



- (51) **International Patent Classification:**
C12N 9/08 (2006.01)
- (21) **International Application Number:**
PCT/US2013/055199
- (22) **International Filing Date:**
15 August 2013 (15.08.2013)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
61/683,913 16 August 2012 (16.08.2012) US
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- (81) **Designated States** (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) **Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished upon receipt of that report (Rule 48.2(g))



(54) **Title:** LIGNIN DEGRADING ENZYMES FROM MACROPHOMINA PHASEOLINA AND USES THEREOF

(57) **Abstract:** The present invention relates to the field of plant breeding and disease resistance in respect of lignin degradation of plant by *Macrophomina phaseolina* ("M. phaseolina"). The present invention discloses isolated polynucleotide encoding of the lignin degrading enzymes, produced by *Macrophomina phaseolina*, comprising and consisting of nucleotide sequence set forth in SEQ. ID Nos. 2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53, 56, 59, 62, 65, 68, 71, 74, 77, 80, 83, 86, 89, 92, 95, 98, 101, 104, 107, 110, 1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106 and 109 or the complement of such sequences. The present invention also relates to isolated polypeptide encoded by the polynucleotide sequences set forth in SEQ ID Nos. 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 63, 66, 69, 72, 75, 78, 81, 84, 87, 90, 93, 96, 99, 102, 105, 108 and 111; a recombinant gene construct comprising the polynucleotide; a transformant and a transgenic fungus comprising the recombinant gene construct, having enhanced production of lignin degrading enzyme. The invention provides polypeptides having an oligomerase activity, e.g., enzymes that convert recalcitrant soluble oligomerase to fermentable sugar in saccharification process of biomass.

Lignin degrading enzymes from *Macrophomina phaseolina* and uses thereof

RELATED APPLICATIONS

This application claims the benefit of priority to United States Provisional Patent Application serial number 61/683913, filed August 16, 2012; the contents of which are
5 hereby incorporated by reference.

FIELD OF INVENTION

This invention relates to the lignin degrading proteins/enzymes and genes of *M. phaseolina*. More specifically, the present invention discloses nucleotide acid sequences of these proteins and facilitates the reduction lignin content of lignocellulosic materials. The
10 present invention also relates to methods for selecting and isolating enzymes from *M. phaseolina* that are capable of degrading lignin, processes for cloning a gene segment from *M. phaseolina*, and methods of using the enzyme product of the gene segment. Particularly it can be used in the production or processing of pulps, woodpulp, methanol and textile.

15 BACKGROUND OF THE INVENTION

Lignin is the the second most abundant organic polymer, exceeded only by cellulose. It binds with cellulose fibres which make up approximately one-fourth of the weight of dry wood. This aromatic polymer is recalcitrant to degradation. Lignin is covalently associated with hemicelluloses in the cell wall via numerous types of linkage. Among the linkage, the
20 most abundant lignin substructure is the β -aryl ether, which accounts for approximately 40% of the inter phenylpropane linkages (Higuchi T 1990. Lignin biochemistry: biosynthesis and biodegradation. Wood Sci. Technol. 24: 23-63). In addition lignin does not possess any repeating units like other biopolymer such as cellulose, protein, starch etc. Ether bonds are often prevalent, providing a variety of linkages to the numerous aromatic residues.
25 These structural features dictate constraints on the degradation of the lignin. A portion of a typical structure is illustrated in Figure 1 and that the arylglycerol β -aryl ether structure red color in the figure is quantitatively the most important linkage, constituting at least 40% of the polymer. But, biodegradation of lignin is a prerequisite for the processing of

biofuel, and wood pulp from plant raw materials. The improving of lignin degradation would drive the output from biofuel processing to better gain or better efficiency factor.

Lignin is a component of lignocellulose, which must be degraded to allow efficient use of cellulosic material for saccharification, paper production, biofuel production or upgradation of fodder. Lignocellulose degradation is a multienzymatic process involving both hydrolytic and oxidative enzymes. In general lignin composed of three principal building blocks namely, *p*-coumaryl alcohol, coniferyl alcohol and sinapyl alcohol. In addition, grass and dicot lignin also contain large amounts of phenolic acids such as *p*-coumaric and ferulic acid, which are esterified to alcohol groups.

10 Lignin peroxidases (LiP), manganese peroxidases (MnPs) and laccases are three families of enzymes that are involved in the biological degradation of lignin. LiP oxidizes nonphenolic lignin substructures by abstracting one electron and generating cation radicals (Kirk TK, Tien M, Kersten PJ, Mozuch MD and Kalyanaraman B 1986. Ligninase of *Phanerochaete chrysosporium*. Mechanism of its degradation of the non-phenolic arylglycerol β -aryl ether substructure of lignin. Biochem J 236: 279-287; Kirk TK and Farrell RL 1987. Enzymatic "combustion": The microbial degradation of lignin. Annu Rev Microbiol 41: 465-505) and MnP oxidizes phenolic rings to phenoxyl radicals which lead to decomposition of Lignin (Gold MH, Wariishi H and Valli K 1989. Extracellular peroxidases involved in lignin degradation by the white-rot basidiomycete *Phanerochaete chrysosporium*. In: Biocatalysis in Agricultural Biotechnology, pp. 127-140. Edited by Whitaker JR and Sonnet PE. American Chemical Society, Washington, DC). Whereas laccase is capable of oxidizing both phenolic and non-phenolic moieties of lignin but that the latter is dependent on the co-presence of primary laccase substrates (Bourbonnais R and Paice MG 1990. Oxidation of non-phenolic substrates. An expanded role for laccase in lignin biodegradation. FEBS Lett 267(1): 99-102). Figure 2 showed a dimeric model compounds that represent the major arylglycerol β -aryl ether lignin structure undergo $C\alpha$ - $C\beta$ cleavage upon oxidation by LiP (Kirk *et al.* 1986. Ligninase of *Phanerochaete chrysosporium*. Mechanism of its degradation of the non-phenolic arylglycerol β -aryl ether substructure of lignin. Biochem J 236: 279-287).

Research on lignin biodegradation has increased enormously in recent years. Especially since the discovery of the first lignocellulose degrading fungus *Phanerochaete chrysosporium* genome was sequenced due to the interest on biological degradation of

lignin (Martínez *et al.* 2004. Genome sequence of the lignocellulose degrading fungus *Phanerochaete chrysosporium* strain RP78. *Nature Biotechnol* 22(6): 695-700). Perhaps the best studied, is the degradation of lignin in lignocellulose by white rot fungi, *Phanerochaete chrysosporium* (Aust SD 1995. Mechanisms of Degradation by White Rot Fungi. *Environ Health Perspect* 103:59-61; Leisola MSA, Ulmer D and Fiechter A 1984. Factors affecting lignin degradation in lignocellulose by *Phanerochaete chrysosporium*. *Arch Microbiol* 137: 171-175; Ulmer D, Leisola M, Puhakka J and Fiechter A 1983. *Phanerochaete chrysosporium*: Growth pattern and lignin degradation. *Appl Microbiol Biotechnol* 18: 153-157; Chua MGS, Chen CL, Chang HM and Kirk TK 1982. ¹³CNMR spectroscopic study of lignin degraded by *Phanerochaete chrysosporium*. I. New structures. *Holzforschung* 36: 165-172). White-rot fungi produce a range of extracellular lignolytic enzymes, including heme-dependent lignin peroxidases, manganese peroxidases, and versatile peroxidases and copper-dependent laccases (Sanchez C 2009. Lignocellulosic residues: biodegradation and bioconversion by fungi. *Biotechnol Adv* 27: 185-194; Ten Have R, Teunissen PJM 2001. Oxidative mechanisms involved in lignin degradation by white-rot fungi. *Chem Rev* 101: 3397-3413). With the aid of these extracellular peroxidase and laccase enzyme, white-rot fungi degrade lignin (Timothy DHB , Ahmad M, Hardiman EM and Rahmanpour R 2001. Pathways for degradation of lignin in bacteria and fungi. *Nat. Prod. Rep* 28: 1883-1896).

Increasing interest in the exploitation of plant biomass as a renewable resource has provided an impetus for research on microbial degradation of lignocellulose. Large quantity of biomass (mainly lignocellulosic materials) is generated from forestry, agriculture and food industry which are not used in byproduct processes. To effectively utilize this plant biomass as renewable resources, alternative means of degradation of lignocellulose need to be explored. It is desirable to identify new fungi capable of degrading lignin for use in the manufacture of cellulosic products from lignocellulosic materials.

In order to be efficient, the degradation of lignin requires several types of enzymes acting cooperatively. At least two categories of enzymes are necessary to degrade lignin: Lignin peroxidase that oxidizes nonphenolic lignin substructures and laccase that oxidize both phenolic and nonphenolic lignin substructure thus they can degrade cooperatively. To

realize and commercialize the mentioned enzymes, stable supply of various lignin degrading proteins are needed. Therefore, it is desirable for the industry to completely identify these lignin degrading genes and their encoded proteins, thus utilizing the genetic information for degradation of lignin from lignocellulosic materials.

5 SUMMARY OF THE INVENTION

It has surprisingly been found that the fungus *M. phaseolina*, which are not closely related to either *Trichoderma reesi* or *Phanerochaete chrysosporium*, are capable of producing lignin degrading enzymes.

Accordingly, among other things, the present invention relates to the identification of and
10 its corresponding use of lignin degrading enzyme which is derivable from *M. phaseolina*. The present invention also relates to the use of *M. phaseolina* fungi in the degradation of lignin content of cellulosic materials.

The primary object of the present invention is to disclose sets of nucleotides sequences encoding lignin peroxidase (SEQ ID Nos. 1, 2, 4, 5, 7, 8, and/or any mixtures/combinations
15 thereof), chloroperoxidase (SEQ ID Nos. 10, 11, 13, 14, 16, 17, 19, 20, 22, 23, 25, 26, and/or any mixtures/combinations thereof) and haemperoxidase (SEQ ID Nos. 28, 29, 31, 32, 34, 35, 37, 38, 40, 41, 43, 44, and/or any mixtures/combinations thereof) of the fungi *M. phaseolina*.

The present invention also discloses sets of nucleotides sequences encoding multicopper
20 oxidase (SEQ ID Nos. 46, 47, 49, 50, 52, 53, 55, 56, 58, 59, 61, 62, 64, 65, 67, 68, 70, 71, 73, 74, 76, 77, 79, 80, 82, 83, 85, 86, 88, 89, 91, 92, 94, 95, 97, 98, 100, 101, 103, 104, 106, 107, 109, 110, and/or any mixtures/combinations thereof) of the fungi *M. phaseolina*.

It is preferred that the isolated polynucleotide of the claimed invention consists and/or comprises of a nucleic acid sequence selected from the group comprising and/or
25 consisting of SEQ ID Nos. 2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53, 56, 59, 62, 65, 68, 71, 74, 77, 80, 83, 86, 89, 92, 95, 98, 101, 104, 107, 110, 1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106 and 109, and/or any mixtures/combinations thereof, that codes for the polypeptide selected from the group comprising and/or consisting of SEQ ID Nos.
30 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 63, 66, 69, 72, 75,

78, 81, 84, 87, 90, 93, 96, 99, 102, 105, 108 and 111, and/or any mixtures/combinations thereof. The present invention also relates to an isolated polynucleotide consisting and/or comprising the complement of the nucleotide sequences described above.

Another object of the present invention is to provide the molecular biology and genetic
5 information of the genes and enzymes set forth in the primary object to be utilized for the regulation and conversion of lignin degradation for the production of valuable products from lignocellulosic materials.

In another aspect, to facilitate *in vitro* production of the lignin degrading polypeptide, the present invention include an expression construct capable of expressing polypeptide
10 containing at least 70% sequential amino acids as set forth in SEQ ID Nos. 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 63, 66, 69, 72, 75, 78, 81, 84, 87, 90, 93, 96, 99, 102, 105, 108 and 111. Preferably, the expression construct has inserted DNA or cDNA with sequential nucleotide as set forth in SEQ ID Nos. 2, 5, 8, 11, 14, 17, 20,
23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53, 56, 59, 62, 65, 68, 71, 74, 77, 80, 83, 86, 89, 92,
15 95, 98, 101, 104, 107, 110, 1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106 and 109.

Yet another object of the present invention discloses a recombinant gene construct comprising a polynucleotide template having nucleotide sequence set forth in SEQ ID Nos. 2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53, 56, 59, 62, 65, 68, 71, 74,
20 77, 80, 83, 86, 89, 92, 95, 98, 101, 104, 107, 110, 1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106 and 109, wherein the polynucleotide template is expressible in a host cell to produce an enzyme which oxidize lignin from lignocellulosic materials. Preferably, the recombinant gene construct further comprises a promoter region operably-linked to enhance
25 expression of the polynucleotide template.

In accordance with one of the preferred embodiments of the present invention, the fungus *M. phaseolina* strain ms6 isolated from infected jute plant. The isolated polypeptide is also preferably derived from this strain.

Still another object of the present invention is to provide a potential commercially feasible
30 way to isolate lignin degrading enzyme from *M. phaseolina* in order to keep up with the

increasing global demand on exploitation/utilization of plant biomass as a renewable resource for the manufacture of cellulosic products.

Further object of the invention is directed to utilization of the lignin degrading substances in animal feeds, biofuel, woodpulp, textile and paper industry.

- 5 One skilled in the art will readily appreciate that the present invention is well adapted to carry out the objects and obtain the ends and advantages mentioned, as well as those inherent therein. The embodiments described herein are not intended as limitations on the scope of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

- 10 The accompanying drawings, which are incorporated in and form a part of the specification, illustrate the embodiments of the present invention and, together with the description, serve to explain the principles of the invention.

Figure 1 Displays a common structure of softwood lignin. Major arylglycerol- β -aryl ether structure is shown in red color. The inset shows coniferyl alcohol, the
15 phenylpropanoid building block of softwood lignin.

Figure 2 Displays a cleavage of internal an non-phenolic arylglycerol- β -aryl ether lignin structure by oxidized lignin peroxidase.

Figure 3 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of lignin peroxidase of SEQ ID NO. 1
20 and lane M is DNA molecular weight ladder.

Figure 4 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of lignin peroxidase of SEQ ID NO. 4 and lane M is DNA molecular weight ladder.

Figure 5 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of lignin peroxidase of SEQ ID NO. 7
25 and lane M is DNA molecular weight ladder.

Figure 6 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of chloroperoxidase of SEQ ID NO. 13 and lane M is DNA molecular weight ladder.

- Figure 7 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of chloroperoxidase of SEQ ID NO. 16 and lane M is DNA molecular weight ladder.
- 5 Figure 8 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of chloroperoxidase of SEQ ID NO. 19 and lane M is DNA molecular weight ladder.
- Figure 9 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of chloroperoxidase of SEQ ID NO. 22 and lane M is DNA molecular weight ladder.
- 10 Figure 10 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of chloroperoxidase of SEQ ID NO. 25 and lane M is DNA molecular weight ladder.
- Figure 11 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of haemperoxidase of SEQ ID NO. 15 28 and lane M is DNA molecular weight ladder.
- Figure 12 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of haemperoxidase of SEQ ID NO. 31 and lane M is DNA molecular weight ladder.
- Figure 13 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of haemperoxidase of SEQ ID NO. 20 34 and lane M is DNA molecular weight ladder.
- Figure 14 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of haemperoxidase of SEQ ID NO. 37 and lane M is DNA molecular weight ladder.
- 25 Figure 15 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of haemperoxidase of SEQ ID NO. 40 and lane M is DNA molecular weight ladder.

- Figure 16 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of haemperoxidase of SEQ ID NO. 43 and lane M is DNA molecular weight ladder.
- 5 Figure 17 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 46 and lane M is DNA molecular weight ladder.
- Figure 18 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 49 and lane M is DNA molecular weight ladder.
- 10 Figure 19 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 52 and lane M is DNA molecular weight ladder.
- Figure 20 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 55 and lane M is DNA molecular weight ladder.
- 15 Figure 21 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 58 and lane M is DNA molecular weight ladder.
- Figure 22 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 64 and lane M is DNA molecular weight ladder.
- 20 Figure 23 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 67 and lane M is DNA molecular weight ladder.
- 25 Figure 24 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 70 and lane M is DNA molecular weight ladder.

- Figure 25 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 73 and lane M is DNA molecular weight ladder.
- 5 Figure 26 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 76 and lane M is DNA molecular weight ladder.
- Figure 27 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 79 and lane M is DNA molecular weight ladder.
- 10 Figure 28 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 82 and lane M is DNA molecular weight ladder.
- Figure 29 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 85 and lane M is DNA molecular weight ladder.
- 15 Figure 30 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 88 and lane M is DNA molecular weight ladder.
- Figure 31 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 91 and lane M is DNA molecular weight ladder.
- 20 Figure 32 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 97 and lane M is DNA molecular weight ladder.
- 25 Figure 33 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 100 and lane M is DNA molecular weight ladder.

Figure 34 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 103 and lane M is DNA molecular weight ladder.

5 Figure 35 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 106 and lane M is DNA molecular weight ladder.

Figure 36 is the electrophoresed agarose gel image showing the PCR amplification result in which lane 1 is polynucleotides of multicopper oxidase of SEQ ID NO. 109 and lane M is DNA molecular weight ladder.

10 DETAILED DESCRIPTION OF THE INVENTION

The definitions and/or methods provided herein define the present invention and guide those of ordinary skill in the art in the practice of the present invention. Except where otherwise stated, terms are to be understood according to conventional usage by those of ordinary skill in the relevant art. To the extent to which any of the definitions and/or methods is found to be inconsistent with any of the definitions and/or methods provided in any patent or non-patent reference incorporated herein or in any reference found elsewhere, it is understood that the said definition and/or method which has been expressly provided/adopted in this application will be used herein. The singular terms "a," "an," and "the" include plural referents unless context clearly indicates otherwise. 15 Similarly, the word "or" is intended to include "and" unless the context clearly indicates otherwise. Hence, "comprising A or B" means including A, or B, or A and B. It is further to be understood that all base sizes or amino acid sizes, and all molecular weight or molecular mass values, given for nucleic acids or polypeptides are approximate, and are provided for description. Although methods and materials similar or equivalent to those described herein can be used in the practice or testing of the present disclosure, suitable methods and materials are described below. 20

The present invention provides the nucleotide sequences of *M. phaseolina* encoded protein/enzyme involved in lignin degradation. The genes encode proteins with an enzyme activity that is either in use in an industry or of interest to an industry. The genomic sequences of the invention that encode the enzymes are identified primarily by 25

comparison of nucleotide sequences of *M. phaseolina* genomic DNA and the nucleotide sequences of known enzyme genes of other microorganisms. Prior to this invention, the nucleotide sequences of these *M. phaseolina* genes, the reading frames, the positions of exons and introns, the structure of the enzymes, and their potential usefulness in various industries, such as those involved in the making of food and feed, beverages, textiles and detergents, were not known.

Analysis of the genome sequence of *M. phaseolina* reveals an abundance of genes coding for enzymes which degrade lignin in plant. The nucleotide sequences were initially annotated by software programs, such as Genescan and Glimmer M (The Institute of Genome Research, Rockville, NM), which can identify putative coding regions, introns, and splice junctions. Further automated and manual curation of the nucleotide sequences was performed to refine and establish precise characterization of the coding regions and other gene features.

Over 14000 cDNAs from *M. phaseolina* were partially or fully sequenced. Among them thirty-seven cDNAs encoding new enzymes with putative roles in lignin degradation were discovered.

Open reading frames (ORFs) are analyzed following full or partial sequencing of clones of cDNA libraries derived from *M. phaseolina* mRNA and are further analyzed using sequence analysis software, and by determining homology to known sequences in databases (public/private).

In the context of this disclosure, a number of terms used throughout the specification have the indicated meanings unless expressly indicated to have a different meaning.

As used herein, a "polynucleotide" is a nucleotide sequence such as a nucleic acid fragment. A polynucleotide may be a polymer of RNA or DNA that is single- or double-stranded, that optionally contains synthetic, non-natural or altered nucleotide bases. A polynucleotide in the form of a polymer of DNA may be comprised of one or more segments of cDNA, genomic DNA, synthetic DNA, or mixtures thereof. An isolated polynucleotide of the present invention may include at least one of 150 contiguous nucleotides (both upstream and downstream) derived from SEQ ID No. 1, 4, 7, 10, 13, 16,

19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106 and 109, or the complement of such sequences.

"Polypeptide" as used herein, is a single linear chain of amino acids bonded together by peptide bonds, and having usually a sequence greater than 100 amino acids in length.

- 5 "Isolated" means altered "by the hand of man" from the natural state. If a composition or substance occurs in nature, it has been "isolated" if it has been changed or removed from its original environment, or both. For example, a polynucleotide or a polypeptide naturally present in a living plant or animal is not "isolated," but the same polynucleotide or polypeptide separated from the coexisting materials of its natural state is "isolated", as
- 10 the term is employed herein.

The term "gene", as used herein, is defined as the genomic sequences of the fungi *M. phaseolina*, particularly polynucleotide sequence encoding polypeptide of the series of enzymes involved in the lignin degradation pathway.

- A "coding sequence" or "coding region" refers to a nucleic acid molecule having sequence
- 15 information necessary to produce a gene product, such as an amino acid or polypeptide, when the sequence is expressed. The coding sequence may comprise untranslated sequences (e.g., introns or 5' or 3' untranslated regions) within translated regions, or may lack such intervening untranslated sequences (e.g., as in cDNA).

- The term "primer" as used herein, is an oligonucleotide capable of binding to a target
- 20 nucleic acid sequence and priming the nucleic acid synthesis. An amplification oligonucleotide as defined herein will preferably be 10 to 50, most preferably 15 to 25 nucleotides in length. While the amplification oligonucleotides of the present invention may be chemically synthesized and such oligonucleotides are not naturally occurring nucleic acids.

- 25 The abbreviation used throughout the specification to refer to nucleic acids comprising nucleotide sequences are the conventional one-letter abbreviations. Thus when included in a nucleic acid, the naturally occurring encoding nucleotides are abbreviated as follows: adenine (A), guanine (G), cytosine (C), thymine (T) and uracil (U). Also, unless otherwise specified, the nucleic acid sequences presented herein is the 5' →3' direction.

As used herein, the term "complementary" and derivatives thereof are used in reference to pairing of nucleic acids by the well-known rules that A pairs with T or U and C pairs with G. Complement can be "partial" or "complete". In partial complement, only some of the nucleic acid bases are matched according to the base pairing rules; while in complete or
5 total complement, all the bases are matched according to the pairing rule. The degree of complement between the nucleic acid strands may have significant effects on the efficiency and strength of hybridization between nucleic acid strands as well known in the art. The efficiency and strength of said hybridization is depends upon in detection method.

The term "host cell", as used herein, includes any cell type which is susceptible to
10 transformation, transfection, transduction, expression and the like with a nucleic acid construct or expression vector comprising a polynucleotide of the present invention.

The term "operably linked" denotes herein a configuration in which a control sequence is placed at an appropriate position relative to the coding sequence of the polynucleotide sequence such that the control sequence directs the expression of the coding sequence of
15 a polypeptide.

A "vector" generally refers to a replicon, such as plasmid, phage, cosmid, yeast or virus to which another nucleic acid segment may be operably inserted so as to bring about the replication or expression of the segment. The term "vector" is also intended to refer to a nucleic acid molecule capable of transporting another nucleic acid to which it has been
20 linked. One type of vector is a "plasmid," which refers to a circular double-stranded DNA loop into which additional DNA segments may be ligated. Another type of vector is a viral vector, where additional DNA segments may be ligated into the viral genome. Certain vectors are capable of autonomous replication in a host cell into which they are introduced (e.g., bacterial vectors having a bacterial origin of replication and episomal
25 mammalian vectors). Other vectors can be integrated into the genome of a host cell upon introduction into the host cell, and thereby are replicated along with the host genome. Moreover, certain vectors are capable of directing the expression of genes to which they are operatively linked. Such vectors are referred to herein as "recombinant expression vectors" (or simply, "expression vectors"). In general, expression vectors of utility in
30 recombinant DNA techniques are often in the form of plasmids. In the present specification, "plasmid" and "vector" may be used interchangeably as the plasmid is the

most commonly used form of vector. However, the invention is intended to include such other forms of expression vectors, such as viral vectors (e.g., replication defective retroviruses, adenoviruses and adeno-associated viruses), which serve equivalent functions.

- 5 The term "nucleic acid construct" or "DNA construct" is sometimes used to refer to a coding sequence or sequences operably linked to appropriate regulatory sequences and inserted into a vector for transforming a cell. This term may be used interchangeably with the term "transforming DNA" or "transgene."

The term "promoter" as used herein, refers to a nucleic acid sequence that functions to
10 direct transcription of a downstream gene. The promoter will generally be appropriate to the host cell in which the target gene is being expressed. The promoter together with other transcriptional and translational regulatory nucleic acid sequences (also termed "control sequences") is necessary to express a given gene. In general, the transcriptional and translational regulatory sequences include, but are not limited to, promoter
15 sequences, ribosomal binding sites, transcriptional start and stop sequences, translational start and stop sequences, and enhancer or activator sequences.

The term "*in vitro*" as used herein, refers to a biological reaction occurs in an artificial environment outside a living organism, which is usually conducted in a laboratory using components of an organism that have been isolated from their usual biological context in
20 order to permit a more detailed or more convenient analysis to be performed.

The term "% homology" is used interchangeably herein with the term "% identity" herein and refers to the level of nucleic acid or amino acid sequence identity between the nucleic acid sequence that encodes any one of the inventive polypeptides or the inventive polypeptide's amino acid sequence, when aligned using a sequence alignment program.

- 25 For example, as used herein, 80% homology means the same thing as 80% sequence identity determined by a defined algorithm, and accordingly a homologue of a given sequence has greater than 80% sequence identity over a length of the given sequence. Exemplary levels of sequence identity include, but are not limited to, 80, 85, 90, 95, 98% or more sequence identity to a given sequence, e.g., the coding sequence for any one of
30 the inventive polypeptides, as described herein.

Exemplary computer programs which can be used to determine identity between two sequences include, but are not limited to, the suite of BLAST programs, *e.g.*, BLASTN, BLASTX, and TBLASTX, BLASTP and TBLASTN, publicly accessible at www.ncbi.nlm.nih.gov/BLAST.

5 Sequence searches are typically carried out using the BLASTN program, when evaluating a given nucleic acid sequence relative to nucleic acid sequences in the GenBank DNA Sequences and other public databases. The BLASTX program is preferred for searching nucleic acid sequences that have been translated in all reading frames against amino acid sequences in the GenBank Protein Sequences and other public databases.

10 A preferred alignment of selected sequences in order to determine "% identity" between two or more sequences is performed using for example, the CLUSTAL-W program.

As in setting forth, one embodiment of the present invention is an isolated polynucleotides encoding for lignin degrading polypeptide found in the fungi *M. phaseolina* comprising nucleotide sequence as setting forth in SEQ ID No. 2, 5, 8, 11, 14,
15 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53, 56, 59, 62, 65, 68, 71, 74, 77, 80, 83, 86, 89, 92, 95, 98, 101, 104, 107, 110, 1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106 and 109. Correspondingly, the respective lignin degrading polypeptide encoded by these nucleotide sequences shall possess amino acid sequence as setting forth in SEQ ID Nos. 3, 6, 9, 12, 15,
20 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 63, 66, 69, 72, 75, 78, 81, 84, 87, 90, 93, 96, 99, 102, 105, 108 and 111.

In one embodiment, the 939 bp long polynucleotide illustrated in SEQ ID No. 2 is the full length cDNA clone encoded Lignin peroxidase protein exhibiting an open reading frame encoding a 312 amino acid polypeptide, as in SEQ ID No. 3, with a calculated molecular
25 mass of about 32 kD. Through SMART analysis of SEQ ID No. 2, it reveals presence of Pfam peroxidase domain in the sequence. The protein family with the Pfam domain consists and/or comprises of secretory fungal peroxidases. These are monomeric glycoproteins involved in the degradation of lignin.

Preferably, the 1116 bp long polynucleotide illustrated in SEQ ID No. 5 is the full length
30 cDNA clone encoded Lignin peroxidase protein exhibiting an open reading frame encoding

a 371 amino acid polypeptide, as in SEQ ID No. 6, with a calculated molecular mass of about 40 kD. Through SMART analysis of SEQ ID No. 5, it reveals presence of Pfam peroxidase domain in the sequence. The protein family with the Pfam domain consists and/or comprises of secretory fungal peroxidases. These are monomeric glycoproteins
5 involved in the degradation of lignin.

Similarly, another aspect, the 1023 bp long polynucleotide illustrated in SEQ ID No. 8 is the full length cDNA clone encoded Lignin peroxidase protein exhibiting an open reading frame encoding a 340 amino acid polypeptide, as in SEQ ID No. 9, with a calculated molecular mass of about 35 kD. Through SMART analysis of SEQ ID No. 8, it reveals
10 presence of Pfam peroxidase domain in the sequence. The protein family with the Pfam domain consists and/or comprises of secretory fungal peroxidases. These are monomeric glycoproteins involved in the degradation of lignin.

In another aspect, polynucleotides encoding for chloroperoxidase has 1260 bp as illustrated in SEQ ID No. 11 while the encoded protein is a 419 amino acid polypeptide
15 with a calculated molecular mass of about 45 kD as illustrated in SEQ ID No. 12. The SEQ ID No. 11 contains a Pfam domain, namely peroxidase_2. The said domain involved in the lignin degradation.

In another aspect, polynucleotides encoding for chloroperoxidase has 690 bp as illustrated in SEQ ID No. 14 while the encoded protein is a 229 amino acid polypeptide with a
20 calculated molecular mass of about 25 kD as illustrated in SEQ ID No. 15. The SEQ ID No. 14 contains a Pfam domain, namely peroxidase_2. The said domain involved in the lignin degradation.

In another aspect, polynucleotides encoding for chloroperoxidase has 1194 bp as illustrated in SEQ ID No. 17 while the encoded protein is a 397 amino acid polypeptide
25 with a calculated molecular mass of about 43 kD as illustrated in SEQ ID No. 18. The SEQ ID No. 17 contains a Pfam domain, namely peroxidase_2. The said domain involved in the lignin degradation.

In another aspect, polynucleotides encoding for chloroperoxidase has 1317 bp as illustrated in SEQ ID No. 20 while the encoded protein is a 438 amino acid polypeptide
30 with a calculated molecular mass of about 47 kD as illustrated in SEQ ID No. 21. The SEQ ID

No. 20 contains a Pfam domain, namely peroxidase_2. The said domain involved in the lignin degradation.

In another aspect, polynucleotides encoding for chloroperoxidase has 780 bp as illustrated in SEQ ID No. 23 while the encoded protein is a 259 amino acid polypeptide with a
5 calculated molecular mass of about 29 kD as illustrated in SEQ ID No. 24. The SEQ ID No. 23 contains a Pfam domain, namely peroxidase_2. The said domain involved in the lignin degradation.

In another aspect, polynucleotides encoding for chloroperoxidase has 951 bp as illustrated in SEQ ID No. 26 while the encoded protein is a 316 amino acid polypeptide with a
10 calculated molecular mass of about 35 kD as illustrated in SEQ ID No. 27. The SEQ ID No. 26 contains a Pfam domain, namely peroxidase_2. The said domain involved in the lignin degradation.

In another aspect, polynucleotides encoding for haemperoxidase has 1116 bp as illustrated in SEQ ID No. 29 while the encoded protein is a 371 amino acid polypeptide
15 with a calculated molecular mass of about 41 kD as illustrated in SEQ ID No. 30. The SEQ ID No. 29 contains a Pfam domain, namely peroxidase. Haemperoxidases oxidize lignin subunits using extracellular hydrogen peroxide generated by unrelated oxidases as a co-substrate. The said domain involved in the lignin degradation.

In another aspect, polynucleotides encoding for haemperoxidase has 1623 bp as
20 illustrated in SEQ ID No. 32 while the encoded protein is a 540 amino acid polypeptide with a calculated molecular mass of about 57 kD as illustrated in SEQ ID No. 33. The SEQ ID No. 32 contains a Pfam domain, namely peroxidase. Haemperoxidases oxidize lignin subunits using extracellular hydrogen peroxide generated by unrelated oxidases as a co-substrate. The said domain involved in the lignin degradation.

25 In another aspect, polynucleotides encoding for haemperoxidase has 1599 bp as illustrated in SEQ ID No. 35 while the encoded protein is a 532 amino acid polypeptide with a calculated molecular mass of about 57 kD as illustrated in SEQ ID No. 36. The SEQ ID No. 35 contains a Pfam domain, namely peroxidase. Haemperoxidases oxidize lignin subunits using extracellular hydrogen peroxide generated by unrelated oxidases as a co-
30 substrate. The said domain involved in the lignin degradation.

In another aspect, polynucleotides encoding for haemperoxidase has 2049 bp as illustrated in SEQ ID No. 38 while the encoded protein is a 682 amino acid polypeptide with a calculated molecular mass of about 70 kD as illustrated in SEQ ID No. 39. The SEQ ID No. 38 contains a Pfam domain, namely peroxidase. Haemperoxidases oxidize lignin subunits using extracellular hydrogen peroxide generated by unrelated oxidases as a co-substrate. The said domain involved in the lignin degradation.

In another aspect, polynucleotides encoding for haemperoxidase has 1605 bp as illustrated in SEQ ID No. 41 while the encoded protein is a 534 amino acid polypeptide with a calculated molecular mass of about 57 kD as illustrated in SEQ ID No. 42. The SEQ ID No. 41 contains a Pfam domain, namely peroxidase. Haemperoxidases oxidize lignin subunits using extracellular hydrogen peroxide generated by unrelated oxidases as a co-substrate. The said domain involved in the lignin degradation.

In another aspect, polynucleotides encoding for haemperoxidase has 960 bp as illustrated in SEQ ID No. 44 while the encoded protein is a 319 amino acid polypeptide with a calculated molecular mass of about 35 kD as illustrated in SEQ ID No. 45. The SEQ ID No. 44 contains a Pfam domain, namely peroxidase. Haemperoxidases oxidize lignin subunits using extracellular hydrogen peroxide generated by unrelated oxidases as a co-substrate. The said domain involved in the lignin degradation.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1713 bp as illustrated in SEQ ID No. 47 while the encoded protein is a 570 amino acid polypeptide with a calculated molecular mass of about 64 kD as illustrated in SEQ ID No. 48. The SEQ ID No. 47 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1860 bp as illustrated in SEQ ID No. 50 while the encoded protein is a 619 amino acid polypeptide with a calculated molecular mass of about 69 kD as illustrated in SEQ ID No. 51. The SEQ ID No. 50 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1824 bp as illustrated in SEQ ID No. 53 while the encoded protein is a 607 amino acid polypeptide with a calculated molecular mass of about 67 kD as illustrated in SEQ ID No. 54. The SEQ ID No. 53 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1737 bp as illustrated in SEQ ID No. 56 while the encoded protein is a 578 amino acid polypeptide with a calculated molecular mass of about 63 kD as illustrated in SEQ ID No. 57. The SEQ ID No. 56 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1665 bp as illustrated in SEQ ID No. 59 while the encoded protein is a 554 amino acid polypeptide with a calculated molecular mass of about 61 kD as illustrated in SEQ ID No. 60. The SEQ ID No. 59 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1803 bp as illustrated in SEQ ID No. 62 while the encoded protein is an 600 amino acid polypeptide with a calculated molecular mass of about 65 kD as illustrated in SEQ ID No. 63. The SEQ ID No. 62 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1635 bp as illustrated in SEQ ID No. 65 while the encoded protein is a 544 amino acid polypeptide with a calculated molecular mass of about 61 kD as illustrated in SEQ ID No. 66. The SEQ ID No. 65 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1743 bp as illustrated in SEQ ID No. 68 while the encoded protein is a 580 amino acid polypeptide with a calculated molecular mass of about 63 kD as illustrated in SEQ ID No. 69. The SEQ ID No. 68 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1836 bp as illustrated in SEQ ID No. 71 while the encoded protein is a 611 amino acid polypeptide with a calculated molecular mass of about 67 kD as illustrated in SEQ ID No. 72. The SEQ ID No. 71 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 702 bp as illustrated in SEQ ID No. 74 while the encoded protein is a 233 amino acid polypeptide with a calculated molecular mass of about 26 kD as illustrated in SEQ ID No. 75. The SEQ ID No. 74 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1854 bp as illustrated in SEQ ID No. 77 while the encoded protein is a 617 amino acid polypeptide with a calculated molecular mass of about 68 kD as illustrated in SEQ ID No. 78. The SEQ ID No. 77 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 2073 bp as illustrated in SEQ ID No. 80 while the encoded protein is a 690 amino acid polypeptide with a calculated molecular mass of about 77 kD as illustrated in SEQ ID No. 81. The SEQ ID No. 80 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1824 bp as illustrated in SEQ ID No. 83 while the encoded protein is a 607 amino acid polypeptide with a calculated molecular mass of about 67 kD as illustrated in SEQ ID No. 84. The SEQ ID No. 83 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1932 bp as illustrated in SEQ ID No. 86 while the encoded protein is a 643 amino acid polypeptide with a calculated molecular mass of about 72 kD as illustrated in SEQ ID No. 87. The SEQ ID No. 86 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1950 bp as illustrated in SEQ ID No. 89 while the encoded protein is a 649 amino acid polypeptide with a calculated molecular mass of about 72 kD as illustrated in SEQ ID No. 90. The SEQ ID No. 89 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 2016 bp as illustrated in SEQ ID No. 92 while the encoded protein is a 671 amino acid polypeptide with a calculated molecular mass of about 74 kD as illustrated in SEQ ID No. 93. The SEQ ID No. 92 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 2085 bp as illustrated in SEQ ID No. 95 while the encoded protein is a 694 amino acid polypeptide with a calculated molecular mass of about 78 kD as illustrated in SEQ ID No. 96. The SEQ ID No. 95 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1821 bp as illustrated in SEQ ID No. 98 while the encoded protein is a 606 amino acid polypeptide with a calculated molecular mass of about 68 kD as illustrated in SEQ ID No. 99. The SEQ ID No. 98 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1854 bp as illustrated in SEQ ID No. 101 while the encoded protein is a 617 amino acid polypeptide with a calculated molecular mass of about 68 kD as illustrated in SEQ ID No. 102. The SEQ ID No. 101 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1815 bp as illustrated in SEQ ID No. 104 while the encoded protein is a 604 amino acid polypeptide with a calculated molecular mass of about 67 kD as illustrated in SEQ ID No. 105. The SEQ ID No. 104 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1632 bp as illustrated in SEQ ID No. 107 while the encoded protein is a 543 amino acid polypeptide with a calculated molecular mass of about 61 kD as illustrated in SEQ ID No. 108. The SEQ ID No. 107 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

In another aspect, polynucleotides encoding for multicopper oxidases (laccases) has 1752 bp as illustrated in SEQ ID No. 110 while the encoded protein is a 583 amino acid polypeptide with a calculated molecular mass of about 64 kD as illustrated in SEQ ID No. 111. The SEQ ID No. 110 contains a Pfam domain, namely multicopper oxidase. This multicopper oxidase (laccase) is extracellular, non-haem, copper containing proteins that catalyze the one-electron oxidation of phenols to phenoxy radicals.

The sequences provided by the present invention can also be used as preparatory materials for the rational modification or design of novel enzymes with characteristics that enable the enzymes to perform better in demanding processes.

5 The present disclosure includes as contained in the appended claims, as well as that of the foregoing description. Although this invention has been described in its preferred form with a degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangements of parts may be resorted to without departing from the scope of the invention and claims.

10 Various references are cited herein, the disclosures of which are incorporated by reference in their entireties.

EXAMPLE

The following example is intended to further illustrate the invention, without any intent for the invention to be limited to the specific embodiments described therein.

15 **Example 1 Designing and synthesis of primers**

The primers used in the study were either designed from the manually curated transcriptome and the “gene models” predicted from the genomic sequences of *M. phaseolina* ms6, by choosing the sequences manually with complete ORFs or using databases where similar genes have been successfully isolated from other plants.
20 Comparative bioinformatic analysis of the nucleotide sequences obtained from transcriptome were carried out using NCBI BLAST, BLASTP, RPS-BLAST, BLASTX and PSI-BLAST to identify homologues of the related genes and for the proper identification of gene. Nucleotide sequence alignments were performed through clustalW version 1.82 whenever multiple sequences were found from the “gene pool”. The alignment was then
25 edited. Gene specific primers (both forward and reverse) were selected manually or through Primer 3 plus tool and the primers were custom synthesized.

All oligonucleotides used in this study were synthesized and HPLC purified by the supplier and procured from Integrated DNA Technologies (IDT). Stock solution of 100 pmol were prepared in autoclaved ddH₂O and stored at -20°C, in aliquots for use.

30

Atty. Docket No. JGX-006.25

Oligonucleotides Sequences used as primers for PCR

Gene name	SEQ ID No.	Primer Sequence	Amplified product (bp)
lignin peroxidase	1	Forward GAGACCGCTACACCCACCCCT	1155
		Reverse CACCGCACTACGACCTCGCT	
lignin peroxidase	4	Forward GTCGTCGCGTGGCTGCTAGA	1276
		Reverse CCAGGCATCGGGGAACCTCGG	
lignin peroxidase	7	Forward GGCGGCTCTCTCGCAGACGTA	1234
		Reverse GCCCTGCCCAACCGATTCA	
Chloroperoxidase	10	Forward TGCTGCCTCCGCTCTGTCGC	1769
		Reverse CGCACCATGTCGCCTTGCC	
Chloroperoxidase	13	Forward AACCGCTTTACCTGCCAGCCA	964
		Reverse ATTGGGGTTCGGTGCTCAGGAGT	
Chloroperoxidase	16	Forward ACGGAGCACATGAACACCGTCC	1777
		Reverse CTTCGCACCGCGAGCAGAGG	
Chloroperoxidase	19	Forward TCCCGCGAGCCCTTGGTCTG	1644
		Reverse GCCCTCGCTGGTTCCTTGCT	
Chloroperoxidase	22	Forward ATGTTTTGTTTCGCGCCGCT	1265
		Reverse AATCTACCACTCCCGTCCCGC	
Chloroperoxidase	25	Forward ACCGCCGCTTCGTTTACGTC	475
		Reverse GCCCGCTTACTTTGCCGGTC	
Haem peroxidase	28	Forward TCGCCTGTGCTCACACCACG	1235
		Reverse TTAACGTCCGCCAAGCACGC	

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Gene name	SEQ ID No.	Primer Sequence	Amplified product (bp)
Haem peroxidase	31	Forward CGTTCCCAAGCCCCGACGACTC	1177
		Reverse GGGCAAGTCCCCAAGCCCATC	
Haem peroxidase	34	Forward AATGCGGTTTCTCGGGGGCT	1762
		Reverse TGTTGCTGGCCCTATGAAGGCAT	
Haem peroxidase	37	Forward CCATGGCAAGGCATCCCCGGC	1172
		Reverse TGTGGCATCCCAACAGGGGC	
Haem peroxidase	40	Forward TGGACCTGGCCGTCAAACCG	1488
		Reverse GCCTCACAGAGCCGCACACTC	
Haem peroxidase	43	Forward CAGGCATGCGCTACGAGGCT	800
		Reverse ACCAGCTTACAGACGTGCCCTGA	
Multicopper oxidase	46	Forward TGGGCGGGCAGGTACGTGAAT	1935
		Reverse TCCGTGCTCTGGCCTCGCAT	
Multicopper oxidase	49	Forward GCTGGCGACGACAAGTGGCT	2033
		Reverse CCACAGAGTTCGCGAGGCC	
Multicopper oxidase	52	Forward CATCCCACCGCGGGAAGCCT	2172
		Reverse ATCCCCGCCGTACGGTTTT	
Multicopper oxidase	55	Forward TCGTTGAAGTCGCTGTCCCCT	1944
		Reverse GCCCCGCACACCTGCCATAG	
Multicopper oxidase	58	Forward TGCTTGCTCAAGGGCGCTCA	2177
		Reverse TCAACTCAGACTACTGTCTGAAGTGC	

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Gene name	SEQ ID No.	Primer Sequence	Amplified product (bp)
Multicopper oxidase	61	Forward CACTGGCACGGCTTCACGCA	4930
		Reverse CCGCTACGCGGTCGACTCCT	
Multicopper oxidase	64	Forward CACCCTCCGGTCGGGTAAGT	2116
		Reverse TACAGGTGCTATGCCAGCGTGC	
Multicopper oxidase	67	Forward TAGCATCGGCACAACGCCCAT	1246
		Reverse GAACCGGTGGCCGTGAAGGTG	
Multicopper oxidase	70	Forward ACCCACCGCTCGCTCTACA	2083
		Reverse TGGAAATGCGCAGAAGGACCGT	
Multicopper oxidase	73	Forward GCACGACATGTGGATTGCGGC	788
		Reverse TTGCCAGCCGTGCTCCGTCA	
Multicopper oxidase	76	Forward ACGACGTTGCAAGCTCCGCC	2022
		Reverse CCATCGGGCATAGAAGTCGCCG	
Multicopper oxidase	79	Forward TTCACCGGAGTCGCCTTCCCA	2249
		Reverse CGACGGGCTGCAGTACGAGA	
Multicopper oxidase	82	Forward AATCCCCTCTCACCTCGCCGC	2103
		Reverse GGCCACCCCTCAGAGACCGGA	
Multicopper oxidase	85	Forward CGCCGAACCAAAGCCTCCTCC	2858
		Reverse GCACAGGAGAAAGAGCTCACCCC	
Multicopper oxidase	88	Forward TCGCCCGTCCAGGAGAGATA	2208
		Reverse CCCCCATCTACCGGCCATTC	

Atty. Docket No. JGX-006.25

Gene name	SEQ ID No.	Primer Sequence	Amplified product (bp)
Multicopper oxidase	91	Forward ATGAGGGGTAATCGCGACGG	2382
		Reverse CCCTCTCACAACCTGACCCTGT	
Multicopper oxidase	94	Forward TCACTCAGTGCCCTACCGCTCC	1299
		Reverse CCGCAACGACTCCGTCCGGT	
Multicopper oxidase	97	Forward TGGGCTGATCCCGTTGCAGGA	1405
		Reverse GTAGCCGTGGCTGAGCGTGTT	
Multicopper oxidase	100	Forward TGCCGTTGCTGTAACATGCCGT	2099
		Reverse GACGGCGCTTTGCTCTTGCG	
Multicopper oxidase	103	Forward AGCATGCAATACTCGGTCGGTCT	633
		Reverse CGGGCAGCAGGATGTTTGCCAT	
Multicopper oxidase	106	Forward GGATACTCTCCGGGCACGTTCCG	1703
		Reverse ATGGCAGTGGACTGCGCGAC	
Multicopper oxidase	109	Forward GGAGGGAGCACTGATGCGCT	1873
		Reverse GGCTGCTCCTCCGCTCATGG	

Example 2 Amplification, cloning and sequencing of lignin peroxidase, chloroperoxidase, haemperoxidase and multicopper peroxidase from *M. phaseolina* ms6

Total RNA was isolated from three days old mycelium grown on liquid medium as previously described by Chomczynski P and Sacchi N, Single-step method of RNA isolation by acid guanidinium thiocyanate-phenol-chloroform extraction. (Anal Biochem 1987, 162: 156-159). The quality or the integrity of the RNA was checked by agarose gel electrophoresis and was quantified using Thermo Scientific Nano Drop 2000 as per standard procedures. cDNA first strand was synthesised using SuperScript III reverse

transcriptase (Invitrogen) following the manufacturer's instructions. The gene was amplified from the cDNA by PCR using the gene specific primers. The PCR reaction (50 μ L) contained 1 μ L of cDNA, 20 pmoles of each primers, 5 μ L of 10X PCR Buffer, 5 μ L of 2.5 mM dNTP mix and 1.0 unit of PfuTaq DNA polymerase. PCR was carried out in Thermal
 5
 10
 15
 Sequencing.

Example 3 Analysis of the sequence

The nucleotide sequence and the amino acid sequence were analyzed by BLASTN and BLASTP programs respectively. The sequences reported from other plants were aligned with ClustalW. Phylogenetic analysis was carried out using the Neighbour Joining (NJ).

20 SEQ ID NO : 1
 LENGTH : 1379 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 25 CTGCTCAGCAGATCTTATCCCTCCAGAGCCAGAGCATCTTTAACTGACCAGCTTGCCTTCGTCCCAT
 CGTTTGCATTTTTTTTACACTTGACCAGTCAAGGCCCTCTTCTTCTTTGAGACCGCTACACCCACC
 CCTTCGTACTGTCAAAATGTTATTCTCAAAGTCTTCCATCTTCTCCTCTCCACTGCGGCCAGTGTG
 CAAGCACTCAGCCTCTCCGATGTCTCCTCTGCCGCCTCGGTCTGAAGCGTGAAGCTTCCGGCTTGG
 GGAACAACCTTCTATCTCTCGTTACCGTCGGGACTCTTGCCCTGATGTTTGGCAGAAAGTCGCATC
 CGAGCTGAAGGGCTGGTTCTTGATGGTTCCGTGTGCAGTGACGACGCACGCGCTGCCATCCGCCTC
 30 TCTTTCACGACTGCTTTTCCGGCGGCTGCGATGGGTCCATCATCCTTGCCCACGAGTACACCCGCT
 CCGACAACGCTGGCTTAGCAGACTTTTGCTATGAAGCTAGCGCCTCTCGCGGACCAGTACGAGGTGCG
 AACAGCTGACCTGATCCAATTGCGTGGCGGTAAGCCTTATCTATCCACCTTAAAAA
 aGGAAAAAaGACTATCTCTAACACCTACCTCGACCAGCCCTCGCCACGGCCACCTGTCCCCTCGGC
 CCCCCATAGCCGTCAAAGTCGGCCGCCAGGACTCGTCAACGCCCTCGGCAGAGGGACAGCTCCCCT
 35 CGTCGCGATCCTCGGCCTCCGTCTGATCGACCAGTTCGCGGCGAAGGGGTTCTCTGAGATAGACCT
 CGTCGCCCTCGTCGGTGCCACAGCACTGCCAAGCAGTTCTTCGATCAGCCCCACAAGGCCGGCCAA
 AGCCTCGACTCCACCCCCGCACTTGGGACACCAACTTTTACCGCCAGACGACGCTCGGCACTGCGC
 CCGTTACCCTCGAGAGCGATAAGAACCTCGCCACGGATCTGAGGACCGCGGTGCAGTGGACGGCGTT
 TAATGCCAGGGCGTGTGGCCCGGCGTATGTGAGCGCGTAAGTAGTGCATCATATGTTTCTTCTC

5 TGCTCTCAGATTGTTGAGA ACTAATGGTCAATGTAGGATGAACAAGATGACCGTTTTGGGCAATGAT
 GTCAGCAGCTTGACGGATTGCACGAGTGTATCAGTGCGGCAACGAGCAAGCGCGACATCAAGGCCG
 CACCTATTGCGGATAGGATTTGAGCTATGCAAGCAGTTCTGGGTGAGCGAGGTCGTAGTGGGTGAC
 TGGAGTCTGTTTTTTTTTTTTTTtCTTAATTGGTAATGTCTGCTCTTGTGTTGATACCTGCCAGTATT
 CGCGATTTATTCATCGGGAAGAGTTTAGAGAAGGGGGCA

SEQ ID NO : 2
 LENGTH : 939
 TYPE : DNA
 10 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS
 LOCATION : (1).....(939)

atgttattctcaaagtcttccatctttctcctctccactgcgccagtggtgcaagcactc
 M L F S K S S I F L L S T A A S V Q A L
 15 agcctctccgatgtctcctctgccgcctcggctcctgaagcgtgaagcttccggcttgggg
 S L S D V S S A A S V L K R E A S G L G
 aacaaccttctatctctcgttcaccgctcgggactcttgccctgatggttggcagaaagtc
 N N L L S L V H R R D S C P D V W Q K V
 20 gcatccgagctgaagggctggttcttgatggttccgtgtgcagtgacgacgcacgcgct
 A S E L K G W F L D G S V C S D D A R A
 gccatccgcctctctttccacgactgctttccggcggtgcgatgggtccatcatcctt
 A I R L S F H D C F S G G C D G S I I L
 gccacgagtagaccccgctccgacaacgctggcttagcagactttgctatgaagctagcg
 A H E Y T R S D N A G L A D F A M K L A
 25 cctctcgcggaccagtagcaggtcggaaacagctgacctgatccaattcgcgtggcgcctc
 P L A D Q Y E V G T A D L I Q F A G A L
 gccacggccacctgtccctcggcccccgcatagccgtcaaagtcggcccgccaggactcg
 A T A T C P L G P R I A V K V G R Q D S
 30 tcaacgccctcggcagagggacagctcccctcgtcgcgatcctcggcctccgtcctgatc
 S T P S A E G Q L P S S R S S A S V L I
 gaccagttcgcggcgaaggggttctctgagatagacctcgtcgcctcgtcgggtgccac
 D Q F A A K G F S E I D L V A L V G A H
 agcactgccaaagcagttcttcgatcagcccgacaaggccggccaaagcctcgactccacc
 S T A K Q F F D Q P D K A G Q S L D S T
 35 cccggcacttgggacaccaacttttaccgccagacgacgctcggcactgcgcccgttacc
 P G T W D T N F Y R Q T T L G T A P V T
 ctcgagagcgataagaacctcgccacggatctgaggaccgcggtgcagtgagcggcggtt
 L E S D K N L A T D L R T A V Q W T A F
 40 aatgccagggcggtgtggggcgcggcgatgtgagcgcgatgaacaagatgaccgttttg
 N A Q G V W A A A Y V S A M N K M T V L
 ggcaatgatgtcagcagcttgacggattgcacgagtggttatcagtgccgcaacgagcaag
 G N D V S S L T D C T S V I S A A T S K
 cgcgacatcaaggccgcacctattgcgataggatttga
 45 R D I K A A P I A D R I -

SEQ ID NO : 3
 LENGTH : 312
 TYPE : PRT
 ORGANISM : *M. phaseolina*
 50 MLFSKSSI FLLSTAASVQALSLSVSSAASVLRKREASGLGNLLSLVHRRDSCPVDVWQKVASSELKGW
 FLDG SVCSDDARAAIRLSFHDCFSGGCDGSIILAHEYTRSDNAGLADLFAMKLAPLADQYEVGTADLI
 QFAGALATATCPLGPRIAVKVGQRDSSTPSAEGQLPSSRSSASVLI DQFAAKGFSEIDLVALVGAHS
 TAKQFFDQPKAGQSLDSTPGTWD TNFYRQTTLGTAPVTLESDKNLATDLRTAVQWTFNAQGVWAA
 A YVSAMNKMTVLGNDVSSSLTDCTSVISAATSKRDIKAAPIADRI*

55

SEQ ID NO : 4
 LENGTH : 1416 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 ORGANISM : *M. phaseolina*

5 TCTATATCTTGGCCCTTCGCCTGTTTCGCTTCAGGAGAACCCAACGCCAACATTCAATCTCAACCTCCT
 CTTTGAGTTACAATCGCTACTCTGGGAAATTTGTCCCAGCCTTTCATTCAACAACCTGTTTCTGTTTC
 AAACCAATCCGACGCCATGAAGTTCTCCACAGTCATCTCGAGCGTTGCTCTCACTTCTCTACTCCAG
 CCCGCCCTTGCCTACCCTGGCATGGCAAATGTCGTCTCGGAGATCAAGGCCCGTCAAAACACCAATA
 10 ATGATGGTGACTIONCAAATCCCGAGATGATTGGCGATCTCGCCACCACCGGCCAACACCCCTGTGGG
 CCAAAGCATATAACAATCCTGATGGGGACCGAGTCGGCCGAGACCAAGCAGGCTGGCTACATCCCC
 CCTCTTATCGGCACCAACGCCTGCAAGAGGGACACCTGCTGCATCTGGGCCTACATCGCCGCCGAAC
 TGACCCCTCAATTTCAAGGGCATCACGGGCCGCTGCAACAAGAACGCGCGTGC CGCCATTCCGGCTCGG
 CTTCCACGACGCGGGGACTTGGTCCAAGAGCAGCAACGGCGGCGGCGCGGACGGCTCGATCGCGCTG
 15 TCGGGCACGGAGATCAACAAGGCCGAGAACAACGGGCTGCAGGACATCATCGGCAAGATGATCACGT
 GGCAGAAGCGGTACGGGGTGGGCATGGCGGATCTGATCCAGTTCGCGGCCATCCACGCCGTGGTGAC
 GTGCCCGCTGGGGCCGCGCATCCGCTTCTTCGTTCGGGCGCAAGGACAGCAAAACGGCCAACGACGTC
 AGCCTGCTGCCGGCGTCAACGATTTCGGCCGACAAGCTGATCGCGCTCTTCCAGGACAAGACCATCA
 CGCCGCACGAGCTCGCCGCCCTGCTCGGCGCCACACCACCTCACAGCAGTTCCTTCGTGACACCAC
 20 CCGCGCCGGCGCCCCCAGGACAGCACCCCGGCGTCTGGGACACCCGCTTCTACAACCAAACCACC
 TCCGACCAAGTTCCCAAGAAGGTCTTCCGCTTCGCCAGCGACGTTGTGCTGGCCAAGGACCCGCGTA
 TGAGTGATGAGTGGGCCCGCTTCGCCGACCCCGTCAAGGGCCAGAACCCTGGAATGAGGATTACGC
 CACCGCCTATACCCGCTCAGCCTGCTCGGCGTCAACAACATCAATAACTTGACTGAGTGCAGCAAG
 GTGCTGCCGTGGGCGCAACCGAAGTTCCCGATGCCTGGAACCTGTTCTTGACCAGTAGAGTGTAG
 25 TTTCTTCTTAATATCTGGCGTTCTTGGGGTTCGGTCAAAAAGGAGAAAGATATTATTGTGATATT
 TGGTATACCCTAATGTTGGAACTATACATACGTATACAGGCTTCTTGTAATTACTCGGGCATCTTT
 TGCACAGAG

30 SEQ ID NO : 5
 LENGTH : 1116
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS
 LOCATION : (1).....(1116)

35 atgaagttctccacagtcacatctcgagcggtgctctcacttctctactccagcccgccctt
 M K F S T V I S S V A L T S L L Q P A L
 gcctaccctggcatggcaaatgtcgtctcgagatcaaggcccgtaaaacaccaataat
 A Y P G M A N V V S E I K A R Q N T N N
 gatggtgactcaaatcccgagatgattggcgatctcgccaccaccggcccaaccaccct
 40 D G D S N P E M I G D L A T T G P T T P
 gtgggccaaagcatataacaacatcctgatggggaccgagtcggccgagaccaagcaggct
 V G Q S I Y N I L M G T E S A E T K Q A
 ggctacatccccctcttatcgccaccaacgcctgcaagagggacacctgctgcatctgg
 G Y I P P L I G T N A C K R D T C C I W
 gcctacatcgccgccaactgaccctcaatttcaagggcatcacgggccgctgcaacaag
 45 A Y I A A E L T L N F K G I T G R C N K
 aacgcgctgcccgcattcggtcggcttccacgacgcggggacttggtccaagagcagc
 N A R A A I R L G F H D A G T W S K S S
 aacggcggcgccgacggctcgatcgcgctgtcgggcacggagatcaacaaggccgag
 N G G G A D G S I A L S G T E I N K A E
 50 aacaacgggctgcaggacatcatcggaagatgatcacgtggcagaagcggtagcggggtg
 N N G L Q D I I G K M I T W Q K R Y G V
 ggcatggcgatctgatccagttcggcgccatccacgcccgtggtgacgtgcccgctgggg
 G M A D L I Q F A A I H A V V T C P L G
 ccgcgcatccgcttcttcgtcgggcaaggacagcaaaacggccaacgacgtcagcctg
 55 P R I R F F V G R K D S K T A N D V S L

ctgccgggctcaacgattcggccgacaagctgatcgcgctcttccaggacaagaccatc
 L P G V N D S A D K L I A L F Q D K T I
 acgccgcacgagctcgccgcctgctcggcgccacaccacctcacagcagttcttcgctc
 T P H E L A A L L G A H T T S Q Q F F V
 5 gacaccaccgcgccggcgccccccaggacagcaccggcgctctgggacaccgcttc
 D T T R A G A P Q D S T P G V W D T R F
 tacaaccaaccacctccgaccaagttcccaagaaggtcttccgcttcgccagcgagctt
 Y N Q T T S D Q V P K K V F R F A S D V
 gtgctggccaaggaccgctatgagtgatgagtgggcgcccttcgccgaccccgctcaag
 10 V L A K D P R M S D E W A A F A D P V K
 ggccagaaccactggaatgaggattacgccaccgcctataccgcctcagcctgctcggc
 G Q N H W N E D Y A T A Y T R L S L L G
 gtcaacaacatcaataacttgactgagtgagcaaggtgctgccgtggcgcaaccgaag
 V N N I N N L T E C S K V L P W A Q P K
 15 ttccccgatgcctggaacctgttcttgaccagtag
 F P D A W N L F L D Q -

SEQ ID NO : 6
 LENGTH : 371
 20 TYPE : PRT
 ORGANISM : *M. phaseolina*
 MKFSTVISSVALTSLLPALAYPGMANVVSEIKARQNTNNDGDSNPEMIGDLATGPTTPVGQSIYN
 ILMGTESAETKQAGYIPLIGTNACKRDTCCIWAYIAAELTLNFKGITGRCNKNARAAIRLGFHDAG
 TWSKSSNGGGADGSIALSGETEINKAENGLQDIIGKMITWQKRYGVGMADLIQFAAIHAVVTCPLGP
 25 RIRFFVGRKDSKTANDVSLLPVNDSDAKLIAFQDKTITPHELAALLGAHTTSQQFFVDTRAGAP
 QDSTPGVWDTRFYNQTTSDQVPKKVFRFASDVVLAKDPRMSDEWAAFADPVKQNHWNEDYATAYTR
 LSLLGVNNINNLTECSKVL PWAQPKFPDAWNLF LDQ*

SEQ ID NO : 7
 30 LENGTH : 1323 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 TCGAGATGGCGGCTCTCTCGCAGACGTAAATCTATAAAGCCTTGCCGCGACTTTCTTTTGTGTATCT
 CATCAGCATCGAGTTCCACAAGAGCTTGCTTCCTCTCCTCACTGAGCCTAGCGAGGAGCATCACTCA
 35 GAACCTCCAATCACAATGCGGACCTCATCCCTGTTTCTTGCTTCCGCATGCGGAACATCTGCTTAC
 ACTCTCGTCTCGCTCGACTCTCTGCCAAGCACTCTTATGACATAACCTCCCGCACCATCTCCAACC
 TCGACCCCGCAACCTCCTCTCCGCGCGCAAGACGCCGACTGCCCGGCCATCTGGAGGACCATCTC
 AGCCGACCTGACCAAGAGCTTCCTCGCCAACGCGGAGTGACCCGACCTCGCCCGCGCCGATCCGC
 TACGCCTTCCACGACGCGGGCACCTTCTCGCTCAAGCTGCCACCTACGCGCCGGCCTCCGGCGGCG
 40 CCGACGGCTCGCTGCTGCTCGTTCGATTCCGAGATCCAGCGGCCGAGAACACGGGCTGCAGGCGTA
 CAACGACTTCATCAAGGCCAAGTACAGCACGTACAAGTCTCGGGCGTTCGGCGCCGCCGACCTGATC
 CAGTTCGCGGGCAACCACGCGTGGTGACGTGCCGGGCGGGCCACGGTCAAGACGCTCGTTCGGCC
 GCGGCGACAGCACGACCGCTCGCCGCTGAACGTGATGCCGCGGGGTTTCGGCGGGGACGACCA
 CGACTCGTCTGCTCCAGCTCTTCCAGGACAAGGGGTTTCAGCGCCGTCGACCTGGCCGCGCTGATCGGC
 45 GCCCACACCACCTCCACGAACATCGCGGAGGCGCAGATCCCCGTCGGCGCGCCCGCAGGACAGCACGC
 CGGGCAGGTGGGACGTCAAGTACTACGCCGAGACGTACGCCCGCCCGCGGGCGTCTCCCGCTTCGC
 CTCCGACATCAACCTCTCCGACCCGACGAAAGCGGTTCGGCAAAGAGTTCCAGGGATTCGTCAACAAC
 CAGGGTAAGTGGACGGGCAAGTTTGGCGACGCCATGTTCCGTCTGAGTGTGTTGGGCATCCCGCCGG
 CGACGTACAAGAATTTTCGCGACTGCACCGCTGCGCTGCCAAGGGCACGAGCGCCAAGCGGGACAT
 50 CCGCAGCGCCCCGATCAACGACCGCGCAAGGTAGAGGAGGGGAAAAGAAAGAAAGAAAATAA
 AAAGCGCAGCGAGGATGAATCGGTTGGGGCAGGGCGTTTCGGTTGAGGTTGTTTGTTCGCTCGCCTG
 CCTTTTTTTTTTTTTTTtAATCCCTCTCATGATCCATCGAATGAGAACACTT

SEQ ID NO : 8
 55 LENGTH : 1023

TYPE : DNA
 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS

LOCATION : (1).....(1023)

5 atgCGGacctcatccctgTtccttgcttccgcAtgCGgaacatctgcttacactctcgTc
 M R T S S L F L A S A C G T S A Y T L V
 tcgctcgactctctgccaagcactcttcatgacataacctcccgcaccatctccaacctc
 S L D S L P S T L H D I T S R T I S N L
 gacccccgcaacctcctctccgcgcgcaagacgcccgactgcccggccatctggaggacc
 10 D P R N L L S A R K T P D C P A I W R T
 atctcagccgacctgaccaagagcttccctcgccaacggcgagtgcaccgacctcgcccgc
 I S A D L T K S F L A N G E C T D L A R
 gccgccatccgctacgccttccacgacgcgggcaccttctcgctcaagctgcccacctac
 A A I R Y A F H D A G T F S L K L P T Y
 15 gCGccggcctccggcggcgccgacggctcgctgctgctcgctcgattcggagatccagcgg
 A P A S G G A D G S L L L V D S E I Q R
 cccgagaacaacgggctgcaggcgtacaacgacttcatcaaggccaagtacagcacgtac
 P E N N G L Q A Y N D F I K A K Y S T Y
 aagtccctcgggcgtcggcgccgcccacctgatccagttcgccggcaaccacgccgtggtg
 20 K S S G V G A A D L I Q F A G N H A V V
 acgtgcccggggcgccacggtaagacgctcgctcggccgcgccgacagcacgaccgcg
 T C P G G P T V K T L V G R G D S T T A
 tcgCCgctgaacgtgatgCCgCCggggttcggcgCGggcagcGaccacgactcgctgctc
 S P L N V M P P G F G A G S D H D S L L
 25 cagctcttccaggacaaggggttcagcgcctcgacctggccgCGctgatcggcgcccac
 Q L F Q D K G F S A V D L A A L I G A H
 accacctccagAACatcgCGgaggcgcagatccccgtcggcgCGccgCaggacagcagc
 T T S T N I A E A Q I P V G A P Q D S T
 ccgggcaggtgggacgtcaagtactacgCCgagacgtacgccccgcccggggcgtctcc
 30 P G R W D V K Y Y A E T Y A P P A G V S
 cgcttcgctccgacatcaacctctccgacccgacgaaagcggtcggcaaagagttccag
 R F A S D I N L S D P T K A V G K E F Q
 ggattcgtcaacaaccagggttaagtggacgggcaagtttgccgacgccatgttccgctcg
 G F V N N Q G K W T G K F A D A M F R L
 35 agtgtgttgggcatcccgcccgcgacgtacaagaatttcgCGgactgcaccgctcgctg
 S V L G I P P A T Y K N F A D C T A A L
 cccaagggcagcagcGccaagcgggacatccgcagcGccccgatcaacgaccgCGcaagg
 P K G T S A K R D I R S A P I N D R A R
 tag
 40 -

SEQ ID NO : 9
 LENGTH : 340
 TYPE : PRT

45 ORGANISM : *M. phaseolina*
 MRTSSLFLASACGTSAYTLVSLDLSLPSTLHDITSRTISNLDPRNLLSARKTPDCPAIWRITISADLTK
 SFLANGECTDLARAAIRYAFHDAGTFSLKLPTYAPASGGADGSLLLVDSEIQRPENGLQAYNDFIK
 AKYSTYKSSGVGAADLIQFAGNHAVVTCPPGPTVKTLVGRGDSTTASPLNVMPPGFGAGSDHDSLLQ
 LFQDKGFSAVDLAALIGAHTTSTNIAEAQIPVGAPQDSTPGRWDVKYYAETYAPPAGVSRFASDINL
 50 SDPTKAVGKEFQGFVNNQGWTKGFADAMFRLSVLGIPPATYKNFADCTAALPKGTSAKRDIRSAPI
 NDRAR*

SEQ ID NO : 10
 LENGTH : 1930 (including 150 bp 5' UTR and 150 bp 3' UTR)

TYPE : DNA
ORGANISM : M. phaseolina

GAGCACGGCAGGTAGGTTGCATCCGAGAGGTCGTGGTAGGTAGGTATATATTGCTGCCTCCGCTCTG
TCGCTCTATAGAGGCAGGTCTTGGACATCTGTGAACAGGTTACCTTCTCATAATTTGATCCATTGGC
5 GAAGATATACTCAAGAATGCCGTCTACCTGGATGATTGCATTGGGCGCACTCACCCcTTGCCGGCCAG
TCCGCAGCCTTTCTGTCTGTGGCAGAACAATACGCTGCTCAGACATCTCACAAGGAGAAAAGAGTAA
ATGCAATTAGCCCCGGGTTCAATGCGGCGGCACAGAGGATTGACGTCTCGGGAGCTCACACTTTTCGT
GCCCCCTGGCCCCGGTGACCAGAGAGGGCCCTGCCCGGGTCTGAATGCCTTAGCGAACCAGTAAGTG
10 CTCTGCAAGTCTCACAGGTCTTCTTGTACTGACAAAGTGTAGCAACTATTTGCCCCAGTGAGTTCTC
CACAACCTTATTCCCAGAACCTTGTACTGATTGTCTTTCAGCAATGGCGTTCGCAACAATCACGCAGT
TCGTCCAGGCCACAAACCAGGGTTAGTACAGCATCACCGCCACGGAAGCTACTACGTCTAGCTGAACC
ACATACGCAGTATACGGCATGGGTCTCGACCTTGGCACGTTCTGTCCGTCTACGGCGCGGTAATGG
ATGGCGACGGCCTCAGCTGGTCCATCGGCGGCGCGCCAGTACCGCAAACCTACTCAACCTCCTTAC
15 TCAGCCGCAAGGCCTCTCAGTTTCGCACAACAAGTACGAGACAGATGCATCGCTACGCGCGGAGAC
CTGTACCAATAGTGCCTATCCCCTTCTTCTGCCTCCCGCCACTCCGCTGACCTGCACCGCAGTGG
CGACAACCTCCCAGGTCGTCAATTCGCAATGGGACGCCCTCTTCGCGAAGCAAGCGGCACTGCCCAAT
GACCAGTCCAATTATGGCTAGGTGTGCTGACCGACTTCCGAGTCGAGCGTTTCCAGCAGAGCGTCG
ATGAAAACCCCTACTTCTTCAACGCGCCCTTTTCCGGTGTGCTCGTGCAGCCTGCCGCGTACACATT
20 CATCTACCGCTTCATGGGCAACAAGAGCGCCGAGAAACCCGAGGGTGTGCTGACGAAAGAGGTGCTG
AAGAGCTTCTTCGGCTTCACTGGGCTGACGACGACATGACATACGTGAGTCCCATCCCAGCCGCTT
TCTCATTTCTTCCCACTCGAGTCTCCACATCCCCCCCCCCCCCCCCCCCCcACcATTTGTTG
TCGCCCTTCCCTCCAGCCACGCCACTGCCCAACGCCACCGTCTGACCCACCGCAGAACCCCGGCC
ACGAGCGCATCCCCGAAAACCTGGTACAAGCGCGCCCCGGCGACGAATACACGATCCCCTTCTACGC
25 ACTTGACCTCAACGCCGCGCGCTGCAGCACCCGCAATTCTGTCCGTTCGCGGCAACACGGGCACC
ACCAACTCCTTCGCCGGCGTTCGACCTGCAGGACCTGAGCGGCGGCTGTACAACGCCGCCAGCCTGC
TCGAGGGCAACAACCTCGCTTCCGTTTCCAGGCGGCCGTTCCAATTTCGCGCCGACCTGTTGAA
AGGGCTGGTGGAGCGATTTGACCAAGCCGTTGGTGTCTTGGGAGATGCGTTGGCGAGTGCCTTGAAT
GGATTAGGTGTCCGCAGTTAGGCGGCCAGGCGTGGGATGATAGCGCGCTGGCGCAGTTTCCGGGGT
30 ATGCTAGGCTGAGGGCGGATGGGACGTACGGGAAGTAATGGACGCGGAGAAGTAGTGTGGCAGAGGC
GACATGGTGCATGGTGGACTGCGGCTTCAACGACAATGCAGAGATGATGGTATGAGGAAACTGCA
CAGCAGTCTGCATGGATTGTCTAGACTAGACGAATTTTATGATTTTGAATGAAC

SEQ ID NO : 11
LENGTH : 1260
35 TYPE : DNA
ORGANISM : M. phaseolina
FEATURE NAME/KEY : CDS
LOCATION : (1).....(1260)

atgccgtctacctggatgattgcattgggcgcactcacccttgccggccagtcgagcagcc
40 M P S T W M I A L G A L T L A G Q S A A
tttcctgctgtggcagaacaatcgctgctcagacatctcacaaggagaaaagagtaaat
F P A V A E Q Y A A Q T S H K E K R V N
gcaattagccccgggttcaatgcgggcgacagaggattgacgtctcgggagctcacact
A I S P G F N A A A Q R I D V S G A H T
45 ttcgtgccccctggccccggtgaccagagagggccctgccccgggtctgaatgccttagcg
F V P P G P G D Q R G P C P G L N A L A
aaccacaatggcgtcgcaacaatcacgcagttcgtccaggccacaaaccaggatatacggc
N H N G V A T I T Q F V Q A T N Q V Y G
atgggtctcgaccttggcacgttccctgtccgtctacggcgcggtaatggatggcgacggc
50 M G L D L G T F L S V Y G A V M D G D G
ctcagctgggtccatcggcggcgcgcccagtagcgaacactactcaacctccttactcag
L S W S I G G A P S T A N L L N L L T Q
ccgcaaggcctctcaggttcgcacaacaagtagcagacagatgcatcgcctacgcgcgga
P Q G L S G S H N K Y E T D A S P T R G
55 gacctgtaccaatatggcgacaactccccgggtcgtcatttcgcaatgggacgcccctcttc

D L Y Q Y G D N S R V V I S Q W D A L F
 gcgaagcaagcggcactgcccaatgaccagtccaattatggcctaggtgtgctgaccgac
 A K Q A A L P N D Q S N Y G L G V L T D
 ttccgagtcgagcgtttccagcagagcgtcgatgaaaaccctacttcttcaacgcgccc
 5 F R V E R F Q Q S V D E N P Y F F N A P
 ttttccggtgtgctcgtgcagcctgccgcgtacacattcatctaccgcttcatgggcaac
 F S G V L V Q P A A Y T F I Y R F M G N
 aagagcgcggagaaaccgaggggtgtgctgacgaaagaggtgctgaagagcttcttcggc
 K S A E K P E G V L T K E V L K S F F G
 10 ttcaactgggctgacgacgatgacatacaaccccgccacgagcgcacccccgaaaac
 F T G P D D D M T Y N P G H E R I P E N
 tggtagaagcgcgccccggcgacgaatacacgatccccttctacgcacttgacctcaac
 W Y K R A P G D E Y T I P F Y A L D L N
 gccgcggcgtgcagcaccgcaattcctgtccgtcggcggcaacacgggaccaccaac
 15 A A A L Q H P Q F L S V G G N T G T T N
 tccttcgcccgcgtgcacctgcaggacctgagcggcggcctgtacaacgccgcccagcctg
 S F A G V D L Q D L S G G L Y N A A S L
 ctcgagggcaacaacctcgctgcttcggtttccaggcggccgtccaattcgcgccggac
 L E G N N L A C F G F Q A A V Q F A P D
 20 ctggtgaaagggctggtagcgatttgaccaagccggtgggtgtcctgggagatgcgttg
 L L K G L V S D L T K P L G V L G D A L
 gcgagtgcggtgaatggattaggggtgccgcagttaggcggccaggcgtgggatgatagc
 A S A L N G L G C P Q L G G Q A W D D S
 gcgctggcgcagtttccggggatgctaggctgagggcggatgggacgtacgggaagtaa
 25 A L A Q F P G Y A R L R A D G T Y G K -

SEQ ID NO : 12
 LENGTH : 419
 TYPE : PRT
 30 ORGANISM : *M. phaseolina*
 MPSTWMIALGALTLAAGQSAAFPAVAEQYAAQTSHKEKRVNAISPGFNAAAQRIDVSGAHTFVPPGPG
 DQRGPCPLNALANHNGVATITQFVQATNQVYGMGLDLGTFLSVYGAVMDGDGLSWSIGGAPSTANL
 LNLLTQPQGLSGSHNKYETDASPTRGDLYQYGDNSRVVISQWDALFAKQAALPNDQSNYGLGLVLTDF
 RVERFQQSVDENPYFFNAPFSGVLVQPAAYTFIYRFMGNKSAEKPEGVLTKEVLKSFSGFTGPD
 35 TYNPGHERIPENWYKRAPGDEYTIIFYALDLNAAALQHPQFLSVGGNTGTTNSFAGVDLQDLSGGLY
 NAASLLEGNNLACFGFQAAVQFAPDLLKGLVSDLTKPLGVLGDALASALNGLGCPQLGGQAWDDSAL
 AQFPGYARLRADGTYGK*

SEQ ID NO : 13
 LENGTH : 1108 (including 150 bp 5' UTR and 150 bp 3' UTR)
 40 TYPE : DNA
 ORGANISM : *M. phaseolina*
 CTGATGGTATGTACTTTGGTAAGCACGCCATTAACACTCGCTCCATCGCCTCGAGTTACCCTGTTG
 GAGCAGCAACCACAACCTTGAGCGAACAAATTCGGCCATTAATACCATCGTACGAAGAAGGCTTAACC
 GCTTTACCTGCCAGCCATGAATCCAATCTGCTTTTTATCCCTGCTCACGGCCATGCTAGGCATGGCC
 45 ATGGGCGGTGGAACCCCTCTGAACCATGCTGAACCTTTTGATCCCACGAACAGCTTGTGGGTGTGAC
 TGATGCGCATGAGCCATTCTTCTGATATCACCAACGCTCGCAGCCCCTGTCCCGGCCTTAACACG
 TTGGCGAACAGGAAGCTCATTGCCCCCTTGCTATGAAGAAAACCTGGAATTTACGCTCCTCCCGG
 TGGCTTCGACGGTGTGCGGAACACGATGAACCTTGTTAAGGCTCTGGTTGATAGTGTGTTGCTTTT
 ATCGGGGGTACCACCTTTGCGTTGACGAGAACATCACGATTCGGCCTAATAATTTACACGCAGCC
 50 TCAGCGGCACACAAATCTCCCTAGATTCTGAGGCCTCGCCTACACGCCACGACGCGTACGACCCCTCG
 GGCTACTCCGGCTCGAGCAGCATCGAAATGAAGTGAACCTTCTTCAAACAGCTGTACGAGAAGCAG
 GCCGGGATCCCACGCGATGCGGTTAACTTTGCACTGGATGTTCTTGCTCAAACATGTTGGAGCTGG
 TGGTGGTCAGCATCAAGAACAACCCGAACTTCTTCTGAGCCCAACGCACATCGCATTCCGACCATC
 GACGGCCACATGTGCATTCCTCAACTTGTTCGCGAACACAGCACTGAGCATTGGCTGACCTCTCTC
 55 CTGAATAGAGAGGGGAGGGTCTCGCCATTCAATCCATGCTCAAACATGACGCTTTGTAGTCTTCAGC

TCAGATTGTCACCAATCTGAAGGCGAGATCCCACCTTCTATACTCAGATTAAAGACCTAATAATACAA
TCGTATACTCAGCGAGAGAAGCACGAGAAGGACCGAGCCAACATTCACCTCATCCTTCACACAACAC
ACTCCTGAGCACCGACCCCAATTCTAAATCAGCCCC

5 SEQ ID NO : 14
LENGTH : 690
TYPE : DNA
ORGANISM : *M. phaseolina*
FEATURE NAME/KEY : CDS

10 LOCATION : (1).....(690)

atgaatccaatctgctttttatccctgctcacggccatgctagggcatggccatgggcggt
M N P I C F L S L L T A M L G M A M G G
ggaaaccctctgaaccatgctgaaccttttgatcccacgaacagcttaaaacctggaatt
G N P L N H A E P F D P T N S L K P G I
15 tacgctcctccccgggtggcttcgacgggtgctcggaactacgatgaacttgtaaggctctg
Y A P P G G F D G V A N Y D E L V K A L
gttgatagtgtgttggcttttgatcgggggtcaccacctttcggttgacgagaacatcacg
V D S V L L L I G G H H L S V D E N I T
attccgcctaataatctcacacgcagcctcagcggcacacaaatctccctagattctgag
20 I P P N N F T R S L S G T Q I S L D S E
gcctcgctacacgccacgacgcgtacgacctcgggcctactccggctcgagcagcatc
A S P T R H D A Y D P R A Y S G S S S I
gaaatgaagtggaaacttcttcaaacagctgtacgagaagcaggccgggatcccacgcgat
E M K W N F F K Q L Y E K Q A G I P R D
25 gcggttaactttgcaactggtgctcttctgctcaaacatggtggagctggtggtggtcagc
A V N F A L D V L A Q N M L E L V V V S
atcaagaacaacccgaacttcttctgagcccaacgcacatcgcattcggaccatcgagc
I K N N P N F F L S P T H I A F G P S T
gcccacatgtgcattcccaacttgctcgcgaaccacagcactgagcattggctgacctct
30 A H M C I P N L F A N H S T E H W L T S
ctcctgaatagagagggagggtctcgccattcattccatgctcaaactatgacgctttgt
L L N R E G G S R H S F H A Q T M T L C
agtcttcagctcagattgtcaccaatctga
S L Q L R L S P I -

35

SEQ ID NO : 15
LENGTH : 229
TYPE : PRT
40 ORGANISM : *M. phaseolina*

MNPI C F L S L L T A M L G M A M G G N P L N H A E P F D P T N S L K P G I Y A P P G G F D G V A N Y D E L V K A L V D S V L L L
I G G H H L S V D E N I T I P P N N F T R S L S G T Q I S L D S E A S P T R H D A Y D P R A Y S G S S S I E M K W N F F K Q L Y E K Q
A G I P R D A V N F A L D V L A Q N M L E L V V V S I K N N P N F F L S P T H I A F G P S T A H M C I P N L F A N H S T E H W L T S L
L N R E G G S R H S F H A Q T M T L C S L Q L R L S P I *

45

SEQ ID NO : 16
LENGTH : 1554 (including 150 bp 5' UTR and 150 bp 3' UTR)
TYPE : DNA
ORGANISM : *M. phaseolina*

50 AAGCCTTGCTGGATCGACCTTTTTCAATTCGGCGAGATACACCCAAGTCATTGAACATCGAAACAGT
ACTTGCCTTCGTCAAATATGCGGTCACTCTTCCCTTGCTTCCCTTATTACTTTCTGCGGCGTCCGCTTT
CCCTTTCGTGGCAGATATGCCAGAGGTAGACTCTTCTCTCTTCCGTGAAGCACCCGTACGTAGGCAA
CAACCTGGCGGCAACCAACCTGGCGGAGCGGCGACTTGCCCTTCAATGCCAACCACGTCCCCGCTG
CGCCAGTGACAGCTCGATTTCCCTATAACAACGCAAAGAACGGAGTTCCCGGCAACGGAAAGGGCGG
55 TTACCAGGTTCCAGCGCCTGGTGACACGGCTCATCAGTTCATTGCACCAACAGCGCACGATATCCGT

GGGCCTTGCCCGGGCCTGAACGCTGCGGCCAATCACGGCGTGAGTCTTTTCTGTAGTCCCATTTCGA
 GTTTCAAGTCTCCTGACGGTGACCCTAAACAGTTCTCGCGCGGACGGCATAGTGACCTTCAACGA
 ACTGGTTCGACGCCCAGCAGAATGTCTACAATGTCGGCTACGACCTCTCTGTGCTGCTCGCCGTCCTC
 5 GGCTCACGCTCACCGACGGTGACCCCATCACCCAAAACTGTCTATCGGCTGCGACGCAACGACAC
 GCACATCTGTGGCCCCCTGCTGACTGGCAGTCAGCCCGGTCTGGATGGCCACAACAAGTTTCAAGC
 GGACACGTCGCTCACACGCAACGACTACTTCTGGCGGGCGGCGACAACCTCAACTTCAACGGCACG
 CTCTTCGGCATGATGGTGGATACGTGCCAGGGCAACTTCAACCGTGAGAACCTGGCGCTGTACCGCA
 AGCAGCGCTACGACCAGAGCCTACGCGACAACGAGAACTTCTACTTCGGCCCCGTAAGCCTGCTGCT
 10 GTTCGGCGCCGAGCTTCTTTTACGAGCTGATGCCAGCGGCACGCACAACCTACGCGCCCGATCTC
 GACACCATCTCGTCTCTTCTTCGGCGCCGAGCAGGCGCCCGATGGCTCCTGGCGCTTACCAGCCGAGC
 GTATCCCGGACAACCTGGACCAACCGTGTGCTGCCGTACACCAATGAGGACGTGACGCGCGAAATCCT
 GGCTATGTACCTCCTCAACCCTGTGCTATTTGGCGGCGCCACAGGCGACGGCGGCTTCAACACGCTG
 CCGAAGTTTGGCTCCATCCAGGACGGCAAGATCGTTGAGGCACCCAATACGCTGTGCCTGCTGTACC
 15 AGCTGTGACGCGAGAGCGTGCCGAGCTCGTGAATGGCATCATCACGCCGACTGTGGATGCGCTGAA
 CCTGGTTCGCGGATAAGCTAGCGCCGAGTTCAAGAACTTGGGGTGCCCGAATCCGTTGACTTGAATG
 AGTGATGGCCGTGTAGAGCCTCTGCTCGCGGTGCGAAGGAAAAAGAAAAAGTGAGGGGATTTTTGGC
 GAGAAAATGAAATTCACGAAGATACTGCCCGGATGGTAGAGGGAAACTTGGTCATGCATGTGCATGCG
 AAGGCGTTGATAT

20 **SEQ ID NO** : 17
LENGTH : 1194
TYPE : DNA
ORGANISM : *M. phaseolina*
FEATURE NAME/KEY : CDS

25 **LOCATION** : (1).....(1194)

atgccagaggtagactcttctctcttccgtgaagcaccgtagctaggcaacaacctggc
 M P E V D S S L F R E A P V R R Q Q P G
 ggcaaccaacctggcggagcggcgacttgcccttcaatgccaaccacgtccccgctgcg
 G N Q P G G A A T C P F N A N H V P A A
 30 ccagtgacagctcgatctccctataacaacgcaaagaacggagttccccggcaacggaaag
 P V T A R F P Y N N A K N G V P G N G K
 ggcggttaccaggttccagcgcctggtgacacggctcatcagttcattgcaccaacagcg
 G G Y Q V P A P G D T A H Q F I A P T A
 cacgatatccgtgggcttgcccgggctgaacgctgcgcccaatcacggcttctcgcg
 35 H D I R G P C P G L N A A A N H G F L A
 cgcgacggcatagtgacctcaacgaactggtcgacgcccagcagaatgtctacaatgtc
 R D G I V T F N E L V D A Q Q N V Y N V
 ggctacgacctctctgtgctgctgcgcgctcctcggcctcacgctcaccgacggtgacccc
 G Y D L S V L L A V L G L T L T D G D P
 40 atcacccaaaaactgtctatcggtgcgacgcaacgacacgcacatctgtggccccctg
 I T Q K L S I G C D A T T R T S V A P L
 ctgactggcagtcagccccggtctggatggccacaacaagttcgaagcggacacgctcgctc
 L T G S Q P G L D G H N K F E A D T S L
 acacgcaacgactacttctggcgggcgggcgacaacttcaacttcaacggcacgctcttc
 45 T R N D Y F L A G G D N F N F N G T L F
 ggcgatgatggtggatacgtgccagggcaacttcaacgctgagaacctggcgtgtaccgc
 G M M V D T C Q G N F N R E N L A L Y R
 aagcagcgtacgaccagagcctacgcgacaacgagaacttctacttcggccccgctaagc
 K Q R Y D Q S L R D N E N F Y F G P L S
 50 ctgctgctgttcggcgccgagccttctttacgagctgatgccagcggcagcagcacaac
 L L L F G A A S F L Y E L M P S G T H N
 tacgcgcccgatctcgacaccatctcgtccttcttcggcgccgagcagggcggccgatggc
 Y A P D L D T I S S F F G A E Q A P D G
 tcctggcgttccaccgagcgtatcccgacaactggaccaaccgctgtgctgcccgtac
 55 S W R F T A E R I P D N W T N R V L P Y

accaatgaggacgtgacgcgcgaaatcctggctatgtacctcctcaaccctgtgctattt
 T N E D V T R E I L A M Y L L N P V L F
 ggcggcgccacagggcagcggcgcttcaacacgctgccgaagtttggctccatccaggac
 G G A T G D G G F N T L P K F G S I Q D
 5 ggcaagatcgttgaggcaccacaatcagctgtgctgctgtaccagctgtcgacgcagagc
 G K I V E A P N T L C L L Y Q L S T Q S
 gtgccgagctcgctgaatggcatcatcacgccgactgtggatgagctgaacctggtcgcg
 V P S S L N G I I T P T V D A L N L V A
 10 gataagctagcggcgagttcaagaacttgggggtgcccgaatccggttgacttga
 D K L A P Q F K N L G C P N P L T -

SEQ ID NO : 18
LENGTH : 397
TYPE : PRT
 15 **ORGANISM** : *M. phaseolina*
 MPEVDSSLFREAPVRRQQPGGNQPGGAATCPFANANHVPAAPVTARFPYNNAKNGVPGNGKGGYQVPA
 PGDTAHQFIAPTAHDIRGPCPLNAAANHGFLARDGIVTFNELVDAQQNVYVNGYDLSVLLAVLGLT
 LTDGDPITQKLSIGCDATTRTSVAPLLTGSQPGLDGHNKFEADTSLTRNDYFLAGGDNFNFNGLTFLG
 MMVDTCQGNFNRENALYRKQRYDQSLRDNENFYFGPLSLLLFGAASFLYELMPSGTHNYAPDLDTI
 20 SSFFGAEQAPDGSWRFTAERI PDNWTNRVLPYTNEVDVREILAMYLLNPVLFGGATGDGGFNTLPKF
 GSIQDGKIVEAPNTLCLLYQLSTQSVPSLNGIITPTVDALNLVADKLAPQFKNLGCNPPLT*

SEQ ID NO : 19
LENGTH : 1792 (including 150 bp 5' UTR and 150 bp 3' UTR)
TYPE : DNA
 25 **ORGANISM** : *M. phaseolina*
 ACCGACCACCATCCATTGCTCTTTTCGCTGGCGGCTGGCGTCCAAGGCTCACTCTCACTCTAGTCAC
 TCTTTGCAATCTCTGAATTCCTCGAGCCCTTGGTCTGCGTTGTTAAGGATTTGTTGTCCGGGCATC
 CCCTCTCTTTTCGCAATGAAGTTCTCGTCCGCCCTTCTCTGCTCTCCTCGAGCTCCCTTGTCTGTC
 30 GATGCCCTTCCCCGCCCTCGGTGCGCAGAACCCTTGAGGGCCTCACTCCGAAAGGTTGACCGCTGCCC
 TCAAGACGGTTCGAGAAGTACAGGAAGGAGAAGCGCCTTATCATCGACTCCAGCAAGCCTATCGATAC
 CACCGGCGACCAGCTTTCCAGCCACCCAGCGAAACCGACCAGCGCGGCCCTGTCTGGCTTGAAC
 GCCCTGGCCAACCATGGCTACATCTCTCGCGACGGCATCACCAGCTTCGCCGAGGTTGTACCCGCCA
 TTAACCAAGGTTTCGTCTGATTTCGTTCGAGAGAAGGCGTGGCTTGGCACTGACAAGGATGTGAAGTG
 35 ATGGGCATGGGCATCGAGCTCTCTCTGATTCTCGGTGTTATGGGTACCGTGTGGACGGGTAACCCGC
 TTTTCGCTGGACCCTGGCTTCTCTATCGGTGGGACCGCCCCGGTGTATGGCTCCGACAACATTCTGGG
 CAACCTTGTCCGCCTGCTCGGTACGTAAGTGTCCCTCATCGGAGCCACGCCGCCGAGCTAAGCTGA
 GACGTCTGCAGGTGACCCCTCGTGGTCTGCAAGGCTCCACAACCTGGATTGAGTCTGACTCCTCTCTG
 ACGCGTGTATGATCTGTACCTCACCGGAGATGCCTGGACGATGAACATGACGCTCTTCCGCGACATCT
 40 ACGACCGCGCGGATGAGGATGGCGTCATCTCCATGGATCTGCTCGCCGACCAGGCCGCCCGTCTGCTG
 GGAGTACAGCATCGGCCACAACCCCAACTTCTACTACGGCCCTGTCACCGGCATGGTCAGCCGTAAT
 GCCGGCTACTTTTTTCTCGGCCGCTGCTGTCAAACACACCGATGAACATCCGGACGGAATTCTCA
 CTCAAGAAGTTTTCAAGAAGTTCTTCGCCGCTACGAGGACGAGCAGGGCAACATGGAATACCGCAA
 GGGCCACGAGACCTTCCCGACAACCTGGTACCGCAAGCCGGTTCGAGTATGGCCTGGTCCCGCTCAAC
 TTGGACCTCGTTGGCTGGGTCTTGAAGCACCTGAGCTGGGAAGGTACGTCGTCCTTCTCACCCCA
 45 AGATGGGAAGGCATGTGAAGTACTCGGCTTCCCACAGCATCGGCGGTAACACTGGCACCGTCAACT
 CCTTCTCCGGCCTCGATCTGCACAGCATCACCGGCGGCGTCTCAATGCCACTTCGCTCCTCGAGAA
 CAACAACCTGCTGTGTTTGTCTTTGAAGTCTCAAGACCTTCGCCCCAACTCCCTCTCCCCGCTC
 CTGTGACGCTCGAAGTCCGCTCAAGCTTATCGCCGACACCTGGCCACCCGCTCTTGAGCCTGG
 CCTGCCCTGCCTGGAAGGATATGACCGACGGTGGCGAGCCGCTGTGGGATGGCATTGAGAACAGGTT
 50 CCCTGGCGGAGCAAGGCCGATCGAGTTTGTAGAGTTGCTCGAGAGGACACAGGACGTCTGGAGCA
 TGACGTCTGGGTGAACGTACTGCGTGAAGAAGAGCAAAGGAACCGAGGGCGAGAAATGATGTA
 GTTAGCGTCTTGATTCTAATTCGATACCATTTACATTCTTCGCCTTATCC

SEQ ID NO : 20
 LENGTH : 1317
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 5 FEATURE NAME/KEY : CDS
 LOCATION : (1).....(1317)

atgaagttctcgctccgccttctcctgctctcctcgagctcccttgtcgtcgatgccttc
 M K F S S A L L L L S S S S L V V D A F
 10 cccgccctcggtgcgcagaaccttgagggcctcactccggaaaggttgaccgctgccttc
 P A L G A Q N L E G L T P E R L T A A L
 aagacggtcgagaagtacaggaaggagaagcgccttatcatcgactccagcaagcctatc
 K T V E K Y R K E K R L I I D S S K P I
 15 gataccaccggcgaccacgctttccagccaccagcgaaacccgaccagcgcggccctgt
 D T T G D H A F Q P P S E T D Q R G P C
 cctggcttgaacgccctggccaacctggtacatctctcgcgacggcatcaccagcttc
 P G L N A L A N H G Y I S R D G I T S F
 gccgaggttgtcaccgccattaaccaagtgatgggcatgggcatcgagctctctctgatt
 A E V V T A I N Q V M G M G I E L S L I
 20 ctcggtgttatgggtaccgtgtggacgggtaaccgctttcgcctggaccctggcttctct
 L G V M G T V W T G N P L S L D P G F S
 atcggtgggaccgcccccggtgatggctccgacaacattctgggcaacctgtcggcctg
 I G G T A P G D G S D N I L G N L V G L
 ctcggtgacctcgtggtctgcaaggctcccacaactggattgagtctgactcctctctg
 L G D P R G L Q G S H N W I E S D S S L
 25 acgctgatgatctgtacctcaccggagatgctggacgatgaacatgacgctcttccgc
 T R D D L Y L T G D A W T M N M T L F R
 gacatctacgaccgcgcggtgaggatggcgtcatctccatggatctgctcgccgaccag
 D I Y D R A D E D G V I S M D L L A D Q
 gccgccgctcgctgggagtacagcatcgccacaacccccacttctactacggccctgtc
 30 A A R R W E Y S I G H N P N F Y Y G P V
 accggcatggtcagccgtaatgccggctacttttctcctcggccgctgctgtcaaaccac
 T G M V S R N A G Y F F L G R L L S N H
 accgatgaacatccggacggaattctcactcaagaagttttcaagaagttcttcgccgctc
 T D E H P D G I L T Q E V F K K F F A V
 35 tacgaggacgagcagggcaacatggaataaccgcaagggccacgagaccttcccggacaac
 Y E D E Q G N M E Y R K G H E T F P D N
 tggtagccgcaagccggtcgagtatggcctggcctcccgcctcaacttggacctcgttggctgg
 W Y R K P V E Y G L V P L N L D L V G W
 gtcttgaagcaccctgagctgggaagcatcggcggtaacactggcaccgctcaactccttc
 40 V L K H P E L G S I G G N T G T V N S F
 tccggcctcgatctgcacagcatcaccggcggtcctcaatgccacttcgctcctcgag
 S G L D L H S I T G G V L N A T S L L E
 aacaacaacctgctgtgttttgtctttgaagtctcaagaccttcgcccccaactccttc
 N N N L L C F V F E V L K T F A P N S L
 45 tccccgctcctgtcgacgctcgaagtgccgctcaagcttatcgccgacaccctggccacc
 S P L L S T L E V P L K L I A D T L A T
 ccgctcttgagcctggcctgcctggaaggatgatgaccgacggtggcgagccgctg
 P L L S L A C P A W K D M T D G G E P L
 tgggatggcattcagaacaggttccctggcgcgagcaaggccggatcgagtttgtag
 50 W D G I Q N R F P G A S K A G S S L -

SEQ ID NO : 21
 LENGTH : 438
 TYPE : PRT
 55 ORGANISM : *M. phaseolina*

MKFSSALLLLSSSSLVVDAFPALGAQNLEGLTPERLTAALKTVEKYRKEKRLIIDSSKPIDTTGDHA
 FQPPSETDQRGPCPLNALANHGYISRDGITSFAEVVTAIQVMGMGIELSLILGVMGTVWVTGNPLS
 LDPGFSGTAPGDGSDNILGNLVLLGDPRGLQGSNWIESDSSLTRDDLTLTGDWMTMNTLFRD
 IYDRADEDGVISMDLLADQAARRWEYSIGHNPNFYYPVTGMVSRNAGYFFLGRLLSNHTDEHPDGI
 5 LTQEVFKKFFAVYEDEQGNMEYRKGHETFPDNWYRKPVEYGLVPLNLDLVGWVLKHPELGSIGGNTG
 TVNSFSGLDLHSITGGVLNATSLENNNLLCFVFEVLKTFAPNSLSPLLSTLEVPLKLIADTLATPL
 LSLACPAWKDMTDGGEPLWDGIQNRFPGASKAGSSL*

10 SEQ ID NO : 22
 LENGTH : 1391 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 ORGANISM : *M. phaseolina*

15 ATACTAACGCCGTGCAACCCCGGGCAGCGCAGGTCTTGTTGATCGATATAAATGTTTTGTTTCGCG
 CCGCTATTGAAATTGGACACTCCAAGTGTTCATACATTCTTTCCCTATTGATCAATTGCTG
 CAAAAAACATTCCATCATGAAGCTCACCGTCTGTGCCACGACCCCTTGCTTCGCTTTGGTTTATGGA
 CAAGGCTCCTACGAGGGGTGGAAGCCAGCTGGGCCAGACGACTGTATGTTAGTGAATTTCTACGT
 TTCTTTGATTTGCGCTGATGTACATCTACAGTTTCGCGGCCCTTGCCCTATGATGAATACCTTGGCC
 AACCATGGCTTTCTCCCCACGATGGCAGGAATATCACGAAAGCCAACGCAATCCACGCTCTCAACA
 CAGCTATCAACTTCAACACTTCCCTCGCTGCTATCATGTGGGAGCAGGCTATCATTGCAAACCCGGA
 20 GCCCAATGCTACGTTCTTCACTCTGTACGTGACTTCAAGCAAGCGTCTTTTGAGCTACCCTGAGTAG
 GGGGCTGCTCCGAAAGGCGACTTATCTAAACCTCCTCTTTCCACTATGTGAAGCTCTGACATTA
 AATATTGAACAGTGACCATCTTAATCGTCAACAGTCTTGAGCAGCATGCCAGCTTGGAGTGAGTG
 GAAGCCGCTTTCTCCAGCCTATTCCAACAAATCTCCTGACCAACACTCCTCTTCAGCCGATCCGAC
 GCCTTCTTCGGCAACAACCACGTCTTCAACCAAATCTTCGACGTCTCTCGCGCTGGTGGACGG
 25 AGGAAACCGTAGACGCCAAGATGCTGGCCAACAGCAAGTTGTTCCGGCAGATCGAGTCGCGAGCCGC
 CAACCCGAATTACACCTTCAACCAAATACCGAGGCCTTTAGCTTGGGCGAGGTGGCTGCTCCCATC
 ATCGTCTTCGGCGACACGCGGCCGACCGTCAACAGGAGTCTGGTCGAGTACTTCTTCGGTGAGC
 CAAGACCTCAGAGACTTTGGTCTGCAAGGGTTCAAATACTAATTATGGGGTGGTCTTGCAGAGAA
 CGAACGCTCCCGACCGAGTTGGGCTGGACTAAGCAGGCTAATGATGTGTCTCTGGAGGTGATCCTG
 30 GAGATCCAGGACCTCGTCCGCAACGCGACCAACCTGATCACCGATGCCCGCTGCCGGCAGCGCCTC
 ACAAGCGGGACCTGCACGCCCTTACAGCCTCTAGATACGAATATAAAGCTGGCATGAAGATACCA
 GGGGTTTTGAGAATTGTGTCTTCGGCGGGACGGGAGTGGTAGATTGAGCCTTGTGGGCTTCAAGT
 GTCTGGGCATGGTTTGTCTTGGTCTTTTACATGATTTCCCTAGCACGCC

35 SEQ ID NO : 23
 LENGTH : 780
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS

40 LOCATION : (1).....(780)
 atgaagctcaccgtctgtgccacgaccctttgcttcgctttggtttatggacaaggtcc
 M K L T V C A T T L C F A L V Y G Q G S
 tacgaggggtggaagccagctgggcccagacgactttcgcggcccttgccctatgatgaat
 Y E G W K P A G P D D F R G P C P M M N
 45 accttgccaacctatggctttctccccacgatggcaggaatatcacgaaagccaacgca
 T L A N H G F L P H D G R N I T K A N A
 atccacgctctcaacacagctatcaacttcaacacttccctcgctgctatcatgtgggag
 I H A L N T A I N F N T S L A A I M W E
 caggctatcattgcaaaccggagcccaatgctacgttcttcactcttgaccatcttaat
 50 Q A I I A N P E P N A T F F T L D H L N
 cgtcacaacgtcttgagcagcagatgccagcttgagccgatccgacgccttcttcggcaac
 R H N V L E H D A S L S R S D A F F G N
 aaccacgtcttcaaccaaactatcttcgacgtctctcgcgctgggtggacggaggaacc
 N H V F N Q T I F D V S R A W T E E T
 55 gtagacgccaagatgctggccaacagcaagttgttccggcagatcgagtcgagcggccg

V D A K M L A N S K L F R Q I E S R A A
aaccggaattacaccttcacccaaactaccgaggccttttagcttgggagggctgctgct
N P N Y T F T Q T T E A F S L G E V A A
cccatcatcgtcttcggcgaccacgcggccggcaccgtcaacaggagtctggtcgagtac
5 P I I V F G D H A A G T V N R S L V E Y
ttcttcgagaacgaacgcctcccgaccgagttgggctggactaagcaggctaataatgatgtg
F F E N E R L P T E L G W T K Q A N D V
tctctggaggtcatcctggagatccaggacctcgtccgcaacgcgaccaacctgatcacc
10 S L E V I L E I Q D L V R N A T N L I T
gatgccccgctgcccggcagcgcctcacaagcgggacctgcacgccccttacagcctctag
D A P L P A A P H K R D L H A P Y S L -

SEQ ID NO : 24
LENGTH : 259
15 TYPE : PRT
ORGANISM : *M. phaseolina*
MKLTVCATTLFCFALVYGQGSYEGWKPAAGPDDFRGPCPMMNTLANHGFLPHDGRNITKANAIHALNTA
INFNTSLAAIMWEQAI IANPEPNATFFTLDLHLNRHNVLEHDASLSRSDAFFGNHVFNQTI F DV SRA
WWTEETVDKMLANSKLFQRQIESRAANPNYTFQTTEAFSLGEVA API IVFGDHAAGTVNRSLVEYF
20 FENERLPTELGWTKQANDVSLEVILEIQDLVRNATNLI TDAPLPAAPHKRD LHAPYSL*

SEQ ID NO : 25
LENGTH : 1314 (including 150 bp 5' UTR and 150 bp 3' UTR)
TYPE : DNA
25 ORGANISM : *M. phaseolina*
GGCCCCGAAAGGGAGACAAAATACGAGATTCTCCTATTACGCGCCCAAGAATCGACAACACCGCCC
ATCAGCTACCGCCGCTTCGTTTACGTCGTCGCGAGCAGCAACGCCCGACGCTACAGTCAGTCAACA
GCCTCCAGCCGCCACGATGCCAACGCAGTGCATCTGTCAATGCTCGTCCTCACGCATGCGGTGCCG
30 ATCGCGGTTATCCGGGCTGGGAAGCGCAGCAAGTTGTGCGAGAAGCGCCCTCCAAGCACCACAACG
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GCACTACTTTGAGAAGCAGGTAAACGGCTCCGGCAATGGCTACTACCGGCGGTGCTCCTGCCCGGCA
GTCAACATCATGGCGAACAGGGGCTACATCAGCCGCTCGGGCCGGGACATCAGCTACGAGGAGATAG
CGATGGCATCGCGGGAGCTGTTCAACTTCGGCGACGACAACGTGAGCAGCGGCCCTGCAGACCGGC
AAAGTAAGCGGGCTCACCAACAATTCTTCTTGACAGATCATGATCGTGCTGGGGCCAGCTTCGCG
35 GCGCACCCGGGCGCGAGCGCATCGACCTCGACATGCTGGCCGACGACGCGGTGCAGCACATACCA
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GCTGGAGCAGCTGCTGGCGACGTCCAAGGACGGCGTACGCTGACGCTCGAAGACGCGCCGAGCAC
CACCACCTGCGGCACAACCAGTCGCTGGCCGAGAACCCTCGGCTTCGGCTTCAGCAACTCCGACGCCA
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40 CACGCTGTATGTGGAAGACGTCAAGACCCTGTTTCGTCGACGAAGACCTGCCGGACGGATACGGCCGG
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45 TCGGAAAAGAATAACGGAGATTTAAAAAATTTTTTTTTT

SEQ ID NO : 26
LENGTH : 951
TYPE : DNA
50 ORGANISM : *M. phaseolina*
FEATURE NAME/KEY : CDS
LOCATION : (1).....(951)
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55 tatccgggctgggaagcgcagcaagttgtcgcagaagcgcctccaagcaccacaacgac

Y P G W E A Q Q V V A E A P S K H H N D
 ctctacgtgcccaaccaagccatccggtgccgggaaagtgccgtacatcccggacgag
 L Y V P N P S H P V P G K V P Y I P D E
 gaagagcactactttgagaagcaggtaaacggctccggcaatggctactaccggcggtcg
 5 E E H Y F E K Q V N G S G N G Y Y R R S
 tcctgcccggcagtcacatcatggcgaacaggggctacatcagccgctcgggcccgggac
 S C P A V N I M A N R G Y I S R S G R D
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 I S Y E E I A M A S R E L F N F G D D N
 10 atcatgatcgtgctggggcccagcttcgcgggcaccgggcccgcgagcgcacatcgacctc
 I M I V L G P S F A A H P G R E R I D L
 gacatgctggccgacgacgcgggtgcagcacatcaccaactgccctgcggcgccgacgcgg
 D M L A D D A V Q H I T N C P A A P T R
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 15 T D R A L G D N V N L N T T L L E Q L L
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 A T S K D G V T L T L E D A A E H H H L
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 R H N Q S L A E N P G F R F S N S D A I
 20 tgctcgcttgccgacgtacccaacctgttcggtatcctgggcccggcagggcaagcatggg
 C S L A Q Y A N L F G I L G R Q G K H G
 ctcaacacgctgtatgtggaagacgtcaagaccctgttcgctcgaagacacctgccggac
 L N T L Y V E D V K T L F V D E D L P D
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 25 G Y G R R E L P Y F S T E A N N Y I D R
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 M A H H I G F E I E R P F P A N D A D L
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 K D I E P V Q A R F E V V D G C -

30
SEQ ID NO : 27
LENGTH : 316
TYPE : PRT
ORGANISM : *M. phaseolina*
 35 MPNAVHLSMLVLTHAVPIAGYPGWEAQQVVAEAPSKHHNDLYVPNPSHPVPGKVPYIPDEEEHYFEK
 QVNGSGNGYYRRSSCPAVNIMANRGYISRSGRDISYEEIAMASRELNFNGDDNIMIVLGPSFAAHPG
 RERIDLMLADDAVQHITNCPAAPTRTRDRALGDNVNLNTTLLEQLLATSKDGVTLTLEDAAEHHHLR
 HNQSLAENPGFRFSNSDAICSLAQYANLFGILGRQKGHLNTLYVEDVKTLFVDEDLPGDYGRRLEP
 YFSTEANNYIDRMAHHIGFEIERPFPANDADLKDIEPVQARFEVVDGC*

40 **SEQ ID NO** : 28
LENGTH : 1480 (including 150 bp 5' UTR and 150 bp 3' UTR)
TYPE : DNA
ORGANISM : *M. phaseolina*
 45 ATCTGGCTTTTCTCTCTTCTCTGTGCGGGCGTCCCTTGCGCAACAGATAACCCATTCATCCCTTCAG
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 GTTTCCCGCACACCCAATGGCTTCCACCCGCGAGTCCGTCTTCGCCCAGCGCGCTTCTGCGCTCC
 GCCCCGGCCTCCATCAAGTCGAATGCCGCCGCTCATCTCGCTTCGCCGTCCCTACCCAAGCATTCC
 GCCAGCAGTCTCGCCGCGGCTACTCTTCCGAGGCCGGCTCCAAGTCTAACGGCCCCAACCCCGCCAT
 50 CTGGATTGGTGTCTCTCGCCGTCTGGGTGGCGCCGGTACTATGCCTACAGCTCGGGTGCCTGGCGCC
 CAGATCGCCTCCAAGGAACCTTACCCCCAAGCCGAGGACTACCAGAAGGTCTACGACGCCATCG
 CCAAGGCCCTCGAAGAGCACGACTACGACGACGGCAGCTACGGCCCTGTCTGCTGAGACTGGC
 TTGGCACGCCAGCGGAACGTGAGTGACTTCCCAACACTTCCAGCCCACCATTGAACCACGCACTGA
 CGCCCTCCCTCACAGCTACGACAAGGAAACCGGCACCGGCGGCTCCAACGGCGCCACGATGCGCTTC
 GCGCCCAGGCGGACCACGGCGCAACGCCGCTCAAGGCGCCCGGCGACTTCTCGAGCCCATCA
 55 AGCAGCAGTTCCTGGATTACGTACTCGGACCTGTGGACGCTGGCAGGCGTCTGCGATCCAGGA

GATGCAGGGCCCCAAGGTGCCGTGGCGCCCCGGCCGCAGCGATCGCGACGTCTCCTTCTGCACGCC
 GACGGCCGCCTGCCCCGACGCCTCCAAGGACCAGAACCACCTCCGCGCCATCTTCGCGCCGATGGGT
 GGAATGACCAGGAGATCGTGGCGCTGTGGGCGCGCATGCGCTGGGGAGGTGCCATACGGATAGGAG
 TGGATTGATGGCCCCGTGGACCTTCAGCCCCGACGACGCTGACGAACGATTATTTCAAGTTGTTGATC
 5 GACGAGAAGTGGCAGTGGCGGAAGTGGGATGGACCTAAGCAGTTGGAGGACAAGAAGACGAAGAGCC
 TGATGATGCTGCCGACGGATTACGCGTTGGTGCAGGACAAGAAGTTTAAGCCCTGGGTGAGAGGTA
 CGCGAAGGATCAGGATGCCTTCTTCAAGGACTTCTCGAACGTGGTTATGAGGTTGTTGAGCTGGGC
 GTGCCGTTCCAGAGTGGTGAGGACTCGAGGATTGTGTTTTAAGAGCAGCTTCGACTAGGCGTGCTTGG
 CGGACGTTAATTCTGATCGACGGGGTTTTGATGGGAAGTTGTAAAAGTTCTATGACGATCAGTAAAG
 10 AAGGGTTGTTTTTGCTTTTGAGTTTCGAGGACTAAAGACTAAGACAAGAGTAGCGCAAAGGTGGGAA
 AGAATA

SEQ ID NO : 29
 LENGTH : 1116
 15 TYPE : DNA
 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS
 LOCATION : (1).....(1116)

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 S I K S N A A R S S R F A V P T Q A F R
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 Q Q S R R G Y S S E A G S K S N G P N P
 25 gccatctggattgggtgctctcgcccgcctggggtggcgccgggtactatgcctacagctcg
 A I W I G A L A V L G G A G Y Y A Y S S
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 G A G A Q I A S K E P F T P K P E D Y Q
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 30 K V Y D A I A K A L E E H D D Y D D G S
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 Y G P V L L R L A W H A S G T Y D K E T
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 G T G G S N G A T M R F A P E A D H G A
 35 aacgcccggcctcaaggcggcccgcgacttcctcgagcccacatcaagcagcagttcccgtgg
 N A G L K A A R D F L E P I K Q Q F P W
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 I T Y S D L W T L A G V A A I Q E M Q G
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 40 P K V P W R P G R S D R D V S F C T P D
 ggccgcctgcccgacgcctccaaggaccagaaccacctccgcccacatcttcggccgcatg
 G R L P D A S K D Q N H L R A I F G R M
 gggttggaatgaccaggagatcgtggcgctgctcgggcgcgcatgcgctggggagggtgcat
 G W N D Q E I V A L S G A H A L G R C H
 45 acggataggagtggattcgatggcccgtggaccttcagcccgcgacgctgacgaacgat
 T D R S G F D G P W T F S P T T L T N D
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 50 L E D K K T K S L M M L P T D Y A L V Q
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 D F S N V V M R L F E L G V P F Q S G E
 55 gactcgaggattgtgtttaagagcagcttcgactag

D S R I V F K S S F D -

5 SEQ ID NO : 30
 LENGTH : 371
 TYPE : PRT
 ORGANISM : *M. phaseolina*
 MASTARSVFARSALLRSAPASIKSNAARSSRFVPTQAFRQQSRRGYSSEAGSKSNGPNPAIWIGAL
 AVLGGAGYYAYSSGAGAQIASKEPFTPKPEDYQKVYDAIAKALEEHDDYDDGSYGPVLLRLAWHASG
 TYDKETGTGGSNGATMRFAPADHGANAGLKAARDFLEPIKQQFPWITYSDLWTLAGVAAIQEMQGP
 10 KVPWRPGRSDRVSFCTPDGRLPDASKDQNLRAIFGRMGWNDQEIVALSGAHALGRCHTDRSGFDG
 PWTFSPTTLTNDYFKLLIDEKWQRKWDGPKQLEDKTKSLMMLPTDYALVQDKKFKPWVERYAKDQ
 DAFFKDFSNVMRLFELGVFPQSGEDSRIVFKSSFD*

15 SEQ ID NO : 31
 LENGTH : 1981 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 TAGAAGGCGCATGGAGTCGCACGCAGGGACCATGCGCAACACGGTGCCTGCAGAGAGGCGAAAGCCC
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 20 ACACCGCTATCGCGCGATGAAAGCCATCAGCATCGCCGTGTTGCGCCGCTCAGTGGTACCTCACACT
 CTGGCAGACTATGTTTGGCCCTCGCAACATGACTTGTGGAGGATATGTTGGCCATCCAACAAGGCT
 ATATTCGCATGGGCTTCACTGACTGTATGTCGACATTCACTTGAGCCTGAAGTAATGTCTCCCTACT
 AAAGCATCGTCAAGTGGTTGTTCCCTGCGGTACGCGCAGCAACAGGCCCGGAGTAAACAACGCGGC
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 25 GATGCCCTCCCTCCTCTACGAGGTGCAACGGCCCGAGAACGAGGGCTCAGCCTTTAACGACACCTTCG
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 30 GGTTCAACACCAGCGACATGATCGCCCTCGTTGCCCTGTGGCCATACCGTCGGCGGCGTGCACAGCGT
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 CGGCCGCGACGCCGAGGGCACCAGCATCGCCCTCAATGTACCCGACCGCGCTGGCGGGCGCAAGCTG
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 GGTTCGAATTTGCGACGCAGCTCGACGTGCGAGCCGGCATCCAGGCCTTTGATATCCAGCTCACGAC
 40 GGAGGCGACCGGACACGTGGAGACGTTTCGACAACGCTGGCACCGGCGGCTATCCTAGTCTCGACGAC
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 GGTTGACGAGATGGGTGTGATGTTGCCGAAGCTTGTGCTAGAGGCAGTGCCAATGGAGAGGTCAAAC
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 45 AGTTTCGATGTTGTGTTGACGGCTGGGGGAGACGAGATTGTGTCTGGCCTGCACGGGACCAGCGATCT
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50 SEQ ID NO : 32
 LENGTH : 1623
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS
 LOCATION : (1).....(1623)
 55 atgaaagccatcagcatcgccgtgttcgccgctcagtggtacctcacactctggcagac

M K A I S I A V F A A S V V P H T L A D
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 Y V W P S Q H D L L E D M L A I Q Q G Y
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 5 I R M G F T D L V V P C G H G S N R P G
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 V N N A A Q W I R T G F H D F A T H D S
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 A A G T G G L D A S L L Y E V E R P E N
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 E G S A F N D T F A D M H D F I N P R S
 agcgctcggatctgatagcgtggcgcgtcgcacatcggttgcggcttgcggcggaccc
 S A S D L I A L A V V A S V A A C G G P
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 15 K I P L R A G R I D A V E A G P A G V P
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 K P D D S L E S T I D A F A R T G F N T
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 S D M I A L V A C G H T V G G V H S V D
 20 ttccccgagatcacggcggcggagaaagacgtcctggacgtgccgcaatttgacagcagc
 F P E I T G G E K D V L D V P Q F D S S
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 25 L V F G A N D T T N S D K R V F S A D G
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 30 gccgacatcaagccctacatcgacaagctcgagctcacaccaacgcctccgcctcggcc
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 35 S I A L N V T D R A G G R K L V P A P R
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 40 gaggcgaccggacacgtggagacgttcgacaacgctggcaccggcggctatcctagtctc
 E A T G H V E T F D N A G T G G Y P S L
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 D D L L Y L Q S Q S C M D T T A T E G N
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 45 I T V T V A A A V R E D A A K A G A A P
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 50 gacatcccaatcgatgccgctggctggagcacgaagttcgatggtgtggttgacggctggg
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55 -

SEQ ID NO : 33
 LENGTH : 540
 TYPE : PRT
 5 ORGANISM : *M. phaseolina*
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 AACGGPKIPLRAGRIDAVEAGPAGVPKPDDSESTIDAFARTGFNTSDMIALVACGHTVGGVHSVDF
 10 PEITGGKEDVLDVPQFDSSGTIFDTAVVDEYLDSNGANPLVFGANDTTNSDKRVFSADGNSTMAKLG
 DPATFKATCAALFERMINTVPSVTLSEPIELADIKPYIDKLELTPNASALAFEGRI RLRTSPVTGR
 DAEGTSIALNVTDRAGGRKLVPA PRAVLRGGTSYGFDFEQFSWFEFATQLDVAAGIQAFDIQLTTEA
 TGHVETFDNAGTGGYPSLDDLLYLQSQSCMDTTATEGNI TVTVAAAVREDAAKAGAAPVVRMAHKVQ
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 CSGN*
 15
 SEQ ID NO : 34
 LENGTH : 2012 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 ORGANISM : *M. phaseolina*
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 25 TGCCCAAACGCTGGGGCGGCAGACCTCTGCACAGTGGCTCCGAGTTGCCTTCCATGATTT CGTCACG
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 35 TCGGCTGTACGAAAGCGATCAGAACAGGACAATGCAAGCTCTCGGT CAGTCAAAGAATACTTCTTT
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 40 GGAAAGACTATGGCATCCATTACAGCAAGGGTTATTGAAGAGAAAGGGAATAGTTTCTGGGGGGCCA
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 45 GGCACCGAAGGTCGAGAAGCATGAGTTGAATCTCGAAAGAGATCAAGATATTGGTTTGTACTCTATA
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 TTT CAGACGGCACTGTCTGGCAAGATAGTTACAACAGATTTGCAGTGCCGTAGAGCATCCTGAAAAAT
 GTCTTCGTCAAATGCCTTCATAGGGCCAGCAACAAATTTTCAGGCAGATATGTAGCTAGAGAGTCA
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 50 CC
 SEQ ID NO : 35
 LENGTH : 1599
 TYPE : DNA
 55 ORGANISM : *M. phaseolina*

FEATURE NAME/KEY : CDS

LOCATION : (1).....(1599)

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 R A A L H Y P N A L I S R M E H L L V D
 acggacggctcattcaggtctggtttcaaggacgCCatcaaccctgCacgaactacatt
 T D G S F R S G F K D A I N P C T N Y I
 10 tcaggtgCCcaaacgctggggCGgcagacctctgCacagtggctcCGagttgCcttccat
 S G A Q T L G R Q T S A Q W L R V A F H
 gatttcgtcagggCCacgtCGacgagggcactggCGggatCGacCGctccatCGgcttc
 D F V T A H V D E G T G G I D A S I G F
 gaaactctCCgagcagaagattCCgggtCCgcattcaatgacagtttCGccttctttgct
 E T L R A E D S G S A F N D S F A F F A
 15 cCGttcgtggatgCGcaaaccttccatggCCgacctCGtagCCctctctgTggtgacttct
 P F V D A Q T S M A D L V A L S V V T S
 ctgggCCactCGggtggtctgcatgtCCcatatCGagCGggCCgtatCGatgctacgggC
 L G H C G G L H V P Y R A G R I D A T G
 ggagggCCgTtCGgcttCCCGaacCCgagacaagcctggaagagacCCtggagagttt
 20 G G P F G V P E P E T S L E E T L E E F
 gccaatgctggttccaatgctgaagatgCCattggattaacggCGtCGgggCattctctc
 A N A G F N A E D A I G L T A C G H S L
 ggCCCGctccatcagggCGggttCCcaacgtCGtGCCgaatCGgCCatagcaccaaac
 G R V H H G G F P N V V P E S A I A P N
 25 aacacCGCGggCGgCGtgaacctggactCCacacgggataaattCGacatcagcattgct
 N T A G G V N L D S T R D K F D I S I V
 aaagaatacctCGgcaactatgggCagCGCGggacctctCGttaccagtgacaacgtg
 K E Y L G N Y G Q R G G P L V T S D N V
 actgtCCgctCGgatcttCGgctgtacgaaagCGatcagaacaggacaatgcaagctctc
 30 T V R S D L R L Y E S D Q N R T M Q A L
 ggtcagTcaaaagaatacttctttagcactgtggaaatctatttgagaggatgatcaac
 G Q S K E Y F F S T C G N L F E R M I N
 accgTtCCgCGgaggtcactttgtcagatgtcatccatCCgatgacggTgCagCCggtg
 T V P R E V T L S D V I H P M T V Q P V
 35 aatttcacgTtCGatcatcaatgaccagCGctgaggttatcaggagtagTgCGgtat
 N F T F D I I N D Q A L R L S G V V R Y
 ttGCCctcagataatgctgCaccgtCGacgctCGaggtctcactCGCCgacaaagCCgga
 L P S D N A A P S T L E V S L A D K A G
 aagactatggcatccattacagcaagggTtattgaagagaaagggaaatagTtctggggg
 40 K T M A S I T A R V I E E K G N S F W G
 gCCacagcttactacCCggtCGtttttgacataaaccttGctgggattgcttctCGcaac
 A T A Y Y P V V F D I N L A G I A S R N
 aatcttctggaagctCCaggttCGcacagcatctcctcagacatttgagctgcaaccg
 N L P G K L Q V R T A S P Q T F E L Q P
 45 gagctgTttttcataccatCCgTtctagCCctggcaggggataagtgtgggggctGCC
 E L F F I P S R S S P G T G I S V G A A
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 I G A A A R S R N S T L S V E S V E A V
 gtCagTgtGCCgTatCCcagacgggaacactggcaccgaaggtCGagaagcatgagTtg
 50 V S V P V S Q T G T L A P K V E K H E L
 aatctCGaaagagatcaagatattggtttgtactctatattcaaggggaacctaaCGcat
 N L E R D Q D I G L Y S I F K G N L S D
 gatttgcttcaacctgCagacgacCGgttgatcaccggcaacttttCagacggcact
 D L A F N L Q T T V D I T A T F S D G T
 55 gtctggaagatagTtacaacagatttgcagTgCCgtag

V W Q D S Y N R F A V P -

5 SEQ ID NO : 36
 LENGTH : 532
 TYPE : PRT
 ORGANISM : *M. phaseolina*
 MRFLGGFYLLLAATRHTPTARAALHYPNALISRMEHLLVDTDGSFRSGFKDAINPCTNYISGAQTLG
 RQTSAQWLRVAFHDFVTAHVDEGTGGIDASIGFETLRAEDSGSAFNDSFAFFAPFVDAQTSMDLVA
 LSVVTSLGHCGLHVPYRAGRIDATGGGPFVPEPETSLEETLEEFANAGFNAEDAIGLTACGHSLG
 10 RVHHGGFPNVVPESAIAPNNTAGGVNLDSTRDKFDISIVKEYLGNYGQRGGPLVTSDNVTVRSDLRL
 YESDQNRMQALGQSKEYFFSTCGNLFERMINTVPREVTLSDVIHPMTVQPVNFTFDIINDQALRLS
 GVVRYLPSDNAAPSTLEVSLADKAGKTMASITARVIEEKGNFWGATAYYPVVFDINLAGIASRNNL
 PGKLQVRTASPTFELQPELFFIPSRSSPGTGISVGAAIGAAARSRNSTLSVESVEAVVSVVPSQTG
 TLAPKVEKHELNLERDQDIGLYSIFKGNLSDDLAFNLQTTVDITATFSDGTVWQDSYNRFAVP*

15 SEQ ID NO : 37
 LENGTH : 2401 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 TTTTAATATATTCTGCCGCTAAAACGTTCCGCATGTGCTCCTGATTTTTCTCGACCGCCATTTCTCG
 20 CCTCCGCATCGGCTCCCTGCTTCGGCGCGCTCGTCGCTAGCATCCAGTTTTCGCCAGTCCTTCCGTTT
 CTCCCGCTCTTGAACCATGGCAAGGCATCCCGCCCTGACCCCTGGTGTGGGTGCGCAGGCGTGGTCTAC
 CACGCCATTGGCACCGCTGCTGCCCGACATGGCCATCTTCCATGGATGAACTGGAGGACATCATGG
 TCCTCAACACCGGCTACCGCGCCCGCAGCTTCGCAGTGCCCGTCACACCCTGCGGCTTCTCGTCGCA
 AGGCCCCGACGCGTCCAAGCTGCCGAATGGATACGAACCGCCTTCCACGACATGGCTCCCGGCAGC
 25 GTGTATACCGGCGTGGAGGACTGGACGCATCGATAGCTTACGAAACACGGAGCTTGGAAAATCTCG
 GCCCCGCTTCAACACCACACTAGCTACCTACGCGCCGTATCTGACAAGCAGATCTTCCATGGCTGA
 CATCATGCGCTAGGAGTCTACACGGCGGTGCGGTCTGCGGAGGTCCAATCGTGCCTATCCGGACA
 GGCAGAGTAGACGCAAAGGCAGCAGGCCCGCAAGGTGTGCCTCTGCCGCAGAATCTATCGGAACTT
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 30 CACTCTGGGCGGCGTGCACGCATCTGCCAACCCGGAGATCGTGCCCGTGGGGTGGCGGAGGACGGC
 GTCGTCAAGTTCGACACGACGGACGCGTTTGACAACAAGGTTGTCAACGAGTACCTCTCGAATAAA
 CCAAGAACTCGCTTGTGTGGGCCCCCTACTGCGAACGGCCGGAACCTCGGACGCTCGTGTCTTTGC
 GCGGATGAAAATGCTACGGTCAAGGCTCTGGCTGACCCTGATACGTTCAACAGTGTTTGCGCTAGG
 35 ATGCTGCAGAAGATGATTGATGTTGTTCCAACGGGCGTGGTGTCTCACTGACCCGATTTCAATCTATG
 TATCCGTGTTAGGACTACGGAGCGCTCTGCGAGCCAGATTGAGAAGGTGAGCTTGTCTACAAGGAC
 CGCGAGGGGGCCGAATCCTCGACAGCTTTGAGCACCGAATCCTCAGGTTGGCCCTCTGGGTTGATG
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 ACGGGGTCTCCGCAAACATCCCCACCGACTCCGGCATCTCCTCATTCAACGTCTCATACCCTCAC
 40 CAGCGGCGAAACCGAACTTCACGACAATAATGGCAGCGGTTTCCCCCTCCAAGACACCGTCATCTTT
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 CCTCCGCCCCACCTCAGCGTCACCCTCAAGGTCCCCAACTCCCGCTCCGTCTCCCGTCTCTCCA
 GGTCAACAGTTCGCGCCAACTCGCCGACACGCGCTTTGACGTCAAGCTCGGCGCTGCCGCCGCCGACG
 45 CCTTCAAGTCTCCGCGGACCTCGGTGATGCTGCCAGGACCTGAGCCCCGAACCGCCACTTCTTC
 CAGCGCGCTAGCTCCTCGAGCACGGCTGCGCCGCCGCTCGTCTCTCTGCGCACCAAGCTCC
 TCTGACCTCCCGGCCCCCTCCCCAGCACAAACCCACGTCTCCACCCAATCTCCTCATCTACAA
 CATTAGCATCATCGACCACCCCAACGCCCAACAACACTCGCCTGCCCCGCCGCTGACGGCGCCACCTG
 50 GACGCTATCCGGCGGCCAGAAGTTCGCCGTCAAGTGCAGGCAAGGACTACCAGGCCGGCCAGATCGGC
 GTCACGTGGACGGCCAGCTTCGAGGCCTGTCTGCAGGCGTGGTGGATACGGACACGTGCCAGGCGG
 TCGCATTCGTGGGGAGTGCAGAGGCGGGCGGGCAGTGCTACTTGAAGGACCAGAGCGCGGGCAGTGT
 GGATGTTGAGGGGGTGTGGGGGGCGGTTCTGGAAAGCTGAGCGGTGGGCGATGGAGTAGGGGATAG

AGGGTTTGGGCTGGGGGTAATGAATTACTTCTGATGAGCTTCTACTACTGCAGGTGGCACAAATCA
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SEQ ID NO : 38
 5 LENGTH : 2049
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS
 LOCATION : (1).....(2049)

10 atggcaaggcatcccggcctgaccctgggtggtggtcgcagggcgtggtctaccacgccatt
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 G T A A A P T W P S S M D E L E D I M V
 ctcaacaccggctaccgcgcccgcagcttcgcagtgcccgtcacaccctgcggcttctcg
 15 L N T G Y R A R S F A V P V T P C G F S
 tcgcaaggccccggacgcgtccaagctgccgaatggatacgaaccgccttccacgacatg
 S Q G P G R V Q A A E W I R T A F H D M
 gctcccggcagcgtgtataccggcgtcggaggactggacgcacatcgatagcttacgaaaca
 A P G S V Y T G V G G L D A S I A Y E T
 20 cggagcttgaaaaatctcggccccgccttcaacaccacactagctacctacgcgcccgat
 R S L E N L G P A F N T T L A T Y A P Y
 ctgacaagcagatcttccatggctgacatcattgctgctaggagtctacacggcggtgctg
 L T S R S S M A D I I A L G V Y T A V R
 tcatgctggaggtccaatcgtgcctatccggacagggcagagtagacgcaaaggcagcaggg
 25 S C G G P I V P I R T G R V D A K A A G
 ccgcaagggtgctcctctgccgcagaattctatcggaacttttcaaaccagtttctccgt
 P Q G V P L P Q N S I G T F Q N Q F L R
 actggcttcaacacgacggagatgatccaagtgggtggcgtgtggccacactctggggggc
 T G F N T T E M I Q V V A C G H T L G G
 30 gtgcacgcacatctgccaaccggagatcgtgcccgtgggggtcggcggaggacggcgtcgtc
 V H A S A N P E I V P V G S A E D G V V
 aagttcgacacgacggacgcgtttgacaacaaggttgtcaccgagtagctctcgaataca
 K F D T T D A F D N K V V T E Y L S N T
 accaagaactcgcttggttggtgggcccctctactgcgaacggccggaactcggacgctcgt
 35 T K N S L V V G P S T A N G R N S D A R
 gtctttgcgccggatggaaatgctacgggtcagggctctggctgaccctgatacgttcaac
 V F A A D G N A T V R A L A D P D T F N
 agtggttgctgctaggatgctgcagaagatgattgatgttggtccaacggggcgtggtgctc
 S V C A R M L Q K M I D V V P T G V V L
 40 actgacccgatttcaatctatgatgtcaaaccagtgggctgcagctgacattgcttggt
 T D P I S I Y D V K P S G L Q L T L L G
 ggaggagagtcggtaaagcttacgggagatccgtgttaggactacggagcgtctcgcg
 G G E S V K L T G D I R V R T T E R S A
 agccagattgagaaggtcgagcttgtctacaaggaccgcgagggggccgaatcctcgaca
 45 S Q I E K V E L V Y K D R E G A E S S T
 gctttgagcaccgaatcctcaggttcggcctctgggttcgatgacagcttcgagttctac
 A L S T E S S G S A S G F D D S F E F Y
 ggggtctccgcaaacatccccaccgactccggcatctcctcattcaacgtcctcatcacc
 G V S A N I P T D S G I S S F N V L I T
 50 ctaccagcggcgaaacccaacttcacgacaataatggcagcgggttccccctccaagac
 L T S G E T E L H D N N G S G F P L Q D
 accgtcatctttcaaagcccgcagagctgcctcagcggcaccaccatgaccgtcgccgcc
 T V I F Q S P Q S C L S G T T M T V A A
 gccgtcctcaataccgcctcctccgccccaccctcagcgtcaccctcaaggtccccaac
 55 A V L N T A S S A P T L S V T L K V P N

tcccgctccgctcctccccgtcctccaggtcagcacagtcgccatgacgaagagctcgtct
 S R S V L P V L Q V S T V A M T K S S S
 gtcggcccgtacgacctctactcaaccacatacagctaacctccgccaactcgccgac
 V G P Y D L Y S T T Y T L T S A Q L A D
 5 acgcgctttgacgtcaagctcggcgctgccgccgacgccttcaagtcctccgcccgac
 T R F D V K L G A A A A D A F K S S A D
 ctcggtgatgcctgccaggacctgagccccgaaccgcccacttcttccagcgcgcctagc
 L G D A C Q D L S P E P P T S S S A P S
 10 tcctcgagcacggctgcgccgcccggcctcgtcctcctctgccgcaccaagctcctctgac
 S S S T A A P P A S S S S A A P S S S D
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 L P A P S P S T T P T S S H P I S S S T
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 T L A S S T T P T P T T L A C P A A D G
 15 gccacctggacgtatccggcgccagaagttcgccgtcaagtgcggcaaggactaccag
 A T W T L S G G Q K F A V K C G K D Y Q
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 A G Q I G V T W T A S F E A C L Q A C V
 20 gatacggacacgtgccaggcggcgcattcgtggggagtgcagaggcggggcggttctg
 D T D T C Q A V A F V G S A E A G G Q C
 tacttgaaggaccagagcgcgggcagtggtggtgaggggggtgtggggggcggttctg
 Y L K D Q S A G S V D V E G V W G A V L
 gaaagctga
 E S -

25
SEQ ID NO : 39
LENGTH : 682
TYPE : PRT
ORGANISM : *M. phaseolina*

30 MARHPGLTLVWVAGVVYHAIGTAAAPTWPSSMDELEDIMVLNTGYRARSFAVPVTPCGFSSQGPGRV
 QAAEWIRTAFHDMAPGSVYTGVGGLDASIAYETRSLLENLGPANFTTLATYAPYLTSRSMADI IALG
 VYTAVRSCGGPIVPIRTGRVDAKAAGPQGVPLPQNSIGTFQNFRLRTGFNTTEMIQVVACGHTLGGV
 HASANPEI VPVGS AEDGVVKFDTTDAFDNKVVTEYLSNNTTKNSLVVGPSTANGRNSDARVFAADGNA
 TVRALADPDTFNSVCARMLQK MIDVVPTGVVLTDPISIYDVKPSGLQLTLGGGESVKLTGDIRVRT
 35 TERSASQIEKVELVYKDREGAESSTALSTESSGSASGFDDSF EFGV SANIPTDSGISSFNVLITLT
 SGETELHDNNGSGFPLQD TVIFQSPQSCLSGTTMTVAAAVLNTASSAPTL SVTLKVPNSRSVLPVLQ
 VSTVAMTKSSSVGPDLYSTTYTLTSAQLADTRFDVKLGAAAADAFKSSADLGDACQDLSPEPPTSS
 SAPSSSSTAAPPASSSSAAPPSSDLPAPSPSTTPTSSHPISSSTTLASSTTPTTLACPAADGATW
 TLSGGQKFAVKCGKDYQAGQIGVTWTASFEACLQACVDTDTCQAVAFVGS AEAAGGQCYLKDQSAGSV
 40 DVEGVWGA VLES*

SEQ ID NO : 40
LENGTH : 2004 (including 150 bp 5' UTR and 150 bp 3' UTR)
TYPE : DNA
ORGANISM : *M. phaseolina*

45 CCTTCTGAAATTT CATGGCCAGCTTCTCGGTCTTTCTAATGAATTATAAGGCTATCTTCTGCAGC
 TTGTCGTCGACGTTCTAGGATTCAACCACCGTCATTCTTCTCAAATCTCAGTCCAGTCGTTA
 CAGCTAATCACTTAATATGAAGCCCGCCGCTCTTGACGGCATTGGCCTGCTTAATGTCCTACCCATT
 ACCGCCGAATACGTCTGGCCTTCTAAATACGACTATTTGGAAGACCTGCTTTACCTTCAATCCGGTT
 50 ATCTGCGTGAGGGATTTGTCGACGGTATGCATATATGAACAACCTGCTGGTGTCCCCAACTAATGGC
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 CCGCACTGCATAACCATGATATGGCCACTCATGATGCCGATGCTGGCACTGGTGGCTTGGACGCCTCT
 ATCATGTTTGAGACCGAGCGGGACGAAAACGTGGGCGATGCGTTCAATGGTACCTTCCGGCTTTACAA
 ACAACTACTACAACATCAAAGCATCCGCTGCTGATCTTCTTGCACTCTCCACTGTCATCGCCGTTGG
 55 AAAGTCCGCTGGCCCCGAAGATTCCTTTCCGTGTCGGTTCGGTGGACGCCACGGAGGCTGGCCCTCTG

GGTGTTCCEAAGCCGGATCAAGACGTTGATACGCACATTCAAATTTTTGCCAAGGCAGGCTTTAACA
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 ATGGTGGCCTGCGGCCACACCCTTGGTGGCGTCCATGGCAAGGACTTCCCCGAGATCACTTTCAACG
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 5 GACCGAGTATCTTGGCGGAAACCCCCCAACCCCTCGTCAACGGCAAGAACGAGACCAACAACAGC
 GATAAGCGCGTCTTTGGTGCCGACAACAACGCCACAATGCACTCCCTGTCCGACCCCTCCGTCTTCC
 AGTCCTCTGCCAAGACATCCTCGCCCGCATGATCGACACCGTCCCCTCCAACGTCGCTCTCACC
 GCCTCTCGACCCAATCCTCATCAAGCCCTACATCCAAACCTTCTCCCTCGTCAACGCCACCCACCTC
 ACCCTGACCGGCCGCATCCGCGTCCGTACCGACTGGGACAGCTACACCGACCAGTCAGTCCACCTCA
 10 CCTACAACCCGCGCACAGCGCCCGCCAGAATGCGACCCTCAACACCACCATCCCACCACCCGCGC
 CACCTTCCAGGGCGGCACCTCCAGCGGCATCTTTGGTGAAGTCTTCGCCTGGCAGGTTCTCCGCC
 ACCCTCCCACATCCAGCTCGATTACCGGCTTCACTGTACCGTCCACGCGGGTCCACGGGCGAAT
 CCACCACCTACGACAACGCCGGCAGCACGAACGGCTACGCGCTCGACGACACGCTGCTCTACCAGAG
 CGCGCAGTCGTGCCGCGACGTCCGACACCACAACCATCACCGCTGCTGTGCGCAAGGACTTCTCGCC
 15 CGAGGTGCAAAGGTGCGCGTCCGAGATGGTGAACAGGGTGCCGCGCCAGGGCGTGTACGTGCCGGCGC
 TAGAGGTGCAACCGTGGGGGGCGGAGACGGTCAAGGAGGTCCGCGAGTGGGTATCGTGCAGGCTAA
 GGGTGAGTTGACGATGGAGAGCTTGAGCACAACGTTTGACGTCGTTGCGGGCGAGAAAAGGGTTCGAG
 TTCCAAAGGACGAATGTGCTGGGGGAGGAGTGTGCGGCTCTGTGAGGCGTAACTTAAAAAAAAAAAA
 AAAGGAAGGATATATCAGTTTCTGGTACATACTTGAATGAAAAGTCTATGATTCTGATGTCCATAAC
 20 ATTACTCTAGGCTTGAAACAACAATGCTGAATGTGCTTTATTGTGAGATAAAGAGTGTCTCT

SEQ ID NO : 41
 LENGTH : 1605
 TYPE : DNA
 25 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS
 LOCATION : (1).....(1605)

atgaagcccgcgctcttgcaggcattggcctgcttaatgtcctaccattaccgcccga
 M K P A A L A G I G L L N V L P I T A E
 30 tacgtctggccttctaaatacgactatgtggaagacctgctttaccttcaatccggttat
 Y V W P S K Y D Y L E D L L Y L Q S G Y
 ctgctgagggatttgcgacgggtgtggctcctgttcgcttttccctccgctggacctggc
 L R E G F V D G V A P C S F S S A G P G
 35 cgtcaaaccgcagcgggaatgggtccgcaactgcataccatgatatggccactcatgatgcc
 R Q T A A E W V R T A Y H D M A T H D A
 gatgctggcactggtggcttggacgcctctatcatggttgagaccgagcgggacgaaaac
 D A G T G G L D A S I M F E T E R D E N
 gtgggcgatgcttcaatggtaccttccgctttacaacaactactacaacatcaaagca
 V G D A F N G T F G F T N N Y Y N I K A
 40 tccgctgctgatcttcttgcactctccactgtcatcgccgcttggaaactgcggtggcccg
 S A A D L L A L S T V I A V G N C G G P
 aagattccttccgctgctcggtcgcgctggacgccacggaggctggccctctgggtgttccc
 K I P F R V G R V D A T E A G P L G V P
 45 aagccgatcaagacggtgatagcacattcaaatttttccaaggcaggctttaacacc
 K P D Q D V D T H I Q I F A K A G F N T
 agcgacatgatcaccatggtggcctgcggccacacccttgggtggcgtccatggcaaggac
 S D M I T M V A C G H T L G G V H G K D
 ttccccgagatcactttcaacgacacggagaccaatttcgctcaagttcgaaggcaacaac
 F P E I T F N D T E T N F V K F E G N N
 50 tccttctccaactttgataacaccgctcgtgaccgagatcttggcggaaaccccccaac
 S F S N F D N T V V T E Y L G G N P P N
 cccctcgtcaccggcaagaacgagaccaacaacagcgataagcgctcttgggtgccgac
 P L V T G K N E T N N S D K R V F G A D
 aacaacgccacaatgcactccctgtcggaccctccgctcttccagtcctcctgccaagac
 55 N N A T M H S L S D P S V F Q S S C Q D

atcctcgcccgcatgatcgacaccgtcccctccaacgtcgctctcaccgagcctctcgac
 I L A R M I D T V P S N V A L T E P L D
 ccaatcctcatcaagccctacatccaaaccttctccctcgtcaacgccaccacctcacc
 P I L I K P Y I Q T F S L V N A T H L T
 5 ctgaccggccgcatccggtccgtaccgactgggacagctacaccgaccagtcagtccac
 L T G R I R V R T D W D S Y T D Q S V H
 ctcacctacaacccgcgcacagcgcccgcagaatgacacccctcaacaccaccatcccc
 L T Y N P R T A P A Q N A T L N T T I P
 accaccgcgccaccttccagggcgccacctccagcgccatctttgggtgaagtcttcgcc
 10 T T R A T F Q G G T S S G I F G E V F A
 tggcacgagttctccgccaccctccccacatccagctcgattaccggcttcaactgtcacc
 W H E F S A T L P T S S S I T G F T V T
 gtcacgcgcccgtccacggggaatccaccacctacgacaacgccggcagcacgaacggc
 V T R G S T G E S T T Y D N A G S T N G
 15 tacgcgctcgacgacacgctgctctaccagagcgcgcagtcgtgcccgcagctcggcacc
 Y A L D D T L L Y Q S A Q S C R D V G T
 acaaccatcaccgctgctgtgccaaggacttctcgcccggaggtgcaaaggctcgccgtc
 T T I T A A V R K D F L A R G A K V A V
 gagatggtgaacagggtgccgcgccaggcggtgtacgtgcccggcgttagaggctcgaaccg
 20 E M V N R V P R Q G V Y V P A L E V E P
 tggggggcgagacgggtcaaggaggtcggcgagtggtcatcgtgcaggctaagggtgag
 W G A E T V K E V G E W V I V Q A K G E
 ttgacgatggagagcttgagcacaacgtttgacgtcgttgccggcgagaaaagggtcgag
 L T M E S L S T T F D V V A G E K R V E
 25 ttccaaaggacgaatgtgctgggggaggagtggtgcccgtctgtga
 F Q R T N V L G E E C A A L -

30 **SEQ ID NO** : 42
LENGTH : 534
TYPE : PRT
ORGANISM : *M. phaseolina*

MKPAALAGIIGLLNLVLPITAEYVWPSKYDYLEDLLYLQSGYLREGFVDGVAPCSFSSAGPGRQTAAEWVRTAYH
 DMATHDADAGTGGLDASIMFETERDENVGDAFNFTFGFTNNYYNIKASAADLLALSTVIAVNGCGPKIPFRV
 GRVDATEAGPLGVKPDQDVDTHIQIFAKAGFNTSDMITMVACGHTLGGVHGKDFPEITFNDTETNFVKFEGN
 35 NSFSNFNTVVTEYLGGNPPNPLVTGKNETNNSDKRVFGADNNATMHSLSDPVVFQSSCQDILARMIDTVP SN
 VALTEPLDPILIKPIYIQTFLV NATHLTLTGRIRVRTDWSYTDQSVHLTYNPR TAPAQNATLNTTIP TTRAT
 FQGGTSSGIFGEVFAWHEFSATLPTSSSITGFTVTVTRGSTGESTTYDNAGSTNGYALDDTLLYQSAQSCRDV
 GTTTITAAVRKDFLARGAKVA VEMVNRVPRQGVYVPALEVEPWGAETVKEVGEWVIVQAKGELTMESLSTTFD
 VVAGEKRVEFQRTNVLGEECAAL*

40 **SEQ ID NO** : 43
LENGTH : 1414 (including 150 bp 5' UTR and 150 bp 3' UTR)
TYPE : DNA
ORGANISM : *M. phaseolina*

AGCTTGCCCTCTTCTTCTGTCTTTCTGCCCTTCTTCTCCAGACTCCTTTTCGCCGTAGATTTCTGCC
 TTTTGGACCTCGTTTTCTGCCCTCCACCAATAGCAAGCCAAGAGATTAGATTAGACATCGCCATCCC
 ATCGCCGACTCCAACAATGCCAGCAACCCAGGCGACTACGACGCCGTCCGCCACGACGTCAAGAAC
 CTCTGCACCAGCCCGAGTACGACGACGGTTCCGCCGGGCGCCGTCTCTCGTCCGTCTCGCATGGTATG
 TTACGGCTACCCGCATCCTCCAGCCCAATCCGCCGTTTATCTGCTGTTCTGTTGCTCTGCCATCTTCT
 50 CTCCAGGGGCGAGCAAGTTTTCCCGAGCCTTTTTTTTTTGTCTTACGAACGGCATCTCGAACAGCCCCG
 TGACAACCACACCAGGCATTCGCGAGGGACCTACGACGCCACTCTGACACAGGAGGCAGCAACGGT
 GCAGGCATGCGCTACGAGGCTGAAGGCGGCGACCCCGCAATGCCGGCCTGCAGCACGCCCGCGTCT
 TCCTCGAGCCCATCAAGGCCGCGCACCCCTGGATAACCTACTCTGATCTGTGGACGCTGGCGGGCGT
 GGTCCGCATCAAGGAGATGGGCGGCCCGGACATCCCGTGGCAGCCCGGCCGACCGACTTCGTCCGAC
 55 GACAGCAAGCTGCCGCCGCGGGCCGCTGCCGGACGCCGCGAGGGCGCTGACCACATCCGCTGGA

TTTTCTACCGCATGGGCTTCAACGATCAGGAAATTGTGCGCCCTCAGCGGCGCCACAACCTCGGCCG
 CTGCCACGCCGACCGCTCCGGCTTCGACGGCGCCTGGGTCAACAACCCACCCGCTTCTCCAACCAG
 TACTTTAAGCTCCTGACCTCGGTTCGAGTGGAAAGAGAAGACCTCCCCAGCGGCATCAAGCAGTTTCG
 CCTACTATGATGAGGACTCGGAGGAGGAGCTCATGATGCTGCCACCGATATCGCTCTCTTGCACGA
 5 CCCCTCCTTCCGGCCGTGGGTTCGAGAAGTATGCCGAGGACAAGGATGCCTTTTTTCGCAGACTTCTCA
 AAGGTCTTTGCCAAGCTGATTGAGCTGGGCATAGTCAGAGATGAGAGCGGTGCGGTAATCAACACTG
 ATAACGTCAAGGGCGGCTACATCTCTGCGCCCAAGAAGAGTGAGCTGCCTGGTGCTCCGGGTAAGGC
 TAATGAGGAGGCTGAGCCGCTCATGAAAGAGAATGAGAGGTTCAGGGCACGTCTGTAAGCTGGTTGG
 TTTAGATTTCTTTTTTTTTTTTTTTTTTTTCAAGACCGTTAGACTGCGCAAGCTAGAGGGGACGGATAGAT
 10 GGACGATACCACCTAGATTCCTATGCCTTAAGAGGAGAAAGATAGTGCCTAGAGTTTTTCATAGAGAA
 TGCAAAC

SEQ ID NO : 44
 LENGTH : 960
 TYPE : DNA
 15 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS
 LOCATION : (1).....(960)

atgccagcaaccaggcgactacgacgccgtccgccacgacgtcaagaacctcctgcac
 M P S N P G D Y D A V R H D V K N L L H
 20 cagccccgagtacgacgacggttccgcgggcccgtcctcgtccgtctcgcacatggcattcc
 Q P E Y D D G S A G P V L V R L A W H S
 gcagggacctacgacgcccactctgacacaggaggcagcaacggtgcagggcatgcgctac
 A G T Y D A H S D T G G S N G A G M R Y
 25 gaggtgaaggcgggcagccccgccaatgccggcctgcagcacgcccgcgtcttcctcag
 E A E G G D P A N A G L Q H A R V F L E
 cccatcaaggccgagcaccctggataacctactctgatctgtggacgctggcgggcggtg
 P I K A A H P W I T Y S D L W T L A G V
 gtcgccatcaaggagatgggcccggacatcccgtggcagcccggccgcaccgacttc
 V A I K E M G G P D I P W Q P G R T D F
 30 gtcgacgacagcaagctgccgcccggggccgctgcccggacgcccgcagggcgctgac
 V D D S K L P P R G R L P D A A Q G A D
 cacatccgctggatcttctaccgcatgggcttcaacgatcaggaaattgtcgccctcagc
 H I R W I F Y R M G F N D Q E I V A L S
 35 ggcgcccacaacctcggccgctgccacgcccagccgctccggcttcgacggcgccctgggtc
 G A H N L G R C H A D R S G F D G A W V
 aacaacccccaccgcttctccaaccagtactttaagctcctgacctcggctcgagtggaaa
 N N P T R F S N Q Y F K L L T S V E W K
 gagaagacctccccagcggcatcaagcagttcgctactatgatgaggactcggaggag
 40 E K T L P S G I K Q F A Y Y D E D S E E
 gagctcatgatgctgccaccgatatcgctctcttgcacgaccctccttccggccggtgg
 E L M M L P T D I A L L H D P S F R P W
 gtcgagaagtatgccgaggacaaggatgcctttttcgcagacttctcaaaggtctttgcc
 V E K Y A E D K D A F F A D F S K V F A
 45 aagctgattgagctgggcatagtcagagatgagagcgggtgcggtaatcaacactgataac
 K L I E L G I V R D E S G A V I N T D N
 gtcaagggcggtacatctctgccccagaagagtgagctgcctggtgctccgggtaag
 V K G G Y I S A P K K S E L P G A P G K
 gctaagtagggagctgagccgctcatgaaagagaatgagaggttcagggcacgtctgtaa
 50 A N E E A E P L M K E N E R F R A R L -

SEQ ID NO : 45
 LENGTH : 319

TYPE : PRT
ORGANISM : M. phaseolina

MPSNPGDYDAVRHDKVNLHQP...
5 YRMGFNDQEIVALSGAHLNLRCHADRS...
EELMMLPTDIALLDPSFRPWVEKYAEDKDAFFADFSKVFAKLIELGIVRDESGAVINTDNVKG...
ELPGAPGKANEEAEPLMKENERFRARL*

SEQ ID NO : 46
10 LENGTH : 2160 (including 150 bp 5' UTR and 150 bp 3' UTR)
TYPE : DNA
ORGANISM : M. phaseolina

CAACTCTTTGGATCATTTCGCAGTTCTGCAGATTAGACTACTCTTTTCTCGCTCCACAATGAAGCTTG
15 CATCATGGCTGCTCCTCCTCAAGTACTGGCAGCGCTGGGCGGCAGGTACGTGAATATAA...
TCTTGAGGCAAGCTGGATGGCTCAAGGTAGATGTCCCCGAAGAAACAAAGTGATAGTATCTCTGCTA
ACATGGACAGACGGGAACCCCTCGCGGTGTCTTAACTATCAACGGCCAGACACCTGGTCCATTGATCT
GGGGATATGAAGGAGACACACTTTCGCGTCACTGTGACCAATAAAATGTTTATTGAGGCTACTATGCA
TTGGTCAGAGTGAAGTCTGTCTGGACTGGGAGAATCAACTAACGGAAAGCAGGCACGGTGTCTATCA
20 GGTCGACAAGTACTGGAACGACGGAGTACCTGGCGTGACTCAATGGCCATTGAATCCAGGGATTTCG
TATACTTACGAGTTTACTCTCACCAACCAAACCTGGAAGCTACTTCTACCATGGCCACTTTGGACCCG
CATTTCGCGGACGGCCAACGAGGCCCGCTGTGGATTGCACCGGCCCCCTGGAGACCCCGTCCGTATGA
GCTTGCGTCTGATGACCCGGCAGAGGTTGCAGCAATGCGCGCGGCCGAAGACAATCCGAGACACCTC
ATGGTTTCCGACTGGAACCTATGAGGGAATGGAAGTGTGATTGTGGGCTTCAGAGATGCAGGCATTG
25 CTCCGGCATGTTCTGCGTCCCTCGTGACAAATGGAAGGGCAGGACAACCTTGCCCTCGGCCAGATGA
TATCAAGAAATACGATCCCGAGGGTCCGAGGAATTCACCTGGGTGCCTTCCCTCCAGTCGGCGCT
GAGTTCACCAACAAGAGAGAATGCCGCGAGACTACCACCGACTTCGAGATCATTGAGCCGAAGAAG
GGGAGAAGTATATCTACATGAACTTTATCCACCCTGGAGCCCACCATGAACTGCGAATCGCGGTGGA
CGAGCAGCATGATCATCGTGGCAGCTGACGGGATTTTGTGTCATGCCGAAAAAAGTCCAGGTACGT
TAATGCGAGAAGTTCGACTGAGCGGTGTGACCTATGGCTGCAGGCAATAAACCTCAACATGGGCGA
30 CAGGATCAGTGTCTGTTACCGCTAGACAAGAAGCCGGGGGAATACGCCATCCGCTGTGCTCCATT
TCCGAGGAGCAATTGATTACGGGCTTGAGCATCTTGCCTACCCCGGTGTGCAGGAGCGCCGCAAAG
ACGGTATTATGCTGGCACCGGAAACAAAACCCCATATTGATCTGTTGGGGCGGATGGTCACTGAAGG
AGGTGTGATGATGGATGAAATGACCGATTGTCGCCCCCTTCCGCGCGCTCACCCCGAGCGACGTCT
GATCACACGTTTTCGTTTATCAAACCGCACCGGCCGAGCACATGGATGCTGTCGAGCGAGCCAC
35 ACCAAGGCTTCCGCCAGCAGATGCCTCCTATTATGTGGAACGAAGAGTCTCGTGCCCTACAACCAT
TCAGGGGATGAAGAATGGATCCACCGTAGACATCATCTTCGAGAGCCGCGCATAACCCATGCACCCCT
TTCCACAAACACAATCACAAGGCCTGGATTATTGGTAGAGGAAAGGGCTACTTCCGTTGGCCAGATG
TTGCTACTGCCATCTCGGAAGCTCCAGAGAATTTCAACCTGATCAACCCGCGCTGCGAGATGGTGC
CCGGCTCGAAGCGGAAGAGGGATCCTGGACGGTGATCCGTTACACCATCACCTTTCCTGCCATGAGC
40 ATGCTGCACTGCCATCGTATTCAGCACTTTCGCGTAAGTGTGTGATCTAGCCACCAAACGAATGGTC
ACTGATTGAAACAGGCTGGACAACAGATAGTCCCTTTTGGAGGGCAGGATGTGATGCAAAGCCCTCC
TGAGTACATCAAAAAATGACGCATGCGAGCTTTGTGCCGCACTCCGATAACGGCCCCCTTGACTGA
GAGTTCCTATGCGAGGCCAGAGCACGGAATGGGGTAGTTGAAAGTTAAAACCTGCCACATAAAAAATA
GCTCGAATAACAGGATTTTGCTAGCTCATGGAAGTACCACTTGTTCCTTTGCGTTCAGTCTAATGG
45 CTGCGGTGAAAGCGAA

SEQ ID NO : 47
50 LENGTH : 1713
TYPE : DNA
ORGANISM : M. phaseolina
FEATURE NAME/KEY : CDS
LOCATION : (1).....(1713)

atggctcaaggtagatgtccccgaagaacaaagtgatagtatctctgctaacaatggaca
55 M A Q G R C P R R N K V I V S L L T W T

gacgggaaccctcgcggtgtcttaactatcaacggccagacacctggtccattgatctgg
D G N P R G V L T I N G Q T P G P L I W
ggatatgaaggagacacacttcgcgctcactgtgaccaataaaatgtttattgaggctact
G Y E G D T L R V T V T N K M F I E A T
5 atgcattggcacggtgtctatcaggtcgacaagtactggaacgacgggtagctgctggcgtg
M H W H G V Y Q V D K Y W N D G V P G V
actcaatggccattgaatccagggattcgtatacttacgagtttactctcaccaaccaa
T Q W P I E S R D S Y T Y E F T L T N Q
10 actggaagctactttaccatggccactttggacccgatttcgcgacggccaacgagggc
T G S Y F Y H G H F G P A F A D G Q R G
ccgctgtggattgcaccggccccctggagacccccctcgtatgagcttgcgtctgatgac
P L W I A P A P W R P R P Y E L A S D D
ccggcagaggttgacgaatgcgcgcgccgaagacaatccgagacacctcatggtttcc
P A E V A A M R A A E D N P R H L M V S
15 gactggaactatgagggaaatggaagtgtgattgtgggcttcagagatgcaggcattgct
D W N Y E G M E V L I V G F R D A G I A
ccggcatgttctgcgtccctcgtgacaaatggaagggcaggacaacttgccctcgccca
P A C S A S L V T N G K G R T T C L G P
gatgatcaagaaatacgcacccgagggcggaggaattcacttgggtgccttctcct
20 D D I K K Y D P E G R R N S L G C L P P
ccagtcggcgctgagttcaccaacaagagagaatgcccgagactaccaccgacttcgag
P V G A E F T N K R E C R E T T T D F E
atcattcaggccgaagaaggggagaagtatatctacatgaactttatccaccctggagcc
I I Q A E E G E K Y I Y M N F I H P G A
25 caccatgaactgcaatcgcggtggacgagcagacatgatcatcgtggcagctgacggg
H H E L R I A V D E H D M I I V A A D G
gattttgtcatgccgaaaaaagtcaggcaataaacctcaacatgggagcagagatcagt
D F V M P K K V Q A I N L N M G D R I S
gtcctggtaccgctagacaagaagccgggggaatacgcacatccgctgtcgtccatttcc
30 V L V P L D K K P G E Y A I R L S S I S
gaggagcaattgattacgggcttgagcatcttgcgctaccccggtgtgcaggagcggcgc
E E Q L I T G L S I L R Y P G V Q E R R
aaagacggtattatgctggcaccggaaacaaaaccccatattgatctgttggggcggatg
K D G I M L A P E T K P H I D L L G R M
35 gtcactgaaggaggtgtcatgatggatgaaatgaccgatttggccccctttccgcccgcgc
V T E G G V M M D E M T D L A P F P P R
tcacccccagcgcgctgatcacacgtttcggtttttatcaaaccgcaccggccccgagc
S P P A T S D H T F R F L S N R T G P S
acatggatgctgtcgagcgcgacacaccaaggcttccgcccagcagatgcctcctattatg
40 T W M L S S E P H Q G F R Q Q M P P I M
tggaaacgaagagtctcgtggccctacaaccattcaggggatgaagaatggatccaccgta
W N E E S R G P T T I Q G M K N G S T V
gacatcatcttcgagagccgcgcatacgcacatgcaccctttccacaaacacaatcacaag
D I I F E S R A Y A M H P F H K H N H K
45 gcctggattattggttagaggaagggtacttccggttggccagatggtgctactgccatc
A W I I G R G K G Y F R W P D V A T A I
tcggaagctccagagaatttcaacctgatcaaccgcccgttgcgagatggtgcccggctc
S E A P E N F N L I N P P L R D G A R L
gaagcgggaagagggatcctggacgggtgatccggttacaccatcaccttccctgcatgagc
50 E A E E G S W T V I R Y T I T F P A M S
atgctgcactgccatcgtattcagcactttgcggtggacaacagatagtccttttggag
M L H C H R I Q H F A A G Q Q I V L L E
gggcaggatgtgatgcaagccctcctgagtacatcaaaaaaatgacgcagtcgagcttt
G Q D V M Q S P P E Y I K K M T H A S F
55 gtgcccactccgatacggcccccttgactga

V P P L R Y G P L D -

SEQ ID NO : 48
 LENGTH : 570
 5 TYPE : PRT
 ORGANISM : *M. phaseolina*
 MAQGRCPRRNKVIVSLLTWDGNPRGVLTINGQTPGPLIWGYEGDTLRVTVTNKMFI EATMHWHG VY
 QVDKYWNDGVPGV TQWPIESRDSYTYEFTLTNQTGSYFYHGHFGPAFADGQRGPLWIAPAPWRPRPY
 ELASDDPAEVAAMRAAEDNPRHLMVSDWNYEGMEVLIVGFRDAGIAPACSASLVTNGKGR T T CLGPD
 10 DIKKYDPEGRRNSLGCLPPPVGAEFTNKRECRET T TDFEIIQAE EGEKYIYMNF IHPGAHHELRIAV
 DEHDMIIVAADGDFVMPKQVAINLNMGDRISVLVPLDKKPGEYAIRLSSISEEQLITGLSILRYPG
 VQERRKDGIMLAPETKPHIDLGRMVTEGGVMMDEMTDLAPFP P R S P P A T S D H T F R F L S N R T G P S T W
 M L S S E P H Q G F R Q M P P I M W N E E S R G P T T I Q G M K N G S T V D I I F E S R A Y A M H P F H K H N H K A W I I G R G K G
 Y F R W P D V A T A I S E A P E N F N L I N P P L R D G A R L E A E E G S W T V I R Y T I T F P A M S M L H C H R I Q H F A A G Q Q I
 15 VLLEGQDVMQSPPEYIKKMT HAS F V P P L R Y G P L D *

SEQ ID NO : 49
 LENGTH : 2269 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 20 ORGANISM : *M. phaseolina*
 AGTATGTGCGTTGATCCCGCTGTCTATTGAGCACCAGAGCACTGTCCAGCCACCTTGAGCTATCTC
 AAGGGGCTATCTCATCTGGTCATCTTCGCTGGGGCATCGGTTGCCTTCTCAACCCTTCTCAATTCCC
 CTCACGCTTCTGCAACATGTTCTTCGCTCCCTCCACTTGGGCATCGGCGCCCTATTGGTTGCCGGC
 ACTCTTGCTGGCGACGACAAGTGGCTTAGCCCCGTCTACAAGAACTTTTACGAGTTCCCCCTACCTA
 25 AGCCACCAATCAAGGAAGCGAAAGCGTAAGTCAACTGATATTTCTCTCGCTCGTCATTTGCATGCCT
 AATCTTTCGAGGAAATATACCAACCCGACTACCGGTGCTGTGATCAACTACTACGAAATCACCATCT
 CACCCCTGCAGCAACAGGTTTATCCTGGCCTTGGCAAGGCAAACCTCGTTGGCTACGATGGTATCTC
 TCCCCGTCCCACTTTTAAGATGGAGAGGGGAGAAGAGGCTGTCTCGTTCTGTTTCATCAACAAGGCCTCC
 ATTCCCAATTCCGTCCATCTTCACGGCTCCTACTCCTTTGCCCCCTTCGATGGCTGGGCGGAGGATA
 30 CGACCAGCCCAGGCCAATAACAAGGACTACTACTACCCCAATGCCAGTCTGCCCGTACCCTCTGGTA
 CCACGACCATGCCGTCTTCCACTGCGGAGAACGCCTACTACGGTCAGGCAGGTTTCTACATCCTG
 CACGACTCGGCTGAGGATAGTCTGGGTCTCCCGTCTGGAGACTACGACATCCCGCTCGGTCTGAGCT
 CGAAGCAATACCAGTCCAACGGTGACCTTTTCAGCCGAATGGCGAGACGGATAGCCTTTTTGGCGA
 TGTTATCCATGTCAACGGCCAGCCCTGGCCGTACCTCAAGGTGAGCCAGGAAGTACCGCTTCCGC
 35 CTGCTTGATAACAAGCATTTCCCGTGCCTTCCAGCTGTCACTCCAAGACGATAAGAGCAAGAAGATTG
 ACTTTAACGTATCGCTCCGATGCCGGCCTCCTGTCCAGCCCTGTTCCGACCAACCTGCTACACAT
 TTCCATGGCCGAACGCTGGGAAATTGTCTGCTGACTTCTCCAGTACGCTGGCAAGAACATCACCATG
 AAGAACGAGCGTGACGTGACGGCCGATGAAGACTACAACAGCACTGACAAGGTGATGCGCTTCCGTA
 TAGGCAACAAGGTTACCTCGACTGCCAACAAACCTGCCTGGCAGCCTCCGAGCGTGCCTTTCCC
 40 GCCGAATAAGTCTGGTGTGACAGGAGCTTCAAGTTCGAGCGCAAAGGCGGTGAATGGACTATCAAC
 GCGGTTACCTTTGCCGACGTCGAGAACCGTATTTAGGCAAGCCCCAACGCGGACAGGTTGAGGTCT
 GGGAGCTCGAGAACTCTTCCGGCGGCTGGTCTCACCCTGTTACATCCATCTCATCGACTTCCAGGT
 TATTTCTCGCACTGGTGGCAAGCGTGATGTCTGCCTTACGAGAAGAACGGTCTCAAAGATGTCTGTC
 TTGCTTGGCGTGAACGAGAAGGTGAGAGTTGTCTGCTCGCTTCCAGCCCTGGGAAGGTGTCTACATGT
 45 TCCATTGCCACAACCTGATCCACGAGGACCACGATATGGTGCCTCCAGCATTCTCTGATTACTC
 GCAACAAAGACTGACAAATAATTACAGATGGCCGCTTTCAATGTATCCACCCTTTCAGACTACGGCT
 ACGACCAGAAGGAGACCCTTTTCATCGACCCGATGGAGTCCCGCTGGCGCGCAAAGGATGTCAAGAC
 CGAAGACTTACAACCGATGCCATCCAGTTCGAAGCTTGGCCGCTTTCGCTGAAATAAATCGCTACAAG
 GACGTTGCGAAGATCGAAAGTGCTCTTGAAAATTATTGGAAGACCGCTCCACCCGGGTTCAAGATTA
 50 GCACCACCTCCTCAACTCCGAGCTCAACCGCCGCCACCTCCACCGCTTCCAGCAGTGGCTCAAACAC
 CTCTATTACCGCCCCCATTCAGTCCCCGGCCACTACTTACCCGCGACCACTTCGACCAAGGCGGAT
 GACAAGGCAAGGCTAAGACTTCTACGACCAAACGAAGTAACGAATGGCTTTTAGATCACGCTCA
 TTATAGATAAACTTGGGAGAATTTGGGTGCGTGTTTTTTGGATAGTTTGGTTCGGAGGAGCGCTCTC
 55 TGTAATATGGGCCTCGCAACTCTGTGGATATTTGTTTTCTCGGTGTCTGTTAATATC

SEQ ID NO : 50
 LENGTH : 1860
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 5 FEATURE NAME/KEY : CDS
 LOCATION : (1).....(1860)
 atgttcttcggctccctccacttgggcatcggcgccctattggttgccggcactcttgct
 M F F G S L H L G I G A L L V A G T L A
 ggcgacgacaagtggcttagccccgtctacaagaacttttacgagttccccctacctaag
 10 G D D K W L S P V Y K N F Y E F P L P K
 ccaccaatcaaggaagcgaaagcgaatataccaacccgactaccggtgctgtgatcaac
 P P I K E A K A K Y T N P T T G A V I N
 tactacgaaatcaccatctcaccctgcagcaacaggtttatcctggccttggaaggca
 Y Y E I T I S P L Q Q Q V Y P G L G K A
 15 aacctcgttggctacgatggtatctctcccggctcccacttttaagatggagaggggagaa
 N L V G Y D G I S P G P T F K M E R G E
 gaggtgtcgttctgtttcatcaacaaggcctccattcccaattcctgcatcttcacggc
 E A V V R F I N K A S I P N S V H L H G
 tcctactcctttgcccccttcgatggctggcgaggatacaccagcccaggccaatac
 20 S Y S F A P F D G W A E D T T S P G Q Y
 aaggactactactacccaatgccagctctgcccgtaccctctggtaccacgaccatgcc
 K D Y Y Y P N A Q S A R T L W Y H D H A
 gtcttccacactgccgagaacgcctactacggtcaggcaggtttctacatcctgcacgac
 V F H T A E N A Y Y G Q A G F Y I L H D
 25 tcggctgaggatagtctgggtctcccgtctggagactacgacatcccgtcggctctgagc
 S A E D S L G L P S G D Y D I P L G L S
 tcgaagcaataccagtcacaacgggtgaccttttcagcccgaatggcgagacggatagcctt
 S K Q Y Q S N G D L F S P N G E T D S L
 tttggcgatgttatccatgtcaacggccagccctggccgtacctcaaggtcgagcccagg
 30 F G D V I H V N G Q P W P Y L K V E P R
 aagtaccgcttccgcctgcttgatacaagcatttcccgtgccttccagctgtcactccaa
 K Y R F R L L D T S I S R A F Q L S L Q
 gacgataagagcaagaagattgactttaacgtcatcgcctccgatgccggcctcctgtcc
 D D K S K K I D F N V I A S D A G L L S
 35 agccctgttccgaccaacctgctacacatttccatggccgaacgctgggaaattgtcgtc
 S P V P T N L L H I S M A E R W E I V V
 gacttctcccagtagctggcaagaacatcaccatgaagaacgagcgtgacgtgcaggcc
 D F S Q Y A G K N I T M K N E R D V Q A
 gatgaagactacaacagcactgacaaggctcatgcgcttcgtagtaggcaacaaggttacc
 40 D E D Y N S T D K V M R F V V G N K V T
 tcgactgccacaacaacctgcctggcagcctccgcagcgtgcctttcccgcgaataag
 S T A N N N L P G S L R S V P F P P N K
 tctggtgttgacaggagcttcaagttcgagcgcaaaggcggatgaatggactatcaacggc
 S G V D R S F K F E R K G G E W T I N G
 45 gttacctttgcccagctcgagaaccgtattctaggcaagccccaacgcggacaggttgag
 V T F A D V E N R I L G K P Q R G Q V E
 gtctgggagctcgagaactcttccggcggtggtctcacccttcacatccatctcatc
 V W E L E N S S G G W S H P V H I H L I
 gacttccaggttatttctcgactggtggcaacgctgatgtcctgccttacgagaagaac
 50 D F Q V I S R T G G K R D V L P Y E K N
 ggtctcaaagatgtcgtcttgcttggcggtgaacgagaaggctcagagttgtcgctcgcttc
 G L K D V V L L G V N E K V R V V A R F
 cagccctgggaagggtgtctacatgttccattgccacaacctgatccacgaggaccagat
 Q P W E G V Y M F H C H N L I H E D H D
 55 atgatggccgctttcaatgtatccaccctttcagactacggctacgaccagaaggagacc

M M A A F N V S T L S D Y G Y D Q K E T
 cttttcatcgacccgatggagctcccgctggcgcgcaaaggatgtcaagaccgaagacttc
 L F I D P M E S R W R A K D V K T E D F
 acaaccgatgccatccagtcgaagcttgccgctttcgctgaaataaatcgctacaaggac
 5 T T D A I Q S K L A A F A E I N R Y K D
 gttgcaagatcgaaagtgctcttgaaaattattggaagaccgctcccaccgggttcaag
 V A K I E S A L E N Y W K T A P T G F K
 attagcaccacctcctcaactccgagctcaaccgcccacctccaccgcttccagcagt
 I S T T S S T P S S T A A T S T A S S S
 10 ggctcaaacacctctattaccgccccattcagctccccggccactacttccaccgcgacc
 G S N T S I T A P I Q S P A T T S P A T
 acttcgaccaaggcgatgacaagggcaaggctaagacttctacgaccaaacaagtaa
 T S T K A D D K G K A K T S T T K T K -

15 **SEQ ID NO** : 51
LENGTH : 619
TYPE : PRT
ORGANISM : *M. phaseolina*

MFFGSLHLGIGALLVAGTLAGDDKWLSPVYKNFYEFPLPKPPIKEAKAKYTNPTTGAVINYEITIS
 20 PLQQQVYPGLGKANLVGYDGISPGPTFKMERGEEAVVRFINKASIPNSVHLHGSYSFAPFDGWAEDT
 TSPGQYKDYYPNAQSARTLWYHDHAVFHTAENAYYGQAGFYILHDSAEDSLGLPSGDYDIPLGLSS
 KQYQSNGLFSPNGETDSLFGDVIHVNGQPWPYLLKVEPRKYRFRLLDTSISRFAQLSLQDDKSKKID
 FNVIASDAGLLSSPVPTNLLHISMAERWEIVVDFSQYAGKNI TMKNERDVQADEDYNSTDKVMRFVV
 25 GNKVTSTANNLPGSLRSVPFPNKGSDVRSFKFERKGGEWTINGVTFADVENRILGKPKRQGVV
 ELENSSGWVSHPVHIHLIDFQVISRITGGKRDVLPYEKNGLDKDVLLGVNEKVRVVARFQPWEGVYMF
 HCHNLIHEDHDMMAAFNVSTLSDYGYDQKETLFI DPMSRWRAKDVKTEDFTTDAIQSKLAFAEIN
 RYKDVAKIESALENYWKTAPTGFKISTTSSTPSSTAATSTASSSGSNTSITAPIQSPATTSPATTST
 KADDKGKAKTSTTKTK*

30 **SEQ ID NO** : 52
LENGTH : 2423 (including 150 bp 5' UTR and 150 bp 3' UTR)
TYPE : DNA
ORGANISM : *M. phaseolina*

AAAGGCCTTTGGCTCCCGCCAAAATTGTTTCATCCTCACGCTCACTCCTGCGCTCTTCCCTACAGACC
 35 TTTTGCCTGTAGCTTTAGCTTTCACGGTCTTTTCATTCCCCTTCTCTGGCATTTCATCCCACCGCGGGA
 AGCCTCAATTACCACAATGGTGTCCCTTAAGCAAATCGGTGCCACTCTGTTGGCACTGACTGCTCAA
 ACCTTCGCTGCTGCCATCCCTGAGGCCGAACCGGTGGACCTCGTCGCCCCGTCAAGCCACGACCTA
 CGTCCACCACCTCCTCAACCACCTCGAGGGTCCCATTCCCGATGTACTTGGGGCCCTTCGAGCAG
 40 GGGTTGCTGGAAGAACGGCTTTCAGCATTGCCACTGACTTTGACACGAAGTGGCCATCTACTGGCAAG
 ACTGTCTCATATCGCTTGGAAAGTTACGAATGTCACCAACTGCGAGGACTATCAAAGCAAGGGAATTG
 GAGATGGCTTCTGCAGGCCGATGCTGCTCATCAACAATCAGTTCCCAGGGCCTACCAGTCAGTTTTT
 CCCTCCTCGATGCCGGGTGACAAGGGCGCTAATGACTCGTACTTTCCAGTCAATGCGGAATGGGGAG
 45 ACAACCTTGAGATTACTGTTGTCAATAGTATGCAAGACAACGGCACCTCATTCCACTGGCACGGCAT
 TCGTCAGCTGAACTCATGCCAAAACGATGGTGCCAACGGCGTCACCGAGTGCCCTATTCCTCCCGGC
 GGAAGCTTCACTTATAAGTTCAAGGCTACACAGTATGGTGAGTCTTTGCCTTCTCTTCTACCTTTTC
 CATTTTCATGCAAGCATCTTCATGTGCGTTCTGTTGAGTTTTGAGGCGGAAATACTCTTGAGCTTGCC
 CCGTTCCGTTTGTGAGCCACGTGCAAGGCCACCTGCTCCCACCCTTGTGATAATACTGACCGGCCCT
 TcCAGGAACAACATGGTACCATAGCCATCACTCTGCTCAGTACGGCGATGGGATCCAAGGTGCCATC
 50 GTGATCAATGGCCCGGCAACCGCAATTACGACGAGGATTTAGGCCCGTTGCCCTCACCAGAACCT
 ACGATGAGACGGCATGGACGAAGAACTGGCTGGCGCTGCACGTGGCATTCCCTCCTCAGCCCCTCAA
 CATTCTCTTCAATGGCTCCATGGTCAACAGCACCGGCGGCGGCGCTACAACACCATCTCAGTCAAG
 CAAGGCAAGACTTACCGGCTGCGCCTGATTAACATGAGCGTCGACACTTTCTTCGTATTCTCCATGG
 ACGGGCACGAGTTCCAGATCATCACGGCCGACCTCGTCCCCGTGCACCCTTACAATGCGACCTCGAT
 55 CATGATCGGCATCGGCCAGCGCTACGACATCGTCTTCAAGGCCAACCAGCCCCTGCCAACTACTGG
 CTGCGTACCGAGATCGCCAGCTGCAGTGCCAACGCCATCACGGCCGAAGCCGACATCGTCCCCGGCG

GCATCCTGAACTACGACACCATCGACAAGACGGATCTGCCAGTCTCCACCAAGTCCGTTATCGAGAC
 GACCGACTGCGCCCGGAGCCCTACGACAAGCTGGTCCCCTGGTGGGAGACGCAGGTCGCCAAGGAC
 CAGTTCCTGACCCAGCTCGAGGGCATCGACCTGACGTTTCGCGCGGGCGCCACGGTCGGCAGCGAGA
 CTGGTCTTGTGCAGTGGTACCTGAACGACAGCGCCATGGTCTGCTGACTGGGCCAAACCGACTCTGGA
 5 GTACTTCTCCGAGGGAGACACTAACTATACGTCTTCAATGAACGTTTTCCAGATGCCCGCGGAGGGG
 AAGTGGTCGTTCTGGATCATCCACAACAACGCGGCCGCTCTGCTCGACCACCCGATCCATCTCCACG
 GCCACGACTTTTTTCCACCTGGGCGCCGGCACCGGCACCTGGGACGGCAACGTGGACTCCTTGATCTT
 CGACAATCCTATGCGCAGGGACGTGATGATCTTGCCCACAGGATGGCTTATTATCGCCTTTCCAGCG
 10 GACAAcCCCGGCGCGTGGTTGATGCATTGCCACATCGTAAGTACCCAACAAGCCCATCTCTCTC
 TCTCTCATCAAAGATGACGGCAACTGACAAGCAACCAGGCATGGCACGTTACCGACGGGCTTTCC
 TTGCAGTTCGTTGAAAACCCAGGCTCATTACGCAGGACCTCTCGGGCATGAAGAGCAACTGCGCCG
 CCTGAAAGAGTACGAGGAGAAGGCTTACTATGAGAAGGAGGTTGGCGATTCCGGCTTGTAACCCG
 TGACGGCGGGGATGAGGAGTTTATGACGAGATGTTCACTTTATACCTTCTACCACCACCACCCTT
 15 TTTCTCTTTCTTTTACCGACGTAGGGCTGCACTATCTGGCGCGTCTGTGGTCTGCTTGCATATGC
 ATAAATACCTT

SEQ ID NO : 53
 LENGTH : 1824
 TYPE : DNA
 20 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS
 LOCATION : (1).....(1824)

atggtgtcccttaagcaaatcggtgccactctggtggcactgactgctcaaacccttcgct
 M V S L K Q I G A T L L A L T A Q T F A
 25 gctgccatccctgaggccgaaccggtggacctcgctcgcccgtcaagccacgaccactacg
 A A I P E A E P V D L V A R Q A T T T T
 tccaccacctcctcaaccacctcgagggttcccgattcccgatgtacttggggcccttcg
 S T T S S T T S R V P D S R C T W G P S
 30 agcagggggttgctggaagaacggcttcagcattgccactgactttgacacgaagtggcca
 S R G C W K N G F S I A T D F D T K W P
 tctactggcaagactgtctcatatcgcttgggaagttacgaatgtaccaactgcgaggac
 S T G K T V S Y R L E V T N V T N C E D
 tatcaaagcaaggggaattggagatggcttctgcaggccgatgctgctcatcaacaatcag
 Y Q S K G I G D G F C R P M L L I N N Q
 35 ttcccagggcctaccatcaatgcggaatggggagacaaccttgagattactggttgcatt
 F P G P T I N A E W G D N L E I T V V N
 agtatgcaagacaacggcacctcattccactggcacggcattcgtcagctgaactcatgc
 S M Q D N G T S F H W H G I R Q L N S C
 40 caaaacgatggtgccaacggcgctcaccgagtgccctattcctcccggcggaagcttact
 Q N D G A N G V T E C P I P P G G S F T
 tataagttcaaggctacacagtatggaacaacatggtaccatagccatcactctgctcag
 Y K F K A T Q Y G T T W Y H S H H S A Q
 tacggcgatgggatccaaggtgccatcgatcaatggccccggcaaccgccaattacgac
 Y G D G I Q G A I V I N G P A T A N Y D
 45 gaggatttaggccccgttgccctcaccgaaacctacgatgagacggcatggacgaagaac
 E D L G P V A L T E T Y D E T A W T K N
 tggctggcgctgcacgtggcattccctcctcagcccccaacattctcttcaatggctcc
 W L A L H V A F P P Q P L N I L F N G S
 atggtcaacagcaccggcgggcgccgctacaacaccatctcagtcaagcaaggcaagact
 50 M V N S T G G G R Y N T I S V K Q G K T
 taccggctgcgcctgattaacatgagcgtcgacactttcttcgattctccatggacggg
 Y R L R L I N M S V D T F F V F S M D G
 cacgagttccagatcatcacggccgacctcgtccccgtgcacccttacaatgcgacctcg
 H E F Q I I T A D L V P V H P Y N A T S
 55 atcatgatcggcacggccagcgtacgacatcgtcttcaaggccaaccagcccgtgccc

I M I G I G Q R Y D I V F K A N Q P A A
aactactggctgCGTaccgagatcgccagctgCAGTgccaacgCCatcacggccgaagcc
N Y W L R T E I A S C S A N A I T A E A
gacatcgtccccggcggcatcctgaactacgacaccatcgacaagacggatctgccagtc
5 D I V P G G I L N Y D T I D K T D L P V
tccaccaagtccgttatcgagacgaccgactgCGCCGCGAGCCctacgacaagctggtc
S T K S V I E T T D C A A E P Y D K L V
ccctggTgggagacgcaggtccccaaggaccagttcctgaccagctcgagggcatcgac
P W W E T Q V P K D Q F L T Q L E G I D
10 ctgacgTtcgCGGCGGGcgccacggTcggcagcgagactggTctgtgcagTggTactgT
L T F A A G A T V G S E T G L V Q W Y L
aacgacagcgccatggTcgtcgactgggccaaccgactctggagTacttctccgaggggA
N D S A M V V D W A K P T L E Y F S E G
gacactaactatacgtcttcaatgaacgTtttccagatgcccgcggaggggAagTggTcg
15 D T N Y T S S M N V F Q M P A E G K W S
ttctggatcatccacaacaacgCGGCGCgtctgctcgaccaccgcatccatctccacggc
F W I I H N N A A A L L D H P I H L H G
cacgacttttccacctgggCGCGGcaccggcacctgggacggcaacgTggactcctgT
H D F F H L G A G T G T W D G N V D S L
20 atcttcgacaatcctatgCGcagggacgTgatgatcttgcccacaggatggcttattatc
I F D N P M R R D V M I L P T G W L I I
gcctttccagcggacaaccccgCGCGTggtTgatgcattgccacatcgcatggcagctt
A F P A D N P G A W L M H C H I A W H V
accgacgggcttccctgCagTtCGTgaaaaccagggctcattcacgcaggacctctcg
25 T D G L S L Q F V E N P G S F T Q D L S
ggcatgaagagcaactgCGCGCctggaaagagTACgaggagaaggcttactatgagaag
G M K S N C A A W K E Y E E K A Y Y E K
gaggtTggcgattccggcttGtaa
E V G D S G L -

30
SEQ ID NO : 54
LENGTH : 607
TYPE : PRT
ORGANISM : *M. phaseolina*

35 MVSLKQIGATLLALTAQTFAAAIPEAEPVDLVARQATTTTTSTTSSTTSRVPDSRCTWGPSSRGCWKN
GFSIATDFDTKWPSTGKTVSYRLEVTVNVTNCEYQSKGIGDGFRCRPMLLINNQFPGPTINAEWGDNL
EITVNVNSMQDNGTSFHWHGIRQLNSCQNDGANGVTECPIPPGGSFTYKFKATQYGTWYHSHSAQY
GDGIQGAIIVINGPATANYDEDLGPVALTETETAWTKNWLALHVAFPQPLNILFNGSMVNSTGGG
RYNTISVKQGKTYRLRLINMSVDTFFVFSMDGHEFQIITADLVPVHPYNATSIMIGIGQRYDIVFKA
40 NQPAANYWLRTEIASCSANAITAEADIVPGGILNYDTIDKTDLPVSTKSVIETTTDCAAEPYDKLVPW
WETQVPKDQFLTQLEGIDLTFAGATVGSETGLVQWYLNDSAMVVDWAKPTLEYFSEGDTNYTSSMN
VFQMPAEGKWSFWI IHNNAALLDHP IHLHGDFHFLGAGTGTWDGNVDSLIFDNP MRRDVMILPTG
WLI IAFPADNPGAWLMHCHIAWHVTDGLSLQFVENPGSFTQDLSGMKSNCAAKEYEKEKAYYEKEVG
DSGL*

45
SEQ ID NO : 55
LENGTH : 2147 (including 150 bp 5' UTR and 150 bp 3' UTR)
TYPE : DNA
ORGANISM : *M. phaseolina*

50 GCCACGGCTCCATTTGGATCGTCACTCACCACCACCACCACAACCACTCTCTACTCACCTCTTCACC
AGCCCCCTCTTTCTCCTCACTGGCATCCATTCGTTGAAGTCGCTGTCCCCTTTCTTGTCTTTTCGTC
TTCTTCCACCGTCAGAATGAGGGCTTCTTACCTCTCTGCGGCTGCCTTCTGCGGCTCTCGGCTGCC
GCGCCGCAAGCCGCCAGCACTTCTTCTTCTCTGCTTTCAGCCAACGCCAGTTCCACCAGCTCAGCAG
55 CTACTTCCACTTGCACTGGCAACACTGCCGACGACCGCACTGTGTGGTGC GACTACGACATCAGCAC

G L Q A W E G V F G G I I I N G P A T A
 aattacgacgaggacctcggcatcatgtttctcaatgattgggatcactcgactgttgac
 N Y D E D L G I M F L N D W D H S T V D
 gagctctacgattcagctcagagcagcggctcctcctacgcttgacaccgggtctcattaac
 5 E L Y D S A Q S S G P P T L D T G L I N
 ggaaccaacatctacaatgactccggaacagttactggatctcgctgggagggccagcctg
 G T N I Y N D S G T V T G S R W E A S L
 accgagggtagcagctaccggctccgtcttgtcaacgctgctgtagactcgcacttcaa
 T E G T S Y R L R L V N A A V D S H F K
 10 ttttcgatcgataaccacacccctccagggttatcgccatggacctgggtccccattgagccc
 F S I D N H T L Q V I A M D L V P I E P
 tacgagactactgttctggacattggcatgggtcagcgcctacgacgtcattgttacggca
 Y E T T V L D I G M G Q R Y D V I V T A
 gaccaggcttctgttcttctgatttctggcttcgcgcaattcccagaccgctgctcg
 15 D Q A S V A S D F W L R A I P Q T A C S
 gacaacgataacgcagatgatatcaagggcataatccactacggatcatcaactggact
 D N D N A D D I K G I I H Y G S S T G T
 ccggaaaccactgcttatgattacactgatgctgtgctcgatgaggacagctctgatctc
 P E T T A Y D Y T D A C V D E D S S D L
 20 gtcccgtatgtctctaagactgccacctccggtacctccctggccgaggctgtttccgctc
 V P Y V S K T A T S G T S L A E A V S V
 ggctacaactcggacaacctcttccgctggatcatgaacgagacctctatggaggtcgag
 G Y N S D N L F R W Y M N E T S M E V E
 tgggagaatccaacccttctgcaggtctacaacgacaatctgacgttcactgacacatcg
 25 W E N P T L L Q V Y N D N L T F T D T S
 ggtgttgttcaacttgacaccgcagaccaatggacttcttctcgtcatcgagaccgacaac
 G V V Q L D T A D Q W Y F F V I E T D N
 gctgtgccacaccaatccatcttcacggccacgacttcttctcgtcctggctgcgggcacc
 A V P H P I H L H G H D F F V L A A G T
 30 ggctcttacagttcagacgttactctgactctggataaccctcccgcgcgacacggct
 G S Y S S D V T L T L D N P P R R D T A
 atgcttgactcctctggctacttggctcctggcttctcgagaccgacaaccagggtgctg
 M L D S S G Y L V L A F E T D N P G A W
 ttgatgactgccacatcggctggcacaccagcgagggctttgcccttcagatcttgag
 35 L M H C H I G W H T S E G F A L Q I L E
 cgctacaccgagatccaggatagcctgatcgactacgacgtcctcaatgacacctgctcg
 R Y T E I Q D S L I D Y D V L N D T C S
 acttggctacttactccgaggcaactcgatcgaggaggaggactctgggtgtgtaa
 40 T W S T Y S E A N S I E E E D S G V -

SEQ ID NO : 57
LENGTH : 578
TYPE : PRT
ORGANISM : *M. phaseolina*
 45 MRASYLSAAFLGLSAAAPQAASTSSSSASANASSTSSAATSTCTGNTADDRTVWCDYDISTDYND
 GPDTGVTREYYFVVS DVT VSPDGI SR SAMAVNGS I PGPTI FADWGD TVKVTVYNDL T TSGNGSS IHW
 HGIRQNYTNQNDGVVSI TQCPIAVGETYTYEWKATQY GSSWYHSHIGLQAWEGVFGGI I INGPATAN
 YDEDLGIMFLNDWDHSTVDELYDSAQSSGPPTLDTGLINGTNIYNDSGTVTGSRWEASLTEGTSYRL
 50 RLVNAAVD SHFKFSIDNHTLQVIAMD LVP IEPYETT VLDIGMGQRYDVIVTADQASVASDFWLRAIP
 QTACSDNDNADDIKGIIHYGSSTGTPETTA YDYTDACVDEDS S D LVPYVSKTATSGTSLAEAVSVGY
 NSDNLF R W Y M N E T S M E V E W E N P T L L Q V Y N D N L T F T D T S G V V Q L D T A D Q W Y F F V I E T D N A V P H P I H L H
 GHDF F V L A A G T G S Y S S D V T L T L D N P P R R D T A M L D S S G Y L V L A F E T D N P G A W L M H C H I G W H T S E G F A L
 Q I L E R Y T E I Q D S L I D Y D V L N D T C S T W S T Y S E A N S I E E E D S G V *

55 **SEQ ID NO : 58**

LENGTH : 2302 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 ORGANISM : *M. phaseolina*

5 TGCGCCCTCCCGCGTGGTGGGCACTCTTTTATAAAGGCAGCTCTCCACTCCTGCCCTGTGAATGCT
 TGCTCAAGGGCGCTCAGGCATAGGTAAGTAGGGTAAGTATTGAGGCGTCTGGCTTTGCGGCGAATCT
 TGGGACGATTTTCAGCCATGACTCGCCTTCCGTTCGTCTCCTCGGGCTCGTGGCTACGGCTTTGGCCAAG
 ACGGTCACGTGTTGACTGGGACATTGGCTGGGTTTCCAGGGCTCCCGATGGATTTCGAGCGGCCTGTCA
 TCGCAATCAACGGCCAATGGCCGCTCCCTGTGCTGGAGGCCGACGTCAACGACACCATCATCGCCAC
 10 TGTCACAATTCTCTTGGCAACGAAACGACCAGCATCCACTGGCACGGCATGTGGCAGAGAGGCACG
 CCCGAGCAAGACGGCGGGGCTGGCGTACGCAGTGTCCGATCCCGCCTGGCGAGACTTTTCACGTACG
 AGTTCAAAGCATAACCCGGCCGGTACTTTCTGGTACCACTCGCATGACATGGGCCAGTATCCCGATGG
 CCTGCGCGACCCATGATCATCCATGACCCGACTCCGAAACCCAGAAGAGCAGTGATGGTGAAGTC
 GTGCTCTATGTGTCCGACTGGTACCACGACCAGATGCCGCCGCTTATCCACAGCTTCTGACCACCC
 CCAATTTCAACGGCGCGATGCCAACCCGAACTCCAGCTTGATCAACGATCAGCAGTCCACGTCCAT
 15 CAACATCCGTCCCGGCGAGAAGAAATACGTGCGCATCATCAACACGTCCGCCCTCGCCACGTACTAC
 CTGCAGTTTGGTGGGTTCCGCTTCAGCCACCCCTCCCCTGCGGAAGTGACTGACGATTTTCAGACCAA
 CACAACATCACCGTTGTGCGCAATTGACGGTGTGACGGTCCGTACTACCCCTGTGCTTATGCTGTG
 GCTTCGTGCATAACCCGTCCGCGAGCTTCCCGCCGTTGCATGCCGAGGCGATAAAGGTTTTAGTGCT
 GACCGTAGTTCGTGCAGTGAACCGCAGAGCTGGAAGGCCCTGGAGATCGTCCCCGGCCAGCGGTACG
 20 ACTTCATCATCGAAGGTCTCGAGAACCCCAAGGAACACTACGCATTCATCAACAAGATGGCTGTTCT
 CGGTCTGCAGAACGTCAACAGCCTGGTCTACGACGAGTCCCTTCGGCGAGCCGGAGTCTGTTACGCTG
 AGCTCTGGCGATCTCGGAAGTGATTTACCCTGGTGCCTCTAGATCACGAGCCTCTCTTGAATCCG
 TGGACCACACCATCACGATGGAGGTCAATAATTTGAACATTGATGGCGTTGGCTTTCCGTACGGCTG
 ATCCCGTGGCCGGGAGAAATCTTGCTCACATGTGCCACAGCATCACTCAAGGCCCGACCCGTACAT
 25 TTCACCCCGCACGCCTACCCTGTACACAGCCCTCAGCACCGGCTTCAACGCCACCGACCCAGAAATC
 TACGGCCAGGTGAACCCCTACGTGCTCAACGCCGGTGAAGTCTCCGGCTCGTCGTCAACAGCAACG
 ATCTCGTACCCGCAACAACCTCTGGCCGCGGGCACCCCATGCATCTGCACGGCCACGTTTTCCAGGT
 GGTCCGTGAGTTCTCCGAGCACTGGGACGGCAACACCTCGTCTTCCCCGCCACGCCCATGAAGCGT
 GACACCACCGTCTTATTCGCTGGCGGCAGCCTGGTGTCTCCAGTTCGGTCCGACAACCCGGTGT
 30 GGCTGTGTAAGTATTTTTTTTCCGATGCCCATGGTGCCTGGACGTGAGCTGATGAGGATGGGCCTT
 GCAGTTCACCTGCCATATTGAGTGGCACCTAGACGCCGGCATGTCCGCTACAATCATCGAGGCGCCGC
 TCGACTTGCAGCGCGAGGGCATCAAGATCCCCAGCAGCATCTTGAATCGTGCAGAGCCTTGAACCT
 GACCACTCAAGGCAATTGCGCCGGCAACACCCGCAACCTGGATGACACTGCCGCTGCAGGGTCTAC
 GACACCGATCCATGGGGGTAGGTATATCGGAGTTTAATTGAGCTTGAAGGACATGTGCTGACCGTT
 35 GCGTTTAGTGCGCTTATCACGGATGACGGTGGTGGAAATAGTACCCTGAACGGAACCACTTATAAGA
 GAATTTAGTGTAATCTTAATACGTCTTACATGTACACAACCTATGCATTGTATTCAAATTCTAC
 ATAAGCACTTCGACAGTAGTCTGAGTTGACTGACTAGGCTCGTGGACGGAGGACGCCGTTTCTCGT
 CTTTGCCTGCTAAATTTTCGCGAT

40 SEQ ID NO : 59
 LENGTH : 1665
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS

45 LOCATION : (1).....(1665)
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 M T R L P F V L G L V A T A L A K T V T
 gttgactgggacattggctgggtttccagggctcccgatggattcgagcggcctgtcatc
 V D W D I G W V S R A P D G F E R P V I
 50 gcaatcaacggccaatggccgctccctgtgctggaggccgacgtcaacgacaccatcatc
 A I N G Q W P L P V L E A D V N D T I I
 gccactgtccacaattctctggcaacgaaacgaccagcatccactggcagcggcatgtgg
 A T V H N S L G N E T T S I H W H G M W
 cagagaggcagccccgagcaagacggcggggctggcgtcacgcagtggtccgatcccgct
 55 Q R G T P E Q D G G A G V T Q C P I P P

5 ggcgagactttcacgtacgagttcaaagcatacccgccggtactttctggtaccactcg
 G E T F T Y E F K A Y P A G T F W Y H S
 catgacatgggccagatcccgatggcctgcgcgcacccatgatcatccatgaccccgac
 H D M G Q Y P D G L R A P M I I H D P D
 10 tccgaaaccagaagagcagtgatgggtgaagtctgtctatgtgtccgactggtaccac
 S E T Q K S S D G E V V L Y V S D W Y H
 gaccagatgccgcccgttatccacagcttccctgaccaccccccaatttcaacggcgcgatg
 D Q M P P L I H S F L T T P N F N G A M
 cccaaccggaactccagcttgatcaacgatcagcagtcacagtcacatcaacatccgtccc
 15 P N P N S S L I N D Q Q S T S I N I R P
 ggcgagaagaatacgtgcgcatcatcaacacgtccgcccctcgccacgtactacctgcag
 G E K K Y V R I I N T S A L A T Y Y L Q
 tttgaccaacacaacatcacgcttgcgaattgacgggtggtgacgtcgaaccgcagagc
 F D Q H N I T V V A I D G V D V E P Q S
 20 tggaaggccctggagatcgtccccggccagcggtagcacttcatcatcgaaggtctcgag
 W K A L E I V P G Q R Y D F I I E G L E
 aacccccacaaggaactacgcattcatcaacaagatggctggtctcggtctgcagaacgtc
 N P T R N Y A F I N K M A V L G L Q N V
 aacagcctggtctacgacgagtccttcggcgagccggagtcggttcagcctgagctctggc
 25 N S L V Y D E S F G E P E S F S L S S G
 gatctcgggaagtgatttcaccctgggtgcctctagatcacgagcctctcttggaaatccgtg
 D L G S D F T L V P L D H E P L L E S V
 gaccacacatcacgatggaggtcaataatttgaacattgatggcgttggctttcgcatc
 D H T I T M E V N N L N I D G V G F R I
 30 actcaaggcccggaccgctacatttcaccccgcacgcctaccctgtacacagccctcagc
 T Q G P D P Y I S P R T P T L Y T A L S
 accggcttcaacgccaccgaccagaaatctacggccaggtgaaccctacgtcgtcaac
 T G F N A T D P E I Y G Q V N P Y V V N
 gccggtgaagtcgctccggctcgtcgtcaacagcaacgatctcgtcaccgccaacaactct
 35 A G E V V R L V V N S N D L V T A N N S
 ggccgcccggcaccatgcatctgcacggccacgctttccaggtggtcggtcagttctcc
 G R G H P M H L H G H V F Q V V G Q F S
 gagcactgggacggcaacacctcgtccttccccgccacgccatgaagcgtgacaccacc
 E H W D G N T S S F P A T P M K R D T T
 40 gtcctattcgctggcggcagcctgggtgctccagttccgtgcccgacaaccccggtggttgg
 V L F A G G S L V L Q F R A D N P G V W
 ctggttactgccatattgagtgccacctagacgccggcatgtccgctacaatcatcgag
 L F H C H I E W H L D A G M S A T I I E
 gcgccgctcgacttgcagcgcgagggcatcaagatccccagcagcatcttgaatcgtgc
 45 A P L D L Q R E G I K I P Q Q H L E S C
 agagccttgaacttgaccactcaaggcaattgcgccggcaacaccgccaacctggatgac
 R A L N L T T Q G N C A G N T A N L D D
 actgccgctgcagggctctacgacaccgatccatgggggtgcgcttatcacggatgacggg
 T A A C R V Y D T D P W G A L I T D D G
 50 ggtggaatatgaccctgaacggaaccacttataagagaatttag
 G G N S T L N G T T Y K R I -

SEQ ID NO : 60
 LENGTH : 554
 50 TYPE : PRT
 ORGANISM : *M. phaseolina*
 MTRLPFVLGLVATALAKTVTVDWDIGWVSRAPDGFERPVIAINGQWPLPVLEADVNDTIIATVHNSL
 GNETTSIHWGHMWQRGTPEQDGGAGVTQCP IPPGETFTYEFKAYPAGTFWYHSHDMGQYPDGLRAPM
 I I H D P D S E T Q K S S D G E V V L Y V S D W Y H D Q M P P L I H S F L T T P N F N G A M P N P N S S L I N D Q Q S T S I N I R P G
 55 E K K Y V R I I N T S A L A T Y Y L Q F D Q H N I T V V A I D G V D V E P Q S W K A L E I V P G Q R Y D F I I E G L E N P T R N Y A F

5 INKMAVLGLQNVNSLVYDESFGEPEFSLSLSSGDLGSDFTLVPLDHEPLLESVDHTITMEVNNLNIDG
 VGFRITQGPDPYISPRTPPLYTALSTGFNATDPEIYGQVNPYVNVNAGEVVRLVNVNSNDLVTANNSSGR
 GHMHLHGHVFQVVGQFSEHWDGNTSSFPATPMKRDTTVLFAAGSLVLQFRADNPGVWLFHCHIEWH
 LDAGMSATIIIEAPLDLQREGIKIPQOHLSCRALNLTTQGNCAANTANLDDTAACRVYDTPWGALI
 TDDGGNSTLNGTTYKRI*

SEQ ID NO : 61
 LENGTH : 2460 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 10 ORGANISM : *M. phaseolina*

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 CGCCGTCGCTTTCCAGATGTCTTTTCGTTTCGAAAATTTTCACAGGCCTCATCGCTTTTACCCTGGC
 15 TTAGGCCAAGATGAGACTAATGGGTGAGTATGCTGAACCTTGCAGGATATCTGAATAATAGTTGT
 AGGGTTTCGAAATGGGGCACGTTTCGATGCACCGAGGCTCCAGAAGTTTCTGGATCGGGTGAGGTTAT
 TCTGAAACATTACTGAGCTCGGCACTGATTGGTCGGCAGGGTCATGGCATTCCCTGGGGCGGTATGA
 CTTGTACCAACGCCAACCCGTATACTGAGTAGGACTCGGCCCGTGGTCCACAATCTTCTCTGCGCTG
 ACGTTTCGAAAGAGCTCCAGACACAGGACAGACTGTGCGGTATGATTTACAGTCCAGCGGCATCCG
 20 GTGTCTCCGGACGGCTACAAGAAGAACGTTTTGCTTGTGAACGGGCAATTTCCAGGCCGCTCATGG
 AAGCTAAGTGGGGAGACACAATTGAAGGTAGGATGAGAGTAAATACGGGCAGCAACAAGTCTGACA
 GATACAGTACTGTGCACAACAATAGCCGGACCTGAGGAAGGCACACAATCCACTGGCACGGCT
 TCACGCAGAGAGGGACGCCGTTTCATGGATGGTATCCCTTCCGTATCAAGCTGCCCATTTGCGCCAA
 CAATACCTTTGTGTATACCTTCAAGGCAGACCTTTACGGCACTGGCTGGTACCCTCTCATTACTCT
 25 GGGCAATCCACCGGCGGCTCCTCGGCCAATCGTCGTCCATGGTCCCAGTGCCTTGACTATGATA
 TTGACCTTGGCCCTGTGTTTTTGAATGACTGGTACCACAAGGACTACTTGAGCTTATTGACGGTGG
 TGAGACTTTCCCGTAGGTCAAAGGGCTCGATAGCTGAAACCTCCAACAGTCGTCGGAACGGACCCCA
 GCCTATGGCATCCCAAGGCGGACAACAACATGATAAACGGGAAGATGGACTACGATTGCTCCCTTGT
 CACTGACGGCACGCTTGCCTCTAATGCCGCTTGGCCACGTTTCAGCTTACCAAGGGCGCCACG
 30 CACCGTCTCAGGCTCATAAACGGAGGATCCGCCTCCCTGCAGCACTTTCAGTATCGATGGACACGAGA
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 AAGCCGCCGATTTTTCCAGATATCCACATTAACACCCACCAGGTCCGCCAGCGGACAGACGCT
 CCTCGTACGGCCAACGGCGACGCCACCGGCGCTACTGGATGCGCAGCACCGTCCGCGACGATGAA
 TCCTGCAACTGGTCCAACCAGCCCGCGCGCTCGCCGAGTCTACTACGACGCGCAAACCCCAACCG
 35 TCAAGCCCAACAGCACCGGCTGGCCCCCGTCCGCAACCAGCAAGGCAGCTGCGACAACGACCCGCT
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 TTCGGCTGGACGCAAAACGCAACCGGACACCAAGTCTGGACGGTCAACGACCGCGGCTTCCGCGGCA
 ACTACAACCGCCCCGTGCTGCAGCTCGCCGCGGGCTCGGACACCGCGTCTGTCGCGTACGCGTGGGA
 GCCCCAATGGAACGTCTACGACACGGGCCGCAACCGCACCGTCCGCATCGTCATGCACAACAACCTCC
 40 TCCATGTACCACGTACGTGAGCCCTTGTCTCCCCCCCCCCCCCTCCCTCTCGCTAATGGAAAG
 ACACATGCAGCCCATGCACCTCCACGGGCACAACGCGCAGATCCTCGCCGCGGGCGCCAACGGCCCC
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 ACGGGCACCTGGTGATCCAGTACGCGCAGGACAACCGGGCGTGTGGCCGCTGCACTGCCACATCGC
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 GGGGCCGCGGGTGGAGGGAGGAGATGGCGGGCGTGTGTGCCGGGTGGGAGGCGTACACGCGGATGA
 45 ACGTGGTGGAGCAGGTGGACAGTGGGGTGTGAGTTGGGAGCAAGGAGGGGGTTTGGAGATGCGCGTA
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 GGCGGTGCAATCTCGTTTTCTGTCATCCTGGGTGGATAGGGAGCGGCG

50 SEQ ID NO : 62
 LENGTH : 1803
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS
 LOCATION : (1).....(1803)

55 atgtctttcgtttcgaaaatttcacaggcctcatcgcttttaccgctggcttaggcca

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D E T N G V S K W G T F D A P R L Q K F
ctggatcgggggtcatggcattccctggggcggtatgacttgtaccaacgccaaccgcat
5 L D R G H G I P W G G M T C T N A N P Y
actgaagctccagacacaggacagactgtgcggtatgatttcacagtccagcggcatccg
T E A P D T G Q T V R Y D F T V Q R H P
gtgtctccggacgggtacaagaagaacgttttgcttgtgaacgggcaatttccaggcccg
V S P D G Y K K N V L L V N G Q F P G P
10 ctcatggaagctaactggggagacacaattgaagtgactgtgcacaacaacatagccgga
L M E A N W G D T I E V T V H N N I A G
cctgaggaaggcacacaaatccactggcagcgcttcacgcagagagggagccggtcatg
P E E G T Q I H W H G F T Q R G T P F M
gatggatcccttccgatcaagctgccccattgcccacaacaatacctttgtgtatacc
15 D G I P S V S S C P I A P N N T F V Y T
ttcaaggcagacctttacggcactggctggtaccactctcattactctgggcaatccacc
F K A D L Y G T G W Y H S H Y S G Q S T
ggcggcctcctcggcccaatcgctcgtccatggtcccagtgcgcttgactatgatattgac
G G L L G P I V V H G P S A L D Y D I D
20 cttggccctgtgtttttgaatgactggtaccacaaggactacttgcagcttattgacggt
L G P V F L N D W Y H K D Y L Q L I D G
gtcgtcggaaacggacccccagcctatggcatcccaaggcggacaacaacatgataaacggg
V V G T D P S L W H P K A D N N M I N G
aagatggactacgattgctcccttgtcactgacggcacgccttgcgtctctaagcggcg
25 K M D Y D C S L V T D G T P C V S N A G
ttggccacgcttcagcttcaccaagggcgccacgcaccgtctcaggctcataaacggagga
L A T F S F T K G A T H R L R L I N G G
tccgcctccctgcagcacttcagtatcgatggacacgagatgacagtcatttccaatgac
S A S L Q H F S I D G H E M T V I S N D
30 ttcgtagccgtagagccataaccagacgaagacagtgactcttgcagtcggccagcggaca
F V A V E P Y Q T K T V T L A V G Q R T
gacgtcctcgtcacggccaacgggcgacgccaccggcgccctactggatgvcgacgaccgtc
D V L V T A N G D A T G A Y W M R S T V
gcggaacgatgaatcctgcaactggtccaaccagccccgcgcgctcgccgcagtctactac
35 A D D E S C N W S N Q P A A L A A V Y Y
gacgcggcaaacccccaccgtcaagcccaacagcaccggctggccccccgctcgccaaccag
D A A N P T V K P N S T G W P P V A N Q
caaggcagctgcgacaacgacccgcttacccaaacatccccctcttccccatccccgcg
Q G S C D N D P L T Q T I P L F P I P A
40 gaccccagcccctcaacgacgcttgagctcgacttcggctggacgcaaaacgcaaccgga
D P S P S T T L E L D F G W T Q N A T G
caccaagtctggacgggtcaacgaccgcggttccgcggaactacaaccgccccgctgctg
H Q V W T V N D R G F R G N Y N R P V L
cagctcgccgcggtcggacaccgctcgtccgctacgctgggagcccgaatggaac
45 Q L A A G S D T A S S A Y A W E P E W N
gtctacgacacgggcccgaaccgacccgtccgcatcgtcatgcacaacaactcctccatg
V Y D T G R N R T V R I V M H N N S S M
taccacccatgcacctccacgggcacaacgcgcagatcctcgccgcgggcgccaacggc
Y H P M H L H G H N A Q I L A A G A N G
50 ccctgggacggccgacccgtcgcgcgccccgccaacccggcccgcgacgcttaccag
P W D G R T V A R P A N P A R R D V Y Q
ctcccggcaacgggacactggtgatccagtacgvcgacgggcaacccgggctgtggccg
L P P N G H L V I Q Y A Q D N P G V W P
ctgcactgccacatcgctggcagcgcgagcgggcatgtttgcgagcgtgctggagcgg
55 L H C H I A W H A S A G M F A S V L E R

gcgggggacattgtggggagcagcggggccggcgggtggagggaggagatggcgggcgtg
 A G D I V G S S G A G G W R E E M A G V
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 C A G W E A Y T R M N V V E Q V D S G V
 5 tga
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SEQ ID NO : 63
 LENGTH : 600
 TYPE : PRT

10 ORGANISM : *M. phaseolina*

MSFVSKI FTGLIAFTAGLGQDETNGVSKWGTFDAPRLQKFLDRGHGIPWGGMTCTNANPYTEAPDTG
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 RGTPFMDGIPSVSSCPIAPNNTFVYTFKADLYGTGWYHSHYSQGSTGGLLGPVIVHGPSALDYDIDL
 15 GPVFLNDWYHKDYQLIDGVVGTDPSSLWHPKADNNMINGKMDYDCSLVTDGTPCVSNAGLATFSFTK
 GATHRLRLINGGSASLQHFSIDGHEMTVISNDFVAVEPYQTKTVTLAVGQRTDVLVTANGDATGAYW
 MRSTVADDES CNWSNQPAALAAVYDAANPTVKPNSTGWPPVANQQGSCDNDPLTQTIPLFPIPADP
 SPSTTLELDFGWTQ NATGHQVWTVNDRGFRGNYNRPVLQLAAGSDTASSAYAWEPENVYDTGRNRT
 VRIVMHNSSSMYHPMHLHGHN AQILAAGANGPWDGRTVARPANPARRDVYQLPPNGHLVIQYAQDNP
 20 GVWPLHCHIAWHASAGMFASVLERAGDIVGSSGAGGWREEMAGVCAGWEAYTRMNVVEQVDSGV*

SEQ ID NO : 64
 LENGTH : 2285 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 ORGANISM : *M. phaseolina*

25 TGAAGCCCTCTCTGACGCAGGTATCTATTTTATTAAACCAGTTTCACCCTCCGGTCGGGTAAGTATT
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 CAGAGATATCTTCGCATGATTCGCCTTTCTCTCGTGCTCGGCTTCATGGCCACGACACTGGCCAAG
 ACCGTCACTCTTAACTGGGATATTGGGTGGGTTTCTGCGGCTCCAGATGGATTTACACGGCCCCGTC
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 30 TACGCGAACCTCCTGCGTAACGAGACGACGAGCTTGCACTGGCATGGTATGTGGCACTATAACTCG
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 AGTTCAAGGCGTACCCGGCCGGCACCTTTTGGTATCATTCTCACGATATGGGCCAATATCCCGACGG
 CCTGCGGCCCAATGATCATTACGACCCTAAGGCTGCCGCGGAGCGGGACACTGATAAGGAGTAC
 GTACTTACGGTCTCCGACTGGTACCGTGACCAGATGCCGTCACTTATCCACCGCTACTTGACAACCT
 35 CCACTTATAATAGTACTATGCCAAATCCAACTCGAGCTTGATCAACGATCAGCAGTCTACAACGCT
 AAACATCCGCCCCGGGCAGAAGATATATGTTCCGATTATTAACATGTCAGCCCTCGCAACGTA
 CTACAGTTCGGTAGGTGTATCCATATGGCCCTGTTACACGGACGAAGCTAACGATTAAGATCAACAC
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 40 TGCATGTCGGCATATGTGCCGTTAGCTGCATGCAAACGCGTTACAAGGTTAAGTGCTAACAAACGGGC
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 45 GCCCCGGGGCGGGTCCCGAAGTCCGGTATGAGGCTTACTCACTCCAATCCGCAGCATCACGCAGGGA
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 CACACCTTCCAAGTGGTTGGCCAATATGGCAGCCCTTGGGACGGCGATGCCTCTAAATTCCTGCTG
 50 TTCTATGAAGCGGGATACCACTGTTCTGTTTACTGGCGGGAGCTTGGTGATCCGGTTCCGCGCGGA
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 ACCTGTAACCTCGCAGTCCATTGCCACAACGAATGGCACCTTGACGCCGGCATGGCTGGAACGATTAT
 CGAAGCGCCACTCGAGCTTCAACAAGCGGTCTGACGATTCCGCCGCGACCTCGCGTCGTGCAGG
 GCGTTAACTTAAACGACCCGGGCAATTGTGCCGGTAATACTGCGAACCTAGAGGATACGGCTGCAT
 55 GCAGAGTCTACGACACTGAGCCTTGGGGGTGAGTTACTCCATTATTGTTTTGTTGTTATAACCCCTTG

CTGATGACAATACTTCTCTAGTGCACCTTATCAAGAGAGATGAGGAAACAGCATATTAATAGCACGC
 TGGCATAGCACCTGTAGATGTAGACTGATTCTAGTATTTATTACCTGTGTACACTTGAAGAAAAT
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 CTGCTCC

5

SEQ ID NO : 65
 LENGTH : 1635
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS
 LOCATION : (1).....(1635)

10

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 15 L N W D I G W V S A A P D G F T R P V I
 ggcatacaacggggagtgccgcccccgtttgggaagccgacgtcaacgacactattata
 G I N G E W P P P V L E A D V N D T I I
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 V I T R N L L R N E T T S L H W H G M W
 20 cactataactcgacccacatggacggcgagccaggatttcacagtgtgaaatccctccg
 H Y N S T H M D G G A R I S Q C E I P P
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 25 H D M G Q Y P D G L R A P M I I H D P K
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 D Q M P S L I H R Y L T T S T Y N S T M
 30 ccaaatacaactcgagcttgatcaacgatcagcagctctacaacgctaaacatccgcccc
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 35 F D Q H H L T V I A I D G V D V D P Q T
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 aacccccgaaaggaactatgcatttatcaacaagatggctactcttggcttccagaacaat
 N P E R N Y A F I N K M A T L G F Q N N
 40 aacgtccttagttacgattcgtcctggcctgtcccggagccgttgaacgtgggcagcttc
 N V L S Y D S S W P V P E P L N V G S F
 aatcttagaagcgatttcaacctgacccccgcttgatgaggagctactactggagcccgtg
 N L R S D F N L T P L D E E L L L E P V
 45 gaccacaccttcaccatggaggtcaataacgtgaacgtcgacggcgtaggctcccgcac
 D H T F T M E V N N V N V D G V G S R I
 acgcagggaccggacccttacatcgccccgctacgcccaccctatacaccaccctgagc
 T Q G P D P Y I A P R T P T L Y T T L S
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 T G S N A I N P A I Y G Q A N A Y V V E
 50 gccggcgatattgtccagcttgcgtcaatagtaacgaaccgctcactaccaacacttcc
 A G D I V Q L V V N S N E P V T T N T S
 ggtcgtgggcaccctatgcacttgacggccacaccttccaagtgggtggccaatatggc
 G R G H P M H L H G H T F Q V V G Q Y G
 agcccttgggacggcgatgcctctaattccctgctgttccatgaagcgggataccact
 55 S P W D G D A S K F P A V P M K R D T T

gttctgttactggcgggagcttggtgatccggttccgcgcggacaatcctggagtttgg
 V L F T G G S L V I R F R A D N P G V W
 atgttccattgccacaacgaatggcaccttgacgccggcatggctggaacgattatcgaa
 M F H C H N E W H L D A G M A G T I I E
 5 ggcgcactcgagcttcaacaaagcggctgacgattccgccgcagcacctcgcgctgtgc
 A P L E L Q Q S G L T I P P Q H L A S C
 agggcgtaaacttaacgacccggggcaattgtgcccggtaatactgcaaacctagaggat
 R A L N L T T R G N C A G N T A N L E D
 10 acggctgcatgcagagtctacgacactgagccttgggggtgcacttatcaagagagatgag
 T A A C R V Y D T E P W G A L I K R D E
 gaaacagcatattaa
 E T A Y -

15 SEQ ID NO : 66
 LENGTH : 544
 TYPE : PRT
 ORGANISM : *M. phaseolina*

MIRLSLVLGFMATTLAKTVTLNWDIGWVSAAPDGFTRPVIGINGEWPPPVLEADVNDTIIVITRNLL
 RNETTSLHWHGMWHYNSTHMDGGARISQCEIPGGTFTYKFKAYPAGTFWYHSHDMGQYPDGLRAPM
 20 I IHDPKAAAERDTDKEYVLTVDWYRDQMPSLIHRYLTTSTYNSTMPNPNSSLINDQQSTTLNIRPG
 QKIYVRIINMSALATYYLQFDQHHLTVIAIDGVDVDPQTWEALEIIPGQRYDVIITGLENPERNYAF
 INKMATLGFQNNVLSYDSSWPVPEPLNVGSFNLRSDFNLTPLDEELLLEPVDHTFTMEVNNVNDG
 VGSRITQGPDPYIAPRTPPLYTTLSTGSNAINPAIYGQANAYVVEAGDIVQLVNSNEPVTNTSGR
 GHMHLHGHTFQVVGQYGS PWDGDASKFPAVPMKRDTTVLFTGGSLVIRFRADNPGVWMFHCHNEWH
 25 LDAGMAGTII EAPLELQQSGLTI PPQHLASCALNLTTRGNCAGNTANLEDTAACRVYDTEPWGALI
 KRDEETAY*

30 SEQ ID NO : 67
 LENGTH : 2412 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 ORGANISM : *M. phaseolina*

GGGAGACGATCTGGAAGTGTGTTGTTTACGAATGATTTGGCCGTTGAAACCACCATTCATTGGCACGGT
 CGGTATCCATGGTATACTTTTTACGAAGGCTAGTCAGCTGAAGGAGAAGTTCGGCAGGCATCCTTCA
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 35 ATGACTAGGGCCTAACTTTTGGCGCAGGAGCCGATCCCACCAGGAGGAAACTTCACGTACCGCTTCT
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 CCGCGGACCACTAGTCATCCATCCATCCTCACAACGCCCCGGCCATACGAGACTCTCGCGAGGAAC
 CAGACTGAGCTTACTGCTTTGCAAGAAGCTGAACGCGAAGCGGTGCCTATCCTCCTATCTGACTGGT
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 40 CAGTCTCCTCGCCAATGGATACGGAAGGGTGCAGTGTCTACCGGAATACATTCTGGCAGCCGGAGCT
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 CCATGGCGATGGGTACAAAGTACATGGAGACCAATACCAAGGAGTCGATGCGTATGGAGTCTATGGC
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 45 TGTC AATGGCTTCTCTACCCGTATCAGGCATATCGGGCACGTCGGGCCTGTGCGGCATGTCAAATAT
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 AGCTCTCTCCC GCCAGAGACTTGCACAGACACGTCAGCGCCGCTGCTGACTGTGATGCAAATATA
 CACGAGGCTGGCTTGCAATTAACCTAGTCAACTCCGGTTTCAGTAACCAAGCTCAGCGTCTCACTAGA
 CGCCCATTCGATGTTTGTCTATGCGGCCGACGGATTCTTTGTGAAACCCCAAGAAGTAGAAGTAAGT
 50 TGCACCTCCCCCTAACTTGTGTCGGAAGACTTACCGCGTCTAGGTATTACAAATCTCAATCGGGCA
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 CCCTACGCGGATATGCAACAGGTTATCGAAGCCAAGCGACCGTCTCATATAAGGTAAGCAGCAAGC
 TTTTCCCCACTCGGTATAGAATAACTTCGTTAGGTTGATGCCGCAGAGGACATTATGCCGGTGGA
 CTTGACAAACGACCCTACTGCAACGTGGATGCTTGTCAACGGTTCGGCAAAGTCGAACGCTTCTGAA
 55 TTGAAGACGGACATGCTCGCCCCGTTTCGAGGCAATTGCGCCGCATCCCAAGCGGATATAACTTACG

TTGGTACCACAGCCACTACAGCGCGCAGTACTCGGGCGGTGCTGCTGGTCCTCTCATCGTATACGGT
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 ACTACGATATTGTCAAGCAGACCATGCAGGCCGACCCACGGGCACCACCCCTCCGCCGCCGCTCA
 5 GTCCGACAACAACCTGATCCAGGGCTTTGGCGAATTGACTGCTCGCTGACGACGAAGCCCTGCATT
 CCTGACGCCGGTGTAGCCAAGTTCAAGTTCACTTCCGGCAAGAAGCATCGCCTCAGGCTCATCAACT
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 10 GTCGAAGCCACGGCAAGCCCTCGGACGCGTACTGGATGCGCTCAGAGATCGGGCTCAACAAGTGCA
 ACGTCTTCAATGCGAACGCCCTCCGAGGCCCTCGCCGTATCCTCTACGAGGATGCAGACCTGCTGGC
 CGTGCCAGCTCCTCCGCCAGCCGATGCGGAGCTGACATCGTGCACCAACGACGACATCTCCGTC
 GGCTGCCGCTCCAGCACATCCTGCCCGACCCCAACCCGTCCGTACGACCGAGCTGCACATCGAGA
 ACAAGTACAACGGCACGCACTGGCTCTGGCACTTCGGCGGCCCCAGCTACCGCGCCGACTTCAACGA
 CGCCCTCCTTACCAGCTCCAACAGGGCACGCCGACTTCGGCCCGCAGTCCAACGTGCACGACTTC
 15 GCGCCAACAATCCGTCCGCTTCGTCTACAACCAGTCCCGGCTCAGCATCCCATGCACTTGC
 ATGGCCACAACCTTCTGGGTCCTCGCCGACGGCGTCGGCACCTGGGACGGCGCCATCGCCAACCCGCA
 GAACCCCGAGCGCCGCGACGTGCACGTCCTTCAGCCCGCCAGGGCAGCACCCCGTCTGTACATGGTC
 GTACAGATTGAGCTGGACAACCCGGGCTGTGGCCGTTCCACTGCCACATCGCGTGGCACGTCTCGG
 CGGGGTTGTATTTGAACGTGCTGGAGCGCCGGACGACATCAAGGCGCTGCAGATTCCGGCCGCGGT
 20 TGGTGATCAGTGCAGGGCGTGGGCGGACTACACGGCAAAGAATACGGTGGATCAGATCGACTCGGGG
 TTGAAGAAGGAGTAGAAGGCGTGATAGTTTGCTATTGTTCTTTCTCTCTCTCTTTTTTTTTTTTT
 TTTTACACCTTCCCTTCTTGATACCAGCATGTTTTTGGGCGTTATTTACGGTCTTCTGCGCATTTC
 CAAGGCGTTATGTCTTTCCCTTGGCGATAAG

25 SEQ ID NO : 71
 LENGTH : 1836
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS

30 LOCATION : (1).....(1836)
 atgtctttcggttgccaggtccgtagtaagcggcctcgccagcagagccgcctttactaat
 M S F V A R S V V S G L A S R A A F T N
 ggatcatggaccggtgcctgggagactcatggctccacccaaggttccatctcaccgcaa
 G S W T G A W E T H G S T Q G S I S P Q
 ctacgcaacggcgggcggcctcttggtaccttgagcgtccaaacttgccctggctgtatt
 35 L R N G G G P L G T L D A P N L P G C I
 ggttctccaccgtggggcaaccatgactctcatgaccctttcggcatgcctgatactggc
 G S P P W G N H D S H D P F G M P D T G
 attactcgggagtatgactttactctcacttatcaagacatcgctcccgatggcgtcact
 I T R E Y D F T L T Y Q D I A P D G V T
 40 aagaggggctcggttgcaatgggtcaatatccggggcccacgatcgaggccaactggggc
 K R G V V V N G Q Y P G P T I E A N W G
 gactggatccaggtcacggtccacaacgggtctaggcgaggacgaaggtgaggggtaccgcg
 D W I Q V T V H N G L G E D E G E G T A
 atgcactggcacggctttttgcalaaggagagccagtgatggatgggtgtccccgggtgtt
 45 M H W H G F L Q K E S Q W M D G V P G V
 caacaatgtcctattcctcccggagagagcttcacctaccgcttccgcgctgagcagtat
 Q Q C P I P P G E S F T Y R F R A E Q Y
 ggcacttcttggtaccacagccactacagcgcgagtagctcgggcggtgctgctggctcct
 G T S W Y H S H Y S A Q Y S G G A A G P
 50 ctcatcgatacgggtccggacagccagaggttacgacggtgacctcgggtcccgtcatggta
 L I V Y G P D S Q S Y D V D L G P V M V
 tctgactggtagcactcgcaataactacgatattgtcaagcagaccatgcaggccgacccc
 S D W Y H S Q Y Y D I V K Q T M Q A D P
 acgggacaccacctccgcccgcctcagtcgacaacaacctgatccagggctttggc
 55 T G T T P P P P Q S D N N L I Q G F G

gaattcgactgctcgctgacgacgaagccctgcattcctgacgcccgggtgtagccaagttc
 E F D C S L T T K P C I P D A G V A K F
 aagttcacttccggcaagaagcatcgctcaggctcatcaactccggctccgagggcagtg
 K F T S G K K H R L R L I N S G S E A M
 5 cagaggttctctatcgacggccacaccatgaagatcatcgcacacgacttcgtcccgatc
 Q R F S I D G H T M K I I A H D F V P I
 gagccctacgaggtcacggccctgacccttggcgtcggacagcgggcccagctggtgtc
 E P Y E V T A L T L G V G Q R A D V V V
 10 gaagccacgggcaagccctcggacgcgtactggatgacgctcagagatcgggctcaacaag
 E A T G K P S D A Y W M R S E I G L N K
 tgcaacgtcttcaatgcgaacgcctccgagggcctcgcgctcatcctctacgaggatgca
 C N V F N A N A S E A L A V I L Y E D A
 gacctgctggccgtgccagctcctccgcccagcccgatgaggagctgacatcgtgcacc
 D L L A V P S S S A Q P D A E L T S C T
 15 aacgacgacatctcgcgtcggcctgccgctccagcacatcctgcccgaccccaaccgctcc
 N D D I S V G L P L Q H I L P D P N P S
 gtcacgaccgagctgcacatcgagaacaagtacaacggcacgcactggctctggcacttc
 V T T E L H I E N K Y N G T H W L W H F
 ggcggcccccagctaccgcgccgacttcaacgacgccctcctctaccagctccaacagggc
 20 G G P S Y R A D F N D A L L Y Q L Q Q G
 acgcccgacttcggccccgagtcacaacgtgcacgacttcggcgccaacaatccgtccgc
 T P D F G P Q S N V H D F G A N K S V R
 ttcgctcgtctacaaccacgtcccggctcagcatcccatgcacttgcattggccacaacttc
 F V V Y N H V P A Q H P M H L H G H N F
 25 tgggtcctcgccgacggcgtcggcacctgggacggcgccatcgccaaccgagcagaacccc
 W V L A D G V G T W D G A I A N P Q N P
 cagcggcggcagctgcacgtccttcagcccggccagggcagcaccgctcgtacatggtc
 Q R R D V H V L Q P A Q G S T P S Y M V
 gtacagattgagctggacaacccgggctgtggccgcttccactgccacatcgcgctggcac
 30 V Q I E L D N P G L W P F H C H I A W H
 gtctcggcggggttgtatattgaacgtgctggagcggcggcagacatcaaggcgtgcag
 V S A G L Y L N V L E R P D D I K A A L Q
 attccggccgcggttggtgatcagtgaggcgtgggcccggactacacggcaaagaatcgc
 I P A A V G D Q C R A W A D Y T A K N T
 35 gtggatcagatcgactcggggttgaagaaggagtag
 V D Q I D S G L K K E -

SEQ ID NO : 72
 LENGTH : 611
 40 TYPE : PRT
 ORGANISM : *M. phaseolina*
 MSFVARSVVSGLASRAAFTNGSWTGAWETHGSTQGSISPQLRNGGGPLGLTLDAPNLPGCIGSPWGN
 HDSDHDFGMPDTGITREYDFTLTYQDIAPDGVTKRGVVVNGQYPGPTIEANWGDWIQVTVHNLGED
 EGEGTAMHWHGFLQKESQWMDGVPGVQQCP IPPGESFTYRFRAEQYGTSWYHSHYSAQYSGGAAGPL
 45 IVYGPDSQSYDVDLGPVMVSDWYHSQYYDIVKQTMQADPTGTTPPPPQSDNNLIQGFGEFDCSLTT
 KPCIPDAGVAKFKFTSGKKHRLRLINSGSEAMQRFSIDGHTMKIIAHDFVPIEPYEVTA LTLG V G Q R
 ADVVVEATGKPSDAYWMRSEI GLN K C N V F N A N A S E A L A V I L Y E D A D L L A V P S S S A Q P D A E L T S C T N D
 D I S V G L P L Q H I L P D P N P S V T T E L H I E N K Y N G T H W L W H F G G P S Y R A D F N D A L L Y Q L Q Q G T P D F G P Q S N
 50 V H D F G A N K S V R F V V Y N H V P A Q H P M H L H G H N F W V L A D G V G T W D G A I A N P Q N P Q R R D V H V L Q P A Q G S T P
 S Y M V V Q I E L D N P G L W P F H C H I A W H V S A G L Y L N V L E R P D D I K A L Q I P A A V G D Q C R A W A D Y T A K N T V D Q
 I D S G L K K E *

SEQ ID NO : 73
 LENGTH : 1048 (including 150 bp 5' UTR and 150 bp 3' UTR)
 55 TYPE : DNA

ORGANISM : *M. phaseolina*

GGACCGTTGCGGCGTTACTGATCTTCGGGTGAACGTCTCTCTTCGTACCAGGAAGCCGCCAACGCCG
 AAGAAAGGGAGAAATACGTGTGGCTCAACTTTATCCACCCTGGCGCCCATCATGAGCTGCGGATCTC
 CGTTGACGAGCACGACATGTGGATTGCGGCCGAGATGGAGACTTCGTA AAAACCaAGAAAGTCCAA
 5 GTAAGTTTCCACGTCTCGGTTTCGAGCACGCGCTGACAATCTCAAGGCCATCAATGTCAACATGGGC
 GAGAGGATAAGCGTCCTTATTCCTCTTACCCAAAGTCTTGGAGAGTACGCCATCCGCATGGTCTCTC
 TCGCGGAAGAGCAGCTCATCTGGGGCTTGGGAATTCTCCGGTACCCCGGTGTTCAAGAGAGACGAGA
 TGAGAATGGCATAATGATCCTGCCAGAAAGCCAGCCACACATTGATGTTTCAAGGATAACCTGTTGACT
 GACGGAATTGTGATGGACGAAATGACCGACCTGATCCCGTTTCCCGCGCGCCGTCTCCAGCCAAGG
 10 CCGACCACACCTTTTCGCTTCGCCATCAAGCGGCCGAATCCAAGCACGTGGATTTTGGCATCGGAGCC
 GCATCAAGGATTAGACAACAGCTTCCGCCGTGCTTTGGAACAAGGATTCCCGTGGCCCTACGACG
 TTCGGCGGAATGAAGAACGGCTCGGTTGTGGACATCATTTATGAAAACGGAGCATTTGGGATGCATC
 CGTTTACCAGTGGATGAACGAATCGCATCACAGTATGGCAACTGCTGACATTTTATGCACAACCAC
 AAAGCGTTCATCATCGGCATGGGGATGGGTTCTTCCGGTGGCCAGACGTTGCCCTCGGCCCTCAAGG
 15 AGGCCCTGAAAACCTTAAACATGGTGAACCTCTCTCCGTGACGGAGCACGGCTGGCAAAGGGAGA
 AGGATCGTGGACTGTAATCCGCTACCAGATCACCTCTCCCGCAATGTCCATGTTTACTGTAAGCAG
 CTCTCTGCAAAGTGCCTGACGGTGTAAAGCACTGACGACCTCTC

20 SEQ ID NO : 74
 LENGTH : 702
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS

LOCATION : (1).....(702)
 25 atgtggattgcgggccgcagatggagacttcgtaaaaccaaagaaagtccaagccatcaat
 M W I A A A D G D F V K P K K V Q A I N
 gtcaacatgggagagaggataaagcgtccttattcctcttaccCAAAGTcctggagagtac
 V N M G E R I S V L I P L T Q S P G E Y
 gccatccgcatggtctctctcgcggaagagcagctcatctggggcttgggaattctccgg
 30 A I R M V S L A E E Q L I W G L G I L R
 taccCGGTgttcaagagagacgagatgagaatggcataatgatcctgccagaaagccag
 Y P G V Q E R R D E N G I M I L P E S Q
 ccacacattgatgttcaggataacctgttgactgacggaattgtgatggacgaaatgacc
 P H I D V Q D N L L T D G I V M D E M T
 35 gacctgatccggtttcccgcgcgccgctcctccagccaaggccgaccacacctttcgcttc
 D L I P F P A R R P P A K A D H T F R F
 gccatcaagcggccgaatccaagcacgtggattttggcatcggagccgcatcaaggattc
 A I K R P N P S T W I L A S E P H Q G F
 agacaacagcttccgcccgtgctttggaacaaggattcccgTggccctacgacgttcggc
 40 R Q Q L P P V L W N K D S R G P T T F G
 ggaatgaagaacggctcggttgtggacatcatttatgaaaacggagcattttgggatgcat
 G M K N G S V V D I I Y E N G A F G M H
 ccggtttcaccagtgatgaacgaatcgcacatcacagtatggcaactgctgacatttcatgc
 P F H Q W M N E S H H S M A T A D I S C
 45 acaaccacaaagcgttcatcatcgccatgggggatgggttcttccggtggccagacgttg
 T T T K R S S S A W G M G S S G G Q T L
 cctcggccctcaaggaggccctgaaaactttaacatggtga
 P R P S R R P L K T L T W -

50 SEQ ID NO : 75
 LENGTH : 233
 TYPE : PRT
 ORGANISM : *M. phaseolina*

MWIAAADGDFVKPKKVQAINVNMGERISVLIPLTQSPGEYAIRMVSLAEEQLIWGLGILRYPGVQER
 RDENGIMI LPESQPHIDVQDNLLEDGIVMDEMDDLIPFPARRPPAKADHTFRFAIKRPNPSTWILAS
 EPHQGFQRQLPPVLWNKDSRGPFTTFGGMKNGSVVDIIYENGAFGMHPFHQWMNESHHSMATADISCT
 TTKRSSSAWGMGSSGGQTLRPSRRPLKTLTW*

5

SEQ ID NO : 76
 LENGTH : 2269 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 ORGANISM : *M. phaseolina*

10 GCTGCGAGGCATTTCGAGAGGATTACCGAGTATTGGAGAGGCCGCGTGAAGGCAGCAGAGCATTAAAT
 ACGTGTCTTTGGAGCACGCGAATTACTTTCAAGTTGAACAAGATATCACCTGTCTTGCACGACGTTGC
 AAGCTCCGCCGAGCCATGAAGTGTGCAACTCTTTGGAGCTATCTTGCCTCTGTCTGACCGTCCGGC
 GCTTCTGCGAGGTATTCCATTTCAGCATAGACTTCAAACATTACCTAAATGCTGACAACCTCATTTACA
 GAAGCTTGACGCGGTCTTGCCTCAGCACAAAGACCAACGGAGGGTCCAATTGGGGAACCTTTGGACTG
 15 TCCAAAAGTTACCCGATTTTTTTGACCTCGAACCCGCTGCCCGGCGGCTTCCCGTGGGGTGACAGAAGC
 GGCCTAAGCAACGATCCCTACACTGATGTGCCGAACACCGGGGTGACGAGGTACTACGATTTTCAGCG
 TCGCACGTGGCTATCTCGCTCCAGATGGCTACAACAAAAGTGGCATCTTCATCAACGGCGAGTTCCC
 TGGGCTGCCATTGAGGCCAATTGGGGCGACATGATTGAAGTACGAGTGCACAACAACATCGTCCGGC
 CCTGAAGAAGGCACTGCGTTCCTACTGGCATGGCATTACTCAGAAGGGCACGCAATGGTTTTGACGGCG
 20 TTCCCGCGTGTCCCAATGCCCATTTGCCCTGGATCCTCTTTTACCTACCGCTTCCGTGCCGACGT
 CTACGGCACTTCTTGGTGGCACTCGCACTTCTCTGCGCAATATACCGCTGGTGTCTTTGGGCCCTC
 ATTATCTACGGCCCCAAGCATGTTCTTACGATGTTGATGTCGGCCCTGTAATTTCTCGGTGATTACT
 ACCACCGTGACTACTTTGATGTTCTGAGGATGCTGCCAGCAACACCACTGACTTCAACATCTACGT
 CCCTTGGTCCGACAACAATCTGATCAATGGCAAGAACAACTATAATTGCTCCATGGTAGCTGGAAAC
 25 TCTACGAGCTTCGCCAACGCTACAAGCTCCTCGAACGCCACGTGCTTCTCCAACGCTGGCCTTGCCC
 AGTTCCGTTTTGAGCCAGGCAAAGTGCACCCGCTGCGTCTGATGAACGTGGGCGCAGCAGCACTGCT
 GCACTTCTCAATCGACGGGCACAAAATGCAAGTCAATCGCCACGACTTCAACCTGTTGTCCCGTAC
 GAGGCAGACGTCAATCACGCTGGGCGCCGCCAACGCACCCGACATCCTCGTCACTGCAGATGCCAAC
 CCAACGAGACATACTGGATCCGCTCCACCATCTCGCTCAACTGCTCTGTCTCGCACAAACCAACGC
 30 GCTGGCCGTTCTCTCCTACGAAGGCAATGACCACATAGAAGAGCCACGCAGCCGATTAGCGCCGCC
 GCGGCCGCTGCTGACGAGAAGAGCTTCTCTGCAAGAACGACGACCTGTCCCAGACGGTGCCCTTCT
 TCCCCAAGCCCGTCCGCCGAGCCCGATGTGACCGAGACGATCGAAGTGCACCTCTTACCAATGCGAC
 CGGCCACCATGTGTGGATCATGAACAACCGCACGCAGCGCACGAACTACAACGAGCCCGTCTTGCTG
 CTCGCCAACCCAGGGCAACAGCACCTTCCCGGACGAGTGGAACGTTTACGACTTTGGGCGCAACAAGA
 35 CCATCCGCATCGTCTCTCAACACCGTCTACCAGTCCGCCACCCGATGCACTTGCACGGCCACTCTTT
 CGTAAGACCCTTCTCCTTCGCCACGCATGTGTGCCACTCTGACCTCTTCTCGCAGCAAGTCTT
 CGCCGAAGGCCCGCGCCTGGGACGGCACGACCATCAACAACCCATCCAATCCCGCCCGCCGCGAC
 ACGCACATGCAGCGCCGGTACGGGCACCTGGTAATCCAGTTCGAGGCCGACAACCCGGGCGCGTGGA
 GCTACCACTGCCACATCGCTGGCACGCCAGCATGGGCTACAACATCGAGATCTTCGAGCGCGGCGA
 40 CGAGCTGGCGGCCCGCGGCTATTCTATGGTTCATGCAGCAGACGTGTGATGATTGGAAGGAGTGG
 AGCGGCAGGAATGTGGTCAATCAGATCGACGCGGGCATTTAGATTATCGGCGACTTCTATGCCCGAT
 GGTATAATGTTTTTACCAGCGTGGGATGATGTGGGTTTTGGGGTCGGAATTTGTAGATATGGGCGGG
 GGATTGCCCTGCACAAAATAGACCGATGCACATGTTTATAAAGCAAAAACCTTCCCCT

45 SEQ ID NO : 77
 LENGTH : 1854
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS

50 LOCATION : (1).....(1854)
 atgaagtgtgcaactctttggagctatcttgcctctgtcctgaccgtcgggcgcttctgcy
 M K C A T L W S Y L A S V L T V G A S A
 agaagcttgacgcggtccttgcctcagcacaagaccaacggagggtccaattggggaact
 R S L T R S L P Q H K T N G G S N W G T
 55 ttggactgtccaaagtaccggatTTTTTgacctgaaccgctgcccggcggttcccg

L D C P K L P D F L T S N P L P G G F P
 tggggtgacagaagcggcctaagcaacgatccctacactgatgtgccgaacaccggggtg
 W G D R S G L S N D P Y T D V P N T G V
 acgaggtactacgatttcagcgtcgcacgtggctatctcgctccagatggctacaacaaa
 5 T R Y Y D F S V A R G Y L A P D G Y N K
 agtggcatcttcatcaacggcgagttccctgggctgccattgaggccaattggggcgac
 S G I F I N G E F P G P A I E A N W G D
 atgattgaagtacgagtgcacaacaacatcgtcggccctgaagaaggcactgcgttccac
 M I E V R V H N N I V G P E E G T A F H
 10 tggcatggcattactcagaagggcagcgaatggtttgacggcgttcccggcgtgtcccaa
 W H G I T Q K G T Q W F D G V P G V S Q
 tgccccattgccccctggatcctcttttacctaccgcttccgtgccgacgtctacggcact
 C P I A P G S S F T Y R F R A D V Y G T
 tcttgggtggcactcgcacttctctgcgcaatataccgctgggtgcttttgggcccctcatt
 15 S W W H S H F S A Q Y T A G A F G P L I
 atctacggccccaaagcatgttcccttacgatgttgatgtcggccctgtaattctcgggtgat
 I Y G P K H V P Y D V D V G P V I L G D
 tactaccaccgtgactactttgatgttctggaggatgctgccagcaacaccactgacttc
 Y Y H R D Y F D V L E D A A S N T T D F
 20 aacatctacgtcccttgggtccgacaacaatctgatcaatggcaagaacaactataattgc
 N I Y V P W S D N N L I N G K N N Y N C
 tccatggtagctggaaactctacgagcttcgccaacgctacaagctcctcgaacgccacg
 S M V A G N S T S F A N A T S S S N A T
 tgcttctccaacgctggccttgcccagttccgcttccgagccaggcaaagtgcaccgcctg
 25 C F S N A G L A Q F R F E P G K V H R L
 cgtctgatgaacgtgggcgagcagcactgctgcacttctcaatcgacgggcacaaaatg
 R L M N V G A A A L L H F S I D G H K M
 caagtcatcgcccacgacttcgaacctgttgtcccgtacgaggcagacgtcatcacgctg
 Q V I A H D F E P V V P Y E A D V I T L
 30 ggcgcccgaacgcaccgacatcctcgtcactgcagatgccaacccccaacgagacatac
 G A A Q R T D I L V T A D A N P N E T Y
 tggatccgctccaccatctcgtcactgctctcgcacaaacaccaacgcgctggcc
 W I R S T I S L N C S V S H N T N A L A
 gttctctcctacgaaggcaatgaccacatagaagagccacgcagccgatttagcgcgcc
 35 V L S Y E G N D H I E E P R S R I S A A
 gggccgctgctgacgagaagagcttccctcgtgcaagaacgcagcactgtcccagacgggtg
 A A A A D E K S F L C K N D D L S Q T V
 cccttcttccccaaagccgtcgccgagcccgatgtgaccgagacgatcgaagtgcacctc
 P F F P K P V A E P D V T E T I E V D L
 40 ttaccaatgcgaccggccaccatgtgtggatcatgaacaaccgcacgcagcgcacgaac
 F T N A T G H H V W I M N N R T Q R T N
 tacaacgagcccgtcttgctgctcgcgaaccagggaacagcaccttcccggacgagtgg
 Y N E P V L L L A N Q G N S T F P D E W
 aacgtttacgactttgggcgcaacaagaccatccgcatcgtcctcaacaccgtctaccag
 45 N V Y D F G R N K T I R I V L N T V Y Q
 tccgcccaccgatgcacttgcacggccactctttccaagtctcgcgcaaggccccggc
 S A H P M H L H G H S F Q V L A E G P G
 gcctgggacggcagcaccatcaccaaccatccaatcccgcccgcgcgacacgcacatg
 A W D G T T I T N P S N P A R R D T H M
 50 cagcgcgggtacgggacacgtgtaatccagttcagggccgacaacccggggcgcgtggagc
 Q R R Y G H L V I Q F E A D N P G A W S
 taccactgccacatcgcttggcagccagcatgggctacaacatcgagatcctcagacgcg
 Y H C H I A W H A S M G Y N I E I L E R
 ggcgacgagctggcggccgcccggcgtattcctatggtcatgcagcagacgtgtgatgat
 55 G D E L A A A G A I P M V M Q Q T C D D

tggaaggagtggagcggcaggaatgtggtcaatcagatcgacgcgggcatttag
 W K E W S G R N V V N Q I D A G I -

5 SEQ ID NO : 78
 LENGTH : 617
 TYPE : PRT
 ORGANISM : *M. phaseolina*
 MKCATLWSYLASVLTVGASARSLTRS L P Q H K T N G G S N W G T L D C P K L P D F L T S N P L P G G F P W G D R S G L
 10 SN D P Y T D V P N T G V T R Y Y D F S V A R G Y L A P D G Y N K S G I F I N G E F P G P A I E A N W G D M I E V R V H N N I V G P E
 E G T A F H W H G I T Q K G T Q W F D G V P G V S Q C P I A P G S S F T Y R F R A D V Y G T S W W H S H F S A Q Y T A G A F G P L I I
 Y G P K H V P Y D V D V G P V I L G D Y Y H R D Y F D V L E D A A S N T T D F N I Y V P W S D N N L I N G K N N Y N C S M V A G N S T
 S F A N A T S S S N A T C F S N A G L A Q F R F E P G K V H R L R L M N V G A A A L L H F S I D G H K M Q V I A H D F E P V V P Y E A
 15 D V I T L G A A Q R T D I L V T A D A N P N E T Y W I R S T I S L N C S V S H N T N A L A V L S Y E G N D H I E E P R S R I S A A A A
 A A D E K S F L C K N D D L S Q T V P F F P K P V A E P D V T E T I E V D L F T N A T G H H V W I M N N R T Q R T N Y N E P V L L L A
 N Q G N S T F P D E W N V Y D F G R N K T I R I V L N T V Y Q S A H P M H L H G H S F Q V L A E G P G A W D G T T I T N P S N P A R R
 D T H M Q R R Y G H L V I Q F E A D N P G A W S Y H C H I A W H A S M G Y N I E I L E R G D E L A A A G A I P M V M Q Q T C D D W K E
 W S G R N V N Q I D A G I *

20 SEQ ID NO : 79
 LENGTH : 2373 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 G A C A A T C C C T C C G C T A A A T C C G A C A T C C G G T A C T C T C G C C T C C C G G A T C C C G A G C G G A C A C A C A G C T
 25 T C G C C T G T A T A C C A C T T T C A C C G G A G T C G C C T T C C C A C C C C T A T A A T T C T T T T C C T G T T G A G T C T A
 C T C C G C G C G C G G T A T C A T G A T A G A T A C C A A G A G C A C A G G G T C C G G C G C A G A C G G C G G T C G T T A C G C C
 G C C T T A A G G C A A G A C G A G T C A G A G C T A T A C G A G C A G A A G A A C A T A C G C A G T G T A C A C A G C C C T C C G
 G C G C C G C T A C C T C G G T G G A A A T G G C A G A G A A G A A G C C C T G G G A T T G A T C G A C G A A A A T G T C G T C G C
 T C G A A C A A A A A G A C G C T G T G G A C C C A C C C G C G G T A C T C T G T C T T C C T T G A A T T G C C A T C C T C G G T
 30 C T G G T A C T C A T A A T C G C T C T A C T C G G C G C T C T C G C T T G G T C C A G A G G C T C T C A T C A T A C C G A C C
 C G G T A T C T G G C A G T T C A C A C C A T C G T C C A A G G G T C G C C G C G A A A G T A T G T C C T G G A C C C T G C C T G
 G A T T T C G C T G C A C C G C C G C A G G T C C G C A A A T A C C A C T G G A C G A T C A G G G A C A T C G A G C T T C G C C C A
 G A C G G C G T G A A G C G G C C G T G A T C A C C A T C A A T A A C G A G T T C C C G G G C C G A C C A T C G A A T G C A A C C
 A G G G G G A T A C C G T G C G G G T T G A G G T T C A T A C G A A G C C G T C A A T T C A A C T T C C T T T C A C T G G C A C G G
 35 C A T T T A C C A G A A C G G A A C C A C G T A C A T G G A T G G C A C G G T C G G C A T C A G C C A G T G T C C T A T C A C G T C T
 G G G T C T A G C A T G A C A T A T G A G T T C A A A G T C G A C A G A G A A T C C G G C A C C T A T T G G T A T C A T G C G C A C A
 T G G C T A T G C A G G G C T C A G A T G G T C T T T T T G G T C C T C T G A T C G T C C A T T C G A A A A T G A G C G G A A G C T
 G C A G C A A C T C G A A T A T G C C T C C G A T C A A G T C A T C A T G G T C C A C G A T T A C T A C C A C G A T C T G A C C A G C
 G C G C T G A T A C C A C A C T A C T T A G C G C C G G A T A A C G A G A A C A C A G A G C C T G T C C C T G A C G G A G G T C T C A
 40 T C A A C G G A A T G A A T A A G A G A A T T G C G A G C T C C T C C G T G G T C G A G A C T G T G A T G C C A C T G A T G C A C A
 G C T T G C C A C A T T C G G C C T C G A A C C G A A C A A G A A C C A C C G T C T T C G A A T T A T C A A T A C T G G A G C A T T T
 G C T G A A T T C C A G G T G A A G A T T G A C G A G C A C A C G T T C G C T G T G A C G G A G G T G G A T G G G A C C G A A G T T G
 C T C C C G C C T A C T A C C A C A G G C T C A A C A T C A A T C C C G G A C A G C G T A C A G C A T C G T A A T A A A C A C C A A
 T G T C A C G G A T C G T G A C T C C T T C T G G C T G A G A G C T A A G A T G A T T G A G G C C T G T T T C G C T G A G G A G A A C
 45 C C A A A T C T G G A T C C C G A A G T G C G C G C A T T A T C C A A T A T A C T C G C A A G G A C G A G G A T A C C C A G C C C A
 A G G A A C C T T C G A G C A G A G A C T G G G A C G A C A T C G T G G A C A T G C A G T G T C T C G A C A T G A A C G T G A C A G A
 G C T C C A G C C C G T A G A G A A G G C A A C A C C T C C A C C T G C A G A C A C C A C A C T A T A C C T C C G C T C C A A C T T C
 G A G A T C G G C A A C T G G C G T C T G A G C C G C G G C T T C T T C A A C A G C T C G T C C T G G C G T C C A A C A C T C T C A T
 C C C C A A G C C T G C A C C G C A T G A T C G A C G G C C T C C A C A G C C A A A A C G C C A G C T T C C T C C C C G A C C G A C
 50 G T A C C C C T T C C A G A T C A A C T C G G C C G G C T T C G A C A C T G G G C C C G A G C T G G T C T A C C A G A C C A G C G G C
 A T C C G C A C C A T C G A C A T C C T C G T T T C C A A C T T C G A C G A C G G C A A C C A C C C G C T C C A C C T G C A C G G C T
 A C A A G T A C T T C G T C C T T G C G T C G G G C C A C G G T A C C C G C C C G C G A C C T C T A C G C G C A T C T C G A C A T
 C T C G A A C C C G C T G C G C C G C G A C A C C G C C T C G A T C G A G G C G T T C G G C T G G A T C C T A C T G C G T C T C G T C
 G C C G A C A A C C C G G G C G T C T G G G C C T T C C A C T G C C A C A T C G G C T G G C A C A C C G A G C C G G C A T G C T G A
 55 T G C A G T T C G C C A C G C G T C G A C G T G C T C G C A T C C A G C C A A A T C C C G G A T A C G C A C C T C G C G C T C T G
 C G C G G C C G A C G G G C T C G A C C G C G G C G T C G C C G C C A G A C T C G A C G T G G T T T G G G G A T T T T G G G G A T

CTAGATCCTTGAAAAGTTCTGGAGAGGAGTGGGAGTTTCACCTGGCATGCAAGCGTCTCCGTTTCTT
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 GGTCCCACCTGCGGTACTCATCTTCGAC

5 SEQ ID NO : 80
 LENGTH : 2073
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS

10 LOCATION : (1).....(2073)

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 caagacgagtcagagctatacagagcagaaagaacatacgcagtgtagacagccctccggc
 Q D E S E L Y E Q K E H T Q C T Q P S G
 15 gccgcgtacctcgggtggaaatggcagagaagaagccctgggattgatcgacgaaaatgtc
 A A Y L G G N G R E E A L G L I D E N V
 gtcgctcgaacaaaagacgctgtggaccaccggcggtactctgtcttccttgaattt
 V A R T K R R C G P T R R Y S V F L E F
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 20 A I L G L V L I I A L L G A L A W S R G
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 S H H H T D P V S G S S Q P S S K G R R
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 25 cactggacgatcagggacatcgagcttcgccagacggcggtgaagcggccgctgatcacc
 H W T I R D I E L R P D G V K R P L I T
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 I N N E F P G P T I E C N Q G D T V R V
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 30 E V H N E A V N S T S F H W H G I Y Q N
 ggaaccacgtacatggatggcagcggctcggcatcagccagtgctcctatcacgtctgggtct
 G T T Y M D G T V G I S Q C P I T S G S
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 S M T Y E F K V D R E S G T Y W Y H A H
 35 atggctatgcagggctcagatgggtcttttggctcctctgatcgtccattcgaaaaatgag
 M A M Q G S D G L F G P L I V H S K N E
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 R K L Q Q L E Y A S D Q V I M V H D Y Y
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 40 H D L T S A L I P H Y L A P D N E N T E
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 G R D C D A T D A Q L A T F G L E P N K
 45 aaccaccgtcttcgaattatcaatactggagcatttgctgaattccaggtgaagattgac
 N H R L R I I N T G A F A E F Q V K I D
 gagcacacgcttcgctgtgacggaggtggatgggaccgaagttgctcccgcctactaccac
 E H T F A V T E V D G T E V A P A Y Y H
 aggtcaacatcaatcccggacagcgtacagcatcgtataaacaccaatgtcacggat
 50 R L N I N P G Q R Y S I V I N T N V T D
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 R D S F W L R A K M I E A C F A E E N P
 aatctggatcccgaagtgcgcgccattatccaatatactcgcaaggacgaggataccag
 N L D P E V R A I I Q Y T R K D E D T Q
 55 cccaaggaaccttcgagcagagactgggacgacatcgtggacatgcagtgctcgacatg

P K E P S S R D W D D I V D M Q C L D M
 aacgtgacagagctccagcccgtagagaaggcaacacctccacctgcagacaccacacta
 N V T E L Q P V E K A T P P P A D T T L
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 5 Y L R S N F E I G N W R L S R G F F N S
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 S S W R P T L S S P S L H R M I D G L H
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 S Q N A S F L P D R A Y P F Q I N S A G
 10 ttcgacactgggcccagctgggtctaccagaccagcggcatccgcaccatcgacatcctc
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 15 L A S G H G Y P P A D L Y A H L D I S N
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 P L R R D T A S I E A F G W I L L R L V
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 M L M Q F A T R V D V L A S S Q I P D T
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 25 W F G D F G D L D P -

SEQ ID NO : 81
 LENGTH : 690
 TYPE : PRT
 30 ORGANISM : *M. phaseolina*
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 35 ASDQVIMVHDYYHDLTSALI PHY LAPDNENTE PVPDGLINGMNRNCELLRGRDCDATDAQLATFG
 LEPNKNHRLRI INTGAFAEFQVKIDEHTFAVTEVDGTEVAPAYYHRLNINPGQRYS IVINTNVTD RD
 SFWLRAKMI EACFAEENPNLDPEVRAI IQYTRKDEDTQPKEPSSRDWDDI VDMQCLDMNVTELOPVE
 KATPPPADTTLYLRSNFEIGNWRLSRGFFNSSSWRPTLSSPSLHRMIDGLHSQNASFLPDRAYPFQI
 NSAGFDTP ELVYQTS GIRTIDILVSNFDDGNHPLHLHG YK YFV LASGHGYPADLYAHLDI SNPLR
 40 RDTASIEAFGWILLRLVADNPGVWAFHCHIGWHT EAGMLMQFATRV DVLASSQIPDTHLALCAADGL
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SEQ ID NO : 82
 LENGTH : 2372 (including 150 bp 5' UTR and 150 bp 3' UTR)
 45 TYPE : DNA
 ORGANISM : *M. phaseolina*
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 CGCCTGCTTTTCGTAGTCTCGTCCCTCCGCCCTAGACGTGCTCTTCTCAGACAATTTGCTCAAATCCC
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 50 TCACTTGCCAACGAGCCCATCCCGTTCGACAGGATCCTCTGGGGTGAGAATGGCCCCGCCGGTAACC
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 GCTGACGTGCAGCCCATAGTATGACCTGACCATCAACAACGCCACCTGCAGCCCCGACGGCGGGCCC
 55 AGCCGCCCGTGCCTGATGTTCAACAACAAGATCCCTGGGCCTACGCTTTACGCCAATTGGGGCGACA

TGATCTCCGTTACCATCACCAACAAGATGCCCAACAACGGCACCAGCGTGCACCTGGCATGGTCTGCG
 TCAGTACAATACAAACACCAGGATGGCGTCAACGGAATCACGGAATGCCCTCTGGCTCCCGGCGAT
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 5 AGTATGGCGACGGTGCCGTCGGCCAGCTCATCATCAATGGCCCCGCCTCGGCGAATTACGATTTGAT
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 GCCGCCCTTCAGAGGAAGGCCCGCCGCGCCAGGTGACACCATCCTGGTGAACGGTACGATGAAGT
 CTCCGGATGGCTCTGCTGGTAGCTACAGCCAAGTCAAGGGCCTTGTCAAGGGAAAGAAGTACCGCCT
 GCGTCTCATCAACACCTCGGTGGACAACAACATCCGCGTCTCGCTGGACAACCACCATTACCGTC
 10 GTCACTTCCGACTTCGTCCCGAGCAAGCCTTGGACTACTGACTGGCTTCTCTTAGCCATCGGCCAGC
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 CGCATGTGCTAGCGCCAACAAGTACCGCGGCCGCGGTATATTAGCTACGTTGGTGCCGATGGCAGC
 GCTCCCCAGAGACCGCGTGACTGTTCCAGGTGGCTGTACCGAGCCTCTGCCTGCGCCTTTGTCG
 CAAACCAGGTTCCAAGCCAAGTCTTCTCGACCAAGTGAAGACCCTTAGCGTCGATGTTTATGCGGC
 15 AAACGTCTCGACCAACCAGAAGAACATTGTCTTCTGGGGCATCAACATGACTGCCATTGACATTGAT
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 TCGAGTTGCCACAGAGAACATTGTAAGCGGAGTTAAGCTTCAACCCCGAGAAAATGTTATTAACGAT
 CGCAACAGTGGACCTACTGGATCATCCAAGAACTCCCGGCACTCCCCAATTCCGCATCCAATTCA
 CTTGCACGGTAAGCTGCAGGTCTCAACCTTGCAACCCCGTAGAGATACTGATGGTCGCCTCTGTCCA
 20 GGCCACGACTTCTACATCCTCGGAACCGGCTCTGGTGCCTTCGACCGCAGCACCTCGCCGCTCTCCC
 TCAATTTCAATAACCCACCCGCGCGACGTCGCACTGGTTCCCGGCGGCGGTTGGTTGGCCATTGC
 CTTCCCGACCGACAACCCAGGCGCTTGGCTCATGCACTGCCATATCGTAAGTTTACCTATCTCTCCG
 ACTACGATCAATTGTGTATATTCATGCGCACGGCGCTGACACGTGGATTTCCCTCGCCACAGGCTTG
 GCACATTAGCGAAGGTCTCGGAGTTCAGTTCCTCGAGGGCAAGGATAAGATCAATCTTCCCGACGCT
 25 GCGTGGGAGACGACCTGCTCGAATTGGGACAAGTACTGGGACACCACTATCTACCCCAAGCAGGATT
 CCGGTCTCTGAGGGGTGGCCGTTTTTTTTTCTTCTTTACGGCCCTGAGTTTAAGGGGGTTTGATGT
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30 **SEQ ID NO** : 83
LENGTH : 1824
TYPE : DNA
ORGANISM : *M. phaseolina*
FEATURE NAME/KEY : CDS
LOCATION : (1).....(1824)

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 N E P I P F D R I L W G E N G P A G N H
 40 atgggtgaagcgtcaggccagctccagctcccctgectcatccaccacaagggccccggat
 M V K R Q A S S S S P A S S T T R A P D
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 S A C T N G P L T R S C W S N G F S I A
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 45 T D F D A K W P N T G K T V H Y D L T I
 aacaacgccacctgcagccccgacggcgggcccagccgcccgtgctgatgttcaacaac
 N N A T C S P D G G P S R P C L M F N N
 aagatccctgggcctacgctttacgccaattggggcgacatgatctccgttaccatcacc
 K I P G P T L Y A N W G D M I S V T I T
 aacaagatgcccaacaacggcaccagcgtgactggcatgggtctgctcagtacaataca
 50 N K M P N N G T S V H W H G L R Q Y N T
 aacaccagatggcgtcaacggaatcacggaatgccctctggctcccggcgattccaag
 N T Q D G V N G I T E C P L A P G D S K
 acctacctattccaggctacacagttcggcacgacctgggtccacagccatttctctgcg
 T Y L F Q A T Q F G T T W F H S H F S A
 55 cagtatggcgacgggtgcccgtcggccagctcatcatcaatggccccgcctcggcgcaattac

Q Y G D G A V G Q L I I N G P A S A N Y
 gatttcgatctcggcacctacactatgaccgactgggtactacagcactgcggtccaggtc
 D F D L G T Y T M T D W Y Y S T A F Q V
 gaagatcaatttgatgcccgccttcagaggaaggcccccgcccgccagggtgacaccatc
 5 E D Q F D A A L Q R K A P G P P G D T I
 ctggtgaacgggtacgatgaagtctccggatggctctgctggttagctacagccaagtcaag
 L V N G T M K S P D G S A G S Y S Q V K
 ggccttgtcaagggaaagaagtaccgcctgctctcatcaacacctcgggtggacaacaac
 G L V K G K K Y R L R L I N T S V D N N
 10 atccgcgtctcgcgtggacaaccacccattcaccgctcgtcacttccgacttctgcccagc
 I R V S L D N H P F T V V T S D F V P S
 aagccttggactactgactggcttctcttagccatcggccagcgtacgatgtcatcttc
 K P W T T D W L L L A I G Q R Y D V I F
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 15 T A N Q P A A N Y W F R A E V A T A C A
 agcgccaacaagtaccgcggccggtatattcagctacggttggtgccgatggcagcgt
 S A N K Y R G R G I F S Y V G A D G S A
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 P P E T A V T V P G G C T E P L P A P F
 20 gtcgcaaaccagggttccaagccaagtcttcctcgaccaagtgaagacccttagcgtcgat
 V A N Q V P S Q V F L D Q V K T L S V D
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 V Y A A N V S T N Q K N I V F W G I N M
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 25 T A I D I D W E K P T L E Y V R T K N T
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 S Y P H V Y N L I E L P T E N I W T Y W
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 I I Q E T P G T P P I P H P I H L H G H
 30 gacttctacatcctcggaaaccggctctggtgccttcgaccgcagcacctcgcgctcctcc
 D F Y I L G T G S G A F D R S T S P S S
 ctcaatttcaataaccccaccggcgacgtcgactgggtcccggcgggcgggtggttg
 L N F N N P T R R D V A L V P G G G W L
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 35 A I A F P T D N P G A W L M H C H I A W
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 D A A W E T T C S N W D K Y W D T T I Y
 40 cccaagcaggattccgggtctctga
 P K Q D S G L -

SEQ ID NO : 84
 LENGTH : 607
 45 TYPE : PRT
 ORGANISM : *M. phaseolina*

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 50 YGDGAVGQLI INGPASANYDFDLGTYTMTDWYYSTAFQVEDQFDAALQRKAPGPPGDTILVNGTMKS
 PDGSAGSYSQVKGLVKGKKYRLRLINTSVDNINIRVSLDNHPFTVVVTSDFVPSKPWTTDWLLLAIGQR
 YDVI FTANQPAANYWFRAEVATACASANKYRGRGIFSYVGADGSAPPETA VTVPGCTEPLPAPFVA
 NQVPSQVFLDQVKTLSDVYAANVSTNQNIVFWGINMTAIDIDWEKPTLEYVRKNTSYPHVYNLI
 ELPTENIWTYWIIQETPGTPPI PHPIHLHGHDYFYLGTGSGAFDRSTSPSSLNFNPNPTRRDVALVPG

GGWLAI AFPTDNP GAWLMHCHIAWHI SEGLGVQFLEGKDKINLPDAAWETTCSNWDKYWDTTIYPKQ
 DSSL*

5 SEQ ID NO : 85
 LENGTH : 3008 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 ORGANISM : *M. phaseolina*
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 TGCTCATAACAAGTGAATGGGGTTCCTCAATGCCTGCTGGGACTTGCTGCTCCACCTCCCTTTCTTT
 GCTCCGCGGGGCGGCGGCTTCGAGCGGGATCGCTCGCAGCTTCCGATCTCCTCCGTCGAGTGGCG
 GCGTAGTCATCCACCCGGAGAATGCTTCCCCTGGCTTACCTGCTCTTACCCGAGCATGGAAGGGTG
 15 GGAAAGCTGCAACTACCCGACGACAGGAGCTGCTGGCTTAAAGATGGGAGGGCGAGT CAGCCTTAC
 TTCTCTCAATACGATATCCACACAGACTGTAAGTCTCGATATGGTTGCCCGCATTCATGCTTTCA
 GCTTTACCAGGCCTTCGTGCTAAATTTATGAAGACGAGACCGTCTGGCCTCAGGGTGTAAACCAGAGA
 AGTAAAGTGTGGAAAATCAAAGCCCTGGGGCGCGGGAAACCCGGCCTCTGAGCCTTCATCTATGGCAG
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 20 GTCTGGGCAGAGTCCCTTCTTTTACGCTGCAGCAGATTTGCTTACTCGGTGTTTACTGAACATTTG
 CAGTACTGGATCAACCTCAAGGACCAAGTGGTAAGTGTGCTGCCATTCCCTTGAGTCCGCTGTAGCTGC
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 CAGGTCCTTTAATCGAGGCTTGCTGGGGCGATGAAGTAGTTGTTTATGTGACAAACTACCTGCAGAC
 GAATGGCACTACGTATTCACACGTCTATATCAGTTGTGCCGCGTATGAGCTGATGATGGGGCAGTA
 25 TTCACTGGCACGGTGTGAGACAGCAGTTCAGCAACGAAATGGACGGAGTCAACGGTTTGTCTGCAA
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 30 GATGATCACTGATTGGGTTCAGGATTCGGCTTTTGGGGTCTTCTCCAGGAACTCCTCGCGTCCGAT
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 35 CAGTGCTCCTCAACATAGGTATATAGCGTTTGGTGTCTCGTCTTAGCATGTCTCCAGACACTAACTT
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 CACGATGAGCCAGCGGAGCTGCTGCACCCAATCCTGCCGTGGACGGTGGATCCGCACCCGCAGAACG
 40 ACGTACACAACAACACGTACGAGGTGGCATTTT CAGACGCCAGTTCCACAAGGCCCTTCCGCTGGGA
 CCTGACCGACACGCCCATGTGGCTCGACTTCTCAAACCCGACCATCCTCAACCTGTACAACACCACC
 TGGAAACCCGGAGTACGCCGTCATCGACTGTGAGTTGTCTTCTTACCTCCCGTTCTCCCCAAAAAAC
 ACTAGCAACGAGTGGATGAAGACTGACAGGTACGAAAAAGACAACCTATGACCGCGGCTTCTGTCTAC
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 45 TCCACCTGCACGGCCACGACTTCGCCGCTCTCGCCAGTCCAACCTCGACCTATGACGAGCGCTCCGA
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 50 GTGTGAATGCATGCTGATGATTTTTATAAGATGCACAGGCCCTGGCACTGCAGATTCTGGAGAGGCAG
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55

SEQ ID NO : 86
 LENGTH : 1932
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 5 FEATURE NAME/KEY : CDS
 LOCATION : (1).....(1932)

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 V V I H P E N A S P G F T C S Y P S M E
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 G W E S C N S P D D R S C W L K D G R A
 15 agtcagccttacttctctcaatagcatatccacacagactacgagaccgtctggcctcag
 S Q P Y F S Q Y D I H T D Y E T V W P Q
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 G V T R E Y W I N L K D Q V L F P D G Y
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 20 S K P Y G K V I N D T Y P G P L I E A C
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 W G D E V V V H V T N Y L Q T N G T T I
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 H W H G V R Q Q F S N E M D G V N G I T
 25 cagtgtcctatcgcttatggtgacaccttcacctaccgctttctgtgttactcaatatgga
 Q C P I A Y G D T F T Y R F R V T Q Y G
 actacgtggtaccattcacactactcgtccaatacccagatggcgttgctggccctctc
 T T W Y H S H Y S L Q Y P D G V A G P L
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 30 V F H G P T A A D W D E E W E T P L M I
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 T D W V H D S A F G V F S Q E L L A S D
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 P A N R N V T P P V G D S I L L N G H G
 35 cattacaactgcagcctttctcaggacccaaaaccgctgcgcgcccgggatatggatcttac
 H Y N C S L S Q D Q N R C A P G Y G S Y
 tacacgcaaagattccaaaagggtaaaagggtacttgatcaggctaatctaactcctcagct
 Y T Q R F Q K G K R Y L I R L I N S S A
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 40 G A A F I F S I D G H K M K V I S T D L
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 V P I E P Y E T N A V L L N I G Q R Y N
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 45 gggccaggcggctgtggcagcgtgcacgaccgggcccggtaacgtgacgggcatcctgcgc
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 50 H D E P A E L L H P I L P W T V D P H P
 cagaacgacgtacacaacaacacgtacgaggtcggcatttcagacgcccagttccacaag
 Q N D V H N N T Y E V G I S D A Q F H K
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 A F R W D L T D T P M W L D F S N P T I
 55 ctcaacctgtacaacaccacctggaacccggagtagcgcctcatcgactacaactatgac

L N L Y N T T W N P E Y A V I D Y N Y D
 cgcggcttcgtctacctcgtcatcacggccaacctgacacggctgggcgacaacaagcgc
 R G F V Y L V I T A N L T R L G D N K R
 gagatccccgcccggccaccccatccacctgcacggccacgacttcgccgtcctcgcccag
 5 E I P A G H P I H L H G H D F A V L A Q
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 S N S T Y D E R S D P L N F T L A N P P
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 R R D V V F L P S N G Y V A L A F K P D
 10 aatccccggcatatggttggtgcattgccatatcgcttggcatgccagttctggcctggca
 N P G I W L V H C H I A W H A S S G L A
 ctgcagattctggagaggcagccagatatcctggattcgattggcacgctcgagggcagc
 L Q I L E R Q P D I L D S I G T L E A T
 aataagacgtgtgctggatgggatacgtacgagagggcgcacccgatcgagcaagacgac
 15 N K T C A G W D T Y E R A H P I E Q D D
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 S G I -

20 SEQ ID NO : 87
 LENGTH : 643
 TYPE : PRT
 ORGANISM : *M. phaseolina*

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 25 PLIEACWGDEVVHVNTNYLQTNGTTHWHGVRQQFSNEMDGVNGITQCPIAYGDTFTYFRVTVQYGT
 TWYHSHYSLQYPDGVAGPLVFHGPAAADWDEEWETPLMITDWVHDSAFGVFSQELLASDPANRNVTP
 PVGDSILLNGHGHYNCSSLSQDQNRCAPGYGSYYTQRFQKGRYLIRLINSAGAAFI FSI DGHKMKV
 ISTDLVPIEPYETNAVLLNIGQRYNIIVEANAEPGDYWIRTEIPGGPGGCGSVHDRAGNVGTGILRYD
 GRSTALPTSSKNDYPSDCHDEPAELLHPI LPWTVDPHPQNDVHNNTYEVG I SDAQFHKAFRWDLTDT
 30 PMWLDFSNPTILNLYNTTWNPEYAVIDYNYDRGFVYLIVITANLTRLGDNKREI PAGHP IHLHGHDFA
 VLAQSNSTYDERSDPLNFTLANPPRRDVVFLPSNGYVALAFKPDNPGIWL VHCHIAWHASSGLALQI
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35 SEQ ID NO : 88
 LENGTH : 2404 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 ORGANISM : *M. phaseolina*

AAATGCCATGGACAGCTCGCCCGGGATCGATGTCCTTTCTCCCCGAGCCCCCGTCCGCCGTCCAGGA
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 40 GCGGTCCACCTTCGACATGTGGTGGTTGGCATTGTTCTCATTGCTTGTGGCCGCCACGGCCTGGGCC
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 45 ACCATGGTAAGCCCCGACGATATGCCTGCGGTGAATCAGACTAGTCAATTAACCTTCTCGGTCCACAG
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 50 CCTCGTCAACGGATATGGCATATCGCAGTACCCGGCCACGAACGACGCCGAGAGTTGCAACCTTGCA
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 55 CCAAGAACCTCACCACCTACGCCATTCTGGACTACAGCGACAGCTGCGCCACCAATAGCATCAGCGT

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 TGCACCTCCCGCCACCGTGC AAGGCTGGCTCGACCATGACCTCCACCCGCTCGAAACCTACACGGA
 5 CTTCCCGACGGCGGACGAGGTCACGCGCACCGTCTACATGGACATCTTCCAGCTAGGGCAGGACGGC
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 CGCTCTACACCAACAGCACGCAGTACCTGCCGACTACGACTATGCCGTTCGCATCGGGGACGGGCCA
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 15 GATATCCTCACGCTGCCGCTGCCGATGGTGGAAAGGTTACTTGGTGCCTGGCGGAGATGTGTTCCGGT
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 TGCCAATAAGACCGACGGGAACGGCGGGAAGAATGGCCGGTAGATGGGGGGAGGAGATTACTTGAT
 TCGCAATGGAAGAGGTTACTGCGGAGGGGATTTGTAATGCATGCTACAGTTTTTATGTTATATGCCA
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20 SEQ ID NO : 89
 LENGTH : 1950
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS

25 LOCATION : (1).....(1950)
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 30 agtgcctccattggttgcacgagaggacctccgcccgtggtcaacggcacagttccgggg
 S A S I G C I E R T S A V V N G T V P G
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 gacaaaaacctcaccatgcattggcatggcctcaccatggcagccgctccattcgccgac
 35 D K N L T M H W H G L T M A A A P F A D
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 G S V A A S Q W A I E P F K F F D Y E L
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 N L F D I K P G T Y F Y H S H V G F Q A
 40 attactgccacgggtcccctgctcattaccaaaaagccgggagaggagccgcccgtatgag
 I T A T G P L L I T K K P G E E P P Y E
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 Y E E E R I V L F S D L Y N T T D H D I
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 45 E T G L V A S P F K W S G E V G D V L V
 aacggatattggcatatcgagcgtaccggccacgaacgacgcccagaggttgcaaccttgca
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 55 L L K T W T C E E L A A K T A G R N Q F

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 Y S D S C A T N S I S V E A T I G K D S
 5 acatcgcccccttctacgccccctccttcgctcagcaaaccCGGcaacaacaacaaaac
 T S P P S Y A P P S L S K P G N N N K N
 aacaacaacaccacgctctcccGcaagacgCGCCcaagaccccaccgctgcacctccc
 N N N T T L S R K T P P K T P P L H L P
 10 cccaccgtgcaaggctggctcgaccatgacctccacccgctcgaaacctacacggacttc
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 20 ctcgagatcatcgtcgtcaacacgggCGagctacagcggCGcatggacgtgcatccatg
 L E I I V V N T G S Y S G G M D V H P M
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 25 cggatggCGagaaggaggagccCGcacaaggataatagctggattgCGctgaggataagg
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 30 M Q T V W V F G D S K D I L T L P L P M
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 V V H F F D L D D D D D D D A N K T
 35 gacgggaacggCGggaagaatggccggtag
 D G N G G K N G R -

SEQ ID NO : 90
 LENGTH : 649
 40 TYPE : PRT
 ORGANISM : *M. phaseolina*
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 HVGFQAITATGPLLITKKPGEEPPEYEEERIVLFSDLYNTTDHDIETGLVASPFKWSGEVGDVLVN
 45 GYGISQYPATNDAESCNLAQIPVEAGKTYRLRFI GATALSFLSVGF EKHNLTII EADGHYTEPAEIS
 FLQIGGGQRY SALLKTWTCEELAAKTAGRNQFYIQIETRDRPKNLTTYAILDYS DSCATNSISVEAT
 IGKDSTSPPSYAPPSLSKPGNNNKNNTT LSRKTPPKTPPLHLPPTVQGWLDHDLHPLETYTDFPT
 ADEVTRTVYMDIFQLGQDGYV KWAQN NLSWYEHTPKVPYLVALYTNSTQYLPDYDYAVASGTGHDDR
 VGAWPAKMGEVLEIIVVNTGYS SGM DVHPMHLHG AHPFYL GSGKGTYNRENEKKLAGRVPVTRDS
 50 MMLYRYGEKEE P H K D N S W I A L R I R V T Q P G V W M F H C H T L A H M I M G M Q T V W V F G D S K D I L T L P L M V E G
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SEQ ID NO : 91
 LENGTH : 2569 (including 150 bp 5' UTR and 150 bp 3' UTR)
 55 TYPE : DNA

ORGANISM : *M. phaseolina*

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 5 GCCACAGTCACGTATGACTTTAACGTGACCTGGGTCAACGCCAACCCCTGATGCTGCTTTTCGTGCA
 CTACCATTTGGCATCAATGGCCAGTGGCCGCTCCCTGCAATCGACGTACCAAGGGCGACCGGTTGT
 CATCAACGTCAACAACCAGCTGGAAACGGAGAGTACCAGTTTGCATTTCCATGGAATCTACATGAAT
 GGCACCAACCACATGGATGGCCGACTGGCGTGACCCAGTGCAGATAACCGCCCGGGAGCTCATTCA
 10 CATACAATTTTACGGTATAGCACGATCCACCCCTTGTTTACTTATAGCTAACCGCACGCAGGTGCA
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 AGGTATCATTCTACAACCGCGCCAGTATCCCGATGGATTGCGAGGGCCTTTTATTGTGAGAGACC
 CCGACAATCCGTTCAAGGATGACTATGATGAGGAAGTCGTCTGACATTCTCCGACTGGTACCACGA
 CCGGATCCCCACCCTCATGAAGAGTTTCATTAGTGTCAAAAACCCACCGGCGGGAGCCTGTCCCG
 AACGCGCACTGATGAATGACACTCAGAACCCTCACCTTCCAGATGACTCCCGGGCGGAGATACATGT
 15 TCCGACTAATAAACATTGGTGCATTTGCTGCTCAATACGTCTGGTTCGAAGGCCATACCATGCGTAT
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 20 GTTGCCACCTTTAGCTATCGGGGACTACGATCCGTTTCGATGACTTCACACTTGTGCCTCAAGATGGT
 ATGGAGCTCTACGATCACGTGATCATTCCATCACCTTCGATATGAAGATGGACAATCTCGGGGACG
 GAGCAAATTAGTATGTTGACTGTAGTTGACAACGGCCAAATGCCATGACTGACGAGCGCAGTGCCTT
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 25 TCGAGATCATCCTCAACAACAATGATCCGGGAAAGCACCTTTCCATCTGCATGGGCACGCATTCCA
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 ATGCGCCGCGATACAATCTTGTCCGGCCCAATGGCAATATAGTACTGAGATTCAAGGCTGACAATC
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 CTGACCTCTTACTGTTAGGCATGTTGCGTCCGGCCCTTATTGCCACCATGATAGAGGCACCGCTTGAC
 30 CTGCAATCTTCTCTCGGCAACAGCATTCTGCTGATCACTGGCGAGCTTGTGCCGCCCGGCACAC
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 GTCTTGGGCATGGCAGCCATCGTATGGTACGGGATGGCGCCTCTGACAGATGGAACGGTGCAGCAAC
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 35 GGCAAAACGTGAGCAAAGGATGGCCAGCCGGACTGATTTGGAGGCAGAGATGCGGCAAGAAAAGAGC
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 GGAGTAGCCGCGTTCGTCTAACATGCTAGAGACCAGAAGAAGCAGTCGTGGCAGTGAGCAGATGCT
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 40 TGTGAGAGGGAAAGCTATCACGAATGGCTGAAGAGCTTTGGGCCTTGTACGATGTAATGTTGTCCG
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SEQ ID NO : 92
 LENGTH : 2016
 TYPE : DNA
 45 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS
 LOCATION : (1).....(2016)

atggccagtcctctgttcctcctgcttgctgctgcccctgtgagccgagcgtgccacagtc
 M A Q S L F L L L A A A L C S R A A T V
 50 acgtatgactttaacgtgacctgggtcaccgccaaccctgatgctgcttttcgtcgact
 T Y D F N V T W V T A N P D A A F R R T
 accattggcatcaatggccagtgccgctccctgcaatcgacgtaccaagggcgaccgc
 T I G I N G Q W P L P A I D V T K G D R
 gttgtcatcaacgtcaacaaccagctggaaacggagagtagcagtttgcatttccatgga
 55 V V I N V N N Q L E T E S T S L H F H G

atctacatgaatggcaccaaccacatggatggcccgactggcgtgacccagtgcgagata
 I Y M N G T N H M D G P T G V T Q C E I
 ccgcccgggagctcattcacatacaattttacggctcgaccaaccgggaacttactggat
 P P G S S F T Y N F T V D Q P G T Y W Y
 5 cttctcacaaccgcgccagtatcccgatggattgagggccttttattgtcagagac
 H S H N R G Q Y P D G L R G P F I V R D
 cccgacaatccgttcaaggatgactatgatgaggaagtctcctgacattctccgactgg
 P D N P F K D D Y D E E V V L T F S D W
 taccacgaccggatccccaccctcatgaagagtttcattagtgtcacaacccccaccggc
 10 Y H D R I P T L M K S F I S V T N P T G
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 A E P V P N A A L M N D T Q N L T F Q M
 actcccgggagagatacatgttccgactaataaacattgggtgcatttggctgctcaatac
 T P G R R Y M F R L I N I G A F A A Q Y
 15 gtctggttcgaaggccataccatgcgtatcgtagaagtgcagcggcgtgtacaccgaagcc
 V W F E G H T M R I V E V D G V Y T E A
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 A D A E R I Y M T A A Q R Y S V I I T A
 aagaacgaatctacctcaaacttcgcctttgttgaagcatggatcaggatctctttgat
 20 K N E S T S N F A F V G S M D Q D L F D
 actattccagcaggccttaataataacgtgaccgggtggcttgtctacaatcaacagaac
 T I P A G L N N N V T G W L V Y N Q Q N
 ggcttgtgccaccttttagctatcggggactacgatccgcttcgatgacttcacacttgtg
 G L L P P L A I G D Y D P F D D F T L V
 25 cctcaagatggatggagctctacgatcacgtcgatcattccatcacccctcgatatgaag
 P Q D G M E L Y D H V D H S I T L D M K
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 30 P K V P T L Y T V L S T G N N A T D S R
 atctacggtagcaacaccaacagcttcatattggctaaggacgaagtcgtcgagatcatc
 I Y G S N T N S F I L A K D E V V E I I
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 L N N N D P G K H P F H L H G H A F Q A
 35 atcgcttcgctccgaagaagaagccggcgcgtacgtggcaaacgaaaccttccccagacg
 I V R S E E E A G A Y V A N E T F P Q T
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 P M R R D T I L V R P N G N I V L R F K
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 40 A D N P G V W L F H C H I E W H V A S G
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 L I A T M I E A P L D L Q S S L G N S I
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 P A D H W R A C A A A G T P T A G N A A
 45 ggcaacacgattgattatcttgacctgactggtgaaaacaagagccccggccccgcttccc
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 50 G M A A I V W Y G M A P L T D G T G Q Q
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 A V A A K R E Q R M A S R T D L E A E M
 55 cggcaagaaaagagcggagaaattaccatggtggagcagaggaggagcagccgtgggtca

R Q E K S G E I T M V E Q R R S S R G S
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 S N M L D V R R S S R G S S N M L E T R
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 5 R S S R G S E Q M L S -

SEQ ID NO : 93
 LENGTH : 671
 TYPE : PRT
 10 ORGANISM : *M. phaseolina*
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 15 PGRRYMFRLINIGAFAAQYVWFEGHTMRIVEVDGVYTEAADAERIYMTAAQRYSVIITAKNESTSNF
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 TLDMKMDNLGDGANYAFFNDVITYVEPKVPTLYTVLSTGN NATDSRIYGSNTNSFILAKDEVVEIILN
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 HCHIEWHVASGLIATMIEAPLDLQSSLGNSIPADHWRAAAAAGTPTAGNAAGNTIDYLDLTGENKSP
 20 GPLPSGF EAKGIVALVFSCIAAVLGMAAIVWYGMAPLTDGTGQQQHVV DQQPQGRSAQVGV MPLAVA
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 S*

SEQ ID NO : 94
 LENGTH : 3063 (including 150 bp 5' UTR and 150 bp 3' UTR)
 25 TYPE : DNA
 ORGANISM : *M. phaseolina*
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 30 CCACCAAGGGGTTTGGTAAGTCGTAAAAGTTTCCTCACAGTTCGCAAATTCAGAGTACCGGTTCCAG
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 CGTATGTGCCGACTTGTATTTCTTACATCCAGCCGTCTAGGATCGTTCGGTATCGGTCTCTGCAA
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 35 TCTTCCGTGAGCTCTTCGTGATCAGATCCTCTTCTGGCGGATCTTCATCTGCTGGTACTTCTTCTG
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 TCTTCCACTCTTTGAGCCTCTTCAACCACAAAGGTTGCTACTGGTACCCCGTGTGCTGGAACACTG
 40 CGGCTTCCAGGACAGCCTGGTGCATCACACCATGACGATGACTACTATCCCATATCCAGATAC
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 45 AACTACACGTATACCTGGAGGGCTGAGCAGTACGGAACATCATGGTGAGCTTGATCCGAGGATACAG
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 50 GGTACCAACGTGTACAACAACCTCGGGAACCATAACGGGCTCTCGTTTTGAGACAACATTTGAGGAAG
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 55 ATCATCACCGCCAACCAAGCCGTAGTCGCCACCGACTTCTGGCTGCGTGCCGTCCCGCAGACGGCCT

GCTCCAATAACGCCAACCCAGACAATATCAAAGGAATAATCCGGTACAGCACCTCCACCTCCGCCTA
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 GCCTCGGGCAGGAGTCTATCTGAAGTGGTGACGCTGGGTTCGCAACGTTGACAACCTCAACCGCTGGA
 5 TGATGAACAGCACATCGATGGTTGTTCGAGTGAATGATCCCTCGTTGCTGCAGGTTTGAATAATGA
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 GCGCCTTCGCCGACTTTTTCGTTCCGATGTCTCAAGAAAGGTGCCATGTTGTAATGTGTATCCCAG
 10 AGGCTTCCCGGCTGACTTGTTTTGTCAACACAGTTC AACATCCTCGCCCAAGGGACCGGCACGTACG
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 GTACTTGGTGATTGCATTCGCCACCGATAACCCTGGAGCCTGTGAGGACTTCTTTTTTCTTGTGCA
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 15 TCGCCGCTTATCGACTACGAGACGCTTGAAGGCAACTGCAACAGATGGGACGCGTACGTGTGGTCA
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20 SEQ ID NO : 95
 LENGTH : 2085
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS

LOCATION : (1).....(2085)
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 G F A E A A C T S N S P L N T Y V P D L
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 30 Y F F I P S R L G S F G I G L C N D Y H
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 Y D H W E I L H V L Y A D Q H F I F L F
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 35 ttctgcccgtcatcatatgtcagctcttctttagctcgcggtctgctgtttcttccct
 F C P L I I C Q L F F E L A F C C F F P
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 S D Q H I L F S H L N W H G I V L A R F
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 40 E E L Q L F I F H S F S L F N H K A W C
 gatcacaccattgacgatgactactatcccattatcccagataccggagtacacgcgaa
 D H T I D D D Y Y P I I P D T G V T R E
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 Y W F D L V E V T V A P D G I E R A A M
 45 gcggtcaacggcagcatccctggaccaccattgagggcgatggggcgatatcgccgtc
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 M H V T N S L I S S K N G T S I H F H G
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 50 I Q Q N F T N Q T D G V I S I T Q C P T
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 A P G E N Y T Y T W R A E Q Y G T T W Y
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 55 ccaggacctccaacatttattaacgaagccctgcaggtatcaagatcaatggtccggcga

P G P P T F I N E A L Q V S R S M V R R
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 V P T T I T I L A M S S S N D W S H E T
 tcgagctctctcgagatcgtttctgcaattcgaggtccgccaacacttgagaatgccctt
 5 S S S L E I V S A I R G P P T L E N A L
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 I N G T N V Y N N S G T I T G S R F E T
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 T F E E G K S Y R L R L V S G A I D T H
 10 ttcaaggtgtcattggataaccacagcatgcttgtcatagccaacgaccttgtaccatc
 F K V S L D N H S M L V I A N D L V P I
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 V P Y N T T V L N I G M G Q R Y D V I I
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 15 T A N Q A V V A T D F W L R A V P Q T A
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 C S N N A N P D N I K G I I R Y S T S T
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 S A Y D W T N E C V D E A L T N L V P W
 20 gtgactaagaacgcggcctcgggcacgagctctatctgaagtggtagcgtgggtcgcaac
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 25 P S L L Q V W N N D T N F T D T S G V V
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 R L G T A D E W V M F V I E M T L P I P
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 R P I H L H G H D F N I L A Q G T G T Y
 30 gattcatcgtgctcgtcaccctgtcaaaccgcggcggagggacggttgcgctgctgccc
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 35 C H I G R R T T E G F A I Q I L E R W D
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 E I S P L I D Y E T L E G N C N R W D A
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 Y V S V S D V V Q D D S G V -
 40

SEQ ID NO : 96
LENGTH : 694
TYPE : PRT
ORGANISM : *M. phaseolina*

45 MAWTSALDRSSWLAPASPPRGFAEAACTSN SPLNTYVPDLYFFI PSRLGSFGIGLCNDYHYDHWEILHVLYAD
 QHFIFLFFRELFVDQILFWRIFICWYFFCPLI ICQLFFELAFCCFFPSDQHILFSLNWHGIVLARFEELQLF
 IFHSFSLFNHKAWC DHTIDDDYPI IPDTGVTREYWF DLVEVTVAPDGI ERAAMAVNGS IPGPTIEADWGDIA
 VMHVTNSLISSKNGT SIHFHGIQQNFTNQT DGVISITQCPTAPGENYTYTWRAEQYGT TWYHSHFALQAWEGV
 FGTYIPAPGPPTFINEALQVSRSMVRRVPTTITILAMSSSNDWSHETSSSLEIVSAIRGPPTLENALINGTN
 50 VYNSGTITGSRFETTFEEGKSYRLRLVSGAIDTHFKVSLDNHSM LVIANDLVPIVPYNTTVLNI GMGQRYDV
 IITANQAVVATDFWLRAPQTACSNANPDNIKGI IRYSTST SAYDWTNECVDEALTNLV P V W T K N A A S G T S L
 SEVVT LGRNVDNLNRWMMNSTSMVVEWNDPSLLQVWNNDTNFTDTSGVVRLGTAD EWV M F V I E M T L P I P R P I H
 LHGHDFNILAQGTGT YDSSVSLT LSNPPRRDVAL LPAAGYLVI AFATD NPGAWLMHCH IGRRTTEGF AIQILE
 RWDEISPLIDYETLEGNCNRWDAYVSVSDV VQDDSGV*

55

SEQ ID NO : 97
LENGTH : 2449 (including 150 bp 5' UTR and 150 bp 3' UTR)
TYPE : DNA
ORGANISM : M. phaseolina

5 GCGCACCCCGAATTTTCATGTGGCACTTTGCTGGTGGCGATGCATAAAGTCTCCCAAACCTTGATCT
TCAGCGTCGAGAGCAGCTCAACGTCCGATCCGATTTTTTCGTTACCCGCGCTTCTTGTCCCTCAAGCC
CCCAATAACAATTCAACATGTTTTCTTTTGTGTCGTCAGAAAGCCTCAACTGCCGCTATGGCTGGACTTT
GGCCTTTC AATATGGTCAATGTTCCGGCGAAACAGTCAAGACTGCGTACACTCGCCCCAGAGCAGAC
ACTGCTGGCATGATGGGTTTCGATATCAACACCGATTATGAAGCTAAGATACCCGCAGGGAAGCTCGT
10 GGAGGTAAGATAAACCAGCCACAGACGGCTCAGGCCATCGCAACTCACCTCCCTTAGTACGATTTCA
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15 ACCACAATGGCACATCCATACATTGGCATGGAATTCGCCAATTCGAGACCAATTGGCTTGATGGTGT
TCCCCGGCGTCACTCAATGCCCGTCAAAGGTACTACGGCTGGTTTGTCTTGGGAGAGAAACAGGGGAG
CTAAGTGTCAACCAGCCTGGAGACTCGCAAGTTGTGAATTCGAGCGATGCAATATGGGACCGCATG
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20 CGGGCCACTGTTGATCAGTGATTGGTATCACCACGATGCCTTCGGCCTATTCCATTATGAGATCGCT
TCACCGCACGCGCCGCTTCGGTCAACAATCTTGAATGGCAAGGGAGTCTTTGATTGCGATCCAG
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25 GTATGTTCAAGTGCCTACAAAGAATTGGCGGTAAACTGATCATTCCAGCTCAACGATACGAGATCAT
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30 CTGCAGGGCTGGCCCAACATCTCGGACACAGATTTCGCTCGTACACAAATGGACACTTACCAACAGAA
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35 CCTCCACAACCCAAACCAGGAGGGACGTGGTCAATTGCCGATTTGGCGGCTACGTATGGATCGCATT
CAGGTCAACAATCCAGGAGCGTGGCTGATGCATTGCCATATCGCCTGGCATGCCAGCGCCGACTCT
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CAAGATGATTCCGGCATATGAGTTGGTATTGAACTTCGGCTGAACACGCTCAGCCACGGCTACTTG
40 CTTGGCCAAGATTGAGGGTTGGCCGAGAAATGAGTAGTGGGGATTATCACTTTCTTAGAATGTGCAC
GAAAGGGTAGTGTTCGGTCATGTCTTAGCTTGAAA

SEQ ID NO : 98
LENGTH : 1821
TYPE : DNA
ORGANISM : M. phaseolina
FEATURE NAME/KEY : CDS
LOCATION : (1).....(1821)

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I W S M F G G N S Q D C V H S P Q S R H
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C W H D G F D I N T D Y E A K I P P G K
55 ctgctggagtagtattcactatctcgggaagcagtccttgctccggacggataacttgacg

L V E Y D F T I S E A V L A P D G Y L T
 aatgtcactctggtaaataaggagtattccctggtccaaccctcgaagctgaatggggagat
 N V T L V N G V F P G P T L E A E W G D
 acgatcaggataacgatccacaacaacctcacaaccacaatggcacatccatacattgg
 5 T I R I T I H N N L T N H N G T S I H W
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 H G I R Q F E T N W L D G V P G V T Q C
 ccgtcaaagcctggagactcgcaagttgtcgaattccgagcgtatgcaatatgggaccgca
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 10 tggatcattcacactacagtcttcagtatacaaacggagttctcggacccattcacatc
 W Y H S H Y S L Q Y T N G V L G P I H I
 aagggaccctcgagcatgaactacgacgtggatctcgggccactgttgatcagtgattgg
 K G P S S M N Y D V D L G P L L I S D W
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 15 Y H H D A F G L F H Y E I A S P H A P L
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 P V T T I L N G K G V F D C D P A S D A
 cgttgtacgggagagcaccaacggcacgagatagtgttcgaagagggtaaaagatacaaa
 R C T G E H Q R H E I V F E E G K R Y K
 20 attggactaataaataaccggcagccttctgacatacaagttctggatcgatggccataat
 I G L I N T G S L L T Y K F W I D G H N
 tttacagttgtgcagacggatttcgttcccatcaaaccatacgtcacccgacgttctgatc
 F T V V Q T D F V P I K P Y V T D V L I
 gtcgggatagctcaacgatacagagatcattatcgaagcaaagtgtgacattcacacgtggc
 25 V G I A Q R Y E I I I E A N V T F T R G
 tccaacttctggattcacgcaacgtactgtgacgatgatgacatggtggactcgagagtt
 S N F W I H A T Y C D D D D M L D S R V
 ggcatagtccgctacgacggcagcagcggctcgtgatccgcacacgcccgaagagtgag
 G I V R Y D G S D G R D P H T P P K S E
 30 caacaccccgatacgggtgtcgtgatccagccacggagaatctgttcccatcgtgaag
 Q H P G Y G C R D P A T E N L V P I V K
 agggaagttaggcaagagagtgaacgggctcagccctgctgattacctcaggatcggcctg
 R E V G K R V N G L S P A D Y L R I G L
 cagggctggcccaacatctcggacacagattcgctcgtacacaaatggacacttaccaac
 35 Q G W P N I S D T D S L V H K W T L T N
 agaaccagtacattgattggagggagccaacaatcaaggcgtcacttcggatgtcggg
 R T Q Y I D W R E P T I K A L T S D V G
 gctgattttgcgatgagacatgccccatatacctggactacgagactggcgagtgggtg
 A D F A D E T C P I Y L D Y E T G E W V
 40 tacttcgtcatcgagaacaactacacgctgagcgcgccaacacgccccgcaccatcccc
 Y F V I E N N Y T L S D A N T P R T I P
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 R S V H P I H L H G H D F V I L A Q G D
 ggcattgttcgaccccgctcgacgtgggtgccgaacctccacaaccaaccaggaggacgtg
 45 G M F D P V D V V P N L H N P T R R D V
 gtcaattgcccgattggcggctacgtatggatcgcatccaggtcaacaatccaggagcg
 V N C P I G G Y V W I A F Q V N N P G A
 tggtgatgcattgccatcgcctggcatgccagcgcggactctcactgcagttcatt
 W L M H C H I A W H A S A G L S L Q F I
 50 gagcaacctggcctgatcaaggggttaatggagcagggaggagccttgccggagcttgct
 E Q P G L I K G L M E Q A G A L P E L A
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 55 Q D D S G I -

SEQ ID NO : 99
 LENGTH : 606
 TYPE : PRT
 5 ORGANISM : *M. phaseolina*
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 I SEAVLAPDGYLTNVT LVNGVFP GPTLEAEWGD TIRIT IHNLTNHN GTSI HWHGIR QFETN WLDGV
 PGVTQCPSKPGDSQVVEFRAMQYGTAWYHSHYSLQYTNGVLGPIHI KGPSSMNYDVDLGPLLI SDWY
 10 HHDAFGLFHYEIASPHAPLPVTTI LNKGKVFDCDPASDARCTGEHQ RHEIVFE EGKRYKIGLINTGS
 LLTYKFWIDGHNFTV VQTD FVPIKPYVTDVLI VGI AQRYEII IEANVT FTRGSNFWIHATY CDDDDM
 LDSRVGIVRYDGS DGRDPHTPPKSEQHPGYGCRDPATENLVPIVKREVGKRVNGLS PADYLRIGLQG
 WPNISD TDSL VHKWTL TNRTQYIDWREPTI KALTS DVGADFADETCPI YLDYETGEWVYFVI ENNYT
 LSDANTPR TI PRSVHP IHLHGHD FVILA QGDGMFDPVDV VPNLHNPTRRDV VNCPIGGYVWIAFQVN
 15 NPGAWLMHCHIAWHASAGLSLQFI EQPGLI KGLMEQAGALPELADRCEDWTEYYNTVNI PKGALQDD
 SGI*

SEQ ID NO : 100
 LENGTH : 2347 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 20 ORGANISM : *M. phaseolina*
 GATACAACTCTTCTCCCCGCCTCTCTTTACAAACTGTCTATCGCTCCTTTGTTTTCTGTCCCTCC
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 TTGCCGTTGCTGTAACATGCCGTTTTCTCCACGCCTAAGTATATGCCTTTTAGCATTTTGCTCTCAC
 25 ATTTGTGTTTCGCACTTTTCGATACCAAATGTAAAGGATAGGACCCCCACTTAAGCCCGCAATTACG
 GATTTTCGTTTTCGGCAACCTGTCTTGGGGCGGGCGGAGCCTTCCGACCCACTCGCACAAAGGTGCAGA
 ACGTTTTGGATGACATCAGTCTCCCGGCCCTGAAGATGGCTGTCTTTTCTCAAAGATGCTCGGAAC
 TGCTGGCGCGATAACTTCAACATCGACACCGATTTTCGACGAGCGCTTCCCCACGACCGGGAAGACGG
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 30 ATCACA AACTACCATG GCCCCGTGACGGAATCGAACGCGTGT CATGGCCGTGAATGGCCAATATC
 CCGGCCCGACCCTTATTGCTGATTGGGGGACACGATGGTTATCAACGTCAAGAATAGCCTGGACCA
 CAACGGTACGGGTCTCCATTTCCATGGACTGCGCCAATACAAAAGCAACGGCGCCGATGGGGCGAAC
 GGTATCACAGAATGCCCAATTGCCCCCGGCGAGACCAAGACCTACACCTTTCAATGTACCCAGCACG
 GTAGCTCGTGGTACCACTCGCATTACTCTGTCCAGTACTCCGACGGCGTTCTCGGCGGCATTATCAT
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 35 ACTCCAATGTTTGA ACTAGCCGAAGCTGCCAGGCATTGACAAGGGGCCACCGAAGGCGGATAACG
 GACTCATCAACGGGACGATGAAGAGCCCTGACGGTTCTCTTGGAGCCTATGGCCAGATCCATGTGAA
 GAAGGGTCTGCGGTACAGGATTGCGTAATGAATGTTGGCACTAACGACCACTACCTCTTCTCTGTT
 GATGGGCACAACCTCACCGTGATCGCAAGTGATTTTCGTGCCGTCGTGCCCTTTTCGGCGTCCAGCA
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 40 ACAGAGGTACGACGTGATCCTTATCGCCGACCAAGACATTGACA AACTACTGGATCCGCTCCGACCCG
 GACTCTGCCTGTAGCGTTAACGGCAACGCCGGCAACATAAAAAGCCATCCTCTCGTATGACACGGCTC
 CCGCGGACGCTCAGCCGAATAGCACGCGCCACAGCATCTCTCGGGCTGCAAGGACATGGCAGTCGT
 GCCAAGAGTTGCTAATAACCGTGCCCTCTGATCGCTTTCGCGGACGCCGTCCAGAGCCTGGCGATGAGC
 45 GTCAATATCACGCAGCAGAACGGCCCCGCTCGTCCAGTGGTATATCAACGGCTCGGCTATGGAGGTCG
 ACTGGAGCTACCCGACGGTCCAATATGTCTTAGATGGGAACACGTTCGTACCCGCGTGAGCTGAACCT
 AGTCCAGCTGGATGAGGCGGACCAGTGGTACTACTTTCGTTCATCCAGACCGTGCAAGGCTTGCGTGT
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 AACAGTAAAAGAGGGACAAGTGAATGCGACGTACTGATTTGTTGTCCAATTGGTCCAGGACTTCTAC
 50 ATCTTCGGCGCCGGTCCCGGCGAGTGGGACGGCAACATCGATGGCCTGCAGTTCGACAACCCCTCCG
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 CGCCTGGCTCATGCATTGCCACATCCCGTTCACGTCCAGCAGGGCTTCGGGCTGCAGTTCCTGGAG
 CGGCCGATGAGATTGAGGGCGTCATGGGCGATACGAGCCCGTTTTACAACGAGTGTGCGGCTTGG
 AGGACTACTATGGTGGGGGCCAGGCTTTTCAGCAGTCCGATTCGGGCTTGTAAATGGTGTGGTGGC
 TTGCGCAAGAGCAAAGCGCCGTGGTGTCTGGCGGTGATTTTAGTGGCACGGTTTTGTACTCAT

CAACTCCTAATCACTAAGTCAGCCACCCTCGTTTCCGCCACCCTGTACAGTCAGCATCATAACGTA
AC

SEQ ID NO : 101
 5 LENGTH : 1854
 TYPE : DNA
 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS
 LOCATION : (1).....(1854)

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 A L S I P N V K D R T P H L S P R N Y G
 tttcgtttcggcaacctgtcttggggcgggcgaggccttccgaccactcgcacaaggt
 15 F R F G N L S W G G A E P S D P L A Q G
 gcagaacgtttgatgacatcagctctcccgccccctgaagatggctgtcttttctccaaa
 A E R L D D I S L P A P E D G C L F S K
 gatgctcggaactgctggcgcgataaactcaacatcgacaccgatttcgacgagcgcttc
 D A R N C W R D N F N I D T D F D E R F
 20 cccacgaccgggaagacggtcacttataatctggagatcaciaaactaccatggcccct
 P T T G K T V T Y N L E I T N T T M A P
 gacggaatcgaacgcgctcgtcatggccgctgaatggccaatatcccgccccgacccttatt
 D G I E R V V M A V N G Q Y P G P T L I
 gctgattggggggacacgatggttatcaacgtcaagaatagcctggaccacaacggtacg
 25 A D W G D T M V I N V K N S L D H N G T
 ggtctccatttccatggactgcgccaatacaaaagcaacggcgccgatggggcgaaacggt
 G L H F H G L R Q Y K S N G A D G A N G
 atcacagaatgcccaattgccccggcgagaccaagacctacacctttcaatgtaccag
 I T E C P I A P G E T K T Y T F Q C T Q
 30 cacggtagctcgtggtaccactcgcattactctgtccagtactccgacggcgcttctcggc
 H G S S W Y H S H Y S V Q Y S D G V L G
 ggcattatcatcaacggccccgcccgcgactacgaccacgatcttgggtgtgtacatg
 G I I I N G P A D A H Y D H D L G V Y M
 ctttctgactggtaccacactccaatgtttgaactagccgaagctgccaggcattcgaca
 35 L S D W Y H T P M F E L A E A A R H S T
 aggggcccaccgaaggcgggataacggactcatcaacgggacgatgaagagccctgacggt
 R G P P K A D N G L I N G T M K S P D G
 tctcttggagcctatggccagatccatgtgaagaagggctctgcggtacaggattcgcgta
 S L G A Y G Q I H V K K G L R Y R I R V
 40 atgaatgttggcactaacgaccactacctcttctctgttgatgggcacaacctcacggtg
 M N V G T N D H Y L F S V D G H N L T V
 atcgcaagtgatttcgtgccggtcgtgcccttttccggcgtccagcatttccctcgggtgt
 I A S D F V P V V P F S A S S I S L G V
 ggacagaggtacgacgtgatccttatcgccgaccaagacattgacaactactggatccgc
 45 G Q R Y D V I L I A D Q D I D N Y W I R
 tccgaccggactctgcctgtagcgttaacggcaacggcgaacataaaagccatcctc
 S D P D S A C S V N G N A G N I K A I L
 tcgtatgacacggctcccggcagcctcagccgaatagcacgcgccacagcatctcctcg
 S Y D T A P A D A Q P N S T R H S I S S
 50 ggctgcaaggacatggcagtcgtgccaagagttgctaataccgtgccctctgatcgcttc
 G C K D M A V V P R V A N T V P S D R F
 gcggaacggctccagagcctggcgatgagcgtcaatatcacgcagcagaacggccccgctc
 A D A V Q S L A M S V N I T Q Q N G P L
 gtccagtggtatatcaacggctcggctatggaggctcagctggagctaccggcgggtccaa
 55 V Q W Y I N G S A M E V D W S Y P T V Q

tatgtcctagatgggaacacgtcgtacccgctgagctgaacctagtccagctggatgag
 Y V L D G N T S Y P R E L N L V Q L D E
 gcgaccagtggtactacttctcgtcatccagaccgtgcaaggcttgcgtgtcaacctgccg
 A D Q W Y Y F V I Q T V Q G L R V N L P
 5 cacccaattcatcttcatggccacgacttctacatcctcggcgccggtcccggcgagtgg
 H P I H L H G H D F Y I L G A G P G E W
 gacggcaacatcgatggcctgcagttcgacaaccctccgcgccgatacggcaatgcta
 D G N I D G L Q F D N P P R R D T A M L
 cctgcggtggctacctcatcctcgcctttccggccgacaaccctggcgctggctcatg
 10 P A G G Y L I L A F P A D N P G A W L M
 cattgccacatcccgttccacgtccagcagggcttcgggctgcagttcttggagcggccg
 H C H I P F H V Q Q G F G L Q F L E R P
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 D E I E G V M G D T S P F Y N E C A A W
 15 aaggactactatggtggggccaggcttttccagcagtcagattcgggcttggtaa
 K D Y Y G G G Q A F Q Q S D S G L -

SEQ ID NO : 102
 LENGTH : 617
 20 TYPE : PRT
 ORGANISM : *M. phaseolina*

MPFSPRLSICLLAFCSHIVFALSI PNVKDRTPHLSPRNYGFRFGNLSWGGAEPSDPLAQQGAERLDDI
 SLPAPEDGCLFSKDARNCWRDNFNIDTDFDERFPTTGKTVTYNLEI TNTTMAPDGI ERVVMVAVNGQY
 PGPTLIADWGD TMVINVKNSLDHNGTGLHFHGLRQYKSNADGANGITECPIAPGETKTYTFQCTQH
 25 GSSWYHSHYSVQYSDGVLGGII INGPADAHYDHD LGVYMLSDWYHTPMFELAEAAARHSTRGPPKADN
 GLINGTMKSPDGLGAYGQIHVKKGLRYRIRVMNVGTNDHYLFSVDGHNLTVIASDFVPVVPFSASS
 ISLGVGQRYDVIL IADQDIDNYWIRSDPDSACSVNGNAGNIKAILS YDTAPADAQPNSTRHSISSGC
 KDMAVVPRVANTVPSDRFADAVQSLAMSVNITQONGPLVQWYINGSAMEVDWSYPTVQYVLDGNTSY
 PRELNLVQLDEADQWYFVIQTVQGLRVNLPHPHILHGHDFYILGAGPGEWDGNIDGLQFDNPPRRD
 30 TAMLPAGGYLILAFPADNPGAWLMHCHIPFHVQQGFGLQFLERPDEIEGVMGDTSPFYNECAAWKDY
 YGGGQAFQQSDSGL*

SEQ ID NO : 103
 LENGTH : 2415 (including 150 bp 5' UTR and 150 bp 3' UTR)
 35 TYPE : DNA
 ORGANISM : *M. phaseolina*

TCGAGCAAGATGAATGTATCCTCCGTGGAAAGTCTTTTTTCTCAGGGCGGCCGTCCGCTTTGACCTC
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 CACCTCTCTCGGAAGATGATTGGCCATTCTCTCGTAGCTGTAGCACTCGGCAGCGCAGCCATGGCA
 40 CTGGCTCTTCTCAGAGCCACGTCCCCGCTGCTTGATGAACGGTCCGCACTCTCGGAAGTGCTGGG
 GCAACTACTCCATCGACACGGACTGGTACACCGAACTCCATACACGGGCGTGGTGAGAGAATACTG
 GTTCTTGGTTCGAGAATAACCACCGTAGCACCAGATGTACACGCCCTCTGGGTTGCGCCATTGGCAAC
 GCATGGCAGGCTGACTTGGGGTGGCAGGGATATGAGACATGGGCTCTCACGGTAAACCGCTCGATTCT
 CTGGACCAACAATCGAGGCCAACTGGGGCGACGAAGGTAAAAGTTGTTTCGACTGGGATTCGCCGGCC
 45 GATAATGCTTACTGCTACGCAGTAATCGTTCATGTACCAATGGCATGGAGCGGAATGGTACCGCAA
 TCCATTTCCACGGCCTAAGGCAGCTGGGAGCCACGAAATGGATGGTGTCCCTGGGGTTACGCAGTG
 TCCTATAGTACGCCCGTACCCTCTCTCTCTCGCACTGCTGCGCGCAAGCTATTGATACTTCTCAGGC
 TCCCGGACACTCCTACACATAAAGTGGCGAGCTACTCAATACGGAACGGTGAATCCCCCTCGAGG
 CAGAATCGGCCATACTTTAACTGACGGGTCTGAAAGAGCTGGTATCATTCCCCTTACGATGCAAT
 50 ACTCGGTTCGGTCTACAGGGCCCGATCGTCAATCACGGACCTGCTACGGCAGACTATGACGAGGACCT
 GGGAACGGTCGTCTTGACGAGCTGGAGTACACCTCTCCGTTCCGATGTGGTGGTACGCACGTGTG
 CCTTCCGACCGCCCTCGCTCTCAAACCTCGCTCATCAACGGCAAAAACGTCTTCTATTGCGACAGTA
 CGACCGATTCGAGATGCTACGGTAACGGCACACGGTTCGGAGTGGCGCTTTGAGCAGGGGAAAAGTA
 TCGAATGAGGCTCATCAATACAGGCCTCTACTCAAACCTCCGTTTTGCCATTGACAACCACAACCTC
 55 ACCGTTATTGCGACCGACTTTGTTCTATCAAACCTACACCACAGATAACGTGAGTACCAACCCC

TTGCTTTCGTGCACTCTAACGAGACATTTCTCCAGGTGGCAATTTCAATGGGGCAACGCTACGACA
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 5 GGCAAACATCCTGCTGCCGAACGACTACTCAAACAATACCCTTGGCATAATCCGCTACACAGCAA
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 10 GCCGAATATCTCGCCGTCGACAGCCGGGCGGCAACGAGGGACGCTGGGCGTATCTCGTGTTCAACG
 ACGTCTCCGCCCCGAATCGCTCGCACCCGATGCACCTGCACGGCCACGACTTCTTCTGCTCGGCAC
 CGGCCCTGGCTATTTTGTAGTACGGCAGCAACAGCAGCAGCCTGGCGATGCTCAACCTGCACAACCCG
 CCTCGTCGCGACACGGCGACCTGGCCCGAGTCTGGCTGGATGGTTCGTGCGGTTCTCATGGACAACC
 CGGGGAGCTGGCTGATCCACTGCCACATCGCTGGCACTCGAGCGAGTTCGTGCGCCTGCAGTTCTT
 15 GGAGAGCCCTGAGACGTATGTCCCTCGATTGGAAGGCCAGAGATTGCGGGAGACGTGCGAGGCGTGG
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 TGCATGAACGCATGCTTTGGTCTGTCATGGAGGCTTCGTGAATTGGCGGGAAAAGATGTGACTAACTT
 CTTCTCGCATGTTCTTGGCTCTCTCCTTCTTACTCTCTAAATAATCCGCAAATTTCCATGTGC
 GTA

20 **SEQ ID NO** : 104
LENGTH : 1815
TYPE : DNA
ORGANISM : *M. phaseolina*
FEATURE NAME/KEY : CDS

25 **LOCATION** : (1).....(1815)
 atgattggccattctctcgtagctgtagcactcggcagcgcagccatggcactggctctt
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 cctcagagccacgtccccgctgcttgcacgaacgggtccgcactctcggaagtgctggggc
 P Q S H V P A A C M N G P H S R K C W G
 30 aactactccatcgacacggactggtacaccgaaactccatacacgggctggtgagagaa
 N Y S I D T D W Y T E T P Y T G V V R E
 tactggttcctggtcgagaataaccacgtagcaccagatgtacacgcccctctgggttgc
 Y W F L V E N T T V A P D V H A P L G C
 gccattggcaacgcatggcaggctgacttgggggtggcagggatagagacatgggctctc
 35 A I G N A W Q A D L G W Q G Y E T W A L
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 T V N R S I P G P T I E A N W G D E V I
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 V H V T N G M E R N G T A I H F H G L R
 40 cagctgggagcccacgaaatggatggtgtccctggggttacgcagtgctcctatagctccc
 Q L G A H E M D G V P G V T Q C P I A P
 ggacactcctacacatacaagtggcgagctactcaatacggaaacgagctggtatcattcc
 G H S Y T Y K W R A T Q Y G T S W Y H S
 cacttcagcatgcaataactcggtcggtctacagggcccgatcgtcattcacggacctgct
 45 H F S M Q Y S V G L Q G P I V I H G P A
 acggcagactatgacgaggacctgggaacggtcgtccttgcaggactggagtcacacctct
 T A D Y D E D L G T V V L Q D W S H T S
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 P F A M W W Y A R V P S G P P S L S N S
 50 ctcatcaacggcaaaaacgtcttctattgacagctacgaccgattcgagatgctacggt
 L I N G K N V F Y C D S T T D S R C Y G
 aacggcacacggctcggagtggtgctttagcaggggaaaaagtatcgaatgaggctcatc
 N G T R S E W R F E Q G K K Y R M R L I
 aatacaggcctctactcaacttccggttttgcattgacaaccacaacctcacggttatt
 55 N T G L Y S N F R F A I D N H N L T V I

gcgaccgactttgttccctatcaaaccctacaccacagataacgtggcaatttcaatgggg
 A T D F V P I K P Y T T D N V A I S M G
 caacgctacgacatcgtcgttgaggcaaatacaaccggaaggtgattactggctgcgggct
 Q R Y D I V V E A N Q P E G D Y W L R A
 5 atatggcaaacatcctgctgcccgaacgactactcaacaatacccttggcataatccgc
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 Y T A N S T A E P N T T S P A L S Y P D
 10 acatgcgggcgacgagccggcagcgagcctcgtgccgcacctggccctcaacgagcagcag
 T C G D E P A A S L V P H L A L N A S T
 ccggccgtcgtgcccacctacgacctgtccaaagtcacactcgagctgcccaggggcttc
 P A V V R T Y D L S K V T L E L P K G F
 ctctggacactgaacgacacctacctctggatcaactggtcgtcgccaacgaacttgagg
 L W T L N D T Y L W I N W S S P T N L R
 15 ctggccgagggcgggcgccgctgcccgcgagcctgcccgcgaatatctcgccgtcgac
 L A E G G A A A A A S L P A E Y L A V D
 agccgggcccggcaacgagggacgctggggcgtatctcgtgttcaacgacgtctccgcccgc
 S R A G N E G R W A Y L V F N D V S A R
 aatcgctcgacccgatgcacctgcacggccacgacttcttctcgtcggcaccggccct
 20 N R S H P M H L H G H D F F L L G T G P
 ggctattttgagtacggcagcaacagcagcagcctggcgatgctcaacctgcacaaccgg
 G Y F E Y G S N S S S L A M L N L H N P
 cctcgtcgacacggcgacctggcccagctggtggtggtcgtcgcggttccctcatg
 P R R D T A T W P E S G W M V V A F L M
 25 gacaaccggggagctggctgatccactgccacatcgccctggcactcgagcagcagtcgctc
 D N P G S W L I H C H I A W H S S E S L
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 G L Q F L E S P E T Y V P R L E G Q R L
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 D A G I -

35 SEQ ID NO : 105
 LENGTH : 604
 TYPE : PRT
 ORGANISM : *M. phaseolina*

MIGHSLVAVALGSAAMALALPQSHVPAACMNGPHSRKWCWGNYSIDTDWYTETPYTGVVREYWFLVEN
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 40 HFHGLRQLGAHEMDGVPVGTQCPIAPGHSYTYKWRATQYGTSWYHSHFSMQYSVGLQGPIVIHGPAT
 ADYDEDLGTVVLDQWSHTSPFAMWYARVPSGPPSLNSLINGKNVFCSTTDSRCYGNNGTRSEWR
 FEQGGKYMRLINTGLYSNFRFAIDNHNLTVIATDFVPIKPYTTDNVAISMQRDIDVVEANQPEGD
 YWLRAIWQTSCCPNDYSNNTLGIIRYTANSTAEPNNTSPALSYPDTCGDEPAASLVPHLALNASTPA
 45 VVRTYDLSKVTLELPGFLWTLNNTYLWINWSSPTNLRRLAEGGAAAAASLPAEYLAVDSTRAGNEGRW
 AYLVDNDVSARNRSHPMHLHGHDFFLLGTGPGYFEYGSNSSSLAMLNLHNPPRRDTATWPESGWMVV
 AFLMDNPGSWLIHCHIAWHSSSESLGLQFLESPEYVPRLEGQRLRETCEAWDAFWNRHDSYEQEDAG
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50 SEQ ID NO : 106
 LENGTH : 2275 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 ORGANISM : *M. phaseolina*

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 TCGGCATCAACGGGCTGTGGCCGCCTCCCGTCTTAGAAGCCGACGTTAACGACACCATTATCGTAAC
 CGCGCATAACTCGCTAGGCAATGAGACGACGAGCTTGCACTGGCATGGCATGTGGCAGAACAACCTCG
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 5 GGTTTAAGGCATACCCGGCAGGCACCTTTTGGTACCATTCTCACGCTATGGGCCAATATCCCGACGG
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 ATACTTACGGTCTCGGACTGGTACCGTAACCAGATGCCGCCGCTTATCCACCGCTATCTAACTACTC
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 10 AAACATCCGCCCCGGGGCAGAAGAGCTATATCCGCATTATTAATATATCAGCGCTAGCAACGTTCTAT
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 15 GAACCCCAAAGAAACTATGCATTTATCAATAAGATGGCCGTTCTCGGCTTGCAAGAACAACAATC
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 20 GCCGCTTGCTAACTTCGATACACAGCATCACGCAAGGCCCGTACCCCTACATTACCCCGCGCACACC
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SEQ ID NO : 107
 LENGTH : 1632
 35 TYPE : DNA
 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS
 LOCATION : (1).....(1632)

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 G I N G L W P P P V L E A D V N D T I I
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 V T A H N S L G N E T T S L H W H G M W
 cagaacaactcgactcatatagacggcggaagtagagtctcgagtgcgaaatccctcta
 Q N N S T H I D G G S R V S Q C E I P L
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 50 G G T F T Y R F K A Y P A G T F W Y H S
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 H A M G Q Y P D G L R A P M I I H D P D
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 S A A E Q D A D E Q H I L T V S D W Y R
 55 aaccagatgccgcccgttatccaccgctatctaactactcctaactataacggcgccatg

N Q M P P L I H R Y L T T P N Y N G A M
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 P K P N S S L V N D Q Q S K R L N I R P
 5 gggcagaagagctatatccgcattattaatatcagcgctagcaacgttctatctacag
 G Q K S Y I R I I N I S A L A T F Y L Q
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 F D Q H N M T V V S I D D V N V E P Q S
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 10 W E A L E I T P G Q R Y D V I I T G L E
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 N P Q R N Y A F I N K M A V L G L Q N N
 aacatcctcagttataatcgtcctggcctgaccagagccattggccggtgagtaggttc
 N I L S Y N S S W P D P E P L A V S R F
 15 aacctcgggaagcgatatcaatctaactccgcttgaccacgagccactgctggagcccgtg
 N L G S D I N L T P L D H E P L L E P V
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 D K T F T M E V N N L N I D G V G Y R I
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 T Q G P Y P Y I T P R T P T L Y T A L T
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 T G F N A T N P A I Y G Q T N S Y I V E
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 A G D I V Q L V V N S N D L V T T N T S
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 G R G H P M H L H G H T F Q V V G Q Y G
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 T H W D G D T A K F P T V P M K R D T T
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 M F H C H I E W H L D A G M A A T I I E
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 35 R A L N L T T R G N C A G N T V N L E D
 acggctgcgtgcagaatctacgacactgatccttgggggtgcgcttatcggggaacgtgag
 T A A C R I Y D T D P W G A L I G E R E
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 T A R -
 40

SEQ ID NO : 108
LENGTH : 543
TYPE : PRT
ORGANISM : *M. phaseolina*
 45 M I R L F L V L G F V A T T L A K T V T F N W N I G W V S A A P D G F T R P V I G I N G L W P P P V L E A D V N D T I I V T A H N S L
 G N E T T S L H W H G M W Q N N S T H I D G G S R V S Q C E I P L G G T F T Y R F K A Y P A G T F W Y H S H A M G Q Y P D G L R A P M
 I I H D P D S A A E Q D A D E Q H I L T V S D W Y R N Q M P P L I H R Y L T T P N Y N G A M P K P N S S L V N D Q Q S K R L N I R P G
 Q K S Y I R I I N I S A L A T F Y L Q F D Q H N M T V V S I D D V N V E P Q S W E A L E I T P G Q R Y D V I I T G L E N P Q R N Y A F
 I N K M A V L G L Q N N N I L S Y N S S W P D P E P L A V S R F N L G S D I N L T P L D H E P L L E P V D K T F T M E V N N L N I D G
 50 V G Y R I T Q G P Y P Y I T P R T P T L Y T A L T T G F N A T N P A I Y G Q T N S Y I V E A G D I V Q L V V N S N D L V T T N T S G R
 G H P M H L H G H T F Q V V G Q Y G T H W D G D T A K F P T V P M K R D T T V L F A G G S L V I R F Q A N N P G V W M F H C H I E W H
 L D A G M A A T I I E A P L E F Q R S G L R I P P Q H L A A C R A L N L T T R G N C A G N T V N L E D T A A C R I Y D T D P W G A L I
 G E R E T A R *
 55

SEQ ID NO : 109
 LENGTH : 2052 (including 150 bp 5' UTR and 150 bp 3' UTR)
 TYPE : DNA
 ORGANISM : *M. phaseolina*

5 GCAGCAACTACATCCGGGTAGGCATCAAACGCAAAGATGGTACGGAGGGAGCACTGATGCGCTTTTA
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 30 AATCCTCTCCGCCCGCTCCGCTCATCGCGCTGCCGCTCCTCTTGGGACGCCAACCAAGTTCGTCCC
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 35 AATGAGGGGCTCTGGATGCTGCACTGCCACAATTTGTGGCAT

SEQ ID NO : 110
 LENGTH : 1752
 TYPE : DNA
 40 ORGANISM : *M. phaseolina*
 FEATURE NAME/KEY : CDS
 LOCATION : (1).....(1752)

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R H Y S W K V T K A F R Y P D G V K K A
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 35 N A L V S A D I I T P S L P P A T E H T
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SEQ ID NO : 111
 50 LENGTH : 583
 TYPE : PRT
 ORGANISM : *M. phaseolina*
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 55 TVEARSGDRLVIEVQNALEDEGLSFHWHGLLMRGANYMDGAVGFTQDAIHPGANFTYEFDIADDQAGTFWY

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SENDTSVGS LYPGQRADLILSWPEDTLEASKISITLDGEDFKYPNPALTRTQHFSIFRSAPVPKEKSEASASSEQGRP
ESHAPQTLIDLNALVSADIITPSLPPATEHTLVLYANTLKLSHRGNKPHGYMNQTSWSPQSSPPRPLIALPRSSWD
5 ANQFVPRIPLPNGTSDAPWVTIVLNNLDDGSHPFHLHGAFWVLQTHAAGWGWGSWNP*

INCORPORATION BY REFERENCE

All of the U.S. patents, U.S. published patent applications, and published PCT applications that cited herein are hereby incorporated by reference.

10 EQUIVALENTS

While several embodiments of the present invention have been described and illustrated herein, those of ordinary skill in the art will readily envision a variety of other means and/or structures for performing the functions and/or obtaining the results and/or one or more of the advantages described herein, and each of such variations and/or modifications
15 is deemed to be within the scope of the present invention. Those skilled in the art will recognize, or be able to ascertain using no more than routine experimentation, many equivalents to the specific embodiments of the invention described herein. It is, therefore, to be understood that the foregoing embodiments are presented by way of example only and that, within the scope of the appended claims and equivalents thereto; the invention
20 may be practiced otherwise than as specifically described and claimed.

CLAIMS:**What is claimed is:**

1. An isolated polynucleotide encoding for lignin peroxidase derived from the fungi *M. phaseolina* comprising and/or consisting of nucleotide sequence as set forth in each of the SEQ ID Nos. 1, 2, 4, 5, 7 or 8, and/or any mixtures/combinations thereof.
2. The isolated polynucleotide encoding according to claim 1, wherein the fungi of *M. phaseolina* is strain ms6.
3. An isolated lignin peroxidase polypeptide derived from the fungi *M. phaseolina* comprising and/or consisting of amino acid sequence as provided in SEQ ID Nos. 3, 6 or 9, and/or any mixtures/combinations thereof.
4. The isolated lignin peroxidase polypeptide according to claim 3, wherein the fungi of *M. phaseolina* is strain ms6.
5. An expression construct/vector capable of expressing lignin peroxidase polypeptide containing at least 70% sequential amino acids as provided in SEQ ID Nos. 3, 6 or 9, and/or any mixtures/combinations thereof.
6. An isolated polynucleotides encoding for chloroperoxidase derived from the fungi *M. phaseolina* comprising and/or consisting of nucleotide sequence as set forth in each of the SEQ ID Nos. 10, 11, 13, 14, 16, 17, 19, 20, 22, 23, 25 or 26, and/or any mixtures/combinations thereof.
7. The isolated polynucleotide according to claim 6, wherein the fungi of *M. phaseolina* is strain ms6.
8. An isolated chloroperoxidase polypeptide derived from the fungi *M. phaseolina* comprising amino acid sequence as provided in SEQ ID Nos. 12, 15, 18, 21, 24 or 27, and/or any mixtures/combinations thereof.
9. The isolated polypeptide according to claim 8, wherein the fungi of *M. phaseolina* is strain ms6.

10. An expression construct/vector capable of expressing chloroperoxidase polypeptide containing at least 70% sequential amino acids as provided in SEQ ID Nos. 12, 15, 18, 21, 24 or 27, and/or any mixtures/combinations thereof.
11. An isolated polynucleotide encoding for haemperoxidase derived from the fungi
5 *M. phaseolina* comprising and/or consisting of nucleotide sequence as set forth in each of the SEQ ID Nos. 28, 29, 31, 32, 34, 35, 37, 38, 40, 41, 43 or 44, and/or any mixtures/combinations thereof.
12. The isolated polynucleotide encoding according to claim 11, wherein the fungi of *M. phaseolina* is strain ms6.
- 10 13. An isolated haemperoxidase polypeptide derived from the fungi *M. phaseolina* comprising and/or consisting of amino acid sequence as provided in SEQ ID Nos. 30, 33, 36, 39, 42 or 45, and/or any mixtures/combinations thereof.
14. The isolated polypeptide encoding according to claim 13, wherein the fungi of *M. phaseolina* is strain ms6.
- 15 15. An expression construct/vector capable of expressing haemperoxidase polypeptide containing at least 70% sequential amino acids as provided in SEQ ID Nos. 30, 33, 36, 39, 42 or 45, and/or any mixtures/combinations thereof.
16. An isolated polynucleotides encoding for multicopper oxidase derived from the
20 fungi *M. phaseolina* comprising and/or consisting of nucleotide sequence as set forth in each of the SEQ ID Nos. 46, 47, 49, 50, 52, 53, 55, 56, 58, 59, 61, 62, 64, 65, 67, 68, 70, 71, 73, 74, 76, 77, 79, 80, 82, 83, 85, 86, 88, 89, 91, 92, 94, 95, 97, 98, 100, 101, 103, 104, 106, 107, 109 or 110, and/or any mixtures/combinations thereof.
17. The isolated polynucleotide encoding according to claim 16, wherein the fungi of
25 *M. phaseolina* is strain ms6.
18. An isolated multicopper oxidase polypeptide derived from the fungi *M. phaseolina* comprising and/or consisting of amino acid sequence as provided in SEQ ID Nos. 48, 51, 54, 57, 60, 63, 66, 69, 72, 75, 78, 81, 84, 87, 90, 93, 96, 99, 102, 105, 108 or 111, and/or any mixtures/combinations thereof.

19. The isolated polynucleotide encoding according to claim 18, wherein the fungi of *M. phaseolina* is strain ms6.
20. An expression construct/vector capable of expressing multicopper oxidase polypeptide containing at least 70% sequential amino acids as provided in SEQ ID Nos. 48, 51, 54, 57, 60, 63, 66, 69, 72, 75, 78, 81, 84, 87, 90, 93, 96, 99, 102, 105, 108 or 111, and/or any mixtures/combinations thereof.
21. A recombinant gene construct comprising and/or consisting of a polynucleotide template having nucleotide sequence set forth in SEQ ID Nos. 2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53, 56, 59, 62, 65, 68, 71, 74, 77, 80, 83, 86, 89, 92, 95, 98, 101, 104, 107, 110, 1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106 and/or 109, and/or any mixtures/combinations thereof, wherein the polynucleotide template is expressible in a host cell to produce an enzyme which degrade lignin.
22. A recombinant gene construct according to claim 21 further comprising and/or consisting of a promoter region operably-linked to enhance expression of the polynucleotide template.
23. A transformant comprising and/or consisting of a recombinant gene construct capable of expressing a polynucleotide template having nucleotide sequence set forth in SEQ ID Nos. 2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53, 56, 59, 62, 65, 68, 71, 74, 77, 80, 83, 86, 89, 92, 95, 98, 101, 104, 107, 110, 1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106 and/or 109, and/or any mixtures/combinations thereof, to produce an enzyme which accelerate lignin degradation.
24. A transgenic fungi of *M. phaseolina* with enhanced lignin degradation, comprising a recombinant gene construct having an expressible nucleotide sequence set forth in SEQ ID Nos. 2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53, 56, 59, 62, 65, 68, 71, 74, 77, 80, 83, 86, 89, 92, 95, 98, 101, 104, 107, 110, 1, 4, 7, 10, 13, 16, 19,

22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106 and/or 109, and/or any mixtures/combinations thereof.

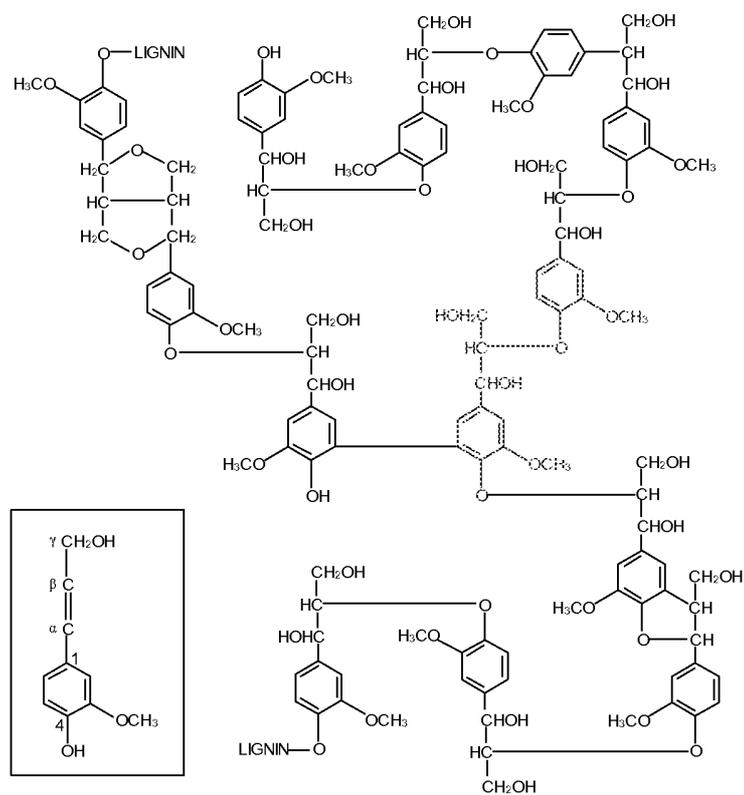


Figure 1

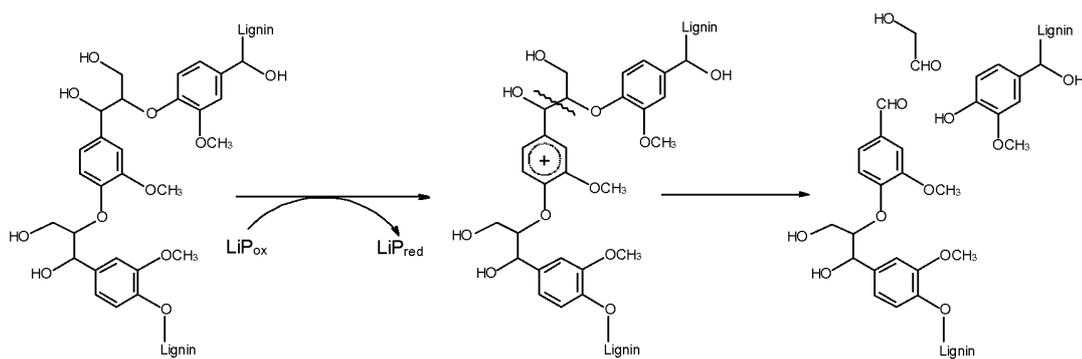


Figure 2

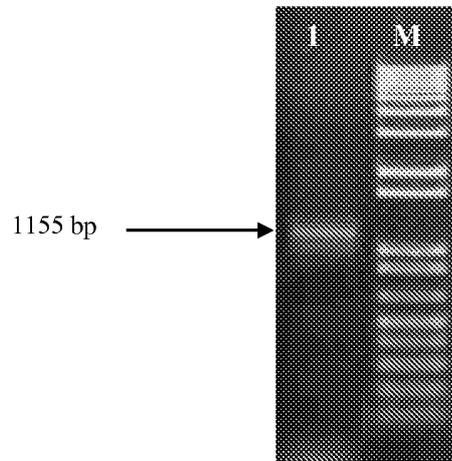


Figure 3

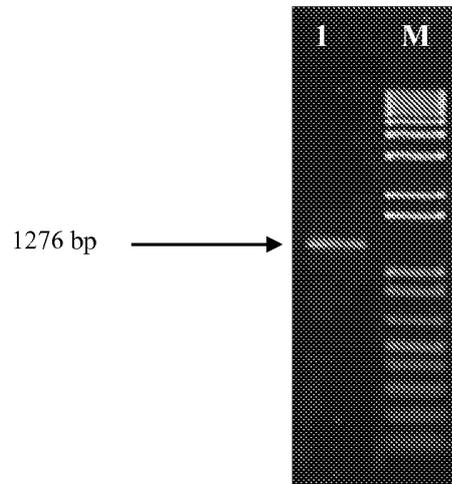


Figure 4

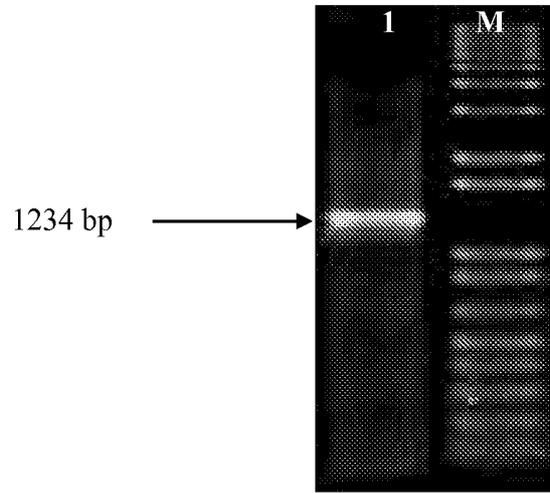


Figure 5

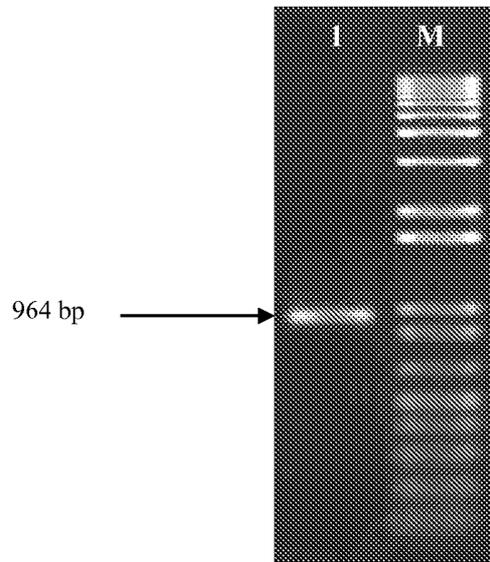


Figure 6

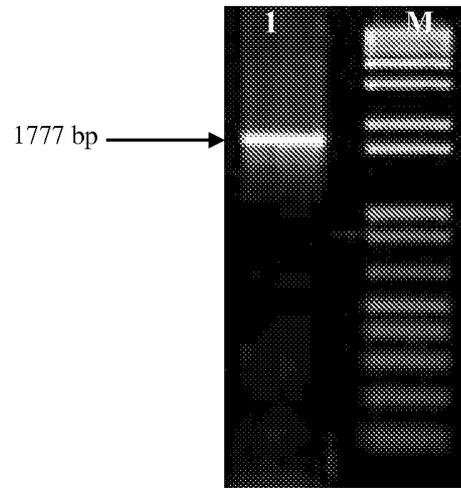


Figure 7

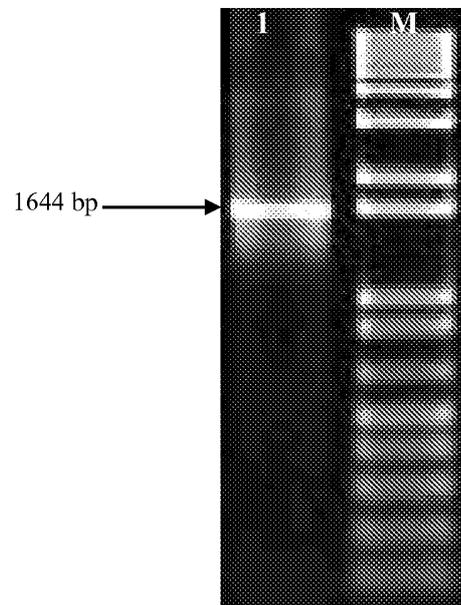


Figure 8

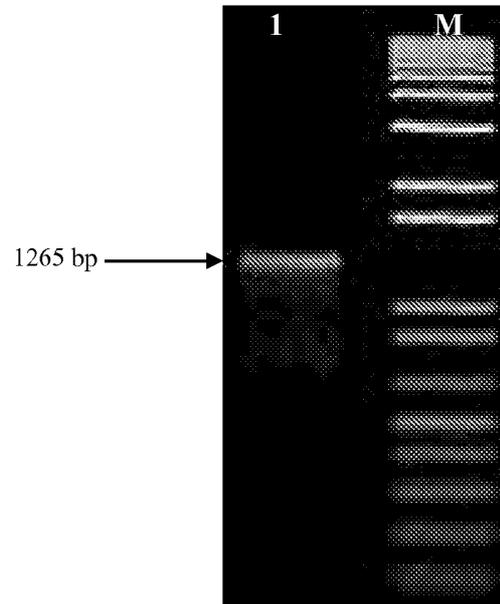


Figure 9

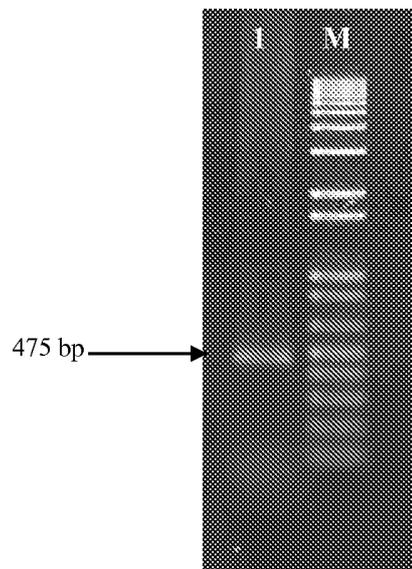


Figure 10

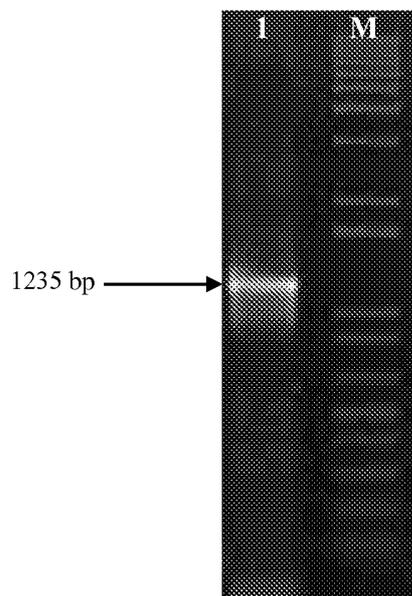


Figure 11

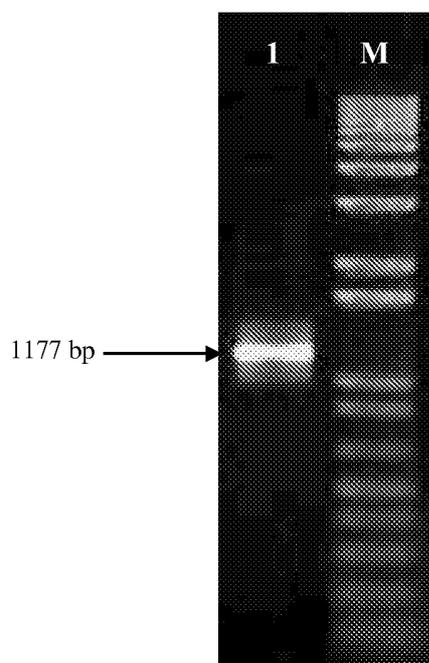


Figure 12

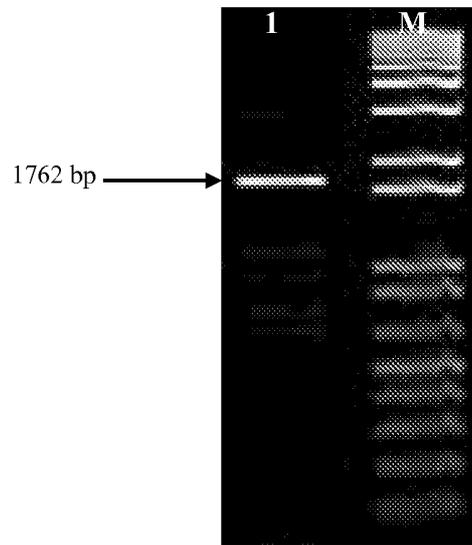


Figure 13

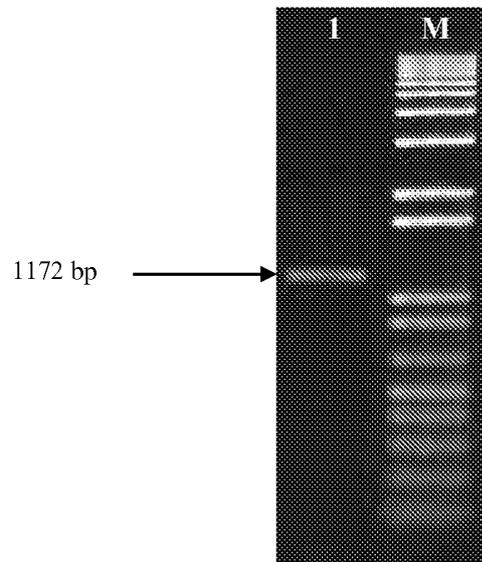


Figure 14

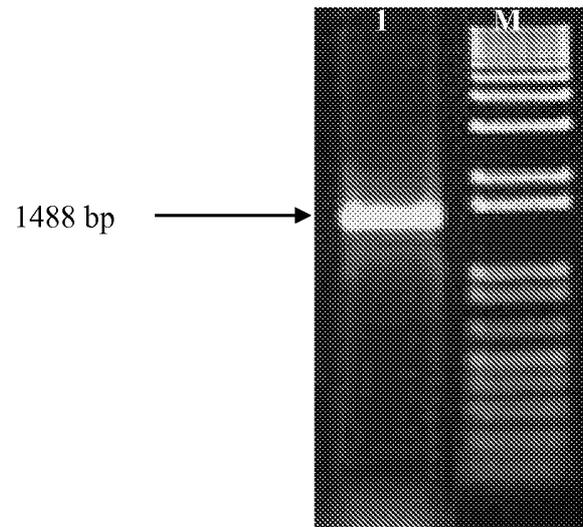


Figure 15

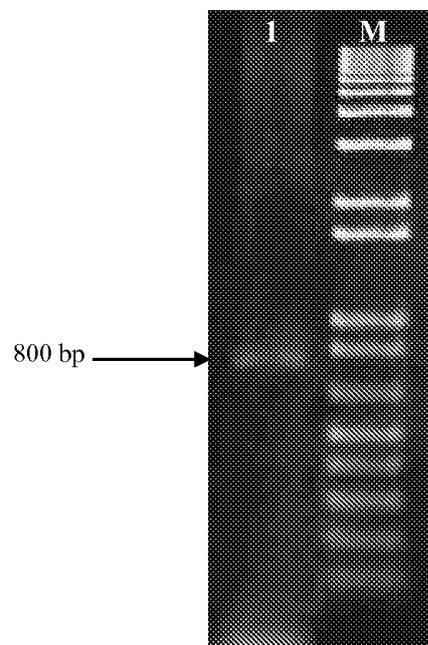


Figure 16

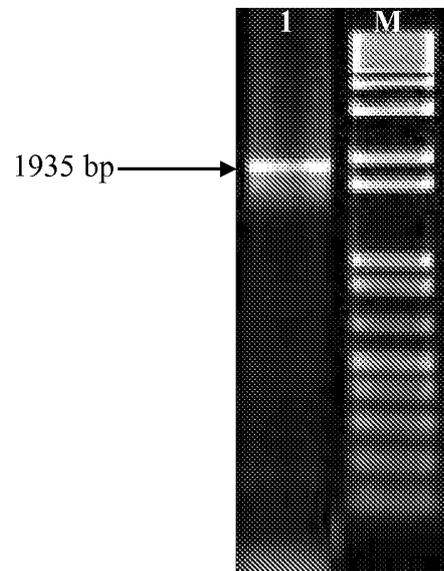


Figure 17

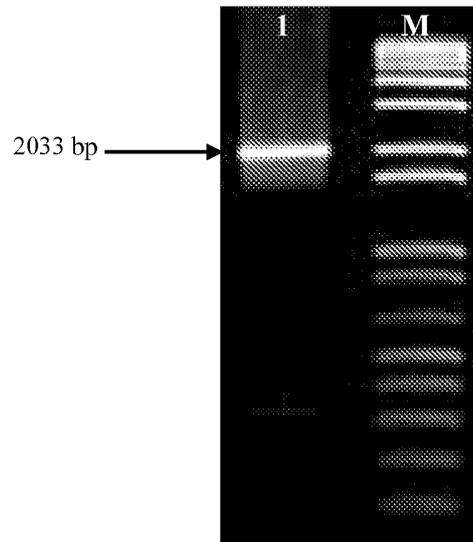


Figure 18

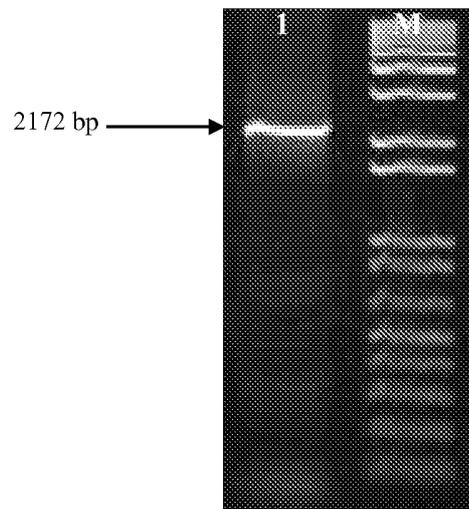


Figure 19

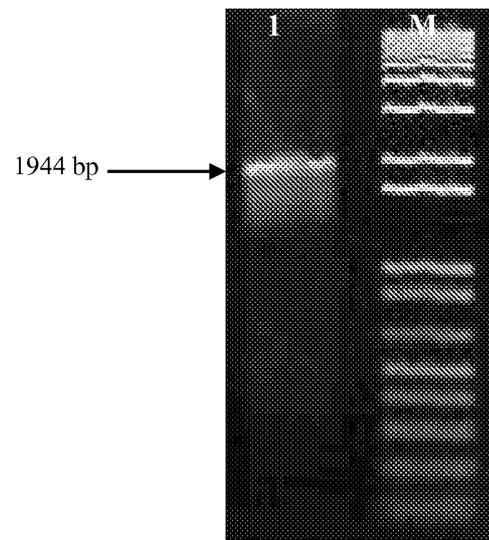


Figure 20

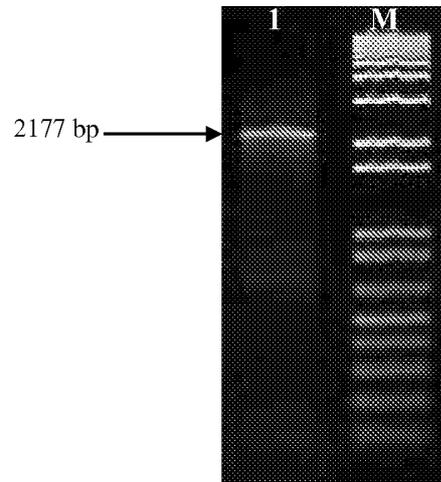


Figure 21

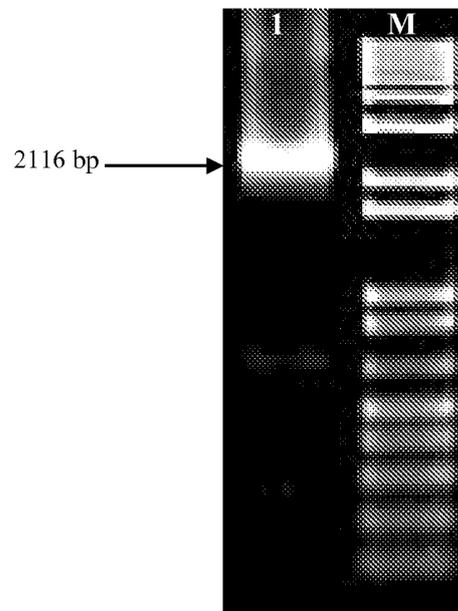


Figure 22

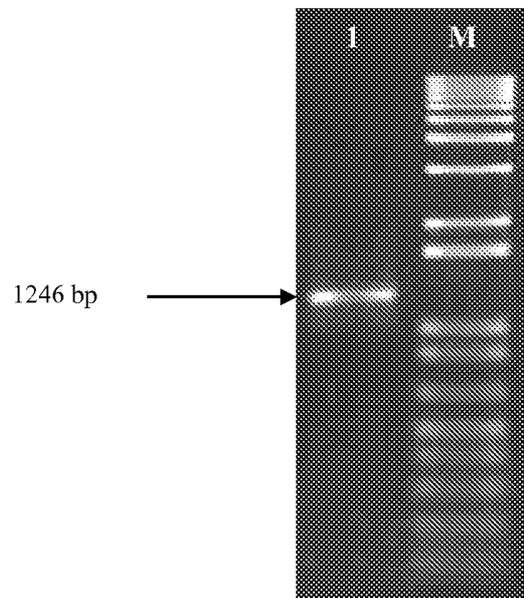


Figure 23

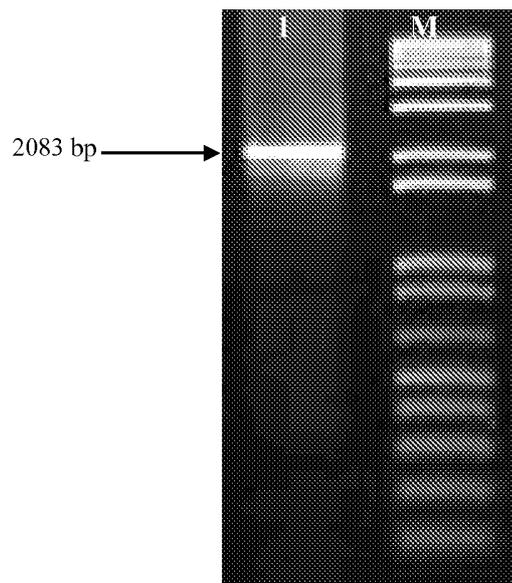


Figure 24

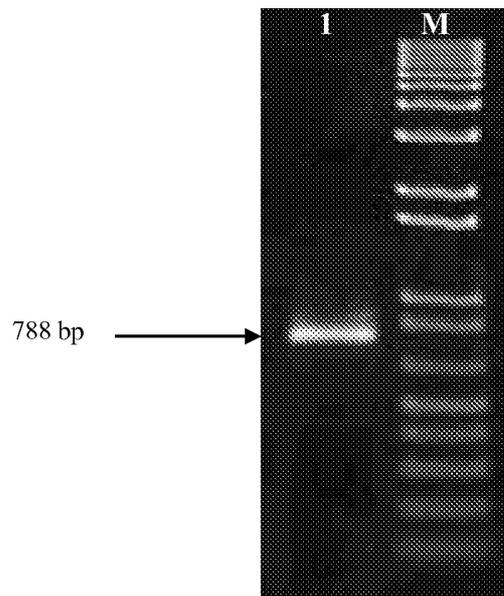


Figure 25

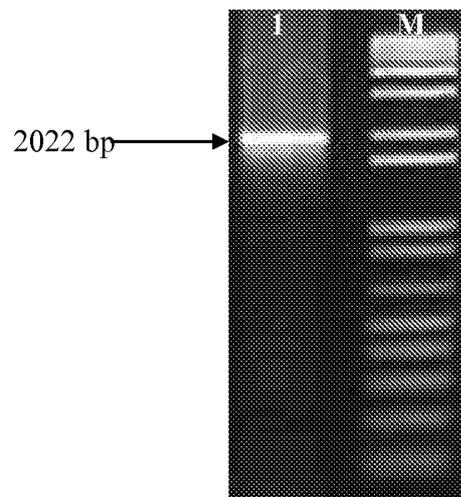


Figure 26

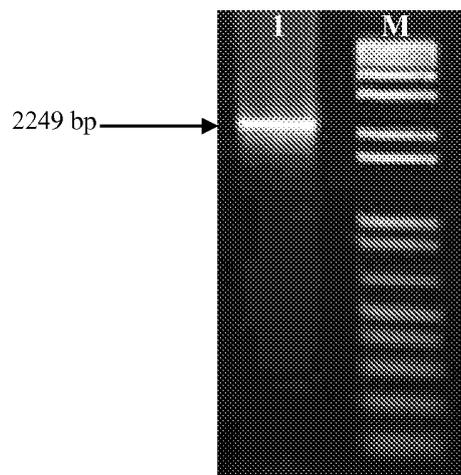


Figure 27

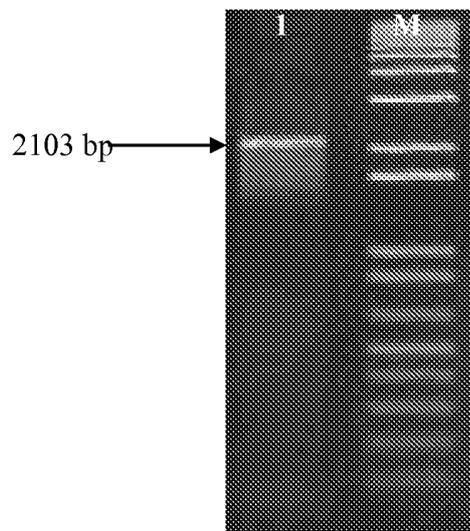


Figure 28

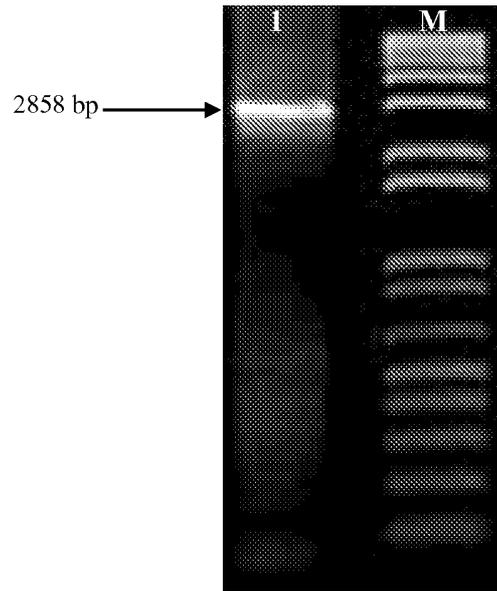


Figure 29

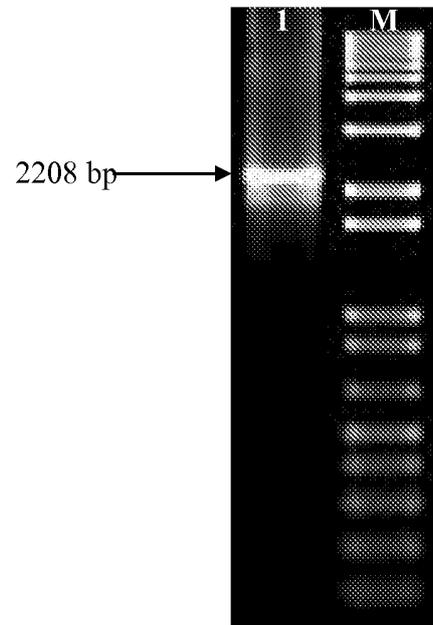


Figure 30

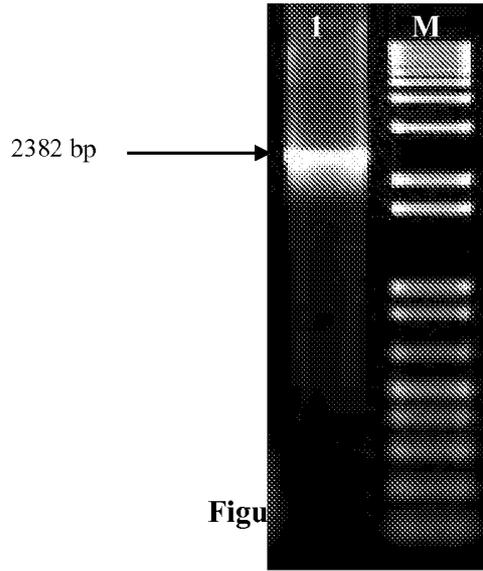


Figure 31

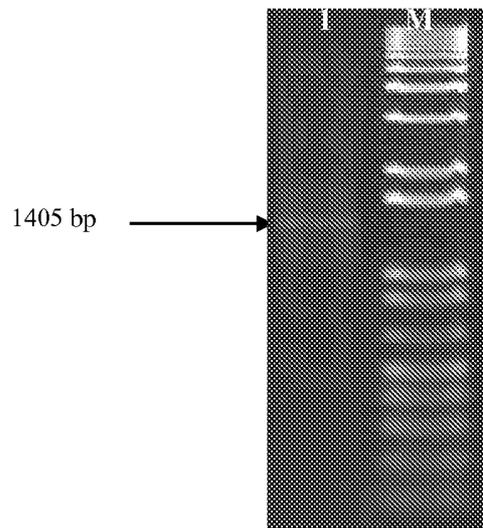


Figure 32

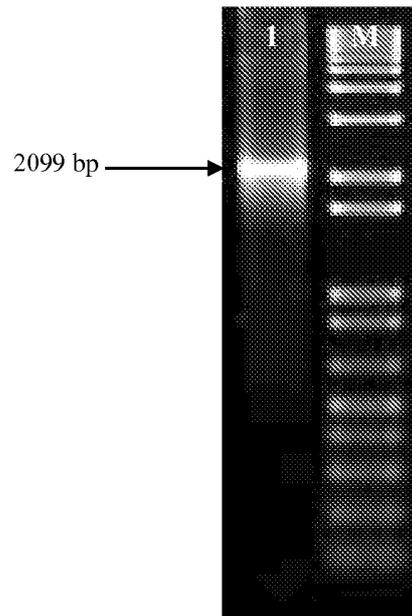


Figure 33

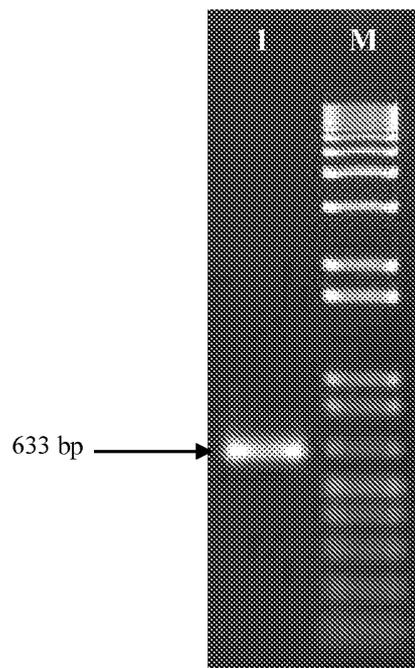


Figure 34

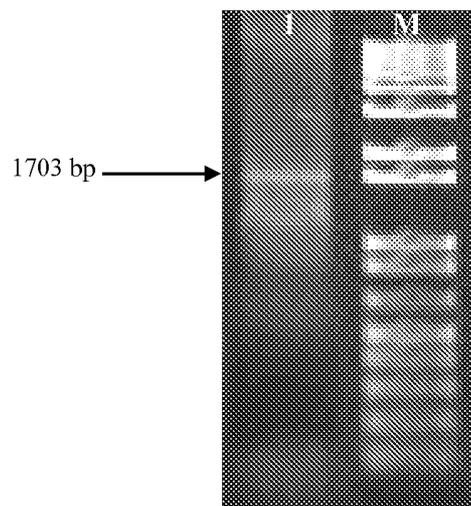


Figure 35

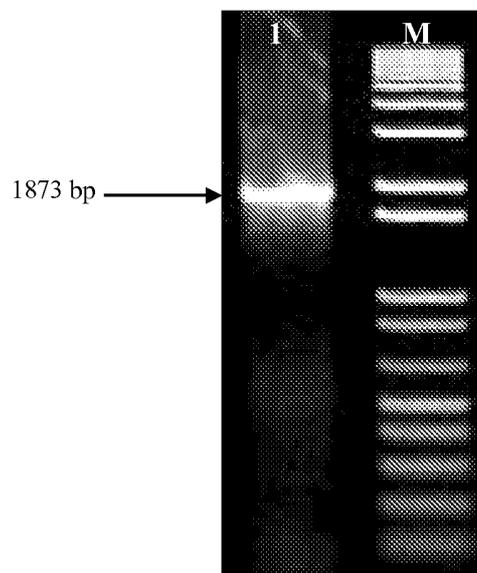


Figure 36

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
20 February 2014 (20.02.2014)

WIPO | PCT

(10) International Publication Number
WO 2014/028773 A3

- (51) **International Patent Classification:**
C12N 9/08 (2006.01) C07H 21/04 (2006.01)
C12N 15/53 (2006.01) C07K 14/37 (2006.01)
- (21) **International Application Number:**
PCT/US2013/055199
- (22) **International Filing Date:**
15 August 2013 (15.08.2013)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
61/683,913 16 August 2012 (16.08.2012) US
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- (74) **Agents:** GORDON, Dana, M. et al.; Foley Hoag LLP, Seaport West, 155 Seaport Blvd., Boston, MA 02210-2600 (US).
- (81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).
- Published:**
- with international search report (Art. 21(3))
 - before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))
- (88) **Date of publication of the international search report:**
17 April 2014

(54) **Title:** LIGNIN DEGRADING ENZYMES FROM MACROPHOMINA PHASEOLINA AND USES THEREOF

(57) **Abstract:** The present invention relates to the field of plant breeding and disease resistance in respect of lignin degradation of plant by *Macrophomina phaseolina* ("M. phaseolina"). The present invention discloses isolated polynucleotide encoding of the lignin degrading enzymes, produced by *Macrophomina phaseolina*, comprising and consisting of nucleotide sequence set forth in SEQ. ID Nos. 2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53, 56, 59, 62, 65, 68, 71, 74, 77, 80, 83, 86, 89, 92, 95, 98, 101, 104, 107, 110, 1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106 and 109 or the complement of such sequences. The present invention also relates to isolated polypeptide encoded by the polynucleotide sequences set forth in SEQ ID Nos. 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 63, 66, 69, 72, 75, 78, 81, 84, 87, 90, 93, 96, 99, 102, 105, 108 and 111; a recombinant gene construct comprising the polynucleotide; a transformant and a transgenic fungus comprising the recombinant gene construct, having enhanced production of lignin degrading enzyme. The invention provides polypeptides having an oligomerase activity, e.g., enzymes that convert recalcitrant soluble oligomerase to fermentable sugar in saccharification process of biomass.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US13/55199

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - C12N 9/08; C12N 15/53; C07H 21/04; C07K 14/37 (2013.01)

USPC - 435/192, 320.1; 536/23.2

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8): C12N 9/08, 9/02, 9/00, 15/00, 15/11, 15/52, 15/53, 15/63; C12P 19/34; C07H 21/04; C07K 14/37 (2013.01)

USPC: 435/192, 189, 183, 200, 320.1, 91.1, 91.4, 91.41; 530/350; 536/23.2

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

MicroPatent (US-G, US-A, EP-A, EP-B, WO, JP-bib, DE-C,B, DE-A, DE-T, DE-U, GB-A, FR-A); Google/Google Scholar; ProQuest; ScienceDirect; Search Terms Used: Macrophomina, phaseolina, lignin, ligninase, peroxidase, LiP, fungus, fungi, fungal, mycological, expression, vector, cassette, degrade, break-down, catabolize, recombinant, protein, enzyme

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7423195 B2 (STICKLEN, MB et al.) September 9, 2008; abstract; column 9, lines 14-16; column 10, lines 36-50; column 23, lines 51-55	1-5, 21-24
A	WO 2009/005564 A2 (SALMON, KA et al.) January 8, 2009; paragraph [0235]; Claims 53, 251	1-5, 21-24
A	WO 2009/108941 A2 (DANIELL, H) September 3, 2009; pages 557-558 of the sequence listing file, Table 3	1, 2, 21-24
A	WO 2012/027282 A2 (CLARK, L et al.) March 1, 2012; abstract; paragraph [0008]; page 67, Table 2; pages 1283-1284 of the sequence listing file	3-5

 Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

10 February 2014 (10.02.2014)

Date of mailing of the international search report

21 FEB 2014

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:

Shane Thomas

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.c of the first sheet)

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of a sequence listing filed or furnished:

a. (means)

on paper

in electronic form

b. (time)

in the international application as filed

together with the international application in electronic form

subsequently to this Authority for the purposes of search

2. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

3. Additional comments:

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

-Please See Supplemental Page-

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Groups I+: Claims 1-5, 21-24, SEQ ID NOs: 2, 3

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

***-Continuation of Box No. III - Observations where unity of invention is lacking:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Groups I+: Claims 1-5, 21-24 (in-part), and SEQ ID NO: 2 (DNA nucleic acid sequence encoding for lignin peroxidase derived from the fungi *M. phaseolina*) are directed toward an isolated polynucleotide encoding for lignin peroxidase derived from the fungi *M. phaseolina* comprising and/or consisting of nucleotide sequence as set forth in each of the SEQ ID Nos. 1, 2, 4, 5, 7 or 8, and/or any mixtures/combinations thereof; an isolated lignin peroxidase polypeptide derived from the fungi *M. phaseolina* comprising and/or consisting of amino acid sequence as provided in SEQ ID Nos. 3, 6 or 9, and/or any mixtures/combinations thereof; an expression construct/vector capable of expressing lignin peroxidase polypeptide containing at least 70% sequential amino acids as provided in SEQ ID Nos. 3, 6 or 9, and/or any mixtures/combinations thereof; a recombinant gene construct comprising and/or consisting of a polynucleotide template having nucleotide sequence set forth in SEQ ID Nos. 2, 5, 8, 1, 4, or 7, and/or any mixtures/combinations thereof, wherein the polynucleotide template is expressible in a host cell to produce an enzyme which degrades lignin; a transformant comprising and/or consisting of a recombinant gene construct capable of expressing a polynucleotide template having nucleotide sequence set forth in SEQ ID Nos. 2, 5, 8, 1, 4, and/or 7, and/or any mixtures/combinations thereof, to produce an enzyme which accelerate lignin degradation; a transgenic fungi of *M. phaseolina* with enhanced lignin degradation, comprising a recombinant gene construct having an expressible nucleotide sequence set forth in SEQ ID Nos. 2, 5, 8, 1, 4, and/or 7, and/or any mixtures/combinations thereof.

The isolated polynucleotide encoding for lignin peroxidase derived from the fungi *M. phaseolina* comprising and/or consisting of nucleotide sequence of SEQ ID Nos. 1 or 3 and an associated lignin peroxidase polypeptide derived from the fungi *M. phaseolina* comprising and/or consisting of amino acid sequence as provided in SEQ ID No. 3, an expression construct/vector capable of expressing lignin peroxidase polypeptide containing at least 70% sequential amino acids as provided in SEQ ID No. 3, a recombinant gene construct comprising and/or consisting of a polynucleotide template having nucleotide sequence set forth in SEQ ID Nos. 1 or 2, wherein the polynucleotide template is expressible in a host cell to produce an enzyme which degrades lignin, a transformant comprising and/or consisting of a recombinant gene construct capable of expressing a polynucleotide template having nucleotide sequence set forth in SEQ ID Nos. 1 or 2, to produce an enzyme which accelerate lignin degradation; and a transgenic fungi of *M. phaseolina* with enhanced lignin degradation, comprising a recombinant gene construct having an expressible nucleotide sequence will be searched to the extent that they encompass SEQ ID NOs: 2 (DNA sequence encoding for lignin peroxidase derived from the fungi *M. phaseolina*), 3 (lignin peroxidase polypeptide amino acid sequence from the fungi *M. phaseolina*). It is believed that claims 1 (in part), 2, 3 (in part), 4, 5 (in part), 21 (in part), 22, 23 (in part), and 24 (in part) encompass this first named invention and thus these claims will be searched without fee to the extent that they encompass SEQ ID NOs: 2 (DNA sequence encoding for lignin peroxidase derived from the fungi *M. phaseolina*), 3 (lignin peroxidase polypeptide amino acid sequence from the fungi *M. phaseolina*). Applicants must indicate, if applicable, the claims which encompass the first named invention if different than what was indicated above for this group. Failure to clearly indicate how any paid additional invention fees are to be applied to the "+" group(s) will result in only the first claimed invention to be searched/examined. Additional SEQ ID NOs can be searched upon the payment of additional fees. An Exemplary Election would be: 10 (DNA sequence encoding for lignin peroxidase derived from the fungi *M. phaseolina*.)

Groups II+: Claims 6-10, 21 (in part), 22, 23 (in part), 24 (in part), and SEQ ID NOs: 11 (DNA sequence encoding for lignin peroxidase derived from the fungi *M. phaseolina*), 12 (lignin peroxidase polypeptide amino acid sequence from the fungi *M. phaseolina*) are directed toward an isolated polynucleotide encoding for chloroperoxidase derived from the fungi *M. phaseolina* comprising and/or consisting of nucleotide sequence as set forth in each of the SEQ ID Nos. 10, 11, 13, 14, 16, 17, 19, 20, 22, 23, 25 or 26, and/or any mixtures/combinations thereof; an isolated chloroperoxidase polypeptide derived from the fungi *M. phaseolina* comprising amino acid sequence as provided in SEQ ID Nos. 12, 15, 18, 21, 24 or 27, and/or any mixtures/combinations thereof; and an expression construct/vector capable of expressing chloroperoxidase polypeptide containing at least 70% sequential amino acids as provided in SEQ ID Nos. 12, 15, 18, 21, 24 or 27, and/or any mixtures/combinations thereof; a recombinant gene construct comprising and/or consisting of a polynucleotide template having nucleotide sequence set forth in SEQ ID Nos. 11, 14, 17, 20, 23, 26, 10, 13, 16, 19, 22, and/or 25, and/or any mixtures/combinations thereof, wherein the polynucleotide template is expressible in a host cell to produce an enzyme which degrades lignin; a transformant comprising and/or consisting of a recombinant gene construct capable of expressing a polynucleotide template having nucleotide sequence set forth in SEQ ID Nos. 11, 14, 17, 20, 23, 26, 10, 13, 16, 19, 22, and/or 25, and/or any mixtures/combinations thereof, to produce an enzyme which accelerate lignin degradation; a transgenic fungi of *M. phaseolina* with enhanced lignin degradation, comprising a recombinant gene construct having an expressible nucleotide sequence set forth in SEQ ID Nos. 11, 14, 17, 20, 23, 26, 1, 4, 7, 10, 13, 16, 19, 22, and/or 25, and/or any mixtures/combinations thereof.

Groups III+: Claims 11-15, 21 (in part), 22, 23 (in part), 24 (in part), and SEQ ID NOs: 29 (DNA sequence encoding for lignin peroxidase derived from the fungi *M. phaseolina*), 30 (lignin peroxidase polypeptide amino acid sequence from the fungi *M. phaseolina*) are directed towards an isolated polynucleotide encoding for haemperoxidase derived from the fungi *M. phaseolina* comprising and/or consisting of nucleotide sequence as set forth in each of the SEQ ID Nos. 28, 29, 31, 32, 34, 35, 37, 38, 40, 41, 43 or 44, and/or any mixtures/combinations thereof; an isolated haemperoxidase polypeptide derived from the fungi *M. phaseolina* comprising and/or consisting of amino acid sequence as provided in SEQ ID Nos. 30, 33, 36, 39, 42 or 45, and/or any mixtures/combinations thereof; an expression construct/vector capable of expressing haemperoxidase polypeptide containing at least 70% sequential amino acids as provided in SEQ ID Nos. 30, 33, 36, 39, 42 or 45, and/or any mixtures/combinations thereof; a recombinant gene construct comprising and/or consisting of a polynucleotide template having nucleotide sequence set forth in SEQ ID Nos. 29, 32, 35, 38, 41, 44, 28, 31, 34, 37, 40, and/or 43, and/or any mixtures/combinations thereof, wherein the polynucleotide template is expressible in a host cell to produce an enzyme which degrades lignin; a transformant comprising and/or consisting of a recombinant gene construct capable of expressing a polynucleotide template having nucleotide sequence set forth in SEQ ID Nos. 29, 32, 35, 38, 41, 44, 28, 31, 34, 37, 40, and/or 43, and/or any mixtures/combinations thereof, to produce an enzyme which accelerate lignin degradation; a transgenic fungi of *M. phaseolina* with enhanced lignin degradation, comprising a recombinant gene construct having an expressible nucleotide sequence set forth in SEQ ID Nos. 29, 32, 35, 38, 41, 44, 28, 31, 34, 37, 40, and/or 43, and/or any mixtures/combinations thereof.

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Groups IV+: Claims 16-20, 21 (in part), 22, 23 (in part), 24 (in part), and SEQ ID NOS: 47 (DNA sequence encoding for lignin peroxidase derived from the fungi *M. phaseolina*), 48 (lignin peroxidase polypeptide amino acid sequence from the fungi *M. phaseolina*) are directed towards an isolated polynucleotide encoding for multicopper oxidase derived from the fungi *M. phaseolina* comprising and/or consisting of nucleotide sequence as set forth in each of the SEQ ID Nos. 46, 47, 49, 50, 52, 53, 55, 56, 58, 59, 61, 62, 64, 65, 67, 68, 70, 71, 73, 74, 76, 77, 79, 80, 82, 83, 85, 86, 88, 89, 91, 92, 94, 95, 97, 98, 100, 101, 103, 104, 106, 107, 109 or 110, and/or any mixtures/combinations thereof; an isolated multicopper oxidase polypeptide derived from the fungi *M. phaseolina* comprising and/or consisting of amino acid sequence as provided in SEQ ID Nos. 48, 51, 54, 57, 60, 63, 66, 69, 72, 75, 78, 81, 84, 87, 90, 93, 96, 99, 102, 105, 108 or 111, and/or any mixtures/combinations thereof; an expression construct/vector capable of expressing multicopper oxidase polypeptide containing at least 70% sequential amino acids as provided in SEQ ID Nos. 48, 51, 54, 57, 60, 63, 66, 69, 72, 75, 78, 81, 84, 87, 90, 93, 96, 99, 102, 105, 108 or 111, and/or any mixtures/combinations thereof; a recombinant gene construct comprising and/or consisting of a polynucleotide template having nucleotide sequence set forth in SEQ ID Nos. 47, 50, 53, 56, 59, 62, 65, 68, 71, 74, 77, 80, 83, 86, 89, 92, 95, 98, 101, 104, 107, 110, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106 and/or 109, and/or any mixtures/combinations thereof, wherein the polynucleotide template is expressible in a host cell to produce an enzyme which degrades lignin; a transformant comprising and/or consisting of a recombinant gene construct capable of expressing a polynucleotide template having nucleotide sequence set forth in SEQ ID Nos. 47, 50, 53, 56, 59, 62, 65, 68, 71, 74, 77, 80, 83, 86, 89, 92, 95, 98, 101, 104, 107, 110, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106 and/or 109, and/or any mixtures/combinations thereof, to produce an enzyme which accelerate lignin degradation; a transgenic fungi of *M. phaseolina* with enhanced lignin degradation, comprising a recombinant gene construct having an expressible nucleotide sequence set forth in SEQ ID Nos. 47, 50, 53, 56, 59, 62, 65, 68, 71, 74, 77, 80, 83, 86, 89, 92, 95, 98, 101, 104, 107, 110, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106 and/or 109, and/or any mixtures/combinations thereof.

The inventions listed as Groups I+-IV+ do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical features of Groups I+ include lignin peroxidase, not present in any other Groups, the special technical features of Groups II+ include chloroperoxidase, not present in any other Groups, the special technical features of Groups III+ include heamperoxidase, not present in any other Groups, the special technical features of Groups IV+ include multicopper oxidase, not present in any other Groups.

Groups I+-IV+ share the technical features including an isolated polynucleotide comprising or consisting of a nucleotide sequence encoding an enzyme derived from *M. phaseolina*; an isolated polypeptide derived from *M. phaseolina*; an expression construct/vector capable of expressing an enzyme; a recombinant gene construct comprising and/or consisting of a polynucleotide template having a nucleotide sequence; a transformant comprising and/or consisting of a recombinant gene construct capable of expressing a polynucleotide template having nucleotide sequence; and a transgenic fungi of *M. phaseolina* with enhanced lignin degradation, comprising a recombinant gene construct having an expressible nucleotide sequence. Groups I+ share the technical features including an isolated polynucleotide encoding for lignin peroxidase derived from the fungi *M. phaseolina* comprising and/or consisting of a nucleotide sequence; an isolated lignin peroxidase polypeptide derived from the fungi *M. phaseolina* comprising and/or consisting of amino acid sequence; and an expression construct/vector capable of expressing lignin peroxidase polypeptide containing at least 70% sequential amino acids.

However, these shared technical elements are previously disclosed by WO 2011/104339 A1 (DE MARIA) and further in view of WO 1991/018090 A1 to Nevalainen, et al. (hereinafter 'Nevalainen'), US 2001/0041666 A1 to Svendsen, et al. (hereinafter 'Svendsen'), US 2006/0051305 A1 to Belinky, et al. (hereinafter 'Belinky') and WO 1997/009431 A1 to Xu, et al. (hereinafter 'Xu').

De Maria discloses an isolated polynucleotide (isolated polynucleotide; page 6, lines 24-25) comprising or consisting of a nucleotide sequence encoding (comprising or consisting of a nucleotide sequence encoding; page 2, line 4) an enzyme derived from *M. phaseolina* (an enzyme derived from *M. phaseolina*; page 50, lines 8-11); an isolated (isolated; page 4, lines 21-25) polypeptide derived from *M. phaseolina* (enzyme (polypeptide) derived from *M. phaseolina*; page 50, lines 8-11); an expression construct/vector capable of expressing an enzyme (expression vector (construct) capable of expressing an enzyme; page 37, lines 9-17); a recombinant gene construct comprising and/or consisting of a polynucleotide template having a nucleotide sequence (a recombinant gene construct comprising and/or consisting of a polynucleotide template having nucleotide sequence; page 37, line 9 - page 38, line 16); a transformant comprising and/or consisting of a recombinant gene construct capable of expressing a polynucleotide template having nucleotide sequence (a transformant comprising and/or consisting of a recombinant gene construct capable of expressing a polynucleotide template having a nucleotide sequence; page 7, lines 19-23); and a transgenic fungi comprising a recombinant gene construct having an expressible nucleotide sequence fungal host cell (transgenic fungi); page 40, lines 20-21), comprising a recombinant gene construct having an expressible nucleotide sequence (comprising a recombinant gene construct having an expressible nucleotide sequence; page 40, lines 15-19), an isolated polynucleotide (isolated polynucleotide; page 6, lines 24-25) encoding (encoding; page 2, line 4) for a peroxidase derived from the fungi (peroxidase derived from fungi (page 51, lines 13-17) comprising and/or consisting of a nucleotide sequence (comprising or consisting of a nucleotide sequence; paragraph [0040]); an isolated (isolated; page 4, lines 21-25) peroxidase polypeptide derived from fungi (peroxidase derived from fungi (page 51, lines 13-17) comprising and/or consisting of amino acid sequence (amino acid sequence; page 7, line 10); an expression construct/vector capable of expressing (expression vector capable of expressing; page 37, lines 9-17) peroxidase polypeptide containing at least 70% sequential amino acids (peroxidase (peroxidase polypeptide containing at least 70% sequential amino acids); page 51, lines 13-17). De Maria further discloses a degradative enzyme derived from *M. phaseolina*, as a part of a detergent composition (detergent composition; page 45, lines 10-14).

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De Maria does not disclose transgenic *M. phaseolina* with enhanced lignin degradation, an enzyme which degrades lignin, or accelerating the degradation of lignin; lignin peroxidase derived from the fungi *M. phaseolina*, an isolated lignin peroxidase polypeptide derived from the fungi *M. phaseolina* comprising and/or consisting of amino acid sequence, expressing lignin peroxidase polypeptide; an isolated polynucleotide encoding for chloroperoxidase derived from the fungi *M. phaseolina* comprising and/or consisting of a nucleotide sequence; an isolated chloroperoxidase polypeptide derived from the fungi *M. phaseolina* comprising amino acid sequence; an expression construct/vector capable of expressing chloroperoxidase polypeptide containing at least 70% sequential amino acids; an isolated polynucleotide encoding for haemperoxidase derived from the fungi *M. phaseolina* comprising and/or consisting of nucleotide sequence; an expression construct/vector capable of expressing haemperoxidase polypeptide containing at least 70% sequential amino acids; an isolated polynucleotide encoding for multicopper oxidase derived from the fungi *M. phaseolina* comprising and/or consisting of a nucleotide sequence; an isolated multicopper oxidase polypeptide derived from the fungi *M. phaseolina* comprising and/or consisting of amino acid sequence; an expression construct/vector capable of expressing multicopper oxidase polypeptide containing at least 70% sequential amino acids.

Nevalainen discloses an enzyme which degrades lignin (lignin-degrading enzyme; abstract), comprising a lignin peroxidase (lignin peroxidase; page 17, lines 17-29) comprising an amino acid sequence (amino acid sequence; page 22, line 31 to page 23, line 13), and expressing a lignin peroxidase polypeptide (expressing the enzymes (expressing a lignin peroxidase polypeptide); page 19, lines 17-20).

Svendsen discloses an isolated polynucleotide encoding a haloperoxidase (a vector (an isolated polynucleotide) encoding a haloperoxidase; paragraph [0105]) which may be a chloroperoxidase derived from fungi (chloroperoxidase derived from fungi; paragraphs [0010]-[0012]) comprising and/or consisting of a nucleotide sequence (comprising or consisting of a nucleotide sequence; paragraph [0034]); an isolated chloroperoxidase polypeptide (isolated chloroperoxidase polypeptide; paragraphs [0010]-[0012]) derived from fungi (derived from fungi; paragraphs [0010]-[0012]) comprising an amino acid sequence (comprising an amino acid sequence; paragraph [0010]-[0012]); an expression construct/vector capable of expressing (expression construct/vector capable of expressing; paragraph [0105]) a chloroperoxidase polypeptide containing at least 70% sequential amino acids (a chloroperoxidase polypeptide (a chloroperoxidase containing at least 70% sequential amino acids); paragraphs [0010]-[0012]) for use in a detergent composition (detergent composition; paragraph [0148]).

Belinky discloses an isolated polynucleotide encoding for (expression vector encoding (isolated polynucleotide encoding); paragraph [0195]) haemperoxidase modifying enzyme derived from the fungi (haemperoxidase modifying enzyme derived from fungi; paragraph [0206]) comprising and/or consisting of nucleotide sequence (consisting of a nucleotide sequence; paragraph [0196]); an isolated (isolated; paragraph [0224]) haemperoxidase polypeptide derived from the fungi (haemperoxidase polypeptide derived from the fungi; paragraph [0206]) comprising and/or consisting of amino acid sequence (comprising or consisting of an amino acid sequence; paragraph [0098]); and an expression construct/vector capable of expressing haemperoxidase polypeptide containing at least 70% sequential amino acids (an expression construct/vector capable of expressing haemperoxidase polypeptide containing at least 70% sequential amino acids; paragraphs [0195], [0196]) for the modification of lignin (modification of lignin; paragraph [0017]).

Xu discloses an isolated polynucleotide encoding (a vector for recombinant expression (an isolated polynucleotide encoding; page 6, lines 22-24) for multicopper oxidase (multicopper oxidase; abstract) derived from fungi (derived from fungi; page 4, lines 1-4) comprising and/or consisting of a nucleotide sequence (comprising and/or consisting of a nucleotide sequence; page 2, lines 19-20); an isolated multicopper oxidase polypeptide derived from the fungi (an isolated multicopper oxidase polypeptide derived from the fungi; page 4, lines 1-4) comprising and/or consisting of amino acid sequence (comprising and/or consisting of an amino acid sequence; page 2, lines 7-8); an expression construct/vector capable of expressing multicopper oxidase polypeptide containing at least 70% sequential amino acids (an expression construct/vector capable of expressing multicopper oxidase polypeptide containing at least 70% sequential amino acids; page 6, lines 22-24), wherein the multicopper oxidase is a laccase (the multicopper oxidase is a laccase; page 3, line 32 to page 4, line 4).

It would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have modified the disclosure of De Maria, in order to have included additional enzymes for degrading plant material, including the degradation of lignin, as previously disclosed by Nevalainen, by enzymes such as lignin peroxidase, as expressed by a host cell, as disclosed by Nevalainen, utilizing the host cells disclosed by De Maria, for enabling the production of a composition comprising a plurality of enzymes. Additionally, it would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have modified the previous disclosure of De Maria, in order to have included additional enzymes for degrading plant material in a detergent composition, as previously disclosed by De Maria, with a chloroperoxidase, as previously disclosed by Svendsen, for use in a detergent composition. Also, it would have been obvious to a person of ordinary skill in the art, at the time of the invention to have modified the disclosure of De Maria, in order to have included additional enzymes for degrading plant material in a detergent composition, as previously disclosed by De Maria, with a lignin-modifying haemperoxidase, as disclosed by Belinky, for providing a detergent mixture with an increased range of substrates treatable with the detergent. It would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have modified the previous disclosure of De Maria, in order to have included additional enzymes for degrading plant material in a detergent composition, such as a laccase for the degradation of lignin, as previously disclosed by Xu, for providing a detergent mixture with an increased range of substrates treatable with the detergent.

Furthermore, although De Maria, does not disclose isolating further enzymes from *M. phaseolina* or transgenic *M. phaseolina* with enhanced lignin degradation, it would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have utilized any fungus as a host cell for the production of any enzymes useful in a detergent composition, as previously disclosed above by De Maria, including any of the sources for an enzyme, including *M. phaseolina*, and to have isolated useful enzymes from said host, in order to have provided for a plurality of enzymes which would have been capable of functioning well in a particular composition. Also, it would have been obvious to a person of ordinary skill in the art to have produced transgenic *M. phaseolina* as hosts comprising nucleic acid constructs for the expression of enzymes useful in the previous disclosure of De Maria, as the production of a transgenic *M. phaseolina* expressing said enzymes would have produced *M. phaseolina* with enhanced lignin degradation, through routine experimentation and testing.

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Since none of the special technical features of the Groups I+-IV+ inventions is found in more than one of the inventions, and since all of the shared technical features are previously disclosed by a combination of the De Maria, Nevalainen, Svendsen, Belinky and Xu references, unity of invention is lacking.



(12) 发明专利申请

(10) 申请公布号 CN 104919043 A

(43) 申请公布日 2015. 09. 16

(21) 申请号 201380054125. 6

(22) 申请日 2013. 08. 15

(30) 优先权数据

61/683913 2012. 08. 16 US

(85) PCT国际申请进入国家阶段日

2015. 04. 16

(86) PCT国际申请的申请数据

PCT/US2013/055199 2013. 08. 15

(87) PCT国际申请的公布数据

W02014/028773 EN 2014. 02. 20

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(51) Int. Cl.

C12N 9/08(2006. 01)

C12N 15/53(2006. 01)

C07H 21/04(2006. 01)

C07K 14/37(2006. 01)

权利要求书2页 说明书115页 附图10页

(54) 发明名称

来自菜豆壳球孢菌的木质素降解酶及其用途

(57) 摘要

本发明涉及关于通过菜豆壳球孢菌(Macrophomina phaseolina) (“菜豆壳球孢菌(M. phaseolina)”)实现植物的木质素降解的植物育种和抗病性的领域。本发明公开编码由菜豆壳球孢菌生成的木质素降解酶的分离的多核苷酸,其包含在以下序列中列出的核苷酸序列或所述序列的互补序列并由所述核苷酸序列或所述序列的互补序列组成:SEQ ID No. 2、5、8、11、14、17、20、23、26、29、32、35、38、41、44、47、50、53、56、59、62、65、68、71、74、77、80、83、86、89、92、95、98、101、104、107、110、1、4、7、10、13、16、19、22、25、28、31、34、37、40、43、46、49、52、55、58、61、64、67、70、73、76、79、82、85、88、91、94、97、100、103、106 和 109。本发明还涉及由在以下序列中列出的多核苷酸序列编码的分离的多肽:SEQ ID No. 3、6、9、12、15、18、21、24、27、30、33、36、39、42、45、48、51、54、57、60、63、66、69、72、75、78、81、84、87、90、93、96、99、102、105、108 和 111;包含所述多核苷酸的重组基因构建体;包含所述重组基因构建体的转化体和转基因真菌,其增强木质素降解酶的制备。本发明提供具有寡聚体酶活性的多肽,例如在生物质的糖化过程中将抗拒溶解的寡聚体酶转化成可发酵糖的酶。

1. 一种分离的多核苷酸, 编码来源于真菌菜豆壳球孢菌的木质素过氧化物酶, 其包含如在 SEQ ID No. 1、2、4、5、7 或 8 中的每一个和 / 或其任何混合 / 组合中列出核苷酸序列和 / 或由所述核苷酸序列组成。

2. 如权利要求 1 所述的分离的多核苷酸编码, 其中所述菜豆壳球孢菌真菌为菌株 ms6。

3. 一种分离的木质素过氧化物酶多肽, 其来源于所述真菌菜豆壳球孢菌, 其包含如在 SEQ ID No. 3、6 或 9 和 / 或其任何混合 / 组合中提供的氨基酸序列和 / 或由所述氨基酸序列组成。

4. 如权利要求 3 所述的分离的木质素过氧化物酶多肽, 其中所述菜豆壳球孢菌真菌为菌株 ms6。

5. 一种表达构建体 / 载体, 其能够表达含有至少 70% 的如在 SEQ ID No. 3、6 或 9 和 / 或其任何混合 / 组合中所提供的连续氨基酸的木质素过氧化物酶多肽。

6. 一种分离的多核苷酸, 编码来源于所述真菌菜豆壳球孢菌的氯过氧化物酶, 其包含如在 SEQ ID No. 10、11、13、14、16、17、19、20、22、23、25 或 26 中每一个和 / 或其任何混合 / 组合中所列的核苷酸序列和 / 或由所述核苷酸序列组成。

7. 如权利要求 6 所述的分离的多核苷酸, 其中所述菜豆壳球孢菌真菌为菌株 ms6。

8. 一种分离的氯过氧化物酶多肽, 其来源于真菌菜豆壳球孢菌, 其包含如在 SEQ ID No. 12、15、18、21、24 或 27 和 / 或其任何混合 / 组合中所提供的氨基酸序列。

9. 如权利要求 8 所述的分离的多肽, 其中所述菜豆壳球孢菌真菌为菌株 ms6。

10. 一种表达构建体 / 载体, 其能够表达含有至少 70% 的如在 SEQ ID No. 12、15、18、21、24 或 27 和 / 或其任何混合 / 组合中所提供的连续氨基酸的氯过氧化物酶多肽。

11. 一种分离的多核苷酸, 编码来源于真菌菜豆壳球孢菌的血红素过氧化物酶, 其包含如在 SEQ ID No. 28、29、31、32、34、35、37、38、40、41、43 或 44 中每一个和 / 或其任何混合 / 组合中所列的核苷酸序列和 / 或由所述核苷酸序列组成。

12. 如权利要求 11 所述的分离的多核苷酸编码, 其中所述菜豆壳球孢菌真菌为菌株 ms6。

13. 一种分离的血红素过氧化物酶多肽, 其来源于真菌菜豆壳球孢菌, 其包含在 SEQ ID No. 30、33、36、39、42 或 45 和 / 或其任何混合 / 组合中所提供的氨基酸序列和 / 或由所述氨基酸序列组成。

14. 如权利要求 13 所述的分离的多肽编码, 其中所述菜豆壳球孢菌真菌为菌株 ms6。

15. 一种表达构建体 / 载体, 其能够表达含有至少 70% 的如在 SEQ ID No. 30、33、36、39、42 或 45 和 / 或其任何混合 / 组合中所提供的连续氨基酸的血红素过氧化物酶多肽。

16. 一种分离的多核苷酸, 编码来源于真菌菜豆壳球孢菌的多铜氧化酶, 其包含如在以下序列中的每一个和 / 或其任何混合 / 组合中所列的核苷酸序列和 / 或由所述核苷酸序列组成: SEQ ID No. 46、47、49、50、52、53、55、56、58、59、61、62、64、65、67、68、70、71、73、74、76、77、79、80、82、83、85、86、88、89、91、92、94、95、97、98、100、101、103、104、106、107、109 或 110。

17. 如权利要求 16 所述的分离的多核苷酸编码, 其中所述菜豆壳球孢菌真菌为菌株 ms6。

18. 一种分离的多铜氧化酶多肽, 其来源于真菌菜豆壳球孢菌, 其包含如在以下序列中

所提供的氨基酸序列和 / 或由所述氨基酸序列组成 :SEQ ID No. 48、51、54、57、60、63、66、69、72、75、78、81、84、87、90、93、96、99、102、105、108 或 111 和 / 或其任何混合 / 组合。

19. 如权利要求 18 所述的分离的多核苷酸编码,其中所述菜豆壳球孢菌真菌为菌株 ms6。

20. 一种表达构建体 / 载体,其能够表达含有至少 70% 的如在 SEQ ID No. 48、51、54、57、60、63、66、69、72、75、78、81、84、87、90、93、96、99、102、105、108 或 111 和 / 或其任何混合 / 组合中所提供的连续氨基酸的木质素过氧化物酶多肽。

21. 一种重组基因构建体,其包含具有如在以下序列中所列的核苷酸序列的多核苷酸模板和 / 或由所述多核苷酸模板组成 :SEQ ID No. 2、5、8、11、14、17、20、23、26、29、32、35、38、41、44、47、50、53、56、59、62、65、68、71、74、77、80、83、86、89、92、95、98、101、104、107、110、1、4、7、10、13、16、19、22、25、28、31、34、37、40、43、46、49、52、55、58、61、64、67、70、73、76、79、82、85、88、91、94、97、100、103、106 和 / 或 109 和 / 或其任何混合物 / 组合,其中所述多核苷酸模板可在宿主细胞中表达以生成降解木质素的酶。

22. 一种如权利要求 21 的重组基因构建体,其还包含操作式连接增强所述多核苷酸模板的表达的启动子区和 / 或由所述启动子区组成。

23. 一种转化体,其包含能够表达具有如在以下序列中所列的核苷酸序列的多核苷酸模板的重组基因构建体和 / 或由所述重组基因构建体组成以生成加速木质素降解的酶 : SEQ ID No. 2、5、8、11、14、17、20、23、26、29、32、35、38、41、44、47、50、53、56、59、62、65、68、71、74、77、80、83、86、89、92、95、98、101、104、107、110、1、4、7、10、13、16、19、22、25、28、31、34、37、40、43、46、49、52、55、58、61、64、67、70、73、76、79、82、85、88、91、94、97、100、103、106 和 / 或 109 和 / 或其任何混合物 / 组合。

24. 一种具有增强的木质素降解的菜豆壳球孢菌的转基因真菌,其包含具有如在以下序列中所列的可表达核苷酸序列的重组基因构建体 :SEQ ID No. 2、5、8、11、14、17、20、23、26、29、32、35、38、41、44、47、50、53、56、59、62、65、68、71、74、77、80、83、86、89、92、95、98、101、104、107、110、1、4、7、10、13、16、19、22、25、28、31、34、37、40、43、46、49、52、55、58、61、64、67、70、73、76、79、82、85、88、91、94、97、100、103、106 和 / 或 109 和 / 或其任何混合 / 组合。

来自菜豆壳球孢菌的木质素降解酶及其用途

[0001] 相关申请

[0002] 本申请要求保护 2012 年 8 月 16 日提交的美国临时专利申请序号 61/683913 的优先权权益,其内容通过引用结合到本文中。

发明领域

[0003] 本发明涉及菜豆壳球孢菌的木质素降解蛋白 / 酶和基因。更具体地讲,本发明公开了这些蛋白的核苷酸序列并促进木质纤维素材料的木质素含量降低。本发明还涉及从菜豆壳球孢菌中选择并分离能够降解木质素的酶的方法、克隆来自菜豆壳球孢菌的基因片段的方法和使用所述基因片段的酶产物的方法。特定地讲,其可用于制造或加工纸浆、木浆、甲醇和纺织品。

[0004] 发明背景

[0005] 木质素是仅次于纤维素的第二丰富的有机聚合物。其与纤维素纤维结合,构成干木材重量的约四分之一。该芳族聚合物抗拒降解。木质素经由许多类型的键与在细胞壁中的半纤维素共价连接。在键合之中,最丰富的木质素亚结构为 β -芳基醚,其占内苯基丙烷键的约 40% (Higuchi T 1990. Lignin biochemistry: biosynthesis and biodegradation. Wood Sci. Technol. 24:23-63)。另外,木质素不具有像例如纤维素、蛋白质、淀粉等其它生物聚合物一样的任何重复单元。醚键常常是普遍存在的,提供与许多芳族残基的多种键合。这些结构特点决定着在木质素降解方面的局限性。典型结构的一部分在图 1 中说明并且在该图中的芳基甘油醇 β -芳基醚结构红色是数量上最重要的键合,构成该聚合物的至少 40%。但是,木质素的生物降解是由植物原料加工生物燃料和木浆的先决条件。木质素降解的改进将驱动生物燃料加工产量,实现更好的增益或更好的效率因子。

[0006] 木质素是木质纤维素的一种组分,必须将其降解以允许有效使用纤维素材料来糖化、造纸、生物燃料制造或粗饲料升级。木质纤维素降解为包括水解酶和氧化酶两者的多酶过程。通常,木质素由三种主要的构筑嵌段,即对羟基肉桂醇、松柏醇和芥子醇构成。另外,草和双子叶植物木质素还含有大量的酚酸,例如对羟基肉桂酸和阿魏酸,它们与醇基酯化。

[0007] 木质素过氧化物酶 (LiP)、锰过氧化物酶 (MnP) 和漆酶是在木质素的生物降解中包括的三个酶家族。LiP 通过抽出一个电子并产生阳离子基团而氧化非酚木质素亚结构 (Kirk TK, Tien M, Kersten PJ, Mozuch MD 和 Kalyanaraman B 1986. Ligninase of *Phanerochaete chrysosporium*. Biochem J 236:279-287; Kirk TK 和 Farrell RL 1987. Enzymatic "combustion": The microbial degradation of lignin. Annu Rev Microbiol 41:465-505), 且 MnP 将酚环氧化成苯氧基,导致木质素分解 (Gold MH, Wariishi H 和 Valli K 1989. Extracellular peroxidases involved in lignin degradation by the white-rot basidiomycete *Phanerochaete chrysosporium*. In: Biocatalysis in Agricultural Biotechnology, 第 127-140 页,由 Whitaker JR 和 Sonnet PE 编辑. American Chemical Society, Washington, DC)。而漆酶能够氧化木质素的酚部分和非酚部分两者,而且后者取决于共存的初级漆酶底物 (Bourbonnais R 和 Paice MG 1990. Oxidation of

non-phenolic substrates. An expanded role for laccase in lignin biodegradation. FEBS Lett 267(1):99-102)。图 2 显示代表在由 LiP 氧化时经受 C α -C β 裂解的主要芳基甘油醇 β -芳基醚木质素结构的二聚模型化合物 (Kirk 等, 1986. Ligninase of Phanerochaete chrysosporium. Mechanism of its degradation of the non-phenolic arylglycerol β -aryl ether substructure of lignin. Biochem J 236:279-287)。

[0008] 近年来,关于木质素生物降解的研究大大增加。特别是自从发现第一木质纤维素降解真菌黄孢原毛平革菌 (Phanerochaete chrysosporium) 以来,出于对木质素的生物降解的意义而将基因组定序 (Martínez 等, 2004. Genome sequence of the lignocellulose degrading fungus Phanerochaete chrysosporium strain RP78. Nature Biotechnol 22(6):695-700)。可能最好的研究是通过白腐真菌黄孢原毛平革菌降解在木质纤维素中的木质素 (Aust SD 1995. Mechanisms of Degradation by White Rot Fungi. Environ Health Perspect 103:59-61; Leisola MSA, Ulmer D 和 Fiechter A 1984. Factors affecting lignin degradation in lignocellulose by Phanerochaete chrysosporium. Arch Microbiol 137:171-175; Ulmer D, Leisola M, Puhakka J 和 Fiechter A 1983. Phanerochaete chrysosporium: Growth pattern and lignin degradation. Appl Microbiol Biotechnol 18:153-157; Chua MGS, Chen CL, Chang HM 和 Kirk TK 1982. ¹³C NMR spectroscopic study of lignin degraded by Phanerochaete chrysosporium. I. New structures. Holzforschung 36:165-172)。白腐真菌生成许多胞外木质素酶,包括血红素依赖性木质素过氧化物酶、锰过氧化物酶和多用途过氧化物酶及铜依赖性漆酶 (Sanchez C 2009. Lignocellulosic residues: biodegradation and bioconversion by fungi. Biotechnol Adv 27:185-194; Ten Have R, Teunissen PJM 2001. Oxidative mechanisms involved in lignin degradation by white-rot fungi. Chem Rev 101:3397-3413)。借助于这些胞外过氧化物酶和漆酶,白腐真菌降解木质素 (Timothy DHB, Ahmad M, Hardiman EM 和 Rahmanpour R 2001. Pathways for degradation of lignin in bacteria and fungi. Nat. Prod. Rep 28:1883-1896)。

[0009] 采用植物生物质作为可再生资源的日益增加的意义提供研究木质纤维素的微生物降解的动力。大量生物质 (主要是木质纤维素材料) 自林业、农业和食品工业中产生,它们没有用于副产物加工中。为了有效地利用该植物生物质作为可再生资源,必须研究降解木质纤维素的备选方法。需要鉴定能够降解木质素以便在由木质纤维素材料生产纤维素产物的过程中使用的新真菌。

[0010] 为了有效,木质素的降解需要协同作用的几种类型的酶。降解木质素需要至少两类酶:氧化非酚木质素亚结构的木质素过氧化物酶和氧化酚木质素亚结构和非酚木质素亚结构两者的漆酶,因此它们可协同地降解。为了获得所提到的酶并使其商业化,需要各种木质素降解蛋白质的稳定供应。因此,工业上需要全面地鉴定这些木质素降解基因及它们编码的蛋白质,因此利用遗传信息以便降解来自木质纤维素材料的木质素。

[0011] 发明概述

[0012] 已经意外地发现真菌菜豆壳球孢菌能够生成木质素降解酶,菜豆壳球孢菌与里氏木霉 (Trichoderma reesi) 或黄孢原毛平革菌并不密切相关。

[0013] 因此,尤其,本发明涉及可来源于菜豆壳球孢菌的木质素降解酶的鉴定及其对应

用途。本发明还涉及菜豆壳球孢菌真菌在降解纤维素材料的木质素内含物中的用途。

[0014] 本发明的主要目的在于公开编码真菌菜豆壳球孢菌的以下酶的核苷酸序列集：木质素过氧化物酶 (SEQ ID No. 1、2、4、5、7、8 和 / 或其任何混合 / 组合)、氯过氧化物酶 (SEQ ID No. 10、11、13、14、16、17、19、20、22、23、25、26 和 / 或其任何混合 / 组合) 和血红素过氧化物酶 (haemperoxidase) (SEQ ID No. 28、29、31、32、34、35、37、38、40、41、43、44 和 / 或其任何混合 / 组合)。

[0015] 本发明还公开编码真菌菜豆壳球孢菌的多铜氧化酶的核苷酸序列集 (SEQ ID No. 46、47、49、50、52、53、55、56、58、59、61、62、64、65、67、68、70、71、73、74、76、77、79、80、82、83、85、86、88、89、91、92、94、95、97、98、100、101、103、104、106、107、109、110 和 / 或其任何混合 / 组合)。

[0016] 优选本发明的分离的多核苷酸由选自包含以下序列和 / 或由以下序列组成的群组的核酸序列组成和 / 或构成：SEQ ID No. 2、5、8、11、14、17、20、23、26、29、32、35、38、41、44、47、50、53、56、59、62、65、68、71、74、77、80、83、86、89、92、95、98、101、104、107、110、1、4、7、10、13、16、19、22、25、28、31、34、37、40、43、46、49、52、55、58、61、64、67、70、73、76、79、82、85、88、91、94、97、100、103、106 和 109 和 / 或其任何混合 / 组合，其编码选自包含以下序列和 / 或由以下序列组成的群组的多肽：SEQ ID No. 3、6、9、12、15、18、21、24、27、30、33、36、39、42、45、48、51、54、57、60、63、66、69、72、75、78、81、84、87、90、93、96、99、102、105、108 和 111 和 / 或其任何混合 / 组合。本发明还涉及由上述核苷酸序列的互补序列组成和 / 或包含上述核苷酸序列的互补序列的分离的多核苷酸。

[0017] 本发明的另一目的在于提供在所述主要目的中列出的基因和酶的分子生物学和遗传信息，以用于木质素降解的调节和转化，从而由木质纤维素材料制造有价值的产物。

[0018] 另一方面，为了促进体外制备木质素降解多肽，本发明包括能够表达含有至少 70% 的如在以下序列中列出的连续氨基酸的多肽的表达构建体：SEQ ID No. 3、6、9、12、15、18、21、24、27、30、33、36、39、42、45、48、51、54、57、60、63、66、69、72、75、78、81、84、87、90、93、96、99、102、105、108 和 111。优选所述表达构建体具有具有如在以下序列中所列出的连续核苷酸的插入的 DNA 或 cDNA：SEQ ID No. 2、5、8、11、14、17、20、23、26、29、32、35、38、41、44、47、50、53、56、59、62、65、68、71、74、77、80、83、86、89、92、95、98、101、104、107、110、1、4、7、10、13、16、19、22、25、28、31、34、37、40、43、46、49、52、55、58、61、64、67、70、73、76、79、82、85、88、91、94、97、100、103、106 和 109。

[0019] 本发明的又一目的公开包含具有在以下序列中列出的核苷酸序列的多核苷酸模板的重组基因构建体：SEQ ID No. 2、5、8、11、14、17、20、23、26、29、32、35、38、41、44、47、50、53、56、59、62、65、68、71、74、77、80、83、86、89、92、95、98、101、104、107、110、1、4、7、10、13、16、19、22、25、28、31、34、37、40、43、46、49、52、55、58、61、64、67、70、73、76、79、82、85、88、91、94、97、100、103、106 和 109，其中所述多核苷酸模板可在宿主细胞中表达以生成氧化来自木质纤维素材料的木质素的酶。优选所述重组基因构建体还包含操作式连接以增强所述多核苷酸模板的表达的启动子区。

[0020] 根据本发明的优选实施方案之一，真菌菜豆壳球孢菌菌株 ms6 从感染的黄麻植物分离。所述分离的多肽优选也来源于该菌株。

[0021] 本发明的再一目的在于提供从菜豆壳球孢菌中分离木质素降解酶以跟得上对于

采用 / 使用植物生物质作为可再生资源以便生产纤维素产品的日益增加的全球需求的潜在商业可行的方法。

[0022] 本发明的其它目的涉及木质素降解物质在动物饲料、生物燃料、木浆、纺织品和造纸工业中的用途。

[0023] 本领域的技术人员将容易地了解本发明非常适合实现这些目的并且获得所提到的结果和优势以及其中固有的那些。本文所述的实施方案并非旨在限制本发明的范围。

[0024] 附图简述

[0025] 结合在本说明书中并形成本说明书的一部分的附图说明本发明的实施方案并且与所述描述一起用来解释本发明的原理。

[0026] 图 1 显示出软木木质素的常见结构。主要的芳基甘油醇 - β - 芳基醚结构以红色示出。插图显示松柏醇, 软木木质素的苯丙素构筑嵌段 ;

[0027] 图 2 显示出由氧化的木质素过氧化物酶裂解内部非酚芳基甘油醇 - β - 芳基醚木质素结构 ;

[0028] 图 3 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像, 其中道 1 为 SEQ ID NO. 1 的木质素过氧化物酶的多核苷酸且道 M 为 DNA 分子量梯形带 ;

[0029] 图 4 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像, 其中道 1 为 SEQ ID NO. 4 的木质素过氧化物酶的多核苷酸且道 M 为 DNA 分子量梯形带 ;

[0030] 图 5 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像, 其中道 1 为 SEQ ID NO. 7 的木质素过氧化物酶的多核苷酸且道 M 为 DNA 分子量梯形带 ;

[0031] 图 6 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像, 其中道 1 为 SEQ ID NO. 13 的氯过氧化物酶的多核苷酸且道 M 为 DNA 分子量梯形带 ;

[0032] 图 7 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像, 其中道 1 为 SEQ ID NO. 16 的氯过氧化物酶的多核苷酸且道 M 为 DNA 分子量梯形带 ;

[0033] 图 8 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像, 其中道 1 为 SEQ ID NO. 19 的氯过氧化物酶的多核苷酸且道 M 为 DNA 分子量梯形带 ;

[0034] 图 9 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像, 其中道 1 为 SEQ ID NO. 22 的氯过氧化物酶的多核苷酸且道 M 为 DNA 分子量梯形带 ;

[0035] 图 10 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像, 其中道 1 为 SEQ ID NO. 25 的氯过氧化物酶的多核苷酸且道 M 为 DNA 分子量梯形带 ;

[0036] 图 11 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像, 其中道 1 为 SEQ ID NO. 28 的血红素过氧化物酶的多核苷酸且道 M 为 DNA 分子量梯形带 ;

[0037] 图 12 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像, 其中道 1 为 SEQ ID NO. 31 的血红素过氧化物酶的多核苷酸且道 M 为 DNA 分子量梯形带 ;

[0038] 图 13 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像, 其中道 1 为 SEQ ID NO. 34 的血红素过氧化物酶的多核苷酸且道 M 为 DNA 分子量梯形带 ;

[0039] 图 14 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像, 其中道 1 为 SEQ ID NO. 37 的血红素过氧化物酶的多核苷酸且道 M 为 DNA 分子量梯形带 ;

[0040] 图 15 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像, 其中道 1 为 SEQ ID NO. 40 的血红素过氧化物酶的多核苷酸且道 M 为 DNA 分子量梯形带 ;

[0041] 图 16 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 43 的血红素过氧化物酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0042] 图 17 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 46 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0043] 图 18 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 49 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0044] 图 19 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 52 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0045] 图 20 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 55 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0046] 图 21 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 58 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0047] 图 22 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 64 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0048] 图 23 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 67 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0049] 图 24 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 70 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0050] 图 25 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 73 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0051] 图 26 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 76 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0052] 图 27 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 79 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0053] 图 28 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 82 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0054] 图 29 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 85 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0055] 图 30 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 88 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0056] 图 31 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 91 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0057] 图 32 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 97 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0058] 图 33 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 100 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0059] 图 34 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 103 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带;

[0060] 图 35 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像,其中道 1 为 SEQ ID NO. 106 的

多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带；

[0061] 图 36 为显示 PCR 扩增结果的电泳琼脂糖凝胶图像，其中道 1 为 SEQ ID NO. 109 的多铜氧化酶的多核苷酸且道 M 为 DNA 分子量梯形带。

[0062] 发明详述

[0063] 本文提供的定义和 / 或方法限定本发明并指引本领域的普通技术人员实施本发明。除非另有说明，否则术语应根据相关技术领域的普通技术人员的常规用法来理解。在某种程度上发现任何定义和 / 或方法与在结合在本文中的任何专利或非专利参考文献或在其它地方见到的任何参考文献中提供的任何定义和 / 或方法不一致，应理解，在本文中将在使用在本申请中明确提供 / 采用的所述定义和 / 或方法。除非上下文明确指明，否则单数术语“一种 / 个”和“所述 / 该”包括复数个讨论对象。类似地，除非上下文明确指明，否则词语“或”旨在包括“和”。因此，“包含 A 或 B”意指包括 A 或 B，或者 A 和 B。还应该理解，所有碱基大小或氨基酸大小和对于核酸或多肽给出的所有分子量或分子质量值都是近似值，并为了描述而提供。尽管在本公开的实施例或试验中可使用与本文所述的那些方法和材料类似或等效的方法和材料，但是下文描述合适的方法和材料。

[0064] 本发明提供编码在木质素降解中包括的蛋白质 / 酶的菜豆壳球孢菌的核苷酸序列。所述基因编码在工业中使用或对于工业有意义的具有酶活性的蛋白质。编码所述酶的本发明的基因组序列主要通过比较菜豆壳球孢菌基因组 DNA 的核苷酸序列和其它微生物的已知酶基因的核苷酸序列来鉴定。在本发明之前，这些菜豆壳球孢菌基因的核苷酸序列、阅读框、外显子和内含子的位置、酶的结构及其在各种工业上潜在有用性（例如，包括在制造食品和饲料、饮料、纺织品和洗涤剂中包括的那些）是未知的。

[0065] 菜豆壳球孢菌的基因组序列的分析揭示编码降解在植物中的木质素的酶的基因的丰度。核苷酸序列最初通过例如 Genescan 和 Glimmer M(The Institute of Genome Research, Rockville, Md.) 的软件程序注解，其可鉴定推定编码区、内含子和剪接位点。另外，进行核苷酸序列的自动和手动处理 (curation) 以精细限定并确立编码区和其它基因特征的精确表征。

[0066] 来自菜豆壳球孢菌的超过 14000 种 cDNA 被部分或完全地定序。其中，发现了编码在木质素降解中具有推定作用的新酶的 37 种 cDNA。

[0067] 在完全或部分地定序来源于菜豆壳球孢菌 mRNA 的 cDNA 文库的无性系之后分析开放阅读框 (ORF) 并且使用序列分析软件并通过测定与在数据库（公用 / 专用）中的已知序列的同源性来进一步分析。在本公开的情况下，除非明确指明具有不同的含义，否则在本说明书中使用的许多术语具有指明的含义。

[0068] 本文使用的“多核苷酸”为例如核酸片段的核苷酸序列。多核苷酸可为 RNA 或 DNA 的聚合物，其为单链或双链的，任选含有合成、非自然或改变的核苷酸碱基。以 DNA 的聚合物形式的多核苷酸可由 cDNA、基因组 DNA、合成 DNA 的一个或多个片段或其混合物构成。本发明的分离的多核苷酸可包含来源于以下序列或这些序列的互补序列的 150 种邻接核苷酸（上游和下游两者）中的至少一种：SEQ ID No. 1、4、7、10、13、16、19、22、25、28、31、34、37、40、43、46、49、52、55、58、61、64、67、70、73、76、79、82、85、88、91、94、97、100、103、106 和 109。

[0069] 本文使用的“多肽”为通过肽键键结在一起的氨基酸并通常具有大于 100 个氨基

酸长度的序列的线性单链。

[0070] “分离的”意指“经人手”从自然状态改变。如果组合物或物质在自然中存在,如果已经将其自其原始环境改变或移出或两者,则将其视为“分离的”。例如,自然地存在于活的植物或动物中的多核苷酸或多肽不是“分离的”,但从其自然状态的共存材料中分离出的相同多核苷酸或多肽为“分离的”,如该术语在本文中所示。

[0071] 本文使用的术语“基因”通常定义为真菌菜豆壳孢菌的基因组序列,特定地为编码在木质素降解途径中包括的一系列酶的多肽的多核苷酸序列。

[0072] “编码序列”或“编码区”是指在表达该序列时具有生成例如氨基酸或多肽的基因产物所必需的序列信息的核酸分子。编码序列可包含在转译区内的未转译序列(例如,内含子或 5' 或 3' 未转译区),或者可缺乏这类插入的未转译序列(例如,如在 cDNA 中)。

[0073] 本文使用的术语“引物”为能够结合目标核酸序列并引发核酸合成的寡聚核苷酸。如本文中定义的扩增寡聚核苷酸将优选具有 10-50 个、最优选 15-25 个核苷酸的长度。本发明的扩增寡聚核苷酸可在化学上合成,而这类寡聚核苷酸不是自然存在的核酸。

[0074] 在本说明书中提到包含核苷酸序列的核酸而使用的缩写为常规单字母缩写。因此,当包含在核酸中时,自然存在的编码核苷酸如下缩写:腺嘌呤(A)、鸟嘌呤(G)、胞嘧啶(C)、胸腺嘧啶(T)和尿嘧啶(U)。并且,除非另作指定,否则本文提供的核酸序列为 5' → 3' 方向。

[0075] 本文使用的术语“互补”及其派生词用以提到通过如下熟知规则配对的核酸:A 与 T 或 U 配对且 C 与 G 配对。互补序列可为“部分的”或“完整的”。在部分互补序列中,仅一些核酸碱基根据碱基配对规则匹配;而在完全或全部互补序列中,所有碱基都根据配对规则匹配。如在本领域中熟知,在核酸链之间的互补程度可对在核酸链之间的杂交效率和强度具有明显的影响。所述杂交的效率和强度取决于检测方法。

[0076] 本文使用的术语“宿主细胞”包括对用包含本发明的多核苷酸的核酸构建体或表达载体转化、转染、转导、表达等敏感的任何细胞类型。

[0077] 术语“操作式连接”在本文中指示其中控制序列相对于多核苷酸序列的编码序列置于适当位置使得控制序列引导多肽的编码序列的表达的构造。

[0078] “载体”通常是指复制子,例如质粒、噬菌体、装配型质粒、酵母菌或病毒,另一核酸片段可操作式插入其中以引起该片段的复制或表达。。术语“载体”还旨在指能够转运与其连接的另一核酸的核酸分子。一种类型的载体为“质粒”,其是指可连接另外的 DNA 片段的环状双链 DNA 环路。另一类型的载体为病毒载体,其中另外的 DNA 片段可连接到病毒基因组中。某些载体能够在引入它们的宿主细胞中自主复制(例如,具有细菌复制起点的细菌载体和附加体哺乳动物载体)。其它载体可在引入宿主细胞中后集成到宿主细胞的基因组中,并由此与宿主基因组一起复制。此外,某些载体能够引导与它们操作式连接的基因的表达。这类载体在本文中称为“重组表达载体”(或简称为“表达载体”)。通常,在重组 DNA 技术中有用的表达载体常以质粒的形式。在本说明书中,“质粒”和“载体”可互换使用,因为质粒是最常用形式的载体。然而,本发明旨在包括这类其它形式的表达载体,例如病毒载体(例如,复制缺陷反转录病毒、腺病毒和腺病毒相关病毒),其提供等效功能。

[0079] 术语“核酸构建体”或“DNA 构建体”有时用以指操作式连接适当调节序列并插入载体中以便转化细胞的一个或多个编码序列。该术语可与术语“转化 DNA”或“转基因”互

换使用。

[0080] 本文使用的术语“启动子”通常是指用以引导下游基因的转录的核酸序列。启动子通常将适合其中正表达目标基因的宿主细胞。启动子与其它转录和转译调节核酸序列（也称为“控制序列”）一起是表达给定基因所必需的。通常，转录和转译调节序列包括但不限于启动子序列、核糖体结合位点、转录起停序列、转译起停序列和增强子或活化子序列。

[0081] 本文使用的术语“活体外”是指在活生物体外的人造环境中发生的生物反应，其通常在实验室中使用生物体的已经从它们的常用生物演化关系中分离的组分进行以容许进行更详细或更方便的分析。

[0082] 术语“%同源性”在本文中与本文中的术语“%一致性”可互换地使用且通常是指当使用序列比对程序比对在编码本发明多肽或本发明多肽的氨基酸序列中的任一个的核酸序列之间的核酸或氨基酸序列一致性的水平。

[0083] 例如，本文使用的 80%同源性意指通过限定算法测定的 80%序列一致性的情况，且因此给定序列的同源物在一段给定序列上具有大于 80%的序列一致性。序列一致性的例示性水平包括但不限于与给定序列，例如如本文所述的本发明多肽中的任一种的编码序列的 80%、85%、90%、95%、98%或更高的序列一致性。

[0084] 可用以测定在两种序列之间的一致性的例示性计算机程序包括但不限于在 www.ncbi.nlm.nih.gov/BLAST 上公开访问的 BLAST 程序组，例如 BLASTN、BLASTX 和 TBLASTX、BLASTP 和 TBLASTN。

[0085] 在相对于在 GenBank DNA 序列及其它公用数据库中的核酸序列评价给定的核酸序列时，序列检索通常使用 BLASTN 程序进行。BLASTX 程序优选用于检索在所有阅读框中已经相对于在 GenBank 蛋白序列及其它公用数据库中的氨基酸序列转译的核酸序列。

[0086] 用以测定在两个或多个序列之间的“%一致性”的选择序列的优选比对使用例如 CLUSTAL-W 程序进行。

[0087] 如所阐述，本发明的一个实施方案为包含如在以下序列中列出的核苷酸序列的编码在真菌菜豆壳球孢菌中见到的木质素降解多肽的分离的多核苷酸：SEQ ID No. 2、5、8、11、14、17、20、23、26、29、32、35、38、41、44、47、50、53、56、59、62、65、68、71、74、77、80、83、86、89、92、95、98、101、104、107、110、1、4、7、10、13、16、19、22、25、28、31、34、37、40、43、46、49、52、55、58、61、64、67、70、73、76、79、82、85、88、91、94、97、100、103、106 和 109。对应地，由这些核苷酸序列编码的对应木质素降解多肽将具有如在以下序列中列出的氨基酸序列：SEQ ID No. 3、6、9、12、15、18、21、24、27、30、33、36、39、42、45、48、51、54、57、60、63、66、69、72、75、78、81、84、87、90、93、96、99、102、105、108 和 111。

[0088] 在一个实施方案中，在 SEQ ID No. 2 中说明的 939bp 长的多核苷酸为编码木质素过氧化酶蛋白的全长 cDNA 无性系，表现出编码如在 SEQ ID NO. 3 中具有约 32kD 的计算分子量的含 312 个氨基酸的多肽的开放阅读框。通过 SEQ ID No. 2 的 SMART 分析，揭示出在该序列中存在 Pfam 过氧化物酶域。具有 Pfam 域的蛋白质家族由分泌型真菌过氧化物酶组成和 / 或包含分泌型真菌过氧化物酶。这些是在木质素降解中包括的单体糖蛋白。

[0089] 优选在 SEQ ID No. 5 中说明的 1116bp 长的多核苷酸为编码木质素过氧化酶蛋白的全长 cDNA 无性系，表现出编码如在 SEQ ID NO. 6 中具有约 40kD 的计算分子量的含 371 个氨基酸的多肽的开放阅读框。通过 SEQ ID No. 5 的 SMART 分析，揭示出在该序列中存在

Pfam 过氧化物酶域。具有 Pfam 域的蛋白质家族由分泌型真菌过氧化物酶组成和 / 或包含分泌型真菌过氧化物酶。这些是在木质素降解中包括的单体糖蛋白。

[0090] 类似地,另一方面,在 SEQ ID No. 8 中说明的 1023bp 长的多核苷酸为编码木质素过氧化物酶蛋白的全长 cDNA 无性系,表现出编码如在 SEQ ID NO. 9 中具有约 35kD 的计算分子量的含 340 个氨基酸的多肽的开放阅读框。通过 SEQ ID No. 8 的 SMART 分析,揭示出在该序列中存在 Pfam 过氧化物酶域。具有 Pfam 域的蛋白质家族由分泌型真菌过氧化物酶组成和 / 或包含分泌型真菌过氧化物酶。这些是在木质素降解中包括的单体糖蛋白。

[0091] 另一方面,如在 SEQ ID No. 11 中说明,编码氯过氧化物酶的多核苷酸具有 1260bp,同时如在 SEQ ID No. 12 中说明,编码的蛋白为具有约 45kD 的计算分子量的含 419 个氨基酸的多肽。SEQ ID No. 11 含有 Pfam 域,即过氧化物酶_2。所述域包括在木质素降解中。

[0092] 另一方面,如在 SEQ ID No. 14 中说明,编码氯过氧化物酶的多核苷酸具有 690bp,同时如在 SEQ ID No. 15 中说明,编码的蛋白为具有约 25kD 的计算分子量的含 229 个氨基酸的多肽。SEQ ID No. 14 含有 Pfam 域,即过氧化物酶_2。所述域包括在木质素降解中。

[0093] 另一方面,如在 SEQ ID No. 17 中说明,编码氯过氧化物酶的多核苷酸具有 1194bp,同时如在 SEQ ID No. 18 中说明,编码的蛋白为具有约 43kD 的计算分子量的含 397 个氨基酸的多肽。SEQ ID No. 17 含有 Pfam 域,即过氧化物酶_2。所述域包括在木质素降解中。

[0094] 另一方面,如在 SEQ ID No. 20 中说明,编码氯过氧化物酶的多核苷酸具有 1317bp,同时如在 SEQ ID No. 21 中说明,编码的蛋白为具有约 47kD 的计算分子量的含 438 个氨基酸的多肽。SEQ ID No. 20 含有 Pfam 域,即过氧化物酶_2。所述域包括在木质素降解中。

[0095] 另一方面,如在 SEQ ID No. 23 中说明,编码氯过氧化物酶的多核苷酸具有 780bp,同时如在 SEQ ID No. 24 中说明,编码的蛋白为具有约 29kD 的计算分子量的含 259 个氨基酸的多肽。SEQ ID No. 23 含有 Pfam 域,即过氧化物酶_2。所述域包括在木质素降解中。

[0096] 另一方面,如在 SEQ ID No. 26 中说明,编码氯过氧化物酶的多核苷酸具有 951bp,同时如在 SEQ ID No. 27 中说明,编码的蛋白为具有约 35kD 的计算分子量的含 316 个氨基酸的多肽。SEQ ID No. 26 含有 Pfam 域,即过氧化物酶_2。所述域包括在木质素降解中。

[0097] 另一方面,如在 SEQ ID No. 29 中说明,编码血红素过氧化物酶的多核苷酸具有 1116bp,同时如在 SEQ ID No. 30 中说明,编码的蛋白为具有约 41kD 的计算分子量的含 371 个氨基酸的多肽。SEQ ID No. 29 含有 Pfam 域,即过氧化物酶。血红素过氧化物酶使用由作为辅助底物的无关氧化酶产生的胞外过氧化氢氧化木质素亚单元。所述域包括在木质素降解中。

[0098] 另一方面,如在 SEQ ID No. 32 中说明,编码血红素过氧化物酶的多核苷酸具有 1623bp,同时如在 SEQ ID No. 33 中说明,编码的蛋白为具有约 57kD 的计算分子量的含 540 个氨基酸的多肽。SEQ ID No. 32 含有 Pfam 域,即过氧化物酶。血红素过氧化物酶使用由作为辅助底物的无关氧化酶产生的胞外过氧化氢氧化木质素亚单元。所述域包括在木质素降解中。

[0099] 另一方面,如在 SEQ ID No. 35 中说明,编码血红素过氧化物酶的多核苷酸具有 1599bp,同时如在 SEQ ID No. 36 中说明,编码的蛋白为具有约 57kD 的计算分子量的含 532 个氨基酸的多肽。SEQ ID No. 35 含有 Pfam 域,即过氧化物酶。血红素过氧化物酶使用由作为辅助底物的无关氧化酶产生的胞外过氧化氢氧化木质素亚单元。所述域包括在木质素降

解中。

[0100] 另一方面,如在 SEQ ID No. 38 中说明,编码血红素过氧化物酶的多核苷酸具有 2049bp,同时如在 SEQ ID No. 39 中说明,编码的蛋白为具有约 70kD 的计算分子量的含 682 个氨基酸的多肽。SEQ ID No. 38 含有 Pfam 域,即过氧化物酶。血红素过氧化物酶使用由作为辅助底物的无关氧化酶产生的胞外过氧化氢氧化木质素亚单元。所述域包括在木质素降解中。

[0101] 另一方面,如在 SEQ ID No. 41 中说明,编码血红素过氧化物酶的多核苷酸具有 1605bp,同时如在 SEQ ID No. 42 中说明,编码的蛋白为具有约 57kD 的计算分子量的含 534 个氨基酸的多肽。SEQ ID No. 41 含有 Pfam 域,即过氧化物酶。血红素过氧化物酶使用由作为辅助底物的无关氧化酶产生的胞外过氧化氢氧化木质素亚单元。所述域包括在木质素降解中。

[0102] 另一方面,如在 SEQ ID No. 44 中说明,编码血红素过氧化物酶的多核苷酸具有 960bp,同时如在 SEQ ID No. 45 中说明,编码的蛋白为具有约 35kD 的计算分子量的含 319 个氨基酸的多肽。SEQ ID No. 44 含有 Pfam 域,即过氧化物酶。血红素过氧化物酶使用由作为辅助底物的无关氧化酶产生的胞外过氧化氢氧化木质素亚单元。所述域包括在木质素降解中。

[0103] 另一方面,如在 SEQ ID No. 47 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1713bp,同时如在 SEQ ID No. 48 中说明,编码的蛋白为具有约 64kD 的计算分子量的含 570 个氨基酸的多肽。SEQ ID No. 47 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0104] 另一方面,如在 SEQ ID No. 50 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1860bp,同时如在 SEQ ID No. 51 中说明,编码的蛋白为具有约 69kD 的计算分子量的含 619 个氨基酸的多肽。SEQ ID No. 50 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0105] 另一方面,如在 SEQ ID No. 53 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1824bp,同时如在 SEQ ID No. 54 中说明,编码的蛋白为具有约 67kD 的计算分子量的含 607 个氨基酸的多肽。SEQ ID No. 53 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0106] 另一方面,如在 SEQ ID No. 56 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1737bp,同时如在 SEQ ID No. 57 中说明,编码的蛋白为具有约 63kD 的计算分子量的含 578 个氨基酸的多肽。SEQ ID No. 56 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0107] 另一方面,如在 SEQ ID No. 59 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1665bp,同时如在 SEQ ID No. 60 中说明,编码的蛋白为具有约 61kD 的计算分子量的含 554 个氨基酸的多肽。SEQ ID No. 59 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0108] 另一方面,如在 SEQ ID No. 62 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1803bp,同时如在 SEQ ID No. 63 中说明,编码的蛋白为具有约 65kD 的计算分子量的含 600 个氨基酸的多肽。SEQ ID No. 62 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催

化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0109] 另一方面,如在 SEQ ID No. 65 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1635bp,同时如在 SEQ ID No. 66 中说明,编码的蛋白为具有约 61kD 的计算分子量的含 544 个氨基酸的多肽。SEQ ID No. 65 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0110] 另一方面,如在 SEQ ID No. 68 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1743bp,同时如在 SEQ ID No. 69 中说明,编码的蛋白为具有约 63kD 的计算分子量的含 580 个氨基酸的多肽。SEQ ID No. 68 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0111] 另一方面,如在 SEQ ID No. 71 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1836bp,同时如在 SEQ ID No. 72 中说明,编码的蛋白为具有约 67kD 的计算分子量的含 611 个氨基酸的多肽。SEQ ID No. 71 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0112] 另一方面,如在 SEQ ID No. 74 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 702bp,同时如在 SEQ ID No. 75 中说明,编码的蛋白为具有约 26kD 的计算分子量的含 233 个氨基酸的多肽。SEQ ID No. 74 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0113] 另一方面,如在 SEQ ID No. 77 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1854bp,同时如在 SEQ ID No. 78 中说明,编码的蛋白为具有约 68kD 的计算分子量的含 617 个氨基酸的多肽。SEQ ID No. 77 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0114] 另一方面,如在 SEQ ID No. 80 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 2073bp,同时如在 SEQ ID No. 81 中说明,编码的蛋白为具有约 77kD 的计算分子量的含 690 个氨基酸的多肽。SEQ ID No. 80 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0115] 另一方面,如在 SEQ ID No. 83 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1824bp,同时如在 SEQ ID No. 84 中说明,编码的蛋白为具有约 67kD 的计算分子量的含 607 个氨基酸的多肽。SEQ ID No. 83 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0116] 另一方面,如在 SEQ ID No. 86 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1932bp,同时如在 SEQ ID No. 87 中说明,编码的蛋白为具有约 72kD 的计算分子量的含 643 个氨基酸的多肽。SEQ ID No. 86 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0117] 另一方面,如在 SEQ ID No. 89 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1950bp,同时如在 SEQ ID No. 90 中说明,编码的蛋白为具有约 72kD 的计算分子量的含 649 个氨基酸的多肽。SEQ ID No. 89 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0118] 另一方面,如在 SEQ ID No. 92 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 2016bp,同时如在 SEQ ID No. 93 中说明,编码的蛋白为具有约 74kD 的计算分子量的含 671

个氨基酸的多肽。SEQ ID No. 92 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0119] 另一方面,如在 SEQ ID No. 95 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 2085bp,同时如在 SEQ ID No. 96 中说明,编码的蛋白为具有约 78kD 的计算分子量的含 694 个氨基酸的多肽。SEQ ID No. 95 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0120] 另一方面,如在 SEQ ID No. 98 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1821bp,同时如在 SEQ ID No. 99 中说明,编码的蛋白为具有约 68kD 的计算分子量的含 606 个氨基酸的多肽。SEQ ID No. 98 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0121] 另一方面,如在 SEQ ID No. 101 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1854bp,同时如在 SEQ ID No. 102 中说明,编码的蛋白为具有约 68kD 的计算分子量的含 617 个氨基酸的多肽。SEQ ID No. 101 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0122] 另一方面,如在 SEQ ID No. 104 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1815bp,同时如在 SEQ ID No. 105 中说明,编码的蛋白为具有约 67kD 的计算分子量的含 604 个氨基酸的多肽。SEQ ID No. 104 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0123] 另一方面,如在 SEQ ID No. 107 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1632bp,同时如在 SEQ ID No. 108 中说明,编码的蛋白为具有约 61kD 的计算分子量的含 543 个氨基酸的多肽。SEQ ID No. 107 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0124] 另一方面,如在 SEQ ID No. 110 中说明,编码多铜氧化酶(漆酶)的多核苷酸具有 1752bp,同时如在 SEQ ID No. 111 中说明,编码的蛋白为具有约 64kD 的计算分子量的含 583 个氨基酸的多肽。SEQ ID No. 110 含有 Pfam 域,即多铜氧化酶。该多铜氧化酶(漆酶)为催化酚单电子氧化成苯氧基的胞外非血红素含铜蛋白质。

[0125] 本发明提供的序列也可用作合理修饰或设计新酶以具有使得这些酶在需求过程中有更好表现的特性的准备材料。

[0126] 本公开包括如在随附权利要求书所包含的以及上文描述的那些。尽管已经在特定程度上以其优选形式描述了本发明,但应理解,该优选形式的公开仅通过举例而产生,而且可在不脱离本发明和权利要求书的范围和精神的情况下在构造的细节和各部分的组合和配置方面采取许多改变。

[0127] 本文中引用了多个参考文献,它们的公开内容通过引用全文结合到本文中

实施例

[0128] 以下实施例旨在进一步说明本发明,而绝不是想要将本发明限于本文描述的具体实施方案。

[0129] 实施例 1 引物的设计和合成

[0130] 在该研究中使用的引物通过用完整 ORF 手动选择序列或使用其中类似的基因已

经从其它植物中成功地分离的数据库由手动辅助转录组和由菜豆壳球孢菌 ms6 菌株的基因组序列预测的“基因模型”设计。由转录组获得的核苷酸序列的比较生物信息分析使用 NCBI BLAST、BLASTP、RPS-BLAST、BLASTX 和 PSI-BLAST 进行以鉴定相关基因的同源物并恰当地鉴定基因。每当从“基因池”中寻找多个序列时,核苷酸序列比对都经由 1.82 版 clustalW 进行。随后编辑该比对。基因特异性引物(正向和反向)手动地或经由 Primer 3+ 工具选择且这些引物常规地合成。

[0131] 在本研究中使用的所有寡聚核苷酸都是合成的且由供应商 HPLC 纯化并自 Integrated DNA Technologies (IDT) 获得。在高压处理的 ddH₂O 中制备 100pmol 的储备溶液并将其以等分试样储存在约 -20°C 下以便使用。

[0132] 用作 PCR 的引物的寡聚核苷酸序列

[0133]

基因名称	SEQ ID No.	引物序列	扩增产物(bp)
木质素过氧化物酶	1	正向 GAGACCGCTACACCCACCCCT	1155
		反向 CACCGCACTACGACCTCGCT	
木质素过氧化物酶	4	正向 GTCGTCGCGTGGCTGCTAGA	1276
		反向 CCAGGCATCGGGGA ACTTCGG	
木质素过氧化物酶	7	正向 GGCGGCTCTCTCGCAGACGTA	1234
		反向 GCCCTGCCCAACCGATTCA	

[0134]

氯过氧化物酶	10	正向 TGCTGCCTCCGCTCTGTCGC	1769
		反向 CGCACCATGTCGCCTCTGCC	
氯过氧化物酶	13	正向 AACCGCTTTACCTGCCAGCCA	964
		反向 ATTGGGGTTCGGTGCTCAGGAGT	
氯过氧化物酶	16	正向 ACGGAGCACATGAACACCGTCC	1777
		反向 CTTCGCACCGCGAGCAGAGG	
氯过氧化物酶	19	正向 TCCCGCGAGCCCTTGGTCTG	1644
		反向 GCCCTCGCTGGTTCCTTTGCT	
氯过氧化物酶	22	正向 ATGTTTTGTTTCGCGCCGCT	1265
		反向 AATCTACCACTCCCGTCCCGC	
氯过氧化物酶	25	正向 ACCGCCGCCTTCGTTTACGTC	475
		反向 GCCCGCTTACTTTGCCGGTC	
血红素过	28	正向 TCGCCTGTGCTCACACCACG	1235

[0135]

氧化物酶		反向 TTAACGTCCGCCAAGCACGC	
基因名称	SEQ ID No.	引物序列	扩增产物 (bp)
血红素过氧化物酶	31	正向 CGTTCCCAAGCCCGACGACTC 反向 GGGCAAGTCCCAAGCCCATC	1177
血红素过氧化物酶	34	正向 AATGCGGTTTCTCGGGGGCT 反向 TGTTGCTGGCCCTATGAAGGCAT	1762
血红素过氧化物酶	37	正向 CCATGGCAAGGCATCCCGGC 反向 TGTGGCATCCCAACAGGGGC	1172
血红素过氧化物酶	40	正向 TGGACCTGGCCGTCAAACCG 反向 GCCTCACAGAGCCGCACACTC	1488
血红素过	43	正向 CAGGCATGCGCTACGAGGCT	800

[0136]

氧化物酶		反向 ACCAGCTTACAGACGTGCCCTG A	
多铜氧化酶	46	正向 TGGGCGGGCAGGTACGTGAAT	1935
		反向 TCCGTGCTCTGGCCTCGCAT	
多铜氧化酶	49	正向 GCTGGCGACGACAAGTGGCT	2033
		反向 CCACAGAGTTCGCGAGGCC	
多铜氧化酶	52	正向 CATCCCACCGCGGGAAGCCT	2172
		反向 ATCCCCGCCGTCACGGTTTT	
多铜氧化酶	55	正向 TCGTTGAAGTCGCTGTCCCGT	1944
		反向 GCCCCGCACACCTGCCATAG	
多铜氧化酶	58	正向 TGCTTGCTCAAGGGCGCTCA	2177
		反向 TCAACTCAGACTACTGTCTGAAG TGC	

[0137]

基因名称	SEQ ID No.	引物序列	扩增产物(bp)
多铜氧化酶	61	正向 CACTGGCACGGCTTCACGCA	4930
		反向 CCGCTACGCGGTCGACTCCT	
多铜氧化酶	64	正向 CACCTCCGGTCGGGTAAGT	2116
		反向 TACAGGTGCTATGCCAGCGTGC	
多铜氧化酶	67	正向 TAGCATCGGCACAACGCCCAT	1246
		反向 GAACCGGTGGCCGTGAAGGTG	
多铜氧化酶	70	正向 ACCCACCGCTCGCTCTCACA	2083
		反向 TGGAAATGCGCAGAAGGACCGT	
多铜氧化酶	73	正向 GCACGACATGTGGATTGCGGC	788
		反向 TTGCCAGCCGTGCTCCGTCA	
多铜氧化酶	76	正向 ACGACGTTGCAAGCTCCGCC	2022

[0138]

化酶		反向 CCATCGGGCATAGAAGTCGCCG	
多铜氧化酶	79	正向 TTCACCGGAGTCGCCTTCCCA	2249
		反向 CGACGGGCTGCAGTACGAGA	
多铜氧化酶	82	正向 AATCCCCTCTCACCTCGCCGC	2103
		反向 GGCCACCCCTCAGAGACCGGA	
多铜氧化酶	85	正向 CGCCGAACCAAAGCCTCCTCC	2858
		反向 GCACAGGAGAAAGAGCTCACCC C	
多铜氧化酶	88	正向 TCGCCC GTCCAGGAGAGATA	2208
		反向 CCCCATCTACCGGCCATTC	

[0139]

基因名称	SEQ ID No.	引物序列	扩增产物(bp)
多铜氧化酶	91	正向 ATGAGGGGTAATCGCGACGG	2382
		反向 CCCTCTCACA ACTGACCCTGT	

[0140]

多铜氧化酶	94	正向 TCACTCAGTGCCCTACCGCTCC	1299
		反向 CCGCAACGACTCCGTCCGGT	
多铜氧化酶	97	正向 TGGGCTGATCCCGTTGCAGGA	1405
		反向 GTAGCCGTGGCTGAGCGTGTT	
多铜氧化酶	100	正向 TGCCGTTGCTGTAAACATGCCGT	2099
		反向 GACGGCGCTTTGCTCTTGCG	
多铜氧化酶	103	正向 AGCATGCAATACTCGGTCGGTCT	633
		反向 CGGGCAGCAGGATGTTTGCCAT	
多铜氧化酶	106	正向 GGATACTCTCCGGGCACGTTCG	1703
		反向 ATGGCAGTGGACTGCGCGAC	
多铜氧化酶	109	正向 GGAGGGAGCACTGATGCGCT	1873
		反向 GGCTGCTCCTCCGCTCATGG	

[0141] 实施例 2 来自菜豆壳球孢菌 ms6 的木质素过氧化物酶、氯过氧化物酶、血红素过氧化物酶和多铜过氧化物酶的扩增、克隆和定序

[0142] 总 RNA 从在液体培养基中生长三天的菌丝体中分离,如先前由 Chomczynski P 和 Sacchi N, Single-step method of RNA isolation by acid guanidinium thiocyanate-phenol-chloroform extraction. (Anal Biochem 1987, 162:156-159) 所述。RNA 的品质或完整性通过琼脂糖凝胶电泳检查并使用 Thermo Scientific Nano Drop 2000 按照标准程序量化。cDNA 第一链使用 SuperScript III 逆转录酶 (Invitrogen) 按照生产商说明书合成。基因通过 PCR 使用基因特异性引物从 cDNA 扩增。PCR 反应 (50 μ L) 含有 1 μ L cDNA、20pmole 的每种引物、5 μ L 的 10X PCR 缓冲剂、5 μ L 的 2.5mM dNTP 混合物和 1.0 单位的 PfuTaq DNA 聚合酶。PCR 在 Thermal Cycler (Applied Biosystems) 中使用以下条件进行:在 95 $^{\circ}$ C 下初始变性 5 分钟,接着在 95 $^{\circ}$ C 下变性 30 秒循环 35 次,在 59-61 $^{\circ}$ C 下退火 30 秒和根据目标基因的长度,在 72 $^{\circ}$ C 下伸长 1-2.0 分钟,在 72 $^{\circ}$ C 下最后伸长 7 分钟。PCR 产物通过 1% 琼脂糖凝胶使用 1X TAE 缓冲剂分析且扩增子按照生产商说明书使用 QIAGEN 凝胶提取试剂盒从凝胶中洗脱。将纯化的 PCR 产物连接到 pCR[®]8/GW/TOPO[®] TA 克隆试剂盒 (Invitrogen) 并转化成胜任大肠杆菌细胞 (Invitrogen)。质粒按照生产商说明书使用 QIAprep Spin Miniprep 试剂盒 (QIAGEN) 从推定菌落分离。插入子的存在通过使用基因特异性引物检查且对阳性质粒进行定序。

[0143] 实施例 3 序列的分析

[0144] 核苷酸序列和氨基酸序列分别通过 BLASTN 和 BLASTP 程序分析。将自其它植物报道的序列与 ClustalW 比对。种系发生分析使用 Neighbour Joining (NJ) 进行。

[0145] SEQ ID NO:1

[0146] 长度:1379 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0147] 类型:DNA

[0148] 生物体:菜豆壳球孢菌

[0149] CTGCTCAGCAGATCTTATCCCTCCAGAGCCAGAGCATCTTTAACTGACCAGCTTGCCTTCGTCCCATCG
 TTTGCATTTTTTTTACACTTGACCAGTCAAGGCCCTCTTCCTTCTTTGAGACCGCTACACCCACCCCTTCGTACTGT
 CAAAATGTTATTCTCAAAGTCTTCCATCTTTCTCTCTCCACTGCGGCCAGTGTGCAAGCACTCAGCCTCTCCGATG
 TCTCTCTGCCGCTCGGTCTGAAGCGTGAAGCTTCGGGCTGGGGAACAACCTTCTATCTCTCGTTCACCGTCGG
 GACTCTTGCCCTGATGTTTGGCAGAAAAGTCGCATCCGAGCTGAAGGGCTGGTTCTTGGATGGTTCCGTGTGCAGTGA
 CGACGCACGCGCTGCCATCCGCTCTTTCCACGACTGCTTTTCCGGCGGCTGCGATGGGTCCATCATCCTTGCCC
 ACGAGTACACCCGCTCCGACAACGCTGGCTTAGCAGACTTTGCTATGAAGCTAGCGCCTCTCGCGGACCAGTACGAG
 GTCGGAACAGCTGACCTGATCCAATTGCTGGCGTAAGCCTTATCTATCCACCTTAAACAAAAAAAAAAAAaGGAA
 AAAAAaGACTATCTCTAACACCTACCTCGACCAGCCCTCGCCACGGCCACCTGTCCCCTCGGCCCGCATAGCCGTC
 AAAGTCGGCCGCGGACTCGTCAACGCCCTCGGCAGAGGGACAGCTCCCCTCGTCGCGATCCTCGGCCTCCGTCCT
 GATCGACCAGTTTCGGCGGAAGGGGTTCTCTGAGATAGACCTCGTCGCCCTCGTCGGTGCCACAGCACTGCCAAGC
 AGTTCTTCGATCAGCCCACAAGGCCGCCAAAAGCCTCGACTCCACCCCGGCACTGGGACACCAACTTTTACCGC
 CAGACGACGCTCGGCACTGCGCCCGTTACCCTCGAGAGCGATAAGAACCCTCGCCACGGATCTGAGGACCGCGGTGCA
 GTGGACGGCGTTTAAATGCCAGGGCGTGTGGCCGCGGCGTATGTGAGCGCGTAAGTAGTGCATCATATGTTTCTTC
 TCTGCTCTCAGATTGTTGAGAACTAATGGTCAATGTAGGATGAACAAGATGACCGTTTTGGGCAATGATGTCAGCAG
 CTTGACGGATTGCACGAGTGTATCAGTGCGGCAACGAGCAAGCGCGACATCAAGGCCGCACCTATTGCGGATAGGA
 TTTGAGCTATGCAAGCAGTTCTGGGTGAGCGAGGTCGTAGTGCGGTGACTGGAGTTCTGTTTTTTTTTTTTTTtCTT

AATTGGTAATGTCTGCTCTTGTGGATACCTGCCAGTATTCGCGATTTATTCATCGGGAAGAGTTTAGAGAAGGGGG
CA

[0150] SEQ ID NO:2

[0151] 长度 :939

[0152] 类型 :DNA

[0153] 生物体 :菜豆壳球孢菌

[0154] 特征名 / 键 :CDS

[0155] 定位 : (1)..... (939)

[0156]

atgttattctcaaagtcttccatctttctcctctccactgcgggccagtgtgcaagcactc
M L F S K S S I F L L S T A A S V Q A L
agcctctccgatgtctcctctgcccctcggtcctgaagcgtgaagcttccggcttgggg
S L S D V S S A A S V L K R E A S G L G
aacaaccttctatctctcgttcaccgctcgggactcttgccctgatgtttggcagaaagtc
N N L L S L V H R R D S C P D V W Q K V
gcatccgagctgaagggctggttcttggatggttccggtgtgcagtgacgacgcacgcgct
A S E L K G W F L D G S V C S D D A R A
gccatccgctctctttccacgactgcttttccggcggctgcatgggtccatcctcctt
A I R L S F H D C F S G G C D G S I I L
gcccacgagtaccccgcctccgacaacgctggcttagcagactttgctatgaagctagcg
A H E Y T R S D N A G L A D F A M K L A
cctctcggcgaccagtagcaggtcggaaacagctgacctgatccaattcgcctggcgccctc
P L A D Q Y E V G T A D L I Q F A G A L
gccacggccacctgtcccctcggcccccgcatagccgtcaaagtccggcccgccaggactcg
A T A T C P L G P R I A V K V G R Q D S
tcaacgcccctcggcagagggacagctcccctcgtcgcgatcctcggcctccgtcctgatc
S T P S A E G Q L P S S R S S A S V L I
gaccagttcggcggaaggggttctctgagatagacctcgtcgcctcgtcgggtgccccac
D Q F A A K G F S E I D L V A L V G A H
agcactgccaagcagttcttcgatcagcccgacaaggccggccaaagcctcgactccacc
S T A K Q F F D Q P D K A G Q S L D S T
cccggcacttgggacaccaactttaccgccagacgacgctcggcactgcccggcttacc
P G T W D T N F Y R Q T T L G T A P V T
ctcgagagcgataagaacctcggccacggatctgaggaccgcggtgcagtggacggcgttt
L E S D K N L A T D L R T A V Q W T A F
aatgcccagggcgtgtggcccgcgcgatgtgagcgcgatgaacaagatgaccggttttg
N A Q G V W A A A Y V S A M N K M T V L
ggcaatgatgtcagcagcttgacggattgcacgagtggtatcagtgcggaacgagcaag
G N D V S S L T D C T S V I S A A T S K
cgcgacatcaaggccgcacctattgcggataggatttga
R D I K A A P I A D R I-

[0157] SEQ ID NO:3

[0158] 长度 :312

[0159] 类型 :PRT

[0160] 生物体 :菜豆壳球孢菌

[0161] MLFSKSSIFLLSTAASVQALSLSLVSSAASVLKREASGLGNLLSLVHRRDSCPDVWQKVA SELKGW
FLDGSVCSDDARAAIRLSFHDCFSGGCDGSIILAHEYTRSDNAGLADFAMKLAPLADQYEVGTADLIQFAGALAT
ATCPLGPRIAVKVGRQDSSSTPSAEGQLPSSRSSASVLIDQFAAKGFSEIDLVALVGAHSTAKQFFDQPKAGQSL
DSTPGTWDTNFYRQTTLGTAPVTLES DKNLATDLRTAVQWTFNAQGVWAAAYVSAMNKMTVLGNDVSSLTDCTS
VISAATSKRDIKAAPIADRI*

[0162] SEQ ID NO:4

[0163] 长度 :1416 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0164] 类型 :DNA

[0165] 生物体 :菜豆壳球孢菌

[0166] TCTATATCTTGCCCTTCGCCTGTTTCGCTTCAGGAGAACCCAACGCCAACATTCAATTCTCAACCTCCTCT
TTGAGTTACAATCGCTACTCTGGGAAATTTGTCCCAGCCTTTCATTCAACAACACTGTTTCTGTTTCAAACCAATCCGA
CGCCATGAAGTTCTCCACAGTCATCTCGAGCGTTGCTCTCACTTCTCTACTCCAGCCCCGCCCTTGCCCTACCCTGGCA
TGGCAAATGTCGTCTCGGAGATCAAGGCCGTCAAAAACACCAATAATGATGGTGACTCAAATCCCGAGATGATTGGC
GATCTCGCCACCACCGGCCCAACCACCCCTGTGGGCCAAAGCATATACAACATCCTGATGGGGACCGAGTCGGCCGA
GACCAAGCAGGCTGGCTACATCCCCCTCTTATCGGCACCAACGCCTGCAAGAGGGACACCTGCTGCATCTGGGCCCT
ACATCGCCGCCGAACCTGACCCTCAATTTCAAGGGCATCACGGGCGCTGCAACAAGAACGCGCGTGCCGCCATTCGG
CTCGGCTTCCACGACGCGGGGACTTGGTCCAAGAGCAGCAACGGCGGGCGCGGACGGCTCGATCGCGCTGTCCGG
CACGGAGATCAACAAGGCCGAGAACAACGGGCTGCAGGACATCATCGGCAAGATGATCACGTGGCAGAAGCGGTACG
GGGTGGGCATGGCGGATCTGATCCAGTTTCGCGGCCATCCACGCCGTGGTGACGTGCCCGCTGGGGCCGCGCATCCGC
TTCTTCGTGGGCGCAAGGACAGCAAAAACGGCCAACGACGTCAGCCTGCTGCCGGGCGTCAACGATTCGGCCGACAA
GCTGATCGCGCTCTTCCAGGACAAGACCATCACGCCGCACGAGCTCGCCGCCCTGCTCGGCGCCCACACCACCTCAC
AGCAGTTCTTCGTGACACCACCCGCGCCGGCGCCCCCAGGACAGCACCCCGGCGTCTGGGACACCCGCTTCTAC
AACCAACCACCTCCGACCAAGTTCCCAAGAAGGTCTTCCGCTTCGCCAGCGACGTTGTGCTGGCCAAGGACCCGCG
TATGAGTGATGAGTGGGCCGCTTCGCCGACCCCGTCAAGGGCCAGAACCCTGGAATGAGGATTACGCCACCCGCT
ATACCCGCTCAGCCTGCTCGGCGTCAACAACATCAATAACTTGACTGAGTGCAGCAAGGTGCTGCCGTGGGCGCAA
CCGAAGTTCCCGATGCCTGGAACCTGTTCTTGGACCAGTAGAGTGTAGTTTCTTCTTAATATCTGGCGTTCTTGGG
GGTTTGGTCAAAAAGGAGAAAGATATTATTGTCGATATTTGGTATACCCTAATGTTGGGAACATAACATACGTATAC
AGGCTTCTTGTAACTACTCGGGCATCTTTTGCACAGAG

[0167] SEQ ID NO:5

[0168] 长度 :1116

[0169] 类型 :DNA

[0170] 生物体 :菜豆壳球孢菌

[0171] 特征名 / 键 :CDS

[0172] 定位 : (1) (1116)

[0173]

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atgaagttctccacagtcacatctcgagcggttgctctcacttctctactccagccccccctt
M K F S T V I S S V A L T S L L Q P A L
gcctaccctggcatggcaaatgtcgtctcggagatcaaggcccgctcaaaacaccaataat
A Y P G M A N V V S E I K A R Q N T N N
gatggtgactcaaatcccagatgattggcgatctcgccaccaccggcccaaccaccctt
D G D S N P E M I G D L A T T G P T T P
gtgggcccagcatatacaacatcctgatggggaccgagtcggccgagaccaagcaggct
V G Q S I Y N I L M G T E S A E T K Q A
ggctacatccccctcttatcggcaccaacgcctgcaagagggacacctgctgcatctgg
G Y I P P L I G T N A C K R D T C C I W
gcctacatcgccgccaactgacctcaatttcaagggcatcacgggcccgtgcaacaag
A Y I A A E L T L N F K G I T G R C N K
aacgcgctgcccattcggctcggcttccacgacgccccgacttggccaagagcagc
N A R A A I R L G F H D A G T W S K S A
aacgcggcgccgacggctcgcgctgctcgggcacggagatcaacaaggccgag
N G G G A D G S I A L S G T E I N K A E
aacaacgggctgcaggacatcatcggcaagatgatcacgtggcagaagcgggtacggggtg
N N G L Q D I I G K M I T W Q K R Y G V
ggcatggcggtctgatccagttcggggccatccacgccgtggtgacgtgcccgtgggg

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[0174]

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G M A D L I Q F A A I H A V V T C P L G
ccgcgcatccgcttctcgtcggcgcaaggacagcaaaacggccaacgacgtcagcctg
P R I R F F V G R K D S K T A N D V S L
ctgccggcgctcaacgattcggccgacaagctgatcgcgctcttccaggacaagaccatc
L P G V N D S A D K L I A L F Q D K T I
acgcccacgagctcggccctgctcggcgcccacaccacctcacagcagttcttctgctc
T P H E L A A L L G A H T T S Q Q F F V
gacaccaccgcgccggcgccccccaggacagcacccccggcgctctgggacaccocgcttc
D T T R A G A P Q D S T P G V W D T R F
tacaaccaaaccacctccgaccaagttcccagaaggtcttccgcttcgcccagocgctt
Y N Q T T S D Q V P K K V F R F A S D V
gtgctggccaaggaccgctatgagtgatgagtgggccgcttcgcccagcccgctcaag
V L A K D P R M S D E W A A F A D P V K
ggcagaaccactggaatgaggattacgccaccgctatacccgccctcagcctgctcggc
G Q N H W N E D Y A T A Y T R L S L L G
gtcaacaacatcaataacttgactgagtgagcaaggtgctgcccgtggggcgcaaccgaag
V N N I N N L T E C S K V L P W A Q P K
ttccccgatgcttggaaacctgttcttggaccagtag
F P D A W N L F L D Q-

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[0175] SEQ ID NO:6

[0176] 长度 :371

[0177] 类型 :PRT

[0178] 生物体 :菜豆壳球孢菌

[0179] MKFSTVISSVALTSLLQPALAYPGMANVVSEIKARQNTNNDGDSNPEMIGDLATTGPTTPVGQSIYNIL
 MGTESAETKQAGYIPLIGTNACKRDTCCIWAYIAAELTLNFKGITGRCNKNARAAIRLGFHDAGTWSKSSNGGGAD
 GSIALSGTEINKAENGLQDIIGKMITWQKRYGVGMADLIQFAAIHAVVTCPLGPRI RFFVGRKDSKTANDVSLLPG
 VNDSADKLIALFQDKTITPHELAALLGAHTTSQQFFVDTRAGAPQDSTPGVWDTRFYNQTTSDQVPKKVFRFASDV
 VLAKDPRMSDEWAAFADPVKGNHWNEDYATAYTRLSLLGVNNINNLTECSKVL PWAQPKFPDAWNLF LDQ*

[0180] SEQ ID NO:7

[0181] 长度 :1323 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0182] 类型 :DNA

[0183] 生物体 :菜豆壳球孢菌

[0184] TCGAGATGGCGGCTCTCTCGCAGACGTAAATCTATAAAGCCTTGCCGCGACTTTCTTTTGTGTATCTCA
TCAGCATCGAGTTCCACAAGAGCTTGCTTCCTCTCCTCACTGAGCCTAGCGAGGAGCATCACTCAGAACCCTCCAAT
CACAATGCGGACCTCATCCCTGTTCTTGCTTCCGCATGCGGAACATCTGCTTACACTCTCGTCTCGCTCGACTCTC
TGCCAAGCACTCTTCATGACATAACCTCCCGCACCATCTCCAACCTCGACCCCGCAACCTCCTCTCCGCGCGCAAG
ACGCCCCGACTGCCCGCCATCTGGAGGACCATCTCAGCCGACCTGACCAAGAGCTTCCTCGCCAACGGCGAGTGCAC
CGACCTCGCCCCGCGCCGATCCGCTACGCTTCCACGACGCGGGCACCTTCTCGCTCAAGCTGCCACCTACGCGC
CGGCTCCGCGGCGCCGACGGCTCGCTGCTGCTCGTTCGATTCGGAGATCCAGCGGCCCGAGAACAACGGGCTGCAG
GCGTACAACGACTTCATCAAGGCCAAGTACAGCACGTACAAGTCTCGGGCGTCGGCGCCCGGACCTGATCCAGTT
CGCCGGCAACCACGCCGTGGTGACGTGCCGGGCGGGCCACGGTCAAGACGCTCGTCGGCCGCGGCGACAGCACGA
CCGCGTCGCCGCTGAACGTGATGCCCGGGGTTTCGGCGGGGACGCGACCACGACTCGCTGCTCCAGCTCTTCCAG
GACAAGGGGTTTCAGCGCCGTCGACCTGGCCGCGCTGATCGGCGCCACACCACCTCCACGAACATCGCGGAGGCGCA
GATCCCCGTCGGCGCGCCGAGGACAGCACGCCGGCAGGTGGGACGTCAAGTACTACGCCGAGACGTACGCCCCGC
CCGCGGGCGTCTCCCGCTTCGCTCCGACATCAACCTCTCCGACCCGACGAAAGCGGTCGGCAAAGAGTTCCAGGGA
TTCGTCAACAACCAGGGTAAGTGGACGGGCAAGTTTGCCGACGCCATGTTCCGTCTGAGTGTGTTGGGCATCCCGCC
GGCGACGTACAAGAATTTTCGCGGACTGCACCGCTGCGCTGCCAAGGGCACGAGCGCCAAGCGGGACATCCGCAGCG
CCCCGATCAACGACCGCGCAAGGTAGAGGAGGGGAAAAGAAAGGAAGAAAAGAAAATAAAAAGCGCAGCGAGGATGA
ATCGGTTGGGGCAGGGCGTTTCGGTTGAGGTTGTTGTTTGCTCGCCTGCCTTTTTTTTTTTTTTTtAATCCCTCTCAT
GATCCATCGAATGAGAACACTT

[0185] SEQ ID NO:8

[0186] 长度 :1023

[0187] 类型 :DNA

[0188] 生物体 :菜豆壳球孢菌

[0189] 特征名 / 键 :CDS

[0190] 定位 : (1) (1023)

[0191]

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atgCGGacctcatccctgttccttgcctccgcacatctgcttacactctcgtc
M R T S S L F L A S A C G T S A Y T L V
tcgctcgactctctgccaagcactcttcatgacataacctcccgaccatctccaacctc
S L D S L P S T L H D I T S R T I S N L
gacccccgcaacctctctccgcgcgcaagacgcccgactgcccggccatctggaggacc
D P R N L L S A R K T P D C P A I W R T
atctcagccgacctgaccaagagcttccctcgccaacggcgagtgcaccgacctcgccccg
I S A D L T K S F L A N G E C T D L A R
gccgccatccgctacgccttccacgacgcgggcaccttctcgctcaagctgcccacctac
A A I R Y A F H D A G T F S L K L P T Y
gcgcccggcctccggcgggcgccgacggctcgctgctgctcgctcgattcggagatccagcgg
A P A S G G A D G S L L L V D S E I Q R
cccgagaacaacgggctgcaggcgtacaacgacttcatcaaggccaagtacagcacgtac
P E N N G L Q A Y N D F I K A K Y S T Y
aagtcctcgggctcggcgccgacctgatccagttcggcggcaaccacgcccgtggtg
K S S G V G A A D L I Q F A G N H A V V
acgtgccccggggggccacggtaagacgctcgctcggccgcgggcgacagcacgaccgcg
T C P G G P T V K T L V G R G D S T T A
tcgccgctgaacgtgatgccgccccgggttcggcgcgggcagcgaccacgactcgctgctc
S P L N V M P P G F G A G S D H D S L L
cagctcttccaggacaaggggttcagcgccgtcgacctggccgcgctgatcgggccccac
Q L F Q D K G F S A V D L A A L I G A H
accacctccacgaacatcgcgaggcgcagatccccgctcggcgcgccgcaggacagcacg
T T S T N I A E A Q I P V G A P Q D S T
ccgggcaggtgggacgtcaagtactacgccgagacgtacgccccgcccggggcgtctcc
P G R W D V K Y Y A E T Y A P P A G V S
cgcttcgctccgacatcaacctctccgacctcgacgaaagcgggtcggcaaagagttccag
R F A S D I N L S D P T K A V G K E F Q
ggattcgtcaacaaccagggttaagtggacgggcaagtttgccgacgccatggttcgctcg
G F V N N Q G K W T G K F A D A M F R L
agtgtgttgggcatcccgcggcgacgtacaagaatttcgcggaactgcaccgctgcgctg
S V L G I P P A T Y K N F A D C T A A L
cccaagggcacgagcgcgaagcgggacatccgcagcgcgcccgatcaacgaccgccaagg
P K G T S A K R D I R S A P I N D R A R
tag
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[0192] SEQ ID NO:9

[0193] 长度 :340

[0194] 类型 :PRT

[0195] 生物体 :菜豆壳球孢菌

[0196] MRTSSLFLASACGTSAYTLVSLDSLPLSTLHDITSRTISNLDPRNLLSARKTPDCPAIWRTISADLTKSF
LANGECTDLARAAIRYAFHDAGTFSLKLPTYAPASGGADGSLLLVDSEIQRPENGLQAYNDFIKAKYSTYKSSVGG
AADLIQFAGNHAVVTCPPGPTVKTLVGRGDSTASPLNVMPPGFGAGSDHDSLLQLFQDKGFSAVDLAALIGAHTTS
TNIAEAQIPVGAPQDSTPGRWDVKYYAETYAPPAGVSRFASDINLSDPTKAVGKEFQGFVNNQKWTGKFADAMFRL
SVLGIPPATYKNFADCTAALPKGTSAKRDIRSAPINDRAR*

[0197] SEQ ID NO:10

[0198] 长度 :1930 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0199] 类型 :DNA

[0200] 生物体 :菜豆壳球孢菌

[0201] GAGCACGGCAGGTAGGTTGCATCCGAGAGGTCGTGGTAGGTAGGTATATATTGCTGCCTCCGCTCTGTC
GCTCTATAGAGGCAGGTCTTGGACATCTGTGAACAGGTTACCTTCTATAATTTGATCCATTGGCGAAGATATACTC
AAGAATGCCGTCTACCTGGATGATTGCATTGGGCGCACTACCcTTGCCGGCCAGTCCGCAGCCTTTCTGCTGTGG

CAGAACAATACGCTGCTCAGACATCTCACAAGGAGAAAAGAGTAAATGCAATTAGCCCCGGGTCAATGCGGCGGCA
CAGAGGATTGACGTCTCGGGAGCTCACACTTTCGTGCCCCCTGGCCCCGGTGACCAGAGAGGGCCCTGCCCGGGTCT
GAATGCCTTAGCGAACCAGTAAGTGTCTCTGCAAGTCTCACAGGTCTTCTTGTACTGACAAAGTGTAGCAACTATTTG
CCCCAGTGAGTTCTCCACAACCTTCATTCCCGAAACCTTGTCACTGATTGTCTTCAGCAATGGCGTCGCAACAATCAC
GCAGTTTCGTCCAGGCCACAAACCAGGGTTAGTACAGCATCACCGCCACGGAAGCTACTACGTGAGTGAACCACATA
CGCAGTATACGGCATGGGTCTCGACCTTGGCACGTTTCTGTCCGTCTACGGCGCGGTAATGGATGGCGACGGCCTCA
GCTGGTCCATCGGCGGCGCGCCAGTACCGCAAACCTACTCAACCTCCTTACTCAGCCGCAAGGCCTCTCAGGTTCCG
CACAACAAGTACGAGACAGATGCATCGCTACGCGCGGAGACCTGTACCAATAGTGCCTATCCCCTTCTTCTGCC
TCCCGCCACTCCGCTGACCTGCACCGCAGTGGCGACAACCTCCCGGGTTCGTATTTGCAATGGGACGCCCTCTTCGC
GAAGCAAGCGGCACTGCCAATGACCAGTCCAATTATGGCCTAGGTGTGCTGACCGACTTCCGAGTCGAGCGTTTCC
AGCAGAGCGTCGATGAAAACCCCTACTTCTTCAACGCGCCCTTTTCCGGTGTGCTCGTGCAGCCTGCCGCGTACACA
TTCATCTACCGCTTCATGGGCAACAAGAGCGCCGAGAAACCCGAGGGTGTGCTGACGAAAGAGGTGCTGAAGAGCTT
CTTCGGCTTCACTGGCCTGACGACGACATGACATACGTGAGTCCCATCCCGCCGCTTTCTCATTTCTTCCCCTC
GAGTCTCCACATCCCCCCCCCCCCCCCCCCCCCcAcATTGTGTCGCCCTTCCCTCCAGCCACGCCACTGC
CCACAACGCCACCGTCTGACCCACCGCAGAACCCCGGCCACGAGCGCATCCCCGAAAACCTGGTACAAGCGCGCCCC
GGCGACGAATACACGATCCCCTTCTACGCACTTGACCTCAACGCCGCGGCGCTGCAGCACCCGCAATTCCTGTCCGT
CGGCGGAACACGGGCACCACCAACTCCTTCGCCGGCGTCGACCTGCAGGACCTGAGCGGCGGCCTGTACAACGCCG
CCAGCCTGCTCGAGGGCAACAACCTCGCCTGCTTCGGTTTCCAGGGCGCGTCCAATTCGCGCCGGACCTGTTGAAA
GGGCTGGTGAGCGATTTGACCAAGCCGTTGGGTGTCTGGGAGATGCGTTGGCGAGTGCCTTGAATGGATTAGGGTG
TCCGCAGTTAGGCGGCCAGGCGTGGGATGATAGCGGCTGGCGCAGTTTCCGGGGTATGCTAGGCTGAGGGCGGATG
GGACGTACGGGAAGTAATGGACGCGGAGAAGTAGTGTGGCAGAGGCGACATGGTGCATGGTGGACTGCGGCTTCA
ACGACAATGCAGAGATGATGGTATGAGGAAACTGCACAGCAGTCTGCATGGATTTGCTAGACTAGACGAATTTTATG
ATTTTGAATGAAC

[0202] SEQ ID NO:11

[0203] 长度 :1260

[0204] 类型 :DNA

[0205] 生物体 :菜豆壳球孢菌

[0206] 特征名 / 键 :CDS

[0207] 定位 : (1) (1260)

[0208]

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F P A V A E Q Y A A Q T S H K E K R V N
gcaattagccccgggttcaatgcggcggcacagaggattgacgtctcgggagctcacact
A I S P G F N A A A Q R I D V S G A H T
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F V P P G P G D Q R G P C P G L N A L A
aaccacaatggcgtcgcaacaatcacgcagttcgtccaggccacaaaccagggtatacggc
N H N G V A T I T Q F V Q A T N Q V Y G
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M G L D L G T F L S V Y G A V M D G D G
ctcagctggtccatcggcggcgcgcccagtagccgcaaacctactcaacctccttactcag
L S W S I G G A P S T A N L L N L L T Q
ccgaaggcctctcaggttcgcacaacaagtacgagacagatgcatcgcctacgcgcgga
P Q G L S G S H N K Y E T D A S P T R G
gacctgtaccaatattggcgacaactcccgggtcgtcatttcgcaatgggacgcccctcttc
D L Y Q Y G D N S R V V I S Q W D A L F
ggaagcaagcggcactgccaatgaccagttccaattatggcctaggtgtgctgaccgac
A K Q A A L P N D Q S N Y G L G V L T D
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F R V E R F Q Q S V D E N P Y F F N A P
ttttccgggtgctcgtgcagcctgcccgcgtacacattcatctaccgcttcatgggcaac
F S G V L V Q P A A Y T F I Y R F M G N
aagagcgcgagaaaaccgggggtgtgctgacgaaagaggtgctgaagagcttcttcggc

[0209]

K S A E K P E G V L T K E V L K S F F G
ttcaactgggectgacgacgacatgacatacaaccggccacgagcgcacccccgaaaac
F T G P D D D M T Y N P G H E R I P E N
tggtacaagcgcgccccggcgacgaatacacgatcccccttctacgcacttgacctcaac
W Y K R A P G D E Y T I P F Y A L D L N
gccgcggcgtgcagcaccgcaattcctgtcgcgtcggcggcaacacgggcaaccaccaac
A A A L Q H P Q F L S V G G N T G T T N
tccttcgcccggcgtcgacctgcaggacctgagcggcggcctgtacaacgcccagcctg
S F A G V D L Q D L S G G L Y N A A S L
ctcgagggcaacaacctcgccctgcttcgggttccaggcggcctccaattcgcgcccggac
L E G N N L A C F G F Q A A V Q F A P D
ctggtgaaagggctggtgagcgatttgaccaagccggttggtgctcctgggagatgcggtg
L L K G L V S D L T K P L G V L G D A L
gcgagtgcggtgaatggattaggggtgctccgcagttaggcggccaggcgtgggatgatagc
A S A L N G L G C P Q L G G Q A W D D S
gcgctggcgcagtttccggggatgctaggctgagggcggatgggacgtacgggaagtaa
A L A Q F P G Y A R L R A D G T Y G K-

SEQ ID NO: 12

[0210] 长度 :419

[0211] 类型 :PRT

[0212] 生物体 :菜豆壳球孢菌

[0213] MPSTWMIALGALTLAQSAAFPVAEYAAQTSHKEKRVNAISPGFNAAAQRIDVSGAHTFVPPGPGDQ
RGPCPGLNALANHNGVATITQFVQATNQVYGMGLDLGTLFSLVYGAVMDGDLSWSIGGAPSTANLLNLLTQPQGLSG
SHNKYETDASPTRGDLYQYGDNSRVVISQWDALFAKQAALPNDQSNYGLGVLDFRVERFQQSVDENPYFFNAPFSG
VLVQPAAYTFIYRFMGNKSAEKPEGVLTKEVLKSSFFGFTGPDDDMTYNPGHERIPENWYKRAPGDEYTIPIFYALDLN
AALQHPQFLSVGGNTGTTNSFAGVDLQDLSGGLYNAASLLEGNNLACFGFQAAVQFAPDLLKGLVSDLTKPLGVLG
DALASALNGLGCPQLGGQAWDDSALAQFPGYARLRADGTYGK*

[0214] SEQ ID NO:13

[0215] 长度 :1108 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0216] 类型 :DNA

[0217] 生物体 :菜豆壳球孢菌

[0218] CTGATGGTATGTACTTTGGTAAGCACGCCATTAACACTCGCTCCATCGCCTCGAGTTACCCTGTTGGA
GCAGCAACCACAACCTTGAGCGAACAATTCGGCCATTAATACCATCGTACGAAGAAGGCTTAACCGCTTTACCTGCC
AGCCATGAATCCAATCTGCTTTTTATCCCTGCTCACGGCCATGCTAGGCATGGCCATGGGCGGTGGAAACCCTCTGA
ACCATGCTGAACCTTTTGATCCCACGAACAGCTTGTGGGTGTGACTGATGCGCATGAGCCATTCTTCCTGATATCA
CCAACGCTCGCAGCCCCTGTCCCGGCTTAACACGTTGGCGAACCAGGAAGCTCATTGCCCCCTTGCTATGAAGAA
AACCTGGAATTTACGCTCCTCCCGGTGGCTTCGACGGTGTGCGGAACACTACGATGAACTTGTTAAGGCTCTGGTTGAT
AGTGTGTTGCTTTTGATCGGGGTCACCACCTTTCGGTTGACGAGAACATCACGATTCCGCCTAATAATTTACACG
CAGCCTCAGCGGCACACAAATCTCCCTAGATTCTGAGGCCTCGCCTACACGCCACGACGCGTACGACCCTCGGGCCT
ACTCCGGCTCGAGCAGCATCGAAATGAAGTGGAACTTCTTCAAACAGCTGTACGAGAAGCAGGCCGGGATCCCACGC
GATGCGGTAACTTTGCACTGGATGTTCTTGCTCAAAACATGTTGGAGCTGGTGGTGGTCAGCATCAAGAACAACCC
GAACTTCTTCCTGAGCCCAACGCACATCGCATTCCGGACCATCGACGGCCCACATGTGCATTCCCAACTTGTTGCGGA
ACCACAGCACTGAGCATTGGCTGACCTCTCTCCTGAATAGAGAGGGAGGGTCTCGCCATTTCATTCCATGCTCAA
ACTATGACGCTTTGTAGTCTTCAGCTCAGATTGTCACCAATCTGAAGGCGAGATCCCCTTCTATACTCAGATTAAGAC
CTAATAATACAATCGTATACTCAGCGAGAGAAGCACGAGAAGGACCGAGCCAACATTACCTCATCCTTCACACAAC
ACACTCCTGAGCACCGACCCCAATTCTAAATCAGCCCC

[0219] SEQ ID NO:14

[0220] 长度 :690

[0221] 类型 :DNA

[0222] 生物体 :菜豆壳球孢菌

[0223] 特征名 / 键 :CDS

[0224] 定位 : (1) (690)

[0225]

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ggaaaccctctgaaccatgctgaaccttttgatcccacgaacagcttaaacctggaatt
G N P L N H A E P F D P T N S L K P G I
tacgctcctcccgggtggcttcgacgggtgctcggaactacgatgaacttgtaaggctctg
Y A P P G G F D G V A N Y D E L V K A L
gttgatagtgtgttgcttttgatcgggggtcaccaccttcggttgacgagaacatcacg
V D S V L L L I G G H H L S V D E N I T
attcgcctaataatcacacgcagcctcagcggcacacaaatctccctagattctgag
I P P N N F T R S L S G T Q I S L D S E
gcctcgcctacacgccacgacgcgtacgacctcgggctactccggctcgagcagcattc
A S P T R H D A Y D P R A Y S G S S S I
gaaatgaagtggaacttcttcaaacagctgtacgagaagcaggccgggatcccacgcgat
E M K W N F F K Q L Y E K Q A G I P R D
gcggttaactttgactggatgttcttgctcaaacatggttgagctgggtgggtcagc
A V N F A L D V L A Q N M L E L V V V S
atcaagaacaaccgaacttctcctgagcccaacgcacatcgcattcggaccatogaag
I K N N P N F F L S P T H I A F G P S T
gccacatgtgcattcccacttctcctgagcccaacgcacatcgcattcggaccatogaag
A H M C I P N L F A N H S T E H W L T S
ctcctgaatagagagggaggggtctcgcattcattccatgctcaaacatgaagctttgt
L L N R E G G S R H S F H A Q T M T L C
agtcttcagctcagattgtcaccaatctga
S L Q L R L S P I-

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[0226] SEQ ID NO:15

[0227] 长度 :229

[0228] 类型 :PRT

[0229] 生物体 :菜豆壳球孢菌

[0230] MNPICFLSLLTAMLGAMGGGNPLNHAEPFDPTNSLKPGIYAPPGGFDGVANYDELVKALVDSVLLLI
 GHHLSVDENITIPPNNFTRSLSGTQISLDSEASPTRHDAYPDRAYSGSSSIEMKWNFFKQLYEKQAGIPRDAVN
 FALDVAQNMLELVVVSIKNNPNFFLSPTTHIAFGPSTAHMCIPNLFANHSTEHWLTSLLNREGGSRHSFHAQ
 TMTLCSLQ
 LRLSPI*

[0231] SEQ ID NO:16

[0232] 长度 :1554 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0233] 类型 :DNA

[0234] 生物体 :菜豆壳球孢菌

[0235] AAGCCTTGCTGGATCGACCTTTTCAATTCCGGCAGATACACCAAGTCATTGAACATCGAAACAGTAC
 TTGCTTCGTCAAATATGCGGTCACTCTTCTTGCTTCTTATTACTTTCTGCGGCGTCCGCTTTCCCTTTCTGTCG
 AGATATGCCAGAGGTAGACTCTTCTCTCTCCGTGAAGCACCCGTACGTAGGCAACAACCTGGCGGCAACCAACCTG
 GCGGAGCGGCGACTTGCCCTTTCAATGCCAACACGTCCCCGCTGCGCCAGTGACAGCTCGATTTCCCTATAACAAC
 GCAAAGAACGGAGTTCCCGCAACGAAAGGGCGGTTACCAGGTTCCAGCGCCTGGTGACACGGCTCATCAGTTCAT
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 GTAGTCCCATTTCGAGTTTCAAGTCTCCTGACGGTGACCCTAAACAGTTCTCGCGCGGACGGCATAGTGACCTTC
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 CACGCTCACCGACGGTGACCCATCACCAAAAACTGTCTATCGGCTGCGACGCAACGACACGCACATCTGTGGCC
 CCCTGCTGACTGGCAGTCAGCCCGGTCTGGATGGCCACAACAAGTTCGAAGCGGACACGTCGCTCACACGCAACGAC
 TACTTCTGGCGGGCGGCGACAACCTCAACTCAACGGCACGCTCTTCGGCATGATGGTGGATACGTGCCAGGGCAA
 CTTCAACCGTGAGAACCTGGCGCTGTACCGCAAGCAGCGCTACGACCAGAGCCTACGCGACAACGAGAACTTCTACT

TCGGCCCCGCTAAGCCTGCTGCTGTTTCGGCGCCGCCAGCTTCCTTTACGAGCTGATGCCAGCGGCACGCACAACACTAC
GCGCCCGATCTCGACACCATCTCGTCTTCTTCGGCGCCGAGCAGGCGCCCGATGGCTCCTGGCGCTTCACCGCCGA
GCGTATCCCGGACAACACTGGACCAACCGTGTGCTGCCGTACACCAATGAGGACGTGACGCGCGAAATCCTGGCTATGT
ACCTCCTCAACCCTGTGCTATTTGGCGGCCACAGGCGACGGCGGCTTCAACACGCTGCCGAAGTTTGGCTCCATC
CAGGACGGCAAGATCGTTGAGGCACCCAATACGCTGTGCCTGCTGTACCAGCTGTGACGCGAGAGCGTGCCGAGCTC
GCTGAATGGCATCATCACGCCGACTGTGGATGCGCTGAACCTGGTCGCGGATAAGCTAGCGCCGCAGTTCAAGAACT
TGGGGTGCCGAATCCGTTGACTTGAATGAGTGATGGCCGTGTAGAGCCTCTGCTCGCGGTGCGAAGGAAAAGAAAA
AAGTGAGGGGATTTTTGGCGAGAAATGAAATTCACGAAGATACTGCCCGGATGGTAGAGGGAAACTTGGTCATGCAT
GTGCATGCGAAGGCGTTGATAT

[0236] SEQ ID NO:17

[0237] 长度 :1194

[0238] 类型 :DNA

[0239] 生物体 :菜豆壳球孢菌

[0240] 特征名 / 键 :CDS

[0241] 定位 : (1) (1194)

[0242]

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 G N Q P G G A A T C P F N A N H V P A A
 ccagtgacagctcgatttccctataacaacgcaaagaacggagttcccggaacggaaag
 P V T A R F P Y N N A K N G V P G N G K
 ggcggttaccaggttccagcgcctggtgacacggctcatcagttcattgcaccaacagcg
 G G Y Q V P A P G D T A H Q F I A P T A
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 R D G I V T F N E L V D A Q Q N V Y N V
 ggctacgacctctctgtgctgctcgccgctcctcgccctcacgctcaccgacggtgacccc
 G Y D L S V L L A V L G L T L T D G D P
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 I T Q K L S I G C D A T T R T S V A P L
 ctgactggcagtcagcccgtctggatggccacaacaagttcgaagcggacacgctcgctc
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 T R N D Y F L A G G D N F N F N G T L F
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 G M M V D T C Q G N F N R E N L A L Y R
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 L L L F G A A S F L Y E L M P S G T H N
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 G G A T G D G G F N T L P K F G S I Q D
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 G K I V E A P N T L C L L Y Q L S T Q S
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 V P S S L N G I I T P T V D A L N L V A
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[0243] SEQ ID NO:18

[0244] 长度 :397

[0245] 类型 :PRT

[0246] 生物体 :菜豆壳球孢菌

[0247] MPEVDSSLFREAPVRRQQPGGNQPGGAATCPFANANHVPAAPVTARFPYNNAKNGVPGNGKGGYQVPAPG
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 IGCDATTRTSVAPLLTGSQPGLDGHNKFEADTSLTRNDYFLAGDNFNFNGLTFLGMMVDTCQGNFNRENALYRKQR
 YDQSLRDNENFYFGPLSLLLFGAASFLYELMPSGTHNYAPDLDTISSFFGAEQAPDGSWRFTAERIPDNWTRNRLPY
 TNEDVTREILAMYLLNPVLFGGATGDGGFNTLPKFGSIQDGKIVEAPNTLCLLYQLSTQSVPSLNGIITPTVDALN
 LVADKLAPQFKNLGCNPLT*

[0248] SEQ ID NO:19

[0249] 长度 :1792 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0250] 类型 :DNA

[0251] 生物体 :菜豆壳球孢菌

[0252] ACCGACCACCATCCATTCGCTCTTTTCGCTGGCGGCTGGCGTCCAAGGCTCACTCTCACTCTAGTCACTC
TTTGCAATCTCTGAATTCCCGCGAGCCCTTGGTCTGCGTTGTTAAGGATTTGTTGTCCGGGCATCCCCTCTCTTTTC
CGCAATGAAGTTCTCGTCCGCCCTTCTCCTGCTCTCCTCGAGCTCCCTTGTCGTCGATGCCTTCCCCGCCCTCGGTG
CGCAGAACCTTGAGGGCCTCACTCCGAAAGGTTGACCGCTGCCCTCAAGACGGTCGAGAAGTACAGGAAGGAGAAG
CGCCTTATCATCGACTCCAGCAAGCCTATCGATACCACCGGCGACCACGCTTCCAGCCACCCAGCGAAACCGACCA
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CACTCAAGAAGTTTTCAAGAAGTTCTTCGCCGTCTACGAGGACGAGCAGGGCAACATGGAATACCGCAAGGGCCACG
AGACCTTCCCGACAACCTGGTACCGCAAGCCGGTCGAGTATGGCCTGGTCCCGCTCAACTGGACCTCGTTGGCTGG
GTCTTGAAGCACCTGAGCTGGGAAGGTACGTCGTCCCTTCTCACCCCAAGATGGGAAGGCATGTGAACTGACTCGG
CTTCCACAGCATCGGCGGTAACACTGGCACCGTCAACTCCTTCTCCGGCCTCGATCTGCACAGCATCACCGGCGGC
GTCCTCAATGCCACTTCGCTCCTCGAGAACAACAACCTGCTGTGTTTTGTCTTTGAAGTTCTCAAGACCTTCGCCCC
CAACTCCCTCTCCCCGCTCCTGTCGACGCTCGAAGTGCCGCTCAAGCTTATCGCCGACACCCTGGCCACCCCGCTCT
TGAGCCTGGCCTGCCCTGCCTGGAAGGATATGACCGACGGTGGCGAGCCGCTGTGGGATGGCATTGAGAACAGGTTTC
CCTGGCGGAGCAAGGCCGGATCGAGTTTGTAGAGTTGCTCGAGAGGACACAGGACGTCTGGAGCATGACGTCTGGG
TGAACGTACTGCGTGGAAGAAGAGCAAAGGAACCAGCGAGGGCGAGAAATGATGTAGTTAGCGTCTTGATTCTAATT
CGATACCATTTACATTCTTCGCCCTTATCC

[0253] SEQ ID NO:20

[0254] 长度 :1317

[0255] 类型 :DNA

[0256] 生物体 :菜豆壳球孢菌

[0257] 特征名 / 键 :CDS

[0258] 定位 : (1) (1317)

[0259]

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cccgccctcggtgctcagaaccttgagggcctcactccggaaaggttgaccgctgccttc
P A L G A Q N L E G L T P E R L T A A L
aagacggctcgagaagtacaggaaggagaagcgccttatcatcgactccagcaagcctatc
K T V E K Y R K E K R L I I D S S K P I
gataccaccggcgaccacgctttccagccaccagcgaaccgaccagecgggccctgt
D T T G D H A F Q P P S E T D Q R G P C
cctggcttgaacgccttgccaaccatggctacatctctcgcgacggcatcaccagcttc
P G L N A L A N H G Y I S R D G I T S F
gccgaggttgaccgcccattacccaagtgatgggcatgggcatcgagctctctctgatt
A E V V T A I N Q V M G M G I E L S L I
ctcgggttatgggtaccgctgtggacgggtaaccgccttctcgtggaccctggcttctct
L G V M G T V W T G N P L S L D P G F S
atcgggtgggaccgccccgggtgatggctccgacaacattctgggcaaccttgtcgccctg

[0260]

I G G T A P G D G S D N I L G N L V G L
ctcgggtgaccctcgtggctctgcaaggctcccacaactggattgagtctgactcctctctg
L G D P R G L Q G S H N W I E S D S S L
acgctgatgatctgtacctcaccggagatgcctggacgatgaacatgacgctcttccgc
T R D D L Y L T G D A W T M N M T L F R
gacatctacgaccgctggatgaggatggcgtcatctccatggatctgctcgccgaccag
D I Y D R A D E D G V I S M D L L A D Q
gccgcccgtcgtgggagtacagcatcgccacaacccccacttctactacggccctgtc
A A R R W E Y S I G H N P N F Y Y G P V
accggcatggtcagccgtaatgccggctactttttcctcggccgctgctgtcaaacccac
T G M V S R N A G Y F F L G R L L S N H
accgatgaacatccggacggaattctcactcaagaagttttcaagaagttcttcgcccgtc
T D E H P D G I L T Q E V F K K F F A V
tacgaggacgagcagggcaacatggaataccgcaagggccacgagaccttccccggacaac
Y E D E Q G N M E Y R K G H E T F P D N
tggtaccgcaagccggtcagatggcctggctcccgcctcaacttggacctcgttggctgg
W Y R K P V E Y G L V P L N L D L V G W
gtcttgaagcaccctgagctgggaagcatcggcggttaacactggcaccgtcaactccttc
V L K H P E L G S I G G N T G T V N S F
tccggcctcgatctgcacagcatcaccggcggcgtcctcaatgccacttgcctcctcgag
S G L D L H S I T G G V L N A T S L L E
aacaacaacctgctgtgttttgccttgaagttctcaagaccttcgcccccaactccttc
N N N L L C F V F E V L K T F A P N S L
tccccgctcctgtcagcgtcgaagtgccgctcaagcttatcgccgacaccttggccacc
S P L L S T L E V P L K L I A D T L A T
ccgctcttgagcctggcctgcctgccaaggatgatgaccgacgggtggcgagccgctg
P L L S L A C P A W K D M T D G G E P L
tgggatggcattcagaacaggttccctggcgcgagcaagggccggatcgagttttag
W D G I Q N R F P G A S K A G S S L-

[0261] SEQ ID NO:21

[0262] 长度 :438

[0263] 类型 :PRT

[0264] 生物体 :菜豆壳球孢菌

[0265] MKFSSALLLSSSSLVVDAFPALGAQNLEGLTPERLTAALKTVEKYRKEKRLIIDSSKPIDTTGDHAFQ
PPSETDQRGPCPLNALANHGYSRDTGITSFAEVVTA INQVMGMGIELSLILGVMGTVWTGNPLSLDPGFSIGGTAP
GDGSDNILGNLVLLGDPRGLQGSHNWIESDSSLTRDDLYLTGDWMTNMTLFRDIYDRADEDGVISMDLLADQAAR
RWEYSIGHNPNFYYPVTGMVSRNAGYFFLGRLLSNHTDEHPDGLTQEVFKKFFAVYEDEQGNMEYRKGHETFPDN
WYRKPVEYGLVPLNLDLVGWVWKHPVLSIGGNTGVNSFSGLDLHSITGGVNLNATSLLENNNLLCFVFEVLKTFAP
NSLSPLLSTLEVPLKLIADTLATPLLSLACPAWKDMTDGGEPLWDGIQNRFPGASKAGSSL*

[0266] SEQ ID NO:22

[0267] 长度 :1391 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0268] 类型 :DNA

[0269] 生物体 :菜豆壳球孢菌

[0270] ATACTAACGCCGTGCAACCCCCGGGCAGCGCAGGTCTTGTTGATCGATATAAATGTTTTGTTTCGCGCC
GCTATTGAAATTGGACACTCCAACCTGTTTTCCATACATTCATCTTCCCTATTGATCAATTGCTGCAAAAAACATTC
CATCATGAAGCTCACCGTCTGTGCCACGACCCTTTGCTTCGCTTTGGTTTATGGACAAGGCTCCTACGAGGGGTGGA
AGCCAGCTGGGCCAGACGACTGTATGTTTACAGTGAATTTCTACGTTTCCTTTGATTTGCGCTGATGTACATCTACAG
TTCGCGGCCCTTGCCCTATGATGAATACCTTGCCCAACCATGGCTTTCTCCCCACGATGGCAGGAATATCACGAAA
GCCAACGCAATCCACGCTCTCAACACAGCTATCAACTTCAACACTTCCCTCGCTGCTATCATGTGGGAGCAGGCTAT
CATTGCAAAACCCGGAGCCCAATGCTACGTTCTTCACTCTGTACGTGACTTCAAGCAAGCGTCTTTTGAGCTACCCTG
AGTAGGGGGCTGCTCCGAAAGGCGACTTATCTAAACCTCCTCTTTCCACTATGTGAAGCTCTGACATTAACATAAT
TGAACAGTGACCATCTTAATCGTCACAACGTCTTGGAGCACGATGCCAGCTTGAGGTGAGTGAAGCCGCCTTTCTC
CAGCCTATTCCAACAAATCTCCTGACCAACACTCCTCTTCAGCCGATCCGACGCCTTCTTCGGCAACAACCACGTCT
TCAACCAAATATCTTCGACGTCTCTCGCGCGTGGTGGACGGAGGAAACCGTAGACGCCAAGATGCTGGCCAACAGC
AAGTTGTTCCGGCAGATCGAGTCGCGAGCCGCCAACCCGAATTACACCTTCAACCAAATACCGAGGCCTTTAGCTT
GGGCGAGGTGGCTGCTCCCATCATCGTCTTCGGCGACCACGCGGCCGCCACCGTCAACAGGAGTCTGGTTCGAGTACT
TCTTCGGTGAGCCAAGACCTCAGAGACTTTGGTCTGCAAGGGTTCAAAATTACTAATTATGGGGTGGTCTTGCAGAG
AACGAACGCCTCCCGACCGAGTTGGGCTGGACTAAGCAGGCTAATGATGTGTCTCTGGAGGTCATCCTGGAGATCCA
GGACCTCGTCCGCAACGCGACCAACCTGATCACCGATGCCCGCTGCCGGCAGCGCCTACAAGCGGGACCTGCACG
CCCCTTACAGCCTCTAGATACGAATATAAAGCTGGCATGAAGATCACCAGGGGTTTTTGAAGAATTGTGTCTTCGGCG
GGACGGGAGTGGTAGATTGAGCCTTGTGGGCTTCAGGTGTCTGGGGCATGGTTTGCTTTGGTCCTTTTACATGATT
TCCCTAGCACGCC

[0271] SEQ ID NO:23

[0272] 长度 :780

[0273] 类型 :DNA

[0274] 生物体 :菜豆壳球孢菌

[0275] 特征名 / 键 :CDS

[0276] 定位 : (1) (780)

[0277]

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atgaagctcaccgtctgtgccacgaccctttgcttcgctttggtttatggacaaggctcc
M K L T V C A T T L C F A L V Y G Q G S
tacgaggggtggaagccagctgggcccagacgactttcgcggcccttgccctatgatgaat
Y E G W K P A G P D D F R G P C P M M N
accttgccaaccatggctttctccccacgatggcaggaatatcacgaaagccaacgca
T L A N H G F L P H D G R N I T K A N A
atccacgctctcaacacagctatcaacttcaacacttccctcgctgctatcatgtgggag
I H A L N T A I N F N T S L A A I M W E
caggctatcattgcaaaccggagcccaatgctacgttcttcaactcttgaccatottaat
Q A I I A N P E P N A T F F T L D H L N
cgtcacaacgtcttggagcagatgccagcttgagccgatccgacgccttcttcggcaac
R H N V L E H D A S L S R S D A F F G N
aaccagcttccaacaaactatcttcgacgtctctcgcgcgtggtggacggaggaaacc
N H V F N Q T I F D V S R A W W T E E T
gtagacccaagatgctggccaacagcaagttgttccggcagatcgagtcgcgagccgcc
V D A K M L A N S K L F R Q I E S R A A
aaccgaattacaccttcaacaaactaccgaggccttttagcttgggaggtggctgct
N P N Y T F T Q T T E A F S L G E V A A
cccatcatcgtcttcggcgaccacgcggccggcaccgtcaacaggagtctggtcgagtac
P I I V F G D H A A G T V N R S L V E Y
ttcttcgagaacgaacgcctcccgaccgagttgggctggactaagcaggctaataatgatgtg
F F E N E R L P T E L G W T K Q A N D V
tctctggaggtcatcctggagatccaggacctcgtccgcaacgcgaccaacctgatcacc
S L E V I L E I Q D L V R N A T N L I T
gatgccccgctgccggcagcgcctcacaagcgggacctgcacgcccccttacagcctctag
D A P L P A A P H K R D L H A P Y S L-

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[0278] SEQ ID NO:24

[0279] 长度 :259

[0280] 类型 :PRT

[0281] 生物体 :菜豆壳球孢菌

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[0282] MKLTVCATTLFCFALVYGQGSYEGWKPAGPDDFRGPCPMNTLANHGF LPHDGRNITKANAIHALNTAIN
FNTSLAAIMWEQAI IANPEPNATFFTL DHLNRHNVLEHDASLSRSDAFFGNNHVFNQ TIFDVSRAWWTEETVDAKML
ANSKLF RQIESRAANPNYTFQTTEAFSLGEVAAP IIVFGDHAAGTVNRS LVEYFFENERLPTELGWTKQANDVSLE
VILEIQDLVRNATNLITDAPLPAAPHKRDLHAPYSL*

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[0283] SEQ ID NO:25

[0284] 长度 :1314(包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0285] 类型 :DNA

[0286] 生物体 :菜豆壳球孢菌

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[0287] GGCCCCGAAAGGGAGACAAAATACGAGATTCTCCTATTACGCGCCCAAGAATCGACAACACCGCCCAT
CAGCTACCGCCGCTTCGTTTACGTCGTCGCAGCAGCAACGCCCCGACGCTACAGTCAGTCAACAGCCTCCAGCCGC
CACGATGCCCAACGCAGTGCATCTGTCAATGCTCGTCCTCACGCATGCGGTGCCGATCGCGGGTTATCCGGGCTGGG
AAGCGCAGCAAGTTGTCGAGAAGCGCCCTCCAAGCACCACAACGACCTCTACGTGCCCAACCAAGCCATCCGGTG
CCGGGGAAAGTGCCGTACATCCCGGACGAGGAAGGCACTACTTTGAGAAGCAGGTAACGGCTCCGGCAATGGCTA
CTACCGGCGGTCTGCTCCTGCCCCGAGTCAACATCATGGCGAACAGGGGCTACATCAGCCGCTCGGGCCGGGACATCA
GCTACGAGGAGATAGCGATGGCATCGCGGGAGCTGTTCAACTTCGGCGACGACAACGTGAGCAGCGGCCCTGCAGA
CCGGCAAAGTAAGCGGGCTACCAACAATTCCTTCTTGACAGATCATGATCGTGCTGGGGCCAGCTTCGCGGCGCA
CCCGGGCCGCGAGCGCATCGACCTCGACATGCTGGCCGACGACGCGGTGCAGCACATACCAACTGCCCTGCGGCGC
CGACGCGGACGGACCGCGCTGGGCGACAACGTGAACCTGAACACGACGCTGCTGGAGCAGCTGCTGGCGACGTCC

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AAGGACGGCGTCACGCTGACGCTCGAAGACGCAGCCGAGCACCACCACCTGCGGCACAACCAGTCGCTGGCCGAGAA
 CCCC GGCTTCCGCTTCCAGCAACTCCGACGCCATCTGCTCGCTTGCAGTACGCCAACCTGTTTCGGTATCCTGGGCC
 GGCAGGGCAAGCATGGGCTCAACACGCTGTATGTGGAAGACGTCAAGACCCTGTTTCGTCGACGAAGACCTGCCGGAC
 GGATACGGCCGGAGGGAGCTGCCGTATTTCTCGACCGAGGCCGAACAACACTACATCGACCGTATGGCCCACCACATCGG
 CTTTCGAGATCGAGCGCCGTTCCCGGCCAACGACGCCGACCTGAAGGACATCGAGCCGGTGAAGCCAGATTTGAAG
 TGGTGGACGGATGCTGAGCGGTGCAAAAATTTAAAAAAAATTTTTTTTAGGCAGAAGTCAAGCATTTAATCGGGCTA
 TACACACATCATTCCGTGCAAAACAAAATCATTCTACAGCTGTACCGCCTCGAAAAGAATAACGGAGATTTAAAAA
 AAAAAAAAAAAAC

[0288] SEQ ID NO:26

[0289] 长度 :951

[0290] 类型 :DNA

[0291] 生物体 :菜豆壳球孢菌

[0292] 特征名 / 键 :CDS

[0293] 定位 : (1)..... (951)

[0294]

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 M P N A V H L S M L V L T H A V P I A G
 tatccgggctgggaagcgcagcaagttgtcgcagaagcgccctccaagcaccacaacgac
 Y P G W E A Q Q V V A E A P S K H H N D
 ctctacgtgcccacccaagccatccgggtgccgggaaagtgccgtacatcccggacgag
 L Y V P N P S H P V P G K V P Y I P D E
 gaagagcactactttgagaagcaggtaaaccggctccggcaatggctaactaccggcggtcg
 E E H Y F E K Q V N G S G N G Y Y R R S
 tcctgccggcagtcacatcatggcgaacaggggctacatcagccgctcgggcccgggac
 S C P A V N I M A N R G Y I S R S G R D
 atcagctacgaggagatagcgatggcatcgcgggagctgttcaacttcggcgacgacaac
 I S Y E E I A M A S R E L F N F G D D N
 atcatgatcgtgctggggcccagcttcgcggcgcccccgggcccgcgagcgcacatcgacctc
 I M I V L G P S F A A H P G R E R I D L
 gacatgctggccgacgacgcggtgcagcacatcaccaactgccctgcggcgccgacgcggt
 D M L A D D A V Q H I T N C P A A P T R
 acggaccgcgcgctgggcgacaacgtgaacctgaacacgacgctgctggagcagctgctg
 T D R A L G D N V N L N T T L L E Q L L
 gcgactccaaggacggcgtcacgctgacgctcgaagacgcagccgagcaccaccacctg
 A T S K D G V T L T L E D A A E H H H L
 cggcacaaccagtcgctggccgagaaccccggcttcgcttcagcaactccgacgccatc
 R H N Q S L A E N P G F R F S N S D A I
 tgctcgttcgagcagtagccaacctgttcggtatcctgggcccggcagggcaagcatggg
 C S L A Q Y A N L F G I L G R Q G K H G
 ctcaacacgctgtatgtggaagacgtcaagaccctgttcgctcgaagaagacctgccggac
 L N T L Y V E D V K T L F V D E D L P D
 ggatacggccggaggagctgccgtatcttcgacccgagggcgaacaactacatcgaccgt
 G Y G R R E L P Y F S T E A N N Y I D R
 atggcccaccacatcggttcgagatcgagcggccgttcccggccaacgacgcgcgacctg
 M A H H I G F E I E R P F P A N D A D L
 aaggacatcgagccggtgcaagccagatttgaagtgggtggacggatgctga
 K D I E P V Q A R F E V V D G C-

[0295] SEQ ID NO:27

[0296] 长度 :316

[0297] 类型 :PRT

[0298] 生物体 :菜豆壳球孢菌

[0299] MPNAVHLSMLVLTHAVPIAGYPGWEAQQVVAEAPSKHHNDLYVPNPSPHPVPGKVPYIPDEEEHYFEK
QVNGSGNGYYRRSSCPAVNIMANRGYISRSGRDISYEEIAMASRELFNFGDDNIMIVLGPFSFAAHPGRERIDLDM
LADDAVQHITNCPAAPTRTRDRALGDNVNLNTTLEQLLATS KDGVTLTLEDAAEHHLRHNQSLAENPGFRFSNS
DAICSLAQYANLFGILGRQKGHGLNTLYVEDVKTFLVDEDLDPDGYGRRELPYFSTEANNYIDRMAHHIGFEIERP
FPANDADLKDIEPVQARFEVVDGC*

[0300] SEQ ID NO:28

[0301] 长度 :1480 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0302] 类型 :DNA

[0303] 生物体 :菜豆壳球孢菌

[0304] ATCTGGCTTTTCTCTCTTCTCTGTCGGGCGTCCCTTGC GCAACAGATACCCCATTCATCCCTTCAGTG
CTTCTtCTTATCTCTTCGCGCGCTTTTCCCAACCCACAGCCTCTTATCGCCTGTGCTCACACCACGTTTCCCGCACA
CCCAATGGCTTCCACCGCCAGGTCCGTCTTCGCCCAGCGCGCTTCTGCGCTCCGCCCCGGCCTCCATCAAGTCGA
ATGCCGCCGCTCATCTCGCTTCGCGTCCCTACCCAAGCATTCCGCCAGCAGTCTCGCCGCGGCTACTCTTCCGAG
GCCGGCTCCAAGTCTAACGGCCCCAACCCCGCCATCTGGATTGGTGCTCTCGCCGTCCTGGGTGGCGCCGGTACTA
TGCCTACAGCTCGGGTGCCGGCGCCAGATCGCCTCCAAGGAACCCTTCAACCCCAAGCCGAGGACTACCAGAAGG
TCTACGACGCCATCGCCAAGGCCCTCGAAGAGCACGACGACTACGACGACGGCAGCTACGGCCCTGTCCTGCTGAGA
CTGGCTTGGCACGCCAGCGGAACGTGAGTGACTTCCCAACACTTCCAGCCCACCATTGAACCACGCACTGACGCC
TCCCTCACAGCTACGACAAGGAAACCGGCACCGGCGGCTCCAACGGCGCCACGATGCGCTTCGCGCCCAGGCGGAC
CACGGCGCAACGCCGGCCTCAAGGCGGCCCGGACTTCCTCGAGCCCATCAAGCAGCAGTTCCCGTGGATTACGTA
CTCGGACCTGTGGACGCTGGCAGGCGTCGCTGCGATCCAGGAGATGCAGGGCCCCAAGGTGCCGTGGCGCCCCGGCC
GCAGCGATCGCGACGTCTCCTTCTGCACGCCGACGGCCGCTGCCCGACGCCTCCAAGGACCAGAACCACCTCCGC
GCCATCTTCGGCCGCATGGGTTGGAATGACCAGGAGATCGTGGCGCTGTGGGGCGCGCATGCGCTGGGGAGGTGCCA
TACGGATAGGAGTGGATTTCATGGCCCGTGGACCTTCAGCCCGACGACGCTGACGAACGATTATTTCAAGTTGTTGA
TCGACGAGAAGTGGCAGTGGCGGAAGTGGGATGGACCTAAGCAGTTGGAGGACAAGAAGACGAAGAGCCTGATGATG
CTGCCGACGATTACGCGTTGGTGCAGGACAAGAAGTTTAAAGCCCTGGGTTCGAGAGGTACGCGAAGGATCAGGATGC
CTTCTTCAAGGACTTCTCGAACGTGGTTATGAGGTTGTTTCGAGCTGGGCGTGCCGTTCCAGAGTGGTGAGGACTCGA
GGATTGTGTTTAAAGAGCAGCTTCGACTAGGCGTGCTTGGCGGACGTTAATTCTGATCGACGGGTTTATGATGGGAAGT
TGTAAGGTTCTATGACGATCAGTAAAGAAGGTTGTTTTGCTTTTGTGTTTCGAGGACTAAAGACTAAGACAAG
AGTAGCGCAAAGGTGGGAAAGAATA

[0305] SEQ ID NO:29

[0306] 长度 :1116

[0307] 类型 :DNA

[0308] 生物体 :菜豆壳球孢菌

[0309] 特征名 / 键 :CDS

[0310] 定位 : (1) (1116)

[0311]

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atggcttccaccgccaggtccgtcttcgcccgcagcgcgcttctgcgctccgccccggcc
M A S T A R S V F A R S A L L R S A P A
tccatcaagtcgaatgccgcccgtcatctcgtctcgcctcctacccaagcattccgc
S I K S N A A R S S R F A V P T Q A F R
cagcagtctcgcgcggctactcttcgaggccggctccaagtctaacggcccccaacccc
Q Q S R R G Y S S E A G S K S N G P N P
gccatctggattggtgctctcgcgctcctgggtggcgccgggtactatgcctacagctcg
A I W I G A L A V L G G A G Y Y A Y S S
ggtgccggcgcccagatcgctccaaggaacccttcacccccaaagcccgaggactaccag
G A G A Q I A S K E P F T P K P E D Y Q
aaggtctacgacgccatcgccaaggccctcgaagagcagcagcactacgacgacggcagc
K V Y D A I A K A L E E H D D Y D D G S
tacggccctgtcctgctgagactggcttggcagcgcggaacctacgacaaggaaacc

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[0312]

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Y G P V L L R L A W H A S G T Y D K E T
ggcaccggcggtccaacggcgccacgatgcgcttcgcccgcagggcgaccacggcgcc
G T G G S N G A T M R F A P E A D H G A
aacgccggcctcaaggcgcccgcgacttctcgcagccatcaagcagcagttcccggtgg
N A G L K A A R D F L E P I K Q Q F P W
attacgtactcggacctgtggacgctggcagggcgtcgtcgcgatccaggagatgcagggc
I T Y S D L W T L A G V A A I Q E M Q G
cccaaggtgccgtggcgccccggcgcagcgcgatcgcgacgtctccttctgcacgcccgc
P K V P W R P G R S D R D V S F C T P D
ggcgcctgccgcagcctccaaggaccagaaccacctccgcgccatcttcggcccgcatg
G R L P D A S K D Q N H L R A I F G R M
ggttgaatgaccaggagatcgtggcgctgtcgggcgcgcatgcgctggggaggtgccat
G W N D Q E I V A L S G A H A L G R C H
acggataggagtggattcgatggcccgtggaccttcagcccgcagcagcgtgacgaacgat
T D R S G F D G P W T F S P T T L T N D
tatttcaagttgttgatcgacgagaagtggcagtgccggaagtgggatggacctaaagcag
Y F K L L I D E K W Q W R K W D G P K Q
ttggaggacaagaagacgaagagcctgatgctgcccgcgagattacgcggttggtgcag
L E D K K T K S L M M L P T D Y A L V Q
gacaagaagttaagccctgggtcgagaggtacgcgaaggatcaggatgccttcttcaag
D K K F K P W V E R Y A K D Q D A F F K
gacttctcgaacgtggttatgaggttgttcgagctggcgctgcccgttccagagtggtgag
D F S N V V M R L F E L G V P F Q S G E
gactcgaggattgtgtttaagagcagcttcgactag
D S R I V F K S S F D-

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[0313] SEQ ID NO:30

[0314] 长度 :371

[0315] 类型 :PRT

[0316] 生物体 :菜豆壳球孢菌

[0317] MASTARSVFARSALLRSAPASIKSNAARSSRFAVPTQAFRQQSRRGYSSEAGSKSNGPNPAIWIGALAV
LGGAGYYAYSSGAGAQIASKEPFTPKEPQKVYDAIAKALEEHDDYDDGSYGPVLLRLAWHASGTYDKETGTGGSN
GATMRFAPADHGANAGLKAARDFLEPIKQQFPWITYSDLWTLAGVAAIQEMQPKVPWRPGRSDRVSFCTPDGRL
PDASKDQNLHRAIFGRMGWNDQEIVALSGAHALGRCHTDRSGFDGPWTFSP TTLTNDYFKLLIDEKQWRKWDGPKQ
LEDKKTSLMMLPTDYALVQDKKFKPWVERYAKDQDAFFKDFSNVVMRLFELGVFPFQSGEDSRIVFKSSFD*

[0318] SEQ ID NO:31

[0319] 长度 :1981 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0320] 类型 :DNA

[0321] 生物体 :菜豆壳球孢菌

[0322] TAGAAGGCGCATGGAGTCGCACGCAGGGACCATGCGCAACACGGTGCCTGCAGAGAGGGCGAAAGCCCAT GCATATCACATTGATTTTTAAAGAAGGAAGTGCAAGAAGCATTGAGACATCGCACTCACCCCTCAACACCGCTATCG CGCGATGAAAGCCATCAGCATCGCCGTGTTCCGCCGTCAGTGGTACCTCACACTCTGGCAGACTATGTTTGGCCCT CGCAACATGACTTGTTGGAGGATATGTTGGCCATCCAACAAGGCTATATTCGCATGGGCTTCACTGACTGTATGTCTG ACATTCACTTGAGCCTGAAGTAATGTCTCCCTACTAAAGCATCGTGAAGTGGTTGTTCCCTTGCGGTCACGGCAGCA ACAGGCCCCGGAGTAAACAACGCGGCACAATGGATTTCGGACGGGTTTCCACGACTTCGCCACCCACGACTCGGCCGCT GGGACCGGGCCCTCGATGCCTCCCTCCTCTACGAGGTCGAACGGCCCCGAGAACGAGGGCTCAGCCTTTAAACGACAC CTTTCGCCGACATGCACGACTTTATCAATCCCCGATCAAGCGCCTCGGATCTGATAGCGCTGGCCGTCGTGCATCGG TTGCGGCTTGCGGCGGACCCAAGATCCCCCTGCGAGCGGGACGAATTGATGCTGTGGAGGCGGGCCCGCCGGCGTT CCCAAGCCCCGACGACTCACTGGAGAGCACGATCGATGCATTTCGCGCGGACGGGGTTCAACACCAGCGACATGATCGC CCTCGTTGCCTGTGGCCATACCGTCGGCGGCGTGCACAGCGTAGATTTCCCCGAGATCACCGGCGGCGAGAAAGACG TCCTGGACGTGCCGAATTTGACAGCAGCGGCACCATCTTCGACACCGCAGTCGTGGACGAATACCTCGACAGCAAC GGGCCCAACCCCTCGTCTTCGGAGCCAACGACACCACGAACCTCGGACAAGCGCGTCTTCAGCGCCGACGGCAACAG CACCATGGCCAAGCTCAAAGACCCCCGCCACATTCAAAGCCACCTGCGCCGCCCTCTTCGAGCGTATGATCAACACCG TCCCCTCATCCGTCACCCCTCAGCGAACCATCGAGCTGGCCGACATCAAGCCCTACATCGACAAGCTCGAGCTCACA CCCAACGCCTCCGCCCTCGCCTTCGAAGGCCGCATCCGGCTGCGCACCTCCCCCGTCACCGGCCGCGACGCCGAGGG CACCAGCATCGCCCTCAATGTACCCGACCGCGCTGGCGGGCGCAAGCTGGTGCCGGCGCCGCGCGCCGTGTTGCGCG GCGGCACCTCGTACGGCTTCTTCGACGAGCAGTTCAGCTGGTTCGAATTTGCGACGCAGCTCGACGTCGCAGCCGGC ATCCAGGCCTTTGATATCCAGCTCAGCAGCGAGGCGACCGGACACGTGGAGACGTTTCGACAACGCTGGCACCGGCGG CTATCCTAGTCTCGACGACTTGCTATACTTGAGTCGCAATCGTGCATGGACACGACTGCCACGGAGGGGAATATAA CGGTGACGGTTGCGGCGGCGGTGCGCGAGGATGCGGCGAAGGCGGGTTCGGCGCCAGTGGTGAGGATGGCGCATAAG GTTCAGCAGATGGGTGTGATGTTGCCGAAGCTTGTCTGAGAGGAGTCCCAATGGAGAGGTCAAACGTTTCGCAGGG CGGGTATGTATTGTACGAGGTGGACATCCAATCGATGCCGCTGGCTGGAGCACGAAGTTCGATGTTGTGTTGACGG CTGGGGGAGACGAGATTGTGTCTGGCCTGCACGGGACCAGCGATCTTACCACATGTTCCGGGAACTGACCGGTTGAT GGGCTTGGGGACTTGCCTGAGTAGCATAGCATCGGCGTGTGTTGGGTTTGTGTTACAGGTGTGGAAGATCAGATGAA GGAAGAACCAACAGGTGATTGAACCTATGTGCGAAGTCAGCAATGCAGTGATGGTCTCGGCGTC

[0323] SEQ ID NO:32

[0324] 长度 :1623

[0325] 类型 :DNA

[0326] 生物体 :菜豆壳球孢菌

[0327] 特征名 / 键 :CDS

[0328] 定位 : (1) (1623)

[0329]

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Y V W P S Q H D L L E D M L A I Q Q G Y
attcgcattgggttcaactgacttggttgcttgcgggtcacggcagcaacaggcccgga
I R M G F T D L V V P C G H G S N R P G
gtaaacaacgcggcacaatggattcggacgggtttccacgacttcgccacccacgactcg
V N N A A Q W I R T G F H D F A T H D S
gccgctgggaccggcgccctcgatgcctccctcctctacgaggtcgaacggcccgagAAC
A A G T G G L D A S L L Y E V E R P E N
gagggtcagcctttaacgacaccttcgccgacatgcacgactttatcaatccccgatca
E G S A F N D T F A D M H D F I N P R S
agcgcctcggatctgatagcgcgtggccgctcgtcgcacatcggttgccggttgccgggaccc
S A S D L I A L A V V A S V A A C G G P
aagatccccctgcgagcgggacgaattgatgctgtggaggcgggccccggcgggttccc
K I P L R A G R I D A V E A G P A G V P
aagcccgcagactcaactggagagcagcatcgatgcattcgcgaggcggggttcaacacc
K P D D S L E S T I D A F A R T G F N T
agcgacatgatcgccctcgttgctgtggccataccgctcggcggcgtgcacagcgtagat
S D M I A L V A C G H T V G G V H S V D
ttccccgagatcaccggcggcgagaaagacgtcctggacgtgccgcaatgtgacagcagc
F P E I T G G E K D V L D V P Q F D S S
ggcaccatcttcgacaccgcagtcgtggacgaatacctcgacagcaacggcggccaccccc
G T I F D T A V V D E Y L D S N G A N P
ctcgtcttcggagccaacgacaccacgaactcggacaagcgcgtcttcagcgcgcgacggc
L V F G A N D T T N S D K R V F S A D G
aacagcaccatggccaagctcaaagacccccgccacattcaaagccacctgcgcgcgcctc
N S T M A K L K D P A T F K A T C A A L
ttcgagcgtatgatcaacaccgtccccctcatccgtcaccctcagcgaacccatogagctg
F E R M I N T V P S S V T L S E P I E L
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A D I K P Y I D K L E L T P N A S A L A
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F E G R I R L R T S P V T G R D A E G T
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S I A L N V T D R A G G R K L V P A P R
gccgtgttgccggcggcacctcgtacggcttcttcgacgagcagttcagctggttogaa
A V L R G G T S Y G F F D E Q F S W F E
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[0330]

F A T Q L D V A A G I Q A F D I Q L T T
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gacgacttgctatacttgacgtcgcaatcgtgcacacgactgccacggaggggaat
D D L L Y L Q S Q S C M D T T A T E G N
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I T V T V A A A V R E D A A K A G A A P
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E A V P M E R S N V S Q G G Y V L Y E V
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D I P A I D A A G W S T K F D V V L T A G
ggagacgagattgtgtcctgcacgggaccagcagatcttaccacatggtcgggaaac
G D E I V S G L H G T S D L T T C S G N
tga
-

[0331] SEQ ID NO:33

[0332] 长度 :540

[0333] 类型 :PRT

[0334] 生物体 :菜豆壳球孢菌

[0335] MKAISIAVFAASVVPHTLADYVWPSQHDLLEDMLAIQQGYIRMGFTDLVVP CGHGSNRPGVNNAQWIR
TGFHDFATHDSAAGTGGLDASLLYEVEPENECSAFNDTFADMHDFINPRSSASDLIALAVVASVAACGGPKIPLRA
GRIDAVEAGPAGVPKPDDSLESTIDAFARTGFNTSDMIALVACGHTVGGVHSDVDFPEITGGEKDVLDVPQFDSSGTI
FDTAVVDEYLDSNGANPLVFGANDTTNSDKRVFSADGNSTMAKLDKDPATFKATCAALFERMINTVPSSVTLSEPIEL
ADIKPYIDKLELTPNASALAFEGRI RLRTSPVTGRDAEGT SIALNVTDRAGGRKLV PAVRAVLRGGTSYGFDEQFS
WFEFATQLDVAAGIQAFDIQLTTEATGHVETFDNAGTGGYPSLDDLLYLQSQSCMDTTATEGNITVTVA AAVREDA A
KAGAAPVVRMAHKVQQMGVMLPKLVVEAVPMERSNVSQGGYVLYEVDIPIDAAGWSTKFDVVLTAGGDEIVSGLHGT
SDLTTCSGN*

[0336] SEQ ID NO:34

[0337] 长度 :2012 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0338] 类型 :DNA

[0339] 生物体 :菜豆壳球孢菌

[0340] GGGGGAGGCCAATGCATGTCAGCAAAAATACCTGTGGCTACCCCTGTTATGGCCACATCCAGCCCATTTT
GAATGGACGGTATAAAATCTCTTCTGAAAACCTTCAGAAAATTAAGGCAGGGACTATTGAAGGTTTTGCCGTATCTGC
CAAAATGCGGTTTTCTCGGGGGCTTCTATCTACTCCTTGCTGCCACTCGCCACACACCTACGGCCAGAGCTGCGCTGC
ACTACCCAAATGCCCTCATTCTCGCATGGAACACCTGCTGGTTGATACGGACGGCTCATT CAGGTCTGGTTTCAAG
GACGCCATCAACCCCTGCACGAACTACATTT CAGGTGCCCAAACGCTGGGGCGGCAGACCTCTGCACAGTGGCTCCG
AGTTGCCTTCCATGATTTCTGTCACGGCCACGTCGACGAGGGCACTGGCGGGATCGACGCGTCCATCGGCTTCGAAA
CTCTCCGAGCAGAAGATTCCGGGTCCGCATTCAATGACAGTTTCGCCTTCTTTGCTCCGTTCTGTGGATGCGCAAAC
TCCAGTATCACCCATCGAGCCTTCCCCGTCGAGGGCCGTGGCATGCGCTGACGTCCTTGCAGTGGCCGACCTCGTAG
CCCTCTCTGTGGTGACTTCTCTGGGCCACTGCGGTGGTCTGCATGTCCCATATCGAGCGGGCCGTATCGATGCTACG
GGCGGAGGGCCGTTTCGGCGTTCCCGAACCCGAGACAAGCCTGGAAGAGACCCTGGAAGAGTTTGCCAATGCTGGTTT
CAATGCTGAAGATGCCATTGGATTAACGGCGTGCGGGCATTCTCTCGGCCGCGTCCATCACGGCGGGTTCCCCAACG
TCGTGCCCCGAATCGGCCATAGCACAAAACAACCCGCGGGCGGGCTGAACCTGGACTCCACACGGGATAAATTCGAC
ATCAGCATTGTCAAAGAATACCTCGGCAACTATGGGCAGCGCGGGACCTCTCGTTACCAGTGACAACGTGACTGT
CCGCTCGGATCTTCGGCTGTACGAAAGCGATCAGAACAGGACAATGCAAGCTCTCGGTCAGTCAAAGAATACTTCT
TTAGCACCTGTGAAATCTATTTGAGAGGATGATCAACACCGTTCGCGCGAGGTCACCTTTGTCAGATGTCATCCAT
CCGATGACGGTGCAGCCGGTGAATTTACGTTTCGATATCATCAATGACCAGGCGCTGAGGTTATCAGGAGTAGTGCG
GGTGAGCTTCCAAATAGAGCTGTTTCGGTCTGCACGCAACTGACCGAGCCCCGAGTATTTGCCCTCAGATAATGCT
GCACCGTCGACGCTCGAGGTCTCACTCGCCGACAAAAGCCGAAAAGACTATGGCATCCATTACAGCAAGGGTTATTGA
AGAGAAAGGGAATAGTTTCTGGGGGGCCACAGCTTACTACCCGGTCGTTTTTGGACATAAACCTTGCTGGGATTGCTT
CTCGCAACAATCTTCTGGGAAGCTCCAGGTTTCGCACAGCATCTCCTCAGACATTTGAGCTGCAACCGGAGCTGTTT
TTCATAACCATCCCCTTAGCCCTGGCACGGGGATAAGTGTGGGGGCTGCCATAGGTGCTGCTGCGCGGTCCCGCAA
CTCGACTCTGAGTGTAGAGAGTGTGGAAGCCGTGGTCAGTGTGCCGGTATCCCAGACGGGAACACTGGCACCGAAGG
TCGAGAAGCATGAGTTGAATCTCGAAAAGAGATCAAGATATTGGTTTGTACTCTATATTCAAGGGGAACCTAAGCGAT
GATTTGGCTTTCAACCTGCAGACGACCGTTGATATCACGGCAACTTTTTTCAGACGGCACTGTCTGGCAAGATAGTTA
CAACAGATTTGCAGTGCCGTAGAGCATCTGAAAATGTCTTCGTCAAAATGCCTTCATAGGGCCAGCAACAAATTTT

CAGGCAGATATGTAGCTAGAGAGTCATTCAAATACAAATGTCTTGGTTGTCGAACAAGTTCGTGAGACGCTGCTCAT
GCACAATACAAGTGAGCC

[0341] SEQ ID NO:35

[0342] 长度 :1599

[0343] 类型 :DNA

[0344] 生物体 :菜豆壳球孢菌

[0345] 特征名 / 键 :CDS

[0346] 定位 : (1)..... (1599)

[0347]

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agagctGcgctgCactaccCAAatgCCctcatttctCGcatggaacacctgctggttgat
R A A L H Y P N A L I S R M E H L L V D
acggacggtcattcaggtctggtttcaaggacgCCatcaacCCctgcacgaactacatt
T D G S F R S G F K D A I N P C T N Y I
tcaggtGCCAAacgctggggCGgcagacctctgcacagtgGctccgagttgccttccat
S G A Q T L G R Q T S A Q W L R V A F H
gatttCGtcacggCCcagctCGacgagggcactggCGgggatCGacCGctccatCGgcttc
D F V T A H V D E G T G G I D A S I G F
gaaactctccgagcagaagattCCgggtCCgcattcaatgacagtttCGccttctttgct
E T L R A E D S G S A F N D S F A F F A
ccgttCGtggtgCGCAAacttccatggCGcactCGtagCCctctctgTggtgacttct
P F V D A Q T S M A D L V A L S V V T S
ctgggCCactGcggtggtctGcatgtCCcatatCGagCGggCGgtatCGatgGtaCGggc
L G H C G G L H V P Y R A G R I D A T G
ggagggCGgttCGGcgttCCCGaCCCGagacaagCCtGgaagagacCCtGgaagagttt
G G P F G V P E P E T S L E E T L E E F
GCCaatGctGgtttCAatGctgaagatGCCattggattaacGGcGtgCGggcattctctc
A N A E D A I G L T A C G H S L
ggCGcGtccatcacGGCGgttCCCAacGtCGtGCCgaatCGGCCatagcACCAaac
G R V H H G G F P N V V P E S A I A P N
aacacCGCGggCGGcgTgaacctggactCCacacGGgataaattCGacatcagcattgtc
N T A G G V N L D S T R D K F D I S I V
aaagaatacctCGGcaactatgggCGcGCGggCGgacctctCGttaccagtgacaacGtg
K E Y L G N Y G Q R G G P L V T S D N V
actgtCCGctCGgatcttCGGctgtacGaaagCGatcagaacaggacaatGcaagctctc
T V R S D L R L Y E S D Q N R T M Q A L
ggtcagTcaaaagaatacttctttagcactgtggaaatctatttgagaggatgatcaac
G Q S K E Y F F S T C G N L F E R M I N
accgttCCGCGcGaggtcactttgtcagatgtcatccatCCgatGacggTgcagCCggTg
T V P R E V T L S D V I H P M T V Q P V
aatttCaGttCGatatcatcaatgaccagGCGctgaggttatcaggagtagtgCGgtat
N F T F D I I N D Q A L R L S G V V R Y
ttGCCctcagataatGctGcaccGtCGacGctCGaggtctcactCGCCgacaaagCCgga
L P S D N A A P S T L E V S L A D K A G
aagactatggcatccattacagcaagggttattgaagagaaagggaaatagtttctggggg
K T M A S I T A R V I E E K G N S F W G
GCCacagcttactacCCGgtCGtttttgacataaaccttGctgggattgcttctCGcaac
A T A Y Y P V V F D I N L A G I A S R N
aatcttctCGggaagctCCaggttCGcacagcatctcctcagacatttgagotGcaacCG
N L P G K L Q V R T A S P Q T F E L Q P
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E L F F I P S R S S P G T G I S V G A A

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[0348]

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ataggtgctgctgcgcggtcccgcaactcgactctgagtgtagagagtggtggaagccgtg
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gtcagtggtccgggtatcccagacgggaacactggcaccgaaggtcgagaagcatgagttg
V S V P V S Q T G T L A P K V E K H E L
aatctcgaaagagatcaagatattggtttgtactctatattcaaggggaacctaaagcgat
N L E R D Q D I G L Y S I F K G N L S D
gatttggtttcaacctgcagacgaccgttgatatacaggcaactttttcagacggcact
D L A F N L Q T T V D I T A T F S D G T
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V W Q D S Y N R F A V P-

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[0349] SEQ ID NO:36

[0350] 长度 :532

[0351] 类型 :PRT

[0352] 生物体 :菜豆壳球孢菌

[0353] MRFLGGFYLLLAATRHTPTARAALHYPNALISRMEHLLVDTDGSFRSGFKDAINPCTNYISGAQTLGRQ
 TSAQWLRVAFHDFVTAHVDEGTGGIDASIGFETLRAEDSGSAFNDSFAFFAPFVDAQTSMDLVALSVVTSLGHC
 LHVPYRAGRIDATGGGPFVPEPETSLEETLEEFANAGFNAEDAIGLTACGHSLGRVHHGGFPNVVPE
 SAIAPNNTAGGVNLDSTRDKFDISIVKEYLGNYGQRGGPLVTSDNVTVRSDLRLYESDQNRMQALGQ
 SKEYFFSTCGNLFERMIN TVPREVTLSDVIHPMTVQPVNFTFDIINDQALRLSGVVRYLPSD
 NAAPSTLEVSLADKAGKTMASITARVIEEKGNS FWGATAYYPVFDINLAGIASRNNLPGKLQ
 VRTASPQTFELQPELFFIPSRSSPGTGISVGAAIGAAARSNSTLSV ESVEAVVSVVPSQ
 TGLAPKVEKHELNLERDQDIGLYSIFKGNLSDDLAFNLQTTVDITATFSDGTVWQDSYNRFA
 VP*

[0354] SEQ ID NO:37

[0355] 长度 :2401 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0356] 类型 :DNA

[0357] 生物体 :菜豆壳球孢菌

[0358] TTTTAATATATTCTGCCGCTAAAACGTTCCGCATGTGCTCCTGATTTTTCTCGACCGCCATTTCTCGCC
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 AACCATGGCAAGGCATCCCGGCTGACCTGGTGTGGGTGCGCAGGCGTGGTCTACCACGCCATTGGCACCGCTGCTG
 CCCCACATGGCCATCTTCCATGGATGAACTGGAGGACATCATGGTCTCAACACCGGCTACCGCGCCCGCAGCTTC
 GCAGTCCCCGTACACCCTGCGGCTTCTCGTCGCAAGGCCCGGACGCGTCCAAGCTGCCGAATGGATACGAACCGC
 CTTCCACGACATGGCTCCCGGCGAGCGTGATACCGGCGTGGAGGACTGGACGCATCGATAGCTTACGAAACACGGA
 GCTTGAAAATCTCGCCCCGCTTCAACACCACACTAGCTACCTACGCGCGTATCTGACAAGCAGATCTTCCATG
 GCTGACATCATTGCGCTAGGAGTCTACACGGCGGTGCGGTCATGCGGAGGTCCAATCGTGCCTATCCGGACAGGCAG
 AGTAGACGCAAAGGCAGCAGGCCCGCAAGGTGTGCCTCTGCCGCAGAATTCTATCGGAACTTTTCAAACAGTTTC
 TCCGTAAGGTTGTCACCGAGTACCTCTCGAATACAACCAAGAACTCGCTTGTGTGGGCCCTTACTGCGAACGGCCGGA
 ACTCGGACGCTCGTGTCTTTGCGGCGGATGGAAATGCTACGGTCAGGGCTCTGGCTGACCCTGATACGTTCAACAGT
 GTTTGCGCTAGGATGCTGCAGAAGATGATTGATGTTGTTCCAACGGCGTGGTGCTCACTGACCCGATTTCAATCTA
 TGATGTCAAACCCAGTGGGCTGCAGCTGACATTGCTTGGTGGAGGAGATCGGTAAAGCTTACGGGAGATATCCGTG
 TTAGGACTACGGAGCGCTCTGCGAGCCAGATTGAGAAGGTGAGCTGTCTACAAGGACCGCGAGGGGGCCGAATCC

TCGACAGCTTTGAGCACCGAATCCTCAGGTTTCGGCCTCTGGGTTTCGATGACAGCTTCGAGGTATAACTCATCCTAAG
CCCCTGTTGGGATGCCACACTAACGGCCGAGAAAGTTCTACGGGGTCTCCGCAAACATCCCCACCGACTCCGGCATC
TCCTCATTCAACGTCCTCATCACCTCACCAGCGGCGAAACCGAACTTCACGACAATAATGGCAGCGGTTTCCCCCT
CCAAGACACCGTCATCTTTCAAAGCCCCGAGAGCTGCCTCAGCGGCACCACCATGACCGTCGCCGCCGCCGTCCTCA
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GTCAGCACAGTCGCCATGACGAAGAGCTCGTCTGTTCGGCCCGTACGACCTTACTCAACCACATACACGCTAACCTC
CGCCCAACTCGCCGACACGCGCTTTGACGTCAAGCTCGGCGCTGCCGCCGCCGACGCCTTCAAGTCTCCGCCGACC
TCGGTGATGCCTGCCAGGACCTGAGCCCCGAACCGCCACTTCTTCCAGCGCGCCTAGCTCCTCGAGCACGGCTGCG
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TGTGGGGGGCGTTCTGGAAAGCTGAGCGGTCGGGCGATGGAGTAGGGGATAGAGGGTTTGGGCTGGGGGGTAATGA
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[0359] SEQ ID NO:38

[0360] 长度 :2049

[0361] 类型 :DNA

[0362] 生物体 :菜豆壳球孢菌

[0363] 特征名 / 键 :CDS

[0364] 定位 : (1) (2049)

[0365]

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G T A A A P T W P S S M D E L E D I M V
ctcaacaccggctaccgcgcccgcagcttcgcagtgcccgtcacaccctgcggttctctcg
L N T G Y R A R S F A V P V T P C G F S
tcgcaaggccccggacgcgtccaagctgccgaatggatacgaaccgccttccacgacatg
S Q G P G R V Q A A E W I R T A F H D M
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A P G S V Y T G V G G L D A S I A Y E T
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S C G G P I V P I R T G R V D A K A A G
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P Q G V P L P Q N S I G T F Q N Q F L R
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T G F N T T E M I Q V V A C G H T L G G
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V H A S A N P E I V P V G S A E D G V V
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K F D T T D A F D N K V V T E Y L S N T
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T K N S L V V G P S T A N G R N S D A R
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V F A A D G N A T V R A L A D P D T F N
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S V C A R M L Q K M I D V V P T G V V L
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T D P I S I Y D V K P S G L Q L T L L G
ggaggagagtcggtaaagcttacgggagatatccgtgtaggactacggagcgcctcgcg
G G E S V K L T G D I R V R T T E R S A
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S Q I E K V E L V Y K D R E G A E S S T
gctttgagcaccgaatcctcaggttcggcctctgggttcgatgacagcttcgagttctac
A L S T E S S G S A S G F D D S F E F Y
ggggtctccgcaaacatccccaccgactccggcatctcctcattcaacgtcctcatcacc
G V S A N I P T D S G I S S F N V L I T
ctcaccagcggcgaaccgaacttcacgacaataatggcagcgggttccccctccaagac
L T S G E T E L H D N N G S G F P L Q D
accgtcatctttcaaagcccgcagagctgcctcagcggcaccaccatgaccgtgcgcgcc
T V I F Q S P Q S C L S G T T M T V A A
gccgtcctcaataccgcctcctccgccccaccctcagcgtcaccctcaaggtccccaac
A V L N T A S S A P T L S V T L K V P N

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[0366]

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gtcggccccgtacgacctctactcaaccacatacacgtaaacctccgccccaaactcgcggac
V G P Y D L Y S T T Y T L T S A Q L A D
acgcgctttgacgtcaagctcggcgctgccgccgacgccttcaagtcctccgcccagac
T R F D V K L G A A A A D A F K S S A D
ctcggatgatgcctgccaggacctgagccccgaaccgcccacttcttccagcgcgcctagc
L G D A C Q D L S P E P P T S S S A P S
tcctcgagcagcggctgcgcccgcggcctcgtcctcctctgccgcaccaagctcctctgac
S S S T A A P P A S S S S A A P S S S D
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L P A P S P S T T P T S S H P I S S S T
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T L A S S T T P T P T T L A C P A A D G
gccacctggacgtatccggcgccagaagtccgcccgtcaagtgccggaaggactaccag
A T W T L S G G Q K F A V K C G K D Y Q
gccgccacgtcggcgctcacgtggacggcagcttcgaggcctgtctgcagcggcgtgctg
A G Q I G V T W T A S F E A C L Q A C V
gatacggacacgtgccaggcggcgcattcgtggggagtgccagaggcggggcgggcagtgcc
D T D T C Q A V A F V G S A E A G G Q C
tacttgaaggaccagagcgcgggcagtggtggtgaggggggtgtggggggcggttctg
Y L K D Q S A G S V D V E G V W G A V L
gaaagctga
E S-

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[0367] SEQ ID NO:39

[0368] 长度 :682

[0369] 类型 :PRT

[0370] 生物体 :菜豆壳球孢菌

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[0371] MARHPGLTLVWVAGVVYHAIGTAAAPTWPSSMDELEDIMVLNTGYRARSFAVPVTPCGFSSQGPGRVQA
AEWIRTAFHDMAPGSVYTGVGGLDASIAYETRSLENLGPANFTLATYAPYLTSRSSMADI IALGVYTA VRSCGGPI
VPIRTGRVDAKAAGPQGVPLPQNSIGTFQNQFLRTGFNTTEMIQVVACGHTLGGVHASANPEI VPVGS AEDGVVKFD
TTDAFDNKVVTEYLSNNTTKNSLVVGPSTANGRNSDARVFAADGNATVRALADPDTFNSVCARMLQK MIDVVPTGVVL
TDPI SIYDVKPSGLQLTLLGGGESVKLTGDIRVRTTERSASQIEKVELVYKDREGAESSTALSTESSGSASGFDDSF
EFYGVSANIPTDSGISSFNVLITLTSGETELHDNNGSGFPLQDTVIFQSPQSCLSGTTMTVA AVLNTASSAP TLSV
TLKVPNSRSVLPVLQVSTVAMTKSSSVGPYDLYSTTYTLTSAQLADTRFDVKLGAAAADAFKSSADLGDACQDLSPE
PPTSSSAPSSSSTAAPPASSSSAAPSSSDLPAPSPSTTPTSSHP ISSSTTLASSTTPTTLACPAADGATWTLSGG
QKFAVKCGKDYQAGQIGVTWTASFEACLQACVDTDTCQAVAFVGS AEGGCY LK DQSAGSVDVEGVW GAVLES*

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[0372] SEQ ID NO:40

[0373] 长度 :2004 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0374] 类型 :DNA

[0375] 生物体 :菜豆壳球孢菌

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[0376] CCTTCCTGAAATTTTCATGGCCAGCTTCTCGGTCTTTCTAATGAATTATAAGGCTATCTTCCTGCAGCTT
GTCGTCTGCACGTTCTAGGATTCAACCACCCGTCATTCCTTCTCAAATCTCAGTCCAGTCGTTACAGCTAATCACT
TAATATGAAGCCC GCGCTCTTGCAGGCATTGGCTGCTTAATGTCTACCATTACCGCCGAATACGTCTGGCCTT
CTAAATACGACTATTTGGAAGACCTGCTTTACCTTCAATCCGGTTATCTGCGTGAGGGATTTGTCGACGGTATGCAT
ATATGAACAAC TGTGGTGTCCCCAACTAATGGCTTTTAGGTGTGGCTCCTTGTTCGTTTTCCTCCGCTGGACCTG
GCCGTCAAACCGCAGCGGAATGGGTCCGCACTGCATACCATGATATGGCCACTCATGATGCCGATGCTGGCACTGGT
GGCTTGGACGCCTCTATCATGTTTGAGACCGAGCGGGACGAAAACGTGGGCGATGCGTTCAATGGTACCTTCGGCTT

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TACAAACAACACTACTACAACATCAAAGCATCCGCTGCTGATCTTCTTGCACCTCTCCACTGTCATCGCCGTTGGAAACT
 GCGGTGGCCCGAAGATTCTTTCCGTGTCGGTCGCGTGGACGCCACGGAGGCTGGCCCTCTGGGTGTTCCCAAGCCG
 GATCAAGACGTTGATACGCACATTCAAATTTTTGCCAAGGCAGGCTTTAACACCAGTAGGCCTTGAATTACCTGAGG
 TCCACCTACCAGCCGCTGACTAGAAATAGGCGACATGATCACCATGGTGGCCTGCGGCCACACCCTTGGTGGCGTCCA
 TGGCAAGGACTTCCCCGAGATCACTTTCAACGACACGGAGACCAATTCGTCAAGTTCGAAGGCAACAACCTCTTCT
 CCAACTTTGATAACACCGTCGTGACCGAGTATCTTGGCGGAAACCCCCCAACCCCTCGTCACCGGCAAGAACGAG
 ACCAACAACAGCGATAAGCGCGTCTTTGGTGCCGACAACAACGCCACAATGCACTCCCTGTCGGACCCCTCCGTCTT
 CCAGTCTCCTGCCAAGACATCTCGCCCGCATGATCGACACCGTCCCCTCCAACGTCGCTCTCACCAGCCTCTCG
 ACCCAATCTCATCAAGCCCTACATCCAAACCTTCTCCCTCGTCAACGCCACCCACCTCACCTGACCGGCCGCATC
 CGCGTCCGTACCGACTGGGACAGCTACACCGACCAGTCAGTCCACCTCACCTACAACCCGCGCACAGCGCCCGCCCA
 GAATGCGACCCTCAACACCACCATCCCCACCACCCGCGCCACCTTCCAGGGCGGCACCTCCAGCGGCATCTTTGGTG
 AAGTCTTCGCTGGCACGAGTTCTCCGCCACCCTCCCCACATCCAGCTCGATTACCGGCTTCACTGTCACCGTCACG
 CGCGGCTCCACGGGCGAATCCACCACCTACGACAACGCCGGCAGCACGAACGGCTACGCGCTCGACGACACGCTGCT
 CTACCAGAGCGCGCAGTCGTGCCGCGACGTCGGCACCACAACCATCACCGCTGCTGTGCGCAAGGACTTCTCGCCC
 GAGGTGCAAAGGTCGCCGTCGAGATGGTGAACAGGGTGCCGCGCCAGGGCGTGTACGTGCCGGCGCTAGAGGTGCAA
 CCGTGGGGGGCGGAGACGGTCAAGGAGGTCGGCGAGTGGGTGTCATCGTGCAGGCTAAGGGTGAGTTGACGATGGAGAG
 CTTGAGCACAACGTTTGACGTCGTTGCGGGCGAGAAAAGGGTCGAGTTCCAAAGGACGAATGTGCTGGGGGAGGAGT
 GTGCGGCTCTGTGAGGCGTAACTTAAAAAAAAAAAAAAAAAGGAAGGATATATCAGTTTCTGGTACATACTTCGAATGA
 AAGTCTATGATTTCGTATGTCCATAACATTACTCTAGGCTTGAAACAACAATGCTGAATGTGCTTTATTGTGAGATAA
 AGAGTGCCT

- [0377] SEQ ID NO:41
- [0378] 长度 :1605
- [0379] 类型 :DNA
- [0380] 生物体 :菜豆壳球孢菌
- [0381] 特征名 / 键 :CDS
- [0382] 定位 : (1) (1605)
- [0383]

atgaagcccgccgctcttgcaggcattggcctgcttaatgtcctaccattaccgcccga
M K P A A L A G I G L L N V L P I T A E
tacgtctggccttctaaatacgcactatgttggaagacctgctttaccttcaatccggttat
Y V W P S K Y D Y L E D L L Y L Q S G Y
ctgctgtagggatgtgctgacgggtgtggctccttggtcgttttccctccgctggacctggc
L R E G F V D G V A P C S F S S A G P G
cgtcaaaccgcagcgggaatgggtccgcactgcataccatgatatggccactcatgatgcc
R Q T A A E W V R T A Y H D M A T H D A
gatgctggcactgggtggcttggacgcctctatcatgtttgagaccgagcgggacgaaaac
D A G T G G L D A S I M F E T E R D E N
gtgggagatgcgttcaatggtaccttcggctttacaacaactactacaacatcaaagca
V G D A F N G T F G F T N N Y Y N I K A
tccgctgctgatcttcttgcactctccactgtcatcgccgttggaaactgocggtggcccg
S A A D L L A L S T V I A V G N C G G P
aagattccttccgctgctgggtcggcggcggcggaggtggccctctgggtgttccc
K I P F R V G R V D A T E A G P L G V P
aagccggatcaagacggttgatagcacattcaaatttttgccaaggcaggctttaacacc
K P D Q D V D T H I Q I F A K A G F N T
agcgacatgatcaccatggtggcctgcccacacccttgggtggcgtccatggcaaggac
S D M I T M V A C G H T L G G V H G K D
ttccccgagatcactttcaacgacacggagaccaatttcgtcaagttcgaaggcaacaac
F P E I T F N D T E T N F V K F E G N N
tcttctccaactttgataacaccgctcgtgaccgagatcttggcggaaaccccccaac
S F S N F D N T V V T E Y L G G N P P N
ccctcgtcaccggcaagaacgagaccaacaacagcgataagcgcgtctttgggtgcogac
P L V T G K N E T N N S D K R V F G A D
aacaacgcccaatgcactccctgctcggacccctccgtcttccagtcctcctgccaagac
N N A T M H S L S D P S V F Q S S C Q D
atcctcgcggcgcacatgcacaccgctcccctccaacgctcgtctcaccggagcctctogac
I L A R M I D T V P S N V A L T E P L D
ccaatcctcatcaagccctacatccaaccttctccctcgtcaacgccaccacccctcacc
P I L I K P Y I Q T F S L V N A T H L T
ctgaccggcgcacccgctcggcggcggcggcggcggcggcggcggcggcggcggcggcggc
L T R V R I R V R T D W D S Y T D Q S V H
ctcacctacaaccgcgcacagcggccggccagaatgacaccctcaacaccaccatcccc

[0384]

L T Y N P R T A P A Q N A T L N T T I P
accacccgcccaccttccagggcggcacctccagcggcatctttgggtgaagtcttccgccc
T T R A T F Q G G T S S G I F G E V F A
tggcagcaggttctccgccaccctccccacatccagctcgcattaccggcttcaactgtcacc
W H E F S A T L P T S S S I T G F T V T
gtcacgcgcggtccacgggccaatccaccacctacgacaacgcccggcagcagcaacggc
V T R G S T G E S T T Y D N A G S T N G
tacgcgctcgcagcagcgcgtctaccagagcgcgcagtcgctgcccgcgacgtcggcacc
Y A L D D T L L Y Q S A Q S C R D V G T
acaaccatcaccgctgctgtgcgcaaggacttccctcgcggcggaggtgcaaaggctcgcgctc
T T I T A A V R K D F L A R G A K V A V
gagatggtgaacaggggtgcccgcggcggcggcggcggcggcggcggcggcggcggcggcggc
E M V N R V P R Q G V Y V P A L E V E P
tggggggcggagacgggtcaaggaggtcggcggcggcggcggcggcggcggcggcggcggcggc
W G A E T V K E V G E W V I V Q A K G E
ttgacgatggagccttgagcacaacgcttgcagctcgttgcggggcggagaaaagggtcgag
L T M E S L S T T F D V V A G E K R V E
ttccaaaggacgaatgtgctggggggaggagtgctgcccgtctgtga
F Q R T N V L G E E C A A L-

[0385] SEQ ID NO:42

[0386] 长度 :534

[0387] 类型 :PRT

[0388] 生物体 :菜豆壳球孢菌

[0389] MKPAALAGIGLLNVLPIITAEYVWPSKYDYLEDLLYLQSGYLREGFVDGVAPCSFSSAGPGRQTAAEWVR
TAYHDMATHDADAGTGGLDASIMFETERDENVGDAFNGTFGFTNNYYNIKASAADLLALSTVIAVGNCGGPKIPFRV
GRVDATEAGPLGVPKPDQDVDTHIQIFAKAGFNTSDMITMVACGH TLGGVHGKDFPEITFNDTETNFVKFEGNNSFS
NFDNTVVTEYLGGNPPNPLVTGKNETNNSDKRVFGADNNATMHSLSDPVSFQSSCQDILARMIDTVPSNVALTEPLD
PILIKPYIQTFSLVNATHLTLTGRIRVRTDWSYTDQSVHLTYNPRTPAPAQNATLNTTIPTTRATFQGGTSSGIFGE
VFAWHEFSATLPTSSSITGFTVTVTRGSTGESTTYDNAGSTNGYALDDTLLYQSAQSCRDVGTTTITA AVRKDFLAR
GAKVAVEMVNRVPRQGVYVPALEVEPWGAETVKEVGEWVIVQAKGELTMESLSTTFD VVAGEKRVEFQR TNVLGEEC
AAL*

[0390] SEQ ID NO:43

[0391] 长度 :1414(包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0392] 类型 :DNA

[0393] 生物体 :菜豆壳球孢菌

[0394] AGCTTGCCTCTTCTTCTGTCTTTCTGCCCCCTTCTTCTCCAGACTCCTTTCGCCGTAGATTTCTGCCTT
TTGGACCTCGTTTTCTGCCCTCCACCAATAGCAAGCCAAGAGATTAGATTAGACATCGCCATCCCATCGCCGACTCC
AACAAATGCCAGCAACCCAGGCGACTACGACGCCGTCCGCCACGACGTCAAGAACCTCCTGCACCAGCCCAGTACG
ACGACGGTTCGCCGGGCCCCGTCCTCGTCCGTCTCGCATGGTATGTTACGGCTACCCGCATCCTCCAGCCCAATCCG
CCGTTTATCTGCTGTTCTGGCTCTGCCATCTTCTTCTCCAGGGGCAGCAAGTTTCCCGAGCCTTTTTTTTTTGTCTT
ACGAACGGCATCTCGAACAGCCCCTGACAACACACCAGGCATTCGCGAGGGACCTACGACGCCACTCTGACACA
GGAGGCAGCAACGGTGCAGGCATGCGCTACGAGGCTGAAGGCGGGACCCCGCCAATGCCGGCCTGCAGCACGCCCG
CGTCTTCTCGAGCCCATCAAGGCCGCGCACCCCTGGATAACCTACTCTGATCTGTGGACGCTGGCGGGCGTGGTCCG
CCATCAAGGAGATGGGCGGCCCGGACATCCCGTGGCAGCCCGGCCGACCGACTTCGTGACGACAGCAAGCTGCCG
CCGCGGGGCCGCTGCCGACGCCGCGCAGGGCGCTGACCACATCCGCTGGATTTTCTACCGCATGGGCTTCAACGA
TCAGGAAATTGTCGCCCTCAGCGGCGCCACAACCTCGGCCGCTGCCACGCCGACCGCTCCGGCTTCGACGGCGCCT
GGGTCAACAACCCACCCGCTTCTCCAACAGTACTTTAAGCTCCTGACCTCGGTGAGTGGAAAGAGAAGACCCTC
CCCAGCGCATCAAGCAGTTCGCTACTATGATGAGGACTCGGAGGAGGAGCTCATGATGCTGCCACCGATATCGC
TCTCTTGACGACCCCTCCTTCCGGCCGTGGGTGAGAAAGTATGCCGAGGACAAGGATGCCTTTTTTCGACACTTCT
CAAAGGTCTTTGCCAAGCTGATTGAGCTGGGCATAGTCAGAGATGAGAGCGGTGCGGTAATCAAACTGATAACGTC
AAGGGCGGTACATCTCTGCGCCCAAGAAGAGTGAGTGCCTGGTGCTCCGGGTAAGGCTAATGAGGAGGCTGAGCC
GCTCATGAAAGAGAATGAGAGGTTCCAGGGCACGTCTGTAAGCTGGTTGGTTTAGATTTCTTTTTTTTTTTTTTTCA
AGACCGTTAGACTGCGCAAGCTAGAGGGGACGGATAGATGGACGATACCACCTAGATTCCTATGCCTTAAGAGGAGA
AAGATAGTGCCTAGAGTTTTTCATAGAGAATGCAAAC

[0395] SEQ ID NO:44

[0396] 长度 :960

[0397] 类型 :DNA

[0398] 生物体 :菜豆壳球孢菌

[0399] 特征名 / 键 :CDS

[0400] 定位 : (1) (960)

[0401]

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atgccagcaaccaggcgactacgacgccgtccgccacgacgtcaagaacctcctgcac
M P S N P G D Y D A V R H D V K N L L H
cagcccagtagcagcagcgggtccgccggggcccgctcctcgctcctcgcattgcatcc
Q P E Y D D G S A G P V L V R L A W H S
gcaggacactacgacgcccactctgacacaggaggcagcaacgggtgcaggcatgcgctac
A G T Y D A H S D T G G S N G A G M R Y
gaggctgaaggcggcgacccccgccaatgccggcctgcagcagccccgcgtcttctcogag
E A E G G D P A N A G L Q H A R V F L E
cccatcaaggccgcgaccccctggataacctactctgatctgtggacgctggcggggcgtg
P I K A A H P W I T Y S D L W T L A G V
gtcgccatcaaggagatggcgggcccgacatcccgtggcagccccggccgcaccgacttc
V A I K E M G G P D I P W Q P G R T D F
gtcgacgacagcaagctgccgcccggggcgcctgccggacgccgcgagggcgctgac
V D D S K L P P R G R L P D A A Q G A D
cacatccgctggatcttaccgcatgggcttcaacgatcaggaaattgtcgccctcagc
H I R W I F Y R M G F N D Q E I V A L S
ggcgcccacaacctcgccgctgccacgccgaccgctccggcttcgacggcgccctgggtc
G A H N L G R C H A D R S G F D G A W V
aacaacccccaccgcttctccaaccagtactttaagctcctgacctcggctcagtgaggaaa
N N P T R F S N Q Y F K L L T S V E W K
gagaagacctccccagcggcatcaagcagttcgcctactatgatgaggactcggaggag
E K T L P S G I K Q F A Y Y D E D S E E
gagctcatgatgctgccaccgatatcgctctcttgcacgacccccctcctccggccgctgg
E L M M L P T D I A L L H D P S F R P W
gtcgagaagtatgccgaggacaaggatgcctttttcgcagacttctcaaagggtctttgcc
V E K Y A E D K D A F F A D F S K V F A
aagctgattgagctgggcatagtcagagatgagagcgggtgcggtaatacaactgataac
K L I E L G I V R D E S G A V I N T D N
gtcaaggcggctacatctctgcgcccagaagagtgagctgcctggtgctccgggtaag
V K G G Y I S A P K K S E L P G A P G K
gtaatgaggaggctgagccgctcatgaaagagaatgagaggttcagggcacgtctgtaa
A N E E A E P L M K E N E R F R A R L-

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[0402] SEQ ID NO:45

[0403] 长度 :319

[0404] 类型 :PRT

[0405] 生物体 :菜豆壳球孢菌

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[0406] MPSNPGDYDAVRHDKNLLHQPEYDDGSAGPVLVRLAWHSAGTYDAHSDTGGSSNGAGMRYEAGGDP
ANAGLQHARVFLEPIKAAHPWITYSDLWTLAGVVAIKEMGGPDIPWQPGRTDFVDDSKLPPRGRLPDAAQGADHI
RWIFYRMGFNDQEIVALSGAHLNLRCHADRSGFDGAWVNNPTRFSNQYFKLLTSVEWKEKTLPSGIKQFAYYDED
SEEELMMLPTDIALLDPSFRPWVEKYAEDKDAFFADFSKVFALIELGIVRDESGAVINTDNVKGYYISAPKKS
ELPGAPGKANEEAELMKENERFRARL*

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[0407] SEQ ID NO:46

[0408] 长度 :2160 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0409] 类型 :DNA

[0410] 生物体 :菜豆壳球孢菌

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[0411] CAACTCTTTGGATCATTTCGAGTTCTGCAGATTAGACTACTCTTTTCTCGCTCCACAATGAAGCTTGCA
TCATGGCTGCTCCTCCCTCAAGTACTGGCAGCGCTGGGCGGGCAGGTACGTGAATATAACTTGACTCTTGAGGCAAG
CTGGATGGCTCAAGGTAGATGTCCCCGAAGAAACAAAGTGATAGTATCTCTGCTAACATGGACAGACGGGAACCCTC
GCGGTGTCTTAACATCAACGGCCAGACACCTGGTCCATTGATCTGGGGATATGAAGGAGACACACTTCGCGTCACT
GTGACCAATAAAATGTTTATTGAGGCTACTATGCATTGGTCAGAGTGAAGTCTGTCTGGACTGGGAGAATCAACTAA
CGGAAAGCAGGCACGGTGTCTATCAGGTCGACAAGTACTGGAACGACGGAGTACCTGGCGTGACTCAATGGCCCATT

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GAATCCAGGGATTTCGTATACTTACGAGTTTACTCTCACCAACCAAACCTGGAAGCTACTTCTACCATGGCCACTTTGG
ACCCGCATTCGCGGACGGCCAACGAGGCCCGCTGTGGATTGCACCGGCCCCCTGGAGACCCCGTCCGTATGAGCTTG
CGTCTGATGACCCGGCAGAGGTTGCAGCAATGCGCGCGGCCGAAGACAATCCGAGACACCTCATGGTTTCCGACTGG
AACTATGAGGGAATGGAAGTGCTGATTGTGGGCTTCAGAGATGCAGGCATTGCTCCGGCATGTTCTGCGTCCCTCGT
GACAAATGGAAAGGGCAGGACAACCTTGCTCGGCCAGATGATATCAAGAAATACGATCCCGAGGGTTCGGAGGAATT
CACTTGGGTGCCTTCCCTCCAGTCGGCGCTGAGTTCACCAACAAGAGAGAATGCCGCGAGACTACCACCGACTTC
GAGATCATTGAGCCGAAGAAGGGGAGAAGTATATCTACATGAACTTTATCCACCCTGGAGCCCACCATGAACTGCG
AATCGCGGTGGACGAGCACGACATGATCATCGTGGCAGCTGACGGGGATTTTGTTCATGCCGAAAAAAGTCCAGGTAC
GTTAATGCGAGAAGTTGCACTGAGCGGTGCTGACCTATGGCTGCAGGCAATAAACCTCAACATGGGCGACAGGATCA
GTGTCCTGGTACCGCTAGACAAGAAGCCGGGGGAATACGCCATCCGCCTGTCGTCCATTTCCGAGGAGCAATTGATT
ACGGGCTTGAGCATCTTGCGCTACCCCGGTGTCAGGAGCGCCGCAAAGACGGTATTATGCTGGCACCGGAAACAAA
ACCCCATATTGATCTGTTGGGGCGGATGGTCACTGAAGGAGGTGTCATGATGGATGAAATGACCGATTTGGCCCCCT
TTCCGCCGCGCTCACCCCGAGCGACGTCTGATCACACGTTTCGGTTTTTATCAAACCGCACCGGCCCGAGCACATGG
ATGCTGTCGAGCGAGCCACACCAAGGCTTCCGCCAGCAGATGCCTCCTATTATGTGGAACGAAGAGTCTCGTGGCCC
TACAACCATTCAGGGGATGAAGAATGGATCCACCGTAGACATCATCTTCGAGAGCCGCGCATAACCCATGCACCCTT
TCCACAAACACAATCACAAGGCTGGATTATTGGTAGAGGAAAGGGCTACTTCCGTTGGCCAGATGTTGCTACTGCC
ATCTCGGAAGCTCCAGAGAATTTCAACCTGATCAACCCGCCGTTGCGAGATGGTGCCCGGCTCGAAGCGGAAGAGGG
ATCCTGGACGGTGATCCGTTACACCATCACCTTTCCTGCCATGAGCATGCTGCACTGCCATCGTATTCAGCACTTTG
CGGTAAGTGTGTGATCTAGCCACCAAACGAATGGTCACTGATTGAAACAGGCTGGACAACAGATAGTCCTTTTGGAG
GGGCAGGATGTGATGCAAAGCCCTCCTGAGTACATCAAAAAAATGACGCATGCGAGCTTTGTGCCGCCACTCCGATA
CGGCCCCCTTGACTGAGAGTTCCCATGCGAGGCCAGAGCACGGAATTGGGTAGTTGAAGTTAAAACCTGCCACATAA
AAAATAGCTCGAATAACAGGATTTTGCTAGCTCATGGAAGTCCACTTGTTCCTTTGCGTTCAGTCTAATGGCTGC
GGTGAAGCGAA

[0412] SEQ ID NO:47

[0413] 长度 :1713

[0414] 类型 :DNA

[0415] 生物体 :菜豆壳球孢菌

[0416] 特征名 / 键 :CDS

[0417] 定位 : (1) (1713)

[0418]

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gacgggaaccctcgcggtgtcttaactatcaacggccagacacctgggccattgatctgg
D G N P R G V L T I N G Q T P G P L I W
ggatatgaaggagacacacttcgcgtcactgtgaccaataaaatgtttattgaggetact
G Y E G D T L R V T V T N K M F I E A T
atgcattggcacggtgtctatcaggtcgacaagtactggaacgacggagtacctggcggtg
M H W H G V Y Q V D K Y W N D G V P G V
actcaatggcccattgaatccagggattcgtatacttacgagtttactctaccaaccaa
T Q W P I E S R D S Y T Y E F T L T N Q
actggaagcacttctaccatggccactttggaccgcatttcgaggacggccaacgagggc
T G S Y F Y H G H F G P A F A D G Q R G
ccgctgtggattgcaccggccccctggagacccccgtccgtatgagcttgctgatgac
P L W I A P A P W R P R P Y E L A S D D
ccggcagaggttgacagcaatgcgcgaggccgaagacaatccgagacacctcatggttcc
P A E V A A M R A A E D N P R H L M V S
gactggaactatgaggggaatggaagtgtgattgtgggcttcagagatgcaggcattgct
D W N Y E G M E V L I V G F R D A G I A
ccggcatgttctgcgtccctcgtgacaaatggaaagggcaggacaacttgctcggcca
P A C S A S L V T N G K G R T T C L G P
gatgatcaagaaatagatcccggaggtcggaggaattcacttgggtgccttctctct
D D I K K Y D P E G R R N S L G C L P P

[0419]

ccagtcggcgctgagttaccaacaagagagaatgccgagagactaccaccgacttcgag
P V G A E F T N K R E C R E T T T D F E
atcattcaggccgaagaaggggagaagtatatctacatgaactttatccaccctggagcc
I I Q A E E G E K Y I Y M N F I H P G A
caccatgaatgcgaatcgcggtggacgagcagacatgatcatcgtggcgagctgacggg
H H E L R I A V D E H D M I I V A A D G
gattttgtcatgccgaaaaaagtcaggcaataaacctcaacatgggagcagagatcagt
D F V M P K K V Q A I N L N M G D R I S
gtcctggtaccgctagacaagaagccgggggaatacggccatccgcctgtcgtccatttcc
V L V P L D K K P G E Y A I R L S S I S
gaggagcaattgattacgggcttgagcatcttgcgctacccccggtgtgcaggagcgccgc
E E Q L I T G L S I L R Y P G V Q E R R
aaagacggtattatgctggcaccggaaacaaaaccccatattgatctgttggggcgggatg
K D G I M L A P E T K P H I D L L G R M
gtcactgaaggaggtgtcatgatggatgaaatgaccgatttggccccctttccgcccgcgc
V T E G G V M M D E M T D L A P F P P R
tcacccccagcgacgtctgatcacacgtttcgggtttttatcaaaccgcaccggccccgagc
S P P A T S D H T F R F L S N R T G P S
acatggatgctgtcgagcgagccacaccaaggttccgcccagcagatgcctcctattatg
T W M L S S E P H Q G F R Q Q M P P I M
tggaacgaagagtctcgtggccctacaaccattcaggggatgaagaatggatccaccgta
W N E E S R G P T T I Q G M K N G S T V
gacatcatttcgagagccgagcagcagcaccctttccacaaacacaatcacaag
D I I F E S R A Y A M H P F H K H N H K
gcctggattattggtagaggaaagggctacttccggttggccagatggtgctactgccatc
A W I I G R G K G Y F R W P D V A T A I
tcggaagctccagagaatttcaacctgatcaaccgcccgttgcgagatggtgcccggctc
S E A P E N F N L I N P P L R D G A R L
gaagcgggaagagggatcctggacgggtgatccgttacaccatcacctttcctgccatgagc
E A E E G S W T V I R Y T I T F P A M S
atgctgcaactgccatcgtattcagcactttgcccgtggacaacagatagtccttttggag
M L H C H R I Q H F A A G Q Q I V L L E
gggcaggatgtgatgcaaagccctcctgagtacatcaaaaaaatgacgcagtcgagcctt
G Q D V M Q S P P E Y I K K M T H A S F
gtgccgcccactccgatacggcccccttgactga
V P P L R Y G P L D-

[0420] SEQ ID NO:48

[0421] 长度 :570

[0422] 类型 :PRT

[0423] 生物体 :菜豆壳球孢菌

[0424] MAQGRCPRRNKVIIVSLLTWT DGNPRGVLTINGQTPGPLIWGYEGDTLRVTVTNKMFIEATMHWHGVIYQV
DKYWN DGVPGVTQWP IESRDSYTYEFTLTNQ TGSYFYHGHFGPAFADGQRGPLWIAPAPWRPRPYELASDDPAEVAA
MRAAEDNPRHLMVSDWN YEGMEVLIVGFRDAGIAPACSASLVTNGKGRITCLGPDDIKKYDPEGRRNSLGCLPPPVG
AEFTNKRECRETTDFEIIQAEEGEKYIYMNF IHPGAHHELRIAVDEHDMIIVAADGDFVMPKKVQA INLNMGDRIS
VLVPLDKKPGEYAIRLSSISEEQLITGLSILRYPGVQERRKDGIMLAPETKPHIDLGRMVTEGGVMMDEM TDLAPF
PPRSPATS DHTFRFLSNRTGPSTWMLSSEPHQGFRQQMPPIMWNEESRGPTTIQGMKNGSTVDIIFESRAYAMHPF
HKHNHKAWIIGRGKGYFRWPDVATAISEAPENFNLINPPLRDGARLEAEEGSWTVIRYTIITFPAMSM LHCRIQHFA
AGQQIVLLEGGDVMQSPPEYIKKMT HASFVPLRYGPLD*

[0425] SEQ ID NO:49

[0426] 长度 :2269 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0427] 类型 :DNA

[0428] 生物体 :菜豆壳球孢菌

[0429] AGTATGTGCGTTGATCCCGCTGTCTATTCGAGCACCAGAGCACTGTCCAGCCACCTTGAGCTATCTCAA
GGGGCTATCTCATCTGGTCATCTTCGCTGGGGCATCGGTTGCCTTCTCAACCCTTCTCAATCCCCTCACGCTTCTG
CAACATGTTCTTCGGCTCCCTCCACTTGGGCATCGGGCCCTATTGGTTGCCGGCACTCTTGCTGGCGACGACAAGT
GGCTTAGCCCCGTCTACAAGAACTTTTACGAGTCCCCCTACCTAAGCCACCAATCAAGGAAGCGAAAGCGTAAGTC
AACTGATATTTCTCTCGCTCGTCATTTGCATGCCTAATCTTCGCAGGAAATATAACCAACCCGACTACCGGTGCTGTG
ATCAACTACTACGAAATCACCATCTCACCCCTGCAGCAACAGTTTATCCTGGCCTTGGAAGGCAAACCTCGTTGG
CTACGATGGTATCTCTCCCGTCCCACTTTTAAGATGGAGAGGGGAGAAGAGGCTGTCGTTTCGTTTCATCAACAAGG
CCTCCATTCCCAATTCCGTCCATCTTCACGGCTCTACTCCTTTGCCCCCTTCGATGGCTGGGCGGAGGATACGACC
AGCCCAGGCCAATACAAGGACTACTACTACCCCAATGCCAGTCTGCCCCGTACCCTCTGGTACCACGACCATGCCGT
CTTCCACACTGCCGAGAACGCCTACTACGGTCAGGCAGGTTTCTACATCCTGCACGACTCGGCTGAGGATAGTCTGG
GTCTCCCGTCTGGAGACTACGACATCCCGCTCGGTCTGAGCTCGAAGCAATACCAGTCCAACGGTGACCTTTTCAGC
CCGAATGGCGAGACGGATAGCCTTTTTGGCGATGTTATCCATGTCAACGGCCAGCCCTGGCCGTACCTCAAGGTGGA
GCCCAGGAAGTACCGCTTCCGCTGCTTGATACAAGCATTTCGCGTCCAGCTGTCACTCCAAGACGATAAGA
GCAAGAAGATTGACTTTAACGTCATCGCTCCGATGCCGGCCTCCTGTCCAGCCCTGTTCCGACCAACCTGCTACAC
ATTTCCATGGCCGAACGCTGGGAAATTGTCGTCGACTTCTCCCAGTACGCTGGCAAGAATCACCATGAAGAACGA
GCGTGACGTGCAGGCCGATGAAGACTACAACAGCACTGACAAGGTCATGCGCTTCGTAGTAGGCAACAAGTTACCT
CGACTGCCAACAACAACCTGCCTGGCAGCCTCCGACGCTGCCTTTCCCGCCGAATAAGTCTGGTGTGACAGGAGC
TTCAAGTTTCGAGCGCAAAGGCGGTGAATGGAATCAACGGCGTTACCTTTGCCGACGTCGAGAACCGTATTCTAGG
CAAGCCCCAACGCGGACAGGTTGAGGTCTGGGAGCTCGAGA ACTCTTCCGGCGGCTGGTCTCACCCCGTTCACATCC
ATCTCATCGACTTCCAGGTTATTTCTCGCACTGGTGGCAAGCGTGATGTCCTGCCTTACGAGAAGAACGGTCTCAA
GATGTCGCTTGTGTTGGCGTGAACGAGAAGGTCAGAGTTGTCGCTCGCTTCCAGCCCTGGGAAGGTGTCTACATGTT
CCATTGCCACAACCTGATCCACGAGGACCAGATATGGTGCCTCCAGCATTCTCTGATTACTCGCAACAAAGAC
TGACAAATAATTACAGATGGCCGCTTTCAATGTATCCACCCTTTCAGACTACGGCTACGACCAGAAGGAGACCCTTT
TCATCGACCCGATGGAGTCCCGCTGGCGCGCAAAGGATGTCAAGACCGAAGACTTCACAACCGATGCCATCCAGTCG

AAGCTTGCCGCTTTCGCTGAAATAAATCGCTACAAGGACGTTGCGAAGATCGAAAGTGCTCTTGAAAATTATTGGAA
 GACCGCTCCCACCGGTTCAAGATTAGCACCACTCCTCAACTCCGAGCTCAACCGCCGCCACCTCCACCGCTTCCA
 GCAGTGGCTCAAACACCTCTATTACCGCCCCATTAGTCCCCGGCCACTACTTCACCCGCGACCACTTCGACCAAG
 GCGGATGACAAGGGCAAGGCTAAGACTTCTACGACCAAAACGAAGTAACGAAATGGCTTTTAGATCACGCTCATTAT
 AGATAAACTTGGGAGAATTTGGGTCGGTGTTTTTGGATAGTTTGGTTCGGAGGAGCGCTCTCTGTAAATATGGGCC
 TCGCGAACTCTGTGGATATTTGTTTCTCGGTGTCTGTTAATATC

[0430] SEQ ID NO:50

[0431] 长度 :1860

[0432] 类型 :DNA

[0433] 生物体 :菜豆壳球孢菌

[0434] 特征名 / 键 :CDS

[0435] 定位 : (1) (1860)

[0436]

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atgttcttcggctccctccacttgggcacatggcgccctattggttgcccggcactcttgct
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ggcgacgacaagtggcttagccccgtctacaagaacttttacgagttccccctacctaag
G D D K W L S P V Y K N F Y E F P L P K
ccaccaatcaaggaagcgaagcgaatataccaaccgactaccggtgctgtgatcaac
P P I K E A K A K Y T N P T T G A V I N
tactacgaaatcaccatctcaccctgcagcaacagggtttatcctggccttggcaaggca
Y Y E I T I S P L Q Q Q V Y P G L G K A
aacctcgttggtacgatggtatctctcccggctccacttttaagatggagaggggagaa
N L V G Y D G I S P G P T F K M E R G E
gaggctgctgcttcgttcatcaacaaggcctccattcccaattccgtccatcttcaoggc
E A V V R F I N K A S I P N S V H L H G
tctactcctttgcccccttcgatggctggcgaggatacgaccagcccaggccaatac
S Y S F A P F D G W A E D T T S P G Q Y
aaggactactactacccaatgcccagtctgcccgtaccctctggtaccaogacocatgcc
K D Y Y Y P N A Q S A R T L W Y H D H A
gtctccacactgccgagaacgcctactacggtcaggcaggtttctacatcctgcaogac
V F H T A E N A Y Y G Q A G F Y I L H D
tcggctgaggatagtctgggtctcccgtctggagactacgacatcccgtcggctctgagc
S A E D S L G L P S G D Y D I P L G L S
tcgaagcaataccagtcacaacgggtgaccttttcagcccgaatggcgagacggatagcctt

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[0437]

S K Q Y Q S N G D L F S P N G E T D S L
 tttggcgatggttatccatgtcaacggccagccctggccgtacctcaaggctcgagcccagg
 F G D V I H V N G Q P W P Y L K V E P R
 aagtaccgcttccgctgcttgatacaagcatttcccgctgccttccagctgtcaactocaa
 K Y R F R L L D T S I S R A F Q L S L Q
 gacgataagagcaagaagattgactttaacgtcatcgcctccgatgccggcctcctgtcc
 D D K S K K I D F N V I A S D A G L L S
 agccctggttccgaccaacctgctacacatttccatggccgaacgctgggaaattgtcgtc
 S P V P T N L L H I S M A E R W E I V V
 gaetttcccagtagctggcaagaacatcacatgaagaacgagcgtgacgtgcagggcc
 D F S Q Y A G K N I T M K N E R D V Q A
 gatgaagactacaacagcactgacaaggatcatgctgcttcgtagtaggcaacaaggttacc
 D E D Y N S T D K V M R F V V G N K V T
 tcgactgccaacaacaacctgctggcagcctccgcagcgtgcctttcccgcgcaataag
 S T A N N N L P G S L R S V P F P P N K
 tctgggtgtgacaggagcttcaagttcgagcgcgcaaggcggtgaatggactatcaacggc
 S G V D R S F K F E R K G G E W T I N G
 gttaccttggcgacgtcgagaaccttctaggaagccccaacgaggacaggttgag
 V T F A D V E N R I L G K P Q R G Q V E
 gtctgggagctcgagaactcttccggcggtggtctcacccttccacatccatctcctc
 V W E L E N S S G G W S H P V H I H L I
 gacttccaggttatttctcgactggtggcaagcgtgatgtcctgccttacgagaagaac
 D F Q V I S R T G G K R D V L P Y E K N
 ggtctcaaagatgtcgtcttggcttggcgtgaacgagaaggcagagttgtcgctcgcttc
 G L K D V V L L G V N E K V R V V A R F
 cagccctgggaaggtgtctacatgttccattgccacaacctgatccacgaggaccacgat
 Q P W E G V Y M F H C H N L I H E D H D
 atgatggccgctttcaatgtatccacccttccagactacggctacgaccagaaggagacc
 M M A A F N V S T L S D Y G Y D Q K E T
 cttttcatcgaccgatggagctcccgctggcgcgcaaggatgtcaagaccgaagacttc
 L F I D P M E S R W R A K D V K T E D F
 acaaccgatgccatccagtcgaagcttggcgcttttcgctgaaataaatcgctacaaggac
 T T D A I Q S K L A A F A E I N R Y K D
 gttcggaagatgaaagtgctcttgaataatttgaagaccgctcccaccgggttcaag
 V A K I E S A L E N Y W K T A P T G F K
 attagcaccacctcctcaactccgagctcaaccgcccacctccaccgcttccagcagt
 I S T T S S T P S S T A A T S T A S S S
 ggctcaaacacctctattaccgccccattcagctcccggcactacttccaccgogacc
 G S N T S I T A P I Q S P A T T S P A T
 acttcgaccaaggcggatgacaagggcaaggctaagacttctacgacccaaaacgaagtaa
 T S T K A D D K G K A K T S T T K T K-

[0438] SEQ ID NO:51

[0439] 长度 :619

[0440] 类型 :PRT

[0441] 生物体 :菜豆壳球孢菌

[0442] MFFGSLHLGIGALLVAGTLAGDDKWLSPVYKNFYEFPLPKPPIKEAKAKYTNPTTGAVINYEITIS
 PLQQQVYPGLGKANLVGYDGISPGPTFKMERGEEAVVRFINKASIPNSVHLHGSYSFAPFDGWAEDTTPGQYKD
 YYYPNASARTLWYHDHAVFHTAENAYYGQAGFYILHDSAEDSLGLPSGDYDIPLGLSSKQYQSNGLDFSPNGET
 DSLFGDV IHVNGQPWPYLKVEPRKYRFRLLDTSISR AFQLSLQDDKSKKIDFNVIASDAGLLSSPVPTNLLHISM
 AERWEIVVDFSQYAGKNITMKNERDVQADEDYNSTDKVMRFVVG NKVTSTANNLPGSLRSVPFPNKS GVD R S F
 KFERKGGEWTINGVTFADVENRILGK PQRGQVEVWELENSGGWSHPVHIHLIDFQVISRTGGKRDVLPYEK NGL
 KDVVLLGVNEKVRVVARFQPWEGVYMFHCHNLIHEDHDMMAAFNVSTLSDYGYDQKETLFDIPMESRWR AKDVKT
 EDFTTDAIQSKLAFAEINRYKDVAKIESALENYWKTAPTGFKISTTSSTPSSTAATSTASSSGSNTSITAPIQS
 PATTSPATTSTKADDKGKAKTSTTKTK*

[0443] SEQ ID NO:52

[0444] 长度 :2423 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0445] 类型 :DNA

[0446] 生物体 :菜豆壳球孢菌

[0447] AAAGGCCTTTGGCTCCCGCCAAAATTGTTTCATCCTCACGCTCACTCCTGCGCTCTTCCCTACAGACCTT
TTGCCTGTAGCTTTAGCTTCACGGTCTTTTCATTCCCCTTCTCTGGCATTTCATCCCACCGCGGAAGCCTCAATTAC
CACAATGGTGTCCCTTAAGCAAATCGGTGCCACTCTGTTGGCACTGACTGCTCAAACCTTCGCTGCTGCCATCCCTG
AGGCCGAACCGGTGGACCTCGTCGCCCGTCAAGCCACGACCACTACGTCCACCACCTCCTCAACCACCTCGAGGGTT
CCCATTCCCATTGACTTGGGGCCCTTCGAGCAGGGGTTGCTGGAAGAACGGCTTCAGCATTGCCACTGACTTTGA
CACGAAGTGGCCATCTACTGGCAAGACTGTCTCATATCGCTTGAAGTTACGAATGTCACCAACTGCGAGGACTATC
AAAGCAAGGGAATTGGAGATGGCTTCTGCAGGCCGATGCTGCTCATCAACAATCAGTTCAGGGCCTACCAGTCAG
TTTTTCCCTCCTCGATGCCGGGTGACAAGGGCGCTAATGACTCGTACTTCCAGTCAATGCGGAATGGGGAGACAAC
CTTGAGATTACTGTTGTCAATAGTATGCAAGACAACGGCACCTCATTCCACTGGCACGGCATTTCGTAGCTGAACTC
ATGCCAAAACGATGGTGCCAACGGCGTCACCGAGTGCCCTATTCCTCCCGCGGAAGCTTCACTTATAAGTTCAAGG
CTACACAGTATGGTGAGTCTTTGCCCTTCTTCTACCTTTTCCATTTTCATGCAAGCATCTTCATGTGCGTTCTGTTG
AGTTTTGAGGCGGAAATACTCTTGAGCTTGCCCCGTTCCGTTTGTGAGCCACGTGCAAGGCCACCTGCTCCCACCT
TGTCATAATACTGACCGCCCTTcCAGGAACAACATGGTACCATAGCCATCACTCTGCTCAGTACGGCGATGGGATC
CAAGGTGCCATCGTGATCAATGGCCCGCAACCGCCAATTACGACGAGGATTTAGGCCCGTTGCCCTCACCGAAAC
CTACGATGAGACGGCATGGACGAAGAACTGGCTGGCGCTGCACGTGGCATTCCCTCCTCAGCCCCTCAACATTCTCT
TCAATGGCTCCATGGTCAACAGCACCGGCGGCGGCTACAACACCATCTCAGTCAAGCAAGGCAAGACTTACCGG
CTGCGCCTGATTAACATGAGCGTCGACACTTTCTTCGTATTCTCCATGGACGGGCACGAGTTCAGATCATCACGGC
CGACCTCGTCCCCGTGCACCCTTACAATGCGACCTCGATCATGATCGGCATCGGCCAGCGCTACGACATCGTCTTCA
AGGCCAACCCAGCCCGCTGCCAACTACTGGCTGCGTACCGAGATCGCCAGCTGCAGTGCCAACGCCATCACGGCCGAA
GCCGACATCGTCCCCGGCGGCATCCTGAACTACGACACCATCGACAAGACGGATCTGCCAGTCTCCACCAAGTCCGT
TATCGAGACGACCGACTGCGCCGCGGAGCCCTACGACAAGCTGGTCCCCTGGTGGGAGACGCAGGTCCCCAAGGACC
AGTTCCTGACCCAGCTCGAGGGCATCGACCTGACGTTTCGCGGGGGCGCCACGGTCGGCAGCGAGACTGGTCTTGTG
CAGTGGTACCTGAACGACAGCGCCATGGTCGTCGACTGGGCCAAACCGACTCTGGAGTACTTCTCCGAGGGAGACAC
TAACTATACGTCTTCAATGAACGTTTTCCAGATGCCCCGGAGGGGAAGTGGTCGTTCTGGATCATCCACAACAACG
CGGCCGCTCTGCTCGACCACCCGATCCATCTCCACGGCCACGACTTTTTCCACCTGGGCGCCGGCACCGGCACCTGG
GACGGCAACGTGGACTCCTTGATCTTCGACAATCCTATGCGCAGGGACGTGATGATCTTGCCCACAGGATGGCTTAT
TATCGCCTTTCCAGCGGACAAcCCC GGCGGTGGTTGATGCATTGCCACATCGTAAGTACCCAACAAGCCCCATCTC
TCTCTCTCTCTCATCAAAGATGACGGCAACTGACAAGCAACCAGGCATGGCACGTTACCGACGGGCTTTCCTTGC
AGTTCGTTGAAAACCCAGGCTCATTACGCGAGGACCTCTCGGGCATGAAGAGCAACTGCGCCGCTGGAAAGAGTAC
GAGGAGAAGGCTTACTATGAGAAGGAGGTTGGCGATTCCGGCTTGTAACCGTGACGGCGGGGATGAGGAGTTTAT
GACGAGATGTTCACTTTATACTTACCACCACCACCCTTTTCTCTTTTACCGACGTAGGGCTGCACT
ATCTGGCGCGTCTGTGGTCTGCTTTCATATGCATAAATACCTT

[0448] SEQ ID NO:53

[0449] 长度 :1824

[0450] 类型 :DNA

[0451] 生物体 :菜豆壳球孢菌

[0452] 特征名 / 键 :CDS

[0453] 定位 :(1) (1824)

[0454]

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M V S L K Q I G A T L L A L T A Q T F A
gctgccatccctgaggccgaaccgggtggacctcgctcgcccgtcaagccacgaccactacg
A A I P E A E P V D L V A R Q A T T T T
tccaccacctcctcaaccacctcgagggttcccgatgccgatgtacttggggcccttgcg
S T T S S T T S R V P D S R C T W G P S
agcaggggttgctggaagaacggcttcagcattgccactgactttgacacgaagtggcca
S R G C W K N G F S I A T D F D T K W P
tctactggcaagactgtctcatatcgcttggaagttacgaatgtcaccaactgcgaggac
S T G K T V S Y R L E V T N V T N C E D
tatcaaagcaaggaattggagatggcttctgcaggccgatgctgctcatcaacaatcag
Y Q S K G I G D G F C R P M L L I N N Q
ttcccagggcctaccatcaatgcggaatggggagacaaccttgagattactggtgtcaat
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[0455]

F P G P T I N A E W G D N L E I T V V N
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 S M Q D N G T S F H W H G I R Q L N S C
 caaaacgatgggtgccaacggcgctaccgagtgccctattcctcccggggaagcttcaact
 Q N D G A N G V T E C P I P P G G S F T
 tataagttcaaggctacacagtatggaacaacatggtaccatagccatcactctgctcag
 Y K F K A T Q Y G T T W Y H S H H S A Q
 tacggcgatgggatccaaggtgccatcgatcaatggcccggcaaccgccaattacgac
 Y G D G I Q G A I V I N G P A T A N Y D
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 E D L G P V A L T E T Y D E T A W T K N
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 W L A L H V A F P P Q P L N I L F N G S
 atggtcaacagcaccggcgccgctacaacaccatctcagtcaagcaaggcaagact
 M V N S T G G G R Y N T I S V K Q G K T
 taccggctgcccctgattaacatgagcgtcgacactttctcgtattctccatggacggg
 Y R L R L I N M S V D T F F V F S M D G
 cacgagttccagatcatcacggccgacctcgtccccggtgcacccttacaatgcgacctcg
 H E F Q I I T A D L V P V H P Y N A T S
 atcatgatcgccatcgccagcgtacgacatcgtcttcaaggccaaccagccccgctgcc
 I M I G I G Q R Y D I V F K A N Q P A A
 aactactggctgctgaccgagatcgccagctgcagtgccaacgccatcacggccgaagcc
 N Y W L R T E I A S C S A N A I T A E A
 gacatcgtccccggcgccatcctgaactacgacaccatcgacaagacggatctgcccagtc
 D I V P G G I L N Y D T I D K T D L P V
 tccaccaagtccggtatcgagacgaccgactgcgcccggagccctacgacaagctggtc
 S T K S V I E T T D C A A E P Y D K L V
 cctggtgggagacgcaggtccccaaggaccagttcctgaccagctcgagggcatcgac
 P W W E T Q V P K D Q F L T Q L E G I D
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 L T F A A G A T V G S E T G L V Q W Y L
 aacgacagcgcctatggtcgtcactgggccaaccgactctggagtacttctccgagggga
 N D S A M V V D W A K P T L E Y F S E G
 gacactaactacgtcttcaatgaacgttttccagatgcccgggaggggaagtggctg
 D T N Y T S S M N V F Q M P A E G K W S
 ttctggatcatccacaacaacgcggccgctctgctcgaccaccgatccatctccaagcc
 F W I I H N N A A A L L D H P I H L H G
 caegactttttccacctggcgccggcaccggcacctgggacggcaacgtggactccttg
 H D F F H L G A G T G T W D G N V D S L
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 I F D N P M R R D V M I L P T G W L I I
 gcctttccagcggacaacccccggcgctgggttgatgcattgccacatcgcatggcacggt
 A F P A D N P G A W L M H C H I A W H V
 accgacgggctttccttgagttcgttgaaccaccaggctcattcacgcaggacctctcg
 T D G L S L Q F V E N P G S F T Q D L S
 ggcatgaagagcaactgcgccgctggaaagagtacgaggagaaggettactatgagaag
 G M K S N C A A W K E Y E E K A Y Y E K
 gaggttggcgattccggcttghtaa
 E V G D S G L-

[0456] SEQ ID NO:54

[0457] 长度 :607

[0458] 类型 :PRT

[0459] 生物体 :菜豆壳球孢菌

[0460] MVSLKQIGATLLALTAQTFAAAIPAEFPVDLVARQATTTTSTTSSTTSRVPDSRCTWGPSSRGCWKNF
 SIATDFDTKWPSTGKTVSYRLEVNTNVEDYQSKGIGDGF CRPMLL INNQFPGPT INAEWGNLEITVVNSMQDNG
 TSFHWHGIRQLNSCQNDGANGVTECPIPPGGSFTYKFKATQYGT TWYHSHSAQYGDGIQGAIVINGPATANYDEDL
 GPVALTETYDETAWTKNWLALHVAFPPLNILFN GSMVNSTGGGRYNTISVKQGKTYRLRLINMSVD TFFVFSMDG

HEFQIITADLVPVHPYNATSIMIGIGQRYDIVFKANQPAANYWLRTEIASCSANAITAEADIVPGGILNYDTIDKTD
LPVSTKSVIETTDCAAEPYDKLVPPWETQVPKQFLTLQLEGIDLTFAGATVGSSETGLVQWYLNDSAMVVDWAKPTL
EYFSEGDNTYTSSMNVFQMPAEGKWSFWI IHNNAAALLDHP IHLHGHDFFHLGAGTGTWDGNVDSLIFDNPMMRDVM
ILPTGWLIIAFPADNPGAWLMHCHIAWHVTDGLSLQFVENPGSFTQDLSGMKSNCAAWKEYEYEKAYYEKEVGDSGL*

[0461] SEQ ID NO:55

[0462] 长度 :2147 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0463] 类型 :DNA

[0464] 生物体 :菜豆壳球孢菌

[0465] GCCACGGCTCCATTTGGATCGTCACTCACCACCACCACCACAACCACTCTCTACTCACCTCTTCACCAG
CCCCCTCTTTCTCCTCACTGGCATCCATTCGTTGAAGTCGCTGTCCCGTTTTCTTGTCTTTCGTCTTCTTCCACCGT
CAGAATGAGGGCTTCTTACCTCTCTGCGGCTGCCTTCCTGGGCTCTCGGCTGCCGCGCCGAAGCCGCCAGCACTT
CTTCTTCTCTGCTTCAGCCAACGCCAGTTCACCAGCTCAGCAGCTACTTCCACTTGCCTGGCAACACTGCCGAC
GACCGCACTGTGTGGTGCCTACTACGACATCAGCACCAGCTACTACAACGACGGACCCGACACGGGGTCAACCGCA
GTACTACTTCGTCGTCAGCGACGTGACCGTCTCGCCGATGGCATCTCGCGCTCCGCTATGGCGGTGAACGGCAGCA
TCCCCGGCCCCACCATTTTCGCCGACTGGGGTGACACAGTGAAAGTTACTGTCTACAACGACCTCACCACGAGCGGC
AACGGCTCTTCCATCCATTGGCACGGTATCCGGCAGAACTACACGAACCAGAATGATGGTGTGGTGTCTATTACGCA
ATGCCCGATTGCGGTGCGCGAGACCTACACCTACGAGTGGAAGGCCACGCAGTACGGCTCTTCTGGTACCACTCTC
ACATTGGCTGCAGGCCTGGGAGGGTGTTCGCGGTGGTATCATTATCAACGGTCCCGCTACTGCAAATTACGACGAG
GACCTCGGCATCATGTTTCTCAATGATTGGGATCACTCGACTGTTGACGAGCTCTACGATTACGCTCAGAGCAGCGG
TCCTCCTACGCTTGACACCGGTCTCATTAACGGAACCAACATCTACAATGACTCCGGAACAGTTACTGGATCTCGCT
GGGAGGCCAGCCTGACCGAGGGTACCAGCTACCGGCTCCGTCTTGCAACGCTGCTGTAGACTCGCACTTCAAATTT
TCGATCGATAACCACACCCTCCAGGTTATCGCCATGGACCTGGTCCCCATTGAGCCCTACGAGACTACTGTTCTGGA
CATTGGCATGGGTGAGCGCTACGACGTCATTGTTACGGCAGACCAGGCTTCTGTTGCTTCTGATTTCTGGCTTCGCG
CAATCCCCAGACCGCTGCTCGGACAACGATAACGCAGATGATATCAAGGGCATAATCCACTACGGATCATCAACT
GGTACTCCGAAACCACTGCTTAGTAAGTTCGATGTCCACATCTTCCGAGCTCTCCGCTAATGATTCAACAGTGAT
TACACTGATGCCTGTGTCGATGAGGACAGCTCTGATCTCGTAAGTGCTCGAGATTCACGGTCGTCTGGAAAGAGTAG
GCGCGCTGACTGTGATCTTTAGGTCCCGTATGTCTCTAAGACTGCCACCTCCGGTACCTCCCTGGCCGAGGCTGTTT
CCGTGCGCTACAACCTCGGACAACCTCTTCCGCTGGTACATGAACGAGACCTCTATGGAGGTCGAGTGGGAGAATCCA
ACCCTTCTGCAGGTCTACAACGACAATCTGACGTTCACTGACACATCGGGTGTGTTCAACTTGACACCGCAGACCA
ATGGTACTTCTTCGTCATCGAGACCGACAACGCTGTGCCACACCCAATCCATCTTACGGCCACGACTTCTTCGTCC
TGGCTGCGGGCACCAGGCTTACAGTTCAGACGTTACTCTGACTCTGGATAACCCCTCCCCGCCGACACGGCTATG
CTTGACTCCTCTGGCTACTTGGTCTGGCTTTCGAGACCGACAACCCAGGTGCGTGGTTGATGCACTGCCACATCGG
CTGGCACACCAGCGAGGGCTTTGCCCTCAGATCTTGGAGCGCTACACCGAGATCCAGGATAGCCTGATCGACTACG
ACGTCCTCAATGACACCTGCTCGACTTGGTCTACTTACTCCGAGGCAAACCTCGATCGAGGAGGAGGACTCTGGTGTG
TAAGGAAAACCTCTGAGTGACAATCCGTCTATGGCAGGTGTGCGGGGCGCTTTGGAGCTCTCTCTATCTCTGTGAAAG
ATCTTGTATATAACGTGATGCCAGCCTCTCCCTGACATTTGGTGTTCGGTTGATCTACATATATTTCTTATTTA

[0466] SEQ ID NO:56

[0467] 长度 :1737

[0468] 类型 :DNA

[0469] 生物体 :菜豆壳球孢菌

[0470] 特征名 / 键 :CDS

[0471] 定位 : (1) (1737)

[0472]

```
atgagggcttcttacctctctgcggtgccttctgggcctctcggtgcccgcgcccga  
M R A S Y L S A A A F L G L S A A A P Q  
gccgccagcacttcttcttctctgcttcagccaacgccagttccaccagctcagcagct  
A A S T S S S S A S A N A S S T S S A A  
acttccaacttgcaactggcaactgcccagcaccgcactgtgtggtgcgactacgacatc  
T S T C T G N T A D D R T V W C D Y D I  
agcaccgactactacaacgacggacccgacacgggggtcaccgcgagtagtactacttcgtc  
S T D Y Y N D G P D T G V T R E Y Y F V  
gtcagcgacgtgaccgtctcgcccgatggcatctcgcgctccgctatggcggtgaacggc  
V S D V T V S P D G I S R S A M A V N G
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[0473]

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agcatccccggccccaccatttttcgccgactgggggtgacacagtgaaagttactgtctac
S I P G P T I F A D W G D T V K V T V Y
aacgacctcaccacgagcggcaacggctcttccatccattggcacgggtatccggcagaac
N D L T T S G N G S S I H W H G I R Q N
tacacgaaccagaatgatgggtgtgggtgtctattacgcaatgccccgattgcggtcggcgag
Y T N Q N D G V V S I T Q C P I A V G E
acctacacctacgagtggaaggccacgcagtagcggctcttccctgggtaccactctcacatt
T Y T Y E W K A T Q Y G S S W Y H S H I
ggcctgcaggcctgggaggggtgttttcgggtgggtatcattatcaacgggtcccgcactgca
G L Q A W E G V F G G I I I N G P A T A
aattacgacgaggacctcggcatcatgtttctcaatgattgggatcactcgactggtgac
N Y D E D L G I M F L N D W D H S T V D
gagctctacgattcagctcagagcagcggctcctcctacgcttgacaccgggtctcattaac
E L Y D S A Q S S G P P T L D T G L I N
ggaaccaacatctacaatgactccggaacagttactggatctcgtctgggagggccagcctg
G T N I Y N D S G T V T G S R W E A S L
accgagggtagcagctaccggctccgtcttgtcaacgctgctgtagactcgcacttcaaa
T E G T S Y R L R L V N A A V D S H F K
ttttcgatcgataaccacaccctccagggttatcgccatggacctgggtccccattgagccc
F S I D N H T L Q V I A M D L V P I E P
tacgagactactgttctggacattggcatgggtcagcgtacgacgtcattgttaaggca
Y E T T V L D I G M G Q R Y D V I V T A
gaccaggtctctgttctctgatttctggcttcgcgcaattccccagaccgctgctcg
D Q A S V A S D F W L R A I P Q T A C S
gacaacgataacgcagatgatatcaagggcataatccactacggatcatcaactgggtact
D N D N A D D I K G I I H Y G S S T G T
ccggaaccactgcttatgattacactgatgcctgtgtcgatgaggacagctctgatctc
P E T T A Y D Y T D A C V D E D S S D L
gtcccgtatgtctctaagactgccacctccggtaacctccctggccgaggetgtttccgtc
V P Y V S K T A T S G T S L A E A V S V
ggctacaactcggacaacctcttccgctgggtacatgaacgagacctctatggaggtcgag
G Y N S D N L F R W Y M N E T S M E V E
tgggagaactcaacccttctgcaggtctacaacgacaatctgacgttccactgacacatcg
W E N P T L L Q V Y N D N L T F T D T S
gggtgtgttcaacttgacaccgcagaccaatgggtacttcttctcgtcatcgagaccgacaac
G V V Q L D T A D Q W Y F F V I E T D N
gctgtgccacacccaatccatcttcacggccacgacttcttctcgtcctggctgcgggcacc
A V P H P I H L H G H D F F V L A A G T
ggctcttacagttcagacgttactctgactctggataaccctccccgcggcagacacggct
G S Y S S D V T L T L D N P P R R D T A
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M L D S S G Y L V L A F E T D N P G A W
ttgatgcaactgccacatcggctggcacaccagcaggggctttgcccttcagatcttggag
L M H C H I G W H T S E G F A L Q I L E
cgctacaccgagatccaggatagcctgatcgactacgacgtcctcaatgacacctgctcg
R Y T E I Q D S L I D Y D V L N D T C S
acttggctacttactccgagggcaactcgatcgaggaggaggactctggtgtgtaa
T W S T Y S E A N S I E E E D S G V-

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[0474] SEQ ID NO:57

[0475] 长度 :578

[0476] 类型 :PRT

[0477] 生物体 :菜豆壳球孢菌

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[0478] MRASYLSAAAFGLSAAAPQAASTSSSSASANASSTSSAATSTCTGNTADDRTVWCDYDISTDYNDGP
DTGVTREYYFVVSDVTVSPDGISRSAMAVNGSIPGPTIFADWGD TVKVTVYNDLTTSGNGSSIHWHGIRQNYTNQND
GVVSITQCPIAVGETYTYEWKATQYGSSWYHSHIGLQAWEGVFGGIIINGPATANYDEDL GIMFLNDWDHSTVDELY
DSAQSSGPPTLDTGLINGTNIYNSGTVTGSRWEASL TEGTSYRLRLVNAAVDSHFKFSIDNHTLQVIAMDLVPIEP

```

YETTVLDIGMGQRYDVIVTADQASVASDFWLRAIPQTACSDNDNADDIKGI IHYGSSTGTPETTAYDYTDACVDEDS
SDLVPYVSKTATSGTSLAEAVSVGYNSDNLFWRWMNETSMEVEWENPTLLQVYNDNLFTDTSGVVQLDTADQWYFF
VIETDNAVPHPIHLHGHDFVLAAGTGSYSSDVTLTLDNPPRRDTAMLDSGYLVLAFETDNPGAWLMHCHIGWHTS
EGFALQILERYTEIQDSLIDYDVLNDTCSTWSTYSEANSIEEEDSGV*

[0479] SEQ ID NO:58

[0480] 长度 :2302 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0481] 类型 :DNA

[0482] 生物体 :菜豆壳球孢菌

[0483] TGCGCCCCTCCCGCTGCTGGGCACTCTTTTATAAAGGCAGCTCTCCACTCCTGCCCTGTGAATGCTTG
CTCAAGGGCGCTCAGGCATAGGTAAGTAGGGTAAGTATTGAGGCGTCTGGCTTTGCGGCGAATCTTGGGACGATTTT
AGCCATGACTCGCCTTCCGTTCTCGTCTCGGGCTCGTGGCTACGGCTTTGGCCAAGACGGTCACTGTTGACTGGGACA
TTGGCTGGGTTTCCAGGGCTCCCGATGGATTCGAGCGGCTGTCATCGCAATCAACGGCCAATGGCCGCTCCCTGTG
CTGGAGGCCGACGTCAACGACACCATCATCGCCACTGTCCACAATTTCTCTGGCAACGAAACGACCAGCATCCACTG
GCACGGCATGTGGCAGAGAGGCACGCCGAGCAAGACGGCGGGGCTGGCGTCACGCAGTGTCCGATCCCGCTGGCG
AGACTTTACGTACGAGTTCAAAGCATAACCCGGCCGGTACTTTCTGGTACCACTCGCATGACATGGGCCAGTATCCC
GATGGCCTGCGCGACCCATGATCATCCATGACCCCGACTCCGAAACCCAGAAGAGCAGTGTGGTGAAGTCGTGCT
CTATGTGTCCGACTGGTACCACGACCAGATGCCCGGCTTATCCACAGCTTCCTGACCACCCCAATTTCAACGGCG
CGATGCCCAACCCGAACCTCAGCTTGATCAACGATCAGCAGTCCACGTCCATCAACATCCGTCCCGGCGAGAAGAAA
TACGTGCGCATCATCAACACGTCCGCCCTCGCCACGTACTACCTGCAGTTTGGTGGGTTCCGCTTCAGCCACCCCTC
CCCTGCGGAAGTGACTGACGATTTACAGACCAACACAACATCACCGTTGTGCAATTGACGGTGTGACGGTCCGTAC
TACCCCTGTGCTTATGCTGTGGCTTCGTGCATAACCCGTCGGCAGCTTCCCGCCGTTGCATGCCCGAGGCGATAAAA
GGTTTTAGTGCTGACCGTAGTCGTGCAGTCGAACCGCAGAGCTGGAAGGCCCTGGAGATCGTCCCGGCCAGCGGTA
CGACTTCATCATCGAAGGTCTCGAGAACCCCAAGGAACTACGCATTCATCAACAAGATGGCTGTTCTCGGTCTGC
AGAACGTCAACAGCCTGGTCTACGACGAGTCCTTCGGCGAGCCGGAGTCGTTACGCCTGAGCTCTGGCGATCTCGGA
AGTGATTTACCCCTGGTGCCTCTAGATCAGAGCCTCTCTTGGAAATCCGTGGACCACACCATCACGATGGAGGTCAA
TAATTTGAACATTGATGGCGTTGGCTTTCGGTACGGCTGATCCCGTGGCCGGGAGAAATCTTGCTCACATGTGCCAC
AGCATCACTCAAGGCCCGGACCCGTACATTTACCCCGCACGCCTACCCTGTACACAGCCCTCAGCACCAGGCTTCAA
CGCCACCGACCCAGAAATCTACGGCCAGGTGAACCCCTACGTCGTC AACGCCGTGAAGTCGTCGGCTCGTCGTCA
ACAGCAACGATCTCGTCACCGCCAACAACCTTGCCCGCGGGCACCCCATGCATCTGCACGGCCACGTTTTCCAGGTG
GTCGGTCAAGTTCTCCGAGCACTGGGACGGCAACACCTCGTCCTTCCCGCCACGCCATGAAGCGTGACACCACCGT
CCTATTGCTGGCGGAGCCTGGTGTCCAGTTCGTCGCGACAACCCGGTGTGGTGTGTAAGTATTTTTTTTT
TCCGATGCCCATGGTGCCTGGACGTGAGCTGATGAGGATGGGCCTTGCAGTTCCTGCCATATTGAGTGGCACCTAG
ACGCCGGCATGTCCGCTACAATCATCGAGGCGCGCTCGACTTGCAGCGGAGGGCATCAAGATCCCCCAGCAGCAT
CTTGAATCGTGCAGAGCCTTGAACCTGACCACTCAAGGCAATTGCGCCGGCAACACCGCCAACCTGGATGACACTGC
CGCCTGCAGGGTCTACGACACCGATCCATGGGGTAGGTCATATCGGAGTTTAATTGAGCTTGAAGGACATGTGCTG
ACCGTTGCGTTTAGTGCGCTTATCACGGATGACGGTGGTGGAAATAGTACCCTGAACGGAACCACTTATAAGAGAAT
TTAGTGTGTAATCTTAATACGTCTTCACATGTACACAACCTATGCATTGTATTCAAATTTACATAAGCACTTCGAC
AGTAGTCTGAGTTGACTGACTAGGCTCGTGGACGGAGGACGCCGTTTCTCGTCTTTGCCTGCTAAAATTTTCGGAT

[0484] SEQ ID NO:59

- [0485] 长度 :1665
[0486] 类型 :DNA
[0487] 生物体 :菜豆壳球孢菌
[0488] 特征名 / 键 :CDS
[0489] 定位 : (1) (1665)
[0490]

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M T R L P F V L G L V A T A L A K T V T
gttgactgggacattggctgggtttccagggctcccgatggattcgagcggcctgtcatc
V D W D I G W V S R A P D G F E R P V I
gcaatcaacggccaatggccgctccctgtgctggaggccgacgtcaacgacaccatcatc
A I N G Q W P L P V L E A D V N D T I I
gccactgtccacaattctcttggcaacgaaacgaccagcatccactggcagggcatgtgg
A T V H N S L G N E T T S I H W H G M W
cagagaggcagccccgagcaagacggcggggctggcgtcacgcagtgtccgatcccgct
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[0491]

Q R G T P E Q D G G A G V T Q C P I P P
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 G E T F T Y E F K A Y P A G T F W Y H S
 catgacatgggccagtatcccgatggcctgcgcgcacccatgatcatccatgaacccgac
 H D M G Q Y P D G L R A P M I I H D P D
 tccgaaaccagaagagcagtgatgggtgaagtcgtgctctatgtgtccgactggtaccac
 S E T Q K S S D G E V V L Y V S D W Y H
 gaccagatgccgcccgttatccacagcttccctgaccaccccccaatttcaacggcgcgatg
 D Q M P P L I H S F L T T P N F N G A M
 cccaaccggaactccagcttgatcaacgatcagcagtcacgctccatcaacatccgctccc
 P N P N S S L I N D Q Q S T S I N I R P
 ggcgagaagaaatacgtgcgcatcatcaacacgtccgcccctcgccacgtaactacctgcag
 G E K K Y V R I I N T S A L A T Y Y L Q
 ttgaccaacacaacatcaccgttgctcgcaattgacgggtggtgacgtcgaaccgcagagc
 F D Q H N I T V V A I D G V D V E P Q S
 tggaaggccctggagatcgtccccggccagcggtagcacttcatcatcgaaggctctcgag
 W K A L E I V P G Q R Y D F I I E G L E
 aaccacacaaggaactacgcattcatcaacaagatggctggttctcggtctgcagaacgctc
 N P T R N Y A F I N K M A V L G L Q N V
 aacagcctggtctacgacgagtccttcggcgagccggagtcggttcagcctgagctctggc
 N S L V Y D E S F G E P E S F S L S S G
 gatctcggaagtgatttaccctggtgcctctagatcacgagcctctcttggaaatccgtg
 D L G S D F T L V P L D H E P L L E S V
 gaccacaccatcacgatggaggtaataatttgaacattgatggcggttggttttgcgac
 D H T I T M E V N N L N I D G V G F R I
 actcaaggcccgaccctacatttaccctgcacgcctaccctgtacacagccctcagc
 T Q G P D P Y I S P R T P T L Y T A L S
 accggttcaacgccaccgacccagaaatctacggccaggtgaacccctacgtcgtcaac
 T G F N A T D P E I Y G Q V N P Y V V N
 gccggtgaagtgcgtccggctcgtcgtcaacagcaacgatctcgtcaccgccaacaactct
 A G E V V R L V V N S N D L V T A N N S
 ggccgcgggcaccatgcatctgcacggccacgttttccagggtggtcggtcagttctcc
 G R G H P M H L H G H V F Q V V G Q F S
 gagcactgggacggcaacacctcgtccttccccgccacgcccatagaagcgtgacaccacc
 E H W D G N T S S F P A T P M K R D T T
 gtcctattcgtcggcgagcctggtgctccagttccgtgccgacaaccccggtggttgg
 V L F A G G S L V L Q F R A D N P G V W
 ctgtttactgcatattgagtggcacctagacgcccggcatgtccgctacaatcatcgag
 L F H C H I E W H L D A G M S A T I I E
 gcgcccgtcgaacttgacgagcggggcatcaagatccccagcagcatcttgaatcgtgc
 A P L D L Q R E G I K I P Q Q H L E S C
 agagccttgaacttgaccactcaaggcaattgcgcccggcaacaccgccaacctggatgac
 R A L N L T T Q G N C A G N T A N L D D
 actgccgctgcaggtctacgacaccgatccatgggggtgcgcttatcacggatgacgggt
 T A A C R V Y D T D P W G A L I T D D G
 ggtggaatagtagccctgaacggaaccacttataagagaatttag
 G G N S T L N G T T Y K R I-

[0492] SEQ ID NO:60

[0493] 长度 :554

[0494] 类型 :PRT

[0495] 生物体 :菜豆壳球孢菌

[0496] MTRLPFVLGLVATALAKTVTVDWDIGWVSRAPDGFERPVIAINGQWPLPVLEADVNDTIIATVHNSLGN
 ETTSIHWGMMWQRGTPEQDGGAGVTQCPIPPGETFTYEFKAYPAGTFWYHSHDMGQYPDGLRAPMI IHDPSSETQKS
 SDGEVVLYVSDWYHDMQMPPLIHSFLTTPNFNGAMPNPSSSLINDQQSTSINIRPGEKKYVRIINTSALATYYLQFDQ
 HNITVVAIDGVDVEPQSWKALEIVPGQRYDFIIEGLENPTRNYAFINKMAVLGLQNVNSLVYDESFGEPEFSLS
 DLGSDFTLVPLDHEPLLESVDHTITMEVNNLNIDGVGFTRITQGPDPYISPRTPTLYTALSTGFNATDPEIYGQVNPY

VVNAGEVVRLVVSNDLVTANNSGRGHPMHLHGHVQVVGQFSEHWDGNTSSFPATPMKRDTTVLFAGGSLVLQFRA
DNPGVWLFHCHIEWHL DAGMSATI IEAPLDLQREGIKIPQQHLESCRALNLTQGN CAGNTANLDDTAACRVYDTP
WGALITDDGGGNSTLNGTTYKRI*

[0497] SEQ ID NO:61

[0498] LENGTH:2460(包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0499] 类型 :DNA

[0500] 生物体 :菜豆壳球孢菌

[0501] CTCCGTACTACTGCTGACTTCACATCCACAGCATGCAAGGACTCGAGGGCTTCTGATTTAACGAGCAC
TCACTTGCTTTTGTCTGCGTTTTCTTTTCGTTTTCTACTATTTTCATCTTGATCCATTGTTCTCGCCGTCGCTTT
CCAGATGTCTTTGTTTTCGAAAATTTTCACAGGCCCTCATCGCTTTTACCGCTGGCTTAGGCCAAGATGAGACTAATG
GGTGAGTATGCTGAACCTTGCAGGATATCTGAATAATAGTTGTAGGGTTTCGAAATGGGGCACGTTTCGATGCACC
GAGGCTCCAGAAGTTTCTGGATCGGGTGAGGTTATCTGAAACATTACTGAGCTCGGCACTGATTGGTCGGCAGGGT
CATGGCATTCCCTGGGGCGGTATGACTTGTACCAACGCCAACCCGTATACTGAGTAGGACTCGGCCCGTGGTCCACA
ATCTTCTCTGCGCTGACGTTTCGAAAAGAGCTCCAGACACAGGACAGACTGTGCGGTATGATTTACAGTCCAGCGGC
ATCCGGTGTCTCCGACGGCTACAAGAAGAAGCGTTTTGCTTGTGAACGGGCAATTTCCAGGCCCGCTCATGGAAGCT
AACTGGGGAGACACAATTGAAGGTAGGATGAGAGTAAATACGGGCAGCAACAACCTGCTGACAGATACAGTACTGTG
CACAACAACATAGCCGACCTGAGGAAGGCACACAAAATCCACTGGCAGGGCTTACGCAGAGAGGGACGCCGTTTCAT
GGATGGTATCCCTCCGTATCAAGCTGCCCCATTGCGCCCAACAATACCTTTGTGTATACCTTCAAGGCAGACCTTT
ACGGCACTGGCTGGTACCCTCTCATTACTCTGGGCAATCCACCGGCGGCCTCCTCGGCCAATCGTCGTCCATGGT
CCCAGTGCCTTGACTATGATATTGACCTTGGCCCTGTGTTTTGAATGACTGGTACCACAAGGACTACTTGCAGCT
TATTGACGGTGGTGAAGACTTTCCCGTAGGTCAAAGGGCTCGATAGCTGAAACCTCCAACAGTCGTGGAACGGACCC
CAGCCTATGGCATCCCAAGGCGGACAACAACATGATAAACGGGAAGATGGACTACGATTGCTCCCTTGTCACTGACG
GCACGCCTTGGCTCTCTAATGCCGGCTTGGCCACGTTACGCTTACCAAGGGCGCCACGCACCGTCTCAGGCTCATA
AACGGAGGATCCGCTCCCTGCAGCACTTCAGTATCGATGGACACGAGATGACAGTCATTTCCAATGACTTCGTAGC
CGTAGAGCCATAACCAGACGAAGACAGTACTCTTGACGTAAGCCGCCGATTTTTCCAGATATCCCACATTAATAAC
ACCCACCAGGTCGGCCAGCGGACAGACGTCCTCGTCACGGCCAACGGCGACGCCACCGGCGCCTACTGGATGCGCAG
CACCGTCGCGGACGATGAATCCTGCAACTGGTCCAACCAGCCCGCCGCGCTCGCCGAGTCTACTACGACGCGGCAA
ACCCACCGTCAAGCCCAACAGCACCGGCTGGCCCCCGTCGCCAACAGCAAGGCAGCTGCGACAACGACCCGCTT
ACCCAAACCATCCCCCTCTTCCCATCCCCGCGGACCCAGCCCCCAACGACGCTTGGCTCGACTTCGGCTGGAC
GCAAAACGCAACCGGACACCAAGTCTGGACGGTCAACGACCGCGGCTTCCGCGGCAACTACAACCGCCCCGTGCTGC
AGCTCGCCGCGGGCTCGGACACCGCGTCTCGCGTACGCGTGGGAGCCCGAATGGAACGTCTACGACACGGGCCG
AACCGCACCGTCCGCATCGTCATGCACAACAACCTCCATGTACCACGTACGTGAGCCCTTGTCTCCCCCCCCCCC
CCCCCTCCCCTCTCGTAATGGAAAGACACATGCAGCCCATGCACCTCCACGGGCACAACGCGCAGATCCTCGCCGC
GGGCGCCAACGGCCCCTGGGACGGCCGACCGTCGCGCGCCCCGCCAACCCGGCCCCCGCGACGTCTACCAGCTCC
CGCCGAACGGGCACCTGGTATCCAGTACGCGCAGGACAACCCGGGCGTGTGGCCGCTGCACTGCCACATCGCGTGG
CACGCGAGCGCGGGCATGTTTGCAGCGTGTGGAGCGGGCGGGGACATTGTGGGGAGCAGCGGGGCCGGCGGGTG
GAGGGAGGAGATGGCGGGCGTGTGTCCGGGTGGGAGGCGTACACGCGGATGAACGTGGTGGAGCAGGTGGACAGTG
GGGTGTGAGTTGGGAGCAAGGAGGGGGTTTGGAGATGCGCGTATATGGTAAGCGGTTGGGGTTCTTGTGTTGACTCGA
TTTGCTCTGCAGGCGGTGTCTTTTTGACTGTGGCGGTGCAATCTCGTTTTCTGTCATCCTGGGTGGATAGGGAGC

GGCG

[0502] SEQ ID NO:62

[0503] LENGTH:1803

[0504] 类型 :DNA

[0505] 生物体 :菜豆壳球孢菌

[0506] 特征名 / 键 :CDS

[0507] 定位 : (1)..... (1803)

[0508]

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D E T N G V S K W G T F D A P R L Q K F
ctggatcggggatcatggcattccctggggcggtatgacttgtaccaacgccaaccggtat
L D R G H G I P W G G M T C T N A N P Y
actgaagctccagacacaggacagactgtgcggtatgatttcacagtccagcggcatccg
T E A P D T G Q T V R Y D F T V Q R H P
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[0509]

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 ctcatggaagctaactggggagacacaattgaagtgactgtgcacaacaacatagccgga
 L M E A N W G D T I E V T V H N N I A G
 cctgaggaaggcacacaaatccactggcagggcttcacgcagagaggggacgccgttcatg
 P E E G T Q I H W H G F T Q R G T P F M
 gatggtatcccttccgtatcaagctgccccattgcgccaacaatacctttgtgtatacc
 D G I P S V S S C P I A P N N T F V Y T
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 F K A D L Y G T G W Y H S H Y S G Q S T
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 G G L L G P I V V H G P S A L D Y D I D
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 aagtgactacgattgctcccttgtcactgacggcagcccttgctctctaattgccggc
 K M D Y D C S L V T D G T P C V S N A G
 ttggccagcttcagcttcaccaagggcgccacgcaccgtctcaggctcataaacggagga
 L A T F S F T K G A T H R L R L I N G G
 tccgctcctcgcagcacttcagtatcgatggacacgagatgacagtcatttccaatgac
 S A S L Q H F S I D G H E M T V I S N D
 ttctgtagccgtagagccataaccagacgaagacagtgactcttgacagtcggccagcggaca
 F V A V E P Y Q T K T V T L A V G Q R T
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 D V L V T A N G D A T G A Y W M R S T V
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 A D D E S C N W S N Q P A A L A A V Y Y
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 D A A N P T V K P N S T G W P P V A N Q
 caaggcagctgcgacaacgaccgcttacccaaacatccccctcttccccatccccggc
 Q G S C D N D P L T Q T I P L F P I P A
 gacccccccctcaacgacgcttgagctcacttcggctggagcgaacacgcaaccgga
 D P S P S T T L E L D F G W T Q N A T G
 caccaagtctggacggtcaacgaccgcggttccgcggaactacaaccgccccgctgctg
 H Q V W T V N D R G F R G N Y N R P V L
 cagctcggcggggctcggacaccgctcgtccgctacgcgctgggagcccgaatggaac
 Q L A A G S D T A S S A Y A W E P E W N
 gtctacgacacgggcccgaaccgcaccgtccgcatcgtcatgcacaacaactcctccatg
 V Y D T G R N R T V R I V M H N N S S M
 taccacccatgcacctccacgggcacaacgcgcagatcctcgcggcggggcgccaacggc
 Y H P M H L H G H N A Q I L A A G A N G
 ccctgggacggccgaccgtcgcgcgccccgccaacccggccccgcccgcagctctaccag
 P W D G R T V A R P A N P A R R D V Y Q
 ctcccggcaacgggcacctggtgatccagtagcgcgaggacaacccgggctgtggccg
 L P P N G H L V I Q Y A Q D N P G V W P
 ctgcaactgccacatcgcgtggcagcgcgagcgggcatgtttgcgagcgtgctggagcgg
 L H C H I A W H A S A G M F A S V L E R
 gcgggggacattgtggggagcagcggggccggcggtggagggaggagatggcggggcgtg
 A G D I V G S S G A G G W R E E M A G V
 tgtgccgggtgggagcgtacacgcggatgaacgtggtggagcaggtggacagtggggtg
 C A G W E A Y T R M N V V E Q V D S G V
 tga
 -

- [0510] SEQ ID NO:63
- [0511] 长度 :600
- [0512] 类型 :PRT
- [0513] 生物体 :菜豆壳球孢菌
- [0514] MSFVSKIFTGLIAFTAGLGQDETNGVSKWGTFDAPRLQKFLDRHGIPWGGMTCTNANPYTEAPDTGQT

VRYDFTVQRHPVSPDGYKKNVLLVNGQFPGLMEANWGDTEIVTVHNNIAGPEEGTQIHWHGFTQRGTPFMDGIPSV
SSCPIAPNNTFVYTFKADLYGTGWYHSHYSGQSTGGLLGPVIVHGPSALDYDIDLGPVFLNDWYHKDYLQLIDGVVG
TDPSSLWHPKADNNMINGKMDYDCSLVTDGTPCVSNAGLATFSFTKGATHRLRLINGGSASLQHFSIDGHEMTVISND
FVAVEPYQTKTVTLAVGQRTDVLVTANGDATGAYWMRSTVADDESCNWSNQPAALAAVYYDAANPTVKPNSTGWPPV
ANQQGSCDNDPLTQTIPLFPIPADPSPSTLELDFGWTQATGHQVWTVNDRGFRGNYNRPVLQLAAGSDTASSAYA
WEPEWNVYDTGRNRTVRIVMHNSSMYHPMHLHGNAQILAAGANGPWDGRTVARPANPARRDVYQLPPNGHLVIQY
AQDNPVWPLHCHIAWHASAGMFASVLERAGDIVGSSGAGGWREEMAGVCAGWEAYTRMNVVEQVDSGV*

[0515] SEQ ID NO:64

[0516] 长度 :2285 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0517] 类型 :DNA

[0518] 生物体 :菜豆壳球孢菌

[0519] TGAAGCCCTCTCTGACGCAGGTATCTATTTTATTAAACCAGTTTCACCCTCCGGTCGGGTAAGTATTTG
CTCAAACAAACTTGTCCAAGTGTGAGTTAGGTAAGCTAGGAGGCTCACGAATCAAGAGACTCTCCAGAGATATCTT
CGCCATGATTGCCTTTCTCTCGTGCTCGGCTTCATGGCCACGACACTGGCCAAGACCGTCACTCTTAAGTGGGATA
TTGGGTGGGTTTCTGCGGCTCCAGATGGATTTACACGGCCCGTCATTGGCATCAACGGGGAGTGGCCGCCCCCcGTT
TTGGAAGCCGACGTCAACGACACTATTATAGTAATTACGCGGAACCTCCTGCGTAACGAGACGACGAGCTTGCAGT
GCATGGTATGTGGCACTATAACTCGACCCACATGGACGGCGGAGCCAGGATTTACAGTGTGAAATCCCTCCGGGG
GGACATTCACGTACAAGTTCAAGGCGTACCCGGCCGGCACCTTTTGGTATCATTCTCACGATATGGGCCAATATCCC
GACGGCCTGCGCGCCCAATGATCATTACGACCCTAAGGCTGCCGCGGAGCGGGACACTGATAAGGAGTACGTACT
TACGGTCTCCGACTGGTACCGTGACCAGATGCCGTCCTTATCCACCGCTACTTGACAACCTCCACTTATAATAGTA
CTATGCCAAATCCAACTCGAGCTTGATCAACGATCAGCAGTCTACAACGCTAAACATCCGCCCGGGCAGAAGATA
TATGTTTCGATTATTAACATGTCAGCCCTCGCAACGTAATCTACAGTTCGGTAGGTGTATCCATATGGCCCTGTT
ACACGGACGAAGCTAACGATTAAGATCAACACCACTTGACTGTTATTGCCATTGACGGTGTGACGGTTGGTAACCT
TATTACCTATTCTGCGCTAAGATGCATGTCGGCATATGTGCCGTTAGCTGCATGCAAACGCGTTACAAGGTTAAGTG
CTAACACGGGCAGTCGATCCCCAGACTTGGGAGGCTCTGGAGATTATCCCTGGACAGCGGTACGACGTCATTATCA
CCGGCCTAGAGAACCCCGAAAGGAAGTATGCATTTATCAACAAGATGGCTACTCTTGGCTTCCAGAACAATAACGTC
CTTAGTTACGATTCGTCCTGGCCTGTCCCGGAGCCGTTGAACGTGGGCAGCTTCAATCTTAGAAGCGATTTCAACCT
GACCCCGCTTGATGAGGAGCTACTACTGGAGCCCGTGGACCACACCTTACCATGGAGGTCAATAACGTGAACGTCG
ACGGCGTAGGCTCCCGGTGAGATATTCCTACCCCCCGGCCCGGGCGGGTCCCGAAGTCGGTATGAGGCTTAC
TCACTCCAATCCGCAGCATCACGCAGGACCGGACCCTTACATCGCCCCGCTACGCCACCCTATACACCACCCTG
AGCACCGGCTCTAATGCTATTAACCCCGCATATACGGCCAGGCGAACGCTTACGTAGTGAAGCCGGCGATATTGT
CCAGCTTGTGTCGAATAGTAACGAACCCGTCCTACCAACACTTCCGGTCTGTTGGCACCCCTATGCACTTGCACGGCC
ACACCTTCCAAGTGGTTGGCCAATATGGCAGCCCTGGGACGGCGATGCCCTCAAATTCCTGCTGTTCTATGAAG
CGGGATAACCACTGTTCTGTTTACTGGCGGGAGCTTGGTGATCCGGTTCGCGCGGACAATCCTGGAGTTTGGATGTG
TACGGCTCCGCTTTGCTCGAAGACCCGCTTTGAAAGCGTTGACTGACCTGTAACCTCGCAGTCCATTGCCACAACGA
ATGGCACCTTGACGCCGGCATGGCTGGAACGATTATCGAAGCGCCACTCGAGCTTCAACAAAGCGGTCTGACGATTC
CGCCGACGACCTCGCGTCGTGCAGGGCGTTAACTTAAACGACCCGGGCAATTGTGCCGTAATACTGCGAACCTA
GAGGATACGGCTGCATGCAGAGTCTACGACACTGAGCCTTGGGGGTGAGTTACTCCATTATTGTTTTGTTGTTATAA
CCCTTGCTGATGACAATACTTCTCTAGTGCACTTATCAAGAGAGATGAGGAAACAGCATATTAATAGCACGCTGGC

ATAGCACCTGTAGATGTAGACTGATTTCTAGTATTTATTACCTGTGTACACTGAAGAAAATTGTTGTAAAATGATA
TGTCCCATGCAACTGAACATGGCCTACGTGGCGAGAGTTTATCAGGCGCCTTCTGCTCC

[0520] SEQ ID NO:65

[0521] 长度 :1635

[0522] 类型 :DNA

[0523] 生物体 :菜豆壳球孢菌

[0524] 特征名 / 键 :CDS

[0525] 定位 : (1) (1635)

[0526]

atgattcgccctttctctcgtgctcggcttcattggccacgacactggccaagaccgctcact
M I R L S L V L G F M A T T L A K T V T
cttaactgggatattgggtgggtttctgctgctccagatggatttacacggcccgctcatt

[0527]

L N W D I G W V S A A P D G F T R P V I
 ggcacacacggggagtgccgcccccgttttggaagccgacgtcaacgacactattata
 G I N G E W P P P V L E A D V N D T I I
 gtaattacgcggaacctcctgcgtaacgagacgacgagcttgcaactggcatggatgtgg
 V I T R N L L R N E T T S L H W H G M W
 cactataactcgacccacatggacggcggagccaggatttcacagtggtgaaatccctccg
 H Y N S T H M D G G A R I S Q C E I P P
 ggggggacattcacgtacaagttcaaggcgtaccggccggcaccttttggtatcattct
 G G T F T Y K F K A Y P A G T F W Y H S
 cacgatatgggccaatatcccgacggcctgcgcgccccaatgatcattcacgacccctaag
 H D M G Q Y P D G L R A P M I I H D P K
 gctgccgaggagcgggacactgataaggagtacgtacttacgggtctccgactggtaacct
 A A A E R D T D K E Y V L T V S D W Y R
 gaccagatgccgtcacttatccaccgctacttgacaacttccacttataatagtactatg
 D Q M P S L I H R Y L T T S T Y N S T M
 ccaaatccaaactcgagcttgatcaacgatcagcagctctacaacgctaacaatccgcccc
 P N P N S S L I N D Q Q S T T L N I R P
 gggcagaagatataatgttcggattattaacatgtcagccctcgcaacgtaactatctacag
 G Q K I Y V R I I N M S A L A T Y Y L Q
 ttgatcaacaccacttgactggttattgccattgacgggtgctgacgctgatccccagact
 F D Q H H L T V I A I D G V D V D P Q T
 tgggaggctctggagattatccctggacagcgggtacgacgtcattatcaccggcctagag
 W E A L E I I P G Q R Y D V I I T G L E
 aaccccgaaaggaactatgcatttatcaacaagatggctactcttggtccagaacaat
 N P E R N Y A F I N K M A T L G F Q N N
 aacgtccttagttacgattcgtcctggcctgtcccggagccggtgaacgtgggcagcttc
 N V L S Y D S S W P V P E P L N V G S F
 aatcttagaagcgtattcaacctgaccccgcttgatgaggagctactactggagcccgtg
 N L R S D F N L T P L D E E L L L E P V
 gaccacaccttcaccatggaggtcaataacgtgaacgtcgacggcgtaggctcccgcatc
 D H T F T M E V N N V N V D G V G S R I
 acgcagggaccggacccttacatcgccccgcgtacgcccaccctatacaccaccctgagc
 T Q G P D P Y I A P R T P T L Y T T L S
 accgctctaadtgtattaaccccccatatacggccaggcgaacgcttacgtagtgga
 T G S N A I N P A I Y G Q A N A Y V V E
 gccggcgatattgtccagcttgtcgtcaatagtaacgaaccgctcactaccaacacttcc
 A G D I V Q L V V N S N E P V T T N T S
 ggtcgtgggaccctatgcacttgacggccacaccttccaagtgggtggccaatatggc
 G R G H P M H L H G H T F Q V V G Q Y G
 agcccttgggacggcgatgcctctaaattccctgctgttccctatgaagcgggataacct
 S P W D G D A S K F P A V P M K R D T T
 gttctgtttactggcgggagcttgggtgatccgggtccgcgaggacaatcctggagtttgg
 V L F T G G S L V I R F R A D N P G V W
 atgttcattgccacaacgaatggcaccttgacgcccggcatggctggaacgattatcgaa
 M F H C H N E W H L D A G M A G T I I E
 ggcactcgagcttcaaaaagcggcttgacgattccgcgcgacacctcgcgtcgtgc
 A P L E L Q Q S G L T I P P Q H L A S C
 agggcgtaaaacttaacgacccggggcaattgtgcccggtaatactgcaaacctagaggat
 R A L N L T T R G N C A G N T A N L E D
 acggctgatgcagagtctacgacactgagccttgggggtgacttatcaagagagatgag
 T A A C R V Y D T E P W G A L I K R D E
 gaaacagcatattaa
 E T A Y-

[0528] SEQ ID NO:66

[0529] 长度 :544

[0530] 类型 :PRT

[0531] 生物体 :菜豆壳球孢菌

[0532] MIRLSVLVGFMAATLAKTVTLNWDIGWVSAAPDGFTRPVIINGEWPPPVLEADVNDTIIVITRNLLRN

ETTSLHWGMMWHYNSTHMDGGARISQCEIPPGGTFTYKFKAYPAGTFWYHSHDMGQYPDGLRAPMI IHDPKAAAERD
TDKEYVLTVSDWYRDQMPSLIHRYLTTSTYNSTMPNPSSLINDQQSTTLNIRPGQKIYVRI INMSALATYYLQFDQ
HHLTVIAIDGVDVDPQTWEALEIIPGQRYDVIITGLENPERNYAFINKMATLGFQNNNVLSYDSSWPVPEPLNVGSF
NLRSDFNLTPLDEELLLPEVDHTFTMEVNNVNDVGVSRITQGPDPYIAPRTPTLYTTLSTGSNAINPAIYGQANAY
VVEAGDIVQLVVNSNEPVTNTSGRGHPMHLHGHTFQVVGQYGSPWDGDASKFPAVPMKRDTTVLF TGGS LVI R FRA
DNPGVWMFHCHNEWHL DAGMAGTI IEAPLELQQSGLT IPPQHLASCALNLTTRGNCAGNTANLEDTAACRVYDTEP
WGALIKRDEETAY*

[0533] SEQ ID NO:67

[0534] 长度 :2412 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0535] 类型 :DNA

[0536] 生物体 :菜豆壳球孢菌

[0537] GGGAGACGATCTGGAAGTGTGTTGTTTCAGAATGATTTGGCCGTTGAAACCACCATTTCATTGGCACGGTCCG
GTATCCATGGTATACTTTTTACGAAGGCTAGTCAGCTGAAGGAGAAGTTCGGCAGGCATCCTTCAGCAAGGAACACC
ACACATGGACGGAGTTCCGGGAGTAACACAGGTTGGTTGATGACCTTCTATCGGGATGACTAGGGCCTAACTTTTGG
CGCAGGAGCCGATCCCACCAGGAGGAACTTCACGTACCGCTTCTCGCTCAAAAACGAATACGGCTTCTACTGGTAT
CACTCGCATTTCCGAGCATACTCGGACGACGCCATCCGCGGACCACTAGTCATCCATCCATCCTCACAACGCCCCG
GCCATACGAGACTCTCGCGAGGAACCAGACTGAGCTTACTGCTTTGCAAGAAGCTGAACCGGAAGCGGTGCCTATCC
TCCTATCTGACTGGTACCATCGCGTTTCGGACGACATCTTCAACGAATACCTAACAAACAGGCGCGTTCCCCAGTTGC
GTGGACAGTCTCCTCGCAATGGATACGGAAGGGTGCGGTGTCTACCGGAATACATTCTGGCAGCCGGAGCTGGGCT
AGGCATGGAGCCTGCACCTGTCAATGCTACCGGACTAGCATCGGCACAACGCCATGTCTTCCATGGCGATGGGTA
CAAAGTACATGGAGACCAATACCAAGGAGTCGATGCGTATGGAGTCTATGGCACTAGACACTACGTCCATGGAGCAT
CACATGCGACGCATGGATTCCATGTCAGCGGAGGATATGTCCATGAATACGATGACTGCTCATTCTACGCCTGCGGC
TGCGCCCCGACTCAGGCATGCCGATGGGCTCCATGTCAATGGCTTCTCTACCCGTATCAGGCATATCGGGCAGCTCGG
GCCTGTGGGCATGTCAAATATGGCGAGCGGTCCCCTGGTCCCTCGCGGTGCAGTGTCCCATGATGTTTCAGACCG
GGCTACAACATCAGCTCTCTCCCGCCAGAGACTTGACACAGACAGTCAGCGCCGCTGCTGACTGTGCATGCAAATA
TACACGAGGCTGGCTTGCAATAAACCTAGTCAACTCCGGTTCAGTAACCAAGCTCAGCGTCTCACTAGACGCCATT
CGATGTTTGTCTATGCGGCCGACGGATTCTTTGTGAAACCCCAAGAAGTAGAAGTAAGTTGCACCTCCCCCTAACTT
GTCGTGGAAGACTTACCGGCTTAGGTATTACAAATCTCAATCGGGCAACGGTACTCAGTAATGATCAACTTAAT
CAACGGCCCCGAAACTACACTCTACGGTTTTCGTCGTATCCCTACGGCGATATGCAACAGGTTATCGAAGGCCAAGC
GACCGTCTCATATAAGGTAAGCAGCAAGCTTTTCCCCACTCGGTATAGAACTAACTTCGTTAGGTTGATGCCGCAG
AGGACATTATGCCGGTGGACTTGACAAACGACCCTACTGCAACGTGGATGCTTGTCAACGGTTCGGCAAAGTCAAC
GCTTCTGAATTGAAGACGGACATGCTCGCCCCGTTTCGAGGCAATTGCGCCGCCATCCCAAGCGGATATAACTTACGA
CTTACGATCAGTCAGACAGAGATCGTAACTGGGTGTTAAACGGATATCCCTATTCGGAACCTTCGACGCCTATTA
TCTACGGCAATGCGTCGGAAGCGTGGAACGCAAATACTACAATCCGCATTCCTTCCAACCTCGACCGTAGACATTATA
ATGCGGATTGCCAACGACTCAATGGATACGGCAAGTTGCAGTCCAGGCCCGCTCAAAAACGCCTGCATAAGCTAACC
CGATAATGCCGTAGATGGGTCATCCTATGCACCTTCACGGCCACCGTTCCTTCGCCCTCGGCTCTGGATCGGGCTCC
TTCCCATATCAGAACGCCGTCGACGCGCTCCATCCCTCATTAACTCGAAAACCCCTCCGTACCGGGACACAACCGA
TTTACCACCTTCAGGCTGGGCAGTCATTTCGCTATGTAGCCAACAATCCAGGCGCATGGATGTTTCACTGCCACATCC
AGTGGCACCTCGTGAGCGGCATGGCATTGGTGTGTTGTCGAAGGAGAAGAGCAGCTGCCTGGTTTGGTGGGTGCGGCT

GCGAACGGAACAAGCAATGCGAATAGCGCGTCACCGGCGCGTAGCACTCGAGAGCATGCGGCCTTTGCCGTTGTTGC
TACCCTAAGCACTGTTTTCTTCGCGTATGGCTACTAATGCGCGAAGCGCCATGTAAGAGCGCGCCTGAGGTAATAAA
GGTGGCGACTGCAAAAAGCTCATGTCCCGCGAATGATGGGAGTTCCTTGGAGATTCTGAATCAAAGACGTCGATATT
CTGGGTCCAGTCGGTGCAGAACAGACCCCATGG

[0538] SEQ ID NO:68

[0539] 长度 :1743

[0540] 类型 :DNA

[0541] 生物体 :菜豆壳球孢菌

[0542] 特征名 / 键 :CDS

[0543] 定位 : (1)..... (1743)

[0544]

```

atggacggagttccgggagtaaacacaggagccgatcccaccaggaggaaacttcacgtac
M D G V P G V T Q E P I P P G G N F T Y
cgcttctcgctcaaaaacgaatacggcttctactggatcactcgcatcctccgagcatac
R F S L K N E Y G F Y W Y H S H F R A Y

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[0545]

tcggacgacgccatccgcggaccactagtcacatccatccatcctcacaacgccccggcca
S D D A I R G P L V I H P S S Q R P R P
tacgagactctcgcgaggaaccagactgagcttactgctttgcaagaagctgaacgogaa
Y E T L A R N Q T E L T A L Q E A E R E
gcggtgcctatcctcctatctgactggtaccatcgcggttcggacgacatcttcaacgaa
A V P I L L S D W Y H R V S D D I F N E
tacctaacaacaggcgcggtccccagttgcggtggacagtctcctcgccaatggatagcga
Y L T T G A F P S C V D S L L A N G Y G
agggtgcggtgtctaccggaatacattctggcagccggagctgggctaggcatggagcct
R V R C L P E Y I L A A G A G L G M E P
gcacctgtcaatgctaccgcgactagcatcggcacaacgcccattgtcttccatggcgatg
A P V N A T A T S I G T T P M S S M A M
ggtacaaagtacatggagaccaataccaaggagtcgatgcggtatggagtctatggcacta
G T K Y M E T N T K E S M R M E S M A L
gacactacgtccatggagcatcacatgcgacgcatggattccatgtcagcggaggatag
D T T S M E H M R R M D S M S A E D M
tccatgaatacagatgactgctcattctacgctcgcggctgcgcccgactcaggcatgcog
S M N T M T A H S T P A A A P D S G M P
atgggtccatgtcaatggcttctctaccggtatcaggcatatcgggcacgtcgggctg
M G S M S M A S L P V S G I S G T S G L
tcgggcatgtcaaatacggcagcgggtccccttggctcctcgcggctgcagtgctccatg
S G M S N M A S G P L G P R G C S A P M
atggtcagaccgggctacaacatcagctctctcccgccagagacttgcacagacagctca
M F R P G Y N I S S L P P E T C T D T S
gcgccgctgctgactgtcagatgcaaacatacacagggtggcttgcattaaacctagtc
A P L L T V D A N Y T R G W L A L N L V
aactccgggtcagtaaccaagctcagcgtctcactagacgcccattcgatggttgtctat
N S G S V T K L S V S L D A H S M F V Y
gcgccgacggattccttgtgaaaccccaagaagtagaagtattacaaatctcaatcggg
A A D G F F V K P Q E V E V L Q I S I G
caacgggtactcagtaatgatcaaacttaacacggcccgaaactacactctacggttt
Q R Y S V M I K L N Q R P G N Y T L R F
gctcgtatccctacggcgatagcaacagggttatcgaaggccaagcagcgcctcatat
S Y P Y G D M Q Q V I E G Q A T V S Y
aagggtgatgccgacagaggacattatgccggtggacttgaaaacgaccctactgcaacg
K V D A A E D I M P V D L T N D P T A T
tggatgcttgtcaacggttcggcaagtcgaacgcttctgaattgaagacggacatgctc
W M L V N G S A K S N A S E L K T D M L
gccccgttcgaggcaattgcgcccgcacccaagcggatataacttaagacttcaagatc
A P F E A I A P P S Q A D I T Y D F T I
agtcagacagagatcatgggtcactctatgcaccttcacggccaccgggttcttgcocctc
S Q T E I M G H P M H L H G H R F F A L
ggctctggatcgggctccttcccatatcagaacgccgctcgacgcgcctccatccctcatt
G S G S G S F P Y Q N A V D A P P S L I
aacctcgaaaaccctccgtaccgggacacaaccgatttaccaccttcaggctgggcagtc
N L E N P P Y R D T T D L P P S G W A V
attcgctatgtagccaacaatccaggcgcagtgatggttccactgccacatccagtgggcac
I R Y V A N N P G A W M F H C H I Q W H
ctcgtgagcggcatggcattgggtgttgcgaaggagaagagcagctgctggttgggtg
L V S G M A L V F V E G E E Q L P G L V
ggtgccgctgcgaacggaacaagcaatgcgaatagcgcgtcaccggcgcgtagcactcga
G A A A N G T S N A N S A S P A R S T R
gagcatgccccttgcggttggctaccctaagcactgttttcttcgctatggctac
E H A A F A V V A T L S T V F F A Y G Y
taa
-

- [0546] SEQ ID NO:69
- [0547] 长度 :580
- [0548] 类型 :PRT
- [0549] 生物体 :菜豆壳球孢菌

[0550] MDGVPGVTQEP IPPGGNFTYRFS LKNEYGFYWHSHFRAYSDDAIRGPLVIHPSSQRPRPYETLARNQT
ELTALQEAEREAVPILLSDWYHRVSDDIFNEYLTGAFPPSCVDSL LANGYGRVRCLEPEYILAAGAGLGMEPAPVNAT
ATSIGTTPMSSMAMGTKYMETNTKESMRMESMALD TTSMEHHMRRMDSMSAEDMSMNTMTAHSTPAAAPDSGMPMGS
MSMASLPVSGISGTSGLSGMSNMASGPLGPRGCSAPMMFRPGYNISSLPPETCTDTSAPLLTVDANYTRGWLALNLV
NSGSVTKLSVSLDAHSMFVYAADGFFVKPQEVEVLQISIGQRYSVMIKLNQRPGNYTLRFASYPYQDMQQVIEGQAT
VSYKVDAEDIMPVDLTNDPTATWMLVNGSAKSNASELKT DMLAPFEAIAPPSQADITYDFTISQTEIMGHPMHLHG
HRFFALGSGSGSFPYQNAVDAPPSLINLENPPYRDTTDLPPSGWAVIRYVANNPGAWMFHCHI QWHLVSGMALVFVE
GEEQLPGLVGAAANGTSNANSASPARSTREHA AFAVVATLSTVFFAYGY*

[0551] SEQ ID NO:70

[0552] 长度 :2242 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0553] 类型 :DNA

[0554] 生物体 :菜豆壳球孢菌

[0555] AGTCCACCCTTTCTATTTCTTTCTCACGTCACATTCAGATACCCGGGCTCCTTTCAACTGCCAAATT
TCCTTTTTCCCGGACTCATTCCCTCCCCGACTCTCTACTCTTCTCTCAATTTCTACCACCCACCGCTCGCTCT
CACAATGTCTTTTCGTTGCCAGGTCCGTAGTAAGCGGCCTCGCCAGCAGAGCCGCCTTTACTAATGGATCATGGACCG
GTGCCTGGGAGACTCATGGCTCCACCCAAGGTTCCATCTCACCGCAACTACGCAACGGTACGTACCAGGTTCAAGTTG
TTTAAATCCCAAATTTGACTGATCTTTGTTGCAGGCGGGCCCTCTTGGTACCTTGGACGCTCCAAACTTGCCTGG
CTGTATTGGTTCTCCACCGTGGGGCAACCATGACTCTCATGACCCTTTCGGCATGCCTGATACTGGCATTACTCGGG
AGTATGACTTTACTCTCACTTATCAAGACATCGCTCCCGATGGCGTCACTAAGAGGGGCGTGGTGTCAATGGTCAA
TATCCCGGGCCACGATCGAGGCCAACTGGTGCATACACTACATCACGCACATGACATCAGGCTAACACTTCGT
TCAGGGGCGACTGGATCCAGGTACGGTCCACAACGGTCTAGGCGAGGACGAAGGTGAGGGTACCGCGATGCACTGG
CACGGCTTTTTGCAGAAGGAGAGCCAGTGGATGGATGGTGTCCCCGGTGTCAACAATGTCCTATTCTCCCGGAGA
GAGCTTACCTACCGCTTCCGCGCTGAGCAGTATGGCACTTCTTGGTACCACAGCCACTACAGCGCGCAGTACTCGG
GCGGTGCTGCTGGTCTCTCATCGTATACGGTCCGGACAGCCAGAGTTACGACGTTGACCTCGGTCCCGTCATGGTA
TCTGACTGGTACCCTCGCAATACTACGATATTGTCAAGCAGACCATGCAGGCCGACCCACGGGACCCCTCC
GCCGCCGCTCAGTCCGACAACAACCTGATCCAGGGCTTTGGCGAATTCGACTGCTCGCTGACGACGAAGCCCTGCA
TTCCTGACGCCGGTGTAGCCAAGTTCAAGTTCACTTCCGGCAAGAAGCATCGCTCAGGCTCATCAACTCCGGCTCC
GAGGCGATGCAGAGGTTCTCTATCGACGGCCACACCATGAAGATCATCGCACACGACTTCGTCCCGATCGAGCCCTA
CGAGGTACAGGCCCTGACCCTTGGCGTCGGACAGCGGGCCGACGTGGTGTGCGAAGCCACGGGCAAGCCCTCGGACG
CGTACTGGATGCGCTCAGAGATCGGGCTCAACAAGTGCAACGTCTTCAATGCGAACGCCTCCGAGGCCCTCGCCGTC
ATCCTCTACGAGGATGCAGACCTGTGGCCGTGCCAGTCTCTCCGCCAGCCCGATGCGGAGCTGACATCGTGAC
CAACGACGACATCTCCGTCCGCTGCCGCTCCAGCACATCCTGCCGACCCCAACCCGTCCGTACGACCGAGCTGC
ACATCGAGAACAAGTACAACGGCACGCACTGGCTCTGGCACTTCGGCGGCCCCAGCTACCGCGCCGACTTCAACGAC
GCCCTCTCTACCAGCTCCAACAGGGCACGCCGACTTCGGCCCGCAGTCCAACGTGCACGACTTCGGCGCCAACAA
ATCCGTCCGCTTCGTCTGCTACAACCAGTCCCGGCTCAGCATCCCATGCACTTGCATGGCCACAACCTTCTGGGTCC
TCGCCGACGGCGTCGGCACCTGGGACGGCGCCATCGCCAACCCGAGAACCCCGAGCGCCGCGACGTGCACGTCCTT
CAGCCCGCCAGGGCAGACCCCGTCTGATACATGGTGTACAGATTGAGCTGGACAACCCGGGCGCTGTGGCCGTTCCA
CTGCCACATCGCGTGGCACGTCTCGGCGGGTGTATTTGAACGTGCTGGAGCGCCCGGACGACATCAAGGCGCTGC
AGATTCGGCCGCGGTTGGTGATCAGTGCAGGGCGTGGGCGGACTACACGGCAAAGAATACGGTGGATCAGATCGAC

TCGGGGTTGAAGAAGGAGTAGAAGGCGTGATAGTTTGCTATTGTTCTTTCTCTCTCTCTCTTTTTTTTTTTTTTTTTTT
ACACCTTCCCTTCTTGATACCAGCATGTTTTTGGGCGTTATTTACGGTCCTTCTGCGCATTCCAAGGCGTTATGTC
TTTCCCTTGCGGATAAG

[0556] SEQ ID NO:71

[0557] 长度 :1836

[0558] 类型 :DNA

[0559] 生物体 :菜豆壳球孢菌

[0560] 特征名 / 键 :CDS

[0561] 定位 : (1)..... (1836)

[0562]

atgtctttcgttgccaggtcgtagtaagcggcctcgccagcagagccgcctttactaat

[0563]

M S F V A R S V V S G L A S R A A F T N
ggatcatggaccgggtgctgggagactcatggctccaccaaggttccatctcaccgcaa
G S W T G A W E T H G S T Q G S I S P Q
ctacgcaacggcggcggcctcttggtaccttgacgctccaaacttgctggctgtatt
L R N G G G P L G T L D A P N L P G C I
ggttctccaccgtggggcaaccatgactctcatgaccctttcggcatgctgatactggc
G S P P W G N H D S H D P F G M P D T G
attactcgggagatgactttactctcacttatcaagacatcgctcccgatggcgtcact
I T R E Y D F T L T Y Q D I A P D G V T
aagaggggctgctgttgaatgggtcaatatcccgggcccacgatcgaggccaactggggc
K R G V V V N G Q Y P G P T I E A N W G
gactggatccagggtcacgggtccacaacgggtctaggcgaggacgaaggtgagggtagccg
D W I Q V T V H N G L G E D E G E G T A
atgcactggcagggctttttgcagaaggagagccagtggatggatgggtgtccccgggtgtt
M H W H G F L Q K E S Q W M D G V P G V
caacaatgtcctatttctcccggagagagcttcacctaccgcttccgcgctgagcagtat
Q Q C P I P P G E S F T Y R F R A E Q Y
ggcacttcttggtaccacagccactacagcgcgcagtactcgggctgctgctgctgctcct
G T S W Y H S H Y S A Q Y S G G A A G P
ctcatcgtatacgggtccggacagccagagttacgacgcttgacctcgggtcccgtcatggta
L I V Y G P D S Q S Y D V D L G P V M V
tctgactggtaccactcgcaataactacgatattgtcaagcagaccatgcaggccgaccccc
S D W Y H S Q Y Y D I V K Q T M Q A D P
acgggcaccacccccctccgcccgcgctcagtcgcgacaacaacctgatccagggctttggc
T G T T P P P P Q S D N N L I Q G F G
gaattcactcgtcgtgacgacgaagccctgcattcctgacgcccgggtgtagccaagtcc
E F D C S L T T K P C I P D A G V A K F
aagttcacttccggcaagaagcatcgccctcaggetcatcaactccggctccgaggcgatg
K F T S G K K H R L R L I N S G S E A M
cagaggttctctatcgaacggccacaccatgaagatcatcgcacacgacttctgcccgatc
Q R F S I D G H T M K I I A H D F V P I
gagccctacgaggtcacggccctgacccttggcgtcggacagcgggcccagctggttgc
E P Y E V T A L T L G V G Q R A D V V V
gaagccacgggcaagccctcggacgcgtactggatgcgctcagagatcgggctcaacaag
E A T G K P S D A Y W M R S E I G L N K
tgcaacgttctcaatgcgaacgcctccgaggccctcgcgctcatcctctacgaggatgca
C N V F F N A N A S E A L A V I L Y E D A
gacctgltgvcogtgcacgtcctcctcgcgccagccgatgaggagctgacgtgcacc
D L L A V P S S S A Q P D A E L T S C T
aacgacgacatctccgtcggcctgcccctccagcacatcctgcccgaccccaaccgctcc
N D D I S V G L P L Q H I L P D P N P S
gtcacgaccgagctgcacatcgagaacaagtaacaacggcacgcactggctctggcacttc
V T T E L H I E N K Y N G T H W L W H F
ggcggccccagctaccgcgcccacttcaacgacgcctcctctaccagctccaacagggc
G G P S Y R A D F N D A L L Y Q L Q Q G
acgcccgacttccggcccgcagtcacaacgtgcacgacttccggcgccaacaatccgtccgc
T P D F G P Q S N V H D F G A N K S V R
ttcgtcgtctacaaccacgtcccggctcagcatcccagcacttgcattggccacaacttc
F V V Y N H V P A Q H P M H L H G H N F
tgggtcctcgcgacggcgtcggcacctgggacggcgccatcgccaaccgagcagaacccc
W V L A D G V G T W D G A I A N P Q N P
cagcgcgcgacgtgcacgtccttcagcccgcagggcagcaccgctcgtacatggtc
Q R R D V H V L Q P A Q G S T P S Y M V
gtacagattgagctggacaacccgggctgtggccgttccactgccacatcgctggcac
V Q I E L D N P G L W P F H C H I A W H
gtctcggcggggttgtatttgaacgtgctggagcgcggcggacgacatcaaggcgtgacg
V S A G L Y L N V L E R P D D I K A L Q
attccggccgctggtgatcagtgacgggctgggcccggactacacggcaagaatac
I P A A V G D Q C R A W A D Y T A K N T

[0564]

gtggatcagatcgactcggggtgaagaaggagtag
V D Q I D S G L K K E-

[0565] SEQ ID NO:72

[0566] 长度 :611

[0567] 类型 :PRT

[0568] 生物体 :菜豆壳球孢菌

[0569] MSFVARSVVSGLASRAAFTNGSWTGAWETHGSTQGSISPQLRNGGGPLGTLDAPNLPGCIGSPPWGN
HDSHDPFGMPDTGITREYDFTLYQDIAPDGVTKRGVVVNGQYPGPTIEANWGDWIQVTVHNGLGEDEGEGTAMH
WHGFLQKESQWMDGVPVGVQQCPPIPPGESFTYRFRAEQYGTSWYHSHYSAQYSGGAAGPLIVYGPDSQSYDVDLGP
VMVSDWYHSQYYDIVKQTMQADPTGTTTPPPPQSDNNLIQGFGEFDCSLTTKPCIPDAGVAKFKFTSGKKHRLRL
INSGSEAMQRFSIDGHTMKIIAHDFVPIEPIYEVTA TLGVGQRADVVEATGKPSDAYWMRSEI GLNKC NVFNAN
ASEALAVILYEDADLLAVPSSSAQPDAELT SCTNDDISVGLPLQHILPDPNPSVTTELHIENKYNGTHLWHFGG
PSYRADFN DALLYQLQGGTPDFG PQSNVHDFGANKSVRFVYVNHVPAQHMPHLHGHNFWVLADGVGTWDGAIANP
QNPQR RDVHVLQPAQGSTPSY MVVQIELDN PGLWPFHCHIAWHVSAGLYLNVLERPDDIKALQIPAAVGDQCRAW
ADYTAKNTVDQIDSGLKKE*

[0570] SEQ ID NO:73

[0571] 长度 :1048 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0572] 类型 :DNA

[0573] 生物体 :菜豆壳球孢菌

[0574] GGACCGTTGCGGCGTTACTGATCTTCGGGTGAACGTCTCTCTTCGTACCAGGAAGCCGCCAACGCCGAA
GAAAGGGAGAAATACGTGTGGCTCAACTTTATCCACCCTGGCGCCCATCATGAGCTGCGGATCTCCGTTGACGAGCA
CGACATGTGGATTGCGGCCGAGATGGAGACTTCGTAAAACCaAAGAAAGTCCAAGTAAGTTTCCACGTCTCGGTTT
CGAGCACGCGCTGACAATCTCAAGGCCATCAATGTCAACATGGGCGAGAGGATAAGCGTCCTTATTCCTCTTACCCA
AAGTCCTGGAGAGTACGCCATCCGCATGGTCTCTCTCGCGGAAGAGCAGCTCATCTGGGGCTTGGGAATTCTCCGGT
ACCCCGGTGTTCAAGAGAGACGAGATGAGAATGGCATAATGATCCTGCCAGAAAGCCAGCCACACATTGATGTTTCAG
GATAACCTGTTGACTGACGGAATTGTGATGGACGAAATGACCGACCTGATCCCGTTTCCCGCGCGCCGTCTCCAGC
CAAGGCCGACCACACCTTTTCGCTTCGCCATCAAGCGGCCGAATCCAAGCACGTGGATTTTGGCATCGGAGCCGCATC
AAGGATTCAGACAACAGCTTCCGCCGGTGCTTTGGAACAAGGATTCCTCGTGGCCCTACGACGTTCCGGCGGAATGAAG
AACGGCTCGGTTGTGGACATCATTTATGAAAACGGAGCATTTGGGATGCATCCGTTTACCAGTGGATGAACGAATC
GCATCACAGTATGGCAACTGCTGACATTTTCATGCACAACCACAAAGCGTTCATCATCGGCATGGGGATGGGTTCTT
CCGGTGGCCAGACGTTGCTCGGCCCTCAAGGAGGCCCTGAAAACCTTAAACATGGTGAACCCTCTCTCCGTGACG
GAGCACGGCTGGCAAAGGGAGAAGGATCGTGGACTGTAATCCGCTACCAGATCACCTCTCCCGCAATGTCCATGTTA
CACTGTAAGCAGCTCTCTGCAAAGTGCCTGACGGTGTAAGCACTGACGACCTCTC

[0575] SEQ ID NO:74

[0576] 长度 :702

[0577] 类型 :DNA

[0578] 生物体 :菜豆壳球孢菌

[0579] 特征名 / 键 :CDS

[0580] 定位 : (1) (702)

[0581]

atgtggattgcggccgcagatggagacttcgtaaaaccaaagaaagtccaagccatcaat
M W I A A A D G D F V K P K K V Q A I N
gtcaacatgggagagaggataagcgtccttattcctccttaccctaaagtcctggagagtac
V N M G E R I S V L I P L T Q S P G E Y
gccatccgcatggtctctctcgcggaagagcagctcatctggggccttggaattctccgg
A I R M V S L A E E Q L I W G L G I L R
taccctgggtgttcaagagagacgagatgagaatggcataatgatcctgccagaaagccag
Y P G V Q E R R D E N G I M I L P E S Q
ccacacattgatgttcaggataacctgttgactgacggaattgtgatggacgaaatgacc
P H I D V Q D N L L T D G I V M D E M T
gacctgatcccgcttcccgcgcgccgctcctccagccaaggccgaccacaccttccgcttc
D L I P F P A R R P P A K A D H T F R F
gccatcaagcggccgaatccaagcacgtggattttggcatcggagccgcatcaaggattc

[0582]

A I K R P N P S T W I L A S E P H Q G F
agacaacagcttccgcccgtgctttggaacaaggattcccgtggccctacgacgttcggc
R Q Q L P P V L W N K D S R G P T T F G
ggaatgaagaacggctcggttgtggacatcatttatgaaaacggagcatttgggatgcat
G M K N G S V V D I I Y E N G A F G M H
ccgtttcaccagtggatgaacgaatcgcacatcacagtatggcaactgctgacatttccatgc
P F H Q W M N E S H H S M A T A D I S C
acaaccacaaagcgttccatcatcggcatgggggatgggttcttccgggtggccagacgttg
T T T K R S S S A W G M G S S G G Q T L
cctcggccctcaaggaggccctgaaaactttaacatggtga
P R P S R R P L K T L T W-

[0583] SEQ ID NO:75

[0584] 长度 :233

[0585] 类型 :PRT

[0586] 生物体 :菜豆壳球孢菌

[0587] MWIAAADGDFVKPKKVQAINVNMGERISVLIPLTQSPGEYAIRMVSLAEEQLIWGLGILRYPGVQERRD
ENGIMILPESQPHIDVQDNLLTDGIVMDEMTDLIPFPARRPPAKADHTFRFAIKRPNPSTWILASEPHQFRQQLPP
VLWNKDSRGPTTFGGMKNGSVVDIIYENGAFGMHPFHQWMNESHSMATADISCTTTKRSSSAWGMSSGGQTLPRP
SRRPLKTLTW*

[0588] SEQ ID NO:76

[0589] 长度 :2269 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0590] 类型 :DNA

[0591] 生物体 :菜豆壳球孢菌

[0592] GCTGCGAGGCATTCGAGAGGATTACCGAGTATTGGAGAGGCCGCTGAAGGCAGCAGCATTAAATAC
GTGCTTTGGAGCACGCGAATTACTTTCAAGTTGAACAAGATATCACCTGTCTGCACGACGTTGCAAGCTCCGCCG
AGCCATGAAGTGTGCAACTCTTTGGAGCTATCTTGCTCTGCCTGACCGTCGGCGCTTCTGCGAGGTATTCCATTC
AGCATAGACTTCAAACATTACCTAAATGCTGACAACCTCATTTACAGAAGCTTGACGCGTCTTGCCTCAGCACAAG
ACCAACGGAGGGTCCAATTGGGGAACCTTTGGACTGTCCAAAGTTACCCGATTTTTTACCTCGAACCCGCTGCCCCG
CGGCTTCCCGTGGGGTGACAGAAGCGGCCAAGCAACGATCCCTACACTGATGTGCCGAACACCGGGGTGACGAGGT
ACTACGATTTACGCGTCGCACGTGGCTATCTCGCTCCAGATGGCTACAACAAAAGTGGCATCTTCATCAACGGCGAG
TTCCCTGGGCTGCCATTGAGCCAATTGGGGCGACATGATTGAAGTACGAGTGACAACAACATCGTCGGCCCTGA
AGAAGGCACTGCGTTCCACTGGCATGGCATTACTCAGAAGGGCACGCAATGGTTTACGGCGTTCGGCGGTGTCCC
AATGCCCCATTGCCCTGGATCCTCTTTTACCTACCGCTCCGTGCCGACGTCTACGGCACTTCTTGGTGGCACTCG

CACTTCTCTGCGCAATATACCGCTGGTGTCTTTGGGCCCTCATTATCTACGGCCCCAAGCATGTTCCCTTACGATGT
TGATGTGGCCCTGTAATTCTCGGTGATTACTACCACCGTGACTACTTTGATGTTCTGGAGGATGCTGCCAGCAACA
CCACTGACTTCAACATCTACGTCCCTTGGTCCGACAACAATCTGATCAATGGCAAGAACAATAATTGCTCCATG
GTAGCTGGAACTCTACGAGCTTCGCCAACGCTACAAGTCCCTCGAACGCCACGTGCTTCTCCAACGCTGGCCTTGC
CCAGTTCCGTTTCGAGCCAGGCAAAGTGCACCGCCTGCGTCTGATGAACGTGGGCGCAGCAGCACTGCTGCACTTCT
CAATCGACGGGCACAAAATGCAAGTCATCGCCACGACTTCGAACCTGTTGTCCCGTACGAGGCAGACGTCATCACG
CTGGGCGCCGCCAACGCACCGACATCCTCGTCACTGCAGATGCCAACCCCAACGAGACATACTGGATCCGCTCCAC
CATCTCGCTCAACTGCTCTGTCTCGCACAAACCAACGCGCTGGCCGTTCTCTCCTACGAAGGCAATGACCACATAG
AAGAGCCACGCAGCCGATTAGCGCCGCCGCGGCCGCTGCTGACGAGAAGAGCTTCCTCTGCAAGAACGACGACCTG
TCCCAGACGGTGCCCTTCTTCCCAAGCCGTCGCCGAGCCCGATGTGACCGAGACGATCGAAGTCGACCTCTTCAC
CAATGCGACCGGCCACCATGTGTGGATCATGAACAACCGCACGCAGCGCACGAATAACAACGAGCCCGTCTTGCTGC
TCGCCAACAGGGCAACAGCACCTTCCCGGACGAGTGGAACGTTTACGACTTTGGGCGCAACAAGACCATCCGCATC
GTCCTCAACACCGTCTACCAGTCCGCCACCGATGCACTTGACGGCCACTCTTTCGTAAGACCCTTCATCCCTTC
GCCACGCATGTGTGCCACTCTGACCTCTTCTCGCAGCAAGTCCCTCGCCGAAGGCCCCGGCGCCTGGGACGGCACG
ACCATCACCAACCCATCCAATCCCGCCCGCCGCGACACGCACATGCAGCGCCGGTACGGGCACCTGGTAATCCAGTT
CGAGGCCGACAACCCGGGCGCGTGGAGCTACCACTGCCACATCGCCTGGCACGCCAGCATGGGCTACAACATCGAGA
TCCTCGAGCGCGGCGACGAGCTGGCGGCCCGCGCTATTCCTATGGTCATGCAGCAGACGTGTGATGATTGGAAG
GAGTGGAGCGGCAGGAATGTGGTCAATCAGATCGACGCGGGCATTAGATTATCGGCGACTTCTATGCCCGATGGTA
TAATGTTTTTACCAGCGTGGGATGATGTGGTTTGGGGTCGGAATTTGTAGATATGGGCGGGGATTGCCTGCACA
AAATAGACCGATGCACATGTTTATAAAGCAAAAACCTTCCCAT

[0593] SEQ ID NO:77

[0594] 长度 :1854

[0595] 类型 :DNA

[0596] 生物体 :菜豆壳球孢菌

[0597] 特征名 / 键 :CDS

[0598] 定位 : (1) (1854)

[0599]

atgaagtgtgcaactcttttgagctatcttgccctctgtcctgaccgtcggcgcttctgcg
M K C A T L W S Y L A S V L T V G A S A
agaagcttgacgcggctccttgccctcagcacaagaccaacggagggtccaattggggaact
R S L T R S L P Q H K T N G G S N W G T
ttggactgtccaaagttaccgattttttgacctcgaaccccgctgcccggcggttcccg
L D C P K L P D F L T S N P L P G G F P
tggggtgacagaagcggcctaagcaacgatccctacactgatgtgccgaacacccggggtg
W G D R S G L S N D P Y T D V P N T G V
acgaggtactacgatttcagcgtcgcacgtggctatctcgcctccagatggctacaacaaa
T R Y Y D F S V A R G Y L A P D G Y N K
agtggcatcttcatcaacggcaggttccctgggacctgaccattgaggccaattggggcgac
S G I F I N G E F P G P A I E A N W G D
atgattgaagtacgagtgcacaacaacatcgtcggccctgaagaaggcactgogttccac
M I E V R V H N N I V G P E E G T A F H
tggcatggcattactcagaaggcagcaatggtttgacggcggttcccggcggttcccaa
W H G I T Q K G T Q W F D G V P G V S Q
tgccccattgccccggatcctcttttacctaccgcttccggtgccgacgtctacggcact
C P I A P G S S F T Y R F R A D V Y G T
tcttgggtggcactcgcacttctctgcgcaatataccgctgggtgcttttgggccccctcatt
S W W H S H F S A Q Y T A G A F G P L I
atctacggccccaagcatgttcccttacgatgttgatgtcggccctgtaattctcggtgat
I Y G P K H V P Y D V D V G P V I L G D
tactaccaccgtgactactttgatgttctggaggatgctgccagcaacaccactgacttc
Y Y H R D Y F D V L E D A A S N T T D F
aacatctacgtcccttggccgacaacaatctgatcaatggcaagaacaactataattgc
N I Y V P W S D N N L I N G K N N Y N C
tccatggtagctggaaactctacgagcttcgcccaacgctacaagctcctcgaacgccacg
S M V A G N S T S F A N A T S S S N A T
tgcttctccaacgctggccttgcccagttccggttccgagccaggcaagtgcaccgcctg
C F S N A G L A Q F R F E P G K V H R L
cgtctgatgaacgtgggcgagcagcactgctgcacttctcaatcgacggggcacaanaatg
R L M N V G A A A L L H F S I D G H K M
caagtcacgcccacgacttcgaacctgttgcctccgtagcaggcagacgtcatcacgctg
Q V I A H D F E P V V P Y E A D V I T L
ggcgccgcccacgcaccgacatcctcgtcactgcagatgccaaacccaacgagacatac
G A A Q R T D I L V T A D A N P N E T Y
tggatccgctccaccatctcgcctcaactgctctgtctcgcacaacaccaacgcogotggcc
W I R S T I S L N C S V S H N T N A L A
gttctctcctacgaaggcaatgaccacatagaagagccacgcagccgcatttagcgcggcc
V L S Y E G N D H I E E P R S R I S A A
gcgccgctgctgacgagaagagcttccctctgcaagaacgacgacctgtcccagacgggtg
A A A A D E K S F L C K N D D L S Q T V
cccttcttcccgaagcccgtcgcggagcccgatgtgaccgagacgatcgaagtgcacctc
P F F P K P V A E P D V T E T I E V D L
ttaccaatgacgaccggccaccatgtgtggatcatgaacaaccgcacgcagcgcacgaac
F T N A T G H H V W I M N N R T Q R T N
tacaacgagcccgtcttctgctgctcgcacaaccagggcaacagcaccttcccggagcagtg
Y N E P V L L L A N Q G N S T F P D E W
aacgtttacgactttgggcgcaacaagaccatccgcatcgtcctcaacaccgtctaccag
N V Y D F G R N K T I R I V L N T V Y Q
tccgcccaccgatgcacttgacggccactctttccaagtccctcgcgaaggccccggc

[0600]

S A H P M H L H G H S F Q V L A E G P G
g c c t g g g a c g g c a c g a c c a t c a c c a a c c c a t c c a a t c c c g c c c g c c g c g a c a c g c a c a t g
A W D G T T I T N P S N P A R R D T H M
c a g c g c c g g t a c g g g c a c c t g g t a a t c c a g t t c g a g g c c g a c a a c c c g g g c g c g t g g a g c
Q R R Y G H L V I Q F E A D N P G A W S
t a c c a c t g c c a c a t c g c c t g g c a c g c c a g c a t g g g c t a c a a c a t c g a g a t c c c t c g a g c g c
Y H C H I A W H A S M G Y N I E I L E R
g g c g a c g a g c t g g c g g c c c g g c g c t a t t c c t a t g g t c a t g c a g c a g a c g t g t g a t g a t
G D E L A A A G A I P M V M Q Q T C D D
t g g a a g g a g t g g a g c g g c a g g a a t g t g g t c a a t c a g a t c g a c g c g g g c a t t t a g
W K E W S G R N V V N Q I D A G I -

[0601] SEQ ID NO:78

[0602] 长度 :617

[0603] 类型 :PRT

[0604] 生物体 :菜豆壳球孢菌

[0605] MKCATLWSYLASVLTVGASARSLTRSLPQHKTNNGGSNWGTLDCPKLPDFLTSNPLPGGFPWGDRSGL
SNDPYTDVPTGVTRYDFSVARGYLAPDGYNKSGIFINGEFPGPAIEANWGMIEVRVHNNIVGPEEGTAFHWH
GITQKGTQWFDGVPVGSQCPIAPGSSFTYRFRADVGTSSWWSHFSAQYTAGAFGLI IYGPKHVPYDVDVGPVI
LGDYYHRDYFDVLEDAASNTDFNIYVPWSDNLLINGKNNYNCMSVAGNSTSFANATSSSNATCFSNAGLAQFRF
EPGKVHRLRLMNVGAAALLHFSIDGHKMQVIAHDFEPVVPYEADVITLGAAQRTDILVTADANPNETYWIRSTIS
LNCSVSHNTNALAVLSYEGNDHIEEPRSRIAAAAAADEKSFCLKNDLSQTVPPFPKVAEPDVTETIEVDLFT
NATGHVWIMNRTQRTNYNEPVLLLQNGNSTFPDEWNVYDFGRNKTIRIVLNTVYQSAHPMHLHGHSFQVLAE
GPGAWDGTITNPSNPARRDTHMQRRYGHGLVIQFEADNPGAWSYHCHIAWHASMGYNIILERGDELAAGAIPM
VMQQTCDWKEWGRNVVNQIDAGI*

[0606] SEQ ID NO:79

[0607] 长度 :2373 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0608] 类型 :DNA

[0609] 生物体 :菜豆壳球孢菌

[0610] GACAATCCCTCCGCTAAATCCGACATCCGGTACTCTCGCTCCCGGATCCCGAGCGGACACACAGCTTC
GCCTGTATACCACTTTCACCGGAGTCGCCTTCCCACCCCCTATAATTCTTTTCTGTTGAGTCTACTCCGCGCGCGG
TATCATGATAGATACCAAGAGCACAGGGTCCGGCGCAGACGGCGGTCTGTTACGCCGCTTAAGGCAAGACGAGTCAG
AGCTATACGAGCAGAAAGAACATACGCAGTGTACACAGCCCTCCGGCGCCGCTACCTCGGTGAAAATGGCAGAGAA
GAAGCCCTGGGATTGATCGACGAAAATGTCGTCGCTCGAACAAAAAGACGCTGTGGACCCACCCGGCGGTACTCTGT
CTTCTTGAATTTGCCATCCTCGGTCTGGTACTCATAATCGCTCTACTCGGCGCTCTCGCTTGGTCCAGAGGCTCTC
ATCATCATAACCGACCCGGTATCTGGCAGTTCACAACCATCGTCCAAGGGTCGCCGCGGAAAGTATGTCCTGGACCCT
GCCTGGGATTTGCTGCACCGCCGAGGTCCGCAAATACCACTGGACGATCAGGGACATCGAGCTTCGCCAGACGG
CGTGAAGCGGCCGCTGATCACCATCAATAACGAGTTCCCGGGGCCGACCATCGAATGCAACCAGGGGATAACCGTGC
GGGTTGAGGTTCAACGAAGCCGTCAATTCAACTTCCTTTACTGGCACGGCATTACCAGAACGGAACCACGTAC
ATGGATGGCACGGTCGGCATCAGCCAGTGTCTATCACGCTGGGTCTAGCATGACATATGAGTTCAAAGTCGACAG
AGAATCCGGCACCTATTGGTATCATGCGCACATGGCTATGCAGGGCTCAGATGGTCTTTTTGGTCTCTGATCGTCC
ATTCGAAAAATGAGCGGAAGCTGCAGCAACTCGAATATGCCTCCGATCAAGTCATCATGGTCCACGATTACTACCAC
GATCTGACCAGCGCTGATACCACACTACTTAGCGCCGATAACGAGAACACAGAGCCTGTCCCTGACGGAGGTCT
CATCAACGGAATGAATAAGAGAAATTGCGAGCTCCTCCGTGGTCGAGACTGTGATGCCACTGATGCACAGCTTGCCA

CATTCGGCCTCGAACCGAACAAGAACCACCGTCTTCGAATTATCAATACTGGAGCATTGCTGAATTCAGGTGAAG
ATTGACGAGCACACGTTTCGCTGTGACGGAGGTGGATGGGACCGAAGTTGCTCCCGCCTACTACCACAGGCTCAACAT
CAATCCCGGACAGCGCTACAGCATCGTAATAAACACCAATGTCACGGATCGTGACTCCTTCTGGCTGAGAGCTAAGA
TGATTGAGGCCTGTTTCGCTGAGGAGAACCCAAATCTGGATCCCGAAGTGC GCGCCATTATCCAATATACTCGCAAG
GACGAGGATAACCCAGCCCAAGGAACCTTCGAGCAGAGACTGGGACGACATCGTGGACATGCAGTGTCTCGACATGAA
CGTGACAGAGCTCCAGCCCGTAGAGAAGGCAACACCTCCACCTGCAGACACCACACTATACTCCGCTCCAACCTTCG
AGATCGGCAACTGGCGTCTGAGCCGCGGCTTCTTCAACAGCTCGTCCTGGCGTCCAACACTCTCATCCCCAAGCCTG
CACCGCATGATCGACGGCCTCCACAGCCAAAACGCCAGCTTCCTCCCCGACCGAGCGTACCCCTTCCAGATCAACTC
GGCCGGCTTCGACACTGGGCCGAGCTGGTCTACCAGACCAGCGGCATCCGCACCATCGACATCCTCGTTTCCAAC
TCGACGACGGCAACCACCCGCTCCACCTGCACGGCTACAAGTACTTCGTCCTTGCCTCGGGCCACGGCTACCCGCCC
GCCGACCTCTACGCGCATCTCGACATCTCGAACCCGCTGCGCCGCGACACCGCCTCGATCGAGGCGTTCGGCTGGAT
CCTACTGCGTCTCGTCGCCGACAACCCGGGCGTCTGGGCCTTCCACTGCCACATCGGCTGGCACACCGAGGCCGGCA
TGCTGATGCAGTTCGCCACGCGCGTCGACGTGCTCGCATCCAGCCAAATCCCGGATACGCACCTCGCGCTCTGCGCG
GCCGACGGGCTCGACCGCGGCGCGTCGCCGCCAGACTCGACGTGGTTTGGGGATTTTGGGGATCTAGATCCTTGAAA
AGTTCTGGAGAGGAGTGGGAGTTTACCTGGCATGCAAGCGTCTCCGTTTCTTCAGGCCAGGCTGACCCACTTCCCG
CGCACGCCGATCTCGTACTGCAGCCCGTCGCTTCCATGTTTAGGTCCCACCTGCGGTACTCATCTTCGAC

[0611] SEQ ID NO:80

[0612] 长度 :2073

[0613] 类型 :DNA

[0614] 生物体 :菜豆壳球孢菌

[0615] 特征名 / 键 :CDS

[0616] 定位 : (1) (2073)

[0617]

atgatagataaccaagagcacaggggtccggcgcagacggcggtcgttacgcgccttaagg
M I D T K S T G S G A D G G R Y A A L R
caagacgagtcagagctatacgagcagaaagaacatacgacagtgacacagccctccggc
Q D E S E L Y E Q K E H T Q C T Q P S G
gccgcgtacctcggtggaaatggcagagaagaagccctgggattgatcgacgaaaatgtc
A A Y L G G N G R E E A L G L I D E N V
gtcgtcgaacaaaaagacgctgtggacccaccggcggtactctgtcttccttgaattt
V A R T K R R C G P T R R Y S V F L E F
gccatcctcggtctggtactcataatcgctctactcggcgctctcgttgggtccagagge
A I L G L V L I I A L L G A L A W S R G
tctcatcatcataccgaccgggtatctggcagttcacaaccatcgtccaaggggtcgccgc
S H H H T D P V S G S S Q P S S K G R R
ggaagatgtcctggaccctgctgggatttcgctgcaccgcccgcaggtccgcaaatac
G K Y V L D P A W D F A A P P Q V R K Y
cactggacgatcagggacatcgagcttcgccagacggcgtgaagcggccgctgatcacc
H W T I R D I E L R P D G V K R P L I T
atcaataacgagttcccggggccgaccatcgaatgcaaccagggggataccgtgcggggt
I N N E F P G P T I E C N Q G D T V R V
gaggttcataacgaagcgtcaattcaacttcctttcactggcacggcatttaccagaac
E V H N E A V N S T S F H W H G I Y Q N
ggaaccacgtacatggatggcacggctggcatcagccagtgctctatcacgtctgggtct
G T T Y M D G T V G I S Q C P I T S G S
agcatgacatagagttcaaagtcgacagagaatccggcacctattgggtatcatgcgcac
S M T Y E F K V D R E S G T Y W Y H A H
atggctatgcagggctcagatgggtcttttggctcctctgatcgtccattcgaaaaatgag
M A M Q G S D G L F G P L I V H S K N E
cggaagctgcagcaactcgaatatgcctccgatcaagtcacatcaggtccacgattaactac
R K L Q Q L E Y A S D Q V I M V H D Y Y
cacgatctgaccagcgcgctgataccacactacttagcgcgggataacgagaacacagag
H D L T S A L I P H Y L A P D N E N T E
cctgtccctgacggaggtctcatcaacggaatgaataagagaaattgcgagctcctccgt
P V P D G G L I N G M N K R N C E L L R
ggtcgagactgtgatgccactgatgcacagcttgccacattcggcctcgaaccgaacaag
G R D C D A T D A Q L A T F G L E P N K
aaccaccgtcttcgaattatcaatactggagcatttgctgaattccaggtgaagattgac
N H R L R I I N T G A F A E F Q V K I D
gagcacacgttcgtgtgacggaggtggatgggaccgaagttgctcccgcctactaccac
E H T F A V T E V D G T E V A P A Y Y H
aggtcaacatcaatcccggacagcgtacagcatcgtaataaacaccaatgtcacggat
R L N I N P G Q R Y S I V I N T N V T D
cgtgactccttctggctgagagctaagatgattgaggcctgttctcgtgaggagaaccca
R D S F W L R A K M I E A C F A E E N P
aatctggatcccgaagtgcgcgccattatccaatatactcgcaaggacgaggatacccag
N L D P E V R A I I Q Y T R K D E D T Q

[0618]

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cccaaggaaccttcgagcagagactgggacgacatcgtggacatgcagtggtctcgacatg
P K E P S S R D W D D I V D M Q C L D M
aacgtgacagagctccagcccgtagagaaggcaacacctccacctgcagacaccacaacta
N V T E L Q P V E K A T P P P A D T T L
tacctccgctccaacttcgagatcggcaactggcgtctgagccgcggtctcttcaacagc
Y L R S N F E I G N W R L S R G F F N S
tcgtcctggcgtccaacactctcatcccccaagcctgcaccgcatgatcgacggcctccac
S S W R P T L S S P S L H R M I D G L H
agccaaaacgccagcttcctccccgaccgagcgtaccccttcagatcaactcggccggc
S Q N A S F L P D R A Y P F Q I N S A G
ttcgacactgggcccagctggtctaccagaccagcggcatccgcaccatcgacatcctc
F D T G P E L V Y Q T S G I R T I D I L
gtttccaacttcgacgacggcaaccaccgctccacctgcacggctacaagtacttcgtc
V S N F D D G N H P L H L H G Y K Y F V
cttgctcgggccacggctacccgcccggacctctacgcgcacatctcgacatctogaac
L A S G H G Y P P A D L Y A H L D I S N
ccgctgcgcccgcacaccgctcgatcgaggcgttcggctggatcctactgctctcgtc
P L R R D T A S I E A F G W I L L R L V
gccgacaacccggcgtctgggccttcactgccacatcggctggcacaccgaggccggc
A D N P G V W A F H C H I G W H T E A G
atgctgatgcagttcgccacgcgctcgacgtgctcgcacatccagccaaatcccgatacg
M L M Q F A T R V D V L A S S Q I P D T
cacctcgcctctgcgcccgcacgggctcgaccgcccgcgctcgcgccagactcgacg
H L A L C A A D G L D R G A S P P D S T
tggtttggggattttggggatctagatccttga
W F G D F G D L D P-

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[0619] SEQ ID NO:81

[0620] 长度 :690

[0621] 类型 :PRT

[0622] 生物体 :菜豆壳球孢菌

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[0623] MIDTKSTGSGADGGRYAALRQDESELYEQKEHTQCTQPSGAAYLGGNGREEALGLIDENVVARTKRRCG
PTRYRVSFLEFAILGLVLI IALLGALAWSRSHHTDPVSGSSQPSSKRRRGKYVLDPAWDF AAPPQVRKYHWTIRD
IELRPDGVKRPLITINNEFPGPTIECNQGD TVRVEVHNEAVNSTSFHWHGIYQNGTTYMDGT VGISQCPITSGSSMT
YEFKVDRESGTYWYHAHMAMQGS DGLFGPLIVH SKNERKLQQLEYASDQVIMVHDY YHDLTSALIPHYLAPDNENTE
PVPDGLINGMKNRCELLRGRDC DATDAQLATFGLEPNKNHRLRIINTGAF AEFQVKIDEHTFAVTEVDGTEVAPA
YYHRLNINPGQRY SIVINTNVTDRDSFWLR AKMIEACFAEENPNLDPEVRAI IQYTRKDEDTQKPESSRDWDDIVD
MQCLDMNVT ELQPVEKATPPPADTTLYLR SNFEIGNWR LSRGFFNSSSWRPTLSSPSLHRMIDGLHSQNASFLPDRA
YPFQINSAGFDTGP ELVYQTS GIRTIDILVSNFDDGNHPLHLHG YK YFVLASGHGYPADLYAHLDISNPLRRDTAS
IEAFGWILLRLVADNPGVWAFHCHIGW HTEAGMLMQFATRVDVLASSQIPDTHLALCAADGLDRGASPPDSTWFGDF
GDLDP*

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[0624] SEQ ID NO:82

[0625] 长度 :2372 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0626] 类型 :DNA

[0627] 生物体 :菜豆壳球孢菌

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[0628] TATATGTTCTCCGTCTCAACGGAAATCCGGCAGTGC GCAAGACGAGCCCCCTTTTCTTCTGCTTCG
CCTGCTTTTCGTAGTCTCGTCTCCGCCCTAGACGTCGTCTTCTCAGACAATTTGCTCAAATCCCCTCTCACCTCGC
CGCCATGCGCTTCGCGAGCCTCGCCGTGGCATGGCTCACAACGTGCGTTGTCCAATCACTGCCAACGAGCCCATCC
CGTTTCGACAGGATCTCTGGGGTGAGAATGGCCCCGCCGTAACCATATGGTGAAGCGTCAGGCCAGCTCCAGCTCC

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CCTGCCTCATCCACCACAAGGGCCCCGGATTCCGCCTGCACAAACGGCCCTTTGACGAGGAGCTGCTGGTCCAATGG
CTTTTCCATAGCCACTGACTTTGACGCCAAGTGGCCCAATACCGGAAAGACCGTCCATGTAAGCGCGCCTGCAGATA
TGCATCCGTCCTGCTGCTGACGTGCAGCCATAGTATGACCTGACCATCAACAACGCCACCTGCAGCCCCGACGGCG
GGCCCAGCCGCCGTGCCTGATGTTCAACAACAAGATCCCTGGGCCTACGCTTTACGCCAATTGGGGCGACATGATC
TCCGTTACCATCACCAACAAGATGCCCAACAACGGCACCAGCGTGCCTGGCATGGTCTGCGTCAGTACAATACAAA
CACCCAGGATGGCGTCAACGGAATCACGGAATGCCCTCTGGCTCCCGGGCGATTCCAAGACCTACCTATTCCAGGCTA
CACAGTTCGGCAGCAGCTGGTTCCACAGCCATTTCTCTGCGCAGTATGGCGACGGTGCCGTCGGCCAGCTCATCATC
AATGGCCCCGCCTCGGCGAATTACGATTTTCGATCTCGGCACCTACACTATGACCGACTGGTACTACAGCACTGCGTT
CCAGGTGCAAGATCAATTTGATGCCGCCCTTCAGAGGAAGGCCCGCCAGGTGACACCATCCTGGTGAACG
GTACGATGAAGTCTCCGGATGGCTCTGCTGGTAGCTACAGCCAAGTCAAGGGCCTTGTC AAGGGAAAGAAGTACCGC
CTGCGTCTCATCAACACCTCGGTGGACAACAACATCCGCGTCTCGCTGGACAACCACCCATTACCCGTCGTCCTTC
CGACTTCGTCCCGAGCAAGCCTTGGACTACTGACTGGCTTCTCTTAGCCATCGGCCAGCGCTACGATGTCATCTTCA
CGGCCAATCAACCCGCGGCCAATTATTGGTTCCGTGCAGAAGTTGCCACCGCATGTGCTAGCGCCAACAAGTACCGC
GGCCGCGGTATATTACGCTACGTTGGTGGCGATGGCAGCGCTCCCCAGAGACCGCCGTGACTGTTCCAGGTGGCTG
TACCGAGCCTCTGCCTGCGCTTTTCGTCGCAAACCAGGTTCCAAGCCAAGTCTTCCCTCGACCAAGTGAAGACCCTTA
GCGTCGATGTTTATGCGGCAAACGTCTCGACCAACCAGAAGAACATTGTCTTCTGGGGCATCAACATGACTGCCATT
GACATTGATTGGGAGAAGCCGACGCTGGAATACGTCAGGACAAAAAATACCAGTACCCCCACGTTTACAACCTTGAT
CGAGTTGCCACAGAGAACATTGTAAGCGGAGTTAAGCTTCAACCCCGAGAAATGTTATTAACGATCGCAACAGTGG
ACCTACTGGATCATCCAAGAAACTCCCGGCACTCCCCAATTCGCGATCCAATTCACTTGCACGGTAAGCTGCAGGT
CTCAACCTTGCAACCCCGTAGAGATACTGATGGTCGCCTCTGTCCAGGCCACGACTTCTACATCCTCGGAACCGCT
CTGGTGCCTTCGACCGCAGCACCTCGCCGTCTCCCTCAATTTCAATAACCCACCCGGCGCGACGTGCGACTGGTT
CCCGGGCGGGTGGTTGGCCATTGCCTTCCCGACCGACAACCCAGGCGCTTGGCTCATGCACTGCCATATCGTAAG
TTTACCTATCTCTCCGACTACGATCAATTGTGTATATTCATGCGCACGGCGTGACACGTGGATTTCCCTCGCCACA
GGCTTGGCACATTAGCGAAGGTCTCGGAGTTCAGTTCCTCGAGGGCAAGGATAAGATCAATCTTCCCGACGCTGCGT
GGGAGACGACCTGCTCGAATTGGGACAAGTACTGGGACCACTATCTACCCCAAGCAGGATTCCGGTCTCTGAGGG
GTGGCCGGTTTTTTTTTTCTTTTACGGGCCTGAGTTTAAGGGGGTTTGTATGTTTTGCTGAAAAAAGACCCGTAGTG
ATTCTTGATTATACTTTTTCGTTTTATTTCATATTGATAGGAAGCAACCTGATCGCACTTCGTAAACCGCA

[0629] SEQ ID NO:83

[0630] 长度 :1824

[0631] 类型 :DNA

[0632] 生物体 :菜豆壳球孢菌

[0633] 特征名 / 键 :CDS

[0634] 定位 : (1) (1824)

[0635]

atgCGcttcGcgagcctcgccgtggcatggctcacaacgtgCGttgtccaatcacttgcc
M R F A S L A V A W L T T C V V Q S L A
aacgagcccatcccgttcgacaggatcctctggggtgagaatggccccgCGgtaaccat
N E P I P F D R I L W G E N G P A G N H
atggtgaagcgtcaggccagctccagctcccctgcctcatccaccacaagggccccggat
M V K R Q A S S S S P A S S T T R A P D
tccgctgcacaaacggccctttgacgaggagctgctggTccaatggcttttccatagcc
S A C T N G P L T R S C W S N G F S I A
actgactttgacgccaagtggcccaataaccggaaagaccgtccattatgacctgaccatc
T D F D A K W P N T G K T V H Y D L T I
aacaacgcccctgcagccccgacggcgggcccagccgcccgtgcctgatgttcaacaac
N N A T C S P D G G P S R P C L M F N N
aagatccctgggctacgctttacgccaattggggcgacatgatctccgTtaccatcacc
K I P G P T L Y A N W G D M I S V T I T
aacaagatgcccacaacggcaccagcgtgcactggcatggTctgcgtcagtacaataca
N K M P N N G T S V H W H G L R Q Y N T
aacacccaggatggcgtcaacggaatcacggaatgcccctctggctccccggogattccaag
N T Q D G V N G I T E C P L A P G D S K
acctacctattccaggctacacagttcggcagcactggTtccacagccatttctctgCG
T Y L F Q A T Q F G T T W F H S H F S A
cagtatggcgacggtgccgtcggccagctcatcatcaatggccccgCctcggcgaattac
Q Y G D G A V G Q L I I N G P A S A N Y
gatttcgatctcggcacctacactatgaccgactggTactacagcactgcgttccaggTc
D F D L G T Y T M T D W Y Y S T A F Q V
gaagatcaatttgatgcccgccttcagaggaaggcccccgccccgCCaggtgacaccatc
E D Q F D A A L Q R K A P G P P G D T I
ctggtgaacggTtacgatgaagtctccggatggctctgctggtagctacagccaagtcaag

[0636]

L V N G T M K S P D G S A G S Y S Q V K
ggccttgtcaagggaaagaagtaccgcctgcgtctcatcaacacctcgggtggacaacaac
G L V K G K K Y R L R L I N T S V D N N
atccgcgtctcgcctggacaaccacccattcaccgctcgtcacttccgaacttcgccccgagc
I R V S L D N H P F T V V T S D F V P S
aagccttggactactgactggcttctcttagccatcgggccagcgcctacgatgtcatcttc
K P W T T D W L L L A I G Q R Y D V I F
acggccaatcaacccgcggccaattattggttccgctgcagaagttgccaccgcgatgtgct
T A N Q P A A N Y W F R A E V A T A C A
agcgccaacaagtaccgcggccgcggtatattcagctacggttggtgccgatggcageget
S A N K Y R G R G I F S Y V G A D G S A
ccccagagaccgcccgtgactggtccagggtggtgtaccgagcctctgcoctgocctttc
P P E T A V T V P G G C T E P L P A P F
gtcgcmaaaccagggtccaagccaagtcttctcctcgaccaagtgaagacccttagcgtcgat
V A N Q V P S Q V F L D Q V K T L S V D
gtttatgcggaacgtctcgaccaaccagaagaacattgtcttctggggcatcaacatg
V Y A A N V S T N Q K N I V F W G I N M
atgccattgacattgattgggagaagccgacgctggaatacgtcaggacaaaaataacc
T A I D I D W E K P T L E Y V R T K N T
agctacccccacgtttacaacttgatcgagttgccacagagaacatttggacctactgg
S Y P H V Y N L I E L P T E N I W T Y W
atcatccaagaaactcccggcactcccccaattccgcacccaattcacttgcacggccac
I I Q E T P G T P P I P H P I H L H G H
gacttctacatcctcgggaaccggctctgggtgccttcgaccgcagcacctcgcgcctctcc
D F Y I L G T G S G A F D R S T S P S S
ctcaatttcaataacccccaccggcgacgctgcactgggttcccggcgggcggttggttg
L N F N N P T R R D V A L V P G G G W L
gccattgccttcccgaccgacaaccaggcgcttggctcatgcactgcatatcgcttgg
A I A F P T D N P G A W L M H C H I A W
cacattagcgaaggtctcggagttcagttcctcaggggcaaggataagatcaatcttccc
H I S E G L G V Q F L E G K D K I N L P
gacgctcgtgggagacgacctgctcgaattgggacaagtactgggacaccactatctac
D A A W E T T C S N W D K Y W D T T I Y
ccaagcaggattccggtctctga
P K Q D S G L-

[0637] SEQ ID NO:84

[0638] 长度 :607

[0639] 类型 :PRT

[0640] 生物体 :菜豆壳球孢菌

[0641] MRFASLAVAWLTTCCVVQSLANEPFDRILWGENGPAGNHMVKRQASSSSPASSTTRAPDSACTNGPLT
RSCWSNGFSIATDFDAKWPNTGKTVHYDLTINNATCSPDGGPSRPCLMFNNKIPGPTLYANWGDMSVITNKMPNN
GTSVHWHGLRQYNTNTQDGVNGITECLAPGDSKTYLFAQATQFGTTWFHSHFSAQYGDGAVGQLIINGPASANYDFD
LGTYTMTDWYYSTAFQVEDQFDAALQRKAPGPPGDTILVNGTMKSPDGSAGSYSQVKGLVKGKKYRLRLINTSVDNN
IRVSLDNHPFTVVTSDFVPSKPWTTDWLLLAIGQRYDVIFTANQPAANYWFRAEVATACASANKYRGRGIFS YV GAD
GSAPPETA V T V P G G C T E P L P A P F V A N Q V P S Q V F L D Q V K T L S V D V Y A A N V S T N Q K N I V F W G I N M T A I D I D W E K P T L E Y
V R T K N T S Y P H V Y N L I E L P T E N I W T Y W I I Q E T P G T P P I P H P I H L H G H D F Y I L G T G S G A F D R S T S P S S L N F N N P T R R D V
A L V P G G G W L A I A F P T D N P G A W L M H C H I A W H I S E G L G V Q F L E G K D K I N L P D A A W E T T C S N W D K Y W D T T I Y P K Q D S G L *

[0642] SEQ ID NO:85

[0643] 长度 :3008 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0644] 类型 :DNA

[0645] 生物体 :菜豆壳球孢菌

[0646] GAGAAGAGCTTTTCGAAGCCATGTCAGCAGGATTAGCTCCTGAGACAGCCCTGCCCCAAAGTCCCGTAT

TTCTATGGCCGCAGTTCTCTCCTCGCCGAACCAAAGCCTCCTCCAGTACTTTCTTCTCAAACCTGCTCATAACAAG
TGCAATGGGGTTCTTCAATGCCTGCTGGGACTTGCTGCTCCACCTCCCTTTCTTTGCTCCGCGGGGCGGCGGCTTCG
AGCGGGATCGCTCGCAGCTTCCGATCTCCTCCGGTCCGAGTGGCGGCGTAGTCATCCACCCGGAGAATGCTTCCCCT
GGCTTACCTGCTCTTACCCGAGCATGGAAGGGTGGGAAAGCTGCAACTACCCGACGACAGGAGCTGCTGGCTTAA
AGATGGGAGGGCGAGTCAGCCTTACTTCTCTCAATACGATATCCACACAGACTGTAAGTCTCGATATGGTTGCCCG
CATTGCATGCTTTACGCTTTACCAGGCCTTCGTGCTAAATTTATGAAGACGAGACCGTCTGGCCTCAGGGTGTAAAC
AGAGAAGTAAGTGTGAAAAATCAAAGCCTGGGGCGGGGAAACCCGGCCTCTGAGCCTTCATCTATGGCAGCCCGT
ACACATCGAGAGACGAAGTATTTATCGCGAAGAGAATGCCCCTGATCTCTTTAAGCACATACATCTGCATGAATATT
TCAATTCCCCTTGTCATCAGGGATGATCAAGGGGCCATGCCGTTACCAAATGTCTGGGCAGAGTCCCTTCTTTTCA
CGCTGCAGCAGATTTGCTTACTCGGTGTTTACTGAACATTTGCAGTACTGGATCAACCTCAAGGACCAAGTGGTAAG
TGCTGCCATTCCCTTGAGTCCGCTGTAGCTGCTCATAACCCAGCTTTTCCCCGACGGTTATTCCAAGCCTTATGGC
AAAGTAATCAACGACACCTACCCAGGTCCTTTAATCGAGGCTTGCTGGGGCGATGAAGTAGTTGTTTCATGTGACAAA
CTACCTGCAGACGAATGGCACTACGTATTCACACGCTTATATCAGTTGTGCCGCGGTATGAGCTGATGATGGGGCAG
TATTTACTGGCACGGTGTGAGACAGCAGTTCAGCAACGAAATGGACGGAGTCAACGGTTTGTTCGCAAGATCCCAC
TATTTACCTCCTCGGCTCACGTATGTAGGTATTACACAGTGTCCCTATCGCTTATGGTGACACCTTCACCTACCGCT
TTCGTGTTACTCAATATGGAACCTACGTGTAAGTGTTCGACTCCTGATCTGGTCTCAGCCATTGACACGGAAGTAG
GGTACCATTACACTACTCGCTCCAATACCCAGATGGCGTTGCTGGCCCTCTCGTATTTACGGCCCTACAGCAGCC
GATTGGGATGAAGAGTGGGAGACCCCGCTGATGATCACTGATTGGGTTACGATTCCGGCTTTTGGGGTCTTCTCCCA
GGAACCTCCTCGCGTCGGATCCTGCCAACCGGAACGTCACACCACCCGTGGGGGACAGCATTCTGCTTAACGGACACG
GACATTACAACCTGCAGCCTTTCTCAGGACCAAAACCGCTGCGCGCCGGGATATGGATCTTACTACACGCAAAGATTC
CAAAAGGGTAAAAGGTACTTGATCAGGCTAAATAACTCCTCAGCTGGAGCAGCATTTATCTTCTCCATAGACGGACA
CAAAATGAAGGTCATCTCCACGGATCTCGTTCCCATGAGCCGTACGAGACAAATGCAGTGTCTCCTCAACATAGGTA
TATAGCGTTTGGTGCTCGTCTTAGCATGTCTCCAGACACTAACTTCCCGCAGGCCAACGCTACAACATCATCGTCCG
AAGCCAACGCCGAACCCGGCGACTACTGGATCCGTACCGAGATACCCGGCGGGCCAGGCGGCTGTGGCAGCGTGCAC
GACCGGGCCGGTAACGTGACGGGCATCCTGCGTACGACGGACGAGTACCGCGCTACCGACCTCATCGAAGAATGA
CTACCCGTCCGACTGCCACGATGAGCCAGCGGAGCTGCTGCACCCAATCCTGCCGTGGACGGTGGATCCGCACCCGC
AGAACGACGTACACAACAACACGTACGAGGTCGGCATTTCAGACGCCAGTTCACAAAGGCCCTTCCGCTGGGACCTG
ACCGACACGCCCATGTGGCTCGACTTCTCAAACCCGACCATCCTCAACCTGTACAACACCACCTGGAACCCGGAGTA
CGCCGTATCGACTGTGAGTTGTCTTCTTACCTCCCGTTCTCCCCAAAAAACACTAGCAACGAGTGGATGAAGACT
GACAGGTACGAAAACAGACAACACTATGACCGCGGCTTCGTCTACCTCGTCATCACGGCCAACTGACACGGCTGGGCG
ACAACAAGCGCGAGATCCCCGCCGGCCACCCATCCACCTGCACGGCCACGACTTCGCCGTCTCGCCAGTCCAAC
TCGACCTATGACGAGCGCTCCGACCCGCTCAATTTACCCTCGCCAACCCGCCGCGCCGATGTCTCTTCCCTGCC
GAGCAACGGCTACGTCGCGCTGGCGTTCAAGCCGGACAATCCCGGCATATGGTTGGTGCATTGCCATATCGCTTGGC
ATGCCAGTTCTGGTGAGTGTTTTCTTTTTCTTTTTGGTAACTTTGTTTTCTGTGGCTTTTTTAAAAGTGTGTGAA
TGCATGCTGATGATTTTTATACGATGCACAGGCCTGGCACTGCAGATTCTGGAGAGGCAGCCAGATATCCTGGATTC
GATTGGCACGCTCGAGGCGACGAATAAGACGTGTGCTGGATGGGATACGTACGAGAGGGCGCATCCGATCGAGCAA
GACGACAGCGGTATCTGATTAGACGTACCTCTGCGTCAGATCCGACGAGTTGGGAGTGAATGATGCCCTCTGGAAG
GATTGTGAAGGATGGGGTGAGCTTTTCTCCTGTGCATTTTCTCTCATGTTGAGGAGCTCTGTTTCGTAGCTGGAGT
ACGCTCATTTATTTCC

[0647] SEQ ID NO:86

[0648] 长度 :1932

[0649] 类型 :DNA

[0650] 生物体 :菜豆壳球孢菌

[0651] 特征名 / 键 :CDS

[0652] 定位 : (1) (1932)

[0653]

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G G G F E R D R S Q L P I S S G P S G G  
gtagtcatccaccggagaatgcttcccctggcttcacctgctcttaccgagcatggaa  
V V I H P E N A S P G F T C S Y P S M E  
gggtgggaaagctgcaactcaccgacgacaggagctgctggcttaaagatgggagggcg  
G W E S C N S P D D R S C W L K D G R A  
agtcagccttacttctctcaatacgaatccacacagactacgagaccgtctggcctcag
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[0654]

S Q P Y F S Q Y D I H T D Y E T V W P Q
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 tccaagccttatggcaaagtaatcaacgacacctaccaggtcctttaatogagggttgc
 S K P Y G K V I N D T Y P G P L I E A C
 tggggcgatgaagtagttgttcatgtgacaaactacctgcagacgaatggcactactatt
 W G D E V V V H V T N Y L Q T N G T T I
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 H W H G V R Q Q F S N E M D G V N G I T
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 Q C P I A Y G D T F T Y R F R V T Q Y G
 actacgtggtaccattcacactactcgcctcaatacccagatggcgttgcgtggccotctc
 T T W Y H S H Y S L Q Y P D G V A G P L
 gtatttcacggccctacagcagccgattgggatgaagagtgggagacccccgctgatgatc
 V F H G P T A A D W D E E W E T P L M I
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 T D W V H D S A F G V F S Q E L L A S D
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 P A N R N V T P P V G D S I L L N G H G
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 H Y N C S L S Q D Q N R C A P G Y G S Y
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 Y T Q R F Q K G K R Y L I R L I N S S A
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 V P I E P Y E T N A V L L N I G Q R Y N
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 I I V E A N A E P G D Y W I R T E I P G
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 G P G G C G S V H D R A G N V T G I L R
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 H D E P A E L L H P I L P W T V D P H P
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 Q N D V H N N T Y E V G I S D A Q F H K
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 A F R W D L T D T P M W L D F S N P T I
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 L N L Y N T T W N P E Y A V I D Y N Y D
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 R G F V Y L V I T A N L T R L G D N K R
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 R R D V V F L P S N G Y V A L A F K P D
 aatcccggcatatgggttggtgcattgccatctcgttggcatgccagttctggcctggca
 N P G I W L V H C H I A W H A S S G L A
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 L Q I L E R Q P D I L D S I G T L E A T
 aataagacgtgtgctggatgggatacgtacgagagggcgcatccgatcgagcaagacgac
 N K T C A G W D T Y E R A H P I E Q D D
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 S G I-

[0655] SEQ ID NO:87

[0656] 长度 :643

[0657] 类型 :PRT

[0658] 生物体 :菜豆壳球孢菌

[0659] MGGFNACWDL L L L L L P F F A P R G G G F E R D R S Q L P I S S G P S G G V V I H P E N A S P G F T C S Y P S M E G W E S C N S P D
D R S C W L K D G R A S Q P Y F S Q Y D I H T D Y E T V W P Q G V T R E Y W I N L K D Q V L F P D G Y S K P Y G K V I N D T Y P G P L I E A C W G D E V V
V H V T N Y L Q T N G T T I H W H G V R Q Q F S N E M D G V N G I T Q C P I A Y G D T F T Y R F R V T Q Y G T T W Y H S H Y S L Q Y P D G V A G P L V F H
G P T A A D W D E E W E T P L M I T D W V H D S A F G V F S Q E L L A S D P A N R N V T P P V G D S I L L N G H G H Y N C S L S Q D Q N R C A P G Y G S Y
Y T Q R F Q K G K R Y L I R L I N S S A G A A F I F S I D G H K M K V I S T D L V P I E P Y E T N A V L L N I G Q R Y N I I V E A N A E P G D Y W I R T E
I P G G P G G C G S V H D R A G N V T G I L R Y D G R S T A L P T S S K N D Y P S D C H D E P A E L L H P I L P W T V D P H P Q N D V H N N T Y E V G I S
D A Q F H K A F R W D L T D T P M W L D F S N P T I L N L Y N T T W N P E Y A V I D Y N Y D R G F V Y L V I T A N L T R L G D N K R E I P A G H P I H L H
G H D F A V L A Q S N S T Y D E R S D P L N F T L A N P P R R D V V F L P S N G Y V A L A F K P D N P G I W L V H C H I A W H A S S G L A L Q I L E R Q P
D I L D S I G T L E A T N K T C A G W D T Y E R A H P I E Q D D S G I *

[0660] SEQ ID NO:88

[0661] 长度 :2404 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0662] 类型 :DNA

[0663] 生物体 :菜豆壳球孢菌

[0664] A A A T G C C A T G G A C A G C T C G C C C G G G A T C G A T G T C C T T T C T C C C C G A G C C C C C G T C G C C C G T C C A G G A G A
G A T A A C C T T C T C A T A G G G C C T C A T T C C T A C T C T C T C C T T C C C T T T T + C G T T A C C C T C C C C G A C C G C G G T C C A C C T T
C G A C A T G T G G T G G T T G G C A T T G T T C A T T G C T T G T G G C C G C C A C G G C C T G G G C C A A G G A G C C C T A C C T C A A G G T C C
A C G A T G A T A C C T T T A T T C C A G A T G C C G T G T T G C G G G T A A C A G A G G A G A G T G C C T C A T T G G T T G C A T C G A G A G G A C C
T C C G C C G T G G T C A A C G G C A C A G A T T C C G G G G C G A T T T T G G A A T T C C A A T C C G G C A G C G T G G T A T G G G T T C G T G T T T A
C A A T G A T A T G G C A G A C A A A A C C T C A C C A T G G T A A G C C C G A C G A T A T G C C T G C G G T G A A T C A G A C T A G T C A A T T A A
C T T C T C G G T C C A C A G C A T T G G C A T G G C C T C A C C A T G G C A G C C G T C C A T T C G C C G A C G G T T C C G T T G C A G C C A G C C A
G T G G G C G A T C G A G C C G T T C A A A T T C T T C G A C T A C G A G C T C A A C C T A T T C G A C A T C A A G C C T G G G A C G T A T T T C T A C C
A C T C C C A T G T C G G A T T C C A G G C A A T T A C T G C C A C G G G T C C C C T G T C A T T A C C A A A A G C C G G G A G A G G A G C C G C C G
T A T G A G T A C G A G G A G A A C G C A T C G T C C T C T T T T C C G A C C T T T A C A A C A C G A C G G A C C A C G A C A T T G A A A C C G G A C T
G G T A G C C A G C C C T T T C A A A T G G A G C G G T G A G G T C G G A G A C G T C C T C G T C A A C G G A T A T G G C A T A T C G C A G T A C C C G G
C C A C G A A C G A C G C C G A G A G T T G C A A C C T T G C A C A G A T T C C C G T G_g A A G C T G G G A A G A C G T A C C G T T T G C G T T T C A T T
G G T G C C A C T G C C C T T T C T T T C C T C T C C G T T G G C T T T G A G A A G C A C A A T C T T A C C A T C A T C G A G G C G G A T G G C C A C T A
C A C G G A A C C T G C A G A A A T C A G C T T C C T T C A A A T C G G C G G C G G C C A A C G G T A T T C T G C T C T C C T A A A G A C A T G G A C T T
G C G A G G A G C T C G C C G C C A A G A C T G T G G T C G A A A C A G T T C T A C A T C C A A A T C G A G A C T C G T G A C A G G C C C A A G A A C
C T C A C C A C C T A C G C A T T C T G G A C T A C A G C G A C A G C T G C G C C A C C A A T A G C A T C A G C G T C G A G G C C A C C A T C G G C A A
G G A C T C A A C A T C G C C C C T T C C T A C G C C C T C C T T C G C T C A G C A A C C C G G C A A C A A C A A A A C A A C A A C A A C A
C C A C G C T C T C C C G C A A G A C G C C G C C C A A G A C C C C A C C G T G C A C C T C C C G C C C A C C G T G C A A G G C T G G C T C G A C C A T
G A C C T C C A C C C G C T C G A A A C C T A C A C G G A C T T C C C G A C G G C G G A C G A G G T C A C G C G C A C C G T C T A C A T G G A C A T C T T
C C A G C T A G G G C A G G A C G G C T A C G T C A A G T G G G C G C A G A A C A A C C T G T C G T G G T A C G A G C A C A C G C C C A A G G T T C C C T
A C C T C G T C G C G C T C T A C A C C A A C A G C A C G A G T A C C T G C C C G A C T A C G A C T A T G C C G T C G C A T C G G G G A C G G G C C A C
G A C G A C C G C G T C G G T G C C T G G C C C G C C A A G A T G G G C G A G G T G C T C G A G A T C A T C G T C G T C A A C A C G G G C A G C T A C A G
C G G C G G C A T G G A C G T G C A T C C C A T G C A C C T G C A C G G C G C G A C C C G T T C T A T T T G G G G A G T G G G A A G G G C A C G T A C A
A C A G A G A G G A A C G A G A A G A A G T T G G C G G G A G G G T G C C G G T C A C G A G G A T T C G A T G A T G C T G T A T C G G T A T G G C
G A G A A G G A G G A G C C G C A C A A G G A T A A T A G C T G G A T T G C G T G A G G A T A A G G G T G A C G C A G C C G G G G T G T G G A T G T T

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Y L K V H D D T F I P D A V L R V T E E
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S A S I G C I E R T S A V V N G T V P G
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P I L E F Q S G S V V W V R V Y N D M A
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N L F D I K P G T Y F Y H S H V G F Q A
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Y E E E R I V L F S D L Y N T T D H D I
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E T G L V A S P F K W S G E V G D V L V
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N G Y G I S Q Y P A T N D A E S C N L A
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Y S D S C A T N S I S V E A T I G K D S
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T S P P S Y A P P S L S K P G N N N K N
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N N N T T L S R K T P P K T P P L H L P
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P T V Q G W L D H D L H P L E T Y T D F
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G Y V K W A Q N N L S W Y E H T P K V P
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Y L V A L Y T N S T Q Y L P D Y D Y A V
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L E I I V V N T G S Y S G G M D V H P M
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H L H G A H P F Y L G S G K G T Y N R E
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[0672]

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V E G Y L V P G G D V F G D D D H D P V
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V V H F F D L D D D D D D D D D A N K T
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D G N G G K N G R-

[0673] SEQ ID NO:90

[0674] 长度 :649

[0675] 类型 :PRT

[0676] 生物体 :菜豆壳球孢菌

[0677] MWWLALFSLVAATAWAKEPYLKVHDDTFIPDAVLRVTEESASIGCIERTSAVVNGTVPGPILFQSGS
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LLITKKPGEEPPEYEEERIVLFSPLYNTTDHDIETGLVASPFKWSGEVGDVLVNGYGISQYPATNDAESCENLAQIP
VEAGKTYRLRFIGATALSFLSVGFKEHNLTIIEADGHYTEPAEISFLQIGGGQRYSTALLKTWTCEELAAKTAGRNQF
YIQIETRDRPKNLTTYAILDYSDESCATNSISVEATIGKDSTSPPSYAPPSLSKPGNNKNNNNNTLSRKTPPKTPPL
HLPPTVQGLDHLPLETYTDFPTADEVTRTVYMDIFQLGQDGYVYKWAQNNLSWYEHTPKVPYLVALYTNSTQYLP
DYDYAVASGTGHDDRVAWPAKMGEVLEIIVVNTGSYSGGMDVHPMHLHGAHPFYLGSKGTYNRENEKLAGRVP
VTRDSMMLYRYGEEKPHKDNSWIALRIRVTQPGVWMFHCHTLAHMIMGMTVWVFGDSKDILTLPLPMVEGYLVPG
GDVFGDDHDPVVVHFFDLDDDDDDDDANKTDGNGGKNR*

[0678] SEQ ID NO:91

[0679] 长度 :2569 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0680] 类型 :DNA

[0681] 生物体 :菜豆壳球孢菌

[0682] CGCCCATTACACCATTCTGACTCTCCTCCGGAGCTCGCATCAGGGCGCTCTCTCGCCCTCCT
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AGCCATGGCCAGTCTCTGTTCTCCTGCTTGTGCTGCCCTGTGCAGCCGCGCTGCCACAGTCACGTATGACTTTA
ACGTGACCTGGGTACCGCCAACCCTGATGCTGCTTTTCGTGCGACTACCATTGGCATCAATGGCCAGTGGCCGCTC
CCTGCAATCGACGTCACCAAGGGCGACCGGTTGTATCAACGTCAACAACCAGCTGAAAACGGAGAGTACCAGTTT
GCATTTCCATGGAATCTACATGAATGGACCAACCACATGGATGGCCCCACTGGCGTGACCCAGTGCGAGATACCGC
CCGGGAGCTCATTACATAAATTTTACGGTATAGCACGATCCCACCCCTTGTTTACTTATAGCTAACCACGACGAG
GTCGACCAACCGGAACTTACTGGTGAGTAGCCAGCTGTTGGCGTCAAGACTGGGAAAGCTGACGTAGCTTCAGGTA
TCATTCTACAACCGCGCCAGTATCCCGATGGATTGCGAGGGCCTTTTATTGTCAGAGACCCCGACAATCCGTTCA
AGGATGACTATGATGAGGAAGTCGTCTGACATTCTCCGACTGGTACCACGACCGGATCCCCACCCTCATGAAGAGT
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CTTCCAGATGACTCCCGGGCGGAGATACATGTTCCGACTAATAAACATTGGTGCATTTGCTGCTCAATACGTCTGGT
TCGAAGGCCATAACCATGCGTATCGTAGAAGTCGACGGCGTGTACACCGAAGCCGAGATGCAGAGCGAATTTACATG
ACTGCCGCTCAACGCTACAGCGTAATCATCACCGCAAAGAACAATCTACCTCAAACCTTCGCCTTTGTTGGAAGCAT
GGATCAGGTCAGCTATCCTTTTACTGGGCCGACATTTTCTTCTTAACATAATGCAGGATCTCTTTGATACTATT
CCAGCAGGCCTTAATAATAACGTGACCGGGTGGCTTGCTACAATCAACAGAACGGCTTGTTGCCACCTTTAGCTAT

CGGGGACTACGATCCGTTTCGATGACTTCACACTTGTGCCTCAAGATGGTATGGAGCTCTACGATCACGTCGATCATT
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AATGCCATGACTGACGAGCGCAGTGCCTTTTTCAACGACGTGACCTACGTCGAGCCCAAGGTGCCGACTCTGTACAC
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GCAATCGTTCGCTCCGAAGAAGAAGCCGGCGGTACGTGGCAAACGAAACCTTCCCCCAGACGCCAATGCGCCGCGA
TACAATTCTTGTCCGGCCCAATGGCAATATAGTACTGAGATTCAAGGCTGACAATCCTGGTGTCTGGCTGTTCCATT
GTCATATTGAATGGTATGCTCCTTGGTATCTTTTATCCTAGCTCTACTGACCTCTTACTGTTAGGCATGTTGCGTCG
GGCCTTATTGCCACCATGATAGAGGCACCGCTTGACCTGCAATCTTCTCTCGGCAACAGCATTCCCTGCTGATCACTG
GCGAGCTTGTGCCGCCGCCGGCACACCTACTGCAGGCAACGCGCAGGCAACACGATTGATTATCTTGACCTGACTG
GTGAAAACAAGAGCCCCGGCCCGCTTCCCTCTGGCTTTGAAGCGAAAGGCATTGTCGCGCTTGTCTTCAGTTGTATT
GCTGCTGTCTTGGGCATGGCAGCCATCGTATGGTACGGGATGGCGCCTCTGACAGATGGAAGTGGTCAGCAACAACA
CGTTGTGGATCAACAGCCGCAAGGACGCTCCGCACAAGTTGGCGTCATGCCCCTAGCGGTGCGGCAAAAACGTGAGC
AAAGGATGGCCAGCCGGACTGATTTGGAGGCAGAGATGCGGCAAGAAAAGAGCGGAGAAATTACCATGGTGGAGCAG
AGGAGGAGCAGCCGTGGGTCATCGAACATGCTGGATGTCAGGAGGAGTAGCCGCGGTTTCGTCTAACATGCTAGAGAC
CAGAAGAAGCAGTCGTGGCAGTGAGCAGATGCTGTCATGAGGACCAACATCATGGTAGCAAGGTAAGTGGAAATCGG
CTGTGAAGAAATACAGGGTCAGTTGTGAGAGGGAAAGCTATCACGAATGGCTGAAGAGCTTTGGGCCTTGTTACGAT
GTAATGTTGTCCGAAATGTTGTGGTAATTATTGTA

[0683] SEQ ID NO:92

[0684] 长度 :2016

[0685] 类型 :DNA

[0686] 生物体 :菜豆壳球孢菌

[0687] 特征名 / 键 :CDS

[0688] 定位 : (1) (2016)

[0689]

atggcccagtcctctgttccctcctgcttgctgctgccctgtgcagccgctgccacagtc
M A Q S L F L L L A A A L C S R A A T V
acgtatgactttaacgtgacctgggtcaccgccaaccctgatgctgcttttctgctgact
T Y D F N V T W V T A N P D A A F R R T
accattggcatcaatggccagtgccgctccctgcaatcgacgtcaccaagggcgaccgc
T I G I N G Q W P L P A I D V T K G D R
gttgatcatcaacgtcaacaaccagctggaacggagagtaccagtttgcatttccatgga
V V I N V N N Q L E T E S T S L H F H G
atctacatgaatggcaccaaccacatggatggcccactggcgtgacctgagagata
I Y M N G T N H M D G P T G V T Q C E I
ccgcccgggagctcattcacatacaattttacggctgaccaaccgggaacttaactgggat
P P G S S F T Y N F T V D Q P G T Y W Y
cattctcacaaccgcgccagtatcccgatggattgctgagggccttttattgtcagagac
H S H N R G Q Y P D G L R G P F I V R D
ccgacaatccgttcaaggatgactatgatgaggaagtcgtcctgacattctccgactgg
P D N P F K D D Y D E E V V L T F S D W
taccagaccggatccccaccctcatgaagagtttcattagtgtcacaacccccaccggc
Y H D R I P T L M K S F I S V T N P T G
gaggagcctgtcccgaacgcgccactgatgaatgacactcagaacctcaccttccagatg
A E P V P N A A L M N D T Q N L T F Q M
actcccgggaggagatacatgttccgactaataaacattgggtgcattttgctgctcaatac
T P G R R Y M F R L I N I G A F A A Q Y
gtctggttcgaaggccataccatgcgtatcgtagaagtcgacggcgtgtacaccgaagcc
V W F E G H T M R I V E V D G V Y T E A
gcagatgcagagcgaatttacatgactgccgctcaacgctacagcgtaatcatcaccgca
A D A E R I Y M T A A Q R Y S V I I T A
aagaacgaatctacctcaaacttgcctttgttgaagcatggatcaggatctctttgat
K N E S T S N F A F V G S M D Q D L F D
actattccagcaggccttaataataacgtgaccgggtggcttgtctacaatcaacagaac
T I P A G L N N N V T G W L V Y N Q Q N
ggcttgttggccaccttagctatcggggactacgatccgttcgatgacttcacacttgtg
G L L P P L A I G D Y D P F D D F T L V
cctcaagatggatggagctctacgatcacgtcgatcattccatcaccctcgatatgaag
P Q D G M E L Y D H V D H S I T L D M K
atggacaatctcggggacggagcaaattatgcctttttcaacgacgtgacctacgtcgag
M D N L G D G A N Y A F F N D V T Y V E
cccaaggtgccgactctgtacacgggtgttgtctactggcaataatgccacagactcgaga
P K V P T L Y T V L S T G N N A T D S R
atctacggtagcaacaccaacagcttcatattggctaaggacgaagtcgtcgagatcatc
I Y G S N T N S F I L A K D E V V E I I
ctcaacaacaatgatccgggaagcaccctttccatctgcatgggcacgcattccaagca
L N N N D P G K H P F H L H G H A F Q A

[0690]

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atcgttcgctccgaagaagaagccggcgctacgtggcaaacgaaaccttccccagacg
I V R S E E E A G A Y V A N E T F P Q T
ccaatgcgcccgcgatacaattcttgtccggcccaatggcaatatagtaactgagattcaag
P M R R D T I L V R P N G N I V L R F K
gctgacaatcctgggtgtctggctgttccattgtcatattgaatggcatggttgcgtcgggc
A D N P G V W L F H C H I E W H V A S G
cttattgccaccatgatagaggcaccgcttgacctgcaatcttctctcggcaacagcatt
L I A T M I E A P L D L Q S S L G N S I
cctgctgatcactggcgagcttgtgcccggccggcacacctactgcaggcaacgcagca
P A D H W R A C A A A G T P T A G N A A
ggcaacacgattgattatcttgacctgactggtgaaaacaagagccccggccccgcttccc
G N T I D Y L D L T G E N K S P G P L P
tctggctttgaagcgaaaggcattgtcgcgcttgtcttcagttgtattgctgctgtcttg
S G F E A K G I V A L V F S C I A A V L
ggcatggcagccatcgtatggtaggggatggcgccctctgacagatggaactggtcagcaa
G M A A I V W Y G M A P L T D G T G Q Q
caacacgttgtgatcaacagccgcaaggacgctccgcacaagttggcgctcatgcccta
Q H V V D Q Q P Q G R S A Q V G V M P L
gcggtcgcggcaaaacgtgagcaaaggatggccagccggactgatttggaggcagagatg
A V A A K R E Q R M A S R T D L E A E M
cggcaagaaaagagcgggagaaattaccatggtggagcagaggaggagcagccgtgggtca
R Q E K S G E I T M V E Q R R S S R G S
tcgaacatgctggatgtcaggaggagttagccgcggttctgcttaacatgctagagaccaga
S N M L D V R R S S R G S S N M L E T R
agaagcagtcgtggcagtgagcagatgctgtcatga
R S S R G S E Q M L S-

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[0691] SEQ ID NO:93

[0692] 长度 :671

[0693] 类型 :PRT

[0694] 生物体 :菜豆壳球孢菌

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[0695] MAQSLFLLLAAALCSRAATVTYDFNVTWWTANPDAAFRRTTIGINGQWPLPAIDVTKGDRVVINVNNQL
ETESTSLHFHGIYMNGTNHMDGPTGVTQCEIPPGSSFTYNFTVDQPGTYWYHSHNRGQYPDLRGPFIVRDPDPFK
DDYDEEVVLTFSDWYHDRIPTLMKSFISVTNPTGAEPVPNAALMNDTQNLTFQMTGRRYMFRLINIGAFAAQYVWF
EGHTRIVEVDGVYTEAADAERIYMTAAQRYSVIITAKNESTSNFAFVGSMDQDLFDTIPAGLNNVNTGWL VYNQQN
GLLPPLAIGDYDPFDDFTLVPQDGMELYDHDVHSITLDMKMDNLGDGANYAFFNDVTYVEPKVPTLYTVLSTGNNAT
DSRIYGSNTNSFILAKDEVVEIILNNNDPGKHPFHLHGAFQAI VRSEEEAGAYVANETFPQTPMRRDTILVRPNGN
IVLRFKADNPGVWLFHCHIEWHVASGLIATMIEAPLDLQSSLGNSIPADHWRACAAAGTPTAGNAAGNTIDYLDLTG
ENKSPGPLPSGF EAKGIVALVFSCIAAVLGMAAIVWYGMAPLTDGTGQQQHVVVDQQPQGRSAQVGMPLAVAAKREQ
RMASRTDLEAEMRQEKSGETMVEQRRSSRGSSNMLDVRSSRGSSNMLETRSSRGSEQMLS*

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[0696] SEQ ID NO:94

[0697] 长度 :3063 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0698] 类型 :DNA

[0699] 生物体 :菜豆壳球孢菌

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[0700] ACGCCTCGCCAACCTCATCTTCGTGCGAACAGGCTTAGGTATCAAGCCTCCTTTGCAATCACTTACGCGG
CCCTCTTACCTCCTGCTCATGTTTGAACAAATCACACCTCTTTGAAACGCTAGAAACACACTGTTTCTATACCGTC
GAGAATGGCCTGGACCTCAGCTCTAGATCGATCCTCGTGGCTTGCCCCAGCTTCCCCACCAAGGGGGTTTGGTAAGT
CGTAAAAGTTTCTCACAGTTCGCAAATTCAGAGTACCGGTTACGCCTCTGATCTTTGCCACTGTCACGGCGGCAGC
TGAAGCCGCGTGTACGTGCAATTCTCCCCTGAATACGTATGTGCCGACTGTATTTCTTCATACCCAGCCGTCTAG

```

GATCGTTCGGTATCGGTCTCTGCAACGACTACCACTACGACCACTGGGAAATCCTCCACGTTCTCTACGCTGACCAG
CACTTCATCTTCGTCTACAGCGAAGACTAGCTCGGCCAGCTCGGCATCGCTTTCACGCACTACTCCTTCACCTGCCA
GCTCTTCTCCGTGAGCTCTTCGTGATCAGATCCTCTTCTGGCGGATCTTCATCTGCTGGTACTTCTTCTGCCCGC
TCATCATATGTCAGCTCTTCTTTGAGCTCGCGTTCTGCTGTTTCTTCCCTAGTGACCAGCATATCCTCTTCTCTCAC
CTCAACTGGCACGGTATCGTCCTCGCCCGCTTCGAAGAGCTCCAGCTCTTCATCTTCCACTCTTTCAGCCTCTTCAA
CCACAAAGGTTGCTACTGGTACCCCGTGTGCTGGAAAACACTGCGGCTTCCAGGACAGCCTGGTGGGATCACACCATT
GACGATGACTACTATCCCATTATCCCAGATACCGGAGTCACACGCGAATACTGGTTCGACCTTGTGAGGTGACTGT
TGCCCCTGATGGCATTGAGAGAGCTGCCATGGCGGTCAACGGCAGCATCCCTGGACCCACCATTGAGGCGGATTGGG
GCGATATCGCCGTCATGCATGTGACCAACAGCTTGATCTCGAGCAAGAACGGCACTAGCATTCAATTCACGGTATC
CAGCAGAACTTCACAAATCAAACGGACGGTGTATTTCCATCACTCAGTGCCCTACCGCTCCTGGCGAGAACTACAC
GTATACCTGGAGGGCTGAGCAGTACGGAACACTACATGGTGAGCTTGATCCGAGGATACAGATGTAAAGGAGATGCTAA
GATATCACAGGTACCATTCTCACTTTGCGCTTCAAGCTTGGGAAGGTGTCTTTGGAGGTACATACATCCCCGCTCCA
GGACCTCCAACATTTATTAACGAAGCCCTGCAGGTATCAAGATCAATGGTCCGGCGAGTGCCAACTACGATTACGAT
CTTGGCCATGTCTTCTGTGAGTTTCGACGCCCTTTTCCACTCATTGTATAAAGTAAGCTTATGCGACAAAAGCCA
ACGATTGGAGCCACGAGACTTCGAGCTCTCTCGAGATCGTTTCTGCAATTCGAGGTCCGCCAACACTTGAGAATGCC
CTTATCAACGGTACCAACGTGTACAACAACACTCGGGAACCATAACGGGCTCTCGTTTTGAGACAACATTTGAGGAAGG
CAAATCCTACAGGTTGAGGTTGGTCAGCGGCCATCGACACGCATTTCAAGGTGTCATTGGGTAAGTTGAGCCAAA
ACATTGAGATTTCTGAGATCTAAAGCTGATTGTGTTGCAGATAACCACAGCATGCTTGTATAGCCAACGACCTTG
TACCCATCGTGCCGTACAACACGACCGTCTGAACATCGGAATGGGTCATCCACTTTCTATCAGGAACTGGCCATCA
AACTGACACTGAACCCAGGCCAACGCTACGATGTAATCATCACCGCCAACCAAGCCGTAGTCGCCACCGACTTCTG
GCTGCGTGCCGTCCCGCAGACGGCTGCTCCAATAACGCCAACCCAGACAATATCAAAGGAATAATCCGGTACAGCA
CCTCCACCTCCGCCTACGACTGGACGAACGAATGCGTTCGACGAGGCCCTACCAACCTCGTGCCATGGGTGACTAAG
AACGCGGCCTCGGGCACGAGTCTATCTGAAGTGGTGACGCTGGGTCGCAACGTTGACAACCTCAACCGCTGGATGAT
GAACAGCACATCGATGGTTGTGAGTGGAATGATCCCTCGTTGCTGCAGGTTTGAATAATGATACCAATTTACGG
ATACGAGCGGCGTGGTCAGGCTTGGTACGGCGGACGAGTGGGTCATGTTTGTATCGAGATGACGCTGCCGATTCCG
CGTCCCATCCATCTTACGGGCATGATGTAGATTTCTTCCAGCCGCCCCCCCCCCCCCTTTTTTTTTGGGCTCTAC
TTCCTAGAATACCGGACGGAGTCGTTGCGGAGCGGCCTTCGCCGACTTTTTCGTTCCGATGTCTCAAGAAAGGTGT
CCATGTTGTAATGTGTATCCCAGAGGCTTCCCGGCTGACTTGTTTTGTCAACACAGTTCAACATCCTCGCCCAAGGG
ACCGGCACGTACGATTCATCCGTGTCGCTCACCTGTCAAACCCGCCGCGGAGGGACGTTGCGCTGCTGCCCGCAGC
CGGGTACTTGGTGATTGCATTCGCCACCGATAACCCTGGAGCCTGTGAGGACTTCTTTTTTCTTGTGCATCCCTGG
ATGTCATCCTTGCTGTGAAATTTTTGGCTGACGCATTCGCTCAATGCAGGGCTCATGCACTGCCACATCGGCCGGC
GCACTACGGAGGGCTTCGCAATCCAGATCCTCGAGCGCTGGGACGAGATCTCGCCGCTTATCGACTACGAGACGCT
TGAAGGCAACTGCAACAGATGGGACGCGTACGTGTCGGTCAGCGATGTCGTACAGGACGATTCTGGCGTATGAGCA
ATGAAGGTTAGAGTATTTGCGACGTGTTTTATCATATATAACAACCTTTTTAATCGTAGTCGCTCCTTAACCATAAT
GTTAATCCATCACTTGGGCCATCCAAGCACCAACAAAACATTTGAGCCTTCCCAATCAGGACTGGCACAAG

[0701] SEQ ID NO:95

[0702] 长度 :2085

[0703] 类型 :DNA

[0704] 生物体 :菜豆壳球孢菌

[0705] 特征名 / 键 :CDS

[0706] 定位 : (1) (2085)

[0707]

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G F A E A A C T S N S P L N T Y V P D L
tatttcttcataccagccgtctaggatcgttcggatcggtctctgcaacgactaccac
Y F F I P S R L G S F G I G L C N D Y H
taagaccactgggaaatcctccacgttctctacgctgaccagcacttcatcttctcttc
Y D H W E I L H V L Y A D Q H F I F L F
ttccgtgagctcttcgctcgatcagatcctcttctggcggatcttcatctgctggtaacttc
F R E L F V D Q I L F W R I F I C W Y F
ttctgcccgcctcatcatatgtcagctcttctttgagctcgcggttctgctgtttcttccct
F C P L I I C Q L F F E L A F C C F F P
agtgaccagcatatcctcttctctcacctcaactggcacggtatcgctcctgcccgccttc
S D Q H I L F S H L N W H G I V L A R F
gaagagctccagctcttcatcttccactctttcagcctcttcaaccacaaagcctgggtgc
E E L Q L F I F H S F S L F N H K A W C
gatcacaccattgacgatgactactatcccattatcccagataccggagtcacacgcgaa
D H T I D D D Y Y P I I P D T G V T R E
```

[0708]

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 A V N G S I P G P T I E A D W G D I A V
 atgcatgtgaccaacagcttgatctcgagcaagaacggcactagcattcatttccacgggt
 M H V T N S L I S S K N G T S I H F H G
 atccagcagaacttcacaaatcaaacggacgggtgttatttccatcactcagtgccctacc
 I Q Q N F T N Q T D G V I S I T Q C P T
 gtcctggcgagaactacacgtatacctggagggctgagcagtagcgaactacatgggtac
 A P G E N Y T Y T W R A E Q Y G T T W Y
 cattctcactttgcgcttcaagcttgggaaggtgtctttggaggtacatacatccccgct
 H S H F A L Q A W E G V F G G T Y I P A
 ccaggacctccaacatttattaacgaagccctgcaggtatcaagatcaatggtcgggca
 P G P P T F I N E A L Q V S R S M V R R
 gtgccaactacgattacgatcttggccatgtcttccccaacgattggagccacgagact
 V P T T I T I L A M S S S N D W S H E T
 tccagctctctcgagatcgcttctgcaattcgaggtccgccaacacttgagaatgcccctt
 S S S L E I V S A I R G P P T L E N A L
 atcaacggtagcaacgtgtacaacaactcggaaccataacgggctctcgcttttgagaca
 I N G T N V Y N N S G T I T G S R F E T
 acatttgaggaaggcaaatcctacaggttgaggtgggtcagcggcgccatogacaacgcat
 T F E E G K S Y R L R L V S G A I D T H
 ttcaaggtgtcattggataaccacagcatgcttgtcatagccaacgacctgtaccatc
 F K V S L D N H S M L V I A N D L V P I
 gtgccgtacaacacgacctcctgaacatcggaatgggccaacgctacgatgtaatcacc
 V P Y N T T V L N I G M G Q R Y D V I I
 accgccaaccaagccgtagtcgccaccgacttctggctgctgcccgtcccgcagacggcc
 T A N Q A V V A T D F W L R A V P Q T A
 tgcctcaataacgccaaccagacaatatcaaaggaataatccgggtacagcacctccacc
 C S N N A N P D N I K G I I R Y S T S T
 tccgcctacgactggacgaacgaatgcgtcgacgaggccctcaccaacctcgtgcatgg
 S A Y D W T N E C V D E A L T N L V P W
 gtgactaagaacgcccctcgggacgagtcctatctgaagtgggtgacgctgggtcgcaac
 V T K N A A S G T S L S E V V T L G R N
 gttgacaacctcaaccgctggatgatgaacagcacatcgatgggttgcgagtggaatgat
 V D N L N R W M M N S T S M V V E W N D
 ccctcgttgcaggtttggaataatgataccaatttcacggatacagagcggcgtggtc
 P S L L Q V W N N D T N F T D T S G V V
 aggcttggtagcggcgacgagtggtcatgtttgttatcgagatgacgctgcccattccg
 R L G T A D E W V M F V I E M T L P I P
 cgtcccattccatcttcacggcatgatttcaacatcctcgcccaagggaccggcacgtac
 R P I H L H G H D F N I L A Q G T G T Y
 gattcatccgtgtcgtcaccctgtcaaaccgcccgggagggacggttgcgctgctgccc
 D S S V S L T L S N P P R R D V A L L P
 gcagccgggtacttgggtgattgcattcgccaccgataaccctggagcctggctcatgcac
 A A G Y L V I A F A T D N P G A W L M H
 tgccacatcgccggcgactacggagggcttcgcaatccagatcctcgagcgtggggac
 C H I G R R T T E G F A I Q I L E R W D
 gagatctcgccgcttatcgactacgagacgcttgaaggcaactgcaacagatgggacgcg
 E I S P L I D Y E T L E G N C N R W D A
 tacgtgtcggtcagcagatgtcgtacaggacgattctggcgtatga
 Y V S V S D V V Q D D S G V-

[0709] SEQ ID NO:96

[0710] 长度 :694

[0711] 类型 :PRT

[0712] 生物体 :菜豆壳球孢菌

[0713] MAWTSALDRSSWLAPASPPRGFAEAACTSNSPLNTYVPDLYFFIPSRLGSFGIGLCNDYHYDHWEILHV
 LYADQHFIFLFFRELFDVQILFWRIFICWYFFCPLIICQLFFELAFCCFFPSDQHILFSLNWHGIVLARFEELQLF

IFHSFSLFNHKAWCDHTIDDDYYP IIPDTGVTREYWFDLVEVTVAPDGIERAAMAVNGSIPGPTIEADWGDIAVMHV
TNSLISSKNGTSIHFHGIQQNFTNQTDGVISITQCPTAPGENYTYTWRAEQYGTWYHSHFALQAWEGVFGGTYIPA
PGPPTFINEALQVSRSMVRRVPTTITILAMSSSNDWSHETSSSLEIVSAIRGPPTLENALINGTNVYNNSGTITGSR
FETTFEEGKSYRLRLVSGAIDTHFKVSLDNHSM LVIANDLVP IVPYNTTVLNIGMGQRYDVIITANQAVVATDFWLR
AVPQTACSNANPDNIKGIIRYSTSTSAWDWTNECVDEALTNLVPWVTKNAASGTSLEVVTLGRNVDNLNRWMMNS
TSMVVEWNDPSLLQVWNNDTNFTDTSGVVRLGTADEWVMFV IEMTLP IPRPIHLHGDFNILAQGTGTYDSSVSLTL
SNPPRRDVALLPAAGYLVI AFATDNP GAWLMHCHIGRRTTEGF AIQILERWDEISPLIDYETLEGNCNRWDAYVSVS
DVVQDDSGV*

[0714] SEQ ID NO:97

[0715] 长度 :2449 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0716] 类型 :DNA

[0717] 生物体 :菜豆壳球孢菌

[0718] GCGCACCCCGAATTTTCATGTGGCACTTTGCTGGTGGCGATGCATAAAGTCTCCCAAACCTTGATCTTC
AGCGTCGAGAGCAGCTCAACGTCCGATCCGATTTTTTCGTTACCGCGCTTCTTGTCCTCAAGCCCCAATACAATT
CAACATGTTTTCTTTTGTGCTCCAGAAGCCTCAACTGCCGCTATGGCTGGACTTTGGCCTTCAATATGGTCAATGT
TCGGCGGAAACAGTCAAGACTGCGTACACTCGCCCCAGAGCAGACACTGCTGGCATGATGGGTTCGATATCAACACC
GATTATGAAGCTAAGATAACCGCCAGGGAAGCTCGTGGAGGTAAGATAACCCAGCCACAGACGGCTCAGGCCATCGCA
ACTCACCTCCCTTAGTACGATTTCACTATCTCGGAAGCAGTCCTTGCTCCGGACGGATACTTGACGAATGTCACTCT
GGTAAATGGAGTATCCCTGGTCCAACCTCGAAGCTGAATGGGGAGATACGATCAGTATGCCTTCTTCATATGAAA
TCTTTCTGTGTGCCTTTTGACGTGATTGCTGACATTTCTGCCAGGGATAACGATCCACAACAACCTCACAAACCAC
AATGGCACATCCATACATTGGCATGGAATTCGCCAATTCGAGACCAATTGGCTTGATGGTGTTCGGCGTCACTCA
ATGCCCGTCAAAGGTACTACGGCTGGTTTGTCTTTGGGAGAGAAACAGGGGAGCTAAGTGTACCAGCCTGGAGACTC
GCAAGTTGTGCAATTCCGAGCGATGCAATATGGGACCGCATGGTATCATTACACTACAGTCTTCAGTGTGATGATC
AATCACAGAGCTCTTGAGCGGCACTTACGCTAACCATGATTAGATACAAACGGAGTTCTCGGTATTTGCTATCTCCC
TTCCATACAGTTTACAACCTGTGGGCTGATCCCGTTGCAGGACCCATTCACATCAAGGGACCCTCGAGCATGAACTA
CGACGTGGATCTCGGGCCACTGTTGATCAGTGATTGGTATCACCACGATGCCTTCGGCCTATTCCATTATGAGATCG
CTTACCACGACGCGCCGCTTCCGGTCACTAATCTTGAATGGCAAGGGAGTCTTTGATTGCGATCCAGCCAGCGAT
GCTCGTTGTACGGGAGAGCACCAACGGCACGAGATAGTGTTCGAAGAGGGTAAAAGATACAAAATTGGACTAATAAA
TACCGGCAGCCTTCTGACATACAAGTTCTGGATCGATGGCCATAATTTTACAGTTGTGCAGACGGATTTCTGTTCCCA
TCAAACCATACGTCACCGACGTTCTGATCGTCCGGATAGGTATGTTTCAGTGCCTACAAAGAATTGGCGGTAAACTGA
TCATTTCCAGCTCAACGATACGAGATCATTATCGAAGCAAATGTGACATTCACACGTGGCTCCAACCTTCTGGATTCA
CGCAACGTACTGTGACGATGATGACATGTTGGACTCGAGAGTTGGCATAGTCCGCTACGACGGCAGCGACGGTCTGTG
ATCCGCACACGCCGCCAAGAGTGAGCAACACCCCGGATACGGGTGTCGTGATCCAGCCACGGAGAATCTTGTTCCT
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GCCCAACATCTCGGACACAGATTCGCTCGTACACAAAATGGACTTACCAACAGAACCCAGTACATTGATTGGAGGG
AGCCAACAATCAAGGCGCTCACTTCGGATGTCGGGGCTGATTTTGGCGATGAGACATGCCCCATATACCTGGACTAC
GAGACTGGCGAGTGGGTGACTTCGTGATCGAGAACAACACTACAGCTGAGCGACGCCAACACGCCCCGACCATCCC
CCGCTCGGTCCATCCCATCCACTTACACGGGCATGACTTCGTGATCCTCGCCAGGGTGACGGCATGTTCCGACCCCG
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GCGAGGACTGGACTGAGTACTACAATACTGTAAACATACCAAAAGGCGCACTGCAAGATGATTGGGCATATGAGTT
GGTATTGAACTCCGGCTGAACACGCTCAGCCACGGCTACTTGCTTGGCCAAGATTGAGGGTTGGCCGAGAAATGAG
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[0719] SEQ ID NO:98

[0720] 长度 :1821

[0721] 类型 :DNA

[0722] 生物体 :菜豆壳球孢菌

[0723] 特征名 / 键 :CDS

[0724] 定位 : (1) (1821)

[0725]

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M F S F V V Q K P Q L P L W L D F G L S
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I W S M F G G N S Q D C V H S P Q S R H
tgctggcatgatgggttcgatatcaacaccgattatgaagctaagataccgccagggag
C W H D G F D I N T D Y E A K I P P G K
ctcgtggagtagcatttccactatctcgggaagcagtccttgctccggacggataacttgacg
L V E Y D F T I S E A V L A P D G Y L T
aatgtcaactotggtaaatggagtagtccctgggtccaaccctcgaagctgaatggggagat
N V T L V N G V F P G P T L E A E W G D
acgatcaggataactgatccacaacaacctcacaaccacaatggcacatccatacattgg
T I R I T I H N N L T N H N G T S I H W
catggaattcgaattcggagaccaattggcttgatgggtggtcccggtcactcaatgc
H G I R Q F E T N W L D G V P G V T Q C
ccgtcaaagcctggagactcgcaagttgtcgaattccgagcgaatgcaatgaggaccgca
P S K P G D S Q V V E F R A M Q Y G T A
tggtatcattcacactacagttctcagatatacaaacggagttctcggaccattcacatc
W Y H S H Y S L Q Y T N G V L G P I H I
aaggaccctcgagcatgaactacgacgtggatctcgggccactggtgatcagtgattgg
K G P S S M N Y D V D L G P L L I S D W
tataccaacgatgccttcggcctattccattatgagatcgcttcaccgcacgcgcgctt
Y H H D A F G L F H Y E I A S P H A P L
ccggtcacaactatcttgaatggcaagggagtctttgattgcgatccagccagcgaatgct
P V T T I L N G K G V F D C D P A S D A
cgttgtagcgggagagcaccacggcagagatagtggttcgaagagggtaaaagatacaaa
R C T G E H Q R H E I V F E E G K R Y K
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I G L I N T G S L L T Y K F W I D G H N
tttacagttgtgcagaagcgtttcgttcccatcaaaccatacgtcaccgacgttctgatc
F T V V Q T D F V P I K P Y V T D V L I
gtcgggatagctcaacgatacagagatcattatcgaagcaaattgtgacattcacacgtggc
V G I A Q R Y E I I I E A N V T F T R G
tccaacttctggattcacgcaacgtactgtgacgatgatgacatggtggactcgagagtt
S N F W I H A T Y C D D D D M L D S R V
ggcatagtcgcgtacgacggcagcagcggctcgtgatccgcacacgcgccccaagagtgag
G I V R Y D G S D G R D P H T P P K S E
caacaccccgatacgggtgtcgtgatccagccacgggagaatcttgttcccatcgtgaag
Q H P G Y G C R D P A T E N L V P I V K
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R E V G K R V N G L S P A D Y L R I G L
cagggtggcccacatctcggacacagattcgtcgtacacaaatggacacttaccac
Q G W P N I S D T D S L V H K W T L T N
agaaccagtagcattgattggagggagccaacaatcaaggcgtcacttcggatgctcggg
R T Q Y I D W R E P T I K A L T S D V G
gctgattttgcggatgagacatgccccatatacctggactacgagactggcagtggggtg
A D F A D E T C P I Y L D Y E T G E W V
tacttgcgcacatcgagaacaactacacgctgagcgcgccaacacgccccgcaccatcccc
Y F V I E N N Y T L S D A N T P R T I P
cgctcgggtccatcccatccacttacacgggcatgacttcgtgatcctcgcgccaggggtgac
R S V H P I H L H G H D F V I L A Q G D
ggcatggttcgacccccgacgctggtgcccgaacctccacaaccaaccaggaggacgtg
G M F D P V D V V P N L H N P T R R D V
gtcaattgcccgattggcggctacgtatggatcgattccagggtcaacaatccaggagcg
V N C P I G G Y V W I A F Q V N N P G A
tggtgatgcattgccatctgcctggcatgccagcgcggactctcactgcagttcatt
W L M H C H I A W H A S A G L S L Q F I
gagcaacctggcctgatcaaggggttaattggagcaggcaggagccttgccggagcttgct
E Q P G L I K G L M E Q A G A L P E L A
gatcgatgcgaggactggactgagtactacaatactgtaaacataccaaaaggcgcactg

[0726]

D R C E D W T E Y Y N T V N I P K G A L
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 Q D D S G I-

[0727] SEQ ID NO:99

[0728] 长度 :606

[0729] 类型 :PRT

[0730] 生物体 :菜豆壳球孢菌

[0731] MFSFVVQKPQLPLWLDGFLSIWSMFGGNSQDCVHSPQSRHCWHDGFDINTDYEAKIPPGKLV EYDFTIS
 EAVLAPDGYLTNVTLVNGVFPPTLEAEWGDITIRITIHNNLTNHNHGTSHWHGIRQFETNWL DGVPGVTQCPSKPGD
 SQVVEFRAMQYGTAWYHSHYSLQYTNGVLGPIHIKGPSSMNYDVLGPLLISDWYHHDAFGLFHYEIASPHAPLPVT
 TILNGKGVFDCDPASDARCTGEHQ RHEIVFEEGKRYKIGLINTGSLTYKFWIDGHNFTVVQTD FVPIKPYVTDVLI
 VGIAQRYEIIIEANVTFTRGSNFWIHATYCCCCM LDRVGI VRYDGS DGRDPHTPPKSEQHPGYGCRDPATENLVP
 IVKREVGKRVNGLSPADYLRIGLQGWPNISD TDSL VHKWTLNRTQYIDWREPTIKAL TSDVGADFADETCPIYLDY
 ETGEWVYFVIENNYTLSDANTPRTIPRSVHP IHLHGHD FVILAQGDGMFDPVDVVPNLHNPTRRDV VNCPIGGYVWI
 AFQVNNPGAWLMHCHIAWHASAGLSLQFIEQPGLIKGLMEQAGALPELADR CEDWTEYYNTVNI PKGALQDDSGI*

[0732] SEQ ID NO:100

[0733] 长度 :2347 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0734] 类型 :DNA

[0735] 生物体 :菜豆壳球孢菌

[0736] GATACAACTCTTCTCCCCGCTCTCTTTCACAACTGTCTATCGCTCCTTTGTTTTCTGTCCCTCCTT
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 TAACATGCCGTTTTCTCCACGCTAAGTATATGCCTTTTAGCATTGCTCTCACATTGTGTTTCGCACTTTTCGATAC
 CAAATGTAAAGGATAGGACCCCCACTTAAGCCCGCGCAATTACGGATTCGTTTCGGCAACCTGTCTTGGGGCGGG
 GCGGAGCCTTCCGACCCACTCGCACAAAGGTGCAGAACGTTTGGATGACATCAGTCTCCCGGCCCTGAAGATGGCTG
 TCTTTTCTCCAAAGATGCTCGGAACTGCTGGCGGATAACTTCAACATCGACACCGATTCGACGAGCGCTTCCCCA
 CGACCGGGAAGACGGTCACTGTAAGGAATCATCGCACCTCTTGAACCCTTACGCTAATACCGAGGGCAGTATAATC
 TGGAGATCACAAACTACTACATGGCCCTGACGGAATCGAACGCGTCGTCATGGCCGTGAATGGCCAATATCCCGGC
 CCGACCCTTATTGCTGATTGGGGGACACGATGGTTATCAACGTCAAGAATAGCCTGGACCACAACGGTACGGGTCT
 CCATTTCCATGGACTGCGCAATACAAAAGCAACGGCGCCGATGGGGCGAACGGTATCACAGAATGCCAATTGCC
 CCGGCGAGACCAAGACCTACACCTTTCAATGTACCCAGCACGGTAGCTCGTGGTACCACTCGCATTACTCTGTCCAG
 TACTCCGACGGGTTCTCGGCGCATTATCATCAACGGCCCGCCGACGCGCACTACGACCACGATCTTGGTGTGTA
 CATGCTTTCTGACTGGTACCACACTCCAATGTTTGAAGTAGCCGAAGCTGCCAGGCATTCGACAAGGGGCCACCGA
 AGGCGGATAACGGACTCATCAACGGGACGATGAAGAGCCCTGACGGTCTCTTGGAGCCTATGGCCAGATCCATGTG
 AAGAAGGGTCTGCGGTACAGGATTCGCGTAATGAATGTTGGCACTAACGACCACTACCTCTTCTCTGTTGATGGGCA
 CAACCTCACCGTATCGCAAGTATTCGTGCCGGTCGTGCCCTTTTCGGCGTCCAGCATTCCCTCGGTGTTGGTG
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 GACCAAGACATTGACAATACTACTGGATCCGCTCCGACCCGGACTCTGCCTGTAGCGTTAACGGCAACGCCGCAACAT
 AAAAGCCATCCTCTCGTATGACACGGCTCCCGCGGACGCTCAGCCGAATAGCACGCGCCACAGCATCTCCTCGGGCT
 GCAAGGACATGGCAGTCGTGCCAAGAGTTGCTAATACCGTGCCCTCTGATCGCTTCGCGGACGCCGTCCAGAGCCTG
 GCGATGAGCGTCAATATCACGCAGCAGAACGGCCCGCTCGTCCAGTGGTATATCAACGGCTCGGCTATGGAGGTCGA

CTGGAGCTACCCGACGGTCCAATATGTCCTAGATGGGAACACGTCGTACCCGCGTGAGCTGAACCTAGTCCAGCTGG
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CTTCATGGCCACGTACGTTCCCTCCTTTCCCTTCCCTAAACGAAACAGTAAAAGAGGGACAAGTGAATGCGACG
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TGGCCTGCAGTTTCGACAACCCCTCCGCGGCGGATACGGCAATGCTACCTGCGGGTGGCTACCTCATCTCGCCTTTC
CGGCCGACAACCCCTGGCGCCTGGCTCATGCATTGCCACATCCCGTTCACGTCCAGCAGGGCTTCGGGCTGCAGTTC
TTGGAGCGGCCGGATGAGATTGAGGGCGTCATGGGCGATACGAGCCCGTTTTACAACGAGTGTGCGGCTTGGAAGGA
CTACTATGGTGGGGGCCAGGCTTTTCAGCAGTCCGATTCGGGCTTGTAATTGGTCGTGGTGGCTTGCGCAAGAGCAA
AGCGCCGTCGGTGCTCTGGCGGTGATTTTTAGTGGCACGGTTTTTGTACTCATCAACTCCTAATCACTAAGTCAGCC
ACCCTCGTTTTCCGCCACCCTGTACAGTCAGCATCATAACGTAAC

[0737] SEQ ID NO:101

[0738] LENGTH:1854

[0739] 类型 :DNA

[0740] 生物体 :菜豆壳球孢菌

[0741] 特征名 / 键 :CDS

[0742] 定位 : (1) (1854)

[0743]

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A L S I P N V K D R T P H L S P R N Y G
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F R F G N L S W G G A E P S D P L A Q G
gcagaacgtttgatgacatcagtcctcccgccccctgaagatggctgtcttttctccaaa
A E R L D D I S L P A P E D G C L F S K
gatgctcggaactgctggcgcgataacttcaacatcgacacccgatttcgacgagcgcttc
D A R N C W R D N F N I D T D F D E R F
cccacgaccgggaagacgggtcacttataatctggagatcaciaaacactaccatggcccct
P T T G K T V T Y N L E I T N T T M A P
gacggaatcgaacgcgtcgtcatggccgtgaatggccaatatcccgggcccggacccttatt
D G I E R V V M A V N G Q Y P G P T L I
gctgattggggggacacgatggttatcaacgtcaagaatagcctggaccacaacgggtacg
A D W G D T M V I N V K N S L D H N G T
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G L H F H G L R Q Y K S N G A D G A N G
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I T E C P I A P G E T K T Y T F Q C T Q
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G I I I N G P A D A H Y D H D L G V Y M
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L S D W Y H T P M F E L A E A A R H S T
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S L G A Y G Q I H V K K G L R Y R I R V
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M N V G T N D H Y L F S V D G H N L T V
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I A S D F V P V V P F S A S S I S L G V
ggacagaggtacgacgtgatccttatcgccgaccaagacattgacaactactggatccgc
G Q R Y D V I L I A D Q D I D N Y W I R
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S D P D S A C S V N G N A G N I K A I L
tcgtatgacacgggtcccggcgacgtcagccgaatagcacgcgccacagcatctcctcg
S Y D T A P A D A Q P N S T R H S I S S
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G C K D M A V V P R V A N T V P S D R F
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A D A V Q S L A M S V N I T Q Q N G P L
gtccagtggtatatcaacggctcggctatggaggctgactggagctaccggacgggtccaa
V Q W Y I N G S A M E V D W S Y P T V Q
tatgtcctagatgggaacacgtcgtaccccgctgagctgaacctagtccagctggatgag
Y V L D G N T S Y P R E L N L V Q L D E
gcgaccagtggtactacttcgtcatccagaccgtgcaaggcttgctgtgtcaacctgccc
A D Q W Y Y F V I Q T V Q G L R V N L P
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H P I H L H G H D F Y I L G A G P G E W

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[0744]

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 cctgcgggtggctacctcatcctcgcctttccggcgcacaaccctgggcgctggtcatg
 P A G G Y L I L A F P A D N P G A W L M
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 H C H I P F H V Q Q G F G L Q F L E R P
 gatgagattgagggcgatgggagatacagagcccgttttacaacgagtggtgcggcttgg
 D E I E G V M G D T S P F Y N E C A A W
 aaggactactatggtggggccaggcttttcagcagtcggattcgggcttgttaa
 K D Y Y G G G Q A F Q Q S D S G L-

[0745] SEQ ID NO:102

[0746] 长度 :617

[0747] 类型 :PRT

[0748] 生物体 :菜豆壳球孢菌

[0749] MPFSPRLSICLLAFCSHIVFALSIPNVKDRTPHLSPRNYGFRFGNLSWGAEPSDPLAQAERLDDI
 SLPAPEDGCLFSKDARNCWRDNFNIDTDFDERFPTTGKTVTYNLEITNTTMAPDGIERVVMAVNGQYPGPTLIAD
 WGDTMVINVKNSLDHNGTGLHFHGLRQYKSNADGANGITECPIAPGETKTYTFQCTQHGSWYHSHYSVQYSDG
 VLGGIIINGPADAHYDHLGVYMLSDWYHTPMFELAEAAHRSTRGPPKADNGLINGTMKSPDGLGAYGQIHVKK
 GLRYRIRVMNVGTNDHYLFSVDGHNLTVIASDFVPVVPFSASSISLGVGQRYDVILIADQDIDNYWIRSDPDSAC
 SVNGNAGNIKAILS YDTAPADAQPNSTRHSISSGCKDMAVPRVANTVPSDRFADAVQSLAMSVNITQQNGPLVQ
 WYINGSAMEVDWSYPTVQYVLDGNTSYPRELNLVQLDEADQWYFVIQTVQGLRVNLPHPHHLHGDFYILGAGP
 GEWDGNIDGLQFDNPPRRDTAMLPAGGYLILAFPADNPGAWLMHCHIPFHVQQGFGLQFLERPDEIEGVMGDTSP
 FYNECAAWKDYYGGGQAFQQSDSGL*

[0750] SEQ ID NO:103

[0751] 长度 :2415 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0752] 类型 :DNA

[0753] 生物体 :菜豆壳球孢菌

[0754] TCGAGCAAGATGAATGTATCCTCCGTGAAAAGTCTTTTTTCTCAGGGCGGCCGTCCGCTTTGACCTCTG
 CCCTCTTGCTGGATTATAGAATACCCAGACGCCATGTAGTGCATGGCCTTGTAACCTACCCACCACCTCTCTCGC
 GAAGATGATTGGCCATTCTCTCGTAGCTGTAGCACTCGGCAGCGCAGCCATGGCACTGGCTCTCCTCAGAGCCACG
 TCCCCGCTGCTTGCATGAACGGTCCGCACTCTCGGAAGTGCTGGGGCAACTACTCCATCGACACGGACTGGTACACC
 GAAACTCCATACACGGGCGTGGTGAGAGAATACTGGTTCCTGGTCGAGAATACCACCGTAGCACCAGATGTACACGC
 CCCTCTGGGTTGCGCCATTGGCAACGCATGGCAGGCTGACTTGGGGTGGCAGGGATATGAGACATGGGCTCTCACGG
 TAAACCGCTCGATTCTGGACCAACAATCGAGGCCAACTGGGGCGACGAAGTAAAGTTGTTTCGACTGGGATTCGC
 CGGCCGATAATGCTTACTGCTACGCAGTAATCGTTCATGTCACCAATGGCATGGAGCGGAATGGTACCGCAATCCAT
 TTCCACGGCCTAAGGCAGCTGGGAGCCACGAAATGGATGGTGTCCCTGGGGTTACGCAGTGTCTATAGTACGCCC
 GTACCCTCTCTCTCTCGCACTGCTGCGCGCAAGCTATTGATACTTCTCAGGCTCCCGGCACTCCTACACATAACAAG
 TGGCGAGCTACTCAATACGGAACGGTGAATCCCCCTCGAGGCAGAATCGGCCATACTTAACTGACGGGTCTGAAA
 GAGCTGGTATCATTCCCACTTCAGCATGCAATACTCGGTTCGGTCTACAGGGCCCGATCGTCATTACCGGACCTGCTA
 CGGCAGACTATGACGAGGACCTGGGAACGGTCGTCTTGCAGGACTGGAGTCACACCTCTCCGTTCCGATGTGGTGG
 TACGCACGTGTGCCTTCCGGACCGCCCTCGCTCTCAAACCTCGCTCATCAACGGCAAAAACGTCTTCTATTGCGACAG
 TACGACCGATTCGAGATGCTACGGTAACGGCACACGGTCGGAGTGGCGCTTTGAGCAGGGGAAAAAGTATCGAATGA

GGCTCATCAATACAGGCTCTACTCAAACCTCCGTTTTGCCATTGACAACCACAACCTCACCGTTATTGCGACCGAC
TTTGTTCCTATCAAACCCTACACCACAGATAACGTGAGTCACCAACCCCTTGCTTTCGTGCACTCTAACGAGACATT
TCTCCCAGGTGGCAATTTCAATGGGGCAACGCTACGACATCGTCGTTGAGGCAAATCAACCGAAGGTGATTACTGG
CTGCGGTAAGGCTCTAATGAATTGATCAGACATTGAAAAAAAAAGGGGGCGGGGGGAACCCCATCAACTGACATTCA
ACCCTACCTAGGGCTATATGGCAAACATCCTGCTGCCCGAACGACTACTCAAACAATACCCTGGCATAATCCGCTA
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CAGCGAGCCTCGTGCCGACCTGGCCCTCAACGCGAGCAGCCGGCCGTCGTGCGCACCTACGACCTGTCCAAAGTC
ACACTCGAGCTGCCAAAGGGCTTCTCTGGACACTGAACGACACCTACCTCTGGATCAACTGGTCGTCGCCAACGAA
CTTGAGGCTGGCCGAGGGCGGGCCGCTGCGGCGAGCCTGCCCGCCGAATATCTCGCCGTCGACAGCCGGGCCG
GCAACGAGGGACGCTGGGCGTATCTCGTGTTCAACGACGTCTCCGCCCGCAATCGCTCGCACCCGATGCACCTGCAC
GGCCACGACTTCTTCTGCTCGGCACCCGGCCCTGGCTATTTTGTAGTACGGCAGCAACAGCAGCAGCCTGGCGATGCT
CAACCTGCACAACCCGCCTCGTCGCGACACGGCGACCTGGCCCGAGTCTGGCTGGATGGTCGTCGCGTTTCTCATGG
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AGCCCTGAGACGTATGTCCCTCGATTGGAAGGCCAGAGATTGCGGGAGACGTGCGAGGCGTGGGATGCATTCTGGAA
TCGCCACGACTCATAAGAGGATGCGGGGATATAAGGGCCGCGAGGACTGCATGAACGCATGCTTTGGTCCT
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- [0755] SEQ ID NO:104
[0756] 长度 :1815
[0757] 类型 :DNA
[0758] 生物体 :菜豆壳球孢菌
[0759] 特征名 / 键 :CDS
[0760] 定位 : (1) (1815)
[0761]

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S R A G N E G R W A Y L V F N D V S A R
aatcgcctcgcacccgatgcacctgcacggccacgacttcttctcctgctcggcaaccggccct
N R S H P M H L H G H D F F L L G T G P
ggctatcttgagtacggcagcaacagcagcagcctggcgatgctcaacctgcacaacccg
G Y F E Y G S N S S S L A M L N L H N P
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P R R D T A T W P E S G W M V V A F L M
gacaacccggggagctggctgatccactgccacatcgccctggcactcgagcagtgctc
D N P G S W L I H C H I A W H S S E S L
ggcctgcagttcctggagagccctgagacgtatgtccctcgattggaaggccagagattg
G L Q F L E S P E T Y V P R L E G Q R L
cgggagacgtcgcgagggcgtgggatgcattctggaatgccacgactcatacagagcaagag
R E T C E A W D A F W N R H D S Y E Q E
gatgcggggatataa
D A G I-

[0763] SEQ ID NO:105

[0764] 长度 :604

[0765] 类型 :PRT

[0766] 生物体 :菜豆壳球孢菌

[0767] MIGHSLVAVALGSAAMALALPQSHVPAACMNGPHSRKCGWGNYSIDTDWYTETPYTGVVREYWFLVENTT
VAPDVHAPLGCALGNWQADLQWQYETWALTVNRSIPGPTIEANWGDEVIVHVTNGMERNGTAIHFHGLRQLGAHE
MDGVPGVTQCPAIPGHSYTYKWRATQYGTSSWYHSHFSMQYSVGLQGPVIVHGPATADYDEDLGTVVLDWSHTSPFA
MWWYARVPSGPPSLSNSLINGKNVFCYDSTTDSRCYNGTRSEWRFEQKKYRMRLINTGLYSNFRFAIDNHNLTVI
ATDFVPIKPYTTDNVAISMGQRYDIVVEANQPEGDYWLRAIWQTSCCPNDSYNNLGIIRYANSTAEPNTTSPALS
YPDTCGDEPAASLVPHLALNASTPAVVRTYDLSKVTLELPGFLWTLNDTYLWINWSSPTNLRLAEGGAAAAASLPA
EYLAVDSRAGNEGRWAYLVFNDVSARNRSHPMHLHGHDFFLLGTGPGYFEYGSNSSSLAMLNLHNPPRRDTATWPES
GWMVVAFLMDNPGSWLIHCHIAWHSSSESLGLQFLESPETYVPRLEGQRLRETCEAWDAFWNRHDSYEQEDAGI*

[0768] SEQ ID NO:106

[0769] 长度 :2275 (包括 150 bp 5' UTR 和 15 0bp 3' UTR)

[0770] 类型 :DNA

[0771] 生物体 :菜豆壳球孢菌

[0772] TCGATGCATCCCTCTCTGACGCAGATCTCTTTTATAAAACCGACTGTCATCCTCGATTGAGTCAGTCTT
TGCTCAAACGGACTTATTCAAAGGTCAGTTGGGTGAGTTGGGAGGCTGATGGATTCAGGATACTCTCCGGGCACGTT
CGCCATGATTGCCTTTTTCTCGTGCTCGGCTTTGTGGCCACGACATTGGCCAAGACTGTTACTTTAACTGGAACA
TCGGCTGGGTTTCTGCGGCTCCAGATGGATTTACACGGCCCGTCATCGGCATCAACGGGCTGTGGCCGCTCCCCTC
TTAGAAGCCGACGTTAACGACACCAATTATCGTAACCGCGCATAAATCGCTAGGCAATGAGACGACGAGCTTGCAGT
GCATGGCATGTGGCAGAACAACCTCGACTCATATAGACGGCGGAAGTAGAGTCTCGCAGTGCAGAAATCCCTCTAGGGG
GCACCTTTACGTACAGGTTAAGGCATACCCGGCAGGCACTTTTTGGTACCATTCTCACGCTATGGCCAATATCCC
GACGGCTACGGGCCCCGATGATTATTCAGACCTGATTCTGCTGCGGAGCAGGACGCCGATGAGCAGCATATACT
TACGGTCTCGGACTGGTACCGTAACCGATGCCCGGCTTATCCACCGCTATCTAACTACTCCTAACTATAACGGCG
CCATGCCGAAACCAACTCGAGCTTAGTTAACGACCAGCAGTCCAAGAGGCTAAACATCCGCCCGGGCAGAAGAGC
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[0773] SEQ ID NO:107

[0774] 长度 :1632

[0775] 类型 :DNA

[0776] 生物体 :菜豆壳球孢菌

[0777] 特征名 / 键 :CDS

[0778] 定位 : (1) (1632)

[0779]

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G I N G L W P P P V L E A D V N D T I I
gtaaccgcgcataactcgttaggcaatgagacgacgagcttgcaactggcatggcatgtgg
V T A H N S L G N E T T S L H W H G M W
cagaacaactcgactcatatagacggcggaagttagagtctcgcagtgcgaaatccctcta
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ggggcacctttacgtacaggtttaaggcatacccgccaggcactttttgggtaccattct
G G T F T Y R F K A Y P A G T F W Y H S
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H A M G Q Y P D G L R A P M I I H D P D
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N Q M P P L I H R Y L T T P N Y N G A M
ccgaaacccaactcgagcttagttaacgaccagcagtcgaagaggctaaacatccgcccg
P K P N S S L V N D Q Q S K R L N I R P
gggcagaagagctatatccgcattattaatatcagcgcctagcaacggttctatctacag
G Q K S Y I R I I N I S A L A T F Y L Q
ttcgatcaacacaacatgactgtcgtttctatcgacgatgttaacgtcgcagccccagagt
F D Q H N M T V V S I D D V N V E P Q S
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W E A L E I T P G Q R Y D V I I T G L E
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N P Q N Y A F I N K M A V L G L Q N N
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N I L S Y N S S W P D P E P L A V S R F
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N L G S D I N L T P L D H E P L L E P V
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T Q G P Y P Y I T P R T P T L Y T A L T
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T G F N A T N P A I Y G Q T N S Y I V E
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[0780]

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R A L N L T T R G N C A G N T V N L E D
acggctcgcgtgcagaatctacgacactgatccttgggggtgcgcttatcggggaacgtgag
T A A C R I Y D T D P W G A L I G E R E
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T A R-

[0781] SEQ ID NO:108

[0782] 长度 :543

[0783] 类型 :PRT

[0784] 生物体 :菜豆壳球孢菌

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ADEQHILTVSDWYRNQMPPLIHRYLTPNYNGAMPKPNSSLVNDQQSKRLNIRPGQKSYIRI INISALATFYLQFDQ
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IVEAGDIVQLVVNSNDLVTTNTSGRGHPMHLHGHTFQVVGQYGTHWDGDTAKFPTVPMKRDTTVLFAGGSLVIRFQA
NNPGVVMFHCHIEWHL DAGMAATIEAPLEFQRSGLRIPPQH LAACRALNLTTRGNCAGNTVNLEDTAACRIYDTP
WGALIGERETAR*

[0786] SEQ ID NO:109

[0787] 长度 :2052 (包括 150 bp 5' UTR 和 150 bp 3' UTR)

[0788] 类型 :DNA

[0789] 生物体 :菜豆壳球孢菌

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AACCATGTCCTCAGATTCTCAGAAGCATGGCGCTGTGCTCCGTAGGCGCAGCATACCACAGCAACCAGAAGAAGAAA
CCCCGCCTTCAACAACCCGGAAGTCATCGGAAAATCGACATAGCGTTCTATCATGGTTTCTCTTGTCTTTTCATGC
GCCATCTTCGCGACGTTTATTTCTATCTCAATAGCGCAACGGCATAACAACTGCGGGGTCTTATTACACAATAAC
TGGCCTCAAGGCTTTTCTGTCCCATGGGAACTCTGACAACAATTTGACAGTCATCCTGGCAAGGGCCATACGGCG
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ACCAAGGCTTTTTCGATACCCAGATGGGGTGAAAAAGGCTGTTTATCTGATTAACGACGGCTTTCTGGGACCCACAGT
CGAAGCTCGTTCTGGCGATAGACTGGTGATTGAGGTCCAAAATGCGTTGGAAGACGAAGGTCTCTCCTTCCACTGGC
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CCGGGCGGCCACTGGAGCTGCAGCGCGGGTGACGAGGGATACGGTCATGGTGCCGCGGAGGGGGTATGCGGTGCT
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[0791] SEQ ID NO:110

[0792] 长度 :1752

[0793] 类型 :DNA

[0794] 生物体 :菜豆壳球孢菌

[0795] 特征名 / 键 :CDS

[0796] 定位 : (1)..... (1752)

[0797]

```

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P E E E T P P S T T R K S S E N R H S V
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L S W F L F V L S C A I F A T F I S Y L
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N S A T A Y Q T A G S Y Y T I T G L K A
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F L S H G N S D N N F D S H P G K G P Y
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R H Y S W K V T K A F R Y P D G V K K A
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W Y H A H D Q V Q R A D G L F G G L I I
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N T G T L A G F T L S I P G A A M Q V I
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E V D G G N A V T S D S E N D T S V G S
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L Y P G Q R A D L I L S W P E D T L E A
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S K I S I T L D G E D F K Y P N P A L T
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[0798]

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L V L Y A N T L K L S H R G N K P H G Y
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R S S W D A N Q F V P R I P L P N G T S
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D A P W V T I V L N N L D D G S H P F H
ctacatggccacgcttctgggtgctccaaacccacgcccaggggtgggggtgggggtcg
L H G H A F W V L Q T H A A G W G W G S
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W N P-

[0799] SEQ ID NO:111

[0800] 长度 :583

[0801] 类型 :PRT

[0802] 生物体 :菜豆壳球孢菌

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GFLGPTVEARSGDRLVIEVQNALEDEGLSFHWHGLLMRGANYMDGAVGFTQDAIHGANFTYEFDIADDQAGTFWYH
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GAFNCSKAIPARPVECFEGTATPNLQFNFRRLRLVNTGTLAGFTLIPGAAMQVIEVDGGNAVTSSENDTS
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QTLIDLNALVSADIITPSLPPATEHTLVLYANTLKLSHRGNKPHGYMNQTSWSPQSSPPRPLIALPRSSWDANQFVP
RIPLPNTSDAPWVTIVLNNLDDGSHPFHLHGHAFWVLQTHAAGWGWGSWNP*

[0804] 通过引用结合

[0805] 在本文中提到的所有美国专利、美国公开的专利申请和公开的 PCT 申请都通过引用结合到本文中。

[0806] 等效物

[0807] 虽然在本文中已经描述并说明了本发明的数个实施方案,但是本领域的普通技术人员将容易地想到用于起到本文所述的作用和 / 或获得本文所述的结果和 / 或一个或多个本文所述的优势的许多其它方式和 / 或结构,并且认为每个这样的改变和 / 或改进都在本发明的范围内。本领域的技术人员仅仅使用常规实验就将认识到或能够确定本文所述的本发明的具体实施方案的许多等效物。因此,应理解上述实施方案仅出于举例而提供,并且在随附权利要求书及其等效物的范围内,本发明可以不同于具体描述并要求保护的方式来实施。

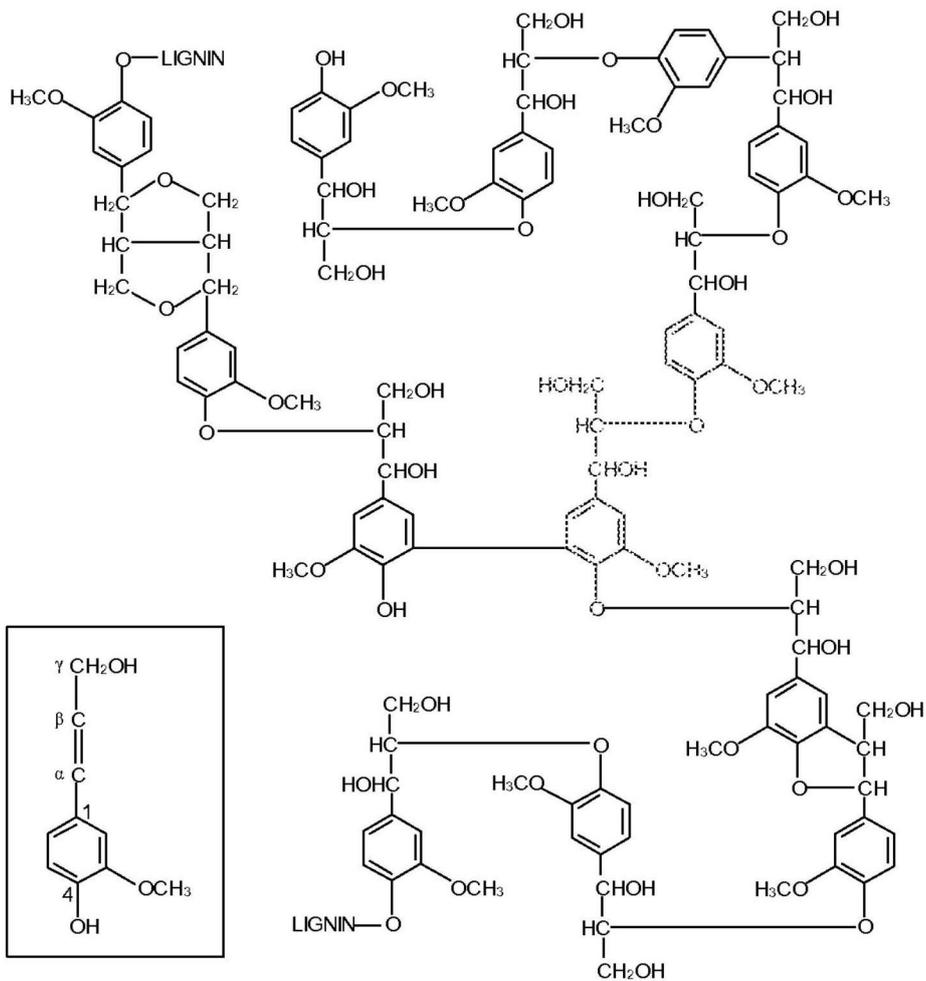


图 1

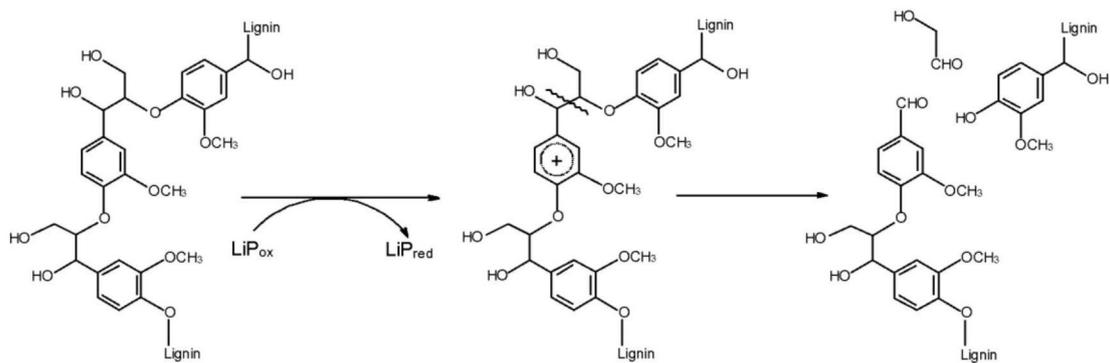


图 2

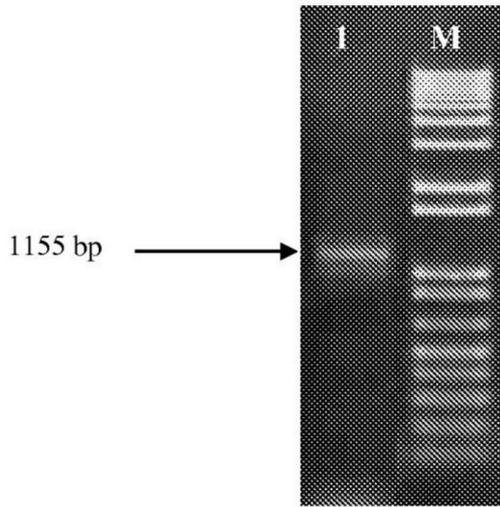


图 3

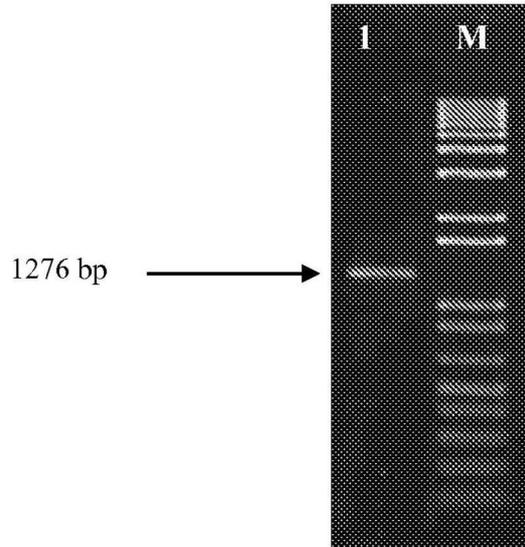


图 4

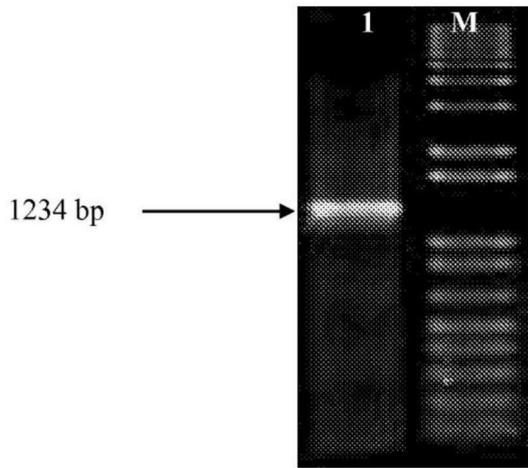


图 5

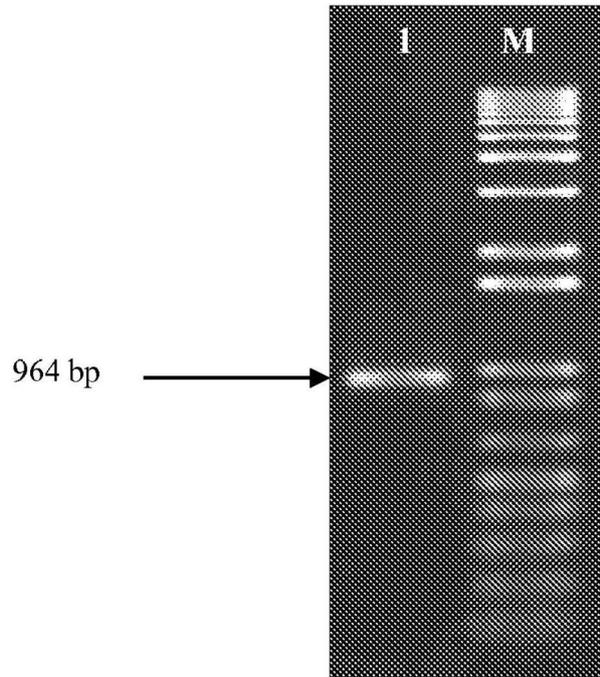


图 6

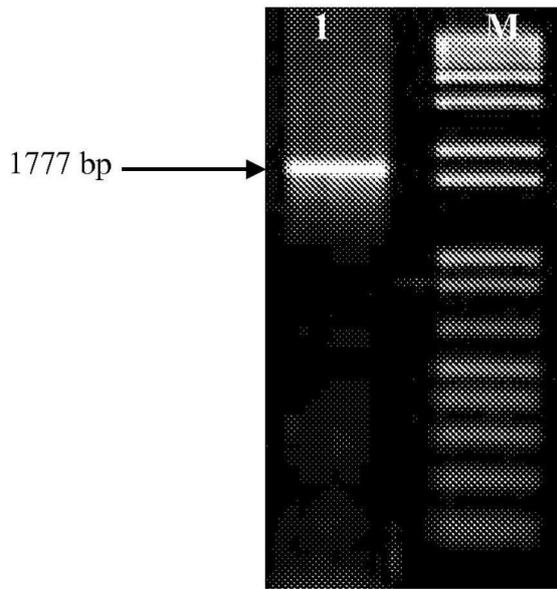


图 7

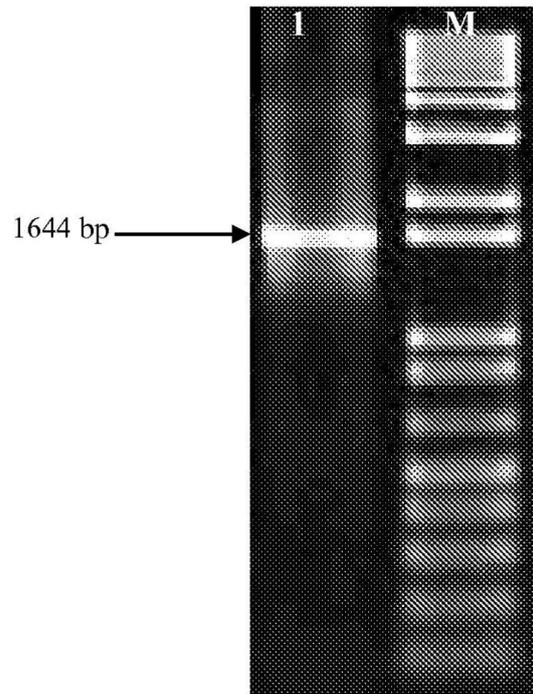


图 8

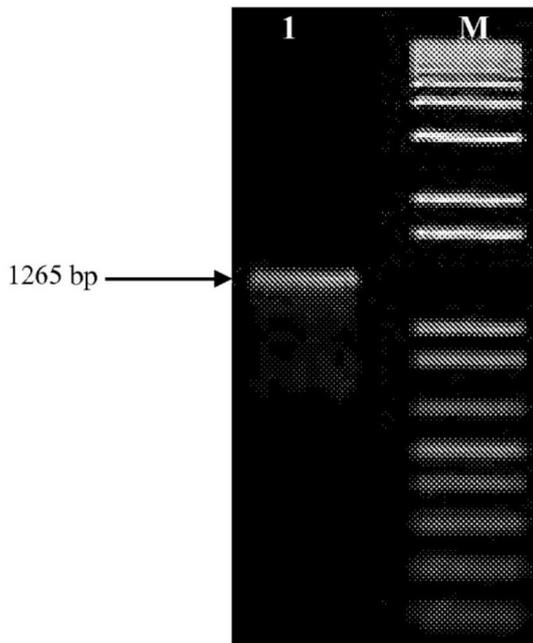


图 9

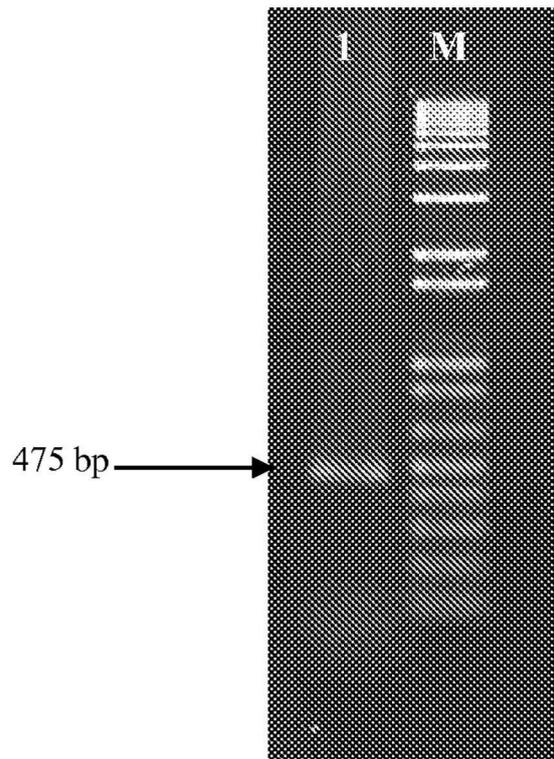


图 10

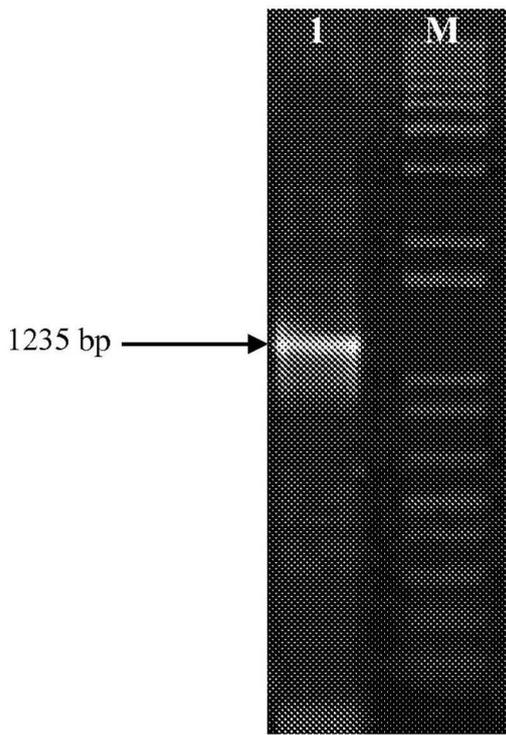


图 11

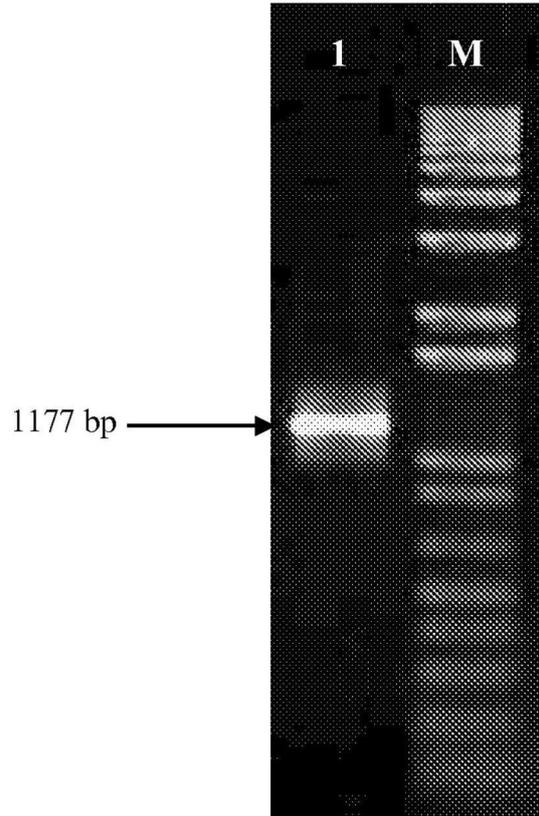


图 12

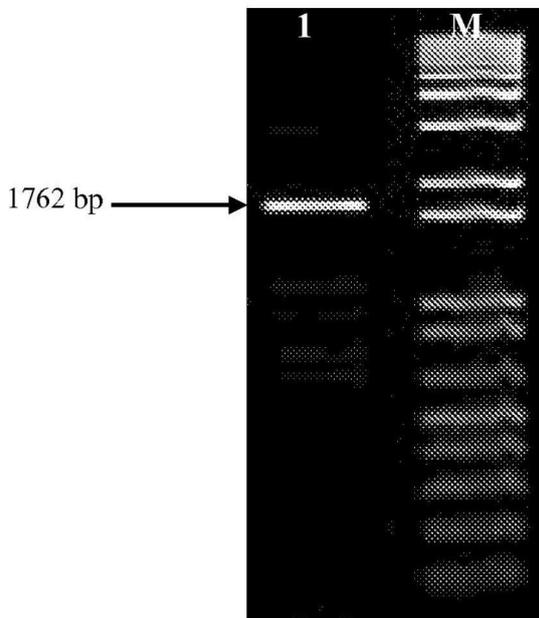


图 13

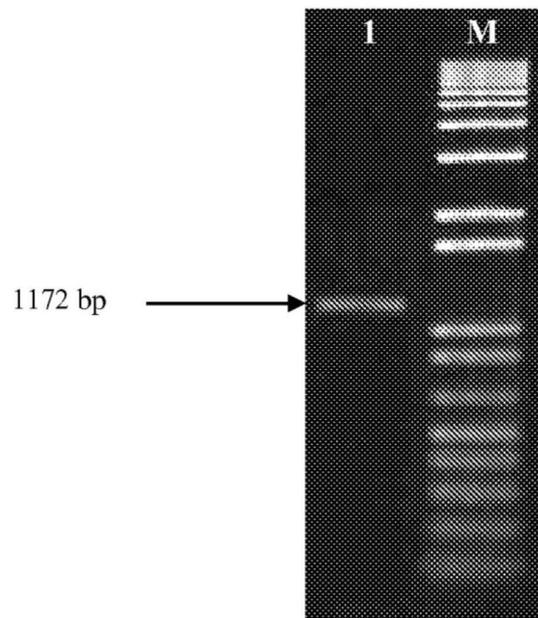


图 14

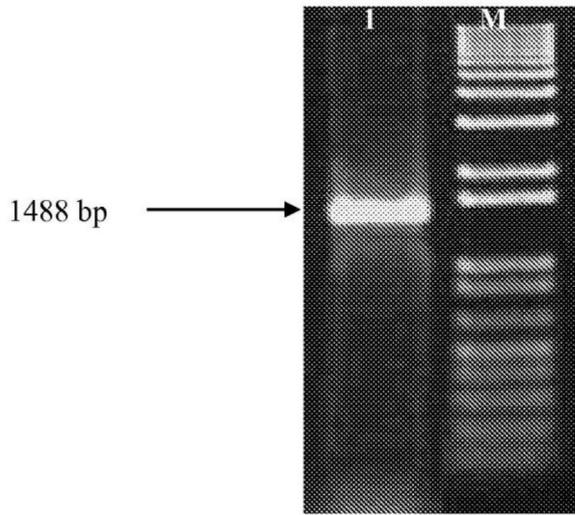


图 15

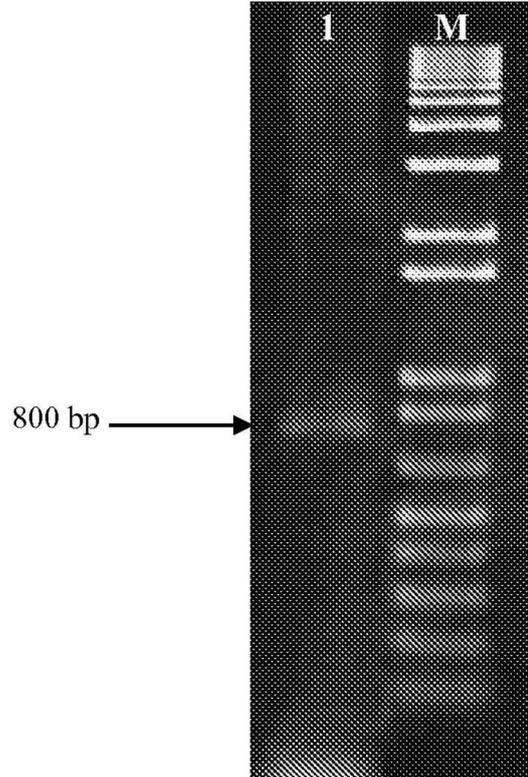


图 16

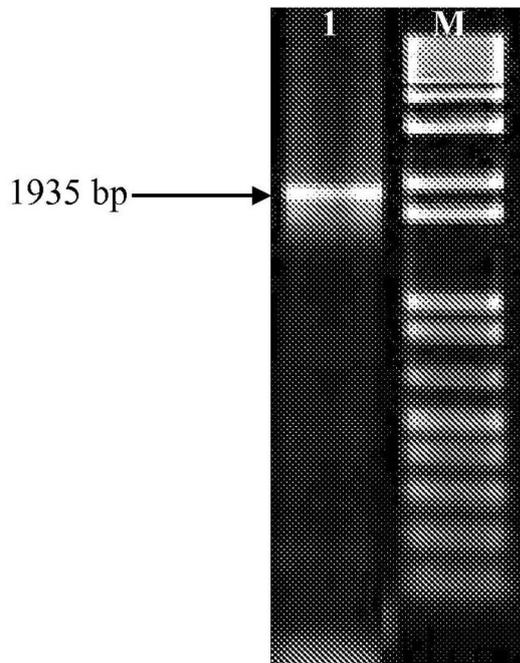


图 17

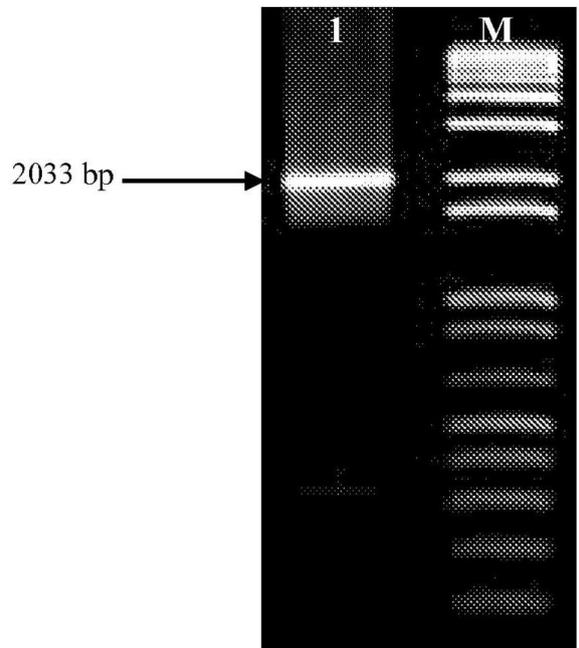


图 18

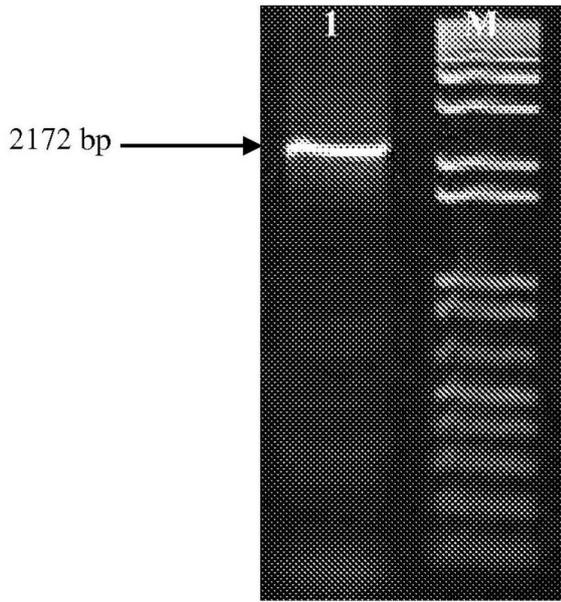


图 19

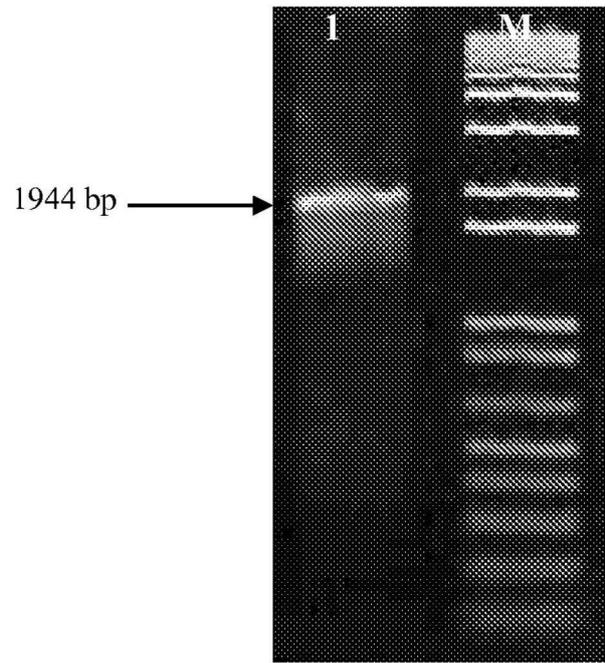


图 20

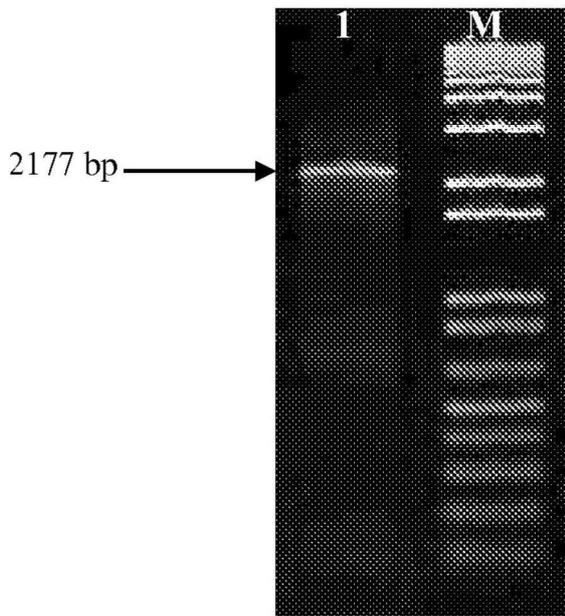


图 21

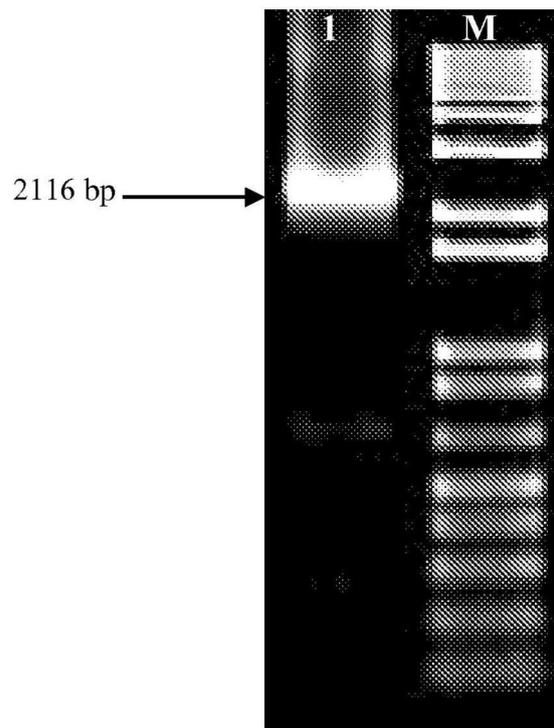


图 22

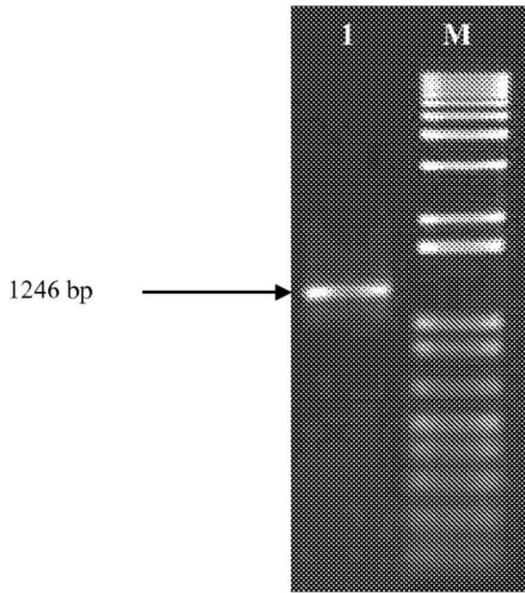


图 23

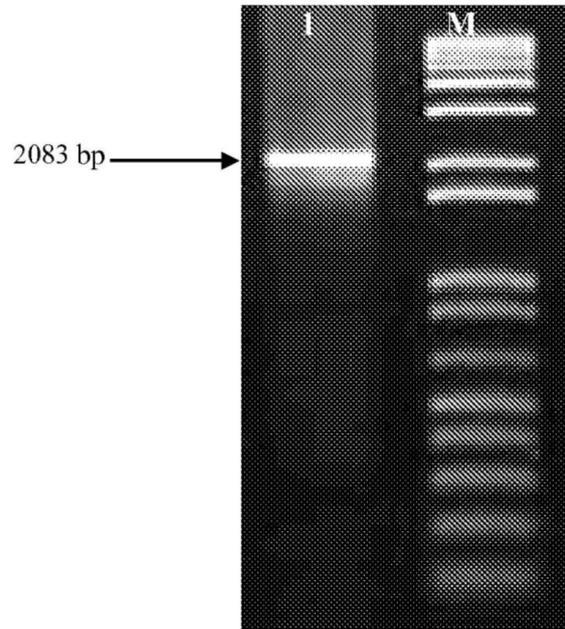


图 24

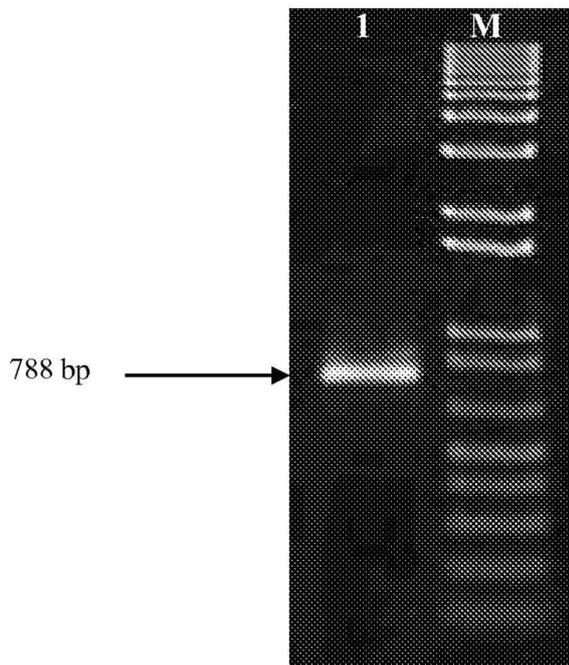


图 25

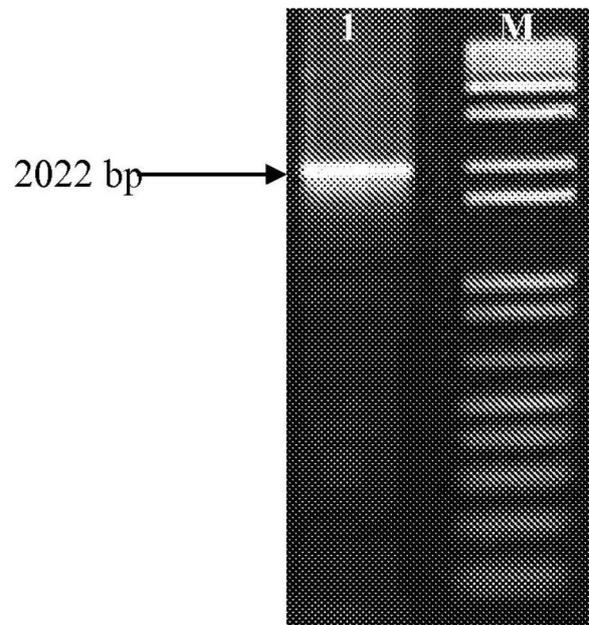


图 26

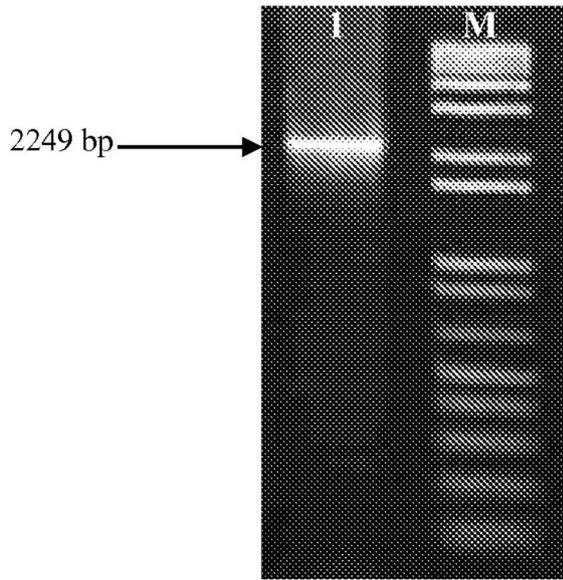


图 27

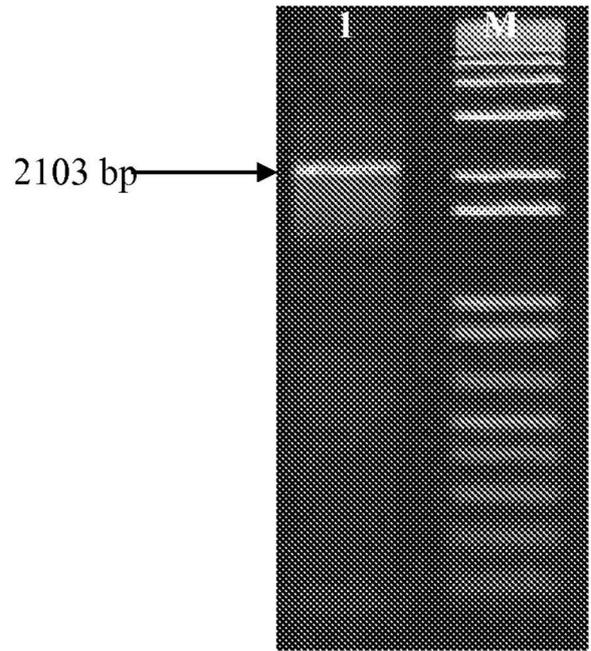


图 28

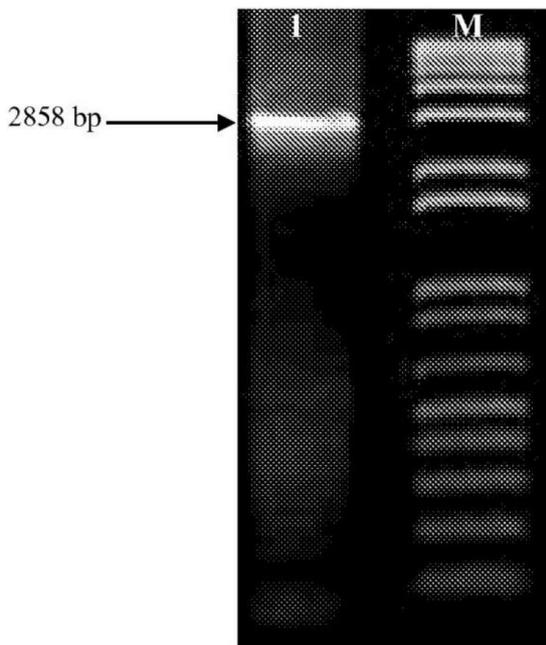


图 29

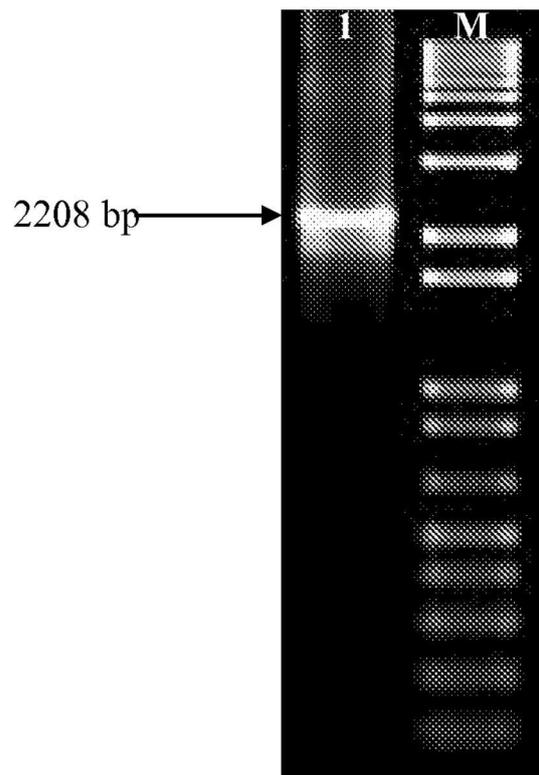


图 30

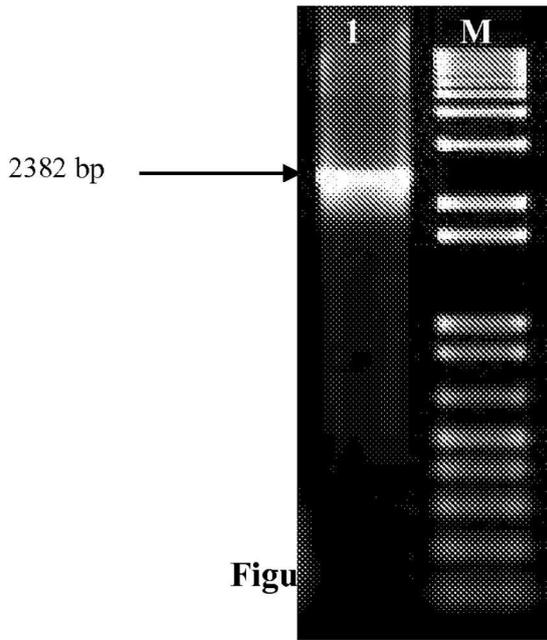


图 31

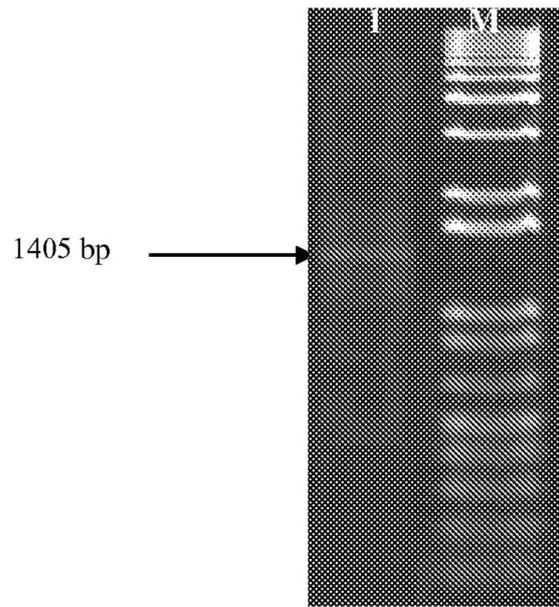


图 32

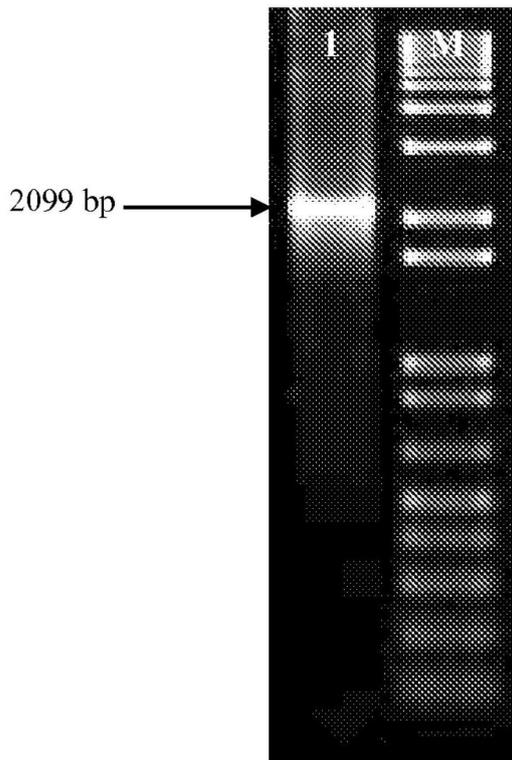


图 33

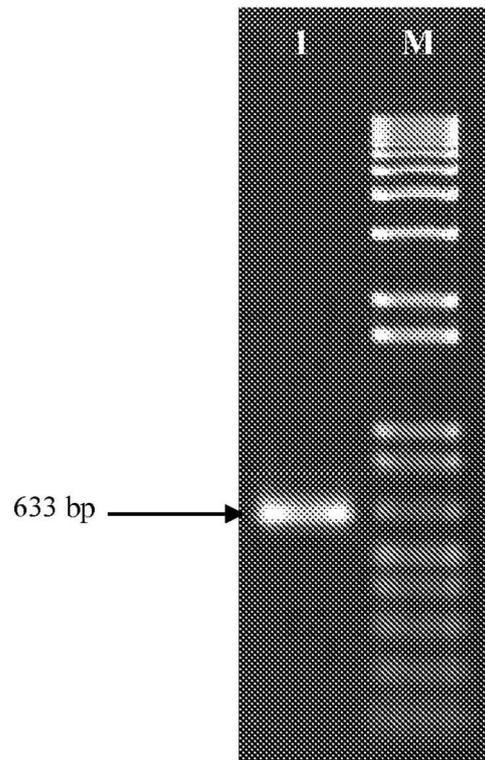


图 34

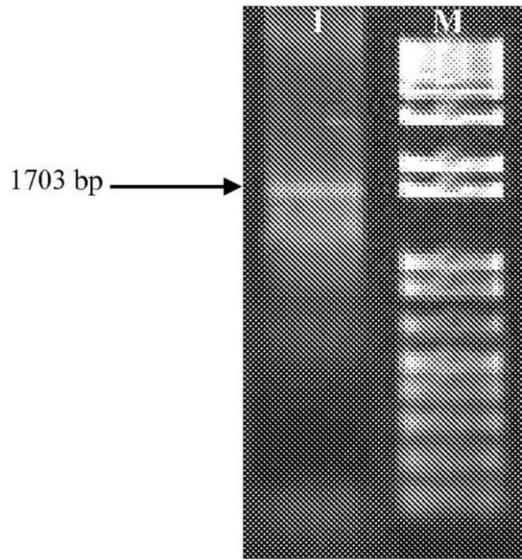


图 35

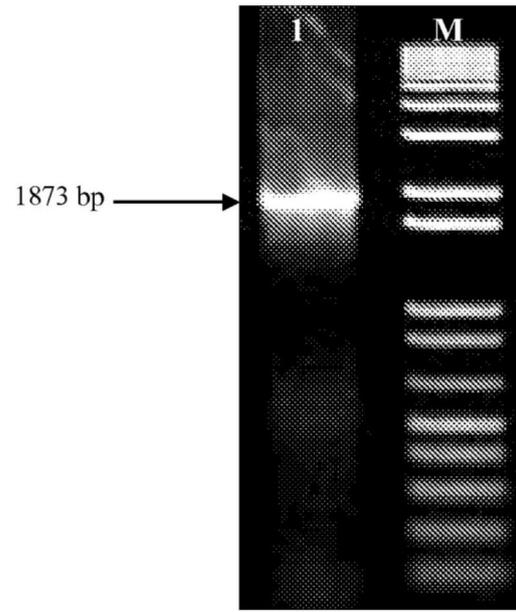


图 36