Lys
35 40 45

Lys Ile Leu Pro Gln Lys Gln Thr Gln Lys Ser Ser Ser Ser Asn
50 55 60

Tyr Ala Ser Leu Val Ser Ser Leu Pro Ser Ala Ile Gln Thr His Glu
65 70 75 80

Pro Gln Asn Ser Val Leu Ser Arg Thr Leu Asn Ser Ile Thr Ile Ile
85 90 95

Gly Phe His Pro Leu Lys Leu Ile Phe Ile Cys Asn Val Thr Pro Asn
100 105 110

Pro Gln Phe Thr His Tyr Pro Thr Arg Ile Asn Leu Leu Glu His Arg
115 120 125

Phe His Leu Ser Ile Val Ser Leu Asn Phe Asn Glu Thr Leu Thr Leu
130 135 140

Gln Leu Asn Thr Glu
145

<210> 681

<211> 418

<212> PRT

<213> Papaver somniferum

<400> 681

pctca2017050779-seql.txt

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Met Pro Met Tyr Asp Tyr Ile Tyr Gly Thr Met Asp Lys Ser Ser Asp
1      5      10      15

Asp Leu Tyr Glu Thr Ser Leu Lys Arg Thr Glu Glu Ser Pro Asp Val
20      25      30

Val His Leu Thr His Pro Thr Thr Pro Asp Ser Ile Tyr His Leu Arg
35      40      45

Leu Gly Phe Ala Ser Leu Ala Ser Lys Pro Tyr Met Arg Glu Ala Asn
50      55      60

Asn Lys His Tyr Phe Ile Ile Lys Trp Ile Leu Trp Pro Leu Thr Phe
65      70      75      80

Leu Trp Ser Val Leu Phe Gln Arg Met Leu Ser His Thr Phe Val Leu
85      90      95

Glu Arg Asn Ile Phe Asp Asp His Gln Val Thr Lys Lys Leu Leu Gln
100     105     110

Val Gln Thr Trp Ala Ile Pro Arg Tyr Ser Tyr Gln Tyr Lys Arg Leu
115     120     125

Thr Arg Gln Arg Gly Thr Ile Asn Ser Leu Ile Glu Lys Ala Ile Leu
130     135     140

Asp Ala Asp Lys Ala Gly Ala Lys Val Ile Ser Leu Gly Leu Leu Asn
145     150     155     160

Gln Gly Glu Glu Met Asn Arg Asn Gly Glu Val Tyr Ile Gln Lys His
165     170     175

Pro Asn Leu Lys Ile Lys Ile Val Asp Gly Ser Ser Leu Ala Ala Ala
180     185     190

Ile Val Leu Asn Ser Ile Thr Asn Leu Lys Thr Gln Gln Gln Val Val
195     200     205

Val Met Met Arg Gly Arg Leu Thr Lys Leu Ala Cys Tyr Ile Ala Leu
210     215     220

Ala Leu Cys Gln Arg Gly Ile Gln Val Val Val Lys Leu Gln Ser Thr
225     230     235     240

Asp Asp Phe Glu Lys Leu Arg Ser Arg Phe Phe Ser Thr Ser Ser Ala
245     250     255

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pctca2017050779-seql.txt

Ser Gln Ala Ser Leu Leu Ala Ala Asn Asn Leu Ile Pro Ser Thr Lys
260 265 270

Tyr Ser Ala His Gly Asn Arg Gln Val Trp Leu Val Asp Asp Glu Phe
275 280 285

Ser Ser Glu Glu His Met Ser Ala Pro Lys Glu Thr Ile Phe Ile Pro
290 295 300

Tyr Ser Gln Ile Pro Pro Trp Ser Asn Phe Lys Lys Asn Pro Ile Gly
305 310 315 320

Ala Ala Asn Ile Leu Arg Lys Asp Cys Val Tyr Tyr Ser Thr Pro Ala
325 330 335

Met Met Ile Pro Ser Ser Leu Glu Asn Val His Ser Cys Glu Asn Trp
340 345 350

Leu Pro Arg Arg Val Met Ser Ala Trp Arg Val Ala Gly Met Leu His
355 360 365

Ala Leu Glu Asp Trp Glu Gly His Glu Cys Gly Asn Trp Phe Ile Lys
370 375 380

Glu Asn Asp Asn Met Ile Asp Lys Val Trp Ala Ala Gly Leu Arg His
385 390 395 400

Gly Phe Arg Pro Tyr Tyr Leu Pro Val Pro Cys Thr Ser Ala Val Ile
405 410 415

Ala Ala

<210> 682

<211> 182

<212> PRT

<213> Papaver somniferum

<400> 682

Met His Pro Trp Lys Ala Pro Gly Pro Asp Asp Phe Pro Leu Gly Phe
1 5 10 15

Phe Gln Thr Gln Trp Gly Thr Thr Lys Glu Asp Val Ile Gln Met Ile
20 25 30

Gln Ser Leu Phe Thr Ser Gly Arg Met Leu Arg Lys Met Asn Lys Thr
35 40 45

pctca2017050779-seql.txt

Asn Leu Cys Leu Ile Pro Asn Ile Gln Leu Pro Gln Ala Pro Gly Asp
50 55 60

Tyr Met Pro Ile Asp Leu Cys Asn Thr Thr Tyr Lys Leu Ile Thr Lys
65 70 75 80

Ile Met Ala Met Arg Leu Lys Pro Leu Met Asn Lys Leu Ile Ser Pro
85 90 95

Met Gln Ala Ser Tyr Val Pro Gly Arg Gln Ile Gly Asp Asn Ile Thr
100 105 110

Leu Ala His Glu Leu Ile His Trp Met Lys Arg Lys Lys Thr Lys Met
115 120 125

Gly Tyr Met Glu Ser Lys Leu Asp Met Phe Asn Ala Phe Asp Gln Val
130 135 140

Glu Trp Ser Phe Leu Pro Lys Val Met Glu Thr Phe Gly Phe Ala Asp
145 150 155 160

His Phe Cys Asp Leu Ile His Glu Cys Ile Ser Thr Lys Lys Ile Gln
165 170 175

Ile Met Leu Asn Gly Ser
180

<210> 683
<211> 111
<212> PRT
<213> Papaver somniferum

<400> 683

Met Ala Met Ser Lys Ser Arg Asn Arg Phe Val Phe Val Arg Tyr Phe
1 5 10 15

Pro Met Ala Met Ser Lys Ser Arg Ser Leu Thr Gln Cys Ala Ala Lys
20 25 30

Met Ser Lys Ser Arg Asn Arg Phe Val Phe Val Arg Tyr Phe Pro Met
35 40 45

Ala Met Ser Lys Ser Arg Ile Leu Thr Gln Cys Ala Ala Lys Thr Ile
50 55 60

Arg Arg Lys Leu Lys Trp Ile His Lys Leu Val Val Thr Val Thr Phe
65 70 75 80

pctca2017050779-seql.txt

Leu Phe Ala Ile Leu Lys Tyr Ile Ser His Ile Trp Ile Arg Leu Phe
85 90 95

Met Val Glu Val His Phe Ser Tyr Val Ser Val Tyr Lys Tyr Asn
100 105 110

<210> 684

<211> 649

<212> PRT

<213> Papaver somniferum

<400> 684

His Thr Phe Phe Gly Lys Ala Ala His Leu Val Asp Ser Thr Asn Gln
1 5 10 15

Val Gly His Phe Gln Lys Val Leu Thr Ser Ile Gly Asn Phe Cys Ile
20 25 30

Cys Ser Ile Ala Val Gly Leu Ile Ile Glu Ile Ile Val Met Phe Pro
35 40 45

Ile Gln His Arg Pro Tyr Arg Thr Gly Ile Asn Asn Leu Leu Val Leu
50 55 60

Leu Ile Gly Gly Ile Pro Ile Ala Met Pro Thr Val Leu Ser Val Thr
65 70 75 80

Leu Ala Ile Gly Ser His Arg Leu Ser Gln Gln Gly Ala Ile Thr Lys
85 90 95

Arg Met Thr Ala Ile Glu Glu Met Ala Gly Met Asp Val Leu Cys Ser
100 105 110

Asp Lys Thr Gly Thr Leu Thr Leu Asn Arg Leu Thr Val Asp Arg Ser
115 120 125

Leu Ile Glu Val Phe Asn Lys Asn Met Asp Lys Asp Thr Val Val Leu
130 135 140

Leu Ala Ala Arg Ala Ser Arg Leu Glu Asn Gln Asp Ala Ile Asp Thr
145 150 155 160

Ala Ile Val Asn Met Leu Ala Asp Pro Lys Glu Ala Arg Glu Asn Ile
165 170 175

Thr Pro Val His Phe Leu Pro Phe Asn Pro Val Glu Lys Arg Thr Ala
180 185 190

pctca2017050779-seql.txt

Ile Thr Tyr Ile Asp Ala Glu Gly Asn Trp His Arg Ala Ser Lys Gly
195 200 205

Ala Pro Glu Gln Ile Leu Asn Leu Cys Gln Glu Lys Glu Gln Ile Ala
210 215 220

Gly Lys Val His Ala Ile Ile Asp Lys Phe Ala Glu Arg Gly Leu Arg
225 230 235 240

Ser Leu Gly Val Ala Cys Gln Glu Val Pro Glu Lys Ser Glu Ala Ser
245 250 255

Pro Gly Gly Pro Trp Thr Phe Cys Gly Leu Leu Pro Leu Phe Asp Pro
260 265 270

Pro Arg His Asp Ser Ala Glu Thr Ile Arg Arg Ala Leu His Leu Gly
275 280 285

Val Cys Val Lys Met Ile Thr Gly Asp Gln Leu Ala Ile Ala Lys Glu
290 295 300

Thr Gly Arg Arg Leu Gly Met Gly Thr Asn Met Tyr Pro Ser Ser Ala
305 310 315 320

Leu Leu Asp Arg Asn Arg Asp Asp His Glu Ala Leu Pro Val Asp Glu
325 330 335

Leu Val Glu Gln Ala Asp Gly Phe Ala Gly Val Phe Pro Glu His Lys
340 345 350

Tyr Glu Ile Val Lys Met Leu Gln Glu Lys Lys His Ile Cys Gly Met
355 360 365

Thr Gly Asp Gly Val Asn Asp Ala Pro Ala Leu Lys Lys Ala Asp Ile
370 375 380

Gly Ile Ala Val Ser Asp Ser Thr Asp Ala Ala Arg Ser Ala Ala Asp
385 390 395 400

Ile Val Leu Thr Glu Pro Gly Leu Ser Val Ile Ile His Ala Val Leu
405 410 415

Thr Ser Arg Ser Ile Phe Gln Arg Met Lys Asn Tyr Thr Ile Tyr Ala
420 425 430

Val Ser Ile Thr Ile Arg Ile Val Leu Gly Phe Val Leu Leu Thr Leu

pctca2017050779-seql.txt
435 440 445

Ile Trp Lys Tyr Asp Phe Pro Pro Phe Met Val Leu Val Ile Ala Ile
450 455 460

Leu Asn Asp Gly Thr Ile Met Thr Ile Ser Lys Asp Arg Val Lys Pro
465 470 475 480

Ser Pro Lys Pro Asp Asn Trp Lys Leu Asn Glu Ile Phe Ala Thr Gly
485 490 495

Ile Val Ile Gly Thr Tyr Leu Ala Leu Val Thr Val Leu Phe Tyr Trp
500 505 510

Ile Val Thr Ala Thr Thr Phe Ile Gln Thr His Phe His Leu Arg Thr
515 520 525

Leu Ser Leu Thr Asn Gly Glu Val Ser Ser Ala Val Tyr Leu His Val
530 535 540

Ser Val Ile Ser Gln Ala Leu Ile Phe Val Thr Arg Ser Gln Ser Trp
545 550 555 560

Ser Phe Val Glu Arg Pro Gly Ile Leu Leu Met Cys Ala Phe Val Val
565 570 575

Ala Gln Leu Val Ala Thr Val Ile Ala Val Tyr Ala Asn Val Ser Phe
580 585 590

Ala Ser Ile His Gly Ile Gly Trp Gly Trp Ala Gly Ala Ile Trp Phe
595 600 605

Tyr Ser Leu Leu Leu Ala Ala Glu Pro Gly Ile Cys Cys Leu Ile Glu
610 615 620

Arg Arg Leu Ser Leu Leu Arg Lys Ile Thr Gly Arg Lys Ile Glu Lys
625 630 635 640

Gln Ser Gly Phe Phe Leu Lys Asp Tyr
645

<210> 685
<211> 132
<212> PRT
<213> Papaver somniferum

<400> 685

Met Tyr Asn Val Lys Asn Pro Ile Ile Ile Asp Gln Asn Tyr Cys Asp
Page 619

```

1              5              10              15
Gln Asp Asp Pro Cys Asp Glu Gln Glu Ser Ala Val Gln Ile Ser Asp
      20              25              30
Val Ile Tyr Lys Asn Ile Thr Gly Thr Ser Ala Ser Glu Val Ala Val
      35              40              45
Tyr Phe Asp Cys Ser Lys Asn Tyr Pro Cys Gln Asp Ile Val Leu Gln
      50              55              60
Asp Ile Asn Leu Val Arg Asp Glu Asp Gly Lys Ala Ala Thr Ser Ser
      65              70              75              80
Cys Lys Asn Val Lys Leu Thr Gln Val Gly Lys Val Ser Pro Gly Cys
      85              90              95
Ser Arg Val Gln Leu Lys Glu Trp Phe Leu Lys Arg Ile Glu Glu Glu
      100              105              110
Glu Glu Lys Glu Glu Asp Ile Phe His Gly His Asp Gln Val Val Tyr
      115              120              125
Tyr Thr Asp His
      130

```

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<210> 686
<211> 296
<212> PRT
<213> Papaver somniferum
<400> 686

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```

Met Ala Pro Gln Lys Asn Val Phe Ser Asn Ile Leu Phe Ser Ile Val
1              5              10              15
Leu Ile Phe Ile Leu Cys Asn Asn Ser Tyr Cys Cys Arg Gly Gly Ala
      20              25              30
Thr Leu Thr Ser Leu Asp Leu His Pro Thr Asp Glu Gln Pro Ser Asp
      35              40              45
Ser Asn Asn Glu Gln Gly Glu Ile Leu Arg Phe Arg Gly Ile Asn Asn
      50              55              60
Gly His Ile Lys Val Ser Ala Lys Arg Met Met Ser Val Ala Asp Phe
      65              70              75              80
Gly Ala Lys Gly Asp Gly Lys Thr Asp Asp Ser Lys Ala Phe Phe Lys

```


Ala Trp Lys Lys Ala Cys Ser Ser Lys Asn Ala Ile Glu Leu Val Ile
 100 105 110

Pro Lys Lys Lys Asn Tyr Cys Leu Lys Pro Ala Thr Phe Lys Gly Pro
 115 120 125

Cys Lys Ser Asn Ile Thr Ile Lys Ile Asp Gly Ala Ile Glu Ala Ser
 130 135 140

Ala Asp Arg Ser Asp Tyr Lys Arg Asp Val Arg His Trp Ile Ile Phe
 145 150 155 160

Lys Lys Ile Gln Asn Leu Val Val Glu Gly Asp Gly Thr Ile Asp Gly
 165 170 175

Lys Gly Asp Ile Trp Trp Lys Asn Ser Cys Lys Ile Asn Lys Ser Arg
 180 185 190

Pro Cys Thr His Ala Pro Thr Ala Leu Thr Phe Lys Glu Cys Asn Asn
 195 200 205

Leu Thr Val Glu Asn Ile Thr Ile Lys Asp Gly Gln Gln Met His Leu
 210 215 220

Ser Phe Gln Lys Cys Met Lys Val Glu Ala His Asn Leu Leu Ile Thr
 225 230 235 240

Ala Pro Glu Lys Ser Pro Asn Thr Asp Gly Ile His Val Thr Arg Thr
 245 250 255

Gln Asn Ile Thr Ile Ile Asn Ser Val Ile Gly Thr Gly Asp Asp Cys
 260 265 270

Ile Ser Ile Val Asn Gly Ser Arg Asn Val Gln Ala Thr Asn Thr Thr
 275 280 285

Cys Gly Pro Gly His Gly Ile Arg
 290 295

<210> 687

<211> 172

<212> PRT

<213> Papaver somniferum

<400> 687

Met Pro His Val Tyr Gln Ala Thr Ser Ala Lys Cys Ala Phe Arg Val

pctca2017050779-seql.txt

```

1           5           10           15
Cys Ser Asp Gln Lys Arg Glu Phe Leu Ser Lys Phe His Ser Pro Val
20          25          30
Arg Arg Ala Leu Leu Val Ile Thr Gln Ile Ile Ser Pro Leu Lys Ile
35          40          45
Arg Asn Cys Lys Thr Leu Ile Ser Pro Ser Pro Pro Ser Ile Phe Arg
50          55          60
Phe Pro Gln Phe Gln Ile Leu Ser Gln Val Leu Gln Ile Asp Pro Cys
65          70          75          80
Asn Lys Phe Pro His Lys Phe Gln Phe Leu Phe Leu Ile Phe Asp Leu
85          90          95
Pro Pro Asn Gln Asn Pro Asn Lys Trp Ser Ile His Phe Val Ile Trp
100         105         110
Asp Phe Gly Gly Gly Ile Gly Thr His Lys Asp Asn His Ser Met Met
115         120         125
Ile Phe Pro Leu Lys Thr Glu Pro Tyr Glu Phe Met Glu Ala Gly Ile
130         135         140
Arg Ile Lys Ala Phe Cys Cys Cys Arg Asn Ser Ser Arg Lys Leu Cys
145         150         155         160
Leu Ile Asp Phe Ile Asn Gln Val Ser Asn Cys Glu
165         170

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<210> 688
 <211> 191
 <212> PRT
 <213> Papaver somniferum

<400> 688

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Met Asp Leu Lys Glu Gln Asn Asp Leu Leu Ile Asp Leu Glu Ser Gly
1           5           10          15
Gly Ser Glu Glu Glu Ala Val Ile Leu Ile Val Asn Asn Lys Glu Gln
20          25          30
Gln Gln Glu Pro Ile Ala Ser Lys Ala Arg Asn Leu Leu Asp Lys Ala
35          40          45
Trp Asn Gly Ile Ile Thr Ser Ser Ile Asp Val Ile Thr Gly Gly Gly

```

pctca2017050779-seql.txt

50

55

60

Gly Glu Asp Gly Lys Asn Ala Val Ala Asn Gly Asp Leu Glu Asn Gly
65 70 75 80

Gly Glu Val Val Glu Lys Arg Cys Leu Leu Gln Gly Gly Gly Gly Gly
85 90 95

Glu Asp Thr Leu Ser Pro Leu Leu Val Val Lys Lys Lys Glu Lys Lys
100 105 110

Ser Lys Thr Lys Val Ser Ala Pro Lys Pro Pro Arg Pro Pro Arg Gly
115 120 125

Pro Ser Leu Asp Ala Ala Asp Gln Lys Leu Ile Arg Glu Ile Ser Glu
130 135 140

Leu Ala Met Leu Lys Arg Ala Arg Ile Glu Arg Met Arg Ala His Lys
145 150 155 160

Lys Met Lys Ala Ser Lys Ala Ala Ser Ser Asn Ser Asn Met Tyr Ala
165 170 175

Met Ile Ile Thr Val Met Phe Cys Leu Val Ile Ile Val Gln Val
180 185 190

<210> 689

<211> 592

<212> PRT

<213> Papaver somniferum

<400> 689

Glu Lys Glu Gly Lys Glu Lys Gly Lys Asp Val Asp Glu Arg Pro Ala
1 5 10 15

Tyr Met Asp Asp Phe Asp Asp Asp Phe Gly Gln Tyr Met Lys Gly Glu
20 25 30

His Asp Val Asp Leu Phe Pro Glu Glu Glu Val Phe Thr Pro Val Asp
35 40 45

Pro Ser Lys Met Glu Val Lys Thr Arg Phe Ala Asn Lys Glu Ala Phe
50 55 60

Lys Lys His Leu Arg Gly Tyr Cys Val Leu Asn Lys Cys Gln Tyr Ile
65 70 75 80

Leu Asp Arg Ser Ala Pro Ser Arg Ile Lys Ala Glu Cys Arg Phe Lys

Thr Glu His Asp Cys Pro Trp Phe Val Tyr Ala Ser Lys Lys Glu Gly
 100 105 110
 Glu Lys Thr Phe Val Leu Arg Lys Val Asn Leu Glu His Lys Cys Glu
 115 120 125
 Gly Asp Pro Gln Asn Arg Asn Arg Ser Ala Asp Pro His Phe Val Lys
 130 135 140
 Asp Phe Val Leu Asp Gln Met Lys Asn Lys Pro Lys Lys Val Val Pro
 145 150 155 160
 Asp Pro Tyr Lys Ile Lys Glu Asp Phe Leu Ala Glu Lys Arg Val Asn
 165 170 175
 Ile Pro Tyr Gln Cys Ala Trp Lys Ala Arg Asn Leu Val Leu Glu Ser
 180 185 190
 Leu Tyr Gly Asn Tyr Lys Glu Ser Tyr Asn Glu Val Pro Ala Phe Cys
 195 200 205
 Lys Met Phe Thr Lys Cys Asn Asp Gly Ser Val Ala Lys Phe Thr Phe
 210 215 220
 Asp Thr Val Asn Asn Thr Phe Glu Ser Met Thr Leu Ser Phe Glu Pro
 225 230 235 240
 Ala Met Arg Gly Trp Arg Lys Ala Cys Arg Gly Val Ile Gly Leu Asp
 245 250 255
 Ala Cys His Leu Thr Gly Glu Tyr Gly Gly Val Leu Met Ala Ala Thr
 260 265 270
 Ala Leu Asp Gly Gln Asn Gly Leu Val Met Leu Gly Ile Met Val Cys
 275 280 285
 Arg Ala Glu Thr Lys Glu Asn Trp Ile Ile Phe Leu Lys His Leu Lys
 290 295 300
 Asp Ala Ile Leu Ala His Pro Val Lys Val Ala Phe Ile Ser Asp Arg
 305 310 315 320
 Gln Lys Gly Leu Leu Glu Ala Val Gly Ile Val Phe Pro Gly His His
 325 330 335

pctca2017050779-seql.txt

His Arg Tyr Cys Trp Arg His Leu Tyr Lys Asn Phe Lys Lys Asp Tyr
 340 345 350
 Lys Gly Leu Glu Leu Tyr Ser Ser Leu Trp Asn Ala Ala Lys Ala Tyr
 355 360 365
 Lys Glu Lys His Phe Gln Glu His Phe Asp Asn Ile Val Lys Gln Ser
 370 375 380
 Ala Ala Ala Gly Ala Tyr Leu Ser Arg Glu Asp Pro Ala Thr Trp Ser
 385 390 395 400
 Arg Ala Phe Phe Asn Pro Ile His Cys Cys Glu His Met Asn Asn Asn
 405 410 415
 Phe Ser Glu Ser Phe Asn Asn Met Ile Asn Lys Met Arg Asn Lys Pro
 420 425 430
 Ile Ile Met Ile Gly Ile Met Tyr Ala Asn Leu Val Met Gly Thr Trp
 435 440 445
 Tyr Asn Arg Arg Thr Glu Ser Ala Ser Trp Val Asp Gly Asn Leu Val
 450 455 460
 Pro Thr Ala Val Thr Leu Ile Lys Lys Met Leu Glu Phe Val Thr Asp
 465 470 475 480
 Tyr Gly Val Asp Pro Cys Val Ala Gly Glu Leu Tyr Met Val Thr Ser
 485 490 495
 Pro Lys Asn Ser Val Phe Thr Val Asn Ile Leu Ala Lys Thr Cys Ser
 500 505 510
 Cys Leu Gln Trp Gln Leu Arg Gly Phe Pro Cys Met His Ala Val Ser
 515 520 525
 Ala Leu His Ser Ile Arg Pro Gln Trp Arg Lys Tyr Cys Ser Asp Tyr
 530 535 540
 Tyr Ser Val Glu Asn Tyr Lys Ala Thr Tyr Ala Pro Thr Phe Ala Pro
 545 550 555 560
 Leu Asp Asp Lys Ser Glu Trp Val Gln Trp Asp Leu Ile Gln Leu Gln
 565 570 575
 Arg Gly Lys Gly Leu Asn Val Met His Lys Ala Ser Pro Ser Ala Thr
 580 585 590

pctca2017050779-seql.txt

<210> 690
 <211> 165
 <212> PRT
 <213> Papaver somniferum

<400> 690

Met Leu Lys Glu Phe Gly Leu Val Gly Leu His Asp Leu Phe Glu Ile
 1 5 10 15

Arg Glu Lys Trp Thr Pro Ala Tyr Asn Arg Gly Thr Phe Phe Ala Gly
 20 25 30

Met Asn Ser Thr Gln Arg Ser Asp Ser Ile Ile Ser Phe Phe Asp His
 35 40 45

Ser Val Asn Ser Arg Met Cys Leu Arg Glu Phe Val Glu Ser Cys Asp
 50 55 60

Gln Ala Leu Glu Arg Ile Tyr Ile Arg Glu Arg Asp Glu Asp Tyr Glu
 65 70 75 80

Ser Ile His Val Lys Arg Ile Phe Val Ser Gln Asp Leu Leu Val Lys
 85 90 95

His Ala Ser Glu Ile Tyr Thr Arg Asn Leu Phe Ile Lys Val His Glu
 100 105 110

Gln Phe Asn Ala Ser Ser Arg Tyr Arg Ser Glu Ala Ile Glu Ala Asp
 115 120 125

Gly Asp Glu Glu Thr Tyr Arg Val Tyr Ser Phe Asn Asp Glu Val Pro
 130 135 140

Thr Glu Gln Phe Leu Val Lys Ile Asn Lys Val Thr Asn Lys Gly Val
 145 150 155 160

Cys Gly Cys Gln Glu
 165

<210> 691
 <211> 104
 <212> PRT
 <213> Papaver somniferum

<400> 691

Met Tyr Ala Asn Arg Ser Ser Val Leu Asp Asn Asp Gly Leu Val Met
 1 5 10 15

pctca2017050779-seql.txt

Lys Asp His Lys Leu Gly Thr Glu Ala Thr Arg Ile Ser His Tyr Cys
20 25 30

Gln Arg Ser Thr Lys Leu Ala Tyr Ile Leu Gly Lys Ser Glu Lys Ala
35 40 45

Tyr Asp Val Ala Met Gly Phe Leu Asp Gln Ala Phe Glu Lys Leu Lys
50 55 60

Glu Ile Asp Ile Asp Glu Leu Arg Ala Glu Tyr Gly Lys Asn Thr Gln
65 70 75 80

Leu Glu Lys Tyr Ala Asn Asp Glu Gln Leu Val Thr Glu Asn Ser Cys
85 90 95

Asp Ala Ala Glu Leu Thr His Arg
100

<210> 692
<211> 140
<212> PRT
<213> Papaver somniferum

<400> 692

Met Val Gly Phe Ser Gly Ser Ala Gly Trp Thr Ala Glu Thr His Arg
1 5 10 15

Ile Leu Ser Trp Gln Phe Ser Ser Thr Leu Glu Ile Asn Glu Gly Lys
20 25 30

Thr Asn Lys Glu Asn Leu Ser Asp Ile Tyr Arg Gly Asn Gly Ser Lys
35 40 45

Asp Asp Glu Arg Arg Ser Gly Ser Lys Ile Gly Leu Val Val Gly Leu
50 55 60

Val Val Gly Leu Gly Val Phe Gly Cys Gly Phe Cys Leu Ala Leu Val
65 70 75 80

Phe Trp Trp Ala Gln Arg Thr Leu Met Thr Ile Lys Arg Ile Pro Ile
85 90 95

Trp Thr Met Asn Leu Arg Lys Val Arg Asp Gln Arg Ser Ser His Ile
100 105 110

Ala Thr Trp Phe Met Gln Arg Ile Thr Leu Met Lys Val Glu Lys Leu
115 120 125

pctca2017050779-seql.txt

Gly Arg Glu Asp Pro Gly Glu Phe Thr Arg Asp Phe
130 135 140

<210> 693
<211> 153
<212> PRT
<213> Papaver somniferum

<400> 693

Leu Thr Asp Phe Asp Thr His Phe Ser Phe Ile Ile Gly Ser Ile Glu
1 5 10 15

Ala Lys Gly Asn Gly Asp Gly Ile Thr Phe Phe Leu Ala Pro Phe Gly
20 25 30

Ser Lys Val Pro Pro Arg Ser Ser Val Gly Ser Leu Ala Leu Phe Val
35 40 45

Ser Glu Arg Ala Asp Asp Pro Arg Lys Asn Arg Val Val Ala Val Glu
50 55 60

Phe Asp Thr Phe Gln Asn Ala Trp Asp Pro Ser Pro Asp His Val Gly
65 70 75 80

Ile Asn Val Asn Ser Ile Val Ser Val Ala Asn Val Ser Trp Asn Ser
85 90 95

Ser Met Lys Asp Gly Arg Thr Ala Asn Ala Gln Val Ser Tyr Asn Ser
100 105 110

Thr Thr Lys Asn Leu Ser Val Phe Leu Ala Tyr Asp Asp Tyr Pro Val
115 120 125

Phe Gly Gly Lys Ser Ile Leu Tyr His Ile Val Asp Leu Ser Lys Val
130 135 140

Leu Pro Gln Arg Ile Met Val Gly Phe
145 150

<210> 694
<211> 539
<212> PRT
<213> Papaver somniferum

<400> 694

Met Glu Glu Glu Lys Ile Ser Leu Leu Met Lys Asn Trp Ala Ile Asp
1 5 10 15

Ile Asp Val Leu Asn Arg Asp Ser Gln Lys Ala Arg Trp Asn Lys Pro

Ser Ile Tyr Lys Leu Pro Ala Pro Thr Thr Gly Gly Ser Ser Phe His
35 40 45

His Asn Asp Asn Asn Lys Lys Ser Ala Ala Tyr Leu Pro Tyr Thr Val
50 55 60

Ser Phe Gly Pro Tyr His His His Lys Gly Asp His Leu Lys Lys Met
65 70 75 80

Asp Pro His Lys His Arg Val Leu Gly His Phe Leu Arg Arg Tyr Asn
85 90 95

Ile Asn Pro Gln Lys Leu Val Asp Ser Leu Thr Thr Thr Ser Cys Gly
100 105 110

Arg Gln Gln Val Asp His Val Asp Glu Ala Asn Thr Asp Pro Lys Ala
115 120 125

Leu Pro Ile Leu Ala Glu Glu Glu Val Leu Pro Val Leu Gln His Leu
130 135 140

Met Asp Ser Tyr Asp Ser Leu Asp Asp Glu Trp Leu Tyr Asp Arg Asp
145 150 155 160

Gly Phe Leu Lys Leu Met Ile Leu Asp Gly Cys Phe Met Leu Glu Ile
165 170 175

Leu Gln Trp Ser Ser Val Tyr Asp Asn His Asn Ala Leu Ser Ser Gly
180 185 190

Ser Val Thr Ala Ala Thr Ser Leu Ala Gly Ser Ile Asp Asp Tyr Phe
195 200 205

Tyr Ala Asp Asn Asp Pro Ile Phe Ser Arg His Gly Lys Leu Tyr Val
210 215 220

Met Ser His Ile Arg Arg Asp Met Leu Met Leu Glu Asn Gln Leu Pro
225 230 235 240

Met Leu Leu Leu Lys Thr Leu Leu Gly Ala Val Leu Pro Thr Gln Gln
245 250 255

Lys Glu Asp Ile Glu Glu His Leu Asn Thr Ile Ala Ser Asn Phe Cys
260 265 270

pctca2017050779-seql.txt

Arg Gly Asn Ser Ser Tyr Arg Asn Gln Asn Thr Gly Ser Cys Leu His
 275 280 285
 Val Leu Asp Leu Tyr Arg Lys Ser Leu Leu Ser Ile Leu Pro Glu Asp
 290 295 300
 Leu Arg Glu Gly Ser Ala Leu Lys Asn Lys Asn Ser Gly Asp His Tyr
 305 310 315 320
 Cys Trp Gly Arg Ser Lys Ala Lys Gly Pro Thr Ile Leu Phe Ser Gly
 325 330 335
 Gln Thr Ala Ser Ala Asp Gln Lys Asn Ser Thr Ala Gly Ser Asp Gly
 340 345 350
 Thr Gly Glu Asp Ile Ile Arg Ser Ala Met Asn Leu His Asp Ser Gly
 355 360 365
 Ile Lys Phe Glu Lys Ser Thr Asp Asn Leu Thr Asp Ile Trp Phe Glu
 370 375 380
 Gly His Val Leu Lys Leu Pro Val Met Val Ile Asp Asp Ile Thr Glu
 385 390 395 400
 Ser Thr Leu Leu Asn Leu Met Ala Phe Glu Arg Phe His Val Gly Ala
 405 410 415
 Gly Asn Gly Ile Thr Ser Tyr Val Cys Phe Met Asp Asn Ile Ile Asp
 420 425 430
 Ser Ser Asp Asp Val Lys Ile Leu Arg Ser Ala Gly Val Leu His Asn
 435 440 445
 Ala Ile Gly Ser Asp Lys Ala Val Ala Lys Leu Phe Asn Glu Met Thr
 450 455 460
 Lys Asp Val Thr Pro Asp Pro Glu Ser Arg Leu Glu Lys Val Val Gln
 465 470 475 480
 Lys Gln Leu Asp Glu Tyr Cys Arg Ser Gln Trp His Glu Trp Arg Ala
 485 490 495
 Asn Leu Cys His Thr Tyr Phe Lys Ser Pro Trp Ala Leu Leu Ser Leu
 500 505 510
 Leu Ala Ala Val Phe Leu Leu Ala Leu Thr Ile Cys Gln Thr Phe Tyr
 515 520 525

pctca2017050779-seql.txt

Thr Ile Tyr Pro Tyr Tyr Lys Pro Ser Gly Lys
530 535

<210> 695
<211> 266
<212> PRT
<213> Papaver somniferum

<400> 695

Met Thr Gly Lys Arg His Tyr Phe Ser Glu Leu Asn Glu Lys Ile Lys
1 5 10 15

Gly Gln Val Lys Phe Gly Asp Gly Ser Ser Val Glu Ile Glu Gly Lys
20 25 30

Gly Ser Ile Leu Phe Gln Ser Lys Thr Gly Glu Gln Lys Leu Val Thr
35 40 45

Asn Ile Tyr Phe Ile Pro Asn Leu Gln Ser Asn Ile Leu Ser Leu Gly
50 55 60

Gln Ala Thr Glu Val Gly Cys Asp Val Arg Met Arg Gln Asp Tyr Leu
65 70 75 80

Thr Val His Asp Pro Ser Gly Arg Leu Leu Val Arg Val Ser Arg Ser
85 90 95

Gln Asn Arg Val Tyr Lys Ile Ser Leu Met Ile Gly Arg Pro Leu Cys
100 105 110

Leu Asn Met Arg Leu Glu Asp Gln Thr Trp Lys Trp His Ala Arg Leu
115 120 125

Gly His Ile Ser Phe Arg Thr Leu Lys Thr Met Ser Gln Asn Lys Met
130 135 140

Val Arg Gly Leu Pro Gln Ile Asn Asp Glu Ser Lys Ile Cys Glu Ser
145 150 155 160

Cys Leu Val Gly Lys Gln Thr Arg Gln Gly Phe Pro Lys Ala Thr Thr
165 170 175

Phe Arg Val Val Val Ser His Asp Val Val Phe Asp Glu Thr Thr His
180 185 190

Trp Asn Trp Lys Glu Thr Asn Asp Gly Pro Ser Arg Asp Pro Gly Met
195 200 205

pctca2017050779-seql.txt

Phe His Met Arg Trp Gly Gln Val Ile Asp Glu Gly Glu Gly Pro Ile
210 215 220

Ile Ile Asn Thr Asn Gly Asn Asn Asp Val Asn Gln Glu Glu Glu Glu
225 230 235 240

Asn Asn Glu Thr Thr Glu Asn Asn Glu Glu Glu Glu Glu Glu Glu Glu
245 250 255

Glu Glu Glu Glu Glu Glu Glu Glu Glu Glu
260 265

<210> 696
<211> 145
<212> PRT
<213> Papaver somniferum

<400> 696

Met Ser Glu Phe Glu Arg Val Lys Met Lys Asp Thr Asp Thr Ile Asp
1 5 10 15

Ser Phe Ala Gly Lys Leu Ser Glu Ile Ala Ser Lys Ala Ala Ser Leu
20 25 30

Gly Gln Ser Ile Asp Glu Asp Lys Leu Val Lys Lys Phe Leu Asn Ser
35 40 45

Leu Pro Arg Ser Lys Tyr Ile His Ile Ile Ala Ser Leu Glu Gln Val
50 55 60

Leu Asp Leu Lys Lys Thr Ser Tyr Glu Asp Ile Ile Gly Arg Leu Lys
65 70 75 80

Ala Tyr Glu Glu Arg Ile Leu Asp Glu Glu Asn Asn Gly Glu Thr Gln
85 90 95

Gly Lys Leu Leu Tyr Thr Asn Ser Tyr Gln Gln Asn Ser Ala Thr Arg
100 105 110

Gly Arg Gly Arg Gly Arg Gly Arg Val Asn Lys Gly Arg Gly Arg
115 120 125

Gly Gly Arg Phe Asn Ser Gln Asp Arg Thr Thr Ser Gln Asn Asp Gln
130 135 140

Asn
145

pctca2017050779-seql.txt

<210> 697
 <211> 271
 <212> PRT
 <213> Papaver somniferum

<400> 697

Met Ser Ser Lys Phe Glu Met Ser Asp Leu Gly Lys Leu Thr Tyr Tyr
 1 5 10 15

Leu Gly Ile Glu Val His Gln Gly Val Asp Gly Ile His Ile Lys Gln
 20 25 30

Glu Ala Tyr Ala Arg Arg Ile Leu Lys Glu Ala Gly Leu Glu Thr Cys
 35 40 45

Asn Pro Thr Lys Ile Pro Met Glu Phe Gly Leu Lys Val Ser Lys Ala
 50 55 60

Gln Glu Glu Ala Glu Ile Asp Pro Thr Ser Tyr Gly Arg Asn Val Gly
 65 70 75 80

Cys Leu Arg Tyr Leu Leu His Thr Arg Pro Asp Leu Ala Phe Ser Val
 85 90 95

Gly Val Ala Ser Arg Tyr Met Gln Ser Pro Arg Lys Ser His Gly Asp
 100 105 110

Val Ile Lys Gln Ile Leu Arg Tyr Leu Arg Gly Thr Ile Ser Tyr Gly
 115 120 125

Leu Lys Tyr Gly Lys Gly Gly Ser Lys Gly Ile Val Gly Tyr Ser Asp
 130 135 140

Ser Ser His Asn Val Asp Gln Asp Asp Gly Lys Ser Thr Thr Gly His
 145 150 155 160

Ile Phe Tyr Leu Gly Glu Ala Pro Ile Thr Trp Cys Ser Gln Lys Gln
 165 170 175

Asp Ala Val Ala Leu Ser Ser Cys Glu Ala Glu Phe Met Ala Ala Thr
 180 185 190

Glu Ala Thr Lys Gln Ser Ile Trp Leu Gln Glu Leu Met Gly Glu Ile
 195 200 205

Lys Gly Arg Glu Pro Glu Lys Val Leu Ile Lys Ile Asp Asn Lys Ser
 210 215 220

pctca2017050779-seql.txt

Ala Ile Ala Leu Thr Lys Asn Pro Val Phe His Gly Lys Thr Lys His
225 230 235 240

Ile His Lys Arg Tyr His Phe Ile Arg Glu Cys Ile Glu Lys Glu Ile
245 250 255

Ile Asn Val Glu His Ile Pro Gly Thr Glu Gln Lys Ala Asp Ile
260 265 270

<210> 698

<211> 294

<212> PRT

<213> Papaver somniferum

<400> 698

Met Leu Leu Ser Val Asn Asp Glu Pro Arg Asn Phe Gln Glu Ala Lys
1 5 10 15

Val Ser Thr Lys Trp Thr Gln Ala Cys Arg Glu Glu Ile Ile Ser Ile
20 25 30

Asn Arg Asn Lys Thr Trp Phe Leu Val Asp Lys Pro Gly Gly Val Lys
35 40 45

Val Ile Gly Leu Lys Trp Ile Phe Lys Val Lys Arg Asn Ala Asp Gly
50 55 60

Thr Ile Asn Lys Tyr Lys Ala Arg Leu Val Ala Lys Gly Tyr Val Gln
65 70 75 80

Glu Ser Gly Ile Asp Phe Asp Glu Val Phe Ala Pro Val Ala Arg Leu
85 90 95

Glu Thr Ile Arg Leu Leu Ile Ala Glu Ala Ala Ser Asn Ser Trp Glu
100 105 110

Ile His His Leu Asp Val Lys Thr Ala Phe Leu His Gly Glu Leu Ser
115 120 125

Glu Asp Val Tyr Val Glu Gln Pro Glu Gly Phe Glu Val Lys Gly Gln
130 135 140

Glu His Arg Val Tyr Lys Leu Thr Lys Ala Leu Tyr Gly Leu Arg Gln
145 150 155 160

Ala Pro Arg Ala Trp Asn Thr Lys Leu Asp Gln Ile Ile Lys Gly Met
165 170 175

pctca2017050779-seql.txt

Arg Phe Ile Lys Cys Ser Lys Glu Ser Ser Val Tyr Arg Arg Glu Glu
180 185 190

Lys Gly Thr Leu Leu Val Ile Ala Val Tyr Val Asp Asp Leu Phe Leu
195 200 205

Thr Gly Asn Ser Leu Lys Val Ile Asn Glu Phe Lys Arg Glu Met Ser
210 215 220

Ser Lys Phe Glu Met Ser Asp Leu Gly Lys Leu Thr Tyr Tyr Leu Gly
225 230 235 240

Ile Glu Ile His Gln Gly Val Asp Gly Ile Gln Ile Lys Gln Glu Ala
245 250 255

Tyr Ala Arg Arg Ile Leu Lys Glu Ala Gly Leu Glu Thr Cys Asn Pro
260 265 270

Thr Lys Ile Pro Met Glu Phe Gly Leu Lys Val Ser Lys Ala Gln Glu
275 280 285

Glu Ala Glu Ile Asp Pro
290

<210> 699
<211> 449
<212> PRT
<213> Papaver somniferum

<400> 699

Met Gly Phe Glu Val Ile Asp Arg Ile Gly Val Val Asn Glu Ser Arg
1 5 10 15

Thr Glu Glu Ile Gly Ser Thr Ile Val Lys Gln Glu Val Ser Val Glu
20 25 30

Glu Gln Leu Thr Ser Met Ser Ile His Gly Ser Arg Asn Thr Ser Pro
35 40 45

Ser Ser Arg Ala Gly Ser Arg Asn Thr Ser Pro Ser Ser Arg Ala Gly
50 55 60

Ser Arg Asn Thr Ser Pro Ser Arg Gln Lys Ala Val Lys Thr Lys Pro
65 70 75 80

Arg Gly Phe Asp Glu Glu Thr Val Ala Thr Phe Gly Lys Phe Ile His
85 90 95

pctca2017050779-seql.txt

Pro Asp Ile Gln Met Glu Asp Asn Ile Trp Ala Met Leu Pro Glu Asp
100 105 110

Leu Leu Asn Glu Ile Leu Ala Arg Val Pro Pro Phe Met Ile Phe Arg
115 120 125

Leu Arg Ser Val Cys Lys Arg Trp Asn Ser Ile Leu Gln Asp Asn Ser
130 135 140

Phe Leu Lys Leu Tyr Ser Gln Leu Pro Ser His Gly Pro Cys Leu Leu
145 150 155 160

Thr Phe Ser Lys Ser Pro Gln Thr Leu Gln Cys Ser Ile Phe Ser Leu
165 170 175

Pro Leu Lys Thr Trp Tyr Lys Ile Pro Phe Thr Phe Leu Pro Gln Trp
180 185 190

Ala Phe Trp Leu Val Gly Ser Ser Gly Gly Leu Val Cys Phe Ser Gly
195 200 205

Ser Asp Gly Val Thr Phe Lys Thr Leu Val Cys Asn Pro Leu Thr Gln
210 215 220

Ala Trp Arg Thr Leu Pro Ile Met His Tyr Asn Gln Gln Arg Gln Leu
225 230 235 240

Ile Leu Val Ala Asp Arg Thr Asp Arg Ser Phe Lys Val Ile Ala Thr
245 250 255

Ser Asp Ile Tyr Gly Asp Lys Thr Leu Pro Thr Glu Val Tyr Asp Ser
260 265 270

Lys Leu Asn Ser Trp Ser Val His Gln Ile Met Pro Ala Val Asn Leu
275 280 285

Cys Ser Ser Lys Met Ala Phe Cys Asp Ser Arg Leu Tyr Leu Glu Thr
290 295 300

Leu Ser Pro Leu Gly Leu Met Met Tyr Arg Leu Asp Thr Gly Tyr Trp
305 310 315 320

Glu Gln Leu Ala Ala Lys Phe Pro Arg Ser Leu Leu Asp Gly Tyr Leu
325 330 335

Val Ala Gly Thr Gln Lys Arg Leu Phe Leu Val Gly Arg Ile Gly Leu
340 345 350

pctca2017050779-seql.txt

Tyr Ser Thr Leu Gln Ser Met Arg Ile Trp Glu Leu Asp His Ser Lys
355 360 365

Ile Leu Trp Val Glu Ile Ser Arg Met Pro Pro Lys Tyr Phe Arg Ala
370 375 380

Leu Leu Arg Leu Ser Ala Glu Arg Phe Glu Cys Phe Gly Gln Asp Asn
385 390 395 400

Leu Ile Cys Phe Thr Ser Trp Asn Gln Gly Lys Gly Leu Leu Tyr Asp
405 410 415

Val Gly Lys Lys Val Trp Ser Trp Ile Ala Gly Cys Ala Leu Gln Ser
420 425 430

Tyr Asn Ser Gln Val Cys Phe Tyr Glu Pro Arg Phe Asp Val Ser Ile
435 440 445

His

<210> 700

<211> 370

<212> PRT

<213> Papaver somniferum

<400> 700

Met Ile Pro Leu Leu Asp Phe Ser His Gln Leu Ser Leu Arg Ser Leu
1 5 10 15

Lys Ile Thr Ile Leu Val Thr Pro Lys Asn Leu Pro Ile Leu Asn Pro
20 25 30

Leu Leu Ser Glu Asn Pro Ser Ile Lys Thr Leu Val Leu Pro Phe Pro
35 40 45

Asn His Pro Arg Leu Pro Gln Gly Val Glu Asn Val Lys Asp Leu Ser
50 55 60

Pro Asn His Phe Tyr Thr Met Leu Asn Ala Met Ser Gly Leu Tyr Asn
65 70 75 80

Pro Ile Leu Glu Trp Phe Lys Ser His Pro Ser Pro Pro Val Ala Ile
85 90 95

Ile Ser Asp Phe Phe Leu Gly Trp Thr His Glu Leu Ala Cys Glu Leu
100 105 110

pctca2017050779-seql.txt

Gly Ile Pro Arg Ile Asp Phe Ser Pro Ser Gly Ala Met Ala Ile Ala
115 120 125

Val Met Asp Lys Leu Phe Gln Asn Val Pro Lys Leu Asn Gly Asp Pro
130 135 140

Tyr His Gln Ile Glu Ser Phe Pro Asp Ile Pro Ser Ser Pro Phe Tyr
145 150 155 160

Pro Trp Trp Gln Leu Pro Ser Leu Tyr Arg Ser Leu Lys His Gly Glu
165 170 175

Pro Glu Ser Asp Phe Ile Arg Lys Ser Met Leu Ala Asn Phe Asp Ser
180 185 190

Trp Gly Ile Val Ile Asn Ser Phe Asn Glu Leu Glu Ser Val Tyr Leu
195 200 205

Asp Tyr Leu Arg Lys Lys Pro Asn Gly Leu Gly Tyr Tyr Asn Arg Val
210 215 220

Trp Ala Val Gly Pro Ile Leu Pro Ser Asp Asp Asp Ala Thr Gly Pro
225 230 235 240

Ala Lys Glu Arg Gly Gly Ser Gly Ser Val Ser Thr Asp Asp Ile Leu
245 250 255

Ser Trp Leu Asp Thr Cys Pro Asp Ser Ser Val Val Tyr Val Cys Phe
260 265 270

Gly Ser Gln Val Val Leu Ser Thr Lys Gln Met Glu Gly Leu Ala Arg
275 280 285

Arg Leu Glu Ser Ser Gly Val Arg Phe Leu Trp Cys Val Lys Glu Pro
290 295 300

Thr Thr Gly His Val Asp Gly Glu Tyr Ser Val Val Pro Ala Gly Phe
305 310 315 320

Glu Asp Arg Thr Ala Gly Lys Gly Met Leu Ile Arg Gly Trp Ala Pro
325 330 335

Gln Leu Pro Ile Leu Lys His Arg Ser Val Gly Ser Phe Met Thr His
340 345 350

Cys Gly Trp Asn Ser Val Ile Glu Gly Leu Thr Ser Gly Val Val Met

pctca2017050779-seq1.txt
360 365

355

Leu Thr
370

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<210> 701
<211> 397
<212> PRT
<213> Papaver somniferum

<400> 701
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Met Ala Arg Gly Pro Arg Ser Ser Ser Arg Ser Arg Arg Ser Ala Thr
1 5 10 15

Pro Ser Thr Asn Ser Ala Ser Thr Trp Arg Pro Leu Val Asp Thr Arg
20 25 30

Arg Ser Pro Ser Asn Asp Gly Leu Gly Ser His Gly Ser Pro Tyr Ala
35 40 45

Ser Asn Gly His Met Ser Leu Pro Ser Ser Glu Gly Glu His Ser Pro
50 55 60

Gly Gln Gly Ser Pro Leu Ser Gly Gly Glu Pro Trp Pro Glu Ala Leu
65 70 75 80

Gln Gln Thr Asn Thr Asp Ser Glu Ala Asp Asn Ser Glu Glu Ser Val
85 90 95

Ile Gly Asp Gln Arg Ile Pro Ile Ala Phe Asn Asp Asn Gly Gln Pro
100 105 110

Ile Gly Pro Thr Arg Arg Thr Phe Ser Thr Lys Leu Gly Lys Ile Thr
115 120 125

Arg Asn Leu Ala Ser Pro Gly Tyr Ile Thr Trp Lys Asp Val Leu Leu
130 135 140

Pro Val Lys Glu Ser Ile Trp Lys Ser Ile Thr Asn Asp Tyr Met Val
145 150 155 160

Pro Gln Val Leu Lys Asp Lys Val Leu Lys Arg Ala His Lys Ala Trp
165 170 175

Lys Asn Ser Lys Thr Pro Leu Arg Leu Ile Cys Asp Lys Tyr Thr Thr
180 185 190

Val Ala Glu Met Lys Asn Asn Arg Pro Gly Asn Val Arg Lys Glu Asp
Page 639

195

Trp Glu Lys Phe Val Asp Met Val Asn Lys Asp Glu Asp Arg Val Ile
210 215 220

Arg Glu Lys Met Lys Arg Ala Arg Lys Glu Leu Lys Ala Leu His Ser
225 230 235 240

Ile Gly Arg Val Gly Ile Ala Ser Arg Arg Glu Glu Met Glu Lys Gln
245 250 255

Asn Pro Ile Val Gln Lys Thr Val Arg Glu Leu Tyr Ala Met Glu Glu
260 265 270

Asn Arg Asn Glu Thr Pro Leu Asp Lys Asp Ala Val Ala Lys Thr Phe
275 280 285

Gly Val Asp Gly Arg Gly Thr Val Arg Gly Met Gly Gly Gly Val Ser
290 295 300

Lys Thr Glu Leu Arg Ala Ser Ala Val Ser Arg Glu Gln Leu Arg Gln
305 310 315 320

Glu Lys Leu Lys Thr Val Ala Val Glu Thr Arg Val Cys Gly Leu Glu
325 330 335

Glu Thr Val Glu Glu Leu Arg Gln Leu Ala Leu Asn Ala Asn Pro Ser
340 345 350

Thr Ser Asn Pro Ser Asn Ala Gln Gln Met Asn Val Gly Gly Arg Arg
355 360 365

Ile Gln Asn Ile Val Leu Arg Asn Met Arg Trp Gly Ala Val Ala Phe
370 375 380

Gly Arg Ile Asp Arg Ile Ala Asp Glu Asn Asp Ala Phe
385 390 395

<210> 702
<211> 125
<212> PRT
<213> Papaver somniferum

<400> 702

Met Lys Ala Arg Tyr Gln Cys Ser Asn Val Phe Phe Thr Glu Leu Leu
1 5 10 15

Lys Phe Met Lys Thr Ile Leu Pro Glu Gly Asn Thr Leu Pro Asp Ser
Page 640

20

Cys Arg Lys Ala Lys Asp Met Ile Lys Pro Phe Asn Leu Pro Val Glu
35 40 45

Ile Ile His Ala Cys Ser Asn Asp Cys Ile Leu Tyr Arg Lys Glu Tyr
50 55 60

Ala Asp Cys Asp Glu Cys Pro Lys Cys His Ala Ser Arg Trp Gln Leu
65 70 75 80

Pro Pro Glu Gly Ser Asn Pro Asn Ala Lys Lys Val Pro Val Lys Lys
85 90 95

Leu Arg Tyr Phe Pro Ile Thr Glu Arg Leu Gln Arg Trp Tyr Gly Thr
100 105 110

Pro Trp Ile Ala Glu Gln Met Tyr Trp His Ser Asn Val
115 120 125

<210> 703
<211> 146
<212> PRT
<213> Papaver somniferum
<400> 703

Met Arg His Pro Val Asp Ser Ser Ser Trp Lys Ser Ile Asp Arg Lys
1 5 10 15

Trp Pro Ala Phe Ala Ser Glu Lys Arg Asn Val Arg Leu Gly Leu Val
20 25 30

Thr Asp Gly Phe Asn Pro Phe Gly Met Met Thr Ser His Asn Thr Trp
35 40 45

Pro Val Met Ile Asn Ala Tyr Asn Leu Pro Pro Ser Ile Cys Thr Gly
50 55 60

Lys Asp Phe Thr Met Leu Val Leu Leu Ile Pro Gly Pro Ser Ala Pro
65 70 75 80

Asn His Asn Ile Asp Val Tyr Leu Gln Pro Leu Ile Glu Glu Leu Ile
85 90 95

Glu Leu Trp Leu Ser Gly Lys Leu Thr Tyr Asp Ala His Thr Lys Thr
100 105 110

Cys Phe Thr Met Lys Ala Ile Leu Met Trp Cys Ile His Asp Tyr Pro
Page 641

115

Ala Tyr Ala His Met Ser Gly Leu Arg Thr Ser Gly Lys Phe Gly Cys
130 135 140

Leu Ala
145

<210> 704
<211> 118
<212> PRT
<213> Papaver somniferum

<400> 704

Met Tyr Pro Phe Glu Arg Phe Thr Pro Leu Thr Thr Asp Pro Phe Asn
1 5 10 15

Leu Ile Leu Leu Asn Leu Cys Thr Leu Tyr Ile Trp Cys Tyr Leu Leu
20 25 30

Asn Lys Asn Tyr Ile Gly Gly Ser Ile Thr Ala Gln His Asp Val Val
35 40 45

Glu Gly Ala Arg His Trp Met Glu Phe Ile Pro Glu Gly Lys Leu Lys
50 55 60

Ser Tyr Lys Cys His Gly Lys Val Ala Leu Arg Gly Glu Val Tyr Glu
65 70 75 80

Gly Pro His Pro Pro Thr Ser Arg Gly Lys Pro Tyr Gln Leu Thr Ala
85 90 95

Val Gln His Glu Gln Val Gln Leu Trp Val Leu Arg His Ser Asp Glu
100 105 110

Asn Ile Glu Trp Glu Glu
115

<210> 705
<211> 109
<212> PRT
<213> Papaver somniferum

<400> 705

Met Thr Ser Glu Asn Asn Lys Lys Leu Gly Gly Arg Lys Met Leu Val
1 5 10 15

Thr Ala Asp Asn Asp Arg Lys Thr Ala Ile Lys His Glu Asn Ala Gly
20 25 30

pctca2017050779-seql.txt

Gln Phe Ile Gly Glu Ala Thr Thr Lys Ile Ser Gly Ala Glu His Ser
35 40 45

Ser Val Gly Asn Thr Asp Lys Ser Gln Lys Gly Asn Asn Glu Gly Gly
50 55 60

Glu Leu Asn Val Glu Ser Asn Lys Phe Met Ser Asn Thr Asp Arg Ser
65 70 75 80

Ser Leu Pro Val Asn Val Ser Leu Gly Asp Ser Ile Ala Val Ser Ala
85 90 95

Asp Tyr Leu Asp Pro Arg Pro His Pro Pro Lys Asn Asn
100 105

<210> 706
<211> 144
<212> PRT
<213> Papaver somniferum

<400> 706

Met Thr Ala Pro Thr Glu Ser Val Gln Cys Phe Arg Arg Lys Lys Thr
1 5 10 15

Ala Val Ala Val Thr His Cys Lys Lys Gly Arg Gly Leu Ile Lys Ile
20 25 30

Asn Gly Ser Pro Ile Glu Leu Val Glu Pro Glu Ile Leu Arg Phe Lys
35 40 45

Ala Tyr Glu Pro Ile Leu Ile Leu Gly Arg Gln Arg Phe Ala Gly Val
50 55 60

Asp Met Arg Ile Arg Val Arg Gly Gly Gly His Thr Ser Gln Ile Tyr
65 70 75 80

Ala Ile Arg Gln Ser Ile Ala Lys Ala Leu Val Ala Tyr Tyr Gln Lys
85 90 95

Tyr Val Asp Glu Gln Gln Lys Lys Glu Ile Lys Asp Ile Leu Val Arg
100 105 110

Tyr Asp Arg Thr Leu Leu Val Ala Asp Pro Arg Arg Cys Glu Pro Lys
115 120 125

Lys Phe Gly Gly Arg Gly Ala Arg Ser Arg Phe Gln Lys Ser Tyr Arg
130 135 140

pctca2017050779-seql.txt

<210> 707
 <211> 362
 <212> PRT
 <213> Papaver somniferum

<400> 707

Met Asn Ala Tyr Asp Leu Leu Asn Phe Ile Phe Thr Ile Val Phe Trp
 1 5 10 15

Arg Thr His Leu Arg Leu Phe Phe Ser Phe Phe Ile Leu Phe Val Leu
 20 25 30

Asn Trp Tyr Ser Arg Phe Gly Lys Ile Ser Ser Gln Gln Lys Val Phe
 35 40 45

Ser Thr Lys Pro Val Pro Phe Phe Gln Gln Leu Gln Glu Val Leu Ser
 50 55 60

Phe His Val Ser His Leu Cys Phe Arg Val Ile Glu Leu Lys Thr Leu
 65 70 75 80

Thr Gly Ile Phe Thr Ala His Ile Val Thr Arg Leu Thr Tyr Asp Ala
 85 90 95

Ala Ala Pro Met His Trp Pro Val Asp Ile Pro Pro Gln Pro Ala Tyr
 100 105 110

Ile Ser Arg Ser Val Ile Thr Ser Glu Pro His Ala Lys Glu Arg Val
 115 120 125

Leu Asp Asp Asp Glu Ala Ala Ser Leu Thr Thr Ser Glu Leu Pro Ser
 130 135 140

Pro Glu Ile Ile Asp Asp Asp Glu Ala Ala Ala Ser Cys Pro Phe Ser
 145 150 155 160

Met Arg Lys Phe Ser Asn Val Gln Asn Ser Ser Glu Tyr Asp Ile Ile
 165 170 175

Lys Glu Ile Thr Phe Arg Asp Ile Cys Gly Arg Leu Ser Asn Cys His
 180 185 190

Phe Leu Asn Asn Lys Ile Gln Trp Ile Gly Ile Phe Arg Val Arg Arg
 195 200 205

Lys Tyr Thr Phe Thr Phe Arg Phe Asn Phe Thr Arg Met Leu Phe Asn
 210 215 220

pctca2017050779-seql.txt

Tyr Tyr Ser Ala Asn Ile Ile Lys Leu Ala Phe Phe Arg Leu Ser Tyr
225 230 235 240

Cys Arg His Leu Asn Met Gly Ile Arg Ile Ser Met Leu Gln Asn His
245 250 255

Val Val Ala Ser Gln Asn Tyr Phe Ile Ile Ala Asn Asn Asp Cys Thr
260 265 270

Glu Arg Ala Ser Ile Ser Ile Ile His Ser Phe Val Cys Phe Phe Asn
275 280 285

Cys Phe Cys Tyr Glu Phe Met Val Leu Val Leu Tyr Ser Phe Leu Val
290 295 300

Thr Arg Lys Cys Ser Gly Asn Arg Tyr Ser Ser Ile Leu Gly Phe Asp
305 310 315 320

Asn Phe Ser Phe Phe His Gly Gly Ile Glu Lys Leu Glu Trp Asp Ser
325 330 335

Val Ile Arg Gln Ile Ser Glu Arg Asn Ser Tyr Ser Glu Phe Arg Thr
340 345 350

Met Leu Asn Trp Lys Asn Leu Asp Ser Arg
355 360

<210> 708
<211> 178
<212> PRT
<213> Papaver somniferum
<400> 708

Met Leu Ser Glu Leu Asp Leu Ala Thr Lys Asn Arg Pro Cys Thr Phe
1 5 10 15

Thr Pro Asp Met Phe Arg Cys Ser Gln Gln Ile Leu Glu Gly Val Asp
20 25 30

Leu Lys His Met Leu Glu Phe Ala Gly His Lys Glu Glu Val Leu Ser
35 40 45

Thr Arg Arg Ala Lys Lys Ile Met Glu Glu Val Gln Ile Pro Glu Leu
50 55 60

Ser Asp His Ile Asp Val Arg Asn Pro Glu Leu Val Met Glu Gln Phe
65 70 75 80

pctca2017050779-seql.txt

Lys Gly Tyr Glu Glu Lys Val Lys Asn Ala Ser Ser Glu Ile Gly Asp
85 90 95

Asn Leu Asn Val Tyr Leu Gly Ser Leu Pro Val Leu Lys Ala Val Lys
100 105 110

Arg Val Leu Leu Arg Leu Glu Arg Ile Cys Leu Leu Lys Ser Val Asn
115 120 125

Ser Lys Arg Met Cys Leu Trp Asn Pro Asp Asp Asp Ile Lys Leu Leu
130 135 140

Glu Lys Ser His Asp Ala Ala Gln Lys Ala Met Lys Ala Gly Gln Ser
145 150 155 160

Gly Lys Thr Ser Asn Arg Phe Lys Glu Val Asn Ser Ala Thr Leu Leu
165 170 175

Ile Leu

<210> 709
<211> 109
<212> PRT
<213> Papaver somniferum

<400> 709

Met Ser Val Glu Glu Asp His Asp Asp Val Met Ser Glu Glu Asp Ile
1 5 10 15

Thr Val Val Glu Ser Met Thr Ser Gln Glu His Ala Ser Lys Lys Arg
20 25 30

Lys Phe Thr Ser Lys Val Trp Asn Asp Phe Asp Trp Ser Arg Asp Lys
35 40 45

Asp Gly Lys Glu Lys Ala Thr Cys Lys His Cys Arg Lys Glu Tyr Ala
50 55 60

Tyr Asp Ser Gln Lys Gly Gly Thr Ser Thr Met Ser Arg Tyr Leu Lys
65 70 75 80

Lys Phe Pro Arg Leu Lys Met Gln Asp Val Gly Gln Leu Leu Leu Ser
85 90 95

Thr Asn Asn Gly Glu Gln Ala Thr Arg Ala Arg Lys Ile
100 105

pctca2017050779-seql.txt

<210> 710
 <211> 302
 <212> PRT
 <213> Papaver somniferum

<400> 710

Met Asn Phe Gly Thr Asn Gln Gly Val Asn Gly Gly Phe Ser Ile Thr
 1 5 10 15

Arg Glu Thr Ser Lys Cys Ile Pro Val Ala Asn Gly Pro Ile His His
 20 25 30

Trp Lys His Ser Asn Trp Ser Asn Val Asp Asn Tyr Gly Asn Phe Met
 35 40 45

Thr Pro Ser Ser Lys Asp Leu Ser Leu Leu Pro Asn Arg Val Thr Pro
 50 55 60

Thr Ser Ser Ile Ser Ile Ser Pro Asn Phe Ala Glu Pro Ile Gln Asn
 65 70 75 80

Met Cys Pro Gln Ser Ser Thr Phe Cys Thr Ser Leu His Val Ser Pro
 85 90 95

Ser Ala Thr Leu Asn Pro Gln Met Gln Phe Leu Gln Pro Gly Ser Leu
 100 105 110

Ser Ser Thr Glu Tyr Met Met Pro Gln Thr Ala Gln Thr Met Leu Pro
 115 120 125

Val Gln Leu Gln Gly Glu Asn Leu Val Ala Tyr Gln Arg Tyr Glu Gly
 130 135 140

Gln Gln Ile Met Asn Gly Gly His Thr Glu Leu Leu Gly Asp Val Ile
 145 150 155 160

Gly Ala Gly Thr Phe Asp Trp Ala Thr Gly Arg Thr Phe Asp Val Ala
 165 170 175

Arg Thr Asp Asn Ile Ile Ser Gln Gln Lys Gly Leu Gln Leu Gln Ser
 180 185 190

Lys Arg Val Asp Phe Ile Met Asn His Asp Asn Gln Asn Ala Gln Met
 195 200 205

Asp Glu Ile Phe Thr Ala Thr Glu His Ser Gln Ile His Gly Asn His
 210 215 220

pctca2017050779-seql.txt

Ser Gln Ala Asn Arg Ser Phe Thr Phe Ser Leu Glu Asp Glu Thr Asn
225 230 235 240

Ser Ser Ile Ser Ser Ile Asp Ala Leu His Lys Pro Arg Met Arg Trp
245 250 255

Thr Gln Lys Leu His Asp Cys Phe Val Gln Ala Ile Asn Asp Leu Gly
260 265 270

Gly Ala Asp Lys Ala Thr Pro Lys Ser Val Gln Met Lys Met Gly Val
275 280 285

Glu Gly Leu Thr Ile Tyr His Val Lys Ser His Leu Gln Lys
290 295 300

<210> 711
<211> 268
<212> PRT
<213> Papaver somniferum

<400> 711

Met Ala Phe Leu Asp Gly Asn Pro Pro Glu Arg Leu Cys Lys Pro Val
1 5 10 15

Val Asp His Ile Glu Ser Leu Gly Gly Glu Val Arg Leu Asn Ser Arg
20 25 30

Ile Lys Lys Ile Glu Leu Lys Lys Asp Gly Thr Val Lys Arg Leu Met
35 40 45

Leu Thr Asn Gly Asp Ala Ile Glu Gly Asp Ala Tyr Val Ile Ala Thr
50 55 60

Pro Val Asp Ile Leu Lys Leu Leu Ile Pro Glu Glu Trp Lys Glu Val
65 70 75 80

Gly Tyr Phe Lys Arg Leu Asp Lys Leu Val Gly Val Pro Val Ile Asn
85 90 95

Val His Ile Trp Phe Asp Lys Lys Leu Lys Asn Thr Tyr Asp His Leu
100 105 110

Leu Phe Ser Arg Ser Pro Leu Leu Ser Val Tyr Ala Asp Met Ser Val
115 120 125

Thr Cys Lys Glu Tyr Tyr Asp Pro Asn Lys Ser Met Leu Glu Leu Val
130 135 140

pctca2017050779-seql.txt

Phe Ala Pro Ala Glu Glu Trp Ile Ser Arg Ser Asp Ser Glu Ile Ile
145 150 155 160

Glu Ala Thr Met Gln Glu Leu Ala Lys Leu Phe Pro Asp Glu Ile Ala
165 170 175

Ala Asp Gln Ser Lys Ala Lys Ile Leu Lys Tyr His Ile Val Lys Thr
180 185 190

Pro Arg Ser Val Tyr Lys Thr Ile Pro Asp Cys Glu Pro Ala Arg Pro
195 200 205

Leu Gln Arg Ser Pro Ile Glu Gly Phe Tyr Leu Ala Gly Asp Tyr Thr
210 215 220

Lys Gln Lys Tyr Leu Ala Ser Met Glu Gly Ala Val Leu Ser Gly Lys
225 230 235 240

Leu Cys Ala Gln Ala Ile Val Lys Asp Cys Glu Met Leu Ala Ala Arg
245 250 255

Val Glu Glu Lys Thr Thr Ala Glu Ala Thr Val Ala
260 265

<210> 712
<211> 315
<212> PRT
<213> Papaver somniferum

<400> 712

Met Ser Asp Gln Thr Val Ser Val Ser Ser Leu Asp Asp Asn Thr Gln
1 5 10 15

His His Ser Leu Cys Asp Phe Asn Ser Ile Ser Ser Ser Ser Ser Cys
20 25 30

Phe Ser Ser Phe Pro Phe Gln Leu Asn Leu Glu Leu Arg Ser Ile Ile
35 40 45

Ile Ser Tyr Leu Ile Leu Ile Leu Ile Leu Thr Pro Ile Leu Pro Leu
50 55 60

Asn Asp Asn Asn Glu Lys Lys Lys Lys Met Thr Ser Thr Thr Ala Ser
65 70 75 80

Thr Val Ser Ser Val Ile Asn Arg Ile Trp Asn Ser Asn Ser Ser Asn
85 90 95

pctca2017050779-seql.txt

```

Ser Thr Ser Thr Thr Arg Gly Gly Thr Asn His Leu Leu Phe Gly Gly
      100      105      110

Phe Arg Gly Ser Ile Ala Thr Ser Ser Ser Ser Met Leu Leu Pro Arg
      115      120      125

Ser Leu Lys Ser His Gln Thr Pro Thr Ala Arg Thr Thr Asn Lys Lys
      130      135      140

Lys Asn Asn Ser Pro Arg Arg Pro Asn Leu Gln Val Val Cys Met Asp
      145      150      155      160

Tyr Pro Arg Pro Glu Leu Asp Asn Thr Val Asn Tyr Leu Glu Ala Ala
      165      170      175

Tyr Phe Ser Ser Ser Phe Thr Val Ser Pro Arg Pro Asn Lys Pro Leu
      180      185      190

Ile Val Val Ile Ala Gly Ala Gly Leu Ala Gly Leu Ser Thr Ala Lys
      195      200      205

Tyr Leu Ala Asp Ala Gly His Lys Pro Ile Leu Leu Glu Ala Arg Asp
      210      215      220

Val Leu Gly Gly Lys Val Ala Ala Trp Lys Asp Asp Asp Gly Asp Trp
      225      230      235      240

Tyr Glu Thr Gly Leu His Ile Phe Phe Gly Ala Tyr Pro Asn Val Gln
      245      250      255

Asn Leu Phe Gly Glu Leu Gly Ile Ser Asp Arg Leu Gln Trp Lys Glu
      260      265      270

His Ser Met Ile Phe Ala Met Pro Ser Lys Pro Gly Glu Phe Ser Arg
      275      280      285

Phe Asp Phe Pro Asp Val Leu Pro Ala Pro Leu Asn Gly Ile Trp Ala
      290      295      300

Ile Leu Arg Asn Asn Glu Met Leu Thr Trp Pro
      305      310      315

```

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<210> 713
<211> 513
<212> PRT
<213> Papaver somniferum

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pctca2017050779-seql.txt

<400> 713

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Met Ala Ala Gly Thr Thr Thr Thr Arg His Gln His Leu Val Ile Ser
1      5      10     15

Ser Ser Phe Tyr Cys Thr Phe Leu Leu Leu Ile Thr Gln Gly Ser
      20     25     30

Thr Val Glu Gly Phe Gly Cys Asn Trp Gly Thr Arg Ala Thr His Pro
      35     40     45

Leu Pro Ala Asp Ile Val Val Lys Leu Leu Gln Asp Asn Gly Phe Asp
      50     55     60

Lys Val Lys Leu Phe Glu Pro Asp Pro His Ala Leu Thr Ala Leu Ala
65     70     75     80

Thr Ser Gly Ile Gln Val Met Leu Gly Ile Pro Asn Glu Phe Leu Ala
      85     90     95

Ala Leu Ala Ser Ser Val Arg Val Ala Glu Asn Trp Val Gln Gln Asn
      100    105    110

Val Ser Ala Tyr Ile Arg Asp Gly Val Asp Ile Arg Tyr Val Ala Val
      115    120    125

Gly Asn Glu Pro Phe Leu Lys Thr Tyr Gly Gln Ala Tyr Leu Gln Thr
      130    135    140

Thr Phe Pro Ala Leu Lys Asn Ile Gln Ala Ala Leu Ile Lys Ala Gly
145    150    155    160

Leu Gly Lys Gln Ile Lys Val Thr Val Pro Leu Asn Ala Asp Val Tyr
      165    170    175

Gln Thr Asp Thr Asp Leu Pro Ser Gly Gly Asp Phe Arg Pro Asp Ile
      180    185    190

His Ser Leu Met Ile Ser Ile Val Lys Phe Leu Ser Glu Ser Ser Tyr
      195    200    205

Pro Leu Thr Ile Asn Ile Tyr Pro Phe Leu Ser Leu Tyr Ala Asp Ser
      210    215    220

His Phe Pro Val Asp Tyr Ala Phe Phe Ser Gly Thr Ala Thr Pro Val
225    230    235    240

Val Asp Gly Pro Ile Ser Tyr Ser Asn Val Phe Glu Ala Asn Tyr Asp

```

245

250

255

Thr Leu Ile Trp₂₆₀ Ala Leu Glu Lys Asn₂₆₅ Gly Phe Pro Ser Val₂₇₀ Pro Val

Ile Ile Gly₂₇₅ Glu Val Gly Trp₂₈₀ Thr Asp Gly Asp₂₈₅ Pro Asn Ala Asn

Val Glu₂₉₀ Tyr Ala Arg Arg Phe₂₉₅ Asn Gln Gly Leu Phe₃₀₀ Asn Arg Ile Phe

Gln Gly Gln Gly Thr Pro₃₁₀ Lys Arg Lys Ser Ala₃₁₅ Pro Glu Thr Tyr Val₃₂₀

Phe Gly Leu Ile Asp₃₂₅ Glu Asp Ala Lys Ser₃₃₀ Ile Asp Pro Gly Asn₃₃₅ Phe

Glu Arg His Trp₃₄₀ Gly Met Phe Asn Tyr₃₄₅ Asp Gly Thr Leu Lys₃₅₀ Tyr Ser

Leu Gln Leu₃₅₅ Gly Asn Asn Arg Lys₃₆₀ Leu Val Pro Ala Lys₃₆₅ Gly Val Lys

Tyr Leu₃₇₀ Glu Lys Gln Trp Cys₃₇₅ Val Met Ser Pro Gln₃₈₀ Ala Ser Thr Ser

Asp₃₈₅ Pro Ile Phe Val Glu₃₉₀ Ser Val Thr Tyr Ala₃₉₅ Cys Thr His Ala Asp₄₀₀

Cys Thr Ser Leu Ser₄₀₅ Tyr Gly Ser Ser Cys₄₁₀ Gly Asp Leu Asp Ala₄₁₅ Ala

Ser Asn Ala Ser₄₂₀ Tyr Ala Phe Asn Arg₄₂₅ Phe Tyr Gln Thr Ala₄₃₀ Asn Gln

Gln Arg Gly₄₃₅ Ser Cys Asn Phe Asn₄₄₀ Asn Leu Ala Val Val₄₄₅ Thr Thr Thr

Asn Pro₄₅₀ Asn Thr Gln Asp Pro₄₅₅ Lys Cys Lys Phe Asp₄₆₀ Ile Met Ile Asp

Val Ser Lys Gln Ala Lys₄₇₀ Leu Ser Pro Pro Lys₄₇₅ Ser Arg Ser Arg Ser₄₈₀

Ala Ser Ser Pro Gly₄₈₅ Leu Val Gln Gln Asn₄₉₀ Ser Leu Ser Ser Trp₄₉₅ Met

pctca2017050779-seql.txt

Ile Ser Thr Val Phe Val Thr Leu Val Leu Ile Val Ser Ser Ser Leu
 500 505 510

Val

<210> 714
 <211> 604
 <212> PRT
 <213> Papaver somniferum

<400> 714

Met Phe Pro Ile Gln His Arg Pro Tyr Arg Thr Gly Ile Asn Asn Leu
 1 5 10 15

Leu Val Leu Leu Ile Gly Gly Ile Pro Ile Ala Met Pro Thr Val Leu
 20 25 30

Ser Val Thr Leu Ala Ile Gly Ser His Arg Leu Ser Gln Gln Gly Ala
 35 40 45

Ile Thr Lys Arg Met Thr Ala Ile Glu Glu Met Ala Gly Met Asp Val
 50 55 60

Leu Cys Ser Asp Lys Thr Gly Thr Leu Thr Leu Asn Arg Leu Thr Val
 65 70 75 80

Asp Arg Ser Leu Ile Glu Val Phe Asn Lys Asn Met Asp Lys Asp Thr
 85 90 95

Val Val Leu Leu Ala Ala Arg Ala Ser Arg Leu Glu Asn Gln Asp Ala
 100 105 110

Ile Asp Thr Ala Ile Val Asn Met Leu Ala Asp Pro Lys Glu Ala Arg
 115 120 125

Glu Asn Ile Thr Pro Val His Phe Leu Pro Phe Asn Pro Val Glu Lys
 130 135 140

Arg Thr Ala Ile Thr Tyr Ile Asp Ala Glu Gly Asn Trp His Arg Ala
 145 150 155 160

Ser Lys Gly Ala Pro Glu Gln Ile Leu Asn Leu Cys Gln Glu Lys Glu
 165 170 175

Gln Ile Ala Gly Lys Val His Ala Ile Ile Asp Lys Phe Ala Glu Arg
 180 185 190

pctca2017050779-seql.txt

Gly Leu Arg Ser Leu Gly Val Ala Cys Gln Glu Val Pro Glu Lys Ser
 195 200 205
 Glu Ala Ser Pro Gly Gly Pro Trp Thr Phe Cys Gly Leu Leu Pro Leu
 210 215 220
 Phe Asp Pro Pro Arg His Asp Ser Ala Glu Thr Ile Arg Arg Ala Leu
 225 230 235 240
 His Leu Gly Val Cys Val Lys Met Ile Thr Gly Asp Gln Leu Ala Ile
 245 250 255
 Ala Lys Glu Thr Gly Arg Arg Leu Gly Met Gly Thr Asn Met Tyr Pro
 260 265 270
 Ser Ser Ala Leu Leu Asp Arg Asn Arg Asp Asp His Glu Ala Leu Pro
 275 280 285
 Val Asp Glu Leu Val Glu Gln Ala Asp Gly Phe Ala Gly Val Phe Pro
 290 295 300
 Glu His Lys Tyr Glu Ile Val Lys Met Leu Gln Glu Lys Lys His Ile
 305 310 315 320
 Cys Gly Met Thr Gly Asp Gly Val Asn Asp Ala Pro Ala Leu Lys Lys
 325 330 335
 Ala Asp Ile Gly Ile Ala Val Ser Asp Ser Thr Asp Ala Ala Arg Ser
 340 345 350
 Ala Ala Asp Ile Val Leu Thr Glu Pro Gly Leu Ser Val Ile Ile His
 355 360 365
 Ala Val Leu Thr Ser Arg Ser Ile Phe Gln Arg Met Lys Asn Tyr Thr
 370 375 380
 Ile Tyr Ala Val Ser Ile Thr Ile Arg Ile Val Leu Gly Phe Val Leu
 385 390 395 400
 Leu Thr Leu Ile Trp Lys Tyr Asp Phe Pro Pro Phe Met Val Leu Val
 405 410 415
 Ile Ala Ile Leu Asn Asp Gly Thr Ile Met Thr Ile Ser Lys Asp Arg
 420 425 430
 Val Lys Pro Ser Pro Lys Pro Asp Asn Trp Lys Leu Asn Glu Ile Phe
 435 440 445

pctca2017050779-seql.txt

Ala Thr Gly Ile Val Ile Gly Thr Tyr Leu Ala Leu Val Thr Val Leu
450 455 460

Phe Tyr Trp Ile Val Thr Ala Thr Thr Phe Ile Gln Thr His Phe His
465 470 475 480

Leu Arg Thr Leu Ser Leu Thr Asn Gly Glu Val Ser Ser Ala Val Tyr
485 490 495

Leu His Val Ser Val Ile Ser Gln Ala Leu Ile Phe Val Thr Arg Ser
500 505 510

Gln Ser Trp Ser Phe Val Glu Arg Pro Gly Ile Leu Leu Met Cys Ala
515 520 525

Phe Val Val Ala Gln Leu Val Ala Thr Val Ile Ala Val Tyr Ala Asn
530 535 540

Val Ser Phe Ala Ser Ile His Gly Ile Gly Trp Gly Trp Ala Gly Ala
545 550 555 560

Ile Trp Phe Tyr Ser Leu Leu Leu Ala Ala Glu Pro Gly Ile Cys Cys
565 570 575

Leu Ile Glu Arg Arg Leu Ser Leu Leu Arg Lys Ile Thr Gly Arg Lys
580 585 590

Ile Glu Lys Gln Ser Gly Phe Phe Leu Lys Asp Tyr
595 600

<210> 715
<211> 606
<212> PRT
<213> Papaver somniferum

<400> 715

Met Ala Ile Thr Asn Asp Val Gly Glu Glu Glu Ile Glu Met Met Met
1 5 10 15

Lys Tyr Leu Ile Val Arg Pro Glu Lys Gly Gly Ile Phe Asn Met Ser
20 25 30

Arg Tyr Leu Leu Arg Tyr Asp Ala Ala Asn His Asp Phe Ile Glu Thr
35 40 45

Ser Asn Asn His Tyr Ser Asn Asp Gly Tyr Gly Asp Glu Leu Val Thr
50 55 60

pctca2017050779-seql.txt

Val Ser Arg Gly Ile Ser Ser Val Ser Asp Gly Gly Gly Gly Gln Asp
65 70 75 80

Asp His Arg Leu Val Ile Ile Val Ser Ile Ile Val Arg Lys Ile Ile
85 90 95

Gly Val Leu Gly Lys Pro Met Glu Trp Met Gly Tyr Leu Val Glu Phe
100 105 110

Leu Leu Asn Leu Leu Ser Leu Asn Gly Gly Ser Ile Phe Ser Leu Leu
115 120 125

Thr Val Leu Leu Asn Gly Lys Val Val Arg Pro Gln Arg Asn Ser Glu
130 135 140

Thr Phe Ile Ser Ala Ile Gly His Leu Asp Gly Arg Ile Asp Leu Tyr
145 150 155 160

Asn Lys Gln Met Pro Ser Ser Thr His Asp Asp Pro Leu Leu Ser Ser
165 170 175

Thr Asp Ala Asn Gly Asn Gly Glu Met Ile Val Asn Asp Lys Lys Thr
180 185 190

Ser Asn Ile Phe Asp Leu Gly Asp Asp Arg Cys Leu Met Asp Leu Cys
195 200 205

Met Met Ala Ser Lys Leu Ala Tyr Glu Asn Ala Lys Val Val Arg Asn
210 215 220

Ile Val Val His His Trp Lys Met His Phe Val Glu Phe Phe Asn Gly
225 230 235 240

Trp Asn Asp Phe Gln Lys Glu Lys Ser Thr Gln Val Phe Ile Leu Cys
245 250 255

Asp Lys Pro Val Asp Ala Asn Leu Ile Leu Ile Ser Phe Arg Gly Thr
260 265 270

Glu Pro Phe Asp Ala Asp Asp Trp Ser Thr Asp Phe Asp Tyr Ser Trp
275 280 285

Tyr Asp Ile Pro Lys Leu Gly Lys Val His Met Gly Phe Leu Glu Ala
290 295 300

Leu Gly Leu Gly Asn Arg Asp Gln Val Thr Thr Phe His Asn His Leu
305 310 315 320

pctca2017050779-seql.txt

Gln Ala Val Gly Gly Arg Asp Gly Tyr Asn Ser Lys Thr Ser Phe Pro
325 330 335

Asp Glu Asp Ala Lys Ser Asp Ala Thr Arg Lys Lys Arg Leu Leu Pro
340 345 350

Glu Met Ala Glu Leu Thr Ala Tyr Tyr Ala Val Arg Thr Arg Leu Lys
355 360 365

Glu Leu Ile Asn Glu His Lys Asn Ala Lys Phe Leu Val Thr Gly His
370 375 380

Ser Leu Gly Gly Ala Leu Ala Ile Leu Phe Pro Ser Val Leu Val Leu
385 390 395 400

His Glu Glu Met Glu Met Met Asn Arg Leu Leu Cys Val Tyr Thr Phe
405 410 415

Gly Gln Pro Arg Ile Gly Asp Arg Gln Leu Gly Arg Tyr Met Glu Pro
420 425 430

His Leu Asn Tyr Pro Thr Pro Arg Tyr Phe Arg Val Val Tyr Cys Asn
435 440 445

Asp Leu Val Pro Arg Leu Pro Tyr Asp Asn Asn Thr Phe Leu Phe Lys
450 455 460

His Phe Gly Pro Cys Leu Tyr Tyr Asn Ser Leu Tyr Ile Glu Thr Glu
465 470 475 480

Leu Glu Glu Glu Pro Asn Pro Asn Phe Tyr Gly Ile Lys Phe Leu Ile
485 490 495

Pro Glu Tyr Leu Asn Ala Ala Trp Glu Leu Ala Arg Ser Leu Thr Met
500 505 510

Gly Tyr Thr His Gly Pro Glu Tyr Lys Glu Gly Trp Phe Cys Ile Leu
515 520 525

Leu Arg Leu Met Gly Leu Ala Leu Pro Gly Ile Ser Ala His Cys Pro
530 535 540

Thr Asp Tyr Val Lys Ser Val Arg Leu Gly Arg Met Ser Ser Ser Ser
545 550 555 560

Tyr Ser Ser Pro Ser Arg Tyr Pro Ser Arg Arg Ser Lys Tyr Val Ser

565

570

575

Ala Ile Ile Leu Asn Glu Glu Leu Asn Leu Gln Cys Pro Tyr Phe Arg
 580 585 590

Ser Gly Thr Trp Leu Ser Ser Phe Thr Gly Ser Ser Ser Arg
 595 600 605

<210> 716

<211> 202

<212> PRT

<213> Papaver somniferum

<400> 716

Met Cys Val Ser Ser Asn Val Trp His Gly Arg Leu Gly His Val Asn
 1 5 10 15

Tyr Lys Ser Met His Lys Leu Ala Ser Val Gly Cys Ile Leu Lys Phe
 20 25 30

Thr Leu Asp Lys Ser His Lys Cys Glu Ile Cys Val Glu Ser Lys His
 35 40 45

Ala Lys Lys Ser Phe Arg Lys Asn Val Gln Arg Asn Thr Lys Pro Leu
 50 55 60

Glu Leu Ile His Ser Asp Val Val Asp Met Lys Ser Val Gln Thr Arg
 65 70 75 80

Gly Gly Lys Lys Trp Phe Val Thr Phe Ile Asp Asp Cys Thr Arg Tyr
 85 90 95

Cys Gln Asp Tyr Leu Leu Arg Gly Lys Asp Asp Ala Leu Glu Ala Phe
 100 105 110

Lys Ile Tyr Lys Arg Glu Val Glu Asn Gln Leu Asn Ala Thr Ile Lys
 115 120 125

Thr Phe Arg Ser Asp Arg Gly Gly Glu Tyr Leu Ile Pro Ile Gly Asp
 130 135 140

Phe Cys Glu Glu His Gly Ile Ile His Glu Thr Thr Ala Pro Tyr Ser
 145 150 155 160

Pro Gln Ser Asn Gly Val Ala Glu Arg Lys Asn Arg Thr Leu Lys Asp
 165 170 175

Met Met Asn Ala Met Leu Ile Ser Ser Gly Leu Pro Ala Asp Leu Trp

180

Gly Glu Ala Val Leu Leu Thr Ser Ile Ser
195 200

<210> 717
<211> 312
<212> PRT
<213> Papaver somniferum
<400> 717

Glu His Leu Lys Tyr Ile Arg Asp Met Ala Ser Lys Pro Gly Ile Leu
1 5 10 15

Thr Glu Trp Pro Trp Ala Thr Leu Gly Arg Phe Lys Tyr Ile Leu Leu
20 25 30

Ala Pro Phe Val Leu Asp Ser Leu Ser Pro Leu Phe Phe Glu Ser Asp
35 40 45

Thr Arg Lys Trp Asp Leu Ser Tyr Ser Leu Thr Phe Pro Phe Leu Leu
50 55 60

Trp Arg Val Ile His Asn Gln Ile Trp Ile Ser Phe Ser Arg Phe Arg
65 70 75 80

Thr Ser Lys Ser Lys Asn Arg Ile Leu Asp Lys Ser Ile Glu Phe Glu
85 90 95

Gln Val Asp Arg Glu Ser Asn Trp Asp Asp Asn Ile Ile Leu Gln Gly
100 105 110

Leu Met Phe Tyr Leu Gly Gln Lys Tyr Leu Glu Gly Gly Ser His Leu
115 120 125

Pro Leu Trp Arg Thr Asp Gly Val Val Met Thr Ile Leu Leu His Thr
130 135 140

Gly Pro Val Glu Phe Leu Tyr Tyr Trp Leu His Arg Ser Leu His His
145 150 155 160

His Phe Leu Tyr Ser Arg Tyr His Ser His His His Ser Ser Ile Ala
165 170 175

Thr Glu Pro Ile Thr Ser Val Ile His Pro Phe Gly Glu His Leu Met
180 185 190

Tyr Phe Ala Leu Phe Met Ile Pro Leu Leu Asn Met Val Phe Thr Gly
Page 659

195

Thr Gly Ser Ile Val Ala Phe Ala Ala Tyr Ile Thr Tyr Ile Asp Phe
210 215 220

Met Asn Asn Met Gly His Cys Asn Phe Glu Phe Ile Pro Ser Ser Leu
225 230 235 240

Phe Thr Thr Phe Pro Phe Leu Lys Cys Ile Phe Tyr Thr Ala Ser Tyr
245 250 255

His Ser Leu His His Thr Gln Phe Arg Thr Asn Tyr Ala Leu Phe Met
260 265 270

Pro Met Tyr Asp Tyr Ile Tyr Gly Thr Val Asp Lys Ser Ser Asp Glu
275 280 285

Leu Tyr Glu Thr Ser Leu Lys Arg Ala Glu Glu Ser Pro Asp Val Val
290 295 300

His Leu Thr His Pro Thr Thr Pro
305 310

<210> 718
<211> 406
<212> PRT
<213> Papaver somniferum

<400> 718

Met Pro Met Tyr Asp Tyr Ile Tyr Gly Thr Met Asp Lys Ser Ser Asp
1 5 10 15

Asp Leu Tyr Glu Thr Ser Leu Lys Arg Thr Glu Glu Ser Pro Asp Val
20 25 30

Val His Leu Thr His Pro Thr Thr Pro Asp Ser Ile Tyr His Leu Arg
35 40 45

Leu Gly Phe Ala Ser Leu Ala Ser Lys Pro Tyr Met Arg Glu Ala Asn
50 55 60

Asn Lys His Tyr Phe Ile Ile Lys Trp Ile Leu Trp Pro Leu Thr Phe
65 70 75 80

Leu Trp Ser Val Leu Phe Gln Arg Met Leu Ser His Thr Phe Val Leu
85 90 95

Glu Arg Asn Ile Phe Asp Asp His Gln Val Thr Lys Lys Leu Leu Gln

pctca2017050779-seql.txt

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100                                105                                110
Val Gln Thr Trp Ala Ile Pro Arg Tyr Ser Tyr Gln Tyr Lys Arg Leu
    115                                120                                125
Thr Arg Gln Arg Gly Thr Ile Asn Ser Leu Ile Glu Lys Ala Ile Leu
    130                                135                                140
Asp Ala Asp Lys Ala Gly Ala Lys Val Ile Ser Leu Gly Leu Leu Asn
145                                150                                155                                160
Gln Gly Glu Glu Met Asn Arg Asn Gly Glu Val Tyr Ile Gln Lys His
    165                                170                                175
Pro Asn Leu Lys Ile Lys Ile Val Asp Gly Ser Ser Leu Ala Ala Ala
    180                                185                                190
Ile Val Leu Asn Ser Ile Thr Asn Leu Lys Thr Gln Gln Gln Val Val
    195                                200                                205
Val Met Met Arg Gly Arg Leu Thr Lys Leu Ala Cys Tyr Ile Ala Leu
    210                                215                                220
Ala Leu Cys Gln Arg Gly Ile Gln Val Val Val Lys Leu Gln Ser Thr
225                                230                                235                                240
Asp Asp Phe Glu Lys Leu Arg Ser Arg Phe Phe Ser Thr Ser Ser Ala
    245                                250                                255
Ser Gln Ala Ser Leu Leu Ala Ala Asn Asn Leu Ile Pro Ser Thr Lys
    260                                265                                270
Tyr Ser Ala His Gly Asn Arg Gln Val Trp Leu Val Asp Asp Glu Phe
    275                                280                                285
Ser Ser Glu Glu His Met Ser Ala Pro Lys Glu Thr Ile Phe Ile Pro
    290                                295                                300
Tyr Ser Gln Ile Pro Pro Trp Ser Asn Phe Lys Lys Asn Pro Lys Gly
305                                310                                315                                320
Ala Ala Asn Ile Leu Arg Lys Asp Cys Val Tyr Tyr Ser Thr Pro Ala
    325                                330                                335
Met Met Ile Pro Ser Ser Leu Glu Asn Val His Ser Cys Glu Asn Trp
    340                                345                                350

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pctca2017050779-seql.txt

Leu Pro Arg Arg Val Met Ser Ala Trp His Val Ala Gly Val Val His
 355 360 365

Ala Leu Glu Gly Trp Asp Ser His Glu Cys Gly Asp Lys Leu Leu Asp
 370 375 380

Val Glu Lys Val Trp Ser Ala Ala Val Arg His Gly Phe Arg Leu Pro
 385 390 395 400

Ile Val Val His Ser Ser
 405

<210> 719

<211> 136

<212> PRT

<213> Papaver somniferum

<400> 719

Met Thr Val Val Asn Val Cys Ala Phe Cys Asn Val Ser Glu Glu Ser
 1 5 10 15

Val Glu His Leu Phe Leu His Cys Ser Phe Val Gly Gln Ile Trp Glu
 20 25 30

Gln Phe Leu His Gln Leu Gly Ile Gly Trp Val His Pro Thr Thr Val
 35 40 45

Met Glu Phe Leu Trp Lys Trp Lys Leu Lys Phe Ser Thr Lys Pro Leu
 50 55 60

Ile Phe Leu Arg Tyr Cys Leu Pro Phe Ala Ile Trp Trp Ser Val Trp
 65 70 75 80

Leu Glu Arg Asn Asp Ile Leu Ile Ala Gln Lys Gln Gly Arg Lys Thr
 85 90 95

Leu Thr Ser Leu Ile Ile Asp Ile Lys Ser Leu Ile Phe Ser Trp Thr
 100 105 110

Val Asn Val Glu Ser Phe Lys Gln Ile Lys Phe Asp Asp Phe Val Phe
 115 120 125

Asp Trp Val Asn Leu Phe Arg Glu
 130 135

<210> 720

<211> 265

<212> PRT

<213> Papaver somniferum

pctca2017050779-seql.txt

<400> 720

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Met Gly Glu Trp Glu Asn Met Lys Pro Ser Asp Gln Thr Ser Gln Leu
1      5      10     15
Val Phe Lys Pro Leu Met Ile Ser Met Val Gly Ile Ala Phe Thr Ala
20     25     30
Leu Ala Ile Val Thr Tyr Gln Phe Ile Ile Thr Lys Tyr Cys Val Arg
35     40     45
Arg Arg Glu Ser Met Ile Glu Arg Asn Glu Leu Arg Ser His Gln Ala
50     55     60
Met Val Asn Arg Gly Val Asp Glu Asn Val Leu Lys Ala Ile Pro Ile
65     70     75     80
Ile Thr Tyr His His Gln Gln Gln Gln Gln Ser Arg Asp Glu Glu Glu
85     90     95
Glu Val Phe Cys Val Asp Gln Thr Glu Cys Ser Val Cys Leu Gly Asp
100    105    110
Leu Gln Glu Gly Asp Met Leu Arg Leu Leu Pro Asn Cys Lys His Val
115    120    125
Phe His Val Pro Cys Ile Asp Gln Trp Trp Leu Thr His Ser Thr Cys
130    135    140
Pro Ile Cys Arg Ser Pro Val Thr Gly Arg Asn Asp Asp Ser Val Cys
145    150    155    160
Leu Gln Ile Gln Ala Glu Gly Asp Glu Glu Gly Leu Val Ser His Gln
165    170    175
His His Gln Glu Gln Gln Tyr Asn Cys Ser Glu Gly Ser Asn Asn Asn
180    185    190
Glu Gly Gly Asn Ser Ser Ile Met Val Gly Ser Lys Leu Arg His Cys
195    200    205
Val Ser Leu Ile Trp Pro Ala Asn Tyr Glu Asp Glu Val Arg Lys Gln
210    215    220
Gln Ser Lys Thr Val Leu Leu Lys Arg Ser Met Ser Val Asp Cys Ser
225    230    235    240

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pctca2017050779-seql.txt

Phe Val Cys Ile Lys Ile Gln Pro Arg Thr Asp Ser Ser Ser Ser Ser Ser
245 250 255

Ser Ser Thr Trp Lys Thr Thr Ser Lys
260 265

<210> 721

<211> 318

<212> PRT

<213> Papaver somniferum

<400> 721

Met Ser Ser Val Gln Glu Gln Glu Leu Pro Glu Pro Asp His Tyr Asn
1 5 10 15

Asp Val Met Ser Gly Asp Gly Gln Asp Asp Asp Asp Asp Val Glu Met
20 25 30

Leu Asp Ser Val Asn Glu Asp Pro Thr Val Gly Cys Ala Pro Ala Gln
35 40 45

Val Ala Arg Gly Lys Lys Asn Arg Leu Arg Ser Glu Val Trp Glu Phe
50 55 60

Phe Lys Leu Val Lys Tyr Lys Asp Gly Thr Thr Lys Gly Val Cys Lys
65 70 75 80

Ala Cys Asn Val Gly Tyr Lys Tyr Glu Ser Gln Arg Gly Gly Thr Ser
85 90 95

Ala Met Lys Arg His Lys Cys Ile Lys Arg Gln Ser Met Asp Val Gly
100 105 110

Gln Met Ile Leu Ala Ser Gln Asn Ser Gln Met Ser Thr Arg Val Arg
115 120 125

Lys Val Asp Gln Met Lys Leu Arg Asp Leu Phe Ser Ala Leu Leu Ile
130 135 140

Ala Arg Asn Val Pro Phe Ala Leu Val Glu Trp Lys Glu Phe Arg Asp
145 150 155 160

Ile Cys Ala Tyr Leu Asn Asp Asp Phe Lys Pro Ile Ser Arg Asn Thr
165 170 175

Gly Lys Ala Asp Val Val Lys Lys His Lys Ala Gln Lys Glu Val Ile
180 185 190

pctca2017050779-seql.txt

Arg Asn Arg Leu Lys Leu Ala Pro Gly Arg Ile Cys Leu Thr Ser Asp
195 200 205

Met Trp Thr Ser Val Thr Thr Thr Gly Tyr Ile Ser Leu Thr Ala His
210 215 220

Tyr Leu Asp Lys Asp Trp Val Leu Gln Lys Lys Leu Leu Asn Phe Ser
225 230 235 240

Pro Leu Pro Pro Pro His Thr Gly Glu His Leu Ser Ser Lys Leu Phe
245 250 255

Ala Met Ile Glu Asp Trp Gly Ile Glu Glu Lys Val Ser Asn Ile Thr
260 265 270

Leu Asp Asn Ala Ala Asn Asn Gly Ala Cys Ala Gly Ile Met Lys Ser
275 280 285

Arg Leu Val Ala Lys Lys Ile Leu Leu Asn Asp Gly Lys Tyr Phe His
290 295 300

Val Arg Cys Cys Ala His Ile Leu Ala Leu Ile Val Lys Glu
305 310 315

<210> 722
<211> 722
<212> PRT
<213> Papaver somniferum

<400> 722

Met Leu Asn Leu Lys Met Glu Val Leu Leu Leu Phe Cys Val Ala Phe
1 5 10 15

Ser Cys Ile Phe Gln Ser Asn Leu Leu Leu Ile Asn Gly Asp Thr Asp
20 25 30

Gln Lys Asp Ala Ala Ala Leu Gly Val Met Tyr Thr Ser Leu Asn Ser
35 40 45

Pro Gln Gln Leu Thr Gly Trp Ile Ala Asn Gly Gly Asp Pro Cys Gly
50 55 60

Ile Gly Ile Asn Trp Lys Gly Val Thr Cys Thr Gly Thr Ser Val Thr
65 70 75 80

Ala Leu Lys Leu Ser Gly Leu Gln Leu Asn Gly Asn Val Gly Tyr Asn
85 90 95

pctca2017050779-seql.txt

Leu Gln Asp Leu Ser Ser Leu Lys Glu Leu Asp Leu Ser Asn Asn Asn
 100 105 110
 Leu Gly Gly Ser Ile Pro Tyr Ser Leu Pro Pro Asn Leu Glu Arg Leu
 115 120 125
 Asn Leu Ala Lys Asn Thr Phe Asn Gly Ala Ile Pro Tyr Ser Ile Ser
 130 135 140
 Leu Met Ala Ser Leu Lys Tyr Leu Asp Leu Ser His Asn Gln Leu Gln
 145 150 155 160
 Asn Gln Leu Gly Asp Leu Phe Asn Asn Leu Pro Glu Leu Ile Thr Leu
 165 170 175
 Asp Val Ser Phe Asn Ala Leu Asn Ser Asn Leu Ser Gln Ser Leu Ser
 180 185 190
 Ala Leu Pro Ser Val Lys Asn Ile Tyr Leu Gln Asn Asn Gln Phe Thr
 195 200 205
 Gly Thr Leu Asp Val Leu Ala Asn Leu Pro Leu Glu Asn Leu Asn Val
 210 215 220
 Glu Asn Asn Gln Phe Ile Gly Trp Val Pro Ala Gln Leu Lys Gly Ile
 225 230 235 240
 Lys Ser Leu Lys Thr Gly Gly Asn Gln Trp Phe Ser Gly Pro Ala Pro
 245 250 255
 Pro Ala Pro Pro Gly Pro Pro Arg Arg Ala Lys Pro Lys Pro Lys Ser
 260 265 270
 Asp Asp Asn Gly Lys Asp Lys Ser Asp Ser Asn Gly Asp Gly Lys Lys
 275 280 285
 Ser Gly Leu Gly Ala Gly Gly Ile Ala Gly Ile Ile Val Ala Leu Leu
 290 295 300
 Val Val Gly Leu Ala Val Ala Phe Ile Leu Ile Lys Lys Lys Lys Ser
 305 310 315 320
 Lys Lys Ser Ser Thr Asp Ile Glu Lys His Glu Glu Asp His His Phe
 325 330 335
 Thr Pro Leu Ala Ser Asn Glu Val Lys Glu Met Lys Ser Met Gln Ala
 340 345 350

pctca2017050779-seql.txt

Pro Ser Glu Pro Ala Lys Lys Thr Phe Glu Thr Thr Ser Ala Ala Val
355 360 365

Asn Leu Arg Pro Pro Pro Ile Glu Arg Leu Lys Ser Phe Asp Glu Glu
370 375 380

Asp Tyr Ser Thr Lys Pro Val Val Val Lys Lys Ala Asn Ala Ala Pro
385 390 395 400

Ile Ser Ala Thr Val Tyr Ser Ile Ala Asp Leu Gln Met Ala Thr Ala
405 410 415

Ser Phe Ser Val Asp Asn Leu Ile Gly Glu Gly Ser Ile Gly Arg Val
420 425 430

Tyr Gln Ala Gln Phe Asp Asp Gly Lys Val Leu Ala Val Lys Lys Ile
435 440 445

Asp Ser Ser Ala Leu Pro Asn Gln Ser Ser Arg Asp Phe Leu Glu Ile
450 455 460

Val Ser Asp Ile Ser Arg Leu His His Pro Asn Val Thr Glu Leu Val
465 470 475 480

Gly Tyr Cys Ser Glu His Gly Gln His Leu Leu Ile Tyr Asp Phe Tyr
485 490 495

Lys Asn Gly Ser Leu His Asp Phe Leu His Leu Ser Asp Glu Tyr Ser
500 505 510

Lys Pro Leu Ser Trp Ser Ser Arg Val Thr Ile Ala Leu Gly Thr Ala
515 520 525

Arg Ala Leu Glu Tyr Leu His Glu Val Cys Ser Pro Ser Ile Val His
530 535 540

Lys Asn Phe Lys Ser Gly Asn Ile Leu Leu Asp Ser Glu Leu Thr Pro
545 550 555 560

His Leu Ser Asp Cys Gly Met Ala Ser Phe Val Gln Asn Ala Asp His
565 570 575

Gln Gly Leu Asp Ile Asn Thr Gly Ser Gly Tyr Ser Ala Pro Glu Val
580 585 590

Ala Met Ser Gly Gln Tyr Thr Leu Lys Ser Asp Val Tyr Ser Phe Gly
595 600 605

pctca2017050779-seql.txt

Val Val Met Leu Glu Leu Leu Thr Gly Arg Lys Pro Phe Asp Ser Ser
610 615 620

Arg Ser Arg Ser Glu Gln Ser Leu Val Arg Trp Ala Thr Pro Gln Leu
625 630 635 640

His Asp Ile Asp Ala Leu Asp Lys Met Val Asp Ser Ser Leu Lys Gly
645 650 655

His Tyr Pro Pro Lys Ser Leu Ser Arg Phe Ala Asp Val Val Ala Leu
660 665 670

Cys Val Gln Ser Glu Pro Glu Phe Arg Pro Pro Met Ser Glu Val Val
675 680 685

Gln Ala Leu Val Arg Leu Val Gln Arg Ala Asn Met Ser Lys Arg Asn
690 695 700

Leu Gly Glu Asp Arg Arg Ser Glu Asp Pro Asp Val Val Gln Asp Asp
705 710 715 720

Met Tyr

<210> 723
<211> 426
<212> PRT
<213> Papaver somniferum

<400> 723

Met Ala Pro Glu Pro Glu Asp Asp Ile Met Asn Glu Lys Asn Pro Pro
1 5 10 15

Pro Leu Asp Glu Asp Asp Ile Ala Leu Leu Lys Thr Tyr Gly Leu Gly
20 25 30

Pro Tyr Ser Asn Ser Ile Lys Lys Thr Glu Lys Glu Ile Lys Glu Met
35 40 45

Ala Lys Lys Val Asn Asp Leu Cys Gly Ile Lys Glu Ser Asp Thr Gly
50 55 60

Leu Ala Ala Pro Ser Gln Trp Asp Leu Val Ser Asp Lys Gln Met Met
65 70 75 80

Gln Glu Glu Gln Pro Leu Gln Val Ala Arg Cys Thr Lys Ile Ile Asn
85 90 95

pctca2017050779-seql.txt

Ala Asn Thr Glu Asp Ala Lys Tyr Val Ile Asn Val Lys Gln Ile Ala
100 105 110

Lys Phe Val Val Gly Leu Gly Asp Lys Val Ser Pro Thr Asp Ile Glu
115 120 125

Glu Gly Met Arg Val Gly Val Asp Arg Asn Lys Tyr Gln Ile Gln Ile
130 135 140

Pro Leu Pro Pro Lys Ile Asp Pro Ser Val Thr Met Met Thr Val Glu
145 150 155 160

Glu Lys Pro Asp Val Thr Tyr Ala Asp Val Gly Gly Cys Lys Glu Gln
165 170 175

Ile Glu Lys Met Arg Glu Val Val Glu Leu Pro Met Leu His Pro Glu
180 185 190

Lys Phe Val Lys Leu Gly Ile Asp Pro Pro Lys Gly Val Leu Cys Tyr
195 200 205

Gly Pro Pro Gly Thr Gly Lys Thr Leu Leu Ala Arg Ala Val Ala Asn
210 215 220

Arg Thr Asp Ala Cys Phe Ile Arg Val Ile Gly Ser Glu Leu Val Gln
225 230 235 240

Lys Tyr Val Gly Glu Gly Ala Arg Met Val Arg Glu Leu Phe Gln Met
245 250 255

Ala Arg Ser Lys Lys Ala Cys Ile Val Phe Phe Asp Glu Val Asp Ala
260 265 270

Ile Gly Gly Ala Arg Phe Asp Asp Gly Val Gly Gly Asp Asn Glu Val
275 280 285

Gln Arg Thr Met Leu Glu Ile Val Asn Gln Leu Asp Gly Phe Asp Ala
290 295 300

Arg Gly Asn Ile Lys Val Leu Met Ala Thr Asn Arg Pro Asp Thr Leu
305 310 315 320

Asp Pro Ala Leu Leu Arg Pro Gly Arg Leu Asp Arg Lys Val Glu Phe
325 330 335

Gly Leu Pro Asp Leu Glu Ser Arg Thr Gln Ile Phe Lys Ile His Thr

340

Arg Thr Met Asn Cys Glu Arg Asp Ile Arg Phe Glu Leu Leu Ala Arg
 355 360 365

Leu Cys Pro Asn Ser Thr Gly Ala Asp Ile Arg Ser Val Cys Thr Glu
 370 375 380

Ala Gly Met Tyr Ala Ile Arg Ala Arg Arg Lys Thr Val Thr Glu Lys
 385 390 395 400

Asp Phe Leu Asp Ala Val Asn Lys Val Ile Lys Gly Tyr Gln Lys Phe
 405 410 415

Ser Ala Thr Pro Lys Tyr Met Val Tyr Asn
 420 425

<210> 724
 <211> 431
 <212> PRT
 <213> Papaver somniferum
 <400> 724

Met Ala Glu Gln Glu Leu Glu Met Glu Leu Glu Asp Tyr Ser Leu Lys
 1 5 10 15

Lys Glu Lys Lys Lys Lys Arg Lys Arg Lys Gln Pro Ile Asp Leu Lys
 20 25 30

Ile Glu Met Val Lys Glu Asn Gln Glu Lys Ile Ala Pro Leu Val Gly
 35 40 45

Tyr Phe Pro Thr Gly Tyr Asp Pro His Lys Lys Ala Gln Asp Asp Gly
 50 55 60

Asn Gly Asp Asp Val Lys Val Tyr Arg His Val Arg Arg Ser Arg Leu
 65 70 75 80

Glu Leu Val Val Lys Pro Lys Gly Ser Lys Val Asn Phe Val Gly Thr
 85 90 95

Asn Tyr Ser Gly Glu Ala Glu Ala Pro Ile Ser Cys Gln Tyr Ala Leu
 100 105 110

Gly Val Phe Asp Lys Glu Thr Gln Thr Leu Lys Ile Val Lys Ile Glu
 115 120 125

Ser Asn Lys Ile Phe Arg Leu Glu Pro Lys Phe Ala Gly Lys Asp Lys

130

135

140

Ala Pro Asp Glu Ala Lys Val Glu Ala Leu Thr Ala Gln Glu Arg Ala
 145 150 155 160

Glu Arg Leu Asn Asp Leu Thr Met Ala Leu Gly Thr Lys Lys Ala Lys
 165 170 175

Lys Gln Val Arg Glu Lys Ala Asn Leu Asn Arg Lys Glu Asn Glu Glu
 180 185 190

Thr Gln Lys Gln Met Gly Glu Lys Ile Lys Lys Leu Lys Val Leu Ala
 195 200 205

Asn Ala Thr Ala Gly Asp Asn Ser Glu Pro Ala Arg Asn Ile Pro Tyr
 210 215 220

His Asp Thr Thr Ala Glu Thr Pro Glu Arg Ala Tyr Pro Ile Glu Lys
 225 230 235 240

Ile Ile Ser Lys Gly Glu Asn Glu Ile Leu Gln Lys Ala Leu His Tyr
 245 250 255

Leu Phe Tyr Thr Glu Lys Val Ala Leu Glu Ala Phe Pro Ile Phe Val
 260 265 270

Arg Asn Arg Ile Gln Lys Met Lys Glu Ile Glu Asp Glu Thr Glu Arg
 275 280 285

Gln Thr Leu Gly Val Ile Leu Ser Tyr Met Thr His Leu Ile Lys Phe
 290 295 300

Lys Asp Lys His Ser Val Asp His Gln Ala Ser Ala Lys Asp His Arg
 305 310 315 320

Ile Pro Glu Met Leu Leu Gln Ser Phe Lys Ser Lys Phe Lys Asp Ala
 325 330 335

Asp Asp Gly Gly Lys Lys Lys Arg Glu Met Ser Gly Pro Lys Asn Asp
 340 345 350

Leu Leu Ile Ser His Val Leu Val Leu Ser Leu Met Val Asp Asp Phe
 355 360 365

Asn Ser Asn Pro Thr Asp Ile Ala Gln Asp Leu Arg Met Thr Thr Leu
 370 375 380

pctca2017050779-seql.txt

Lys Leu Arg Pro His Tyr Leu Asn Leu Gly Val Lys Met Val Gly Gly
 385 390 395 400

Asn Gly Lys Gly Lys Ile Ala Gln Ala Thr Leu Pro Val Pro Leu Asn
 405 410 415

Phe Pro Pro Met Glu Gln Arg Arg Arg Lys Lys Gly Arg Lys Tyr
 420 425 430

<210> 725

<211> 272

<212> PRT

<213> Papaver somniferum

<400> 725

Met Lys Ala Ala Arg Leu Ile Val Phe Pro Ile Lys Gly Arg Asn Trp
 1 5 10 15

Cys Phe Ser Arg Ser Ile Glu Gln Thr Val Gln Glu Ser Glu Ala Thr
 20 25 30

Lys Pro Ser Pro Lys Phe Lys Asp Leu Tyr Lys Lys Ile Thr Ser Lys
 35 40 45

Gly Lys Pro Met Asn Gln Asn Val Glu Ile Ile Thr Glu Phe Phe Ser
 50 55 60

Thr Lys Met Asn Lys Ala Trp Ala Gly Leu Gly Glu Ala Pro Glu Gly
 65 70 75 80

Ser Ile Lys Asn Lys Ile His Gly Leu Gly Val Lys Leu Leu Ala Arg
 85 90 95

Val Lys Pro Ser Glu Ile Phe Leu Lys Ser Ile Ser Lys Asp Val Thr
 100 105 110

Asn Val Glu Ile Thr Tyr Pro Thr Ser Leu Asn Pro Arg Leu Val Arg
 115 120 125

Arg Arg Leu Arg His Ile Ala Phe Arg Gly Ser Val Ile His Arg Arg
 130 135 140

Tyr Phe Tyr Gly Ser Val Ser Leu Leu Pro Leu Thr Ala Ala Cys Ala
 145 150 155 160

Ile Leu Pro Leu Pro Asn Ile Pro Phe Phe Trp Thr Leu Phe Arg Thr
 165 170 175

pctca2017050779-seql.txt

Tyr Ser His Trp Arg Ala Leu Gln Gly Ser Glu Arg Leu Leu Val Leu
180 185 190

Val Ser Asp Gly Ser Thr Thr Val Lys Glu Gln Lys Arg Asp Ser Asp
195 200 205

Asp Glu Asp Glu Gln Glu His Lys Ser Leu Asn Ala Pro Ile Pro Gln
210 215 220

Trp Val Leu His Pro Ser Glu Asp Leu Asp Lys Tyr Leu Gln Asp Leu
225 230 235 240

Asp Glu Lys Asp Gly Leu Ser Lys Ser Val Val Ser Lys Ile Cys Lys
245 250 255

Ala Tyr His Leu Asp Thr Gln Glu Val Asp Lys Tyr Arg Cys Ser Val
260 265 270

<210> 726
<211> 457
<212> PRT
<213> Papaver somniferum

<400> 726

Met Leu Lys Leu Gly Phe Thr Leu Thr Ser Phe Thr Tyr Ser Arg Phe
1 5 10 15

Ile Ser Phe Leu Cys Lys Val Lys Asn Phe Ser Phe Ile Glu Arg Leu
20 25 30

Leu Glu Asp Met Asp Arg Tyr Gly Ala Ile Pro Asp Met Trp Ser Tyr
35 40 45

Asn Ile Tyr Val Asn Leu Leu Cys Lys Glu Asn Glu Leu Asp Lys Ala
50 55 60

Leu Glu Val Met Gln Thr Met Leu Gln Lys Gly Ser Asp Pro Asp Val
65 70 75 80

Val Thr Tyr Thr Thr Val Leu Lys Gly Leu Cys Ser Asp Gly Arg Tyr
85 90 95

Glu Leu Ala Val Lys Leu Trp Arg Glu Met Ile Gly Arg Gly Leu Leu
100 105 110

Pro Asp Gly Ile Thr Cys Gly Val Leu Val Phe Gly Leu Cys Lys Arg
115 120 125

pctca2017050779-seql.txt

Gly Glu Val Asp Leu Ala Tyr Asp Leu Thr Val Asp Ser Met Lys Gly
 130 135 140
 Lys Thr Pro Leu Ser Val Ser Val Tyr Asn Ala Leu Ile His Gly Tyr
 145 150 155 160
 Cys Gln Lys Gly Glu Val Lys Lys Ala Gln Ala Ile Glu Glu Phe Met
 165 170 175
 Arg Lys Asn Gly Cys Ala Pro Asp Met Val Thr Tyr Asn Ile Glu Leu
 180 185 190
 Asn Tyr Cys Cys Asn Asn Gly Met Leu Glu Glu Ala Ala Lys Leu Leu
 195 200 205
 Lys Lys Met Glu Arg Ser Gln Thr Lys Pro Asp Thr Tyr Ser Tyr Asn
 210 215 220
 Gln Phe Leu Lys Ala Leu Cys Lys Ala Asn Arg Met Asp Ser Ala Tyr
 225 230 235 240
 Asn Leu Leu Val Lys Thr Met Glu Lys Arg Gly Leu Cys Asp Thr Val
 245 250 255
 Ser Tyr Asn Thr Met Ile Arg Ala Tyr Cys Trp Ala Arg Glu Thr Gln
 260 265 270
 Lys Ala Tyr Arg Met Phe Glu Glu Met Ser Gly Lys Gly Phe Glu Pro
 275 280 285
 Asp Val Val Thr Phe Thr Ile Leu Ile Asn Ala Phe Phe Lys Lys Gly
 290 295 300
 Arg Ala Asp Leu Ala Glu Asp Leu Leu Asp Arg Met Ser Gln Lys Gly
 305 310 315 320
 Leu Phe Pro Asp Arg Val Leu Tyr Thr Thr Met Ile Asp His Leu Cys
 325 330 335
 Lys Ser Gly Arg Val Asp Gln Ala Gln Asn Phe Phe Arg Asp Met Glu
 340 345 350
 Arg Leu Arg Ile Thr Pro Asp Val Ile Cys Tyr Asn Ala Leu Ile Asn
 355 360 365
 Gly Leu Phe Lys Ala Phe Arg Val Ala Glu Gly Met Gln Phe Tyr Glu
 370 375 380

pctca2017050779-seql.txt

Asp Met Gln Arg Asn Gly Cys His Pro Asp Glu Val Thr Tyr Lys Leu
385 390 395 400

Ile Ile Gly Gly Leu Ile Arg Glu Lys Lys Leu Thr Ile Ala Cys Lys
405 410 415

Val Trp Asp Gln Met Met Glu Asn Gly Phe Thr Leu Asp Ala Ala Leu
420 425 430

Ser Lys Thr Leu Thr Asn Ala Ile Gln Ser Lys Asp Ala Ser Val Met
435 440 445

Asn Met Ser Thr Gly Thr Asn Leu Leu
450 455

<210> 727
<211> 581
<212> PRT
<213> Papaver somniferum

<400> 727

Met Pro Leu Leu Asp Ile Ala Thr Ser Gln Pro Thr Phe Gly Asn His
1 5 10 15

Phe Cys Thr Ser Ser Arg Tyr Gln Thr Leu Leu His Gly Asn Thr Thr
20 25 30

Ser Val Lys Leu Val Asn Phe Gly Lys Glu Lys Arg Leu Phe Ser Thr
35 40 45

Trp Glu Val Ser Ile Gln Leu Pro Thr Lys Val Arg Phe Asp Met Gly
50 55 60

Gly Asn Arg Arg Gly Arg Ala Leu Leu Ile Lys Ala Val Ala Thr Leu
65 70 75 80

Glu Pro Lys Tyr Leu Val Gln Ser Glu Asp Arg Ser Ala Asn Leu Glu
85 90 95

Leu Gly Ser Glu Ala Ala Ser Ser Gln Tyr Pro Gly Glu Glu Asp Glu
100 105 110

Ala Glu Val Asp Glu Arg Glu Arg Leu Arg Arg Leu Arg Ile Ser Lys
115 120 125

Ala Asn Lys Gly Asn Val Pro Trp Asn Lys Gly Arg Lys His Ser Ala
130 135 140

pctca2017050779-seql.txt

Glu Thr Leu Arg Arg Ile Arg Glu Arg Thr Lys Ile Ala Met Gln Asn
 145 150 155 160
 Pro Lys Val Lys Met Lys Leu Val Asn Leu Gly His Ala Gln Ser Glu
 165 170 175
 Glu Thr Arg Asn Lys Ile Gly Val Gly Val Arg Met Gly Trp Gln Arg
 180 185 190
 Arg Arg Glu Lys Leu Met Val Gln Glu Thr Cys Cys Phe Glu Trp Gln
 195 200 205
 Asn Leu Ile Ala Asp Ala Ser Arg Arg Gly Tyr Ala Gly Glu Ala Glu
 210 215 220
 Leu Gln Trp Glu Ser Tyr Glu Val Leu Asp Glu Gln Leu Lys Arg Glu
 225 230 235 240
 Trp Leu Glu Ser Ile Glu Gln Arg Arg Met Ala Pro Arg Pro Lys Gly
 245 250 255
 Ser Lys Arg Ala Pro Lys Ser Leu Glu Gln Arg Arg Lys Ile Ser Glu
 260 265 270
 Ala Ile Ser Ala Lys Trp Ala Asp Pro Ser Tyr Arg Glu Arg Val Cys
 275 280 285
 Asp Ala Leu Asn Lys Tyr His Gly Ile Pro Glu Gly Arg Glu Arg Lys
 290 295 300
 Pro Arg Arg Lys Pro Ser Gly Asp Arg Asn Ala Ala Arg Lys Lys Ala
 305 310 315 320
 Tyr Ser Glu Ala Glu Thr Asp Ala Lys Arg Arg Ala Lys Pro Lys Ile
 325 330 335
 Arg Lys Ser Arg Ala Ala Pro Tyr Lys Asp Pro Leu Ala Asp Ser Lys
 340 345 350
 Leu Glu Met Ile Arg Asn Ile Arg Ala Gln Arg Ala Val Thr Glu Thr
 355 360 365
 Lys Lys Thr Glu Ala Val Glu Arg Ala Lys Leu Leu Ile Ala Glu Ala
 370 375 380
 Glu Lys Ala Ala Lys Ala Leu Glu Val Ala Ala Thr Lys Ser Pro Leu
 385 390 395 400

pctca2017050779-seql.txt

Ala Leu Ala Ser Leu Met Glu Thr Arg Lys Leu Ile Ala Glu Ala Thr
405 410 415

Arg Ser Ile Gln Ala Ala Glu Ser Gly Gln Ile Ser Tyr Leu Gly Asn
420 425 430

Lys Lys Asp Ser Ser Pro Phe Asp Leu Asn Glu Asp Leu Leu Glu Asp
435 440 445

Glu Thr Gly Glu Lys Asp Glu Asn Met Pro Ser Pro Asp Gln Lys Glu
450 455 460

Val Asn Gly Thr His Val Tyr Ser Asp Ala Ile Ser Asp Phe Glu Phe
465 470 475 480

Gly Asn Phe Asp Leu Glu Gly Leu Leu Asp Asp Asp Glu Leu Leu Glu
485 490 495

Met Glu Gly Leu Asp Asp Asp Asp Asp Asp Phe Val Pro Ala Gln
500 505 510

Val Glu Val Asn Gly Tyr Ser His Lys Leu Asp Pro Lys Ser Glu Leu
515 520 525

Ala Val Pro Val Glu Glu Met Gln Glu Ala Ile Lys Ser Gln Ser Thr
530 535 540

Ala Gln Glu Val Pro Val Ser Asn Lys Ala Glu Lys Thr Ser Val Arg
545 550 555 560

Ser Asn Asn Thr Thr Val Lys Lys Lys Trp Ile Arg Gly Arg Leu Val
565 570 575

Glu Val Glu Glu Asp
580

<210> 728
<211> 316
<212> PRT
<213> Papaver somniferum

<400> 728

Met Ser Met Glu Arg Ile Val Gly Ala Lys Tyr Lys Leu Gly Arg Lys
1 5 10 15

Ile Gly Ser Gly Ser Phe Gly Glu Ile Tyr Leu Ala Thr Gln Ile Asp
20 25 30

pctca2017050779-seql.txt

Thr Asn Glu Ile Phe Ala Val Lys Ile Glu Asn Thr Lys Thr Lys His
35 40 45

Pro Gln Leu Leu Tyr Glu Ala Lys Leu Tyr Asn Ile Leu Gln Gly Gly
50 55 60

Ser Gly Ile Ala Gly Ile Lys Trp Phe Gly Val Asp Gly Glu Glu Asn
65 70 75 80

Val Leu Val Ile Asp Leu Leu Gly Pro Ser Leu Glu Asp Leu Phe Val
85 90 95

Tyr Cys Gly Arg Lys Phe Ser Leu Lys Thr Val Leu Met Leu Ala Asp
100 105 110

Gln Met Ile Thr Arg Ile Glu Tyr Met His Ser Lys Gly Phe Leu His
115 120 125

Arg Asp Ile Lys Pro Asp Asn Phe Leu Met Gly Leu Gly Arg Lys Ala
130 135 140

Asn Gln Val Tyr Ile Ile Asp Phe Gly Leu Ala Lys Arg Tyr Arg Glu
145 150 155 160

Ser Thr Thr Asn Arg His Ile Pro Tyr Arg Glu Asn Lys Ser Leu Thr
165 170 175

Gly Thr Ala Arg Tyr Ala Ser Cys Asn Thr His Leu Gly Ile Glu Gln
180 185 190

Ser Arg Arg Asp Asp Leu Glu Ser Leu Gly Tyr Val Leu Leu Tyr Phe
195 200 205

Leu Arg Gly Ser Leu Pro Trp Gln Gly Leu Lys Ala Ala Thr Lys Lys
210 215 220

Gln Lys Tyr Asp Lys Ile Cys Glu Lys Lys Leu Ser Thr Pro Ile Glu
225 230 235 240

Val Leu Cys Lys Ser His Pro Val Glu Phe Ala Ser Tyr Phe His Tyr
245 250 255

Cys His Ser Leu Thr Phe Asp Gln Arg Pro Asp Tyr Gly Phe Leu Lys
260 265 270

Arg Leu Phe Arg Asp Leu Phe Thr Arg Glu Gly His Gln Phe Asp Tyr

275

Ile Phe Asp Trp Thr Ile Leu Lys Tyr Gln Gln Ala Gln Lys Thr Lys
290 295 300

Val Gln Pro Arg Gly Pro Val Ser Ile Pro Ile Phe
305 310 315

<210> 729
<211> 353
<212> PRT
<213> Papaver somniferum

<400> 729

Met Lys Lys Gln Thr Lys Ala Ile Ser Met Ser Arg Leu Ile Gly Phe
1 5 10 15

Asp Gln Ile Ser Thr Lys Ser Gly Gln Ile Ser Phe Glu Asp Val Lys
20 25 30

Ile Leu Thr Ser Asn Gly Leu Lys Ile Phe Ala Asn Ser Ile Ile Leu
35 40 45

Gly Ser Ser Ser Lys Val Leu Glu Lys Ile Leu Asp Arg Pro Ser Lys
50 55 60

His Gln Asn Ser Val Lys Val Ile Pro Ile Leu Gly Val Pro Cys Asp
65 70 75 80

Ala Val Thr Ala Phe Ile Gln Phe Leu Tyr Ser Ser Arg Cys Thr Glu
85 90 95

Glu Glu Ile Asp Gly Tyr Gly Ile His Leu Leu Ala Leu Ser His Val
100 105 110

Phe Ser Val Gln Gln Leu Lys Gln Arg Cys Thr Lys Gly Leu Ser Thr
115 120 125

Arg Leu Met Val Glu Asn Val Val Asp Val Leu Gln Leu Ala Arg Leu
130 135 140

Cys Asp Ala Pro Asp Leu Tyr Leu Lys Cys Met Arg Phe Leu Ser Lys
145 150 155 160

Glu Phe Lys Ala Val Lys Arg Thr Glu Gly Trp Lys Phe Leu Arg Ala
165 170 175

Asn Asp Ala Val Leu Glu Leu Glu Ile Leu Gln Tyr Leu Asp Glu Ile

pctca2017050779-seql.txt

180

185

190

Glu Ser Arg Asp Lys Lys Arg Ser Arg Ser Lys Glu Glu Arg Gly Ile
195 200 205

Tyr Leu Glu Leu Ser Glu Ala Met Glu Cys Leu Glu His Ile Cys Thr
210 215 220

Glu Gly Cys Thr Asn Val Gly Pro Tyr Asp Arg Glu Pro Thr Lys Lys
225 230 235 240

Thr Gly Pro Cys Glu Lys Phe Ser Thr Cys Gln Gly Leu Gln Gly Leu
245 250 255

Ile Lys His Phe Ala Met Cys Thr Lys Arg Met Asn Gly Gly Cys Cys
260 265 270

Arg Cys Lys Arg Met Gly Gln Leu Leu Lys Leu His Ala Ser Ile Cys
275 280 285

Asp Gln Asp Asp His Cys Cys Lys Val Pro Leu Cys Arg Gln Phe Lys
290 295 300

Leu Lys Asn Gln Leu Glu Arg Lys Ala Asp Asp Gly Arg Trp Arg Leu
305 310 315 320

Leu Val Lys Lys Val Val Cys Ala Lys Thr Val Ser Ser Leu Ser Ser
325 330 335

Pro Lys Leu Met Ile Leu Arg Arg Lys Glu Glu Glu Asp Arg Gln Gln
340 345 350

Arg

<210> 730

<211> 112

<212> PRT

<213> Papaver somniferum

<400> 730

Met Leu Thr Asn Trp Ser Thr Thr Glu Thr Arg Leu His Lys Phe Trp
1 5 10 15

Asp Leu Arg Ala Glu Gln Lys Lys Gly Arg Leu Asn Arg Leu Pro Lys
20 25 30

Arg Asp Ala Ala Met Leu Lys Arg Gln Leu Tyr His Leu Gln Thr Tyr

35

Leu Gly Gly Ile Lys Tyr Met Thr Gly Leu Pro Asp Ile Val Ile Ile
50 55 60

Val Asp Gln Gln Glu Glu Tyr Thr Ala Leu Arg Glu Cys Val Thr Leu
65 70 75 80

Gly Ile Pro Thr Ile Cys Leu Ile Asp Thr Asn Cys Asp Pro Asp Leu
85 90 95

Ala Asp Ile Ser Ile Pro Ala Asn Asp Asp Ala Ile Ala Ser Ile Arg
100 105 110

<210> 731
<211> 147
<212> PRT
<213> Papaver somniferum
<400> 731

Met Phe Leu Phe Ile Phe Val Ser Asn Trp Ser Gly Ala Leu Leu Pro
1 5 10 15

Trp Lys Ile Ile Gln Leu Pro His Gly Glu Leu Ala Ala Pro Thr Asn
20 25 30

Asp Ile Asn Thr Thr Val Ala Leu Ala Leu Leu Thr Ser Val Ala Tyr
35 40 45

Phe Tyr Ala Gly Leu Thr Lys Lys Gly Leu Gly Tyr Phe Gly Lys Tyr
50 55 60

Ile Gln Pro Thr Pro Ile Leu Leu Pro Ile Asn Ile Leu Glu Asp Phe
65 70 75 80

Thr Lys Pro Leu Ser Leu Ser Phe Arg Leu Phe Gly Asn Ile Leu Ala
85 90 95

Asp Glu Leu Val Val Val Val Leu Val Ser Leu Val Pro Leu Val Val
100 105 110

Pro Ile Pro Val Met Phe Leu Gly Leu Phe Thr Ser Gly Ile Gln Ala
115 120 125

Leu Ile Phe Ala Thr Leu Ala Ala Ala Tyr Ile Gly Glu Ser Met Glu
130 135 140

Gly His His

145

<210> 732
 <211> 108
 <212> PRT
 <213> Papaver somniferum

<400> 732

Met Asn Leu Met Asn Cys Lys Ser Pro Asp Ile Thr Tyr Ile Val Ser
 1 5 10 15

Lys Leu Ser Ile Tyr Thr Cys Ser Pro Glu Gln Glu His Trp Asp Ala
 20 25 30

Leu Asn Arg Val Leu Trp Tyr Leu Lys Tyr Cys Ile Thr Phe Cys Phe
 35 40 45

Ile Tyr Glu Arg Tyr Leu Val Val Leu Glu Gly Leu Cys Asp Ala Asn
 50 55 60

Trp Ile Val Asp Ser Glu Glu Ser Lys Ser Thr Ser Gly Tyr Val Phe
 65 70 75 80

Thr Leu Ala Arg Gly Phe Val Ser Gly Ser Phe Ser Asp Lys His Ile
 85 90 95

Leu Leu Asn Ser Leu Trp Asn Leu Arg Val Leu Arg
 100 105

<210> 733
 <211> 280
 <212> PRT
 <213> Papaver somniferum

<400> 733

Met Val Leu Ala Met Glu Gln Trp Ser Ser Ser Leu Glu Arg Arg His
 1 5 10 15

Asp Glu Pro Glu Phe Asn Leu Arg Glu Trp Ala Leu Lys Ala Arg Asn
 20 25 30

Ile Ser Arg Thr Asn Thr Ser Ser Arg Arg Phe Ser Ala Pro Asn Ile
 35 40 45

Thr Ser Phe Arg Glu Leu Glu Thr Lys Ser Phe Arg Ser Asn Thr Thr
 50 55 60

Ile Thr Ser Thr Ala Ser Ser Pro Gly His Thr Leu Thr Asp Glu Ile
 65 70 75 80

pctca2017050779-seql.txt

Asp Pro Ser Thr Tyr Ser Phe Thr Ser Ala Leu Lys Ala Leu Gln Ala
85 90 95

Lys Thr Gly Tyr Gly Trp Glu Trp Leu Ser Pro Glu Gly Ile Ser Leu
100 105 110

Ser Ser Lys Trp Asn Glu Ala Glu Lys Tyr Ile Cys Asn Pro Phe Ser
115 120 125

Gly Glu Phe Pro Ala Glu Cys Leu Ser Ala Lys Thr Leu Arg Arg Arg
130 135 140

Ser Met Ser Ser Ser Thr Ser Lys Phe Thr Met Ser Ala Pro Leu Asp
145 150 155 160

Tyr Ser Phe Arg Pro Pro Leu Ser Arg Ser Lys Ser Asn Arg Thr Gln
165 170 175

Asp His Lys Glu Ile Asp Ser Gln Ser Thr Ile Gln Glu Glu Lys Ala
180 185 190

Glu Ser Phe Lys Lys Asp Leu Glu Ser Ile Ile Pro Thr Asn His Asn
195 200 205

Ser Ser Asn Ser Asn Gly Ala Ser Ser Pro Ala Pro Ser Ser Thr Asn
210 215 220

Pro Pro Val Glu Glu Lys Arg Leu Ile Met Gln Asp Glu Val Glu Gly
225 230 235 240

Arg Glu Glu Pro Thr Ile Ser Thr Ile Glu Pro Lys Phe Asp Asp Asp
245 250 255

Gln Phe Asn Ser His Gly Cys Val Cys Lys Trp Val Ile Leu Tyr Leu
260 265 270

Thr Lys Leu Gln Tyr Glu Ala Gly
275 280

<210> 734

<211> 211

<212> PRT

<213> Papaver somniferum

<400> 734

Met Lys Leu Lys Gln Leu Glu Ser Tyr Leu Gly Asn Leu Asp Gln Phe
1 5 10 15

pctca2017050779-seql.txt

Ser Asn Pro Lys Ile Glu Leu Glu Gln Tyr Pro Thr Gly Ser His Ile
20 25 30

Ala Ser Arg Met Leu Tyr Thr Ala Glu Asn Ser Phe Gly Asp Ile Ser
35 40 45

Gly Lys Val Val Ala Asp Phe Gly Cys Gly Cys Gly Thr Leu Ser Ile
50 55 60

Ala Ser Ala Leu Leu Gly Ala Glu Tyr Val Leu Gly Ile Asp Val Asp
65 70 75 80

Thr Asp Ser Leu Glu Ile Ala Gly Glu Asn Ala Glu Asp Leu Glu Val
85 90 95

Asp Ile Asn Phe Val Gln Cys Asp Ile Asn Asn Leu Asn Leu Arg Gly
100 105 110

Lys Ile Val Asp Thr Val Val Met Asn Pro Pro Phe Gly Thr Arg Lys
115 120 125

Lys Gly Ala Asp Met Asn Phe Leu Ala Val Ala Met Lys Val Ala Ser
130 135 140

Gln Ala Val Tyr Ser Leu His Lys Thr Thr Thr Arg Asp His Ile Lys
145 150 155 160

Lys Thr Ala Leu Arg Asp Leu Asn Ala Lys Ser Ala Glu Val Ile Cys
165 170 175

Glu Leu Arg Tyr Asp Val Pro Gln Leu Tyr Lys Phe His Lys Lys Lys
180 185 190

Glu Val Asp Ile Ala Val Asp Leu Trp Arg Phe Val Pro Gln Arg Asp
195 200 205

Gln Glu Arg
210

<210> 735
<211> 103
<212> PRT
<213> Papaver somniferum

<400> 735

Lys Thr Gln Lys Phe Leu Arg Gln Phe Arg Gly Lys Leu Lys Asp Ser
1 5 10 15

pctca2017050779-seql.txt

Leu Val Ile Glu Val Leu Gln Leu Leu Lys His Arg Pro Glu Val Gly
20 25 30

Val Lys Phe Phe Ile Trp Ala Ala Arg Gln Ile Gly Tyr Thr His Thr
35 40 45

Pro Ala Thr Tyr Ala Ala Leu Leu Val Thr Leu Gly Val Glu Asp Asn
50 55 60

Asp Ser Ser Asn Asn Lys Asn Asn Tyr Val Arg Val Pro Glu His Leu
65 70 75 80

Leu Leu Glu Ile Arg Asp Asp Gly Asp Lys Val Ile Leu Gly Lys Leu
85 90 95

Leu Asn Phe Leu Ile Gln Lys
100

<210> 736

<211> 130

<212> PRT

<213> Papaver somniferum

<400> 736

Met Val Thr Tyr Asn Ala Ile Leu Gln Val Leu Leu Lys Ala Asp Arg
1 5 10 15

Leu Asp Ala Ala Cys Leu Leu His Arg Glu Met Ser Asn Ser Gly Ile
20 25 30

Gly Val Asp Gly Leu Thr Leu Gly Ser Phe Ala Arg Ser Leu Cys Lys
35 40 45

Phe Gly Arg Trp Gln Glu Ala Leu Gly Ile Ile Glu Lys Glu Asp Tyr
50 55 60

Ile Tyr Asp Ala Val Ile Tyr Thr Lys Met Ile Ser Gly Leu Cys Glu
65 70 75 80

Ala Ser Leu Phe Glu Glu Ala Met Glu Phe Leu His Arg Met Arg Ser
85 90 95

Asn Asn Cys Val Pro Asn Val Ile Thr Tyr Arg Thr Leu Leu Asp Gly
100 105 110

Cys Leu Arg Lys Arg Gln Leu Gly Arg Cys Lys Arg Ile Leu Ser Met
115 120 125

pctca2017050779-seql.txt

Met Ile
130

<210> 737
<211> 416
<212> PRT
<213> Papaver somniferum

<400> 737

Met Leu Ser Ala Gly Cys Val Pro Asn Val Val Thr Tyr Thr Val Leu
1 5 10 15

Ile Asp Gly His Cys Lys Ala Gly Asp Val Lys Lys Ala Cys Gln Ile
20 25 30

Tyr Ser Arg Met Gly Gly Asn Gly Asp Met Pro Asp Val Ser Gln Tyr
35 40 45

Phe Arg Val Asp Gly Asn Asn Pro Thr Glu Pro Asn Val Phe Thr Tyr
50 55 60

Gly Ala Leu Val Asp Gly Leu Cys Lys Ala His Lys Val Ser Glu Ala
65 70 75 80

Arg Asp Leu Phe Glu Thr Met Ser Gly Glu Gly Cys Glu Pro Asn Asn
85 90 95

Val Val His Asp Ala Leu Ile Asp Gly Leu Cys Lys Ala Gly Lys Leu
100 105 110

Asp Glu Ala Gln Glu Val Phe Ala Lys Met Ser Glu Cys Gly His Ser
115 120 125

Pro Ser Val Tyr Thr Tyr Ser Ser Leu Ile Asp Arg Leu Phe Lys Asp
130 135 140

Lys Arg Val Asp Leu Ala Met Lys Val Leu Ser Lys Met Leu Glu Asn
145 150 155 160

Ser Cys Ser Pro Thr Val Val Thr Tyr Thr Glu Met Val Asp Gly Leu
165 170 175

Cys Lys Val Gly Lys Thr Glu Glu Ala Tyr Lys Leu Phe Val Leu Met
180 185 190

Glu Asn Lys Gly Cys Arg Pro Asn Val Val Thr Tyr Thr Ala Met Ile
195 200 205

pctca2017050779-seql.txt

Asp Gly Phe Gly Lys Val Gly Asp Ile Asn Met Cys Leu Lys Leu Phe
210 215 220

Arg Gln Met Ser Ala Lys Gly Cys Ala Pro Asn Phe Ile Thr Tyr Arg
225 230 235 240

Val Leu Ile Asp His Cys Cys Ala Ala Gly His Leu Asp Glu Gly His
245 250 255

Glu Leu Leu Gln Glu Met Lys Gln Thr Cys Trp Pro Ala His Val Thr
260 265 270

Gly Tyr Arg Lys Val Ile Glu Gly Phe Asn Arg Glu Phe Ile Cys Ser
275 280 285

Leu Gly Leu Leu Asp Val Met Val Ala Asp Gly Ser Leu Pro Ile Val
290 295 300

Pro Ala Tyr Arg Ile Leu Val His Ser Phe Cys Lys Ala Gly Arg Leu
305 310 315 320

Asp Val Ala Leu Glu Leu Tyr Lys Glu Leu Val Thr Val Ser Asp Gly
325 330 335

Leu Gly Leu Ser His Asn Leu Tyr Ala Ser Leu Ile Lys Ser Leu Ser
340 345 350

Leu Ala Phe Lys Val Asp Glu Ala Phe Gly Leu Tyr Val Asp Met Thr
355 360 365

Arg Met Gly Tyr Ile Pro Asp Ile Ser Val Ile Phe Asn Leu Ile Lys
370 375 380

Gly Leu Thr Lys Val Asn Lys Trp Asp Glu Ala Leu Gln Leu Ser Asp
385 390 395 400

Ser Ile Cys Gln Met Asp Ile Asn Tyr Ile Pro Gly Val Glu Glu Thr
405 410 415

<210> 738

<211> 239

<212> PRT

<213> Papaver somniferum

<400> 738

Met Thr Phe Pro Lys Leu Glu Ile Val Gly Glu His Lys Ile Asp Thr
1 5 10 15

pctca2017050779-seql.txt

Val Val Cys Gly Phe Gly Tyr His Ser Ser Ile Gln Asn Tyr Lys Ile
20 25 30

Val Arg Ile Tyr Tyr Ile Gln Asn Gln Pro Leu Gly Arg Val Gln Val
35 40 45

Tyr Thr Leu Gly Gly Gly Ser Ser Gly Trp Arg Asp Leu Gly Glu Thr
50 55 60

Val Tyr Ser Leu Arg His Ser Lys Phe Cys Leu Arg Gly Asp Arg Ser
65 70 75 80

Pro Phe Gly Val Leu Ala Asn Gly Ala Leu His Trp Leu Asp Thr Glu
85 90 95

Gln Lys Ile Val Ser Phe Asp Leu Val Ala Glu Asn Leu Tyr Leu Leu
100 105 110

Pro Ser Pro Pro Phe Val Ser Asp Thr Ser Val Thr Asn Cys Phe Gln
115 120 125

Leu Gln Val Leu Gly Gly Cys Leu Cys Phe Val His Leu Lys Pro Asp
130 135 140

Lys Phe Leu Asp Ile Trp Leu Leu Arg Lys Lys Gly Glu Ser Ser Ser
145 150 155 160

Ser Asp Val Asn Val Gln Asp Tyr Asp Ser Leu Thr Trp Ile Lys Glu
165 170 175

Phe Ser Ile Pro Ile Met Gly Asp Ala Ala Glu Pro Phe Ser Leu Thr
180 185 190

Glu Val Val Lys Cys Tyr Cys Gly Thr Ser Leu Leu Ser Val Met Ile
195 200 205

Lys Lys Leu Gln Pro Ser Ile Ser Phe Trp Val Ala Leu Phe Trp Met
210 215 220

Ala Leu Val Ile Val Gln Phe Leu Ile Gln Ala Ala Phe Phe Arg
225 230 235

<210> 739
<211> 73
<212> PRT
<213> Papaver somniferum

pctca2017050779-seql.txt

<400> 739

Met Lys Ile Glu Ile Glu Gly Ala Ser Ile Asp Pro Pro Val Phe Pro
 1 5 10 15

Ala Val Asn Thr Ala Ile Phe Ala Asn Pro Val Gly Phe Pro Gln Arg
 20 25 30

Gly Leu Arg Arg Gly Gly Ala Met Gly Arg Leu Arg Gly Gly Thr Gly
 35 40 45

Ser Gly Gly Arg Ile Pro Gln Arg Gly Gly Gly Arg Gly Arg Asp Lys
 50 55 60

Tyr His Thr Glu Ala Met Gln Ile Asn
 65 70

<210> 740

<211> 589

<212> PRT

<213> Papaver somniferum

<400> 740

Met Ser Leu Gln Gln Ala Gly Gln Pro Arg Pro Thr Ala Asn Gly Thr
 1 5 10 15

Gly Arg Arg Arg Gly Glu Gln Glu Thr Gly Phe Arg Ser Gly Ser Asn
 20 25 30

Phe Pro Thr Glu Lys Pro Asn His Gly Met Ala Ile Val Gly Gly Ile
 35 40 45

Leu Asn Arg Ser Arg Glu Gly Gly Val Gln Gly Pro Ser Arg Asp Arg
 50 55 60

Leu Ile Tyr Leu Ala Ala Cys Leu Ile Gly His Arg Val Glu Val Gln
 65 70 75 80

Val Lys Asn Gly Ser Ile Phe Ser Gly Ile Leu His Ala Met Asn Ala
 85 90 95

Glu Asn Asp Phe Gly Ile Val Leu Lys Met Ala Asn Leu Thr Lys Val
 100 105 110

Gly Leu Ser Lys Gly His Lys Pro Gly Ser Asp Ser Ile Ser Lys Ala
 115 120 125

Pro Ser Lys Thr Leu Ile Val Pro Ala Lys Glu Leu Val Gln Val Ile
 130 135 140

pctca2017050779-seql.txt

Ala Lys Asp Val Ser Val Thr Gly Ser Glu Val Lys Asn Asp Gly Gln
145 150 155 160

Leu Glu Gly Arg Gln Asp Leu Met Ile Asp Ser Tyr Ile Ser Lys Ser
165 170 175

Gln Phe Val Asp Val Gly Arg Glu Leu Ala Pro Trp Ala Pro Asp Glu
180 185 190

Asp Asp Leu Gln Cys Pro Glu Leu Asp Asn Ile Phe Asp Gly Pro Trp
195 200 205

Asn Ser Arg Lys Trp Asp Gln Phe Glu Thr Asn Glu Ala Leu Phe Gly
210 215 220

Val Lys Ser Thr Phe Asp Glu Glu Leu Tyr Thr Thr Lys Leu Asp Arg
225 230 235 240

Gly Pro Gln Met Arg Glu Arg Glu Arg Glu Ala Ser Arg Ile Ala Arg
245 250 255

Glu Ile Glu Gly Glu Asp Thr Lys Asp Met His Leu Ala Glu Glu Arg
260 265 270

Gly Arg His Phe Asp Leu Asp Val Asp Glu Glu Thr Arg Phe Ser Ser
275 280 285

Val Leu Arg Thr Val Asp Asp Ser Gly Tyr Asp Asp Asp Glu Asp Ile
290 295 300

Val Leu Asp Thr His Asn Met Glu Thr Phe Gly Asp Ser Ser Gly Ala
305 310 315 320

Ala Ser Lys Arg Ser Phe Ser Asp Val Ala Arg Gly Lys Thr Asp Asn
325 330 335

Leu Gly Pro Ser Pro Ser Ser Ser Ser Val Ala Asp Glu Ala His Ser
340 345 350

Arg Phe Asn Ala Gly Arg Asp Gln Tyr Phe Ser Ala Ser Gly Asp Arg
355 360 365

Pro Arg Gln Ile Asp Cys Glu Ser Thr Gln Ser Arg Val Asn Glu Asn
370 375 380

Lys Phe Lys Glu Leu Asp Gly Arg Lys Asn Ser Val Lys Glu Ser Val

pctca2017050779-seq1.txt

385 390 395 400

Glu Arg Lys Ser Val Asn Glu Val Gln Ala Pro Asn Leu Glu Gly Ser
405 410 415

Arg Arg Ser Gln Val Thr Thr Gln His Val His Pro Arg Gly Arg Ser
420 425 430

Gly Ser Ser Ala Ser Ser Thr Ala Glu Ser Ala Gln Ser Gly Ala Ser
435 440 445

Pro Thr Met Ala Arg Ser Gly Leu Ser Pro Ser Ser Ser Met Gly Ser
450 455 460

Leu Ser Ser Glu Lys Ser Ala Leu Asn Pro Asn Ala Lys Glu Phe Lys
465 470 475 480

Phe Asn Pro Asn Ala Lys Ser Phe Thr Pro Ser Val Ser Pro Val Arg
485 490 495

Pro Pro Ser Pro Val Pro Asp Gly Ser Tyr Tyr Tyr Pro Asn Asn Val
500 505 510

Ser Pro Val Gln His Met His Gly Leu Pro Val Gly Val Gly Met Gly
515 520 525

Ala Ala Tyr Gly Gly Pro Gln Pro Val Met Tyr Thr Pro Gln Val Ala
530 535 540

Pro Ile Gln Pro Ala Gln Thr Phe Leu His Pro Asn Gly Gln Leu Tyr
545 550 555 560

Gly Gln Gln Met Ile Val Gly His Pro Arg Gln Val Leu Tyr Met Pro
565 570 575

Asn Tyr Pro Pro Asp Met Pro Tyr Lys Gly Arg Asp Phe
580 585

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<210> 741
<211> 67
<212> PRT
<213> Papaver somniferum
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<400> 741

Met Gly Val Phe Thr Phe Val Cys Lys Ser Ser Gly Gly Lys Trp Ser
1 5 10 15

Ala Lys Gln Phe Glu Gly Asp Val Glu Ala Ser Ala Asp Cys Ala Tyr

20

Asp Leu Glu Arg Lys Leu Val Gln Glu Ala Leu Ser Arg Asp Ser Ser
35 40 45

Gly Ala Val Gln Ser Asn Phe Ser Leu Ile Thr Pro Thr Ser Gly Val
50 55 60

Phe Gln Val
65

<210> 742
<211> 474
<212> PRT
<213> Papaver somniferum
<400> 742

Met Gln Arg Val Arg Ile Ile Leu Arg Phe Val Ile Leu Asn Ile Phe
1 5 10 15

Val Ile Thr Pro Tyr Asn Gln Lys Leu Gly Phe Cys Leu Asn Val Trp
20 25 30

Phe Lys Leu Asn Val Trp Phe Ile Thr Leu Gln Thr Cys Leu Leu Thr
35 40 45

Met Arg Gly Gly Ser Ser Ser Thr Pro Thr Ala Ser Val Ser Ser Asn
50 55 60

Lys Arg Pro Pro Arg Pro Pro Pro Asn Ala Ser Ser Asp Gly Gly Ala
65 70 75 80

Asn Ser Ala Gly Gly Ala Ser Ala Ala Lys Asp Ala Ser Val Ala Gly
85 90 95

Asp Ala Ser Ala Asp Gly Asp Ala Thr Glu Ala Val Ile Lys Val Thr
100 105 110

Glu Thr His Ser Asn Lys Arg Lys Thr Pro Glu Asp Ala Thr Glu Asp
115 120 125

Asp Thr Glu Val Ser Gln Val Thr Glu Pro Lys Gly Lys Lys Arg Ser
130 135 140

Asp Val Trp Asn His Phe Asp Met Asp Pro Lys Pro Ser Lys Tyr Ala
145 150 155 160

Lys Cys Arg His Cys Lys Thr Lys Ile Ala Ala Gln Gly Thr Lys Tyr

165

170

175

Gly Thr Gly Gly Met Asn Asn His Leu Lys Ile Cys Lys Lys Lys Pro
 180 185 190
 Lys Glu Glu Lys Gly Gln Gln Thr Leu Asp Phe Gln Pro Ala Arg Leu
 195 200 205
 Gly Gly Glu Gly Lys Leu Val Ala Ala Thr Phe Asn Gln Asp Ala Cys
 210 215 220
 Thr Lys Ala Val Ile Leu Phe Val Ile Leu Asp Glu Gln Pro Phe Arg
 225 230 235 240
 Val Val Glu Gly Glu Gly Phe Lys Glu Leu Cys Arg Val Leu Glu Ser
 245 250 255
 Arg Phe Lys Ile Pro Ser Arg Met Thr Ile Ser Arg Gly Val Leu Asn
 260 265 270
 Leu Tyr Glu Ala Glu Lys Glu Lys Met Lys Asn Tyr Phe Lys Glu Asn
 275 280 285
 Asn Val Arg Val Cys Leu Thr Thr Asp Thr Trp Thr Ser Asn Ala Gln
 290 295 300
 Asn Lys Ser Tyr Met Val Val Thr Ala His Phe Ile Asp Lys Asp Trp
 305 310 315 320
 Lys Leu His Lys Leu Val Ile Asn Phe Phe Gln Ile Leu Gly His Ser
 325 330 335
 Gly Glu Val Ile Gly Lys Met Leu Glu Glu Cys Leu Leu Asp Trp Glu
 340 345 350
 Leu Pro Gly Val Phe Thr Ile Thr Leu Asp Asn Val Ser Ala Asn Asp
 355 360 365
 Leu Ala Ile Asp Tyr Leu Arg Glu Asp Gly His Leu Lys Glu Gln Val
 370 375 380
 Ile Ser Ser Lys Gly Val Leu Asn Thr Lys Phe Met Gln Val Arg Cys
 385 390 395 400
 Ala Ala His Val Leu Ala Leu Val Val Asn Ala Gly Leu Gly Glu Tyr
 405 410 415

pctca2017050779-seql.txt

His Met Ala Ile Lys Arg Val Arg Ala Val Val Lys His Val Met Ser
 420 425 430

Ser Pro Ala Arg Leu Ser Lys Phe Met Asp Cys Ala Lys Gln Glu Lys
 435 440 445

Ile Asp Cys Lys Lys Arg Phe Ser Phe Arg Cys Gly Tyr Lys Met Glu
 450 455 460

Phe His Leu His Asp Val Gly Ser Cys Leu
 465 470

<210> 743

<211> 174

<212> PRT

<213> Papaver somniferum

<400> 743

Met Arg Tyr Leu Asp Leu Ser Arg Cys Asn Phe Tyr Gly Gly His Asp
 1 5 10 15

Val Ser Ile Asn Gln Leu Tyr Asn Leu Gln Thr Leu Val Leu His Arg
 20 25 30

Cys His Asp Val Lys Thr Ile Leu Leu Gly Ile Gly Ser Leu Lys Thr
 35 40 45

Leu Arg His Leu Asp Leu Ser Tyr Ser Asp Val Glu Thr Leu Pro Asp
 50 55 60

Cys Val Val Gln Leu Ala Asn Phe Gln Thr Leu Asp Leu Asn Met Cys
 65 70 75 80

Lys Arg Leu Val Ala Leu Pro Val Asn Ile Gly Ser Leu Glu Ala Leu
 85 90 95

Arg Val Leu Lys Val Lys Asn Cys Ile Thr Leu Arg Val Leu His Thr
 100 105 110

Asp Val Gly Thr Leu Thr Arg Phe Arg Cys Leu Asp Leu Ser Val Thr
 115 120 125

Lys Ile Lys Val Leu Pro Lys Ser Cys Ile Asn Asn Leu Arg Asn Leu
 130 135 140

Glu Leu Met Val Phe Gly Lys Cys Arg Ile Pro Lys Glu Ile Lys Asn
 145 150 155 160

pctca2017050779-seql.txt

Trp Pro Lys Leu Arg Leu Leu Lys His Lys Arg Glu Arg Arg
165 170

<210> 744
<211> 118
<212> PRT
<213> Papaver somniferum

<400> 744

Met Ile Ala Thr Val Thr Ser Asp Ala Glu Asn Lys Gln Val Asn Ser
1 5 10 15

Ala Ser Val Arg Leu Trp Leu Arg Trp Leu Arg Asp Val Ala Tyr Asp
20 25 30

Ala Asp Asp Val Leu Asp Glu Phe Ser Tyr Glu Ala Met Arg Arg Ser
35 40 45

Glu Ile His Arg Lys Arg Asp Gln Val Leu Glu Phe Phe Ser Ser Ser
50 55 60

Ser Ala Leu Ser Phe Pro Ile Lys Met Val Asn Lys Ile Lys Ala Ile
65 70 75 80

Asn Lys Lys Leu Asp Glu Ile Thr Ser Thr Met Val Lys Phe Glu Leu
85 90 95

Gln Thr Ser Asp Pro Asp Asp Asp Leu Arg Ser Thr Glu Lys Gln Asp
100 105 110

Arg Lys His Phe Thr Leu
115

<210> 745
<211> 238
<212> PRT
<213> Papaver somniferum

<400> 745

Met Glu Thr Leu Lys Glu Trp Val Val Pro Ile Tyr Asn Thr Phe Pro
1 5 10 15

Ser Leu Glu Lys Leu Glu Ile Phe Asn Cys Pro Lys Leu Arg Ser Ile
20 25 30

Pro Asn Ser Phe Pro Phe Leu Lys Lys Leu Tyr Leu Met Asp Asn Asn
35 40 45

Ser Glu Ala Val Ala Ala Ile Leu Ala Thr Gly Gly Leu Thr Ser Val

50

55

60

Thr Phe Ile Glu Ile Arg Glu Ser Pro Gln Leu Leu Tyr Ile Pro Leu
65 70 75 80

Ser Leu Leu Ser Gln Asn Asn Thr Pro Asn Leu Gln Glu Leu Val Ile
85 90 95

His Glu Cys Ser Glu Phe Leu Gly Phe Val Gly Asp Asp Tyr Ile Phe
100 105 110

Glu Val Tyr Asn Asn Ser Glu Lys Asn Gly Asp Asp Asp Asn Gly Tyr
115 120 125

Asp Asp Leu Glu Ala Leu Val Phe Phe Leu Ser Lys Met Asn Leu Asp
130 135 140

Ser Asn Ser Gly Asn Ile Ser Asn Ser Leu Leu Ser Leu Gln Leu Ile
145 150 155 160

Asp Cys Pro Asn Leu Trp Val Leu Pro Asp Ile Trp Ser Phe Asn Ser
165 170 175

Leu Arg Lys Leu Thr Ile Phe Lys Cys Asp Glu Leu Lys Glu Leu Ile
180 185 190

Thr Asn Tyr Leu Glu Glu Ser Phe Ile Phe Leu Glu Glu Leu Lys Val
195 200 205

Asp Phe Ile Gln Lys Glu Phe Ile Gln Glu Asp Pro Thr Asp Ser Arg
210 215 220

Lys Leu Val Asn Leu Met Glu Phe Val Asp Gln Trp Lys Lys
225 230 235

<210> 746

<211> 795

<212> PRT

<213> Papaver somniferum

<400> 746

Met Phe Asp Ser Ser Tyr Ser Leu Ser Ser Trp Ser Val Gly Phe Gln
1 5 10 15

Leu Gly Thr Pro Cys Phe Trp Glu Glu Val Ser Ile Leu Val Gln Leu
20 25 30

Gly Val Leu Gly Ser Ile Leu Ile Cys Phe Met Lys Lys Arg Cys Ala

His Gly Ser Arg Ser Ile Glu Glu Gly Val Gly Lys Tyr Pro Ser Ser
50 55 60

Ile Arg Leu Gly Phe Val Tyr Lys Ser Ala Leu Val Cys Ser Val Leu
65 70 75 80

Ile Ala Gly Thr His Ile Leu Met Leu Trp Met Ile Leu Asn Gly Tyr
85 90 95

Asp Ala Leu Cys Lys Ser Lys Asn Ser Val Leu Cys Lys Glu Ile Leu
100 105 110

Leu Glu Ile Thr Cys Leu Ile Thr Leu Leu Leu Val Leu Asn Leu Arg
115 120 125

His Ser Arg Ser Leu Lys Leu Thr Arg Val Leu Arg Val Trp Trp Ile
130 135 140

Leu Ser Phe Ile Leu Ser Ile Val His Thr Thr Leu Tyr Thr Ser Tyr
145 150 155 160

Ile His Thr Asn His Arg Ser Leu Thr Ile Val Tyr Tyr Val Asn Phe
165 170 175

Val Ser Leu Ile Ser Ser Thr Tyr Leu Val Gly Ile Ser Ile Asn Gly
180 185 190

Ala Thr Gly Ile Ser Phe Ile Thr Asn Ser Thr Thr Glu Ser Leu Leu
195 200 205

Asn Lys Leu Glu Asn His Ser Asp Gly Lys Lys Glu Lys Glu Ser Pro
210 215 220

Tyr Gln Arg Ala Thr Leu Leu Gln Leu Ile Thr Phe Ser Trp Leu Ser
225 230 235 240

Pro Leu Phe Lys Val Gly Tyr Lys Lys Pro Leu Glu Gln Glu Asp Val
245 250 255

Pro Gly Ile His Ile Lys Asp Ser Ala Glu Phe Leu Ser His Ser Phe
260 265 270

Asn Asn Ile Leu Lys Gln Val Lys Glu Thr Lys Asn Thr Arg Ser Pro
275 280 285

pctca2017050779-seql.txt

Ser Ile Tyr Met Ala Ile Phe Leu Phe Ile Arg Lys Lys Ala Ala Ile
 290 295 300
 Asn Ala Phe Phe Ala Val Ile Asn Ala Gly Ala Ser Tyr Val Gly Pro
 305 310 315 320
 Tyr Leu Ile Asn Asp Phe Val Ala Phe Leu Thr Gln Lys Lys His Tyr
 325 330 335
 Ser Leu Lys Thr Gly Tyr Ile Ile Val Leu Ala Phe Ile Ser Ala Lys
 340 345 350
 Thr Val Glu Val Ile Ala Asp Arg Gln Trp Val Phe Gly Ala Arg Gln
 355 360 365
 Leu Gly Met Asn Leu Lys Gly Val Leu Ile Thr His Ile Tyr Lys Lys
 370 375 380
 Gly Leu His Leu Ser Ser Gln Ser Arg Gln Ser His Thr Ser Gly Glu
 385 390 395 400
 Ile Ile Asn Leu Met Ser Val Asp Ile Gln Arg Ile Thr Glu Phe Ile
 405 410 415
 Trp Tyr Met Asn Ile Ile Gly Met Leu Pro Ile Gln Ile Ser Leu Ala
 420 425 430
 Thr Cys Ile Leu Tyr Leu Asn Leu Gly Leu Ser Ser Tyr Ala Gly Leu
 435 440 445
 Ala Ala Thr Leu Met Val Met Leu Cys Thr Ile Pro Leu Gln Arg Ile
 450 455 460
 Gln Lys Arg Leu Gln Ser Arg Ile Met Glu Ala Lys Asp Glu Arg Met
 465 470 475 480
 Lys Ala Thr Ser Glu Ile Leu Arg Asn Met Lys Thr Leu Lys Leu Gln
 485 490 495
 Ala Trp Asp Met Lys Tyr Ile Leu Lys Leu Glu Asn Leu Arg Lys Ile
 500 505 510
 Glu Tyr Ser Trp Leu Trp Lys Ser Leu His Leu Ser Ala Leu Trp Gly
 515 520 525
 Phe Ile Phe Met Thr Ser Pro Thr Phe Ile Ser Ala Val Thr Phe Gly
 530 535 540

pctca2017050779-seql.txt

Ser Cys Ile Leu Leu Gly Ile Pro Leu Thr Ala Gly Lys Val Leu Ser
545 550 555 560

Ala Leu Ala Thr Phe Arg Met Leu Gln Asp Ser Met Phe Thr Leu Pro
565 570 575

Asp Ser Leu Ser Val Ile Ala Gln Ala Lys Val Ser Val Asp Arg Ile
580 585 590

Glu Ala Tyr Leu Gln Glu Asp Glu Ile Gln Asp Asp Ala Val Ile Phe
595 600 605

Val Pro Lys Thr Ser Glu Val Glu Ile Glu Ile Glu Asn Gly Ile Phe
610 615 620

Asn Trp Asp Val Lys Ser His Ser Pro Thr Leu Ser Arg Ile Gln Leu
625 630 635 640

Lys Val Lys Arg Gly Met Lys Val Ala Ile Cys Gly Thr Val Gly Ser
645 650 655

Gly Lys Ser Ser Leu Leu Ser Cys Ile Leu Gly Glu Ile Pro Lys Ile
660 665 670

Ser Gly Glu Val Lys Ile Ser Gly Thr Lys Ala Tyr Val Pro Gln Ser
675 680 685

Pro Trp Ile Phe Thr Gly Ser Val Arg Asp Asn Ile Leu Phe Gly Asn
690 695 700

Pro Tyr Asp Lys Val Arg Tyr Glu Arg Thr Ile Arg Ala Cys Ala Leu
705 710 715 720

Thr Lys Asp Leu Glu Leu Phe Gln Ala Gly Asp Leu Thr Glu Ile Gly
725 730 735

Glu Arg Gly Ile Asn Met Ser Gly Gly Gln Lys Gln Arg Ile Gln Leu
740 745 750

Ala Arg Ala Ala Tyr Gln Asp Ala Asp Thr Tyr Ile Leu Asp Asp Pro
755 760 765

Phe Ser Ala Val Asp Ala His Thr Gly Ser Gln Leu Phe Glu Val Ile
770 775 780

Phe Ser Ser Tyr Met Ile Gln Ser Lys Arg Glu
785 790 795

pctca2017050779-seql.txt

<210> 747
 <211> 366
 <212> PRT
 <213> Papaver somniferum

<400> 747

Met Glu Met Asn Leu Arg Leu Ile Asp Asn Gln Ser Arg Pro Trp Phe
 1 5 10 15

His Asn Glu Ala Ala Ile Glu Trp Leu Ser Phe Arg Leu Asn Ile Leu
 20 25 30

Ser Asn Leu Val Phe Ala Phe Ser Leu Val Ile Leu Val Ser Leu Pro
 35 40 45

Glu Gly Ile Leu Asn Pro Ser Ile Ala Gly Leu Ala Val Thr Tyr Gly
 50 55 60

Leu His Leu Asn Ile Leu Gln Ala Cys Val Ile Trp His Leu Cys Asn
 65 70 75 80

Ala Gln Asn Lys Met Ile Ser Val Glu Arg Ile Leu Gln Tyr Ser Lys
 85 90 95

Leu Thr Ser Glu Ala Pro Leu Val Ile Glu Glu Cys Arg Pro Pro Ser
 100 105 110

Asn Trp Pro Glu Phe Gly Glu Ile Cys Phe Lys Asn Leu Glu Val Arg
 115 120 125

Tyr Ala Glu His Leu Pro Ser Ile Leu Lys Asn Ile Asn Cys Lys Ile
 130 135 140

Pro Gly Arg Lys Lys Val Gly Val Val Gly Arg Thr Gly Ser Gly Lys
 145 150 155 160

Ser Thr Leu Ile Gln Ala Leu Phe Arg Thr Val Glu Pro Arg Asp Gly
 165 170 175

Cys Ile Leu Ile Asp Asp Ile Asn Ile Cys Asn Ile Gly Leu His Asp
 180 185 190

Leu Arg Ser Arg Leu Ser Ile Ile Pro Gln Asp Pro Thr Met Phe Glu
 195 200 205

Gly Thr Val Arg Ala Asn Leu Asp Pro Leu Ala Gln Phe Ser Asp Lys
 210 215 220

pctca2017050779-seql.txt

Glu Ile Trp Glu Ala Leu His Lys Cys Gln Leu Gly Asp Leu Val Arg
225 230 235 240

Asn Lys Glu Gly Lys Leu Asp Ser Thr Val Ala Asp Asn Gly Glu Asn
245 250 255

Trp Ser Val Gly Gln Arg Gln Leu Phe Cys Leu Gly Arg Ala Leu Leu
260 265 270

Lys Lys Ser Ser Ile Leu Val Leu Asp Glu Ala Thr Ala Ser Ile Asp
275 280 285

Ser Ala Thr Asp Glu Ile Ile Gln Lys Val Ile Ser Gln Glu Phe Glu
290 295 300

Asn Arg Thr Val Val Ser Ile Ala His Arg Ile His Thr Ile Ile Asp
305 310 315 320

Ser Asp Leu Val Leu Val Leu Ser Glu Gly Arg Ile Ala Glu Tyr Asp
325 330 335

Met Pro Ala Arg Leu Leu Glu His Glu Asp Ser Phe Phe Ser Lys Leu
340 345 350

Ile Lys Glu Tyr Ser Met Arg Ser Lys Gly Ser Ser Thr Ala
355 360 365

<210> 748
<211> 227
<212> PRT
<213> Papaver somniferum
<400> 748

Met Ser Phe Leu Phe Gly Lys Arg Lys Thr Pro Ala Glu Leu Leu Arg
1 5 10 15

Glu Asn Lys Arg Met Leu Asp Lys Ser Ile Arg Glu Ile Glu Arg Glu
20 25 30

Arg Gln Gly Leu Gln Ala Gln Glu Lys Lys Leu Ile Val Glu Ile Lys
35 40 45

Lys Ser Ala Lys Gln Gly Gln Met Gly Ala Val Lys Val Met Ala Lys
50 55 60

Asp Leu Ile Arg Thr Arg His Gln Val Glu Lys Phe Tyr Lys Leu Lys
65 70 75 80

pctca2017050779-seql.txt

Ser Gln Leu Gln Gly Val Ser Leu Arg Ile Gln Thr Leu Lys Ser Thr
85 90 95

Gln Ala Met Gly Glu Ala Met Lys Gly Val Thr Lys Ala Met Gly Gln
100 105 110

Met Asn Arg Gln Met Asn Leu Pro Ser Leu Gln Lys Ile Met Met Glu
115 120 125

Phe Glu Arg Gln Asn Glu Lys Met Glu Met Thr Ser Glu Val Met Ala
130 135 140

Asp Ala Ile Asp Asp Ala Leu Glu Gly Asp Glu Glu Gln Glu Thr
145 150 155 160

Glu Asp Leu Val Asn Gln Val Leu Asp Glu Ile Gly Ile Asp Ile Asn
165 170 175

Ser Glu Leu Met Asn Ala Pro Ala Thr Ala Val Ala Ala Pro Ala Ala
180 185 190

Thr Thr Lys Val Ala Gln Ala Glu Gln Pro Ala Ala Ala Gly Gly Asn
195 200 205

Asp Asp Gly Gly Ile Asp Met Asp Leu Gln Ala Arg Leu Asp Asn Leu
210 215 220

Arg Arg Met
225

<210> 749
<211> 298
<212> PRT
<213> Papaver somniferum

<400> 749

Met Ala Ser Ser Ser Ser Ala Ser Lys Ser Asp Gln Pro Gln Ile Ala
1 5 10 15

Lys Phe Lys Ile Ala Leu Cys Gln Ile Ser Val Ser Leu Asp Lys Asn
20 25 30

Thr Asn Ile Asp Arg Ala Arg Thr Met Ile Lys Asp Ala Ala Lys Ile
35 40 45

Gly Ala Lys Leu Ile Val Leu Pro Glu Met Trp Asn Cys Pro Tyr Ala
50 55 60

pctca2017050779-seql.txt

Asn Glu Asn Phe Pro Ile Tyr Ala Glu Asp Phe Asp Asn Arg Glu Leu
 65 70 75 80
 Ser Pro Ser Phe Met Met Leu Ser Glu Val Ala Cys Ser Glu Gly Val
 85 90 95
 Thr Val Val Gly Gly Ser Ile Thr Glu Arg Cys Gly Asp Gln Leu Tyr
 100 105 110
 Asn Thr Cys Cys Val Phe Gly Ser Thr Gly Asp Leu Ile Ala Lys His
 115 120 125
 Arg Lys Ile His Leu Phe Asp Leu Thr Gly Asp Val Cys Phe Lys Glu
 130 135 140
 Ser Glu Thr Phe Ala Ala Gly Asn Arg Pro Thr Ile Val Asp Thr Asp
 145 150 155 160
 Val Gly Arg Ile Gly Ile Gly Ile Cys His Asp Leu Arg Phe Pro Glu
 165 170 175
 Leu Ala Met Leu Tyr Arg Glu Arg Gly Ala Asp Leu Ile Cys Tyr Pro
 180 185 190
 Gly Ala Phe Asn Met Ser Thr Gly Asn Leu Phe Trp Glu Leu Val Gln
 195 200 205
 Arg Ala Arg Ala Val Asp Asn Gln Leu Phe Val Ala Thr Cys Ser Pro
 210 215 220
 Ala Arg Asp Ser Ser Gly Ser Tyr Met Ile Trp Gly His Ser Thr Leu
 225 230 235 240
 Val Gly Pro Phe Gly Glu Val Ile Ala Thr Ser Glu His Glu Glu Thr
 245 250 255
 Thr Ile Ile Ala Glu Ile Asp Tyr Ser Val Cys Gln Leu Arg Arg Glu
 260 265 270
 Asn Leu Pro Leu Glu Lys Gln Lys Arg Gly Asp Ile Tyr Gln Phe Val
 275 280 285
 Asp Cys Thr Lys Glu Leu Asn Ser Gln Gln
 290 295

<210> 750

pctca2017050779-seql.txt

<211> 120

<212> PRT

<213> Papaver somniferum

<400> 750

Met Ser Thr Asn Val Ile Gln Glu His Lys Asn Leu Met Thr Thr Lys
1 5 10 15

Tyr Phe Val Ile Pro Cys His Tyr Asn Thr Glu Ser Thr Ile Ser Phe
20 25 30

Cys Leu Lys Ile Ser Lys Thr Glu Ile Gln Leu Lys Gln Thr His Ala
35 40 45

Arg Leu Leu Lys Thr Leu Ile His Ser Ser His Gln Leu His His Leu
50 55 60

Leu Thr Gln Leu Leu Lys Leu Pro Ser Lys Lys Leu Ser Tyr Ala Arg
65 70 75 80

Asn Leu Phe Asp Gln Ile Pro Gln Arg Gly Cys Met Arg Trp Val Phe
85 90 95

Trp Gln Val Gly Leu Arg Phe Arg Leu Cys Leu Met Leu Val Arg Gly
100 105 110

Tyr Arg Leu Phe Val Lys Val Lys
115 120

<210> 751

<211> 435

<212> PRT

<213> Papaver somniferum

<400> 751

Met Val Gln Glu Glu His Asp Val Ala Asp Gly Gly Glu Val Gln Glu
1 5 10 15

Gly Thr Ser Ala Ala Val Gly Val Thr Pro Ile Val Pro Gln Glu Val
20 25 30

Arg Arg Ser Ser Arg Thr Pro Lys Pro Asn Pro Arg Tyr Ala Leu Asn
35 40 45

Tyr Leu Leu Leu Thr Asp Gly Val Glu Pro Glu Asp Ile Lys Glu Ala
50 55 60

Leu Ala Ala Asp Asp Ser Gly Lys Trp Gln Leu Ala Met Glu Asp Glu
65 70 75 80

pctca2017050779-seql.txt

Ile Asn Ser Leu Glu Glu Asp Gly Thr Trp Val Leu Val Lys Leu Pro
85 90 95

Arg Gly Lys Lys Ala Leu His Asn Lys Trp Val Tyr Arg Met Lys Ser
100 105 110

Glu Ala Asn Gly Asp Ile Arg Tyr Lys Glu Arg Leu Val Val Lys Gly
115 120 125

Phe Gln Gln Lys Pro Ser Val Asp Tyr Asn Glu Ile Phe Ser Pro Val
130 135 140

Val Lys Met Thr Thr Ile Arg Val Val Leu Ser Leu Val Ala Ser Glu
145 150 155 160

Asp Leu Tyr Leu Glu Gln Leu Asp Val Lys Thr Thr Phe Leu His Gly
165 170 175

Asn Leu Asp Glu Glu Ile Tyr Met Lys His Pro Glu Gly Phe Ile Val
180 185 190

Lys Gly Lys Glu Glu Met Val Cys Lys Leu Lys Lys Ser Leu Tyr Gly
195 200 205

Leu Lys Gln Ala Arg Arg Gln Trp Tyr Lys Lys Phe Asp Asn Phe Met
210 215 220

His Arg Gly Gly Tyr Ser Arg Cys Asn Ala Asp His Cys Cys Tyr Phe
225 230 235 240

Lys Arg Cys Ser Ser Asp Tyr Ile Ile Leu Leu Leu Tyr Val Asp Asp
245 250 255

Met Leu Val Ser Gly Thr Ser Leu Gln Glu Val Glu Asn Leu Lys Lys
260 265 270

Gln Leu Ser Ser Glu Phe Ala Val Lys Asp Leu Gly Glu Ala Lys Gln
275 280 285

Ile Leu Gly Met Arg Ile Ile Arg Asp Ile Ala Asn Gly Val Leu Met
290 295 300

Leu Ser Gln Ala Asp Tyr Ile Glu Arg Val Leu Lys Arg Phe Asn Met
305 310 315 320

Glu Asn Ala Lys Pro Val Ser Ser Pro Ile Gly Ser Gln Ile Leu Val

325

330

335

Ser Ser Met Gln Cys Ala Lys Thr Asn Glu Glu Lys Glu Tyr Met Ala
 340 345 350

Asn Val Pro Tyr Ser Ser Ala Ile Gly Ser Leu Met Tyr Ala Met Val
 355 360 365

Cys Met Arg Pro Asp Ile Ala His Ala Val Gly Val Val Ser Arg Tyr
 370 375 380

Ala Ser Asn Pro Gly Lys Gln His Trp Glu Ala Val Lys Trp Ile Leu
 385 390 395 400

Arg Tyr Leu Arg Gly Asn Thr Asn Val Ser Leu Cys Tyr Gly Lys Gly
 405 410 415

Gly Ser Ile Leu Arg Gly Tyr Val Asp Ala Asp Phe Lys Gly Asp Val
 420 425 430

Asp Lys Arg
 435

<210> 752

<211> 265

<212> PRT

<213> Papaver somniferum

<400> 752

Met Gly Ser Ser Ser Ile Asp Val Lys Pro Ala Glu Thr Gln Glu Val
 1 5 10 15

Ser Ile Lys Asp Gln Ala Gln Leu Trp Asn Met Ile Tyr Gly Phe Ala
 20 25 30

Asp Ser Leu Val Val Arg Cys Ala Val Glu Leu Gly Ile Pro Asp Ile
 35 40 45

Ile Lys Asn Asn Asn Gly Pro Ile Thr Leu Ala Gln Leu Ser Ser Lys
 50 55 60

Leu Pro Ile Pro Asn Val Asn Ser Asp His Leu Tyr Arg Ile Val Arg
 65 70 75 80

Tyr Leu Ile Asn Leu Asn Ile Leu Gln Gln Glu Ile Cys Arg Asn Val
 85 90 95

Lys Val Tyr Ser Leu Lys Pro Val Gly Thr Leu Leu Leu Arg Asp Ala

pctca2017050779-seql.txt

100

105

110

Glu Arg Ser Met Val Pro Ile Leu Leu Gly Asn Thr Gln Lys Asp Phe
 115 120 125

Leu Val Pro Trp His Phe Val Lys Glu Gly Leu Val Asn Gly Ser Thr
 130 135 140

Thr Ala Phe Glu Lys Gly Met Gly Met Asp Ile Trp Lys Tyr Leu Glu
 145 150 155 160

Gly Asn Pro Asp Gln Ser Gln Leu Phe Asn Glu Gly Met Ala Gly Glu
 165 170 175

Thr Ser Leu Leu Thr Lys Thr Leu Ile Glu Asp Cys Arg Asp Thr Phe
 180 185 190

Gln Asn Leu Asp Ser Leu Val Asp Ile Gly Gly Gly Asn Gly Thr Thr
 195 200 205

Ile Lys Ala Ile Tyr Glu Ala Phe Pro His Ile Lys Cys Thr Leu Tyr
 210 215 220

Asp Leu Pro His Val Val Ala Asn Ser His Asp Leu Pro Asn Ile Glu
 225 230 235 240

Lys Val Pro Gly Asp Met Phe Lys Ser Val Pro Ser Ala Gln Ala Ile
 245 250 255

Leu Leu Lys Val Arg Leu Leu Leu Ser
 260 265

<210> 753

<211> 544

<212> PRT

<213> Papaver somniferum

<400> 753

Met Glu Leu Phe Ile Lys Leu Pro Phe Ile Gln Pro Ile Pro Phe Ser
 1 5 10 15

Ile Ile Leu Val Thr Thr Val Ser Ile Val Leu Leu Tyr Ser Val Phe
 20 25 30

Phe Trp Val Thr Asp Lys Lys Lys Lys Arg Lys Lys Ala Pro Asn Ala
 35 40 45

Ala Gly Ala Trp Pro Leu Ile Gly His Leu Arg Leu Leu Met Asn Asp

50

55

60

Lys Glu Pro Leu Tyr Arg Ala Leu Gly Ser Met Ala Asp Lys Tyr Gly
 65 70 75 80

Pro Ala Phe Asn Val Arg Leu Gly Ser Gln His Ile Leu Val Leu Ser
 85 90 95

Asn Ser Asp Met Val Lys Glu Cys Phe Gly Val Gln Asn His Asp Lys
 100 105 110

Leu Phe Ser Asn Arg Thr Thr Ser Leu Ser Val Lys Tyr Ile Phe Asn
 115 120 125

Glu Ala Thr Ser Ile Gly Phe Thr Pro Phe Gly Thr Tyr Trp Arg Glu
 130 135 140

Met Arg Lys Ile Thr Ala Gln Gln Leu Leu Ser Lys Gln Cys Leu Glu
 145 150 155 160

Ser Trp Arg His Leu Arg Ile Lys Glu Ile Asp Ala Ser Phe Ser Arg
 165 170 175

Leu Asn Asp Leu Cys Cys Asn Asn Gly Thr Gly Thr Thr Thr Pro Ile
 180 185 190

Arg Met Asp Asn Trp Ile Ala Asp Leu Thr Tyr Asn Val Phe Ala Ser
 195 200 205

Val Val Phe Gly Tyr Gln Ser Gly Gly Arg Ala Ala Val Thr Gly Asp
 210 215 220

Thr Ala Ser Ile Ser Glu Lys Tyr Lys Asn Thr Met Ile Glu Ala Phe
 225 230 235 240

Val Val Leu Thr Thr Ser Phe Ala Val Ser Asp Val Phe Pro Cys Leu
 245 250 255

Glu Trp Val Asp Arg Leu Arg Gly Ile Val Arg Asp Leu Lys Arg Ala
 260 265 270

Arg Asp Ala Leu Asn Ser Ile Ala Gly Cys Leu Ile Glu Glu His Arg
 275 280 285

Gln Lys Arg Ser Leu Ala Ser Leu Ser Lys His Asp Ser Thr Asp Lys
 290 295 300

pctca2017050779-seql.txt

Gly Val Gly Asp Pro Gln Asp Phe Ile Asp Ile Leu Leu Ser Ile Ala
 305 310 315 320

Glu Gln Ser Gln Leu Pro Gly Asp Asp Pro Asp Leu Val Ile Lys Thr
 325 330 335

Met Ile Leu Glu Thr Val Ser Gly Gly Leu Asp Thr Thr Thr Ser Thr
 340 345 350

Leu Thr Trp Thr Leu Ser Leu Leu Val Asn His Pro Gln Val Leu Lys
 355 360 365

Lys Ala Ile Glu Glu Ile Asp Met His Val Gly Leu Asp Arg Asp Val
 370 375 380

Gln Glu Ser Asp Ile Pro Lys Leu Val Tyr Ile Asn Ala Ile Ile Lys
 385 390 395 400

Glu Thr Met Arg Leu Tyr Pro Val Phe Pro Leu Ile Asp Arg Phe Thr
 405 410 415

Leu Glu Glu Cys Glu Val Gly Gly Phe His Val Pro Ala Gly Gly Arg
 420 425 430

Leu Ile Leu Asn Val Trp Lys Ile Gln Arg Asp Pro Ser Val Trp Glu
 435 440 445

Asn Pro Leu Glu Phe Lys Pro Glu Arg Phe Leu Ser Asn Asp Asp Asp
 450 455 460

Asn Lys Val Asp Met Asp Phe Lys Ala Gln Lys Tyr Glu Leu Phe Pro
 465 470 475 480

Phe Gly Ile Gly Arg Arg Ile Cys Pro Gly Met Leu Ser Ser Leu Gln
 485 490 495

Val Met His Leu Val Leu Ala Arg Leu Ile His Cys Phe Asp Met Lys
 500 505 510

Ala Ala Ser Ala Asn Gly Lys Ile Asp Met Ala Glu Lys Pro Gly Ile
 515 520 525

Ile Cys Tyr Gln Ile Ala Pro Leu Glu Val Arg Ile Thr Thr Arg Gln
 530 535 540

<210> 754
 <211> 354
 <212> PRT

<213> Papaver somniferum

<400> 754

Met Gly Ser Ser Ile Asp Ala Glu Thr His Glu Val Asp Ile Lys Asp
 1 5 10 15

Gln Ala Gln Leu Trp Asn Ile Ile Tyr Gly Tyr Ala Asp Ser Leu Val
 20 25 30

Leu Arg Cys Thr Val Glu Ile Gly Ile Ala Asp Ile Ile Lys Asn Asn
 35 40 45

Asn Gly Ser Ile Thr Leu Ser Glu Leu Val Ser Lys Leu Pro Leu Ser
 50 55 60

Asn Val Asn Ser Asp Asn Leu Tyr Arg Leu Leu Arg Tyr Leu Val His
 65 70 75 80

Leu Asn Ile Leu Gly Gln Gln Thr Cys Ala Ala Gly Val Asp Arg Val
 85 90 95

Tyr Ser Leu Lys Pro Val Gly Thr Leu Leu Leu Lys Asp Ser Glu Arg
 100 105 110

Ser Met Ala Pro Val Ile Leu Gly Leu Ser Gln Lys Asp Phe Leu Phe
 115 120 125

Val Trp Asn Phe Val Lys Glu Gly Leu Gly Thr Gly Ser Thr Thr Ala
 130 135 140

Phe Glu Lys Ala Met Gly Met Asp Met Trp Lys Tyr Leu Glu Val Asn
 145 150 155 160

Pro Asn Gln Ser Gln Leu Phe Asp Glu Gly Gln Ala Gly Glu Thr Arg
 165 170 175

Leu Leu Thr Lys Thr Leu Leu Val Asp Cys Arg Asp Thr Phe Gln Gly
 180 185 190

Met Asp Ser Leu Val Asp Val Gly Gly Gly Asn Gly Thr Thr Ile Lys
 195 200 205

Ala Ile His Glu Ala Phe Pro His Ile Lys Cys Thr Leu Tyr Asp Leu
 210 215 220

Pro His Val Ile Ala Asn Ser Asp Asp His Pro Asn Ile Leu Lys Val
 225 230 235 240

pctca2017050779-seql.txt

Pro Gly Asp Met Phe Met Ser Val Pro Ser Ala Gln Val Leu Leu Leu
245 250 255

Lys Cys Val Leu His Asp Trp Thr Asp Glu His Cys Val Asn Ile Leu
260 265 270

Lys Lys Cys Lys Glu Ala Ile Pro Lys Glu Thr Gly Lys Val Ile Ile
275 280 285

Val Asp Val Ala Leu Glu Glu Glu Ser Glu His Glu Leu Thr Lys Ala
290 295 300

Arg Leu Ile Leu Asp Ile Asp Met Leu Val Asn Thr Gly Gly Arg Glu
305 310 315 320

Arg Thr Ala Glu Asp Trp Glu Asn Leu Leu Lys Arg Ala Gly Phe Arg
325 330 335

Ser His Lys Ile Arg Pro Ile Arg Ala Ile Gln Ser Val Ile Glu Ala
340 345 350

Phe Pro

<210> 755

<211> 175

<212> PRT

<213> Papaver somniferum

<400> 755

Met Cys Val His Tyr Glu Leu Pro Asp Asn His Leu His Thr Pro Arg
1 5 10 15

Leu Val Glu Lys Val Glu Leu Pro Glu Lys Ala Ile Thr Glu Ala Asp
20 25 30

Ile Val Lys Gln Pro Leu Trp His Glu Tyr Glu Gly Trp Glu Pro Pro
35 40 45

Arg Asp Arg Ser Gln Ile Ile Gln Ser Glu Cys Lys Gln Val Thr Asn
50 55 60

Ala Lys Arg Ser Val Pro Glu Leu Asn Asp Asn Glu Ala Trp Arg Gly
65 70 75 80

Ala Gly Thr Gly Phe Ser Ala Gly Arg Gly Lys Thr Ile Gln Lys Thr
85 90 95

pctca2017050779-seql.txt

Ser Cys Pro Asp Thr Asn Ile Gln Pro Ser Thr Ala Gly Gly Gly Leu
100 105 110

Asn Asn Gly Lys Gly Arg Arg Ser Tyr Pro Asn Arg Gly Lys Ala Phe
115 120 125

Thr Gln Arg Val Ser Ser Tyr Asp Ser Tyr Asn Thr Arg Ser Arg Phe
130 135 140

Gln Pro Ser Pro Ala Ala Asn Asp Ser Ser Ser Gly Pro Ser Tyr Val
145 150 155 160

Ala Arg Ser Pro Ser Tyr Val Ala Gln Arg Trp Ser Gly Glu Pro
165 170 175

<210> 756
<211> 76
<212> PRT
<213> Papaver somniferum

<400> 756

Met Phe Leu Asn Pro Tyr Glu His Pro Lys Cys Asn Leu Asn Arg Gln
1 5 10 15

Asp Leu Phe Leu Ile Arg Met Ser Gly Ser Asn Glu Thr Trp Ser Val
20 25 30

Asp Ser Phe Gly Cys Ile Thr Lys Pro Ser Leu Asn Thr Gln Asn Ser
35 40 45

Asn Ser Tyr Leu Phe Phe Leu Phe Leu Pro Leu Arg Leu Phe Ser Phe
50 55 60

Ser Ala Cys Ala Ile Lys Ser Ser Asn Glu Tyr Ser
65 70 75

<210> 757
<211> 394
<212> PRT
<213> Papaver somniferum

<400> 757

Met Ala Gly Phe Ser Ser Thr Pro Val His Ile Ser Ile Phe Leu Phe
1 5 10 15

Ser Leu Cys Ile Leu Ser Leu Ser Ser Leu Ser Trp Ser Ser Ser Gly
20 25 30

pctca2017050779-seq1.txt

Ser Asn Leu Glu Arg Gln Asn Asp Asp Tyr Glu Lys Trp Val Ser Trp
 35 40 45
 Asn Val Glu Asn His Lys Lys Lys Ile Ser Thr Thr Trp Glu Thr Asn
 50 55 60
 Gln Gly Met Val Thr Ala Gly His Arg Lys Arg Ser Gly Arg Ser Val
 65 70 75 80
 Val Asp Ser Lys Leu Arg Arg Ala Asp Leu Arg Thr Val Arg Met Cys
 85 90 95
 Val Ser Gln Asp Gly Ser Cys Asp Phe Ala Ser Ile Arg Glu Ala Ile
 100 105 110
 Asp Ser Ile Pro Leu Asn Asn Thr Arg Arg Thr Ile Leu Asp Ile Lys
 115 120 125
 Pro Gly Leu Tyr Arg Glu Lys Ile Val Val Pro Leu Ala Lys Pro Phe
 130 135 140
 Ile Thr Phe Met Gly Asp Ser Gln Asn Pro Pro Thr Ile Thr Gly Asn
 145 150 155 160
 Asp Thr Ala Ser Thr Ile Gly Asp Asp Gly Arg Pro Leu Thr Thr Phe
 165 170 175
 His Ser Ala Thr Val Ala Val Asn Ser Asp Tyr Phe Val Ala Ile Asn
 180 185 190
 Val Ile Phe Glu Asn Thr Val Pro His Val Thr Gly Thr Leu Ala Glu
 195 200 205
 Gln Ala Val Ala Leu Arg Ile Ser Gly Asn Lys Ala Ala Phe Tyr Asn
 210 215 220
 Cys Thr Phe Tyr Gly Tyr Gln Asp Thr Leu Tyr Asp His Lys Gly Leu
 225 230 235 240
 His Tyr Phe Lys Asn Cys Phe Ile Gln Gly Ser Val Asp Phe Ile Phe
 245 250 255
 Gly Tyr Gly Arg Ser Leu Tyr Glu Thr Cys Tyr Leu Asn Ser Val Ala
 260 265 270
 Thr Lys Val Ala Ser Met Thr Ala Gln Lys Arg Thr Asn Ser Ser Leu
 275 280 285

pctca2017050779-seql.txt

Ser Ser Gly Phe Ser Phe Lys Asp Ser Val Val Thr Gly Ser Gly Leu
290 295 300

Leu Tyr Leu Gly Arg Ala Trp Gly Asp Arg Ser Arg Val Ile Phe Ser
305 310 315 320

Tyr Thr Phe Met Asp Lys Val Val Leu Ser Gln Gly Trp Asn Asp Trp
325 330 335

Gly Asp Gln Lys Arg Glu Arg Ser Val Tyr Tyr Gly Glu Tyr Lys Cys
340 345 350

Ser Gly Pro Gly Ala Asn Ala Thr Gly Arg Val Gln Trp Ala Arg Leu
355 360 365

Leu Ser Asp His Glu Ala Lys Pro Phe Ile Gly Ala Tyr Tyr Ile Asp
370 375 380

Gly Asp Ala Trp Leu Thr Ser Gln Thr Leu
385 390

<210> 758
<211> 208
<212> PRT
<213> Papaver somniferum

<400> 758

Met Ala Ala Ala Ala Val Thr Thr Pro Val Val Glu Gly Thr Gly Ala
1 5 10 15

Pro Gln Tyr Asp Val Lys Leu Phe Asn Lys Trp Thr Phe Asp Glu Val
20 25 30

Glu Val Ser Asp Ile Ser Leu Val Asp Tyr Val Gly Val Ala Ala Arg
35 40 45

His Ala Thr Tyr Val Pro His Thr Ala Gly Arg Tyr Ser Ala Lys Arg
50 55 60

Phe Arg Lys Ala Gln Cys Pro Ile Val Glu Arg Leu Thr Asn Ser Leu
65 70 75 80

Met Met His Gly Arg Asn Asn Gly Lys Lys Ile Met Ala Val Arg Ile
85 90 95

Ile Lys His Val Met Asp Ile Ile His Leu Leu Thr Asp Gln Asn Pro
100 105 110

pctca2017050779-seql.txt

Ile Gln Val Ile Val Asp Ala Val Ile Asn Ser Gly Pro Arg Glu Asp
115 120 125

Ala Thr Arg Ile Gly Ser Ala Gly Val Val Arg Arg Gln Ala Val Asp
130 135 140

Ile Ser Pro Leu Arg Arg Val Asn Gln Ala Ile Tyr Leu Leu Thr Thr
145 150 155 160

Gly Ala Arg Glu Ser Ala Phe Arg Asn Val Lys Thr Ile Ala Glu Cys
165 170 175

Leu Ala Asp Glu Leu Ile Asn Ala Ala Lys Gly Ser Ser Asn Ser Tyr
180 185 190

Ala Ile Lys Lys Lys Asp Glu Ile Glu Arg Val Ala Lys Ala Asn Arg
195 200 205

<210> 759
<211> 408
<212> PRT
<213> Papaver somniferum

<400> 759

Met Glu Gly Lys Val Gly Gly Gly Val Gly Gly Glu Ile Arg Arg Val
1 5 10 15

His Ile Ile Tyr Phe Leu Ser Arg Met Gly Arg Val Glu His Pro His
20 25 30

Leu Ile Arg Val His His Leu Ser Lys Asn Gly Val His Leu Arg Asp
35 40 45

Val Lys Arg Trp Leu Ser Glu Leu Arg Gly Lys Asp Met Pro Asp Ala
50 55 60

Phe Ala Trp Ser Tyr Lys Arg Arg Tyr Lys Thr Gly Tyr Val Trp Gln
65 70 75 80

Asp Leu Leu Asp Asp Asp Leu Ile Ser Pro Ile Ser Asp Asn Glu Tyr
85 90 95

Val Ile Lys Gly Ser Glu Ile Thr Thr Leu Ser Phe Asp Pro Cys Phe
100 105 110

His Gly Glu Lys Lys Gly Ser Thr Leu Ala Lys Ala Glu Thr Ile Thr
115 120 125

pctca2017050779-seql.txt

Ser Ile Glu Glu Ile Lys Ser Lys Ile Pro Asp Ser Lys Ser Ser Asn
130 135 140

Gly Gly Glu Ser Gln Phe Asp Gly Glu Asp Ser Gly Pro Leu Asp Ser
145 150 155 160

Glu Thr Ser Thr Glu Ser Ser Glu Ser Ile Lys Glu Arg Asn Ser Asp
165 170 175

Asp Asp His Gln Lys Gln Arg Ser Ile Val Pro Ile Thr Glu Ile Lys
180 185 190

Glu Leu Asn Asp Glu Thr Glu Asn Ser Leu Gln Lys Asn Asp Lys Asn
195 200 205

Glu Ile Thr Glu Lys Gln Asn Pro Ser Ser Ser Ser Ser Thr Thr Ser
210 215 220

Thr Ala Arg Ser Ser Ser Ser Ser Ser Ser Ser Ser Phe Asn Lys
225 230 235 240

Ser Lys Ser Tyr Ser Ser Gly Gly Ala Thr Asn Val Phe Arg Ser Leu
245 250 255

Leu Ser Cys Arg Ala Thr Asp Ile Asn Asp Ser Ala Leu Met Met Ile
260 265 270

Arg Arg Ser Ser Cys Ser Ser Ser Ser Glu Ile Cys Lys Phe Glu Asn
275 280 285

Leu Gly Gly Ser Asp Thr Asn Thr Ser Gly Ile Leu Trp Asn Gln His
290 295 300

Gln Ser Arg Arg Ser Ile Ser Lys Pro Ser Ser Ser Ser Ser Glu
305 310 315 320

Asn Ser Thr Ser Lys Lys Ser Asn Glu Phe Gly Gly Ser Leu Lys Lys
325 330 335

Val Ser Ala Ala Phe Lys Pro Val Ala Glu Pro His Cys Ser Gln Cys
340 345 350

Gly Lys Gly Phe Lys Pro Glu Arg Leu His Ser His Met Lys Ser Cys
355 360 365

Arg Gly Leu Lys Ser Leu Ser Lys Asn Arg Asn Ser Ala Thr Ala Gly
370 375 380

pctca2017050779-seql.txt

Tyr Asp Phe Glu Thr Glu Gln Lys Phe Thr Thr Leu Gly Ser Phe Lys
385 390 395 400

Glu Arg Asn Gln Gln Gly Cys Phe
405

<210> 760
<211> 182
<212> PRT
<213> Papaver somniferum

<400> 760

Met Ser Thr Thr Gly Thr Val Ser Val Gln Phe His Pro Ile Val Lys
1 5 10 15

Ile Cys Gly Ser Glu Asn Asp Lys Phe Ser Val Ile His Pro Lys Leu
20 25 30

Glu Phe Pro Arg Ser Lys Phe Leu Arg Phe Asn Leu Cys Ser Thr Asp
35 40 45

Ser Thr Arg Lys Gly Cys Ile Gly Arg Val Ser Ala Val Pro Glu Asp
50 55 60

Glu Asp Phe Phe Trp Glu Lys Ala Leu Thr Thr Leu Leu Asp Met Val
65 70 75 80

Glu Thr Pro Thr His Met Lys Asn Leu Ser Ile Lys Glu Leu Lys Gln
85 90 95

Leu Ala Asp Glu Ile Arg Ser Glu Leu Ser Phe Ile Thr Ser Lys Met
100 105 110

Pro Arg Tyr Phe Lys Ala Ile Leu Ala Thr Val Glu Leu Thr Val Val
115 120 125

Leu His His Val Phe Asp Ser Leu Thr Asp Lys Ile Leu Trp Asp Val
130 135 140

Val Gln Gln Glu Thr Glu Val Thr Phe Ile Ser Asn Arg His Ala Ser
145 150 155 160

Val Glu Val Asn Ser Met Lys His Pro Thr Leu Asp Asn Leu Ala Arg
165 170 175

Ile His Leu Leu His Leu
180

pctca2017050779-seql.txt

<210> 761
 <211> 120
 <212> PRT
 <213> Papaver somniferum

<400> 761

Met Asn Arg Thr Leu Leu Glu Lys Val Arg Cys Met Leu Ser Asn Ala
 1 5 10 15

Gly Leu Gly Lys Glu Phe Trp Ala Glu Ala Val Thr Cys Ala Cys Phe
 20 25 30

Leu Ile Asn Arg Phe Pro Ser Ala Val Leu Glu Gly Lys Thr Pro Met
 35 40 45

Glu Lys Trp Phe Gly Lys Pro Ala Tyr Asp Tyr Asp Ser Ile Tyr Ile
 50 55 60

Phe Gly Cys Pro Ala Trp Tyr His Val Ser Lys Asn Lys Leu Asp Ser
 65 70 75 80

Arg Val Val Lys Arg Ile Phe Val Gly Met Lys Ser Gly Val Lys Gly
 85 90 95

Phe Lys Ile Trp Asn Pro Val Glu Lys Lys Ile Val Met Ser Ile Asp
 100 105 110

Val Thr Phe Met Arg Cys Leu Trp
 115 120

<210> 762
 <211> 612
 <212> PRT
 <213> Papaver somniferum

<400> 762

Met Glu Glu Glu Glu Gln Pro Ile Glu Ile Arg Ala Leu Lys Ser Leu
 1 5 10 15

Gly Leu Gly Phe Asp Leu Thr Ser Asp Phe Arg Leu Lys Phe Ala Lys
 20 25 30

Lys Gly Asn Lys Gly Glu Asp Asp Gly Ile Gly Arg Leu Ile Val Leu
 35 40 45

Asp Glu Glu Asp Gln Arg Asp Val Val Leu Pro Gly Gly Lys Ile Ile
 50 55 60

pctca2017050779-seql.txt

Ser Gly Val Ser Arg Asp Ile Lys Cys Asp Lys Gly Asp Arg Ile Arg
65 70 75 80

Phe Lys Ser Asp Val Val Glu Phe Asn Gln Met Ser Glu Leu Leu Asn
85 90 95

Gln Lys Ser Thr Val Gln Gly Lys Ile Pro Ser Gly Tyr Phe Asn Ser
100 105 110

Ile Phe Asp Phe Ser Gly Leu Trp Met Ala Asp Ala Thr Asp Thr Lys
115 120 125

Tyr Leu Ala Phe Asp Gly Tyr Phe Ile Ser Leu Tyr Tyr Leu His Leu
130 135 140

Thr Thr Ser Pro Leu Val Leu Gln Gly Arg Ile Lys Lys Ala Val Pro
145 150 155 160

Ser Asn Trp Asp Pro Ala Ser Leu Ser Arg Phe Ile Arg Thr Phe Gly
165 170 175

Thr His Ile Ile Val Gly Leu Ala Ile Gly Gly Gln Asp Val Val Cys
180 185 190

Val Arg Gln Lys His Ser Ser Ser Ile Pro Pro Ala Asp Leu Lys Gln
195 200 205

Tyr Leu Glu Asp Leu Gly Asp Ser Trp Phe Ser Asp Gly Gly Ser Thr
210 215 220

Ser Pro Phe Arg Arg Thr Gly Asp Ala Lys Arg Lys Val Pro Glu Val
225 230 235 240

Phe Gln Arg Val Leu Gln Ser Asn Arg Met Gln Leu Asn Arg Ile Thr
245 250 255

Glu Thr Ser Ser Lys Asp Gly Leu Thr Val Val Cys Ser Lys Arg Gly
260 265 270

Gly Asp Ala Tyr Leu His Thr His His Lys Trp Leu Gln Thr Val Ala
275 280 285

Ser Asn Pro Asp Ala Ile Leu Phe Lys Phe Val Pro Ile Thr Ser Leu
290 295 300

Leu Ser Gly Ile Pro Gly Ser Gly Tyr Leu Ser His Ala Ile Asn Leu
305 310 315 320

pctca2017050779-seql.txt

Tyr Leu Arg Tyr Lys Pro Asp Pro Lys Asp Leu Gln Tyr Phe Leu Glu
 325 330 335
 Phe Gln Val Pro Arg Gln Trp Ala Pro Met Phe Asn Glu Leu Pro Leu
 340 345 350
 Gly His Gln Arg Arg Ala Ser Cys Pro Ser Leu Gln Phe Ser Phe Met
 355 360 365
 Gly Ser Lys Leu His Val Asn Ser Thr Gln Val Ser Ser Gly Arg Thr
 370 375 380
 Pro Ala Val Gly Leu Arg Leu Tyr Leu Glu Gly Lys Ala Cys Asn Arg
 385 390 395 400
 Leu Ala Ile His Val Gln His Leu Ser Asn Leu Pro Arg Leu Leu Glu
 405 410 415
 Ser Ser Trp Ala Gly Pro Thr Thr Leu Lys Gln Cys Gln Trp Arg Gly
 420 425 430
 Ser Asp Glu Ser Ser Val Pro Tyr Leu Glu Pro Ile Lys Trp Lys Arg
 435 440 445
 Tyr Ser Asn Ile Cys Thr Ser Val Val Lys His Asp Pro Gly Trp Leu
 450 455 460
 His Gly Glu Ser Pro Gly Val Phe Ile Val Thr Gly Ala Gln Leu Met
 465 470 475 480
 Thr Lys Gly Lys Trp Pro Lys His Ile Leu His Leu Arg Leu Leu Tyr
 485 490 495
 Thr His Ile Pro Gly Phe Ser Ile Gln Lys Thr Glu Trp Ala Val Ala
 500 505 510
 Pro Ala Ser Ser Gln Lys Ser Ser Phe Leu Thr Asn Phe Ser Thr Thr
 515 520 525
 Phe Thr Thr Ser Gly Pro Ser Lys Ala Ala Pro Val Val Ala Ile Asn
 530 535 540
 Ser Gly Val Tyr Ser Asp Gly Pro Pro Arg Pro Val His Ser Gln Lys
 545 550 555 560
 Leu Leu Lys Tyr Val Glu Thr Ser Glu Ile Val Arg Gly Pro His Asp

565

570

575

Ile Pro Gly His Trp Met Val Ile Ala Ala Lys Leu Val Thr Glu Gly
 580 585 590

Gly Lys Ile Gly Leu Leu Val Lys Phe Ala Leu Leu Asp Tyr Ser Ser
 595 600 605

Pro Thr Ser Glu
 610

<210> 763

<211> 187

<212> PRT

<213> Papaver somniferum

<400> 763

Met Val Leu Phe Ser Arg Lys Gly Ala Ser Gly Phe Ser Ala Cys Asn
 1 5 10 15

Thr Ala Glu Glu Val Thr Gln Gly Ile Asp Gly Ser Gly Leu Thr Ala
 20 25 30

Ile Ile Thr Gly Ser Ser Asn Gly Ile Gly Ala Glu Thr Ala Arg Val
 35 40 45

Leu Ala Met Arg Gly Val Gln Ile Val Met Ala Val Arg Asn Thr Ala
 50 55 60

Ala Gly Thr Ala Val Lys Glu Thr Ile Leu Lys Glu Thr Pro Ser Ala
 65 70 75 80

Thr Ile Glu Val Leu Glu Leu Asp Leu Ser Ser Met Ala Ser Val Arg
 85 90 95

Lys Phe Ala Gly Glu Phe Glu Ser Leu Gly Leu Pro Leu Asn Ile Leu
 100 105 110

Val Asn Asn Ala Gly Val Met Ala Leu Pro Tyr Lys Leu Ser Pro Asp
 115 120 125

Lys Ile Glu Leu Gln Phe Ala Thr Asn His Leu Gly His Phe Leu Leu
 130 135 140

Thr Asn Leu Leu Leu Glu Thr Met Lys Lys Thr Ala Ser Gln Ser Asn
 145 150 155 160

Ile Glu Gly Arg Ile Val Asn Ile Ser Ser Glu Ala His Lys Leu Ala

165

170

175

Tyr Lys Glu Gly Ile Arg Phe Asp Lys Leu Arg
 180 185

<210> 764

<211> 198

<212> PRT

<213> Papaver somniferum

<400> 764

Met Ile Ser Phe Ser Leu Val Leu Asp Asn Ser Leu Ser Asn Lys Met
 1 5 10 15

Phe Leu Arg His Phe Leu Cys Leu Ser Ala Met Phe Leu Arg His Phe
 20 25 30

Gly Ala Ser Phe Leu His His Cys Gly Ala Asn Ser Pro Ile Phe Asp
 35 40 45

Glu Trp Phe Met Asp Cys Tyr Ser Arg Phe Lys Ser Ile Asn Asn Leu
 50 55 60

Thr Leu Ile Pro Val Arg Ser Ile Ser Tyr Arg Gly Arg Ile Gln Thr
 65 70 75 80

Asn Gln Met Val Gly Ile Ile Ser Leu Leu Tyr Ile Ile Arg Asn Trp
 85 90 95

Ala Ser Leu Arg Val Ile Ala Leu Ser Leu Cys Asn Leu Ser Val Ile
 100 105 110

Asp Ile Leu Ile Tyr Ile Arg Ile Leu Ile Ile Leu Gln Leu Thr Ala
 115 120 125

Leu Leu Thr Thr Glu Ser Asp Asn Arg Ile Ser Ile Asp Thr Lys Asn
 130 135 140

Val Asn Ala Ser Thr Ala Ser Asn Asn His Met Lys Cys Val Phe Phe
 145 150 155 160

Phe Phe Leu Leu Thr Trp Trp Asp Leu Ile Tyr Leu Met Val Glu Gly
 165 170 175

Asp Lys Val Trp Arg Thr Ala Ser Asn Asn His Met Lys Tyr Val Phe
 180 185 190

Phe Phe Phe Leu Leu Thr

195

<210> 765
 <211> 358
 <212> PRT
 <213> Papaver somniferum

<400> 765

Met Asp Ile Lys Leu Glu Asp Glu Glu Gln Glu Ile Lys Tyr Gln Gly
 1 5 10 15

His Val Trp Asn Met Ile Cys Gly Ser Val Asn Ser Ser Val Leu Lys
 20 25 30

Cys Thr Ile Val Leu Gly Leu Phe Asp Thr Ile His Asn Ser Ser Lys
 35 40 45

Pro Met Thr Leu Ser Ser Leu Ser Ser Ala Ser Pro Ser Leu Ser Pro
 50 55 60

Leu Lys Thr Glu Asn Leu Tyr Arg Leu Leu Arg Tyr Leu Ser His Met
 65 70 75 80

Asn Leu Ile Val Ile Asn Ser Ile Gln Gly Ser Asp Asp Thr Phe Ser
 85 90 95

Leu Thr Asp Thr Ser Lys Leu Leu Leu Ser Asn Gln Glu Arg Ser Leu
 100 105 110

Lys Asp Trp Val Leu Gly Ile Asp Asp Pro Leu Ala Ile Asn Gly Trp
 115 120 125

His Glu Leu Thr Asp Tyr Cys Leu Ser Pro Val Asp Ala Pro Val Pro
 130 135 140

Phe Val Lys Met His Gly Lys Thr Met Trp Glu Phe Ala Ala Asp Ile
 145 150 155 160

Pro Glu Val Asn Glu Leu Ile Asn Asn Ser Met Ala Cys Asp Thr Lys
 165 170 175

Leu Val Met Pro Ala Phe Leu Gln Gly Cys Arg Gly Ile Leu Asn Lys
 180 185 190

Gly Ile Val Lys Lys Met Val Asp Ile Gly Gly Gly Thr Gly Ala Ala
 195 200 205

Met Ser Tyr Val Val Lys Ala Phe Pro Asp Ile Lys Cys Met Val Phe

210

215

Asp Leu Pro His Val Val Ala Asn Ala Pro Glu Ile Glu Gly Val Glu
225 230 235 240

Leu Val Gly Gly Asp Met Phe Glu Phe Ile Pro Pro Ala Asp Ala Leu
245 250 255

Leu Leu Lys Phe Ile Leu His Asn Trp Asp Asp Val Gly Cys Ile Gln
260 265 270

Leu Leu Lys Lys Cys Lys Glu Thr Ile Ser Ala Glu His Gly Lys Val
275 280 285

Ile Ile Ile Glu Met Val Leu Glu Glu Asp Asp Gln Asp Asn Asp Ala
290 295 300

Leu Ala Gln Ala Arg Leu Ser Leu Asp Leu Asp Met Met Val Cys Ser
305 310 315 320

Gly Gly Arg Glu Arg Thr Lys Asp Glu Trp Arg Ile Leu Val Glu Glu
325 330 335

Ala Gly Phe Ser Lys Ile Glu Phe Ile Ser Ile Phe Ala Ile Gln Ser
340 345 350

Val Ile Val Ala Tyr Pro
355

<210> 766

<400> 766
000

<210> 767

<400> 767
000

<210> 768

<211> 337

<212> PRT

<213> Papaver somniferum

<400> 768

Met Glu Ser Asn Gln Glu Ser Phe Trp Gln Phe Ser Asp Gln Leu Arg
1 5 10 15

Leu His Asn Ser Ser Phe Ala Asn Leu Ser Ile Asn Asp Ser Ile Trp
20 25 30

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Gly Ser Ser Leu Asn Ser Lys Lys Pro Glu Glu Arg Arg Asn Phe Asp
35 40 45

Ile Arg Val Gly Gly Asn Arg Asn Asp Ser Thr Phe Pro Ser Ser Asn
50 55 60

Lys Asn Ile Asp Tyr Ser Asn Asn Thr Lys Gln Val Gln Gln Gln Gln
65 70 75 80

Gln Gln Lys Asn Gly Ala Gly Ser Asp Tyr Leu Asn Gly Phe Asn Asp
85 90 95

Ala Trp Lys Ile Ala Thr Lys Phe Gly Gly Ile Gly Asp Gly Gly Ser
100 105 110

Ser Leu Met Gln Lys Asn Met Asn Phe Asn Val Asn Gly Gly Phe Asn
115 120 125

Lys Gly Val Tyr Ser Lys Thr Asp Asn Phe Lys Gln Ser Asn Thr Lys
130 135 140

Ile Val Asn Asp Asn Ser Asn His Lys Lys Asn Glu Glu Val Tyr Glu
145 150 155 160

Gly Lys Phe Gly Lys Lys Asn Asn Asn Asn Asn Ser Asn Ser Asn Asn
165 170 175

Asn Asn Asn Asn Asn Lys Asn Ser Val Asp Lys Arg Phe Lys Thr Leu
180 185 190

Pro Ala Ala Glu Ser Leu Pro Arg Asn Glu Thr Val Gly Gly Tyr Ile
195 200 205

Phe Val Cys Asn Asn Asp Thr Met Gln Glu Asn Leu Gln Arg Gln Leu
210 215 220

Phe Gly Leu Pro Pro Arg Tyr Arg Asp Ser Val Arg Ala Ile Thr Pro
225 230 235 240

Gly Leu Pro Leu Phe Leu Tyr Asn Tyr Ser Thr His Gln Leu His Gly
245 250 255

Ile Phe Glu Ala Ser Ser Phe Gly Gly Thr Asn Ile Asp Pro Thr Ala
260 265 270

Trp Glu Asp Lys Lys Cys Arg Gly Glu Ser Arg Phe Pro Ala Gln Val
275 280 285

pctca2017050779-seql.txt

Arg Val Leu Leu Arg Lys Ile Cys Glu Pro Leu Glu Glu Asp Ser Phe
290 295 300

Arg Pro Val Leu His His Tyr Asp Gly Pro Lys Phe Arg Leu Glu Leu
305 310 315 320

Asn Ile Pro Glu Ala Leu Ala Leu Leu Asp Ile Phe Ser Glu Asn Ser
325 330 335

Pro

<210> 769
<211> 636
<212> PRT
<213> Papaver somniferum

<400> 769

Met Glu Ala Leu Gln Ile Ser Cys Thr Val Val Thr Cys Lys Ser Ser
1 5 10 15

Pro Thr Thr Thr Ala Phe Lys Pro Arg Ser Thr Thr Ser Leu Lys Lys
20 25 30

Ser Asn Ile Phe Gly Ile Thr Asn Ser Ser Ser Gly Ile Leu Leu Ser
35 40 45

Leu Lys Thr Ser Ile Thr Asp Arg Glu Ile Arg Phe Arg Cys Tyr Gln
50 55 60

Asp Gly Phe Ser Ile Ser Asp Ala Glu Glu Ile Asp Ala Lys Asp Lys
65 70 75 80

Asp Gly Ile Phe Met Thr Tyr Lys Lys Lys Thr Asp Pro Gly Val Ser
85 90 95

Lys Ile Gly Glu Val Ile Ala Glu Ser Val Ala Asp Val Gly Glu Ala
100 105 110

Ile Glu Glu Val Val Lys Pro Lys Ala Ala Gly Glu Thr Tyr Ser Ile
115 120 125

Val Val Val Ser Ser Glu Ala Val Pro Tyr Ser Lys Thr Gly Gly Leu
130 135 140

Gly Asp Val Cys Gly Ser Leu Pro Ile Ala Leu Ala Ala Arg Gly His
145 150 155 160

pctca2017050779-seql.txt

Arg Val Met Val Val Ser Pro Arg Tyr Val Asn Gly Ser Ala Ser Asp
165 170 175

Lys Ile Tyr Lys Gly Ala Leu Asp Ala Gln Cys Arg Ile Lys Ile Pro
180 185 190

Cys Phe Glu Ala Glu His Glu Val Ala Phe Phe His Glu Tyr Arg Ala
195 200 205

Gly Val Asp Trp Val Phe Val Asp His Pro Ser Tyr His Arg Pro Gly
210 215 220

Asn Pro Tyr Gly Asp Gln Phe Gly Ala Tyr Gly Asp Asn Gln Phe Arg
225 230 235 240

Phe Thr Leu Leu Ser His Ala Ala Cys Glu Ala Pro Leu Val Leu Pro
245 250 255

Leu Gly Gly Phe Thr Tyr Gly Glu Lys Cys Met Phe Leu Val Asn Asp
260 265 270

Trp His Ala Ser Leu Val Pro Val Leu Leu Ala Ser Lys Tyr Arg Pro
275 280 285

Tyr Gly Val Tyr Lys Asp Ala Arg Ser Ile Leu Ala Ile His Asn Leu
290 295 300

Ala His Gln Gly Val Glu Pro Ala Ala Thr Tyr Lys Asn Phe Gly Leu
305 310 315 320

Pro Ala Glu Trp His Gly Ala Leu Glu Trp Val Phe Pro Thr Trp Ala
325 330 335

Arg Thr His Ala Leu Asp Thr Gly Glu Ala Val Asn Ile Met Lys Gly
340 345 350

Ala Ile Val Thr Ala Asp Arg Ile Leu Thr Val Ser Lys Gly Tyr Ala
355 360 365

Trp Glu Ile Thr Thr Val Glu Gly Gly Tyr Gly Leu Asp Gly Leu Ile
370 375 380

Ser Ser Arg Glu Ser Val Leu Asp Gly Ile Thr Asn Gly Ile Asp Ile
385 390 395 400

Asp Glu Trp Asn Pro Ser Ser Asp Val His Ile Pro Phe His Tyr Ser

405

410

415

Ile Asp Asp Leu Ser Gly Lys Gln Glu Cys Lys Ala Ala Leu Gln Lys
 420 425 430

Glu Leu Gly Leu Pro Val Arg Pro Asp Val Pro Leu Ile Gly Phe Ile
 435 440 445

Gly Arg Leu Asp Tyr Gln Lys Gly Ile Asp Met Ile Glu Ala Ala Met
 450 455 460

Pro Glu Leu Met Met Asp Asp Val Gln Phe Ile Met Leu Gly Ser Gly
 465 470 475 480

Asn Ala Arg Met Glu Asp Trp Met Lys Ala Thr Glu Ala Ala Tyr Lys
 485 490 495

Asp Lys Tyr Arg Gly Trp Val Gly Phe Asn Val Pro Ile Ser His Arg
 500 505 510

Ile Thr Ala Gly Ala Asp Ile Leu Leu Met Pro Ser Arg Phe Glu Pro
 515 520 525

Cys Gly Leu Asn Gln Leu Tyr Ala Met Arg Tyr Gly Thr Ile Pro Val
 530 535 540

Val His Cys Thr Gly Gly Leu Arg Asp Thr Val Glu Asn Phe Asp Pro
 545 550 555 560

Phe Ala Asn Glu Gly Ser Gly Lys Gly Thr Gly Trp Thr Phe Ser Pro
 565 570 575

Leu Ala Lys Asp Pro Met Leu Gly Val Leu Arg Ile Ala Met Asp Thr
 580 585 590

Tyr Arg Lys His Lys Asp Ser Trp Lys Gly Leu Met Lys Arg Gly Met
 595 600 605

Glu Gln Asp Phe Thr Trp Asp Lys Ala Ala Ala Gln Tyr Glu Gln Val
 610 615 620

Phe Lys Trp Ala Phe Met Asp Pro Pro Tyr Val Lys
 625 630 635

<210> 770

<211> 475

<212> PRT

<213> Papaver somniferum

pctca2017050779-seql.txt

<400> 770

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Met Met Gly Met Ser Lys Lys Lys Lys Thr Ala Lys Asn Trp Phe Thr
 1      5      10      15

Ser Val Lys Asn Ala Phe Lys Ser Ser Ala Pro Ile Ser Ser Ser Pro
      20      25      30

Ser Ser Lys Asp Tyr Ser Leu Ala Asn Lys Ile Ile Glu Glu Gly His
 35      40      45

Glu Ile Pro Glu Ile Val Ser Leu Glu His Tyr Pro Val Cys Asp Thr
 50      55      60

Ser Ser Leu Thr Thr Thr Ile Asp Glu Asn Asn Ala Glu Ala Val Leu
 65      70      75      80

Glu Met Arg Asp Glu Asp Arg Arg Arg Ser Asn His Ala Ile Ala Met
      85      90      95

Ala Val Val Ala Ala Glu Ala Ala Val Leu Ala Ala His Glu Ala Thr
      100      105      110

Lys Val Ser Arg Phe Ser Ser Tyr Asn Arg Arg Arg Phe Tyr Gly Tyr
      115      120      125

Ser Lys Glu Glu Arg Ala Ala Thr Lys Ile Gln Ser His Tyr Lys Gly
      130      135      140

Tyr Leu Ala Arg Arg Ala Leu Lys Ala Leu Arg Gly Leu Val Lys Leu
      145      150      155      160

Gln Ala Leu Val Arg Gly His Asn Val Arg Lys Gln Ala Glu Met Thr
      165      170      175

Met Arg Cys Met Gln Ala Ile Val Arg Val Gln Ala Arg Thr Lys Ala
      180      185      190

Asp Arg Leu Arg Leu Gln Gly Ala Thr Ser His Asp Asn Glu Lys Asn
      195      200      205

Lys Ala Lys Lys Ser Ala Thr Glu Thr Trp Asn Asn Ser Arg Gly Arg
      210      215      220

Gln Gln Gln Ala Arg Asn Ser Phe Ser Phe Glu Lys Glu Tyr Ser Arg
      225      230      235      240

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pctca2017050779-seql.txt

Ser Ser Thr Gln Lys Met Asn Lys Gln Glu Asn Tyr Leu Ser Ser Asn
 245 250 255

Ser Met Thr Ile Lys Asn Glu Arg Ala Leu Ala Tyr Ala Tyr Pro Tyr
 260 265 270

Gln Asp Ser Val Ser Asn Arg Gln Asn Ser Val Asp Ser Tyr Ser Asp
 275 280 285

Glu Lys Thr Asn Gln Gly Gly Trp Asn Leu Leu Asp Arg Trp Ile Asp
 290 295 300

Ser Gln Pro Trp His Arg Asp Lys His Val Ala Ala Ile Pro Glu Ser
 305 310 315 320

Ser Tyr Thr Ser Arg Thr Tyr Asn Thr Asp Asp Asp Asn Ala Ser Glu
 325 330 335

Arg Thr Ala Asp Thr Asp Leu Val Ser Leu Ser Pro Ser Tyr Gln Leu
 340 345 350

Arg Phe Asn Pro Ile Ser Asn Leu Ser Lys Leu Gly Ile Asn Ser Ala
 355 360 365

Gly Ser Val Pro Ile Arg Gln Arg Lys Gln Arg Val Met Val Ser Val
 370 375 380

Glu Thr Glu Asn Val Asn Thr Pro Ser Tyr Met Ala Thr Thr Gln Ser
 385 390 395 400

Ala Lys Ala Lys Ala Lys Ser Ala Gln Asn Ser Leu Leu Ser Ser Ser
 405 410 415

Ser Ser Thr Arg Arg Ile Phe Leu Asn Asp Leu Ser Met Ser Ser Ser
 420 425 430

Thr Asp Gly Ile Gly Thr Gly Glu Val Arg Thr Met Asn Gln Leu Gly
 435 440 445

Pro Ile Asn Ser Pro Ser Pro Thr Ser Ser Gln Lys Met Met Arg Leu
 450 455 460

Leu Lys Met Gly Lys Pro Ile Lys Gly Val Arg
 465 470 475

<210> 771
 <211> 184
 <212> PRT

<213> Papaver somniferum

<400> 771

Met Lys Ile Ser Ser Gly Thr Arg Ser Lys Leu Lys Gln Ile Glu Ser
 1 5 10 15

Ile Ser Leu Phe Leu Asp Leu Pro Glu Glu Val His Asp Glu Ile Phe
 20 25 30

Leu Lys Leu Pro Ala Lys Ser Ile Leu Val Ser Arg Cys Val Cys Lys
 35 40 45

Leu Phe Tyr Asn Leu Leu Ser Lys Pro Asn Phe Ile Lys Asn His Leu
 50 55 60

Asn Leu Thr Val Gln Thr Lys Ile Asn Asn Pro Lys Leu Leu Phe Ser
 65 70 75 80

His Tyr Ser Arg Gly Lys His Pro Thr Ile Tyr Ser Ile Pro Ile Asp
 85 90 95

Tyr Ala Ser Ile Ser Ser Ser Ser Ser Val Thr Ser Ser Leu Leu Cys
 100 105 110

Glu Cys Asp Gly Ala Val Leu Ile Asn Tyr Pro Phe Glu Ser Lys Glu
 115 120 125

Met Asn Tyr Leu Glu Phe Leu Gly Ser Leu Asn Gly Leu Ile Cys Ser
 130 135 140

Arg Ile Ser Lys Thr Asp Arg Val Ala Tyr Glu Lys Gly Tyr Phe Leu
 145 150 155 160

Glu Thr Asp Tyr Phe Ser Ile Leu Asn Pro Leu Thr Arg Glu Phe Lys
 165 170 175

Glu Phe Thr Lys Pro Glu Tyr Ser
 180

<210> 772

<211> 1316

<212> PRT

<213> Papaver somniferum

<400> 772

Met Asp Leu Ala Thr Ile Phe Val Ser Pro Ile Leu Gln Asp Leu Ile
 1 5 10 15

pctca2017050779-seq1.txt

Pro Lys Leu Leu Thr Tyr Cys Ser Asp Glu Phe Asn Leu Val Trp Gly
 20 25 30
 Trp Gly Val Lys Asp Asp Leu Arg Lys Leu Ala Gln Thr Leu Lys Lys
 35 40 45
 Ile Glu Ala Val Leu His Asp Ala Glu Lys Arg Gln Gly Gly Asn Asp
 50 55 60
 Lys Leu Val Lys Ile Trp Leu Gly Glu Leu Gln Asp Val Ala Tyr Asp
 65 70 75 80
 Ala Val Asp Ile Phe Asp Glu Leu His Ile Lys Asp Leu Glu Gln Lys
 85 90 95
 Lys Lys Thr Val Ser Lys Val Phe Pro Cys Leu Pro Leu Lys Pro Phe
 100 105 110
 Gly Phe Asp Tyr Lys Ile Ala Leu Lys Val Lys Asp Val Asn Glu Lys
 115 120 125
 Leu Asp Arg Ile Thr Lys Asp Met Glu Arg Phe Asn Phe Thr Ser Gln
 130 135 140
 Phe Gly Ser Ser Ser Thr Ser Gly Ser Asn Ile Thr Val Met Asn Glu
 145 150 155 160
 Ile Arg Glu Glu Thr Ser Ser His Ile Ser Asp Ser Ser Ala Val Val
 165 170 175
 Gly Arg Ile Asp Glu Lys Leu Glu Ile Ile Lys Leu Leu Asn Gln Asp
 180 185 190
 Asp Tyr Ser Val Val Arg Ile Thr Gly Met Gly Gly Met Gly Lys Thr
 195 200 205
 Thr Leu Ala Gln Phe Val Tyr Ala Asn Thr Ser Asp Asp Thr Phe Val
 210 215 220
 Val Lys Lys Trp Val Ser Met Tyr Gly Lys Thr Lys Pro Glu Glu Ile
 225 230 235 240
 Phe Leu Asp Leu Leu Glu Pro Lys Pro Asp Arg Arg Ser Ser Leu Asp
 245 250 255
 Glu Ile Lys Ala Ser Leu Lys Gln Lys Leu Met Val Gly Lys Ser Leu
 260 265 270

pctca2017050779-seql.txt

Ile Val Leu Asp Asp Val Trp Thr Asn His Gly Ile Asp Ile Lys Lys
275 280 285

Leu Leu Lys Asp Ile Leu Ser Met Ser Ser Leu Arg Ile Lys Ile Leu
290 295 300

Met Thr Met Arg Ser Thr Glu Pro Ile Pro Pro Leu Thr Gly Cys Arg
305 310 315 320

Tyr Lys Thr Tyr Pro Leu Gln Gly Leu Val Glu Asp Asp Cys Trp Ser
325 330 335

Ile Ile Lys Lys Thr Ala Phe Ala His Gly Gly Ala Glu Glu Thr Glu
340 345 350

Asp Leu Ile Asn Ile Gly Arg Gln Ile Ser Ile Lys Cys Gly Gly Leu
355 360 365

Pro Leu Ala Ala Lys Thr Leu Gly Gly Leu Leu Tyr Ser Lys Lys Asn
370 375 380

Val Glu Asp Trp Leu Phe Ile Leu Asn Ser Lys Ile Trp Asn Leu Pro
385 390 395 400

Pro Thr Asp Asp Lys Ile Met Ser Ile Leu Lys Leu Ser Tyr Asp His
405 410 415

Leu Ser Pro Asp Val Lys Arg Cys Phe Ser Tyr Cys Ser Ile Phe Pro
420 425 430

Lys Gly His Val Phe Ser Lys Asn Glu Val Ile Arg Met Trp Met Ala
435 440 445

Glu Gly Phe Leu Ile Ser Pro Trp Gln Ala Asn Glu Ser Pro Glu Ile
450 455 460

Val Gly Asn Gly Tyr Phe Lys Ile Leu Leu Leu Asn Ser Phe Phe Gln
465 470 475 480

Asp Glu Arg Arg Asn Ile Trp Gly Asp Ile Lys Ser Phe Arg Met His
485 490 495

Asp Leu Val His Asp Leu Ser Val Ser Ile Thr Gly Cys Glu Ser Leu
500 505 510

Asn Ile Thr Ile Asp Asp Ile Pro Lys Ile Asp Gln Ser Phe Thr Phe
515 520 525

pctca2017050779-seql.txt

Arg Arg Leu Gly Leu Gln Val Leu His Ser Gly Val Ser Thr Ala Ile
530 535 540

Pro Ser Glu Ile Tyr Lys Ala Phe Lys Lys Leu His Thr Phe Val Tyr
545 550 555 560

Ser Gly Leu His Asp Gly Glu Asp Val Trp Ala Arg Arg Val Cys Thr
565 570 575

Phe Gly Phe Ile Arg Val Leu Lys Leu Ser His Thr Gly Ile Glu Glu
580 585 590

Leu Pro Lys Ser Ile Cys Lys Leu Lys His Leu Arg Tyr Leu Asp Val
595 600 605

Lys Arg Cys Asn Arg Leu Lys Glu Leu Pro Gln Asp Ile Arg Lys Leu
610 615 620

Ile Gly Leu Glu Tyr Leu Ile Phe Arg Asn Lys Tyr Thr Leu Ser Ala
625 630 635 640

Lys Met Pro Arg Lys Val Ser Arg Leu Ser Ala Leu Lys Lys Leu Ser
645 650 655

Val Phe Ile Val Gly Glu Glu Gly Lys Gly Ser Gly Ile Glu Glu Leu
660 665 670

Lys Asp Leu Asn Leu Leu Gly Gly Lys Leu Ser Ile Glu Asp Leu Gly
675 680 685

Asn Val Thr Asp Gly Thr Gln Ala Asn Leu Met Gly Lys Lys Asn Ile
690 695 700

Arg His Leu Glu Leu Ser Trp Asp Ser Arg Gly Cys Asn Asp Pro Asp
705 710 715 720

Arg Ile Ile Lys Asp Val Glu Val Ile Asn Asp Leu Gln Pro His Leu
725 730 735

Asn Leu Lys Lys Leu Gly Val Ser His Phe Gly Gly Ser Glu Ile Pro
740 745 750

Thr Trp Leu Arg Ser Ala Ser Val His Leu Pro Lys Leu Val Ser Ile
755 760 765

Thr Leu Tyr Arg Cys Asn Glu Cys Glu His Phe Pro Ala Leu Gly Gly

770

775

780

Leu Gln His Leu Lys Tyr Leu Phe Met Asp Gly Phe Gly Gly Val Lys
 785 790 795 800

Arg Ile Gly Asn Glu Phe Cys Pro Ser Asn Glu Glu Ala Val Ser Phe
 805 810 815

Pro Ser Leu Val Leu Leu Tyr Ile Tyr His Tyr Thr Asn Ser Val Asn
 820 825 830

Ser Asp Arg Ser Ser Arg Ala Ser Thr Phe Ser Trp Ser Glu Asp Leu
 835 840 845

Glu Asn Gln Asn Gly Ser Thr Leu Ser Thr Thr Pro Thr Glu Phe Pro
 850 855 860

Phe Leu Arg Lys Leu Tyr Phe His Ile Glu Arg Gln Val Asp Ala Asn
 865 870 875 880

Leu Lys Ser Leu Ser Pro Lys Leu Leu Trp Gly Val Leu Gln Thr Leu
 885 890 895

Leu Val Ala Gly Cys Asn Glu Phe Val Gly Phe Glu Gln Gln His Arg
 900 905 910

His Gln Leu Asp His Leu Ser Tyr Ser His Leu Arg Arg Leu Glu Val
 915 920 925

Phe Lys Cys Pro Ser Leu Thr Val Leu Pro Ala Asp Phe Ser Gly Leu
 930 935 940

Asn Ser Leu Thr Tyr Leu Ala Ile Glu Glu Cys Ser Ser Leu His Ser
 945 950 955 960

Leu Pro Asp Gly Ile Gln Tyr Leu Pro Ala Leu Glu Thr Leu Ile Ile
 965 970 975

Gly Gly Phe Ser Glu Asp Leu Thr Ser Phe Pro Phe Pro Ala Ala Ser
 980 985 990

Gly Ser Asp Gly Glu Lys Tyr Phe Val Ser Leu Arg Val Leu Lys Ile
 995 1000 1005

Cys Gly Trp Pro Thr Leu Ser Ala Glu Leu Pro Asp Gln Leu Gln
 1010 1015 1020

pctca2017050779-seq1.txt

Leu	Leu	Thr	Cys	Leu	Gln	Cys	Phe	Thr	Ile	Arg	Gly	Phe	Pro	Cys
1025						1030					1035			
Leu	Ser	Ser	Leu	Pro	Glu	Trp	Phe	Arg	Glu	Leu	Ser	Ser	Leu	Gln
1040						1045					1050			
Asn	Leu	Tyr	Phe	Leu	Asn	Cys	Ser	Arg	Leu	Gln	Tyr	Leu	Pro	Ser
1055						1060					1065			
Asp	Glu	Gln	Met	Gln	Arg	Leu	Thr	Ser	Leu	Lys	Thr	Ile	Tyr	Ile
1070						1075					1080			
Trp	Asn	Cys	Pro	Leu	Leu	Leu	Glu	Arg	Cys	Ser	Gly	Asn	Glu	Glu
1085						1090					1095			
Gly	His	Lys	Ile	Ala	Arg	Arg	Lys	Gln	Val	Ile	Gly	Ser	Ser	Pro
1100						1105					1110			
Ser	Leu	Leu	Asp	His	Ile	Pro	Arg	Asp	Ala	Asp	Met	Asn	Leu	Glu
1115						1120					1125			
Leu	Leu	Ala	Arg	Arg	Thr	Ser	Gly	Ile	Phe	Ser	Asn	Gln	Asn	Lys
1130						1135					1140			
Glu	Lys	Arg	Trp	Ile	Asp	Ser	Cys	Gly	Arg	Lys	Cys	Phe	Met	Phe
1145						1150					1155			
Phe	Pro	Thr	Ser	Phe	Tyr	Ile	Ala	Trp	Gly	Asp	Asp	Thr	Arg	Tyr
1160						1165					1170			
Trp	Thr	Trp	Leu	Ser	Val	Thr	Glu	Pro	Ser	Ala	Ala	Ser	Asn	Asn
1175						1180					1185			
Ala	Glu	Ile	Glu	Val	Pro	Glu	Leu	Ile	Lys	Val	Cys	Trp	Leu	Asp
1190						1195					1200			
Val	His	Gly	Thr	Leu	Asp	Met	Ser	Lys	Leu	Thr	Pro	Gly	Val	Asn
1205						1210					1215			
Tyr	Glu	Val	Val	Phe	Ile	Val	Met	Leu	Arg	Glu	Arg	Ser	Tyr	Gly
1220						1225					1230			
Trp	Gly	Lys	Pro	Val	Asn	Leu	Cys	Leu	Val	Leu	Pro	Asp	Gly	Gln
1235						1240					1245			
Arg	Leu	Asp	Gln	Thr	Leu	Val	Leu	Glu	Thr	Met	Pro	Lys	Ser	Thr
1250						1255					1260			

pctca2017050779-seql.txt

Trp Ile Glu Ile His Val Gly Asp Phe Gln Thr Pro Glu Gln Gln
1265 1270 1275

Pro Gly Asp Gln Glu Lys Gln Val Lys Phe Asn Leu Ser Glu Gln
1280 1285 1290

Glu Thr Leu Phe Trp Lys Ser Gly Leu Val Ile Glu Gly Ala Ile
1295 1300 1305

Val Arg Pro Lys Lys Ser Ser Ser
1310 1315

<210> 773
<211> 116
<212> PRT
<213> Papaver somniferum

<400> 773

Gly Lys Gln Gln Val Glu Glu Glu Glu Gln Glu Glu Lys Glu Val Glu
1 5 10 15

Glu Glu Glu Glu Lys Glu Glu Glu Glu Glu Glu Lys Lys Arg Lys Arg
20 25 30

Pro Gly Val Ser Val Lys Glu Tyr Glu Asp Asn Gly Asp Leu Ile Ile
35 40 45

Cys Gln Leu Ser Ser Arg Arg Lys Val Thr Ile Gln Glu Phe Lys Gly
50 55 60

Lys Ala Leu Val Ser Ile Arg Glu Tyr Tyr Glu Lys Asp Gly Lys Glu
65 70 75 80

Leu Pro Ser Thr Lys Gly Ile Ser Leu Thr Ala Glu Gln Trp Phe Thr
85 90 95

Phe Ser Lys Ser Val Pro Gly Ile Glu Gln Ala Ile Lys Lys Met Gln
100 105 110

Thr Arg Ser Arg
115

<210> 774
<211> 125
<212> PRT
<213> Papaver somniferum

<400> 774

pctca2017050779-seql.txt

Ala Cys Cys Val Leu Tyr Leu Val Gly Arg Asn Leu Tyr Ala Phe Leu
1 5 10 15

Gln Lys Leu Leu Glu Val Leu Arg Cys Thr Leu Phe Ile Ile Val Asp
20 25 30

Leu Ala Val Phe Cys Phe Arg Tyr Asp Ala Val Met Glu Ser Trp Gln
35 40 45

Leu Thr Phe Asn Trp Gly Gln Gly Val Ala Phe Gln Ile Arg Asp Val
50 55 60

Lys Thr Arg Val Phe Thr Asp Ile Ala Trp Val Thr Met Lys Thr Tyr
65 70 75 80

Val Asp Asp Pro Asn Ser Gly Pro Phe Asn Val Thr Asn Val Tyr Glu
85 90 95

Phe His Lys Gly Gln Trp Tyr Leu Val His His His Cys Ser Val Ile
100 105 110

Leu Ile Gly Ala Glu Ala Asp Gln Gln Asn Val Phe Gly
115 120 125

<210> 775
<211> 129
<212> PRT
<213> Papaver somniferum

<400> 775

Met Ala Asn Arg Gly Thr Ala Ser Asn Asn Ser Ala Leu Ile Ser Met
1 5 10 15

Ile Ala Asp Glu Asp Thr Ile Thr Gly Phe Leu Leu Ala Gly Val Gly
20 25 30

Asn Val Asp Leu Arg Arg Asn Thr Asn Tyr Leu Ile Val Asp Ser Lys
35 40 45

Thr Thr Val Lys Ala Ile Glu Asp Ala Phe Lys Asp Phe Ile Ser Arg
50 55 60

Glu Asp Ile Ala Ile Val Leu Ile Ser Gln Tyr Val Ala Asn Met Ile
65 70 75 80

Arg Phe Leu Val Asp Ser Tyr Asn Lys Pro Val Pro Ala Ile Leu Glu
85 90 95

pctca2017050779-seql.txt

Ile Pro Ser Lys Asp His Pro Tyr Asp Ala Gln His Asp Ser Val Leu
100 105 110

Ser Arg Val Lys Tyr Leu Phe Ser Ser Glu Ser Val Ala Gly Asp Arg
115 120 125

Arg

<210> 776

<211> 310

<212> PRT

<213> Papaver somniferum

<400> 776

Met Glu Met Asp Asn Ile Glu Cys Val Ser Ser Ile Glu Glu Gly Gly
1 5 10 15

Glu Asp Ile His Gln His His Gln Phe Gly Ser Ser Lys Pro Leu Ile
20 25 30

Asn Asn Leu Ile Ser Pro Ala Thr Ser Val Tyr Glu Leu Leu Glu Cys
35 40 45

Pro Val Cys Thr Asn Ser Met Tyr Pro Pro Ile His Gln Cys His Asn
50 55 60

Gly His Thr Leu Cys Ser Thr Cys Lys Thr Arg Val His Asn Arg Cys
65 70 75 80

Pro Thr Cys Arg Gln Glu Leu Gly Asp Ile Arg Cys Leu Ala Leu Glu
85 90 95

Lys Val Ala Glu Ser Leu Gln Leu Pro Cys Arg Tyr Gly Ser Leu Gly
100 105 110

Cys Pro Asp Ile Phe Pro Tyr Tyr Ser Lys Leu Lys His Glu Ala Met
115 120 125

Cys Asn Phe Arg Pro Tyr Asn Cys Pro Tyr Ala Gly Ser Glu Cys Ala
130 135 140

Ile Val Gly Asp Ile Pro Ser Leu Val Thr His Leu Arg Asp Asp His
145 150 155 160

Lys Val Asp Met His Thr Gly Cys Thr Phe Asn His Arg Tyr Val Lys
165 170 175

pctca2017050779-seq1.txt

Ser Asn Pro Arg Glu Val Glu Asn Ala Thr Trp Met Leu Thr Val Phe
180 185 190

Asn Cys Phe Gly Gln Tyr Phe Cys Leu His Phe Glu Ala Phe Gln Leu
195 200 205

Gly Met Ala Pro Val Tyr Met Ala Phe Leu Arg Phe Met Gly Asp Glu
210 215 220

Thr Asp Ala Arg Asn Tyr Cys Tyr Ser Leu Glu Val Gly Ala Asn Gly
225 230 235 240

Arg Lys Leu Ile Phe Glu Gly Thr Pro Arg Ser Ile Arg Asp Ser His
245 250 255

Arg Lys Val Arg Asp Ser His Asp Gly Leu Ile Ile Gln Arg Asn Met
260 265 270

Ala Leu Phe Phe Ser Gly Gly Asp Arg Lys Glu Leu Lys Leu Arg Val
275 280 285

Thr Gly Arg Ile Trp Lys Glu Gln Gln Asn Gln Glu Ala Gly Ala Cys
290 295 300

Ile Pro Asn Leu Cys Ser
305 310

<210> 777
<211> 320
<212> PRT
<213> Papaver somniferum

<400> 777

Met Glu Met Asp Asn Ile Glu Cys Val Ser Ser Ser Asp Gly Gly Gly
1 5 10 15

Gly Met Glu Glu Glu Asp Ile Arg Thr His Asn His Asn His Asn Asn
20 25 30

Gln Phe Ser Ser Ser Lys Gly Leu Asn Asn Asn Gly Ile Ser Pro Ala
35 40 45

Ala Thr Ser Val His Glu Leu Leu Glu Cys Pro Val Cys Thr Asn Ser
50 55 60

Met Tyr Pro Pro Ile His Gln Cys His Asn Gly His Thr Leu Cys Ser
65 70 75 80

pctca2017050779-seql.txt

Thr Cys Lys Thr Arg Val His Asn Arg Cys Pro Thr Cys Arg Gln Glu
 85 90 95
 Leu Gly Asp Ile Arg Cys Leu Ala Leu Glu Lys Val Ala Glu Ser Leu
 100 105 110
 Glu Leu Pro Cys Lys Tyr Gly Ser Leu Gly Cys Pro Glu Ile Phe Pro
 115 120 125
 Tyr Tyr Ser Lys Leu Lys His Glu Ala Leu Cys Asn Phe Arg Pro Tyr
 130 135 140
 Asn Cys Pro Tyr Ala Gly Ser Glu Cys Ala Val Val Gly Asp Ile Pro
 145 150 155 160
 Phe Leu Val Thr His Leu Arg Asp Asp His Lys Val Asp Met His Thr
 165 170 175
 Gly Cys Thr Phe Asn His Arg Tyr Val Lys Ser Asn Pro Arg Glu Val
 180 185 190
 Glu Asn Ala Thr Trp Met Leu Thr Val Phe Asn Cys Phe Gly Gln Tyr
 195 200 205
 Phe Cys Leu His Phe Glu Ala Phe Gln Leu Gly Met Ala Pro Val Tyr
 210 215 220
 Met Ala Phe Leu Arg Phe Met Gly Asp Glu Asn Asp Ala Arg Asn Tyr
 225 230 235 240
 Ser Tyr Ser Leu Glu Val Gly Ala Asn Gly Arg Lys Leu Ile Trp Glu
 245 250 255
 Gly Thr Pro Arg Ser Ile Arg Asp Ser His Arg Lys Val Arg Asp Ser
 260 265 270
 His Asp Gly Leu Ile Ile Gln Arg Asn Met Ala Leu Phe Phe Ser Gly
 275 280 285
 Gly Asp Arg Lys Glu Leu Lys Leu Arg Val Thr Gly Arg Ile Trp Lys
 290 295 300
 Glu Gln Gln Asn Gln Glu Ala Gly Val Cys Ile Pro Asn Leu Cys Ser
 305 310 315 320
 <210> 778
 <211> 526
 <212> PRT

<213> Papaver somniferum

<400> 778

Met Arg Thr Glu Ser Ile Lys Thr Asn Arg Pro Met Asp Leu Leu Leu
 1 5 10 15

Gln Tyr Leu Gln Pro Ile Ser Val Ala Leu Val Val Ile Ala Leu Val
 20 25 30

Trp Asn Tyr Gly Arg Arg Asn Pro Thr Lys Lys Leu Ala Pro Glu Ala
 35 40 45

Ser Gly Gly Arg Pro Ile Met Gly His Leu His Leu Phe Asn Asp Gly
 50 55 60

Glu Leu Thr His Arg Lys Leu Gly Ala Met Ala Asp Thr Tyr Gly Pro
 65 70 75 80

Val Phe Asn Ile Arg Phe Gly Ser His Lys Thr Leu Val Val Ser Asp
 85 90 95

Trp Glu Ile Val Lys Glu Cys Phe Thr Thr Asn Asp Lys Leu Phe Ser
 100 105 110

Asn Arg Pro Gly Thr Leu Gly Ile Lys Leu Met Phe Tyr Asp Ala Asp
 115 120 125

Ser Val Gly Tyr Ala Pro Tyr Gly Ala Tyr Trp Arg Asp Leu Arg Lys
 130 135 140

Ile Ser Thr Leu Lys Leu Leu Ser Asn His Arg Ile Asp Thr Ile Lys
 145 150 155 160

His Leu Arg Ser Ser Glu Val Glu Ser Cys Phe Glu Ser Leu Tyr Ser
 165 170 175

Gln Trp Gly Asn Gly Glu Lys Ser Gly Glu Phe Ala Pro Val Arg Met
 180 185 190

Asp Ser Trp Leu Gly Asp Leu Thr Phe Asn Val Val Ala Arg Ile Val
 195 200 205

Ala Gly Lys Lys Asn Phe Ser Ala Asn Gly Asp Val Gly Ala Gln Arg
 210 215 220

Tyr Lys Ala Ala Met Asp Glu Ala Met Arg Leu Met Arg Phe Phe Ala
 225 230 235 240

pctca2017050779-seql.txt

Phe Ser Asp Val Ile Pro Ser Leu Ser Trp Leu Asp Asn Leu Arg Gly
 245 250 255
 Leu Val Arg Glu Met Lys Lys Cys Ala Ser Glu Ile Asp Ser Ile Met
 260 265 270
 Ala Thr Trp Val Glu Glu His Arg Val Lys Arg Asn Ser Gly Gly Asn
 275 280 285
 Ser Gln Leu Glu His Asp Phe Ile Asp Val Cys Leu Asp Ile Met Glu
 290 295 300
 His Ser Ser Leu Pro Gly Asp Asp Pro Asp Leu Val Val Lys Ser Thr
 305 310 315 320
 Cys Leu Asp Met Ile Leu Gly Gly Ser Asp Thr Thr Thr Val Thr Leu
 325 330 335
 Thr Trp Ala Met Ser Leu Leu Leu Asn His Pro Gln Val Leu Gln Lys
 340 345 350
 Ala Lys Glu Glu Leu Glu Thr Gln Val Gly Lys Asn Arg Gln Val Asp
 355 360 365
 Asp Ser Asp Ile Pro Asn Leu Pro Phe Ile Gln Ala Ile Ile Lys Glu
 370 375 380
 Thr Met Arg Leu Tyr Pro Ala Gly Pro Leu Ile Glu Arg Arg Thr Met
 385 390 395 400
 Glu Asp Cys Glu Val Ala Gly Tyr Gln Val Pro Ala Gly Thr Arg Leu
 405 410 415
 Leu Val Asn Val Trp Lys Met Gln Arg Asp Gly Asn Val Tyr Lys Gly
 420 425 430
 Asp Pro Leu Glu Phe Arg Pro Asp Arg Phe Leu Thr Ser Asn Ala Asp
 435 440 445
 Val Asp Leu Lys Gly Gln His Tyr Glu Leu Ile Pro Phe Gly Ala Gly
 450 455 460
 Arg Arg Ile Cys Pro Gly Val Ser Phe Ala Val Gln Leu Met His Leu
 465 470 475 480
 Val Leu Ala Arg Leu Leu His Glu Phe Glu Ile Thr Thr Val Glu Pro
 485 490 495

pctca2017050779-seql.txt

Glu Thr Lys Val Asp Met Ala Glu Ser Gly Gly Leu Leu Cys Tyr Lys
500 505 510

Ile Met Pro Leu Glu Val Leu Ile Lys Pro Arg Leu Glu Ile
515 520 525

<210> 779

<211> 384

<212> PRT

<213> Papaver somniferum

<400> 779

Met Ile Ile Glu Thr Leu Asp Ile Leu Gly Pro Asn Gln Asn Gly Asn
1 5 10 15

Ser Gly Thr His Thr Gln Lys Pro Ile Lys Thr Arg Asn Trp Leu Leu
20 25 30

Ile Ile Ile Asn Cys Ala Leu Val Phe Cys Gly Val Ile Gly Gly Pro
35 40 45

Leu Leu Met Arg Leu Tyr Tyr Leu His Gly Gly Ser Arg Lys Trp Leu
50 55 60

Ser Ser Phe Leu Gln Thr Ala Gly Phe Pro Val Leu Ile Phe Pro Leu
65 70 75 80

Ile Phe Leu Tyr Ile Lys Pro Lys Leu Ser Thr Gln Asn Asn Asp Gln
85 90 95

Ser Ser Ser Phe Phe Met Glu Pro Lys Leu Phe Leu Trp Ser Ala Ile
100 105 110

Val Gly Ile Val Phe Gly Val Ser Asn Phe Met Tyr Ala Leu Gly Leu
115 120 125

Ser Tyr Leu Pro Val Ser Thr Ser Thr Ile Leu Phe Ala Thr Gln Leu
130 135 140

Cys Phe Thr Ala Ile Phe Ala Trp Leu Ile Val Lys Gln Lys Phe Thr
145 150 155 160

Ala Phe Ile Ile Asn Ala Val Ile Val Met Thr Leu Gly Ser Ile Leu
165 170 175

Leu Gly Ile Asn Thr Asn Gly Asp Arg Pro Ile Gly Val Ser Lys Thr
180 185 190

pctca2017050779-seql.txt

Gln Tyr Leu Ile Gly Phe Leu Met Thr Leu Ala Ala Ala Ala Leu Thr
195 200 205

Gly Leu Gly Thr Pro Phe Val Glu Leu Ser Phe Ile Lys Ala Thr Arg
210 215 220

Asn Ile Thr Tyr Pro Thr Leu Leu Gln Phe Gln Val Ile Leu Cys Leu
225 230 235 240

Phe Gly Thr Cys Leu Asn Val Ile Gly Met Leu Ile Asn Lys Asp Phe
245 250 255

Gln Ala Ile Pro Arg Glu Ala Asp Met Phe Glu Leu Gly Lys Ser Lys
260 265 270

Tyr Tyr Met Ile Ile Cys Leu Thr Ala Leu Thr Trp Gln Leu Ser Gly
275 280 285

Ile Gly Leu Val Gly Leu Ile Leu Tyr Thr Asn Ala Leu Phe Asn Gly
290 295 300

Ile Tyr Val Ser Val Leu Val Pro Phe Thr Glu Val Ala Ala Val Ile
305 310 315 320

Phe Phe His Glu Lys Phe Thr Gly Leu Lys Gly Met Ala Leu Ala Leu
325 330 335

Cys Leu Trp Gly Phe Ser Ser Tyr Phe Tyr Gly Glu Tyr Lys Met Met
340 345 350

Asn Lys Val Gly Asp Asn Glu Thr His Glu Lys Ile Glu Glu Ala Glu
355 360 365

Ser Glu Pro Lys Arg Leu Glu Asp Gln Gln Ala Pro Tyr Ser Thr Val
370 375 380

<210> 780
<211> 105
<212> PRT
<213> Papaver somniferum

<400> 780

Met Leu Glu Lys Lys Asp Gly Arg Leu Ser Arg Lys Phe Asn Leu Lys
1 5 10 15

Lys Leu Arg Asp Thr Phe Cys Asp Thr Lys Lys Ile Phe Asp Lys Glu
20 25 30

pctca2017050779-seql.txt

Gly Arg Val Asn Pro Val Arg Ile Asn Ala Thr Ala Ser Gly Tyr Leu
35 40 45

Leu Tyr Val Leu Gly Lys Cys Ile Phe Pro Asp Ser Ser Gly Ser Leu
50 55 60

Val Asp Ala Ser Tyr Met Gln Leu Leu Asp Pro Leu Asp Lys Met His
65 70 75 80

Glu Tyr Ser Trp Gly Thr Ala Met Val Ala Phe Leu Asn Asn Glu Leu
85 90 95

Thr Lys Gly Ser Arg Ala Leu Thr Ala
100 105

<210> 781
<211> 146
<212> PRT
<213> Papaver somniferum

<400> 781

Met Lys Phe Asn Pro Arg Val Ser Ser Ser Arg Arg Lys Asn Arg Lys
1 5 10 15

Ala His Phe Thr Ala Pro Ser Ser Val Arg Arg Val Leu Met Ser Ser
20 25 30

Pro Leu Ser Ser Glu Leu Arg Ser Lys Tyr Asn Val Arg Ser Val Pro
35 40 45

Val Arg Lys Asp Asp Glu Val Gln Val Val Arg Gly Thr Phe Lys Gly
50 55 60

Arg Glu Gly Lys Val Ile Gln Val Tyr Arg Lys Lys Trp Val Ile His
65 70 75 80

Val Glu Arg Ile Thr Arg Glu Lys Val Asn Gly Ser Thr Val Asn Val
85 90 95

Gly Val Asn Pro Ser Lys Cys Val Ile Thr Lys Leu Arg Leu Asp Lys
100 105 110

Asp Arg Lys Ser Leu Leu Asp Arg Lys Ala Lys Gly Arg Ala Ala Ala
115 120 125

Asp Lys Asp Lys Gly Thr Lys Phe Thr Thr Asp Asp Val Met Lys Asn
130 135 140

pctca2017050779-seql.txt

Val Asp
145

<210> 782
<211> 134
<212> PRT
<213> Papaver somniferum

<400> 782

Met Ala Ile His Leu Tyr Lys Thr Ser Thr Pro Ser Thr Arg Asn Gly
1 5 10 15

Ala Val Asp Ser Gln Val Lys Ser Asn Ser Arg Asn Asn Leu Ile Ser
20 25 30

Gly Gln Gln Arg His Cys Gly Lys Gly Arg Asn Ala Arg Gly Ile Ile
35 40 45

Thr Ala Arg His Arg Gly Gly Gly His Lys Arg Leu Tyr Arg Lys Ile
50 55 60

Asp Phe Arg Arg Asn Glu Lys Asp Ile Ser Gly Arg Ile Val Thr Ile
65 70 75 80

Glu Tyr Asp Pro Asn Arg Asn Ala Tyr Ile Cys Leu Ile His Tyr Gly
85 90 95

Asp Gly Glu Lys Arg Tyr Ile Leu His Pro Arg Gly Ala Ile Ile Gly
100 105 110

Asp Thr Ile Val Ser Gly Thr Glu Val Pro Ile Ser Met Gly Asn Ala
115 120 125

Leu Pro Leu Ser Ala Val
130

<210> 783
<211> 99
<212> PRT
<213> Papaver somniferum

<400> 783

Met Thr Leu Leu Phe Pro Phe Asp Val Val Ile Tyr Ala Gly Thr Arg
1 5 10 15

Thr Asp Ala Ser Ser His Phe Ser Ala Gly Cys Pro Tyr Gly Lys Trp
20 25 30

pctca2017050779-seql.txt

Thr Thr Glu Arg Ser Ser Phe Glu Asp Cys Asp Thr Val Thr Val Asn
35 40 45

His Gly Lys His Pro Ala Ser Ala Ile Pro Ser Cys Ala Ser Ala Ser
50 55 60

Lys Cys Met Ile Pro Ser Asn Leu Ile Leu Lys Val Val Asn Ile Gly
65 70 75 80

Cys Phe Gly Arg Tyr Tyr Arg Phe Leu Ser Cys Ile Gly Lys Lys Leu
85 90 95

Tyr Asp Ile

<210> 784

<211> 127

<212> PRT

<213> Papaver somniferum

<400> 784

Met Ser Pro Tyr Arg Leu Val Phe Gly Lys Ala Cys His Leu Pro Val
1 5 10 15

Glu Ile Glu His Arg Ala Tyr Trp Ala Ile Lys Asn Leu Asn Phe Ser
20 25 30

Leu Asp Lys Glu Gly Ala Gln Arg Lys Leu Gln Phe Asn Glu Leu Asp
35 40 45

Glu Ile Leu Arg Asp Ala Tyr Asp Ser Ala Lys Glu Tyr Lys Asn Lys
50 55 60

Met Lys Leu Val His Asp Arg Asn Ile Leu Arg Lys Ser Phe Ser Pro
65 70 75 80

Gly Gln Lys Val Leu Leu Tyr Asp Thr Arg Leu His Leu Phe Ser Gly
85 90 95

Lys Leu Arg Ser Arg Trp Thr Gly Pro Phe Val Val Arg Thr Val Phe
100 105 110

Pro His Gly Ala Val Glu Ile Glu Thr Pro Asp Gly Ser Ser Ser
115 120 125

<210> 785

<211> 318

<212> DNA

<213> Papaver somniferum

<400> 785

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gaggtgaatg tgattgtcaa gaactccggg ttgtggcctg cggtggagag ttcgaatatt    120
gagcatgata aagttaccgt atctgcattc tgtgagaggt tctacagaga gactgataca    180
atgttattcc cattcgggtga gatggcgaca actcccgatg atgctcaaca aattctaggc    240
ctcgagggttg atggaaaagc agtcactgag ggattcgata ataagtttcc tttcaaggat    300
atttaciaat tgagctag                                           318

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<210> 786

<211> 108

<212> PRT

<213> Papaver somniferum

<400> 786

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Met Thr Thr Thr Ser Tyr Ser Val Ser Lys Gln Thr Gln His Glu Tyr
1           5           10           15

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Leu Gln Phe Ser Thr Ser Tyr Thr Gly Tyr Leu Thr Arg Thr Met Met
20           25           30

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Ile Tyr Asp Gln Leu Arg Pro Ser Met Lys Leu Gln Leu Val Lys Val
35           40           45

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Tyr Gln Val Tyr His Val Thr Leu Glu Glu Leu Ser Asn Trp Val Thr
50           55           60

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Gly Thr Trp Thr Arg Arg Lys Ile Ser Ser Trp Val Phe Ala Val Thr
65           70           75           80

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Gly Val Lys Arg Lys Phe Arg Leu Thr Gly Asp Met Ser Trp Pro Asn
85           90           95

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Tyr Asp Pro Lys Arg Ser Ile Pro Gly Leu Lys Ser
100          105

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<210> 787

<211> 339

<212> PRT

<213> Papaver somniferum

<400> 787

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Met Gly Ser Ser Gln Gly Ser Thr Thr Leu Ser Val Lys Glu Leu Lys
1           5           10           15

```

```

Arg Glu Val Tyr Phe Ile Asp Ser Leu Pro Val Tyr Val Lys Glu Leu

```

Ile Ala Gly Gly Tyr Ala Gly Ala Phe Ala Lys Thr Ala Val Ala Pro
35 40 45

Leu Glu Arg Ile Lys Ile Leu Leu Gln Thr Arg Thr Glu Gly Tyr His
50 55 60

Ser Ile Gly Val Trp Arg Ser Leu Lys Lys Leu Leu Lys Gln Glu Gly
65 70 75 80

Val Arg Gly Phe Tyr Lys Gly Asn Gly Ala Ser Val Leu Arg Ile Val
85 90 95

Pro Tyr Ala Ala Leu His Phe Met Thr Tyr Glu Gln Tyr Arg Cys Trp
100 105 110

Ile Leu Asn Asn Tyr Ser Ala Leu Gly Thr Gly Pro Ile Val Asp Leu
115 120 125

Val Ala Gly Ser Val Ala Gly Gly Thr Ala Val Leu Val Thr Tyr Pro
130 135 140

Leu Asp Leu Ala Arg Thr Lys Leu Ala Tyr Gln Val Leu Gly Arg Arg
145 150 155 160

Gly Gly Ser Phe Gly Asn Gly Met Ser Ser Ser Gln Ser Leu Pro Ala
165 170 175

Tyr Ser Gly Ile Arg Asp Val Phe Lys Ser Val Tyr Arg Glu Gly Gly
180 185 190

Ala Arg Ser Leu Tyr Arg Gly Ile Gly Pro Thr Leu Ile Gly Ile Leu
195 200 205

Pro Tyr Ala Gly Leu Lys Phe Tyr Val Tyr Glu Glu Leu Lys Arg His
210 215 220

Val Pro Glu Glu Gln Gln Lys Ser Val Met Met Arg Leu Ser Cys Gly
225 230 235 240

Ala Leu Ala Gly Leu Phe Gly Gln Thr Phe Thr Tyr Pro Leu Asp Val
245 250 255

Val Arg Arg Gln Met Gln Val Gln Thr Met Gln Pro Ser Asn His Leu
260 265 270

pctca2017050779-seq1.txt

Gly Asn Pro Arg Tyr Arg Thr Thr Met Gln Gly Leu Thr Ser Ile Ile
275 280 285

Arg Asp Gln Gly Cys Lys Gln Leu Phe Ala Gly Leu Ser Ile Asn Tyr
290 295 300

Val Lys Ile Val Pro Ser Val Ala Ile Gly Phe Thr Ala Tyr Asp Met
305 310 315 320

Met Lys Ser Tyr Leu Arg Val Pro Pro Arg Gln Lys Ala Pro Ser Ala
325 330 335

Ser Ala Gly

<210> 788
<211> 339
<212> PRT
<213> Papaver somniferum

<400> 788

Met Ser Arg Gly Arg Glu Lys His Leu Asp Thr Val Tyr Lys Ala Arg
1 5 10 15

Thr Val Val Ala Glu Asp Thr Val Val Lys Gln Asp His Tyr Asn Val
20 25 30

Ser Ser His Gly Arg Pro Glu Val Val Pro Gln Arg Asp Asn Glu Gln
35 40 45

Leu Trp Ser Arg Arg Arg Arg Asp His Thr Ala Asp Val Glu Lys Glu
50 55 60

Arg Gly His Glu Val Ala Asp Lys Val Ser Ala Val Lys Glu Lys Glu
65 70 75 80

Lys Asp Arg Glu Val Ala Glu Thr Ala Lys Pro Gln Tyr Lys Ala Phe
85 90 95

Ala Pro Pro Pro Tyr Val Lys Gln Pro Asn Val Val Lys Asn Gly Ile
100 105 110

Gln Asn Asp Thr Phe Gly Pro Glu Lys Thr Leu Leu Glu Pro Pro Val
115 120 125

His Arg Arg Tyr Met Asn Val Gly Ser Glu Arg Ser His Asp Glu Arg
130 135 140

pctca2017050779-seql.txt

Gln Glu Phe Arg Pro Ala Lys Val Asn His Val Asn Glu His Ser His
145 150 155 160

His Asp Asp Ser Val Ser Asp Arg Ala Leu Lys Pro Lys Pro Met Ser
165 170 175

Val Arg Arg Arg Gln Met Lys Pro Pro Leu Ser Tyr Glu Asn Pro Thr
180 185 190

Ser Ile Glu Gly Asp Asp Thr Met Arg Arg Val Pro Ser Ala Arg Arg
195 200 205

Arg Glu Ala Arg Asn Gly Leu Gln His Ala Leu Asp Asp Asp His Lys
210 215 220

Lys Glu Lys Asp Glu Glu Glu Leu Ala Met Asp Gln Leu Leu Met His
225 230 235 240

Tyr Ser Lys Lys Pro Thr Lys Tyr Glu Pro Ile Met Val Lys Ala Gly
245 250 255

Leu Ser Ser Asn Val Arg Pro Ser Ser Arg Asp Glu Thr Glu Arg Gln
260 265 270

Arg Pro Ser Thr Arg Asn Glu Thr Glu Arg Arg Arg Pro Phe Arg Ala
275 280 285

Thr Ser Leu Pro Pro Glu Pro Ala Thr Pro Pro Lys Glu Ala Gly Lys
290 295 300

Ala Pro Ser Arg Ala Thr Ser Phe Gln Pro Glu Arg Leu Phe Val His
305 310 315 320

Pro Asn Leu Pro Glu Tyr Asp Asp Leu Ala Ala Arg Ile Ala Ser Leu
325 330 335

Arg Glu Arg

<210> 789
<211> 169
<212> PRT
<213> Papaver somniferum

<400> 789

Met Gly Arg Thr Ile His Ile Tyr Gly Phe Pro Ser Tyr Val Thr Ala
1 5 10 15

pctca2017050779-seql.txt

Glu Leu Ile Lys Asp Phe Leu Glu Asp Tyr Thr Gly Lys Gly Ser Val
 20 25 30

Tyr Ala Leu Gln Val Thr Ile Pro Lys Asn Lys Gly Pro Asn Pro Arg
 35 40 45

Ala Tyr Ala Asp Ile Gln Phe Thr Thr Thr Gln Asn Ala Asp Tyr Met
 50 55 60

Ser Leu Leu Ile Asn Gln Pro Gln Arg Leu Ser Tyr Gly Thr Ser Tyr
 65 70 75 80

Leu Lys Val Phe Gly Arg Asp Arg Asp Ile Ile Pro Lys Pro Arg Val
 85 90 95

Ser Met Phe His Leu Lys Val Pro Thr Leu His Phe Gly Cys Gln Val
 100 105 110

Ser Asn Asp Cys Phe Tyr Thr Leu Cys Lys Thr Lys Asp Val Ser Val
 115 120 125

Asp Phe Gly Phe Gly Phe Arg Lys Leu Cys Cys Leu Leu Ser Tyr Lys
 130 135 140

Asp Pro Leu Lys Ile Lys Pro Val Asn Tyr Lys Leu Glu Leu Ser Tyr
 145 150 155 160

Glu Ser Ile Trp Glu Ile Gln Leu Arg
 165

<210> 790

<211> 1143

<212> PRT

<213> Papaver somniferum

<400> 790

Leu Asn Pro Lys Phe Cys Phe Leu Leu Leu Phe Phe Leu Cys Ser Leu
 1 5 10 15

Leu Pro Leu Leu Ala Ser Ile Ile Pro Ile Leu Phe Arg Arg Leu Pro
 20 25 30

Asn Pro His Leu Lys Val Ser Ile Asn Ala Leu His Arg Leu Ala Ser
 35 40 45

Asn His Ser Phe Cys Gln Met Ala Asn Lys Glu Thr Asp Gly Ala Lys
 50 55 60

pctca2017050779-seql.txt

Ser Tyr Ala Arg Arg Asp Lys Leu Leu Gly Ile Glu Arg Asp Val Gln
 65 70 75 80
 Thr Trp Trp Asp Glu Ser Asp Val Phe Leu Ala Glu Ser Cys Lys Asn
 85 90 95
 Pro Pro Lys Leu Gly Glu Lys Phe Phe Gly Asn Phe Pro Tyr Pro Tyr
 100 105 110
 Met Asn Gly Leu Leu His Leu Gly His Ala Phe Ser Leu Ser Lys Leu
 115 120 125
 Glu Phe Ser Ala Ala Tyr His Arg Leu Arg Gly Ala Asn Val Leu Leu
 130 135 140
 Pro Phe Gly Phe His Cys Thr Gly Met Pro Ile Lys Ala Ser Ala Asp
 145 150 155 160
 Lys Leu Ala Arg Glu Ile Glu Arg Phe Gly Asn Pro Pro Val Phe Pro
 165 170 175
 Ser Lys Glu Asp Gln Ile Val Asn Lys Val Gln Glu Pro Glu Val Asp
 180 185 190
 Thr Ser Gly Lys Thr Glu Pro Asp Lys Phe Lys Ser Lys Lys Ser Lys
 195 200 205
 Ala Ala Ser Lys Ser Gly Gly Glu Lys Tyr Gln Trp Glu Ile Met Lys
 210 215 220
 Glu Tyr Gly Leu Ala Asp Ala Glu Ile Ser Lys Phe Gln Asp Pro Ser
 225 230 235 240
 His Trp Leu Ile Tyr Phe Pro Pro Val Ala Lys Glu Asp Leu Lys Ala
 245 250 255
 Phe Gly Leu Gly Cys Asp Trp Arg Arg Ser Phe Ile Thr Thr Asp Met
 260 265 270
 Asn Pro Tyr Tyr Asp Ser Phe Val Arg Trp Gln Ile Gly Lys Leu Lys
 275 280 285
 Glu Met Gly Lys Ile Val Lys Asp Leu Arg Tyr Ala Ile Tyr Ser Pro
 290 295 300
 Leu Asp Gly Glu Pro Cys Ala Asp His Asp Arg Ala Ser Gly Glu Gly
 305 310 315 320

pctca2017050779-seql.txt

Val Leu Pro Gln Asp Tyr Thr Leu Ile Lys Met Glu Val Val Pro Pro
325 330 335

Phe Pro Ala Lys Met Gly Ser Leu Glu Gly Lys Arg Val Phe Leu Ala
340 345 350

Ala Ala Thr Leu Arg Pro Glu Thr Met Tyr Gly Gln Thr Asn Ala Trp
355 360 365

Ile Leu Ala Glu Gly Lys Tyr Gly Ala Tyr Glu Ile Asn Asp Thr Asp
370 375 380

Val Phe Val Val Thr Glu Arg Ala Ala Leu Asn Leu Ala Tyr Gln Asn
385 390 395 400

Leu Ser Arg Ile Pro Glu Lys Pro Thr Cys Leu Val Glu Leu Ile Gly
405 410 415

Gln Asp Leu Ile Gly Leu Pro Val Gln Ser Pro Leu Ser Phe Asn Lys
420 425 430

Ile Ile Tyr Thr Leu Pro Met Met Asn Val Leu Thr Asp Lys Gly Thr
435 440 445

Gly Ile Val Thr Ser Val Pro Ser Asp Ser Pro Asp Asp Phe Met Thr
450 455 460

Met Asn Asp Leu Glu Thr Lys Lys Ala Leu Arg Glu Lys Phe Gly Val
465 470 475 480

Lys Ala Glu Trp Val Phe Pro Phe Glu Val Val Pro Ile Ile Asn Ile
485 490 495

Pro Glu Phe Gly Glu Lys Ser Ala Glu Lys Val Cys Met Asp Leu Lys
500 505 510

Ile Lys Ser Gln Asn Glu Lys Glu Lys Leu Ala Glu Ala Lys Arg Leu
515 520 525

Thr Tyr Leu Lys Gly Phe Thr Glu Gly Thr Met Leu Val Gly Glu Phe
530 535 540

Ala Gly Met Arg Val Gln Asp Ala Lys Pro Leu Ile Arg Thr Lys Leu
545 550 555 560

Leu Glu Asn Ser Gln Ala Val Ser Tyr Ser Glu Pro Glu Lys Lys Val
565 570 575

pctca2017050779-seql.txt

Met Ser Arg Ser Gly Asp Glu Cys Val Val Ala Leu Thr Asp Gln Trp
580 585 590

Tyr Ile Thr Tyr Gly Glu Glu Gly Trp Arg Lys Met Ala Glu Glu Cys
595 600 605

Leu Ser Glu Met Lys Leu Tyr His Asp Glu Thr Arg Asn Gly Phe Glu
610 615 620

His Thr Leu Ser Trp Leu Asn Lys Trp Gly Cys Ser Arg Ser Phe Gly
625 630 635 640

Leu Gly Thr Arg Ile Pro Phe Asp Glu Gln Phe Leu Val Glu Ser Leu
645 650 655

Ser Asp Ser Thr Leu Tyr Met Ala Tyr Tyr Thr Ile Ala His Met Leu
660 665 670

Gln Asn Gly Glu Met Tyr Gly Arg Asp Ala Ser Leu Val Lys Pro Glu
675 680 685

Gln Met Thr Asp Glu Val Trp Asn Tyr Val Phe Cys Asp Gly Leu Tyr
690 695 700

Pro Lys Ser Ser Thr Ile Ser Gln Ser Val Leu Asn Lys Met Lys Gln
705 710 715 720

Glu Phe Ser Tyr Trp Tyr Pro Phe Asp Leu Arg Val Ser Gly Lys Asp
725 730 735

Leu Ile Gln Asn His Leu Thr Phe Thr Ile Tyr Asn His Thr Ala Leu
740 745 750

Leu Pro Gln His His Trp Pro Arg Gly Phe Arg Cys Asn Gly His Ile
755 760 765

Met Leu Asn Ser Glu Lys Met Ser Lys Ser Thr Gly Asn Phe Lys Thr
770 775 780

Leu Arg Gln Ala Ile Glu Asp Phe Ser Ala Asp Ala Thr Arg Phe Ala
785 790 795 800

Leu Ala Asp Ala Gly Asp Gly Met Asp Asp Ala Asn Phe Val Phe Asp
805 810 815

Thr Ser Thr Ser Ala Ile Met Arg Leu Thr Lys Glu Ile Ser Trp Met


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      820                      825                      830
Glu Glu Ile Leu Glu Ser Glu Ser Ser Leu Arg Ser Gly Pro Ser Thr
      835                      840                      845
Tyr Ala Asp Arg Val Phe Leu Asn Glu Ile Asn Ile Ala Val Ala Glu
      850                      855                      860
Thr Glu Lys Asn Phe Asp Glu Tyr Met Phe Arg Asp Ala Leu Lys Thr
      865                      870                      875
Gly Phe Tyr Asp Leu Gln Ala Ala Arg Asp Glu Tyr Arg Phe Ser Cys
      885                      890                      895
Gly Ile Gly Gly Met Asn Arg Asp Leu Leu Trp Arg Phe Met Asp Val
      900                      905                      910
Gln Thr Arg Leu Ile Thr Pro Ile Cys Pro His Tyr Ala Glu Tyr Val
      915                      920                      925
Trp Arg Lys Leu Leu Lys Lys Asp Gly Phe Val Ile Lys Ala Gly Trp
      930                      935                      940
Pro Thr Ala Gly Ile Pro Asp Leu Thr Leu Arg Arg Ala Asn Met Tyr
      945                      950                      955
Leu Gln Asp Thr Ile Ala Ser Met Arg Lys Leu Leu Glu Lys Gln Ile
      965                      970                      975
Ser Gly Ser Lys Lys Pro Asn Lys Lys Ala Thr Pro Val Thr Leu Pro
      980                      985                      990
Ser Thr Glu Asn Lys Pro Thr Lys Gly Leu Ile Tyr Val Asn Glu His
      995                      1000                     1005
Tyr Asp Gly Trp Lys Ala Glu Cys Leu Asn Ile Leu Arg Ala Asn
      1010                     1015                     1020
Phe Asn Thr Glu Ser Cys Gln Phe Lys Pro Asp Ser Glu Ile Gln
      1025                     1030                     1035
Leu Ala Leu Lys Gln Ser Asn Val Gly Gln Gln Ala Asn Phe Lys
      1040                     1045                     1050
Gln Val Gln Lys Leu Cys Met Pro Phe Leu Lys Phe Lys Lys Asp
      1055                     1060                     1065

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pctca2017050779-seql.txt

Glu Ala Leu Ser Val Gly Ile Gln Ala Leu Asp Leu Lys Leu Pro
 1070 1075 1080

Phe Gly Glu Met Glu Val Leu Gln Glu Asn Gln Glu Leu Ile Arg
 1085 1090 1095

Arg His Leu Gly Leu Glu Gln Val Gln Val Leu Asp Ala Leu Asn
 1100 1105 1110

Ala Asp Asp Ile Ile Lys Ala Gly Gln His Ala Ile Leu Leu Gln
 1115 1120 1125

Gln Thr Pro Leu Ser Pro Gly Ser Pro Thr Ser Ile Phe Leu Ser
 1130 1135 1140

<210> 791

<211> 1015

<212> PRT

<213> Papaver somniferum

<400> 791

Ala Arg Ile Leu Phe Pro Phe His Arg Ser Asp Ser Arg Val Leu Phe
 1 5 10 15

Ser Ser Leu Met Glu Glu Val Ala Met Asn Pro Asn Asp Leu Asn Pro
 20 25 30

Asn Thr Thr Thr Pro Met Glu Glu Ile Ser Thr Ile Ser Met Asp Ser
 35 40 45

Ser Thr Thr Ser Ser Ser Val Thr Thr Thr Thr Thr Thr Ile Thr Gln
 50 55 60

Ile Ser Val Ser Glu Lys Leu Gln Ile Thr Asp Glu Gln Val Arg Val
 65 70 75 80

Ser Gly Phe Gly Ser Gly Ser Leu Leu Lys Pro Leu Val Lys Cys Ser
 85 90 95

Glu Lys Val Ser Glu Ser Lys Phe Gln Val Glu Ser Val Val Gly Ser
 100 105 110

Val Ser Val His Lys Glu Val Gly Glu Asn Gly Gly Gly Val Leu Glu
 115 120 125

Glu Val Glu Ile Arg Val Ser Glu Met Glu Lys Val Glu Glu Ile Ser
 130 135 140

pctca2017050779-seql.txt

Asp Val Val Val Leu Ser Glu Glu Glu Glu Lys Glu Asp Val Val
 145 150 155 160
 Gly Ser Val Ser Val Asn Lys Glu Asn Gly Val Val Val Leu Glu Glu
 165 170 175
 Gly Glu Asn Arg Lys Glu Ile Arg Val Ser Glu Met Glu Thr Glu Glu
 180 185 190
 Gly Ala Gly Ala Ile Glu Glu Glu Glu Lys Gln Asp Leu Val Val Asp
 195 200 205
 Asp Glu Lys Met Val Cys Glu Asn Val Asn Gly Gly Asp Glu Ser Met
 210 215 220
 Ser Ala Ala Ser Glu Glu Glu Glu Asp Ala Ser Gly Gly Asp Asp Lys
 225 230 235 240
 Thr Ser Thr Gly Asp Asn Lys Met Gly Ser Pro Val Asp Asp Gly Asp
 245 250 255
 Glu Ser Met Ser Ala Ala Ser Glu Glu Asp Val Ser Gly Gly Asp Val
 260 265 270
 Glu Thr Thr Thr Gly Asp Lys Ala Glu Glu Ala Glu Glu Glu Glu
 275 280 285
 Glu Glu Asn Met Val Gly Val Asp Val Lys Glu Asp Ser Ser Leu Ala
 290 295 300
 Ala Glu Gly Ile Ser Gly Ala Val Lys Thr Thr Gly Lys Gly Gly Gly
 305 310 315 320
 Gly Thr Lys Ala Glu Glu Lys Gly Lys Asn Gln Ala His Ala Tyr Asp
 325 330 335
 Met Gly Val Ser Asn Val Val Cys Thr Ser Val Asn Asp Ser Asn Phe
 340 345 350
 Gly Ser Leu Val Val Asp Leu Gly Ile Cys Lys Asn Met Gly Glu Ile
 355 360 365
 Val Lys His Asn Glu Glu Gly Asn Glu Tyr Ser Val Ser Asp Leu Ile
 370 375 380
 Trp Gly Lys Val Ser Ser His Pro Trp Trp Pro Gly Gln Ile Phe Asp
 385 390 395 400

pctca2017050779-seql.txt

Pro Gln Ala Ala Ser Lys Leu Ala Lys Lys His Gln Lys His Asp Arg
405 410 415

Lys Arg Leu Leu Val Ala Tyr Phe Gly Asp Gln Thr Phe Ala Trp Asn
420 425 430

Val Ala Ser Ser Leu Lys Pro Phe Glu Ala Asn Phe Ser Gln Met Glu
435 440 445

Arg Gln Thr Asp Met Glu Glu Phe Arg Ser Ala Ile Gly Ser Ala Leu
450 455 460

Asp Glu Ile Ser Arg Arg Val Gln Arg Gly Leu Leu Cys Ser Cys Val
465 470 475 480

Pro Asp Glu Ala Cys Ser Glu Ile Lys Ser Gln Ile Ile Thr Asn Ala
485 490 495

Gly Ile Arg Ala Glu Ser Ser Arg Arg Asp Gly Val Asp Arg Asn Val
500 505 510

Gly Ala Ala Thr Phe Glu Pro Gly Lys Val Val Glu Asn Ile Lys Asn
515 520 525

Phe Ala Leu Asn Pro Leu Gly Gly Cys Asp Lys Met Glu Asn Val Val
530 535 540

Thr Arg Ala Gln Leu Ala Ala Phe Tyr Arg Ser Lys Gly His Pro Arg
545 550 555 560

Met Ala Glu Tyr Gly Ile Trp Gly Gly Leu Leu Asp Pro Asp Phe Gln
565 570 575

Met Pro Ala Leu Thr Ser Lys Thr Glu Glu Ala Pro Ser Glu Lys Arg
580 585 590

Lys Leu Gly Ser Gln Asp Lys Pro Pro Ser Thr Pro Thr Pro Gly Gly
595 600 605

Lys Lys Gln Lys Ser Val Gly Ser Phe Ser Asp Asp Leu Ala Gly Lys
610 615 620

Thr Gly Lys Glu Gly Leu Ser Gln Ser Ser Asn Glu Asp Ala Glu Phe
625 630 635 640

Arg Thr Pro Gly Ser Phe Lys Val Gly Glu Ser Leu Arg Arg Val Ala
645 650 655

pctca2017050779-seql.txt

Ser Gln Leu Lys Gly Ser Pro Pro Ile Leu Asn Ser Ser Gly Gly Arg
660 665 670

Ser Arg Lys Ser Ala Cys Lys Ile Asp Arg Ser Ser Glu Lys Leu Asn
675 680 685

Glu Lys Ser Lys Lys Arg Lys Ile Thr Ile Pro Lys Glu Tyr Ser Asp
690 695 700

Pro Asp Glu Met Leu Ser Gln Leu His Leu Ala Ala Arg Asp Pro Met
705 710 715 720

Lys Gly Tyr Ser Phe Leu Thr Ile Ile Val Gly Phe Phe Thr Asp Tyr
725 730 735

Arg Asn Ser Ile Asn Leu Asp Gln Ser Gly Ser Gly Lys Lys Lys Ser
740 745 750

Ser Gln Leu Lys Ser Ser Gly Gly Arg Asp Gly Lys Leu Ser Lys Phe
755 760 765

Glu Ala Asn Ala Ala Glu Ile Tyr Ser Asp Glu Glu Asp Asp Pro Tyr
770 775 780

Trp Thr Asp Met Ile Ser Gly Gly Thr Pro Glu Glu Gln Ser Pro Arg
785 790 795 800

Lys Val Gln Lys Arg Lys Arg Lys Pro Thr Pro Lys Ala Lys Ser Lys
805 810 815

Lys Asp Ser Ser Thr Val Glu Leu Glu Lys Asn Pro Pro Ser Ser Pro
820 825 830

Ser Leu Val Ile Glu Glu Tyr Ser Ser Ser Asp Glu Ser Glu Gly Ser
835 840 845

Ile Tyr Thr Ile Asp Ser Lys Gln Pro Asp Pro Asp Val Ser Thr Asn
850 855 860

Leu Ile Thr Glu Ala Pro Ala Val Ser Asn Ile Ile Lys Asn Asn Ala
865 870 875 880

Asp Asp Pro Ser Pro Thr Ala Leu Val Leu Asn Phe Thr Gln Ala Glu
885 890 895

Ser Ile Pro Leu Glu Thr Asp Leu Asn Lys Ile Phe Ser Arg Phe Gly

pctca2017050779-seql.txt

900

905

910

Pro Leu Leu Glu Ser Asp Thr Glu Val Thr Arg Lys Cys Cys Arg Ala
 915 920 925

Lys Val Val Phe Lys Asn Arg Asn Asp Ala Glu Val Ala Phe Ser Ser
 930 935 940

Ala Gly Lys Phe Ser Ile Phe Gly Pro Ala Leu Ala Ser Tyr Gln Leu
 945 950 955 960

Arg Tyr Leu Ser Ser Thr Pro Ser Thr Ala Ser Pro Cys Pro Leu Pro
 965 970 975

Ala Ala Ser Pro Cys Pro Leu Pro Ala Ala Ser Pro Cys Pro Pro Pro
 980 985 990

Ala Thr Ser Pro Ala Pro Leu Ser Ala Thr Ser Pro Ala Pro Leu Ser
 995 1000 1005

Ala Thr Ser Pro Ala Pro Leu
 1010 1015

<210> 792

<211> 296

<212> PRT

<213> Papaver somniferum

<400> 792

Met Asp Tyr Asp Ala Ser Pro Ala Ile Glu Leu His His Asp Val Gln
 1 5 10 15

Ile Glu Glu Val Glu Glu Tyr Phe Ala Asn Tyr Met Ile Asn Asp Ser
 20 25 30

Leu Gly Val Ile Ala Asn Thr His Thr Ala Phe Ala Asp Lys Glu Gln
 35 40 45

Leu Lys Ala Glu Ser Lys Glu Cys Ile Glu Leu Ala Lys Leu Phe Ser
 50 55 60

Ile Ala Val Asp Phe Pro Lys Thr Gly Val Pro Ala Glu Ile Pro Pro
 65 70 75 80

His Leu Arg Val Lys Glu Tyr Pro Asp Phe Met Glu Lys Leu Asp Arg
 85 90 95

Pro Thr Tyr Glu Ser Lys Arg Val Met Gly Lys Leu Phe Arg Gln Val

pctca2017050779-seql.txt

100

105

110

Lys Asp Ile Ala Pro His Thr Ser His Ile Lys Ser Phe Thr Leu Glu
115 120 125

Val Ala Arg Lys Ser Tyr Asp Ala Asp Met Glu Val Asp Gly Phe Glu
130 135 140

Asp Tyr Leu Asp Asp Ala Trp Phe His Lys Gly Glu Phe Asp Tyr Lys
145 150 155 160

Leu Ala Asn Leu Met Asp Tyr Tyr Gly Ile Lys Thr Glu Ala Glu Ile
165 170 175

Leu Gly Gly Ser Val Met Lys Leu Ser Lys Ser Phe Asn Met Arg Arg
180 185 190

Asp Ala Glu Ser Ile Ser Leu Ala Val Arg Ala Leu Lys Lys Glu Ala
195 200 205

Arg Thr Trp Phe Asp Lys Lys Ser Ile Phe Asn Ser Gly Ser Gln Glu
210 215 220

Asp Asp Asp Ile Tyr Ala Lys Ala Ser Ala Trp Tyr His Val Thr Tyr
225 230 235 240

His Pro Ser Tyr Phe Gly Asn Tyr Arg Gln Glu Lys Ser Arg Glu His
245 250 255

Phe Leu Ser Phe Pro Trp Cys Val Tyr Asp Lys Leu Ile His Ile Lys
260 265 270

Lys Asn Asn Ser Met Arg Arg Lys His Asn Trp Ser Leu Glu Asp Gln
275 280 285

Phe Met Ser Ser Leu Arg Leu Ser
290 295

<210> 793

<211> 121

<212> PRT

<213> Papaver somniferum

<400> 793

Met Ala Glu Ser Lys Pro Glu Gln Ser Ala Cys Gln Ser Val Glu Glu
1 5 10 15

Val Lys Ala Pro Asn Leu Met Glu Arg Ala Lys Glu Glu Val Thr Ala

20

25

30

Ile Ala His Thr Asp Arg Ser Pro Lys His His Ile Glu Thr His Gly
 35 40 45

Thr Ser Asp Asp Ile Asp Glu Asn Thr Lys Pro Glu Glu Ile Lys Gly
 50 55 60

Pro Ser Val Phe Gln Arg Ala Lys Glu Glu Ile Glu Ala Leu Val Glu
 65 70 75 80

Ala Ile His Pro Lys Lys Glu Ser Ser Ser Ser Asp Asp His Ser Lys
 85 90 95

Lys Asp Gly Gly Gly Phe Phe Ala Ser Ile Gly Arg Ser Leu Glu Lys
 100 105 110

Val Cys Ser Pro Lys Gly Lys Lys Thr
 115 120

<210> 794

<211> 103

<212> PRT

<213> Papaver somniferum

<400> 794

Met Ala Glu Ile Asp Leu Glu Leu Pro Val Ile Glu Ala Lys Ser Val
 1 5 10 15

Glu Asp Leu Asn Ala Val Leu Lys Gln Leu His Glu Gly Asp Asn Ser
 20 25 30

Glu Ala Ser Val Val Asn Lys Pro Val Leu Lys Glu Ser Thr Ala Ser
 35 40 45

Asp His Met Leu Asp Glu Pro Leu Leu Ile Glu Thr Lys Asp Glu Leu
 50 55 60

Gly Glu Leu Thr Pro Tyr Thr Gln Glu Arg His Leu Ala Glu Thr Asp
 65 70 75 80

Leu Glu Leu Pro Val Ile Glu Ala Arg Phe Ile Glu Asp Val Asp Ala
 85 90 95

Val Leu Lys Gln Leu His Lys
 100

<210> 795

pctca2017050779-seql.txt

<211> 368

<212> PRT

<213> Papaver somniferum

<400> 795

Met Lys Glu Ala Asp Leu Leu Asn Lys Gln Met Asp Ala Leu Ile Ala
 1 5 10 15

Phe Arg Ile Lys Val Glu Asn Pro Asp Gly Thr Asn His His Phe Val
 20 25 30

Asn Trp Ser Val Glu Met Asn Glu Leu Ala Ser Gly Val Ala Ala Ser
 35 40 45

Ala Ala Ala Val Ser Leu Thr Ser Pro Arg Val Ala Ser Pro Ala Thr
 50 55 60

Val Thr Ile Ser Ala Leu Pro Ser Pro Thr Ala Met Pro His Met Asp
 65 70 75 80

Ala Ile Ser Thr Asp Asp Ser Val Arg Gly Gly Arg Arg Phe Thr Asp
 85 90 95

Ser Thr Ser Thr Asp Ala Val Ser Arg Pro Ala Ser Leu Asp Val Leu
 100 105 110

Asn His Val Thr Phe Asn Asn Thr Leu Asp Thr Pro Arg Ser Thr Ile
 115 120 125

Lys Gly Met Leu Lys Asn Asn Glu Ile Thr Tyr Gly Arg Lys Asn Leu
 130 135 140

His Lys Val Glu Gln Gln Leu Gln Gln Ala Phe Val Glu Leu Tyr Ser
 145 150 155 160

Glu Leu Arg Leu Leu Lys Ser Phe Ser Phe Leu Asn Val Leu Ala Phe
 165 170 175

Ser Lys Ile Met Lys Lys Tyr Asp Lys Ile Ser Ser Arg Asn Ala Ser
 180 185 190

Lys Ser Tyr Leu His Met Val Asp Asn Ser Tyr Ile Gly Ser Phe Asp
 195 200 205

Gly Val Thr Arg Leu Met Glu Arg Val Glu Ala Thr Phe Ile Lys His
 210 215 220

Phe Thr Asn Ala Asn Arg Ser Lys Gly Ile Arg Ile Leu Arg Pro Ala

pctca2017050779-seq1.txt

petca2017050719_seq1.txt

Ala Lys Arg Glu Arg His Arg Thr Thr Phe Ser Leu Gly Phe Phe Ala
245 250 255

Gly Cys Gly Leu Ala Leu Leu Ala Ser Leu Ile Leu Ile Val Arg Ala
260 265 270

Arg Asn Ile Leu Gly Met Asp Gly Ser Thr Ile Tyr Met Glu Thr Leu
275 280 285

Phe Pro Leu Tyr Ser Leu Phe Gly Phe Ile Val Leu His Met Leu Met
290 295 300

Tyr Ala Ile Asn Val Tyr Ala Trp Arg Arg Tyr Arg Val Asn Tyr Pro
305 310 315 320

Phe Ile Phe Gly Phe Lys Gln Gly Thr Glu Leu Gly Tyr Arg Glu Val
325 330 335

Phe Leu Ile Ser Ser Ala Leu Ala Thr Leu Ala Leu Ala Ser Val Leu
340 345 350

Ala Asn Leu Asp Met Glu Met Asp Lys Asn Thr Lys Asp Phe Lys Thr
355 360 365

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<210> 796
<211> 117
<212> PRT
<213> Papaver somniferum
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<400> 796

Met Arg Ile Asn Phe Leu Ile Pro Leu Asp His Gln Pro Glu Val Lys
1 5 10 15

Gln Thr Tyr Gln Gln Phe Leu Met Tyr Gly Pro Leu Leu Leu Ile Gly
20 25 30

Lys His Leu Val His Leu Leu Asp Cys Lys Lys Lys Phe Tyr Asp Ala
35 40 45

Thr Leu Lys Phe Ser Gly Ser Thr Tyr Val Thr Phe Asn Leu Phe Leu
50 55 60

Asp Glu Val Ile Cys Ile Asn Asp Val Leu Gln Glu Trp Val Lys Asn
65 70 75 80

Asp Asn Val Leu Phe Ala Asp Met Ala Gly Trp Met Val Leu Lys Tyr

85

90

95

Glu Lys Tyr Trp Ala Val Asp Lys Ile Asn Lys Met Leu Tyr Ile Val
 100 105 110

Val Leu Leu Asp Thr
 115

<210> 797
 <211> 690
 <212> PRT
 <213> Papaver somniferum

<400> 797

Met Ala Thr Gly Asp Asp Asn Ser Asp Ser Val Leu Ser Asp Val Glu
 1 5 10 15

Gly Asp Asp Pro Val Pro Ile Val Leu Asp Thr His Ser Ser Ser Lys
 20 25 30

Glu Ser Val Val Ser Ile Glu Arg Phe Gln Glu Val Val Ser Glu Leu
 35 40 45

Asp Arg Glu Arg Lys Ala Arg Glu Val Ala Glu Lys Ala Lys Ser Glu
 50 55 60

Leu Gln Val Ser Phe Asn Arg Leu Lys Ala Leu Thr His Glu Ala Ile
 65 70 75 80

Lys Lys Arg Asp Glu Ser Val Arg Gln Arg Asp Glu Ala Val Arg Glu
 85 90 95

Lys Glu Glu Ala Leu Ser Phe Asn Glu Lys Thr Leu Lys Glu Leu Glu
 100 105 110

Glu Val Val Arg Leu Lys Asp Glu Leu Leu Lys Gln Arg Asp Glu Ser
 115 120 125

Ala Gln Glu Leu Asp Asp Val Val Lys Ala Arg Asp Ser Thr Met Ser
 130 135 140

Glu Ile Glu Ala Ser Thr Gln Leu Leu Val Thr Gly Ile Glu Lys Ile
 145 150 155 160

Ser Gly Lys Val Ser Asn Phe Lys Asn Phe Ser Val Gly Gly Leu Pro
 165 170 175

Arg Ser Gln Lys Tyr Ser Gly Leu Pro Ala Val Ala Tyr Gly Ile Ile

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180                                     185                                     190
Lys Arg Thr Asn Glu Ile Val Glu Glu Leu Leu Lys Gln Ile Asp Thr
195                                     200                                     205
Ala Thr Lys Ser Arg Asn Asp Ala Arg Glu Gln Ile Asp His Arg Asn
210                                     215                                     220
Tyr Glu Ile Ala Ile Glu Val Ser Gln Leu Glu Ala Ala Ile Ser Gly
225                                     230                                     235                                     240
Leu Arg Glu Glu Val Ala Ala Lys Ala Ser Gly Ile Glu Asn Leu Glu
245                                     250                                     255
Lys Ser Leu Ser Asp Lys Glu Ile Met Val Ser Glu Met Asn Glu Lys
260                                     265                                     270
Leu Asn Val Ala Asp Lys Glu Val Gly Glu Leu Lys Gln Leu Val Asn
275                                     280                                     285
Asp Tyr Asp Gly Lys Leu Lys Asn Leu Glu Ser Lys Met Glu Ser Gln
290                                     295                                     300
Arg Pro Leu Gln Ser Glu Gln Leu Lys Tyr Ile Ser Asn Ile His Glu
305                                     310                                     315                                     320
Gln Leu His Glu Ile Ile Lys Ile Val Asp Glu Asn Lys Leu Asp His
325                                     330                                     335
Pro Asp Leu Ser His Ser Met Phe Leu Pro Gln Met Asp Met Asp Glu
340                                     345                                     350
Asn Leu Arg Ala Ser Leu Ala Gly Met Glu Ser Ile Ser Glu Leu Ile
355                                     360                                     365
Lys Ile Thr Met Glu Lys Val Arg Asn Gln Val Glu Val Lys Gly Arg
370                                     375                                     380
Glu Ala Lys Asn Leu Asn Glu Thr Val Ala Arg Leu Val Lys Glu Lys
385                                     390                                     395                                     400
Ser His Ile Gly Thr Leu Leu Arg Ser Ala Leu Ser Arg Lys Met Lys
405                                     410                                     415
Leu Asp Pro Leu Ser Lys Thr Ser Glu Val Leu Gln Val Ala Glu Asn
420                                     425                                     430

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pctca2017050779-seql.txt

Gly Leu Arg Glu Ala Gly Leu Asp Val Arg Phe Thr Cys Leu Tyr Gly
 435 440 445
 Asn Gly Asp Lys Met Asp Ser His Gly Lys Gln Ala Ala Glu Glu Ile
 450 455 460
 Glu Glu Asp Glu Val Tyr Thr Leu Ala Gly Ala Leu Glu Lys Ile Val
 465 470 475 480
 Asn Ala Ser Gln Leu Glu Ile Ile Asp Leu His His Ser Val Glu Glu
 485 490 495
 Leu Ser Ser Gln Ser Asn Gln Leu Lys Ala Gln Val Glu Ala Gln Asp
 500 505 510
 Arg Glu Leu Ser Gln Arg Lys Leu Leu Ile Glu Glu Leu Lys Glu Lys
 515 520 525
 Glu Ser Met Ala Asn Gln Ser Val Glu Asp Leu Met Met Asp Ile Ala
 530 535 540
 Ala Ala Glu Glu Glu Ile Ala Arg Trp Lys Val Ala Ala Glu Gln Glu
 545 550 555 560
 Ala Ala Ala Gly Arg Ser Val Glu Gln Glu Phe Leu Ala Gln Leu Ser
 565 570 575
 Val Leu Arg Gln Glu Leu Asp Glu Met Lys Gln Thr Met Leu Glu Ser
 580 585 590
 Asp Lys Lys Leu Lys Phe Lys Glu Glu Thr Ala Ala Ala Ala Met Ala
 595 600 605
 Ala Arg Asp Ala Ala Glu Lys Ser Leu Arg Leu Ala Asp Leu Arg Ala
 610 615 620
 Ser Arg Leu Arg Glu Arg Leu Glu Glu Leu Ser Gln Gln Ile Glu Glu
 625 630 635 640
 Ser Asp Thr Arg Glu Asp Ser Arg Asn Arg Thr Arg Gln Arg Tyr Ala
 645 650 655
 Cys Trp Pro Trp Gln Trp Leu Gly Met Asn Tyr Val Gly Tyr Gln Gln
 660 665 670
 Pro Glu Thr Gln Gln Gln Asn Ser Asn Glu Met Glu Leu Ala Glu Pro
 675 680 685

pctca2017050779-seql.txt

Leu Ile
690

<210> 798
<211> 172
<212> PRT
<213> Papaver somniferum

<400> 798

Met Val Arg Ser Tyr Leu Val Leu Pro Ser Pro Leu Asn Pro Thr Pro
1 5 10 15

Lys Ser Lys Ile Val Asn Pro Leu Asp Ser Arg Pro Thr Ala Gly Ala
20 25 30

Phe Thr Lys Val Ser Arg Lys Pro Thr Asn His Ser Lys Phe Thr Gly
35 40 45

Lys Cys Gly Val Ala Arg Cys Thr Asp Cys His Ile Asn Pro Gly Asn
50 55 60

Lys Ser Lys Asp Lys Ala Lys Gly Thr Gln Lys Leu Lys Ser Cys Ser
65 70 75 80

Ala Ala Met Asn Gln Arg Ser Leu Ala Trp Ser Val Val Asp Ala Asn
85 90 95

Asn Gly Asn Gly Leu Asn Tyr Asp Ser Lys Ser Ala Thr Gly Ile Leu
100 105 110

Cys Ala Ile Ser Ser Ser Glu Tyr Phe Asp Asp Tyr Asp Asp Asp Asp
115 120 125

Asp Asp Asp Ile Glu Phe Glu Glu Tyr Glu Ser Asn Glu Gln Leu Thr
130 135 140

Ser Leu Thr Gly Ala Glu Gln Phe Gln Glu Ile Glu Phe Val Leu Asp
145 150 155 160

Cys Gln Ala Glu Glu Asp Val Gly Trp Cys Val Leu
165 170

<210> 799
<211> 733
<212> PRT
<213> Papaver somniferum

<400> 799

pctca2017050779-seql.txt

Met Asp Leu Gly Asn Ser Glu Val Glu Arg Asn Gln Arg Leu Glu Ser
 1 5 10 15
 Leu Ile Ala Arg Arg Arg Ala Arg Lys Ser Phe Arg Met Ser Glu Ser
 20 25 30
 Glu Met Asn Met Met Asp Leu Asp Phe Asn Gly Pro Pro Phe Gln Ile
 35 40 45
 Ala Pro Ile Ser Thr Gly Arg Arg Asn Pro Phe Asp Leu His Tyr Asp
 50 55 60
 Ser Tyr Met Gly Pro Gly Leu Pro Pro Met Pro Gly Ser Ala Pro Ser
 65 70 75 80
 Val Met Leu Pro Arg Arg Asn Pro Phe Asp Leu Pro Tyr Asp Asp Pro
 85 90 95
 Leu Glu Glu Arg Pro Asp Leu Ala Gly Asp Ser Phe Gly Glu Glu Phe
 100 105 110
 Met Thr Ala His Glu Lys Asp Met His Tyr Arg Arg Cys Glu Ser Phe
 115 120 125
 Asn Met Gly Ala Tyr Phe Phe Lys Asp His Arg Gln Glu Lys Asn Asn
 130 135 140
 Val Ser Arg Phe Lys Pro Arg Phe Val Thr Glu Glu Met Ala Ser Glu
 145 150 155 160
 Gly Arg Phe Ser Arg Phe Ser Arg Gln Met Ser Glu Ala Ser Glu Ser
 165 170 175
 Lys Met Ser Phe Ala Ser Glu Thr Glu Ser His Ser Thr Ile Ala Asn
 180 185 190
 Gln Glu Asp Ile Ser Ser Leu Val Glu Glu Lys Ile Ser Ser His Gln
 195 200 205
 Glu Asp Ile Ser Asn Leu Val Glu Glu Gln Gln Ile Ser Ser His Glu
 210 215 220
 Arg Glu Leu Ser Pro Ser Val Glu Asp Thr Pro Gly Arg Met Lys Leu
 225 230 235 240
 Glu Ser Glu Leu Trp Lys Glu Asp His Leu Asp Ser Glu Ser Asp Lys
 245 250 255

pctca2017050779-seql.txt

Glu Gly Lys Asp Glu Val Asp Leu Ile Lys Val Glu Asp Glu Thr Asp
 260 265 270
 Glu Ser Lys Thr Thr His Gly Thr Gln Ser Arg Phe Tyr Ser Glu Phe
 275 280 285
 Leu Ala Leu Glu Glu His Leu Thr Ser Tyr Val His Val Asn Gln Glu
 290 295 300
 Val Gly Glu Glu Gln His His Thr Arg Ser Ser Ser Leu Ser Ser Ser
 305 310 315 320
 Gly Val Arg Glu Lys Ile Lys Glu Asn Ser Glu Asp Glu Glu Ser Ser
 325 330 335
 His Gly Thr Gln Ser Ser Tyr Val His Val Asp Gln Asp Met Gly Glu
 340 345 350
 His Gln Gln His Thr Arg Ser Asn Ser His Ser Ser Ser Asp Met His
 355 360 365
 Glu Lys Ile Phe Asp Val Asn Val Asp Glu Glu Leu Ser Ala Leu Asp
 370 375 380
 Pro Ala Arg Gly Glu Val His Glu His Ser Ser Ser Phe Met Gln Ser
 385 390 395 400
 Thr Val Ile Asp Ser Asp Arg Val Val Gly Glu Asp Asp Arg His Thr
 405 410 415
 Glu Ala Pro Val Tyr Asp Leu Ser Pro Ser Ala Ser Lys Arg Asn Met
 420 425 430
 Ser Asp Met Met Ser Phe Glu Glu Thr Val Ser Tyr Lys Asp Asn Met
 435 440 445
 Val Phe Ala Ser Thr Ser Ser Val Gly Ser Asp Met His Val Glu Val
 450 455 460
 Pro Glu Pro Val Thr Val Glu Asp Ile Thr Leu Leu Ala Asp Lys Glu
 465 470 475 480
 Ala Ser Val Gln Ile Gly Ser Pro Arg Lys Leu Met Thr Pro Gly Tyr
 485 490 495
 Glu Lys Ser Trp Glu Pro Ser Ala Glu Leu Cys Val Ile Asp Glu Asn
 500 505 510

pctca2017050779-seql.txt

Glu Ala Glu Lys Glu Gly Leu Pro Cys Glu Glu Ala Ser Phe Pro Ser
515 520 525

Ser Ser Phe His Pro Lys Ile Ala Ala Glu Val Leu Gln Ser Asp Lys
530 535 540

Asp Glu Lys Val Asp Thr Leu Asp Leu Pro Tyr Ser Asp Glu Met Ser
545 550 555 560

Ser Arg Asp Ile Ala Leu Ser Glu Leu Lys Asp Gln Leu Val Gln Pro
565 570 575

Ser Ser Ser Val His Gln Glu Asn Ser Glu Gly Ile Ser Ile Leu Ser
580 585 590

Asp Ile Ser Ala Met Glu Asp Gly Ala Ile Gln Glu Val Gly Gly Pro
595 600 605

Leu Val Asp Glu His Gln Glu Asp Asp Val Ser Asn Leu Pro Thr Phe
610 615 620

Leu Ser Thr Pro Thr Ser Pro Pro Thr Glu Phe Val Gln Glu Val Gly
625 630 635 640

Gly Pro Leu Val Gly Glu His Gln Glu Asp Asp Val Leu Asn Leu Pro
645 650 655

Thr Phe Leu Ser Ala Pro Thr Ser Pro Pro Ser Glu Phe Ile Gly Tyr
660 665 670

Gln Gln His Gln Met Val Phe Glu Asp Asp Ser His Asp Gly Thr Gln
675 680 685

Tyr Glu Ser Lys Phe Asp Phe Asn Gln Glu Ser Ile Gly Tyr His Glu
690 695 700

Ala Asn Glu Glu Phe Asp Asp Glu Glu Pro Ala Gly Ile Glu Glu Ile
705 710 715 720

Asp Glu Glu Phe Leu Thr Glu Leu Asp Ala Val Gly Asp
725 730

<210> 800
<211> 160
<212> PRT
<213> Papaver somniferum

pctca2017050779-seql.txt

<400> 800

Arg His Leu Ala Glu Thr Asp Leu Glu Leu Pro Val Ile Glu Ala Arg
1 5 10 15

Phe Ile Glu Asp Val Asp Ala Val Leu Lys Gln Leu His Lys Gly Asp
20 25 30

Asn Ser Glu Thr Phe Ile Ala Asn Glu Pro Glu Leu Lys Gly Ser Ala
35 40 45

Val Pro Ser Ala Glu Ser Phe Asp His Met Leu Asp Asp Pro Leu Leu
50 55 60

Leu Glu Thr Lys Asp Met Gln Gly Glu Leu Thr Leu His Thr Gln Glu
65 70 75 80

Gln His Leu Thr Glu Thr Asp Leu Glu Leu Pro Val Ile Glu Ala Arg
85 90 95

Ser Ile Glu Asp Val Asp Ala Val Leu Lys Gln Leu Arg Gly Gly Asp
100 105 110

Asn Ser Glu Ala Leu Ile Leu Asn Lys Pro Val Ser Glu Glu Ser Thr
115 120 125

Val Ala Cys Ala Lys Ser Ser Asp His Gly Leu Asp Glu Pro Gln Leu
130 135 140

Met Glu Thr Glu Asp Gly Gln Gly Glu Leu Thr His Leu Lys Leu Glu
145 150 155 160

<210> 801

<211> 186

<212> PRT

<213> Papaver somniferum

<400> 801

Met Leu Leu Arg Leu Ile Asn Asn Val Val Cys Arg Val Ala Phe Gly
1 5 10 15

Leu Lys Tyr Glu Glu Asp Gly Lys Asn Lys Ile Tyr Leu Thr Leu Gln
20 25 30

Glu Thr Glu Asn Leu Leu Ala Gly Phe Ser Thr Ala Asp Leu Phe Pro
35 40 45

Trp Met Ser Trp Ile His Lys Phe Asp Gly Ser Asp Lys Lys Leu Asp
50 55 60

pctca2017050779-seql.txt

Lys Asn Phe Gly Arg Met Asp Glu Phe Tyr Asp Lys Val Ile Asp Glu
65 70 75 80

His Ile Cys Arg Cys Ser Leu Lys Thr Gly Val Glu Glu Asp Phe Val
85 90 95

Asp Val Leu Leu Arg Val Gln Lys Asp Pro Ser Gln Gly Ile Ser Leu
100 105 110

Thr Arg Asp Asn Ile Lys Gly Ile Leu Met Asp Thr Phe Val Ala Gly
115 120 125

Thr Asp Thr Ser Ala Ala Thr Leu Val Trp Thr Met Ala Glu Leu Ile
130 135 140

Arg Asn Pro Thr Thr Met Lys Arg Ala Gln Asp Glu Val Arg Ser Val
145 150 155 160

Ile Gly Ile Lys Glu Met Val Lys Glu Ser Asp Leu His Lys Leu Ser
165 170 175

Tyr Thr Lys Leu Val Ile Lys Glu Ala Phe
180 185

<210> 802
<211> 588
<212> PRT
<213> Papaver somniferum

<400> 802

Met Ser Leu Gln Gln Ala Gly Gln Pro Arg Pro Thr Ala Asn Gly Thr
1 5 10 15

Gly Arg Arg Arg Gly Glu Arg Glu Thr Gly Phe Arg Ser Gly Ser Asn
20 25 30

Phe Pro Thr Glu Lys Pro Asn His Gly Met Ala Ile Val Gly Gly Ile
35 40 45

Leu Asn Gly Ser Ile Glu Gly Gly Leu Glu Gly Pro Ser Arg Asp Arg
50 55 60

Leu Ile Tyr Leu Ala Ala Cys Leu Ile Gly His Arg Val Glu Val Gln
65 70 75 80

Val Lys Asn Gly Ser Ile Phe Ser Gly Ile Leu His Ala Met Asn Ala
85 90 95

pctca2017050779-seql.txt

Glu Asn Asp Phe Gly Ile Val Leu Lys Met Ala Ser Leu Thr Lys Asp
100 105 110

Gly Leu Ser Lys Gly His Lys Pro Gly Ser Asp Ser Ile Ser Lys Ala
115 120 125

Pro Ser Lys Thr Leu Ile Val Pro Ala Lys Glu Leu Val Gln Val Ile
130 135 140

Ala Lys Asp Val Ser Val Thr Gly Ser Gly Val Lys Asn Asp Gly His
145 150 155 160

His Glu Gly Arg Gln Asp Leu Met Ile Asp Ser Tyr Ile Ser Lys Ser
165 170 175

Gln Phe Val Asp Ala Gly Arg Glu Leu Ala Pro Trp Ala Pro Asp Glu
180 185 190

Asp Asp Leu Gln Cys Pro Glu Leu Asp Asn Ile Phe Asp Gly Pro Trp
195 200 205

Asn Ser Arg Lys Trp Asp Gln Phe Glu Thr Asn Glu Ala Leu Phe Gly
210 215 220

Val Lys Ser Thr Phe Asp Glu Glu Leu Tyr Thr Thr Lys Leu Asp Arg
225 230 235 240

Gly Pro Gln Met Arg Glu Arg Glu Arg Glu Ala Ser Arg Ile Ala Arg
245 250 255

Glu Ile Glu Gly Glu Asp Thr Lys Asp Met His Leu Ala Glu Glu Arg
260 265 270

Gly Arg His Phe Asp Leu Asp Val Asp Glu Glu Thr Arg Phe Ser Ser
275 280 285

Val Leu Arg Thr Val Asp Asp Ser Gly Tyr Asp Glu Asp Glu Asp Ile
290 295 300

Val Leu Asp Thr His Asn Met Glu Thr Phe Gly Asp Ser Ser Gly Ala
305 310 315 320

Ala Ser Lys Arg Ser Phe Ser Asp Val Ala Arg Gly Lys Thr Asp Asn
325 330 335

Leu Gly Pro Ser Pro Ser Ser Ser Ser Val Ala Asp Glu Ala His Ser

340

Arg Phe Asn Ala Gly Arg Asp His Phe Ser Ala Ser Gly Asp Arg Ala
355 360 365

Arg Gln Ile Asp Ser Glu Ser Thr Gln Ser Arg Val Tyr Glu Asn Lys
370 375 380

Phe Lys Glu Leu Asp Gly Arg Lys Asn Gly Ala Lys Glu Leu Val Glu
385 390 395 400

Arg Lys Pro Val Asn Glu Ala Gln Thr Gln Asn Leu Glu Gly Ser Arg
405 410 415

Lys Ser Gln Val Thr Thr Gln His Val His Pro Arg Gly Arg Pro Gly
420 425 430

Ser Ser Ala Ser Ser Thr Ala Glu Ser Ala Gln Ser Gly Val Ala Pro
435 440 445

Thr Leu Gly Arg Pro Gly Leu Ser Pro Ser Ser Ser Met Gly Ser Leu
450 455 460

Ser Ser Glu Lys Ser Thr Leu Asn Pro Phe Ala Lys Glu Phe Lys Leu
465 470 475 480

Asn Pro Asn Ala Lys Ser Phe Thr Pro Ser Pro Ala Pro Ile Arg Pro
485 490 495

Pro Ser Pro Val Ser Asp Ser Ser Tyr Tyr Tyr Pro Asn Asn Val Ser
500 505 510

Pro Val Gln His Met His Gly Leu Pro Val Gly Val Gly Met Gly Thr
515 520 525

Ser Tyr Gly Gly Pro Gln Pro Val Met Tyr Thr Pro Gln Val Ala Pro
530 535 540

Ile Gln Pro Ala Gln Thr Phe Leu His Pro Asn Gly Gln Leu Tyr Gly
545 550 555 560

Gln Gln Met Ile Val Gly His Pro Arg Gln Val Leu Tyr Met Pro Ser
565 570 575

Tyr Pro Pro Asp Met Pro Tyr Lys Gly Arg Asp Phe
580 585

pctca2017050779-seql.txt

<210> 803
 <211> 174
 <212> PRT
 <213> Papaver somniferum

<400> 803

Met Arg Tyr Leu Asp Leu Ser Arg Cys Asn Phe Tyr Gly Gly His Asp
 1 5 10 15

Val Ser Ile Asn Gln Leu Tyr Asn Leu Gln Thr Leu Val Leu His Arg
 20 25 30

Cys His Asp Val Lys Thr Ile Leu Leu Gly Ile Gly Ser Leu Lys Thr
 35 40 45

Leu Arg His Leu Asp Leu Ser Tyr Ser Asp Val Glu Thr Leu Pro Asp
 50 55 60

Cys Val Val Gln Leu Ala Asn Phe Gln Thr Leu Asp Leu Asn Met Cys
 65 70 75 80

Lys Arg Leu Val Ala Leu Pro Val Asn Ile Gly Ser Leu Glu Ala Leu
 85 90 95

Arg Val Leu Lys Val Lys Asn Cys Ile Thr Leu Arg Val Leu His Thr
 100 105 110

Asp Val Gly Thr Leu Thr Arg Phe Arg Cys Leu Asp Leu Ser Val Thr
 115 120 125

Lys Ile Lys Val Leu Pro Lys Ser Cys Ile Asn Asn Leu Arg Asn Leu
 130 135 140

Glu Leu Met Val Phe Gly Lys Cys Arg Ile Pro Lys Glu Ile Lys Asn
 145 150 155 160

Trp Pro Lys Leu Arg Leu Leu Lys His Lys Arg Glu Arg Arg
 165 170

<210> 804
 <211> 118
 <212> PRT
 <213> Papaver somniferum

<400> 804

Met Ile Ala Thr Val Thr Ser Asp Ala Glu Asn Lys Gln Val Asn Ser
 1 5 10 15

Ala Ser Val Arg Leu Trp Leu Arg Trp Leu Arg Asp Val Ala Tyr Asp

20

Ala Asp Asp Val Leu Asp Glu Phe Ser Tyr Glu Ala Met Arg Arg Ser
35 40 45

Glu Ile His Arg Lys Arg Asp Gln Val Leu Glu Phe Phe Ser Ser Ser
50 55 60

Ser Ala Leu Ser Phe Pro Ile Lys Met Val Asn Lys Ile Lys Ala Ile
65 70 75 80

Asn Lys Lys Leu Asp Glu Ile Thr Ser Thr Met Val Lys Phe Glu Leu
85 90 95

Gln Thr Ser Asp Pro Asp Asp Asp Leu Arg Ser Thr Glu Lys Gln Asp
100 105 110

Arg Lys His Phe Thr Leu
115

<210> 805
<211> 80
<212> PRT
<213> Papaver somniferum
<400> 805

Met Glu Leu Leu Ile Leu Ser Thr Leu Glu Trp Lys Met Asn Pro Ala
1 5 10 15

Thr His Ile Ser Leu Leu Asp His Ile Ile Arg Arg Phe Gly Phe Gln
20 25 30

Val Phe Ser Leu Pro Ser Ile Ser Leu Val Ala Ala Val Met Leu Asn
35 40 45

Val Ile Asp Glu Val Glu Thr Glu Asn Pro Met Glu Tyr Gln His Gln
50 55 60

Leu Met Thr Ala Leu Lys Leu Thr Lys Glu Asp Val Asn Glu Cys Tyr
65 70 75 80

<210> 806
<211> 227
<212> PRT
<213> Papaver somniferum
<400> 806

Met Ser Phe Leu Phe Gly Lys Arg Lys Thr Pro Ala Glu Leu Leu Arg
1 5 10 15

pctca2017050779-seql.txt

Glu Asn Lys Arg Met Leu Asp Lys Ser Ile Arg Glu Ile Glu Arg Glu
20 25 30

Arg Gln Gly Leu Gln Ala Gln Glu Lys Lys Leu Ile Val Glu Ile Lys
35 40 45

Lys Ser Ala Lys Gln Gly Gln Met Gly Ala Val Lys Val Met Ala Lys
50 55 60

Asp Leu Ile Arg Thr Arg His Gln Val Glu Lys Phe Tyr Lys Leu Lys
65 70 75 80

Ser Gln Leu Gln Gly Val Ser Leu Arg Ile Gln Thr Leu Lys Ser Thr
85 90 95

Gln Ala Met Gly Glu Ala Met Lys Gly Val Thr Lys Ala Met Gly Gln
100 105 110

Met Asn Arg Gln Met Asn Leu Pro Ser Leu Gln Lys Ile Met Met Glu
115 120 125

Phe Glu Arg Gln Asn Glu Lys Met Glu Met Thr Ser Glu Val Met Ala
130 135 140

Asp Ala Ile Asp Asp Ala Leu Glu Gly Asp Glu Glu Glu Gln Glu Thr
145 150 155 160

Glu Asp Leu Val Asn Gln Val Leu Asp Glu Ile Gly Ile Asp Ile Asn
165 170 175

Ser Glu Leu Met Asn Ala Pro Ala Thr Ala Val Ala Ala Pro Ala Ala
180 185 190

Thr Thr Lys Val Ala Gln Ala Glu Gln Pro Ala Ala Ala Gly Gly Asn
195 200 205

Asp Asp Gly Gly Ile Asp Met Asp Leu Gln Ala Arg Leu Asp Asn Leu
210 215 220

Arg Arg Met
225

<210> 807
<211> 236
<212> PRT
<213> Papaver somniferum

<400> 807

Met Ala His Ser Leu Thr Glu His Val Glu Glu Gly Ser Cys Asp Arg
 1 5 10 15

Thr Leu Ile Leu Ser Asn Ala Leu Ile His Met Tyr Ala Lys Cys Ala
 20 25 30

Ser Ile Asp Gln Ala Leu Leu Glu Phe Ser Lys Met His Glu Arg Asp
 35 40 45

Val Ile Thr Tyr Gly Ala Leu Ile Thr Ala Leu Ala Asp His Gly Arg
 50 55 60

Pro Gln Glu Ala Leu Glu Leu Phe Ser Lys Met Gln Lys Lys Gly Ile
 65 70 75 80

Gln Pro Asn Lys Val Thr Phe Leu Gly Val Phe Asn Ala Cys Ser Tyr
 85 90 95

Ala Gly Leu Val Glu Gln Gly Cys Lys Tyr Phe Lys Leu Met Thr Thr
 100 105 110

Thr Cys Met Ile Glu Pro Ser Thr Glu His Ile Ser Cys Met Val Asp
 115 120 125

Leu Leu Gly Arg Ala Gly Lys Leu Asn Glu Ala Tyr Lys Leu Ile Leu
 130 135 140

Glu Asn Thr Gly Ala Ser Arg Asp Ala Gly Ala Trp Gly Ala Leu Leu
 145 150 155 160

Gly Ala Cys Ala Val His Gly Asn Val Glu Leu Gly Glu Ile Ser Ala
 165 170 175

Gln Arg Leu Phe Glu Ile Glu Pro Asp Asn Ser Gly Asn Tyr Val Leu
 180 185 190

Leu Ala Asn Ile Tyr Ala Ser Val Arg Arg Trp Asp Asp Ala Ala Arg
 195 200 205

Val Arg Thr Thr Leu Ser Glu Arg Arg Met Ser Lys Thr Val Gly Tyr
 210 215 220

Ser Trp Ile Lys Glu Glu Asn Gly Ala Arg Thr Phe
 225 230 235

<210> 808

pctca2017050779-seql.txt

<211> 1121

<212> PRT

<213> Papaver somniferum

<400> 808

Met Tyr Thr Gly Ala Thr Ser His Leu Thr Ala Asp Ser Gly Thr Leu
1 5 10 15

Asn Thr Val Phe Asn Thr Ser Asn Ile His Ser Ile Leu Ile Gly Asn
20 25 30

Gly His Ser Ile Pro Val Thr Ala Ser Gly Thr Lys Phe Ile Asp Ile
35 40 45

Pro Ser Arg Thr Leu Lys Leu Lys Asp Thr Leu Val Ala Pro Asp Ile
50 55 60

Ile Lys Asn Leu Val Ser Val Arg Lys Phe Thr Thr Asp Asn His Val
65 70 75 80

Ser Val Glu Phe Asp Pro Ser Gly Phe Ser Val Lys Asp Leu Asn Ser
85 90 95

Arg Lys Ile Leu Leu Arg Cys Asn Ser Ser Gly Glu Leu Tyr Pro Ile
100 105 110

Thr Thr Ser Ala Val Ser Pro Ser Thr Ser Ser Leu Ser His Pro Ile
115 120 125

Ser Leu Ala Val Cys Ser His Asp Ile Trp His Ser Arg Leu Gly His
130 135 140

Pro Gly Lys Ala Ile Leu Asp Asn Leu Arg Ala Asn Ser Ser Ile Gln
145 150 155 160

Cys Asn Lys Asn Gln Ser Thr Lys Leu Cys His Ser Cys Gln Val Ser
165 170 175

Lys His Val Arg Leu Pro Phe Phe Glu Ser Asn Ser Val Thr Phe Ala
180 185 190

Pro Phe Asp Ile Ile His Ser Asp Leu Trp Thr Ser Pro Leu His Val
195 200 205

Glu Thr Gly Phe Asn Tyr Tyr Leu Ile Leu Leu Asp Asp Phe Thr Asn
210 215 220

Tyr Leu Trp Ile Tyr Pro Leu Lys Leu Lys Ser Gln Val Tyr Thr Lys

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225                230                235                240
Phe Leu Glu Phe Arg Ser Phe Val Lys Thr Gln Phe Glu Arg Glu Ile
                245                250                255
Lys Tyr Phe Gln Cys Asp Met Gly Arg Glu Phe Asp Asn Ser Ser Phe
                260                265                270
His Asp Phe Thr His Lys Asn Gly Leu Val Phe Arg Phe Ser Cys Pro
                275                280                285
His Thr Ser Ser Gln Asn Gly Lys Ala Glu Arg Met Ile Arg Arg Val
                290                295                300
Asn Asp Ile Thr Arg Thr Leu Met Ser His Ala Ser Val Pro Pro Lys
305                310                315                320
Tyr Trp Ala Asp Ser Leu His Met Ala Val Tyr Leu His Thr Ile Leu
                325                330                335
Pro Ser Lys Ile Leu Asn Phe Ser Ser Pro Val Ser Ile Leu Tyr Gln
                340                345                350
Arg Gln Pro Thr Tyr Ser His Ile Arg Thr Phe Gly Cys Leu Cys Phe
                355                360                365
Pro Asn Leu Ser Ala Thr Thr Thr His Lys Leu Ser Pro Arg Ser Thr
                370                375                380
Lys Cys Val Phe Leu Gly Phe Pro Thr His His Arg Gly Tyr Arg Cys
385                390                395                400
Leu Asp Leu Ala Thr Asn Lys Ile Ile Leu Ser Arg His Val Thr Phe
                405                410                415
His Glu Asn Val Phe Pro Phe Lys Asn Asn Val Ser Thr Pro Ser Asp
                420                425                430
Cys Gln Asp Ser Pro Ser Thr Pro Ser Ser Thr Leu Leu Pro Ile Arg
                435                440                445
Phe Arg Tyr Pro Thr Ser Pro His Pro Pro Val Gln Pro Pro Ser Ala
                450                455                460
Thr Thr Ser Val Pro Ser Ser Thr Thr Gln Gln Arg Pro Asp Val Ala
465                470                475                480

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pctca2017050779-seql.txt

Pro Pro Ser Ser Ala Thr Ala His Thr Pro Ser Pro Ala Ile His Pro
 485 490 495
 Tyr Thr Pro Pro His Arg Arg Ser Ile Thr Ala Pro His Leu His Ile
 500 505 510
 Pro Pro Gln Gln Gln Ser Ala Pro Thr Ala Pro Asp Ser Asn Ile Ser
 515 520 525
 Val Arg Pro Val Thr Ala Thr Glu Pro Asp Ser Asn Thr Ser Ala Pro
 530 535 540
 Ala Thr Ala Pro Asp Ser Asn Thr Ser Ala Pro Asp Cys Thr Ile Gln
 545 550 555 560
 Ala Val Thr Pro Pro Ser Ser Ala Gln Pro Gly Thr Ser Ala Asn Ser
 565 570 575
 Ser Arg His Val Thr Arg Ala Ser Arg Gly Ile Phe Arg Pro Ile His
 580 585 590
 Arg Leu Asn Leu Asn Val Gln Thr Gln Gln His Ile Ser Asn Leu Pro
 595 600 605
 Lys Ser His Leu Tyr Ala Leu Arg Asp Pro Asn Trp Thr Lys Ala Met
 610 615 620
 Leu Asp Gly Phe Ile Ala Met Leu Lys Thr Asn Thr Trp Asp Leu Val
 625 630 635 640
 Pro Arg Pro Ile Gly Ser His Val Ile Arg Ser Met Trp Leu Phe Arg
 645 650 655
 His Lys Phe Asn Ala Asp Gly Thr Leu Gln Arg Tyr Lys Ala Arg Leu
 660 665 670
 Val Ala Asn Gly Lys Ser Gln Gln Val Gly Val Asp Cys Phe Glu Thr
 675 680 685
 Phe Ser Leu Val Val Lys Pro Ala Thr Ile Arg Thr Val Leu Ser Ile
 690 695 700
 Ala Thr Ser Arg Ser Trp Pro Ile His Gln Leu Asp Val Lys Asn Ala
 705 710 715 720
 Phe Leu His Gly Asp Leu Ser Glu Thr Val Tyr Met His Gln Pro Pro
 725 730 735

pctca2017050779-seql.txt

Gly Phe Val Asp Pro Ala Arg Pro Asp Tyr Val Cys Arg Leu Arg Arg
740 745 750

Ser Leu Tyr Gly Leu Lys Gln Thr Pro Arg Ala Trp Phe Gln Arg Phe
755 760 765

Ala Thr Phe Ile Thr Gly Cys Gly Phe Arg Gly Ser Val Cys Asp Pro
770 775 780

Ser Leu Phe Ile Tyr Arg Ser Gly Arg Glu Thr Ala Tyr Leu Leu Leu
785 790 795 800

Tyr Val Asp Asp Ile Ile Leu Thr Ala Ser Thr Asp Ala Leu Leu Ala
805 810 815

Arg Phe Ile Asp Leu Met Lys Leu Glu Phe Ser Met Thr Asp Leu Gly
820 825 830

Pro Leu His His Phe Leu Gly Ile Thr Ala Ser Arg Ser Ser Ser Gly
835 840 845

Leu Phe Leu Ser Gln Ser Leu Tyr Thr Lys Asp Ile Ile Ala Arg Ala
850 855 860

Ser Met Thr Asn Cys Asn Pro Val Ala Thr Pro Val Asp Thr His Ser
865 870 875 880

Lys Leu Ser Ala Thr Ser Gly Pro Ala Leu Ser Asp Pro Thr Leu Tyr
885 890 895

Arg Ser Leu Ala Gly Ala Leu Gln Tyr Leu Thr Phe Thr Arg Pro Asp
900 905 910

Ile Ser Tyr Ala Val Gln Gln Val Cys Leu Phe Met His Asp Pro Arg
915 920 925

Glu Pro His Met Gln Ala Ile Lys Arg Ile Ile Arg Tyr Leu Gln Gly
930 935 940

Thr Ile Asp His Gly Leu Ser Leu Ser Val Ser Asn Ile Ser Gly Leu
945 950 955 960

Thr Ala Tyr Ser Asp Ala Asp Trp Ala Gly Cys Pro Asp Ser Arg Arg
965 970 975

Ser Thr Ser Gly Tyr Cys Ile Phe Leu Gly Asp Asn Leu Val Ser Cys
980 985 990

pctca2017050779-seql.txt

Ser Ser Lys Arg Gln Ala Thr Val Ser Arg Ser Ser Ala Glu Ala Glu
995 1000 1005

Tyr Arg Gly Val Ala Asn Ala Val Ala Glu Thr Thr Trp Leu Arg
1010 1015 1020

Asn Leu Leu Leu Glu Leu His Met Pro Leu Gln Arg Ala Thr Leu
1025 1030 1035

Val Asp Cys Asp Asn Val Ser Ala Val Tyr Met Ser Gly Asp Pro
1040 1045 1050

Val Gln His Gln Arg Thr Lys His Val Glu Ile Asp Ile His Phe
1055 1060 1065

Val Arg Glu Arg Val Arg Ile Gly Asp Ile Arg Val Leu His Ile
1070 1075 1080

Pro Ser Glu His Gln Tyr Ala Asp Ile Phe Thr Lys Gly Leu Pro
1085 1090 1095

Arg Gln Leu Phe Ile Asn Phe Arg Ser Ser Leu Ser Val Cys Ser
1100 1105 1110

Ser Pro Ala Gln Thr Lys Gly Val
1115 1120

<210> 809
<211> 175
<212> PRT
<213> Papaver somniferum

<400> 809

Met Glu Pro Arg Lys Val Leu Ile Leu Val Val Leu Gly Leu Phe Gly
1 5 10 15

Asn Ile Ser Phe Thr Ala Ser Gln Leu Phe Pro Pro Pro Ile Gln Ser
20 25 30

Phe Ile Pro Ile Glu Leu Ser Pro Pro Pro Ala Gln Asn Leu Ala Pro
35 40 45

Pro Gln Leu Ser Pro Pro Ala Phe Gln Asn Leu Ala Pro Pro Leu Thr
50 55 60

Pro Pro Pro Pro Pro Pro Ala Pro Phe Pro Pro Pro Pro Phe Val
65 70 75 80

pctca2017050779-seql.txt

Pro Pro Pro Pro Pro Gln Ala Gln Ser Pro Pro Pro Pro Pro Pro Pro
85 90 95

Pro Ala Pro Gln His Ser Pro Pro Pro Pro Pro His Trp Arg Arg
100 105 110

Pro Pro Pro Pro Trp Gly Asn Pro Asn Tyr Ala Gly Arg Arg Asn Glu
115 120 125

Trp Arg Lys Ser Gly Lys Glu Met Asn Phe Gly Lys Lys Ile Gly Tyr
130 135 140

Leu Phe Leu Cys Val Gly Gly Ala Leu Gln Ile Gly Val Ile Ser Phe
145 150 155 160

Leu Gly Phe Lys Arg Trp Lys Ile Ser Lys Ile Lys Asp Arg Gly
165 170 175

<210> 810
<211> 218
<212> PRT
<213> Papaver somniferum

<400> 810

Met Ala Ser Ser Ile Ser Lys Thr Arg Asn Leu Gln Thr Tyr Phe Ser
1 5 10 15

Ser Ala Asn Arg Ile Pro Lys Leu Thr Pro Leu Phe Ser Thr Ser Asn
20 25 30

Arg Val Leu Ser Thr Leu Ala Glu Ser Pro Ile Asp Ser Ser Phe Gln
35 40 45

Ala Gln Glu Lys Lys Ser Trp Ser Arg Tyr Leu Leu Phe Leu Pro Gly
50 55 60

Ala Ile Thr Phe Gly Leu Gly Thr Trp Gln Ile Phe Arg Arg Gln Asp
65 70 75 80

Lys Val Glu Met Leu Asp Tyr Arg Arg Asn Arg Leu Gly Leu Asp Pro
85 90 95

Val Val Trp Asn Asn Ile Ser Ser Phe Ser Ser Arg Glu Asp Ser Gly
100 105 110

Ser Leu Glu Phe Arg Arg Val Met Cys Glu Gly Ile Phe Asp Glu Ser
115 120 125

pctca2017050779-seql.txt

Lys Ser Ile Tyr Val Gly Pro Arg Ser Arg Ser Ile Ser Glu Val Thr
130 135 140

Glu Asn Gly Tyr Tyr Val Ile Thr Pro Leu Val Pro Asn Ser Ser Asp
145 150 155 160

Pro Lys Ser Val Gln Ser Pro Val Leu Val Asn Arg Gly Trp Asp Pro
165 170 175

Arg Ser Trp Arg Glu Lys His Gln Lys Asp Ser Gln Asn Val Glu Thr
180 185 190

Val Leu Asn Ile Lys Ile Val Asp Asp Gly Glu Thr Glu Gly Ser Ser
195 200 205

Arg Trp Lys Phe Gly Leu Arg Ser Met Val
210 215

<210> 811
<211> 297
<212> PRT
<213> Papaver somniferum

<400> 811

Met Asp Ile Ser Gly Glu Gln His Leu Asp Val Lys His Asp Val Ile
1 5 10 15

Lys Asn Arg Ile Asp Ala Asn Gly Asn Ile Ile Glu Thr Lys Lys Asp
20 25 30

Gly Val Gly Val His Lys Ile Glu Lys Pro Leu Gln Lys His Gly Gly
35 40 45

Arg Leu Glu His Asn Glu Thr Tyr Cys Gly Ser Cys Tyr Gly Ala Glu
50 55 60

Thr Thr Asp Ala Asp Cys Cys Asn Ser Cys Glu Glu Val Arg Glu Ala
65 70 75 80

Tyr Arg Lys Lys Gly Trp Gly Met Ser Asn Pro Asp Glu Ile Asp Gln
85 90 95

Cys Lys Arg Glu Gly Phe Leu Gln Lys Ile Lys Asp Glu Glu Gly Glu
100 105 110

Gly Cys Asn Ile Tyr Gly Phe Leu Glu Val Asn Lys Val Ala Gly Asn
115 120 125

pctca2017050779-seql.txt

Phe His Phe Ala Pro Gly Lys Ser Phe Gln Gln Ser Asn Val His Val
130 135 140

His Asp Val Thr Ala Phe Gln Lys Asp Ser Phe Asn Ile Ser His Lys
145 150 155 160

Ile Asn Lys Leu Ser Phe Gly Glu Ser Phe Pro Gly Val Val Asn Pro
165 170 175

Leu Asp Arg Val Gln Trp Thr Gln Lys Thr Pro Thr Gly Met Phe Gln
180 185 190

Tyr Phe Val Lys Val Val Pro Thr Val Tyr Thr Asp Ile Asn Asn His
195 200 205

Thr Ile Gln Ser Asn Gln Phe Ser Val Thr Glu His Phe Arg His Ala
210 215 220

Ile Val Gly Gln Pro His Ser Val Pro Gly Val Phe Phe Phe Tyr Asp
225 230 235 240

Leu Ser Pro Ile Lys Val Thr Phe Thr Glu Gln His Val Ser Phe Leu
245 250 255

His Phe Leu Thr Asn Ile Cys Ala Ile Val Gly Gly Met Phe Thr Val
260 265 270

Ser Gly Ile Leu Asp Ser Phe Ile Tyr His Gly Gln Lys Val Ile Arg
275 280 285

Lys Lys Met Glu Ile Gly Lys Phe Ser
290 295

<210> 812
<211> 264
<212> PRT
<213> Papaver somniferum

<400> 812

Met Ala Thr Ser Ser Ser Trp Phe Ser Leu Val Ser Met Tyr Glu Ser
1 5 10 15

His Leu Arg Asn Thr Phe Thr Ser Ser Gly Leu Thr Pro Lys Ser Ile
20 25 30

Asn Ile Asp Ser Asp Thr Asn Ile His Tyr Trp Ser Pro Ile His Pro
35 40 45

pctca2017050779-seql.txt

Leu Thr Leu Pro Thr Leu Val Leu Leu His Gly Phe Gly Gly Asn Cys
 50 55 60
 Leu Trp Gln Trp Ser Lys Gln Val Gln His Leu Ser Thr His Phe Thr
 65 70 75 80
 Leu Tyr Val Pro Asp Leu Ile Tyr Phe Gly Lys Ser Val Thr Lys Ser
 85 90 95
 Ser Glu Arg Ser Glu Asn Phe Gln Ala Val Ser Val Gly Lys Leu Leu
 100 105 110
 Glu Leu Leu Gly Val Thr Thr Tyr Ser Val Met Gly Thr Ser Tyr Gly
 115 120 125
 Gly Phe Val Ala Tyr His Met Ala Arg Leu Trp Pro Asp Arg Val Glu
 130 135 140
 Lys Val Val Ile Ala Asn Ser Ala Leu Asn Ile Thr Ser Lys Asp Val
 145 150 155 160
 Glu Glu Leu Leu Lys Glu Ala Asn Ile Glu Asn Ile Glu Ser Val Phe
 165 170 175
 Met Pro Ser Ser Pro Ala Glu Leu Leu Thr Cys Ile Arg Leu Ile His
 180 185 190
 Lys Gln Leu Pro Thr Tyr Val Pro Glu Phe Phe Leu Asn Asp Phe Leu
 195 200 205
 Asp Asn Leu Cys Asn Glu Asn Arg Lys Glu Lys Leu Glu Leu Leu Lys
 210 215 220
 Gly Thr Thr Val Gly Lys Glu Asp Thr Ile Ser Ile Leu Pro Leu Gln
 225 230 235 240
 Gln Glu Val Leu Leu Ile Trp Gly Glu Asn Asp Ala Ile Phe Pro Leu
 245 250 255
 Glu Lys Gly Tyr Glu Leu Lys Glu
 260

<210> 813
 <211> 94
 <212> PRT
 <213> Papaver somniferum

pctca2017050779-seql.txt

<400> 813

Met Thr Ser Glu Ser Pro Asn Ser Ser Arg Lys Val Val Val His Leu
1 5 10 15

Arg Ala Thr Gly Asp Ala Pro Ile Leu Lys Gln Ala Lys Phe Lys Ile
20 25 30

Ala Gly Thr Asp Lys Phe Ala Lys Val Ile Ala Phe Leu Arg Arg Gln
35 40 45

Leu His Arg Asp Thr Leu Phe Val Tyr Val Asn Ser Ala Phe Ser Pro
50 55 60

Asn Pro Asp Glu Leu Val Asn Asp Leu Tyr Asn Asn Phe Gly Phe Asp
65 70 75 80

Gly Lys Leu Val Val Asn Tyr Ala Cys Ser Met Ala Trp Gly
85 90

<210> 814

<211> 108

<212> PRT

<213> Papaver somniferum

<400> 814

Met Asn Leu Met Asn Cys Lys Ser Pro Asp Ile Ala Tyr Ile Val Ser
1 5 10 15

Lys Leu Ser Gly Tyr Asn Cys Ser Pro Glu Gln Glu Asn Ser Asp Ala
20 25 30

Leu Ser Arg Val Leu Trp Tyr Leu Lys Tyr Cys Ile Thr Phe Cys Phe
35 40 45

Ile Tyr Glu Arg Tyr Leu Val Val Leu Glu Gly Leu Cys Asp Ala Asn
50 55 60

Trp Ile Val Asp Ser Glu Glu Ser Lys Ser Thr Ser Gly Tyr Val Phe
65 70 75 80

Thr Leu Ala Arg Gly Phe Val Ser Gly Ser Phe Ser Asp Lys His Ile
85 90 95

Leu Leu Asn Ser Leu Trp Asn Leu Arg Val Leu Arg
100 105

<210> 815

<211> 84

pctca2017050779-seql.txt

<212> PRT

<213> Papaver somniferum

<400> 815

Met Asn Asp Gly Ala Leu Tyr Ile Ser Lys Leu Gln Phe Leu Val Gln
1 5 10 15

Arg Phe Asn Met Thr Lys Leu Pro Phe Thr Lys Met Arg Ala Cys Cys
20 25 30

His Ala Asn Val Thr Lys Ile Ile Gln Val Lys Ser Phe Ile Ile Met
35 40 45

Leu Asn Gln Asn Ile Met Cys His Ala Gln Ile Ile Asp Tyr Leu Asn
50 55 60

Leu Leu Ala Ser Lys Tyr Ser Cys His Ile His His Cys Gly Thr Thr
65 70 75 80

Ala Met Ile Pro

<210> 816

<211> 265

<212> PRT

<213> Papaver somniferum

<400> 816

Met Gly Glu Trp Glu Asn Met Lys Pro Ser Asp Gln Thr Ser Gln Leu
1 5 10 15

Val Phe Lys Pro Leu Met Ile Ser Met Val Gly Ile Ala Phe Thr Ala
20 25 30

Leu Ala Ile Val Thr Tyr Gln Phe Ile Ile Thr Lys Tyr Cys Val Arg
35 40 45

Arg Arg Glu Ser Met Ile Glu Arg Asn Glu Leu Arg Ser His Gln Ala
50 55 60

Met Val Asn Arg Gly Val Asp Glu Asn Val Leu Lys Ala Ile Pro Ile
65 70 75 80

Ile Thr Tyr His His Gln Gln Gln Gln Gln Ser Arg Asp Glu Glu Glu
85 90 95

Glu Val Phe Cys Val Asp Gln Thr Glu Cys Ser Val Cys Leu Gly Asp
100 105 110

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Leu Gln Glu Gly Asp Met Leu Arg Leu Leu Pro Asn Cys Lys His Val
115 120 125

Phe His Val Pro Cys Ile Asp Gln Trp Trp Leu Thr His Ser Thr Cys
130 135 140

Pro Ile Cys Arg Ser Pro Val Thr Gly Arg Asn Asp Asp Ser Val Cys
145 150 155 160

Leu Gln Ile Gln Ala Glu Gly Asp Glu Glu Gly Leu Val Ser His Gln
165 170 175

His His Gln Glu Gln Gln Tyr Asn Cys Ser Glu Gly Ser Asn Asn Asn
180 185 190

Glu Gly Gly Asn Ser Ser Ile Met Val Gly Ser Lys Leu Arg His Cys
195 200 205

Val Ser Leu Ile Trp Pro Ala Asn Tyr Glu Asp Glu Val Arg Lys Gln
210 215 220

Gln Ser Lys Thr Val Leu Leu Lys Arg Ser Met Ser Val Asp Cys Ser
225 230 235 240

Phe Val Cys Ile Lys Ile Gln Pro Arg Thr Asp Ser Ser Ser Ser Ser
245 250 255

Ser Ser Thr Trp Lys Thr Thr Ser Lys
260 265

<210> 817

<211> 172

<212> PRT

<213> Papaver somniferum

<400> 817

Ser Val Lys Ala Ile Lys Phe Gln Ala Pro Lys Ile Arg Lys Ala Leu
1 5 10 15

Ile His Leu Ile Lys Thr Ser Lys Asn Asn Glu Glu Lys Cys Ile Ala
20 25 30

Gln Gly Ile Leu Lys Asn His Met Lys Asn Phe Glu Phe Phe Leu Gly
35 40 45

Met Val Ile Trp Tyr Asp Leu Leu Ser Val Val Asn Ser Val Ser Lys
50 55 60

pctca2017050779-seql.txt

Ser Leu Gln Ala Lys Asp Met His Met Gly Asp Ala Ile Glu His Ile
65 70 75 80

Lys Met Leu Val Ser Phe Phe Lys Glu Tyr Arg Asp Asn Gly Phe Gln
85 90 95

Ala Ala Leu Val Glu Ala Lys Gln Ile Ala Val Asp Met Gly Ile Ser
100 105 110

Pro Lys Phe Gln Glu Gln Arg Val Arg Lys Arg Lys Lys His Phe Asp
115 120 125

Asp Asp Ala Ser Glu Glu Thr Val Pro Asp Ser Asp Ile Asp Gly Arg
130 135 140

Asp Leu Tyr Thr Glu Leu Lys Ile Met Lys Arg Thr Leu Pro Ala Glu
145 150 155 160

Ile Lys Lys Pro Ile Glu Lys Glu Val Ser Pro Asn
165 170

<210> 818

<211> 221

<212> PRT

<213> Papaver somniferum

<400> 818

Met Pro Pro Leu Lys Arg Lys Gln Ser Ser Gly Cys Gln Asn Arg Lys
1 5 10 15

Ile Ser Lys Lys Lys Glu Glu Phe Lys Lys Ser Leu Val Gly Ser Leu
20 25 30

Glu Lys Tyr Val Val Arg Thr Ser Glu Thr Ile Val Val Asp Asn Val
35 40 45

Asn Val Ala Ile Thr Asp Thr Gly Gly Asn Val Asn Arg Thr Val Glu
50 55 60

Ser Asn Thr Cys Glu Asn Val Asp Gln Asn Leu Asn Glu Ile Asn Arg
65 70 75 80

Asp Gly Asn Asp Ala His Val Ala Gly Asn Val Asp Thr Val Ala Gly
85 90 95

Gly Gly Asp Val Asn Glu Leu Asn Glu Asn Asn Asn Ser Val Asn Val
100 105 110

pctca2017050779-seql.txt

Asn Glu Glu Val Asn Asp Met Asp Gly Cys Thr Ala Thr Glu Phe Asn
115 120 125

Met Glu Glu Pro Asn Gln Asp Ile Phe Asp Pro Lys Asn Trp Gly Lys
130 135 140

Ile Asp Gln Lys Leu Ile Asp Phe Leu Val Glu Asn Gly Pro Arg Arg
145 150 155 160

Val Glu Asp Tyr Asp Phe Pro Tyr Asp Lys Phe Gly Lys Arg Phe Ser
165 170 175

Arg Lys His Tyr Thr Arg Lys Met Ala Asn Arg Glu Lys Gln Asp Arg
180 185 190

Arg Trp Leu Val Tyr Ser Val Ser Leu Asp Lys Val Phe Cys Phe Cys
195 200 205

Cys Lys Leu Phe Lys Lys Asp Asp Ser Thr Gln Leu Ala
210 215 220

<210> 819
<211> 435
<212> PRT
<213> Papaver somniferum

<400> 819

Met Val Gln Glu Glu His Asp Val Ala Asp Gly Gly Glu Val Gln Glu
1 5 10 15

Gly Thr Ser Ala Ala Val Gly Val Thr Pro Ile Val Pro Gln Glu Val
20 25 30

Arg Arg Ser Ser Arg Thr Pro Lys Pro Asn Pro Arg Tyr Ala Leu Asn
35 40 45

Tyr Leu Leu Leu Thr Asp Gly Val Glu Pro Glu Asp Ile Lys Glu Ala
50 55 60

Leu Ala Ala Asp Asp Ser Gly Lys Trp Gln Leu Ala Met Glu Asp Glu
65 70 75 80

Ile Asn Ser Leu Glu Glu Asp Gly Thr Trp Val Leu Val Lys Leu Pro
85 90 95

Arg Gly Lys Lys Ala Leu His Asn Lys Trp Val Tyr Arg Met Lys Ser
100 105 110

pctca2017050779-seql.txt

Glu Ala Asn Gly Asp Ile Arg Tyr Lys Glu Arg Leu Val Val Lys Gly
 115 120 125
 Phe Gln Gln Lys Pro Ser Val Asp Tyr Asn Glu Ile Phe Ser Pro Val
 130 135 140
 Val Lys Met Thr Thr Ile Arg Val Val Leu Ser Leu Val Ala Ser Glu
 145 150 155 160
 Asp Leu Tyr Leu Glu Gln Leu Asp Val Lys Thr Thr Phe Leu His Gly
 165 170 175
 Asn Leu Asp Glu Glu Ile Tyr Met Lys His Pro Glu Gly Phe Ile Val
 180 185 190
 Lys Gly Lys Glu Glu Met Val Cys Lys Leu Lys Lys Ser Leu Tyr Gly
 195 200 205
 Leu Lys Gln Ala Arg Arg Gln Trp Tyr Lys Lys Phe Asp Asn Phe Met
 210 215 220
 His Arg Gly Gly Tyr Ser Arg Cys Asn Ala Asp His Cys Cys Tyr Phe
 225 230 235 240
 Lys Arg Cys Ser Ser Asp Tyr Ile Ile Leu Leu Leu Tyr Val Asp Asp
 245 250 255
 Met Leu Val Ser Gly Thr Ser Leu Gln Glu Val Glu Asn Leu Lys Lys
 260 265 270
 Gln Leu Ser Ser Glu Phe Ala Val Lys Asp Leu Gly Glu Ala Lys Gln
 275 280 285
 Ile Leu Gly Met Arg Ile Ile Arg Asp Ile Ala Asn Gly Val Leu Met
 290 295 300
 Leu Ser Gln Ala Asp Tyr Ile Glu Arg Val Leu Lys Arg Phe Asn Met
 305 310 315 320
 Glu Asn Ala Lys Pro Val Ser Ser Pro Ile Gly Ser Gln Ile Leu Val
 325 330 335
 Ser Ser Met Gln Cys Ala Lys Thr Asn Glu Glu Lys Glu Tyr Met Ala
 340 345 350
 Asn Val Pro Tyr Ser Ser Ala Ile Gly Ser Leu Met Tyr Ala Met Val
 355 360 365

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Cys Met Arg Pro Asp Ile Ala His Ala Val Gly Val Val Ser Arg Tyr
370 375 380

Ala Ser Asn Pro Gly Lys Gln His Trp Glu Ala Val Lys Trp Ile Leu
385 390 395 400

Arg Tyr Leu Arg Gly Asn Thr Asn Val Ser Leu Cys Tyr Gly Lys Gly
405 410 415

Gly Ser Ile Leu Arg Gly Tyr Val Asp Ala Asp Phe Lys Gly Asp Val
420 425 430

Asp Lys Arg
435

<210> 820
<211> 117
<212> PRT
<213> Papaver somniferum

<400> 820

Met Glu Gly Glu Thr Tyr Ser Val Tyr Gly Asn Gly Val Asn His Lys
1 5 10 15

Val Arg Gln Ser Phe His Lys Asn Phe Ile Gln Val Gln Ser Leu Leu
20 25 30

Asp Gln Asn Arg Leu Leu Ile Asn Glu Ile Asn Arg Asn His Glu Ser
35 40 45

Asn Ile Pro His Asp Leu Asn Arg Asn Val Gly Leu Ile Arg Glu Leu
50 55 60

Asn Asn Asn Ile Arg Arg Val Val Leu Leu Tyr Ala Asp Leu Ser Ser
65 70 75 80

Ser Leu Val Ser Tyr Glu Gly Gly Gly Gly Asp Phe Ser Gly Gly Gly
85 90 95

Gly Arg Ser Gly Gly Leu Phe Glu Arg Phe Leu Asn His Asn Gly Lys
100 105 110

Lys Arg Lys Thr Pro
115

<210> 821
<211> 667

pctca2017050779-seql.txt

<212> PRT

<213> Papaver somniferum

<400> 821

Met Met Ser Ile Phe Ser Asp Met Ile Asp Ser Phe Leu Glu Ile Phe
1 5 10 15

Met Asp Asp Phe Ser Val Phe Gly Ser Ser Phe Asp Glu Cys Leu Asp
20 25 30

His Leu Val Leu Val Leu Ser Arg Cys Lys Gln Lys Asn Leu Ile Leu
35 40 45

Asn Trp Glu Lys Cys His Phe Met Val Asn Ser Gly Ile Val Leu Gly
50 55 60

His Ile Val Ser Glu Lys Arg Ile Glu Val Asp Lys Ala Lys Val Asp
65 70 75 80

Leu Ile Gln Gln Leu Pro Gln Pro His Ser Val Lys Gly Ile Arg Ser
85 90 95

Phe Leu Gly His Ala Gly Phe Tyr Arg Arg Phe Ile Lys Asn Phe Ser
100 105 110

Gln Ile Ser Arg Pro Leu Cys Asn Leu Leu Ala Lys Asp Val Val Phe
115 120 125

Asn Phe Asp Ala Ser Cys Val Lys Ala Trp Glu Glu Leu Lys Thr Leu
130 135 140

Leu Thr Thr Ala Pro Ile Val Arg Pro Pro Asp Trp Lys Leu Pro Phe
145 150 155 160

Glu Leu Met Cys Asp Ala Ser Asp Tyr Ala Val Gly Ala Val Leu Gly
165 170 175

Gln Arg Val Asp Arg Leu Pro Tyr Val Ile Tyr Tyr Ala Ser Lys Thr
180 185 190

Leu Asn Asp Ala Gln Leu Asn Tyr Ser Thr Thr Glu Lys Glu Leu Leu
195 200 205

Ala Val Val Phe Ala Leu Asp Lys Phe Arg Ser Tyr Leu Ile Gly Ser
210 215 220

Lys Ile Ile Ile Tyr Thr Asp His Ala Ala Leu Lys Tyr Leu Leu Ser
225 230 235 240

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Lys Lys Asp Ala Lys Ala Arg Leu Ile Arg Trp Ile Leu Leu Leu Gln
 245 250 255
 Glu Phe Asp Leu Glu Ile Arg Asp Lys Lys Gly Cys Glu Asn Val Val
 260 265 270
 Ala Asp His Leu Ser Arg Leu Thr Leu Glu Ser Ile Asp Glu Phe Glu
 275 280 285
 Met Ile Arg Glu Ser Phe Pro Asp Glu Gln Leu Met Ser Ile Ser Asp
 290 295 300
 Leu Pro Trp Phe Ala Asp Ile Val Asn Tyr Leu Ala Thr Gly Arg Met
 305 310 315 320
 Pro Ser Arg Trp Ser Arg Gln Asp Arg Ser Lys Phe Leu Ala Glu Val
 325 330 335
 Lys His Phe Leu Trp Asp Asp Pro Tyr Leu Phe Lys Tyr Cys Pro Asp
 340 345 350
 Gln Ile Ile Arg Lys Cys Val Pro Asn Thr Glu Gln Lys Asn Val Ile
 355 360 365
 Ser Phe Cys His Asp Gln Ala Cys Gly Gly His Phe Ser Ala Lys Lys
 370 375 380
 Thr Ala Ala Lys Ile Leu Gln Cys Gly Phe Tyr Trp Pro Ser Leu Phe
 385 390 395 400
 Lys Asp Cys His Asp Tyr Cys Val Ala Cys Glu Arg Cys Gln Lys Leu
 405 410 415
 Gly Ser Ile Ser Arg Arg Asn Met Met Pro Leu Asn Pro Ile Leu Ile
 420 425 430
 Val Glu Ile Phe Asp Val Trp Gly Ile Asp Phe Met Gly Pro Phe Pro
 435 440 445
 Ile Ser Asp Gly Arg Leu Tyr Ile Leu Val Ala Val Asp Tyr Val Ser
 450 455 460
 Lys Trp Val Glu Ala Ile Ala Thr Arg Thr Asn Asp His Lys Val Val
 465 470 475 480
 Leu Ser Phe Leu Lys Glu Asn Ile Phe Ala Arg Phe Gly Thr Pro Arg

485

490

495

Ala Ile Ile Ser Asp Gly Gly Ser His Phe Arg Asn Lys Tyr Phe Glu
 500 505 510

Ser Leu Val Arg Lys Tyr Gly Ile Thr His Lys Val Ala Thr Pro Tyr
 515 520 525

His Pro Gln Thr Ser Gly Gln Val Glu Val Ser Asn Arg Glu Ile Lys
 530 535 540

Arg Ile Leu Glu Lys Thr Val Asn Pro Ser Arg Lys Asp Trp Ser Leu
 545 550 555 560

Arg Leu Asn Asp Ala Leu Trp Ala Tyr Arg Thr Ala Tyr Lys Thr Pro
 565 570 575

Ile Gly Met Ser Pro Tyr Arg Leu Val Tyr Gly Lys Pro Cys His Leu
 580 585 590

Pro Val Glu Leu Glu His Arg Ala Tyr Trp Ala Ile Lys Glu Leu Asn
 595 600 605

Phe Ser Leu Asp Glu Ala Gly Ile Gln Arg Lys Leu Gln Leu Asn Glu
 610 615 620

Leu Glu Glu Leu Arg Asn Glu Ala Tyr Asp Ser Ala Lys Leu Tyr Lys
 625 630 635 640

Gln Lys Met Lys Met Phe His Asp Lys Arg Ile Leu Arg Lys Ser Phe
 645 650 655

Thr Pro Gly Gln Lys Val Leu Leu Tyr Asp Ser
 660 665

<210> 822

<211> 262

<212> PRT

<213> Papaver somniferum

<400> 822

Met Ser Glu Phe Glu Arg Val Lys Met Lys Asp Thr Asp Thr Ile Asp
 1 5 10 15

Arg Phe Ala Gly Lys Leu Ser Glu Ile Ala Ser Lys Ala Ala Ser Leu
 20 25 30

Gly Gln Ser Ile Asp Glu Asp Lys Leu Val Lys Lys Phe Leu Asn Ser

35

Leu Pro Arg Ser Lys Tyr Ile His Ile Ile Ala Ser Leu Glu Gln Val
50 55 60

Leu Asp Leu Lys Lys Thr Ser Tyr Glu Asp Ile Ile Gly Arg Leu Lys
65 70 75 80

Ala Tyr Glu Glu Arg Ile Leu Asp Glu Glu Asn Asn Gly Glu Thr Gln
85 90 95

Gly Lys Leu Leu Tyr Thr Asn Ser Tyr Gln Gln Asn Ser Ala Thr Arg
100 105 110

Gly Arg Gly Arg Gly Arg Gly Gly Arg Val Asn Arg Gly Arg Gly Arg
115 120 125

Gly Gly Arg Phe Asn Ser Gln Asp Arg Thr Thr Ser Gln Asn Asp Gln
130 135 140

Asn Gln Gly Lys Glu Lys Lys Asp Arg Ser Asn Ile Ile Cys Tyr Arg
145 150 155 160

Cys Asp Lys Pro Gly His Phe Ser Ser Val Cys Pro Glu Arg Ile Arg
165 170 175

Lys Met Glu Glu Ala Asn Lys Asn Glu Thr Arg Glu Ala Asp Thr Ala
180 185 190

Leu Phe Met His Glu Val Val Phe Leu Asn Glu Glu Lys Leu Ile Pro
195 200 205

Lys Asn Tyr Glu Thr Lys Asp Ser Glu Glu Gly Val Trp Tyr Leu Asp
210 215 220

Asn Gly Ala Ser Asn His Met Thr Gly Lys Arg His Tyr Phe Ser Glu
225 230 235 240

Leu Asn Glu Lys Ile Lys Gly Gln Val Lys Phe Gly Asp Gly Ser Ser
245 250 255

Val Glu Ile Glu Gly Lys
260

<210> 823
<211> 245
<212> PRT
<213> Papaver somniferum

pctca2017050779-seql.txt

<400> 823

Met Arg Gln Asp Tyr Leu Thr Val His Asp Pro Ser Gly Arg Leu Leu
 1 5 10 15

Val Arg Val Ser Arg Ser Gln Asn Arg Leu Tyr Lys Ile Ser Leu Met
 20 25 30

Ile Gly Arg Pro Phe Cys Leu Asn Met Arg Leu Gln Asp Gln Thr Trp
 35 40 45

Lys Trp His Ala Arg Leu Gly His Ile Ser Ser Arg Thr Leu Lys Thr
 50 55 60

Met Ser Gln Asn Lys Met Val Arg Gly Leu Pro Gln Lys Asn Gly Val
 65 70 75 80

Val Glu Arg Arg Lys Arg Thr Leu Met Glu Met Thr Arg Ser Ser Leu
 85 90 95

Lys Asp Met Gln Val Pro Lys Tyr Leu Trp Gly Glu Val Val Arg His
 100 105 110

Ser Thr Tyr Leu Ile Asn Arg Ile Pro Thr Lys Ala Leu Lys Asp Met
 115 120 125

Thr Pro Tyr Glu Ile Leu Arg Lys Lys Lys Pro Asn Ile Val His Leu
 130 135 140

Arg Val Phe Gly Cys Lys Ala Tyr Ala Arg Val Asp Ser Ala Thr Leu
 145 150 155 160

Lys Lys Leu Asp Asp Arg Ser Gln Thr Leu Val His Leu Gly Ile Glu
 165 170 175

Pro Gly Ser Lys Ser Tyr Arg Leu Phe Asn Pro Thr Thr Lys Arg Val
 180 185 190

Ile Val Ser Arg Asp Val Val Phe Asp Glu Lys Ala Asn Trp Asn Trp
 195 200 205

Lys Glu Thr Asn Asp Gly Pro Ser Arg Asp Pro Gly Met Phe His Met
 210 215 220

Arg Trp Gly Gln Val Ile Glu Thr Met Ile Ile Asn Thr Asn Gly Asn
 225 230 235 240

Asn Asp Val Asn Gln
245

<210> 824
<211> 186
<212> PRT
<213> Papaver somniferum

<400> 824

Met Ser Ile Lys Phe Lys Phe Arg Ser Ser Val Asn Phe Asp Ser Ile
1 5 10 15

Asp Leu Glu Asp Ser Pro Ser Val Ser Val Arg Asp Leu Lys Ser Arg
20 25 30

Ile Ile Asn Gln Ser Lys Leu Lys Ile Cys Gln Asp Phe Asp Leu Val
35 40 45

Leu Ser Asn Ala Ile Thr Gly Gln Glu Phe Glu Asp Glu Glu Phe Leu
50 55 60

Val Glu Ser Gly Ser Ser Val Ile Ile Lys Arg Val Pro Val Asp Arg
65 70 75 80

Asp Ala Asn Ser Val Arg Pro Ala Val Glu Asn Met Ala Lys Lys His
85 90 95

Tyr Pro Ser Val His Thr Asn Glu Pro Thr Leu Pro Ala Val Cys Gly
100 105 110

Lys Asn Val Glu Val Glu Asn Phe Asp Asp Phe Gly Ile Asp Leu Tyr
115 120 125

Pro Ala Pro Glu Thr Pro Leu Leu Asp Ser Asp Leu Asp Asp Asp Lys
130 135 140

Val Asn Cys Thr Ser Ser Val His Ala Asp Lys Glu Ile Pro Arg Cys
145 150 155 160

Ser Gly Ser Gly Pro Ser Gly Val Lys His Gln Asn Ile Glu Lys Ser
165 170 175

Asp Pro Ser Glu Gly Ile Pro Lys Glu Trp
180 185

<210> 825
<211> 73
<212> PRT
<213> Papaver somniferum

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<400> 825

Met Asn Tyr Asn Ala Leu Phe Gln Met Tyr Val Tyr Ser Phe Ser Ser
1 5 10 15

Ser Leu Tyr Ile Thr Val Ala Ile Leu Val Gln Val Thr Val Asn Gln
20 25 30

Gln Leu Leu Ala Ile Leu Arg Leu Val Asp Ser Asp Cys Ser Arg Met
35 40 45

Ala Gly Cys Trp Cys Phe Arg Asp Phe Cys Cys Ser Phe Met Lys Cys
50 55 60

Gln Thr Phe Leu Leu Gly Val Asn Gln
65 70

<210> 826

<211> 255

<212> PRT

<213> Papaver somniferum

<400> 826

Met Ala Met Met Asn Arg Ile Ser Ser Arg Phe Ser Arg Cys Leu Thr
1 5 10 15

Ser Ser Ile Thr Thr Leu Leu His Phe Asp Ser Ser Ser Ser Ser Leu
20 25 30

Gly Arg His Ser Tyr Asn Thr Ser Ser Leu Gln Arg Tyr Ala Gln Glu
35 40 45

Lys Pro Lys Gln Met Ile Pro Gly Asn Asn Met Lys Trp Gly Ser Leu
50 55 60

Gly Pro Arg Arg Asp Tyr Ser Asn Phe Ala Ser Gly Phe Thr Pro Leu
65 70 75 80

Gln Gln Lys Pro Leu Ser Ser Ile Ile Asp Ile Glu Arg Ala Lys Asn
85 90 95

Phe Ser Pro Glu Asp Leu Ala Asp Ile Trp Asp Asp Tyr His Leu Gly
100 105 110

Arg Gly His Ile Gly Ile Thr Met Lys Ala Lys Leu Tyr His Leu Met
115 120 125

Lys Gln Arg Ala Val Thr Cys Arg His Phe Val Ile Pro Leu Trp Lys

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130

135

140

Gly Thr Gly Tyr Val Thr Met Phe Val Gln Val Gln Met Pro His Ile
 145 150 155 160

Ile Phe Thr Gly Leu Glu Asp Tyr Lys Ala Arg Gly Thr Gln Ala Ala
 165 170 175

Pro Tyr Phe Thr Ala Thr Tyr Phe Thr Glu Phe Ala Glu Thr Lys Asp
 180 185 190

Met Val Leu Val Arg Gly Asp Ile Val Phe Thr Ser Lys Leu Thr Asp
 195 200 205

Thr Glu Ala Gln Trp Leu Leu Glu Ala Thr Gln Ala Phe Tyr Leu Asn
 210 215 220

Asp Ala Arg Tyr Lys Leu Val Glu Gln Phe Asn Lys Gln Thr His Asp
 225 230 235 240

Phe Glu Phe Lys Asp Val Leu Lys Ala Leu Asp Met Pro Val Gly
 245 250 255

<210> 827

<211> 633

<212> PRT

<213> Papaver somniferum

<400> 827

Met Ile Asn Gly Ser Pro Glu Gly Phe Phe Ser Ile Thr Arg Gly Leu
 1 5 10 15

Arg Gln Gly Asp Pro Leu Ser Pro Leu Ile Phe Val Leu Ile Glu Asp
 20 25 30

Val Leu Ser Arg Asn Leu Ser Lys Leu Phe Ala Ala Arg Ser Met His
 35 40 45

His Met Val Ser Lys Lys Gly Val Ala Pro Thr Phe Leu Leu Phe Ala
 50 55 60

Asp Asp Ile Leu Ile Phe Cys Lys Gly Asn Leu His Ser Leu Gln Asn
 65 70 75 80

Leu Lys Glu Met Leu Gly Met Tyr Gln Arg Ala Ser Gly Gln Tyr Val
 85 90 95

Ser Tyr Ala Lys Ser Lys Phe Tyr Phe Gly Gly Asp Arg His Ser Arg
 Page 805

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100                                105                                110
Val Val Ala Ile Ala Asn Phe Met Gly Met Glu Arg Ala Leu Phe Pro
    115                                120                                125
Asp Lys Tyr Leu Gly Ile Gln Leu Lys Pro Gly Ile Val Arg His Ile
    130                                135                                140
His Val His Gln Val Met Glu Lys Ile Met Asp Lys Leu Ala Gly Trp
    145                                150                                155                                160
Lys Gly Lys Leu Leu Ser Phe Gln Ala Arg Leu Val Leu Ile Lys Ser
    165                                170                                175
Val Ile Ser Ser Tyr Leu Leu His Ser Met Ala Val Tyr Lys Trp Pro
    180                                185                                190
Cys Thr Ala Ile Lys Thr Val Glu Arg Ala Ile Arg Asn Phe Leu Trp
    195                                200                                205
Ser Gly Asp Ala Glu Lys Arg Lys His Phe Thr Val Leu Tyr Asp Asn
    210                                215                                220
Leu Cys His Ser Arg Val Glu Gly Gly Leu Gly Leu Lys Lys Leu Asn
    225                                230                                235                                240
Asp Val Asn Arg Ala Met Leu Met Lys Leu Trp Val Ser Ile Arg Asp
    245                                250                                255
Ser Asn Lys Thr Trp Ala Arg Phe Leu Lys Ala Lys Tyr Phe Lys Val
    260                                265                                270
Asn Gly Asn Leu Ile Asp Tyr Lys Leu Gly Ser Ser Val Phe Pro Gly
    275                                280                                285
Ile Arg Leu Val His Asn Phe Val Gln Arg His Thr Arg Ser Ile Ile
    290                                295                                300
Gly Asn Gly Ala Asn Thr Ser Leu Phe Phe Asp Asn Trp Cys Ala Asp
    305                                310                                315                                320
Phe Ser Ile Ala Ser Arg Leu Gly Ile Thr Thr Lys Gly Pro Asn Asp
    325                                330                                335
Phe Lys Ala Lys Val Ser Asp Ile Ile Val Asp Gly Ser Trp Val Ile
    340                                345                                350

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Pro Pro Lys Thr Lys Asp Leu Met Ile Arg Cys Asn Ile Asp Val Asp
 355 360 365
 Asn Leu Pro Leu Ile Gly Gly Gly Asp Asp Tyr Lys Ile Trp Asp Leu
 370 375 380
 Asp Ser Lys Gly Ala Phe Ser Val Lys Ser Asp Lys Ala Ala Ile Arg
 385 390 395 400
 Gly Pro Ile Glu Val Ser Pro Thr Ala Ser Leu Phe Ser Arg Ser Val
 405 410 415
 Val His Pro Thr Leu Ser Val Gln Tyr Trp Lys Leu Phe His Lys Gln
 420 425 430
 Cys Cys Ala Ser Asp Asp Asn Val Met Lys Lys Thr Gly Arg Glu Met
 435 440 445
 Pro Ser Met Cys Arg Leu Cys Arg Asp Asp Cys Lys Asp Val Ser His
 450 455 460
 Ile Thr Trp His Cys Lys Leu Ala Lys Arg Ile Trp Lys Trp Ala Ala
 465 470 475 480
 Ala Ile Phe Lys Ile Gln Pro Asn Glu Asp Leu Val Ala Ser Tyr Lys
 485 490 495
 Val Glu Lys Gly Arg Ser Arg Met Ile Lys Asp Leu Trp Leu Val Ala
 500 505 510
 Asn Leu Ala Ile Val Thr Glu Leu Trp Lys Leu Arg Asn Lys Ala Tyr
 515 520 525
 Phe Glu Asn Met Arg Val Arg Trp Leu Lys Phe Lys Gly Arg Val His
 530 535 540
 Gln Val Ile Arg Asp Asn Ser Ile Arg Met Lys Gly His Met His Asn
 545 550 555 560
 Thr Leu Asp Asp Leu Arg Ile Val Asn Phe Phe Arg Val Lys His Arg
 565 570 575
 Ser Cys Asp His Ser Asp Pro Ile Glu Phe Thr Trp Thr Pro Pro Asn
 580 585 590
 Pro Gly Glu Ile Met Ile Cys Cys Asp Gly Ala Ser Leu Gly Asn Pro
 595 600 605

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Gly Gln Ala Gly Ser Gly Val Val Phe Arg Asp Ser Asn Ser Val Val
610 615 620

Leu Gly Val Leu Cys Val Gly Leu Gly
625 630

<210> 828

<211> 414

<212> PRT

<213> Papaver somniferum

<400> 828

Met Asp Glu Leu Phe Glu Glu Leu Val Gly Tyr Leu Met Gln Lys Glu
1 5 10 15

Glu Ala Asn Ile Gln Glu Asn Thr Asn His Glu Asp His Asn Ser Ile
20 25 30

Pro Gly Gly Ile Asp Asp Asp Asn Met Met Pro Val Ala Met Met Asp
35 40 45

Ser Phe Asn Ile Asn Val Asp Tyr Glu Arg Asp Gly Asp Cys Tyr Asn
50 55 60

Pro His Met Asp Leu Gln Cys Asn Val Asp Asp Tyr Asp Tyr Gln Leu
65 70 75 80

Gly Ala Leu Leu Tyr Asp Glu Cys Leu Ala Asp Leu Pro Leu Leu Asp
85 90 95

Ala Asn Ile Thr Gly Asn Phe Gln Glu Gly Cys Val Ser Gly Asn Pro
100 105 110

Ser Asp Asp Arg Ile Gln Cys Asp Arg Leu Leu Pro Asp Val Thr Asp
115 120 125

Thr Ser Leu Glu Asn Cys Asp Ile Asp Gln Tyr Phe Asn Leu Met Glu
130 135 140

Thr Ser Thr Met Gln Gln Lys Thr Asp Gly Asp Val Cys Cys Asp Pro
145 150 155 160

His Gln Pro Gln Ser Pro Ser Pro Ser Ile Pro Asp His Gln Pro Gln
165 170 175

Gln Val Glu Asp Ile Gly Asp Asp Val Asp Thr Ser Ser Lys Asn Leu
180 185 190

pctca2017050779-seql.txt

Lys Ser Glu Arg Asn Arg Arg Lys Arg Leu Asn Gln Gln Tyr Leu Thr
195 200 205

Leu Arg Ser Ile Val Pro Asn Ile Thr Lys Met Asp Lys Arg Thr Val
210 215 220

Leu Val Asp Ala Leu Ala Tyr Leu Gln Asp Ile Leu His Gln Ile Gln
225 230 235 240

Ile Glu Ile Glu Asn Gln Asn Lys Val Ile Ser Ser Leu Asn Ser Ser
245 250 255

Leu Gly Asn Glu Glu Thr Ile Asn Leu Pro Leu Arg His His Asn Glu
260 265 270

Asp Val Val Ser Ala Val Glu Lys Asn Ala Val Asp Val Ser Gly Asn
275 280 285

Asp Gly Gln Val Gln Pro Leu Phe His Thr Leu Leu Val Glu Pro Val
290 295 300

Val Pro Pro Gly Pro Pro Pro Phe Glu Arg Arg Ala Ile Phe Pro Ala
305 310 315 320

Ile Met Gln Met Glu Val Glu Lys Leu Asp Glu Glu Arg Tyr Val Leu
325 330 335

Arg Ile Val Phe Asn Lys Ala Ser Gly Thr Met Gly Leu Val Gln Arg
340 345 350

Ser Val Glu Met Leu Lys Gly Phe Glu Ser Ile Asn Val Ala Leu Ser
355 360 365

Ala Tyr Asp Gln His His Val Gln Ser Ser Asn Phe Leu Arg Val Ser
370 375 380

Tyr Ser Leu Phe Ile Ser Ser Phe Lys Gly Lys His Cys Asn Tyr Ser
385 390 395 400

Ser Pro Phe Thr Arg Trp Ala Thr Pro Thr Pro Phe Gly Ile
405 410

<210> 829

<211> 489

<212> PRT

<213> Papaver somniferum

<400> 829

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Met Gly Phe Ala Ser Cys Leu Gly Trp Asp Asn Gly Val Met Leu Ala
1      5      10      15

Pro Met Gly Ala Asp Ile Ala Gly Pro Lys Leu Val Ala Ala Val Ala
20      25      30

Asn Ala Gly Gly Leu Gly Leu Leu Ala Ser Pro Val Asn Met Tyr Asp
35      40      45

Ala Thr Leu Lys Met Ile Lys Asp Thr Lys Lys Leu Thr Ser Lys Pro
50      55      60

Phe Gly Ala Gly Ile Leu Leu Gly Phe Asp Gln Ser Ser Thr Ile Lys
65      70      75      80

Ala Ile Phe Asp Glu Lys Leu Ala Cys Met Gln Val Tyr Trp Gly Asp
85      90      95

Phe Ser Lys Glu Met Val Asp Glu Ala His Lys Asn Gly Val Lys Val
100     105     110

Ile His Gln Leu Gly Ser Val Ala Asp Ala Glu Lys Ala Ile Ala Ala
115     120     125

Gly Val Asp Cys Ile Met Ala Gln Gly Pro Glu Ala Gly Gly His Val
130     135     140

Ile Gly His Val Ser Val Ile Ala Leu Val Pro Arg Ile Val Asp Val
145     150     155     160

Ile Gly Asp Arg Asn Val Thr Val Val Ala Thr Gly Ser Ile Ala Asp
165     170     175

Ala Arg Gly Phe Val Ala Ala Leu Ala Leu Gly Ala Lys Gly Ile Cys
180     185     190

Met Gly Thr Arg Phe Ile Ala Ala Glu Glu Ser Tyr Ala Asn Asp Tyr
195     200     205

Tyr Lys Gln Gln Leu Leu His Tyr Thr Glu Ala Asp Thr Asp Tyr Thr
210     215     220

Asp Leu Tyr Ser Arg Ala Thr Trp Arg Ala Pro Thr Arg Val Leu Asn
225     230     235     240

Thr Pro Phe His Gln Lys Trp Lys Pro Val Pro Gln Asp Val Ser Asn
245     250     255

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pctca2017050779-seql.txt

Asn Glu Asp Gln Pro Ile Val Gly Tyr Ser Ile Ile His Gly Gly Glu
 260 265 270
 Thr Ile Leu Arg Arg Phe Ala Gly Gln Val Ala Asn Gln Thr Thr Ala
 275 280 285
 Gly Glu Leu Glu Asn Met Val Met Tyr Gly Gly Gln Gly Val Gly Leu
 290 295 300
 Val Thr Ser Ile Leu Pro Ala Gly Asp Ile Val Lys Ser Val Val Glu
 305 310 315 320
 Gly Ala Glu Lys Ile Ile Lys Glu Leu Gly Ser Arg Thr Gln Val Lys
 325 330 335
 Pro Val Lys Ala Val Val Leu Leu Lys Ser Thr Glu Gly Val Ser Gly
 340 345 350
 Thr Leu Tyr Phe Thr Gln Ala Gly Asp Glu Pro Thr Lys Ile Ile Gly
 355 360 365
 Thr Ile Ser Gly Leu Lys Ala Gly Leu His Gly Phe His Ile His Ala
 370 375 380
 Leu Gly Asp Thr Thr Asn Gly Cys Thr Ser Thr Gly Pro His Phe Asn
 385 390 395 400
 Pro Ala Gly Lys Asp His Gly Ala Pro Gly Asp Glu Thr Arg His Ala
 405 410 415
 Gly Asp Leu Gly Asn Leu Thr Ala Gly Ala Asp Gly Lys Val Glu Val
 420 425 430
 Asn Ile Ser Asp Lys Gln Ile Pro Leu Ser Gly Pro Asn Ser Ile Ile
 435 440 445
 Gly Arg Ala Val Val Val His Ala Asp Pro Asp Asp Leu Gly Lys Gly
 450 455 460
 Gly His Glu Leu Ser Lys Thr Thr Gly Asn Ala Gly Ala Arg Ile Ala
 465 470 475 480
 Cys Gly Ile Ile Gly Leu Gln Ala Asn
 485

<210> 830

pctca2017050779-seql.txt

<211> 307

<212> PRT

<213> Papaver somniferum

<400> 830

Met Ala Gln Leu Pro Pro Lys Val Pro Asn Met Thr Gln Asn Trp Pro
1 5 10 15

Asn Phe His His Gln Lys Met Pro Ser Leu Gly Asn Leu Met Pro Thr
20 25 30

Ala Ala Ala Asn Gly Ser Thr Gln Gln Gln Gln Gln His Ser Pro
35 40 45

Ser Trp Val Asp Glu Phe Leu Asp Phe Ser Ser Thr Lys Arg Asn Ala
50 55 60

His Arg Arg Ser Ala Ser Asp Ser Ile Thr Phe Leu Glu Ala Pro Phe
65 70 75 80

Val Glu Glu Cys Arg Ala Asn Ser Ala Gly Leu Arg Pro Gly Asn Asn
85 90 95

Glu Phe Asp Arg Leu Asp Asp Glu Gln Leu Met Ser Met Phe Ser Asp
100 105 110

Asp Ile Ser Thr Thr Ile Pro Gln Asn Leu Ser Ser Ser Asn Pro Ser
115 120 125

Thr Pro Ser Asp His Asn Ser Ile Asn Asp Asp Lys Pro Thr Pro Ser
130 135 140

Asp Gln Gln Gln Gln Leu Lys Asn Glu Ser Gly Glu Val Gln Ser Ser
145 150 155 160

Cys Gln Ser Asp Gln Val Pro Pro Pro Asn Ser Asn Gly Asp Ser Ile
165 170 175

Ile Asp Pro Lys Arg Val Lys Arg Ile Leu Ala Asn Arg Gln Ser Ala
180 185 190

Gln Arg Ser Arg Val Arg Lys Leu Gln Tyr Ile Ser Glu Leu Glu Arg
195 200 205

Ser Val Thr Ser Leu Gln Thr Glu Val Ser Ala Leu Ser Pro Arg Val
210 215 220

Ala Phe Leu Asp His Gln Arg Leu Val Leu Asn Val Asp Asn Ser Ala

pctca2017050779-seql.txt

225 230 235 240

Leu Lys Gln Arg Ile Ala Ala Leu Ala Gln Asp Lys Ile Phe Lys Asp
245 250 255

Ala His Gln Glu Ala Leu Lys Lys Glu Ile Glu Arg Leu Arg Gln Val
260 265 270

Tyr His Gln Gln Asn Leu Lys Lys Met Asn Asn Ser Asn Asn Asn Ser
275 280 285

Ser Thr Asp Asn Gln Asn Gln Asn Gly Thr Asp Gln Glu Asp Gln Gln
290 295 300

Pro Ile Asn
305

<210> 831
<211> 666
<212> PRT
<213> Papaver somniferum

<400> 831

Met Glu Leu Pro Ser Ile Leu Tyr Leu Lys Phe Phe Glu Thr Ala Pro
1 5 10 15

Asp Gly Lys Ser Arg Asn Cys Lys Phe Cys Lys Gln Ser Tyr Pro Ile
20 25 30

Thr Thr Ala Leu Gly Asn Leu Gly Arg His Leu Lys Tyr Tyr His Pro
35 40 45

Gly Tyr Asp Lys Met Asp Asp Ala Ile Phe Ser Leu Ser Pro Gln Pro
50 55 60

Ile Thr Ile Val Ser Ser Leu Gly Asp Val Asn Thr Arg Pro Ser Pro
65 70 75 80

Gln Pro Ile Thr Ala Gly Arg Glu Thr Ala Asp Asn Asn Gly Gly Ala
85 90 95

Ala Pro Arg Ser Ser Leu Trp Pro Met Ala Ser Val Thr Lys Met Asp
100 105 110

Asp Lys Met Ser Asn Ala Phe Pro Ser Ser Ser Gln Leu Ser Ile Pro
115 120 125

Thr Val Ser Gln Gly Ala Asp Thr Met Gly Asp Ala Ile Ser Arg Pro

130

135

140

Ser Pro Gln Ser Ile Thr Thr Ala Ser Asn Arg Asp Val Glu Pro Lys
 145 150 155 160

Asn Thr Thr Glu Ile Val Glu Ala Ala Ser Leu Tyr Leu Lys Phe Phe
 165 170 175

Glu Thr Ala Pro Asp Gly Lys Ser Arg Ser Cys Lys Phe Cys Asn Gln
 180 185 190

Ser Tyr Pro Val Pro Thr Ala Tyr Gly Asn Leu Gly Arg His Leu Lys
 195 200 205

Tyr Arg His Pro Glu Tyr Glu Lys Met Gly Glu Val Leu Ser Ser Pro
 210 215 220

Ser Pro Gln Arg Ile Ala Thr Val Ser Glu Arg Ala Asp Lys Met Gly
 225 230 235 240

Asn Ala Ile Pro Ile Pro Ser Pro Gln Pro Ile Ala Thr Val Thr Glu
 245 250 255

Thr Ala Ala Lys Lys Pro Glu Ala Val Pro Arg Pro Ser Leu Gln Pro
 260 265 270

Ile Thr Thr Val Ala Lys Thr Ala Asp Lys Gly Asn Val Thr Pro Ala
 275 280 285

Ala Lys Pro Thr Glu Asn Ser Val Thr Ser Phe Phe Lys Ile Ser Leu
 290 295 300

Asp Gly Met Ser Gln Ser Cys Lys Leu Cys Asn Leu Ser Tyr Ser Ile
 305 310 315 320

Ala Thr Ala Ile Gly Asn Leu Gln Arg His Leu Lys His Arg His Pro
 325 330 335

Asp Glu Tyr Asp Lys Met Gly Asp Ile Val Ser Asn Ser Ser Thr Gln
 340 345 350

Leu Ile Thr Thr Ala Ser Thr Ser Asn Thr Val Asp Leu Asp Asn Leu
 355 360 365

Asn Trp Leu Leu Leu Arg Trp Leu Met Gly Gly Ser Phe Pro Pro Ser
 370 375 380

pctca2017050779-seql.txt

Ala Leu Gln Asp Lys Trp Leu Ser Asn Ser Phe Lys Phe Val Asn Pro
 385 390 395 400
 Met Val Lys Leu Trp Ser Asn Glu Arg Leu Gln Ala Ile Ile Arg Glu
 405 410 415
 Val Phe Lys Ser Thr Arg Glu Asp Val Lys Ala Ser Leu Glu Leu Val
 420 425 430
 Asn Ser Lys Ile Ser Leu Thr Leu Glu Phe Trp Thr Ser Tyr Glu Gln
 435 440 445
 Ile Phe Tyr Met Ser Val Thr Gly His Trp Ile Asp Glu Ser Trp Ser
 450 455 460
 Leu His Lys Val Leu Leu Asp Ile Ser Arg Ile Pro Tyr Ser Cys Ser
 465 470 475 480
 Gly Ala Asp Ile Tyr Arg Ala Ile Val Lys Val Leu Lys Ile Tyr Asn
 485 490 495
 Ile Gly Asn Lys Ile Leu Ser Cys Thr His Asp Asn Ser Gln Lys Thr
 500 505 510
 Ile His Ala Cys His Lys Leu Lys Ala Tyr Leu Asp Gly Gln Asn Ser
 515 520 525
 Met Ala Phe Cys Tyr Ile Pro Cys Ala Ala Arg Thr Leu Asn Leu Ile
 530 535 540
 Ile Glu Asp Gly Leu Arg Asn Ala Lys Pro Val Ile Ser Lys Ile Arg
 545 550 555 560
 Glu Phe Val Leu Glu Leu Asn Ile Ser Pro Ala Ile Ser Ser Asp Phe
 565 570 575
 Lys Gln Thr Ala Ser Ala Tyr Gln Glu Gly Ser Trp Glu Phe Pro Ile
 580 585 590
 Asp Ile Ser Thr Arg Trp Ser Gly Ser Tyr Ala Met Leu Asp Ile Ala
 595 600 605
 Cys Lys Ala Ser Lys Ser Met Asp Ala Val Ile Arg Lys His Ala Asp
 610 615 620
 Thr Leu Asp Gly Ser Tyr Met Leu Leu Met Ser Ser Val Ser Ile Cys
 625 630 635 640

pctca2017050779-seql.txt

Pro Arg Leu His Leu Pro Ser Pro Leu Ile Ser Trp Thr Gly Gly Asn
645 650 655

Glu Thr Val Pro Ser Thr His Ala Tyr Leu
660 665

<210> 832

<211> 225

<212> PRT

<213> Papaver somniferum

<400> 832

Met Ala Thr Leu Ala Tyr Leu Leu Asp Gln Leu Ala Thr Ala Ser Arg
1 5 10 15

Leu Thr Ser Thr Asn Ile Gly Gly Asn Phe Thr Leu Leu Gln Val Trp
20 25 30

Ile Tyr Asp His Phe Pro Ile Leu Asn Leu Ala Lys Val Phe Asp Lys
35 40 45

Asp Val Asp Tyr Val Asp Thr Glu Pro Thr Ala Ala Arg Tyr Ala Tyr
50 55 60

Glu Asp Ser Lys Lys Arg Asn Lys Lys Lys Leu Val Glu Ser Leu Arg
65 70 75 80

Glu Thr Leu Asp Cys Leu Gly Val Asp Asp Val Ala Phe Gln Pro Tyr
85 90 95

Glu Asn Glu Asp Glu Glu Asp Glu Val Val Glu Asp Glu Asp Met Pro
100 105 110

Val Gly Met Tyr His Gly Pro Leu Trp Tyr Pro Gly Gly Tyr Val Ile
115 120 125

Tyr Asp Pro Arg Arg Val Leu Arg Gln Leu Gly Cys Val Gln Lys Val
130 135 140

Pro Leu Phe Asp Glu Lys Phe Arg Leu Leu Pro Lys Ser Gly Lys Gly
145 150 155 160

Thr Lys Ile Thr Thr Ser Ser Trp Glu Pro Lys Tyr Asp Pro Asp Pro
165 170 175

Thr Val Glu Phe Trp Asn Asn Leu Asp Asn His Thr Leu Asp Val Ser
180 185 190

pctca2017050779-seql.txt

Lys Leu Thr Pro Leu Leu Asp Asp Pro Cys Glu Glu Asp Pro Gly Tyr
195 200 205

Met Asp Trp Tyr Asn Gln Ile Ser His Pro Phe Ile Ile Asn Lys Lys
210 215 220

Arg
225

<210> 833
<211> 786
<212> PRT
<213> Papaver somniferum

<400> 833

Met Asp Pro Ser Ile Lys Lys Glu Asn Gly Ser Asn Gly Gly Val Glu
1 5 10 15

Val Val Leu Thr Ile Ser Ser Gly Asp Glu Pro Ile Lys Pro Gln Gln
20 25 30

Lys Ser Pro Thr Ser Thr Ser Thr Thr Pro Thr Lys Ser Ser Glu Thr
35 40 45

Asn Phe Ile Pro Pro Arg Asn Ser Asn Val Gly Gly Gly Ser Gly Gly
50 55 60

Gly Gly Gly Gly Gly Tyr Gln Glu Phe Asp Arg Pro Lys Ile Gln Met
65 70 75 80

Thr Ser Phe Cys Pro Ser Pro Glu Ile Ser Arg Ala Cys Gly Ser Pro
85 90 95

Arg Arg Pro Pro Lys Val Pro Asp Asn Ile Thr Pro Arg Arg Ala Leu
100 105 110

Ala Arg Ser Ala Phe Ser Lys Pro Lys Ser Arg Phe Val Glu Pro Ser
115 120 125

Ala Pro Ser Ala Ala Asp Leu Val Asp Lys Asp Lys Ala Pro Pro Ser
130 135 140

Pro Phe Arg Thr Ser Pro Thr Asn Arg Val Ala Gly Gly Thr Pro Arg
145 150 155 160

Ala Gly Gly Gly Thr Lys Thr Ala Pro Val Thr Pro Lys Thr Pro Phe
165 170 175

pctca2017050779-seql.txt

Leu Ser Ser Pro Gly Gly Glu Glu Asp Glu Asp Glu Glu Ile Tyr Lys
 180 185 190
 Ile Asp Lys Gly Ala Pro Ala Asp Val Thr Ser Arg Lys Trp Glu Thr
 195 200 205
 Thr Arg Ile Ile Ile Glu Trp Ile Leu Leu Ile Cys Ile Thr Gly Cys
 210 215 220
 Leu Val Cys Ser Leu Thr Val His Arg Leu Gln Arg Met Met Met Trp
 225 230 235 240
 Gly Leu Glu Leu Trp Lys Trp Cys Val Met Val Met Val Val Val Cys
 245 250 255
 Gly Arg Leu Val Thr Ala Trp Ile Ile His Val Leu Val Phe Leu Ile
 260 265 270
 Glu Lys Asn Phe Leu Phe Lys Lys Lys Val Leu Tyr Phe Val Tyr Gly
 275 280 285
 Leu Lys Lys Ser Val Gln Ile Val Ile Trp Leu Ser Leu Val Leu Leu
 290 295 300
 Ser Trp Thr Leu Leu Phe Asn Arg Gly Val Lys Arg Ser Arg Ser Thr
 305 310 315 320
 Thr Lys Phe Leu Asp Tyr Val Ser Thr Gly Ile Ile Ser Leu Leu Val
 325 330 335
 Gly Ser Val Ile Trp Leu Val Lys Thr Leu Leu Val Lys Met Leu Ala
 340 345 350
 Gly Ser Phe His Val Asn Thr Phe Phe Asp Arg Ile Gln Glu Ser Ile
 355 360 365
 Phe His Gln Tyr Val Leu Gln Thr Leu Ser Gly Pro Pro Met Met Glu
 370 375 380
 Leu Ala Glu Gln Val Gly Ala Val Ala Ser Thr Gly Gln Leu Ser Phe
 385 390 395 400
 Arg Ser Thr Lys Thr Pro Lys Gly Ala Glu Ala Pro Asp Val Ile Asp
 405 410 415
 Val Asn Lys Leu Asn Lys Met Lys Gln Glu Lys Val Ser Ala Trp Thr
 420 425 430

pctca2017050779-seql.txt

Met Lys Gly Leu Val Asn Val Ile Arg Thr Ser Gly Leu Ser Thr Ile
435 440 445

Ser Asn Thr Ile Asp Gln Ile Tyr Ser Glu His Asp Glu Gln Lys Asp
450 455 460

Lys Glu Ile Thr Ser Glu Trp Glu Ala Lys Ala Ala Ala Tyr Arg Ile
465 470 475 480

Phe Arg Asn Val Ala Lys Pro Asn Ser Lys Tyr Ile Asp Glu Asp Asp
485 490 495

Leu Met Arg Phe Leu Ser Lys Glu Glu Val Asp Asn Val Leu Pro Leu
500 505 510

Phe Glu Gly Ala Val Glu Thr Gly Lys Ile Lys Lys Ser Ser Leu Arg
515 520 525

Asn Trp Val Val Lys Val Tyr Leu Glu Arg Lys Ser Leu Ala His Ser
530 535 540

Leu Asn Asp Thr Lys Thr Ala Val Arg Gln Leu Asn Lys Leu Val Ser
545 550 555 560

Gly Ala Val Ile Val Ile Met Ile Ile Val Met Leu Leu Ile Met Gly
565 570 575

Phe Leu Thr Thr Lys Val Val Val Phe Met Ser Ser Gln Met Leu Leu
580 585 590

Val Val Phe Met Phe Gly Asn Thr Ala Lys Gln Ile Phe Glu Ala Ile
595 600 605

Ile Phe Val Phe Val Met His Pro Phe Asp Val Gly Asp Arg Cys Val
610 615 620

Val Asp Gly Val Gln Leu Ile Val Glu Glu Met Asn Ile Leu Asn Thr
625 630 635 640

Ile Phe Leu Arg Tyr Asp Ser Glu Lys Ile Tyr Tyr Pro Asn Ser Ile
645 650 655

Leu Ala Asn Lys Pro Ile Ser Asn Phe Tyr Arg Ser Pro Asn Met Gly
660 665 670

Asp Ala Val Glu Phe Ala Ile Asp Val Ser Thr Thr Ile Glu Arg Val

675

Gly Ala Leu Lys Ser Arg Ile Lys Ala Tyr Ile Asp Gly Lys Pro Gln
690 695 700

His Trp Gln Cys Asn His Ser Val Val Val Lys Glu Ile Glu Asn Val
705 710 715 720

Asn Lys Met Lys Met Ala Leu Tyr Val Thr His Thr Met Asn His Gln
725 730 735

Asn Met Val Glu Lys Asn Ser Arg Arg Thr Glu Leu Met Leu Glu Leu
740 745 750

Lys Lys Ile Phe Glu Asp Leu Ser Ile Lys Tyr His Leu Leu Pro Gln
755 760 765

Glu Val Gln Val Ser Tyr Ile Gly Gly Ala Ala Ala Pro Thr Gly Leu
770 775 780

Arg Pro
785

<210> 834
<211> 149
<212> PRT
<213> Papaver somniferum

<400> 834

Met Arg Tyr Glu Val Ala Leu Tyr Tyr Gly Pro Leu Met Thr Met Tyr
1 5 10 15

Asp Gly Tyr Ser Met Tyr Asp Pro His Arg Val Met Arg Gln Leu Cys
20 25 30

Tyr Val Gln Glu Glu Pro His Phe Asp Glu Glu Lys Pro Phe Phe Thr
35 40 45

Val Asp Met Thr Glu Cys Ser Arg Ser Gln Lys Thr Ile Asn Val Ser
50 55 60

Tyr Asp Pro Ala Pro Thr Gln Glu His Trp Asp Asp Arg Arg Arg Cys
65 70 75 80

Lys Ile Asp Val Ser Leu Leu Asp Glu Val Thr Thr Gly His Glu Ala
85 90 95

Ser Glu Lys Tyr Met Ala Trp Tyr Leu Gly Trp Ala Arg Pro Thr Val
Page 820

100

Ser Arg Glu Met Thr Ala Glu Glu Leu Ala Arg Lys Arg Lys Met Ala
115 120 125

Ser Lys Asp Pro Ala Thr Ser Leu Lys Phe Phe Val Ser Ile Leu Glu
130 135 140

Leu Leu Leu Leu Phe
145

<210> 835
<211> 108
<212> PRT
<213> Papaver somniferum
<400> 835

Met Asn Leu Met Asn Cys Lys Ser Pro Asp Ile Thr Tyr Ile Val Ser
1 5 10 15

Lys Leu Ser Ile Tyr Thr Cys Ser Pro Glu Gln Glu His Trp Asp Ala
20 25 30

Leu Asn Arg Val Leu Trp Tyr Leu Lys Tyr Cys Ile Thr Phe Cys Phe
35 40 45

Ile Tyr Glu Arg Tyr Leu Val Val Leu Glu Gly Leu Cys Asp Ala Asn
50 55 60

Trp Ile Val Asp Ser Glu Glu Ser Lys Ser Thr Ser Gly Tyr Val Phe
65 70 75 80

Thr Leu Ala Arg Gly Phe Val Ser Gly Ser Phe Ser Asp Lys His Ile
85 90 95

Leu Leu Asn Ser Leu Trp Asn Leu Arg Val Leu Arg
100 105

<210> 836
<211> 786
<212> PRT
<213> Papaver somniferum
<400> 836

Met Asp Pro Ser Ile Lys Lys Glu Asn Gly Ser Asn Gly Gly Val Glu
1 5 10 15

Val Val Leu Thr Ile Ser Ser Gly Asp Glu Pro Ile Lys Pro Gln Gln
20 25 30

pctca2017050779-seql.txt

Lys Ser Pro Thr Ser Thr Ser Thr Thr Pro Thr Lys Ser Ser Glu Thr
 35 40 45
 Asn Phe Ile Pro Pro Arg Asn Ser Asn Val Gly Gly Gly Ser Gly Gly
 50 55 60
 Gly Gly Gly Gly Gly Tyr Gln Glu Phe Asp Arg Pro Lys Ile Gln Met
 65 70 75 80
 Thr Ser Phe Cys Pro Ser Pro Glu Ile Ser Arg Ala Cys Gly Ser Pro
 85 90 95
 Arg Arg Pro Pro Lys Val Pro Asp Asn Ile Thr Pro Arg Arg Ala Leu
 100 105 110
 Ala Arg Ser Ala Phe Ser Lys Pro Lys Ser Arg Phe Val Glu Pro Ser
 115 120 125
 Ala Pro Ser Ala Ala Asp Leu Val Asp Lys Asp Lys Ala Pro Pro Ser
 130 135 140
 Pro Phe Arg Thr Ser Pro Thr Asn Arg Val Ala Gly Gly Thr Pro Arg
 145 150 155 160
 Ala Gly Gly Gly Thr Lys Thr Ala Pro Val Thr Pro Lys Thr Pro Phe
 165 170 175
 Leu Ser Ser Pro Gly Gly Glu Glu Asp Glu Asp Glu Glu Ile Tyr Lys
 180 185 190
 Ile Asp Lys Gly Ala Pro Ala Asp Val Thr Ser Arg Lys Trp Glu Thr
 195 200 205
 Thr Arg Ile Ile Ile Glu Trp Ile Leu Leu Ile Cys Ile Thr Gly Cys
 210 215 220
 Leu Val Cys Ser Leu Thr Val His Arg Leu Gln Arg Met Met Met Trp
 225 230 235 240
 Gly Leu Glu Leu Trp Lys Trp Cys Val Met Val Met Val Val Val Cys
 245 250 255
 Gly Arg Leu Val Thr Ala Trp Ile Ile His Val Leu Val Phe Leu Ile
 260 265 270
 Glu Lys Asn Phe Leu Phe Lys Lys Lys Val Leu Tyr Phe Val Tyr Gly

275

Leu Lys Lys Ser Val Gln Ile Val Ile Trp Leu Ser Leu Val Leu Leu
290 295 300

Ser Trp Thr Leu Leu Phe Asn Arg Gly Val Lys Arg Ser Arg Ser Thr
305 310 315 320

Thr Lys Phe Leu Asp Tyr Val Ser Thr Gly Ile Ile Ser Leu Leu Val
325 330 335

Gly Ser Val Ile Trp Leu Val Lys Thr Leu Leu Val Lys Met Leu Ala
340 345 350

Gly Ser Phe His Val Asn Thr Phe Phe Asp Arg Ile Gln Glu Ser Ile
355 360 365

Phe His Gln Tyr Val Leu Gln Thr Leu Ser Gly Pro Pro Met Met Glu
370 375 380

Leu Ala Glu Gln Val Gly Ala Val Ala Ser Thr Gly Gln Leu Ser Phe
385 390 395 400

Arg Ser Thr Lys Thr Pro Lys Gly Ala Glu Ala Pro Asp Val Ile Asp
405 410 415

Val Asn Lys Leu Asn Lys Met Lys Gln Glu Lys Val Ser Ala Trp Thr
420 425 430

Met Lys Gly Leu Val Asn Val Ile Arg Thr Ser Gly Leu Ser Thr Ile
435 440 445

Ser Asn Thr Ile Asp Gln Ile Tyr Ser Glu His Asp Glu Gln Lys Asp
450 455 460

Lys Glu Ile Thr Ser Glu Trp Glu Ala Lys Ala Ala Ala Tyr Arg Ile
465 470 475 480

Phe Arg Asn Val Ala Lys Pro Asn Ser Lys Tyr Ile Asp Glu Asp Asp
485 490 495

Leu Met Arg Phe Leu Ser Lys Glu Glu Val Asp Asn Val Leu Pro Leu
500 505 510

Phe Glu Gly Ala Val Glu Thr Gly Lys Ile Lys Lys Ser Ser Leu Arg
515 520 525

pctca2017050779-seq1.txt

Asn Trp Val Val Lys Val Tyr Leu Glu Arg Lys Ser Leu Ala His Ser
 530 535 540
 Leu Asn Asp Thr Lys Thr Ala Val Arg Gln Leu Asn Lys Leu Val Ser
 545 550 555 560
 Gly Ala Val Ile Val Ile Met Ile Ile Val Met Leu Leu Ile Met Gly
 565 570 575
 Phe Leu Thr Thr Lys Val Val Val Phe Met Ser Ser Gln Met Leu Leu
 580 585 590
 Val Val Phe Met Phe Gly Asn Thr Ala Lys Gln Ile Phe Glu Ala Ile
 595 600 605
 Ile Phe Val Phe Val Met His Pro Phe Asp Val Gly Asp Arg Cys Val
 610 615 620
 Val Asp Gly Val Gln Leu Ile Val Glu Glu Met Asn Ile Leu Asn Thr
 625 630 635 640
 Ile Phe Leu Arg Tyr Asp Ser Glu Lys Ile Tyr Tyr Pro Asn Ser Ile
 645 650 655
 Leu Ala Asn Lys Pro Ile Ser Asn Phe Tyr Arg Ser Pro Asn Met Gly
 660 665 670
 Asp Ala Val Glu Phe Ala Ile Asp Val Ser Thr Thr Ile Glu Arg Val
 675 680 685
 Gly Ala Leu Lys Ser Arg Ile Lys Ala Tyr Ile Asp Gly Lys Pro Gln
 690 695 700
 His Trp Gln Cys Asn His Ser Val Val Val Lys Glu Ile Glu Asn Val
 705 710 715 720
 Asn Lys Met Lys Met Ala Leu Tyr Val Thr His Thr Met Asn His Gln
 725 730 735
 Asn Met Val Glu Lys Asn Ser Arg Arg Thr Glu Leu Met Leu Glu Leu
 740 745 750
 Lys Lys Ile Phe Glu Asp Leu Ser Ile Lys Tyr His Leu Leu Pro Gln
 755 760 765
 Glu Val Gln Val Ser Tyr Ile Gly Gly Ala Ala Ala Pro Thr Gly Leu
 770 775 780

pctca2017050779-seql.txt

Arg Pro
785

<210> 837
<211> 357
<212> PRT
<213> Papaver somniferum

<400> 837

Met Glu Val Val Ser Gln Ile Asp Gln Glu Asn Gln Ala Ile Ile Trp
1 5 10 15

Lys Gln Ile Tyr Gly Phe Ser Glu Ser Leu Leu Leu Lys Cys Ala Val
20 25 30

Gln Cys Glu Ile Ala Glu Thr Ile His Asn His Gly Thr Pro Met Ser
35 40 45

Ile Leu Glu Leu Ala Ala Lys Leu Pro Ile Asp Gln Pro Val Asn Ile
50 55 60

Glu Arg Leu Tyr Arg Val Met Arg Tyr Leu Val His Gln Lys Leu Phe
65 70 75 80

Asn Lys Glu Val Ile Thr Thr Leu Asn Gly Gly Thr Val Gln Val Thr
85 90 95

Glu Lys Tyr Trp Leu Ala Pro Pro Ala Lys Tyr Leu Ile Arg Gly Ser
100 105 110

Gln Gln Ser Met Val Pro Ser Val Leu Gly Ile Ile Asp Glu Asp Met
115 120 125

Phe Ala Pro Trp His Ile Leu Lys Asp Ser Leu Thr Gly Glu Cys Asn
130 135 140

Ile Phe Glu Lys Ala Leu Gly Lys Ser Ile Ser Val Tyr Met Ser Glu
145 150 155 160

Asn Pro Glu Met Asn Gln Ile Ser Asn Gly Ala Met Ala Phe Asp Ser
165 170 175

Gly Leu Val Ile Ser His Leu Val Asn Glu Cys Lys Asn Ile Phe Gly
180 185 190

Asp Glu Ile Lys Thr Leu Val Asp Val Gly Gly Gly Thr Gly Thr Ala
195 200 205

pctca2017050779-seql.txt

Val Ala Ala Ile Ser Lys Ala Phe Pro Asn Ile Lys Cys Thr Leu Phe
210 215 220

Asp Leu Pro His Val Ile Ala Asp Ser Pro Glu Ile Gln Thr Ile Lys
225 230 235 240

Lys Val Ser Gly Asp Met Phe Lys Ser Ile Pro Ser Ala Asp Ala Ile
245 250 255

Phe Met Lys Asn Ile Leu His Asp Trp Asn Asp Asp Glu Cys Ile His
260 265 270

Ile Leu Lys Arg Cys Lys Asp Val Val Ser Ser Gly Gly Lys Leu Ile
275 280 285

Ile Val Glu Met Val Leu Asp Val Asp Ser Val His Pro Tyr Ser Lys
290 295 300

Leu Arg Leu Thr Ser Asp Ile Asp Met Met Val Asn Asn Gly Gly Lys
305 310 315 320

Glu Arg Thr Glu Glu Glu Trp Lys Lys Leu Phe Asp Ala Ala Gly Phe
325 330 335

Ala Ser Cys Lys Phe Thr Gln Met Ser Ala Gly Phe Ala Ala Gln Ser
340 345 350

Ile Ile Glu Val Tyr
355

<210> 838
<211> 286
<212> PRT
<213> Papaver somniferum

<400> 838

Met Gln Ala Tyr Ser Gly Ala Ala Ile Met Gly Ala Ala Val Gln Gln
1 5 10 15

Pro Asn Leu Phe Thr Lys Gly Ser Ser Thr Phe Phe Pro Lys Leu Ser
20 25 30

Ala Thr Thr Asp Arg Phe Pro Ser Gln Val Arg Phe Asn Pro Val Lys
35 40 45

Thr Cys Lys Ala Ala Ser Ser Ser Ile Glu Gly Ser Leu Val Thr Gly
50 55 60

pctca2017050779-seql.txt

Arg Pro Pro Ser Ser Val Ser Val Pro Ile Pro Lys Met Gly Gly Asn
65 70 75 80

Gly Arg Gly Leu Ile Asp Arg Asn Leu Ser Glu Ala Asp Pro Glu Val
85 90 95

Arg Ser Ile Ile Asp Ser Glu Lys Asn Arg Gln Phe Asn Ser Leu Glu
100 105 110

Leu Ile Ala Ser Glu Asn Phe Thr Ser Arg Ala Val Met Glu Ala Val
115 120 125

Gly Ser Cys Leu Thr Asn Lys Tyr Ser Glu Gly Leu Pro Gly Lys Arg
130 135 140

Tyr Tyr Gly Gly Asn Glu Tyr Ile Asp Lys Leu Glu Thr Leu Cys Gln
145 150 155 160

Gln Arg Ala Leu Ala Ala Phe His Leu Asp Pro Lys Lys Trp Gly Val
165 170 175

Asn Val Gln Pro Leu Ser Gly Ser Pro Ala Asn Phe Glu Val Tyr Thr
180 185 190

Ala Leu Leu Asn Pro His Asp Arg Ile Met Gly Leu Asp Leu Pro His
195 200 205

Gly Gly His Leu Ser His Gly Phe Met Thr Pro Lys Arg Arg Val Ser
210 215 220

Gly Thr Ser Ile Tyr Phe Glu Ser Met Pro Tyr Arg Leu Asp Glu Ser
225 230 235 240

Thr Gly Phe Ile Asp Tyr Asp Met Leu Glu Lys Thr Ala Thr Leu Phe
245 250 255

Arg Pro Lys Leu Ile Ile Val Gly Ala Ser Ala Tyr Pro Arg Asp Leu
260 265 270

Asp Tyr Pro Arg Met Arg Lys Ile Leu Phe Gly Leu Phe Ser
275 280 285

<210> 839

<211> 264

<212> PRT

<213> Papaver somniferum

<400> 839

pctca2017050779-seql.txt

Met Gly Ser Ser Ser Ile Asp Val Lys Pro Ala Glu Thr Gln Glu Val
1 5 10 15

Ser Ile Lys Asp Gln Ala Gln Leu Trp Asn Met Ile Tyr Gly Phe Ala
20 25 30

Asp Ser Leu Val Val Arg Cys Ala Val Glu Leu Gly Ile Pro Asp Ile
35 40 45

Ile Lys Asn Asn Asn Gly Pro Ile Thr Leu Ala Gln Leu Ser Ser Lys
50 55 60

Leu Pro Ile Pro Asn Val Asn Ser Asp His Leu Tyr Arg Ile Val Arg
65 70 75 80

Tyr Leu Ile Asn Leu Asn Ile Leu Gln Gln Glu Ile Cys Arg Asn Val
85 90 95

Lys Val Tyr Ser Leu Lys Pro Val Gly Thr Leu Leu Leu Arg Asp Ala
100 105 110

Glu Arg Ser Met Val Pro Ile Leu Leu Gly Asn Thr Gln Lys Asp Phe
115 120 125

Leu Val Pro Trp His Phe Val Lys Glu Gly Leu Val Asn Gly Ser Thr
130 135 140

Thr Ala Phe Glu Lys Gly Met Gly Met Asp Ile Trp Lys Tyr Leu Glu
145 150 155 160

Gly Asn Pro Asp Gln Ser Gln Leu Phe Asn Glu Gly Met Ala Gly Glu
165 170 175

Thr Ser Leu Leu Thr Lys Thr Leu Ile Glu Asp Cys Arg Asp Thr Phe
180 185 190

Gln Asn Leu Asp Ser Leu Val Asp Ile Gly Gly Gly Asn Gly Thr Thr
195 200 205

Ile Lys Ala Ile Tyr Glu Ala Phe Pro His Ile Lys Cys Thr Leu Tyr
210 215 220

Asp Leu Pro His Val Ile Ala Asn Ser Asp Asp His Pro Asn Ile Arg
225 230 235 240

Lys Val Pro Gly Asp Met Phe Met Ser Val Pro Ser Ala Gln Val Leu
245 250 255

pctca2017050779-seql.txt

Leu Leu Lys Val Lys Ile Leu Thr
260

<210> 840
<211> 185
<212> PRT
<213> Papaver somniferum

<400> 840

Met Lys Asp Gln Val Asn Asp Arg Thr Asp Glu Tyr Gly Gly Thr Ile
1 5 10 15

Glu Lys Arg Cys Arg Phe Ala Leu Glu Val Val Lys Ala Val Val Asp
20 25 30

Glu Ile Gly Ala Asn Lys Val Gly Met Arg Ile Ser Pro Phe Gly Asp
35 40 45

Phe Met Glu Thr Gly Asp Ser Lys Pro Glu Ala Leu Gly Leu Phe Met
50 55 60

Ala Glu Ser Leu Asn Lys Tyr Glu Ile Leu Tyr Leu His Met Ile Glu
65 70 75 80

Met Met Lys Val Asp Glu Asp Thr Ser Val Thr Pro Tyr Asn Ser Leu
85 90 95

Pro Met Arg Arg Ala Phe Lys Gly Thr Phe Ile Ser Ala Gly Gly Tyr
100 105 110

Glu Lys Glu Asp Gly Asn Lys Met Ile Asp Lys Asn His Ala Asp Leu
115 120 125

Ile Ala Tyr Gly Arg Leu Phe Leu Ala Asn Pro Asp Leu Pro Lys Arg
130 135 140

Phe Ala Val Asp Ala Pro Leu Asn Lys Tyr Ile Ser Asp Thr Phe Cys
145 150 155 160

Ile Pro Asp Pro Ile Val Gly Tyr Thr Asp Tyr Pro Phe Leu Asp Gln
165 170 175

Ser Ile Ser Ser Thr Asn Cys Ser Lys
180 185

<210> 841
<211> 314

pctca2017050779-seql.txt

<212> PRT

<213> Papaver somniferum

<400> 841

Lys Ser Leu Glu Val Lys Arg Glu Ile Lys Met Glu Ile Val Thr Val
 1 5 10 15

Ala Leu Ile Ala Ile Val Phe Thr Thr Phe Leu Tyr Leu Ile Val Arg
 20 25 30

Glu Ser Ser Pro Asn Gly Leu Pro Pro Gly Pro Lys Pro Trp Pro Ile
 35 40 45

Val Gly Asn Leu Leu Gln Leu Gly Glu Lys Pro His Ser Gln Phe Ala
 50 55 60

Gln Leu Ala Glu Thr Tyr Gly Asp Leu Phe Thr Leu Lys Leu Gly Thr
 65 70 75 80

Gln Thr Val Val Val Ala Ser Thr Pro Leu Ala Ala Ser Glu Val Leu
 85 90 95

Lys Ala His Asp Arg Thr Leu Cys Gly Arg Tyr Val Phe Gln Ser Phe
 100 105 110

Arg Val Lys Asn His Val Glu Asn Ser Ile Val Trp Asn Glu Cys Asn
 115 120 125

Glu Thr Trp Lys Lys Leu Arg Lys Val Cys Arg Thr Gln Leu Phe Thr
 130 135 140

Gln Lys Met Ile Glu Asn Gln Ala Glu Val Arg Glu Ile Lys Thr Met
 145 150 155 160

Glu Met Val Lys Tyr Leu Lys Lys Asn Glu Gly Ile Glu Val Lys Ile
 165 170 175

Val Glu Val Ile Phe Gly Thr Leu Val Asn Met Phe Gly Asn Leu Ile
 180 185 190

Phe Ser Gln Asp Ile Phe Lys Leu Gly Asp Glu Ser Ser Gly Ser Leu
 195 200 205

Glu Met Lys Gln His Ile Trp Arg Met Leu Glu Leu Gly Asn Ser Ala
 210 215 220

Asn Pro Gly Asp Tyr Val Pro Leu Leu Gly Ser Leu Asp Leu Phe Gly
 225 230 235 240

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Gln Arg Lys Asp Val Ala Asp Cys Leu Gln Gly Val Tyr Gly Val Trp
245 250 255

Gly Ala Met Leu Lys Glu Arg Arg Ile Ala Lys Arg Gln Ile Asn Gly
260 265 270

Asp Thr Lys Asn Asp Phe Val Asp Val Leu Leu Asp Ser Gly Leu Asp
275 280 285

Asp Gln Gln Ile Asn Ser Leu Leu Leu Val Ser Ser Ile Phe Ser Phe
290 295 300

His Ile Gln Thr Phe Leu Ile Tyr Arg Tyr
305 310

<210> 842
<211> 544
<212> PRT
<213> Papaver somniferum

<400> 842

Met Glu Leu Phe Ile Lys Leu Pro Phe Ile Gln Pro Ile Pro Phe Ser
1 5 10 15

Ile Ile Leu Val Thr Thr Val Ser Ile Val Leu Leu Tyr Ser Val Phe
20 25 30

Phe Trp Val Thr Asp Lys Lys Lys Lys Arg Lys Lys Ala Pro Asn Ala
35 40 45

Ala Gly Ala Trp Pro Leu Ile Gly His Leu Arg Leu Leu Met Asn Asp
50 55 60

Lys Glu Pro Leu Tyr Arg Ala Leu Gly Ser Met Ala Asp Lys Tyr Gly
65 70 75 80

Pro Ala Phe Asn Val Arg Leu Gly Ser Gln His Ile Leu Val Leu Ser
85 90 95

Asn Ser Asp Met Val Lys Glu Cys Phe Gly Val Gln Asn His Asp Lys
100 105 110

Leu Phe Ser Asn Arg Thr Thr Ser Leu Ser Val Lys Tyr Ile Phe Asn
115 120 125

Glu Ala Thr Ser Ile Gly Phe Thr Pro Phe Gly Thr Tyr Trp Arg Glu
130 135 140

pctca2017050779-seql.txt

Met Arg Lys Ile Thr Ala Gln Gln Leu Leu Ser Lys Gln Cys Leu Glu
145 150 155 160

Ser Trp Arg His Leu Arg Ile Lys Glu Ile Asp Ala Ser Phe Ser Arg
165 170 175

Leu Asn Asp Leu Cys Cys Asn Asn Gly Thr Gly Thr Thr Thr Pro Ile
180 185 190

Arg Met Asp Asn Trp Ile Ala Asp Leu Thr Tyr Asn Val Phe Ala Ser
195 200 205

Val Val Phe Gly Tyr Gln Ser Gly Gly Arg Ala Ala Val Thr Gly Asp
210 215 220

Thr Ala Ser Ile Ser Glu Lys Tyr Lys Asn Thr Met Ile Glu Ala Phe
225 230 235 240

Val Val Leu Thr Thr Ser Phe Ala Val Ser Asp Val Phe Pro Cys Leu
245 250 255

Glu Trp Val Asp Arg Leu Arg Gly Ile Val Arg Asp Leu Lys Arg Ala
260 265 270

Arg Asp Ala Leu Asn Ser Ile Ala Gly Cys Leu Ile Glu Glu His Arg
275 280 285

Gln Lys Arg Ser Leu Ala Ser Leu Ser Lys His Asp Ser Thr Asp Lys
290 295 300

Gly Val Gly Asp Pro Gln Asp Phe Ile Asp Ile Leu Leu Ser Ile Ala
305 310 315 320

Glu Gln Ser Gln Leu Pro Gly Asp Asp Pro Asp Leu Val Ile Lys Thr
325 330 335

Met Ile Leu Glu Thr Val Ser Gly Gly Leu Asp Thr Thr Thr Ser Thr
340 345 350

Leu Thr Trp Thr Leu Ser Leu Leu Val Asn His Pro Gln Val Leu Lys
355 360 365

Lys Ala Ile Glu Glu Ile Asp Met His Val Gly Leu Asp Arg Asp Val
370 375 380

Gln Glu Ser Asp Ile Pro Lys Leu Val Tyr Ile Asn Ala Ile Ile Lys

petca2017050719_seq1.txt

Glu Thr Met Arg Leu Tyr Pro Val Phe Pro Leu Ile Asp Arg Phe Thr
405 410 415

Leu Glu Glu Cys Glu Val Gly Gly Phe His Val Pro Ala Gly Gly Arg
420 425 430

Leu Ile Leu Asn Val Trp Lys Ile Gln Arg Asp Pro Ser Val Trp Glu
435 440 445

Asn Pro Leu Glu Phe Lys Pro Glu Arg Phe Leu Ser Asn Asp Asp Asp
450 455 460

Asn Lys Val Asp Met Asp Phe Lys Ala Gln Lys Tyr Glu Leu Phe Pro
465 470 475 480

Phe Gly Ile Gly Arg Arg Ile Cys Pro Gly Met Leu Ser Ser Leu Gln
485 490 495

Val Met His Leu Val Leu Ala Arg Leu Ile His Cys Phe Asp Met Lys
500 505 510

Ala Ala Ser Ala Asn Gly Lys Ile Asp Met Ala Glu Lys Pro Gly Ile
515 520 525

Ile Cys Tyr Gln Ile Ala Pro Leu Glu Val Arg Ile Thr Thr Arg Gln
530 535 540

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<210> 843
<211> 81
<212> PRT
<213> Papaver somniferum
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<400> 843

Met Asp Ile Leu Met Lys Leu Leu Leu Leu His Glu Pro Ile Thr Leu
1 5 10 15

Tyr Ile Val Leu Val Ile Val Ser Ile Val Leu Leu Tyr Asn Val Phe
20 25 30

Phe Leu Val Thr Pro Asn Lys Asn Lys Lys Arg Lys Ala Pro Asn Ala
35 40 45

Ser Gly Gly Trp Pro Leu Ile Gly His Phe His Leu Phe Ile Ser Gly
50 55 60

Lys Glu Ile Val Tyr Arg Thr Leu Gly Thr Met Ala Asp Lys Tyr Gly
Page 833

65

70

75

80

Pro

<210> 844

<211> 116

<212> PRT

<213> Papaver somniferum

<400> 844

Met Gly Ser Ser Ile Asp Ala Glu Thr Gln Glu Val Gly Ile Lys Asp
 1 5 10 15

Gln Ala Gln Ile Trp Asp Ile Ile Tyr Gly Tyr Ala Asp Ser Leu Val
 20 25 30

Leu Arg Cys Thr Val Glu Ile Gly Ile Ala Asp Ile Ile Lys Asn Asn
 35 40 45

Asn Gly Ser Ile Thr Leu Ser Glu Leu Val Ser Lys Leu Pro Leu Ser
 50 55 60

Asn Val Asn Ser Asp Asn Leu Tyr Arg Ile Leu Arg Tyr Leu Val His
 65 70 75 80

Leu Asn Ile Leu Gly Gln Gln Thr Cys Ala Ala Gly Gly Asp Arg Val
 85 90 95

Tyr Ser Leu Lys Pro Val Gly Thr Leu Leu Leu Lys Asp Ser Glu Thr
 100 105 110

Ser Met Val Pro
 115

<210> 845

<211> 67

<212> PRT

<213> Papaver somniferum

<400> 845

Met Lys Ile Leu Ile Phe Val Thr Val Ile Cys Cys Phe Leu Ser Ser
 1 5 10 15

Leu Phe Tyr Ser Asp Gly Ile Val Gly Ala Asn Ala Arg Trp Arg Pro
 20 25 30

Ser Gln Val Ser Asp Ser Glu Thr Arg Ile Gly Glu Lys Leu Gln Tyr
 35 40 45

pctca2017050779-seql.txt

Met Val Pro Thr Phe Leu Arg Ala Val Glu Ile Leu Ala Glu Gln Gly
50 55 60

Arg Asn Pro
65

<210> 846
<211> 1961
<212> PRT
<213> Papaver somniferum

<400> 846

Met Asp Glu Asn Arg Val Pro Gly Asn Asn Gly Ile Gly Asn Gly Asn
1 5 10 15

Arg Ser Ala Asp Asp Ala Ser Tyr Trp Leu Asp Ala Cys Glu Asp Ile
20 25 30

Pro Cys Asp Leu Ile Asn Asp Ile Val Asp Phe Asp Pro Val Val Pro
35 40 45

Thr Gln Val Val Ile Asp Asp Thr Ala His Gln Gly Val Asp Phe Phe
50 55 60

Gly Gly Ile Asp Arg Ile Leu Glu Ser Ile Lys Asn Gly Ala Gly Phe
65 70 75 80

Ser Glu Asn Glu Ile Val Ala Thr Gly Val Glu Ser Glu Asn Met Val
85 90 95

Thr Asp Gly Arg Ile Ile Gln Ser Ala Glu Val Asn Gly Glu Ala Gln
100 105 110

Lys Glu Lys Leu Ala Lys Thr Glu Leu Lys Ser Asp Gly Phe Cys Leu
115 120 125

Ile Ile Ser Gly Gly Glu Lys Lys Ser Ser Gln Thr Glu Val His Gly
130 135 140

Lys Glu Ile Ser Lys Ser Ser Lys Ala Glu Val His Val Lys Glu Ile
145 150 155 160

Ser Lys Ser Ser Gln Thr Glu Val His Gly Lys Glu Ile Ser Lys Ser
165 170 175

Ser Lys Ala Glu Val His Gly Lys Glu Thr Ser His Ser Lys His Glu
180 185 190

pctca2017050779-seql.txt

Arg Gly Asp Arg Glu Val Arg Arg Ala Arg His Val Glu Pro Val Asp
195 200 205

Arg His Gly Lys Arg Ala Arg Leu Ser Asp Cys Ser Arg His Asp Arg
210 215 220

Ser Asn Glu Arg Leu Ser Lys Lys Arg Pro Arg Asp Tyr Glu Arg Thr
225 230 235 240

Asp Met Asp Arg Asp Arg Gly Arg Asp Arg Asp Arg Asp Arg Ser Ser
245 250 255

Arg Arg Asp His Tyr Ser Tyr Ser Ser Asp Arg Lys Gly Gly Arg Asp
260 265 270

Pro Asp Arg Arg Asp Ser Asp Arg Asp Arg Asp Arg Ala Arg Lys Gly
275 280 285

Tyr Trp Glu Arg Asp Gln Thr Gly Lys Val Val Phe His Ser Gly Ser
290 295 300

Trp Glu Tyr Glu His Glu Arg Glu Ala Lys Arg Val Lys Lys Gln Asn
305 310 315 320

Leu Glu Lys Cys Glu Asn Ile Glu Lys Lys Pro Glu Glu Lys Arg Glu
325 330 335

Lys Pro Val Glu Glu Leu Ala Arg Lys Tyr Gln Leu Asp Val Leu Asp
340 345 350

Gln Ala Lys Lys Lys Asn Thr Ile Ala Phe Leu Glu Thr Gly Thr Gly
355 360 365

Lys Thr Leu Ile Ala Val Leu Leu Ile Lys Ser Leu Cys Lys Asp Met
370 375 380

Met Lys Glu Asn Lys Lys Ile Leu Ala Ile Phe Leu Val Pro Lys Val
385 390 395 400

Pro Leu Val Tyr Gln Gln Ala Glu Val Ile Arg Glu Ser Thr Gly Tyr
405 410 415

Lys Val Gly His Tyr Cys Gly Glu Met Gly Gln Asp Phe Trp Asp Ala
420 425 430

Arg Arg Trp Gln Arg Glu Phe Glu Ser Asn Gln Val Leu Val Met Thr

435

Ala Gln Ile Leu Leu Asn Ile Leu Arg His Ser Ile Ile Lys Met Glu
450 455 460

Thr Ile Asn Leu Leu Ile Leu Asp Glu Cys His His Ala Val Lys Lys
465 470 475 480

His Pro Tyr Ser Leu Val Met Ser Glu Phe Tyr His Arg Thr Pro Lys
485 490 495

Glu Lys Arg Pro Ser Val Phe Gly Met Thr Ala Ser Pro Val Asn Leu
500 505 510

Lys Gly Val Ser Ser Gln Glu Asp Cys Ala Ile Lys Ile Arg Asn Leu
515 520 525

Glu Ser Lys Leu Asp Ala Ile Val Cys Thr Ile Lys Asp Arg Lys Glu
530 535 540

Leu Glu Lys His Val Pro Met Pro Leu Glu Val Ile Val Glu Tyr Asp
545 550 555 560

Lys Ala Ala Ser Leu Trp Ser Leu His Glu Lys Ile Lys Lys Leu Glu
565 570 575

Val Glu Val Glu Glu Ala Ala His Met Ser Ser Arg Arg Ser Lys Trp
580 585 590

Gln Phe Met Gly Ala Arg Asp Ala Gly Ser Lys Asp Glu Leu Arg Leu
595 600 605

Val Tyr Gly Leu Ser Glu Arg Thr Glu Ser Asp Gly Ala Ala Asn Leu
610 615 620

Ile Gln Lys Leu Arg Ala Ile Asn Tyr Ala Leu Gly Glu Leu Gly Gln
625 630 635 640

Trp Cys Ala Tyr Lys Val Ala Leu Ala Phe Leu Thr Ala Leu Gln Asn
645 650 655

Asp Glu Arg Ala Asn Tyr Gln Leu Asp Val Lys Phe Gln Glu Ser Tyr
660 665 670

Leu Ser Lys Val Leu Thr Leu Leu Gln Cys Gln Leu Ser Glu Gly Ala
675 680 685

pctca2017050779-seql.txt

Val Ser Asp Glu Glu Ala Lys Thr Ser Asp Met Glu Ser Asp Asp Val
 690 695 700
 Lys Cys Asp Asp Asn Leu Asp Asp Val Glu Glu Gly Glu Leu Pro Asp
 705 710 715 720
 Ser His Ala Val Ser Gly Gly Glu His Val Asp Val Ile Ile Gly Ala
 725 730 735
 Ala Val Ala Asp Gly Lys Val Thr Pro Lys Val Gln Ser Leu Val Lys
 740 745 750
 Ile Leu Leu Lys Tyr Gln His Thr Glu Asp Phe Arg Ala Ile Val Phe
 755 760 765
 Val Glu Arg Val Val Ser Ala Leu Val Leu Pro Lys Val Phe Ala Glu
 770 775 780
 Leu Pro Ser Leu Ser Phe Ile Lys Cys Ala Ser Leu Ile Gly His Asn
 785 790 795 800
 Asn Ser Gln Glu Met Arg Thr Ser Gln Met Gln Asp Thr Ile Ala Lys
 805 810 815
 Phe Arg Asp Gly Arg Val Thr Leu Leu Val Ala Thr Ser Val Ala Glu
 820 825 830
 Glu Gly Leu Asp Ile Arg Gln Cys Asn Val Val Ile Arg Phe Asp Leu
 835 840 845
 Ala Lys Thr Val Leu Ala Tyr Ile Gln Ser Arg Gly Arg Ala Arg Lys
 850 855 860
 Pro Gly Ser Asp Tyr Ile Leu Met Ala Glu Arg Gly Asn Leu Ser His
 865 870 875 880
 Gln Thr Phe Leu Arg Asn Ala Arg Asn Ser Glu Glu Thr Leu Arg Lys
 885 890 895
 Glu Ala Ile Glu Arg Thr Asp Leu Ser His Leu Lys Gly Thr Ser Lys
 900 905 910
 Leu Thr Thr Val Asp Thr Thr Pro Gly Ser Val Tyr Gln Val Glu Ser
 915 920 925
 Thr Gly Ala Val Val Ser Leu Asn Ser Ala Val Gly Leu Val His Phe
 930 935 940

pctca2017050779-seql.txt

Tyr Cys Ser Gln Leu Pro Ser Asp Arg Tyr Ser Ile Leu Arg Pro Glu
 945 950 955 960
 Phe Ile Met Glu Arg His Gln His Gln Gly Gly Ser Val Glu Tyr Ser
 965 970 975
 Cys Lys Leu Gln Leu Pro Cys Asn Ala Pro Phe Glu Lys Leu Glu Gly
 980 985 990
 Pro Ile Cys Ser Ser Met Arg Leu Ala Gln Gln Ala Val Cys Leu Ala
 995 1000 1005
 Ala Cys Lys Lys Leu His Glu Met Gly Ala Phe Thr Asp Met Leu
 1010 1015 1020
 Leu Pro Asp Lys Gly Ser Gly Glu Glu Gly Glu Lys Leu Asp Glu
 1025 1030 1035
 Asn Ala Val Gly Asp Pro Leu Pro Gly Thr Ala Arg His Arg Glu
 1040 1045 1050
 Phe Tyr Pro Glu Gly Val Ala Glu Ile Leu Arg Gly Glu Trp Ile
 1055 1060 1065
 Leu Ser Ser Lys Asp Thr Cys Gln Lys Met Val Asn Leu His Met
 1070 1075 1080
 Tyr Ala Val Lys Leu Val Asp Val Gly Ala Ser Lys Asp Pro Phe
 1085 1090 1095
 Leu Thr Gln Val Ser Asp Phe Ala Val Leu Phe Gly Ser Lys Leu
 1100 1105 1110
 Asp Ala Glu Val Leu Ser Met Ser Met Asp Leu Phe Val Ala Lys
 1115 1120 1125
 Thr Met Ile Thr Lys Ala Ser Leu Val Phe Gln Gly Ser Ile Asp
 1130 1135 1140
 Ile Thr Val Asn Gln Leu Val Leu Leu Lys Ser Phe His Val Arg
 1145 1150 1155
 Leu Met Ser Ile Val Leu Asp Val Asn Val Glu Pro Ser Ser Thr
 1160 1165 1170
 Pro Trp Asp Ser Thr Lys Ala Tyr Leu Phe Val Pro Val Ile Ser
 1175 1180 1185

pctca2017050779-seql.txt

Glu	Lys	Cys	Ile	Asp	Pro	Ser	Glu	Gly	Ile	Asp	Trp	Gly	Leu	Val
1190						1195					1200			
Glu	Thr	Ile	Val	Gly	Thr	Asp	Ala	Trp	Glu	Asn	Pro	Leu	Gln	Arg
1205						1210					1215			
Ala	Arg	Pro	Asp	Val	Tyr	Leu	Gly	Thr	Asn	Glu	Arg	Thr	Leu	Gly
1220						1225					1230			
Gly	Asp	Arg	Arg	Glu	Tyr	Gly	Tyr	Gly	Lys	Leu	Arg	His	Asp	Met
1235						1240					1245			
Ala	Phe	Gly	Gln	Lys	Ser	His	Pro	Thr	Tyr	Gly	Ile	Arg	Gly	Ala
1250						1255					1260			
Ile	Ala	Gln	Phe	Asp	Val	Val	Lys	Ala	Ser	Gly	Leu	Leu	Pro	Asn
1265						1270					1275			
Arg	Val	Ala	Thr	Glu	Asn	His	Ser	Glu	Ile	Leu	Gly	Gln	Gly	Lys
1280						1285					1290			
Ile	Phe	Met	Ala	Asp	Ser	Cys	Ile	Asn	Ala	Glu	Ser	Leu	Val	Gly
1295						1300					1305			
Ser	Ile	Val	Thr	Ala	Ala	His	Ser	Gly	Lys	Arg	Phe	Tyr	Val	Asp
1310						1315					1320			
Ser	Val	Arg	Tyr	Asp	Met	Asn	Ala	Glu	Asn	Ser	Phe	Pro	Arg	Lys
1325						1330					1335			
Glu	Gly	Tyr	Leu	Gly	Pro	Leu	Glu	Tyr	Ser	Ser	Tyr	Ala	Asp	Tyr
1340						1345					1350			
Tyr	Arg	Gln	Lys	Tyr	Gly	Val	Asp	Leu	Ile	Tyr	Lys	Lys	Gln	Pro
1355						1360					1365			
Leu	Ile	Arg	Gly	Arg	Gly	Val	Ser	Tyr	Cys	Lys	Asn	Leu	Leu	Ser
1370						1375					1380			
Pro	Arg	Phe	Glu	His	Ser	Glu	Ala	His	Glu	Asp	Glu	Ser	Asp	Glu
1385						1390					1395			
Asn	Leu	Asn	Lys	Thr	Tyr	Tyr	Val	Phe	Leu	Pro	Pro	Glu	Leu	Cys
1400						1405					1410			
Phe	Val	His	Pro	Leu	Pro	Gly	Ser	Leu	Val	Arg	Gly	Ala	Gln	Arg

pctca2017050779-seq1.txt

	1415					1420					1425				
Leu	Pro 1430	Ser	Ile	Met	Arg	Arg 1435	Val	Glu	Ser	Met	Leu 1440	Leu	Ala	Val	
Gln	Leu 1445	Arg	Asp	Ser	Ile	Asn 1450	Tyr	Pro	Ile	Ala	Gly 1455	Ser	Lys	Ile	
Leu	Glu 1460	Ala	Leu	Thr	Ala	Ala 1465	Ser	Cys	Gln	Glu	Thr 1470	Phe	Cys	Tyr	
Glu	Arg 1475	Ala	Glu	Leu	Leu	Gly 1480	Asp	Ala	Tyr	Leu	Lys 1485	Trp	Ile	Val	
Ser	Arg 1490	Phe	Leu	Phe	Leu	Lys 1495	Tyr	Pro	Gln	Lys	His 1500	Glu	Gly	Gln	
Leu	Thr 1505	Arg	Met	Arg	Gln	Gln 1510	Met	Val	Ser	Asn	Met 1515	Val	Leu	Tyr	
Gln	Cys 1520	Ala	Leu	Asn	Lys	Gly 1525	Leu	Gln	Ser	Phe	Ile 1530	Gln	Ala	Asp	
Arg	Phe 1535	Ala	Pro	Ser	Arg	Trp 1540	Ser	Ala	Pro	Gly	Val 1545	Leu	Pro	Val	
Phe	Asp 1550	Glu	Asp	Thr	Lys	Asp 1555	Thr	Glu	Ser	Ser	Leu 1560	Phe	Glu	Pro	
Glu	Ser 1565	Asn	Ser	Ser	Asp	Pro 1570	His	Lys	Val	Ala	Leu 1575	Asp	Asn	Asn	
Gly	Tyr 1580	Glu	Asp	Asp	Asp	Met 1585	Glu	Asp	Gly	Glu	Val 1590	Glu	Val	Glu	
Ser	Asp 1595	Ser	Ser	Cys	Tyr	Arg 1600	Val	Leu	Ser	Ser	Lys 1605	Thr	Leu	Ala	
Asp	Val 1610	Val	Glu	Ser	Leu	Ile 1615	Gly	Val	Tyr	Tyr	Val 1620	Glu	Gly	Gly	
Lys	Asn 1625	Ala	Ala	His	His	Leu 1630	Met	Ser	Trp	Ile	Gly 1635	Ile	Glu	Val	
Glu	Phe 1640	Asp	Pro	Glu	Glu	Val 1645	Asp	Ala	Val	Lys	Lys 1650	Pro	Cys	Ser	

pctca2017050779-seq1.txt

Val	Pro	Asp	Ser	Val	Leu	Lys	Ser	Val	Asn	Phe	Asp	Ala	Leu	Glu
1655						1660					1665			
Ser	Ser	Leu	Asn	Ile	Lys	Phe	His	Asp	Lys	Ser	Leu	Leu	Leu	Glu
1670						1675					1680			
Ala	Ile	Thr	His	Ala	Ser	Arg	Pro	Ser	Ala	Gly	Val	Ser	Cys	Tyr
1685						1690					1695			
Gln	Arg	Leu	Glu	Phe	Val	Gly	Asp	Ala	Val	Leu	Asp	His	Leu	Ile
1700						1705					1710			
Thr	Arg	His	Leu	Phe	Phe	Thr	Tyr	Thr	Asp	Leu	Pro	Pro	Gly	Arg
1715						1720					1725			
Leu	Thr	Asp	Leu	Arg	Ala	Ala	Ala	Val	Asn	Asn	Glu	Asn	Phe	Ala
1730						1735					1740			
Arg	Val	Val	Val	Lys	His	Lys	Leu	His	Leu	His	Leu	Arg	His	Gly
1745						1750					1755			
Ser	Ser	Ala	Leu	Glu	Ala	Gln	Ile	Arg	Asp	Phe	Leu	Arg	Asp	Val
1760						1765					1770			
Lys	Asp	Glu	Leu	Leu	Lys	Pro	Gly	Phe	Asn	Ser	Phe	Gly	Val	Gly
1775						1780					1785			
Asp	Cys	Lys	Ala	Pro	Lys	Val	Leu	Gly	Asp	Ile	Phe	Glu	Ser	Ile
1790						1795					1800			
Ala	Gly	Ala	Ile	Phe	Leu	Asp	Ser	Gly	Arg	Asp	Thr	Ser	Val	Val
1805						1810					1815			
Trp	Lys	Val	Phe	Gln	Pro	Leu	Met	His	Pro	Met	Val	Thr	Pro	Glu
1820						1825					1830			
Thr	Leu	Pro	Met	His	Pro	Val	Arg	Glu	Leu	Gln	Glu	Arg	Cys	Gln
1835						1840					1845			
Gln	Gln	Ala	Glu	Gly	Leu	Glu	Tyr	Lys	Ala	Thr	Arg	Ser	Gly	Asn
1850						1855					1860			
Leu	Ala	Thr	Val	Glu	Val	Tyr	Ile	Asp	Gly	Val	Gln	Ile	Gly	Ile
1865						1870					1875			
Ala	Gln	Asn	Pro	Gln	Lys	Lys	Met	Ala	Gln	Lys	Leu	Ala	Ala	Arg
1880						1885					1890			

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Asn Ala Leu Val Val Leu Lys Glu Lys Gln Glu Ile Glu Glu Lys
1895 1900 1905

Glu Lys Gly Glu Asn Gly Lys Lys Lys Asn Gly Asn Pro Ala Phe
1910 1915 1920

Thr Arg Gln Thr Leu Asn Asp Ile Cys Leu Arg Arg Gln Trp Pro
1925 1930 1935

Met Pro Gln Tyr Arg Tyr Phe Phe Leu Phe Val Phe Glu Leu Trp
1940 1945 1950

Met Ser Tyr Gly Leu Thr Ser Phe
1955 1960

<210> 847
<211> 107
<212> PRT
<213> Papaver somniferum

<400> 847

Met Lys Asn Asn Lys Ala Thr Asn Ser Ile Ile Phe Lys Arg Thr Pro
1 5 10 15

Tyr Phe Tyr Phe Leu Leu Pro Arg Asp Ile Lys Ser Ile Thr Ala Arg
20 25 30

Ile Thr Gly Ser Thr Cys Ser Thr Asn Ser Glu Tyr Ile Leu Pro Lys
35 40 45

Asn Leu Ile Ile Asn Phe Ile Phe Ser Ala Cys Leu Met Ser Thr Phe
50 55 60

Met Pro Pro Leu Ser Ala Tyr Cys Phe Arg Gly Ala Phe Phe Cys Leu
65 70 75 80

Ser Asp Ile Leu Ala Gly Ala Leu Glu Cys Asp Leu Asn Arg Pro Arg
85 90 95

Pro Pro Ser Ser Val Ser Phe Phe Phe Lys Ile
100 105

<210> 848
<211> 263
<212> PRT
<213> Papaver somniferum

<400> 848

pctca2017050779-seql.txt

Met Pro Leu Met Lys Phe His Pro Gly Ser Met Gly Val Asp Ala Lys
 1 5 10 15
 Leu Ile Thr Lys Thr Leu Asp Glu Cys Val Ser Gln Pro Asp Asn Glu
 20 25 30
 Asn Gly Asp Lys Asp Leu Lys Ala Lys Leu Ala Pro Gln Gln Ser Glu
 35 40 45
 Gln Pro Ile Ala Ala Glu Gln Lys Lys Glu Glu Glu Asp Asp Lys Glu
 50 55 60
 Asn His Asn Asp Val Lys Thr Cys Ile Ser Val Glu Gln Gln Val Glu
 65 70 75 80
 Met Glu Asn Leu Asp Val Ala Glu Asp Asn Ser Asp His Asn Leu Arg
 85 90 95
 Thr Gln Ser Thr Thr Lys Gly Glu Pro Ile Arg Lys His His Arg Ala
 100 105 110
 Trp Thr Leu Ser Glu Val Thr Gln Leu Val Glu Gly Val Ala Arg Phe
 115 120 125
 Gly Ala Gly Arg Trp Ser Glu Ile Lys Lys Leu Ser Phe Thr Ser Tyr
 130 135 140
 Ser Tyr Arg Thr Ser Val Asp Leu Lys Asp Lys Trp Arg Asn Leu Leu
 145 150 155 160
 Arg Ala Ser Tyr Ala Arg Pro Pro Ala Val Arg Asp Met Leu Asn Ser
 165 170 175
 Lys Lys Gln Ala Ser Ala Ala Leu Pro Ala His Ile Leu Leu Arg Val
 180 185 190
 Arg Glu Leu Ala Glu Lys His Ser Gln Gly Pro Pro Pro Asp Leu Ala
 195 200 205
 Arg Lys Val Gly Asn Ile Arg Gly Arg Lys Pro Gly Gly Gly Ala Gly
 210 215 220
 Ile Phe Gly Arg Lys Ile Val Gly Gly Val Gly Lys Ser His Lys Val
 225 230 235 240
 Arg Gly Val Gly Gly Val Val Ser Ala Gly Ser Lys Pro Ile Val Asn
 245 250 255

pctca2017050779-seql.txt

Glu Thr Arg Ser Gly Phe Leu
260

<210> 849
<211> 181
<212> PRT
<213> Papaver somniferum

<400> 849

Met Val Ala Gly Ile Ile Pro Phe Asp Asp Lys Lys Pro Ile Gln Ala
1 5 10 15

Ala Phe Ala Val Val Asn Lys Lys Leu Arg Pro Val Ile Pro Lys Gly
20 25 30

Cys Pro Pro Pro Leu Arg Asp Leu Ile Glu His Cys Trp Thr Ser Ala
35 40 45

Ser Glu Lys Arg Pro Glu Phe Trp Gln Ile Val Tyr Thr His Leu Asp
50 55 60

His Leu Val Val Asp Met Cys Thr Ser Asn Gly Tyr Met Lys Val Asp
65 70 75 80

Ser Tyr Ile His Ala Ala Phe Leu Gln Ala Trp Leu Trp Glu His Phe
85 90 95

Glu Arg Tyr Ala Pro Lys Pro Leu Ala Leu Leu Pro Glu Ser Trp Gly
100 105 110

Gly Ser Arg Ile Leu Arg Trp Ser Asn Arg Arg Pro Lys Ile Gly Ser
115 120 125

Lys Leu Ile Gly Phe Leu Asp Asn Ser His Thr Ile Asn Phe Arg Pro
130 135 140

Trp Ala Pro Met His Ala Ser Ile Thr Gln Ile Asn Thr Phe Ala Pro
145 150 155 160

Val Pro Ser Met Ser Leu Ser Ser Asp Lys Glu Asp Thr Ser Val Gly
165 170 175

Glu Met Val Phe Met
180

<210> 850
<211> 343
<212> PRT

<213> Papaver somniferum

<400> 850

Met Ser Ser Ser Thr Ser Ser Gly Ser Phe Ser Lys Val His Gly Phe
 1 5 10 15

Asp Ile Ile Lys Phe Asn Gly Lys Asn Asn Phe Thr Ser Trp Gln Ile
 20 25 30

Asp Val Lys Asp Thr Leu Val Ser Met Lys Gln Ile Lys Ala Ile Lys
 35 40 45

Asp Lys Pro Ala Ala Leu Pro Lys Glu Trp Ser Asp Glu Lys Trp Asp
 50 55 60

Asp Leu Val Leu Glu Ala Cys Ser Thr Ile Arg Leu Cys Leu Ser Arg
 65 70 75 80

Glu Ile Thr His Asn Phe Ser Ser Glu Thr Ser Ala Thr Val Leu Trp
 85 90 95

Asp Lys Leu Lys Lys Leu Tyr Leu Gln Lys Asp Leu Thr Ser Glu Leu
 100 105 110

Tyr Leu Lys Arg Arg Ile His Ala Phe Arg Met Ala Ser Gly Lys Pro
 115 120 125

Met Val Asp His Ile Asn Asp Phe Asn Lys Ile Cys Ser Asp Leu Ser
 130 135 140

Asn Ile Ser Val Thr Ile Ser Asp Thr Asp Lys Ser Met Ile Leu Leu
 145 150 155 160

Cys Ser Leu Pro Pro Ser Tyr Asp Ala Phe Val Asp Tyr Leu Leu Ser
 165 170 175

Val Lys Ile Glu Gly Asp Asn Lys Leu Val Phe Asp Asp Val Val Ala
 180 185 190

Ala Leu Gln Ala Lys Ala Leu Arg Lys Gln Glu Leu Ser Asp Glu Ala
 195 200 205

Gln Ala Glu Gly Leu Phe Val Asp Arg Gly Lys Asn Ser Asn Lys Lys
 210 215 220

Gln Lys Ser Lys Asn Arg Phe Lys Lys Asn Asp Ile Glu Cys Tyr Tyr
 225 230 235 240

pctca2017050779-seql.txt

Cys Arg Lys Thr Gly His Ile Arg Val Asp Cys Leu Lys Leu Lys Ala
245 250 255

Arg Asp Glu Lys Arg Glu Lys Ser Asp Leu Lys Asn Val Val Ala Ser
260 265 270

Val Ser Glu Gly Thr Glu Val Leu Glu Asp Pro Met Cys Gly Phe Asp
275 280 285

Glu Glu Val Leu Thr Val Thr Ser Lys Ser Tyr Leu Asn Asp Gly Trp
290 295 300

Met Leu Asp Ser Gly Val Ser Tyr His Met Cys Pro Ser Lys Asp Cys
305 310 315 320

Phe Asn Thr Tyr Arg Glu Val Asn Gly Gly Thr Phe Met Met Gly Asn
325 330 335

Ser Asn Ala Cys Lys Thr Val
340

<210> 851
<211> 318
<212> PRT
<213> Papaver somniferum

<400> 851

Met Ala Gln Leu Leu Ser Pro Val Cys Thr Asp Leu Leu Lys Phe Gln
1 5 10 15

Asn Pro Asn Asn Gln Phe Phe Ser Ser Ile Lys Pro Trp Arg Met Leu
20 25 30

Thr Lys Ile Asn Ser Asn His Leu Ile Thr Thr Phe Ser Gly Ser Lys
35 40 45

Arg Arg Asp Ser Arg Ile Arg Ala Val Ala Glu Glu Ser Phe Ser Ser
50 55 60

Asp Ala Ile Ala Asp Asp Tyr Tyr Ala Val Leu Gly Leu Leu Pro Asp
65 70 75 80

Ala Thr Pro Glu Gln Ile Lys Lys Ala Tyr Tyr Thr Cys Met Lys Ala
85 90 95

Cys His Pro Asp Leu Ser Gly Asn Asp Pro Glu Thr Thr Asn Phe Cys
100 105 110

pctca2017050779-seql.txt

Met Phe Ile Asn Glu Val Tyr Thr Val Leu Ser Asp Pro Val Gln Arg
115 120 125

Met Val Tyr Asp Glu Ile His Gly Tyr Ala Leu Ser Ala Val Asn Pro
130 135 140

Phe Leu Asp Asp Thr Ser Val Lys Asp His Ala Phe Val Asp Glu Phe
145 150 155 160

Ser Cys Ile Gly Cys Lys Asn Cys Ala Asn Val Ala Pro Asp Val Phe
165 170 175

Asn Ile Glu Glu Glu Phe Gly Arg Ala Arg Val Cys Asn Gln Ser Gly
180 185 190

Asn Ile Asp Leu Val Asn Gln Ala Ile Glu Ser Cys Pro Val Asp Cys
195 200 205

Ile His Trp Thr Ser Ala Ala Gln Val Ser Leu Leu Glu Asp Glu Met
210 215 220

Arg Leu Val Glu Arg Val Thr Val Ala Leu Met Leu Ala Gly Met Gly
225 230 235 240

Thr Ser Ser Asp Val Phe Arg Met Ala Asn Asn Arg Trp Glu Lys Arg
245 250 255

Gln Ser Lys Val Leu Glu Lys Ala Arg Ile Arg Met Met Gln Gln Lys
260 265 270

Asp Ala Asn Lys Ser Glu Thr Tyr Trp Asn Asp Leu Trp Gly Lys Pro
275 280 285

Ala Thr Tyr Glu Thr Ser Gly Ile Lys Asn Lys Thr His Gln Ile Leu
290 295 300

Phe Phe Glu Val Phe Ser Leu Pro Ser Phe Ile Ser Phe Thr
305 310 315

<210> 852

<211> 458

<212> PRT

<213> Papaver somniferum

<400> 852

Met Glu Asn Thr Ile Gly Lys Ser Asn Thr Gly Asp Lys Ala Asn Val
1 5 10 15

pctca2017050779-seql.txt

Arg Val Val Val Val Gly Asp Ser Gly Thr Gly Lys Ser Ser Leu Ile
20 25 30

Val Thr Ala Ala Ala Glu Thr Phe Pro Gln Asn Val Pro Pro Val Leu
35 40 45

Pro Pro Thr Arg Leu Pro Ala Asp Phe Tyr Pro Asp Arg Val Pro Val
50 55 60

Thr Ile Ile Asp Thr Ser Ser Ser Met Glu His Arg Thr Lys Leu Ala
65 70 75 80

Gln Glu Leu Lys Leu Ala Asp Ala Val Val Leu Thr Tyr Ala Cys Asp
85 90 95

Thr Pro Ala Thr Leu Asp Arg Leu Ser Thr Phe Trp Leu Pro Glu Leu
100 105 110

Arg Arg Leu Glu Val Lys Val Pro Val Ile Val Val Gly Cys Lys Leu
115 120 125

Asp Ala Arg Glu Asp Thr Gln Val Ser Leu Glu Gln Val Met Ser Pro
130 135 140

Ile Met Gln Gln Phe Arg Glu Ile Glu Thr Cys Ile Glu Cys Ser Ala
145 150 155 160

Arg Ser Leu Ile Gln Val Pro Glu Val Phe Tyr Tyr Ala Gln Lys Ala
165 170 175

Val Leu His Pro Thr Ala Pro Leu Phe Asp Gln Glu Thr Gln Thr Leu
180 185 190

Lys Pro Arg Cys Val Arg Ala Leu Lys Arg Ile Phe Ile Leu Cys Asp
195 200 205

Glu Asp Arg Asp Gly Ala Leu Ser Asp Arg Glu Leu Asn Asp Phe Gln
210 215 220

Val Lys Cys Phe Asn Ala Pro Leu Gln Pro Ser Glu Ile Val Gly Val
225 230 235 240

Lys Arg Val Val Gln Glu Lys Leu Ser Glu Gly Val Asn Asp Arg Gly
245 250 255

Leu Thr Leu Thr Gly Phe Leu Phe Leu His Ala Leu Phe Ile Glu Lys
260 265 270

pctca2017050779-seql.txt

Gly Arg Leu Glu Thr Thr Trp Thr Val Leu Arg Lys Phe Gly Tyr Asp
275 280 285

Asn Glu Ile Lys Leu Arg Asp Asp Leu Ile Pro Leu Ser Phe Lys Arg
290 295 300

Ala Pro Asp Gln Ser Val Glu Leu Thr Thr Glu Ala Val Asp Phe Leu
305 310 315 320

Lys Ser Ile Phe Asn Leu Phe Asp Leu His Gly Asp Ala Ala Leu Arg
325 330 335

Pro Ala Glu Leu Asp Asp Leu Phe Ser Thr Ala Pro Glu Ser Pro Trp
340 345 350

Ser Glu Ala Pro Tyr Lys Glu Ser Ala Glu Lys Thr Ala Leu Gly Gly
355 360 365

Leu Ser Phe Asp Gly Phe Leu Ala Gln Trp Ala Leu Met Thr Leu Leu
370 375 380

Asp Pro Val Lys Ser Val Ala Asn Leu Val Tyr Ile Gly Tyr Gln Gly
385 390 395 400

Asp Ile Ala Ser Val Leu Arg Ile Thr Arg Arg Arg Arg Leu Asp Arg
405 410 415

Lys Lys Gln Gln Ser Asp Arg Asn Val Phe Gln Tyr Phe Met Phe Gly
420 425 430

Pro Lys Arg Cys Trp Glu Val Ile Ile Tyr Gln Leu Phe Thr Arg Lys
435 440 445

Val Trp Tyr Leu Leu Lys Leu Leu Ile Lys
450 455

<210> 853
<211> 166
<212> PRT
<213> Papaver somniferum

<400> 853

Met Ala Asp Leu Gln Val Lys Lys Ile Pro Lys Leu Pro Ile Pro Gly
1 5 10 15

Arg Arg Asn Ile Met Ile Thr Ser Ala Leu Pro Tyr Val Asn Asn Val
20 25 30

pctca2017050779-seql.txt

Pro His Leu Gly Asn Ile Ile Gly Cys Val Leu Ser Ala Asp Val Phe
35 40 45

Ala Arg Tyr Cys Arg Leu Arg Gly Tyr Asn Thr Ile Tyr Met Cys Gly
50 55 60

Thr Asp Glu Tyr Gly Thr Ala Thr Glu Thr Lys Ala Met Glu Glu Gly
65 70 75 80

Cys Thr Pro Lys Glu Ile Cys Asp Lys Tyr His Ala Ile His Arg Asp
85 90 95

Val Tyr Asn Trp Phe Asp Ile Ser Phe Asp Glu Phe Arg Arg Pro Ser
100 105 110

Ser Pro Gln Gln Ile Glu Val Cys Gln Ala Ile Phe Lys Lys Leu Met
115 120 125

Glu Asn Asn Trp Leu Ser Glu Asn Thr Met Gln Gln Val Val His Leu
130 135 140

Gln Val Ser Gly Pro Ser Lys Pro Leu Ser Glu Leu Asp Asp Pro Ala
145 150 155 160

Trp Arg Leu Ala Phe Gly
165

<210> 854
<211> 99
<212> PRT
<213> Papaver somniferum
<400> 854

Met Gln Leu Val Gly Leu Thr Ala Leu Leu Leu Ala Ser Lys Tyr Glu
1 5 10 15

Asp Phe Trp His Pro Lys Leu Arg Gln Glu Leu Glu Glu Leu Gln Val
20 25 30

His Ser Met Leu His Thr Leu Arg His Asp Gly Lys Ser Lys Leu Ala
35 40 45

Leu Ser Arg Phe Ser Arg Cys Ile Met Leu Val Ala Tyr Gly Ala Tyr
50 55 60

Leu Val Phe Gln Leu Phe Ser His Lys His Leu Tyr Glu Val Gly Leu
65 70 75 80

pctca2017050779-seql.txt

Phe Asn Ala Phe Arg Ile Ile Phe Phe Phe Ile Leu Trp Gln Phe Trp
85 90 95

Leu Ser Leu

<210> 855
<211> 164
<212> PRT
<213> Papaver somniferum

<400> 855

Met Ser Thr Ser Asn Ser Lys Phe Ile Lys Cys Val Thr Val Gly Asp
1 5 10 15

Gly Ala Val Gly Lys Thr Cys Leu Leu Ile Ser Tyr Thr Ser Asn Thr
20 25 30

Phe Pro Thr Asp Tyr Val Pro Thr Val Phe Asp Asn Phe Ser Ala Ser
35 40 45

Val Leu Val Asp Ala Gln Ile Val Ser Leu Gly Leu Trp Asp Thr Ala
50 55 60

Gly Gln Glu Asp Tyr Asn Arg Leu Arg Pro Leu Ser Tyr Arg Gly Thr
65 70 75 80

Asp Val Phe Leu Leu Ala Phe Ser Leu Ile Ser Arg Pro Ser Phe Glu
85 90 95

Asn Ile Thr Lys Lys Trp Ile Pro Glu Leu Arg His Tyr Ala Pro Ser
100 105 110

Val Pro Ile Val Leu Val Gly Thr Lys Leu Asp Leu Arg Glu Asp Lys
115 120 125

Gln Phe His Ile Asp Tyr Pro Gly Ala Tyr Thr Ile Ser Thr Ala Gln
130 135 140

Gly Glu Glu Leu Lys Lys Gln Ile Gly Ala Leu Ala Tyr Val Glu Tyr
145 150 155 160

Ile Ser Lys Asn

<210> 856
<211> 164

pctca2017050779-seql.txt

<212> PRT

<213> Papaver somniferum

<400> 856

Met Lys Thr Ser Leu Glu Ile Leu Ser Asp Phe Lys Gln Ala Thr Ser
1 5 10 15

Ala Tyr Arg Glu Gly Ser Trp Glu Phe Pro Ile Asp Val Ser Thr Arg
20 25 30

Trp Ser Gly Asn Tyr Ala Met Leu Asp Ile Ala Arg Arg Ala Ser Lys
35 40 45

Ser Met Asp Ala Val Ile Arg Asn His Glu Glu Ser Leu Ala Ser Cys
50 55 60

Ser Met Leu Leu Asp Pro Ala Glu Lys Val Ala Val Ser Ile Met His
65 70 75 80

Gln Tyr Leu Gly Pro Phe His Gln Ile Thr Ser Ser Ile Cys Thr Thr
85 90 95

Lys Asp Pro Ala Val Gly Leu Val Leu Ser Leu Met Asp Asp Val Val
100 105 110

Lys Met Val Ala Ser Cys Asp Thr Pro Asp Trp Leu Lys Ile Gly Ala
115 120 125

Glu Asp Met Gly Lys Lys Gly Arg Ser Tyr Asn Cys Gly Leu Arg Val
130 135 140

Ser Thr Ser Leu Lys Ile Ser Thr Gln Lys Ala Ile Trp Lys Arg Gln
145 150 155 160

Gly Thr Ile Leu

<210> 857

<211> 94

<212> PRT

<213> Papaver somniferum

<400> 857

Met Asp Ile Lys Ser Ala Phe Leu Asn Gly Ile Ser Lys Glu Glu Val
1 5 10 15

Tyr Val Ala Gln Pro Lys Gly Phe Glu Asn Pro Asp Phe Pro Asp His
20 25 30

pctca2017050779-seql.txt

Met Leu Lys Leu Lys Lys Ala Leu Tyr Gly Leu Lys Gln Ala Pro Arg
35 40 45

Ser Trp Phe Glu Lys Leu Thr Thr Ser Ile Ile Arg Lys Gly Phe Ser
50 55 60

Arg Gly Gly Ala Asp Lys Thr Leu Phe Thr Lys Trp Ser Gly Lys Asp
65 70 75 80

Val Ala Ile Ser Gln Ile Tyr Val Asp Asp Ile Ile Tyr Gly
85 90

<210> 858
<211> 77
<212> PRT
<213> Papaver somniferum

<400> 858

Met Ser Ile Leu Leu Gln Asn Thr Met Gln Arg Ile Val Asn Leu His
1 5 10 15

Leu Pro His Lys Asn Gln Pro Asp Lys Ile Thr Arg Pro Phe Thr Lys
20 25 30

Ser Glu Lys Tyr Met Thr Pro Ser Gly Tyr Lys Cys Leu Thr Asp Ile
35 40 45

Ser Asp Gln Leu Gln His Asn Pro Pro Pro Pro Pro Thr Asn Phe Leu
50 55 60

Trp Thr Leu Pro Cys Pro Pro Lys Val Gln Leu Phe Leu
65 70 75

<210> 859
<211> 73
<212> PRT
<213> Papaver somniferum

<400> 859

Met Lys Arg Asn Trp Asn Ile His Glu Lys Pro Asp Ser Ile Val Ser
1 5 10 15

Ser Leu Tyr Asn Glu Lys Tyr Leu Lys His Gln Pro Ile Leu Gln Asn
20 25 30

Ile Pro Pro Pro Pro Ser Ser Thr Ile Pro Leu Trp Arg Asn Leu Ala
35 40 45

Ser Leu Ile Pro Thr Leu Lys Lys His Leu Phe His Gln Ile Gly Asn
 50 55 60

Gly Ser Thr Thr Pro Ile Gln Ala Asn
 65 70

<210> 860

<211> 86

<212> PRT

<213> Papaver somniferum

<400> 860

Met Gly Lys Gly Lys Arg Gln Lys Ile Pro Ser Ser Arg Leu Lys Gly
 1 5 10 15

Phe Val Met His Thr Ile Arg Glu Asn Ser Leu Pro His Pro His Ser
 20 25 30

Thr Gln Ser Ser Ser Ala Ile Thr Ala Gly Ser Glu Pro Arg Asn
 35 40 45

Phe Lys Glu Ala Met Lys His Pro Gly Trp Arg Lys Pro Trp Lys Gln
 50 55 60

Lys Ser Glu Leu Trp Lys Asn Lys Val Pro Gly Asn Cys Lys Asn Tyr
 65 70 75 80

His Arg Ala Arg Glu His
 85

<210> 861

<211> 114

<212> PRT

<213> Papaver somniferum

<400> 861

Met Gln Asp Asp Val Ala Lys Leu Val Arg Gly Tyr Lys Leu Cys Ser
 1 5 10 15

Thr Ser Lys Pro Ser Asn Met Thr Arg Gly Leu Tyr Leu Pro Leu Pro
 20 25 30

Val Pro Ser Arg Pro Trp Glu Ser Ile Ser Met Asp Phe Leu Gly Gly
 35 40 45

Leu Pro Lys Thr Lys Ser Gly His Asp Tyr Leu Phe Val Val Val Asp
 50 55 60

Arg Leu Ser Lys Met Ile Ala Leu Ile Pro Cys Thr Lys Thr Val Met

pctca2017050779-seq1.txt

65 70 75 80

Gly Ala Asp Ala Gly Lys Leu Phe Phe Lys His Val Trp Lys His Phe
85 90 95

Gly Leu Pro Thr Ser Ile Leu Ser Asp Arg Asp Ser Arg Phe Leu Ser
100 105 110

His Phe

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<210> 862
<211> 86
<212> PRT
<213> Papaver somniferum

<400> 862
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[illegible]

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<210> 863
<211> 85
<212> PRT
<213> Papaver somniferum

<400> 863
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Met Asn Gln Gln Ile Tyr Thr Arg Trp Arg Leu Arg Arg Leu Gly Val
1 5 10 15

Thr Thr Asn Ser Ile Arg Ser Cys Asn Met Ile Glu Arg Met Val Tyr
20 25 30

Pro Val Thr Ser Asn Asn Phe Ser Phe Thr Pro Ile Gln Ser Leu Arg
35 40 45

pctca2017050779-seql.txt

Ile Pro Asn Phe Gln Pro Phe Gln Leu Leu Glu Gly Ala Ser Leu Val
50 55 60

Ser Leu Ala Ser Phe Ala Gln Phe Arg Thr Asn His Lys Thr Lys Leu
65 70 75 80

Ile Lys Arg Asn Met
85

<210> 864
<211> 108
<212> PRT
<213> Papaver somniferum

<400> 864

Met Asn Leu Met Asn Cys Lys Ser Pro Asp Ile Ala Tyr Ile Val Ser
1 5 10 15

Lys Leu Ser Gly Tyr Asn Cys Ser Pro Glu Gln Glu Asn Ser Asp Ala
20 25 30

Leu Ser Arg Val Leu Trp Tyr Leu Lys Tyr Cys Ile Thr Phe Cys Phe
35 40 45

Ile Tyr Glu Arg Tyr Leu Val Val Leu Glu Gly Leu Cys Asp Ala Asn
50 55 60

Trp Ile Val Asp Ser Glu Glu Ser Lys Ser Thr Ser Gly Tyr Val Phe
65 70 75 80

Thr Leu Ala Arg Gly Phe Val Ser Gly Ser Phe Ser Asp Lys His Ile
85 90 95

Leu Leu Asn Ser Leu Trp Asn Leu Arg Val Leu Arg
100 105

<210> 865
<211> 851
<212> PRT
<213> Papaver somniferum

<400> 865

Met Ala Glu Ser Glu Ser Thr Leu Asn Ile Lys Gln Glu Thr Thr Pro
1 5 10 15

Ile Asp Ser Ile Lys Glu Arg Asn Glu Glu Lys Gln Asn Leu Ser Asn
20 25 30

pctca2017050779-seql.txt

Gly Gly Asp Ser Lys Lys Ser Asp Val Gln Val Ile Asp Leu Asp Ser
 35 40 45
 Ser Ser Gly Gly Ser Asp Ser Asp Asp Asp Asp Asp Asn Glu Asp Ser
 50 55 60
 Asp Gly Asp Ala His Met Ser Lys Asp Ser Arg Val Gly Gly Gly Gly
 65 70 75 80
 Ser Asn Lys Arg Lys Lys Lys Lys Arg Arg Ile Asp Asn Arg Gly Val
 85 90 95
 Val Leu Pro Leu Gly Phe Leu Asp Pro Leu Pro Ser Lys Asp Lys Asp
 100 105 110
 Gly Ala Val Pro Lys Pro Pro Ala Thr Pro Lys Asp Val Val Val Pro
 115 120 125
 Lys Pro Pro Ala Thr Pro Lys Asp Phe Val Ala Ser Lys Pro Pro Asn
 130 135 140
 Thr Pro Lys Glu Val Val Val Pro Lys Pro Lys Asp Val Val Met Val
 145 150 155 160
 Gln Thr Cys Lys Gln Phe Trp Lys Ala Gly Asp Tyr Asp Gly Gly Gly
 165 170 175
 Gly Val Val Glu Asp Pro Phe Ala Phe Ser Thr Gly Gly Met Asp His
 180 185 190
 Val Arg Val His Pro Lys Phe Leu His Ser Asn Ala Thr Ser His Lys
 195 200 205
 Trp Ala Leu Gly Ala Phe Ala Glu Leu Leu Asp Asn Ser Leu Asp Glu
 210 215 220
 Val Cys Asn Gly Ala Thr Phe Val Asn Ile Asp Met Leu His Asn Ile
 225 230 235 240
 Lys Asp Gly Ser Glu Met Leu Leu Val Glu Asp Asp Gly Gly Gly Met
 245 250 255
 Asp Pro Asp Lys Met Arg Gln Cys Met Ser Leu Gly Tyr Ser Ala Lys
 260 265 270
 Ser Lys Leu Ala Asn Thr Ile Gly Gln Tyr Gly Asn Gly Phe Lys Thr
 275 280 285

pctca2017050779-seql.txt

Ser Thr Met Arg Leu Gly Ala Asp Val Ile Val Phe Ser Arg Cys Arg
290 295 300

Gly Lys Asn Gly Asn Ser Ser Thr Gln Ser Ile Gly Leu Leu Ser Tyr
305 310 315 320

Thr Phe Leu Arg Gly Thr Gly Lys Glu Asp Ile Val Val Pro Met Leu
325 330 335

Asp Tyr Glu Lys Glu Gly Arg Glu Trp Lys Glu Leu Ile Arg Ser Ser
340 345 350

Ser Ser Asp Trp Ser Arg Asn Val Asp Thr Ile Val Gln Trp Ser Pro
355 360 365

Phe Ala Ser Glu Ala Asp Leu Leu Lys Gln Phe Asn Gly Ile Gly Glu
370 375 380

His Gly Thr Arg Leu Ile Ile Tyr Asn Leu Trp Glu Asp Asp Gln Gly
385 390 395 400

Glu Leu Glu Leu Asp Phe Gln Ser Asp Pro His Asp Ile Gln Ile Arg
405 410 415

Gly Val Asn Arg Asp Glu Lys Lys Ile Glu Met Ala Lys Lys Phe Pro
420 425 430

Asn Ser Arg His Tyr Leu Thr Tyr Arg His Ser Leu Arg Ser Tyr Ala
435 440 445

Ser Ile Leu Tyr Leu Arg Ile Pro Leu Arg Phe Arg Met Val Leu Arg
450 455 460

Gly Lys Asp Ile Val His His Asn Leu Ile Asn Asp Met Met Leu Ala
465 470 475 480

Gln Glu Ile Thr Tyr Arg Pro Gln Pro Gly Ala Asp Gly Met Leu Lys
485 490 495

Asp Pro Asn Val Val Ala Thr Val Thr Met Gly Phe Val Lys Asp Ala
500 505 510

Lys Asp His Ile Asp Val Gln Gly Phe Ser Val Tyr His Lys Asn Arg
515 520 525

Leu Ile Lys Pro Phe Trp Arg Val Trp Asn Pro Ser Gly Ser Asp Gly

530

535

540

Arg Gly Val Ile Gly Val Leu Glu Ala Asn Phe Val Glu Pro Ala His
 545 550 555 560

Asp Lys Gln Gly Phe Glu Arg Thr Thr Val Leu Ala Arg Leu Glu Ala
 565 570 575

Arg Leu Val Gln Met Gln Lys Thr Tyr Trp Thr Thr Leu Cys His Lys
 580 585 590

Val Gly Tyr Ser Cys Arg Arg Asn Lys Lys Leu Val Ala Ala Gly Asp
 595 600 605

Ser Ser Pro Asp Phe Leu Leu Arg Gln Ser Ser Lys Ser Thr Met Gly
 610 615 620

Ser Thr Ser Cys Trp Glu Pro Val Asn Gly Asn Gly Asn Met Tyr Gly
 625 630 635 640

Lys Gly Glu Asn Gly Lys Pro Thr Ser Arg Phe Arg Pro Arg Ser Ser
 645 650 655

Ser Ser Glu Glu Asp Asp Ser Asp Ser Glu Arg Pro Pro Gly Ile Arg
 660 665 670

Lys Lys Thr Lys Tyr Gln Trp Gln Lys Ser Lys Asp Arg Ser Asp Ile
 675 680 685

Asn Ser Ser Glu Ser Asp Val Ile Ile Gln Gln Leu Glu Ala Glu Asn
 690 695 700

Ser Glu Leu Lys Asn Ser Leu Ser Lys Met Lys Glu Ser Phe Leu Arg
 705 710 715 720

Asp Ile Asp Tyr Glu Arg Asp Arg Val Lys Gln Leu Thr Thr Leu Leu
 725 730 735

Asn Gly Asn Gly Pro Thr Asn Ser Asp Pro Ala Thr Leu Ser Arg Leu
 740 745 750

Arg Thr Glu Asn His Glu Leu Gln Asp Arg Met Lys Lys Met Glu Ala
 755 760 765

Leu Phe Ser His Asp Val Gln Ser Glu Lys Glu Arg Cys Asn Leu Leu
 770 775 780

pctca2017050779-seql.txt

Gln Ala Lys Leu Lys Glu Ser Glu Glu Lys Ile Val Glu Met Asn Lys
785 790 795 800

Glu Gln Glu Ala Phe Ile Asp Ile Phe Ala Glu Glu Arg Cys Arg Arg
805 810 815

Glu Lys Glu Glu Glu Asn Leu Arg Ser Lys Leu Lys Asp Ala Ser Asn
820 825 830

Thr Ile Gln Glu Leu Leu Asp Lys Val Arg Gln Leu Glu Lys Ser Asp
835 840 845

Gly Arg Thr
850

<210> 866
<211> 84
<212> PRT
<213> Papaver somniferum

<400> 866

Met Asn Asp Gly Ala Leu Tyr Ile Ser Lys Leu Gln Phe Leu Val Gln
1 5 10 15

Arg Phe Asn Met Thr Lys Leu Pro Phe Thr Lys Met Arg Ala Cys Cys
20 25 30

His Ala Asn Val Thr Lys Ile Ile Gln Val Lys Ser Phe Ile Ile Met
35 40 45

Leu Asn Gln Asn Ile Met Cys His Ala Gln Ile Ile Asp Tyr Leu Asn
50 55 60

Leu Leu Ala Ser Lys Tyr Ser Cys His Ile His His Cys Gly Thr Thr
65 70 75 80

Ala Met Ile Pro

<210> 867
<211> 751
<212> PRT
<213> Papaver somniferum

<400> 867

Met Ala Glu Glu Phe Val Lys Ser Val Glu Asp Gly Ile Lys Leu Ser
1 5 10 15

Lys Arg Ile Tyr Phe Gly Lys Asp Arg Asn Val Thr Pro Pro Arg Ala

20

25

30

Ile Ser Ile Val Ser Glu Lys Gln Gln Gln Tyr Leu Pro Ala Ser Pro
 35 40 45

Met Met Tyr Gly Val Ile Ser Asp Pro Ser Ile Val Asp Asn Pro Asp
 50 55 60

Ile Pro Ser Tyr Gln Pro His Val His Gly Arg Cys Asp Pro Pro Ala
 65 70 75 80

Leu Ile Pro Leu Gln Met Asn Ser Ile Glu Met Glu Val Asn Val Trp
 85 90 95

Leu Asp Thr Val Ser Val Ser Met Val Gly Ser Trp Arg Val His Cys
 100 105 110

Val Met Gly Ser Arg Ser Cys Asp Cys Arg Ile Ala Ile Pro Met Gly
 115 120 125

Asn Gln Gly Ser Ile Leu Gly Val Glu Val Glu Val Asn Arg Arg Ser
 130 135 140

Phe His Ser Gln Leu Thr Ser Val Glu Asp Thr Thr Asp Cys Val Lys
 145 150 155 160

Leu Ala Lys Val Glu Asp Gly Gly Phe Leu Lys Pro Asn Ile Phe Thr
 165 170 175

Leu Thr Ile Pro Gln Ile Asp Gly Gly Ala Asn Ile Ser Val Lys Ala
 180 185 190

Asn Trp Ser Gln Lys Leu Ala Phe Asp Ala Gly Gln Phe Thr Val Asn
 195 200 205

Ile Pro Phe Ser Phe Pro Glu Tyr Val Thr Pro Ala Gly Lys Lys Ile
 210 215 220

Ala Lys Arg Glu Lys Ile Lys Leu Asn Val Asn Pro Gly Ile Gly Ser
 225 230 235 240

Glu Val Leu Cys Lys Thr Ser Ser His Pro Leu Lys Glu Ile Arg Arg
 245 250 255

Gln Ala Gly Lys Leu Ala Phe Ser Tyr Glu Ala Asp Val Leu Thr Trp
 260 265 270

pctca2017050779-seql.txt

Ser Asn Met Glu Phe Asn Phe Ser Tyr Ala Val Ser Ser Lys Asp Ile
 275 280 285
 Ser Ala Gly Leu Leu Leu Gln Ser Pro Pro Val Asp Asp Leu Asp Gln
 290 295 300
 Arg Glu Met Phe Cys Ile His Leu His Pro Gly Asn His Gln Thr Arg
 305 310 315 320
 Lys Val Phe Arg Arg Lys Val Val Phe Val Ile Asp Thr Ser Ala Ser
 325 330 335
 Met Lys Gly Lys Pro Leu Glu Ala Val Lys Ser Ala Leu Ser Ala Ala
 340 345 350
 Leu Ser Lys Leu Asn Pro Glu Asp Ser Phe Ser Ile Ile Ala Phe Asn
 355 360 365
 Gly Glu Thr Tyr Leu Phe Ser Ser Ser Leu Val Pro Ala Thr Lys Glu
 370 375 380
 Thr Ile Glu Asn Ala Thr Gln Trp Ile Ser Ile Asn Phe Ile Ala Glu
 385 390 395 400
 Gly Gly Thr Asn Ile Leu Leu Pro Leu Asn Gln Ala Ile Asp Met Leu
 405 410 415
 Ser Gly Ala Glu Ser Ser Asp Ser Val Pro Leu Ile Phe Leu Leu Thr
 420 425 430
 Asp Gly Thr Val Glu Asp Glu Lys His Ile Cys Asp Val Met Lys Ser
 435 440 445
 His Met Lys Asn Lys Gly Ser Met Ser Pro Arg Ile Ser Thr Phe Gly
 450 455 460
 Ile Gly Thr Tyr Cys Asn His Tyr Phe Leu Gln Ile Leu Ala Gln Ile
 465 470 475 480
 Ser Arg Gly Tyr Tyr Tyr Ala Ala Tyr Glu Val Asp Ser Leu Tyr Val
 485 490 495
 Arg Met Gln Lys Leu Leu Thr Glu Ala Ser Ser Ile Ile Tyr Ala Asn
 500 505 510
 Ile Thr Ile Asp Ser Ile Asp Asn Leu Gln Glu Leu Glu Val Tyr Pro
 515 520 525

pctca2017050779-seql.txt

Ser Leu Phe Pro Asp Leu Leu Ser Gly Met Pro Leu Thr Val Ser Gly
530 535 540

Arg Tyr Glu Gly Arg Phe Pro Asp Ser Val Lys Ile Lys Gly Val Leu
545 550 555 560

Ala Asp Met Ser Asn Tyr Glu Val Asp Leu Lys Leu Gln Gln Ala Lys
565 570 575

Asp Ile Pro Leu Asp Arg Val Phe Ala Lys Arg His Ile Asp Val Leu
580 585 590

Thr Ala Gln Ala Trp Tyr Thr Gln Ser Lys Lys Leu Glu Glu Lys Ile
595 600 605

Ala Arg Met Ser Ile Gln Thr Gly Ile Pro Ser Glu Tyr Thr Arg Met
610 615 620

Val Val Leu Gln Asn Asp Gly Gly Lys Lys Ala Ser Asp Ser Ile Asp
625 630 635 640

Ile Gln Glu Val Asn Lys Leu Asp Leu Gln Lys Lys Val Asp Ser Glu
645 650 655

Gly Arg Lys Ile Met Leu Leu Gln Cys Leu Gly Ile Gly Phe Gly Asn
660 665 670

Leu Thr Ala Thr Thr Glu Ser Ile Pro Pro Gly Trp Gly Glu Pro Glu
675 680 685

Leu Pro Glu Pro Val Ala Asp Ala Phe Val Lys Ala Ala Ser Asn Cys
690 695 700

Cys Ser Ser Leu Ala Asp Leu Cys Cys Cys Met Asn Cys Ile Arg Cys
705 710 715 720

Cys Ser Ser Met Asn Asn Gln Cys Gly Ile Leu Ile Val Gln Leu Cys
725 730 735

Gly Gly Leu Ala Cys Leu Gly Cys Phe Ser Cys Cys Gly Asp Asp
740 745 750

<210> 868

<211> 77

<212> PRT

<213> Papaver somniferum

<400> 868

pctca2017050779-seql.txt

Met Pro His Gln Ser Glu Gln Asp Thr Val Glu Asp Gln Asn Pro Ser
1 5 10 15

Cys Thr Phe Pro Cys Gln Ile Ser Leu Ile Glu Gly Trp Lys Thr Asp
20 25 30

Gly Glu Cys Glu Lys Ile Thr Asn Pro Val Lys Met Arg Ala Ser Ile
35 40 45

Phe Lys Phe Glu Val Glu Asp Trp Ser Phe Asn Ala Phe Ala Ile Ser
50 55 60

Glu Thr Arg Val Pro Ile Asp Val Cys Lys Ala Val Met
65 70 75

<210> 869
<211> 318
<212> PRT
<213> Papaver somniferum

<400> 869

Met Ala Gln Leu Leu Ser Pro Val Cys Thr Asp Leu Leu Lys Phe Gln
1 5 10 15

Asn Pro Asn Asn Gln Phe Phe Ser Ser Ile Lys Pro Trp Arg Met Leu
20 25 30

Thr Lys Ile Asn Ser Asn His Leu Ile Thr Thr Phe Ser Gly Ser Lys
35 40 45

Arg Arg Asp Ser Arg Ile Arg Ala Val Ala Glu Glu Ser Phe Ser Ser
50 55 60

Asp Ala Ile Ala Asp Asp Tyr Tyr Ala Val Leu Gly Leu Leu Pro Asp
65 70 75 80

Ala Thr Pro Glu Gln Ile Lys Lys Ala Tyr Tyr Thr Cys Met Lys Ala
85 90 95

Cys His Pro Asp Leu Ser Gly Asn Asp Pro Glu Thr Thr Asn Phe Cys
100 105 110

Met Phe Ile Asn Glu Val Tyr Thr Val Leu Ser Asp Pro Val Gln Arg
115 120 125

Met Val Tyr Asp Glu Ile His Gly Tyr Ala Leu Ser Ala Val Asn Pro
130 135 140

pctca2017050779-seql.txt

Phe Leu Asp Asp Thr Ser Val Lys Asp His Ala Phe Val Asp Glu Phe
145 150 155 160

Ser Cys Ile Gly Cys Lys Asn Cys Ala Asn Val Ala Pro Asp Val Phe
165 170 175

Asn Ile Glu Glu Glu Phe Gly Arg Ala Arg Val Cys Asn Gln Ser Gly
180 185 190

Asn Ile Asp Leu Val Asn Gln Ala Ile Glu Ser Cys Pro Val Asp Cys
195 200 205

Ile His Trp Thr Ser Ala Ala Gln Val Ser Leu Leu Glu Asp Glu Met
210 215 220

Arg Leu Val Glu Arg Val Thr Val Ala Leu Met Leu Ala Gly Met Gly
225 230 235 240

Thr Ser Ser Asp Val Phe Arg Met Ala Asn Asn Arg Trp Glu Lys Arg
245 250 255

Gln Ser Lys Val Leu Glu Lys Ala Arg Ile Arg Met Met Gln Gln Lys
260 265 270

Asp Ala Asn Lys Ser Glu Thr Tyr Trp Asn Asp Leu Trp Gly Lys Pro
275 280 285

Ala Thr Tyr Glu Thr Ser Gly Ile Lys Asn Lys Thr His Gln Ile Leu
290 295 300

Phe Phe Glu Val Phe Ser Leu Pro Ser Phe Ile Ser Phe Thr
305 310 315

<210> 870

<211> 81

<212> PRT

<213> Papaver somniferum

<400> 870

Met Ser Met Cys Arg Ile Ser Glu Asn Phe Ala Ser Ala Val Ala Val
1 5 10 15

Glu Ser Lys Val Asn Ser Phe Asn Ser Pro Leu Pro Ser Phe Arg Ile
20 25 30

Ser Ile Lys Pro Ser Asn Met Phe Gly Ser Arg Ile Tyr Arg Leu Asn
35 40 45

pctca2017050779-seql.txt

Leu Gln Glu Asn Ile Phe Arg Gln Ser Val Gly Lys Lys Glu Trp Ile
50 55 60

Lys Ser Tyr Tyr Lys Met Trp Lys Ala Ala Val Glu Ser Phe Val Pro
65 70 75 80

Gly

<210> 871
<211> 117
<212> PRT
<213> Papaver somniferum

<400> 871

Met Arg Ile Asn Phe Leu Ile Pro Leu Asp His Gln Pro Glu Val Lys
1 5 10 15

Gln Thr Tyr Gln Gln Phe Leu Met Tyr Gly Pro Leu Leu Leu Ile Gly
20 25 30

Lys His Leu Val His Leu Leu Asp Cys Lys Lys Lys Phe Tyr Asp Ala
35 40 45

Thr Leu Lys Phe Ser Gly Ser Thr Tyr Val Thr Phe Asn Leu Phe Leu
50 55 60

Asp Glu Val Ile Cys Ile Asn Asp Val Leu Gln Glu Trp Val Lys Asn
65 70 75 80

Asp Asn Val Leu Phe Ala Asp Met Ala Gly Trp Met Val Leu Lys Tyr
85 90 95

Glu Lys Tyr Trp Ala Val Asp Lys Ile Asn Lys Met Leu Tyr Ile Val
100 105 110

Val Leu Leu Asp Thr
115

<210> 872
<211> 356
<212> PRT
<213> Papaver somniferum

<400> 872

Met Asp Thr Ile Lys Arg Lys Tyr Leu Met Leu Phe Asn Ser Val Leu
1 5 10 15

pctca2017050779-seq1.txt

Leu Ala Ile Gly Ala Thr Gly Gly Pro Leu Leu Leu Arg Leu Tyr Phe
 20 25 30
 Val Arg Gly Gly Lys Arg Ile Trp Leu Ser Ser Ala Leu Gly Ser Ala
 35 40 45
 Gly Trp Pro Ile Leu Ile Leu Pro Leu Ser Leu Ser Tyr Ile Phe Lys
 50 55 60
 Arg Gly Gly Gly Gly Glu Asn Gly Arg Val Lys Phe Phe Thr Ile Thr
 65 70 75 80
 Pro Pro Leu Ile Ile Phe Ser Ala Phe Ile Gly Leu Leu Leu Gly Leu
 85 90 95
 Asn Asp Tyr Leu Tyr Ser His Gly Val Ser Leu Leu Pro Val Ser Thr
 100 105 110
 Ser Thr Leu Ile Met Ser Thr His Leu Ala Phe Thr Ala Gly Phe Ala
 115 120 125
 Phe Val Leu Val Lys Gln Lys Phe Thr Pro Tyr Ser Ile Asn Ala Val
 130 135 140
 Val Leu Leu Thr Val Gly Ala Ile Leu Leu Gly Leu His Ser Asn Gly
 145 150 155 160
 Asp Lys Pro Val Asn Gln Ser Asn Arg Asp Tyr Tyr Phe Gly Phe Phe
 165 170 175
 Leu Thr Val Gly Ala Ser Val Ile Ser Gly Leu Leu Phe Pro Leu Ala
 180 185 190
 Glu Leu Met Tyr Ile Lys Ala Met Gln Ala Leu Thr Tyr Ser Leu Val
 195 200 205
 Ile Glu Met Gln Ile Val Thr Ala Val Val Ala Ser Leu Phe Cys Ile
 210 215 220
 Val Gly Met Ile Ile Asn Asn Asp Phe Lys Ala Ile Pro Ser Glu Gly
 225 230 235 240
 Lys Glu Tyr Glu Leu Gly Glu Val Lys Tyr Tyr Val Val Leu Val Ser
 245 250 255
 Ile Ala Ile Met Trp Gln Ile Tyr Phe Val Gly Thr Ala Gly Val Ile
 260 265 270

pctca2017050779-seql.txt

Phe Cys Ser Thr Ser Leu Leu Ala Gly Ile Ile Thr Ala Val Ile Leu
275 280 285

Pro Val Thr Glu Ile Leu Ser Val Val Phe Tyr His Glu Ser Phe Lys
290 295 300

Ser Glu Lys Gly Ile Ala Leu Phe Leu Ser Phe Trp Gly Leu Ile Ser
305 310 315 320

Tyr Leu Tyr Gly Asp Tyr Arg Glu Asn Ile Lys Leu Lys Lys Ala Ala
325 330 335

Gln Lys Gln Ser Ser Glu Leu Glu Leu Asp Glu Asn Leu Pro Pro Gln
340 345 350

Thr Asn Leu Gln
355

<210> 873
<211> 73
<212> PRT
<213> Papaver somniferum

<400> 873

Met Val Ser Trp Phe Lys Ser Lys Ser Lys Phe His Ser Gln Ser Gln
1 5 10 15

Ser Thr Asn Ile Asp His Val Asn Pro Gly Phe Leu Leu Thr Arg Lys
20 25 30

Leu Phe Ile Trp Ser Val Ile Val Gly Ile Ile Thr Gly Leu Asp Ser
35 40 45

Phe Leu Phe Ala Val Gly Tyr Ser Tyr Leu Pro Val Ser Val Ala Ser
50 55 60

Leu Leu Leu Ala Thr Gln Leu Ala Phe
65 70

<210> 874
<211> 157
<212> PRT
<213> Papaver somniferum

<400> 874

Met Ile Lys Thr Phe Leu Phe Gly Thr Met Phe Gly Phe Lys Thr Ile
1 5 10 15

pctca2017050779-seql.txt

Ser Ser Leu Phe Pro Asn Asn Ser Phe Ile Asn Gln Ser Ser Asn Met
 20 25 30

Lys Val Ser Glu Leu Ile Val Asn Arg Gln Trp Met Ile Pro Glu Met
 35 40 45

Val Leu Asp Phe Ile Asp Leu Ala Asp Leu Pro Ile Leu His His Gly
 50 55 60

Glu Asp Lys Met Ile Trp Cys Gly Asn Ser Lys Gly Ile Phe Ser Val
 65 70 75 80

Ser Asn Ala Leu Glu Lys Ile Arg Phe Val Met Pro Lys Val Ser His
 85 90 95

Tyr Met Lys Ile Trp Ser Ser Tyr Val His Pro Thr Val Ala Ser Asn
 100 105 110

Val Trp Lys Ile Val Arg Gly Ala Ile Ala Asp Asp Met Asn Met Lys
 115 120 125

Lys Arg Gly Phe Asn Met Leu Ser Arg Cys Leu Phe Cys His Lys Glu
 130 135 140

Glu Asp Ile Thr Asp His Leu Leu Trp His Cys Glu Val
 145 150 155

<210> 875

<211> 154

<212> PRT

<213> Papaver somniferum

<400> 875

Met Gln Ile Phe Val Lys Thr Leu Thr Gly Lys Thr Ile Thr Leu Glu
 1 5 10 15

Val Glu Ser Ser Asp Thr Ile Asp Asn Val Lys Ala Lys Ile Gln Asp
 20 25 30

Lys Glu Gly Ile Pro Pro Asp Gln Gln Arg Leu Ile Phe Ala Gly Lys
 35 40 45

Gln Leu Glu Asp Gly Arg Thr Leu Ala Asp Tyr Asn Ile Gln Lys Glu
 50 55 60

Ser Thr Leu His Leu Val Leu Arg Leu Arg Gly Gly Met Gln Ile Phe
 65 70 75 80

pctca2017050779-seql.txt

Val Lys Thr Leu Thr Gly Lys Thr Ile Thr Leu Glu Val Glu Ser Ser
85 90 95

Asp Thr Ile Asp Asn Val Lys Ala Lys Ile Gln Asp Lys Glu Gly Ile
100 105 110

Pro Pro Asp Gln Gln Arg Leu Ile Phe Ala Gly Lys Gln Leu Glu Asp
115 120 125

Gly Arg Thr Leu Ala Asp Tyr Asn Ile Gln Lys Glu Ser Thr Leu His
130 135 140

Leu Val Leu Arg Leu Arg Gly Gly Asp Tyr
145 150

<210> 876

<211> 187

<212> PRT

<213> Papaver somniferum

<400> 876

Met Gln Ile Phe Val Lys Thr Leu Thr Gly Lys Thr Ile Thr Leu Glu
1 5 10 15

Val Glu Ser Ser Asp Thr Ile Asp Asn Val Lys Ala Lys Ile Gln Asp
20 25 30

Lys Glu Gly Ile Pro Pro Asp Gln Gln Arg Leu Ile Phe Ala Gly Lys
35 40 45

Gln Leu Glu Asp Gly Arg Thr Leu Ala Asp Tyr Asn Ile Gln Lys Glu
50 55 60

Ser Thr Leu His Leu Val Leu Arg Leu Arg Gly Gly Met Gln Ile Phe
65 70 75 80

Val Lys Thr Leu Thr Gly Lys Thr Ile Thr Leu Glu Val Glu Asn Ser
85 90 95

Asp Thr Ile Asp Asn Val Lys Ala Lys Ile Gln Asp Lys Glu Gly Ile
100 105 110

Pro Pro Asp Gln Gln Arg Leu Ile Phe Ala Gly Lys Gln Leu Glu Asp
115 120 125

Gly Arg Thr Leu Ala Asp Tyr Asn Ile Gln Lys Glu Ser Thr Leu His
130 135 140

pctca2017050779-seql.txt

Leu Val Leu Arg Leu Arg Gly Gly Met Gln Ile Phe Val Lys Thr Leu
145 150 155 160

Thr Gly Lys Thr Ile Thr Leu Glu Val Glu Ser Ser Asp Thr Ile Asp
165 170 175

Asn Val Lys Ala Lys Ile Gln Asp Lys Glu Gly
180 185

<210> 877

<211> 71

<212> PRT

<213> Papaver somniferum

<400> 877

Met Phe Phe Ser Cys Ser Ser Ile Phe Phe Arg Val Gln Ser Phe Tyr
1 5 10 15

Phe His Ile Arg Phe Thr Ala Arg Leu Leu Arg Cys Ala Tyr Val Asp
20 25 30

Arg Leu Asn Pro Pro Asn Gly Asp Gly Tyr Asp Ser Asp Ile Asp Glu
35 40 45

Ile Met Asp Ser Ser Ala Met Leu Gly Asp Ile Asp Gly Val Leu Gly
50 55 60

Asp Met Phe Gln Glu Val Ile
65 70

<210> 878

<211> 435

<212> PRT

<213> Papaver somniferum

<400> 878

Met Val Gln Glu Glu His Asp Val Ala Asp Gly Gly Glu Val Gln Glu
1 5 10 15

Gly Thr Ser Ala Ala Val Gly Val Thr Pro Ile Val Pro Gln Glu Val
20 25 30

Arg Arg Ser Ser Arg Thr Pro Lys Pro Asn Pro Arg Tyr Ala Leu Asn
35 40 45

Tyr Leu Leu Leu Thr Asp Gly Val Glu Pro Glu Asp Ile Lys Glu Ala
50 55 60

Leu Ala Ala Asp Asp Ser Gly Lys Trp Gln Leu Ala Met Glu Asp Glu

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65              70              75              80
Ile Asn Ser Leu Glu Glu Asp Gly Thr Trp Val Leu Val Lys Leu Pro
      85              90              95
Arg Gly Lys Lys Ala Leu His Asn Lys Trp Val Tyr Arg Met Lys Ser
      100             105             110
Glu Ala Asn Gly Asp Ile Arg Tyr Lys Glu Arg Leu Val Val Lys Gly
      115             120             125
Phe Gln Gln Lys Pro Ser Val Asp Tyr Asn Glu Ile Phe Ser Pro Val
      130             135             140
Val Lys Met Thr Thr Ile Arg Val Val Leu Ser Leu Val Ala Ser Glu
      145             150             155
Asp Leu Tyr Leu Glu Gln Leu Asp Val Lys Thr Thr Phe Leu His Gly
      165             170             175
Asn Leu Asp Glu Glu Ile Tyr Met Lys His Pro Glu Gly Phe Ile Val
      180             185             190
Lys Gly Lys Glu Glu Met Val Cys Lys Leu Lys Lys Ser Leu Tyr Gly
      195             200             205
Leu Lys Gln Ala Arg Arg Gln Trp Tyr Lys Lys Phe Asp Asn Phe Met
      210             215             220
His Arg Gly Gly Tyr Ser Arg Cys Asn Ala Asp His Cys Cys Tyr Phe
      225             230             235
Lys Arg Cys Ser Ser Asp Tyr Ile Ile Leu Leu Leu Tyr Val Asp Asp
      245             250             255
Met Leu Val Ser Gly Thr Ser Leu Gln Glu Val Glu Asn Leu Lys Lys
      260             265             270
Gln Leu Ser Ser Glu Phe Ala Val Lys Asp Leu Gly Glu Ala Lys Gln
      275             280             285
Ile Leu Gly Met Arg Ile Ile Arg Asp Ile Ala Asn Gly Val Leu Met
      290             295             300
Leu Ser Gln Ala Asp Tyr Ile Glu Arg Val Leu Lys Arg Phe Asn Met
      305             310             315             320

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pctca2017050779-seql.txt

Glu Asn Ala Lys Pro Val Ser Ser Pro Ile Gly Ser Gln Ile Leu Val
325 330 335

Ser Ser Met Gln Cys Ala Lys Thr Asn Glu Glu Lys Glu Tyr Met Ala
340 345 350

Asn Val Pro Tyr Ser Ser Ala Ile Gly Ser Leu Met Tyr Ala Met Val
355 360 365

Cys Met Arg Pro Asp Ile Ala His Ala Val Gly Val Val Ser Arg Tyr
370 375 380

Ala Ser Asn Pro Gly Lys Gln His Trp Glu Ala Val Lys Trp Ile Leu
385 390 395 400

Arg Tyr Leu Arg Gly Asn Thr Asn Val Ser Leu Cys Tyr Gly Lys Gly
405 410 415

Gly Ser Ile Leu Arg Gly Tyr Val Asp Ala Asp Phe Lys Gly Asp Val
420 425 430

Asp Lys Arg
435

<210> 879
<211> 210
<212> PRT
<213> Papaver somniferum

<400> 879

Met Val Ile Asn His Gly Val Ala Glu Ser Leu Ile Asn Glu Met Met
1 5 10 15

Asn Leu Cys Leu Ser Phe Phe Asp Leu Ser Pro Asp Glu Lys Ser Asp
20 25 30

Tyr Val Gly Lys Asp Val Leu Asn Pro Ile Arg Cys Gly Thr Ser Phe
35 40 45

Asn Thr Ser Val Glu Asn Val Tyr Phe Trp Arg Asp Tyr Leu Lys Val
50 55 60

Leu Val His Pro Asp Phe His Ala Pro Leu Lys Pro Asn Ala Phe Arg
65 70 75 80

Asn Ile Ser Tyr Glu Tyr Cys Lys Arg Thr Arg Glu Val Ala Lys Glu
85 90 95

pctca2017050779-seql.txt

Leu Val Asn Ala Ile Ser Glu Ser Leu Gly Leu Gln Gly Asp Tyr Ile
100 105 110

Glu Lys Ala Leu Glu Thr Lys Ser Gly Leu Gln Ile Leu Ile Val Asn
115 120 125

Leu Tyr Pro Pro Cys Pro Gln Pro Glu Leu Ala Met Gly Met Pro Pro
130 135 140

His Ser Asp His Gly Leu Leu Thr Leu Leu Ala Gln Asn Glu Ile Gly
145 150 155 160

Gly Leu Gln Ile Lys His Lys Gly Lys Trp Ile Val Ala Asn Ala Leu
165 170 175

Pro Asn Ser Phe Met Val Asn Ile Gly Asp His Met Glu Val Arg Thr
180 185 190

Phe Ser His Leu Met Pro His Leu Cys Asp Phe Phe Ile Asn Cys Ile
195 200 205

Phe Cys
210

<210> 880
<211> 75
<212> PRT
<213> Papaver somniferum

<400> 880

Met Gly Arg Thr Val Lys Asp Leu Thr Glu Ser Asn Asp Leu Lys Thr
1 5 10 15

Val Pro Ser Glu Tyr Val Phe Pro Thr Asn Pro Glu Glu Val Glu Glu
20 25 30

Ala Glu Gln Gln Ile Pro Ile Ile Asp Tyr His Leu Leu Thr Ser Gly
35 40 45

Ser Pro Asp Gln Arg Ser Gln Ile Ile Glu Asn Leu Arg Ile Ala Cys
50 55 60

Leu Asp Trp Gly Phe Phe Met Val Ile Lys Tyr
65 70 75

<210> 881
<211> 162
<212> PRT
<213> Papaver somniferum

pctca2017050779-seql.txt

<400> 881

Met Gly Ile Met Ile Lys Asp Leu Ile Glu Ser Thr Asp Leu Ile Ser
1 5 10 15

Val Ser Asn Ser Lys His Ala Leu Pro Ala Lys Val Glu Asp Leu Thr
20 25 30

Thr Leu Ala Glu Glu Ser Val Glu Gln Val Ala Leu Pro Ile Ile Asp
35 40 45

Phe Ser Leu Leu Thr Ser Gly Ser Pro Asp Gln Arg Ser Lys Ile Val
50 55 60

Glu Glu Leu Arg Asn Ala Cys Leu His Trp Gly Phe Phe Met Val Val
65 70 75 80

Asn His Gly Val Pro Gln Ser Leu Lys Glu Glu Leu Ile Asn Ser Cys
85 90 95

Met Asn Phe Phe Asp Leu Ser Leu Glu Glu Lys Ser Val Tyr Glu Gly
100 105 110

Glu Asn Ala Ser Asp Pro Cys Ile Leu Asp Pro Ile Ile Cys Gly Thr
115 120 125

Asn Phe Asn Pro Ala Ser Lys Ser Val Ser Phe Trp Arg Asp Tyr Leu
130 135 140

Arg Ile Leu Val His Pro Val Phe His Ser Pro Pro Lys Pro Glu Gly
145 150 155 160

Leu Arg

<210> 882

<211> 67

<212> PRT

<213> Papaver somniferum

<400> 882

Met Gly Val Phe Thr Phe Val Cys Lys Ser Ser Gly Gly Lys Trp Ser
1 5 10 15

Ala Lys Gln Phe Glu Gly Asp Val Glu Ala Ser Ala Asp Cys Ala Tyr
20 25 30

Asp Leu Glu Arg Lys Leu Val Gln Glu Ala Leu Ser Arg Asp Ser Ser

35

Gly Ala Val Gln Ser Asn Phe Ser Leu Ile Thr Pro Thr Ser Gly Val
50 55 60

Phe Gln Val
65

<210> 883
<211> 229
<212> PRT
<213> Papaver somniferum

<400> 883

Met Met Leu Glu Ala Ala Cys Arg Tyr Gln Lys Ala Phe Glu Arg Leu
1 5 10 15

Ala Arg Glu Asp Lys Ala Phe Lys Lys Lys Phe Cys Phe Asn Glu Arg
20 25 30

Ser Ile Pro Pro Val Phe Ser Thr Ser Thr Gly Ala Ser Asn Asp Val
35 40 45

Asp Met Glu Glu Ala Ser Thr Ile Ala His Asn Lys Gly Lys Lys Lys
50 55 60

Ala Pro Pro Pro Pro Pro Ile His Ala Pro Tyr Met Glu Asp Trp Ala
65 70 75 80

Asn Ala Arg Ser Phe Gly Lys Phe Leu Lys Val Phe Phe Asp Leu Thr
85 90 95

Val Lys Phe Ser Tyr Cys Thr Arg Val Thr Ser His Glu Phe Leu Phe
100 105 110

Asn Val Ser Val Ile His Arg Thr Met Asn Thr Trp Val Lys Ser Ser
115 120 125

Asp Pro Phe Leu Ser Gly Met Gly Thr Lys Met Leu Asp Lys Phe Asn
130 135 140

Lys Tyr Trp Gly Glu Tyr Glu Lys Met Asn Thr Leu Met Phe Ile Ala
145 150 155 160

Val Leu Leu Asp Pro Arg Glu Lys Met Lys Gly Leu Asn Phe Ile Leu
165 170 175

Asp Thr Leu Asp Ile Thr Gly Pro Ser Leu Arg Lys His Leu Ser Thr
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180

Tyr Val Lys Thr Asp Phe Gln Glu Leu Phe Glu Glu Tyr Lys Cys Leu
195 200 205

Tyr Ala Asn Asp Glu Asn Met Ser Gly Asp Val Tyr Asp Phe Leu Met
210 215 220

Phe Phe His Asp Val
225

<210> 884
<211> 176
<212> PRT
<213> Papaver somniferum
<400> 884

Met Ser Ser Ala Ala Ser Ala Gly Asp Asn Val Ser Gln Ser Ser Gly
1 5 10 15

Val Thr Asp Asp Glu Asp Ser Ala Tyr Ala Ser Leu Ile Ala Glu Arg
20 25 30

Ala Arg Glu Asp Glu Glu Asp Asp Asn Val Glu Gly Lys Thr Glu Leu
35 40 45

Glu Leu Tyr Leu Glu Glu Lys Arg Glu Pro Arg Ile Ser Pro Thr Gly
50 55 60

Val Gln Phe Asp Ile Leu Gly Trp Trp Arg Thr Asn Cys Thr Arg Tyr
65 70 75 80

Pro Val Leu Ser His Met Ala Arg Asp Ile Leu Ala Ile Pro Val Ser
85 90 95

Tyr Val Ala Ser Glu Ser Ala Phe Ser Thr Gly Arg Arg Val Ile Asp
100 105 110

Pro Tyr Arg Ser Ser Leu Leu Pro Lys Thr Val Glu Ala Leu Ile Cys
115 120 125

Thr Gln Ser Trp Leu Arg Thr Pro Val Asp Leu Asp Leu Asn Thr Leu
130 135 140

Ile Thr Asp Asp Ala Glu Asp Val Ser Glu Cys Leu Gly Ser Leu Ala
145 150 155 160

Thr Ser Lys Phe Ile Arg Ile Asp Ile Asp Asp Glu Glu Glu Glu Asp

165

170

175

<210> 885
 <211> 265
 <212> PRT
 <213> Papaver somniferum

<400> 885

Met Gly Glu Trp Glu Asn Met Lys Pro Ser Asp Gln Thr Ser Gln Leu
 1 5 10 15

Val Phe Lys Pro Leu Met Ile Ser Met Val Gly Ile Ala Phe Thr Ala
 20 25 30

Leu Ala Ile Val Thr Tyr Gln Phe Ile Ile Thr Lys Tyr Cys Val Arg
 35 40 45

Arg Arg Glu Ser Met Ile Glu Arg Asn Glu Leu Arg Ser His Gln Ala
 50 55 60

Met Val Asn Arg Gly Val Asp Glu Asn Val Leu Lys Ala Ile Pro Ile
 65 70 75 80

Ile Thr Tyr His His Gln Gln Gln Gln Gln Ser Arg Asp Glu Glu Glu
 85 90 95

Glu Val Phe Cys Val Asp Gln Thr Glu Cys Ser Val Cys Leu Gly Asp
 100 105 110

Leu Gln Glu Gly Asp Met Leu Arg Leu Leu Pro Asn Cys Lys His Val
 115 120 125

Phe His Val Pro Cys Ile Asp Gln Trp Trp Leu Thr His Ser Thr Cys
 130 135 140

Pro Ile Cys Arg Ser Pro Val Thr Gly Arg Asn Asp Asp Ser Val Cys
 145 150 155 160

Leu Gln Ile Gln Ala Glu Gly Asp Glu Glu Gly Leu Val Ser His Gln
 165 170 175

His His Gln Glu Gln Gln Tyr Asn Cys Ser Glu Gly Ser Asn Asn Asn
 180 185 190

Glu Gly Gly Asn Ser Ser Ile Met Val Gly Ser Lys Leu Arg His Cys
 195 200 205

Val Ser Leu Ile Trp Pro Ala Asn Tyr Glu Asp Glu Val Arg Lys Gln

210

215

220

Gln Ser Lys Thr Val Leu Leu Lys Arg Ser Met Ser Val Asp Cys Ser
 225 230 235 240

Phe Val Cys Ile Lys Ile Gln Pro Arg Thr Asp Ser Ser Ser Ser Ser
 245 250 255

Ser Ser Thr Trp Lys Thr Thr Ser Lys
 260 265

<210> 886

<211> 200

<212> PRT

<213> Papaver somniferum

<400> 886

Met Gly Trp Arg Val Cys Ile Asp Tyr Arg Lys Leu Asn Lys Val Thr
 1 5 10 15

Arg Lys Asp His Phe Pro Leu Pro Phe Ile Gly Gln Met Leu Glu Arg
 20 25 30

Leu Ala Gly His Asn His Tyr Cys Phe Leu Asp Asp Tyr Ser Gly Tyr
 35 40 45

Asn Gln Ile Val Ile Ser Pro Glu Asp Gln Glu Lys Thr Thr Phe Thr
 50 55 60

Cys Pro Phe Gly Thr Phe Ala Tyr Arg Arg Met Pro Phe Gly Leu Cys
 65 70 75 80

Asn Ala Pro Ala Thr Phe Gln Arg Cys Met Met Asn Ile Phe Ser Asp
 85 90 95

Met Ile Glu Lys Phe Leu Glu Val Cys Met Asp Asp Phe Ser Val Phe
 100 105 110

Gly Ser Ser Phe Asp Glu Cys Leu His His Leu Ser Leu Val Leu Ser
 115 120 125

Arg Cys Lys Glu Lys Asn Leu Val Leu Asn Trp Glu Lys Cys His Phe
 130 135 140

Met Val Arg Ser Gly Ile Val Leu Gly Asn Ile Val Ser Ser Lys Gly
 145 150 155 160

Ile Glu Leu Asp Lys Ala Lys Val Asp Leu Ile Lys Thr Leu Gln Val

165

170

175

Pro Lys Thr Val Arg Asp Ile Arg Ser Phe Leu Gly His Ala Gly Phe
 180 185 190

Tyr Arg Arg Phe Ile Lys Asp Phe
 195 200

<210> 887

<211> 82

<212> PRT

<213> Papaver somniferum

<400> 887

Met Ala Ile Glu Val Ala Glu Leu Leu Asn Val Cys Trp Leu Glu Val
 1 5 10 15

Asn Gly Lys Leu Asp Ile Ser Lys Leu Asn Pro Gly Val Lys Tyr Glu
 20 25 30

Val Val Phe Val Val Met Leu Lys Asn Ser Ala Tyr Gly Trp Glu Lys
 35 40 45

Pro Val Asn Leu Arg Leu Val His Ser Gly Ser Gln Thr Gln Leu Arg
 50 55 60

Lys Glu Asp Leu Gln Lys Lys Ala Lys Val Thr Val Asp Arg Ser Ser
 65 70 75 80

Asp Trp

<210> 888

<211> 387

<212> PRT

<213> Papaver somniferum

<400> 888

Met Ala Gln Tyr Ala Leu Phe Lys Phe Ser Val Cys Phe Arg Phe Asp
 1 5 10 15

Phe Leu Trp Ile Phe Phe Phe Thr Phe Arg Leu Lys Lys Leu Asn Leu
 20 25 30

Leu Gln Gln Asn Asn Asn Thr Ser Ala Thr Leu Phe Leu Pro Cys Tyr
 35 40 45

Tyr Phe Ser Leu Tyr Ile Phe Gln Thr Lys Val Ser Glu Glu Ile Thr
 50 55 60

pctca2017050779-seql.txt

Thr Ser Ser Gly Arg Gly Gly Lys Leu Leu Asn Leu Ser Asp Ser Ile
 65 70 75 80
 Leu Ile Ser Leu Ile Lys His Arg Gln Phe Asp Leu Val Met Met Ala
 85 90 95
 Lys Asn Ser Ile Pro Val Leu Gly Leu Leu Leu Leu Cys Cys Phe Ala
 100 105 110
 Ser Ile Thr Glu Ala Thr Tyr Lys Tyr Lys Tyr Gln Asp Pro Lys Lys
 115 120 125
 Pro Leu Gly Ala Arg Ile Arg Asp Leu Met Gly Arg Met Thr Leu Glu
 130 135 140
 Glu Lys Ile Gly Gln Met Thr Gln Ile Glu Arg Ala Val Ala Thr Ala
 145 150 155 160
 Asp Val Met Lys Lys Tyr Phe Ile Gly Ser Val Leu Ser Gly Gly Gly
 165 170 175
 Ser Val Pro Ala Pro Gln Ala Thr Ala Glu Ala Trp Val Asn Met Val
 180 185 190
 Asn Glu Met Gln Lys Gly Ala Leu Ser Thr Arg Leu Gly Ile Pro Met
 195 200 205
 Ile Tyr Gly Ile Asp Ala Val His Gly His Asn Asn Val Tyr Lys Ala
 210 215 220
 Thr Ile Phe Pro His Asn Val Gly Leu Gly Val Thr Arg Asp Pro Ala
 225 230 235 240
 Leu Ile Lys Lys Ile Gly Ala Ala Thr Ala Leu Glu Val Arg Ala Thr
 245 250 255
 Gly Ile Pro Tyr Ala Phe Ala Pro Cys Ile Ala Val Cys Arg Asp Pro
 260 265 270
 Arg Trp Gly Arg Cys Tyr Glu Ser Tyr Ser Glu Asp His Lys Ile Val
 275 280 285
 Gln Leu Met Thr Glu Ile Ile Pro Gly Leu Gln Gly Glu Pro Pro Lys
 290 295 300
 Asn Tyr Arg Lys Gly Val Pro Phe Val Ala Gly Lys Lys Asn Val Ala

pctca2017050779-seq1.txt

petca2017050719_seq1.txt

Ala Cys Ala Lys His Tyr Val Gly Asp Gly Gly Thr Thr Lys Gly Ile
325 330 335

Asn Glu Asn Asn Thr Val Ile Asn Glu Asn Gly Leu Tyr Ser Ile His
340 345 350

Met Pro Ala Tyr Tyr Asn Ser Ile Tyr Lys Gly Val Ser Thr Ile Met
355 360 365

Val Ser Tyr Ser Ser Trp Asn Gly Gln Lys Asn Ala Arg Gln Gln Glu
370 375 380

Ala Tyr His
385

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<210> 889
<211> 428
<212> PRT
<213> Papaver somniferum

<400> 889
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Met Arg Leu Met Asn Gln Val Leu Gln Pro Phe Leu Ser Lys Phe Val
1 5 10 15

Ile Val Tyr Phe Asp Asp Ile Leu Ile Phe Ser Arg Ser Glu Pro Glu
20 25 30

His Leu Gln His Leu Ser Gln Val Phe Gln Val Leu Ala Asp Asn Ser
35 40 45

Leu Tyr Val Asn Leu Lys Lys Cys Thr Phe Met Ala Ser Ser Val Thr
50 55 60

Phe Leu Gly Tyr Val Ile Ser Thr Asp Gly Ile His Val Asp Pro Ser
65 70 75 80

Lys Val Gln Ala Ile Glu Asp Trp Pro Val Pro Thr Ser Ile Arg Asp
85 90 95

Val Arg Ser Phe His Gly Leu Ala Ser Cys Tyr Arg Arg Phe Val Lys
100 105 110

Asn Phe Ser Ser Ile Ser Ala Pro Leu Thr Asp Cys Leu Lys Lys Glu
115 120 125

Lys Phe Glu Trp Thr Glu Ala Met Asp Lys Ser Phe Ile Leu Leu Lys
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130

135

140

Glu Lys Leu Phe Thr Thr Pro Ile Leu Ala Leu Pro Asn Phe Asn Lys
 145 150 155 160

Pro Phe Glu Ile Asp Cys Asp Ala Phe Val Val Gly Ile Gly Ala Val
 165 170 175

Leu Ser Gln Glu Gly His Pro Ile Ala Tyr Tyr Ser Glu Lys Asn Ser
 180 185 190

Asp Ala Gln Lys Lys Trp Ser Thr Tyr Glu Leu Glu Leu Leu Ala Leu
 195 200 205

Val Gln Ser Leu Lys Gln Trp His Thr Tyr Leu Ile His Arg Glu Phe
 210 215 220

Val Val Asn Thr Asp Asn His Ala Leu Lys Phe Leu Asn Thr Ser Ala
 225 230 235 240

Lys Val Asn Arg Met His Asp Arg Trp Leu Ser Thr Leu Asn Lys Tyr
 245 250 255

Thr Phe Ser Val Arg His Lys Ser Gly Lys Leu Asn Gln Val Ala Asp
 260 265 270

Ala Leu Ser Arg Arg Ser His Leu Leu Thr Thr Ile Arg Asn Glu Ser
 275 280 285

Tyr Ala Phe Asp Tyr Ile Lys Asp Ile Tyr Pro Glu Asp Glu Asp Phe
 290 295 300

Gly Lys Leu Trp Asp Gln Cys Ser Ser Gln Thr His Gly Val Asp Asp
 305 310 315 320

Phe Leu Ile Gln Glu Gly Phe Leu Phe Lys Gly Asn Arg Leu Cys Ile
 325 330 335

Pro Gln Gly Ser Leu Arg Leu His Leu Met Arg Glu Leu His Gly Ser
 340 345 350

Gly Leu Gly Gly His Phe Gly Arg Asp Lys Thr Ile Ala Leu Ile Glu
 355 360 365

Glu Arg Tyr Phe Trp Pro Ser Leu Lys Arg Asp Val Gln Lys Phe Val
 370 375 380

pctca2017050779-seql.txt

Gln Lys Cys Met Val Cys Gln Arg Ala Lys Gly Thr Ile Gln Asn Thr
 385 390 395 400

Gly Leu Tyr Thr Pro Leu Pro Val Pro Asp Ala Pro Trp Val Asp Ile
 405 410 415

Ser Met Asp Phe Ile Leu Gly Leu Pro Arg Thr Ala
 420 425

<210> 890

<211> 298

<212> PRT

<213> Papaver somniferum

<400> 890

Met Lys Asp Glu Tyr Asn Ala Met Leu Lys Thr Asn Thr Trp Glu Ile
 1 5 10 15

Val Pro Arg Pro Arg Asp Ala His Val Ile Arg Ser Met Trp Leu Phe
 20 25 30

Arg His Lys Tyr Asn Ala Asp Gly Ser Leu Gln Arg His Lys Ala Arg
 35 40 45

Leu Val Ala Asn Gly Lys Ser Gln Gln Val Gly Val Asp Cys Phe Glu
 50 55 60

Thr Phe Ser Pro Val Val Lys Pro Ala Thr Ile Arg Thr Val Leu Thr
 65 70 75 80

Ile Ala Thr Ser Arg Ser Trp Pro Ile His Gln Leu Asp Val Lys Asn
 85 90 95

Ala Phe Leu His Gly Asp Leu Thr Glu Thr Val Tyr Met His Gln Pro
 100 105 110

Pro Gly Phe Val Asp Pro Asp Tyr Val Cys Arg Leu Arg Arg Ser Leu
 115 120 125

Tyr Gly Leu Lys Gln Ala Pro Arg Ala Trp Phe Gln Arg Phe Pro Lys
 130 135 140

Phe Ile Thr Asn Cys Gly Phe Arg Gly Ser Val Cys Asp Pro Ser Leu
 145 150 155 160

Phe Val Tyr Lys Ser Gly Ser Asn Thr Ala Tyr Leu Leu Leu Tyr Val
 165 170 175

pctca2017050779-seql.txt

Asp Asp Ile Val Leu Thr Ala Ser Asn Asn Thr Leu Leu His Arg Phe
180 185 190

Ile Asp Leu Met Lys Arg Glu Phe Ala Ile Ser Asp Leu Gly Pro Leu
195 200 205

His His Phe Leu Gly Ile Thr Val Thr Arg Ser Ser Ser Gly Leu Tyr
210 215 220

Phe Ser Gln Ser Leu Tyr Ala Gln Glu Ile Ile Ala Arg Ala Ser Met
225 230 235 240

Lys Gln Cys Asn Leu Val Ser Thr Ser Val Asp Thr Asn Ser Lys Leu
245 250 255

Ser Ala Thr Ser Gly Pro Thr Ile Lys Asp Pro Thr Leu Tyr Arg Ile
260 265 270

Leu Asp Gly Ala Leu Gln Tyr Leu Thr Phe Thr Arg Pro Asp Ile Ser
275 280 285

Tyr Ala Val Gln Gln Ile Asn Asn Ile Leu
290 295

<210> 891
<211> 298
<212> PRT
<213> Papaver somniferum

<400> 891

Met Asp Ser Phe Tyr Lys Gly Ile Ile Phe Thr Met Gly Lys Gly Asn
1 5 10 15

Arg Thr Arg Phe Trp Glu Asp Gln Trp Leu Gly Asp Met Pro Leu Lys
20 25 30

Ile Ala Phe Pro Asn Leu Tyr Asn Val Ser Arg Lys Lys Asn Asn Val
35 40 45

Val Ser Gln Phe Tyr Phe Arg Asp Gln Glu Gly Asn Ser Asn Trp Asn
50 55 60

Leu Asp Leu Arg Arg Arg Leu Ser Asp Val Glu Ile Ala Glu Ala Gly
65 70 75 80

Asp Leu Ser His Lys Leu Gln Asn Val Thr Leu Asn Glu Asp Glu Asp
85 90 95

pctca2017050779-seql.txt

Arg Arg Asn Trp Lys Trp Thr Ala Asp Gly Ala Phe Thr Val Arg Ser
100 105 110

Cys Tyr Leu Ser Leu Leu Pro Pro Ser Phe Phe Val Asp Phe Pro His
115 120 125

Lys Ile Val Trp Asn Asn Asn Val Pro Thr Lys Ile Ser Phe Phe Thr
130 135 140

Trp Leu Val His His Asn Ser Leu Leu Thr Gln Asp Asn Leu Glu Arg
145 150 155 160

Lys Gly Arg Thr Leu Val Asn Arg Cys Cys Met Cys Lys Lys Glu Leu
165 170 175

Glu Ile Ile Asn His Leu Phe Leu His Cys Ser Val Ala His Ser Ile
180 185 190

Trp Asp Val Phe Leu Ser Gly Phe Gly Val Gly Arg Pro Gln Gly Asp
195 200 205

Asp Ile Lys Asp Ala Phe Lys Asp Arg Asp Arg Thr Asp Phe Thr Met
210 215 220

Thr Gly Asn Phe Ile Trp Asn Ile Leu Pro Tyr Val Ile Cys Trp Asn
225 230 235 240

Ile Trp Lys Glu His Asn Gln Arg Met Phe Val Thr Glu Ala Lys Glu
245 250 255

Lys Asp Val Gln Lys Val Val Leu Asp Ile Lys Ala Asn Ile Leu Tyr
260 265 270

Trp Ser His Pro Ser Lys Ala Leu Arg Asp Ile Ile Phe Lys Met Leu
275 280 285

Val Phe Lys Trp Glu Glu Leu Ile Arg Arg
290 295

<210> 892
<211> 150
<212> PRT
<213> Papaver somniferum

<400> 892

Met Gln Gln Gln Met Ala Val Asp Ser Ser Leu Ser Leu Phe Ser Thr
1 5 10 15

pctca2017050779-seql.txt

Lys Gly Thr Thr Ala Tyr Ile Glu Gln Ser Thr Pro Phe Pro Thr Asp
20 25 30

Gly Lys Gln Gly Trp Trp Ser Gly Gly Phe Gly Tyr Gly Ile Trp Thr
35 40 45

Gly Val Leu Val Ala Ser Gly Phe Ser Val Val Pro Val Ser Ser Leu
50 55 60

Met Trp Lys Asn His Phe Glu Leu Ala Gly Ser Arg Leu Ser Lys Asp
65 70 75 80

Asp Ser Arg Lys Ala Ala Ser Thr Leu Phe Pro Ser Leu Ser Ser Gln
85 90 95

Leu Thr Arg Lys Lys Asp His Gly Arg Ala Glu Ala Leu Leu Ile Ala
100 105 110

Ala Tyr Gly Lys Gly Leu Val Leu Lys Ser Glu Glu Leu Phe Lys Pro
115 120 125

Glu Ala Leu Leu Pro Lys Ser Glu Glu Cys Leu Leu Glu Ser Asp Ala
130 135 140

Ile Leu Met Lys Ala Gly
145 150

<210> 893
<211> 528
<212> PRT
<213> Papaver somniferum

<400> 893

Met Val His His Leu Asp Ser Gly Gly Leu Pro Lys Glu Arg Val Leu
1 5 10 15

Arg Phe Ala Phe Leu Asn Ser Tyr Phe Lys Thr Glu Leu Arg Asn Pro
20 25 30

Val Asp Glu Ala Ile Leu Ala Tyr Val Tyr Ser Asn Gly Tyr Arg Phe
35 40 45

Glu Gln Ser Lys Trp Lys Lys Ile Asp Glu Thr Pro Phe Asp Phe Thr
50 55 60

Arg Arg Arg Val Ser Val Ile Ile Glu Ala Asp Ser Glu Thr Thr Asp
65 70 75 80

pctca2017050779-seql.txt

Arg Ile Tyr Pro His Leu Gly Thr Asn Lys Leu Val Val Thr Lys Gly
 85 90 95
 Ala Leu Glu Glu Val Leu Gln Val Cys Ser Phe Tyr Asp His Ala Asp
 100 105 110
 Ser Gly Ser Ser Ile Pro Leu Pro Val Glu Asp Gln His Lys Ile Leu
 115 120 125
 His Met Gly Glu Glu Leu Ser Asn Asp Gly Leu Arg Val Leu Gly Val
 130 135 140
 Ala Ile Arg Arg Leu Ala Met Val Gly Glu Ala Asn Ser Val Glu Ser
 145 150 155 160
 Asn Met Val Phe Leu Gly Ile Val Thr Phe Tyr Asp Pro Pro Lys Ser
 165 170 175
 Ser Ala Lys Glu Ala Leu Arg Arg Leu Ala Glu Lys Gly Val Glu Ala
 180 185 190
 Lys Val Leu Thr Gly Asp Ser Val Ser Leu Ala Ile Arg Val Cys Lys
 195 200 205
 Glu Val Gly Ile Arg Thr Thr Tyr Ala Ser Thr Gly Pro Asp Leu Glu
 210 215 220
 Leu Leu Asp Pro Ser Thr Phe His Glu Thr Val Gln Arg Ala Thr Val
 225 230 235 240
 Leu Ala Arg Leu Thr Pro Thr Gln Lys Phe Arg Val Val Gln Ser Leu
 245 250 255
 Gln Thr Ala Gly Asp His Val Val Gly Phe Leu Gly Asp Gly Val Asn
 260 265 270
 Asp Ser Leu Ala Met Asp Ala Ala Asp Val Gly Ile Ser Val Asp Ser
 275 280 285
 Gly Val Ser Val Ala Lys Asp Leu Ala Asp Ile Ile Leu Leu Glu Lys
 290 295 300
 Asp Leu Asn Val Leu Val Ser Gly Val Glu Arg Gly Arg Ile Thr Tyr
 305 310 315 320
 Gly Asn Thr Met Lys Tyr Ile Lys Leu Ser Val Val Ala Asn Val Gly
 325 330 335

pctca2017050779-seql.txt

Ser Val Val Ser Leu Leu Ile Ala Val Val Leu Leu Gly Tyr Glu Pro
340 345 350

Leu Thr Ala Arg Gln Leu Val Val Gln Asn Phe Leu Tyr Asn Val Gly
355 360 365

Gln Ile Pro Ile Pro Trp Asp Thr Val Glu Glu Asp Tyr Ala Lys Phe
370 375 380

Pro Gln Arg Trp Ser Ser Lys Ser Ile Pro Met Phe Met Leu Trp Asn
385 390 395 400

Gly Pro Val Cys Ser Met Phe Asp Ile Gly Cys Leu Val Phe Phe Trp
405 410 415

Cys Tyr Tyr Glu Val Tyr His Pro Ser Ser Gly Asp Lys Leu Tyr His
420 425 430

Ser Gly Trp Phe Val Glu Gly Leu Leu Met Gln Thr Leu Ile Ile His
435 440 445

Met Ile Arg Thr Glu Lys Ile Pro Phe Ile Gln Glu Val Ala Ser Trp
450 455 460

Pro Val Ile Cys Ser Thr Val Leu Ile Ser Ala Val Gly Ile Ala Leu
465 470 475 480

Pro Phe Thr Pro Ile Gly Lys Val Met Gly Met Thr Asp Leu Pro Leu
485 490 495

Ser Tyr Phe Gly Phe Leu Val Val Leu Phe Leu Gly Tyr Phe Phe Leu
500 505 510

Ser Gln Val Val Lys Arg Val Tyr Ile Arg Thr Tyr Lys Glu Trp Leu
515 520 525

<210> 894

<211> 165

<212> PRT

<213> Papaver somniferum

<400> 894

Leu His Ala Val Asn Gly Ser Gln Asn Gly Trp Asp His Ser Ala Gly
1 5 10 15

Arg Asp Gly Ser Val Gly Trp Pro Thr Ser Asn Glu His Ile Gln Gln
20 25 30

pctca2017050779-seql.txt

Ser Leu Asp Ala Ile Glu Phe Ile Ala Ser Lys Tyr Gly Ser Asn Pro
35 40 45

Thr Leu Leu Gly Ile Gln Leu Leu Asn Glu Pro Lys Ala Pro Glu Val
50 55 60

Pro Leu Asn Thr Leu Leu Asp Tyr Tyr Pro Lys Gly Tyr Asn Ile Val
65 70 75 80

Arg Lys Tyr Ser Ala Thr Ala Tyr Val Ile Met Cys Gln Leu Ile Gly
85 90 95

Ala Asp Pro Ser Glu Leu Tyr His Ala Ile Ala Asn Met Gly Leu Ser
100 105 110

Asn Val Val Val Asp Val His Phe Tyr Asn Phe Tyr Gln Ser Lys Phe
115 120 125

Asp Thr Met Ser Pro Ala Glu Asn Ile Gln Phe Val Lys Glu Ser Arg
130 135 140

Lys Ala Gln Val Asp Ser Leu Asn Ser Ala Asn Arg Asp Gly Pro Leu
145 150 155 160

Val Phe Ile Glu Lys
165

<210> 895
<211> 608
<212> PRT
<213> Papaver somniferum

<400> 895

Met Pro Glu Ala Pro Ala Asn Asp Thr Ala Ser Glu Tyr Val Val Val
1 5 10 15

Asp Lys Ser Lys Ile Ala Leu Glu Phe Ile Glu Asn Val Thr Thr Asn
20 25 30

Ala Asp Glu Val Gln Lys Lys Val Leu Gly Glu Ile Leu Ser Arg Ser
35 40 45

Ser His Val Glu Tyr Leu Gln Arg Tyr Asp Leu Lys Gly Arg Val Asp
50 55 60

Arg Glu Thr Phe Lys Lys Ile Ile Pro Val Ile Thr Tyr Glu Asp Leu
65 70 75 80

pctca2017050779-seql.txt

Gln Pro Asp Ile Asn Arg Ile Ala Asn Gly Asp Thr Ser Pro Ile Leu
85 90 95

Cys Gly Gln Pro Ile Ser Glu Phe Leu Thr Ser Ser Gly Thr Ser Ala
100 105 110

Gly Glu Arg Lys Ile Met Pro Thr Ile Glu Glu Glu Leu Asn Arg Arg
115 120 125

Ser Leu Leu Tyr Ser Leu Leu Met Pro Val Met Asn Glu Tyr Val Pro
130 135 140

Gly Leu Asp Lys Gly Lys Gly Met Tyr Phe Leu Phe Ile Lys Ser Glu
145 150 155 160

Ala Lys Thr Pro Ser Gly Leu Val Ala Arg Pro Val Leu Thr Ser Tyr
165 170 175

Tyr Lys Ser Ser His Phe Lys Asn Arg Pro Tyr Asp Pro Tyr Thr Asn
180 185 190

Tyr Thr Ser Pro Asn Glu Thr Ile Leu Cys Pro Asp Ser Tyr Gln Ser
195 200 205

Met Tyr Ser Gln Leu Leu Cys Gly Leu Tyr Gln Asn Lys Glu Val Leu
210 215 220

Arg Val Gly Ala Val Phe Ala Ser Gly Phe Ile Arg Ala Ile Arg Phe
225 230 235 240

Leu Glu Lys His Trp Thr Ser Leu Cys Asn Asp Ile Arg Asn Gly Thr
245 250 255

Ile Asp Ser Gln Ile Thr Asp Pro Ser Val Arg Glu Ala Val Leu Ala
260 265 270

Ile Leu Lys Pro Asn Pro Lys Leu Ala Asp Phe Ile Gln Glu Glu Cys
275 280 285

Ser Lys Asp Ser Trp Lys Gly Ile Ile Thr Arg Leu Trp Pro Asn Thr
290 295 300

Lys Tyr Ile Asp Val Ile Val Thr Gly Thr Met Ser Gln Tyr Ile Pro
305 310 315 320

Thr Leu Asn Tyr Tyr Ser Asn Gly Leu Pro Leu Val Cys Thr Met Tyr
325 330 335

pctca2017050779-seql.txt

Ala Ser Ser Glu Cys Tyr Phe Gly Leu Asn Leu Gln Pro Leu Cys Asp
340 345 350

Pro Ser Glu Val Ser Tyr Thr Leu Ile Pro Thr Met Ala Tyr Phe Glu
355 360 365

Phe Leu Pro Ala His Arg Asn Asn Gly Val Ser Thr Lys Pro Lys Ser
370 375 380

Leu Thr Glu Lys Glu Arg Lys Glu Leu Val Asp Leu Val Asp Val Lys
385 390 395 400

Leu Gly Gln Glu Tyr Glu Leu Ile Val Thr Thr Tyr Ala Gly Leu Tyr
405 410 415

Arg Tyr Arg Val Gly Asp Val Leu Arg Val Thr Gly Phe Lys Asn Lys
420 425 430

Ala Pro Gln Phe Ser Phe Val Cys Arg Lys Asn Val Val Leu Ser Ile
435 440 445

Asp Ser Asp Lys Thr Asp Glu Val Glu Leu Gln Asn Ala Val Ile Asn
450 455 460

Ala Val Asn His Leu Val Pro Phe Asp Ser Ser Leu Val Glu Tyr Thr
465 470 475 480

Ser Tyr Ala Asp Thr Ser Thr Ile Pro Gly His Tyr Val Leu Tyr Trp
485 490 495

Glu Leu Arg His Asp Gly Thr Thr Pro Ile Pro Pro Ser Val Phe Glu
500 505 510

Asp Cys Cys Leu Thr Met Glu Glu Ser Leu Asn Ser Val Tyr Arg Gln
515 520 525

Gly Arg Val Ser Asp Lys Ser Ile Gly Pro Leu Glu Ile Lys Ile Val
530 535 540

Glu Ser Gly Thr Phe Asp Lys Leu Met Asp Tyr Ala Ile Ser Arg Gly
545 550 555 560

Ala Ser Ile Asn Gln Tyr Lys Thr Pro Arg Cys Val Lys Phe Gln Pro
565 570 575

Ile Val Glu Leu Met Asn Ser Arg Val Val Glu Ser Tyr Phe Ser Pro

580

Lys Cys Pro Lys Trp Ile Val Gly Leu Gln Gln Trp Arg Asn Gln Asn
595 600 605

<210> 896
<211> 476
<212> PRT
<213> Papaver somniferum
<400> 896

Met Ala Asp Glu Tyr Gln Ser Ser Gly Gly Ile Cys Ser Gly Asn Trp
1 5 10 15

Trp Asn Asn Met Lys Ile Gly Leu Ser Ser Ser Ser Ser Pro Ala Cys
20 25 30

Ser Thr Thr Leu Thr Asp Ile Gly Ser Tyr Asn Asn Trp Pro Ile Ser
35 40 45

Thr Ile Thr Asp Asp Gln Thr Val Asp Met Lys Tyr Pro Lys Leu Asn
50 55 60

His Gln Ala Ala Ser Pro Ser Asp Thr Ser Val Ile Ala Gly Thr Asn
65 70 75 80

Asp Val Leu Leu Asp Asn Asn Ser Asn Ser Gln Met Met Gly Phe Asp
85 90 95

Leu Ser Ser Pro Leu Thr Thr Ser Asp Trp Ser Gln Pro Leu Leu Ser
100 105 110

Ser Arg Ser Ser Glu Asp His Gln Gln Lys Glu Trp Ser Pro Lys Asn
115 120 125

Cys Ser Gly Ser Ser Gly Gly Glu Asp Ser Ser Ser Ile His Ser Ser
130 135 140

Phe Lys Gln Gln Gln Ile Asn Gln Gly Phe Ser Leu Asp Pro Gln Tyr
145 150 155 160

Cys Tyr Ser Ser Asn Lys Ile Asp Asn Ser Asp Ser Cys Thr Gly Gly
165 170 175

Leu Pro Met Ser Phe Ser Met Asn Ser Ala Ser Tyr Glu Cys Ser Pro
180 185 190

Ser Thr Ser Thr Leu Leu His Ser Leu Tyr Glu Pro Glu Asn His Met
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195

Glu Gln Leu Gln Arg Ser Ser Tyr Asp Glu Asp Asn Arg Met Ser Tyr
210 215 220

Pro Ser Ser Thr Thr Ser Thr Asn Tyr Gln Leu Asn Pro Asn Glu Leu
225 230 235 240

Ser Pro Ser His Pro Asn Trp Ser Ser Lys Phe Pro Gln Phe Leu Lys
245 250 255

Thr Ala Val Ser Ser Arg Gln Gln Pro Ser Asn Thr Asn Ile Asn Asn
260 265 270

His Leu Gln Phe Ser Asn Asn Ser Gln Phe Trp Asn Pro Ser Pro Thr
275 280 285

Ser Ile Leu Thr Gly Asp Asn Pro Ser Arg Leu Leu Ser Ser Pro Gln
290 295 300

Thr Gln Phe Leu Thr Pro Thr Leu Asn Asp His Gln Lys Pro Asn Ser
305 310 315 320

Asn Asn Ser Leu Cys Leu Lys Pro Ser Ile Glu Glu Val Gln Asp Ser
325 330 335

Ser Ser Val Ala Lys Lys Asn Lys Ser Ser Glu Pro Ala Tyr Lys Arg
340 345 350

Pro Arg Met Glu Thr Pro Ser Gln Leu Pro Thr Phe Lys Val Arg Lys
355 360 365

Glu Lys Leu Gly Asp Arg Ile Thr Ala Leu Gln Gln Leu Cys Ser Pro
370 375 380

Phe Gly Lys Thr Asp Thr Ala Ser Val Leu Tyr Glu Ala Ile Glu Tyr
385 390 395 400

Ile Lys Phe Leu His Asp Gln Val Thr Val Leu Ser Asn Pro Tyr Met
405 410 415

Lys His Gly Ser Ala Pro Met Gln Tyr Gln Gln Asn Met Asp Asn Ser
420 425 430

Lys Asp Gly Glu Arg Thr Arg Gln Asp Leu Arg Ser Arg Gly Leu Cys
435 440 445

pctca2017050779-seql.txt

Leu Val Pro Met Ser Ser Thr Phe Ser Val Thr Asn Glu Thr Ser Thr
 450 455 460

Asp Phe Trp Thr Pro Thr Phe Gly Gly Thr Tyr Arg
 465 470 475

<210> 897

<211> 325

<212> PRT

<213> Papaver somniferum

<400> 897

Met Leu Thr Ala Ile Pro Thr Ala Asp Glu Ile Arg Asn Ile Val Phe
 1 5 10 15

Gln Ile Lys Ser Trp Ala Ala Ser Gly Pro Asp Gly Phe Gln Ala Gly
 20 25 30

Phe Tyr Lys His Cys Trp Asp Val Val Gly Pro Asp Val Val Leu Met
 35 40 45

Val Gln Glu Leu Phe Thr Thr Gly Ile Leu Leu Pro Lys Leu Asn Tyr
 50 55 60

Thr Tyr Gln Thr Leu Ile Pro Lys His Asp Ser Ala His Thr Pro Ser
 65 70 75 80

Asp Phe Arg Pro Ile Ser Leu Cys Asn Ile Thr Tyr Lys Ile Ile Ser
 85 90 95

Lys Leu Met Ala Val Arg Leu Lys Thr Leu Leu Ala Lys Ile Val Ser
 100 105 110

Pro Trp Gln Ala Ala Tyr Val Pro Gly Arg Asn Ile Met Asp Asn Thr
 115 120 125

Ile Ile Ala His Glu Met Val Asp Tyr Met Lys Lys Thr Lys Val Phe
 130 135 140

Pro Gly Val Ile Ala Ile Lys Leu Asp Met Ala Lys Ala Phe Asp Arg
 145 150 155 160

Met Glu Trp Asn Phe Val Ile Gln Val Met Gln Ser Leu Gly Phe Asn
 165 170 175

Asp Arg Trp Cys Ser Leu Ile Phe Gln Cys Ile Ser Thr Ser Thr Val
 180 185 190

pctca2017050779-seq1.txt

Ser Leu Met Leu Asn Gly Ser Pro Thr Thr Ser Phe Thr Pro Thr Arg
 195 200 205

Gly Pro Ile Ser Pro Tyr Leu Phe Ile Leu Cys Met Val Gly Phe Ser
 210 215 220

His Ile Ile Ser His Gly Val Ser Ser Asn Leu Ile Leu Pro Val Lys
 225 230 235 240

Pro Ala Ile His Ala Pro His Ile Ser His Leu Phe Phe Ala Asp Asp
 245 250 255

Cys Ile Leu Phe Thr Arg Ala Ser Gly Ser Ser Ile Thr Asn Leu Leu
 260 265 270

Gln Ile Ile Asn Arg Phe Cys Ala Thr Ser Gly Gln Leu Val Asn Phe
 275 280 285

Asn Lys Ser Ser Ile His Phe Ser Ser Lys Leu Ser Asp Ser Ala Lys
 290 295 300

Ala Asp Ile Cys His Met Leu Gln Met Lys Pro Met Pro Leu His Glu
 305 310 315 320

Lys Tyr Leu Gly Val
 325

<210> 898

<211> 608

<212> PRT

<213> Papaver somniferum

<400> 898

Met Pro Glu Ala Pro Ala Asn Asp Thr Ala Ser Glu Tyr Val Val Val
 1 5 10 15

Asp Lys Ser Lys Ile Ala Leu Glu Phe Ile Glu Asn Val Thr Thr Asn
 20 25 30

Ala Asp Glu Val Gln Lys Lys Val Leu Gly Glu Ile Leu Ser Arg Ser
 35 40 45

Ser His Val Glu Tyr Leu Gln Arg Tyr Asp Leu Lys Gly Arg Val Asp
 50 55 60

Arg Glu Thr Phe Lys Lys Ile Ile Pro Val Ile Thr Tyr Glu Asp Leu
 65 70 75 80

pctca2017050779-seql.txt

Gln Pro Asp Ile Asn Arg Ile Ala Asn Gly Asp Thr Ser Pro Ile Leu
 85 90 95
 Cys Gly Gln Pro Ile Ser Glu Phe Leu Thr Ser Ser Gly Thr Ser Ala
 100 105 110
 Gly Glu Arg Lys Ile Met Pro Thr Ile Glu Glu Glu Leu Asn Arg Arg
 115 120 125
 Ser Leu Leu Tyr Ser Leu Leu Met Pro Val Met Asn Glu Tyr Val Pro
 130 135 140
 Gly Leu Asp Lys Gly Lys Gly Met Tyr Phe Leu Phe Ile Lys Ser Glu
 145 150 155 160
 Ala Lys Thr Pro Ser Gly Leu Val Ala Arg Pro Val Leu Thr Ser Tyr
 165 170 175
 Tyr Lys Ser Ser His Phe Lys Asn Arg Pro Tyr Asp Pro Tyr Thr Asn
 180 185 190
 Tyr Thr Ser Pro Asn Glu Thr Ile Leu Cys Pro Asp Ser Tyr Gln Ser
 195 200 205
 Met Tyr Ser Gln Leu Leu Cys Gly Leu Tyr Gln Asn Lys Glu Val Leu
 210 215 220
 Arg Val Gly Ala Val Phe Ala Ser Gly Phe Ile Arg Ala Ile Arg Phe
 225 230 235 240
 Leu Glu Lys His Trp Thr Ser Leu Cys Asn Asp Ile Arg Asn Gly Thr
 245 250 255
 Ile Asp Ser Gln Ile Thr Asp Pro Ser Val Arg Glu Ala Val Leu Ala
 260 265 270
 Ile Leu Lys Pro Asn Pro Lys Leu Ala Asp Phe Ile Gln Glu Glu Cys
 275 280 285
 Ser Lys Asp Ser Trp Lys Gly Ile Ile Thr Arg Leu Trp Pro Asn Thr
 290 295 300
 Lys Tyr Ile Asp Val Ile Val Thr Gly Thr Met Ser Gln Tyr Ile Pro
 305 310 315 320
 Thr Leu Asn Tyr Tyr Ser Asn Gly Leu Pro Leu Val Cys Thr Met Tyr
 325 330 335

pctca2017050779-seql.txt

Ala Ser Ser Glu Cys Tyr Phe Gly Leu Asn Leu Gln Pro Leu Cys Asp
340 345 350

Pro Ser Glu Val Ser Tyr Thr Leu Ile Pro Thr Met Ala Tyr Phe Glu
355 360 365

Phe Leu Pro Ala His Arg Asn Asn Gly Val Ser Thr Lys Pro Lys Ser
370 375 380

Leu Thr Glu Lys Glu Arg Lys Glu Leu Val Asp Leu Val Asp Val Lys
385 390 395 400

Leu Gly Gln Glu Tyr Glu Leu Ile Val Thr Thr Tyr Ala Gly Leu Tyr
405 410 415

Arg Tyr Arg Val Gly Asp Val Leu Arg Val Thr Gly Phe Lys Asn Lys
420 425 430

Ala Pro Gln Phe Ser Phe Val Cys Arg Lys Asn Val Val Leu Ser Ile
435 440 445

Asp Ser Asp Lys Thr Asp Glu Val Glu Leu Gln Asn Ala Val Ile Asn
450 455 460

Ala Val Asn His Leu Val Pro Phe Asp Ser Ser Leu Val Glu Tyr Thr
465 470 475 480

Ser Tyr Ala Asp Thr Ser Thr Ile Pro Gly His Tyr Val Leu Tyr Trp
485 490 495

Glu Leu Arg His Asp Gly Thr Thr Pro Ile Pro Pro Ser Val Phe Glu
500 505 510

Asp Cys Cys Leu Thr Met Glu Glu Ser Leu Asn Ser Val Tyr Arg Gln
515 520 525

Gly Arg Val Ser Asp Lys Ser Ile Gly Pro Leu Glu Ile Lys Ile Val
530 535 540

Glu Ser Gly Thr Phe Asp Lys Leu Met Asp Tyr Ala Ile Ser Arg Gly
545 550 555 560

Ala Ser Ile Asn Gln Tyr Lys Thr Pro Arg Cys Val Lys Phe Gln Pro
565 570 575

Ile Val Glu Leu Met Asn Ser Arg Val Val Glu Ser Tyr Phe Ser Pro
580 585 590

pctca2017050779-seql.txt

Lys Cys Pro Lys Trp Ile Val Gly Leu Gln Gln Trp Arg Asn Gln Asn
595 600 605

<210> 899
<211> 112
<212> PRT
<213> Papaver somniferum

<400> 899

Met Pro Met Phe Asn Lys Tyr Leu Glu Lys Gly Leu Gln Asn Val Arg
1 5 10 15

Asp Tyr Gln Val Leu Ser Val Ser Val Glu Val Val Gly Asp Met Cys
20 25 30

Arg Ala Leu Asp Asp Lys Ile Leu Pro Phe Cys Asp Gly Ile Met Ser
35 40 45

Arg Leu Leu Thr Gly Leu Ser Thr Gly Val Met His Pro Ser Met Thr
50 55 60

Pro Leu Ile Phe Ser Cys Phe Gly Asp Phe Gly Ile Ala Ile Gly Lys
65 70 75 80

His Phe Glu Lys Tyr Leu Pro Tyr Ala Met Pro Met Ile Gln Val Ala
85 90 95

Ser Lys Ile Cys Ala Glu Met Glu Gln Pro Ala Glu Val Trp Tyr Leu
100 105 110

<210> 900
<211> 182
<212> PRT
<213> Papaver somniferum

<400> 900

Met Asp Ser Ile Asn Ser Ser Ile Tyr Phe Cys Ala Tyr Phe Arg Glu
1 5 10 15

Pro Ile Ile Lys Leu Leu Met Ala Pro Leu Gly Val Ser Gly Leu Val
20 25 30

Gly Lys Leu Ser Thr Glu Leu Glu Val Asp Cys Asp Ala Glu Lys Tyr
35 40 45

Tyr Asn Met Tyr Lys His Gly Glu Asp Val Lys Lys Ala Val Pro His
50 55 60

pctca2017050779-seql.txt

Leu Cys Val Asp Val Lys Ile Ile Ser Gly Asp Pro Thr Ser Ser Gly
65 70 75 80

Cys Ile Lys Glu Trp Asn Val Asn Ile Asp Gly Lys Thr Ile Arg Ser
85 90 95

Val Glu Glu Thr Thr His Asp Asp Glu Thr Lys Thr Leu Arg His Arg
100 105 110

Val Phe Glu Gly Asp Val Met Lys Asp Phe Lys Lys Phe Asp Thr Ile
115 120 125

Met Val Val Asn Pro Lys Pro Asp Gly Asn Gly Cys Val Val Thr Arg
130 135 140

Ser Ile Glu Tyr Glu Lys Thr Asn Glu Asn Ser Pro Thr Pro Phe Asp
145 150 155 160

Tyr Leu Gln Phe Gly His Gln Ala Ile Glu Asp Met Asn Lys Tyr Leu
165 170 175

Arg Asp Ser Glu Ser Asn
180

<210> 901
<211> 284
<212> PRT
<213> Papaver somniferum

<400> 901

Met Ile Ile Glu Thr Leu Asp Ile Leu Gly Pro Asn Gln Asn Gly Asn
1 5 10 15

Ser Gly Thr His Thr Gln Lys Pro Ile Lys Thr Arg Asn Trp Leu Leu
20 25 30

Ile Ile Ile Asn Cys Ala Leu Val Phe Cys Gly Val Ile Gly Gly Pro
35 40 45

Leu Leu Met Arg Leu Tyr Tyr Leu His Gly Gly Ser Arg Lys Trp Leu
50 55 60

Ser Ser Phe Leu Gln Thr Ala Gly Phe Pro Val Leu Ile Phe Pro Leu
65 70 75 80

Ile Phe Leu Tyr Ile Lys Pro Lys Leu Ser Thr Gln Asn Asn Asp Gln
85 90 95

pctca2017050779-seql.txt

Ser Ser Ser Phe Phe Met Glu Pro Lys Leu Phe Leu Trp Ser Ala Ile
100 105 110

Val Gly Ile Val Phe Gly Val Ser Asn Phe Met Tyr Ala Leu Gly Leu
115 120 125

Ser Tyr Leu Pro Val Ser Thr Ser Thr Ile Leu Phe Ala Thr Gln Leu
130 135 140

Cys Phe Thr Ala Ile Phe Ala Trp Leu Ile Val Lys Gln Lys Phe Thr
145 150 155 160

Ala Phe Ile Ile Asn Ala Val Ile Val Met Thr Leu Gly Ser Ile Leu
165 170 175

Leu Gly Ile Asn Thr Asn Gly Asp Arg Pro Ile Gly Val Ser Lys Thr
180 185 190

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195 200 205

Gly Leu Gly Thr Pro Phe Val Glu Leu Ser Phe Ile Lys Ala Thr Arg
210 215 220

Asn Ile Thr Tyr Pro Thr Leu Leu Gln Phe Gln Val Ile Leu Cys Leu
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Phe Gly Thr Cys Leu Asn Val Ile Gly Met Leu Ile Asn Lys Asp Phe
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