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(54) Titre : **MATERIAUX ET PROCEDES DE MODIFICATION DE LA TENEUR DES PLANTES EN LIGNINE**
(54) Title: **MATERIALS AND METHODS FOR THE MODIFICATION OF PLANT LIGNIN CONTENT**

(57) **Abrégé/Abstract:**

Novel isolated polynucleotides and polypeptides associated with the lignin biosynthetic pathway are provided, together with constructs including such sequences. Methods for the modulation of lignin content, lignin structure and lignin composition in target organisms are also disclosed, the methods comprising incorporating one or more of the polynucleotides of the present invention into the genome of a target organism.

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(21) International Application Number: PCT/NZ99/00168 (22) International Filing Date: 6 October 1999 (06.10.99) (30) Priority Data: 09/169,789 9 October 1998 (09.10.98) US 60/143,811 14 July 1999 (14.07.99) US (71) Applicants (for all designated States except US): GENESIS RE- SEARCH AND DEVELOPMENT CORPORATION LIM- ITED [NZ/NZ]; 1 Fox Street, Parnell, Auckland (NZ). FLETCHER CHALLENGE FORESTS LIMITED [NZ/NZ]; 585 Great South Road, Penrose, Auckland (NZ). (72) Inventors; and (75) Inventors/Applicants (for US only): BLOKSBERG, Leonard, Nathan [US/NZ]; 5A Korau Road, Greenlane, Auckland (NZ). HAVUKKALA, Ilkka, Jaakko [FI/NZ]; 3/121 Atkin Avenue, Mission Bay, Auckland (NZ). (74) Agents: BENNETT, Michael, Roy et al.; West-Walker Ben- nett, Mobil on the Park, 157 Lambton Quay, Wellington (NZ).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i>
(54) Title: MATERIALS AND METHODS FOR THE MODIFICATION OF PLANT LIGNIN CONTENT		
(57) Abstract Novel isolated polynucleotides and polypeptides associated with the lignin biosynthetic pathway are provided, together with constructs including such sequences. Methods for the modulation of lignin content, lignin structure and lignin composition in target organisms are also disclosed, the methods comprising incorporating one or more of the polynucleotides of the present invention into the genome of a target organism.		

MATERIALS AND METHODS FOR THE MODIFICATION OF PLANT LIGNIN CONTENT

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Technical Field of the Invention

This invention relates to polynucleotides believed to be novel, including partial and extended sequences as well as probes and primers, constructs comprising the polynucleotides, biological materials (including plants, microorganisms and multicellular organisms) incorporating the polynucleotides, polypeptides encoded by the polynucleotides, and methods for using the polynucleotides and polypeptides. The invention relates, more particularly, to the modification of lignin content and composition in biological materials including plants, to polypeptides involved in the lignin biosynthetic pathway, and to polynucleotides encoding such enzymes.

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Background of the Invention

Lignin is an insoluble polymer that is primarily responsible for the rigidity of plant stems. Specifically, lignin serves as a matrix around the polysaccharide components of some plant cell walls. The higher the lignin content, the more rigid the plant. For example, tree species synthesize large quantities of lignin, with lignin constituting between 20% to 30% of the dry weight of wood. In addition to providing rigidity, lignin aids in water transport within plants by rendering cell walls hydrophobic and water impermeable. Lignin also plays a role in disease resistance of plants by impeding the penetration and propagation of pathogenic agents.

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The high concentration of lignin in trees presents a significant problem in the paper industry wherein considerable resources must be employed to separate lignin from the cellulose fiber needed for the production of paper. Methods typically employed for the removal of lignin are highly energy- and chemical-intensive, resulting in increased costs and increased levels of undesirable waste products. In the U.S. alone, about 20 million tons of lignin are removed from wood per year.

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Lignin is largely responsible for the digestibility, or lack thereof, of forage crops, with small increases in plant lignin content resulting in relatively high decreases in digestibility.

For example, crops with reduced lignin content provide more efficient forage for cattle, with the yield of milk and meat being higher relative to the amount of forage crop consumed. During normal plant growth, the increase in dry matter content is accompanied by a corresponding decrease in digestibility. When deciding on the optimum time to harvest
5 forage crops, farmers must therefore chose between a high yield of less digestible material and a lower yield of more digestible material.

For some applications, an increase in lignin content is desirable since increasing the lignin content of a plant would lead to increased mechanical strength of wood, changes in its color and increased resistance to rot. Mycorrhizal species composition and abundance may
10 also be favorably manipulated by modifying lignin content and structural composition.

As discussed in detail below, lignin is formed by polymerization of at least three different monolignols that are synthesized in a multistep pathway, each step in the pathway being catalyzed by a different enzyme. It has been shown that manipulation of the number of copies of genes encoding certain enzymes, such as cinnamyl alcohol dehydrogenase (CAD)
15 and caffeic acid 3-O-methyltransferase (COMT) results in modification of the amount of lignin produced; see, for example, U.S. Patent No. 5,451,514 and PCT Publication No. WO 94/23044. Furthermore, it has been shown that antisense expression of sequences encoding CAD in poplar leads to the production of lignin having a modified composition (Grand C et al., *Planta (Berl.)* 163:232-237, 1985).

20 While polynucleotides encoding some of the enzymes involved in the lignin biosynthetic pathway have been isolated for certain species of plants, genes encoding many of the enzymes in a wide range of plant species have not yet been identified. Thus there remains a need in the art for materials useful in the modification of lignin content and composition in plants and for methods for their use.

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Summary of the Invention

Briefly, the present invention provides isolated polynucleotides identified in the attached Sequence Listing as SEQ ID NOS: 1-266 and 350-375, variants of those sequences, constructs comprising such sequences, extended sequences comprising the sequences of SEQ
30 ID NOS: 1-266 and 350-375, and their variants, probes and primers corresponding to the sequences set out in SEQ ID NOS: 1-266, 350-375 and their variants, and polynucleotides comprising at least a specified number of contiguous residues of any of the polynucleotides identified as SEQ ID NOS: 1-266 and 350-375 (x-mers), all of which are referred to herein,

collectively, as "polynucleotides of the present invention." Polynucleotides of the present invention are preferably obtainable from eucalyptus and pine species, and preferably encode enzymes involved in the lignin biosynthetic pathway. Constructs incorporating such sequences, methods for using such sequences and constructs, and biological materials, including plant cells and plants having an altered genomic and/or lignin content and composition are provided. The present invention also provides isolated polypeptide sequences identified in the attached Sequence Listing as SEQ ID NOS: 267-349 and 376-401; polypeptide variants of those sequences; and polypeptides comprising the polypeptide sequences and variants of those sequences.

10 In one aspect, the present invention provides isolated polynucleotides encoding the following enzymes, or portions of the following enzymes: cinnamate 4-hydroxylase (C4H), coumarate 3-hydroxylase (C3H), phenolase (PNL), O-methyl transferase (OMT), cinnamyl alcohol dehydrogenase (CAD), cinnamoyl-CoA reductase (CCR), phenylalanine ammonia-lyase (PAL), 4-coumarate: CoA ligase (4CL), coniferol glucosyl transferase (CGT), coniferin
15 *beta*-glucosidase (CBG), laccase (LAC), peroxidase (POX), ferulate-5-hydroxylase (F5H), alpha amylase, caffeic acid methyl transferase, caffeoyl CoA methyl transferase, coumarate 6A ligase, cytochrome P450 LXX1A, diphenol oxidase, flavonol glucosyl transferase, flavonoid hydroxylase, and isoflavone reductase.

In one embodiment, polynucleotides of the present invention encompass
20 polynucleotides comprising a nucleotide sequence selected from the group consisting of: (a) polynucleotides recited in SEQ ID NOS: 1-266 and 350-375; (b) complements of the polynucleotides recited in SEQ ID NOS: 1-266 and 350-375; (c) reverse complements of the sequences recited in SEQ ID NOS: 1-266 and 350-375; (d) reverse sequences of the sequences recited in SEQ ID NOS: 1-266 and 350-375; and (e) variants of the
25 polynucleotides recited in SEQ ID NOS: 1-266 and 350-375. In another embodiment of the present invention, polynucleotides comprise at least a specified number of contiguous residues (*x*-mers) of any of the polynucleotides of SEQ ID NOS: 1-266 and 350-375. In yet another aspect, polynucleotides comprise probes and primers corresponding to any of the polynucleotides of SEQ ID NOS: 1-266 and 350-375.

30 In another aspect, the present invention provides constructs comprising a polynucleotide of the present invention, either alone or in combination with one or more of the inventive sequences, or in combination with one or more known polynucleotides; together with host cells and transgenic cells comprising such constructs.

In a related aspect, the present invention provides constructs comprising, in the 5'-3' direction, a gene promoter sequence; an open reading frame coding for at least a functional portion of an enzyme encoded by a polynucleotide of the present invention; and a gene termination sequence. An open reading frame may be orientated in either a sense or antisense direction. DNA constructs comprising a non-coding region of a gene coding for an enzyme encoded by the above polynucleotides or a polynucleotide complementary to a non-coding region, together with a gene promoter sequence and a gene termination sequence, are also provided. Preferably, the gene promoter and termination sequences are functional in a host cell, such as a plant cell. Most preferably, the gene promoter and termination sequences are those of the original enzyme genes but others generally used in the art, such as the Cauliflower Mosaic Virus (CMV) promoter, with or without enhancers, such as the Kozak sequence or Omega enhancer, and *Agrobacterium tumefaciens* nopaline synthase terminator may be usefully employed in the present invention. Tissue-specific promoters may be employed in order to target expression to one or more desired tissues. In a preferred embodiment, the gene promoter sequence provides for transcription in xylem. The construct may further include a marker for the identification of transformed cells.

In a further aspect, transgenic cells, such as transgenic plant cells, comprising the constructs of the present invention are provided, together with plants comprising such transgenic cells, and fruits and seeds of such plants.

In yet another aspect, methods for modulating the lignin content and composition of a target organism such as a plant are provided, such methods including stably incorporating into the genome of the target plant a construct comprising a polynucleotide of the present invention. In a preferred embodiment, the target plant is a woody plant, preferably selected from the group consisting of eucalyptus and pine species, most preferably from the group consisting of *Eucalyptus grandis* and *Pinus radiata*. In a related aspect, a method for producing a plant having altered lignin content is provided, the method comprising transforming a plant cell with a construct comprising a polynucleotide of the present invention to provide a transgenic cell, and cultivating the transgenic cell under conditions conducive to regeneration and mature plant growth.

In yet a further aspect, the present invention provides methods for modifying the activity of an enzyme in a target organism such as a plant, comprising stably incorporating into the genome of the target organism a construct of the present invention. In a preferred embodiment, the target plant is a woody plant, preferably selected from the group consisting

of eucalyptus and pine species, most preferably from the group consisting of *Eucalyptus grandis* and *Pinus radiata*.

The present invention also provides polypeptides comprising the isolated polypeptides identified as SEQ ID NOS: 267-349, 376-401 and variants of those polypeptides.

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Brief Description of the Figures

The above-mentioned and additional features of the present invention and the manner of obtaining them will become apparent, and the invention will be best understood by reference to the following more detailed description, read in conjunction with the accompanying drawing.

10

Figure 1 is a schematic overview of the lignin biosynthetic pathway.

Figure 2 illustrates genomic DNA samples from tobacco plants created in a tagging experiment using a unique sequence identifier from *Pinus* (left panel) and a unique sequence identifier from *Eucalyptus* (right panel). In both panels, lanes A and B contain DNA samples from empty-vector transformed control plants and lanes C-E contain DNA samples from plants transformed with a unique sequence identifier.

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Figure 3 demonstrates detection of a *Pinus* unique sequence identifier in transformed tobacco plants. Lanes A and B show the hybridization of a probe from SEQ ID NO: 402 to the genomic DNA of tobacco plants which lack the *Pinus* unique sequence identifier (empty-vector transformed control plants). Lanes C-E show the hybridization of the probe to the genomic DNA of tobacco plants containing one to three copies of the *Pinus* unique sequence identifier.

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Figure 4 demonstrates detection of a *Eucalyptus* unique sequence identifier in transformed tobacco plants. Lanes A and B show the hybridization of a probe from SEQ ID NO: 403 to the genomic DNA of tobacco plants which lack the *Eucalyptus* unique sequence identifier (empty-vector transformed control plants). Lanes C-E show the hybridization of the probe to the genomic DNA of tobacco plants containing one to two copies of the *Eucalyptus* unique sequence identifier.

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Figure 5 shows the amount of extractable lignin, as a percentage of wild type lignin content, present in tobacco plants transformed with sense and anti-sense genetic constructs of the present invention.

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Detailed Description

Lignin is formed by polymerization of at least three different monolignols, primarily *para*-coumaryl alcohol, coniferyl alcohol and sinapyl alcohol. While these three types of lignin subunits are well known, it is possible that slightly different variants of these subunits may be involved in the lignin biosynthetic pathway in various plants. The relative
 5 concentration of these residues in lignin varies among different plant species and within species. In addition, the composition of lignin may also vary among different tissues within a specific plant. The three monolignols are derived from phenylalanine in a multistep process and are believed to be polymerized into lignin by a free radical mechanism.

Fig. 1 shows different steps in the biosynthetic pathway for coniferyl alcohol together
 10 with the enzymes responsible for catalyzing each step. *para*-Coumaryl alcohol and sinapyl alcohol are synthesized by similar pathways. Phenylalanine is first deaminated by phenylalanine ammonia-lyase (PAL) to give cinnamate which is then hydroxylated by cinnamate 4-hydroxylase (C4H) to form *p*-coumarate. *p*-Coumarate is hydroxylated by coumarate 3-hydroxylase to give caffeate. The newly added hydroxyl group is then
 15 methylated by O-methyl transferase (OMT) to give ferulate which is conjugated to coenzyme A by 4-coumarate:CoA ligase (4CL) to form feruloyl-CoA. Reduction of feruloyl-CoA to coniferaldehyde is catalyzed by cinnamoyl-CoA reductase (CCR). Coniferaldehyde is further reduced by the action of cinnamyl alcohol dehydrogenase (CAD) to give coniferyl alcohol which is then converted into its glucosylated form for export from the cytoplasm to
 20 the cell wall by coniferol glucosyl transferase (CGT). Following export, the de-glucosylated form of coniferyl alcohol is obtained by the action of coniferin *beta*-glucosidase (CBG). Finally, polymerization of the three monolignols to provide lignin is catalyzed by phenolase (PNL), laccase (LAC) and peroxidase (POX).

The formation of sinapyl alcohol involves an additional enzyme, ferulate-5-
 25 hydroxylase (F5H). For a more detailed review of the lignin biosynthetic pathway, see Whetton R and Sederoff R, *The Plant Cell*, 7:1001-1013, 1995.

Quantitative and qualitative modifications in plant lignin content are known to be induced by external factors such as light stimulation, low calcium levels and mechanical stress. Synthesis of new types of lignins, sometimes in tissues not normally lignified, can
 30 also be induced by infection with pathogens. In addition to lignin, several other classes of plant products are derived from phenylalanine, including flavonoids, coumarins, stilbenes and benzoic acid derivatives, with the initial steps in the synthesis of all these compounds being the same. Thus modification of the action of PAL, C4H, 4CL and other enzymes involved in

the lignin biosynthetic pathway may affect the synthesis of other plant products in addition to lignin.

Using the methods and materials of the present invention, the lignin content of a plant may be modulated by modulating expression of polynucleotides of the present invention, or
5 by modifying the polypeptides encoded by polynucleotides or the polynucleotides. The lignin content of a target organism, such as a plant, may be modified, for example, by incorporating additional copies of genes encoding enzymes involved in the lignin biosynthetic pathway into the genome of the target plant. Similarly, a modified lignin content can be obtained by transforming the target plant with antisense copies of such genes. In
10 addition, the number of copies of genes encoding for different enzymes in the lignin biosynthetic pathway can be manipulated to modify the relative amount of each monolignol synthesized, thereby leading to the formation of lignin having altered composition. The alteration of lignin composition would be advantageous, for example, in applications of wood processing for paper, and may also be effective in altering the palatability of wood materials
15 to rotting fungi.

In a first aspect, the present invention provides isolated polynucleotide sequences identified in the attached Sequence Listing as SEQ ID NOS: 1-266 and 350-375, variants of those sequences, extended sequences comprising the sequences set out in SEQ ID NOS: 1-266, 350-375 and their variants, probes and primers corresponding to the sequences set out in
20 SEQ ID NOS: 1-266, 350-375 and their variants, polynucleotides comprising at least a specified number of contiguous residues of any of the polynucleotides identified as SEQ ID NOS: 1-266 and 350-375 (*x*-mers), and extended sequences comprising portions of the sequences set out in SEQ ID NOS: 1-266 and 350-375, all of which are referred to herein, collectively, as "polynucleotides of the present invention." The present invention also
25 provides isolated polypeptide sequences identified in the attached Sequence Listing as SEQ ID NOS: 267-349 and 376-401, polypeptide variants of those sequences, and polypeptides comprising the isolated polypeptide sequences and variants of those sequences.

The polynucleotide disclosed herein were derived from forestry plant sources, namely from *Eucalyptus grandis* and *Pinus radiata*. Some of the polynucleotides of the present
30 invention are "partial" sequences, in that they do not represent a full length gene encoding a full length polypeptide. Such partial sequences may be extended by analyzing and sequencing various DNA libraries using primers and/or probes and well known hybridization and/or PCR techniques. Partial sequences may be extended until an open reading frame encoding a

polypeptide, a full length polynucleotide and/or gene capable of expressing a polypeptide, or another useful portion of the genome is identified. Such extended sequences, including full length polynucleotides and genes, are described as "corresponding to" a sequence identified as one of the sequences of SEQ ID NOS: 1-266, 350-375, or a variant thereof, or a portion of one of the sequences of SEQ ID NOS: 1-266, 350-375, or a variant thereof, when the extended polynucleotide comprises an identified sequence or its variant, or an identified contiguous portion (*x*-mer) of one of the sequences of SEQ ID NOS: 1-266, 350-375, or a variant thereof. Similarly, RNA sequences, reverse sequences, complementary sequences, antisense sequences, and the like, corresponding to the polynucleotides of the present invention, may be routinely ascertained and obtained using the cDNA sequences identified as SEQ ID NOS: 1-266 and 350-375.

The polynucleotides identified as SEQ ID NOS: 1-266 and 350-375 may contain open reading frames ("ORFs") or partial open reading frames encoding polypeptides. Additionally, open reading frames encoding polypeptides may be identified in extended or full length sequences corresponding to the sequences set out as SEQ ID NOS: 1-266 and 350-375. Open reading frames may be identified using techniques that are well known in the art. These techniques include, for example, analysis for the location of known start and stop codons, most likely reading frame identification based on codon frequencies, etc. Suitable tools and software for ORF analysis are available, for example, on the Internet at <http://www.ncbi.nlm.nih.gov/gorf/gorf.html>. Open reading frames and portions of open reading frames may be identified in the polynucleotides of the present invention. Once a partial open reading frame is identified, the polynucleotide may be extended in the area of the partial open reading frame using techniques that are well known in the art until the polynucleotide for the full open reading frame is identified. Thus, open reading frames encoding polypeptides may be identified using the polynucleotides of the present invention.

Once open reading frames are identified in the polynucleotides of the present invention, the open reading frames may be isolated and/or synthesized. Expressible genetic constructs comprising the open reading frames and suitable promoters, initiators, terminators, etc., which are well known in the art, may then be constructed. Such genetic constructs may be introduced into a host cell to express the polypeptide encoded by the open reading frame. Suitable host cells may include various prokaryotic and eukaryotic cells, including plant cells, mammalian cells, bacterial cells, algae and the like.

Polypeptides encoded by the polynucleotides of the present invention may be expressed and used in various assays to determine their biological activity. Such polypeptides may be used to raise antibodies, to isolate corresponding interacting proteins or other compounds, and to quantitatively determine levels of interacting proteins or other compounds.

The present invention also contemplates methods for modulating the polynucleotide and/or polypeptide content and composition of a forestry species, such methods involving stably incorporating into the genome of the organism a genetic construct comprising one or more polynucleotides of the present invention. In one embodiment, the target organism is a forestry species, preferably a woody plant, more preferably a woody plant of the *Pinus* or *Eucalyptus* species, and most preferably *Eucalyptus grandis* or *Pinus radiata*. In a related aspect, a method for producing a forestry plant having an altered genotype or phenotype is provided, the method comprising transforming a plant cell with a genetic construct of the present invention to provide a transgenic cell, and cultivating the transgenic cell under conditions conducive to regeneration and mature plant growth. Forestry plants having an altered genotype or phenotype as a consequence of modulation of the level or content of a polynucleotide or polypeptide of the present invention compared to a wild-type organism, as well as components (seeds, etc.) of such forestry plants, and the progeny of such forestry plants, are contemplated by and encompassed within the present invention.

The isolated polynucleotides of the present invention also have utility in genome mapping, in physical mapping, and in positional cloning of genes. Additionally, the polynucleotide sequences identified as SEQ ID NOS: 1-266, 350-375, and their variants, may be used to design oligonucleotide probes and primers. Oligonucleotide probes and primers have sequences that are substantially complementary to the polynucleotide of interest over a certain portion of the polynucleotide. Oligonucleotide probes designed using the polynucleotides of the present invention may be used to detect the presence and examine the expression patterns of genes in any organism having sufficiently similar DNA and RNA sequences in their cells using techniques that are well known in the art, such as slot blot DNA hybridization techniques. Oligonucleotide primers designed using the polynucleotides of the present invention may be used for PCR amplifications. Oligonucleotide probes and primers designed using the polynucleotides of the present invention may also be used in connection with various microarray technologies, including the microarray technology used by Synteni (Palo Alto, California).

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The polynucleotides of the present invention may also be used to tag or identify an organism or reproductive material therefrom. Such tagging may be accomplished, for example, by stably introducing a non-disruptive non-functional heterologous polynucleotide identifier into an organism, the polynucleotide comprising one of the polynucleotides of the present invention.

The polypeptides of the present invention and the polynucleotides encoding the polypeptides have activity in lignin biosynthetic pathways in plants. The polynucleotides were putatively identified by DNA and polypeptide similarity searches. The polynucleotides and polypeptides of the present invention have demonstrated similarity to the following polypeptides that are known to be involved in lignin biosynthetic processes:

TABLE 1

POLYPEPTIDE IDENTITY	POLYNUCLEOTIDE SEQ ID NO.	POLYPEPTIDE SEQ ID NO.
Cinnamate 4-hydroxylase (C4H)	2, 3, 17, 48, 49, 92, 124, 125, 153-163	
Coumarate 3-hydroxylase (C3H)	4, 18, 50-52, 93, 101, 126, 127, 149-152	
Phenolase (PNL)	5, 35, 36, 81, 116, 183	
O-methyl transferase (OMT)	6, 22-25, 53-55, 94, 104-107, 173-175	
Cinnamyl alcohol dehydrogenase (CAD)	1, 7, 30, 71, 95, 112, 164	
Cinnamoyl-CoA reductase (CCR)	8, 26-29, 58-70, 96, 108-111, 128-134, 167	
Phenylalanine ammonia-lyase (PAL)	9-11, 16, 45-47, 97, 98, 100, 122, 123, 176 242-248	325-331
4-coumarate:CoA ligase (4CL)	2, 56-57, 90, 147, 158 265-266	348-349
Coniferol glucosyl transferase (CGT)	31-33, 72, 113-115, 135, 168	
Coniferin <i>beta</i> -glucosidase (CBG)	34, 73-80, 1360141, 165, 166	
Laccase (LAC)	37-41, 82-84, 117, 118, 142-144, 172	
Peroxidase (POX)	13, 42-44, 85-89, 91, 119-121, 145, 146, 177-182, 249-250, 264, 350-375	332-333 347, 376-401
Ferulate-5-hydroxylase (F5H)	19-21, 102, 103, 169-171	
Alpha amylase	184-186	267-269
Caffeic acid methyl transferase	187-192	270-275
Caffeoyl CoA methyl transferase	193-195	276-278
Coumerate CoA ligase	196-200	279-283
Cytochrome P450 LXXIA	201-206	284-289
Diphenol oxidase	207-217 251-263	290-300 334-346
Flavonol glucosyl transferase	218	301
Flavonoid hydroxylase	219-233	302-316
Isoflavone reductase	234-241	317-324

In one embodiment, isolated polynucleotides of the present invention comprise a sequence selected from the group consisting of: (a) sequences recited in SEQ ID NOS: 1-266 and 350-375; (b) complements of the sequences recited in SEQ ID NOS: 1-266 and 350-375; (c) reverse complements of the sequences recited in SEQ ID NOS: 1-266 and 350-375; 5 (d) reverse sequences of the sequences recited in SEQ ID NOS: 1-266 and 350-375; and (e) sequences having at least 50%, 75%, 90%, or 98% identity, as defined herein, to a sequence of (a) - (d) or a specified region of a sequence of (a) - (d).

In a further aspect, isolated polypeptides encoded by the polynucleotides of the present invention are provided. In one embodiment, such polypeptides comprise an amino 10 acid sequence recited in SEQ ID NOS: 267-349 and 376-401, and variants thereof, as well as polypeptides expressed by polynucleotides of the present invention, including polynucleotides comprising a sequence of SEQ ID NOS: 1-266 and 350-375.

In another aspect, the invention provides genetic constructs comprising a polynucleotide of the present invention, either alone, in combination with one or more 15 additional polynucleotides of the present invention, or in combination with one or more known polynucleotides, together with cells and target organisms comprising such constructs.

In a related aspect, the present invention provides genetic constructs comprising, in the 5'-3' direction, a gene promoter sequence, an open reading frame coding for at least a functional portion of a polypeptide encoded by a polynucleotide of the present invention, and 20 a gene termination sequence. The open reading frame may be oriented in either a sense or antisense direction. Genetic constructs comprising a gene promoter sequence, a polynucleotide of the present invention, and a gene termination sequence are also contemplated, as are genetic constructs comprising a gene promoter sequence, an untranslated region of a polynucleotide of the present invention, or a nucleotide sequence complementary 25 to an untranslated region, and a gene termination sequence. The genetic construct may further include a marker for the identification of transformed cells.

The gene promoter and termination sequences are preferably functional in a host plant and, most preferably, are those native to the host plant. Promoter and termination sequences that are generally used in the art, such as the Cauliflower Mosaic Virus (CMV) promoter, 30 with or without enhancers such as the Kozak sequence or Omega enhancer, and *Agrobacterium tumefaciens* nopaline synthase terminator, are useful. Tissue-specific promoters may be employed in order to target expression to one or more desired tissues.

In a further aspect, methods for producing forestry plants having a modified content of a polynucleotide or polypeptide of the present invention compared to a native organism are provided. The methods involve transforming a target forestry plant with a genetic construct of the present invention to provide a transgenic cell, and cultivating the transgenic cell under conditions conducive to regeneration and mature plant growth. Cells comprising the genetic constructs of the present invention are provided, together with tissues and forestry plants comprising such transgenic cells, and fruits, seeds and other products, derivatives, or progeny of such forestry plants. Propagules of the inventive transgenic plants are included in the present invention. As used herein, the word "propagule" means any part of a plant that may be used in reproduction or propagation, sexual or asexual, including cuttings.

Plant varieties, particularly registrable plant varieties according to Plant Breeders' Rights, may be excluded from the present invention. A plant need not be considered a "plant variety" simply because it contains stably within its genome a transgene, introduced into a cell of the plant or an ancestor thereof.

The word "polynucleotide(s)," as used herein, means a polymeric collection of nucleotides and includes DNA and corresponding RNA molecules and both single and double stranded molecules, including HnRNA and mRNA molecules, sense and anti-sense strands of DNA and RNA molecules, and cDNA, genomic DNA, and wholly or partially synthesized polynucleotides. An HnRNA molecule contains introns and "corresponds to" a DNA molecule in a generally one-to-one manner. An mRNA molecule "corresponds to" an HnRNA and DNA molecule from which the introns have been excised. A polynucleotide of the present invention may be an entire gene, or any portion thereof. A gene is a DNA sequence which codes for a functional protein or RNA molecule. Operable anti-sense polynucleotides may comprise a fragment of the corresponding polynucleotide, and the definition of "polynucleotide" therefore includes all operable anti-sense fragments. Anti-sense polynucleotides and techniques involving anti-sense polynucleotides are well known in the art and are described, for example, in Robinson-Benion et al., "Antisense techniques," *Methods in Enzymol.* 254(23):363-375, 1995; and Kawasaki et al., *Artific. Organs* 20(8):836-848, 1996.

Complements of such isolated polynucleotides, reverse complements of such isolated polynucleotides, and reverse sequences of such isolated polynucleotides, together with variants of such sequences, are also provided. The definition of the terms "complement", "reverse complement" and "reverse sequence", as used herein, is best illustrated by the

following example. For the sequence 5' AGGACC 3', the complement, reverse complement and reverse sequence are as follows:

	complement	3' TCCTGG 5'
	reverse complement	3' GGTCCT 5'
5	reverse sequence	5' CCAGGA 3'.

As used herein, the term "oligonucleotide" refers to a relatively short segment of a polynucleotide sequence, generally comprising between 6 and 60 nucleotides, and comprehends both probes for use in hybridization assays and primers for use in the amplification of DNA by polymerase chain reaction.

10 Identification of genomic DNA and heterologous species DNAs can be accomplished by standard DNA/DNA hybridization techniques, under appropriately stringent conditions, using all or part of a cDNA sequence as a probe to screen an appropriate library. Alternatively, PCR techniques using oligonucleotide primers that are designed based on known genomic DNA, cDNA and protein sequences can be used to amplify and identify
15 genomic and cDNA sequences. Synthetic DNAs corresponding to the identified sequences and variants may be produced by conventional synthesis methods. All of the polynucleotides described herein are isolated and purified, as those terms are commonly used in the art.

In another aspect, the present invention provides isolated polypeptides encoded, or partially encoded, by the above polynucleotides. As used herein, the term "polypeptide"
20 encompasses amino acid chains of any length, including full length proteins, wherein the amino acid residues are linked by covalent peptide bonds. The term "polypeptide encoded by a polynucleotide" as used herein, includes polypeptides encoded by a polynucleotide which comprises an isolated DNA sequence or variant provided herein. In specific embodiments, the inventive polypeptides comprise an amino acid sequence selected from the group
25 consisting of sequences provided in SEQ ID NOS: 267-349 and 376-401, as well as variants of such sequences.

Polypeptides of the present invention may be produced recombinantly by inserting a DNA sequence that encodes the polypeptide into an expression vector and expressing the polypeptide in an appropriate host. Any of a variety of expression vectors known to those of
30 ordinary skill in the art may be employed. Expression may be achieved in any appropriate host cell that has been transformed or transfected with an expression vector containing a DNA molecule that encodes a recombinant polypeptide. Suitable host cells include prokaryotes, yeast and higher eukaryotic cells. Preferably, the host cells employed are *E.*

coli, insect, yeast or a mammalian cell line such as COS or CHO. The DNA sequences expressed in this manner may encode naturally occurring polypeptides, portions of naturally occurring polypeptides, or other variants thereof.

In a related aspect, polypeptides are provided that comprise at least a functional portion of a polypeptide having an amino acid sequence selected from the group consisting of sequences provided in SEQ ID NOS:267-349 and 376-401, and variants thereof. As used herein, the "functional portion" of a polypeptide is that portion which contains the active site essential for affecting the function of the polypeptide, for example, the portion of the molecule that is capable of binding one or more reactants. The active site may be made up of separate portions present on one or more polypeptide chains and will generally exhibit high binding affinity.

Functional portions of a polypeptide may be identified by first preparing fragments of the polypeptide by either chemical or enzymatic digestion of the polypeptide, or by mutation analysis of the polynucleotide that encodes the polypeptide and subsequent expression of the resulting mutant polypeptides. The polypeptide fragments or mutant polypeptides are then tested to determine which portions retain biological activity, using, for example, the representative assays provided below.

A functional portion comprising an active site may be made up of separate portions present on one or more polypeptide chains and generally exhibits high substrate specificity. The term "polypeptide encoded by a polynucleotide" as used herein, includes polypeptides encoded by a polynucleotide comprising a partial isolated polynucleotide of the present invention.

Portions and other variants of the inventive polypeptides may also be generated by synthetic or recombinant means. Synthetic polypeptides having fewer than about 100 amino acids, and generally fewer than about 50 amino acids, may be generated using techniques well known to those of ordinary skill in the art. For example, such polypeptides may be synthesized using any of the commercially available solid-phase techniques, such as the Merrifield solid-phase synthesis method, where amino acids are sequentially added to a growing amino acid chain. See Merrifield, *J. Am. Chem. Soc.* 85: 2149-2146, 1963. Equipment for automated synthesis of polypeptides is commercially available from suppliers such as Perkin Elmer / Applied Biosystems, Inc. (Foster City, California), and may be operated according to the manufacturer's instructions. Variants of a native polypeptide may be prepared using standard mutagenesis techniques, such as oligonucleotide-directed site-

specific mutagensis (Kunkel, T., *Proc. Natl. Acad. Sci. USA* 82: 488-492, 1985). Sections of DNA sequences may also be removed using standard techniques to permit preparation of truncated polypeptides.

In general, the polypeptides disclosed herein are prepared in an isolated, substantially pure form. Preferably, the polypeptides are at least about 80% pure; more preferably at least about 90% pure; and most preferably, at least about 99% pure. In certain preferred embodiments, described in detail below, the isolated polypeptides are incorporated into pharmaceutical compositions or vaccines for use in the treatment of skin disorders.

As used herein, the term "variant" comprehends nucleotide or amino acid sequences different from the specifically identified sequences, wherein one or more nucleotides or amino acid residues is deleted, substituted, or added. Variants may be naturally occurring allelic variants, or non-naturally occurring variants. Variant sequences (polynucleotide or polypeptide) preferably exhibit at least 50%, more preferably at least 75%, and most preferably at least 90% identity to a sequence of the present invention. The percentage identity is determined by aligning the two sequences to be compared as described below, determining the number of identical residues in the aligned portion, dividing that number by the total number of residues in the inventive (queried) sequence, and multiplying the result by 100.

Polynucleotide and polypeptide sequences may be aligned, and percentage of identical nucleotides in a specified region may be determined against another polynucleotide, using computer algorithms that are publicly available. Two exemplary algorithms for aligning and identifying the similarity of polynucleotide sequences are the BLASTN and FASTA algorithms. Polynucleotides may also be analyzed using the BLASTX algorithm, which compares the six-frame conceptual translation products of a nucleotide query sequence (both strands) against a protein sequence database. The similarity of polypeptide sequences may be examined using the BLASTP algorithm. The BLASTN, BLASTX and BLASTP programs are available on the NCBI anonymous FTP server (<ftp://ncbi.nlm.nih.gov>) under /blast/executables/. The BLASTN algorithm Version 2.0.4 [Feb-24-1998] and Version 2.0.6 [Sep-16-1998], set to the default parameters described in the documentation and distributed with the algorithm, are preferred for use in the determination of polynucleotide variants according to the present invention. The BLASTP algorithm, set to the default parameters described in the documentation and distributed with the program, is preferred for use in the determination of polypeptide variants according to the present invention. The use of the

BLAST family of algorithms, including BLASTN, BLASTP, and BLASTX, is described at NCBI's website at URL <http://www.ncbi.nlm.nih.gov/BLAST/newblast.html> and in the publication of Altschul Stephen F, et al., "Gapped BLAST and PSI-BLAST: a new generation of protein database search programs," *Nucleic Acids Res.* 25: 3389-3402, 1997.

5 The computer algorithm FASTA is available on the Internet at the ftp site <ftp://ftp.virginia.edu/pub/fasta/>. Version 2.0.4, February 1996, set to the default parameters described in the documentation and distributed with the algorithm, may be used in the determination of variants according to the present invention. The use of the FASTA algorithm is described in Pearson WR and Lipman DJ, "Improved Tools for Biological
10 Sequence Analysis," *Proc. Natl. Acad. Sci. USA* 85: 2444-2448, 1988; and Pearson WR, "Rapid and Sensitive Sequence Comparison with FASTP and FASTA," *Methods in Enzymology* 183: 63-98, 1990.

 The following running parameters are preferred for determination of alignments and similarities using BLASTN that contribute to the E values and percentage identity for
15 polynucleotide sequences: Unix running command: blastall -p blastn -d embldb -e 10 -G0 -E0 -r 1 -v 30 -b 30 -i queryseq -o results; the parameters are: -p Program Name [String]; -d Database [String]; -e Expectation value (E) [Real]; -G Cost to open a gap (zero invokes default behavior) [Integer]; -E Cost to extend a gap (zero invokes default behavior) [Integer];
20 -r Reward for a nucleotide match (blastn only) [Integer]; -v Number of one-line descriptions (V) [Integer]; -b Number of alignments to show (B) [Integer]; -i Query File [File In]; and -o BLAST report Output File [File Out] Optional. The following running parameters are preferred for determination of alignments and similarities using BLASTP that contribute to the E values and percentage identity of polypeptide sequences: blastall -p blastp -d swissprotdb -e 10 -G 0 -E 0 -v 30 -b 30 -i queryseq -o results; the parameters are: -p
25 Program Name [String]; -d Database [String]; -e Expectation value (E) [Real]; -G Cost to open a gap (zero invokes default behavior) [Integer]; -E Cost to extend a gap (zero invokes default behavior) [Integer]; -v Number of one-line descriptions (v) [Integer]; -b Number of alignments to show (b) [Integer]; -I Query File [File In]; -o BLAST report Output File [File Out] Optional. The "hits" to one or more database sequences by a queried sequence produced
30 by BLASTN, FASTA, BLASTP or a similar algorithm, align and identify similar portions of sequences. The hits are arranged in order of the degree of similarity and the length of sequence overlap. Hits to a database sequence generally represent an overlap over only a fraction of the sequence length of the queried sequence.

The BLASTN, FASTA, and BLASTP algorithms also produce "Expect" (E) values for alignments. The Expect value (E) indicates the number of hits one can "expect" to see over a certain number of contiguous sequences by chance when searching a database of a certain size. The Expect value is used as a significance threshold for determining whether the
5 hit to a database, such as the preferred EMBL database, indicates true similarity. For example, an E value of 0.1 assigned to a polynucleotide hit is interpreted as meaning that in a database of the size of the EMBL database, one might expect to see 0.1 matches over the aligned portion of the sequence with a similar score simply by chance. By this criterion, the aligned and matched portions of the polynucleotide sequences then have a probability of 90%
10 of being the same. For sequences having an E value of 0.01 or less over aligned and matched portions, the probability of finding a match by chance in the EMBL database is 1% or less using the BLASTN or FASTA algorithm.

According to one embodiment, "variant" polynucleotides and polypeptides, with reference to each of the polynucleotides and polypeptides of the present invention, preferably
15 comprise sequences having the same number or fewer nucleic or amino acids than each of the polynucleotides or polypeptides of the present invention and producing an E value of 0.01 or less when compared to the polynucleotide or polypeptide of the present invention. That is, a variant polynucleotide or polypeptide is any sequence that has at least a 99% probability of being the same as the polynucleotide or polypeptide of the present invention, measured as
20 having an E value of 0.01 or less using the BLASTN, FASTA, or BLASTP algorithms set at parameters described above. According to a preferred embodiment, a variant polynucleotide is a sequence having the same number or fewer nucleic acids than a polynucleotide of the present invention that has at least a 99% probability of being the same as the polynucleotide of the present invention, measured as having an E value of 0.01 or less using the BLASTN or
25 FASTA algorithms set at parameters described above. Similarly, according to a preferred embodiment, a variant polypeptide is a sequence having the same number or fewer amino acids than a polypeptide of the present invention that has at least a 99% probability of being the same as a polypeptide of the present invention, measured as having an E value of 0.01 or less using the BLASTP algorithm set at the parameters described above.

30 Alternatively, variant polynucleotides of the present invention hybridize to the polynucleotide sequences recited in SEQ ID NOS: 1-266 and 350-375, or complements, reverse sequences, or reverse complements of those sequences under stringent conditions. As used herein, "stringent conditions" refers to prewashing in a solution of 6X SSC, 0.2% SDS;

hybridizing at 65°C, 6X SSC, 0.2% SDS overnight; followed by two washes of 30 minutes each in 1X SSC, 0.1% SDS at 65° C and two washes of 30 minutes each in 0.2X SSC, 0.1% SDS at 65°C.

The present invention also encompasses polynucleotides that differ from the disclosed sequences but that, as a consequence of the degeneracy of the genetic code, encode the same amino acid sequence are contemplated by the present invention. Such polynucleotides are said to be “degeneratively equivalent” to a polynucleotide disclosed herein. Similarly, polynucleotides that differ from the disclosed sequences but that encode a polypeptide having similar enzymatic activity as a polypeptide encoded by a polynucleotide of the present invention are included within the present invention. Thus, polynucleotides comprising sequences that differ from the polynucleotide sequences recited in SEQ ID NOS: 1-266 and 350-375, or complements, reverse sequences, or reverse complements of those sequences as a result of conservative substitutions are contemplated by and encompassed within the present invention. Additionally, polynucleotides comprising sequences that differ from the polynucleotide sequences recited in SEQ ID NOS: 1-266 and 350-375, or complements, reverse complements, or reverse sequences as a result of deletions and/or insertions totaling less than 10% of the total sequence length are also contemplated by and encompassed within the present invention. Similarly, polypeptides comprising sequences that differ from the polypeptide sequences recited in SEQ ID NOS: 267-349 and 376-401 as a result of amino acid substitutions, insertions, and/or deletions totaling less than 10% of the total sequence length are contemplated by and encompassed within the present invention, provided the variant polypeptide has activity in a lignin biosynthetic pathway.

The polynucleotides of the present invention, including variants, may be isolated from various libraries assembled from plant or non-plant organisms, or may be synthesized using techniques that are well known in the art. Polynucleotides of the present invention may be isolated by high throughput sequencing of cDNA libraries prepared from *Eucalyptus grandis* and *Pinus radiata* as described below in Examples 1 and 2. Alternatively, oligonucleotide probes based on the sequences provided in SEQ ID NO: 1-266 and 350-375 may be synthesized and used to identify positive clones in either cDNA or genomic DNA libraries from *Eucalyptus grandis* and *Pinus radiata* by means of hybridization or PCR techniques. Probes may be shorter than the sequences provided herein but should be at least about 10, preferably at least about 15 and most preferably at least about 20 nucleotides in length. Hybridization and PCR techniques suitable for use with such oligonucleotide probes are well

known in the art. Positive clones may be analyzed by restriction enzyme digestion, DNA sequencing or the like.

Variants of the polynucleotides of the present invention derived from other eucalyptus and pine species, as well as from other commercially important species utilized by the lumber industry, are contemplated. These include the following gymnosperms, by way of example:

5 loblolly pine *Pinus taeda*, slash pine *Pinus elliotti*, sand pine *Pinus clausa*, longleaf pine *Pinus palustris*, shortleaf pine *Pinus echinata*, ponderosa pine *Pinus ponderosa*, Jeffrey pine *Pinus jeffrey*, red pine *Pinus resinosa*, pitch pine *Pinus rigida*, jack pine *Pinus banksiana*, pond pine *Pinus serotina*, Eastern white pine *Pinus strobus*, Western white pine *Pinus monticola*, sugar pine *Pinus lambertiana*, Virginia pine *Pinus virginiana*, lodgepole pine *Pinus contorta*, Caribbean pine *Pinus caribaea*, *P. pinaster*, Calabrian pine *P. brutia*, Afghan pine *P. eldarica*, Coulter pine *P. coulteri*, European pine *P. nigra* and *P. sylvestris*; Douglas-fir *Pseudotsuga menziesii*; the hemlocks which include Western hemlock *Tsuga heterophylla*, Eastern hemlock *Tsuga canadensis*, Mountain hemlock *Tsuga mertensiana*; the spruces

10 which include the Norway spruce *Picea abies*, red spruce *Picea rubens*, white spruce *Picea glauca*, black spruce *Picea mariana*, Sitka spruce *Picea sitchensis*, Englemann spruce *Picea engelmanni*, and blue spruce *Picea pungens*; redwood *Sequoia sempervirens*; the true firs include the Alpine fir *Abies lasiocarpa*, silver fir *Abies amabilis*, grand fir *Abies grandis*, nobel fir *Abies procera*, white fir *Abies concolor*, California red fir *Abies magnifica*, and

20 balsam fir *Abies balsamea*, the cedars which include the Western red cedar *Thuja plicata*, incense cedar *libocedrus decurrens*, Northern white cedar *Thuja occidentalis*, Port Orford cedar *Chamaecyparis lawsoniana*, Atlantic white cedar *Chamaecyparis thyoides*, Alaska yellow-cedar *Chamaecyparis nootkatensis*, and Eastern red cedar *Huniperus virginiana*; the larches which include Eastern larch *Larix laricina*, Western larch *Larix occidentalis*,

25 European larch *Larix decidua*, Japanese larch *Larix leptolepis*, and Siberian larch *Larix siberica*; bold cypress *Taxodium distichum* and Giant sequoia *Sequoia gigantea*; and the following angiosperms, by way of example: *Eucalyptus alba*, *E. bancroftii*, *E. botyroides*, *E. bridgesiana*, *E. calophylla*, *E. camaldulensis*, *E. citriodora*, *E. cladocalyx*, *E. coccifera*, *E. curtisii*, *E. dalrympleana*, *E. deglupta*, *E. delagatensis*, *E. diversicolor*, *E. dunnii*, *E. ficifolia*,

30 *E. globulus*, *E. gomphocephala*, *E. gunnii*, *E. henryi*, *E. laevopinea*, *E. macarthurii*, *E. macrorhyncha*, *E. maculata*, *E. marginata*, *E. megacarpa*, *E. melliadora*, *E. nicholii*, *E. nitens*, *E. nova-angelica*, *E. obliqua*, *E. obtusiflora*, *E. oreades*, *E. pauciflora*, *E. polybractea*, *E. regnans*, *E. resinifera*, *E. robusta*, *E. rudis*, *E. saligna*, *E. sideroxylon*, *E. stuartiana*, *E.*

tereticornis, *E. torelliana*, *E. urnigera*, *E. urophylla*, *E. viminalis*, *E. viridis*, *E. wandoo* and *E. youmanni*.

The polynucleotides of the present invention may alternatively be synthesized, for example, using automated oligonucleotide synthesizers (e.g., Beckman Oligo 1000M DNA Synthesizer) to obtain polynucleotide segments of up to 50 or more nucleic acids. A plurality of such polynucleotide segments may then be ligated using standard DNA manipulation techniques that are well known in the art of molecular biology. One conventional and exemplary polynucleotide synthesis technique involves synthesis of a single stranded polynucleotide segment having, for example, 80 nucleic acids, and hybridizing that segment to a synthesized complementary 85 nucleic acid segment to produce a 5 nucleotide overhang. The next segment may then be synthesized in a similar fashion, with a 5 nucleotide overhang on the opposite strand. The "sticky" ends ensure proper ligation when the two portions are hybridized. In this way, a complete polynucleotide of the present invention may be synthesized entirely *in vitro*.

The polynucleotides identified as SEQ ID NOS: 1-266 and 350-375 may be "partial" or full length sequences. Partial sequences do not represent the full coding portion of a gene encoding a naturally occurring polypeptide. The partial polynucleotide sequences disclosed herein may be employed to obtain the corresponding full length genes for various species and organisms by, for example, screening DNA expression libraries using hybridization probes based on the polynucleotides of the present invention, or using PCR amplification with primers based upon the polynucleotides of the present invention. In this way one can, using methods well known in the art, extend a polynucleotide of the present invention upstream and downstream of the corresponding mRNA, as well as identify the corresponding genomic DNA, including the promoter and enhancer regions, of the complete gene.

The present invention thus comprehends isolated polynucleotides comprising a sequence identified in SEQ ID NOS: 1-266 and 350-375, or a variant of one of the specified sequences, that encode a functional polypeptide, including full length genes. Such extended polynucleotides may have a length of from about 50 to about 4,000 nucleic acids or base pairs, and preferably have a length of less than about 4,000 nucleic acids or base pairs, more preferably a length of less than about 3,000 nucleic acids or base pairs, more preferably yet a length of less than about 2,000 nucleic acids or base pairs. Under some circumstances, extended polynucleotides of the present invention may have a length of less than about 1,800 nucleic acids or base pairs, preferably less than about 1,600 nucleic acids or base pairs, more

preferably less than about 1,400 nucleic acids or base pairs, more preferably yet less than about 1,200 nucleic acids or base pairs, and most preferably less than about 1,000 nucleic acids or base pairs.

Polynucleotides of the present invention also comprehend polynucleotides comprising
5 at least a specified number of contiguous residues (x -mers) of any of the polynucleotides identified as SEQ ID NOS: 1-266 and 350-375 or their variants. According to preferred embodiments, the value of x is preferably at least 20, more preferably at least 40, more preferably yet at least 60, and most preferably at least 80. Thus, polynucleotides of the present invention include polynucleotides comprising a 20-mer, a 40-mer, a 60-mer, an 80-
10 mer, a 100-mer, a 120-mer, a 150-mer, a 180-mer, a 220-mer a 250-mer, or a 300-mer, 400-mer, 500-mer or 600-mer of a polynucleotide identified as SEQ ID NOS: 1-266 and 350-375, or a variant of any x -mer. That is, the definitions for variants described above in terms of E values, % similarity and hybridization, apply also to any x -mer of any polynucleotide of the present invention.

15 Polynucleotide probes and primers complementary to and/or corresponding to SEQ ID NOS: 1-266 and 350-375, and variants of those sequences, are also comprehended by the present invention. Such oligonucleotide probes and primers are substantially complementary to the polynucleotide of interest. An oligonucleotide probe or primer is described as "corresponding to" a polynucleotide of the present invention, including one of the sequences
20 set out as SEQ ID NOS: 1-266 and 350-375 or a variant, if the oligonucleotide probe or primer, or its complement, is contained within one of the sequences set out as SEQ ID NOS: 1-266 and 350-375 or a variant of one of the specified sequences.

Two single stranded sequences are said to be substantially complementary when the nucleotides of one strand, optimally aligned and compared, with the appropriate nucleotide
25 insertions and/or deletions, pair with at least 80%, preferably at least 90% to 95%, and more preferably at least 98% to 100%, of the nucleotides of the other strand. Alternatively, substantial complementarity exists when a first DNA strand will selectively hybridize to a second DNA strand under stringent hybridization conditions. Stringent hybridization conditions for determining complementarity include salt conditions of less than about 1 M,
30 more usually less than about 500 mM and preferably less than about 200 mM. Hybridization temperatures can be as low as 5°C, but are generally greater than about 22°C, more preferably greater than about 30°C and most preferably greater than about 37°C. Longer DNA fragments may require higher hybridization temperatures for specific hybridization. Since the

stringency of hybridization may be affected by other factors such as probe composition, presence of organic solvents and extent of base mismatching, the combination of parameters is more important than the absolute measure of any one alone. The DNAs from plants or samples or products containing plant material can be either genomic DNA or DNAs derived
5 by preparing cDNA from the RNAs present in the sample.

In addition to DNA-DNA hybridization, DNA-RNA or RNA-RNA hybridization assays are also possible. In the first case, the mRNAs from expressed genes would then be detected instead of genomic DNA or cDNA derived from mRNA of the sample. In the second case, RNA probes could be used. In addition, artificial analogs of DNA hybridizing
10 specifically to target sequences could also be used.

In specific embodiments, the oligonucleotide probes and/or primers comprise at least about 6 contiguous residues, more preferably at least about 10 contiguous residues, and most preferably at least about 20 contiguous residues complementary to a polynucleotide sequence of the present invention. Probes and primers of the present invention may be from about 8 to
15 100 base pairs in length or, preferably, from about 10 to 50 base pairs in length or, more preferably, from about 15 to 40 base pairs in length. The probes can be easily selected using procedures well known in the art, taking into account DNA-DNA hybridization stringencies, annealing and melting temperatures, potential for formation of loops and other factors, which are well known in the art. Tools and software suitable for designing probes, and especially
20 suitable for designing PCR primers, are available on the Internet, for example, at <http://www.horizonpress.com/pcr/>. Preferred techniques for designing PCR primers are also disclosed in Dieffenbach CW and Dvksler GS, *PCR primer: a laboratory manual*, CSHL Press: Cold Spring Harbor, NY, 1995.

A plurality of oligonucleotide probes or primers corresponding to polynucleotides of
25 the present invention may be provided in a kit form. Such kits generally comprise multiple DNA or oligonucleotide probes, each probe being specific for a polynucleotide sequence. Kits of the present invention may comprise one or more probes or primers corresponding to a polynucleotide of the present invention, including a polynucleotide sequence identified in SEQ ID NOS: 1-266 and 350-375.

30 In one embodiment useful for high-throughput assays, the oligonucleotide probe kits of the present invention comprise multiple probes in an array format, wherein each probe is immobilized in a predefined, spatially addressable location on the surface of a solid substrate. Array formats which may be usefully employed in the present invention are disclosed, for

example, in U.S. Patents No. 5,412,087, 5,545,531, and PCT Publication No. WO 95/00530, the disclosures of which are hereby incorporated by reference.

The significance of high-throughput screening systems is apparent for applications such as plant breeding and quality control operations in which there is a need to identify large numbers of seed lots and plant seedlings, to examine samples or products for unwanted plant materials, to identify plants or samples or products containing plant material for quarantine purposes etc. or to ascertain the true origin of plants or samples or products containing plant material. Screening for the presence or absence of polynucleotides of the present invention used as identifiers for tagging plants is valuable for later detecting the amount of gene flow in plant breeding, introgression of genes via dispersed pollen, etc.

In this manner, oligonucleotide probe kits of the present invention may be employed to examine the presence/absence (or relative amounts in case of mixtures) of polynucleotides of the present invention in different samples or products containing different materials rapidly and in a cost-effective manner. Examples of plant species that may be examined using the present invention, include forestry species, such as pine and eucalyptus species, other tree species, agricultural plants including crop and forage plants, and horticultural plants.

Another aspect of the present invention involves collections of polynucleotides of the present invention. A collection of polynucleotides of the present invention, particularly the polynucleotides identified as SEQ ID NOS: 1-266, 350-375 and variants and *x*-mers thereof, may be recorded and/or stored on a storage medium and subsequently accessed for purposes of analysis, comparison, etc. Suitable storage media include magnetic media such as magnetic diskettes, magnetic tapes, CD-ROM storage media, optical storage media, and the like. Suitable storage media and methods for recording and storing information, as well as accessing information such as polynucleotide sequences recorded on such media, are well known in the art. The polynucleotide information stored on the storage medium is preferably computer-readable and may be used for analysis and comparison of the polynucleotide information.

Another aspect of the present invention thus involves storage medium on which are recorded a collection of the polynucleotides of the present invention, particularly a collection of the polynucleotides identified as SEQ ID NOS: 1-266, 350-375 and variants thereof, as well as *x*-mers of the polynucleotides of SEQ ID NOS: 1-266 and 350-375, and extended sequences, probes and primers comprising or correspond to a polynucleotide of SEQ ID NOS: 1-266 and 350-375. According to one embodiment, the storage medium includes a

collection of at least 20, preferably at least 50, more preferably at least 100, and most preferably at least 200 of the polynucleotides of the present invention, preferably the polynucleotides identified as SEQ ID NOS: 1-266 and 350-375, or variants of those polynucleotides.

5 In another aspect, the present invention provides genetic constructs comprising, in the 5'-3' direction, a gene promoter sequence; an open reading frame coding for at least a functional portion of a polypeptide encoded by a polynucleotide of the present invention; and a gene termination sequence. As used herein, the "functional portion" of an enzyme is a portion that contains an active site essential for affecting a metabolic step, *i.e.* a portion of the
10 molecule that is capable of binding one or more reactants or is capable of improving or regulating the rate of reaction. An active site may be made up of separate portions present on one or more polypeptide chains and will generally exhibit high substrate specificity. The term "enzyme encoded by a nucleotide sequence" as used herein, includes enzymes encoded by a nucleotide sequence which includes the partial isolated polynucleotides of the present
15 invention.

 The open reading frame may be orientated in either a sense or antisense direction. For applications where amplification of lignin synthesis is desired, the open reading frame may be inserted in the construct in a sense orientation, such that transformation of a target organism with the construct will lead to an increase in the number of copies of the gene and therefore
20 an increase in the amount of enzyme. When down-regulation of lignin synthesis is desired, the open reading frame may be inserted in the construct in an antisense orientation, such that the RNA produced by transcription of the polynucleotide is complementary to the endogenous mRNA sequence. This, in turn, will result in a decrease in the number of copies of the gene and therefore a decrease in the amount of enzyme. Alternatively, regulation may
25 be achieved by inserting appropriate sequences or subsequences (*e.g.*, DNA or RNA) in ribozyme constructs.

 Genetic constructs comprising a non-coding region of a gene coding for an enzyme encoded by the above DNA sequences or a nucleotide sequence complementary to a non-coding region, together with a gene promoter sequence and a gene termination sequence, are
30 also provided. As used herein the term "non-coding region" includes both transcribed sequences which are not translated, and non-transcribed sequences within about 2000 base pairs 5' or 3' of the translated sequences or open reading frames. Examples of non-coding regions which may be usefully employed in the inventive constructs include introns and

5'- non-coding leader sequences. Transformation of a target plant with such a DNA construct may lead to a reduction in the amount of lignin synthesized by the plant by the process of cosuppression, in a manner similar to that discussed, for example, by Napoli et al., *Plant Cell* 2:279-290, 1990; and de Carvalho Niebel et al., *Plant Cell* 7:347-358, 1995.

5 The genetic constructs of the present invention further comprise a gene promoter sequence and a gene termination sequence, operably linked to the polynucleotide to be transcribed, which control expression of the gene. The gene promoter sequence is generally positioned at the 5' end of the polynucleotide to be transcribed, and is employed to initiate transcription of the polynucleotide. Gene promoter sequences are generally found in the
10 5' non-coding region of a gene but they may exist in introns (Luehrsen KR, *Mol. Gen. Genet.* 225:81-93, 1991, or in the coding region, as for example in PAL of tomato (Bloksberg, *Studies on the Biology of Phenylalanine Ammonia Lyase and Plant Pathogen Interaction*, Ph.D. Thesis, University of California, Davis, 1991, University Microfilms International Order No. 9217564). When the construct includes an open reading frame in a sense
15 orientation, the gene promoter sequence also initiates translation of the open reading frame. For DNA constructs comprising either an open reading frame in an antisense orientation or a non-coding region, the gene promoter sequence consists only of a transcription initiation site having a RNA polymerase binding site.

 A variety of gene promoter sequences which may be usefully employed in the DNA
20 constructs of the present invention are well known in the art. The promoter gene sequence, and also the gene termination sequence, may be endogenous to the target plant host or may be exogenous, provided the promoter is functional in the target host. For example, the promoter and termination sequences may be from other plant species, plant viruses, bacterial plasmids and the like. Preferably, gene promoter and termination sequences are from the inventive
25 sequences themselves.

 Factors influencing the choice of promoter include the desired tissue specificity of the construct, and the timing of transcription and translation. For example, constitutive promoters, such as the 35S Cauliflower Mosaic Virus (CaMV 35S) promoter, will affect the activity of the enzyme in all parts of the plant. Use of a tissue specific promoter will result in
30 production of the desired sense or antisense RNA only in the tissue of interest. With DNA constructs employing inducible gene promoter sequences, the rate of RNA polymerase binding and initiation can be modulated by external stimuli, such as light, heat, anaerobic stress, alteration in nutrient conditions and the like. Temporally regulated promoters can be

employed to effect modulation of the rate of RNA polymerase binding and initiation at a specific time during development of a transformed cell. Preferably, the original promoters from the enzyme gene in question, or promoters from a specific tissue-targeted gene in the organism to be transformed, such as eucalyptus or pine are used. Other examples of gene
5 promoters which may be usefully employed in the present invention include, mannopine synthase (mas), octopine synthase (ocs) and those reviewed by Chua et al., *Science* 244:174-181, 1989.

The gene termination sequence, which is located 3' to the polynucleotide to be transcribed, may come from the same gene as the gene promoter sequence or may be from a
10 different gene. Many gene termination sequences known in the art may be usefully employed in the present invention, such as the 3' end of the *Agrobacterium tumefaciens* nopaline synthase gene. However, preferred gene terminator sequences are those from the original enzyme gene or from the target species to be transformed.

The genetic constructs of the present invention may also contain a selection marker
15 that is effective in plant cells, to allow for the detection of transformed cells containing the inventive construct. Such markers, which are well known in the art, typically confer resistance to one or more toxins. One example of such a marker is the NPTII gene whose expression results in resistance to kanamycin or hygromycin, antibiotics which are usually toxic to plant cells at a moderate concentration (Rogers et al., in Weissbach A and H, eds.,
20 *Methods for Plant Molecular Biology*, Academic Press Inc.: San Diego, CA, 1988). Alternatively, the presence of the desired construct in transformed cells can be determined by means of other techniques well known in the art, such as Southern and Western blots.

Techniques for operatively linking the components of the inventive genetic constructs are well known in the art and include the use of synthetic linkers containing one or more
25 restriction endonuclease sites as described, for example, by Maniatis et al., (*Molecular cloning: a laboratory manual*, CSHL Press: Cold Spring Harbor, NY, 1989). The DNA construct of the present invention may be linked to a vector having at least one replication system, for example, *E. coli*, whereby after each manipulation, the resulting construct can be cloned and sequenced and the correctness of the manipulation determined.

30 The genetic constructs of the present invention may be used to transform a variety of plants, both monocotyledonous (e.g., grasses, corn, grains, oat, wheat and barley), dicotyledonous (e.g., *Arabidopsis*, tobacco, legumes, alfalfa, oaks, eucalyptus, maple), and Gymnosperms (e.g., Scots pine; see Aronen, *Finnish Forest Res. Papers*, Vol. 595, 1996),

white spruce (Ellis et al., *Biotechnology* 11:94-92, 1993), and larch (Huang et al., *In Vitro Cell* 27:201-207, 1991). In a preferred embodiment, the inventive genetic constructs are employed to transform woody plants, herein defined as a tree or shrub whose stem lives for a number of years and increases in diameter each year by the addition of woody tissue.

5 Preferably the target plant is selected from the group consisting of eucalyptus and pine species, most preferably from the group consisting of *Eucalyptus grandis* and *Pinus radiata*. As discussed above, transformation of a plant with a genetic construct including an open reading frame coding for an enzyme encoded by an inventive polynucleotide wherein the open reading frame is orientated in a sense direction will produce a modified lignin content in

10 the plant. Transformation of a plant with a genetic construct comprising an open reading frame in an antisense orientation or a non-coding (untranslated) region of a gene will also produced a modification in the lignin content of the transformed plant.

The production of RNA in target cells may be controlled by choice of the promoter sequence, or by selecting the number of functional copies or the site of integration of the

15 polynucleotides incorporated into the genome of the target organism. A target plant may be transformed with more than one construct of the present invention, thereby modulating the lignin biosynthetic pathway for the activity of more than one enzyme, affecting enzyme activity in more than one tissue or affecting enzyme activity at more than one expression time. Similarly, a construct may be assembled containing more than one open reading frame

20 coding for an enzyme encoded by a polynucleotide of the present invention or more than one non-coding region of a gene coding for such an enzyme. The polynucleotides of the present invention may also be employed in combination with other known sequences encoding enzymes involved in the lignin biosynthetic pathway. In this manner, it may be possible to add a lignin biosynthetic pathway to a non-woody plant to produce a new woody plant.

25 Techniques for stably incorporating DNA constructs into the genome of target plants are well known in the art and include *Agrobacterium tumefaciens* mediated introduction, electroporation, protoplast fusion, injection into reproductive organs, injection into immature embryos, high velocity projectile introduction and the like. The choice of technique will depend upon the target plant to be transformed. For example, dicotyledonous plants and

30 certain monocots and gymnosperms may be transformed by *Agrobacterium* Ti plasmid technology, as described, for example by Bevan (*Nucl. Acid Res.* 12:8711-8721, 1984). Targets for the introduction of the DNA constructs of the present invention include tissues, such as leaf tissue, disseminated cells, protoplasts, seeds, embryos, meristematic regions;

cotyledons, hypocotyls, and the like. One preferred method for transforming eucalyptus and pine is a biolistic method using pollen (*see, for example, Aronen, Finnish Forest Res. Papers, Vol. 595:53, 1996*) or easily regenerable embryonic tissues. Other transformation techniques which may be usefully employed in the inventive methods include those taught by Ellis et al. (5 *Plant Cell Reports*, 8:16-20, 1989), Wilson et al. (*Plant Cell Reports* 7:704-707, 1989) and Tautorius et al. (*Theor. Appl. Genet.* 78:531-536, 1989).

Once the cells are transformed, cells having the inventive DNA construct incorporated in their genome may be selected by means of a marker, such as the kanamycin resistance marker discussed above. Transgenic cells may then be cultured in an appropriate medium to (10 regenerate whole plants, using techniques well known in the art. In the case of protoplasts, the cell wall is allowed to reform under appropriate osmotic conditions. In the case of seeds or embryos, an appropriate germination or callus initiation medium is employed. For explants, an appropriate regeneration medium is used. Regeneration of plants is well established for many species. For a review of regeneration of forest trees, *see Dunstan et al.,* (15 "Somatic embryogenesis in woody plants," in Thorpe TA, ed., *In vitro embryogenesis of plants*, Current Plant Science and Biotechnology in Agriculture 20(12):471-540, 1995. Specific protocols for the regeneration of spruce are discussed by Roberts et al., ("Somatic embryogenesis of spruce," in Redenbaugh K, ed., *Synseed: applications of synthetic seed to crop improvement*, CRC Press: Chapter 23, pp. 427-449, 1993). The resulting transformed (20 plants may be reproduced sexually or asexually, using methods well known in the art, to give successive generations of transgenic plants.

In yet a further aspect, the present invention provides methods for modifying the level (concentration) or activity of a polypeptide in a host organism, comprising stably incorporating into the genome of the plant a construct comprising a polynucleotide of the (25 present invention. The genetic NA constructs of the present invention may be used to transform a variety of organisms. Such organisms include plants, such as monocotyledonous angiosperms (*e.g., grasses, corn, grains, oat, wheat and barley*), and dicotyledonous angiosperms (*e.g., Arabidopsis, tobacco, legumes, alfalfa, oaks, eucalyptus, maple*), and gymnosperms (*e.g., Scots pine; see Aronen, Finnish Forest Res. Papers, Vol. 595, 1996*), (30 white spruce (Ellis et al., *Biotechnology* 11:94-92, 1993), and larch (Huang et al., *In Vitro Cell* 27:201-207, 1991).

In preferred embodiments, the genetic constructs of the present invention are employed to transform woody plants, herein defined as a tree or shrub having a stem that

lives for a number of years and increases in diameter each year as a consequence of the addition of woody tissue. The target plant is preferably selected from the group consisting of eucalyptus and pine species, most preferably from the group consisting of *Eucalyptus grandis* and *Pinus radiata*, but also including any of the species in the following list:

5 Pines: *Pinus banksiana*, *Pinus brutia*, *Pinus caribaea*, *Pinus clausa*, *Pinus contorta*, *Pinus coulteri*, *Pinus echinata*, *Pinus eldarica*, *Pinus ellioti*, *Pinus jeffreyi*, *Pinus lambertiana*, *Pinus monticola*, *Pinus nigra*, *Pinus palustris*, *Pinus pinaster*, *Pinus ponderosa*, *Pinus resinosa*, *Pinus rigida*, *Pinus serotina*, *Pinus strobus*, *Pinus sylvestris*, *Pinus taeda*, *Pinus virginiana*.

10 Other gymnosperms: *Abies amabilis*, *Abies balsamea*, *Abies concolor*, *Abies grandis*, *Abies lasiocarpa*, *Abies magnifica*, *Abies procera*, *Chamaecyparis lawsoniana*, *Chamaecyparis nootkatensis*, *Chamaecyparis thyoides*, *Huniperus virginiana*, *Larix decidua*, *Larix laricina*, *Larix leptolepis*, *Larix occidentalis*, *Larix siberica*, *Libocedrus decurrens*, *Picea abies*, *Picea engelmanni*, *Picea glauca*, *Picea mariana*, *Picea pungens*, *Picea rubens*,
15 *Picea sitchensis*, *Pseudotsuga menziesii*, *Sequoia gigantea*, *Sequoia sempervirens*, *Taxodium distichum*, *Tsuga canadensis*, *Tsuga heterophylla*, *Tsuga mertensiana*, *Thuja occidentalis*, *Thuja plicata*.

Eucalypts: *Eucalyptus alba*, *Eucalyptus bancroftii*, *Eucalyptus botyroides*, *Eucalyptus bridgesiana*, *Eucalyptus calophylla*, *Eucalyptus camaldulensis*, *Eucalyptus citriodora*,
20 *Eucalyptus cladocalyx*, *Eucalyptus coccifera*, *Eucalyptus curtisii*, *Eucalyptus dalrympleana*, *Eucalyptus deglupta*, *Eucalyptus delagatensis*, *Eucalyptus diversicolor*, *Eucalyptus dunnii*, *Eucalyptus ficifolia*, *Eucalyptus globulus*, *Eucalyptus gomphocephala*, *Eucalyptus gunnii*, *Eucalyptus henryi*, *Eucalyptus laevopinea*, *Eucalyptus macarthurii*, *Eucalyptus macrorhyncha*, *Eucalyptus maculata*, *Eucalyptus marginata*, *Eucalyptus megacarpa*,
25 *Eucalyptus melliodora*, *Eucalyptus nicholii*, *Eucalyptus nitens*, *Eucalyptus nova-anglica*, *Eucalyptus obliqua*, *Eucalyptus obtusiflora*, *Eucalyptus oreades*, *Eucalyptus pauciflora*, *Eucalyptus polybractea*, *Eucalyptus regnans*, *Eucalyptus resinifera*, *Eucalyptus robusta*, *Eucalyptus rudis*, *Eucalyptus saligna*, *Eucalyptus sideroxylon*, *Eucalyptus stuartiana*, *Eucalyptus tereticornis*, *Eucalyptus torelliana*, *Eucalyptus urnigera*, *Eucalyptus urophylla*,
30 *Eucalyptus viminalis*, *Eucalyptus viridis*, *Eucalyptus wandoo*, *Eucalyptus youmanni*; and hybrids of any of the above species.

Further, the polynucleotides of the present invention have particular application for use as non-disruptive tags for marking organisms, particularly plants. Other organisms may,

however, be tagged with the polynucleotides of the present invention, including commercially valuable animals, fish, bacteria and yeasts. Constructs comprising polynucleotides of the present invention may be stably introduced into an organism as heterologous, non-functional, non-disruptive tags. It is then possible to identify the origin or source of the organism at a later date by determining the presence or absence of the tag(s) in a sample of material.

Detection of the tag(s) may be accomplished using a variety of conventional techniques, and will generally involve the use of nucleic acid probes. Sensitivity in assaying the presence of probe can be usefully increased by using branched oligonucleotides, as described in Horn T, Chang CA and Urdea MS, "Chemical synthesis and characterization of branched oligodeoxyribonucleotides (bDNA) for use as signal amplifiers in nucleic acid quantification assays," *Nucleic Acids Research* 25(23):4842-4849, 1997), enabling detection of as few as 50 DNA molecules in the sample.

The following examples are offered by way of illustration and not by way of limitation.

15

Example 1

Isolation and Characterization of cDNA Clones from *Eucalyptus grandis*

Two *Eucalyptus grandis* cDNA expression libraries (one from a mixture of various tissues from a single tree and one from leaves of a single tree) were constructed and screened as follows.

mRNA was extracted from the plant tissue using the protocol of Chang *et al.* (*Plant Molecular Biology Reporter* 11:113-116, 1993) with minor modifications. Specifically, samples were dissolved in CPC-RNAXB (100 mM Tris-Cl, pH 8.0; 25 mM EDTA; 2.0 M NaCl; 2% CTAB; 2% PVP and 0.05% Spermidine*3 HCl) and extracted with chloroform:isoamyl alcohol, 24:1. mRNA was precipitated with ethanol and the total RNA preparate was purified using a Poly(A) Quik mRNA Isolation Kit (Stratagene, La Jolla, CA). A cDNA expression library was constructed from the purified mRNA by reverse transcriptase synthesis followed by insertion of the resulting cDNA clones in Lambda ZAP using a ZAP Express cDNA Synthesis Kit (Stratagene), according to the manufacturer's protocol. The resulting cDNAs were packaged using a Gigapack II Packaging Extract (Stratagene) employing 1 µl of sample DNA from the 5 µl ligation mix. Mass excision of the library was done using XL1-Blue MRF' cells and XL0LR cells (Stratagene) with ExAssist helper phage (Stratagene). The excised phagemids were diluted with NZY broth (Gibco BRL,

30

Gaithersburg, MD) and plated out onto LB-kanamycin agar plates containing X-gal and isopropylthio-beta-galactoside (IPTG).

Of the colonies plated and picked for DNA miniprep, 99% contained an insert suitable for sequencing. Positive colonies were cultured in NZY broth with kanamycin and cDNA was
 5 purified by means of alkaline lysis and polyethylene glycol (PEG) precipitation. Agarose gel at 1% was used to screen sequencing templates for chromosomal contamination. Dye primer sequences were prepared using a Turbo Catalyst 800 machine (Perkin Elmer/Applied Biosystems, Foster City, CA) according to the manufacturer's protocol.

DNA sequences for positive clones were obtained using a Perkin Elmer/Applied
 10 Biosystems Prism 377 sequencer. cDNA clones were sequenced first from the 5' end and, in some cases, also from the 3' end. For some clones, internal sequence was obtained using subcloned fragments. Subcloning was performed using standard procedures of restriction mapping and subcloning to pBluescript II SK+ vector.

The determined cDNA sequences were compared to known sequences in the EMBL
 15 database (release 46, March 1996) using the FASTA algorithm of February 1996 (Version 2.0.4) (available on the Internet at the ftp site <ftp://ftp.virginia.edu/pub/fasta/>) or the BLASTN algorithm Version 2.0.4 [Feb-24-1998], or Version 2.0.6 [Sept-16-1998], set to the preferred parameters described above. Multiple alignments of redundant sequences were used to build up reliable consensus sequences. Based on similarity to known sequences from other plant
 20 species, the isolated polynucleotides of the present invention were identified as encoding a specified enzyme.

Using the procedures described above, cDNA sequences derived from the *Eucalyptus grandis* library encoding the following polypeptides were isolated: PAL (SEQ ID NOS: 16, 100, 242-246); C4H (SEQ ID NOS: 17, 153, 154, and 161); C3H (SEQ ID NOS: 18, 101, 149
 25 and 150); F5H (SEQ ID NOS: 19-21, 102, 103 and 169-171); OMT (SEQ ID NOS: 22-25, 104-107, 173 and 174); CCR (SEQ ID NOS: 26-29 and 108-111); CAD (SEQ ID NOS: 1, 30 and 112); CGT (SEQ ID NOS: 31-33 and 113-115); CBG (SEQ ID NOS: 34, 165 and 166); PNL (SEQ ID NOS: 35, 36 and 116); LAC (SEQ ID NOS: 37-41, 117 and 118); POX (SEQ ID NOS: 42-44, 119-121, 179, 249-250 and 350-358); caffeic acid methyl transferase (SEQ
 30 ID NOS: 187-192); caffeoyl CoA methyl transferase (SEQ ID NOS: 193-195); coumarate Co-A ligase (SEQ ID NOS: 196-198); cytochrome P450 LXX1A (SEQ ID NOS: 201-206); diphenol oxidase (SEQ ID NOS: 207-217); flavonol glucosyl transferase (SEQ ID NO: 218);

flavonoid hydroxylase (SEQ ID NOS: 219-223); and isoflavone reductase (SEQ ID NOS: 234-240).

Example 2

5 Isolation and Characterization of cDNA Clones from *Pinus radiata*

a) Isolation of cDNA clones by high through-put screening

A *Pinus radiata* cDNA expression library was constructed from xylem and screened as described above in Example 1. DNA sequences for positive clones were obtained using
10 forward and reverse primers on a Perkin Elmer/Applied Biosystems Prism 377 sequencer and the determined sequences were compared to known sequences in the EMBL database as described above.

Based on similarity to known sequences from other plant species, the isolated DNA sequences were identified as encoding the enzymes C4H (SEQ ID NOS: 2, 3, 48, 49, 92, 124,
15 125, 155-160, 162 and 163); C3H (SEQ ID NOS: 4, 50-52, 93, 126, 127, 151 and 152); PNL (SEQ ID NOS: 5, 81 and 183); OMT (SEQ ID NOS: 6, 53-55, 94 and 175); CAD (SEQ ID NOS: 7, 71, 95 and 164); CCR (SEQ ID NOS: 8, 58-70, 96, 128-134 and 167); PAL (SEQ ID NOS: 9-11, 45-47, 97, 98, 122, 123 and 176, 247 and 248); 4CL (SEQ ID NOS: 12, 56, 57, 90, 99, 147, 148, 265 and 266); CGT (SEQ ID NOS: 72, 135 and 168); CBG (SEQ ID NOS:
20 73-80 and 136-141); LAC (SEQ ID NOS: 82-84, 142-144 and 172); POX (SEQ ID NOS: 85-89, 91, 145, 146, 177, 178, 180-182, 264, 359-375); alpha amylase (SEQ ID NOS: 184-186); coumarate 6A ligase (SEQ ID NOS: 199 and 200); flavonoid hydroxylase (SEQ ID NOS: 224-233); isoflavone reductase (SEQ ID NO: 241); and diphenol oxidase (SEQ ID NOS: 251-263).

25

b) Isolation of cDNA clones by PCR

Two PCR probes, hereinafter referred to as LNB010 and LNB011 (SEQ ID NO: 14 and 15, respectively) were designed based on conserved domains in the following peroxidase sequences previously identified in other species: vanpox, hvupox6, taepox, hvupox1, osapox,
30 ntopox2, ntopox1, lespox, pokpox, luspox, athpox, hrpox, spopox, and rvepox (Genbank Accession Nos. D11337, M83671, X56011, X58396, X66125, J02979, D11396, X71593, D11102, L07554, M58381, X57564, Z22920, and Z31011, respectively).

RNA was isolated from pine xylem and first strand cDNA was synthesized as described above. This cDNA was subjected to PCR using 4 μ M LNB010, 4 μ M LNB011, 1 x Kogen's buffer, 0.1 mg/ml BSA, 200 mM dNTP, 2 mM Mg^{2+} , and 0.1 U/ μ l of Taq polymerase (Gibco BRL). Conditions were 2 cycles of 2 min at 94°C, 1 min at 55°C and 1 min at 72°C; 25 cycles of 1 min at 94°C, 1 min at 55°C, and 1 min at 72°C; and 18 cycles of 1 min at 94°C, 1 min at 55°C, and 3 min at 72°C in a Stratagene Robocycler. The gene was re-amplified in the same manner. A band of about 200 bp was purified from a TAE agarose gel using a Schleicher & Schuell Elu-Quik DNA purification kit and clones into a T-tailed pBluescript vector (Marchuk D et al., *Nucleic Acids Res.* 19:1154, 1991). Based on similarity to known sequences, the isolated gene (SEQ ID NO: 13) was identified as encoding pine peroxidase (POX).

Example 3

15 Use of an O-methyltransferase (OMT) Gene to Modify Lignin Biosynthesis

a) Transformation of tobacco plants with a *Pinus radiata* OMT gene

Sense and anti-sense constructs containing a polynucleotide including the coding region of OMT (SEQ ID NO: 53) from *Pinus radiata* were inserted into *Agrobacterium tumefaciens* LBA4301 (provided as a gift by Dr. C. Kado, University of California, Davis, CA) by direct transformation using published methods (see, An G, Ebert PR, Mitra A, Ha SB, "Binary Vectors," in Gelvin SB, Schilperoort RA, eds., *Plant Molecular Biology Manual*, Kluwer Academic Publishers: Dordrecht, 1988). The presence and integrity of the transgenic constructs were verified by restriction digestion and DNA sequencing.

25 Tobacco (*Nicotiana tabacum* cv. Samsun) leaf sections were transformed using the method of Horsch et al. (*Science*, 227:1229-1231, 1985). Five independent transformed plant lines were established for the sense construct and eight independent transformed plant lines were established for the anti-sense construct for OMT. Transformed plants containing the appropriate lignin gene construct were verified using Southern blot experiments. A "+" in the column labeled "Southern" in Table 2 below indicates that the transformed plant lines were confirmed as independent transformed lines.

b) Expression of *Pinus* OMT in transformed plants

Total RNA was isolated from each independent transformed plant line created with the OMT sense and anti-sense constructs. The RNA samples were analysed in Northern blot experiments to determine the level of expression of the transgene in each transformed line. The data shown in the column labeled "Northern" in Table 2 shows that the transformed plant lines containing the sense and anti-sense constructs for OMT all exhibited high levels of expression, relative to the background on the Northern blots. OMT expression in sense plant line number 2 was not measured because the RNA sample showed signs of degradation. There was no detectable hybridisation to RNA samples from empty vector-transformed control plants.

c) Modulation of OMT enzyme activity in transformed plants

The total activity of OMT enzyme, encoded by the *Pinus* OMT gene and by the endogenous tobacco OMT gene, in transformed tobacco plants was analysed for each transformed plant line created with the OMT sense and anti-sense constructs. Crude protein extracts were prepared from each transformed plant and assayed using the method of Zhang et al. (*Plant Physiol.*, 113:65-74, 1997). The data contained in the column labeled "Enzyme" in Table 1 shows that the transformed plant lines containing the OMT sense construct generally had elevated OMT enzyme activity, with a maximum of 199%, whereas the transformed plant lines containing the OMT anti-sense construct generally had reduced OMT enzyme activity, with a minimum of 35%, relative to empty vector-transformed control plants. OMT enzyme activity was not estimated in sense plant line number 3.

d) Effects of *Pinus* OMT on lignin concentration in transformed plants

The concentration of lignin in the transformed tobacco plants was determined using the well-established procedure of thioglycolic acid extraction (*see*, Freudenberg et al., *Constitution and Biosynthesis of Lignin*, Springer-Verlag: Berlin, 1968). Briefly, whole tobacco plants, of an average age of 38 days, were frozen in liquid nitrogen and ground to a fine powder in a mortar and pestle. 100 mg of frozen powder from one empty vector-transformed control plant line, the five independent transformed plant lines containing the sense construct for OMT and the eight independent transformed plant lines containing the anti-sense construct for OMT were extracted individually with methanol, followed by 10% thioglycolic acid and finally dissolved in 1 M NaOH. The final extracts were assayed for absorbance at 280 nm. The data shown in the column labelled "TGA" in Table 2 shows that

the transformed plant lines containing the sense and the anti-sense OMT gene constructs all exhibited significantly decreased levels of lignin, relative to the empty vector-transformed control plant lines.

Table 2

	plant line	transgene	orientation	Southern	Northern	Enzyme	TGA
5	1	control	na	+	blank	100	104
	1	OMT	sense	+	2.9E+6	86	55
10	2	OMT	sense	+	na	162	58
	3	OMT	sense	+	4.1E+6	na	63
	4	OMT	sense	+	2.3E+6	142	66
	5	OMT	sense	+	3.6E+5	199	75
	1	OMT	anti-sense	+	1.6E+4	189	66
15	2	OMT	anti-sense	+	5.7E+3	35	70
	3	OMT	anti-sense	+	8.0E+3	105	73
	4	OMT	anti-sense	+	1.4E+4	109	74
	5	OMT	anti-sense	+	2.5E+4	87	78
	6	OMT	anti-sense	+	2.5E+4	58	84
20	7	OMT	anti-sense	+	2.5E+4	97	92
	8	OMT	anti-sense	+	1.1E+4	151	94

These data clearly indicate that lignin concentration, as measured by the TGA assay, can be directly manipulated by either sense or anti-sense expression of a lignin biosynthetic gene such as OMT.

Example 4

Use of a 4-Coumarate:CoA ligase (4CL) Gene to Modify Lignin Biosynthesis

30

a) Transformation of tobacco plants with a *Pinus radiata* 4CL gene

Sense and anti-sense constructs containing a polynucleotide including the coding region of 4CL (SEQ ID NO: 56) from *Pinus radiata* were inserted into *Agrobacterium tumefaciens* LBA4301 by direct transformation as described above. The presence and integrity of the transgenic constructs were verified by restriction digestion and DNA sequencing.

Tobacco (*Nicotiana tabacum* cv. Samsun) leaf sections were transformed as described above. Five independent transformed plant lines were established for the sense construct and eight independent transformed plant lines were established for the anti-sense construct for 4CL. Transformed plants containing the appropriate lignin gene construct were verified

using Southern blot experiments. A “+” in the column labeled “Southern” in Table 3 indicates that the transformed plant lines listed were confirmed as independent transformed lines.

5 b) Expression of *Pinus* 4CL in transformed plants

Total RNA was isolated from each independent transformed plant line created with the 4CL sense and anti-sense constructs. The RNA samples were analysed in Northern blot experiments to determine the level of expression of the transgene in each transformed line. The data shown in the column labelled “Northern” in Table 3 below shows that the
10 transformed plant lines containing the sense and anti-sense constructs for 4CL all exhibit high levels of expression, relative to the background on the Northern blots. 4CL expression in anti-sense plant line number 1 was not measured because the RNA was not available at the time of the experiment. There was no detectable hybridisation to RNA samples from empty vector-transformed control plants.

15

c) Modulation of 4CL enzyme activity in transformed plants

The total activity of 4CL enzyme, encoded by the *Pinus* 4CL gene and by the endogenous tobacco 4CL gene, in transformed tobacco plants was analysed for each transformed plant line created with the 4CL sense and anti-sense constructs. Crude protein
20 extracts were prepared from each transformed plant and assayed using the method of Zhang et al. (*Plant Physiol.*, 113:65-74, 1997). The data contained in the column labeled “Enzyme” in Table 3 shows that the transformed plant lines containing the 4CL sense construct had elevated 4CL enzyme activity, with a maximum of 258%, and the transformed plant lines containing the 4CL anti-sense construct had reduced 4CL enzyme activity, with a minimum
25 of 59%, relative to empty vector-transformed control plants.

d) Effects of *Pinus* 4CL on lignin concentration in transformed plants

The concentration of lignin in samples of transformed plant material was determined as described in Example 3. The data shown in the column labelled “TGA” in Table 3 shows
30 that the transformed plant lines containing the sense and the anti-sense 4CL gene constructs all exhibited significantly decreased levels of lignin, relative to the empty vector-transformed control plant lines. These data clearly indicate that lignin concentration, as measured by the

TGA assay, can be directly manipulated by either sense or anti-sense expression of a lignin biosynthetic gene such as 4CL.

Table 3

	plant line	transgene	orientation	Southern	Northern	Enzyme	TGA
5	1	control	na	+	blank	100	92
	2	control	na	+	blank	100	104
	1	4CL	sense	+	2.3E+4	169	64
10	2	4CL	sense	+	4.5E+4	258	73
	3	4CL	sense	+	3.1E+4	174	77
	4	4CL	sense	+	1.7E+4	164	80
	5	4CL	sense	+	1.6E+4	184	92
	1	4CL	anti-sense	+	na	59	75
15	2	4CL	anti-sense	+	1.0E+4	70	75
	3	4CL	anti-sense	+	9.6E+3	81	80
	4	4CL	anti-sense	+	1.2E+4	90	83
	5	4CL	anti-sense	+	4.7E+3	101	88
	6	4CL	anti-sense	+	3.9E+3	116	89
20	7	4CL	anti-sense	+	1.8E+3	125	94
	8	4CL	anti-sense	+	1.7E+4	106	97

Example 5

25

Transformation of Tobacco using the Inventive Lignin Biosynthetic Genes

Sense and anti-sense constructs containing polynucleotides including the coding regions of C3H (SEQ ID NO: 18), F5H (SEQ ID NO: 19), CCR (SEQ ID NO: 26) and CGT (SEQ ID NO: 31) from *Eucalyptus grandis*, and OMT (SEQ ID NO: 6), PAL (SEQ ID NO: 45 and 47), C4H (SEQ ID NO: 48 and 49), PNL (SEQ ID NO: 81) and LAC (SEQ ID NO: 83) from *Pinus radiata* were inserted into *Agrobacterium tumefaciens* LBA4301 by direct transformation as described above. The presence and integrity of the transgenic constructs were verified by restriction digestion and DNA sequencing.

Tobacco (*Nicotiana tabacum* cv. Samsun) leaf sections were transformed as described in Example 3. Up to twelve independent transformed plant lines were established for each sense construct and each anti-sense construct listed in the preceding paragraph. Transformed plants containing the appropriate lignin gene construct were verified using Southern blot experiments. All of the transformed plant lines analysed were confirmed as independent transformed lines.

40

Example 6Manipulation of Lignin Content in Transformed Plants

5

a) Determination of transgene expression by Northern blot experiments

Total RNA was isolated from each independent transformed plant line described in Example 5. The RNA samples were analysed in Northern blot experiments to determine the level of expression of the transgene in each transformed line. The column labelled
 10 "Northern" in Table 4 shows the level of transgene expression for all plant lines assayed, relative to the background on the Northern blots. There was no detectable hybridisation to RNA samples from empty vector-transformed control plants.

b) Determination of lignin concentration in transformed plants

15 The concentration of lignin in empty vector-transformed control plant lines and in up to twelve independent transformed lines for each sense construct and each anti-sense construct described in Example 5 was determined as described in Example 3. The column labelled "TGA" in Table 4 shows the thioglycolic acid extractable lignins for plant lines transformed with C3H, F5H, CCR, PAL, C4H, PNL and LAC, expressed as the average percentage of
 20 TGA extractable lignins in transformed plants versus control plants. The range of variation is shown in parentheses.

Table 4

25	<u>transgene</u>	<u>orientation</u>	<u>no. of lines</u>	<u>Northern</u>	<u>TGA</u>
	control	na	3	blank	100 (92-104)
	C3H	sense	5	3.7E+4	74 (67-85)
	F5H	sense	10	5.8E+4	70 (63-79)
30	F5H	anti-sense	9	5.8E+4	73 (35-93)
	CCR	sense	1	na	74
	CCR	anti-sense	2	na	74 (62-86)
	PAL	sense	5	1.9E+5	77 (71-86)
	PAL	anti-sense	4	1.5E+4	62 (37-77)
35	C4H	anti-sense	10	5.8E+4	86 (52-113)
	PNL	anti-sense	6	1.2E+4	88 (70-114)
	LAC	sense	5	1.7E+5	na
	LAC	anti-sense	12	1.7E+5	88 (73-114)

40 Fig. 5 illustrates the quantity of extractable lignin, as a percentage of wild type lignin content, in tobacco plants transformed with PAL (sense and anti-sense), C4H (antisense),

C3H (sense), F5H (sense and antisense), C5H (sense and antisense) C3H (sense; referred to as COMT in Fig. 5), OMT (sense and antisense; referred to as CCOMT in Fig. 5), 4CL (sense and antisense), CCR (sense and antisense) and CGT (antisense) constructs as described in Example 5. Thioglycolic acid-extractable lignin quantities were measured in transgenic plants, normalized to empty-vector control plants. Three extracts were independently derived from each of approximately 10 independently derived transgenic plants. The average of the three extracts is shown by a black dot, as the lignin value for that plant. The average of ten independent transgenic plants transformed with a given cDNA construct is shown as a bar. The average of empty vector transformed control plants is shown as an X. The value for the controls is extrapolated across the field to facilitate comparison. Black bars indicate means which are significantly reduced ($p < 0.05$) in lignin content with respect to control plants. Grey bars indicate means which are not significantly changed from control plants.

Transformed plant lines containing the sense and the anti-sense lignin biosynthetic gene constructs exhibited a mean level of lignin content that was significantly lower than that of empty vector-transformed control plant lines. The most dramatic effects on lignin concentration were seen in the OMT sense plants, and in the PAL sense plants. These data clearly indicate that lignin concentration, as measured by the TGA assay, can be directly manipulated by conventional anti-sense methodology and also by sense over-expression using the inventive lignin biosynthetic genes.

Example 7

Modulation of Lignin Enzyme Activity in Transformed Plants

The activities and substrate specificities of selected lignin biosynthetic enzymes were assayed in crude extracts from transformed tobacco plants containing sense and anti-sense constructs for PAL (SEQ ID NO: 45), PNL (SEQ ID NO: 81) and LAC (SEQ ID NO: 83) from *Pinus radiata*, and CGT (SEQ ID NO: 31) from *Eucalyptus grandis*.

Enzyme assays were performed using published methods for PAL (Southerton SG and Deverall BJ. *Plant Path.* 39:223-230, 1990), CGT (Vellekoop P et al., *FEBS*, 330:36-40, 1993), PNL (Espin CJ et al., *Phytochemistry* 44:17-22, 1997) and LAC (Bao W et al., *Science*, 260:672-674, 1993). The data shown in the column labelled "Enzyme" in Table 5 shows the average enzyme activity from replicate measures for all plant lines assayed, expressed as a percent of enzyme activity in empty vector-transformed control plants. The range of variation is shown in parentheses.

Table 5

	<u>Transgene</u>	<u>orientation</u>	<u>no. of lines</u>	<u>enzyme</u>
5	control	na	3	100
	PAL	sense	5	87 (60-124)
	PAL	anti-sense	3	53 (38-80)
	CGT	anti-sense	1	89
10	PNL	anti-sense	6	144 (41-279)
	LAC	sense	5	78 (16-240)
	LAC	anti-sense	11	64 (14-106)

15 All of the transformed plant lines, except the PNL anti-sense transformed plant lines, showed average lignin enzyme activities which were significantly lower than the activities observed in empty vector-transformed control plants. The most dramatic effects on lignin enzyme activities were seen in the PAL anti-sense transformed plant lines in which all of the lines showed reduced PAL activity and in the LAC anti-sense transformed plant lines which
20 showed as little as 14% of the LAC activity in empty vector-transformed control plant lines.

Example 8Functional Identification of Lignin Biosynthetic Genes

25 Sense constructs containing polynucleotides including the coding regions for PAL (SEQ ID NO: 47), OMT (SEQ ID NO: 53), 4CL (SEQ ID NO: 56 and 57) and POX (SEQ ID NO: 86) from *Pinus radiata*, and OMT (SEQ ID NO: 23 and 24), CCR (SEQ ID NO: 26-28), CGT (SEQ ID NO: 31 and 33) and POX (SEQ ID NO: 42 and 44) from *Eucalyptus grandis*
30 were inserted into the commercially available protein expression vector, pProEX-1 (Gibco BRL). The resultant constructs were transformed into *E. coli* XL1-Blue (Stratagene), which were then induced to produce recombinant protein by the addition of IPTG. Purified proteins were produced for the *Pinus* OMT and 4CL constructs and the *Eucalyptus* OMT and POX constructs using Ni column chromatography (Janknecht R et al., *Proc. Natl. Acad. Sci.*,
35 88:8972-8976, 1991). Enzyme assays for each of the purified proteins conclusively demonstrated the expected substrate specificity and enzymatic activity for the genes tested.

The data for two representative enzyme assay experiments, demonstrating the verification of the enzymatic activity of a *Pinus radiata* 4CL gene (SEQ ID NO: 56) and a *Pinus radiata* OMT gene (SEQ ID NO: 53), are shown in Table 6. For the 4CL enzyme, one
40 unit equals the quantity of protein required to convert the substrate into product at the rate of

0.1 absorbance units per minute. For the OMT enzyme, one unit equals the quantity of protein required to convert 1 pmole of substrate to product per minute.

Table 6

<u>transgene</u>	<u>purification step</u>	<u>total ml extract</u>	<u>total mg protein</u>	<u>total units activity</u>	<u>% yield activity</u>	<u>fold purification</u>
4CL	crude	10 ml	51 mg	4200	100	1
	Ni column	4 ml	0.84 mg	3680	88	53
OMT	crude	10 ml	74 mg	4600	100	1
	Ni column	4 ml	1.2 mg	4487	98	60

The data shown in Table 6 indicate that both the purified 4CL enzyme and the purified OMT enzyme show high activity in enzyme assays, confirming the identification of the 4CL and OMT genes described in this application. Crude protein preparations from *E. coli* transformed with empty vector show no activity in either the 4CL or the OMT enzyme assay.

Example 9

Demonstration of the Presence / Absence of Unique Sequence Identifiers in Plants

Transgenic tobacco plants were created using unique identifier sequences which are not found in tobacco. The unique identifier sequences inserted were isolated from *Pinus radiata*, SEQ ID NO: 402, and *Eucalyptus grandis*, SEQ ID NO: 403. The unique identifier sequences were inserted into *Agrobacterium tumefaciens* LBA4301 (provided as a gift by Dr. C. Kado, University of California, Davis, CA) by direct transformation using published methods (see, An G, Ebert PR, Mitra A, Ha SB, "Binary Vectors," in Gelvin SB, Schilperoort RA, eds., *Plant Molecular Biology Manual*, Kluwer Academic Publishers: Dordrecht, 1988). The presence and integrity of the unique identifier sequences in the *Agrobacterium* transgenic constructs were verified by restriction digestion and DNA sequencing.

Tobacco (*Nicotiana tabacum* cv. Samsun) leaf sections were transformed using the method of Horsch et al. (*Science*, 227:1229-1231, 1985). Three independent transformed plant lines were established for each unique sequence identifier used. Two empty-vector control plant lines were established using an empty gene transfer vector which lacked a unique sequence identifier.

The uniqueness of the sequence identifiers was assayed using Southern blot analyses to test for the presence of the sequence identifier in the genome of the plants. If the sequence identifier is unique and therefore useful as a tag, then the sequence identifier should be clearly absent in plants which have not been tagged and it should be clearly present in plants which have been tagged. In the present example, the unique identifiers would be expected to be absent in the empty-vector transformed control plants. The unique identifier would be expected to be present in the transgenic plants transformed with the unique sequence identifiers.

Genomic DNA was prepared from empty-vector transformed control plants and plants transformed with unique sequence identifiers using the cetyltrimethyl-ammonium bromide (CTAB) extraction method of Murray and Thompson (*Nucleic Acids Research* 8:4321-4325, 1980). The DNA samples were digested with the restriction enzyme EcoRI in the case of the plants transformed with the *Pinus* unique sequence identifier (SEQ ID NO: 402) and the restriction enzyme XbaI in the case of the plants transformed with the *Eucalyptus* unique sequence identifier (SEQ ID NO: 403). The DNA fragments produced in the restriction digests were resolved on a 1% agarose gel; the left panel of Figure 2 and the right panel of Figure 2 show the DNA fragment patterns of the DNA samples from the *Pinus* and *Eucalyptus* experiments, respectively.

After the agarose gel electrophoresis step, the DNA samples were transferred to Hybond-N+ brand nylon membranes (Amersham Life Science, Little Chalfont, Buckinghamshire, England) using methods established by Southern (*J. Mol. Bio.* 98:503-517). The nylon membranes were probed with radioactively-labeled probes for the unique sequence identifiers identified above and washed at high stringency (final wash: 0.5 X salt sodium citrate buffer (SSC) plus 0.1% sodium dodecyl sulfate (SDS), 15 minutes at 65°C). The hybridisation of the probes to complementary sequences in the genomic DNA samples was detected using auto-radiography. The results are shown in Figures 3 and 4.

Figure 3 (corresponding to the left panel of Figure 2) shows the hybridisation pattern detected in the Southern blot analysis using a probe derived from the *Pinus* sequence identifier (SEQ ID NO: 402). Lanes A-B contain DNA samples from empty-vector transformed control plants and lanes C-E contain DNA from plants transformed with SEQ ID NO: 402. There is no hybridization in lanes A-B indicating that SEQ ID NO: 402 is not present in empty-vector transformed tobacco plants; that is, SEQ ID NO: 402 is a unique tag suitable for unambiguous marking of tobacco plants. There is strong hybridisation in lanes

C-E indicating that the plants which received SEQ ID NO: 402 via transformation have been clearly and unambiguously tagged with the unique sequence contained in SEQ ID NO: 402.

Figure 4 (corresponding to the right panel of Figure 2) shows the hybridization pattern detected in the Southern blot analysis using a probe derived from the *Eucalyptus* sequence identifier (SEQ ID NO: 403). Lanes A-B contain DNA samples from empty-vector transformed control plants and lanes C-E contain DNA from plants transformed with SEQ ID NO: 403. There is no hybridisation in lanes A-B indicating that SEQ ID NO: 403 is not present in empty-vector transformed tobacco plants; that is, SEQ ID NO: 403 is a unique tag suitable for unambiguous marking of tobacco plants. There is strong hybridisation in lanes C-E indicating that the plants which received SEQ ID NO: 403 via transformation have been clearly and unambiguously tagged with the unique sequence contained in SEQ ID NO: 403.

The present example clearly demonstrates the utility of the sequences disclosed in this specification for the purposes of unambiguously tagging transgenic materials. A unique sequence was selected from a large number of potential tags and shown to be absent in the genome of the organism to be tagged. The tag was inserted into the genome of the organism to be tagged and a well-established DNA detection method was used to clearly detect the unique sequence identifier used as the tag.

Because of the sequence-specific detection methods used in the example, a user of the invention disclosed in this specification has both a high likelihood of finding a sequence identifier, among the list which has been disclosed, which will be useful for tagging any given organism and an unequivocal method for demonstrating that a tagged organism could only have acquired a given tag through the deliberate addition of the unique sequence to the genome of the organism to be tagged. If the user of this invention maintains the precise sequence of the tag used in a given organism as a secret, then any disputes as to the origin and history of the organism can be unambiguously resolved using the tag detection techniques demonstrated in the present example.

SEQ ID NOS: 1-403 are set out in the attached Sequence Listing. The codes for nucleotide sequences used in the attached Sequence Listing, including the symbol "n," conform to WIPO Standard ST.25 (1998), Appendix 2, Table 1.

All references cited herein, including patent references and non-patent publications, are hereby incorporated by reference in their entireties.

While in the foregoing specification this invention has been described in relation to certain preferred embodiments, and many details have been set forth for purposes of

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illustration, it will be apparent to those skilled in the art that the invention is susceptible to additional embodiments and that certain of the details described herein may be varied considerably without departing from the basic principles of the invention.

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Havukkala, Ilkka

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<210> 8

<211> 740

<212> DNA

<213> Pinus radiata

<400> 8

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aacaaatact	cacctgtggt	ttgttttctt	tctttcttga	acttttggtat	ggcaataatg	420
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cagtgaataa	ttttgttaga	gtgttttagat	ccatctttac	aaggctattg	agtaagggtg	600
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<210> 9

<211> 624

<212> DNA

<213> Pinus radiata

<400> 9

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<210> 10
 <211> 278
 <212> DNA
 <213> Pinus radiata

<400> 10						
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ctgatgttcg	ctacatatct	ggtggcctta	tgccaggcga	tcgatctccg	gcacctggaa	240
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<210> 11
 <211> 765
 <212> DNA
 <213> Pinus radiata

<400> 11						
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tcttgcccag	acgggaatga	cgaatccgat	cacaatttgc	agcccgtcga	gagcgcctgga	180
gctgctggaa	tattacccaa	ttgggtgttt	agcaggatcc	ccatatttca	agaggagttg	240
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gagttgggaa	ccgatttgct	aacagggccc	aagtggagaa	gccccggcga	agatatagaa	420
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gcttgggggtg	ggtgcgctgg	accattcact	ccacgtgcat	atcctgcgtc	tcctgcagcg	540
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cctaaacagc	ttgttcttcg	caataacgaa	tctttcatct	tcgttacttt	gtaaaagatg	720
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<210> 12
 <211> 453
 <212> DNA
 <213> Pinus radiata

<400> 12						
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tccggaacgc	tcaaataaag	atcctcgatt	acaggaaactg	gcgagtctct	cccgcacaat	180
caagccggcg	aaatctgcat	ccgcggaccc	gaaataatga	aaggatatat	taacgacccg	240
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attgacgatg	acgaagaaat	cttcatagtc	gacagagtaa	aggagattat	caatataaag	360
gcttccaggt	ggatcctgct	aatcgaattc	ctgcagcccc	ggggtccact	agttctagag	420
cggccgccac	cgcggtggag	ctccagcttt	tgt			453

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<210> 13
 <211> 278
 <212> DNA
 <213> Pinus radiata

<400> 13
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 attcgacgta atagacacca tcaaaactca agttgaggca gcctgcagtg gtgtcgtgtc 180
 agttgccgac attctcgcca ttgctgcacg cgattcagtc gtccaactgg ggggcccac 240
 atggacggta cttctggggag aaaagacgga tccgatca 278

<210> 14
 <211> 23
 <212> DNA
 <213> Pinus radiata

<400> 14
 cttegaattc wyttycayga ytg 23

<210> 15
 <211> 22
 <212> DNA
 <213> Pinus radiata

<400> 15
 gatcggatcc rtcyykycty cc 22

<210> 16
 <211> 472
 <212> DNA
 <213> Eucalyptus grandis

<400> 16
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 ctgcgccgcc gggagccacc atgccgaccc actgaactgg ggggcggcgg cagcagccct 180
 cacagggagc cacctcgacg aggtgaagcg gatggtcgag gagtaccgga ggccggcggt 240
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 ggtaggggtc gagctctcgg aggcggcccc tcccagggtc aaggccagca gcgactgggt 360
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<210> 17
 <211> 622
 <212> DNA
 <213> Eucalyptus grandis

<400> 17
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 gacgatccca caaattttta accggagagg tacgagggat tggaagggtga tcatgcctac 180
 cgactattgc cgtttgggat ggggaggaga agttgtcctg gtgctggcct tgccaataga 240
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 gccttgtgca aagcgcgtga atgcatgata gctaattgtt ttgcgcacct ttaagaaggt 420
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gccaatgcag ctttaggcct ttctcttagg agaaaaatga tggtttatat aggtactggc	600
aacattgttc aaaaaaaaaa aa	622

<210> 18
 <211> 414
 <212> DNA
 <213> Eucalyptus grandis

<400> 18	
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acccaccca catacagaca agtagatacg cgcacacaga agaagaaaag atggggggtt	180
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cgggtgaactg ggtgtggctg aggccgaaga ggctcgagag gcttctgaga cagcaaggtc	300
tctccggcaa gtcctacacc ttcttggtcg gcgacctcaa ggagaacctg cggatgctca	360
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<210> 19
 <211> 469
 <212> DNA
 <213> Eucalyptus grandis

<400> 19	
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gcccctaatc caaggcgga atccacttgg gctacgggta tgccgggttt ggcttcgtag	420
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<210> 20
 <211> 341
 <212> DNA
 <213> Eucalyptus grandis

<400> 20	
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<210> 21
 <211> 387
 <212> DNA
 <213> Eucalyptus grandis

<400> 21	
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cgcgagtctg gcgaagaagt atggcgggat cttccacctc cgcattgggt tcctgcacat	180
ggttgccgtg tcgtcccccg acgtggcccc ccaggctctc cagggtccacg accgggatctt	240
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cttcgcgcac tacggcccgt tctggcggca gatgcggaag ctgtgcgtga tgaaagctct 360
tcagcggaag cgggctgagt cgtggga 387

<210> 22
<211> 443
<212> DNA
<213> Eucalyptus grandis

<400> 22
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aaagcccaaa ctcgtacaga aggagagaga gagagagaat agaagcatga gtgcatgcac 180
gaaccaagca atcacgacgg ccagtgaaga tgaagagttc ttgttcgcca tggaaatgaa 240
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ctccatcctc tcttgactc tcg 443

<210> 23
<211> 607
<212> DNA
<213> Eucalyptus grandis

<400> 23
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gccggtg 607

<210> 24
<211> 421
<212> DNA
<213> Eucalyptus grandis

<400> 24
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c 421

<210> 25
<211> 760
<212> DNA
<213> Eucalyptus grandis

<400> 25

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cgaagcattc	ggaagtcggc	cacaagagcc	tcttgagag	cgatgctctc	taccagtata	180
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<210> 26

<211> 508

<212> DNA

<213> Eucalyptus grandis

<400> 26

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<210> 27

<211> 495

<212> DNA

<213> Eucalyptus grandis

<400> 27

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aagaggaagg	tggggcagcc	taaaggggca	ctgcgggtca	ctgcatcaag	caataagaag	180
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gacattaacg	gcgagaggcg	gatgaagtcg	caccaatttt	ggatgcctgc	caaaccttga	480
accagtcaac	tactg					495

<210> 28

<211> 472

<212> DNA

<213> Eucalyptus grandis

<400> 28

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<210> 29

<211> 396

<212> DNA

<213> Eucalyptus grandis

<400> 29

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cgtccgggta catcgctcg tggtcgtca agtcctcct ccagcgcggc tacaccgtca	180
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<210> 30

<211> 592

<212> DNA

<213> Eucalyptus grandis

<400> 30

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cgtccccgca tactccacca ccgcgtacag aagatgagct cggagggtgg gaaggaggat	120
tgctcgggtt gggctgcccc ggacccttct gggttcctct cccctacaa attcaccgcg	180
agggccgtgg gaagcgaaga cgtctcgatt aagatcacgc actgtggagt gtgctacgca	240
gatgtggctt ggactaggaa tgtgcaggga cactccaagt atcctctggt gccagggcac	300
gagatagttg gaattgtgaa acagggtggc tccagtgtcc aacgcttcaa agttggcgat	360
catgtggggg tgggaactta tgtcaattca tgcagagagt gcgagtattg caatgacagg	420
ctagaagtcc aatgtgaaaa gtcggttatg acttttgatg gaattgatgc agatgggtaca	480
gtgacaaagg gaggatattc tagtcacatt gtgcgtccatg aaagggtattg cgtcaggatt	540
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<210> 31

<211> 468

<212> DNA

<213> Eucalyptus grandis

<400> 31

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aaacaaatgg gttccgccgg attcgaatcg gccacaaagc cgcacgccgt ttgcattccc	120
taccctgcac aaagccacat tggcgccatg ctcaagctag caaagctcct ccatcacaag	180
ggcttccaca tctccttcgt caacaccgag ttcaaccacc ggcggctcgc cagggtcga	240
ggccccgagt tcacaaatgg aatgctgagc gactttcagt tcctgacaat ccccgatgg	300
cttcctcctt cggacttgga tgcgatccaa gacatcaaga tgctctgcga atcgtccagg	360
aactatatgg tcagcccccac caacgatcct gtatcgagcc tgggctcgaa cccgagcgtc	420
cctccggtga cttgcatcaa tctcgatgg tttcatgaca ctcgtgac	468

<210> 32

<211> 405

<212> DNA

<213> Eucalyptus grandis

<400> 32

ctttactccg ccaagaagat ccaatcgcag ttttcgcaat tggcccatta cacaatg	60
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gtccatcttc	atcggaagt	ctcttggcag	aagaccggag	ttgcatttcc	tggtggaca	120
agcaagcccc	taactcagt	gtctatgtga	gtcttgggag	catcgctct	gtgaacgagt	180
cgaatttttc	cgaaatagct	ttaggtttag	ccgatagcca	gcagccattc	ttgtgggtgg	240
ttcgaccggg	gtcagtgagc	ggctcggaac	tcttagagaa	tttgcccggt	tgctttctgg	300
aggcattaca	ggagaggggg	aagattgtga	aatgggcgcc	tcaacatgaa	gtgctggctc	360
atcgggctgt	cggagcggtt	tggactcaca	atggatggaa	ctcca		405

<210> 33

<211> 380

<212> DNA

<213> Eucalyptus grandis

<400> 33

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aggagctcac	aagcattggc	gacatcttcg	aggaggagaa	gaagcatgag	ggccctcagg	180
tcccgaccat	cgacctcgag	gacatagcgt	ctaaagacct	cgtgggtgag	gagaggtgcc	240
acgaggagct	caggaaggct	gccaccgact	ggggcgctcat	gcacctcgtc	aacctatggga	300
tccccaacga	cctgattgag	cgtgtaaaga	aggctggcga	ggtgttcttc	aacctcccga	360
tcgaggagaa	ggacaagcat					380

<210> 34

<211> 305

<212> DNA

<213> Eucalyptus grandis

<400> 34

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cgaggccgcc	gccggaggcc	ggggagaagc	tggagtagcc	gccgtagccg	gagaaggcgc	120
cgtcgtggtc	ggcggcggcg	gcgtgggtgga	cctcatcgcc	gtccatgctg	aaggcgctcg	180
aggaagcgga	catggctggg	ggatcgatcg	accgatccga	tcggccggag	gatttcgaga	240
tcggagatgg	agagatggaa	atgaaagaga	gagagagaga	gagatccggt	ggactgggtg	300
tgttt						305

<210> 35

<211> 693

<212> DNA

<213> Eucalyptus grandis

<400> 35

gaattcggca	cgagctaaga	gaggagagga	gaggagcaag	atggcactag	caggagctgc	60
actgtcagga	accgtgggtga	gctccccctt	tgtgaggatg	cagcctgtga	acagactcag	120
ggcattcccc	aatgtgggtc	aggccctgtt	tggtgtcaac	tctggccgtg	gcagagtgc	180
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cgcctaccct	aagtctgagg	tcaccattga	gaccacaag	gaagaggagc	tcactgcttg	480
aagctctcct	atatctgctt	ttgcataaat	cagtctcact	ctacgcaact	ttctccactc	540
tctccccctt	tcactacatg	tttgtttagtt	ccttttagtct	cttccttttt	tactgtacga	600
gggatgattt	gatgttattc	tgagtctaata	gtaatggctt	ttctttttcc	tatttctgta	660
tgaggaaata	aaactcatgc	tctaaaaaaa	aaa			693

<210> 36

<211> 418

<212> DNA

<213> Eucalyptus grandis

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<400> 36

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atgccttagt	ttgaaaaatt	aaccaactat	taaaattaat	gatgatgaat	atggattatg	180
tgtgaaaaac	tatatagact	taaaattgac	tcagaagaca	ttcttttctt	cttattttat	240
gatatgatga	attcgggtcta	aacaggcaaa	tggtgtcaaa	cgggaagtcg	gcaaaaactct	300
tcctcggcag	tgactaccgg	gcgggcgatg	atgcggatcc	gggggccggg	tcgctggaga	360
acatcccgca	cggaccggtc	cacgtttggt	gcggtgacaa	caggcagccc	aacctgga	418

<210> 37

<211> 777

<212> DNA

<213> Eucalyptus grandis

<400> 37

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ggacaccggg	ataatcgcg	cggagaccca	ccccatccat	ctgcacggat	tcaacttctt	180
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ttggggactg	aagatggcat	tcttggtgga	caatgggaag	gggcctaaag	agaccctgct	420
tccacctcca	agtgatcttc	caaaatgttg	atcatttgat	catgaggacg	acaagcgatt	480
actaatgaca	ccaagttagt	ggaatcttct	ctttgaaaaa	gaagaagaag	agcaagaaga	540
ataagaaaga	tgaggagaga	agccatagaa	gatttgacca	agaagagaga	gggcaataaa	600
ccaaagagac	ccttgagatc	acgacatccc	gcaattgttt	ctagagtaat	agaaggattt	660
actccgacac	tgctacaata	aattaaggaa	gacaaggaat	ttggtttttt	tcattggagg	720
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<210> 38

<211> 344

<212> DNA

<213> Eucalyptus grandis

<400> 38

atatgttcag	aatttcaa	gtgggaatgt	caacctcctt	gaacttcaga	attcagggcc	60
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tcgatgttca	cgtgggccaa	tccatggctg	tcttagtgac	cttaaatcag	cctccaaagg	180
actactacat	tgtcgcatcc	accgggttca	ccaagacggt	tctcaatgca	actgcagtgc	240
tacactacac	caactcgctt	acccagttt	ccgggccact	accagctggt	ccaacttacc	300
aaaaacattg	gtccatgaag	caagcaagaa	caatcaggtg	gaac		344

<210> 39

<211> 341

<212> DNA

<213> Eucalyptus grandis

<400> 39

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gggagctctc	ctcctcttct	ctgtggcggt	gacattggca	gatgcaaaag	tttactacca	120
tgattttgtc	gttcaagcga	ccaagggtgaa	gaggctgtgc	acgaccacac	acaccatcac	180
ggtgaacggg	caattcccgg	gtccgacttt	ggaagttaac	gacggcgaca	ccctcggtgt	240
caatgtcgtc	aacaaagctc	gctacaacgt	caccattcac	tggcacggcg	tccggcaggt	300
gagatctggt	tgggctgatg	gggcggaatt	tgtgactcaa	t		341

<210> 40

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<211> 358
 <212> DNA
 <213> Eucalyptus grandis

<400> 40

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cagaattcag	ggccatacgt	tgaagctagt	cgaggttgaa	ggatctcaca	ccgtccagaa	120
catgtatgat	tcaatcgatg	ttcacgtggg	ccaatccatg	gctgtcttag	tgaccttaaa	180
tcagcctcca	aaggactact	acattgtcgc	atccacccgg	ttcaccaaga	cggttctcaa	240
tgcaactgca	gtgctacact	acaccaactc	gcttacccca	gtttccgggc	cactaccagc	300
tggtccaact	taccaaaaac	attggtccat	gaagcaagca	agaacaatca	ggtggaac	358

<210> 41
 <211> 409
 <212> DNA
 <213> Eucalyptus grandis

<400> 41

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tgctgatcgg	cgcagctgc	attctcttcg	taaaacatga	cggctgtcgg	caaaacctct	120
ttctctttgg	gagctctcct	cctcttctct	gtggcgggtga	cattggcaga	tgcaaaagtt	180
tactaccatg	attttgtcgt	tcaagcgacc	aaggtgaaga	ggctgtgcac	gacccacaac	240
accatcacgg	tgaacgggca	attcccgggt	ccgactttgg	aagttaacga	cggcgacacc	300
ctcgttgtca	atgtcgtcaa	caaagctcgc	tacaacgtca	ccattcactg	gcacggcgtc	360
cggcaggtga	gatctggttg	ggctgatggg	gcggaatttg	tgactcaat		409

<210> 42
 <211> 515
 <212> DNA
 <213> Eucalyptus grandis

<400> 42

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ctggtgctcc	tgtctggaac	aataactctt	cgttgactgt	tggaagcaga	ggtccaattc	180
ttcttgagga	ttatcacctc	gtggagaaac	ttgccaaact	tgatagggag	aggattccag	240
agcgtgtggt	gcatgccaga	ggagccagtg	caaagggatt	ctttgaggtc	actcatgaca	300
tttcccagct	tacctgtgct	gatttccttc	gggcaccagg	agttcaaaca	cccgtgattg	360
tccgtttctc	cactgtcatc	cacgaaaggg	gcagccctga	aaccctgagg	gaccctcgag	420
gttttgctgt	gaagttctac	acaagagagg	gtaactttga	tctggtggga	aacaatttcc	480
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<210> 43
 <211> 471
 <212> DNA
 <213> Eucalyptus grandis

<400> 43

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gtaagccagg	agtacaagaa	ggctgtcgag	aaatgcaaga	agaagttgag	aggcctcatc	180
gctgagaaga	gctgcgctcc	gctcatgctc	cgcacgcgct	ggcactccgc	cggtaacctc	240
gatgtgaaga	cgaagaccgg	aggcccgttc	gggaccatga	agcacgccgc	ggagctcagc	300
cacggggcca	acagcgggct	cgacgttgcc	gatcaggtct	tgacgccgat	caaggatcag	360
ttccccgtca	tcacttatgc	tgattttctac	cagctggctg	gcgtcgttgc	tgtggaagtt	420
actggtggac	ctgaagttgc	ttttcaccgc	gaagagaggg	aaaccacaac	c	471

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<210> 44
 <211> 487
 <212> DNA
 <213> Eucalyptus grandis

<400> 44
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 cgtccagcgc ttacgattcc agcttttgga caaccaacta cggtgctccc gtctggaaca 180
 atgactcatc gctgactgtt ggaactagag gtccgattct cctggaggac taccatctga 240
 ttgagaaact tgccaacttc gagagagaga ggattcctga gcggtgggtc catgcacggg 300
 gagccagcgc gaaaggggtc ttcgaggtca cccacgacat ctctcacttg acctgtgctg 360
 atttcctccg ggctcctgga gtccagacgc ccgtaatcgt ccgtttctcc accgtcatcc 420
 acgagcgcgg cagcccgaac ctcagggacc ctcgtgggtt tgcagtgaag ttctacacca 480
 gagaggg 487

<210> 45
 <211> 684
 <212> DNA
 <213> Pinus radiata

<400> 45
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 gcgcgcctgc aggtcgacac tagtggtatcc aaagaattcg gcacgaggcc cgacggccac 120
 ttgttggaag ccatggaagc tctccggaaa gccgggattc tggaaccggt taaactgcag 180
 cccaaggaag gactggctct cgtcaacggc acagcgggtg gatccgccgt ggccgcgtcc 240
 gtctgttttg acgccaacgt gctgggctg ctggctgaga ttctgtctgc gctcttctgc 300
 gaggtgatgc aagggaacc ggagttcgta gatccgttaa cccaccagtt gaagcaccac 360
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 aaagaagcag cgcggcttca cgagaaagac ccgttgagca aaccgaaaca agaccgctac 480
 gctctgcgaa catcgccaca gtgggtgggg cctccgatcg aagtcattcc cgctgctact 540
 cactccatcg agcgggagat caattccgtc aacgacaatc cgttaatcga tgtctccagg 600
 gacatggctc tccacggcgg caacttccag ggaacacca tcggagtttc catggacaac 660
 atgcgaatct ctttggcagc cgctc 684

<210> 46
 <211> 418
 <212> DNA
 <213> Pinus radiata

<400> 46
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 gaactcctgg ccatttctga aataaataat cttccaagat cgcctttata caacgactgc 120
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 aaagtggcgg atcatttggg tagcatgcag atcagttggg tgatcgtgta ctgctttcac 360
 tattacttac atatttaaag atcgggaata aaaacatgat tttaattgaa aaaaaaaaa 418

<210> 47
 <211> 479
 <212> DNA
 <213> Pinus radiata

<400> 47
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ttcgagcagc	caaggccatg	gaaggaagtc	actttgaaga	agtgaagcg	atgggtggatt	240
cgtatttggg	agccaaggag	atttccattg	aagggaaatc	tctgacaatc	tcagacgttg	300
ctgccgttgc	tcgaagatcg	caagtgaag	tgaaattgga	tgctgcggct	gccaaatcta	360
gggtcgagga	gagttcaaac	tgggttctca	cccagatgac	caaggggacg	gatacctatg	420
gtgtcactac	tggtttcggg	gccacttctc	acaggagaac	gaaccaggga	gccgagctt	479

<210> 48

<211> 1785

<212> DNA

<213> Pinus radiata

<400> 48

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cacgaggttg	caggtcgggg	atgatttgaa	tcacagaaac	ctcagcgatt	ttgccaagaa	180
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cgatctcgcc	aaggaggtcc	tgcacacca	gggcgtcgag	tttgggtctc	gaaccggaa	300
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gcactacaga	ttcgcgtggg	aagacgagat	cagccgcgtg	gtcgcggatg	tgaaatcccg	480
cgccgagtct	tccacctcgg	gcattgtcat	ccgtaggcgc	ctccagctca	tgatgtataa	540
tattatgtat	aggatgatgt	tcgacaggag	attcgaatcc	gaggacgacc	cgcttttctt	600
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tggggatttc	attcccatct	ttaggcctt	cctcagaggt	tatctcagaa	tctgcaatga	720
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tagcacttca	aaagtttgct	aggatttcaa	taacagacac	cgtcaattat	gtcatgtttc	1680
aataaaagtt	tgcataaatt	aaatgatatt	tcaatatact	attttgactc	tccaccaatt	1740
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<210> 49

<211> 475

<212> DNA

<213> Pinus radiata

<400> 49

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cgaggcgctc	gtacagaagg	gctccgtctt	cgctgaccgc	ccgccccgcc	tcgggatgca	360
gaaaatcttc	agtagcaacc	agcacaacat	cacttcgggt	gaatacggcc	cgctgtggcg	420

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475

<210> 50

<211> 801

<212> DNA

<213> Pinus radiata

<400> 50

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cgtatgttgt	gtggaattgt	gagcggataa	caatttcaca	caggaaacag	ctatgaccat	180
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<210> 51

<211> 744

<212> DNA

<213> Pinus radiata

<400> 51

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aaccacgggg	gcaaggaacg	cacagagcaa	gaatttcaag	atttagctaa	ggagacggga	660
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<210> 52

<211> 426

<212> DNA

<213> Pinus radiata

<400> 52

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<210> 53
 <211> 562
 <212> DNA
 <213> Pinus radiata

<400> 53
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 caggatttct tcttgtccaa acaggtttaa ggaaatggca ggcacaagtg ttgctgcagc 180
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 cgtgtaccct cgtgagcccg agccaatgaa ggagctccgc gaagtgactg ccaagcatcc 360
 ctggaacctc atgactactt ctgccgatga ggggtcaattt ctgggectcc tgctgaagct 420
 cattaacgcc aagaacacca tggagattgg ggtgtacact gggtactcgc ttctcagcac 480
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 tgatatcgga ttgcctataa tt 562

<210> 54
 <211> 1074
 <212> DNA
 <213> Pinus radiata

<400> 54
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 cgctcttctt tctgatggca aggtggtagc tgtggatcca ggagatgacc ccaaatttgg 480
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 tttctgttta gccagaatgt ttcgatcgtc atgggtttctg ttaaagccag aataaaatta 1020
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<210> 55
 <211> 1075
 <212> DNA
 <213> Pinus radiata

<400> 55
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tcgtggacgc	agacaaagtg	aactacgtga	actatcatcc	acggctgatg	aagttagtgc	660
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<210> 56

<211> 1961

<212> DNA

<213> Pinus radiata

<400> 56

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<210> 57

<211> 1010

<212> DNA

<213> Pinus radiata

<400> 57

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<210> 58

<211> 741

<212> DNA

<213> Pinus radiata

<400> 58

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gcatttgcca	aattgtgggt	tataatcctt	cgtagggtgtt	tggcagaaca	gaacctcctg	300
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gtgttagtga	acggaatgat	gtcaaactct	gatgggctga	ctgactctct	tgtgatgtca	660
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<210> 59

<211> 643

<212> DNA

<213> Pinus radiata

<400> 59

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<210> 60

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<211> 441
 <212> DNA
 <213> Pinus radiata

<400> 60
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 tggcatcttg gcttatcaag cgtctcctcc agtgtgggta ccaagtgaga ggaactgtgc 180
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 gctgccatgg tgtttttcac acagcgtctc cagtcgtggg tgtcaaatca gatcccaaga 360
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<210> 61
 <211> 913
 <212> DNA
 <213> Pinus radiata

<400> 61
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 aatcctccgg tccatcgagg aacagtgtgc gttacaggag ctgctgggtt cataggggtca 180
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<210> 62
 <211> 680
 <212> DNA
 <213> Pinus radiata

<400> 62
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<210> 63

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<211> 492
 <212> DNA
 <213> Pinus radiata

<400> 63
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 gagctgctgg cttcatagga tcatggctcg tcatgcggtt gcttgagcga ggatatactg 180
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 ccgaggaccc cgagaacgag ataattaaac ccgctgtcaa tgggatgttg aatgttttga 420
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 tgctttttac gg 492

<210> 64
 <211> 524
 <212> DNA
 <213> Pinus radiata

<400> 64
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<210> 65
 <211> 417
 <212> DNA
 <213> Pinus radiata

<400> 65
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 ataacgagag gacagaagta agtttgtgga aatagcaacc atgcgggtgt ttccttctgg 180
 tctggacccc tctgaggaca atggcaagct cgtttgtgtc atggatgcgt ccagttatgt 240
 aggtttgtgg attgttcagg gccttcttca acgaggctat tcagtgcagc ccacgggtgca 300
 gagagacgct ggcgagggtg agtctctcag aaaattgcat ggggatcgat tgcagatctt 360
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<210> 66
 <211> 511
 <212> DNA
 <213> Pinus radiata

<400> 66
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 tgaagaaaat ggatacggcg cttccaattc tcggaaatta atgtgcctta ccgggggctg 180
 gagtttcctg gggattcata tcgcaagaat gctgctcggc cgggggttact cagtccgttt 240
 cgcaattccg gtaacgccag aagaggcagg ctacttatg gaatccgaag aagcattatc 300
 ggggaagctg gagatatgcc aagccgatct cttggattat cgcagcgttt tcggcaacat 360

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caatgggtgc tccggagtct tccacgtccc tgcgccctgt gatcatctgg atggattaca	420
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gaatttaagg ttttcttaga atttgatac t	511

<210> 67
 <211> 609
 <212> DNA
 <213> Pinus radiata

<400> 67	
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aatatgtaat ccataaactt atgcaggaag tgcctcgtgc cgaattcggc acgagaatca	180
ctgaccttca catatattatt ccaattctaa tatctctact cgctgtctac ctgatttttc	240
agtggcgaac caacttgaca gggttggaca tggccaacag cagcaagatt ctgattattg	300
gaggaacagg ctacattggt cgtcatataa ccaaagccag ccttgctcct ggatcatcca	360
cattccttct tgtcagagag acctccgctt ctaatcctga gaaggctaag cttctggaat	420
ccttcaaggc ctcaggtgct attatactcc atggatcttt ggaggaccat gcaagtcttg	480
tggaggcaat caagaaagt gatgtagtta tctcggctgt caagggacca cagctgacgg	540
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tttggccaa	609

<210> 68
 <211> 474
 <212> DNA
 <213> Pinus radiata

<400> 68	
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gctctatgta gctgcagaca tgggtgaaaa caacacgtct attgtgacca cctctatggc	180
tgcagcaaat tgtgagatgg agaagcctct tctaaattcc tctgccacct caagaatact	240
ggtgatggga gccacagggt acattggccg ttttggtgcc caagaagctg ttgctgctgg	300
tcatactacc tatgctctta tacgcccgtt tgctgcttgt gacctggcca aagcacagcg	360
cgtccaacaa ttgaaggatg ccgggggtcca tatcctttat gggctcttga gtgatcacia	420
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<210> 69
 <211> 474
 <212> DNA
 <213> Pinus radiata

<400> 69	
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gctctatgta gctgcagaca tgggtgaaaa caacacgtct attgtgacca cctctatggc	180
tgcagcaaat tgtgagatgg agaagcctct tctaaattcc tctgccacct caagaatact	240
ggtgatggga gccacagggt acattggccg ttttggtgcc caagaagctg ttgctgctgg	300
tcatactacc tatgctctta tacgcccgtt tgctgcttgt gacctggcca aagcacagcg	360
cgtccaacaa ttgaaggatg ccgggggtcca tatcctttat gggctcttga gtgatcacia	420
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<210> 70
 <211> 608
 <212> DNA
 <213> Pinus radiata

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<400> 70

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aatatgtaat	ccataaactt	atgcaggaag	tgcctcgtgc	cgaattcggc	acgagaaatca	180
ctgaccttca	aatattttatt	ccaattctaa	tatctctact	cgctgtctac	ctgatttttc	240
agtggcgaac	caacttgaca	gggttggaca	tggccaacag	cagcaagatt	ctgattattg	300
gaggaacagg	ctacattggt	cgtcatataa	ccaaagccag	ccttgctctt	ggtcatccca	360
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tggaggcaat	caagaaagtt	gatgtagtta	tctcggctgt	caagggacca	cagctgacgg	540
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ttggccaa						608

<210> 71

<211> 1474

<212> DNA

<213> Pinus radiata

<400> 71

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agagcatgga	acaatactgc	agcaagagga	tttggaacct	caatgatgtg	aacctgacg	480
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gaatcccggga	gaatcttcct	ctggaacaag	cggcccctct	gttatgtgca	ggggttacag	600
ttttcagccc	aatgaagcat	ttcgccatga	cagagcccgg	gaagaaatgt	gggatttttg	660
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ttcagatgtt	tttttaactt	gtatatgtaa	agatcaattt	ctcgtgacag	taaataataa	1380
tccaatgtct	tctgccaat	taatatatgt	attcgtattt	ttatatgaaa	aaaaaaaaaa	1440
aaaaaaaaaa	aaaaaaaaaa	aaaaaaaaaa	aaaa			1474

<210> 72

<211> 1038

<212> DNA

<213> Pinus radiata

<400> 72

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tgccaagctc	tgggccacgg	atttggaatc	tcgtgtcctc	ggggcaccag	agtactgcaa	120
ggcgaatttc	acaaagtatt	tcaccgataa	tttctgggtg	gatcccgcac	tatccaagac	180
ctttgagggg	aaaaaacctt	gctacttcaa	cacaggcgta	atggatgatc	atcttgaaaa	240
atggcgggca	ggggaattca	caagaaagat	cgaaatcttg	atggacatac	agaaggaacg	300
ccgtatctat	gagctcggat	cattaccgcc	atttttactg	gtatttgctg	gtttgggttaa	360

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gcaagtcgat	catcggttga	atcagcacgg	tttaggcgga	gataatttgc	aaggcctttg	420
ccgagatctt	caccctggac	ctgtcagttt	gttgcattgg	agtggtaagg	gcaaaccttg	480
gctacgcctg	gaatgccaag	cggacttgcc	ctctggatac	tttatgggct	ccttatgatc	540
tttatcgatc	aacgtattac	ctaaatgggt	gagagagcct	ctctcctcgg	ggtgcttttt	600
atcgaattaa	acctgatattg	ataaaatgcc	aaatagaact	ttacgcctat	gcattctttca	660
gttttgaatt	tcaattcttg	taacgaatag	aagaaaacaa	tagcacagcc	acaggcagga	720
caaatccatc	atgaggggacc	aatcgtttga	atttagtatt	aataaggttg	ttccatataa	780
cgcctgtgaa	gaatgatatt	gtggactgat	ctattttatat	ttgtactgcc	atgccatcct	840
cagccagcag	agaggcaagc	aatgccgctg	caagtcatgt	aggggaaggcg	ttgtgaactc	900
aattttcggc	gactgtacag	gatgtaaatt	tttggaacat	taatatcatt	atgataagtt	960
cctgaaccaa	caactgtata	ataccttata	aatgtatctg	caactccatt	tttgcataaa	1020
aaaaaaaaaa	aaaaaaaaaa					1038

<210> 73
 <211> 372
 <212> DNA
 <213> Pinus radiata

<400> 73						
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catgcaagag	atctgtagtc	agtagtcttg	ttggatctat	agctttttaga	aaagagtcac	120
gtccttttag	ggtaacatca	ttccaacccat	atccagttcc	accaccggct	acaccttcaa	180
cgggaggagg	agcaagatat	tcagcattgc	tttgggcacc	agatggatag	gcattatttt	240
ccatcggaat	tcagccgagc	tcgccccctc	agtccaatcg	tcgtgaaaat	ccctcaaaat	300
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aaatctgcca	gt					372

<210> 74
 <211> 545
 <212> DNA
 <213> Pinus radiata

<400> 74						
aaagaattcg	gcacgagggc	aatccgagcc	tagccaacca	acttggcagc	aaggagcaca	60
gggagttggc	gagagaagct	gttaggaaat	ctttggtatt	gttgaaaaat	gggaagtcag	120
ccaacaagcc	tttgctccct	ttggagaaga	atgcttccaa	ggttcttggt	gcaggaaccc	180
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gaaacataac	cgtaggaact	acaattctgg	aagctatcaa	actagctgtc	agccccctcta	300
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tgaccattcc	cctaggcgga	ggggacacga	ttaagacggt	ctgtggctcc	ttgaaatgcc	480
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gtttt						545

<210> 75
 <211> 463
 <212> DNA
 <213> Pinus radiata

<400> 75						
gcaggtcgac	actagtggat	ccaaagaatt	cggcacgaga	aaaaacaaat	gttagctagc	60
ctagtgatga	gctttacgta	tacctggcct	tttatacatg	gatctgagtt	tttatgcagg	120
tgtagagcct	tttgttactc	tgtatcactg	ggacttgcca	caagctctgg	aggacgaata	180
cggtaggattt	cgtagcaaaa	aagttgtgga	tgactttggc	atattctcag	aagaatgctt	240
tcgtgctttt	ggagaccgtg	tgaagtactg	ggtaactggt	aacgaaccgt	tgatcttctc	300
atatttttct	tacgatgtgg	ggcttcacgc	accgggcccgc	tgctcgccctg	gatttggaaa	360
ctgcactgcy	ggaaattcag	cgacagagcc	ttatattgta	gcccataaca	tgcttcttgc	420

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acatagtagtacc gctgtttaaaa atatatacgca taaataccca ggg

463

<210> 76
 <211> 435
 <212> DNA
 <213> Pinus radiata

<400> 76

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tggagctacc	agggatcctg	atctggctag	aagaataggg	gctgctacgg	ctttggaagt	120
tcgagctact	ggcattcaat	acacatttgc	tccatgtgtt	gctgtttgca	gagatcctcg	180
atggggccgc	tgctatgaga	gctacagtga	ggatccaaaa	attgtcaagg	ccatgactga	240
gattatcggt	ggcctgcaag	ggaatcctcc	tgctaattct	acaaaagggg	ggccttttat	300
agctggacag	tcaaattgtg	cagcttgtgc	taagcatttt	gtgggttatg	gtggaacaac	360
caaaggtatc	gatgagaata	atactgttat	caactatcaa	gggttatattc	aacattccaa	420
attaccccca	attttt					435

<210> 77
 <211> 451
 <212> DNA
 <213> Pinus radiata

<400> 77

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cactgcttat	tacatgtatg	atcctaaaca	acctaaacaa	aatgtaacag	attaccagac	180
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actccaattg	gctttacatt	gtgccttggg	gtctatacaa	ggccgtcaca	tacgtaaaag	300
aacactatgg	aaatccaact	atgattctct	ctgaaaatgg	aatggacgac	ctggaaacgt	360
gacacttcca	gcaggactgc	atgataccat	caggggtaac	tactataaaa	gctatttgca	420
aaatttgatt	aatgcacgtg	aatgaccggg	g			451

<210> 78
 <211> 374
 <212> DNA
 <213> Pinus radiata

<400> 78

ctgctctgca	agcagtacta	tgcacagcaa	ggcctgctta	actgaaaaca	gagcgctgag	60
cttgaggaaa	cgctcaagca	ttgctgaggc	caccgtttat	ctaaatagcg	caacataggg	120
cttcagaaaa	atggcaatgg	cacaagcatt	cagaggccgt	gtcttgcaag	ctgcccgttt	180
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agctcttagc	ctgctctcat	caaaaagcctt	catctctttc	tctgttgaac	ggcatcggct	300
agctgctaca	aattcaacaa	ttgtgttgca	atctcgaaac	ttttctgcaa	aaggtaaaaa	360
gacaggacaa	tctg					374

<210> 79
 <211> 457
 <212> DNA
 <213> Pinus radiata

<400> 79

gaagaatgga	agagattaat	ggtgataacg	cagtaaggag	gagctgcttt	cctccaggtt	60
tcatgttttg	gatagcaact	tctgcttata	agtgtgaagg	agctgccaac	gaaggtggaa	120
aaggcccaag	catctgggac	tcattttcac	gaacaccagg	caaaattctt	gatggaagca	180
acggtgatgt	agcagtggat	cagtatcatc	gttataaggc	agatgtaaaa	ctgatgaaag	240
atatgggcgt	ggctacctac	agattctcga	tttcatggcc	tcgtatatatt	ccaaagggaa	300

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aaggagagat	caatgaggaa	ggagtagcct	attacaataa	cctcatcaat	gaactcctcc	360
agaatggaat	ccaagcgtct	gtcaactttg	tttcaactggg	atactcccca	gtctctggag	420
gatgaatatg	gcggatttct	gaggccaacc	attgtga			457

<210> 80
 <211> 346
 <212> DNA
 <213> Pinus radiata

<400> 80						
ggtgtgatgg	caggaattcc	agtcctaagg	ccattttgca	tctgtttgct	ttcagtctac	60
atgctgcaca	ttgtagctgc	agtagcttca	ccaaggctag	gtagaagcag	cttcccaagg	120
ggtttcaa	ttggtgcagg	gtcatctgct	tatcaggcgg	aaggagctgc	tcatgagggg	180
ggcaaaggcc	caagcatttg	ggatacattc	tcccacactc	caggtaaaat	cgctgatggg	240
aatattggga	tgttgcagta	gatcaatacc	accgttataa	ggaagatgtg	cagctttctca	300
aatacatggg	aatggacgtc	tatcgtttct	ctatctcctg	gtcacg		346

<210> 81
 <211> 957
 <212> DNA
 <213> Pinus radiata

<400> 81						
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ctgggtcaggt	tccagcattt	ccaaaataca	cacctgctgt	tgtccaaaga	aatttgaaat	180
cttgcactca	gccctacatt	gatttagcaa	acaactacag	tagtgggaaa	atttctgtat	240
tggaagcttg	tgtcaacacg	aacacagaga	agttcaagaa	tgatagtaat	ttgggggttag	300
tcaagcaagt	tttgtcatct	ctttataaac	ggaatattca	gagattgaca	cagacatatc	360
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aactccatgt	tctgcagatg	attcaagatg	gtgagatttt	tgcaaccata	aatcagaaag	480
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atatagatac	tgcaattcgg	agaatcatgg	cactatcaaa	gaagctcacc	acagtagatg	600
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tcatcttcaa	gactcgctta	tattcattac	tttctatgtg	aattgatagt	ctgttaacaa	780
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aaaatctcaa	atttctcgat	gtctagtctt	gattttgatt	atgaatgcga	cttttagttg	900
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<210> 82
 <211> 489
 <212> DNA
 <213> Pinus radiata

<400> 82						
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ggactagagt	aaaagtcctt	ccctttaaca	caactgttca	attgattctt	caagacacca	180
gcatcttcag	cacagacagc	cacctgtcc	atctccatgg	tttcaatttc	tttgtggtgg	240
gccaaagggtg	tggaaactac	aatgaatcaa	cagatgcacc	aaatttttaac	ctcattgacc	300
ctgtcgagag	aaacactgtg	ggagttccca	aaggaggttg	ggctgctata	agatttcgtg	360
cagacaatcc	aggggttttg	ttcatgcact	gtcattttgga	ggttcacaca	tcgtgggggac	420
tgaaaatggc	gtgggtagta	aagaacggaa	aaggggcccat	cgattttcca	cccgggtggg	480
taccagtaa						489

<210> 83

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<211> 471
 <212> DNA
 <213> Pinus radiata

<400> 83
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 tattccaacg ggcaaggagt tcccttcgat aacaccacta ccaactgccat tttagaatac 180
 gagggaagct ctaagacttc aactccagtc atgcctaate ttccattcta taacgacacc 240
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 tgtccggggc agtcttgtgg aggtccaacg gatcaagatt tgcagcaagt atgaatacat 420
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<210> 84
 <211> 338
 <212> DNA
 <213> Pinus radiata

<400> 84
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 aatcagtgcg tctatcttct gctctccttg ttttgctact agcatttgtt gcttacttag 180
 ttgctgtaac aaacgcagat gtccacaatt ataccttcat tattagaaag agacagttac 240
 caggctatgc aataagcgta taatcgccac cgtcaatggc agctaccagg cccaactatt 300
 catgtacgtg atggagacgt tggttaattat caaagctt 338

<210> 85
 <211> 1229
 <212> DNA
 <213> pinus radiata

<400> 85
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 gtcttttctc gtgccgaatt cggcacgaga agatcttggt tcgagtcctc cagctctctc 180
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<210> 86
 <211> 1410

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<212> DNA

<213> Pinus radiata

<400> 86

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atgaattact	atgggggactc	ttgccctcag	gctgaagaga	tcattgctga	acaagtacgc	180
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attctagtat	aattttgtca	tcagttaaag	ttgctcatct	gataataact	ggaaacggta	1320
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<210> 87

<211> 687

<212> DNA

<213> Pinus radiata

<400> 87

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ataattttctg	tcaatggatt	agttgtccat	gaagatgac	tgtcaaagcc	tgtgcatggg	180
ctttcgtgga	cattttataa	ggacagttgc	cccgaacttg	aggccatagt	gaaatcggtg	240
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<210> 88

<211> 688

<212> DNA

<213> Pinus radiata

<400> 88

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gatgacgaag	tacgtgatcg	ttagctccat	tgtatgtttc	tttgtatttg	tttctgcgtg	120
cataatttct	gtcaatggat	tagttgtcca	tgaagatgat	ctgtcaaagc	ctgtgcatgg	180

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gctttcgtgg	acattttata	aggacagttg	ccccgacttg	gaggccatag	tgaaatcggt	240
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catgactggt	ttgtgcaggg	ttgcgatggg	tccgtggtgc	tgacaggaac	taaaagaaac	360
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tggccgcaga	gatagcctaa	agtttgccag	tcaatccgta	gttctcgcca	atataccaac	600
tccaacttta	aatttgacac	agctgatgaa	catttttggc	tccaaaggat	tcagtttggc	660
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<210> 89

<211> 278

<212> DNA

<213> Pinus radiata

<400> 89

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attcgacgta	atagacacca	tcaaaactca	agttgaggca	gcctgcagtg	gtgtcgtgtc	180
atgtgccgac	attctcgcca	ttgctgcacg	cgattcagtc	gtccaactgg	ggggcccaac	240
atggacggta	cttctgggag	aaaagacgga	tccgatca			278

<210> 90

<211> 1960

<212> DNA

<213> Pinus radiata

<400> 90

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ggtcgagcat	ctgtacagat	cgaagcttcc	cgatatcgag	atctccgacc	atctgcctct	180
tcattcgtat	tgctttgaga	gagtagcgga	attcgcagac	agaccctgtc	tgatcgatgg	240
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cggctctggcg	aagctcgggt	tgcagcaggg	gcaggttgtc	atgcttctcc	ttccgaattg	360
catcgaattt	gcgtttgtgt	tcatgggggc	ctctgtccgg	ggcgccattg	tgaccacggc	420
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catagttacc	ctggcagctt	atgtggagaa	actggccgat	ctgcagagcc	acgatgtgct	540
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aacgccctac	actcttgcca	tcgctttcaa	tatgcatatt	actataaacg	atatatgttt	1920
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<210> 91
 <211> 701
 <212> DNA
 <213> Pinus radiata

<400> 91						
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ctttcgtgga	cattttataa	ggacagttgc	cccgaacttg	aggccatagt	gaaatcggta	240
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caactttaaa	tttgacacag	ctgatgaaca	tttttggctc	caaaggattc	agtttggccg	660
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<210> 92
 <211> 626
 <212> DNA
 <213> Pinus radiata

<400> 92						
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cagattcgcg	tgggaagacg	agatcagccg	cgtggtcgcg	gatgtgaaat	cccgcgccga	360
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gagaaacggc	tctctctttt	caagga				626

<210> 93
 <211> 660
 <212> DNA
 <213> Pinus radiata

<220>
 <221> unsure
 <222> (1)...(660)
 <223> n at all occurrences indicates unsure

<400> 93						
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<210> 94

<211> 1012

<212> DNA

<213> Pinus radiata

<400> 94

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<210> 95

<211> 1460

<212> DNA

<213> Pinus radiata

<400> 95

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tgtgcagaga	agaaggtatc	atcgatgatt	gaggttggtg	gcctggacta	catcaacacg	1080
gccatggaaa	ggttggagaa	gaacgatgtc	cgttacagat	ttgtgggtgga	tggttgctaga	1140

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taacttgtat	atgtaaagat	caatttctcg	tgacagtaaa	taataatcca	atgtcttctg	1380
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aaaaaaaaaa	aaaaaaaaaa					1460

<210> 96
 <211> 788
 <212> DNA
 <213> Pinus radiata

<400> 96						
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<210> 97
 <211> 577
 <212> DNA
 <213> Pinus radiata

<400> 97						
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<210> 98
 <211> 492
 <212> DNA
 <213> Pinus radiata

<400> 98						
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gatcatcagc	ccgttttctc	gtacatcgac	gatcccacaa	atccatcata	cgcgcttatg	360

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<210> 99
 <211> 391
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 <213> Pinus radiata

<400> 99		
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<210> 100
 <211> 567
 <212> DNA
 <213> Eucalyptus grandis

<400> 100		
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<210> 101
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 <212> DNA
 <213> Eucalyptus grandis

<400> 101		
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<210> 102
 <211> 455
 <212> DNA
 <213> Eucalyptus grandis

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<400> 102

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<210> 103

<211> 1866

<212> DNA

<213> Eucalyptus grandis

<400> 103

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<210> 104

<211> 519

<212> DNA

<213> Eucalyptus grandis

<400> 104

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<210> 105

<211> 594

<212> DNA

<213> Eucalyptus grandis

<400> 105

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<210> 106

<211> 407

<212> DNA

<213> Eucalyptus grandis

<400> 106

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<210> 107

<211> 1630

<212> DNA

<213> Eucalyptus grandis

<400> 107

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<210> 108

<211> 1248

<212> DNA

<213> Eucalyptus grandis

<400> 108

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<210> 109

<211> 481

<212> DNA

<213> Eucalyptus grandis

<400> 109

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 <213> Eucalyptus grandis

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<210> 111
 <211> 448
 <212> DNA
 <213> Eucalyptus grandis

<400> 111	
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<210> 112
 <211> 578
 <212> DNA
 <213> Eucalyptus grandis

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<210> 113
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 <212> DNA
 <213> Eucalyptus grandis

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<400> 113

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ccacattggc	gccatgctca	agctagcaaa	gctcctccat	cacaagggct	tccacatctc	180
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aaatggaatg	ctgagcgact	ttcagttcct	gacaatcccc	gatgggtcttc	ctccttcgga	300
cttggtatgcg	atccaagaca	tcaagatgct	ctgcgaatcg	tccaggaact	atatgggtcag	360
ccccatcaac	gatcttgtat	cgagcctggg	ctcgaacccg	agcgcccttc	cggtgacttg	420
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<210> 114

<211> 479

<212> DNA

<213> Eucalyptus grandis

<400> 114

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attacacaaa	tgcgggtccat	cttcatcggg	aagtctcttg	gcagaagacc	ggagttgcat	180
ttcctggctg	gacaagcaag	cccctaactc	agtggctctat	gtgagttttg	ggagcatcgc	240
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attcttgtgg	gtggttcgac	ccgggtcagt	gagcggtctg	gaactcttag	agaatttgcc	360
cggttgcttt	ctggaggcat	tacaggagag	ggggaagatt	gtgaaatggg	cgcctcaaca	420
tgaagtgctg	gctcatcggg	gtgtcggagc	gttttggact	cacaatggat	ggaactcca	479

<210> 115

<211> 420

<212> DNA

<213> Eucalyptus grandis

<400> 115

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agaagatggg	gagcgttgtg	gctggttagag	tcgagagctt	gtcgagcagt	ggcattcagt	120
cgatcccgcg	ggagtatgtg	aggccgaagg	aggagctcac	aagcattggc	gacatcttcg	180
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ctaaagaccc	cgtggtgagg	gagaggtgcc	acgaggagct	caggaaggct	gccaccgact	300
ggggcgctcat	gcacctcgtc	aaccatggga	tccccaacga	cctgattgag	cgtgtcaaga	360
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<210> 116

<211> 679

<212> DNA

<213> Eucalyptus grandis

<400> 116

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tgggtcaggc	cctgttttgt	gtcaactctg	gccgtggcag	agtgactgcc	atggccgctt	180
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ttattctgag	tctaattgtaa	tggcttttct	ttttcctatt	tctgtatgag	gaaataaaac	660
tcatgctcta	aaaaaaaaa					679

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<210> 117
 <211> 763
 <212> DNA
 <213> Eucalyptus grandis

<400> 117
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 tcgcgccgga gacccacccc atccatctgc acggattcaa cttcttcggt gtgggcaaag 180
 gagtggggaa ttatgacca aagaaggatc ccaagaagtt caatctggtt gaccagtggt 240
 agaggaacac cattggaatc ccatctggtg gatggatagc catcagattc acagcagaca 300
 atccaggagt ttggttcctg cactgccatc tggaagtgca cacaacttgg ggactgaaga 360
 tggcattctt ggtggacaat gggaaggggc ctaaagagac cctgcttcca cctccaagtg 420
 atcttccaaa atgttgatca tttgatcatg aggacgacaa gcgattacta atgacaccaa 480
 gttagtggaa tcttctcttt gaaaaagaag aagaagagca agaagaataa gaaagatgag 540
 gagagaagcc atagaagatt tgaccaagaa gagagagggc aataaaccaa agagaccctt 600
 gagatcacga catcccgcga ttgtttctag agtaatagaa ggatttactc cgacactgct 660
 acaataaatt aaggaagaca aggaatttgg tttttttcat tggaggagtg taatttggtt 720
 tttggcaagc tcatcacatg aatcacatgg aaaaaaaaaa aaa 763

<210> 118
 <211> 538
 <212> DNA
 <213> Eucalyptus grandis

<400> 118
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 tttcctcttg ggagctctcc tctctctctc tgtggcgggtg acattggcag atgcaaaagt 180
 ttactaccat gattttgtcg ttcaagcgac caaggtgaag aggctgtgca cgaccacaa 240
 caccatcacg gtgaacgggc aattcccggg tccgactttg gaagttaacg acggcgcacac 300
 cctcgttgtc aatgtcgtca acaaagctcg ctacaacgtc accattcact ggcacggcgt 360
 ccggcaggtg agatctgggt gggcogatgg gccggaattt gtgactcaat gcccgattag 420
 acccggcgga agttacacgt accgtttcac catccaagga caggtaggaa cgctgtgggtg 480
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<210> 119
 <211> 515
 <212> DNA
 <213> Eucalyptus grandis

<400> 119
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 ctggtgctcc tgtctggaac aataactctt cgttgactgt tggaagcaga ggtccaattc 180
 ttcttgagga ttatcacctc gtggagaaac ttgccaaact tgataggag aggattccag 240
 agcgtgtggt gcatgccaga ggagccagtg caaagggatt ctttgaggct actcatgaca 300
 tttcccagct tacctgtgct gatttccttc gggcaccagg agttcaaaca cccgtgattg 360
 tccgtttctc cactgtcatc cacgaaaggg gcagccctga aaccctgagg gaccctcgag 420
 gttttgctgt gaagttctac acaagagagg gtaactttga tctggtggga aacaatttcc 480
 ctgtcttctt tgtccgtaat gggataaatt ccccg 515

<210> 120
 <211> 458
 <212> DNA
 <213> Eucalyptus grandis

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<400> 120

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caagaaggct	gtcgagaaat	gcaagaagaa	gttgagaggc	ctcatcgctg	agaagagctg	180
cgctccgctc	atgctccgca	tcgcgtggca	ctccgccggt	accttcgatg	tgaagacgaa	240
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cgggctcgac	gttgccgatc	aggtcttgca	gccgatcaag	gatcagttcc	ccgtcatcac	360
ttatgctgat	ttctaccagc	tggctggcgt	cgttgctgtg	gaagttactg	gtggacctga	420
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<210> 121

<211> 1243

<212> DNA

<213> Eucalyptus grandis

<400> 121

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gattccagct	tttggacaac	caactacggg	gctcccgtct	ggaacaatga	ctcatcgctg	180
actgttgaa	ctagagggtcc	gattctcctg	gaggactacc	atctgattga	gaaacttgcc	240
aacttcgaga	gagagaggat	tcctgagcgg	gtgggtccatg	cacggggagc	cagcgcgaaa	300
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cctggagtcc	agacgcccgt	catcgtccgt	ttctccaccg	tcattccacga	gcgcggcagc	420
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<210> 122

<211> 404

<212> DNA

<213> Pinus radiata

<400> 122

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tcggatcttt	ttgttgatgc	agttgtttac	cgatctggaa	tttgattggg	cataaagctt	180
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tttgggtagc	atgcagatca	gttgggtgat	cgtgtactgc	tttcactatt	acttacatat	360
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<210> 123

<211> 415

<212> DNA

<213> Pinus radiata

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<400> 123

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cgttgctcga	agatcgcaag	tgaaagtga	attggatgct	gcggtgcca	aatctagggt	300
cgaggagagt	tcaaactggg	ttctcaccca	gatgaccaag	gggacggata	cctatggtgt	360
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<210> 124

<211> 1659

<212> DNA

<213> Pinus radiata

<400> 124

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cgccaaggag	gtcctgcaca	cccagggcgt	cgagtttggg	tctcgaacct	ggaacgtggt	180
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<210> 125

<211> 461

<212> DNA

<213> Pinus radiata

<400> 125

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aggacccccg	gcatggccga	tcgtagggaa	cgctcttcag	attggatttt	ccagcggcgc	180
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cggttcccgc	cctctgctga	tgatcaccca	ccgcgagctt	gcccacgagg	cgctcgtaca	300
gaagggtcc	gtcttcgctt	gaccgcccgc	ccgcctcggg	gatgcagaaa	atcttcagta	360

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gcaaccagca caacatcact tcggctgaat acggcccgcgt gtggcggagc ttcgcaggaa 420
tctggttaaa gaagccctga gacttcggcg atgaaggctt t 461

<210> 126
<211> 569
<212> DNA
<213> Pinus radiata

<400> 126
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ttaatttagt tcagtctatg ttgggacacc tgcttcatca tttcgtatgg gcacctcctg 180
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taacgtgcag tttctccttt tccatagtca acatgcagct ttctttctct gaagcgcag 420
cagctttctt tctctgaagc ccaacttcta gcaagcaata actgtatatt ttagaacaaa 480
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atatagtaaa gtttactcta aaaaaaaaaa 569

<210> 127
<211> 661
<212> DNA
<213> Pinus radiata

<400> 127
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<210> 128
<211> 427
<212> DNA
<213> Pinus radiata

<400> 128
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gagaaaaaga tggctcattt atggaagtta gatggggcga aagagagact gcaactaatg 240
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tttcacacag cgtctccagt cgtgggtgtc aaatcagatc ccaagatatg gtatgctctg 360
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<210> 129
<211> 1412
<212> DNA

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<213> Pinus radiata

<400> 129

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tcgaggaaca	gtgtgcttta	caggagctgc	tgggttcata	gggtcatggc	tcatcatgcg	180
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<210> 130

<211> 666

<212> DNA

<213> Pinus radiata

<400> 130

atcaatttht	gcatattatt	aaaaagtaag	tgtattcgtt	ctctatattg	atcagtcaca	60
gagtcatggc	cagttgtggt	tccgagaaag	taagagggtt	gaatggagat	gaagcatgcg	120
aagagaacaa	gagagtgggt	tgtgtacttg	gggcaaatgg	gtacatcggc	tcttggctgg	180
tcatgagatt	actggaacat	ggctattatg	ttcatggaac	tgttagggac	ccagaagaca	240
cagggaaagg	tgggcatttg	ctgcggctcc	caggggcaag	tgagaagcta	aagctgttca	300
aggcagagct	taacgacgaa	atggcctthg	atgatgctgt	gagcggttgt	caaggggttt	360
tccacgttgc	caagcctggt	aatctggact	caaacgctct	tcagggggag	gttggttggtc	420
ctgcggtgag	gggaacagta	aatctgcttc	gagcctgcga	acgatcgggc	actgtgaaac	480
gagtgatata	tacctcgtcc	gtttcagcag	tgagattcac	tgggaaacct	gacccccctg	540
atactgtgct	ggatgaatct	cattggactt	cggctcgagta	ttgcagaaag	acaaagatgg	600
tcggatggat	gtactacatc	gccaacactt	atgcagaaga	gggagcccat	aagttcggat	660
cagaga						666

<210> 131

<211> 478

<212> DNA

<213> Pinus radiata

<400> 131

gctggttcaa	gtgtcagccc	aatggcctcc	cctacagaga	atccccagat	ttcagaagag	60
ctgctaaatc	atgagatcca	tcaaggaagt	acagtatgtg	tgacaggagc	tgctggcttc	120
ataggatcat	ggctcgtcat	gcgtttgctt	gagcgaggat	atactgttag	aggaactgtg	180
cgagacactg	gtaatccggt	gaagacgaag	catctattgg	atctgcctgg	ggcgaatgag	240

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aggttaactc	tctggaaagc	agattttggat	gatgaaggaa	gcttttgacgc	cgccattgat	300
ggttgtgagg	gagttttcca	tggtgccact	cccatggatt	ttgaatccga	ggacccccgag	360
aacgagataa	ttaaaccgcg	tgtcaatggg	atgttgaatg	ttttgagatc	gtgtgggaaa	420
accaagtcta	tgaagcgagt	tgttttcacg	tcgtctgctg	ggactctgct	ttttacgg	478

<210> 132

<211> 510

<212> DNA

<213> Pinus radiata

<400> 132

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ctacctccct	gaaaagatga	gcgaggatg	cgtgacagga	ggcacaggct	tcatagctgc	120
ttatctcatt	cgtagtcttc	tccagaaagg	ttacagagtt	cgcactacag	ttcgcaaccc	180
agataatgtg	gagaagttaa	gttatctgtg	ggatctgcct	ggtgcaaacg	aaagactcaa	240
catcgtgaga	gcagatttgc	tagaggaagg	cagttttgat	gcagcagtag	atggtgtaga	300
tggagtattc	catactgcat	cacctgtctt	agtcccatat	aacgagcgct	tgaaggaaac	360
cctaatagat	ccttgtgtga	agggcactat	caatgtcctc	aggtcctggt	caagatcacc	420
ttcagtaaag	cgggtgggtgc	ttacatcctc	ctgctcatca	ataccgatac	gactataata	480
gcttagagcg	ttccctgctg	gactgagtca				510

<210> 133

<211> 890

<212> DNA

<213> Pinus radiata

<400> 133

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ataacgagag	gacagaagta	agtttgtgga	aatagcaacc	atgccggtgt	ttccttctgg	180
tctggacccc	tctgaggaca	atggcaagct	cgtttgtgtc	atggatgcgt	ccagttatgt	240
aggtttgtgg	attgttcagg	gccttcttca	acgaggctat	tcagtgcatt	ccacggtgca	300
gagagacgct	ggcgagggtg	agtctctcag	aaaattgcat	ggggatcgat	tgcagatctt	360
ctatgcagat	gtcttggatt	atcacagcat	tactgatgcg	ctcaagggtc	gttctggtct	420
gtctatacct	ttgagcaccc	tcagagtgtc	gcaggctatg	atgaagtgat	ggcagaaatt	480
gaagtacaag	cagcccacaa	tgcactggaa	gcgtgtgctc	agactgagac	cattgagaaa	540
gttgtgttca	cttcttctgt	ggctgcagca	atttgagag	aagatggaga	ctacaagggt	600
aatgcccttg	acgagaggca	ttggagtgat	gcaaattctt	gcaggaaatt	gaagtgtgtg	660
tacgcattag	ccaagacact	gtcagagaag	gctgcatggg	cgctggcaat	ggacagaggg	720
ttgaatatgg	tgacaatcaa	cgcattctct	attgtaggac	ctggcatcac	atacaaaagc	780
tcaggatcta	ccattgcata	tcttaaaggg	gctgcacaaa	tgtatgagaa	gggcacttta	840
gctagtgtgg	acataagggt	tctagcggat	gcacatatat	gcgcttatga		890

<210> 134

<211> 955

<212> DNA

<213> Pinus radiata

<400> 134

aatcactgac	cttcacatat	ttattccaat	tctaatatct	ctactcgctg	tctacctgat	60
ttttcagtgg	cgaaccaact	tgacagggtt	ggacatggcc	aacagcagca	agattctgat	120
tattggagga	acaggctaca	ttggtcgtca	tataacaaa	gccagccttg	ctcttggtca	180
tccacattc	cttcttgtca	gagagacctc	cgcttcta	cctgagaagg	ctaagcttct	240
ggaatccttc	aaggcctcag	gtgctattat	actccatgga	tctttggagg	accatgcaag	300
tcttgtggag	gcaatcaaga	aagttgatgt	agttatctcg	gctgtcaagg	gaccacagct	360
gacggatcaa	cagaatatta	tcaaggctat	taaggagggt	ggaaccatca	agagggtttt	420
gccatctgag	ttcggaatg	acgttgatag	aacccatgca	gtggagcctg	caaagaccat	480

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gtttgctacc	aaagcgaaaa	ttcgcagggc	cattgaggca	gaaggcatcc	cttacacatt	540
tgtctctagc	aactgttttg	ctgggttggt	cttgccaagt	ttggggcagc	caggccttac	600
cgccccgcca	agggataaag	ttgtgatatc	tggagatgga	aatgccaaag	ttgtttttgt	660
gaaggaggag	gatataggga	cattcaccat	caaggcagtg	gatgacccta	gaactctaaa	720
caagatcctg	tatttgaggc	ttcctgccaa	cacatattct	cttaacgagc	ttgtagctgt	780
gtgggagaag	aagattggca	agtctctgga	gaagacctat	ataccagagg	aagaggctct	840
gaaaaaaatt	gcagagtcgc	cattcccact	caatgctata	atgtcaaccg	gccactctat	900
ttttgtgaaa	ggggatcaaa	caaattttga	aatcggacct	gatggtgtgg	aggct	955

<210> 135

<211> 1024

<212> DNA

<213> Pinus radiata

<400> 135

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ccacggattt	ggaatctcgt	gtcctcgggg	caccagagta	ctgcaaggcg	aatttcacaa	120
agtatttcac	cgataatttc	tggtgggagc	ccgcattatc	caagaccttt	gagggaaaaa	180
aaccctgcta	cttcaacaca	ggcgtaatgg	tgatcgatct	tgaaaaatgg	cgggcagggg	240
aattcacaag	aaagatcgaa	atctggatgg	acatacagaa	ggaacgccgt	atctatgagc	300
tcggatcatt	accgccattt	ttactggtat	ttgctggttt	ggttaagcaa	gtcgatcatc	360
gttggaatca	gcacggttta	ggcggagata	atttgcaagg	cctttgccga	gatcttcacc	420
ctggacctgt	cagtttggtg	cattggagtg	gtaagggcaa	accttggcta	cgcctggaat	480
gccaagcgga	cttgccctct	ggatacttta	tgggctcctt	atgatcttta	tcgatcaacg	540
tattacctaa	atgggtgaga	gagcctctct	cctcgggggtg	ctttttatcg	aattaaacct	600
gatttgataa	aatgccaaat	agaactttac	gcctatgcat	ctttcagttt	tgaatttcaa	660
ttctggtaac	gaatagaaga	aaacaatagc	acagccacag	gcaggacaaa	tccatcatga	720
gggaccaatc	gtttgaattt	agtattaata	aggttgttcc	atataacgcc	tgtgaagaat	780
gatattgtgg	actgatctat	ttatatattgt	actgccatgc	catcctcagc	cagcagagag	840
gcaagcaatg	ccgctgcaag	tcatgtaggg	aaggcgttgt	gaactcaatt	ttcggcgact	900
gtacaggatg	taaatttttg	gaacattaat	atcattatga	taagttcctg	aaccaacaac	960
tgtataatac	cttataaatg	tatctgcaac	tccatttttg	cataaaaaaa	aaaaaaaaaa	1020
aaaa						1024

<210> 136

<211> 497

<212> DNA

<213> Pinus radiata

<400> 136

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aacttttggc	cgcaaagcaa	tctgtacact	ttctctctca	ttccttgcta	caagcatgga	120
tataggttct	aggggtcctg	ggggctcctg	atgcccaatt	gttgctgtgc	ttggcatgac	180
ccaaacatgc	aagagatctg	tagtcagtag	tcttggttga	tctatagctt	ttagaaaaga	240
gtcacgtcct	tttagggtaa	catcattcca	accatatcca	gttccaccac	cggctacacc	300
ttcaacggga	ggaggagcaa	gatattcagc	attgctttgg	gcaccagatg	gataggcatt	360
attttccatc	ggaattcagc	cgagctcgcc	ccctcagtc	aatcgctcgt	aaaatccctc	420
aaaattgggc	aattctggct	cgaaatcgcc	aaattatggg	ctacaacagg	attaaaattg	480
cacagaaatc	tgccagt					497

<210> 137

<211> 528

<212> DNA

<213> Pinus radiata

<400> 137

ggcaatccga	gcctagccaa	ccaacttggc	agcaaggagc	acagggagtt	ggcgagagaa	60
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gctgttagga	aatcttttgg	attgttgaaa	aatgggaagt	cagccaacaa	gcctttgctc	120
cctttggaga	agaatgcttc	caagggttctt	gttgcaggaa	cccatcctga	taatctgggt	180
tatcagtgtg	gtggatggac	gatggaatgg	caaggattaa	gtggaaacat	aaccgtagga	240
actacaattc	tggaagctat	caaactagct	gtcagccctt	ctactgaagt	ggtttatgag	300
caaaatccag	atgctaacta	tgtcaaagga	caagggtttt	catatgccat	tgtggttgtg	360
ggtgaggcac	catacgacga	aacgttttga	gacaatctta	atttgaccat	tcccctaggc	420
ggaggggaca	cgattaagac	ggtctgtggc	tccttgaaat	gccttgtaat	cttgatatct	480
ggaaggccac	ttgttattga	accttatctt	ccattggtgg	atcgtttt		528

<210> 138
 <211> 424
 <212> DNA
 <213> Pinus radiata

<400> 138						
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ggatctgagt	ttttatgcag	gtgtagagcc	ttttgttact	ctgtatcact	gggacttgcc	120
acaagctctg	gaggacgaat	acgggtggatt	tcgtagcaaa	aaagttgtgg	atgactttgg	180
catattctca	gaagaatgct	ttcgtgcttt	tgagaccgt	gtgaagtact	gggtaactgt	240
taacgaaccg	ttgatcttct	catatttttc	ttacgatgtg	gggcttcacg	caccgggccg	300
ctgttcgcct	ggatttgga	actgcactgc	gggaaattca	gcgacagagc	cttatattgt	360
agcccataac	atgcttcttg	cacatagtac	cgctgttaaa	aatatatagc	ataaataccc	420
aggg						424

<210> 139
 <211> 404
 <212> DNA
 <213> Pinus radiata

<400> 139						
gctaccatct	tcctcataa	tattgggctt	ggagctacca	gggatcctga	tctggctaga	60
agaatagggg	ctgctacggc	tttggaagtt	cgagctactg	gcattcaata	cacatttgct	120
ccatgtgttg	ctgtttgcag	agatcctcga	tggggccgct	gctatgagag	ctacagtgag	180
gatccaaaaa	ttgtcaaggc	catgactgag	attatcgttg	gcctgcaagg	gaatcctcct	240
gctaattcta	caaaaggggg	gccttttata	gctggacagt	caaagtgtgc	agcttgtgct	300
aagcattttg	tgggttatgg	tggaacaacc	aaaggatatg	atgagaataa	tactgttatc	360
aactatcaag	ggttatttca	acattccaaa	ttacccccaa	tttt		404

<210> 140
 <211> 437
 <212> DNA
 <213> Pinus radiata

<400> 140						
cctagaattc	tatggtgaaa	attgttgagg	caaggctgcc	caagtttaca	aaggaaacagt	60
cccaaattgg	taaagggttc	atagactatc	taggcgttaa	ccaatacact	gcttattaca	120
tgtatgatcc	taaacaacct	aaacaaaatg	taacagatta	ccagactgga	ctggaataca	180
ggctttgcat	atgctcgcaa	tggagtgcct	attggaccaa	gggcgaactc	caattggcct	240
tacattgtgc	cttgggggtc	atacaaggcc	gtcacatacg	taaaagaaca	ctatggaaat	300
ccaactatga	ttctctctga	aaatgggaatg	gacgacctgg	aaacgtgaca	cttcagcag	360
gactgcatga	taccatcagg	ggtaactact	ataaaagcta	tttgcaaaat	ttgattaatg	420
cacgtgaatg	accggggg					437

<210> 141
 <211> 470
 <212> DNA
 <213> Pinus radiata

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<400> 141

gatacatcca	agctgagaat	ggaagagatt	aatggtgata	acgcagtaag	gaggagctgc	60
tttcctccag	gtttcatggt	tgggatagca	acttctgctt	atcagtgtga	aggagctgcc	120
aacgaagggtg	gaaaaggccc	aagcatctgg	gactcatttt	cacgaacacc	aggcaaaatt	180
cttgatggaa	gcaacggtga	tgtagcagtg	gatcagtatc	atcgttataa	ggcagatgta	240
aaactgatga	aagatatggg	cgtggctacc	tacagattct	cgatttcatt	gcctcgtata	300
tttccaaagg	gaaaaggaga	gatcaatgag	gaaggagtag	cctattacaa	taacctcatc	360
aatgaactcc	tccagaatgg	aatccaagcg	tctgtcaact	ttgtttcact	gggatactcc	420
ccagtctctg	gaggatgaat	atggcggatt	tctgaggcca	accattgtga		470

<210> 142

<211> 413

<212> DNA

<213> Pinus radiata

<400> 142

ataagactaa	ttttccagac	aatcctccat	tcccattcaa	ttacactggg	actccaccca	60
ataatacaca	ggctgtgaat	gggactagag	taaaagtcct	tccctttaac	acaactgttc	120
aattgattct	tcaagacacc	agcatcttca	gcacagacag	ccaccctgtc	catctccatg	180
gtttcaattt	ctttgtgggtg	ggccaagggtg	ttggaaacta	caatgaatca	acagatgcac	240
caaattttta	cctcattgac	cctgtcgaga	gaaacactgt	gggagttccc	aaaggagggtt	300
gggctgctat	aagatttcgt	gcagacaatc	caggggtttg	gttcattgcac	tgtcatttgg	360
aggttcacac	atcgtgggga	ctgaaaatgg	cgtgggtagt	aaagaacgga	aaa	413

<210> 143

<211> 457

<212> DNA

<213> Pinus radiata

<400> 143

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cactgccaat	caggctacag	gtagatacta	catggctgct	cgagcatatt	ccaacgggca	120
aggagttccc	ttcgataaca	ccactaccac	tgccatttta	gaatacagag	gaagctctaa	180
gacttcaact	ccagtcattg	ctaattcttc	attctataac	gacaccaaca	gtgctactag	240
cttcgcta	ggtcttagaa	gcttgggctc	acacgaccac	ccagtccttc	ttcctcagag	300
tgtggaggag	aatctgttct	acaccatcgg	tttgggggtg	atcaaattgtc	cggggcagtc	360
ttgtggagg	ccaacggatc	aagatttgca	gcaagtatga	atacatatca	tttgtccccg	420
aaccacttct	tccaatcctt	caagctcagc	atttttgg			457

<210> 144

<211> 598

<212> DNA

<213> Pinus radiata

<400> 144

gttcggcact	gagagatcca	tttcttttcaa	tgttgagaca	gtgagtagta	ttagttttag	60
atctctttca	ggaatatatc	gtgcttgacg	gatcttttagt	ttctgcaaca	atgtcgttgc	120
aatcagtgcg	tctatcttct	gttctccttg	ttttgctact	agcatttggt	gcttacttag	180
ttgctgtaac	aaacgcagat	gtccacaatt	ataccttcat	tattagaaag	aagacagtta	240
ccaggctatg	caataagcgt	ataatcgcca	cgtcaatgg	acagctacca	ggcccaacta	300
ttcatgtacg	tgatggagac	gttggttaata	tcaaagctta	taacaaagct	gggtacaatg	360
ccactcttca	ctggcatgga	gtcgagcagt	tgcgtacagg	atgggcccag	ggacctgcat	420
atgttacaca	gtgccccatt	ccaccagggtg	gtcgttatac	atacagattc	accatttctg	480
aacaggaagg	caccgtgtgg	tggcacgctc	atgtgtcatg	gctccgagct	acggtgcatg	540
gagctttcgt	aatccttctt	aagagaggca	aaccatatcc	ctttcctaaa	ccccgtgc	598

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<210> 145
 <211> 1080
 <212> DNA
 <213> Pinus radiata

<400> 145

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gaagacacca	tggtgaaggc	ttatcccacc	gtaagcgagg	agtacaaggc	tgccattgac	120
aaatgcaaga	ggaagctccg	agctctcatt	gcagagaaga	actgtgcgcc	gatcatgggt	180
cgaatcgcat	ggcacagcgc	tggtgacttac	gatgtcaaga	ccaagaccgg	agggcccctc	240
gggacgatga	gatatggggc	cgagcttgcc	cacgggtgcta	acagtgggtc	ggacatcgca	300
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ggaagagaag	acaagcctga	gcctccagaa	gaaggccgcc	ttcctgatgc	tacaaaagga	480
cctgatcatc	tgagggatgt	ttttgggtcac	atgggggttga	atgataagga	aattgtggcc	540
ttgtctgggtg	cccacacctt	ggggagatgc	cacaaggaga	gatctgggtt	tgaaggacca	600
tggacctcta	accccccttat	ctttgacaac	tcttacttca	cagagcttgt	gactggagag	660
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gtttatgttc	agaagtatgc	acaggacgaa	gacgctttct	ttgctgacta	tgcggaagct	780
cacctgaagc	tttctgaact	tggtgttgct	gatgcgtaga	ttcatacctt	ctgcagagac	840
aattccttgc	tagatagctt	cgttttgtat	ttcatcta	cttttcgatt	atatagtcac	900
atagaagttg	gtgttatgcg	ccatagtgat	acttgaacct	acatgttttt	gaaaagtatc	960
gatgttcttt	aaaatgaaca	ttgaatacaa	cattttggaa	tctgggtgtg	ttctatcaag	1020
cgcatatttt	aatcgaatgc	ttcgttcctg	ttaaaaaaaa	aaataaaata	aaaaaaaaaa	1080

<210> 146
 <211> 701
 <212> DNA
 <213> Pinus radiata

<400> 146

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atgacgaagt	acgtgatcgt	tagctccatt	gtatgtttct	ttgtatttgt	ttctgcgtgc	120
ataatttctg	tcaatggatt	agttgtccat	gaagatgatc	tgtcaaagcc	tgtgcatggg	180
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ccgagtgage	aacaggctca	gccaaactta	acactaagag	cccgggacct	gcagctgatc	420
gacgaaatta	aaaccgctgt	agaagctagc	tgcagtgggg	ttgtaacttg	tgcagacatt	480
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gccgcagaga	tagcctaaag	tttgccagtc	aatccgtagt	tctcgccaat	ataccaactc	600
caactttaaa	tttgacacag	ctgatgaaca	tttttgggtc	caaaggattc	agtttggccg	660
aaatgggttg	tctttcaggt	ggacacacaa	tccggcattgg	t		701

<210> 147
 <211> 338
 <212> DNA
 <213> Pinus radiata

<400> 147

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tttgagatcg	ggagcctgct	ggatctgggt	cagaggttca	aggtcacggg	agcgccctgtc	120
gtgcctccca	ttgttctcgc	ctttgccaa	aacgcgctcg	tggaaagcta	tgatctgtcg	180
tccattaggg	ttgtgctgtc	cgggtgccgc	cctctcgga	aggagctgga	ggatgcatta	240
aggctacgac	ttcccaaagc	cacttttggt	cagggatacg	gtatgacaga	ggcaggaccg	300
gtgctatcaa	tgtgtctggc	cttcgctaag	gagccctt			338

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<210> 148
 <211> 357
 <212> DNA
 <213> Pinus radiata

<400> 148
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 tttgagatcg ggagcctgct ggatctgggtg cagagggttca aggtcacggt agcgctctgc 120
 gtgcctccca ttgttctcgc ctttgccaag aacgcgctcg tggaaagcta tgatctgtcg 180
 tccattaggg ttgtgctgtc cggtgccgcg cctctcggaaggagctgga ggatgcatta 240
 aggctacgac ttcccaaagc cacttttggt cagggatacg gtatgacaga ggcaggaccg 300
 gtgctatcaa tgtgtctggc cttcgctaag gagcccttcc cgatgaagtc cgggtcgc 357

<210> 149
 <211> 470
 <212> DNA
 <213> Eucalyptus grandis

<220>
 <221> unsure
 <222> (437) ... (437)

<400> 149
 gagaaattca caagcttcac agcacgagag ttaaagagcg agacacgggt tgatccagtg 60
 aagggccggc ccccgagat ggcgaagacg ctcaccgcg tggctggggg agaagaccct 120
 ccagtccaaa gtctgtccgc gataaggatg agcgccccac ggtggcctac aaccagttca 180
 gcaacgtgat ccccgatgata tccctggcgg ggattgacga ggccggcggc cggaagggcc 240
 gagatctgca agaagatcgt ggaggcgtgc gaggactggg gcgtcttcca ggtgggttgac 300
 cacgggggtg atacgggggt catcactgac atgacccggc tcgcgcgtaa gtncttcgct 360
 ctgccctcgg aggaaaagct ccggttcgac atgactggcg gaaaaagggg gggttatcgt 420
 ctccagcatc tcaaggngaa caagttcagg actggtgcaa aagtacgaac 470

<210> 150
 <211> 380
 <212> DNA
 <213> Eucalyptus grandis

<400> 150
 ggaggtcggg gacagagcag tacagcgaga agctcatggc cctcgcttgc aagctcttgg 60
 aggtcctctc ggaggcaatg ggactggaga aggaggcact gaccaaggca tgcgtggaca 120
 tggaccagaa ggtggtgggt aactactacc ccaaagtccc gcagcccgac ctcacgctcg 180
 ggctgaagcg ccacactgac ccgggaacca tcactcttct gctccaggac caggtggggg 240
 gcctccaggc caccagagat ggcggcaaga gctggatcac cgtccagcct gtggaagggg 300
 cttttgtggg caacctaggc gatcatgggt atttcctgag caacgggagg ttcaagaacg 360
 cggaccacca ggcgggtggg 380

<210> 151
 <211> 349
 <212> DNA
 <213> Pinus radiata

<220>
 <221> unsure
 <222> (212) ... (212)

<400> 151
 ttggactcca tacctctcgt ggacctccaa ggtcttttac gcgattctgc tagagccac 60

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gttattcaac	aaattggcgg	ggcctgcgct	gaatatggct	tcttccagat	aatcaatcat	120
ggcatcccag	atgcagttat	caacaggatg	ctggaagtag	cgaaggagtt	tttcagaatg	180
cctgtggagg	accgaatgga	atactattcc	gncgatccgt	ccagaaaaac	acgtttgtcg	240
acgagcttca	acatccataa	agaacaagtc	ttcaactggg	gggctatctc	agacatcatt	300
gttatccggt	agaagatcat	gttcacactt	ggccttcaaa	acctgcggg		349

<210> 152
 <211> 427
 <212> DNA
 <213> Pinus radiata

<220>
 <221> unsure
 <222> (234) ... (234)

<221> unsure
 <222> (240) ... (240)

<400> 152						
atgggtctggg	cagcatacgg	aggacgatgg	aagatggaac	gcaagggtgtg	caacatgcac	60
atggtgggag	ggaaggcggt	ggaagattgg	cagccgggtga	gggacgccga	aatgggcttc	120
atgctccgga	atattctcag	tcactcgcag	cgccggcgaga	cggatgaatgt	gccggacctc	180
ctgaacatct	gcgccgcca	catgatcggt	cagatcattc	taagcaagcg	ggtnttcgan	240
acagaagggg	acgaggccaa	cgagttcaag	gacatgggtg	tggaactcat	gacctgcgct	300
ggatacttca	atatcgagga	cttcattcca	tcgctagcgt	ggatggactt	gcagggcatt	360
cagcggggta	tgaagaagct	ccacaagaaa	tgggacgcac	tcatacagag	gattattgat	420
taacacc						427

<210> 153
 <211> 298
 <212> DNA
 <213> Eucalyptus grandis

<220>
 <221> unsure
 <222> (214) ... (214)

<400> 153						
gttaccaaag	ggcagcaacg	tattcttaaa	catgggttct	atccacaggg	atcccaagat	60
ttgggacaaa	ccgttggagt	ttagacccga	gaggttcttg	gaaggtccta	gcaagtatga	120
tttctcaggt	aacaacttcg	catacatgcc	attcggttct	ggtcgaaggg	tgtgtgcagg	180
gcttgcgctg	gcagagagga	tgctaccata	tgtnttggcc	tctcttttgc	actcattcaa	240
gtgggaaata	ccaccagggt	ctgagctgga	tttacctgga	caagttcggc	cttgtggt	298

<210> 154
 <211> 251
 <212> DNA
 <213> Eucalyptus grandis

<400> 154						
gacttcaaag	ggcaggattt	tgagctgata	cccttcgggtg	caggtagaag	gagctgcccg	60
gctattgcat	ttggaaatgc	cagtgttgag	cttgcttttag	ctcaacttct	tcacagtttc	120
gattgggagc	ttcctgatgg	gatccagcct	agggacttgg	atatgaccga	agtttttggc	180
atcacaatgc	acagaattgc	caacctcatg	gttgtagcca	aaccccgctt	ctcctagacg	240
atactcgtgc	c					251

<210> 155

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<211> 411
 <212> DNA
 <213> Pinus radiata

<220>
 <221> unsure
 <222> (198)... (198)

<400> 155
 acggggctcc ggtgacgaga tactggcagg tcgttgaagc tggttggagg ttcgaatatc 60
 cgagagggat cctgtttctt gtcccccttac cttggttttc ctcacccctc cgaatgcagt 120
 ctaattcgaa gaccgtggaa gagcggcgcc cggggcctgg gtaagagctt gctggagata 180
 tctcggcttg actatgtntt ggctcttttc gtgaatggca agggggatct aggggcatg 240
 atggggctcg ctgtcgtttt gagggaaaat tcgcaactgt tgatggctct gactacatct 300
 ctggccgtct tgattggttg cgttttgttc tttgtttggc ggagaggggg atcggctccc 360
 tcgaagcagc cggagaagcc aactcccctg gtgaaagaag aggaagagga g 411

<210> 156
 <211> 404
 <212> DNA
 <213> Pinus radiata

<400> 156
 gctgaagtta ataaaactaa gtacattgag gttgacatgg aggcagaatt ttcaaatacta 60
 gctttggaca ttattggatt gtgtgtattt aactatgatt ttggatccgt tactcgagaa 120
 tcaccagtaa tcaaggcagt ctatggtaca ttgtttgaag ctgagcatag atcaaccttt 180
 tacataccat actggaaatt tccgctggca agatgggttag ttctcgcga acgaaagttc 240
 catgaagacc taaaggctcat taatgaatgt cttgataatc tgatagcagg ggccaaggaa 300
 acaagacagg aagacgatat cgaggctctt caaggaagag attactctaa agtgaaatat 360
 gcaagtttgc tcagatttct agttgatatg agggagaaga tggt 404

<210> 157
 <211> 259
 <212> DNA
 <213> Pinus radiata

<220>
 <221> unsure
 <222> (116)... (116)

<221> unsure
 <222> (246)... (246)

<400> 157
 ccaatcatcg gcaatttcca ccaagtgaga ctctctcttc accgtgctct caaaaatctt 60
 gctgagaaat atggtcccat tttgtttctg cgctttggct ctgtacccac tgtggntgtt 120
 tcttcatctg agatggccaa acactttctt aaaactcatg atttgatatt tgccagccga 180
 cctccaacat cggtaggaaa atatttcttc tataacttca aagatattgc cttcagtcct 240
 tatggngatc actggagga 259

<210> 158
 <211> 338
 <212> DNA
 <213> Pinus radiata

<400> 158
 aatggcagtt ggggggtcaag gaaatgtggt ctcagcttgc aggcagccat ggaagctaca 60

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atcgtctggt	gggtgttttg	gtagtaatag	tttctctggc	agttttttat	ttgaagagta	120
gaggttcgaa	gaagcgtctg	cctccagggc	cgaaggggtg	cctctgggtg	gaaatttggt	180
tcagggttgca	ttctccggga	agcccttcat	gtatgtgggtg	cgagatctga	gggagcagtt	240
tggctcgatt	ttcacgctcc	aaatggggca	aaaaacgccc	caaattacca	cctccccgaa	300
atttccaaca	cggggcctct	taaaaaagag	ggggcccc			338

<210> 159

<211> 539

<212> DNA

<213> Pinus radiata

<220>

<221> unsure

<222> (1)...(539)

<223> n at all occurrences indicates unsure

<400> 159

aatgtggccg	aggagtctct	gnaagactca	tggatctggc	tttcgccagc	agacctccaa	60
ccatcggtaa	cgaatatattt	ggtataattc	ctccgacgtc	gcattttccc	cctatgggtcc	120
ttactggagg	cagatgcgta	aaatctgtgt	gttaaagttg	ctgagctcaa	gacgcataga	180
ttccttccgc	cacataagag	aagaggaagt	ctcttctatg	gttcgctcta	ttgctaattc	240
ggatctgcat	cctgtgaaca	ttagcagggc	cgtgtcagcc	cttgggattg	atataatctg	300
caggatggcc	ttcggtaaaa	agtactgtga	ccaagaccta	attgggtggca	ttgggatnaa	360
gtcaatgata	aaggaaacgt	ttgtgtnagc	agggtcnttg	aacatgggag	attttatacc	420
atacttggca	tggattgatc	ttcaagggtc	caaccgtcga	ttgaagaaca	tacacaagat	480
ccaagacgac	ttgttagggg	aagatactag	aggcacacgc	ttcgccaacc	gcagaataa	539

<210> 160

<211> 310

<212> DNA

<213> Pinus radiata

<220>

<221> unsure

<222> (16)...(16)

<400> 160

cgaatgggtg	gtcggnaaag	accgcacagt	aaaggagtct	gatttggtaa	gtctgaaata	60
ccttcagtgt	gtggtgaaag	agacgctacg	attatacccg	ggaggacctc	tagcacttcc	120
ccatgagtct	gtggaggctg	tgacagtaga	agggtactat	atacctaaga	agacgatgct	180
gttgggtgaat	gtgtgggcta	taggaaggga	ccccaaagtg	tgggggattg	atgcttcaga	240
attcaagcca	gagagattta	tggaggaatt	aggtgggcat	ctgcatgata	atgtcatgga	300
tttagcaggc						310

<210> 161

<211> 412

<212> DNA

<213> Eucalyptus grandis

<400> 161

cgccacctcc	ctcctcctct	tccccctcct	cctgctcctc	ctggtcgccc	cgcaaaagcc	60
ctccgcctct	gtccgcagtc	accgccagcc	atggatctcc	tcctcctgga	gaagaccctc	120
ctgggcctct	tcgcgcgcgc	catcgtggcc	atcgcgggtc	ccaagctccg	gggcaagcgg	180
ttccgcctcc	ccccgggccc	cctccccgtg	ccatcttctg	gcaactggct	ccaggctcggc	240
gacgacctca	accaccgcaa	cctcaccgac	ctcgccaaga	ggttcggcga	catcctcctc	300
ctccgcatgg	ggcagcgcaa	cctcgtggtc	gtctcgtccc	cggacctctc	caaggagggtg	360
ctccacacgc	agggcgtcga	gttcgggtcc	cgcacccgga	acgtcgtctt	ct	412

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<210> 162
 <211> 329
 <212> DNA
 <213> Pinus radiata

<400> 162
 actttttacaa tgagtgatca caaacaattt tttccaaaat tcataacaaa attttggata 60
 cagtgcataat tcgggcaaac aatctgacgg acttcaaaac tactgacaac aaaacaaacc 120
 atctggggat gaattacaat ggaaatccac acttcatttg gctgcaactg tatatataaa 180
 gtgtttattg cttccagctc ctccagactt tggaagaaat tctatatttt tttttcagga 240
 tctgagcttc aggctattgg tttggccaca acaacggagt ggttgagaat gtgcaggctg 300
 aattgccctc ctttctctgt cacatccac 329

<210> 163
 <211> 475
 <212> DNA
 <213> Pinus radiata

<400> 163
 atttgcgtca gtctctacct ttgcctgcaa cattcacagt cgctgatgga gggcctcccg 60
 cagcaactgt cctgtgctta ctctgggctt tcttcatgat atggtttttg ggcaagagaa 120
 gaactagtgc cacgctgcca ccaggaccct atgcatggcc catcatagga aacctctacc 180
 aattaatact gcccgctcac cgttctctta gaggccttgc tgacaaatat ggtcccatta 240
 tgtttctgcg cttaggctct gtccctaccg tcgtcgtttc ttcttctgag acggccaaag 300
 agtttctcaa aactcatgac ttgatttttg ccagccgacc cccaacagcc gctgggagat 360
 tgatgttttc caactctaaa gacgtggtgt tcgctccgta tggagatcac tggaggcaaa 420
 tgagaaaaat atgcgtgtta gaactactga ctgccaaaag aatcgagctc gtgcc 475

<210> 164
 <211> 372
 <212> DNA
 <213> Pinus radiata

<220>
 <221> unsure
 <222> (22) ... (22)

<400> 164
 tggaaataca gttcgactct gngatttcat aaaatatgat gaggaaagga gaatcagggtg 60
 gatttgaggt taagggatgg gctgccatgg atgactccgg cgtcctctcg cttttcaact 120
 ttactcgcag gaaaacggga tcccacgatg tactttcaag gtagcatact gtggaatctg 180
 tcaactccgat ctgcatcaaa ttcggaatga atggaaaaat tccctatacc caaatggggtt 240
 ccaggccacg aaatcgtagg aactgttgct tgaagtccgg tcagaagtga agaatttttg 300
 ctggctggag aatcggcggt ggggtgtaagg gttgcatggg tttggagggtg ccagccaatt 360
 ggtgaattct tg 372

<210> 165
 <211> 307
 <212> DNA
 <213> Eucalyptus grandis

<400> 165
 tctctctctc tctccctctt gagagtgttg aagtgttagg atgaggattc gagtgccgtc 60
 gatgctgttg ttgtgggtcac tggtgggctt cgtggcgagg tcgacaatgg ccgaagagac 120
 ggtgatcccc gagacaacgc gtttcgacac cggtgggctg agcagatcgg ccttcccga 180
 gggcttcgtc tgggggacgg cgacctcggc ttatcaagtc gaaggcatgg ccgacaaaga 240

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gggacgcggg cctagcatct gggacgtctt cgtcaagatt ccaggaattg tggccggtaa 300
tgcaact 307

<210> 166
<211> 454
<212> DNA
<213> Eucalyptus grandis

<400> 166
gaagaaatta ggtttcttgt tgcggctttt ggtagtgggt ctggtgatag cagagacggt 60
ccatggtgct tatgagttca gcagatacga ctttcctcct ggctttgtgt ttggtgctgg 120
cacttcagct tatcaggctc aaggagcagc aaatgaggat gggaagactc caagtataat 180
ggacacctgg gccactctg actcagggat tacaagcggg gcaaattggag atattgcttg 240
tgatcaatat cacaaataca aggtagatgt ccaactcatg gcagaaatgg gattagacgc 300
ataccgggtt tccatctcat ggtcaaggct catcccaaat gggagagggt ctgtgaatcc 360
gaagggattg cagtactaca acaacctcat caatgaactg atcagccatg ggattgaacc 420
cgcacgtgac cctgcaccat tttgatctgc caca 454

<210> 167
<211> 433
<212> DNA
<213> Pinus radiata

<400> 167
gagaagcaat aggaaaatat ggccctggag aatggtgaaa gaagcagagt actgatcatt 60
ggaggaaccg gttattttgg cagaaggtta gtgaaggcca gccttgctt cggacatgag 120
acttatgtcc agtatcgtgc ccaggcagcc tctgatata acaaagtggg gacgcttatt 180
tccttcaaat ctcaaggagc acacctgggt gatgcttcca ttgacaatca cacaagcctc 240
gtaaatgccg tgaaacgagt ggaagttgta atatcggcga tgggtgccga gggctctgaga 300
gaggggcagc tgaaagtgat cgaggccatt aaagaggcag gaaccgtcaa gcgctttctt 360
ccttctgagt tcgggatggc ccagacagaa tgggtgcacgc catctatccg ggcaacgagg 420
ttttctctga taa 433

<210> 168
<211> 330
<212> DNA
<213> Pinus radiata

<400> 168
cggggagctt gacttgggac tggaaagcag cgggcatcgt ttcctgtggg ttctccgcgg 60
tcctccttcc aatccaaact tatctgcgct gctgcccccg ggtttcgaac agcggacca 120
agatcgtggt ctctgtggtta cctcatgggc tccgcagggt tctatccttg cacaccgtc 180
aacaggagggt tttgtgagtc actgcggttg gaactcgatg ctggagagca tttggtttgg 240
agttcccatt atcgtcttggc cctccaagc tgaccaaaagg ccgatcgggt tactttcttg 300
tgaatgatag tagaatagac ggtaggcttg 330

<210> 169
<211> 398
<212> DNA
<213> Eucalyptus grandis

<400> 169
ggaaaatttg gtatcggtag agagatcctg tgagatcgac gcgtgggtcg accttcaaaa 60
tttgacccgt gaggtgatct ctcgaaacagc gtttggcagt agcttcgaag aaggcaaaag 120
gatctccgaa cttcaggggg aacaagccca gctcacgata atagcccttc aatcggtcta 180
catccctggg tggagggttg tgccaactaa gatgaacagg aggatgaaga gcatagataa 240
ggaagtgcgg gctctgctca tggacatcat ccgcagaaga gagaaagcaa taagggaagg 300

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ggaagctgct ggcgatgac tgctggggct gttgctggag tcaaacaatga aggagaatgt 360
 cgggatgagc cttcacgatg tgatggacgg agttgcag 398

<210> 170
 <211> 432
 <212> DNA
 <213> Eucalyptus grandis

<220>
 <221> unsure
 <222> (214) ... (214)

<400> 170
 gttaccaaag ggcagcaacg tattcttaaa catgggttct atccacaggg atcccaagat 60
 ttgggacaaa ccgttggagt ttagacccga gaggttcttg gaaggctcta gcaagtatga 120
 tttctcaggt aacaacttcg catacatgcc attcgggttct ggtcgaaggg tgtgtgcagg 180
 gcttgcgctg gcagagagga tgcaaccata tgtnttggcc tctcttttgc actcattcaa 240
 gtgggaaata ccaccagggt ctgagctgga tttactggac aagttcggcc ttgtggtcaa 300
 gaaaatgaag ccccttgtcg ccattccaag accaagattg tccactctgg agctctacat 360
 gtcgagatag atatttcatt agagtcccaa agctcttcat ttcaattcta agaaataaac 420
 gtatcctgcc ag 432

<210> 171
 <211> 303
 <212> DNA
 <213> Eucalyptus grandis

<220>
 <221> unsure
 <222> (105) ... (105)

<400> 171
 ccatcgcggc cctggcccgg acctacgggc cgctcatgca cctgcggtc gggttcgtac 60
 gacgtggttg tggccgcgtc ggcctccgtg gccgcccagt tcctnaagac ccacgacgcc 120
 aacttctcga gccggccgcc caactccggg gcgaacacat cgcgtacaac taccaggacc 180
 tgatgttcgc gccctacggc ccgcggtggc ggatgctaag gaagataagc tccgtccacc 240
 tcttctccgg caaggctctt aagcattaca gacacgttcg ccagaaaaag gtcgcaatcc 300
 tca 303

<210> 172
 <211> 518
 <212> DNA
 <213> Pinus radiata

<400> 172
 cattagatat atatatatag acacgcattt acgatatcat tgcaacaatg tcattggtag 60
 gctgggttgt ttttctaate gctttgattt cgtatttggc tgccatcaca aatgcagcaa 120
 tcgtcaatta taccttcate attgaagcga agacagttac caggctatgc aaggagaata 180
 caataatcac cgtcaatggg cagctaccag gtccgacat ctatgtccat gacggagaca 240
 ctgttattgt tgaaacttat aacaaggccg agtacaatgc cactcttcac tggcatggag 300
 tggagcagtt gcgtacacca tgggctgatg gacctgcata tgttactcaa tgtcccatte 360
 caccaggtgg tcgttatata tacagattca acatctctgg acaagaagga accgtgtggt 420
 ggcatgcca ttactcatgg ctccgagcta cgggtccatgg agcttttgta atccttccta 480
 aggaaggaag ctcatatccc ttttctaaac ccaatgcc 518

<210> 173
 <211> 309

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<212> DNA
 <213> Eucalyptus grandis

<220>
 <221> unsure
 <222> (284) ... (284)

<221> unsure
 <222> (294) ... (294)

<400> 173
 gccgctgac ctaggattga gatctgcatg ctccccgtgg gtgatggcat cactctctgc 60
 cgtcggatca gctgagcatc taatctcaag tccttatgat cagggttcat tcttaatgta 120
 gaaccacga aaaagagagg gatttatgta tatcttggtg ctgtttcttt tccatgaacc 180
 tagaaacggg attcgcaatt aaatgccaaa ttatgttgct gtttctcttt agtgctctcg 240
 atttcttttt attttttaat ttttttgatc agtttcttcg aatnatctca agtncttcca 300
 aaaaaaaaa 309

<210> 174
 <211> 381
 <212> DNA
 <213> Eucalyptus grandis

<400> 174
 taagacgaag aaatggaaac aacggccaag ccatcgcgaa acgcctttcc gcatatggaa 60
 tgcactatat ttgatcttcc gcatgtggtg gccaatttag aagttagcga gaacgtgaga 120
 tgtgttcttg gggacatggt tgagtccata ccaccagcag atgcaataat attgaagtgg 180
 atactccatg attggagcga tgaagacgct gtgaagatac tgaagcgatg caaggaggcc 240
 ttaggcaagg gcaagggcaa gaaacagaag gtaattataa ttgacatggt gatggacaac 300
 acgaagagcg ccaaagagac ggtcgaaacc cagctcttct atgacatggt gattgatgaa 360
 ccctcgccgt cgggaaaggg g 381

<210> 175
 <211> 236
 <212> DNA
 <213> Pinus radiata

<220>
 <221> unsure
 <222> (37) ... (37)

<400> 175
 tgaattacca catgcggctg atagatctgg tgaaggncgg aggattgatt gcgtatgaca 60
 atactctgtg gcaaggatcc gttgcgcttc cccagaagt cgccatgagc gaaggcatga 120
 gttatgggga agacagagag catatgttgg aactaaacag ggcccttgct gcagaccctc 180
 gcatcgagat tgctcagatc ccaattgccg atggagtgac gctgtgcagg cgcctt 236

<210> 176
 <211> 404
 <212> DNA
 <213> Pinus radiata

<220>
 <221> unsure
 <222> (1) ... (404)
 <223> n at all occurrences indicates unsure

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<400> 176

gtcgggaatt	ccacttacca	gaccattaat	tcacgattca	tcccaccta	gcctggaaat	60
ttgggtctgaa	tctggagccc	aatactgtac	aagtagcctt	ggtctcttcg	ggaatccgtg	120
tntggaaaga	agaaattgag	atccggccaa	agatgggttg	agggtcagac	ctgggcgctg	180
tgcaggccaa	tggaaatcaa	aatggaaatg	gatttcatca	tgtgcattct	gttgatctct	240
gcattcagaa	tggncagac	cctctgaact	gggggcaggc	tgccaaggcc	ctgcagggct	300
cccactttga	agaagtgaag	ctcatgggtg	ngtcctat	cggatccgng	gaagtttcca	360
ttgaaggcaa	atcngtcaca	atcgcggtg	tgaccgcagt	tgcc		404

<210> 177

<211> 415

<212> DNA

<213> Pinus radiata

<220>

<221> unsure

<222> (20) ... (20)

<400> 177

cccaacgcta	tgcgtctgan	caggcaactt	tcttcagtgc	atttgtggcg	gcatggata	60
aattgggcag	tgtgggtgta	aaaactggca	cacaggggga	ggtcaggagg	agatgtgatg	120
cgttcaattg	agaagagtaa	agttcaaatt	ctctccatta	ttaagggtgg	attgtatgca	180
tggttgagat	taatgaacgg	aacaaagaaa	atttaatggt	ttgtaactag	tgagattgat	240
gaattgaata	aagaattttt	cctgtcctct	gattcaacct	gttttgcact	ctgtgaagca	300
ctttacagtc	tggactctgg	aaggaatcca	tcaaatcgtg	actaagaaaa	gggtaatgat	360
tttaaagaga	ttccgttgcg	ctcattccat	tgggggattc	ctgaaaatat	ctgcc	415

<210> 178

<211> 409

<212> DNA

<213> Pinus radiata

<400> 178

gatgggcg	caattctttt	cagccggctg	gtgtagttgc	tgttgagggt	acgggaggtc	60
ccacaattga	gtttgtccct	ggtcgtaagg	attcactggc	atcaccacga	gaagggcg	120
ttcctgatgc	gaagaaagg	tcacaacacc	taagggat	cttttatagg	atgggcctat	180
ctgacaagga	tatagttgct	ctttctggag	cgcacaccat	tgggaaaagc	acatccagaa	240
agggtcaggct	ttgatggagc	atggaccgag	cagcctctga	agtttgataa	ttcatatttt	300
gtagagcttc	tcaaaggcga	gtctgaagga	ttactccaat	tgcctacgga	caaagtcttg	360
gtagaggatc	ccagtttccg	cccttatgtg	gatctttatg	ccaaggatg		409

<210> 179

<211> 411

<212> DNA

<213> Eucalyptus grandis

<220>

<221> unsure

<222> (393) ... (393)

<400> 179

agagcttctc	ccagagaggc	ctctctatgg	aagatctcgt	cgtcttttcg	ggaggccaca	60
cactaggatt	ttcccactgc	tctccttcg	caggcaggat	cgcgaacttc	aacaccacgc	120
acgacatcga	cccacgatg	cacccatccc	tggcagcgag	cctaagaggc	gtgtgcccga	180
gcaagaacag	gccaaaaaac	gcagggacca	ccatggaccc	ttcctcgacc	accttcgaca	240
acacgtacta	cgggctgatc	ctccagggga	agggcctgtt	ctcttcggac	caggccctcc	300
tggcagtgcc	caagacgaag	gatctggctg	agaagttcgc	aggctcgcac	aaggaattca	360

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cggatgcatt cgtcaagtcc atgatcaaga ttnagcagca tcacaggcgg a

411

<210> 180
 <211> 334
 <212> DNA
 <213> Pinus radiata

<400> 180

gcatcatggg aagtacaact gggaagaaga gacagcctaa cagcaagcaa aacagcagca	60
aataacaaca ttccagcccc cacatcaa at gttgcaacac ttaactccaa gtttcagaat	120
gtaggcctca ctgaacaaga catgggtcaca ctctcaggag cccatacaat aggaaaggcg	180
cgttggtgcaa cattcaactc tagggtcacg ggacaaccgg atcccactct tcagaaagag	240
tttttgacat cgctccaaca aatctgcttt caagggctag ccagtaataa caacaccgta	300
acttcactgg atgtggagac tcccgtcatt tttg	334

<210> 181
 <211> 343
 <212> DNA
 <213> Pinus radiata

<400> 181

atttcgctga actggatctg gatcgaagaa ggtattgcat atcaaagaaa gaggcaaata	60
tgactccggc cactgttttg ctttctatat ttgtgattgt atatggtagt gctgtgaacg	120
ctctgccaac tcccgtggcg ggtctttcgt ggacgttcta caacacaagt tgcccgtcat	180
tggagtcgat agtgcggaag cgcattggaag cctatttgag tgcagacatc acacaagctg	240
caggattgct gaggctccac ttccacgact gttttgtcca gggatgcgac ggggtctgtg	300
tgctgaactc aacatcgggg gagcaaacag ttgcgcccaa ctt	343

<210> 182
 <211> 443
 <212> DNA
 <213> Pinus radiata

<220>
 <221> unsure
 <222> (164) ... (164)

<400> 182

atttcgctga actggatctg gatcgaagaa ggtattgcat atcaaagaaa gacgcaaata	60
tgactccggc cactgttttg ctttctatat ttgtgattgt atatggtagt gctgtgaacg	120
ctctgccaat tcccgtggcg ggtctttcgt ggaccgtttt acancacaag ttgcccgtca	180
ttggagtcga tagtgcggaag ggcattggaag gcctatttga gtgcagacat cacacaagct	240
gcaggattgc tgaggctcca cttccacgac tgttttgtcc agggatgcga cgggtctgtg	300
ttgctgaact caacatcggg ggagcaaaca gttgcccga acttatcact cagagcggag	360
gctctgaaaa tcatcaatga catcaaagag aacgtagaag cggcgtgcag cggaactgtg	420
tcgtgtgcag acattcttgc ctt	443

<210> 183
 <211> 243
 <212> DNA
 <213> Pinus radiata

<400> 183

acattgatga ttgtgctacg cgtatTTTTT tcaatctcta gcacttggga aggtctggag	60
gagggcggtc caagggtgcc tgagggccgt gaccgttctt cactataaac accatattca	120
gtccccatac taaatggtcg tctaaatggc agtggagaaa ccacactcct ggattgtcag	180
ctttgaatct tategcaacc caaccgtcag caggagctat tactgtgttg cgtagtgggg	240

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atc

243

<210> 184

<211> 473

<212> DNA

<213> Pinus radiata

<400> 184

ggtggcccct	agaagaaaca	cactcagaga	gtttgatcta	taagaggaga	gattcactcc	60
aaaatgcaca	gggagattca	ctccaccatc	aaattttaat	cattggcctt	tttccttca	120
acggccgatg	gcgtaaacac	gcgtaagcaa	acaccaagat	cctgaaacag	tcgactgatc	180
gattcagaat	aatttgaaag	gaaactggac	tactcaatca	atttggtgac	atttatcaag	240
aaatggatga	ttcagtacag	gaggtatcca	aggaaggcaa	tcaatgggca	ggattcattg	300
agggtgagaa	tgtaatccga	agaggaaggg	agattcttct	acagcatgat	aaccgggagg	360
cacataactg	ggagtcacat	aaacataagt	ggtggccaca	tttggaagaa	aaaatcccgc	420
acattgccaa	agcaggattt	acatctatat	ggctgccgcc	tgcttttgat	tcg	473

<210> 185

<211> 641

<212> DNA

<213> Pinus radiata

<400> 185

ggcaccgagc	tgggataccc	ctgctgcgac	ttgatccctt	ttgaacagga	attattttaat	60
tttcctaatt	attttagttt	gcaaggaaac	ttgactactc	catcaatttg	tttacagttt	120
tcgaaaaatg	ggctatccag	ttcaggaggt	atccaaggaa	cacgatcaat	gggcaggatt	180
tggtgaaggt	gaaagtgtgc	ttcaaagagg	aaggagatt	cttctccagg	gttttaactg	240
ggagtcacat	aaatacaagt	ggtggccaaa	tttggaagaa	aagatcccgc	acattgctaa	300
agcaggattt	acatctgtat	ggctgccacc	tgcttttgat	tctgctgcac	cccaagggtta	360
cttgccccga	aacatttatt	ctctgaactc	tgcataatgg	tcagaatatc	agctgaaaag	420
cttacttatg	acaatgcgaa	agaaaaatgt	gagagccatg	gctgacatag	ttatcaatca	480
tcgcatggga	agctctcagg	ggtttgagg	cttgataaat	cgctattatg	gttgccctgcc	540
ttgggatgaa	cgtgctgtta	cacgttggtc	tggtggactt	ggaaactgga	gcacagggga	600
taattttcat	ggagtaccaa	acgttgatca	caccaagat	t		641

<210> 186

<211> 655

<212> DNA

<213> Pinus radiata

<400> 186

agaatggcca	agtttcgatc	tctgtcttta	ttgttatgg	tctcctgcat	catagtcaat	60
gcagcctctc	ctgcacaagc	agaagctaca	acgcctcctc	tgaataccct	cttacttcag	120
ggcttcaatt	gggattcagc	ccagagttct	actccttgg	ataatgtatt	gaagggaatt	180
gtagacgatg	cagcggacgc	cggcattacg	tacgtctgg	ttccgccgcc	ctcacaatcc	240
ggcgcccctc	aaggttat	gccagcgaag	ctctatgatt	tagactcgtc	ctacgggagc	300
gagcaacaac	taaaggatgc	cgtgaatgcg	ttccaccaa	agggaattgc	gattatgggc	360
gacatcgtga	taaaccatcg	gaacgggacg	aagcaggacg	ataaaggata	ttggtgcgtg	420
tttgagggcg	ggaaggggga	cggactctcg	gactggggac	cctgggcggt	caccgtgaag	480
gaccaaccat	atccgttg	cggctccggc	caggcggaca	ccggagggga	cttcaagtac	540
gccccggacg	tggaccacac	caatcccaag	atacagcaag	atgtgtcgga	gtggatgaat	600
tggtcgaagt	ccatgtcgga	tttgatggct	ggaggttcga	ctacgtcaag	gctac	655

<210> 187

<211> 438

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<212> DNA

<213> Eucalyptus grandis

<400> 187

ctgggggtggg	gaggctgggc	gacgtgggcg	ggagcgcggg	ggactgcctc	cggatgatca	60
tggggaagca	cacgcacgtc	cggaaggga	tcaacttcga	cttgcccag	gtcgtggcca	120
aagcgctcc	cattcctggg	gtgacccatg	ttgggtggcg	catgttcaag	tccatccctg	180
ctggtgatgc	cattttcatg	aggtggatac	tgacgacatg	gacggacgac	gagtgcgaagc	240
agatactgga	aaactgcttc	aaggcactcc	ctgcgggagg	gaagctgatt	gcctgcgagc	300
cgggtgctacc	gcagcactca	gatgatagcc	acaggactcg	agcacttctt	gagggcgaca	360
tcttcgtgat	gaccatctac	agggccaagg	gcaagcatag	gactgagcag	gaattccagc	420
agctcgggct	ctctaccg					438

<210> 188

<211> 597

<212> DNA

<213> Eucalyptus grandis

<400> 188

acccaacaat	ggccgacaac	caagaacgcg	aagggcgcg	tcaagaagag	gaagtcggga	60
agctggcggt	ccagctggcc	agcgcggtgg	tgctcccgat	gaccctcaag	tcggccctcg	120
agctcggcat	catcgacgcc	ctcgtctccg	ccgggtgggt	cctctcggct	gccgagatag	180
cgagccgggt	tggcgccaag	aaccggggg	ccccagtcct	ggtggaccgg	atgatgcgcc	240
tcctggcgag	ccacggcggt	atcgagtggc	ggttgaggag	gggcgacggc	aacggagatg	300
gaggggagag	agagtacggg	ccaggaccca	tgtgcagggt	ctttgccaa	gaccaagaag	360
gtggagatgt	tggtcctctg	tttctgctaa	ttcacgacaa	ggtcttcatg	gagagttggt	420
accacttgaa	cgatgtcatc	atggaaggag	gggttccggt	cgagagggca	tacgggatga	480
cggcgcttcga	gtatcctgcc	gttgacgata	ggttcaatca	agttttcaac	cgggccatgg	540
cgagtcatac	ttccctcatc	atgaagaaaa	tactcgatgt	ctacagaggg	tttgaag	597

<210> 189

<211> 470

<212> DNA

<213> Eucalyptus grandis

<400> 189

cccgaccccg	ctttacatga	acaagatcct	cgagtcgtac	cgtggggttg	agggcgcaaa	60
gacgattgcc	gacctagggt	gcggcgctcg	ccagaacctt	cggctcatat	tggacaagtt	120
cccaaattctc	aggggcatac	tctatgatct	gcctcatgtg	atcaaagatg	cacctgcca	180
tcctcgtatg	gagcgtgtcg	gaggagacct	gttaaagtct	gttccgaaag	cagatatact	240
cttcatgaag	tggcttttcc	atgggtctacg	agacgatttc	tgcaaaatgc	tactccagaa	300
ctgttacgag	gcgctgccac	caaattggcaa	ggtgggtcatc	gtggacccga	tccttcccga	360
ataccccgag	acagacatag	tgtcgaggaa	ctcgttcacc	tccgacatga	tcattgctata	420
cacgagccct	ggagaagacc	ggacgaggaa	agagctggag	gtgctcgcac		470

<210> 190

<211> 499

<212> DNA

<213> Eucalyptus grandis

<400> 190

gtccagtttt	cagccgtgct	atgaagaagc	caacagttta	gaccgttgga	ttcagcctcc	60
gtcggatctg	cttcataata	tgtccgataa	agaactatct	tggagagcga	cccttggttc	120
taaaatcaag	aagtatccat	tcagaagagt	tccaaaaatt	gctttcatgt	tcttgaccaa	180
gggtccattg	ccgctggctc	ctctttggga	gaggttcttc	aagggccatg	aggggcttta	240
ttcgatctat	attcattccc	atccatcatt	ccatgcccac	tttcatcctt	ggtcgggtatt	300
taacaggaga	caaatcccaa	gtcagggtgtc	tgagtggggc	aggatgagca	tgtgtgatgc	360

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agagaaaaga	ctcctagcca	acgcattgct	agacatatcc	aatgagcggg	tcattcttct	420
ttctgaatca	tgcattccgc	tgtataactt	cagcctcatc	tatcactaca	ttatgaagtc	480
cggatatagc	ttcatgggt					499

<210> 191
 <211> 1036
 <212> DNA
 <213> Eucalyptus grandis

<400> 191						
ggcaagtggg	ggctggaatt	cacacccatt	gcgctctctc	tctctctcta	gacccatctt	60
cgaaagccaa	aagaaaagac	agtcggaaga	aaaaatataa	aaaaaaacat	gagttcgaag	120
gaagccccag	tcattacaac	ttcccatgaa	gatgaagaaa	ttttgaatgc	ctttgagggtc	180
ccctcaatgg	cttttggtcc	catgggtcttg	aaaggcgctc	atgagctggg	gattcttgaa	240
ttgctggcca	agggtgacca	gctctctccg	ttggacatcg	tggcccgcct	ctctatcgac	300
aacccggccg	caccggacac	gatcgaccgg	atgctgcggc	tccttgcgag	ttactccatc	360
ttatcgtgca	ctctcgtgga	ggataaagaa	ggccgcccc	agaggctcta	cggcctcggg	420
cctcggagca	agttcttttt	ggaccagaat	ggagcttcta	ctttaccaac	tcatatgcta	480
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ccgagattca	acgacctgta	caacaagtcg	atgaggaccg	ggtcggcgat	ttacatgccc	660
aagatcgctc	agcattatcg	tgggttttca	aaggcgaaga	cggtcgtcaa	tgtgggcggg	720
ggcatcggcg	agaccctgaa	aaccatactc	tccaagaatc	cccacatccg	cgccatcaac	780
tacgacttgc	ctcatgtgat	cgcaactgct	cctcccattc	ctgggtattac	gcatgttgga	840
ggagacattc	taaagtccgt	ccctaaagcg	gatgtccatt	tcctgaagtc	ggttctccat	900
cgcggggatg	atgagttctg	cgtgaagggtg	ctcaagaatt	gctgggaggc	attgccgccg	960
acgggggaaag	tgggtgatcg	ggaggaagtg	accccgagtg	atcctgggac	cgacgatgtc	1020
tcacagacca	cgctct					1036

<210> 192
 <211> 682
 <212> DNA
 <213> Pinus radiata

<400> 192						
agacgttgga	ggaggtatag	gctctgcctt	gtccatcatt	gtgaaggaac	atccacacat	60
tcgtggcatt	aatctcgatc	tgccctcatgt	cattgccact	gcgcctctca	taactggggg	120
ggagcacatg	gagggaaata	tgttcgagca	cataccttct	gccgatgcag	tcattgatgaa	180
gtggatcctc	catgactggg	cggacgagga	gtgtgtgaaa	ttgctgagaa	gaagctacga	240
cgcaacgcca	gcgaaggga	aggtgttaat	tgtggaagca	gttggtgagg	gagacaaaga	300
aggtgaaagc	atgtcgaggc	gattgggatt	gttatatgat	atatcgatga	tggcttacac	360
aactggtggg	aaggagagaa	cagaggaaga	attcaaaggg	ttgttccagc	gcgcagggtt	420
caagagccac	accatcatca	agttgccttt	ccttcagtcg	ctcatagtgc	tgtccaaagc	480
ctaataagct	attgcgcttc	cgattatcgt	tacaataacg	ttgggtttgc	tgggggttgtt	540
atcatgcagt	atatgacctc	tggttttatgt	tatctggcag	tataagattt	ctgaagacat	600
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taatattttt	acaaaaaaa	aa				682

<210> 193
 <211> 399
 <212> DNA
 <213> Eucalyptus grandis

<400> 193						
agcgtcta	ggttcctatt	tagaagttca	gaaagtctct	gtctttccta	ccttgccggg	60
tagtctcttc	ggacgtactc	aaacatggag	caaggctggg	acaagggcga	gacccctggc	120
agcaaagctc	tctcgaagta	catattggag	accaatgcat	atccgagaga	gcacgagcag	180

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ctgaaagaac	tcagggagggc	cacgggtccag	aagtacccaaa	tccggagtat	aatgaacgtg	240
ccggttgatg	aggggcagct	gatctccatg	atgttgaagc	tcatgaatgc	gaagaagaca	300
atcgagatcg	gagtcttcac	cggctactct	cttctgacca	ccgcacttgc	acttccggcc	360
gacggcaaga	taatagcgat	agaccaggat	aaggaggcc			399

<210> 194

<211> 399

<212> DNA

<213> Eucalyptus grandis

<400> 194

cggacgtact	cagacatgga	gcgaggcggg	gacaagggcg	agatcctggc	aagcaaagct	60
ctctcgaagt	acatattgga	gacgaatgca	tatccgagag	agcacgagca	gctaaaagaa	120
ctcagggagg	ccacgggtcca	aaagtaccaa	atgcggagta	taatgagcgt	gccggctgat	180
gaggggcagc	taatctccat	gatgttgaag	ctcatgaatg	cgaagaaaac	aatcgagatc	240
ggagtcttca	cgggctattc	tcttctcacc	accgcacttg	cacttccggc	cgacggcaag	300
ataatagcaa	tagaccggga	taaggaggcc	tatgaaattg	gcctgccata	tatcaaaaaa	360
gccggagtcg	atcataagat	caacttcate	cagtcggat			399

<210> 195

<211> 296

<212> DNA

<213> Eucalyptus grandis

<400> 195

ttgcagtaca	tattggagac	gaatgcatat	ccgagagagc	acgagcagct	gaaagaactc	60
agggaggcca	cagtccagaa	gtaccaaate	cggagtataa	tgaacgtgcc	ggctgacgag	120
gggcagctaa	tctccatgat	gttgaagctc	atgaatgcga	agaagacgat	cgagatcgga	180
gtcttcaccg	gctgttctct	tctcaccacc	gcacttgcac	ttccggccga	tggcaagata	240
atagcgatag	acccggataa	ggaggcctat	gaaattggcc	taccatatat	ccgaaa	296

<210> 196

<211> 474

<212> DNA

<213> Eucalyptus grandis

<400> 196

gcgccaccac	caaacgctca	ccttctcate	atcagccctc	tgtctctgtc	tctgtctctc	60
gattctccgc	cccgccacga	caatggaggc	gaagccgtcg	gagcagcccc	gcgagttcat	120
cttccggtcg	aagctccccg	acatctacat	tcccgacaac	ctctccctcc	acgcctactg	180
cttcgagaa	atctccgagt	tcgccgaccg	cccctgcgtc	atcaacgggg	ccaccggccg	240
gacctacacc	tatgccgagg	tcgagctgat	ctcccgcggg	gtctcagccg	gcctcaacgg	300
gctcggcgtc	ggacagggcg	acgtgatcat	gctgctcctc	cagaactgcc	ctgagttcgt	360
gttcgcggtc	ctcggcgcg	cctaccgggg	cgccatcagc	acgaccgcga	acccgttcta	420
caccccgggc	gagatcgcca	agcaggcctc	agctgcccgg	gccaaagatc	tgat	474

<210> 197

<211> 543

<212> DNA

<213> Eucalyptus grandis

<400> 197

gttcgccgac	aaggtgaggg	cgttcgcgga	ggagaacggg	gtgaaggctc	tgtgcatcga	60
taccgcgccg	gagggctgcc	tgcacttctc	ggaattgatg	caggcgagcg	agaacgccgc	120
ccccgcggcg	gacgtcaagc	cggacgacgt	cttggcgctc	ccctattcgt	cgggcacgac	180
ggggcttccc	aagggagtg	tgcttacgca	caggggtcaa	gtgaccagcg	tggcgagca	240
ggtcgacgga	gacaacccca	acttgtactt	ccacaaggag	gacgtgatcc	tgtgcacgct	300

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cccgttggtc	cacatatact	ccctcaactc	ggtgatgttc	tgcgcgctcc	gtgtcggcgc	360
cgccatcctg	atcatgcaga	agttcgagat	cgtggcgctg	atggagctcg	tgcagcggta	420
ccgggtgacg	atcctgcccc	ttgtcccgcc	gatcgtgctg	gagatcgcaa	agagcgccga	480
ggtggaccgg	tacgacctgt	cgtcgatccg	gaccatcatg	tcgggtgcgg	cccgatgggg	540
aag						543

<210> 198

<211> 564

<212> DNA

<213> Eucalyptus grandis

<400> 198

ctggacaact	agttgcagga	ggtgaagctc	aagttatcag	cgtggataca	ctaaaatctc	60
ttccccctaa	tcagttaggg	gaaatatggg	ttcgtggacc	taacatgatg	aaaggatatt	120
ataacaatcc	acaagcaact	aaattgacaa	ttgataacaa	gggttggttg	cacactggag	180
accttgata	ttttgatgag	gaagggaac	tatatgttgt	tgatcgaatc	aaagagctca	240
tcaagtacaa	aggttttcag	attgctccag	ctgagcttga	aggactcctt	ctttcacatc	300
ctgaaatttt	agatgctggt	gtcattccat	ttcctgatgc	tgaagctggt	gaagttccta	360
ttgcatatgt	cgttcgctca	cctaccagct	ctctaactga	agaggaagtc	cagaaattca	420
ttgccaatca	ggttgcacca	ttcaaaagac	taaggagggt	gacattcgct	aacagcgctc	480
caaagtctgc	ttccggcaaa	attttgagac	gtgagctgat	tgcaaaagta	cgagcaaaga	540
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<210> 199

<211> 455

<212> DNA

<213> Pinus radiata

<400> 199

ggctactttg	atgaggaagg	aggattat	attgtggatc	gtattaaaga	actaatcaaa	60
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attgcagatg	ctggagttat	tccccctcct	gatctaaaag	ctggagaggt	tccaatagca	180
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aagcaggctg	caccatttaa	aagggtgcat	agagtcaatt	ttgtagactc	tatacccaag	300
tctgcctcag	ggaagattct	tcgacgagag	cttattgcta	aggccaaatc	aaaattgtaa	360
gcaaagaaat	atatcatttt	ttctgggtatc	atgatacaaa	gttgcacaaa	cttatttgta	420
agtgtcaccc	cagatgaaca	aggaatttgt	tccgc			455

<210> 200

<211> 569

<212> DNA

<213> Pinus radiata

<400> 200

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caagtaggtg	ggggtggggg	agcttaagtc	aaatctagtg	ctttctctgt	aagattttcc	120
cttttttttc	ttgctaagag	tagccatgat	tgaggtagag	tcagctcccc	ccatggcacg	180
gtccactgag	aacgagaata	accagcatga	tgccgaagaa	ggggcggtat	tgaatgaggg	240
cggcatggat	tttctgtatc	ggtcaaagct	tccagacata	gatattccat	accatcttcc	300
attgcactcg	tattgcttcg	agaaactgga	cgagctcaga	gagaagccat	gtctgataca	360
ggggtcgaac	gggaagattt	acagctatgg	cgaagtggaa	ttgatattctc	gcaagggtggc	420
ctcgggtttg	gccaaattgg	gattcaaaaa	gggggacgtg	gtcatgctgc	tgctgccccaa	480
ttgccccgaa	tttgtctttg	ttttcctagg	ggcgtccatg	gctggtgcca	ttgccaccac	540
ggcgaaccct	ttttacactc	cctccgata				569

<210> 201

<211> 993

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<212> DNA

<213> Eucalyptus grandis

<400> 201

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tccagggcct	ccatcacttc	ccatcatagg	caacttccac	cagctcggcc	ccctgcctca	180
tcagtctctg	tggaaactct	ccagacgata	tggtcccgctc	atgctcatcc	gcctcgggtg	240
cacccctacc	atcgtaatct	cctcccttga	tgctgccagg	gaggtcctca	agaccacga	300
ccttgatagt	tgcagtcgcc	cgcagatgg	cggcccggga	cgcctctcct	atgactccct	360
cgacatggcc	ttcgtggagt	acggcgatta	ctggaggagg	ttaaggacgc	tgtgtgtgct	420
cgagctgttt	agcatgaagc	gagtcagtc	cttccgatac	atcagggaag	aggaggtggg	480
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gggaagcttc	tcggcatctg	attatttccc	tcgactcggc	tggattgtgg	acaggttcac	720
ggggctccat	tcgaggttgg	agaagagctt	tcgcaatttg	gacgatctct	atcagaaggt	780
gatcgaagag	catcggaatg	cgaataagag	caacgaggga	aaggaggaca	ttgtcgatgt	840
gctgctgaag	atggagaaag	atcagactga	gctcgcgggg	gtccggctca	aggaagataa	900
catcaaggcc	atcttgatga	atatatttct	cggaggagtg	gacaccggtg	cagtgtcatg	960
gactggacaa	tggctgagct	cgctaggaac	ccg			993

<210> 202

<211> 349

<212> DNA

<213> Eucalyptus grandis

<400> 202

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gaagcttctc	ggcatctgat	tatttccctc	gactcggctg	gattgtggac	aggttcacgg	120
ggctccattc	gaggttggag	aagagctttc	gcaatttggg	cgatctctat	cagaaggtga	180
tcgaagagca	tcggaatgag	aataagagca	acgaggga	ggaggacatt	gtcgatgtgc	240
tgctgaagat	ggagaaagat	cagactgagc	tcgcggtgtg	ccggctcaag	gaagataaca	300
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<210> 203

<211> 432

<212> DNA

<213> Eucalyptus grandis

<400> 203

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caacctccca	ccgagccctc	ctaagttgcc	gatcatcggc	aatcttcacc	agcttggcaa	120
atcgccacac	atatctctcc	atcgccctgc	gagaaactac	gggccaatca	tgtccttgca	180
gctcggcgaa	gtcccaacca	tagtcgtttc	ctcagccgca	atggccaagg	aggtgatgaa	240
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tgactgcaca	gacatggcct	tctctcccta	tggcgcttat	tggaggcaca	taaggaaaat	360
ctgcatactt	gaagtgttta	gcgcaaaaacg	ggttcagtc	tttagtcatg	tcaggaggagga	420
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<210> 204

<211> 407

<212> DNA

<213> Eucalyptus grandis

<400> 204

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ccgccatcac	cgccgaagct	ccctatcatc	gggaacctcc	accagctcag	tgatcacccct	120
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gacctcattt	tctccgaccg	acccaggtca	accctgtcgg	agaggctttt	gtaccaccgc	300
aaggacgtgg	ctctggcgcc	gtttggcgag	tactggaggg	aatgaggag	catctgtgtc	360
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<210> 205

<211> 384

<212> DNA

<213> Eucalyptus grandis

<400> 205

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ctcaagaccc	acgatctcac	attctcgtcc	cgaccccggtg	tggcggccgg	gaaatacact	180
gtttacaact	actccgacat	cacctgggtct	ccctacggag	agcactggcg	tctcgccaga	240
aaaatctgcc	tcatggagct	cttcagtgcc	aaacgcctcg	aatctttcga	gtacatcaga	300
gtagaagagg	tcgcccggat	gctgagttcc	gtcttcgaaa	ccagccggca	gggccttcct	360
gtagaaatca	gggaagagac	gact				384

<210> 206

<211> 543

<212> DNA

<213> Eucalyptus grandis

<400> 206

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ttatatgaaa	ctcgtctattg	ctctagttgc	gttggtgggtg	gcatggagct	tcttcgtcaa	120
gggaagaaat	aggaagctgc	ccccgggacc	gttctctttg	cccatcatcg	gaaatctcca	180
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agtgcgtaag	gtgtgcgttt	tacagttgct	gagctccaga	cgttgggatt	atttccgctt	480
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aaa						543

<210> 207

<211> 1320

<212> DNA

<213> Eucalyptus grandis

<400> 207

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ctgaagttgg	cagaaggcaa	aacgaggcac	tacaccttcc	atatcgattc	ccataacatg	180
acgaggctgt	gccacacgag	gagtgtgctg	agtgtaaaca	agcagtatcc	agggccgccc	240
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gtcacgattc	actggcatgg	ggttcggcaa	ctgaggacgg	gatgggcgga	tggaaccggct	360
tacgtaaccc	agtgtcccat	acagaccaac	cagagctaca	cctacaactt	caccctcacc	420
ggccagagag	gaacgctgct	gtggcacgcg	cacgtctcgt	ggctaagatc	gagcatccac	480
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cccaactcca	ccttcctcat	ggcagcgtgg	ccctatttca	cgggcatggg	cactttcgcg	960
aattccaccg	tcgccggaat	ccttgagtag	gaacatccaa	agagctcaaa	ttaccgcgcg	1020
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gccaaattta	cagggcaatt	gcgtagtgtt	gccagcgcta	agtttcctgc	caacgtgcca	1140
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aacaccacgt	gtcaaggacc	aaatggcacg	aaattcgccg	catcagtcaa	caacatatcg	1260
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<210> 208

<211> 980

<212> DNA

<213> Eucalyptus grandis

<400> 208

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ctctctatgc	tagggaagat	gacaccgtgc	tcgtgagggg	ctctaaccgt	gtcaaataca	180
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catacattac	ccaatgcccg	atccagccgg	gccaaagcta	tgtgtacaat	ttcaccatca	300
cgggccaacg	gggcaccctc	ctgtggcatg	cacacatact	ctggctcagg	gcaaccctgc	360
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tgaccgcgac	cgccacatta	cactactctg	gcacgcttgc	tgcgacctcc	acgacctca	900
ccaagactcc	cccacaaaac	gcgaccgctg	tggccaacaa	tttcgttaac	tcgctccgga	960
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<210> 209

<211> 305

<212> DNA

<213> Eucalyptus grandis

<400> 209

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caccatccat	tggcatggta	ttcggcagct	gaggtcgggg	tgggccgacg	ggccggcata	180
catcacccaa	tgcccaattc	agccaggcca	aagctatgtg	tacaatttca	ccatcacggg	240
ccaacggggc	accctccttt	ggcatgcgca	catactctgg	ctcagggcaa	ccctgcacgg	300
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<210> 210

<211> 411

<212> DNA

<213> Eucalyptus grandis

<400> 210

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gcaaagctgg	caacggaagc	agagtgcgtg	caagcatgaa	caacgtgaca	ttcgtgatgc	120
cgacgacagc	cattctccaa	gcacatttct	tcaacaaaag	cggcgtcttc	acgagcgatt	180
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ccacaagcgg gacaaaggtg taccgggttg gttataacte gacgggtccag ctgggtgtttc	300
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<210> 211

<211> 311

<212> DNA

<213> Eucalyptus grandis

<400> 211

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aatcaagcca tcaagtccgg attggcaccg aatgtctcgg atgctcacac gatcaatggc	120
catccagggc caagtcccaa ttgcccttcc caggggtggat ttacattgcc tgttgagagt	180
ggcaagaagt acatgctccg aatcatcaat gctgcgctca atgaggagct cttcttcaag	240
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<210> 212

<211> 334

<212> DNA

<213> Eucalyptus grandis

<400> 212

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cgaatgtctc ggatgctcac acgatcaatg gccatccagg gccaaagtcc aattgccctt	180
cccaggggtgg atttacattg cctgttgaga gtggcaagaa gtacatgctc cgaatcatca	240
atgctgcgct caatgaggag ctcttcttca agattgctgg gcaccagctg accatcgtgg	300
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<210> 213

<211> 1374

<212> DNA

<213> Eucalyptus grandis

<400> 213

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caacgctgcg ctcaatcagg aactcttctt caccgtagcg aaccataggt tcaactgtgt	180
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cgcgagagttt	cagttcagtg	attgtttccc	ctgaattcag	ggagccacca	gttggttgct	1320
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<210> 214
 <211> 418
 <212> DNA
 <213> Eucalyptus grandis

<400> 214						
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cgctagagaa	ggcgaccggc	tcctaataca	agtcgttaac	aatgtccagt	acaatgtcac	360
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<210> 215
 <211> 466
 <212> DNA
 <213> Eucalyptus grandis

<400> 215						
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ctcttttatg	atthttgtgg	aaatgagaca	cctattgaga	tgctatgtga	gacaaatcgg	180
agcgtactaa	ctgtgaacgg	tctatttctt	gggccggaga	tccatgctca	caagggtgac	240
actattttac	ttaatgtcac	caacttagga	ccttatggag	tcactattca	ctggcatgga	300
gtgagacaaa	tacggtatcc	ttgggtctgat	ggcccagaat	atgtcacgca	atgccccatc	360
cctacaaact	cgagctttct	tcaaaaaatc	aaactcaccg	aggaagaggg	cacgggtgtg	420
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<210> 216
 <211> 757
 <212> DNA
 <213> Eucalyptus grandis

<400> 216						
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tcttggtgag	agagagagag	agatgggaac	atttctaggg	tttgtggtca	ccatgaccct	300
gctcttttgc	atgggtcaag	gcgaagtcac	ctactatgat	ttcgtggtga	aggagacacc	360
tattcagatg	ttatgtggga	cgaatcagac	cgtattgact	gtgaatgggc	tgtttcctgg	420
gccagagatt	catgctcaca	aaggcgacac	catctacgtt	aatgtcacca	acacaggacc	480
ttatggagtc	actattcatt	ggcatggagt	gagacaaata	agatatccct	gggtccgacg	540
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<210> 217
 <211> 251
 <212> DNA
 <213> Eucalyptus grandis

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<400> 217

acacaagtct	ccttctttgt	tctggatcaa	gtgattgtta	caagttcatt	tttctcttgt	60
tgagagagag	agatgggaac	atctctaggg	tttgtggtca	ccatgaccct	gctcttttgc	120
atggctcaag	gcgaagtcct	ctactatgat	ttcgtggtga	aggagacacc	tattcagatg	180
ttatgtggga	cgaatcagac	cgtattgact	gtgaatggtc	tgtttcctgg	gccagagatt	240
catgctcaca	a					251

<210> 218

<211> 762

<212> DNA

<213> Pinus radiata

<400> 218

gcctggcagt	aatgtctaata	gaacaactcc	tggaatttgc	ttggggattg	gcttccagta	60
accaatcctt	cttgtggggt	gtgagggtcag	atatcgtgca	tggtgaatct	gccatattac	120
ccaaagagtt	cattgaggaa	accaaggata	gaggtatgct	ggtgggttgg	gcgcctcaga	180
ttaaaggact	gtcgcaccca	tctgtgggag	gatttctaac	tcacagcggg	tggaactcta	240
cattggaaag	cattagtgcg	ggtgtgccaa	tgatgtgctg	gcccttcttt	gccgagcaag	300
aaacaaatgc	taaatttgtg	tgtgaagagt	ggggaatagg	aatgcagggt	aagaaaatgg	360
tgaagagaga	agagttggcg	atactggtga	ggaattcgat	caaagggtga	gaaggagatg	420
aaatgaggaa	aagaattgga	aaactgaagg	aaactgccaa	gcgagcagtt	agtgaaggag	480
gctcttctaa	gaacaactta	gacaagttac	tccatcatat	attcctcaag	ggaatgcatt	540
aaatgatagt	ccagaatggt	gaagcaaaca	attagttaga	agagaacgtg	taggacgaac	600
gaaaacatcc	cagtacccca	agcgttcata	tttctgcatt	tcgcattaaa	tttactttgt	660
attgttcgcg	acatatgtat	tttcagggtg	tcagggtttcc	ccagagttga	acctcatttt	720
caattagatt	gtttcacgct	tttacggcgc	aggggggtgt	ga		762

<210> 219

<211> 1144

<212> DNA

<213> Eucalyptus grandis

<400> 219

aaatagctca	aagggttagtg	tcgcgaccta	aattgggtgtc	aacagctagc	caatggagtc	60
ctgctctatt	tcgctatttt	ggctgggcct	cctcctcccc	gcacttctag	ttttccttct	120
caaccgtcgg	aagcgcacca	agcttcccc	tcagccccca	gcatggcccc	tgatcggcaa	180
cattttcgcg	ctcgggacca	tgccgcacca	gaacctccac	aacctccgag	ccaagcatgg	240
gcctgtcttg	tggttgaagc	tcggttccgt	gaacaccatg	gtgatccaat	cagctcgagc	300
ggccatggag	ttattcaagg	gccatgactt	cgtgttcgca	gaccgcaagt	gttcccaagc	360
gtttactgct	ctcggctatg	accaaggctc	gctcgtctct	ggtcgtcatg	gtgactactg	420
gcgcgctctc	cggcgtctct	gctccgcgga	gctcctcgtg	aacaagcgcg	tcaacgatac	480
ggcccacctc	aggcaaaaagt	gtgtcgacag	catgatcatg	tatatagaag	aagaaatggc	540
agtcaaacaa	gcaacaaaag	ggcaaggaat	cgacttatct	cacttctctt	ttctcctggc	600
atttaaatgtg	gtgggcaaca	tggtgtctct	acgggatcta	ttggacccaa	aatcgaagga	660
tgggccccgag	ttctacgacg	ccatgaaccg	gttcatggag	tgggctggca	agcccaacgt	720
agccgacttc	atgccatggt	tgaaatggtt	ggatccgcag	gggatcaagg	caggcatggc	780
gaaggacatg	ggtcgagcca	tgaggattgc	cgaaggcttt	gtgaaagaga	ggttggagga	840
gcgaaagcta	aggggagaga	tgagaacaac	gaatgatttc	ttggacgcag	tattggatta	900
tgagggcgat	ggaaaagaag	gccctcacia	tatctcttcc	cagaacataa	atataatcat	960
tctggaaatg	tttttcgccc	gatcggagag	tacaagtagc	accatcgagt	gggcgatggc	1020
ggagctactc	cgccaacccg	agtcaatgaa	aaaggccaaa	gatgagattg	accaggttgt	1080
gggggttgaa	agaaagctcg	aggaaaatga	cacggaaaag	atgccatttt	tgcaagccgt	1140
ggtg						1144

<210> 220

<211> 563

<212> DNA

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<213> Eucalyptus grandis

<400> 220

agctcaaagc	ttagccaatg	gagtcctgct	ctatttctgct	atthttggctg	ggcctcctcc	60
tcccggcact	tctagtthtc	cttctcaacc	gtcgggaagcg	caccaagctt	ccccctcagc	120
ccccagcatg	gcccgtgatc	ggcaacattt	tcgacctcgg	gacctatgccg	caccagaacc	180
tccacaacct	ccgagccaag	catgggcctg	tcttgtgggt	gaagctcggg	tccgtgaaca	240
ccatgggtgat	ccaatcagct	caagcggcca	tggagtattt	caagggccat	gacttcgtgt	300
tcgctggaccg	caagtgttcc	caagcgttta	ctgctcttgg	ctatgaccaa	ggctcgtctg	360
ctcttggctg	tcatgggtgac	tactggcgcg	ctctccggcg	tctctgctcc	gctggagctcc	420
tcgtgaacaa	gcgcgtcaac	gagacggccc	acctcaggca	aaagtgtgtc	gacagcatga	480
tcatgtacat	agaggaagaa	atggcagtca	aacaagcaac	aaaagggcaa	ggaatcgact	540
tatctcactt	cctctttctc	ctg				563

<210> 221

<211> 447

<212> DNA

<213> Eucalyptus grandis

<400> 221

taatgaaggc	ccaagatgag	attgatttcta	tgattggcca	tgatagtttg	ttagaagaat	60
cggatgtttc	aaaactacct	taccttcagt	gcattatctt	ggagaccctt	cgactaaaca	120
cgacggcacc	acttctcctc	ccacacgcgt	catcggctga	ttgcactata	ggaggatact	180
tcgtcccacg	cgacactatt	gtgatgggtga	atgcatgggc	cattcacaaa	gaccttcagt	240
tgtggggagga	tccattgagc	ttcaagcctg	aaaggttcga	gggcaatggc	agcgaaaagc	300
aacaaaagct	actattgcct	tttggactgg	gacggagggc	atgccctggg	gcccccttgg	360
ctcatcgggt	catgggggtg	acgttgggct	tgttgattca	gtgttttgat	tggaaaagag	420
taagcgaaga	agagattgac	atgacgg				447

<210> 222

<211> 494

<212> DNA

<213> Eucalyptus grandis

<400> 222

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ggtgggttgag	ctgaaagaga	aattcgatgc	gttcattcag	ggcttgatca	acgagcaccg	120
gaggaagaag	ggcgacccag	agctcgcaga	cagcatgatc	agtcactctc	tgcactctaca	180
agaatctcag	ccggaagact	actcggactc	catgatcaaa	gggcttgtcc	ttgttttgtt	240
agttgcggga	acagacacgt	catcgcttac	attagaatgg	ataatgacaa	acttactaaa	300
caatcctgaa	aagttagaga	aggcccga	tgagattgat	tctgttattg	gccacgatcg	360
tctggtagaa	gaatcggatg	tttcgaatct	accttacctt	cagtgcata	tcttagagac	420
ccttcgacta	aacaccacgg	tgccacttct	cgtcccgcac	gcatcatcag	ctgattgcac	480
cattgggtgga	tact					494

<210> 223

<211> 492

<212> DNA

<213> Eucalyptus grandis

<400> 223

gttgtcagat	gcgatcccgg	ctcttggctg	gttggactca	ggtggctata	gacgatcgat	60
ggacgagaca	gcgaaagagt	tggatgtttt	ggctcagggg	tggctagagg	agcatagaag	120
gaagagattg	tcctgcccc	aagacgacag	agagcaagat	ttcatggatt	ggatgatcaa	180
cgcctcga	ggtcgggaatt	ttccagattt	tgacgcggat	acagttatta	aggcgacttg	240
tttgaacatg	ataatagcgg	ggactgatac	ttcgacgggtg	gcgatcacct	gggcgctatc	300
gctgctaattg	aacaaccgtc	gtgcattgaa	gaaggcgcaa	caagagctgg	acacccatgt	360

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tggcaggagt	aggcccgtgg	aagagtccga	tgtgaaaaac	ttgacctacc	tccaagccat	420
cgtcaaggaa	gcactgcgtt	tatatcctcc	agtaccggtg	aacggcctta	gaagctccat	480
ggaagagtgc	ac					492

<210> 224
 <211> 391
 <212> DNA
 <213> Pinus radiata

<400> 224						
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acaaacccca	cgaagctctc	ttccacctcg	ctcagaagta	cggccctctc	atgtgtgtct	120
ctctcggaat	gaaaactaca	gtggtagtct	cctctccggc	catggcaaag	caagttctca	180
agacccatga	ccatgttttt	gcgggccgaa	cggtcataca	gtcagttcag	tgcctttctt	240
acgacaagtc	ctcagtaatt	tggggcccaat	atggatccca	ctggcgtttg	ctcagacgca	300
tatccaatac	aaagctcttc	agcgtcaaga	ggttagaagc	cctggaacat	ttgagaagag	360
atgaagtatt	ccgaacaatc	aagcagattc	t			391

<210> 225
 <211> 536
 <212> DNA
 <213> Pinus radiata

<400> 225						
ctcgttttatt	tacaagctgc	ggtgaaagaa	actcttcgac	tccatccatc	cgggccttta	60
ttggtgcgcc	atatttttg	taccgcgtcc	tgcaatgtat	tggggtatga	aatcccgcag	120
aatactctcg	ttctcgtgaa	tgtttgggcg	attgggagga	accctaagtc	atgggaggac	180
gccgaagttt	tcaagccaga	gagattcatg	gaaaaagtgt	ggtctgaagt	agatgcaaat	240
ggagatcaaa	actttgggtg	ccttctcttc	ggagcagggc	ggagaagatg	cccaggacag	300
caattgggaa	cgcttcttgt	agagtttggg	ttggcacagc	tgttgactg	cttcaactgg	360
aggcttcctt	tggatgacat	aatggcgaa	aatcaagaag	tggatatgaa	tgaaatgttt	420
aatggagtca	cgctgcgcaa	agctcgtgag	ctctcggcta	ttccgacacc	acgccttgaa	480
tgcattgctc	acctgaaata	ggtcatcagg	tttcgagtga	aacctgtgga	gataga	536

<210> 226
 <211> 463
 <212> DNA
 <213> Pinus radiata

<400> 226						
gaaagggtacc	gtcccgttg	aaaaatatct	acagctttta	gattggacgc	aattataaac	60
attttattcc	agtttgatg	tgttatctct	gatcgtgttg	gagatgtgtg	gctgagccta	120
atcatgcatg	gagcaacttg	tccaggaaaa	gaaaaggcag	actgcccccg	gggcctttct	180
cgttgcccat	tatcggcaat	cttcacatgc	taggaaagat	tcctcaccga	tactggcag	240
agctgtctat	gaaatacggg	cctctcctgt	ctctccgcct	cggctctact	cccgccttag	300
tcgtctcttc	tccagaaata	gccagtgaat	ttctcaaaac	ccatgatcag	ctttttgcca	360
gcagaattcc	ctctgctgct	attaaggtat	tgacctacaa	tttgteccggc	ctcatatttt	420
ccccgtatgg	cccttgctgg	aggcaagtgc	gtaaaactttg	cgt		463

<210> 227
 <211> 463
 <212> DNA
 <213> Pinus radiata

<400> 227						
ggctgagcct	aatcatgggt	attacatatc	ttgaaccttt	gtagtagatg	ttgtttgtgg	60
atatagctaa	tatcaaattg	tttgagatag	atgtttgctg	gtagatatag	ctagattagt	120

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acagtgaacc	atctaaaaaa	ctggcgatgg	agtttgtaga	gttttgtata	acactcgtca	180
ctgctcttct	ttttgttgta	ttggtagcag	catggagcaa	cttgttcagg	aaaagaaaag	240
gcagactgcc	cccggggcct	ttctcgttgc	ccattatcgg	caatcttcac	atgctaggaa	300
agattcctca	ccgatcactg	gcagagctgt	ctatgaaata	cgggcctctc	ctgtctctcc	360
gcctcggctc	tactcccgcc	ttagtcgtct	cttctccaga	aatagccagt	gaatttctca	420
aaacccatga	tcagcttttt	gccagcagaa	ttccctctgc	tgc		463

<210> 228

<211> 463

<212> DNA

<213> Pinus radiata

<400> 228

gaattgcttt	ctgcgtgtcc	agttcatgaa	tgcccatact	tttattttta	tctcgtctact	60
gttattcttc	tgggcgtggg	gacgggatgg	ggtttcttat	tccggggaag	aaaacagaag	120
cttcctcggg	ggccttttca	gtggccgatt	gttggaacc	ttcacatgat	gggagagctt	180
ccacaccaag	caattacagc	tctctctatg	aaatatgggc	ctctcatgtc	tctccgcctc	240
ggctcctatc	tcactttggg	cgtttcttct	ccagatgtgg	ccgaggagtt	cctgaagact	300
catgatctgg	ctttcgccag	cagacctcca	accatcggtg	cgaagtactt	ttgggtataat	360
tcctccgacg	tcgcattttc	cccctatggg	ccttactgga	ggcagatgcg	taaaatctgt	420
gtgttacagt	tgctgagctc	aagacgcata	gattccttcc	gcc		463

<210> 229

<211> 463

<212> DNA

<213> Pinus radiata

<400> 229

actgtgacca	agacctaat	ggtggcattg	ggatcaagtc	aatgataaag	gaaacgtttg	60
tgtagcagg	gtctttgaac	atgggagatt	ttataccata	cttggcatgg	attgatcttc	120
aaggtctcaa	ccgtcgattg	aagaacatac	acaagatcca	agacgacttg	ttaggggaaga	180
tactagagga	acacgcttcg	ccaccgcaga	ataaccccaa	ctacatgcca	gatctcgtgg	240
atgttttgct	cgcggcctct	gcggatgaag	atctggagtt	cgaattact	cgagacaata	300
taaaatctgt	catctatgta	tatattgtcc	atgcaattat	tagatttcaa	tgacttaaata	360
aaaacatgac	acggtgatta	tatcttgaca	tttggttttg	atttggtttg	ttggtaggat	420
atcttgtccg	ctgggttcgga	ctcgtcgtct	gcaagcatag	agt		463

<210> 230

<211> 543

<212> DNA

<213> Pinus radiata

<400> 230

ggcaccagac	gagctggaac	gtgtcgttgg	attgggtcgt	atggtaaggg	aatctgatct	60
gcctcgtctc	gtttattttac	aagctgtggg	gaaagaaact	ctgaggctat	acccacaggg	120
gccgatttta	ttccgccact	tgtcttcgga	gccctgcaat	gtcctgggct	atgaaatctc	180
tcaaaacact	caagttcttg	ttaatatattg	ggcgattgga	aggaactctg	agtcatggga	240
agatgccgga	agcttcaaac	ctgagagatt	catggaaaga	gttgggtctg	aggtagatac	300
aaatggagat	caaaattctg	cgtggcttcc	cttcggagca	gggaggagaa	gatgccaggg	360
acagcaattg	ggaacgcttg	ttgcagaaat	tgggctggca	cagctcttgc	actgtttcaa	420
atggaggctt	cccgaagctg	atatggatgg	cccaaatcaa	gaacttgaca	tgatggaaag	480
gtttaatgga	atcacatcgc	cgaggggctaa	ggaactgttt	gcgattccga	caccccgctc	540
tga						543

<210> 231

<211> 381

<212> DNA

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<213> Pinus radiata

<400> 231

ggaatcctct	ttgatatggt	gctcgggtggg	tcagacacag	cgcctacaat	aatagagtgg	60
gcaatatcgg	aggcgctgat	aaaccctcca	gtgatgaaga	aacttcagga	cgagctggaa	120
cgcgtcgttg	gattggatcg	catggcatgc	gaatctgac	tgcctcagct	cgtttattta	180
caagctatgg	taaaagaaac	gcttcgactt	cacccagcgg	ggcctctttt	gaaccgtcgc	240
ttatccgctg	agtcctgcaa	tgtgttgggg	tacgaattcc	ctaaaaacac	tcgtgttctc	300
gttaatgctt	gggcgattgg	gaggaacca	aagttatggg	aggacgctga	aactttcaag	360
ccagaaagat	tcacgggaag	a				381

<210> 232

<211> 384

<212> DNA

<213> Pinus radiata

<400> 232

ccacttcggc	aacagttgaa	tgggcaatgg	ctgagcttat	cagaaaacca	acgctactga	60
aaaaggccca	ggcagagctg	gatgaggttg	ttggtcgaga	gaagagaatg	gaggaatcag	120
acatagcaaa	attgccctat	ctacaagcag	tagtgaagga	ggtactcaga	ttgcaccag	180
cagctccact	gataattcct	cgaagagcag	acaactctgc	cgagattggg	ggatatgttg	240
tcccagagaa	cacgcaggtg	tttgtgaata	tctggggcat	cggaagagat	cccaacgttt	300
ggaaggaacc	tctgaaattc	aaaccggaaa	ggtttttaga	ctgtaatact	gactacagag	360
gccaggattt	tgaactgata	ccat				384

<210> 233

<211> 405

<212> DNA

<213> Pinus radiata

<400> 233

gagaagatga	agtttccgct	atgattcgct	ctattgttaa	ttcagatgcc	cacaaggact	60
ctcgtcctgt	caacatcaag	caacttgcgt	catcccttgt	gacagctata	gtcttgagga	120
tgaccttcgg	taaaaagtat	tcggaccggg	attcaggagc	attcagttca	atgatcaaag	180
aaagtttact	gttactcggc	tcctttaata	ttggagaata	cataccttac	ttgaactgga	240
tggatttgca	aggtctcaac	cgccggctga	agaagctacg	tacaacacaa	gaccagttgc	300
tagagaaagt	aatagaggaa	catgctgccc	agaatcggag	caacatgacg	catgatcttg	360
tggatgcctt	acttgcagcc	tctgcggata	aagatagaga	gctcc		405

<210> 234

<211> 348

<212> DNA

<213> Eucalyptus grandis

<400> 234

catatacgat	caagagagtt	tgctgaatgc	aattaagcag	gttgatgtgg	taatctctgc	60
tgtggggcaa	gcacaaacgg	aggaccaaga	ccggattggt	gctgccatca	aagcagccgg	120
gaatatcaag	agattcttgc	cttcagagtt	tggaaatgat	gtggatcggt	tccatgctgt	180
ggagccagta	aaaactggat	ttgctctcaa	ggccaagatc	cgccgccttg	ttgaggccga	240
gggaatccct	tatacctatg	tgtcttctaa	ctcttttgca	ggttactacc	ttcaaacatt	300
gtcacagccc	ggggctacag	ctccccctag	agataacgtt	gttatctt		348

<210> 235

<211> 640

<212> DNA

<213> Eucalyptus grandis

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<400> 235

ctgtgtgtta	agctagtagt	cagtcaagca	ttgaaggcat	gaacacctta	aagacatgaa	60
cagatgaaga	tttggagtct	caattatact	gtgtgttaag	ctagtagtca	gtcaagcatt	120
gaaggcatga	acaccttaaa	gacatgaaca	gatgaagatt	tggagtctca	atggtattat	180
tgcctacctt	atctccagtc	acagcagagt	cgcttctaga	aaccgatcga	gttcgccgga	240
aaacaccgcg	cctccgccgt	gaaaaccact	cagagatggc	tgcgaagagc	aaggtcctgg	300
tgatcggagg	cactggatac	atcggaaagt	tcatecgtgga	agccagtgtc	aagtccggtc	360
gccctacctt	cgctctcgcg	agggagtcca	ctctctccaa	ccccgccaa	gccaagatcg	420
tcgaagggtt	caagagcctc	ggcgtcactt	tagttcacgg	agacatatac	gatcaagaga	480
gtctattgaa	tgcgatcaag	caggtcgatg	tggtaatctc	tgctgtgggg	cgagcacaaa	540
tagaggacca	agacaggatt	gttgctgcca	tcaaagcagc	cgggaatatc	aagagatttg	600
tgccttcaga	gtttggaaac	aacgtggatc	gtgtccatgc			640

<210> 236

<211> 464

<212> DNA

<213> Eucalyptus grandis

<400> 236

gtctcgagtt	ttttcttatt	taattaattt	tctttttaga	gattcttgcc	ttcagagttt	60
ggaaatgatg	tggatcgtgt	ccatgctgtg	gagccagtaa	aaactggatt	tgctctcaag	120
gccaagatcc	gccgcctcgt	tgaggccgag	ggaatccctt	atacctatgt	gtcttctaag	180
tcttttgcag	gttactacct	tcaaacattg	tcacagcccg	gggctacagc	tccccctaga	240
gataacgttg	ttatcttagg	ggatggaaat	gccaaagtgg	tgtttaacaa	ggaggatgac	300
atcggcacct	ataccatcaa	agctgtggat	gateccaagga	ccttgaacaa	aattctgtac	360
atcaggcctc	ctgccaacac	ctactcaatg	aatgagctcg	tgtctttgtg	ggagagaaag	420
atcggcaagg	ctctggagag	ggtgtatgtt	ccagaggagc	aaat		464

<210> 237

<211> 315

<212> DNA

<213> Eucalyptus grandis

<400> 237

cttctagaaa	ccgatcgagt	tgcgccgaaa	acaccgcgcc	tccgccgtga	aaaccacttc	60
agagatggcc	gcgaagagca	aggtcctgg	gatcggaggc	actgggtaca	tcggaaagt	120
catcgtggaa	gccagtgtga	agtcgggtcg	ccctaccttc	gttctcgcga	gggagtccac	180
tctctccaac	cccgccaagg	ccaagatcgt	ccaaggtttc	aagagcctcg	gcgtcacttt	240
agttcacgga	gacatatacg	atcaagagag	tctgttgaat	gcgatcaagc	aggtcgatgt	300
ggtaatctct	gctga					315

<210> 238

<211> 376

<212> DNA

<213> Eucalyptus grandis

<400> 238

caaagtcacg	tcagagaccg	atcaagtctg	ccggaaaaca	ccacgcgcgc	tatgaaaaga	60
ccctccaaga	tggcagagat	gagcagagtc	ttgggtgattg	gaggcgccgg	atacatcgga	120
aagttcattg	tgaaagcgtg	tgctaagtcc	ggtcacccta	cctttgttct	cgagacggag	180
tccactctct	ccaaccccg	caacgccgaa	atcatcaaag	gtttcaagag	cttaggcgtg	240
aacctagtcc	atggagacat	atacgatcaa	aaaagtctgt	tgagtgcgat	taagcaagtt	300
gatgtggtaa	tatctactgt	ggggcaagca	cagctagaag	accaagacag	gattgttgca	360
gcatcaaag	cagccg					376

<210> 239

<211> 297

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PCT/NZ99/00168

<212> DNA

<213> Eucalyptus grandis

<400> 239

atcaagttcg	ccggaaaaca	ccacgcccgc	tgtgaaaaga	ccctccaaga	tggcagagat	60
gagcagagtc	ttggtgatcg	gaggcgccgg	atacatcgga	aagttcatcg	tgaaagcgtg	120
tgctaagtcc	ggtcacccta	cctttgttct	cgagacggag	tccactctct	ccaaccccgc	180
caacgccgaa	atcatcaaag	gtttcaagag	cttaggcgtg	aacctagtc	atggagacat	240
atacgatcaa	aagagtctgt	tgagtgcgat	taagcaagtt	gatgtggtaa	tctctac	297

<210> 240

<211> 951

<212> DNA

<213> Pinus radiata

<400> 240

tctcgcacag	ttgacgacgt	tttcttgtat	ttgtagcgtt	cggcacgata	ggggaaaaac	60
gatggcatgc	gctactgatg	ttgcacgtca	gtttctgcca	tgcgtccaac	ccgtgccgtc	120
cagcatggga	ggagagaccg	cccggtcgat	caacctcacc	tgcaatggcc	tctccccgcc	180
tcaaccgcag	tacaacgccg	agaacaacca	tgatcaggac	accacagttg	ccacaagggt	240
tctcattatt	ggcgccaccg	ggttcatcgg	tcggtttgtt	gcagaggcca	gtgtgaaatc	300
cgggcgccca	acttatgccc	ttgtgcggcc	gacaacatta	agttcgaagc	ccaaggatcat	360
tcagtctctg	gtggattcgg	gtattcaagt	tgtttatgga	tgtctacatg	atcacaattc	420
tttggtgaaa	gccatcaggc	aggttgacgt	tgttatttct	actgttggtg	gagccctaata	480
tcttgatcag	ctcaagattg	tggatgccat	caaggaagtt	ggcactgtca	agagatttct	540
tccttcagag	tttgacacg	atgtagaccg	agcagatccc	gtagagcctg	ctcttagttt	600
ttacatagaa	aagagaaaag	tccggcgtgc	agtggaggaa	gcaaagattc	cttacacata	660
catctgctgc	aactccatag	ctggctggcc	atactattat	cacacacatc	caactgagct	720
ccccccacca	aaggaacagt	ttgagatcta	tggggatgga	agcgttaaag	cctttttcgt	780
tactggggac	gatattggcg	cgtataccat	gaaagctgtg	gatgaccctc	gtactctgaa	840
caagtctatt	catttcagac	caccaaagaa	ttttctcaac	ttaaacgaac	tcgcagacat	900
atggggagaat	aagattaaca	gaactctgcc	aagagtatct	gtctcagcag	a	951

<210> 241

<211> 371

<212> DNA

<213> Pinus radiata

<400> 241

tttagctgac	attttattaa	ttcaaagtgg	caagatgaca	ggtctcaagg	actctgctaa	60
tagggttttg	ataataggag	gcacgggata	cattgggaaa	tacatggcaa	aagccagcgt	120
ttcacagggc	tatccaacct	acgttcttgt	ccgtcctgct	acagcagctg	cccctgattc	180
cttcaaagca	aagctacttc	agcaattcaa	agatattggc	attcatattc	ttgaaggatc	240
attagatgat	cacaacagcc	ttgtggatgc	aatcaagcaa	gtagacatag	taatatccgc	300
agttgccatt	cctcagcatt	tggatcagtt	taatatcata	aacgccatta	aggatgttgg	360
aatggaaata	t					371

<210> 242

<211> 687

<212> DNA

<213> Eucalyptus grandis

<400> 242

taatggcgag	ctccaccgt	ctcactactg	tgagagggac	ctgctcaaag	tggtcgaccg	60
cgagcatgtg	ttcacctacg	ctgatgacgc	ctgcagcgcc	acctacccgc	tgatgcagaa	120
gctgaggcaa	gtcctggtcg	accaggcact	ggtgaatggc	gagagcgagc	tgaacccgag	180
cacttcgatc	ttccaaaaga	tcgtggcctt	cgaggaggag	ctcaaggccc	agttgccgaa	240

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ggacgtcgag	ggcgttcgag	tccagtacga	gacaggcaac	ctcgccatcc	ccaaccagat	300
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gctcacgggc	gagggcgtga	tatccccctgg	cgaggacttc	gacaaggctct	tcactgcgat	420
ctgtgctgga	aaactgattg	atccgctgct	ggagtgccta	agcggttgga	acgggtgctcc	480
tcttcccata	tcttaggaat	tgctctatat	tctttctcct	tctttttccc	tttccgttac	540
ttgccaagta	aatctcatgt	atccaatctt	ttctatcaag	agacaattgt	atttcttggt	600
ttctgtttgg	tcctttttgt	ctcctcccaa	gtgaagaaat	tggagaatat	aagtaattga	660
gtaaattttt	acatggaaaa	aaaaaaa				687

<210> 243

<211> 344

<212> DNA

<213> Eucalyptus grandis

<400> 243

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tccaaaagat	cgtggccttc	gaggaggagc	tcaaggccca	gttgccgaag	gacgtcgagg	120
gcgttcgagt	ccagtacgag	acaggaaacc	tcgccatccc	caaccagatc	aaggaatgca	180
ggtcctatcc	attgtacaag	ctgggtgaggg	aggagctggg	gactgccctg	ctcacggggc	240
agggcgtgat	atcccctggc	gaggacttcg	acaaggctct	cactgcgatc	tgtgctggaa	300
aactgattga	tccgctgctg	gagtgcctaa	gcgggttgga	cggt		344

<210> 244

<211> 681

<212> DNA

<213> Eucalyptus grandis

<400> 244

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ggacgtgaac	tccttggggc	tgatctcgtc	gaggaagact	gccgaggcca	tcgatgtgct	180
gaagctcatg	tcctccacct	tcctggtcgc	cctgtgccag	gccatcgacc	tgaggcacct	240
ggaagagaac	ctcaagagcg	tggtcaagaa	cacgggtgaac	caagtggcca	agaaggctct	300
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ggtggtcgac	cgggagtagc	tcttcgccta	catcgatgac	ccctgcagcg	ccacgtaccc	420
cctgatgcag	aaactgaggc	aggctcctcg	ggacgatgcg	ctggacgacg	tcgaccggga	480
gaagaacccc	agcacctcca	tcttccagaa	gattggggct	ttcgaggagg	agctcaaggc	540
actcctccc	aaggaggctg	agaacgcgag	agctcagttc	gagagcggga	actcggcgat	600
cgctaacaag	atcagggggg	gcaggctcgta	cccattgtac	aggttcgtga	gggaagagct	660
cgggaccggg	ttgctcacgg	g				681

<210> 245

<211> 1455

<212> DNA

<213> Eucalyptus grandis

<400> 245

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aagcgtctc	ctccagttgt	cttccttcgt	tcgctcatct	ctcctcgtag	attattagca	120
tacgacctct	tgtatcggac	cgggatccgc	tatcgttaac	gtacacacgt	tctagtgtg	180
aatggagatg	gagagcacca	cgggcaccgg	caacggcctt	cacagcctct	gcgccgccgg	240
gagccaccat	gccgaccac	tgaactgggg	ggcggcgcca	gcagccctca	cagggagcca	300
cctcgacgag	gtgaagcgga	tggtcgagga	gtaccggagg	ccggcggtgc	gcctcggcgg	360
ggagtccctc	acgatagccc	agggtggcgg	ggtggcgagt	caggaggggg	taggggtcga	420
gctctcggag	gcggcccgtc	ccagggtcaa	ggccagcagc	gactgggtca	tggagagcat	480
gaacaaggga	actgacagct	acgggggtcac	caccgggttc	ggcgccactt	ctcaccggag	540
gacgaagcaa	ggcgggtgctt	tgcagaagga	acttataagg	ttcttgaatg	ccgggatctt	600

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cggcaacggc	acggagtcgt	gccacaccct	gcctcaatcc	tecacccgag	ccgccatgct	660
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catcaccaag	ttcctcaacc	acaacatcac	cccgtgacctg	cccctcaggg	gcaccatcac	780
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ctccaaggcc	gtcgggcctg	atgggaagtc	cctggacgct	gtcgaggcct	tcgggctcgc	900
cgggattgac	acgggcttct	tcgagctgca	gccaaaggaa	gggttggcgc	tcgtgaacgg	960
cacggcagtc	gggtctggcc	tggcttccat	cgtectcttc	gaggccaaca	tactcgcggt	1020
cctgtccgag	gtcctgtcag	cgatcttcgc	agaggatgatg	caggggaagc	cggagtccac	1080
agaccacttg	acgcataaat	tgaagcacca	tcccgggcag	attgagtctg	cggctataat	1140
ggagcacatt	ttggatggaa	gcgcttacgt	gaaggctgct	aaaaagttgc	acgagatgga	1200
tcgctccag	aagccaaagc	aggacaggta	cgctctcagg	acttctcccc	agtggctagg	1260
gccccagatt	gaggtgatcc	gagcggcaac	caagatgatt	gagagggaaa	tcaattcggt	1320
caatgacaac	ccgctgatcg	atgtcgcgag	gaacaaggcc	ctgcacgggtg	ggaacttcca	1380
ggggaccccg	attggtgtct	ccatggacaa	cactcgcttg	gcggttgctg	ccatagggaa	1440
gctcatgttc	gcgca					1455

<210> 246

<211> 294

<212> DNA

<213> Eucalyptus grandis

<400> 246

caacagtggc	atcacgccgt	gcttgccgct	ccgcggctcg	atctccgcct	ctggtgactt	60
ggtacccttt	tcctacatcg	cgggtctttt	gacgggacgt	cccaattcca	aagcggctcg	120
acccgctggg	gagaccctca	cggccaaaca	agcctttgag	ctcgtggga	tcagtgggtg	180
attcttcgag	ttgcagccga	aggaaggact	tgcccttggtg	aatgggacgg	gagttgggtc	240
tgccttagct	gccatagtgc	tttttgaagc	taatatgctc	actgtcctct	caga	294

<210> 247

<211> 1520

<212> DNA

<213> Pinus radiata

<400> 247

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aaaagccctt	tgaattgcag	cctaaagaag	gtctggccat	tgtcaatggc	acttcagtgg	180
gagcagcact	ggcttccatt	gtgtgtttcg	atgccaatgt	tcttgctctg	ctctctgaag	240
taatctctgc	catgttctgc	gaggttatga	atgggaagcc	tgagtttaca	gatccattaa	300
ctcacaagct	gaagcaccat	cctggccaaa	tggaagctgc	agcgatcatg	gagtatgtct	360
tggacgggag	tcttatatga	aacacgctgc	taagctccat	gagatgaatc	ctctgcagaa	420
gccaaagcag	gatcgctatg	cgcttcgcac	ttcgccctcag	tggctcggcc	ctcagggtgga	480
gattatcaga	tctgcaactc	acatgattga	gcgggaaatc	aattctgtga	atgacaatcc	540
agtaattgat	gttgccagag	acaaagctct	acatggaggg	aatttccagg	gcacacctat	600
tggtgtttcc	atggataatc	ttcgtctgtc	aatttcagca	attgggaaat	tgatgttcgc	660
tcaattctca	gagcttgtga	atgattacta	caatggaggc	ttgccttcga	atctgagtgg	720
tgggccta	cccagcctgg	attatggact	gaaagggggc	gagatcgcta	tggcttctta	780
cacttctgag	cttctttacc	tggcaaatcc	tgtcaccagc	catgtacaga	gcgccgaaca	840
gcataaccag	gatgtcaatt	ctctgggtct	cgtttcagct	agaaaatctg	ccgaggccat	900
cgatattctg	aagctgatgc	tctccacata	cctgacagct	ctgtgccagg	ctgtggattt	960
aaggcatctg	gaggaaaaca	tgctggccac	tgtgaagcag	attgtttctc	aggtagccaa	1020
gaaaaccctg	agcacagggc	tcaacgggga	gcttttgcca	ggccgtttct	gcgaaaagga	1080
tttgctccag	gtagtggata	acgaacatgt	tttctcttac	attgacgatc	cgtgcaatgc	1140
cagctaccca	ttgactcaga	aactgagaaa	catcctgggtg	gaacatgcct	tcaagaacgc	1200
agaagggtgag	aaggatccca	acacttccat	tttcaataag	attcctgtgt	ttgaagccga	1260
gctgaaggca	cagcttgaac	cgcaagttag	tctggccaga	gaaagttatg	acaaagggac	1320
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aaaccagctc	ggtacccttc	aggcatgggt	attccatata	aatattgtaa	tgagatgttt	1440
aattatttac	tgctctcttt	tttttccgga	gcttgccgacc	gccttcgatt	ccgtgcacta	1500
cgcgaggacg	aagcctctgt					1520

<210> 248
 <211> 449
 <212> DNA
 <213> Pinus radiata

<400> 248						
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gtgcagaagt	ttgattcgtg	aattatttgt	ttgtttaatt	atagtgcaca	tggcgcctca	120
ggaattcaca	ggcgaagtga	aattctgtgc	gggaaatggc	ggtacggcgt	ctttgaacga	180
tccgctgaat	tgggcagccg	cagcggagtc	catgaaggga	tctcacttcg	aggaagttaa	240
acgaatgtgg	gaggagtttc	gttctccagt	tgtgaggctc	cagggatccg	gtctcacgat	300
tgcccaggtg	gcagccgtgg	ccaggagaac	gggatccgtg	agagtcgaac	ttgagaccgg	360
cgcgaaaggc	cgggtagatg	agagcagtaa	ttgggtgatg	gacagtatgg	cgaacgggac	420
ggatagctat	ggcgttacga	cggggttcgt				449

<210> 249
 <211> 512
 <212> DNA
 <213> Eucalyptus grandis

<400> 249						
gaacttggtg	aagttaggaa	gtatactagg	catggccatc	ggtgttgcac	tcttcagctc	60
gcttcttgta	ctttcatttg	tctctccaat	ctcttcacta	agttccaatt	actacgacaa	120
gacctgtccc	aatgctgagt	tgatcgctgc	aaatgctgtc	aagaatgcgg	caatgaagga	180
caaaaccgtt	ccggctgctc	ttctgcggat	gcattttcac	gactgtttca	ttagggggtg	240
cgatgcgtcg	gtgcttttaa	actccaaagg	aagcaacaaa	gcggagaagg	atggacctcc	300
taatgtctct	ctgcactcat	tttttgtaat	cgacaatgcc	aaaaaggagt	tgggaagcttc	360
ttgccccggc	gtggtttcat	gtgcggacat	cttggcacta	gctgctagag	attccgtcgt	420
actgtccgga	ggtccgactt	gggatgtgcc	caaggggaagg	aaggatggaa	gaacatcaaa	480
agccagcgag	acgactcaac	tcccagcacc	ac			512

<210> 250
 <211> 354
 <212> DNA
 <213> Eucalyptus grandis

<400> 250						
ctggtaatca	ccatagttgt	cttctttggg	cacataggag	actcagaagg	aggggacttg	60
aggaagaatt	tctacaagag	cgcattgtct	cttgctgagg	aaatagtga	gaatgtcacg	120
tgggaagcatg	ccgccagtaa	ctcagctttg	cccgccaaagt	tcctgaggat	gcattttccac	180
gattgcttcg	ttagggggtg	cgatggctca	gttttgctag	actcgacggc	gaacaacaag	240
gcggagaagg	tggcgggttc	gaaccagtcg	ctaaccgggt	tcgacgtaat	agacgagatc	300
aaggagaagc	tggaggaaac	atgccctggg	gtcgtctctt	gtgccgacat	cctg	354

<210> 251
 <211> 195
 <212> DNA
 <213> Pinus radiata

<400> 251						
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tcggatgcat	ataccctaaa	tggacagcca	ggagacctgt	ataactgctc	tagggcagga	120
acattccggt	ttctgggtcaa	acaaggagaa	acttaccttc	tacggatggt	caatgctgca	180

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ctcaatagtg cccac

195

<210> 252

<211> 377

<212> DNA

<213> Pinus radiata

<400> 252

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cggttataga	tgaagcactc	cgcactgggtg	gtgcgcccaa	tttgtcggat	gcatataccc	120
taaatggaca	gccaggagac	ctgtataact	gctctagggc	aggaacattt	cggtttcctg	180
taaaacaagg	agaaacttac	cttctccgga	tggatcaatgc	tgcactcaat	agtgccact	240
ttttcaagat	cgcaggccac	aaatttacag	tagtagctgt	ggatgcttcc	tacaccaagc	300
catacaaaca	gatgtaatcg	ccattgctcc	cggtcagact	actgatgttc	tcgtcacggc	360
cgaccaacct	gtgggca					377

<210> 253

<211> 387

<212> DNA

<213> Pinus radiata

<400> 253

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aatgacgagc	tcttttttga	tgttgcaaac	catcatctga	aagtgggtgga	gattgacgca	180
gtatacacia	agccactaat	aacgaactca	atagtaattg	ctccaggcca	gaccacaaat	240
gccttgatcc	acaccaacia	aaggagtggc	aggtatttca	tggctgctcg	ctcattcatg	300
gacgcgcccg	tctccgtcga	caataaaacc	gccacagcca	ttttgcagta	cgtcaattca	360
atacaaattc	tgttataatg	cccagca				387

<210> 254

<211> 534

<212> DNA

<213> Pinus radiata

<400> 254

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gttgtactac	ttgctgttca	acttggtgca	gggaaaacga	ccagacatta	ctcattccat	120
gtgagggtga	agaacgttac	tcgtctctgc	cacacaaagc	cattgattac	agtcaatggg	180
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aatcatgtta	gcaataatgt	ctcaattcac	tggcatggag	ttcgacaatt	gaggtctggt	300
tgggcagatg	gccctgctta	cataacccaa	tggccaattc	aaacgggaca	gacttatgtt	360
tataacttca	ctgtcacagg	acagagggga	actctctggt	ggcacgctca	catctcttgg	420
ctaagagcga	gcgtatatgg	cgctttcatc	atctatccta	aacgccatgt	tccttatcca	480
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<210> 255

<211> 1076

<212> DNA

<213> Pinus radiata

<400> 255

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cggtttggtg	gcatgcccac	tactcatggc	tccgagctac	tgtgcatgga	gcttttgtaa	120
tccttcctaa	gaaaggaagc	tcatatccct	tttctaaacc	gcatgctgaa	attcctatta	180
taataggtga	atgggtggaac	gctaacccca	tcgcccgttat	agacgaagcg	gttcgcacag	240
gtgggtgcgc	taatttatcc	gatgccttca	ccataaatgg	acagccagga	gatctgttta	300

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actgctctac	ctcgggaaca	tttcgcctcc	ctgtagaaag	cggagaaacg	taccttctgc	360
ggattgtgaa	tgctgcactc	aatagcgggc	actttttcaa	gatagcaggc	cacgaattta	420
cagtggtagc	tgtggatgct	tgttacacca	agccatacaa	aacagatgta	ctcgtcatat	480
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tggccgcccg	agcgtatcaa	aatcaggcgg	caggcgattt	cactaacacc	acaacaactg	600
ccattctaga	gtacattgga	agtgaaaatt	ctactcgccc	aattttgcct	agccttccag	660
cctacaacga	cactgccact	gtcactagat	ttagcagagc	actgcgaagt	ctggcatccc	720
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attacactgc	caatgggtatc	tttacggggg	attttccatc	aaaacctgaa	gttagattca	960
actacacggg	ggacgatata	ccccgaaaat	tttgggctcc	ggaccccgca	acaaaagtga	1020
aggtgctcga	atacaactcc	acagtgcagc	tcgtttttca	gtcaacaaac	atcttc	1076

<210> 256

<211> 483

<212> DNA

<213> Pinus radiata

<400> 256

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ctcaaaatat	gcagcagcga	tgctcgtgctt	gctcatcgca	gtagttgcat	tagagggttg	120
ggcagaaacg	agacattaca	aatttgacat	aaaattcaag	aacgttactc	gtttatgccca	180
cacaaagccg	atagttacag	cgaatggcaa	gttcccaggc	ccaacaatat	atgcacgaga	240
aggagacaca	gtcactgtga	aagtaaccaa	tcacgtgaca	tacaacgtgt	ccatacactg	300
gcacgggata	aggcagttgc	ggactgggtg	ggctgatggg	cctgcttata	ttacgcagtg	360
ccccattcaa	acaggccaaa	cttatgtata	taactttaca	atcacagggc	agcgaggcac	420
acttttctgg	cacgctcaca	ttctctgggt	acgtgcaaca	ttgaatgggc	ccatcgtcac	480
tct						483

<210> 257

<211> 470

<212> DNA

<213> Pinus radiata

<400> 257

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gatatagtag	caggaaagca	tgcgacagaca	accaggcatt	acaagttcaa	cgtgaggcta	180
agcaatgtga	cacgtctttg	ccgcacgaaa	cctttgatta	cagtgaatgg	aaagtatcca	240
ggacctacag	ttgttgctcg	cgaggagat	cgggtaatta	taaaacttgt	aaaccacgtg	300
aaggacaacg	tcactattca	ctggcatggc	gttcgacagc	tgagatcggg	atgggcggat	360
ggtcctgggt	atatcactca	atgtccactt	caaaccggaa	tgagttacgt	ttataatttc	420
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<210> 258

<211> 472

<212> DNA

<213> Pinus radiata

<400> 258

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tcctggacaa	acatatcttc	ttcgtatcat	caatgctgca	ctcaatgatg	aactcttcct	180
tgccattgca	aatcacagtt	taacagttgt	ggagggtgat	gcagtgtatg	tcaagccttt	240
ccagacagat	actcttctta	taaccccagg	gcagactacc	aatgtttttac	ttactgctaa	300
tgctactagt	ggtaaaaata	aacaatttgt	catagctgct	agtccttttg	ttaccgggtc	360

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agggacattt	gataattcca	ctgttgcagg	aattgtgagt	tataattctc	ataagtttaa	420
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<210> 259
 <211> 405
 <212> DNA
 <213> Pinus radiata

<400> 259						
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tgcactacat	cggcaggaat	tctgaatcag	atattcccgc	cgtaatacct	ctcatgccac	180
gacttcctct	cctcaacgac	actgcgtttg	caacgagttt	cacctccaag	ctcagaagct	240
tgaattctgt	tcagtttccc	gcaaaagtcc	cgcagacaat	agatcgcaat	ctcttcttcg	300
cagtggggct	tgcgacggag	tcttgtcaga	cctgtaacgg	tggcctccgt	gcttccgcat	360
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<210> 260
 <211> 1352
 <212> DNA
 <213> Pinus radiata

<400> 260						
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ccaacgtttc	agatgcattt	actataaatg	gacaaccagg	cgacctatac	aaatgttcta	180
cttcagatac	ctttagcgtg	togatgaaag	gtggggaaac	taatcttcta	cgtgttatca	240
acgtctgact	caatactgac	ctattcttct	ccattgctag	ccacacaatg	acagtgtctg	300
ctgtggatgc	cttgatatac	aaaccttttc	agacgaatgt	tctgatgctc	ggccccggcc	360
agacaacaga	catacttctc	actgccaatc	aggctacagg	tagatactac	atggctgctc	420
gagcatattc	cagcggggcaa	ggagttccct	tcgataaac	cactaccact	gccatttttag	480
aatacgaggg	aagctctaag	acttcaactc	cagtcatgcc	taatcttcca	ttctataacg	540
acaccaacag	tgctactagc	ttcgctaagt	gtcttagaag	cttgggctca	cacgaccacc	600
cagtcttcgt	tcctcagagt	gtggaggaga	atctgttcta	caccatcggt	ttgggggtga	660
tcaaagtgtc	ggggcagttc	tgtggagggtc	ccaacggatc	aagatttgca	gcaagtatga	720
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acgttccagt	caatggctgg	gctgcaataa	gattcgtggc	tgacaatcct	ggagcttggg	1140
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acaatggacc	tgacgctctt	ttgagtctcc	agtcacctcc	cagagatctt	ccgctatgct	1260
gaggaaaact	gtgatgcata	gcgatcctct	attggtecca	cttcattctt	tttccttctc	1320
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<210> 261
 <211> 337
 <212> DNA
 <213> Pinus radiata

<400> 261						
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attataatgc	acaaacagat	cctcagaagt	tcaacctggg	ggatcctcct	atgcgcaaca	180
ctgtgaacgt	tccagtcaat	ggctggggctg	ccataagatt	cgttgctgac	aatcctggag	240

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<210> 262
 <211> 279
 <212> DNA
 <213> Pinus radiata

<400> 262	
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gcaggatttg gcaattataa tccacaaacc gatcctcaaa agttcaacct ggaggatcct	180
cctatgagca acactgtaaa cgttccagtt aatggctggg ctgcaataag attcgtggcc	240
gacaatcctg gcgcttgggt gatgcactgc cacttggac	279

<210> 263
 <211> 279
 <212> DNA
 <213> Pinus radiata

<400> 263	
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ctacgtgtta tcaacgtgc actcaatact gacctattct tctccattgc tagccacaca	180
atgacagttg tcgctgtgga tgccttgtat aaaaaacctt ttcagacgaa tgttctgatg	240
ctcggccccg gccagacaac agacatagcg gccgcgaat	279

<210> 264
 <211> 474
 <212> DNA
 <213> Pinus radiata

<400> 264	
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ttactttgcc aacttgaagc agcagaaggg tgttctgcac tctgatcgca cgctatacga	180
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cggaacgcaa ggagaaatcc ggagggactg cagaaaagta aattagagag ctccatagcct	360
tcattccagag gcatcaacca tgaggataag ttggataaat tatcttgtct taatatcagg	420
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<210> 265
 <211> 1790
 <212> DNA
 <213> Pinus radiata

<400> 265	
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gtacctgttc cagagaatat aagtcttttc cagtttggtc tggaagggtg tgagaaatac	180
cgtgataagg tggccctcgt ggaggcctcc acaggggaagg agtacaacta tggtcagggtg	240
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ttggccggcg cagtgttttc tggggcaaact ccttctgcac acatcaatga agttgaaaaa	420
catatccagg attctggagc aaagattggt gtgacagttg ggtctgctta tgagaagggtg	480
aggcaagtga aactgcctgt tattattgca gataacgagc atgtcatgaa cacaattcca	540

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ctcactcaca	gaaatctgat	tgcaaactctg	tgctctaget	tgtttgatgt	ccatgaatct	720
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ggcatctggt	gcgccactct	tcgcaacgga	ggcaaggctg	tggtcatgtc	cagattcgat	840
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cccaggaatt	ccatcgggga	ggtgtgcgtc	agaagccaat	gtgtcatgcg	agggatttac	1260
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aaaaaccagc	accaaccatt	gtccacttag	gctttgcagc	gttatatata	aataaataat	1740
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<210> 266

<211> 2043

<212> DNA

<213> Pinus radiata

<400> 266

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aaa 2043

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<210> 267
 <211> 92
 <212> PRT
 <213> Pinus radiata

<400> 267

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Asp	Asp	Ser	Val	Gln	Glu	Val	Ser	Lys	Glu	Gly	Asn	Gln	Trp	Ala	Gly
			20					25					30		
Phe	Ile	Glu	Gly	Glu	Asn	Val	Ile	Arg	Arg	Gly	Arg	Glu	Ile	Leu	Leu
			35				40					45			
Gln	His	Asp	Asn	Arg	Glu	Ala	His	Asn	Trp	Glu	Ser	His	Lys	His	Lys
	50					55				60					
Trp	Trp	Pro	His	Leu	Glu	Glu	Lys	Ile	Pro	His	Ile	Ala	Lys	Ala	Gly
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Phe	Thr	Ser	Ile	Trp	Leu	Pro	Pro	Ala	Phe	Asp	Ser				
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<210> 268
 <211> 182
 <212> PRT
 <213> Pinus radiata

<400> 268

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Gln	Glu	Val	Ser	Lys	Glu	His	Asp	Gln	Trp	Ala	Gly	Phe	Val	Glu	Gly
			20					25					30		
Glu	Ser	Val	Leu	Gln	Arg	Gly	Arg	Glu	Ile	Leu	Leu	Gln	Gly	Phe	Asn
			35				40					45			
Trp	Glu	Ser	His	Lys	Tyr	Lys	Trp	Trp	Pro	Asn	Leu	Glu	Glu	Lys	Ile
	50					55				60					
Pro	His	Ile	Ala	Lys	Ala	Gly	Phe	Thr	Ser	Val	Trp	Leu	Pro	Pro	Ala
65				70					75					80	
Phe	Asp	Ser	Ala	Ala	Pro	Gln	Gly	Tyr	Leu	Pro	Arg	Asn	Ile	Tyr	Ser
			85					90					95		
Leu	Asn	Ser	Ala	Tyr	Gly	Ser	Glu	Tyr	Gln	Leu	Lys	Ser	Leu	Leu	Met
			100					105					110		
Thr	Met	Arg	Lys	Lys	Asn	Val	Arg	Ala	Met	Ala	Asp	Ile	Val	Ile	Asn
			115				120					125			
His	Arg	Met	Gly	Ser	Ser	Gln	Gly	Phe	Gly	Gly	Leu	Tyr	Asn	Arg	Tyr
	130					135					140				
Tyr	Gly	Cys	Leu	Pro	Trp	Asp	Glu	Arg	Ala	Val	Thr	Arg	Cys	Ser	Gly
145				150					155					160	
Gly	Leu	Gly	Asn	Trp	Ser	Thr	Gly	Asp	Asn	Phe	His	Gly	Val	Pro	Asn
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Val	Asp	His	Thr	Gln	Asp										
				180											

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<210> 269
 <211> 218
 <212> PRT
 <213> Pinus radiata

<400> 269
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 35 40 45
 Ser Ser Thr Pro Trp Tyr Asn Val Leu Lys Gly Ile Val Asp Asp Ala
 50 55 60
 Ala Asp Ala Gly Ile Thr Tyr Val Trp Phe Pro Pro Pro Ser Gln Ser
 65 70 75 80
 Gly Ala Pro Gln Gly Tyr Leu Pro Ala Lys Leu Tyr Asp Leu Asp Ser
 85 90 95
 Ser Tyr Gly Ser Glu Gln Gln Leu Lys Asp Ala Val Asn Ala Phe His
 100 105 110
 Gln Lys Gly Ile Ala Ile Met Gly Asp Ile Val Ile Asn His Arg Asn
 115 120 125
 Gly Thr Lys Gln Asp Asp Lys Gly Tyr Trp Cys Val Phe Glu Gly Gly
 130 135 140
 Lys Gly Asp Gly Thr Leu Asp Trp Gly Pro Trp Ala Val Thr Val Lys
 145 150 155 160
 Asp Gln Pro Tyr Pro Leu Cys Gly Ser Gly Gln Ala Asp Thr Gly Gly
 165 170 175
 Asp Phe Lys Tyr Ala Pro Asp Val Asp His Thr Asn Pro Lys Ile Gln
 180 185 190
 Gln Asp Leu Ser Glu Trp Met Asn Trp Leu Lys Ser Met Ser Asp Leu
 195 200 205
 Met Ala Gly Gly Ser Thr Thr Ser Arg Leu
 210 215

<210> 270
 <211> 145
 <212> PRT
 <213> Eucalyptus grandis

<400> 270
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 20 25 30
 Asp Leu Pro Glu Val Val Ala Lys Ala Pro Pro Ile Pro Gly Val Thr
 35 40 45
 His Val Gly Gly Asp Met Phe Lys Ser Ile Pro Ala Gly Asp Ala Ile
 50 55 60
 Phe Met Arg Trp Ile Leu Thr Thr Trp Thr Asp Asp Glu Cys Lys Gln
 65 70 75 80
 Ile Leu Glu Asn Cys Phe Lys Ala Leu Pro Ala Gly Gly Lys Leu Ile
 85 90 95
 Ala Cys Glu Pro Val Leu Pro Gln His Ser Asp Asp Ser His Arg Thr
 100 105 110
 Arg Ala Leu Leu Glu Gly Asp Ile Phe Val Met Thr Ile Tyr Arg Ala
 115 120 125

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Lys Gly Lys His Arg Thr Glu Gln Glu Phe Gln Gln Leu Gly Leu Ser
 130 135 140
 Thr
 145

<210> 271
 <211> 198
 <212> PRT
 <213> Eucalyptus grandis

<400> 271
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 35 40 45
 Ser Ala Gly Gly Phe Leu Ser Ala Ala Glu Ile Ala Ser Arg Val Gly
 50 55 60
 Ala Lys Asn Pro Gly Ala Pro Val Leu Val Asp Arg Met Met Arg Leu
 65 70 75 80
 Leu Ala Ser His Gly Val Ile Glu Trp Arg Leu Arg Arg Gly Asp Gly
 85 90 95
 Asn Gly Asp Gly Gly Glu Arg Glu Tyr Gly Pro Gly Pro Met Cys Arg
 100 105 110
 Phe Phe Ala Lys Asp Gln Glu Gly Gly Asp Val Gly Pro Leu Phe Leu
 115 120 125
 Leu Ile His Asp Lys Val Phe Met Glu Ser Trp Tyr His Leu Asn Asp
 130 135 140
 Val Ile Met Glu Gly Gly Val Pro Phe Glu Arg Ala Tyr Gly Met Thr
 145 150 155 160
 Ala Phe Glu Tyr Pro Ala Val Asp Asp Arg Phe Asn Gln Val Phe Asn
 165 170 175
 Arg Ala Met Ala Ser His Thr Ser Leu Ile Met Lys Lys Ile Leu Asp
 180 185 190
 Val Tyr Arg Gly Phe Glu
 195

<210> 272
 <211> 156
 <212> PRT
 <213> Eucalyptus grandis

<400> 272
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 35 40 45
 Asp Leu Pro His Val Ile Lys Asp Ala Pro Ala His Pro Arg Met Glu
 50 55 60
 Arg Val Gly Gly Asp Leu Leu Lys Ser Val Pro Lys Ala Asp Ile Leu
 65 70 75 80
 Phe Met Lys Trp Leu Phe His Gly Leu Arg Asp Asp Phe Cys Lys Met
 85 90 95
 Leu Leu Gln Asn Cys Tyr Glu Ala Leu Pro Pro Asn Gly Lys Val Val

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			100					105					110				
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Arg	Asn	Ser	Phe	Thr	Ser	Asp	Met	Ile	Met	Leu	Tyr	Thr	Ser	Pro	Gly		
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Glu	Asp	Arg	Thr	Arg	Lys	Glu	Leu	Glu	Val	Leu	Ala						
145					150					155							

<210> 273
 <211> 166
 <212> PRT
 <213> Eucalyptus grandis

<400> 273

Ser	Ser	Phe	Gln	Pro	Cys	Tyr	Glu	Glu	Ala	Asn	Ser	Leu	Asp	Arg	Trp		
1				5					10					15			
Ile	Gln	Pro	Pro	Ser	Asp	Leu	Leu	His	Asn	Met	Ser	Asp	Lys	Glu	Leu		
		20					25						30				
Phe	Trp	Arg	Ala	Thr	Leu	Val	Pro	Lys	Ile	Lys	Lys	Tyr	Pro	Phe	Arg		
	35					40						45					
Arg	Val	Pro	Lys	Ile	Ala	Phe	Met	Phe	Leu	Thr	Lys	Gly	Pro	Leu	Pro		
	50					55					60						
Leu	Ala	Pro	Leu	Trp	Glu	Arg	Phe	Phe	Lys	Gly	His	Glu	Gly	Leu	Tyr		
65					70				75						80		
Ser	Ile	Tyr	Ile	His	Ser	His	Pro	Ser	Phe	His	Ala	His	Phe	His	Pro		
			85						90					95			
Trp	Ser	Val	Phe	Asn	Arg	Arg	Gln	Ile	Pro	Ser	Gln	Val	Ser	Glu	Trp		
		100					105						110				
Gly	Arg	Met	Ser	Met	Cys	Asp	Ala	Glu	Lys	Arg	Leu	Leu	Ala	Asn	Ala		
	115					120						125					
Leu	Leu	Asp	Ile	Ser	Asn	Glu	Arg	Phe	Ile	Leu	Leu	Ser	Glu	Ser	Cys		
	130				135						140						
Ile	Pro	Leu	Tyr	Asn	Phe	Ser	Leu	Ile	Tyr	His	Tyr	Ile	Met	Lys	Ser		
145					150					155					160		
Gly	Tyr	Ser	Phe	Met	Gly												
				165													

<210> 274
 <211> 328
 <212> PRT
 <213> Eucalyptus grandis

<400> 274

Ile	Leu	Ser	Arg	Lys	Pro	Lys	Glu	Lys	Thr	Val	Gly	Arg	Lys	Asn	Ile		
1				5					10					15			
Lys	Lys	Asn	Met	Ser	Ser	Lys	Glu	Ala	Pro	Val	Ile	Thr	Thr	Ser	His		
		20					25						30				
Glu	Asp	Glu	Glu	Ile	Leu	Asn	Ala	Phe	Glu	Val	Pro	Ser	Met	Ala	Phe		
	35					40						45					
Val	Pro	Met	Val	Leu	Lys	Gly	Val	His	Glu	Leu	Gly	Ile	Leu	Glu	Leu		
	50					55					60						
Leu	Ala	Lys	Gly	Asp	Gln	Leu	Ser	Pro	Leu	Asp	Ile	Val	Ala	Arg	Leu		
65					70				75						80		
Ser	Ile	Asp	Asn	Pro	Ala	Ala	Pro	Asp	Thr	Ile	Asp	Arg	Met	Leu	Arg		
			85						90					95			
Leu	Leu	Ala	Ser	Tyr	Ser	Ile	Leu	Ser	Cys	Thr	Leu	Val	Glu	Asp	Lys		
		100					105						110				

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Glu Gly Arg Pro Gln Arg Leu Tyr Gly Leu Gly Pro Arg Ser Lys Phe
 115 120 125
 Phe Leu Asp Gln Asn Gly Ala Ser Thr Leu Pro Thr His Met Leu Leu
 130 135 140
 Gln Glu Lys Thr Leu Leu Glu Cys Trp Asn Cys Leu Lys Asp Ala Val
 145 150 155 160
 Lys Glu Gly Gly Ala Asp Pro Phe Thr Arg Arg His Gly Met Asn Val
 165 170 175
 Phe Asp Tyr Met Gly Gln Asp Pro Arg Phe Asn Asp Leu Tyr Asn Lys
 180 185 190
 Ser Met Arg Thr Gly Ser Ala Ile Tyr Met Pro Lys Ile Ala Gln His
 195 200 205
 Tyr Arg Gly Phe Ser Lys Ala Lys Thr Val Val Asn Val Gly Gly Gly
 210 215 220
 Ile Gly Glu Thr Leu Lys Thr Ile Leu Ser Lys Asn Pro His Ile Arg
 225 230 235 240
 Ala Ile Asn Tyr Asp Leu Pro His Val Ile Ala Thr Ala Pro Pro Ile
 245 250 255
 Pro Gly Ile Thr His Val Gly Gly Asp Ile Leu Lys Ser Val Pro Lys
 260 265 270
 Ala Asp Val His Phe Leu Lys Ser Val Leu His Arg Gly Asp Asp Glu
 275 280 285
 Phe Cys Val Lys Val Leu Lys Asn Cys Trp Glu Ala Leu Pro Pro Thr
 290 295 300
 Gly Lys Val Val Ile Val Glu Glu Val Thr Pro Glu Tyr Pro Gly Thr
 305 310 315 320
 Asp Asp Val Ser Gln Thr Thr Leu
 325

<210> 275
 <211> 160
 <212> PRT
 <213> Pinus radiata

<400> 275
 Asp Val Gly Gly Gly Ile Gly Ser Ala Leu Ser Ile Ile Val Lys Glu
 1 5 10 15
 His Pro His Ile Arg Gly Ile Asn Leu Asp Leu Pro His Val Ile Ala
 20 25 30
 Thr Ala Pro Leu Ile Thr Gly Val Glu His Met Glu Gly Asn Met Phe
 35 40 45
 Glu His Ile Pro Ser Ala Asp Ala Val Met Met Lys Trp Ile Leu His
 50 55 60
 Asp Trp Ala Asp Glu Glu Cys Val Lys Leu Leu Arg Arg Ser Tyr Asp
 65 70 75 80
 Ala Thr Pro Ala Lys Gly Lys Val Leu Ile Val Glu Ala Val Val Glu
 85 90 95
 Gly Asp Lys Glu Gly Glu Ser Met Ser Arg Arg Leu Gly Leu Leu Tyr
 100 105 110
 Asp Ile Ser Met Met Ala Tyr Thr Thr Gly Gly Lys Glu Arg Thr Glu
 115 120 125
 Glu Glu Phe Lys Gly Leu Phe Gln Arg Ala Gly Phe Lys Ser His Thr
 130 135 140
 Ile Ile Lys Leu Pro Phe Leu Gln Ser Leu Ile Val Leu Ser Lys Ala
 145 150 155 160

<210> 276

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<211> 112
 <212> PRT
 <213> Eucalyptus grandis

<400> 276
 Ser Leu Arg Thr Tyr Ser Asn Met Glu Gln Gly Trp Asp Lys Gly Glu
 1 5 10 15
 Ile Leu Ala Ser Lys Ala Leu Ser Lys Tyr Ile Leu Glu Thr Asn Ala
 20 25 30
 Tyr Pro Arg Glu His Glu Gln Leu Lys Glu Leu Arg Glu Ala Thr Val
 35 40 45
 Gln Lys Tyr Gln Ile Arg Ser Ile Met Asn Val Pro Val Asp Glu Gly
 50 55 60
 Gln Leu Ile Ser Met Met Leu Lys Leu Met Asn Ala Lys Lys Thr Ile
 65 70 75 80
 Glu Ile Gly Val Phe Thr Gly Tyr Ser Leu Leu Thr Thr Ala Leu Ala
 85 90 95
 Leu Pro Ala Asp Gly Lys Ile Ile Ala Ile Asp Gln Asp Lys Glu Ala
 100 105 110

<210> 277
 <211> 133
 <212> PRT
 <213> Eucalyptus grandis

<400> 277
 Arg Thr Tyr Ser Asp Met Glu Arg Gly Gly Asp Lys Gly Glu Ile Leu
 1 5 10 15
 Ala Ser Lys Ala Leu Ser Lys Tyr Ile Leu Glu Thr Asn Ala Tyr Pro
 20 25 30
 Arg Glu His Glu Gln Leu Lys Glu Leu Arg Glu Ala Thr Val Gln Lys
 35 40 45
 Tyr Gln Met Arg Ser Ile Met Ser Val Pro Ala Asp Glu Gly Gln Leu
 50 55 60
 Ile Ser Met Met Leu Lys Leu Met Asn Ala Lys Lys Thr Ile Glu Ile
 65 70 75 80
 Gly Val Phe Thr Gly Tyr Ser Leu Leu Thr Thr Ala Leu Ala Leu Pro
 85 90 95
 Ala Asp Gly Lys Ile Ile Ala Ile Asp Pro Asp Lys Glu Ala Tyr Glu
 100 105 110
 Ile Gly Leu Pro Tyr Ile Lys Lys Ala Gly Val Asp His Lys Ile Asn
 115 120 125
 Phe Ile Gln Ser Asp
 130

<210> 278
 <211> 98
 <212> PRT
 <213> Eucalyptus grandis

<400> 278
 Leu Gln Tyr Ile Leu Glu Thr Asn Ala Tyr Pro Arg Glu His Glu Gln
 1 5 10 15
 Leu Lys Glu Leu Arg Glu Ala Thr Val Gln Lys Tyr Gln Ile Arg Ser
 20 25 30
 Ile Met Asn Val Pro Ala Asp Glu Gly Gln Leu Ile Ser Met Met Leu
 35 40 45

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Lys Leu Met Asn Ala Lys Lys Thr Ile Glu Ile Gly Val Phe Thr Gly
 50 55 60
 Cys Ser Leu Leu Thr Thr Ala Leu Ala Leu Pro Ala Asp Gly Lys Ile
 65 70 75 80
 Ile Ala Ile Asp Pro Asp Lys Glu Ala Tyr Glu Ile Gly Leu Pro Tyr
 85 90 95
 Ile Arg

<210> 279
 <211> 157
 <212> PRT
 <213> Eucalyptus grandis

<400> 279
 Arg His His Gln Thr Leu Thr Phe Ser Ser Ser Ala Leu Cys Leu Cys
 1 5 10 15
 Leu Cys Leu Ser Ile Leu Arg Pro Ala Thr Thr Met Glu Ala Lys Pro
 20 25 30
 Ser Glu Gln Pro Arg Glu Phe Ile Phe Arg Ser Lys Leu Pro Asp Ile
 35 40 45
 Tyr Ile Pro Asp Asn Leu Ser Leu His Ala Tyr Cys Phe Glu Asn Ile
 50 55 60
 Ser Glu Phe Ala Asp Arg Pro Cys Val Ile Asn Gly Ala Thr Gly Arg
 65 70 75 80
 Thr Tyr Thr Tyr Ala Glu Val Glu Leu Ile Ser Arg Arg Val Ser Ala
 85 90 95
 Gly Leu Asn Gly Leu Gly Val Gly Gln Gly Asp Val Ile Met Leu Leu
 100 105 110
 Leu Gln Asn Cys Pro Glu Phe Val Phe Ala Phe Leu Gly Ala Ser Tyr
 115 120 125
 Arg Gly Ala Ile Ser Thr Thr Ala Asn Pro Phe Tyr Thr Pro Gly Glu
 130 135 140
 Ile Ala Lys Gln Ala Ser Ala Ala Arg Ala Lys Ile Val
 145 150 155

<210> 280
 <211> 180
 <212> PRT
 <213> Eucalyptus grandis

<400> 280
 Phe Ala Asp Lys Val Arg Pro Phe Ala Glu Glu Asn Gly Val Lys Val
 1 5 10 15
 Val Cys Ile Asp Thr Ala Pro Glu Gly Cys Leu His Phe Ser Glu Leu
 20 25 30
 Met Gln Ala Asp Glu Asn Ala Ala Pro Ala Ala Asp Val Lys Pro Asp
 35 40 45
 Asp Val Leu Ala Leu Pro Tyr Ser Ser Gly Thr Thr Gly Leu Pro Lys
 50 55 60
 Gly Val Met Leu Thr His Arg Gly Gln Val Thr Ser Val Ala Gln Gln
 65 70 75 80
 Val Asp Gly Asp Asn Pro Asn Leu Tyr Phe His Lys Glu Asp Val Ile
 85 90 95
 Leu Cys Thr Leu Pro Leu Phe His Ile Tyr Ser Leu Asn Ser Val Met
 100 105 110
 Phe Cys Ala Leu Arg Val Gly Ala Ala Ile Leu Ile Met Gln Lys Phe

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Lys Gln Val Ala Pro Phe Lys Arg Leu His Arg Val Asn Phe Val Asp
 85 90 95
 Ser Ile Pro Lys Ser Ala Ser Gly Lys Ile Leu Arg Arg Glu Leu Ile
 100 105 110
 Ala Lys Ala Lys Ser Lys Leu
 115

<210> 283
 <211> 152
 <212> PRT
 <213> Pinus radiata

<400> 283
 Asp Phe Pro Phe Phe Phe Leu Leu Arg Val Ala Met Ile Glu Val Gln
 1 5 10 15
 Ser Ala Pro Pro Met Ala Arg Ser Thr Glu Asn Glu Asn Asn Gln His
 20 25 30
 Asp Ala Glu Glu Gly Ala Val Leu Asn Glu Gly Gly Met Asp Phe Leu
 35 40 45
 Tyr Arg Ser Lys Leu Pro Asp Ile Asp Ile Pro Tyr His Leu Pro Leu
 50 55 60
 His Ser Tyr Cys Phe Glu Lys Leu Asp Glu Leu Arg Glu Lys Pro Cys
 65 70 75 80
 Leu Ile Gln Gly Ser Asn Gly Lys Ile Tyr Ser Tyr Gly Glu Val Glu
 85 90 95
 Leu Ile Ser Arg Lys Val Ala Ser Gly Leu Ala Lys Leu Gly Phe Lys
 100 105 110
 Lys Gly Asp Val Val Met Leu Leu Leu Pro Asn Cys Pro Glu Phe Val
 115 120 125
 Phe Val Phe Leu Gly Ala Ser Met Ala Gly Ala Ile Ala Thr Thr Ala
 130 135 140
 Asn Pro Phe Tyr Thr Pro Ser Asp
 145 150

<210> 284
 <211> 330
 <212> PRT
 <213> Eucalyptus grandis

<400> 284
 Asp His Pro Pro Ala Met Ala Leu His Ile Leu Phe Thr Trp Leu Ala
 1 5 10 15
 Leu Ser Leu Pro Leu Leu Leu Leu Leu Leu Ser Val Lys Asn Phe
 20 25 30
 Asn Asn Lys Lys Lys Asn Leu Pro Pro Gly Pro Pro Ser Leu Pro Ile
 35 40 45
 Ile Gly Asn Phe His Gln Leu Gly Pro Leu Pro His Gln Ser Leu Trp
 50 55 60
 Lys Leu Ser Arg Arg Tyr Gly Pro Val Met Leu Ile Arg Leu Gly Gly
 65 70 75 80
 Thr Pro Thr Ile Val Ile Ser Ser Pro Asp Ala Ala Arg Glu Val Leu
 85 90 95
 Lys Thr His Asp Leu Asp Ser Cys Ser Arg Pro Gln Met Val Gly Pro
 100 105 110
 Gly Arg Leu Ser Tyr Asp Ser Leu Asp Met Ala Phe Val Glu Tyr Gly
 115 120 125
 Asp Tyr Trp Arg Glu Leu Arg Thr Leu Cys Val Leu Glu Leu Phe Ser

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

<210> 285
 <211> 115
 <212> PRT
 <213> Eucalyptus grandis

<400> 285
Thr Glu Leu Glu Asp Glu Gly Phe Met Asp Met Val His Glu Gly Met
1 5 10 15
Ala Met Leu Gly Ser Phe Ser Ala Ser Asp Tyr Phe Pro Arg Leu Gly
20 25 30
Trp Ile Val Asp Arg Phe Thr Gly Leu His Ser Arg Leu Glu Lys Ser
35 40 45
Phe Arg Asn Leu Asp Asp Leu Tyr Gln Lys Val Ile Glu Glu His Arg
50 55 60
Asn Ala Asn Lys Ser Asn Glu Gly Lys Glu Asp Ile Val Asp Val Leu
65 70 75 80
Leu Lys Met Glu Lys Asp Gln Thr Glu Leu Ala Gly Val Arg Leu Lys
85 90 95
Glu Asp Asn Ile Lys Ala Ile Leu Met Val Tyr His Thr Ile Ser Thr
100 105 110
Tyr Tyr Leu
115

<210> 286
 <211> 143
 <212> PRT
 <213> Eucalyptus grandis

<400> 286
Leu Val Val Ala Ala Leu Leu Ile Val Leu Leu Arg Ser Lys Ser Arg
1 5 10 15

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Lys	Arg	Lys	Ser	Asn	Leu	Pro	Pro	Ser	Pro	Pro	Lys	Leu	Pro	Ile	Ile
			20					25					30		
Gly	Asn	Leu	His	Gln	Leu	Gly	Lys	Ser	Pro	His	Ile	Ser	Leu	His	Arg
		35					40					45			
Leu	Ala	Arg	Asn	Tyr	Gly	Pro	Ile	Met	Ser	Leu	Gln	Leu	Gly	Glu	Val
	50					55					60				
Pro	Thr	Ile	Val	Val	Ser	Ser	Ala	Ala	Met	Ala	Lys	Glu	Val	Met	Lys
65					70					75					80
Thr	His	Asp	Leu	Val	Leu	Ala	Asn	Arg	Pro	Gln	Ile	Phe	Ser	Ala	Lys
				85					90					95	
His	Leu	Phe	Tyr	Asp	Cys	Thr	Asp	Met	Ala	Phe	Ser	Pro	Tyr	Gly	Ala
			100					105					110		
Tyr	Trp	Arg	His	Ile	Arg	Lys	Ile	Cys	Ile	Leu	Glu	Val	Leu	Ser	Ala
		115					120					125			
Lys	Arg	Val	Gln	Ser	Phe	Ser	His	Val	Arg	Glu	Glu	Glu	Val	Ala	
		130					135					140			

<210> 287
 <211> 135
 <212> PRT
 <213> Eucalyptus grandis

<400> 287

Leu	Thr	Phe	Lys	Cys	Leu	Arg	Phe	Leu	Phe	Ser	Ser	Ala	Ala	Ala	Thr
1				5					10					15	
Asn	Leu	His	Leu	Pro	Pro	Ser	Pro	Pro	Lys	Leu	Pro	Ile	Ile	Gly	Asn
			20					25					30		
Leu	His	Gln	Leu	Ser	Asp	His	Pro	His	Arg	Ser	Leu	Gln	Ala	Leu	Ser
		35					40					45			
Arg	Arg	Tyr	Gly	Pro	Leu	Met	Met	Leu	His	Phe	Gly	Ser	Val	Pro	Val
	50					55					60				
Leu	Val	Val	Ser	Ser	Ala	Asp	Cys	Ala	Arg	Asp	Ile	Leu	Lys	Thr	His
65					70					75					80
Asp	Leu	Ile	Phe	Ser	Asp	Arg	Pro	Arg	Ser	Thr	Leu	Ser	Glu	Arg	Leu
				85					90					95	
Leu	Tyr	His	Arg	Lys	Asp	Val	Ala	Leu	Ala	Pro	Phe	Gly	Glu	Tyr	Trp
			100				105						110		
Arg	Glu	Met	Arg	Ser	Ile	Cys	Val	Leu	Gln	Leu	Leu	Ser	Asn	Lys	Arg
		115					120						125		
Val	His	Ser	Phe	Arg	Thr	Val									
		130				135									

<210> 288
 <211> 128
 <212> PRT
 <213> Eucalyptus grandis

<400> 288

Gly	Lys	Leu	Pro	His	Arg	Ser	Leu	Asp	Arg	Leu	Ser	Lys	Thr	Tyr	Gly
1				5					10					15	
Pro	Leu	Met	Tyr	Met	Arg	Leu	Gly	Ser	Met	Pro	Cys	Val	Val	Gly	Ser
		20						25					30		
Ser	Ala	Glu	Met	Ala	Arg	Glu	Phe	Leu	Lys	Thr	His	Asp	Leu	Thr	Phe
		35					40					45			
Ser	Ser	Arg	Pro	Arg	Val	Ala	Ala	Gly	Lys	Tyr	Thr	Val	Tyr	Asn	Tyr
	50					55					60				
Ser	Asp	Ile	Thr	Trp	Ser	Pro	Tyr	Gly	Glu	His	Trp	Arg	Leu	Ala	Arg

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65					70					75					80
Lys	Ile	Cys	Leu	Met	Glu	Leu	Phe	Ser	Ala	Lys	Arg	Leu	Glu	Ser	Phe
				85					90					95	
Glu	Tyr	Ile	Arg	Val	Glu	Glu	Val	Ala	Arg	Met	Leu	Ser	Ser	Val	Phe
			100					105					110		
Glu	Thr	Ser	Arg	Gln	Gly	Leu	Pro	Val	Glu	Ile	Arg	Glu	Glu	Thr	Thr
		115					120					125			

<210> 289
 <211> 179
 <212> PRT
 <213> Eucalyptus grandis

<400> 289

Ile	Arg	Met	Val	Asn	Glu	Leu	Gly	Ser	Glu	Lys	Pro	Phe	Leu	Val	Cys
1			5						10					15	
Leu	Glu	Phe	Tyr	Met	Lys	Leu	Ala	Ile	Ala	Leu	Val	Ala	Leu	Val	Val
			20					25					30		
Ala	Trp	Ser	Phe	Phe	Val	Lys	Gly	Arg	Asn	Arg	Lys	Leu	Pro	Pro	Gly
		35					40					45			
Pro	Phe	Ser	Leu	Pro	Ile	Ile	Gly	Asn	Leu	His	Leu	Leu	Gly	Gln	Leu
	50					55					60				
Pro	His	Arg	Ala	Leu	Thr	Ala	Leu	Ser	Leu	Lys	Phe	Gly	Pro	Leu	Met
65					70					75					80
Ser	Leu	Arg	Leu	Gly	Ser	Ala	Leu	Thr	Leu	Val	Val	Ser	Ser	Pro	Asp
			85						90					95	
Met	Ala	Lys	Glu	Phe	Leu	Lys	Thr	His	Asp	Leu	Leu	Phe	Ala	Ser	Arg
			100					105					110		
Pro	Pro	Ser	Ala	Ala	Thr	Asn	Tyr	Phe	Trp	Tyr	Asn	Cys	Thr	Asp	Ile
		115					120					125			
Gly	Phe	Ala	Pro	Tyr	Gly	Ala	Tyr	Trp	Arg	Gln	Val	Arg	Lys	Val	Cys
	130					135					140				
Val	Leu	Gln	Leu	Leu	Ser	Ser	Arg	Arg	Leu	Asp	Tyr	Phe	Arg	Phe	Ile
145					150					155					160
Arg	Glu	Glu	Glu	Val	Ser	Ala	Met	Ile	His	Ser	Ile	Ala	His	Ser	Asp
			165						170					175	
His	Pro	Val													

<210> 290
 <211> 440
 <212> PRT
 <213> Eucalyptus grandis

<400> 290

Ser	Ser	Leu	Ala	Phe	Gly	Gln	His	Ile	Ile	Ala	Thr	Ser	Tyr	Ser	Cys
1				5					10					15	
Asn	Leu	His	Gln	Ile	Gly	Glu	Met	Ser	Phe	Gln	Asn	Gln	Leu	Phe	Ile
			20					25					30		
Phe	Cys	Thr	Leu	Leu	Leu	Gly	Phe	Leu	Lys	Leu	Ala	Glu	Gly	Lys	Thr
		35					40					45			
Arg	His	Tyr	Thr	Phe	His	Ile	Asp	Ser	His	Asn	Met	Thr	Arg	Leu	Cys
	50					55					60				
His	Thr	Arg	Ser	Val	Leu	Ser	Val	Asn	Lys	Gln	Tyr	Pro	Gly	Pro	Pro
65					70					75					80
Leu	Val	Ala	Arg	Glu	Gly	Asp	Asn	Ile	Leu	Val	Lys	Val	Val	Asn	His
				85					90					95	

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Val Ala Ala Asn Val Thr Ile His Trp His Gly Val Arg Gln Leu Arg
      100      105      110
Thr Gly Trp Ala Asp Gly Pro Ala Tyr Val Thr Gln Cys Pro Ile Gln
      115      120      125
Thr Asn Gln Ser Tyr Thr Tyr Asn Phe Thr Leu Thr Gly Gln Arg Gly
      130      135      140
Thr Leu Leu Trp His Ala His Val Ser Trp Leu Arg Ser Ser Ile His
145      150      155      160
Gly Pro Ile Ile Ile Leu Pro Lys Arg Asn Glu Ser Tyr Pro Phe Glu
      165      170      175
Lys Pro Ser Lys Glu Val Pro Ile Ile Phe Gly Glu Trp Phe Asn Val
      180      185      190
Asp Pro Glu Ala Val Ile Ala Gln Ala Leu Gln Ser Gly Gly Gly Pro
      195      200      205
Asn Val Ser Asp Ala Tyr Thr Ile Asn Gly Leu Pro Gly Pro Leu Tyr
      210      215      220
Asn Cys Ser Ser Lys Asp Thr Phe Lys Leu Lys Val Lys Pro Gly Lys
225      230      235      240
Thr Tyr Leu Leu Arg Leu Ile Asn Ala Ala Leu Asn Asp Glu Leu Phe
      245      250      255
Phe Ser Ile Ala Asn His Ala Val Thr Val Val Glu Val Asp Ala Val
      260      265      270
Tyr Thr Lys Pro Phe Ser Ala Gly Cys Leu His Leu Thr Pro Gly Gln
      275      280      285
Thr Met Asn Val Leu Leu Lys Thr Lys Thr Asp Phe Pro Asn Ser Thr
      290      295      300
Phe Leu Met Ala Ala Trp Pro Tyr Phe Thr Gly Met Gly Thr Phe Asp
305      310      315      320
Asn Ser Thr Val Ala Gly Ile Leu Glu Tyr Glu His Pro Lys Ser Ser
      325      330      335
Asn Tyr Pro Pro Leu Lys Lys Leu Pro Gln Tyr Lys Pro Thr Leu Pro
      340      345      350
Pro Met Asn Ser Thr Gly Phe Val Ala Lys Phe Thr Gly Gln Leu Arg
      355      360      365
Ser Leu Ala Ser Ala Lys Phe Pro Ala Asn Val Pro Gln Lys Val Asp
      370      375      380
Arg Lys Phe Phe Phe Thr Val Gly Leu Gly Thr Ser Pro Cys Pro Lys
385      390      395      400
Asn Thr Thr Cys Gln Gly Pro Asn Gly Thr Lys Phe Ala Ala Ser Val
      405      410      415
Asn Asn Ile Ser Phe Val Leu Pro Ser Val Ala Leu Leu Gln Ala His
      420      425      430
Phe Phe Gly Gln Ser Asn Gly Val
      435      440

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<210> 291
<211> 326
<212> PRT
<213> Eucalyptus grandis

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<400> 291
Pro Ala Val Val Glu Gly Arg Val Arg Asn Tyr Thr Phe Asn Val Val
 1      5      10      15
Met Lys Asn Thr Thr Arg Leu Cys Ser Ser Lys Pro Ile Val Thr Val
      20      25      30
Asn Gly Met Phe Pro Gly Pro Thr Leu Tyr Ala Arg Glu Asp Asp Thr
      35      40      45

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Val Leu Val Arg Val Ser Asn Arg Val Lys Tyr Asn Val Thr Ile His
 50 55 60
 Trp His Gly Ile Arg Gln Leu Arg Thr Gly Trp Ala Asp Gly Pro Ala
 65 70 75 80
 Tyr Ile Thr Gln Cys Pro Ile Gln Pro Gly Gln Ser Tyr Val Tyr Asn
 85 90 95
 Phe Thr Ile Thr Gly Gln Arg Gly Thr Leu Leu Trp His Ala His Ile
 100 105 110
 Leu Trp Leu Arg Ala Thr Leu His Gly Ala Ile Val Ile Leu Pro Lys
 115 120 125
 Arg Gly Val Pro Tyr Pro Phe Pro Lys Pro His Lys Glu Val Val Val
 130 135 140
 Val Leu Gly Glu Trp Trp Lys Ser Asp Thr Glu Gly Val Ile Ser Gln
 145 150 155 160
 Ala Ile Lys Ser Gly Leu Ala Pro Asn Val Ser Asp Ala His Thr Ile
 165 170 175
 Asn Gly His Pro Gly Pro Ser Ser Asn Cys Pro Ser Gln Gly Gly Phe
 180 185 190
 Thr Leu Pro Val Glu Ser Gly Lys Lys Tyr Met Leu Arg Ile Ile Asn
 195 200 205
 Ala Ala Leu Asn Glu Glu Leu Phe Phe Lys Ile Ala Gly His Gln Leu
 210 215 220
 Thr Ile Val Glu Val Asp Ala Thr Tyr Val Lys Pro Phe Lys Thr Asp
 225 230 235 240
 Thr Ile Val Ile Ala Pro Gly Gln Thr Thr Asn Ala Leu Ile Ser Thr
 245 250 255
 Asp Gln Ser Ser Gly Lys Tyr Met Val Ala Ala Ser Pro Phe Met Asp
 260 265 270
 Ser Pro Ile Ala Val Asp Asn Met Thr Ala Thr Ala Thr Leu His Tyr
 275 280 285
 Ser Gly Thr Leu Ala Ala Thr Ser Thr Thr Leu Thr Lys Thr Pro Pro
 290 295 300
 Gln Asn Ala Thr Ala Val Ala Asn Asn Phe Val Asn Ser Leu Arg Ser
 305 310 315 320
 Leu Asn Ser Lys Arg Tyr
 325

<210> 292
 <211> 101
 <212> PRT
 <213> Eucalyptus grandis

<400> 292
 Arg Leu Cys Ser Ser Lys Pro Ile Val Thr Val Asn Gly Met Phe Pro
 1 5 10 15
 Gly Pro Thr Leu Tyr Ala Arg Glu Asp Asp Thr Val Leu Val Arg Val
 20 25 30
 Ser Asn Arg Val Lys Tyr Asn Val Thr Ile His Trp His Gly Ile Arg
 35 40 45
 Gln Leu Arg Ser Gly Trp Ala Asp Gly Pro Ala Tyr Ile Thr Gln Cys
 50 55 60
 Pro Ile Gln Pro Gly Gln Ser Tyr Val Tyr Asn Phe Thr Ile Thr Gly
 65 70 75 80
 Gln Arg Gly Thr Leu Leu Trp His Ala His Ile Leu Trp Leu Arg Ala
 85 90 95
 Thr Leu His Gly Ala
 100

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<210> 293
 <211> 136
 <212> PRT
 <213> Eucalyptus grandis

<400> 293
 Thr Val Asp His Ser Leu Leu Phe Thr Val Gly Leu Gly Ile Asn Pro
 1 5 10 15
 Cys Pro Ser Cys Lys Ala Gly Asn Gly Ser Arg Val Val Ala Ser Met
 20 25 30
 Asn Asn Val Thr Phe Val Met Pro Thr Thr Ala Ile Leu Gln Ala His
 35 40 45
 Phe Phe Asn Lys Ser Gly Val Phe Thr Ser Asp Phe Pro Gly Asn Pro
 50 55 60
 Pro Thr Ile Phe Asn Tyr Thr Gly Ser Pro Pro Ser Asn Leu Arg Thr
 65 70 75 80
 Thr Ser Gly Thr Lys Val Tyr Arg Leu Arg Tyr Asn Ser Thr Val Gln
 85 90 95
 Leu Val Phe Gln Asp Thr Gly Ile Ile Ala Pro Glu Asn His Pro Ile
 100 105 110
 His Leu His Gly Phe Asn Phe Phe Ala Ile Gly Lys Gly Leu Gly Asn
 115 120 125
 Tyr Asn Pro Lys Val Asp Gln Lys
 130 135

<210> 294
 <211> 104
 <212> PRT
 <213> Eucalyptus grandis

<400> 294
 His Lys Glu Val Val Val Val Leu Gly Glu Trp Trp Lys Ser Asp Thr
 1 5 10 15
 Glu Ala Val Ile Asn Gln Ala Ile Lys Ser Gly Leu Ala Pro Asn Val
 20 25 30
 Ser Asp Ala His Thr Ile Asn Gly His Pro Gly Pro Ser Ser Asn Cys
 35 40 45
 Pro Ser Gln Gly Gly Phe Thr Leu Pro Val Glu Ser Gly Lys Lys Tyr
 50 55 60
 Met Leu Arg Ile Ile Asn Ala Ala Leu Asn Glu Glu Leu Phe Phe Lys
 65 70 75 80
 Ile Ala Gly His Gln Leu Thr Ile Val Glu Val Asp Ala Thr Tyr Val
 85 90 95
 Lys Pro Phe Lys Thr Asn Thr Gly
 100

<210> 295
 <211> 110
 <212> PRT
 <213> Eucalyptus grandis

<400> 295
 Arg Gly Val Pro Tyr Pro Phe Pro Lys Pro His Lys Glu Val Val Val
 1 5 10 15
 Val Leu Gly Glu Trp Trp Lys Ser Asp Thr Glu Ala Val Ile Asn Gln
 20 25 30

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Ala	Ile	Lys	Ser	Gly	Leu	Ala	Pro	Asn	Val	Ser	Asp	Ala	His	Thr	Ile
		35					40					45			
Asn	Gly	His	Pro	Gly	Pro	Ser	Ser	Asn	Cys	Pro	Ser	Gln	Gly	Gly	Phe
	50					55					60				
Thr	Leu	Pro	Val	Glu	Ser	Gly	Lys	Lys	Tyr	Met	Leu	Arg	Ile	Ile	Asn
65					70					75					80
Ala	Ala	Leu	Asn	Glu	Glu	Leu	Phe	Phe	Lys	Ile	Ala	Gly	His	Gln	Leu
			85						90					95	
Thr	Ile	Val	Glu	Val	Asp	Ala	Thr	Tyr	Val	Lys	Pro	Phe	Lys		
			100					105					110		

<210> 296

<211> 384

<212> PRT

<213> Eucalyptus grandis

<400> 296

Pro	Asn	Val	Ser	Asp	Ala	Tyr	Thr	Ile	Asn	Gly	Gln	Pro	Gly	Asp	Leu
1				5					10					15	
Tyr	Asn	Cys	Ser	Ser	Lys	Asp	Thr	Val	Ile	Val	Pro	Ile	Asp	Ser	Gly
			20					25					30		
Glu	Thr	His	Leu	Leu	Arg	Val	Ile	Asn	Ala	Ala	Leu	Asn	Gln	Glu	Leu
		35					40					45			
Phe	Phe	Thr	Val	Ala	Asn	His	Arg	Phe	Thr	Val	Val	Gly	Ala	Asp	Ala
	50				55						60				
Ser	Tyr	Leu	Lys	Pro	Phe	Thr	Thr	Ser	Val	Ile	Met	Leu	Gly	Pro	Gly
65				70						75					80
Gln	Thr	Thr	Asp	Val	Leu	Ile	Ser	Gly	Asp	Gln	Pro	Pro	Ala	Arg	Tyr
			85					90						95	
Tyr	Met	Ala	Ala	Glu	Pro	Tyr	Gln	Ser	Ala	Gln	Gly	Ala	Pro	Phe	Asp
			100				105						110		
Asn	Thr	Thr	Thr	Thr	Ala	Ile	Leu	Glu	Tyr	Lys	Ser	Ala	Pro	Cys	Pro
		115					120					125			
Ala	Lys	Gly	Ile	Ser	Ser	Lys	Pro	Val	Met	Pro	Thr	Leu	Pro	Ala	Phe
	130					135					140				
Asn	Asp	Thr	Ala	Thr	Val	Thr	Ala	Phe	Ile	Gln	Ser	Phe	Arg	Ser	Pro
145					150					155					160
Asn	Lys	Val	Asp	Val	Pro	Thr	Asp	Ile	Asp	Glu	Asn	Leu	Phe	Ile	Thr
			165						170					175	
Val	Gly	Leu	Gly	Leu	Phe	Asn	Cys	Pro	Lys	Asn	Phe	Gly	Ser	Ser	Arg
			180					185					190		
Cys	Gln	Gly	Pro	Asn	Gly	Thr	Arg	Phe	Thr	Ala	Ser	Met	Asn	Asn	Val
		195				200						205			
Ser	Phe	Val	Leu	Pro	Ser	Asn	Val	Ser	Ile	Leu	Gln	Ala	Tyr	Lys	Gln
	210					215					220				
Gly	Val	Pro	Gly	Val	Phe	Thr	Thr	Asp	Phe	Pro	Ala	Asn	Pro	Pro	Val
225					230					235					240
Gln	Phe	Asp	Tyr	Thr	Gly	Asn	Val	Ser	Arg	Ser	Leu	Trp	Gln	Pro	Val
			245						250					255	
Pro	Gly	Thr	Lys	Val	Tyr	Lys	Leu	Lys	Tyr	Gly	Ser	Arg	Val	Gln	Ile
			260					265					270		
Val	Leu	Gln	Gly	Thr	Asn	Ile	Gln	Thr	Ala	Glu	Asn	His	Pro	Ile	His
		275					280					285			
Ile	His	Gly	Tyr	Asp	Phe	Tyr	Ile	Leu	Ala	Thr	Gly	Phe	Gly	Asn	Phe
	290					295					300				
Asn	Pro	Gln	Lys	Asp	Thr	Ala	Lys	Phe	Asn	Leu	Val	Asp	Pro	Pro	Met
305					310					315					320

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Arg	Asn	Thr	Val	Gly	Val	Ser	Val	Asn	Gly	Trp	Ala	Val	Ile	Arg	Phe
				325					330					335	
Val	Ala	Asp	Asn	Pro	Gly	Ala	Trp	Leu	Met	His	Cys	His	Leu	Asp	Val
			340					345					350		
His	Ile	Thr	Trp	Gly	Leu	Ala	Val	Val	Phe	Leu	Val	Glu	Asn	Gly	Val
		355					360					365			
Gly	Glu	Leu	Gln	Ser	Leu	Gln	Pro	Pro	Pro	Ala	Asp	Leu	Pro	Pro	Cys
	370					375					380				

<210> 297
 <211> 139
 <212> PRT
 <213> Eucalyptus grandis

<400> 297

Ser	Cys	Leu	Ser	Leu	His	His	His	Leu	Arg	Gln	Val	Thr	Ser	Asp	Phe
1				5					10					15	
Glu	Glu	Asp	Glu	Glu	Arg	Lys	Met	Gly	Ser	Ala	Thr	Ala	Ala	Gly	Ala
			20					25					30		
Ser	Val	Ser	Ser	Arg	Met	Ile	Leu	Met	Arg	Ala	Ala	Phe	Phe	Thr	Leu
		35				40						45			
Cys	Ala	Leu	Val	Phe	Leu	Pro	Ala	Leu	Ala	Gln	Ala	Lys	His	Gly	Gly
	50				55					60					
Val	Thr	Arg	His	Tyr	Lys	Phe	Asp	Ile	Lys	Met	Gln	Asn	Val	Thr	Arg
65				70				75						80	
Leu	Cys	Gln	Thr	Lys	Ser	Ile	Val	Thr	Val	Asn	Gly	Gln	Leu	Pro	Gly
			85					90					95		
Pro	Arg	Ile	Ile	Ala	Arg	Glu	Gly	Asp	Arg	Leu	Leu	Ile	Lys	Val	Val
			100					105					110		
Asn	Asn	Val	Gln	Tyr	Asn	Val	Thr	Ile	His	Trp	His	Gly	Val	Arg	Gln
		115					120					125			
Leu	Arg	Ser	Gly	Trp	Ala	Asp	Gly	Pro	Ala	Tyr					
	130					135									

<210> 298
 <211> 155
 <212> PRT
 <213> Eucalyptus grandis

<400> 298

Pro	Asp	Arg	Val	Ile	Ser	Thr	Ser	Ser	Ile	Leu	Tyr	Gln	Gly	Glu	Arg
1				5					10					15	
Gly	Thr	Met	Gly	Thr	Phe	Leu	Gly	Phe	Ala	Val	Thr	Ala	Thr	Leu	Leu
			20					25					30		
Phe	Cys	Val	Ala	Gln	Gly	Glu	Val	Leu	Phe	Tyr	Asp	Phe	Val	Val	Asn
		35				40					45				
Glu	Thr	Pro	Ile	Glu	Met	Leu	Cys	Glu	Thr	Asn	Arg	Ser	Val	Leu	Thr
	50				55					60					
Val	Asn	Gly	Leu	Phe	Pro	Gly	Pro	Glu	Ile	His	Ala	His	Lys	Gly	Asp
65				70				75						80	
Thr	Ile	Tyr	Val	Asn	Val	Thr	Asn	Leu	Gly	Pro	Tyr	Gly	Val	Thr	Ile
			85					90					95		
His	Trp	His	Gly	Val	Arg	Gln	Ile	Arg	Tyr	Pro	Trp	Ser	Asp	Gly	Pro
			100					105					110		
Glu	Tyr	Val	Thr	Gln	Cys	Pro	Ile	Pro	Thr	Asn	Ser	Ser	Phe	Leu	Gln
		115					120					125			
Lys	Ile	Lys	Leu	Thr	Glu	Glu	Glu	Gly	Thr	Val	Trp	Trp	His	Ala	His

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130 135 140
 Ser Asp Trp Ser Arg Ala Thr Ile His Gly Leu
 145 150 155

<210> 299
 <211> 179
 <212> PRT
 <213> Eucalyptus grandis

<400> 299
 Leu Leu Gln Val His Phe Ser Leu Val Glu Arg Glu Arg Glu Met Gly
 1 5 10 15
 Thr Phe Leu Gly Phe Val Val Thr Met Thr Leu Leu Phe Cys Met Ala
 20 25 30
 Gln Gly Glu Val Ile Tyr Tyr Asp Phe Val Val Lys Glu Thr Pro Ile
 35 40 45
 Gln Met Leu Cys Gly Thr Asn Gln Thr Val Leu Thr Val Asn Gly Leu
 50 55 60
 Phe Pro Gly Pro Glu Ile His Ala His Lys Gly Asp Thr Ile Tyr Val
 65 70 75 80
 Asn Val Thr Asn Thr Gly Pro Tyr Gly Val Thr Ile His Trp His Gly
 85 90 95
 Val Arg Gln Ile Arg Tyr Pro Trp Ser Asp Gly Pro Glu Tyr Ile Thr
 100 105 110
 Gln Cys Pro Ile Pro Thr Asn Ser Ser Phe Leu Gln Lys Ile Ile Leu
 115 120 125
 Thr Glu Glu Glu Gly Thr Leu Trp Trp His Ala His Ser Asp Trp Thr
 130 135 140
 Arg Ala Thr Ile His Gly Pro Ile Ile Ile Leu Pro Val Asn Gly Thr
 145 150 155 160
 Asn Tyr Pro Tyr Lys Phe Asp Glu Gln His Thr Ile Val Ile Ser Glu
 165 170 175
 Trp Tyr Ala

<210> 300
 <211> 62
 <212> PRT
 <213> Eucalyptus grandis

<400> 300
 Glu Arg Glu Met Gly Thr Phe Leu Gly Phe Val Val Thr Met Thr Leu
 1 5 10 15
 Leu Phe Cys Met Ala Gln Gly Glu Val Leu Tyr Tyr Asp Phe Val Val
 20 25 30
 Lys Glu Thr Pro Ile Gln Met Leu Cys Gly Thr Asn Gln Thr Val Leu
 35 40 45
 Thr Val Asn Gly Leu Phe Pro Gly Pro Glu Ile His Ala His
 50 55 60

<210> 301
 <211> 190
 <212> PRT
 <213> Pinus radiata

<400> 301
 Leu Ala Val Met Ser Asn Glu Gln Leu Leu Glu Phe Ala Trp Gly Leu

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1				5				10					15				
Ala	Ser	Ser	Asn	Gln	Ser	Phe	Leu	Trp	Val	Val	Arg	Ser	Asp	Ile	Val		
			20					25					30				
His	Gly	Glu	Ser	Ala	Ile	Leu	Pro	Lys	Glu	Phe	Ile	Glu	Glu	Thr	Lys		
		35					40					45					
Asp	Arg	Gly	Met	Leu	Val	Gly	Trp	Ala	Pro	Gln	Ile	Lys	Val	Leu	Ser		
	50					55					60						
His	Pro	Ser	Val	Gly	Gly	Phe	Leu	Thr	His	Ser	Gly	Trp	Asn	Ser	Thr		
65				70					75					80			
Leu	Glu	Ser	Ile	Ser	Ala	Gly	Val	Pro	Met	Met	Cys	Trp	Pro	Phe	Phe		
			85					90						95			
Ala	Glu	Gln	Glu	Thr	Asn	Ala	Lys	Phe	Val	Cys	Glu	Glu	Trp	Gly	Ile		
		100					105					110					
Gly	Met	Gln	Val	Lys	Lys	Met	Val	Lys	Arg	Glu	Glu	Leu	Ala	Ile	Leu		
	115					120						125					
Val	Arg	Asn	Ser	Ile	Lys	Gly	Glu	Glu	Gly	Asp	Glu	Met	Arg	Lys	Arg		
	130					135				140							
Ile	Gly	Lys	Leu	Lys	Glu	Thr	Ala	Lys	Arg	Ala	Val	Ser	Glu	Gly	Gly		
145				150				155					160				
Ser	Ser	Lys	Asn	Asn	Leu	Asp	Lys	Leu	Leu	His	His	Ile	Phe	Leu	Lys		
			165			170						175					
Gly	Met	His	Gln	Met	Ile	Val	Gln	Asn	Val	Glu	Ala	Asn	Asn				
			180				185					190					

<210> 302

<211> 365

<212> PRT

<213> Eucalyptus grandis

<400> 302

Pro	Met	Glu	Ser	Cys	Ser	Ile	Ser	Leu	Phe	Trp	Leu	Gly	Leu	Leu	Leu		
1			5					10					15				
Pro	Ala	Leu	Leu	Val	Phe	Leu	Leu	Asn	Arg	Arg	Lys	Arg	Thr	Lys	Leu		
		20						25				30					
Pro	Pro	Gln	Pro	Pro	Ala	Trp	Pro	Val	Ile	Gly	Asn	Ile	Phe	Asp	Leu		
	35					40					45						
Gly	Thr	Met	Pro	His	Gln	Asn	Leu	His	Asn	Leu	Arg	Ala	Lys	His	Gly		
	50				55				60								
Pro	Val	Leu	Trp	Leu	Lys	Leu	Gly	Ser	Val	Asn	Thr	Met	Val	Ile	Gln		
65				70				75					80				
Ser	Ala	Arg	Ala	Ala	Met	Glu	Leu	Phe	Lys	Gly	His	Asp	Phe	Val	Phe		
			85			90						95					
Ala	Asp	Arg	Lys	Cys	Ser	Gln	Ala	Phe	Thr	Ala	Leu	Gly	Tyr	Asp	Gln		
	100					105					110						
Gly	Ser	Leu	Ala	Leu	Gly	Arg	His	Gly	Asp	Tyr	Trp	Arg	Ala	Leu	Arg		
	115				120						125						
Arg	Leu	Cys	Ser	Ala	Glu	Leu	Leu	Val	Asn	Lys	Arg	Val	Asn	Asp	Thr		
	130				135				140								
Ala	His	Leu	Arg	Gln	Lys	Cys	Val	Asp	Ser	Met	Ile	Met	Tyr	Ile	Glu		
145				150				155					160				
Glu	Glu	Met	Ala	Val	Lys	Gln	Ala	Thr	Lys	Gly	Gln	Gly	Ile	Asp	Leu		
		165				170						175					
Ser	His	Phe	Leu	Phe	Leu	Leu	Ala	Phe	Asn	Val	Val	Gly	Asn	Met	Val		
	180					185					190						
Leu	Ser	Arg	Asp	Leu	Leu	Asp	Pro	Lys	Ser	Lys	Asp	Gly	Pro	Glu	Phe		
	195					200					205						
Tyr	Asp	Ala	Met	Asn	Arg	Phe	Met	Glu	Trp	Ala	Gly	Lys	Pro	Asn	Val		

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

<210> 303
 <211> 183
 <212> PRT
 <213> Eucalyptus grandis

<400> 303

Pro Met Glu Ser Cys Ser	Ile Ser Leu Phe Trp	Leu Gly Leu Leu Leu
1	5	10
Pro Ala Leu Leu Val Phe	Leu Leu Asn Arg Arg	Lys Arg Thr Lys Leu
20	25	30
Pro Pro Gln Pro Pro Ala	Trp Pro Val Ile Gly	Asn Ile Phe Asp Leu
35	40	45
Gly Thr Met Pro His Gln	Asn Leu His Asn Leu	Arg Ala Lys His Gly
50	55	60
Pro Val Leu Trp Leu Lys	Leu Gly Ser Val Asn	Thr Met Val Ile Gln
65	70	75
Ser Ala Gln Ala Ala Met	Glu Leu Phe Lys Gly	His Asp Phe Val Phe
85	90	95
Ala Asp Arg Lys Cys Ser	Gln Ala Phe Thr Ala	Leu Gly Tyr Asp Gln
100	105	110
Gly Ser Leu Ala Leu Gly	Arg His Gly Asp Tyr	Trp Arg Ala Leu Arg
115	120	125
Arg Leu Cys Ser Ala Glu	Leu Leu Val Asn Lys	Arg Val Asn Glu Thr
130	135	140
Ala His Leu Arg Gln Lys	Cys Val Asp Ser Met	Ile Met Tyr Ile Glu
145	150	155
Glu Glu Met Ala Val Lys	Gln Ala Thr Lys Gly	Gln Gly Ile Asp Leu
165	170	175
Ser His Phe Leu Phe Leu	Leu	
180		

<210> 304
 <211> 148
 <212> PRT
 <213> Eucalyptus grandis

<400> 304

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Met Lys Ala Gln Asp Glu Ile Asp Ser Met Ile Gly His Asp Ser Leu
 1          5          10          15
Leu Glu Glu Ser Asp Val Ser Lys Leu Pro Tyr Leu Gln Cys Ile Ile
          20          25          30
Leu Glu Thr Leu Arg Leu Asn Thr Thr Ala Pro Leu Leu Leu Pro His
          35          40          45
Ala Ser Ser Ala Asp Cys Thr Ile Gly Gly Tyr Phe Val Pro Arg Asp
          50          55          60
Thr Ile Val Met Val Asn Ala Trp Ala Ile His Lys Asp Pro Gln Leu
65          70          75          80
Trp Glu Asp Pro Leu Ser Phe Lys Pro Glu Arg Phe Glu Gly Asn Gly
          85          90          95
Ser Glu Lys Gln Gln Lys Leu Leu Leu Pro Phe Gly Leu Gly Arg Arg
          100          105          110
Ala Cys Pro Gly Ala Pro Leu Ala His Arg Val Met Gly Trp Thr Leu
          115          120          125
Gly Leu Leu Ile Gln Cys Phe Asp Trp Lys Arg Val Ser Glu Glu Glu
          130          135          140
Ile Asp Met Thr
145

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<210> 305
<211> 164
<212> PRT
<213> Eucalyptus grandis

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<400> 305
Tyr Leu Gly Asp Phe Leu Pro Ile Leu Lys Leu Val Asp Tyr Asn Gly
 1          5          10          15
Val Lys Lys Arg Val Val Glu Leu Lys Glu Lys Phe Asp Ala Phe Ile
          20          25          30
Gln Gly Leu Ile Asn Glu His Arg Arg Lys Lys Gly Asp Pro Glu Leu
          35          40          45
Ala Asp Ser Met Ile Ser His Leu Leu His Leu Gln Glu Ser Gln Pro
          50          55          60
Glu Asp Tyr Ser Asp Ser Met Ile Lys Gly Leu Val Leu Val Leu Leu
65          70          75          80
Val Ala Gly Thr Asp Thr Ser Ser Leu Thr Leu Glu Trp Ile Met Thr
          85          90          95
Asn Leu Leu Asn Asn Pro Glu Lys Leu Glu Lys Ala Arg Asn Glu Ile
          100          105          110
Asp Ser Val Ile Gly His Asp Arg Leu Val Glu Glu Ser Asp Val Ser
          115          120          125
Asn Leu Pro Tyr Leu Gln Cys Ile Ile Leu Glu Thr Leu Arg Leu Asn
          130          135          140
Thr Thr Val Pro Leu Leu Val Pro His Ala Ser Ser Ala Asp Cys Thr
145          150          155          160
Ile Gly Gly Tyr

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<210> 306
<211> 163
<212> PRT
<213> Eucalyptus grandis

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<400> 306
Leu Ser Asp Ala Ile Pro Ala Leu Gly Trp Leu Asp Ser Gly Gly Tyr

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1				5					10					15			
Arg	Arg	Ser	Met	Asp	Glu	Thr	Ala	Lys	Glu	Leu	Asp	Val	Leu	Ala	Gln		
			20					25					30				
Gly	Trp	Leu	Glu	Glu	His	Arg	Arg	Lys	Arg	Leu	Ser	Cys	Pro	Lys	Asp		
		35					40					45					
Asp	Arg	Glu	Gln	Asp	Phe	Met	Asp	Trp	Met	Ile	Asn	Ala	Leu	Glu	Gly		
	50					55					60						
Arg	Asn	Phe	Pro	Asp	Phe	Asp	Ala	Asp	Thr	Val	Ile	Lys	Ala	Thr	Cys		
65					70					75					80		
Leu	Asn	Met	Ile	Ile	Ala	Gly	Thr	Asp	Thr	Ser	Thr	Val	Ala	Ile	Thr		
			85					90						95			
Trp	Ala	Leu	Ser	Leu	Leu	Met	Asn	Asn	Arg	Arg	Ala	Leu	Lys	Lys	Ala		
			100					105					110				
Gln	Gln	Glu	Leu	Asp	Thr	His	Val	Gly	Arg	Ser	Arg	Pro	Val	Glu	Glu		
		115					120					125					
Ser	Asp	Val	Lys	Asn	Leu	Thr	Tyr	Leu	Gln	Ala	Ile	Val	Lys	Glu	Ala		
	130					135					140						
Leu	Arg	Leu	Tyr	Pro	Pro	Val	Pro	Val	Asn	Gly	Leu	Arg	Ser	Ser	Met		
145					150					155					160		
Glu	Glu	Cys															

<210> 307
 <211> 129
 <212> PRT
 <213> Pinus radiata

<400> 307

Arg	Leu	Pro	Pro	Gly	Pro	Pro	Gly	Trp	Pro	Ile	Val	Gly	Asn	Leu	Phe
1				5				10					15		
Gln	Leu	Gly	Asn	Lys	Pro	His	Glu	Ala	Leu	Phe	His	Leu	Ala	Gln	Lys
		20					25					30			
Tyr	Gly	Pro	Leu	Met	Cys	Val	Ser	Leu	Gly	Met	Lys	Thr	Thr	Val	Val
	35					40					45				
Val	Ser	Ser	Pro	Ala	Met	Ala	Lys	Gln	Val	Leu	Lys	Thr	His	Asp	His
	50				55					60					
Val	Phe	Ala	Gly	Arg	Thr	Val	Ile	Gln	Ser	Val	Gln	Cys	Leu	Ser	Tyr
65				70				75						80	
Asp	Lys	Ser	Ser	Val	Ile	Trp	Ala	Gln	Tyr	Gly	Ser	His	Trp	Arg	Leu
			85			90							95		
Leu	Arg	Arg	Ile	Ser	Asn	Thr	Lys	Leu	Phe	Ser	Val	Lys	Arg	Leu	Glu
		100					105					110			
Ala	Leu	Glu	His	Leu	Arg	Arg	Asp	Glu	Val	Phe	Arg	Thr	Ile	Lys	Gln
		115					120					125			
Ile															

<210> 308
 <211> 166
 <212> PRT
 <213> Pinus radiata

<400> 308

Leu	Val	Tyr	Leu	Gln	Ala	Ala	Val	Lys	Glu	Thr	Leu	Arg	Leu	His	Pro
1				5				10					15		
Ser	Gly	Pro	Leu	Leu	Val	Arg	His	Leu	Phe	Gly	Thr	Ala	Ser	Cys	Asn
		20						25				30			

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Val Leu Gly Tyr Glu Ile Pro Gln Asn Thr Leu Val Leu Val Asn Val
 35 40 45
 Trp Ala Ile Gly Arg Asn Pro Lys Ser Trp Glu Asp Ala Glu Val Phe
 50 55 60
 Lys Pro Glu Arg Phe Met Glu Lys Val Gly Ser Glu Val Asp Ala Asn
 65 70 75 80
 Gly Asp Gln Asn Phe Gly Cys Leu Leu Phe Gly Ala Gly Arg Arg Arg
 85 90 95
 Cys Pro Gly Gln Gln Leu Gly Thr Leu Leu Val Glu Phe Gly Leu Ala
 100 105 110
 Gln Leu Leu His Cys Phe Asn Trp Arg Leu Pro Leu Asp Asp Ile Asn
 115 120 125
 Gly Glu Asn Gln Glu Val Asp Met Asn Glu Met Phe Asn Gly Val Thr
 130 135 140
 Leu Arg Lys Ala Arg Glu Leu Ser Ala Ile Pro Thr Pro Arg Leu Glu
 145 150 155 160
 Cys Ile Ala His Leu Lys
 165

<210> 309
 <211> 123
 <212> PRT
 <213> Pinus radiata

<400> 309
 Ser Cys Trp Arg Cys Val Ala Glu Pro Asn His Ala Trp Ser Asn Leu
 1 5 10 15
 Ser Arg Lys Arg Lys Gly Arg Leu Pro Pro Gly Pro Phe Ser Leu Pro
 20 25 30
 Ile Ile Gly Asn Leu His Met Leu Gly Lys Ile Pro His Arg Ser Leu
 35 40 45
 Ala Glu Leu Ser Met Lys Tyr Gly Pro Leu Leu Ser Leu Arg Leu Gly
 50 55 60
 Ser Thr Pro Ala Leu Val Val Ser Ser Pro Glu Ile Ala Ser Glu Phe
 65 70 75 80
 Leu Lys Thr His Asp Gln Leu Phe Ala Ser Arg Ile Pro Ser Ala Ala
 85 90 95
 Ile Lys Val Leu Thr Tyr Asn Leu Ser Gly Leu Ile Phe Ser Pro Tyr
 100 105 110
 Gly Pro Cys Trp Arg Gln Val Arg Lys Leu Cys
 115 120

<210> 310
 <211> 114
 <212> PRT
 <213> Pinus radiata

<400> 310
 Tyr Ser Glu Pro Ser Lys Lys Leu Ala Met Glu Phe Val Glu Phe Cys
 1 5 10 15
 Ile Thr Leu Val Thr Ala Leu Leu Phe Val Val Leu Val Ala Ala Trp
 20 25 30
 Ser Asn Leu Phe Arg Lys Arg Lys Gly Arg Leu Pro Pro Gly Pro Phe
 35 40 45
 Ser Leu Pro Ile Ile Gly Asn Leu His Met Leu Gly Lys Ile Pro His
 50 55 60
 Arg Ser Leu Ala Glu Leu Ser Met Lys Tyr Gly Pro Leu Leu Ser Leu

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65					70					75				80	
Arg	Leu	Gly	Ser	Thr	Pro	Ala	Leu	Val	Val	Ser	Ser	Pro	Glu	Ile	Ala
				85					90					95	
Ser	Glu	Phe	Leu	Lys	Thr	His	Asp	Gln	Leu	Phe	Ala	Ser	Arg	Ile	Pro
			100					105					110		
Ser	Ala														

<210> 311
 <211> 154
 <212> PRT
 <213> Pinus radiata

Glu	Leu	Leu	Ser	Ala	Cys	Pro	Val	His	Glu	Cys	Pro	Tyr	Phe	Tyr	Phe
1				5					10					15	
Asn	Leu	Ala	Thr	Val	Ile	Leu	Leu	Gly	Val	Val	Thr	Gly	Trp	Gly	Phe
			20					25					30		
Leu	Phe	Arg	Gly	Arg	Lys	Gln	Lys	Leu	Pro	Pro	Gly	Pro	Phe	Gln	Trp
		35					40					45			
Pro	Ile	Val	Gly	Asn	Leu	His	Met	Met	Gly	Glu	Leu	Pro	His	Gln	Ala
	50					55					60				
Ile	Thr	Ala	Leu	Ser	Met	Lys	Tyr	Gly	Pro	Leu	Met	Ser	Leu	Arg	Leu
65					70					75					80
Gly	Ser	Tyr	Leu	Thr	Leu	Val	Val	Ser	Ser	Pro	Asp	Val	Ala	Glu	Glu
				85					90					95	
Phe	Leu	Lys	Thr	His	Asp	Leu	Ala	Phe	Ala	Ser	Arg	Pro	Pro	Thr	Ile
			100					105					110		
Gly	Thr	Lys	Tyr	Phe	Trp	Tyr	Asn	Ser	Ser	Asp	Val	Ala	Phe	Ser	Pro
		115					120					125			
Tyr	Gly	Pro	Tyr	Trp	Arg	Gln	Met	Arg	Lys	Ile	Cys	Val	Leu	Gln	Leu
	130					135					140				
Leu	Ser	Ser	Arg	Arg	Ile	Asp	Ser	Phe	Arg						
145					150										

<210> 312
 <211> 116
 <212> PRT
 <213> Pinus radiata

Cys	Asp	Gln	Asp	Leu	Ile	Gly	Gly	Ile	Gly	Ile	Lys	Ser	Met	Ile	Lys
1				5					10					15	
Glu	Thr	Phe	Val	Leu	Ala	Gly	Ser	Leu	Asn	Met	Gly	Asp	Phe	Ile	Pro
			20					25					30		
Tyr	Leu	Ala	Trp	Ile	Asp	Leu	Gln	Gly	Leu	Asn	Arg	Arg	Leu	Lys	Asn
		35					40					45			
Ile	His	Lys	Ile	Gln	Asp	Asp	Leu	Leu	Gly	Lys	Ile	Leu	Glu	Glu	His
	50					55					60				
Ala	Ser	Pro	Pro	Gln	Asn	Asn	Pro	Asn	Tyr	Met	Pro	Asp	Leu	Val	Asp
65					70					75					80
Val	Leu	Leu	Ala	Ala	Ser	Ala	Asp	Glu	Asp	Leu	Glu	Phe	Glu	Ile	Thr
				85					90					95	
Arg	Asp	Asn	Ile	Lys	Ser	Val	Ile	Tyr	Val	Tyr	Ile	Val	His	Ala	Ile
			100					105					110		
Ile	Arg	Phe	Gln												
			115												

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<210> 313
 <211> 180
 <212> PRT
 <213> Pinus radiata

<400> 313
 Ala Pro Asp Glu Leu Glu Arg Val Val Gly Leu Gly Arg Met Val Arg
 1 5 10 15
 Glu Ser Asp Leu Pro Arg Leu Val Tyr Leu Gln Ala Val Val Lys Glu
 20 25 30
 Thr Leu Arg Leu Tyr Pro Gln Gly Pro Ile Leu Phe Arg His Leu Ser
 35 40 45
 Ser Glu Pro Cys Asn Val Leu Gly Tyr Glu Ile Ser Gln Asn Thr Gln
 50 55 60
 Val Leu Val Asn Ile Trp Ala Ile Gly Arg Asn Ser Glu Ser Trp Glu
 65 70 75 80
 Asp Ala Gly Ser Phe Lys Pro Glu Arg Phe Met Glu Arg Val Gly Ser
 85 90 95
 Glu Val Asp Thr Asn Gly Asp Gln Asn Ser Ala Trp Leu Pro Phe Gly
 100 105 110
 Ala Gly Arg Arg Arg Cys Pro Gly Gln Gln Leu Gly Thr Leu Val Ala
 115 120 125
 Glu Ile Gly Leu Ala Gln Leu Leu His Cys Phe Lys Trp Arg Leu Pro
 130 135 140
 Glu Ala Asp Met Asp Gly Pro Asn Gln Glu Leu Asp Met Met Glu Arg
 145 150 155 160
 Phe Asn Gly Ile Thr Ser Pro Arg Ala Lys Glu Leu Phe Ala Ile Pro
 165 170 175
 Thr Pro Arg Leu
 180

<210> 314
 <211> 127
 <212> PRT
 <213> Pinus radiata

<400> 314
 Gly Ile Leu Phe Asp Met Leu Leu Gly Gly Ser Asp Thr Ala Pro Thr
 1 5 10 15
 Ile Ile Glu Trp Ala Ile Ser Glu Ala Leu Ile Asn Pro Pro Val Met
 20 25 30
 Lys Lys Leu Gln Asp Glu Leu Glu Arg Val Val Gly Leu Asp Arg Met
 35 40 45
 Ala Cys Glu Ser Asp Leu Pro Gln Leu Val Tyr Leu Gln Ala Met Val
 50 55 60
 Lys Glu Thr Leu Arg Leu His Pro Ala Gly Pro Leu Leu Asn Arg Arg
 65 70 75 80
 Leu Ser Ala Glu Ser Cys Asn Val Leu Gly Tyr Glu Phe Pro Lys Asn
 85 90 95
 Thr Arg Val Leu Val Asn Ala Trp Ala Ile Gly Arg Asn Pro Lys Leu
 100 105 110
 Trp Glu Asp Ala Glu Thr Phe Lys Pro Glu Arg Phe Thr Gly Arg
 115 120 125

<210> 315
 <211> 127

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<212> PRT
 <213> Pinus radiata

<400> 315
 Thr Ser Ala Thr Val Glu Trp Ala Met Ala Glu Leu Ile Arg Lys Pro
 1 5 10 15
 Thr Leu Leu Lys Lys Ala Gln Ala Glu Leu Asp Glu Val Val Gly Arg
 20 25 30
 Glu Lys Arg Met Glu Glu Ser Asp Ile Ala Lys Leu Pro Tyr Leu Gln
 35 40 45
 Ala Val Val Lys Glu Val Leu Arg Leu His Pro Ala Ala Pro Leu Ile
 50 55 60
 Ile Pro Arg Arg Ala Asp Asn Ser Ala Glu Ile Gly Gly Tyr Val Val
 65 70 75 80
 Pro Glu Asn Thr Gln Val Phe Val Asn Ile Trp Gly Ile Gly Arg Asp
 85 90 95
 Pro Asn Val Trp Lys Glu Pro Leu Lys Phe Lys Pro Glu Arg Phe Leu
 100 105 110
 Asp Cys Asn Thr Asp Tyr Arg Gly Gln Asp Phe Glu Leu Ile Pro
 115 120 125

<210> 316
 <211> 134
 <212> PRT
 <213> Pinus radiata

<400> 316
 Glu Asp Glu Val Ser Ala Met Ile Arg Ser Ile Val Asn Ser Asp Ala
 1 5 10 15
 His Lys Asp Ser Arg Pro Val Asn Ile Lys Gln Leu Ala Ser Ser Leu
 20 25 30
 Val Thr Ala Ile Val Leu Arg Met Thr Phe Gly Lys Lys Tyr Ser Asp
 35 40 45
 Arg Asp Ser Gly Ala Phe Ser Ser Met Ile Lys Glu Ser Leu Leu Leu
 50 55 60
 Leu Gly Ser Phe Asn Ile Gly Glu Tyr Ile Pro Tyr Leu Asn Trp Met
 65 70 75 80
 Asp Leu Gln Gly Leu Asn Arg Arg Leu Lys Lys Leu Arg Thr Thr Gln
 85 90 95
 Asp Gln Leu Leu Glu Lys Val Ile Glu Glu His Ala Ala Gln Asn Arg
 100 105 110
 Ser Asn Met Thr His Asp Leu Val Asp Ala Leu Leu Ala Ala Ser Ala
 115 120 125
 Asp Lys Asp Arg Glu Leu
 130

<210> 317
 <211> 115
 <212> PRT
 <213> Eucalyptus grandis

<400> 317
 Ile Tyr Asp Gln Glu Ser Leu Leu Asn Ala Ile Lys Gln Val Asp Val
 1 5 10 15
 Val Ile Ser Ala Val Gly Gln Ala Gln Thr Glu Asp Gln Asp Arg Ile
 20 25 30
 Val Ala Ala Ile Lys Ala Ala Gly Asn Ile Lys Arg Phe Leu Pro Ser

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		35					40					45					
Glu	Phe	Gly	Asn	Asp	Val	Asp	Arg	Val	His	Ala	Val	Glu	Pro	Val	Lys		
	50					55						60					
Thr	Gly	Phe	Ala	Leu	Lys	Ala	Lys	Ile	Arg	Arg	Leu	Val	Glu	Ala	Glu		
65					70					75					80		
Gly	Ile	Pro	Tyr	Thr	Tyr	Val	Ser	Ser	Asn	Ser	Phe	Ala	Gly	Tyr	Tyr		
				85					90					95			
Leu	Gln	Thr	Leu	Ser	Gln	Pro	Gly	Ala	Thr	Ala	Pro	Pro	Arg	Asp	Asn		
			100					105					110				
Val	Val	Ile															
		115															

<210> 318
 <211> 161
 <212> PRT
 <213> Eucalyptus grandis

Arg	Phe	Gly	Val	Ser	Met	Val	Leu	Leu	Pro	Thr	Leu	Ser	Pro	Val	Thr		
1				5					10					15			
Ala	Glu	Ser	Leu	Leu	Glu	Thr	Asp	Arg	Val	Arg	Arg	Lys	Thr	Pro	Arg		
			20					25					30				
Leu	Arg	Arg	Glu	Asn	His	Ser	Glu	Met	Ala	Ala	Lys	Ser	Lys	Val	Leu		
		35					40					45					
Val	Ile	Gly	Gly	Thr	Gly	Tyr	Ile	Gly	Lys	Phe	Ile	Val	Glu	Ala	Ser		
	50					55					60						
Ala	Lys	Ser	Gly	Arg	Pro	Thr	Phe	Ala	Leu	Ala	Arg	Glu	Ser	Thr	Leu		
65				70					75						80		
Ser	Asn	Pro	Ala	Lys	Ala	Lys	Ile	Val	Glu	Gly	Phe	Lys	Ser	Leu	Gly		
				85					90				95				
Val	Thr	Leu	Val	His	Gly	Asp	Ile	Tyr	Asp	Gln	Glu	Ser	Leu	Leu	Asn		
			100					105					110				
Ala	Ile	Lys	Gln	Val	Asp	Val	Val	Ile	Ser	Ala	Val	Gly	Arg	Ala	Gln		
		115					120					125					
Ile	Glu	Asp	Gln	Asp	Arg	Ile	Val	Ala	Ala	Ile	Lys	Ala	Ala	Gly	Asn		
	130					135					140						
Ile	Lys	Arg	Phe	Val	Pro	Ser	Glu	Phe	Gly	Asn	Asn	Val	Asp	Arg	Val		
145					150					155					160		
His																	

<210> 319
 <211> 141
 <212> PRT
 <213> Eucalyptus grandis

Arg	Phe	Leu	Pro	Ser	Glu	Phe	Gly	Asn	Asp	Val	Asp	Arg	Val	His	Ala		
1				5					10					15			
Val	Glu	Pro	Val	Lys	Thr	Gly	Phe	Ala	Leu	Lys	Ala	Lys	Ile	Arg	Arg		
			20					25					30				
Leu	Val	Glu	Ala	Glu	Gly	Ile	Pro	Tyr	Thr	Tyr	Val	Ser	Ser	Asn	Ser		
		35					40					45					
Phe	Ala	Gly	Tyr	Tyr	Leu	Gln	Thr	Leu	Ser	Gln	Pro	Gly	Ala	Thr	Ala		
	50					55					60						
Pro	Pro	Arg	Asp	Asn	Val	Val	Ile	Leu	Gly	Asp	Gly	Asn	Ala	Lys	Val		
65					70					75					80		

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Val	Phe	Asn	Lys	Glu	Asp	Asp	Ile	Gly	Thr	Tyr	Thr	Ile	Lys	Ala	Val
				85					90					95	
Asp	Asp	Pro	Arg	Thr	Leu	Asn	Lys	Ile	Leu	Tyr	Ile	Arg	Pro	Pro	Ala
			100					105					110		
Asn	Thr	Tyr	Ser	Met	Asn	Glu	Leu	Val	Ser	Leu	Trp	Glu	Arg	Lys	Ile
		115					120					125			
Gly	Lys	Ala	Leu	Glu	Arg	Val	Tyr	Val	Pro	Glu	Glu	Gln			
	130					135						140			

<210> 320
 <211> 102
 <212> PRT
 <213> Eucalyptus grandis

Lys	Pro	Ile	Glu	Phe	Ala	Gly	Lys	His	Arg	Ala	Ser	Ala	Val	Lys	Thr
1				5					10					15	
Thr	Ser	Glu	Met	Ala	Ala	Lys	Ser	Lys	Val	Leu	Val	Ile	Gly	Gly	Thr
			20					25					30		
Gly	Tyr	Ile	Gly	Lys	Phe	Ile	Val	Glu	Ala	Ser	Ala	Lys	Ser	Gly	Arg
		35					40					45			
Pro	Thr	Phe	Val	Leu	Ala	Arg	Glu	Ser	Thr	Leu	Ser	Asn	Pro	Ala	Lys
	50					55					60				
Ala	Lys	Ile	Val	Gln	Gly	Phe	Lys	Ser	Leu	Gly	Val	Thr	Leu	Val	His
65				70						75				80	
Gly	Asp	Ile	Tyr	Asp	Gln	Glu	Ser	Leu	Leu	Asn	Ala	Ile	Lys	Gln	Val
				85					90					95	
Asp	Val	Val	Ile	Ser	Ala										
			100												

<210> 321
 <211> 125
 <212> PRT
 <213> Eucalyptus grandis

Gln	Ser	His	Val	Arg	Asp	Arg	Ser	Ser	Ser	Pro	Glu	Asn	Thr	Thr	Arg
1				5					10					15	
Ala	Met	Lys	Arg	Pro	Ser	Lys	Met	Ala	Glu	Met	Ser	Arg	Val	Leu	Val
			20					25					30		
Ile	Gly	Gly	Ala	Gly	Tyr	Ile	Gly	Lys	Phe	Ile	Val	Lys	Ala	Cys	Ala
		35					40					45			
Lys	Ser	Gly	His	Pro	Thr	Phe	Val	Leu	Glu	Thr	Glu	Ser	Thr	Leu	Ser
	50					55					60				
Asn	Pro	Ala	Asn	Ala	Glu	Ile	Ile	Lys	Gly	Phe	Lys	Ser	Leu	Gly	Val
65				70						75				80	
Asn	Leu	Val	His	Gly	Asp	Ile	Tyr	Asp	Gln	Lys	Ser	Leu	Leu	Ser	Ala
				85					90					95	
Ile	Lys	Gln	Val	Asp	Val	Val	Ile	Ser	Thr	Val	Gly	Gln	Ala	Gln	Leu
			100					105					110		
Glu	Asp	Gln	Asp	Arg	Ile	Val	Ala	Ala	Ile	Lys	Ala	Ala			
		115					120					125			

<210> 322
 <211> 98
 <212> PRT
 <213> Eucalyptus grandis

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<400> 322

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Ser Ser Ser Pro Glu Asn Thr Thr Pro Ala Val Lys Arg Pro Ser Lys
 1          5          10          15
Met Ala Glu Met Ser Arg Val Leu Val Ile Gly Gly Ala Gly Tyr Ile
          20          25          30
Gly Lys Phe Ile Val Lys Ala Cys Ala Lys Ser Gly His Pro Thr Phe
          35          40          45
Val Leu Glu Thr Glu Ser Thr Leu Ser Asn Pro Ala Asn Ala Glu Ile
          50          55          60
Ile Lys Gly Phe Lys Ser Leu Gly Val Asn Leu Val His Gly Asp Ile
65          70          75          80
Tyr Asp Gln Lys Ser Leu Leu Ser Ala Ile Lys Gln Val Asp Val Val
          85          90          95
Ile Ser

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<210> 323

<211> 319

<212> PRT

<213> Pinus radiata

<400> 323

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Lys Asp Pro Leu Ala Gln Leu Thr Thr Phe Ser Cys Ile Cys Ser Val
 1          5          10          15
Arg His Asp Arg Gly Lys Thr Met Ala Cys Ala Thr Asp Val Ala Arg
          20          25          30
Gln Phe Leu Pro Cys Val Gln Pro Val Pro Ser Ser Met Gly Gly Glu
          35          40          45
Thr Ala Arg Ser Ile Asn Leu Thr Cys Asn Gly Leu Ser Pro Pro Gln
          50          55          60
Pro Gln Tyr Asn Ala Glu Asn Asn His Asp Gln Asp Thr Thr Val Ala
65          70          75          80
Thr Arg Val Leu Ile Ile Gly Ala Thr Gly Phe Ile Gly Arg Phe Val
          85          90          95
Ala Glu Ala Ser Val Lys Ser Gly Arg Pro Thr Tyr Ala Leu Val Arg
          100          105          110
Pro Thr Thr Leu Ser Ser Lys Pro Lys Val Ile Gln Ser Leu Val Asp
          115          120          125
Ser Gly Ile Gln Val Val Tyr Gly Cys Leu His Asp His Asn Ser Leu
          130          135          140
Val Lys Ala Ile Arg Gln Val Asp Val Val Ile Ser Thr Val Gly Gly
145          150          155          160
Ala Leu Ile Leu Asp Gln Leu Lys Ile Val Asp Ala Ile Lys Glu Val
          165          170          175
Gly Thr Val Lys Arg Phe Leu Pro Ser Glu Phe Gly His Asp Val Asp
          180          185          190
Arg Ala Asp Pro Val Glu Pro Ala Leu Ser Phe Tyr Ile Glu Lys Arg
          195          200          205
Lys Val Arg Arg Ala Val Glu Glu Ala Lys Ile Pro Tyr Thr Tyr Ile
          210          215          220
Cys Cys Asn Ser Ile Ala Gly Trp Pro Tyr Tyr Tyr His Thr His Pro
225          230          235          240
Thr Glu Leu Pro Pro Pro Lys Glu Gln Phe Glu Ile Tyr Gly Asp Gly
          245          250          255
Ser Val Lys Ala Phe Phe Val Thr Gly Asp Asp Ile Gly Ala Tyr Thr
          260          265          270

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Met Lys Ala Val Asp Asp Pro Arg Thr Leu Asn Lys Ser Ile His Phe
 275 280 285
 Arg Pro Pro Lys Asn Phe Leu Asn Leu Asn Glu Leu Ala Asp Ile Trp
 290 295 300
 Glu Asn Lys Ile Asn Arg Thr Leu Pro Arg Val Ser Val Ser Ala
 305 310 315

<210> 324
 <211> 126
 <212> PRT
 <213> Pinus radiata

<400> 324
 Leu Asn Ser Leu Ala Asp Ile Leu Leu Ile Gln Ser Gly Lys Met Thr
 1 5 10 15
 Gly Leu Lys Asp Ser Ala Asn Arg Val Leu Ile Ile Gly Gly Thr Gly
 20 25 30
 Tyr Ile Gly Lys Tyr Met Ala Lys Ala Ser Val Ser Gln Gly Tyr Pro
 35 40 45
 Thr Tyr Val Leu Val Arg Pro Ala Thr Ala Ala Ala Pro Asp Ser Phe
 50 55 60
 Lys Ala Lys Leu Leu Gln Gln Phe Lys Asp Ile Gly Ile His Ile Leu
 65 70 75 80
 Glu Gly Ser Leu Asp Asp His Asn Ser Leu Val Asp Ala Ile Lys Gln
 85 90 95
 Val Asp Ile Val Ile Ser Ala Val Ala Ile Pro Gln His Leu Asp Gln
 100 105 110
 Phe Asn Ile Ile Asn Ala Ile Lys Asp Val Gly Met Glu Ile
 115 120 125

<210> 325
 <211> 164
 <212> PRT
 <213> Eucalyptus grandis

<400> 325
 Asn Gly Glu Leu His Pro Ser His Tyr Cys Glu Arg Asp Leu Leu Lys
 1 5 10 15
 Val Val Asp Arg Glu His Val Phe Thr Tyr Ala Asp Asp Ala Cys Ser
 20 25 30
 Ala Thr Tyr Pro Leu Met Gln Lys Leu Arg Gln Val Leu Val Asp Gln
 35 40 45
 Ala Leu Val Asn Gly Glu Ser Glu Leu Asn Pro Ser Thr Ser Ile Phe
 50 55 60
 Gln Lys Ile Val Ala Phe Glu Glu Glu Leu Lys Ala Gln Leu Pro Lys
 65 70 75 80
 Asp Val Glu Gly Val Arg Val Gln Tyr Glu Thr Gly Asn Leu Ala Ile
 85 90 95
 Pro Asn Gln Ile Lys Glu Cys Arg Ser Tyr Pro Leu Tyr Lys Leu Val
 100 105 110
 Arg Glu Glu Leu Gly Thr Ala Leu Leu Thr Gly Glu Gly Val Ile Ser
 115 120 125
 Pro Gly Glu Asp Phe Asp Lys Val Phe Thr Ala Ile Cys Ala Gly Lys
 130 135 140
 Leu Ile Asp Pro Leu Leu Glu Cys Leu Ser Gly Trp Asn Gly Ala Pro
 145 150 155 160
 Leu Pro Ile Ser

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<210> 326
 <211> 114
 <212> PRT
 <213> Eucalyptus grandis

<400> 326
 Leu Val Asp Gln Ala Leu Val Asn Gly Glu Ser Glu Leu Asn Pro Ser
 1 5 10 15
 Thr Ser Ile Phe Gln Lys Ile Val Ala Phe Glu Glu Glu Leu Lys Ala
 20 25 30
 Gln Leu Pro Lys Asp Val Glu Gly Val Arg Val Gln Tyr Glu Thr Gly
 35 40 45
 Asn Leu Ala Ile Pro Asn Gln Ile Lys Glu Cys Arg Ser Tyr Pro Leu
 50 55 60
 Tyr Lys Leu Val Arg Glu Glu Leu Gly Thr Ala Leu Leu Thr Gly Glu
 65 70 75 80
 Gly Val Ile Ser Pro Gly Glu Asp Phe Asp Lys Val Phe Thr Ala Ile
 85 90 95
 Cys Ala Gly Lys Leu Ile Asp Pro Leu Leu Glu Cys Leu Ser Gly Trp
 100 105 110
 Asn Gly

<210> 327
 <211> 226
 <212> PRT
 <213> Eucalyptus grandis

<400> 327
 Pro Ser Leu Asp Tyr Gly Phe Lys Gly Ala Glu Ile Ala Met Ala Ser
 1 5 10 15
 Tyr Cys Ser Glu Leu Gln Phe Leu Ala Asn Pro Val Thr Asn His Val
 20 25 30
 Gln Ser Ala Glu Gln His Asn Gln Asp Val Asn Ser Leu Gly Leu Ile
 35 40 45
 Ser Ser Arg Lys Thr Ala Glu Ala Ile Asp Val Leu Lys Leu Met Ser
 50 55 60
 Ser Thr Phe Leu Val Ala Leu Cys Gln Ala Ile Asp Leu Arg His Leu
 65 70 75 80
 Glu Glu Asn Leu Lys Ser Val Val Lys Asn Thr Val Asn Gln Val Ala
 85 90 95
 Lys Lys Val Leu Tyr Val Gly Ser Asn Gly Glu Leu His Pro Ser Arg
 100 105 110
 Phe Ser Glu Lys Asp Leu Ile Lys Val Val Asp Arg Glu Tyr Val Phe
 115 120 125
 Ala Tyr Ile Asp Asp Pro Cys Ser Ala Thr Tyr Pro Leu Met Gln Lys
 130 135 140
 Leu Arg Gln Val Leu Val Asp Asp Ala Leu Asp Asp Val Asp Arg Glu
 145 150 155 160
 Lys Asn Pro Ser Thr Ser Ile Phe Gln Lys Ile Gly Ala Phe Glu Glu
 165 170 175
 Glu Leu Lys Ala Leu Leu Pro Lys Glu Val Glu Asn Ala Arg Ala Gln
 180 185 190
 Phe Glu Ser Gly Asn Ser Ala Ile Ala Asn Lys Ile Arg Gly Cys Arg
 195 200 205

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Ser Tyr Pro Leu Tyr Arg Phe Val Arg Glu Glu Leu Gly Thr Gly Leu
 210 215 220
 Leu Thr
 225

<210> 328
 <211> 424
 <212> PRT
 <213> Eucalyptus grandis

<400> 328
 Met Glu Met Glu Ser Thr Thr Gly Thr Gly Asn Gly Leu His Ser Leu
 1 5 10 15
 Cys Ala Ala Gly Ser His His Ala Asp Pro Leu Asn Trp Gly Ala Ala
 20 25 30
 Ala Ala Ala Leu Thr Gly Ser His Leu Asp Glu Val Lys Arg Met Val
 35 40 45
 Glu Glu Tyr Arg Arg Pro Ala Val Arg Leu Gly Gly Glu Ser Leu Thr
 50 55 60
 Ile Ala Gln Val Ala Ala Val Ala Ser Gln Glu Gly Val Gly Val Glu
 65 70 75 80
 Leu Ser Glu Ala Ala Arg Pro Arg Val Lys Ala Ser Ser Asp Trp Val
 85 90 95
 Met Glu Ser Met Asn Lys Gly Thr Asp Ser Tyr Gly Val Thr Thr Gly
 100 105 110
 Phe Gly Ala Thr Ser His Arg Arg Thr Lys Gln Gly Gly Ala Leu Gln
 115 120 125
 Lys Glu Leu Ile Arg Phe Leu Asn Ala Gly Ile Phe Gly Asn Gly Thr
 130 135 140
 Glu Ser Cys His Thr Leu Pro Gln Ser Ser Thr Arg Ala Ala Met Leu
 145 150 155 160
 Val Arg Val Asn Thr Leu Leu Gln Gly Tyr Ser Gly Ile Arg Phe Glu
 165 170 175
 Ile Leu Glu Ala Ile Thr Lys Phe Leu Asn His Asn Ile Thr Pro Cys
 180 185 190
 Leu Pro Leu Arg Gly Thr Ile Thr Ala Ser Gly Asp Leu Val Pro Leu
 195 200 205
 Ser Tyr Ile Ala Gly Leu Leu Thr Gly Arg Pro Asn Ser Lys Ala Val
 210 215 220
 Gly Pro Asp Gly Lys Ser Leu Asp Ala Val Glu Ala Phe Arg Leu Ala
 225 230 235 240
 Gly Ile Asp Thr Gly Phe Phe Glu Leu Gln Pro Lys Glu Gly Leu Ala
 245 250 255
 Leu Val Asn Gly Thr Ala Val Gly Ser Gly Leu Ala Ser Ile Val Leu
 260 265 270
 Phe Glu Ala Asn Ile Leu Ala Val Leu Ser Glu Val Leu Ser Ala Ile
 275 280 285
 Phe Ala Glu Val Met Gln Gly Lys Pro Glu Phe Thr Asp His Leu Thr
 290 295 300
 His Lys Leu Lys His His Pro Gly Gln Ile Glu Ser Ala Ala Ile Met
 305 310 315 320
 Glu His Ile Leu Asp Gly Ser Ala Tyr Val Lys Ala Ala Lys Lys Leu
 325 330 335
 His Glu Met Asp Pro Leu Gln Lys Pro Lys Gln Asp Arg Tyr Ala Leu
 340 345 350
 Arg Thr Ser Pro Gln Trp Leu Gly Pro Gln Ile Glu Val Ile Arg Ala
 355 360 365

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Ala Thr Lys Met Ile Glu Arg Glu Ile Asn Ser Val Asn Asp Asn Pro
 370 375 380
 Leu Ile Asp Val Ala Arg Asn Lys Ala Leu His Gly Gly Asn Phe Gln
 385 390 395 400
 Gly Thr Pro Ile Gly Val Ser Met Asp Asn Thr Arg Leu Ala Val Ala
 405 410 415
 Ser Ile Gly Lys Leu Met Phe Ala
 420

<210> 329
 <211> 97
 <212> PRT
 <213> Eucalyptus grandis

<400> 329
 Asn Ser Gly Ile Thr Pro Cys Leu Pro Leu Arg Gly Ser Ile Ser Ala
 1 5 10 15
 Ser Gly Asp Leu Val Pro Phe Ser Tyr Ile Ala Gly Leu Leu Thr Gly
 20 25 30
 Arg Pro Asn Ser Lys Ala Val Gly Pro Ala Gly Glu Thr Leu Thr Ala
 35 40 45
 Lys Gln Ala Phe Glu Leu Ala Gly Ile Ser Gly Gly Phe Phe Glu Leu
 50 55 60
 Gln Pro Lys Glu Gly Leu Ala Leu Val Asn Gly Thr Gly Val Gly Ser
 65 70 75 80
 Ala Leu Ala Ala Ile Val Leu Phe Glu Ala Asn Met Leu Thr Val Leu
 85 90 95
 Ser

<210> 330
 <211> 412
 <212> PRT
 <213> Pinus radiata

<400> 330
 Val Tyr Arg Ser Ile Asn Ser Gln Ala Glu Ala Pro Ser Trp Pro Asn
 1 5 10 15
 Gly Ser Cys Ser Asp His Gly Val Cys Leu Gly Arg Glu Ser Tyr Met
 20 25 30
 Lys His Ala Ala Lys Leu His Glu Met Asn Pro Leu Gln Lys Pro Lys
 35 40 45
 Gln Asp Arg Tyr Ala Leu Arg Thr Ser Pro Gln Trp Leu Gly Pro Gln
 50 55 60
 Val Glu Ile Ile Arg Ser Ala Thr His Met Ile Glu Arg Glu Ile Asn
 65 70 75 80
 Ser Val Asn Asp Asn Pro Val Ile Asp Val Ala Arg Asp Lys Ala Leu
 85 90 95
 His Gly Gly Asn Phe Gln Gly Thr Pro Ile Gly Val Ser Met Asp Asn
 100 105 110
 Leu Arg Leu Ser Ile Ser Ala Ile Gly Lys Leu Met Phe Ala Gln Phe
 115 120 125
 Ser Glu Leu Val Asn Asp Tyr Tyr Asn Gly Gly Leu Pro Ser Asn Leu
 130 135 140
 Ser Gly Gly Pro Asn Pro Ser Leu Asp Tyr Gly Leu Lys Gly Ala Glu
 145 150 155 160
 Ile Ala Met Ala Ser Tyr Thr Ser Glu Leu Leu Tyr Leu Ala Asn Pro

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				165					170					175			
Val	Thr	Ser	His	Val	Gln	Ser	Ala	Glu	Gln	His	Asn	Gln	Asp	Val	Asn		
			180					185					190				
Ser	Leu	Gly	Leu	Val	Ser	Ala	Arg	Lys	Ser	Ala	Glu	Ala	Ile	Asp	Ile		
		195					200					205					
Leu	Lys	Leu	Met	Leu	Ser	Thr	Tyr	Leu	Thr	Ala	Leu	Cys	Gln	Ala	Val		
	210					215					220						
Asp	Leu	Arg	His	Leu	Glu	Glu	Asn	Met	Leu	Ala	Thr	Val	Lys	Gln	Ile		
225					230					235					240		
Val	Ser	Gln	Val	Ala	Lys	Lys	Thr	Leu	Ser	Thr	Gly	Leu	Asn	Gly	Glu		
			245					250						255			
Leu	Leu	Pro	Gly	Arg	Phe	Cys	Glu	Lys	Asp	Leu	Leu	Gln	Val	Val	Asp		
			260					265					270				
Asn	Glu	His	Val	Phe	Ser	Tyr	Ile	Asp	Asp	Pro	Cys	Asn	Ala	Ser	Tyr		
	275						280					285					
Pro	Leu	Thr	Gln	Lys	Leu	Arg	Asn	Ile	Leu	Val	Glu	His	Ala	Phe	Lys		
	290					295					300						
Asn	Ala	Glu	Gly	Glu	Lys	Asp	Pro	Asn	Thr	Ser	Ile	Phe	Asn	Lys	Ile		
305					310					315					320		
Pro	Val	Phe	Glu	Ala	Glu	Leu	Lys	Ala	Gln	Leu	Glu	Pro	Gln	Val	Ser		
			325					330						335			
Leu	Ala	Arg	Glu	Ser	Tyr	Asp	Lys	Gly	Thr	Ser	Pro	Leu	Pro	Asn	Arg		
			340					345					350				
Ile	Gln	Glu	Cys	Arg	Ser	Tyr	Pro	Leu	Tyr	Glu	Phe	Val	Arg	Asn	Gln		
	355						360					365					
Leu	Gly	Thr	Leu	Gln	Ala	Trp	Leu	Phe	His	Ile	Asn	Ile	Val	Met	Arg		
	370					375					380						
Cys	Leu	Ile	Ile	Tyr	Cys	Ser	Leu	Phe	Phe	Pro	Glu	Leu	Ala	Thr	Ala		
385					390					395					400		
Phe	Asp	Ser	Val	His	Tyr	Ala	Arg	Thr	Lys	Pro	Leu						
			405					410									

<210> 331

<211> 132

<212> PRT

<213> Pinus radiata

<400> 331

Gly	Ser	Ser	Cys	Arg	Ser	Leu	Ile	Arg	Glu	Leu	Phe	Val	Cys	Leu	Ile		
1			5					10					15				
Ile	Val	His	Met	Ala	Pro	Gln	Glu	Phe	Thr	Gly	Glu	Val	Lys	Phe	Cys		
			20					25					30				
Ala	Gly	Asn	Gly	Gly	Thr	Ala	Ser	Leu	Asn	Asp	Pro	Leu	Asn	Trp	Ala		
	35					40					45						
Ala	Ala	Ala	Glu	Ser	Met	Lys	Gly	Ser	His	Phe	Glu	Glu	Val	Lys	Arg		
	50					55				60							
Met	Trp	Glu	Glu	Phe	Arg	Ser	Pro	Val	Val	Arg	Leu	Gln	Gly	Ser	Gly		
65					70					75				80			
Leu	Thr	Ile	Ala	Gln	Val	Ala	Ala	Val	Ala	Arg	Arg	Thr	Gly	Ser	Val		
			85					90					95				
Arg	Val	Glu	Leu	Glu	Thr	Gly	Ala	Lys	Ala	Arg	Val	Asp	Glu	Ser	Ser		
			100					105					110				
Asn	Trp	Val	Met	Asp	Ser	Met	Ala	Asn	Gly	Thr	Asp	Ser	Tyr	Gly	Val		
	115						120					125					
Thr	Thr	Gly	Phe														
	130																

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<210> 332
 <211> 170
 <212> PRT
 <213> Eucalyptus grandis

<400> 332
 Asn Leu Val Lys Leu Gly Ser Ile Leu Gly Met Ala Ile Gly Val Ala
 1 5 10 15
 Leu Phe Ser Ser Leu Leu Val Leu Ser Phe Val Ser Pro Ile Ser Ser
 20 25 30
 Leu Ser Ser Asn Tyr Tyr Asp Lys Thr Cys Pro Asn Ala Glu Leu Ile
 35 40 45
 Val Ala Asn Ala Val Lys Asn Ala Ala Met Lys Asp Lys Thr Val Pro
 50 55 60
 Ala Ala Leu Leu Arg Met His Phe His Asp Cys Phe Ile Arg Gly Cys
 65 70 75 80
 Asp Ala Ser Val Leu Leu Asn Ser Lys Gly Ser Asn Lys Ala Glu Lys
 85 90 95
 Asp Gly Pro Pro Asn Val Ser Leu His Ser Phe Phe Val Ile Asp Asn
 100 105 110
 Ala Lys Lys Glu Leu Glu Ala Ser Cys Pro Gly Val Val Ser Cys Ala
 115 120 125
 Asp Ile Leu Ala Leu Ala Ala Arg Asp Ser Val Val Leu Ser Gly Gly
 130 135 140
 Pro Thr Trp Asp Val Pro Lys Gly Arg Lys Asp Gly Arg Thr Ser Lys
 145 150 155 160
 Ala Ser Glu Thr Thr Gln Leu Pro Ala Pro
 165 170

<210> 333
 <211> 118
 <212> PRT
 <213> Eucalyptus grandis

<400> 333
 Leu Val Ile Thr Ile Val Val Phe Phe Gly His Ile Gly Asp Ser Glu
 1 5 10 15
 Gly Gly Asp Leu Arg Lys Asn Phe Tyr Lys Ser Ala Cys Pro Leu Ala
 20 25 30
 Glu Glu Ile Val Lys Asn Val Thr Trp Lys His Ala Ala Ser Asn Ser
 35 40 45
 Ala Leu Pro Ala Lys Phe Leu Arg Met His Phe His Asp Cys Phe Val
 50 55 60
 Arg Gly Cys Asp Gly Ser Val Leu Leu Asp Ser Thr Ala Asn Asn Lys
 65 70 75 80
 Ala Glu Lys Val Ala Val Pro Asn Gln Ser Leu Thr Gly Phe Asp Val
 85 90 95
 Ile Asp Glu Ile Lys Glu Lys Leu Glu Glu Thr Cys Pro Gly Val Val
 100 105 110
 Ser Cys Ala Asp Ile Leu
 115

<210> 334
 <211> 65
 <212> PRT
 <213> Pinus radiata

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<400> 334

Asn	Ala	Asp	Pro	Ile	Ala	Val	Ile	Asp	Glu	Ala	Leu	Ser	Thr	Gly	Gly
1				5					10					15	
Ala	Pro	Asn	Leu	Ser	Asp	Ala	Tyr	Thr	Leu	Asn	Gly	Gln	Pro	Gly	Asp
			20					25					30		
Leu	Tyr	Asn	Cys	Ser	Arg	Ala	Gly	Thr	Phe	Arg	Phe	Leu	Val	Lys	Gln
		35					40					45			
Gly	Glu	Thr	Tyr	Leu	Leu	Arg	Met	Val	Asn	Ala	Ala	Leu	Asn	Ser	Ala
	50					55						60			
His															
65															

<210> 335

<211> 104

<212> PRT

<213> Pinus radiata

<400> 335

Lys	Pro	His	Gly	Glu	Thr	Pro	Leu	Ile	Ile	Gly	Glu	Trp	Trp	Asn	Ala
1				5					10					15	
Asp	Pro	Ile	Ala	Val	Ile	Asp	Glu	Ala	Leu	Arg	Thr	Gly	Gly	Ala	Pro
			20					25					30		
Asn	Leu	Ser	Asp	Ala	Tyr	Thr	Leu	Asn	Gly	Gln	Pro	Gly	Asp	Leu	Tyr
		35					40					45			
Asn	Cys	Ser	Arg	Ala	Gly	Thr	Phe	Arg	Phe	Pro	Val	Lys	Gln	Gly	Glu
	50					55					60				
Thr	Tyr	Leu	Leu	Arg	Met	Val	Asn	Ala	Ala	Leu	Asn	Ser	Ala	His	Phe
65					70					75				80	
Phe	Lys	Ile	Ala	Gly	His	Lys	Phe	Thr	Val	Val	Ala	Val	Asp	Ala	Ser
				85					90					95	
Tyr	Thr	Lys	Pro	Tyr	Lys	Gln	Met								
			100												

<210> 336

<211> 125

<212> PRT

<213> Pinus radiata

<400> 336

Asp	Ala	His	Thr	Ile	Asn	Gly	Lys	Pro	Gly	Pro	Leu	Phe	Lys	Cys	Pro
1				5					10					15	
Thr	Lys	Asp	Thr	Phe	Val	Val	Pro	Val	Glu	His	Gly	Lys	Thr	Tyr	Leu
			20					25					30		
Leu	Arg	Ile	Ile	Asn	Ala	Ala	Leu	Asn	Asp	Glu	Leu	Phe	Phe	Asp	Val
		35					40					45			
Ala	Asn	His	His	Leu	Lys	Val	Val	Glu	Ile	Asp	Ala	Val	Tyr	Thr	Lys
	50					55					60				
Pro	Leu	Ile	Thr	Asn	Ser	Ile	Val	Ile	Ala	Pro	Gly	Gln	Thr	Thr	Asn
65					70					75				80	
Ala	Leu	Ile	His	Thr	Asn	Lys	Arg	Ser	Gly	Arg	Tyr	Phe	Met	Ala	Ala
			85						90					95	
Arg	Ser	Phe	Met	Asp	Ala	Pro	Val	Ser	Val	Asp	Asn	Lys	Thr	Ala	Thr
			100					105					110		
Ala	Ile	Leu	Gln	Tyr	Val	Asn	Ser	Ile	Gln	Ile	Leu	Leu			
		115					120					125			

<210> 337

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<211> 178
 <212> PRT
 <213> Pinus radiata

<400> 337
 Asn Met Met Ala Pro Met Ala Gly Ala Glu Tyr Gly Ile Lys Leu Ile
 1 5 10 15
 Ile Gln Leu Leu Val Val Leu Leu Ala Val Gln Leu Val Ala Gly Lys
 20 25 30
 Thr Thr Arg His Tyr Ser Phe His Val Arg Leu Lys Asn Val Thr Arg
 35 40 45
 Leu Cys His Thr Lys Pro Leu Ile Thr Val Asn Gly Lys Ser Pro Gly
 50 55 60
 Pro Lys Val Val Val Arg Glu Gly Asp Arg Val Ile Ile Lys Val His
 65 70 75 80
 Asn His Val Ser Asn Asn Val Ser Ile His Trp His Gly Val Arg Gln
 85 90 95
 Leu Arg Ser Gly Trp Ala Asp Gly Pro Ala Tyr Ile Thr Gln Cys Pro
 100 105 110
 Ile Gln Thr Gly Gln Thr Tyr Val Tyr Asn Phe Thr Val Thr Gly Gln
 115 120 125
 Arg Gly Thr Leu Trp Trp His Ala His Ile Ser Trp Leu Arg Ala Ser
 130 135 140
 Val Tyr Gly Ala Phe Ile Ile Tyr Pro Lys Arg His Val Pro Tyr Pro
 145 150 155 160
 Phe Pro Lys Pro Tyr Lys Glu Val Pro Leu Ile Leu Gly Glu Trp Trp
 165 170 175
 Asn Ala

<210> 338
 <211> 358
 <212> PRT
 <213> Pinus radiata

<400> 338
 Pro Ile Pro Pro Gly Gly Arg Tyr Thr Tyr Arg Phe Asn Ile Ser Gly
 1 5 10 15
 Gln Glu Gly Thr Val Trp Trp His Ala His Tyr Ser Trp Leu Arg Ala
 20 25 30
 Thr Val His Gly Ala Phe Val Ile Leu Pro Lys Lys Gly Ser Ser Tyr
 35 40 45
 Pro Phe Ser Lys Pro His Ala Glu Ile Pro Ile Ile Ile Gly Glu Trp
 50 55 60
 Trp Asn Ala Asn Pro Ile Ala Val Ile Asp Glu Ala Val Arg Thr Gly
 65 70 75 80
 Gly Ala Pro Asn Leu Ser Asp Ala Phe Thr Ile Asn Gly Gln Pro Gly
 85 90 95
 Asp Leu Phe Asn Cys Ser Thr Ser Gly Thr Phe Arg Leu Pro Val Glu
 100 105 110
 Ser Gly Glu Thr Tyr Leu Leu Arg Ile Val Asn Ala Ala Leu Asn Ser
 115 120 125
 Gly His Phe Phe Lys Ile Ala Gly His Glu Phe Thr Val Val Ala Val
 130 135 140
 Asp Ala Cys Tyr Thr Lys Pro Tyr Lys Thr Asp Val Leu Val Ile Ser
 145 150 155 160
 Ala Gly Gln Thr Thr Asp Val Leu Ile Thr Ala Asn Gln Ser Val Gly

```
<210> 339
<211> 160
<212> PRT
<213> Pinus radiata
```

```
<210> 340
<211> 156
<212> PRT
<213> Pinus radiata
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<400> 340

Gly	Cys	Cys	Leu	Ser	Thr	Arg	Met	Asn	Met	Ser	Arg	Ser	Lys	Ala	Leu
1				5					10					15	
Leu	Cys	Pro	Ser	Pro	Ala	His	Val	Lys	Tyr	Val	Leu	Ile	Val	Ile	Leu
			20					25					30		
Leu	Ile	Ile	Met	Ile	Gln	Cys	Pro	Asp	Ile	Val	Ala	Gly	Lys	His	Ala
		35					40					45			
Gln	Thr	Thr	Arg	His	Tyr	Lys	Phe	Asn	Val	Arg	Leu	Ser	Asn	Val	Thr
	50					55					60				
Arg	Leu	Cys	Arg	Thr	Lys	Pro	Leu	Ile	Thr	Val	Asn	Gly	Lys	Tyr	Pro
65					70					75					80
Gly	Pro	Thr	Val	Val	Ala	Arg	Glu	Gly	Asp	Arg	Val	Ile	Ile	Lys	Leu
			85						90					95	
Val	Asn	His	Val	Lys	Asp	Asn	Val	Thr	Ile	His	Trp	His	Gly	Val	Arg
			100					105					110		
Gln	Leu	Arg	Ser	Gly	Trp	Ala	Asp	Gly	Pro	Gly	Tyr	Ile	Thr	Gln	Cys
		115					120					125			
Pro	Leu	Gln	Thr	Gly	Met	Ser	Tyr	Val	Tyr	Asn	Phe	Thr	Ile	Val	Gly
	130					135					140				
Gln	Arg	Gly	Thr	Leu	Trp	Trp	His	Ala	His	Ile	Ser				
145					150					155					

<210> 341
 <211> 157
 <212> PRT
 <213> Pinus radiata

<400> 341

Val	Ile	Gln	Gln	Ala	Leu	Gln	Thr	Gly	Gly	Gly	Pro	Asn	Val	Ser	Asp
1				5					10					15	
Ala	Tyr	Thr	Ile	Asn	Gly	Leu	Pro	Gly	Pro	Leu	Tyr	Asn	Cys	Ser	Asn
			20					25					30		
Glu	Thr	Phe	Val	Leu	Lys	Val	His	Pro	Gly	Gln	Thr	Tyr	Leu	Leu	Arg
		35					40					45			
Ile	Ile	Asn	Ala	Ala	Leu	Asn	Asp	Glu	Leu	Phe	Leu	Ala	Ile	Ala	Asn
	50					55					60				
His	Ser	Leu	Thr	Val	Val	Glu	Val	Asp	Ala	Val	Tyr	Val	Lys	Pro	Phe
65					70					75					80
Gln	Thr	Asp	Thr	Leu	Leu	Ile	Thr	Pro	Gly	Gln	Thr	Thr	Asn	Val	Leu
			85					90					95		
Leu	Thr	Ala	Asn	Ala	Thr	Ser	Gly	Lys	Asn	Lys	Gln	Phe	Val	Ile	Ala
			100				105						110		
Ala	Ser	Pro	Phe	Val	Thr	Gly	Ser	Gly	Thr	Phe	Asp	Asn	Ser	Thr	Val
		115					120					125			
Ala	Gly	Ile	Val	Ser	Tyr	Asn	Ser	His	Lys	Phe	Lys	Asn	Ser	Ser	Thr
	130					135					140				
Ile	Ile	Leu	Pro	Lys	Leu	Pro	Ser	Phe	Asn	Asp	Thr	Asn			
145					150					155					

<210> 342
 <211> 134
 <212> PRT
 <213> Pinus radiata

<400> 342

Gly	Gln	Thr	Thr	Asn	Val	Leu	Leu	Glu	Ala	Asn	Lys	Arg	Ser	Gly	Ser
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

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1	5	10	15
Tyr Phe Val	Ala Ala Arg Pro Phe	Met Asp Ala Pro Val	Thr Val Asn
	20	25	30
Asn Lys Thr	Ala Thr Ala Ile Leu	His Tyr Ile Gly Arg	Asn Ser Glu
	35	40	45
Ser Asp Ile	Pro Ala Val Asn Pro	Leu Met Pro Arg Leu	Pro Leu Leu
	50	55	60
Asn Asp Thr	Ala Phe Ala Thr Ser	Phe Thr Ser Lys Leu	Arg Ser Leu
65		70	75
Asn Ser Val	Gln Phe Pro Ala Lys	Val Pro Gln Thr Ile	Asp Arg Asn
	85	90	95
Leu Phe Phe	Ala Val Gly Leu Ala	Thr Glu Ser Cys Gln	Thr Cys Asn
	100	105	110
Gly Gly Leu	Arg Ala Ser Ala Ser	Ile Asn Asn Ile Ser	Phe Val Met
	115	120	125
Pro Ser Ile	Ser Leu Leu		
	130		

<210> 343
 <211> 419
 <212> PRT
 <213> Pinus radiata

<400> 343

Thr Thr Tyr	Pro Phe Thr Phe Thr	Arg Pro His Arg Gln	Ile Pro Ile
1	5	10	15
Leu Leu Gly	Glu Trp Trp Asn Arg	Asn Pro Met Asp Val	Val Asn Gln
	20	25	30
Ala Thr Gln	Thr Gly Ala Ala Pro	Asn Val Ser Asp Ala	Phe Thr Ile
	35	40	45
Asn Gly Gln	Pro Gly Asp Leu Tyr	Lys Cys Ser Thr Ser	Asp Thr Phe
	50	55	60
Ser Val Ser	Met Lys Gly Gly Glu	Thr Asn Leu Leu Arg	Val Ile Asn
65		70	75
Ala Ala Leu	Asn Thr Asp Leu Phe	Phe Ser Ile Ala Ser	His Thr Met
	85	90	95
Thr Val Val	Ala Val Asp Ala Leu	Tyr Thr Lys Pro Phe	Gln Thr Asn
	100	105	110
Val Leu Met	Leu Gly Pro Gly Gln	Thr Thr Asp Ile Leu	Leu Thr Ala
	115	120	125
Asn Gln Ala	Thr Gly Arg Tyr Tyr	Met Ala Ala Arg Ala	Tyr Ser Ser
	130	135	140
Gly Gln Gly	Val Pro Phe Asp Asn	Thr Thr Thr Thr Ala	Ile Leu Glu
145		150	155
Tyr Glu Gly	Ser Ser Lys Thr Ser	Thr Pro Val Met Pro	Asn Leu Pro
	165	170	175
Phe Tyr Asn	Asp Thr Asn Ser Ala	Thr Ser Phe Ala Asn	Gly Leu Arg
	180	185	190
Ser Leu Gly	Ser His Asp His Pro	Val Phe Val Pro Gln	Ser Val Glu
	195	200	205
Glu Asn Leu	Phe Tyr Thr Ile Gly	Leu Gly Leu Ile Lys	Cys Pro Gly
	210	215	220
Gln Ser Cys	Gly Gly Pro Asn Gly	Ser Arg Phe Ala Ala	Ser Met Asn
225		230	235
Asn Ile Ser	Phe Val Pro Pro Thr	Thr Ser Ser Ile Leu	Gln Ala Gln
	245	250	255
His Phe Gly	Met Lys Gly Val Phe	Ser Ala Asp Phe Pro	Asp Asn Pro

<400> 345															
Thr	Arg	Val	Lys	Val	Leu	Asn	Tyr	Asn	Thr	Thr	Val	Gln	Val	Ile	Leu
1				5					10					15	
Gln	Gly	Thr	Asn	Ile	Phe	Ala	Gly	Glu	Ser	His	Pro	Ile	His	Leu	His
			20					25					30		
Gly	Tyr	Asp	Phe	Tyr	Ile	Val	Gly	Ala	Gly	Phe	Gly	Asn	Tyr	Asn	Pro
		35					40					45			
Gln	Thr	Asp	Pro	Gln	Lys	Phe	Asn	Leu	Ala	Asp	Pro	Pro	Met	Arg	Asn
	50					55					60				

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Thr Val Asn Val Pro Val Asn Gly Trp Ala Ala Ile Arg Phe Val Ala
 65 70 75 80
 Asp Asn Pro Gly Ala Trp Val Met His Cys His Leu Asp
 85 90

<210> 346
 <211> 93
 <212> PRT
 <213> Pinus radiata

<400> 346
 Lys Thr Phe Ser Asp Glu Cys Ser Asp Ala Arg Pro Arg Pro Asp Asn
 1 5 10 15
 Arg His Ser Gly Arg Val Asp Gln Leu Ala Asp Thr Phe Ser Val Ser
 20 25 30
 Met Lys Gly Gly Glu Thr Asn Leu Leu Arg Val Ile Asn Ala Ala Leu
 35 40 45
 Asn Thr Asp Leu Phe Phe Ser Ile Ala Ser His Thr Met Thr Val Val
 50 55 60
 Ala Val Asp Ala Leu Tyr Thr Lys Pro Phe Gln Thr Asn Val Leu Met
 65 70 75 80
 Leu Gly Pro Gly Gln Thr Thr Asp Ile Ala Ala Ala Asn
 85 90

<210> 347
 <211> 114
 <212> PRT
 <213> Pinus radiata

<400> 347
 Pro Asp Ser Thr Ile Asn Thr Ser Phe Leu Gln Gln Leu Gln Gly Gln
 1 5 10 15
 Cys Pro Arg Ala Gly Gly Asp Glu Leu Pro Ser Ser Leu Asp Tyr Val
 20 25 30
 Thr Pro Ala Arg Phe Asp Asn Thr Tyr Phe Ala Asn Leu Lys Gln Gln
 35 40 45
 Lys Gly Val Leu His Ser Asp Arg Thr Leu Tyr Asp Pro Ala Ala Ser
 50 55 60
 Gly Ser Val Thr Ser Ser Thr Val Asp His Phe Ser Ser Asp Gln Thr
 65 70 75 80
 Ala Phe Phe Glu Ser Phe Lys Gly Ala Met Ile Lys Met Gly Asn Leu
 85 90 95
 Ser Pro Ser Ala Gly Thr Gln Gly Glu Ile Arg Arg Asp Cys Arg Lys
 100 105 110
 Val Asn

<210> 348
 <211> 551
 <212> PRT
 <213> Pinus radiata

<400> 348
 Met Glu Gly Gln Ile Ala Ala Leu Ser Lys Glu Asp Glu Phe Ile Phe
 1 5 10 15
 His Ser Pro Phe Pro Ala Val Pro Val Pro Glu Asn Ile Ser Leu Phe
 20 25 30

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Gln	Phe	Val	Leu	Glu	Gly	Ala	Glu	Lys	Tyr	Arg	Asp	Lys	Val	Ala	Leu
		35					40					45			
Val	Glu	Ala	Ser	Thr	Gly	Lys	Glu	Tyr	Asn	Tyr	Gly	Gln	Val	Ile	Ser
	50					55					60				
Leu	Thr	Arg	Asn	Val	Ala	Ala	Gly	Leu	Val	Asp	Lys	Gly	Ile	Gln	Lys
65					70					75					80
Gly	Asp	Val	Val	Phe	Val	Leu	Leu	Pro	Asn	Met	Ala	Glu	Tyr	Pro	Ile
				85					90					95	
Ile	Val	Leu	Gly	Ile	Met	Leu	Ala	Gly	Ala	Val	Phe	Ser	Gly	Ala	Asn
			100					105					110		
Pro	Ser	Ala	His	Ile	Asn	Glu	Val	Glu	Lys	His	Ile	Gln	Asp	Ser	Gly
		115					120					125			
Ala	Lys	Ile	Val	Val	Thr	Val	Gly	Ser	Ala	Tyr	Glu	Lys	Val	Arg	Gln
		130					135					140			
Val	Lys	Leu	Pro	Val	Ile	Ile	Ala	Asp	Asn	Glu	His	Val	Met	Asn	Thr
145					150					155					160
Ile	Pro	Leu	Gln	Glu	Ile	Phe	Glu	Arg	Asn	Tyr	Glu	Ala	Ala	Gly	Pro
				165					170					175	
Phe	Val	Gln	Ile	Cys	Gln	Asp	Asp	Leu	Cys	Ala	Leu	Pro	Tyr	Ser	Ser
			180					185					190		
Gly	Thr	Thr	Gly	Ala	Ser	Lys	Gly	Val	Met	Leu	Thr	His	Arg	Asn	Leu
		195					200					205			
Ile	Ala	Asn	Leu	Cys	Ser	Ser	Leu	Phe	Asp	Val	His	Glu	Ser	Leu	Val
	210					215					220				
Gly	Asn	Phe	Thr	Thr	Leu	Gly	Leu	Met	Pro	Phe	Phe	His	Ile	Tyr	Gly
225					230					235					240
Ile	Thr	Gly	Ile	Cys	Cys	Ala	Thr	Leu	Arg	Asn	Gly	Gly	Lys	Val	Val
				245					250					255	
Val	Met	Ser	Arg	Phe	Asp	Leu	Arg	His	Phe	Ile	Ser	Ser	Leu	Ile	Thr
			260					265					270		
Tyr	Glu	Val	Asn	Phe	Ala	Pro	Ile	Val	Pro	Pro	Ile	Met	Leu	Ser	Leu
		275					280					285			
Val	Lys	Asn	Pro	Ile	Val	Asn	Glu	Phe	Asp	Leu	Ser	Arg	Leu	Lys	Leu
	290					295						300			
Lys	Ala	Val	Met	Thr	Ala	Ala	Ala	Pro	Leu	Ala	Pro	Asp	Leu	Leu	Arg
305					310					315					320
Ala	Phe	Glu	Glu	Lys	Phe	Pro	Gly	Val	Glu	Val	Gln	Glu	Ala	Tyr	Gly
				325					330					335	
Leu	Thr	Glu	His	Ser	Cys	Ile	Thr	Leu	Thr	His	Cys	Ala	Pro	Gly	Asn
			340					345					350		
Ile	Arg	Gly	Arg	Ala	Lys	Lys	Ser	Ser	Val	Gly	Phe	Ile	Ile	Pro	Asn
		355					360					365			
Leu	Glu	Val	Lys	Phe	Ile	Asp	Pro	Glu	Thr	Gly	Lys	Ser	Leu	Pro	Arg
	370					375					380				
Asn	Ser	Ile	Gly	Glu	Val	Cys	Val	Arg	Ser	Gln	Cys	Val	Met	Arg	Gly
385					390					395					400
Tyr	Tyr	Lys	Lys	Pro	Thr	Glu	Thr	Glu	Lys	Thr	Val	Asp	Ser	Asp	Gly
				405					410					415	
Trp	Leu	His	Thr	Gly	Asp	Val	Gly	Phe	Ile	Asp	Asp	Asp	Asp	Asp	Val
			420					425					430		
Phe	Ile	Val	Asp	Arg	Ile	Lys	Glu	Leu	Ile	Lys	Tyr	Lys	Gly	Phe	Gln
		435					440					445			
Val	Ala	Pro	Ala	Glu	Leu	Glu	Ala	Ile	Leu	Leu	Ser	His	Pro	Ser	Val
	450					455					460				
Glu	Asp	Ala	Ala	Val	Val	Pro	Leu	Pro	Asp	Glu	Glu	Ala	Gly	Glu	Ile
465					470					475					480
Pro	Ala	Ala	Cys	Val	Val	Met	Ala	Ala	Ser	Ala	Thr	Glu	Thr	Glu	Asp

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				485					490					495					
Asp	Ile	Ser	Lys	Phe	Val	Ala	Ser	Gln	Val	Ala	Thr	Tyr	Lys	Arg	Val				
			500					505					510						
Arg	Leu	Val	Lys	Phe	Val	Ser	Thr	Ile	Pro	Lys	Ser	Ser	Ser	Gly	Lys				
		515					520					525							
Ile	Leu	Arg	Arg	Leu	Leu	Arg	Asp	Asn	Leu	Arg	Glu	Thr	Leu	Lys	Asn				
	530					535					540								
Gln	His	Gln	Pro	Leu	Ser	Thr													
545						550													

<210> 349
 <211> 544
 <212> PRT
 <213> Pinus radiata

<400> 349

Met	Glu	Ala	Lys	Pro	Ser	Glu	Gln	Pro	Arg	Glu	Phe	Ile	Phe	Arg	Ser				
1				5				10						15					
Lys	Leu	Pro	Asp	Ile	Tyr	Ile	Pro	Asp	Asn	Leu	Ser	Leu	His	Ala	Tyr				
			20					25					30						
Cys	Phe	Glu	Asn	Ile	Ser	Glu	Phe	Ala	Asp	Arg	Pro	Cys	Val	Ile	Asn				
		35					40					45							
Gly	Ala	Thr	Gly	Arg	Thr	Tyr	Thr	Tyr	Ala	Glu	Val	Glu	Leu	Ile	Ser				
	50					55					60								
Arg	Arg	Val	Ser	Ala	Gly	Leu	Asn	Gly	Leu	Gly	Val	Gly	Gln	Gly	Asp				
65					70					75					80				
Val	Ile	Met	Leu	Leu	Leu	Gln	Asn	Cys	Pro	Glu	Phe	Val	Phe	Ala	Phe				
			85					90						95					
Leu	Gly	Ala	Ser	Tyr	Arg	Gly	Ala	Ile	Ser	Thr	Thr	Ala	Asn	Pro	Phe				
			100					105					110						
Tyr	Thr	Pro	Gly	Glu	Ile	Ala	Lys	Gln	Ala	Ser	Ala	Ala	Arg	Ala	Lys				
		115					120						125						
Ile	Val	Ile	Thr	Gln	Ala	Ala	Phe	Ala	Asp	Lys	Val	Arg	Pro	Phe	Ala				
	130					135						140							
Glu	Glu	Asn	Gly	Val	Lys	Val	Val	Cys	Ile	Asp	Thr	Ala	Pro	Glu	Gly				
145					150					155					160				
Cys	Leu	His	Phe	Ser	Glu	Leu	Met	Gln	Ala	Asp	Glu	Asn	Ala	Ala	Pro				
				165					170						175				
Ala	Ala	Asp	Val	Lys	Pro	Asp	Asp	Val	Leu	Ala	Leu	Pro	Tyr	Ser	Ser				
			180					185					190						
Gly	Thr	Thr	Gly	Leu	Pro	Lys	Gly	Val	Met	Leu	Thr	His	Arg	Gly	Gln				
		195					200						205						
Val	Thr	Ser	Val	Ala	Gln	Gln	Val	Asp	Gly	Asp	Asn	Pro	Asn	Leu	Tyr				
	210					215						220							
Phe	His	Lys	Glu	Asp	Val	Ile	Leu	Cys	Thr	Leu	Pro	Leu	Phe	His	Ile				
225				230						235					240				
Tyr	Ser	Leu	Asn	Ser	Val	Met	Phe	Cys	Ala	Leu	Arg	Val	Gly	Ala	Ala				
				245					250					255					
Ile	Leu	Ile	Met	Gln	Lys	Phe	Glu	Ile	Val	Ala	Leu	Met	Glu	Leu	Val				
		260						265					270						
Gln	Arg	Tyr	Arg	Val	Thr	Ile	Leu	Pro	Ile	Val	Pro	Pro	Ile	Val	Leu				
		275					280						285						
Glu	Ile	Ala	Lys	Ser	Ala	Glu	Val	Asp	Arg	Tyr	Asp	Leu	Ser	Ser	Ile				
	290					295					300								
Arg	Thr	Ile	Met	Ser	Gly	Ala	Ala	Pro	Met	Gly	Lys	Glu	Leu	Glu	Asp				
305					310					315					320				
Thr	Val	Arg	Ala	Lys	Leu	Pro	Asn	Ala	Lys	Leu	Gly	Gln	Gly	Tyr	Gly				

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				325					330					335					
Met	Thr	Glu	Ala	Gly	Pro	Val	Leu	Ala	Met	Cys	Pro	Ala	Phe	Ala	Lys				
			340					345					350						
Glu	Pro	Phe	Glu	Ile	Lys	Ser	Gly	Ala	Cys	Gly	Thr	Val	Val	Arg	Asn				
		355					360					365							
Ala	Glu	Met	Lys	Ile	Val	Asp	Pro	Glu	Thr	Gly	Ala	Ser	Leu	Pro	Arg				
	370					375					380								
Asn	Gln	Ala	Gly	Glu	Ile	Cys	Ile	Arg	Gly	His	Gln	Ile	Met	Lys	Gly				
385					390				395						400				
Tyr	Leu	Asn	Asp	Ala	Glu	Ala	Thr	Ala	Asn	Thr	Ile	Asp	Lys	Glu	Gly				
			405					410					415						
Trp	Leu	His	Thr	Gly	Asp	Ile	Gly	Tyr	Ile	Asp	Asp	Asp	Asp	Glu	Leu				
			420					425				430							
Phe	Ile	Val	Asp	Arg	Leu	Lys	Glu	Leu	Ile	Lys	Tyr	Lys	Gly	Phe	Gln				
		435					440					445							
Val	Ala	Pro	Ala	Glu	Leu	Glu	Ala	Met	Leu	Ile	Ala	His	Pro	Ser	Ile				
	450					455					460								
Ser	Asp	Ala	Ala	Val	Val	Pro	Met	Lys	Asp	Glu	Val	Ala	Gly	Glu	Val				
465					470				475						480				
Pro	Val	Ala	Phe	Val	Val	Lys	Ser	Asn	Gly	Ser	Val	Ile	Thr	Glu	Asp				
			485					490					495						
Glu	Ile	Lys	Gln	Tyr	Ile	Ser	Lys	Gln	Val	Val	Phe	Tyr	Lys	Arg	Ile				
		500						505					510						
Lys	Arg	Val	Phe	Phe	Thr	Asp	Ala	Ile	Pro	Lys	Ala	Pro	Ser	Gly	Lys				
		515					520					525							
Ile	Leu	Arg	Lys	Asp	Leu	Arg	Ala	Lys	Leu	Ala	Ser	Gly	Val	Tyr	Asn				
	530					535					540								

<210> 350

<211> 717

<212> DNA

<213> Eucalyptus grandis

<400> 350

cctgttttgg	caacaactcc	agcagctctc	tgctcttttt	actataaaaa	aacctatctt	60
cacttcttct	gtacttgcac	acgaacatta	agcgcttgat	cagaacttgt	atcagctccc	120
caccaccacc	aaacagaaga	gaaacagaag	aaaaggaaaa	gttcgaacaa	cttcgaacga	180
tgcgagccct	tgctgttggt	ctcggttctg	ctatcttgct	ggcgatgtgc	gcgagcagtg	240
cgggtgcgct	gagcttggat	tactatgacc	agacgtgccc	gaagctcgag	ttttcggtga	300
ggggggctgt	gaagaaagcg	atgaagaacg	acaacaccgt	tcctgctgct	ttacttcgca	360
tgcaattcca	cgactgcttc	atcagaggat	gtgacgggtc	cgtgctcttg	aactcgacgg	420
caaagaacac	agccgaaaaa	gacggggccg	cgaacatctc	actccacgca	ttctatgtga	480
tcgaccttgc	gaaggaagcg	gtggaagctc	agtgccttgg	ggctgtctct	tgcgccgaca	540
tcttggcctt	ggccgctcgg	gatgctgtcg	ctctgtctgg	aggaccgcat	tgggatgtgc	600
cgaaaggaag	aaaagatggg	aggattcgaa	agcgaatgac	acaaggcaat	taccagctcc	660
gaccttcaac	atctctcaac	tacagcaagc	ttctctcaag	aggcctttcc	atggaga	717

<210> 351

<211> 369

<212> DNA

WO 00/22099

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<213> Eucalyptus grandis

<400> 351

ggcgtctctc	ctctgtctag	tcatgtttct	gaaatacctc	tccgccgcac	tcatctctct	60
tgcaacgatt	cgctctgctt	acggtgcctc	cactccgaag	cgaagagcaa	catgcgcggg	120
cgggcagacc	gtgaaaaacg	aggcctggtg	cgcttggttc	cccgtcctgg	aagacattct	180
gccaacatg	ttcgacaacg	aatgtggcga	cgacgcccac	ggcgctctgc	gtctgagctt	240
ccacgacgcg	atcggtttct	ctccttctca	aggtggagga	ggcgcggaacg	gatccatttt	300
gtcttcagtg	acaccgaact	gcagttcccc	gcgaacgctg	gcctcgacga	cccgatcgac	360
actgagctt						369

<210> 352

<211> 1391

<212> DNA

<213> Eucalyptus grandis

<400> 352

gaaaaactgt	ggtggtgaag	ctgcctcgca	aagatgtgac	gttatctaata	cagcgtctcc	60
ctgcccggaa	aaagccggaa	aaggaactgt	tattttcaag	cttttatttc	accacaatca	120
cggagttata	tattatacca	agatttccgc	gttaacctta	cgccggagaa	acttcatctg	180
agtgtgtgct	cttgcctggt	ttcaacagga	acatatcgat	aatttatgtc	atggctacac	240
acgatatggt	cggtttttcc	gtcgtcgttg	tcctccttgc	cacttcggtt	atcaccactg	300
cccgttgtaa	gctctcaccg	agtcattatc	aatcaacatg	tccgaaagca	ttgtcgattg	360
ttcgagctgg	agtagcaaaa	gcaatcaaga	atgagacccg	gacgggagcg	tccttgcttc	420
ggctgcactt	ccatgactgc	ttcgtcaatg	ggtgcgatgc	gtcgatattg	ttggatgaca	480
cgcttagctt	cgtgggagag	aaaacagcag	ctccgaacaa	caattccgtg	agagggttcg	540
aagtgatcga	ccgcatcaag	gctagtctgg	agaaggagtg	ccctggagtg	gtttcctgtg	600
cagatatcgt	tgccctggct	gctcgcgact	cagtcgttca	tttgggaggt	ccttcatgga	660
ccgtaagctt	aggagagaaag	gattccatta	ctgctagcag	gagccttgct	aacacctcca	720
tacctccacc	tacttctaata	ctcagtgtct	tcataaccag	cttcgctgct	caggggtctt	780
cagtcaagaa	catggtggct	ctttctggtt	cacataccat	tggcctagcg	agatgcactt	840
ccttccgaag	acggatctac	aacgactcga	acatagatac	atccttcgcc	cataaattgc	900
agaagatatg	tcccaggatt	ggaaatgata	gtgtccttca	aaggctagac	atccaaacgc	960
cgaccttctt	tgacaacctt	tactaccaca	atttactgca	gaagaagggc	cttcttcact	1020
ctgatcaaga	gctcttcaat	ggcagttctg	tggattcact	ggtcaagaag	tatgcatgcg	1080
acacaggaaa	atttttccga	gattttgccca	aggcaatgat	caaaatgagc	gaaattaagc	1140
cccccaaagg	aagcaatggt	caaataagga	aaaattgcag	gaaagtgaac	taagtatgaa	1200
gctcatatat	gcaatttgaa	actgccacat	atgaacacgg	tagtgaaatc	agggctcgat	1260
aatgtcccct	gacaatttgt	cgatcatgtat	ctgtcttctt	gactaatttg	tgggtgctgc	1320
ttgaaaaata	aaggagctcg	tctcagtttc	tgtaaaaaaa	aaaaaaaaaa	aaaaaaaaaa	1380
aaaaaaaaaa	a					1391

<210> 353

<211> 337

<212> DNA

<213> Eucalyptus grandis

<400> 353

cagaatgcct	agtcgtcatc	cgatttgggt	aattgtcgcc	atagcttttg	taaccgcact	60
cgggtgggga	agtgcctccg	cacaactctc	tacaaacttc	tactccaaaa	gttgtcccaa	120
tgttttgagc	acggtgaaat	ctgttggtccg	gtccgcgggtg	tcgaaagagc	gccgcatggg	180
tgcttctctc	ctgcgcctct	tctttcatga	ttgcttcgtc	aatgggtgcg	atggctcgat	240
actcctggac	gacacatcct	cgttccaagg	ggagaagacg	gccggcccaa	ataataagtc	300
tttgagagga	tacaacgtca	ttgaccggat	caagtcc			337

<210> 354

<211> 368

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<212> DNA

<213> Eucalyptus grandis

<400> 354

ctcacttccg	agcgcgccat	gcagttcacc	ttttccgccg	ctttcctcgc	tctcgtcaca	60
gtcgcggccg	ctatgcccac	caagcgtgcg	gcgtgcagca	acggacgaac	ggccactcat	120
gcctcgtgct	gtgtgtgggt	cgacgtcctc	gacgatattc	aagagaatct	gttcgacggg	180
ggagagtgcg	gagaggaaac	acacgagtct	ctgcggctca	ctttccacga	tgccatcggc	240
ttctccccga	gcctgtttct	cgagggaaaa	ttcgggtggc	tcggcgctga	tggttccatc	300
atggctcact	ctgacatcga	gaccgtgttc	cccgccaaaca	atggaattga	tgatatcgtc	360
gacgcgca						368

<210> 355

<211> 955

<212> DNA

<213> Eucalyptus grandis

<400> 355

aagaaactca	gacccagacc	cagaccacat	catggcctcc	cgtttcagct	ctttcgtttt	60
ggtttctttt	cttgtgatag	ctgcatcaca	tgttcatgtt	acgagctctg	ctcacttggt	120
gaaggggctc	tcgtggctct	tctacgagaa	gagctgtccc	aaggtggagt	ccgtcatcaa	180
gaaacatctc	aagaagggtg	tcgaggagga	tattggccaa	gctgctgggc	tgcttcgtct	240
gcacttccat	gactgctttg	ttaagggatg	tgatgcttcg	gtgttgctgg	atggatcagc	300
cagtggacca	agtgagcagg	acgctccacc	gaaccggagc	ttgagaccat	cagcattcaa	360
gatcatcgat	gacctccgtg	agctcgtgga	caagaagtgt	ggtcgagtag	tctcttgctg	420
tgatatcgca	gccattgccg	ctcgtgactc	cgttgtcctg	tcaggcggac	ctgagtatga	480
tgtgccgttg	ggaaggcggg	atggactcac	gtttgcgact	caaaatgtga	ccttagagaa	540
tttacctgca	ccaactgaga	acgccagtgc	aattctctcc	gccctagcca	agaaaaactt	600
agacgctacc	gacgtgggtg	ccctctcttg	aggccacacc	atcgggcttg	ggcactgcac	660
ctcctttgag	aatcggctct	acccgaccca	agacccacag	atggagaaga	cctttgcccc	720
tgatctcaag	ggcgtgtgcc	ccaccacaaa	ctccaccaac	actacggctc	tggacatccg	780
atcacccaac	cgattcgaca	acaagtactt	tgtcgatttg	gtgaaccgcc	aaggcctggt	840
cacctcagac	caagatctgt	atgaggatcc	cacaaccagg	gacattgtca	ctagctttgc	900
cgaggaccag	gaattgttct	ttgagaagtt	tgtcctagcc	atgacgaaga	tggggg	955

<210> 356

<211> 308

<212> DNA

<213> Eucalyptus grandis

<400> 356

ctgtgtctag	tcatgttccct	gaagtatctc	tccggcgccc	tcgtctccct	tgcaacgata	60
cgcggtgttt	gcggtgcttc	cgctccgatg	cgaagagcaa	catgtgcggg	tgggcagact	120
gtcaaaaatg	cggcatgttg	tgcattggtc	ccagtactcg	acgacatcag	ggaaaaactt	180
ttcgacaacg	aatgcggcga	tgacgcccac	gctgccctgc	gtctgagttt	ccacgatgca	240
atcggtttct	ctcgttcgaa	aggtggagga	ggcgcggacg	gatccatcat	tgccctcaat	300
aagactga						308

<210> 357

<211> 373

<212> DNA

<213> Eucalyptus grandis

<400> 357

tcaggtcctt	gtcaacatgg	cattcaaact	cgtgggttaat	cttggttagtc	ttgctctcgc	60
cgtcagtgtc	gcaaacttca	agcgagttgc	ttgcccaggt	actacggcca	cagctcgcaa	120
tccggcgctg	tgcgcattct	tctcactgag	agatgacttg	cttacaatac	tcttcggggg	180

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tgtgtgcggc	gaagaggcgc	acgagtctct	ccgattgtct	ttccatgatg	ccattgcggt	240
ttcgcccgc	ttaattaggc	aaggcaaacc	gggagggtga	ggtgctgatg	gctctatgat	300
tactttccca	aacgtcgagc	ccaattttta	tgccaacaac	ggcattattg	attctgtcga	360
ctttttgaca	cca					373

<210> 358

<211> 417

<212> DNA

<213> Eucalyptus grandis

<400> 358

ctcttgtcct	gggaccgtgt	cttgccgcga	cattctcgcc	ctcgggtgctc	aagcttctgt	60
cgttctgtca	ggagggtccat	cttggagggt	gctctcgggg	aggagggaca	gcttgacggc	120
gaaccaagca	ggagcgaaca	catcgatacc	tagccctttt	gattccttgg	ctaacctcac	180
ttccaaattc	gccgctgttg	gcttggacac	caatgacctt	gtcactcttt	ccggagctca	240
cacctttgga	cgtgcacagt	gcaggacatt	cagccctagg	ctctacaact	tcaacgcgag	300
tggcagccca	gatccaacca	taagtccttc	atacttgacc	actctccaac	aactttgccc	360
acagaatgga	agcggctccg	tcctcgccaa	cctcgacccg	acgaccgtga	acacatt	417

<210> 359

<211> 659

<212> DNA

<213> Pinus radiata

<400> 359

cacaatggaa	atagttagg	tcagtaatgg	aacggatgaa	acatatccc	ggccttacac	60
tgcagtttca	gtctgtgctg	atcactggag	cggcattggt	tctatggatc	cagacatcgg	120
atgctcagga	ctgtaatggt	ctgagtcate	actattatca	gaagtcctgt	ccaaatgccc	180
aggctatcat	taaatctgta	gtttcagatg	ctgtcaaaaa	ggaagcgaga	atggctgctt	240
ccttgcttcg	tctgcatttt	catgactggt	ttgttcaggg	ctgtgatgct	tcaattctgc	300
ttgatgacac	tgctagtttc	acaggggaga	agacagcatt	acctaacaga	aattctgtaa	360
gaggctttga	ggtagtggat	aagatcaaaa	gcaaattgga	ggaagcatgt	cctggagtgg	420
tctcatgtgc	tgacattctt	gctgtggcag	cccgtgatcc	agtaggcttt	agtgtgggtc	480
cgtattggga	ggttctactg	ggcaggaggg	actcaaagac	tgcaagcaag	agcgggtgcaa	540
acaacgacat	tcctgcaccc	aactcaaccc	atcagactct	ggaaaccaaa	ttcaacctca	600
aaggtctcaa	tgtgcttgac	ctagtgtgctc	tatcaagggtc	ccataacaat	agggttagc	659

<210> 360

<211> 669

<212> DNA

<213> Pinus radiata

<400> 360

gcggcacgag	cggcaaaaact	aaagctattc	gcagcctccc	tctatggcga	cattagggat	60
ccctctcggc	tcactcagcc	tgtctctcct	cttcttctgc	tgccgacaac	gcagtgtggg	120
actgaaggaa	aattactacg	caacgtcgtg	tccgagagca	gagcacatag	tgaaggagca	180
ggtctacaat	ctctaccagg	agcacggcaa	cactgccgtt	tcatggatca	gacttatctt	240
ccatgactgc	atagtccagt	cgtgcgatgc	ctccattcta	ttagacagta	gtggagacgt	300
gcagacagag	aaacaatcgg	accgaaactt	cggaatgcga	aacttcaagt	atgtggacac	360
cattaaggag	gccatcgagg	tggaatgtcc	tggagtgggtg	tcgtgtgctg	acattattgt	420
tctcgccgca	aaggaggcag	ctgcaatgct	aggaggtcca	cgcctcgcg	tgaaaacagg	480
gagacgagac	agcagaaaaa	gcagtgcagc	agtgggtggac	aaatacgttc	cgctgcataa	540
tggcagcatc	tcctctcttc	tctctgcctt	tgccctctgtg	ggcatcgatg	cgggaaggagc	600
tgtggccctt	ttaggtttga	tacttatcca	ttctgtatta	cattatacat	aaataaaaaa	660
aaaaaaaaa						669

<210> 361

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PCT/NZ99/00168

<211> 916
 <212> DNA
 <213> Pinus radiata

<400> 361

agcaaattgg	ttgcttttgg	agcgcttggt	ccaacagcaa	aaatggctgt	tttgatgaag	60
agctttccgt	gcattgctgt	cattgtgttc	attatctgtt	cgattactga	tactgtgaat	120
gggaaactga	gctccacggt	ttatgataag	tcttgtccca	aggccctgtc	tatagtgcaa	180
gccgggggtga	agcaagcagt	ggctaaggaa	aaacgtatgg	gggcatcgct	tctccgcctt	240
catttccacg	actgcttcgt	taatggctgc	gatgggtctg	tactgttgga	caattccacg	300
accttcacta	gcgagaaata	tgctcttccc	aataacaatt	ccgcgagggg	tttcgaggtg	360
atcgatagca	taaagagcca	actcgagaat	gcttgcaccg	gcgtcgtttc	ttgtgcagac	420
attctcacga	ttgctgctcg	tgattctgtt	gttcagttgg	gtggaccttc	gtggaaggtg	480
atgttgggga	ggcgagactc	aacaacagcg	agcattagcg	gtgcaaacia	taacattccg	540
cctcccactt	ccaatctgac	gaaactcatt	tcactatttc	aggcacaggg	cctctccaca	600
aaggaaatgg	ttgcactctc	tggtgggtcat	accatcgggc	aggcgcaatg	caagaatttc	660
agagcccata	tttacaacga	caccaacata	gatactacgt	acgccacttc	attgcgttca	720
aagtgtccta	gtaccacagg	ctccggagac	agcaacctgt	cgccactgga	ttatacgact	780
cccactgtgt	ttgacaaaaa	ctattactac	aatctgaaaa	gcaaaagagg	acttctccac	840
tccgaccagg	aactcttcaa	cggagggtcc	actgattcgc	atgtgactaa	gtacgcctcc	900
aaccagaata	ccttct					916

<210> 362
 <211> 586
 <212> DNA
 <213> Pinus radiata

<400> 362

gcaaacagca	accttccttc	gccagcttcc	agtctcagca	cactcatgac	agcatttcaa	60
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gcacggtgca	ccacattcag	aactcgcctc	tacaacgata	ccaacattaa	cgtgccttc	180
gtacatctg	cgaaggcgaa	ctgccccagc	actgggtggcg	acaacaccct	ctctcccttg	240
gatgtttctca	cccctaccac	atttgacaac	aagtattaca	ctaattctgaa	aagccaaaag	300
ggacttttcc	actccgatca	ggagctattt	aatggagggtt	ccacagactc	tagagttagt	360
atctacagca	ccagtcaagc	cattttcttt	actgactttg	cagccgccat	ggtgaatatg	420
ggtaatatata	gtccccctcac	tggcaccaac	ggcgagatcc	gcacaaactg	caggaaagtc	480
aattaaaatt	tgtaaagatt	gtattatcta	tagcttttct	ctgaagttat	aagcgaagct	540
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<210> 363
 <211> 1224
 <212> DNA
 <213> Pinus radiata

<400> 363

ctaccactca	atttcgctct	tatcttctgt	gtttcatcgt	tttcttccaa	atatgatgat	60
gaggactcta	gtgtgcattg	ggttaatggc	tgtgtttgta	gccttcatac	atataaacgc	120
tgtgaatggg	cagctgagct	caacgtttta	tgccaaatcg	tgtccgaggt	tgccatcgat	180
agtgaatca	gtggtgaagc	aagcggtagc	taaggagaaa	agaatgggag	cgctccttgg	240
ccgccttcac	tttcacgatt	gcttcgtcaa	cgggtgcgat	ggttcaatct	tattggatga	300
caacgctacg	tttaccggag	aaaagactgc	aggcccaaac	gccaatctctg	cgagaggctt	360
cgaggtaatt	gacagcatta	aaactcaagt	ggaggcagcc	tgcaagtggag	tcgtgtcgtg	420
tgcaagacatt	ctcaccattg	ctgctcgtga	ctctattggt	gaacttcaag	gccccaatg	480
gacggtaatg	cttggaaggc	gagactccac	gactgcgagt	ttaagcgctg	caaacaacia	540
cattccatct	cccgttcca	gtctgagcac	actcatctca	tcttttcaag	ctcacggtct	600
ttctacaaa	gaccttggtg	cactctcagg	tgctcataca	attgggtcaat	cacgatgcgc	660
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aaaggcaaac	tgccccagcg	ctgggtggcga	cagcaacctc	tctcccttag	atgcgggtcac	780
ctcaatcaca	tttgacaaca	agtattactc	taatcttaaa	atacagaaag	gacttctcca	840
ctccgaccag	cagctcttta	atggagggttc	tacagattct	cagggtactg	cgtacagcag	900
caatcagaac	agcttcttta	tagactttac	agctgccatg	gtgaagatgg	gaaatattag	960
ccctctcact	ggcactaacg	ggcaaatccg	caaaaactgc	aggaagtcca	attagtctct	1020
ctgaagattg	tattctccgt	actctttcag	cttatttttt	ctttgtaaca	ttgattttcg	1080
atcgggctagt	gagccttcaa	atcgaagctc	taaaagaaag	caataaacta	catttctgag	1140
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aagacttgta	aaaaaaaaaa	aaaa				1224

<210> 364
 <211> 519
 <212> DNA
 <213> Pinus radiata

<400> 364						
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acgttcgaca	ataaatacta	cacaaatctg	aagagccaaa	agggctcttct	ccactcagac	120
cagcagctgt	ttaatggcgg	ctctgcagat	tcccagggtta	ctacctacag	caccactcag	180
agcaccttct	ttaccgactt	cgcagcttcc	atggtgaata	tgggtaatat	cagtcacctc	240
actggcacca	gcggacaaat	ccgcaaaaac	tgcagaaaac	ctaattgatg	cctctcttag	300
gccatatgta	ctttactggt	ctcatgggat	tatatatttga	ttgtagaatt	atatagatag	360
ttgggagacc	tacggctgcg	ttagacacta	gcaagcctcc	aattggatct	gtgcgtccct	420
agtttggtga	ctatttggtt	gatttcgatg	taccaagtac	aaagtttctc	aacagattaa	480
tccaatgaat	taggttttat	aaaaaaaaaa	aaaaaaaaaa			519

<210> 365
 <211> 646
 <212> DNA
 <213> Pinus radiata

<400> 365						
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aatggcgtca	gtcgtgtgca	tcgctctgct	cttttttttcg	accgttgctt	ttgctcaact	120
caactcaacg	tattatgata	cgctcgtgtcc	caaactcctg	gcaacgggtga	aggctgcagt	180
gaagacggcg	gtggccaatg	agaaacgcac	ggggggcatca	ttgctccgtc	ttcactttca	240
tgattgtttc	gtcaatgggt	gcgatgggtc	agtgttggtg	gacgactctt	cgagtctaac	300
tggggaaaag	actgctcttc	ccaacaacaa	ttcgttgagg	ggtttcgacg	tcatagacac	360
catcaaatca	caagtggaag	cagtttgtag	cggaaatcgta	tcgtgcgctg	acattttggc	420
tattacggct	agagattctg	tcgtcgaatt	gggaggacca	acatggacag	tgctgcttgg	480
aaggagagac	tcagcaactg	ccagcctaag	cgccgcaaac	accaacattc	ccgctcccac	540
ttccaatctc	agtgggtctca	tctcatcttt	tcaagcacag	ggcctttcaa	ccaaggatat	600
gattgtccta	tcaggtgcac	ataccattgg	ccaagctcga	tgcaca		646

<210> 366
 <211> 364
 <212> DNA
 <213> Pinus radiata

<400> 366						
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gagctcatac	gattggccaa	gcgcgggtgca	ccacattcag	agctcgcgtc	tacaacgaat	120
ccaacattga	cacttccttc	gccacttcgg	tgaaggcaaa	ctggccaagc	gctgggtggcg	180
acaacaccct	ctcgccttta	gatctggcca	cgctaccac	atgttgacaac	aagtattaca	240
ctgatttgag	aagccaaaag	ggacttctgc	actccgatca	gcaaatgttt	agcggagggt	300
ctacaaattc	tcaagtcacc	acctatagct	ccaatcaaaa	acaccttctt	tacagacttt	360
acag						364

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<210> 367
 <211> 364
 <212> DNA
 <213> Pinus radiata

<400> 367
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 ccagcgggcc tagcgaacaa gacgctccac cgaacttaac gctgagagca aaagcctttg 180
 aaataattaa cgacatcaag aaacatgttg aaaaggcttg cagcggcggt gtctcttgcg 240
 cggacttgac tgctctcgca gctcgcgagt cggtcagagc agttggagga ccagagtatc 300
 gagtgcctct ggggcgcagg gacagcctga aattcgccac acgaaaagtg acccttgcca 360
 acct 364

<210> 368
 <211> 801
 <212> DNA
 <213> Pinus radiata

<400> 368
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 accgttgctg acgcgcagct tagcgcaacg ttttataata catcatgtcc caaactactc 120
 tcaacgggtgc aggccgctgt gaagcaagcg gtggccaacg agaagcgcat gggggcatcg 180
 ctctctcgcc ttcactttca cgactgcttc gttaatgggt gcgatgggtc tgtgctgctg 240
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 ggttttcgatg tgatagacac catcaagtct caagtggagc cagtttgagc tggagttgtg 360
 tcgtgcgcag atattttggc tattgctgct agagattctg ttgtccagtt gggaggccca 420
 acatggacag tgcagctggg gaggagagac tccaggactg ccagcctaag tggtgcaaac 480
 aacaacattc cggctcctac ttctaattct agtgctctca tctcattatt tcaagctcag 540
 ggtctttcca cgaaggacat ggttgctccta tcagggtgcg acaccatagg ccaagcgcg 600
 tgcacaagct tcagggcccg catctacaac gaatccaaca ttaatgcagc atacgcaact 660
 tccctgaaga caaactgtcc gactacagga agcgacaaca acctgtcacc attggatcgt 720
 gttactccca ctacgtttga catcaactac tactcaaata tgagaagcca aaagggactt 780
 ctccactccg accagcagct g 801

<210> 369
 <211> 1171
 <212> DNA
 <213> Pinus radiata

<400> 369
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 agtttcgcct gtatagctgt aatgggtgtt atcgtgtgtt ctattacaga tactgtgaat 120
 gggcagctga gctccacgtt ttacgacaaa tcttgcccga cggcactgtc ggtagtgaag 180
 gccgcagtga agcaagcggc cgctaacgag aaacggatgg gtgcgtcttt gctccgcctg 240
 cactttcacg actgcttcgt taatgggtgc gatgggtccg ttctgttgga cgattcttcg 300
 accattactg gcgagaagac agctaattcc aatgccatt ctgcgagggg attcgacgta 360
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 atgttgggaa ggcgagactc gacaacagct agcaaaaagc gtgcaaacag taatattccg 540
 cctccgactt ccagctctgag caacctcatc tcaactattc aagcgagggg actctccgca 600
 aaggaaatgg ttgcactttc tggcgggtcat accatcgggc aggcgcaatg caagaatttc 660
 agagcccata tttacaacga gaccaacata gacagtgcgt acgccacttc attgcgttca 720
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 cccactgtgt ttgacaaaaa ctattacagc gacctgaaaa gccaaaaagg acttctccac 840
 tccgaccagg aactcttcaa cggagggtcc actgattcac aggtgactac gtacgcctcc 900

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aaccagaaca	ccttcttctc	cgatttttgct	gcggccatgg	ttaagatggg	aaatatcaaa	960
cctcttaccg	gcaccagcgg	acagatccca	aagaactgca	ggaagccaaa	ctaattatga	1020
tcactgtcga	attatcatca	ctccgttgca	ctgcctttta	attgtaaaag	taacgtttcg	1080
actgatttca	gtctatggat	accatatgct	gatggagctt	gtcatgaata	aataagttca	1140
taactttacc	atcattaata	aaaaaaaaaa	a			1171

<210> 370

<211> 1073

<212> DNA

<213> Pinus radiata

<400> 370

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tcgctattgc	atctcgtgat	tcagtgggtcc	tgagtggagg	gctgggctgg	gaagttttac	120
tggggaggag	agattcgaag	agtgcaggtt	tgagtgggtc	caacaacaat	atccccggcg	180
ccaactcaac	tctgcagacg	cttactacca	agttcaaact	acaagggtcta	gatgaggtag	240
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aggttaacag	ttgatcgttt	taattttaatc	atcttccatc	tcttgcatcg	cattttgtta	720
catctccctt	cttagctgcc	atcaaattgc	attactagat	catccttccc	atggctttca	780
gttgtaacag	gttgaataaa	attgccactt	ctgaattatt	aaacttctga	ttgggctgga	840
cgatagaggg	aaacttcaac	gtcccaatca	aattgtcatg	taagaaatat	ctcgggcagt	900
aaactcagag	tggtaaatca	agattgttga	ataaaatggt	agctcttcgt	taatggctgt	960
ggagaagggtc	aacactcctc	gtgtgttttag	ctatgtgtct	gtttattaac	gcttgcgagt	1020
tttgatgtaa	tggaatcgt	gtcttcaaca	agaataaaaa	aaaaaaaaaa	aaa	1073

<210> 371

<211> 1522

<212> DNA

<213> Pinus radiata

<400> 371

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caaagagAAC	gtcgaagccg	cctgcagcgg	aattgtgtcg	tgtgccgaca	ttgttacttt	480
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ttcaacattt	tcgattatgg	atccagaggc	gtctcaagaa	tcaacatctt	actctatgtg	1140
agattagggg	tatgagcgaa	tctcaaatat	aagcaagcag	cgttaattcc	cagcaaatgc	1200

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taataaatat	atatataacc	ggcatcttgt	aaaccctttg	caatgctggt	tctacaaatt	1260
actttttccc	ttttgacctt	ctgaaagagc	agaaatcaag	cctgaataca	gtgcattctc	1320
gttgaaaata	aatagcggtt	cttggttgata	atcagatttc	caaccgattc	cggcaatttc	1380
caataagaaa	ctttactgaa	tttaaactca	aatgctggcc	aattttgttt	agggcgtttt	1440
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<210> 372
 <211> 311
 <212> DNA
 <213> Pinus radiata

<400> 372						
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tcagtgggtga	agcaagcggt	cgctaaggag	aaaagaatgg	gagcgctcct	ggtccgcctt	240
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<210> 373
 <211> 474
 <212> DNA
 <213> Pinus radiata

<400> 373						
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cagctcacgc	ctattcaatt	tcagcgggtc	aaacagtgcg	gacccaacta	ttcaccaatc	360
tctactgcaa	gacctgcata	gtttatgccc	agatggaaac	agtgatccaa	ataccctggc	420
gccactggac	cctgtgacca	aagacaagct	ccataatgtg	tatttcagaa	atct	474

<210> 374
 <211> 353
 <212> DNA
 <213> Pinus radiata

<400> 374						
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acagtgttca	gcggtagact	ctacaatttc	agcggaacgg	gcagtccgga	tccgacactg	120
aattcctcct	atctatccac	cttgcaaagc	acgtgcccgc	agaatggaag	cgcgaatacg	180
ttaacgtcac	tggatccagg	gactccaaat	acgttcgaca	acaactactt	tgcaaatctg	240
cagattgaga	tgggtctgct	tcagtcgata	aagaacttct	ttccacatcg	ggagcaagca	300
ccatctctac	tgtcaatgat	tatgccagta	gtcaatccga	tttcttcttc	aac	353

<210> 375
 <211> 461
 <212> DNA
 <213> Pinus radiata

<400> 375						
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attgctgtaa	ttgtgtttat	tgtgtgttcg	attaataaca	ctgtgcatgg	gcagctgagc	120
tcaacatttt	atgacaaatc	ttgcccagac	gtgctgtcgg	tagtgaaagc	cgggggtgaag	180

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caagcgggtcg ccaaggagca aaggatgggg gcgtcgcttc tccgacttca cttccacgac	240
tgcttcgtta atggttgcca tgggtccgtt ctggttgatg actcttcgaa aattactggc	300
gagaaaacgg ctattcccaa tgccaattcg gcgagggggg tcatgtgat cgataccata	360
aagagtcagg tcgagaaatc ttgcagcgca gtcgtttcct gttctgacat tctagccatt	420
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<210> 376

<211> 179

<212> PRT

<213> Eucalyptus grandis

<400> 376

Met	Arg	Ala	Leu	Ala	Val	Val	Leu	Gly	Ser	Ala	Ile	Leu	Leu	Ala	Tyr	
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Val	Ala	Ser	Ser	Ala	Gly	Ala	Leu	Ser	Leu	Asp	Tyr	Tyr	Asp	Gln	Thr	
			20					25					30			
Cys	Pro	Lys	Leu	Glu	Phe	Ser	Val	Arg	Gly	Ala	Val	Lys	Lys	Ala	Met	
		35					40					45				
Lys	Asn	Asp	Asn	Thr	Val	Pro	Ala	Ala	Leu	Leu	Arg	Met	His	Phe	His	
	50					55					60					
Asp	Cys	Phe	Ile	Arg	Gly	Cys	Asp	Gly	Ser	Val	Leu	Leu	Asn	Ser	Thr	
65					70					75					80	
Ala	Lys	Asn	Thr	Ala	Glu	Lys	Asp	Gly	Pro	Pro	Asn	Ile	Ser	Leu	His	
				85					90					95		
Ala	Phe	Tyr	Val	Ile	Asp	Leu	Ala	Lys	Glu	Ala	Val	Glu	Ala	Gln	Cys	
			100					105						110		
Pro	Gly	Val	Val	Ser	Cys	Ala	Asp	Ile	Leu	Ala	Leu	Ala	Ala	Arg	Asp	
			115				120					125				
Ala	Val	Ala	Leu	Ser	Gly	Gly	Pro	His	Trp	Asp	Val	Pro	Lys	Gly	Arg	
	130					135					140					
Lys	Asp	Gly	Arg	Ile	Arg	Lys	Arg	Met	Thr	Gln	Gly	Asn	Tyr	Gln	Leu	
145					150					155					160	
Arg	Pro	Ser	Thr	Ser	Leu	Asn	Tyr	Ser	Lys	Leu	Leu	Ser	Arg	Gly	Leu	
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Ser	Met	Glu														

<210> 377

<211> 115

<212> PRT

<213> Eucalyptus grandis

<400> 377

Met	Phe	Leu	Lys	Tyr	Leu	Ser	Ala	Ala	Leu	Ile	Ser	Leu	Ala	Thr	Ile	
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			20					25					30			
Gly	Gly	Gln	Thr	Val	Lys	Asn	Glu	Ala	Cys	Cys	Ala	Trp	Phe	Pro	Val	
		35					40					45				
Leu	Glu	Asp	Ile	Leu	Pro	Asn	Met	Phe	Asp	Asn	Glu	Cys	Gly	Asp	Asp	
	50					55					60					
Ala	His	Gly	Ala	Leu	Arg	Leu	Ser	Phe	His	Asp	Ala	Ile	Gly	Phe	Ser	
65					70					75					80	
Pro	Ser	Gln	Gly	Gly	Gly	Gly	Ala	Asp	Gly	Ser	Ile	Leu	Ser	Ser	Val	
			85					90						95		
Thr	Pro	Asn	Cys	Ser	Ser	Pro	Arg	Thr	Leu	Ala	Ser	Thr	Thr	Arg	Ser	
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Thr Leu Ser
115

<210> 378
<211> 315
<212> PRT
<213> Eucalyptus grandis

<400> 378
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Thr Thr Ala Arg Cys Lys Leu Ser Pro Ser His Tyr Gln Ser Thr Cys
20 25 30
Pro Lys Ala Leu Ser Ile Val Arg Ala Gly Val Ala Lys Ala Ile Lys
35 40 45
Asn Glu Thr Arg Thr Gly Ala Ser Leu Leu Arg Leu His Phe His Asp
50 55 60
Cys Phe Val Asn Gly Cys Asp Ala Ser Ile Leu Leu Asp Asp Thr Pro
65 70 75 80
Ser Phe Val Gly Glu Lys Thr Ala Ala Pro Asn Asn Asn Ser Val Arg
85 90 95
Gly Phe Glu Val Ile Asp Arg Ile Lys Ala Ser Leu Glu Lys Glu Cys
100 105 110
Pro Gly Val Val Ser Cys Ala Asp Ile Val Ala Leu Ala Ala Arg Asp
115 120 125
Ser Val Val His Leu Gly Gly Pro Ser Trp Thr Val Ser Leu Gly Arg
130 135 140
Lys Asp Ser Ile Thr Ala Ser Arg Ser Leu Ala Asn Thr Ser Ile Pro
145 150 155 160
Pro Pro Thr Ser Asn Leu Ser Ala Leu Ile Thr Ser Phe Ala Ala Gln
165 170 175
Gly Leu Ser Val Lys Asn Met Val Ala Leu Ser Gly Ser His Thr Ile
180 185 190
Gly Leu Ala Arg Cys Thr Ser Phe Arg Arg Arg Ile Tyr Asn Asp Ser
195 200 205
Asn Ile Asp Thr Ser Phe Ala His Lys Leu Gln Lys Ile Cys Pro Arg
210 215 220
Ile Gly Asn Asp Ser Val Leu Gln Arg Leu Asp Ile Gln Thr Pro Thr
225 230 235 240
Phe Phe Asp Asn Leu Tyr Tyr His Asn Leu Leu Gln Lys Lys Gly Leu
245 250 255
Leu His Ser Asp Gln Glu Leu Phe Asn Gly Ser Ser Val Asp Ser Leu
260 265 270
Val Lys Lys Tyr Ala Cys Asp Thr Gly Lys Phe Phe Arg Asp Phe Ala
275 280 285
Lys Ala Met Ile Lys Met Ser Glu Ile Lys Pro Pro Lys Gly Ser Asn
290 295 300
Gly Gln Ile Arg Lys Asn Cys Arg Lys Val Asn
305 310 315

<210> 379
<211> 111
<212> PRT
<213> Eucalyptus grandis

<400> 379
Met Pro Ser Arg His Pro Ile Trp Val Ile Val Ala Ile Ala Phe Val

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1				5					10					15		
Thr	Ala	Leu	Gly	Trp	Gly	Ser	Ala	Ser	Ala	Gln	Leu	Ser	Thr	Asn	Phe	
			20					25					30			
Tyr	Ser	Lys	Ser	Cys	Pro	Asn	Val	Leu	Ser	Thr	Val	Lys	Ser	Val	Val	
		35					40					45				
Arg	Ser	Ala	Val	Ser	Lys	Glu	Arg	Arg	Met	Gly	Ala	Ser	Leu	Leu	Arg	
	50					55					60					
Leu	Phe	Phe	His	Asp	Cys	Phe	Val	Asn	Gly	Cys	Asp	Gly	Ser	Ile	Leu	
65					70					75					80	
Leu	Asp	Asp	Thr	Ser	Ser	Phe	Gln	Gly	Glu	Lys	Thr	Ala	Gly	Pro	Asn	
			85					90						95		
Asn	Lys	Ser	Leu	Arg	Gly	Tyr	Asn	Val	Ile	Asp	Arg	Ile	Lys	Ser		
			100					105					110			

<210> 380
 <211> 116
 <212> PRT
 <213> Eucalyptus grandis

<400> 380

Met	Gln	Phe	Thr	Phe	Ser	Ala	Ala	Phe	Leu	Ala	Leu	Val	Thr	Val	Ala	
1				5				10					15			
Ala	Ala	Met	Pro	Thr	Lys	Arg	Ala	Ala	Cys	Ser	Asn	Gly	Arg	Thr	Ala	
			20					25				30				
Thr	His	Ala	Ser	Cys	Cys	Val	Trp	Phe	Asp	Val	Leu	Asp	Asp	Ile	Gln	
		35					40					45				
Glu	Asn	Leu	Phe	Asp	Gly	Gly	Glu	Cys	Gly	Glu	Glu	Thr	His	Glu	Ser	
	50					55					60					
Leu	Arg	Leu	Thr	Phe	His	Asp	Ala	Ile	Gly	Phe	Ser	Pro	Ser	Leu	Phe	
65					70					75					80	
Leu	Glu	Gly	Lys	Phe	Gly	Gly	Leu	Gly	Ala	Asp	Gly	Ser	Ile	Met	Ala	
			85					90					95			
His	Ser	Asp	Ile	Glu	Thr	Val	Phe	Pro	Ala	Asn	Asn	Gly	Ile	Asp	Asp	
			100					105					110			
Ile	Val	Asp	Ala													
			115													

<210> 381
 <211> 308
 <212> PRT
 <213> Eucalyptus grandis

<400> 381

Met	Ala	Ser	Arg	Phe	Ser	Ser	Phe	Val	Leu	Val	Ser	Phe	Leu	Val	Ile	
1				5				10					15			
Ala	Ala	Ser	His	Val	His	Val	Thr	Ser	Ser	Ala	His	Leu	Val	Lys	Gly	
			20					25				30				
Leu	Ser	Trp	Ser	Phe	Tyr	Glu	Lys	Ser	Cys	Pro	Lys	Val	Glu	Ser	Val	
		35					40					45				
Ile	Lys	Lys	His	Leu	Lys	Lys	Val	Phe	Glu	Glu	Asp	Ile	Gly	Gln	Ala	
	50					55					60					
Ala	Gly	Leu	Leu	Arg	Leu	His	Phe	His	Asp	Cys	Phe	Val	Lys	Gly	Cys	
65					70					75					80	
Asp	Ala	Ser	Val	Leu	Leu	Asp	Gly	Ser	Ala	Ser	Gly	Pro	Ser	Glu	Gln	
			85					90					95			
Asp	Ala	Pro	Pro	Asn	Arg	Ser	Leu	Arg	Pro	Ser	Ala	Phe	Lys	Ile	Ile	
			100					105					110			

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Asp Asp Leu Arg Glu Leu Val Asp Lys Lys Cys Gly Arg Val Val Ser
 115 120 125
 Cys Ala Asp Ile Ala Ala Ile Ala Ala Arg Asp Ser Val Val Leu Ser
 130 135 140
 Gly Gly Pro Glu Tyr Asp Val Pro Leu Gly Arg Arg Asp Gly Leu Thr
 145 150 155 160
 Phe Ala Thr Gln Asn Val Thr Leu Glu Asn Leu Pro Ala Pro Thr Glu
 165 170 175
 Asn Ala Ser Ala Ile Leu Ser Ala Leu Ala Lys Lys Asn Leu Asp Ala
 180 185 190
 Thr Asp Val Val Ala Leu Ser Gly Gly His Thr Ile Gly Leu Gly His
 195 200 205
 Cys Thr Ser Phe Glu Asn Arg Leu Tyr Pro Thr Gln Asp Pro Thr Met
 210 215 220
 Glu Lys Thr Phe Ala His Asp Leu Lys Gly Val Cys Pro Thr Thr Asn
 225 230 235 240
 Ser Thr Asn Thr Thr Val Leu Asp Ile Arg Ser Pro Asn Arg Phe Asp
 245 250 255
 Asn Lys Tyr Phe Val Asp Leu Val Asn Arg Gln Gly Leu Phe Thr Ser
 260 265 270
 Asp Gln Asp Leu Tyr Glu Asp Pro Thr Thr Arg Asp Ile Val Thr Ser
 275 280 285
 Phe Ala Glu Asp Gln Glu Leu Phe Phe Glu Lys Phe Val Leu Ala Met
 290 295 300
 Thr Lys Met Gly
 305

<210> 382
 <211> 98
 <212> PRT
 <213> Eucalyptus grandis

<400> 382
 Met Phe Leu Lys Tyr Leu Ser Gly Ala Leu Val Ser Leu Ala Thr Ile
 1 5 10 15
 Arg Gly Val Cys Gly Ala Ser Ala Pro Met Arg Arg Ala Thr Cys Ala
 20 25 30
 Gly Gly Gln Thr Val Lys Asn Ala Ala Cys Cys Ala Trp Phe Pro Val
 35 40 45
 Leu Asp Asp Ile Arg Glu Asn Phe Phe Asp Asn Glu Cys Gly Asp Asp
 50 55 60
 Ala His Ala Ala Leu Arg Leu Ser Phe His Asp Ala Ile Gly Phe Ser
 65 70 75 80
 Arg Ser Lys Gly Gly Gly Gly Ala Asp Gly Ser Ile Ile Ala Phe Asn
 85 90 95
 Lys Thr

<210> 383
 <211> 119
 <212> PRT
 <213> Eucalyptus grandis

<400> 383
 Met Ala Phe Lys Leu Val Val Asn Leu Val Ser Leu Ala Leu Ala Val
 1 5 10 15
 Ser Ala Ala Asn Phe Lys Arg Val Ala Cys Pro Gly Thr Thr Ala Thr

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			20					25					30				
Ala	Arg	Asn	Pro	Ala	Cys	Cys	Ala	Phe	Phe	Ser	Leu	Arg	Asp	Asp	Leu		
		35					40					45					
Leu	Thr	Asn	Leu	Phe	Gly	Gly	Val	Cys	Gly	Glu	Glu	Ala	His	Glu	Ser		
	50					55					60						
Leu	Arg	Leu	Ser	Phe	His	Asp	Ala	Ile	Ala	Phe	Ser	Pro	Ala	Leu	Ile		
65					70					75					80		
Arg	Gln	Gly	Lys	Pro	Gly	Gly	Gly	Gly	Ala	Asp	Gly	Ser	Met	Ile	Thr		
				85					90					95			
Phe	Pro	Asn	Val	Glu	Pro	Asn	Phe	Asn	Ala	Asn	Asn	Gly	Ile	Ile	Asp		
			100					105					110				
Ser	Val	Asp	Phe	Leu	Thr	Pro											
			115														

<210> 384
 <211> 138
 <212> PRT
 <213> Eucalyptus grandis

Ser	Cys	Pro	Gly	Thr	Val	Ser	Cys	Ala	Asp	Ile	Leu	Ala	Leu	Gly	Ala		
1				5					10					15			
Gln	Ala	Ser	Val	Val	Leu	Ser	Gly	Gly	Pro	Ser	Trp	Arg	Val	Leu	Ser		
			20					25					30				
Gly	Arg	Arg	Asp	Ser	Leu	Thr	Ala	Asn	Gln	Ala	Gly	Ala	Asn	Thr	Ser		
		35					40					45					
Ile	Pro	Ser	Pro	Phe	Asp	Ser	Leu	Ala	Asn	Leu	Thr	Ser	Lys	Phe	Ala		
	50					55					60						
Ala	Val	Gly	Leu	Asp	Thr	Asn	Asp	Leu	Val	Thr	Leu	Ser	Gly	Ala	His		
65					70					75					80		
Thr	Phe	Gly	Arg	Ala	Gln	Cys	Arg	Thr	Phe	Ser	Pro	Arg	Leu	Tyr	Asn		
				85					90					95			
Phe	Asn	Ala	Ser	Gly	Ser	Pro	Asp	Pro	Thr	Ile	Ser	Pro	Ser	Tyr	Leu		
		100						105					110				
Thr	Thr	Leu	Gln	Gln	Leu	Cys	Pro	Gln	Asn	Gly	Ser	Gly	Ser	Val	Leu		
		115					120					125					
Ala	Asn	Leu	Asp	Pro	Thr	Thr	Val	Asn	Thr								
		130					135										

<210> 385
 <211> 208
 <212> PRT
 <213> Pinus radiata

Met	Lys	His	Ile	Pro	Gly	Leu	Thr	Leu	Gln	Phe	Gln	Ser	Val	Leu	Ile		
1				5					10					15			
Thr	Gly	Ala	Ala	Leu	Phe	Leu	Trp	Ile	Gln	Thr	Ser	Asp	Ala	Gln	Asp		
			20					25					30				
Cys	Asn	Gly	Leu	Ser	His	His	Tyr	Tyr	Gln	Lys	Ser	Cys	Pro	Asn	Ala		
		35					40					45					
Gln	Ala	Ile	Ile	Lys	Ser	Val	Val	Ser	Asp	Ala	Val	Lys	Lys	Glu	Ala		
	50					55					60						
Arg	Met	Ala	Ala	Ser	Leu	Leu	Arg	Leu	His	Phe	His	Asp	Cys	Phe	Val		
65					70					75					80		
Gln	Gly	Cys	Asp	Ala	Ser	Ile	Leu	Leu	Asp	Asp	Thr	Ala	Ser	Phe	Thr		
				85					90					95			

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Gly	Glu	Lys	Thr	Ala	Leu	Pro	Asn	Arg	Asn	Ser	Val	Arg	Gly	Phe	Glu
			100					105					110		
Val	Val	Asp	Lys	Ile	Lys	Ser	Lys	Leu	Glu	Glu	Ala	Cys	Pro	Gly	Val
		115					120					125			
Val	Ser	Cys	Ala	Asp	Ile	Leu	Ala	Val	Ala	Ala	Arg	Asp	Ser	Val	Gly
	130					135					140				
Phe	Ser	Val	Gly	Pro	Tyr	Trp	Glu	Val	Leu	Leu	Gly	Arg	Arg	Asp	Ser
145					150				155						160
Lys	Thr	Ala	Ser	Lys	Ser	Gly	Ala	Asn	Asn	Asp	Ile	Pro	Ala	Pro	Asn
				165					170					175	
Ser	Thr	His	Gln	Thr	Leu	Glu	Thr	Lys	Phe	Asn	Leu	Lys	Gly	Leu	Asn
		180						185					190		
Val	Leu	Asp	Leu	Val	Ala	Leu	Ser	Arg	Ser	His	Asn	Asn	Arg	Val	Ser
		195					200					205			

<210> 386
 <211> 202
 <212> PRT
 <213> Pinus radiata

Met	Ala	Thr	Leu	Gly	Ile	Pro	Leu	Gly	Ser	Leu	Ser	Leu	Leu	Leu	Leu
1			5					10					15		
Phe	Phe	Cys	Cys	Ala	Gln	Arg	Ser	Val	Gly	Leu	Lys	Glu	Asn	Tyr	Tyr
		20						25				30			
Ala	Thr	Ser	Cys	Pro	Arg	Ala	Glu	His	Ile	Val	Lys	Glu	Gln	Val	Tyr
		35					40					45			
Asn	Leu	Tyr	Gln	Glu	His	Gly	Asn	Thr	Ala	Val	Ser	Trp	Ile	Arg	Leu
	50					55					60				
Ile	Phe	His	Asp	Cys	Ile	Val	Gln	Ser	Cys	Asp	Ala	Ser	Ile	Leu	Leu
65			70							75				80	
Asp	Ser	Ser	Gly	Asp	Val	Gln	Thr	Glu	Lys	Gln	Ser	Asp	Arg	Asn	Phe
			85						90				95		
Gly	Met	Arg	Asn	Phe	Lys	Tyr	Val	Asp	Thr	Ile	Lys	Glu	Ala	Ile	Glu
			100					105					110		
Val	Glu	Cys	Pro	Gly	Val	Val	Ser	Cys	Ala	Asp	Ile	Ile	Val	Leu	Ala
		115					120					125			
Ala	Lys	Glu	Ala	Ala	Ala	Met	Leu	Gly	Gly	Pro	Arg	Ile	Ala	Val	Lys
		130				135					140				
Thr	Gly	Arg	Arg	Asp	Ser	Arg	Lys	Ser	Ser	Ala	Ala	Val	Val	Asp	Lys
145					150					155					160
Tyr	Val	Pro	Leu	His	Asn	Gly	Ser	Ile	Ser	Ser	Leu	Leu	Ser	Ala	Phe
				165						170				175	
Ala	Ser	Val	Gly	Ile	Asp	Ala	Glu	Gly	Ala	Val	Ala	Leu	Leu	Gly	Leu
			180					185				190			
Ile	Leu	Ile	His	Ser	Val	Leu	His	Tyr	Thr						
		195					200								

<210> 387
 <211> 287
 <212> PRT
 <213> Pinus radiata

Met	Lys	Ser	Phe	Pro	Cys	Ile	Ala	Val	Ile	Val	Phe	Ile	Ile	Cys	Ser
1				5					10					15	
Ile	Thr	Asp	Thr	Val	Asn	Gly	Lys	Leu	Ser	Ser	Thr	Phe	Tyr	Asp	Lys

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			20					25					30				
Ser	Cys	Pro	Lys	Ala	Leu	Ser	Ile	Val	Gln	Ala	Gly	Val	Lys	Gln	Ala		
		35					40					45					
Val	Ala	Lys	Glu	Lys	Arg	Met	Gly	Ala	Ser	Leu	Leu	Arg	Leu	His	Phe		
	50					55					60						
His	Asp	Cys	Phe	Val	Asn	Gly	Cys	Asp	Gly	Ser	Val	Leu	Leu	Asp	Asn		
65					70					75					80		
Ser	Thr	Thr	Phe	Thr	Ser	Glu	Lys	Tyr	Ala	Leu	Pro	Asn	Asn	Asn	Ser		
				85					90					95			
Ala	Arg	Gly	Phe	Glu	Val	Ile	Asp	Ser	Ile	Lys	Ser	Gln	Leu	Glu	Asn		
			100					105					110				
Ala	Cys	Thr	Gly	Val	Val	Ser	Cys	Ala	Asp	Ile	Leu	Thr	Ile	Ala	Ala		
		115					120					125					
Arg	Asp	Ser	Val	Val	Gln	Leu	Gly	Gly	Pro	Ser	Trp	Lys	Val	Met	Leu		
	130					135					140						
Gly	Arg	Arg	Asp	Ser	Thr	Thr	Ala	Ser	Ile	Ser	Gly	Ala	Asn	Asn	Asn		
145					150					155					160		
Ile	Pro	Pro	Pro	Thr	Ser	Asn	Leu	Thr	Lys	Leu	Ile	Ser	Leu	Phe	Gln		
				165					170					175			
Ala	Gln	Gly	Leu	Ser	Thr	Lys	Glu	Met	Val	Ala	Leu	Ser	Gly	Gly	His		
			180					185					190				
Thr	Ile	Gly	Gln	Ala	Gln	Cys	Lys	Asn	Phe	Arg	Ala	His	Ile	Tyr	Asn		
	195						200					205					
Asp	Thr	Asn	Ile	Asp	Thr	Thr	Tyr	Ala	Thr	Ser	Leu	Arg	Ser	Lys	Cys		
	210					215					220						
Pro	Ser	Thr	Thr	Gly	Ser	Gly	Asp	Ser	Asn	Leu	Ser	Pro	Leu	Asp	Tyr		
225					230					235				240			
Thr	Thr	Pro	Thr	Val	Phe	Asp	Lys	Asn	Tyr	Tyr	Tyr	Asn	Leu	Lys	Ser		
				245					250					255			
Lys	Arg	Gly	Leu	Leu	His	Ser	Asp	Gln	Glu	Leu	Phe	Asn	Gly	Gly	Ser		
			260					265					270				
Thr	Asp	Ser	His	Val	Thr	Lys	Tyr	Ala	Ser	Asn	Gln	Asn	Thr	Phe			
		275					280					285					

<210> 388
 <211> 161
 <212> PRT
 <213> Pinus radiata

<400> 388

Ala	Asn	Ser	Asn	Leu	Pro	Ser	Pro	Ala	Ser	Ser	Leu	Ser	Thr	Leu	Met		
1				5				10					15				
Thr	Ala	Phe	Gln	Lys	Gln	Gly	Leu	Ser	Thr	Lys	Asp	Leu	Val	Ala	Leu		
			20					25				30					
Ser	Gly	Ala	His	Thr	Ile	Gly	Gln	Ala	Arg	Cys	Thr	Thr	Phe	Arg	Thr		
	35					40					45						
Arg	Ile	Tyr	Asn	Asp	Thr	Asn	Ile	Asn	Ala	Ala	Phe	Ala	Thr	Ser	Ala		
	50					55					60						
Lys	Ala	Asn	Cys	Pro	Ser	Thr	Gly	Gly	Asp	Asn	Thr	Leu	Ser	Pro	Leu		
65					70				75					80			
Asp	Val	Leu	Thr	Pro	Thr	Thr	Phe	Asp	Asn	Lys	Tyr	Tyr	Thr	Asn	Leu		
				85				90						95			
Lys	Ser	Gln	Lys	Gly	Leu	Phe	His	Ser	Asp	Gln	Glu	Leu	Phe	Asn	Gly		
			100					105				110					
Gly	Ser	Thr	Asp	Ser	Arg	Val	Ser	Ile	Tyr	Ser	Thr	Ser	Gln	Ala	Ile		
		115					120					125					
Phe	Phe	Thr	Asp	Phe	Ala	Ala	Ala	Met	Val	Asn	Met	Gly	Asn	Ile	Ser		

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130		135		140											
Pro	Leu	Thr	Gly	Thr	Asn	Gly	Glu	Ile	Arg	Thr	Asn	Cys	Arg	Lys	Val
145					150					155					160
Asn															

<210> 389
 <211> 318
 <212> PRT
 <213> Pinus radiata

<400> 389

Met	Arg	Thr	Leu	Val	Cys	Ile	Gly	Leu	Met	Ala	Val	Phe	Val	Ala	Phe
1				5					10					15	
Ile	His	Ile	Asn	Ala	Val	Asn	Gly	Gln	Leu	Ser	Ser	Thr	Phe	Tyr	Ala
			20					25					30		
Lys	Ser	Cys	Pro	Arg	Leu	Pro	Ser	Ile	Val	Lys	Ser	Val	Val	Lys	Gln
		35					40					45			
Ala	Val	Ala	Lys	Glu	Lys	Arg	Met	Gly	Ala	Ser	Leu	Val	Arg	Leu	His
	50					55					60				
Phe	His	Asp	Cys	Phe	Val	Asn	Gly	Cys	Asp	Gly	Ser	Ile	Leu	Leu	Asp
65					70					75				80	
Asp	Asn	Ala	Thr	Phe	Thr	Gly	Glu	Lys	Thr	Ala	Gly	Pro	Asn	Ala	Asn
				85					90					95	
Ser	Ala	Arg	Gly	Phe	Glu	Val	Ile	Asp	Ser	Ile	Lys	Thr	Gln	Val	Glu
			100					105					110		
Ala	Ala	Cys	Ser	Gly	Val	Val	Ser	Cys	Ala	Asp	Ile	Leu	Thr	Ile	Ala
		115					120					125			
Ala	Arg	Asp	Ser	Ile	Val	Glu	Leu	Gln	Gly	Pro	Thr	Trp	Thr	Val	Met
	130					135					140				
Leu	Gly	Arg	Arg	Asp	Ser	Thr	Thr	Ala	Ser	Leu	Ser	Ala	Ala	Asn	Asn
145					150					155				160	
Asn	Ile	Pro	Ser	Pro	Ala	Ser	Ser	Leu	Ser	Thr	Leu	Ile	Ser	Ser	Phe
				165					170					175	
Gln	Ala	His	Gly	Leu	Ser	Thr	Lys	Asp	Leu	Val	Ala	Leu	Ser	Gly	Ala
			180					185					190		
His	Thr	Ile	Gly	Gln	Ser	Arg	Cys	Ala	Phe	Phe	Arg	Thr	Arg	Ile	Tyr
		195					200					205			
Asn	Glu	Thr	Asn	Ile	Asn	Ala	Ala	Phe	Ala	Thr	Ser	Val	Lys	Ala	Asn
	210				215							220			
Cys	Pro	Ser	Ala	Gly	Gly	Asp	Ser	Asn	Leu	Ser	Pro	Leu	Asp	Ala	Val
225					230					235				240	
Thr	Ser	Ile	Thr	Phe	Asp	Asn	Lys	Tyr	Tyr	Ser	Asn	Leu	Lys	Ile	Gln
				245					250					255	
Lys	Gly	Leu	Leu	His	Ser	Asp	Gln	Gln	Leu	Phe	Asn	Gly	Gly	Ser	Thr
			260					265					270		
Asp	Ser	Gln	Val	Thr	Ala	Tyr	Ser	Ser	Asn	Gln	Asn	Ser	Phe	Phe	Ile
		275					280					285			
Asp	Phe	Thr	Ala	Ala	Met	Val	Lys	Met	Gly	Asn	Ile	Ser	Pro	Leu	Thr
	290					295					300				
Gly	Thr	Asn	Gly	Gln	Ile	Arg	Lys	Asn	Cys	Arg	Lys	Ser	Asn		
305					310					315					

<210> 390
 <211> 95
 <212> PRT
 <213> Pinus radiata

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<400> 390
 Lys Leu Pro Lys Ser Gly Gly Asp Asn Asn Leu Ser Pro Leu Asp Leu
 1 5 10 15
 Leu Thr Pro Thr Thr Phe Asp Asn Lys Tyr Tyr Thr Asn Leu Lys Ser
 20 25 30
 Gln Lys Gly Leu Leu His Ser Asp Gln Gln Leu Phe Asn Gly Gly Ser
 35 40 45
 Ala Asp Ser Gln Val Thr Thr Tyr Ser Thr Thr Gln Ser Thr Phe Phe
 50 55 60
 Thr Asp Phe Ala Ala Ser Met Leu Asn Met Gly Asn Ile Ser Pro Leu
 65 70 75 80
 Thr Gly Thr Ser Gly Gln Ile Arg Lys Asn Cys Arg Lys Pro Asn
 85 90 95

<210> 391
 <211> 201
 <212> PRT
 <213> Pinus radiata

<400> 391
 Met Thr Ser Phe Thr Ala Met Ala Ser Val Val Cys Ile Ala Leu Leu
 1 5 10 15
 Phe Phe Ser Thr Val Ala Phe Ala Gln Leu Asn Ser Thr Tyr Tyr Asp
 20 25 30
 Thr Ser Cys Pro Lys Leu Leu Ala Thr Val Lys Ala Ala Val Lys Thr
 35 40 45
 Ala Val Ala Asn Glu Lys Arg Met Gly Ala Ser Leu Leu Arg Leu His
 50 55 60
 Phe His Asp Cys Phe Val Asn Gly Cys Asp Gly Ser Val Leu Leu Asp
 65 70 75 80
 Asp Ser Ser Ser Leu Thr Gly Glu Lys Thr Ala Leu Pro Asn Asn Asn
 85 90 95
 Ser Leu Arg Gly Phe Asp Val Ile Asp Thr Ile Lys Ser Gln Val Glu
 100 105 110
 Ala Val Cys Ser Gly Ile Val Ser Cys Ala Asp Ile Leu Ala Ile Thr
 115 120 125
 Ala Arg Asp Ser Val Val Glu Leu Gly Gly Pro Thr Trp Thr Val Leu
 130 135 140
 Leu Gly Arg Arg Asp Ser Ala Thr Ala Ser Leu Ser Ala Ala Asn Thr
 145 150 155 160
 Asn Ile Pro Ala Pro Thr Ser Asn Leu Ser Gly Leu Ile Ser Ser Phe
 165 170 175
 Gln Ala Gln Gly Leu Ser Thr Lys Asp Met Ile Val Leu Ser Gly Ala
 180 185 190
 His Thr Ile Gly Gln Ala Arg Cys Thr
 195 200

<210> 392
 <211> 120
 <212> PRT
 <213> Pinus radiata

<400> 392
 Leu Ile Ser Ser Phe Thr Ala His Gly Leu Ser Thr Lys Asp Leu Gly
 1 5 10 15
 Ala Leu Ser Gly Ala His Thr Ile Gly Gln Ala Arg Cys Thr Thr Phe

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Ala	Val	Cys	Ser	Gly	Val	Val	Ser	Cys	Ala	Asp	Ile	Leu	Ala	Ile	Ala
		115						120				125			
Ala	Arg	Asp	Ser	Val	Val	Gln	Leu	Gly	Gly	Pro	Thr	Trp	Thr	Val	Gln
		130				135						140			
Leu	Gly	Arg	Arg	Asp	Ser	Arg	Thr	Ala	Ser	Leu	Ser	Gly	Ala	Asn	Asn
145					150					155					160
Asn	Ile	Pro	Ala	Pro	Thr	Ser	Asn	Leu	Ser	Ala	Leu	Ile	Ser	Leu	Phe
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			180					185						190	
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<400> 395

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Pro Leu Asp Tyr Met Thr Pro Thr Val Phe Asp Lys Asn Tyr Tyr Ser
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 275 280 285
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aggaagccaa gtccaagccc atcgccgtct ccgatgacat caagcctcgt ctct 414

Claims:

1. An isolated polynucleotide comprising a nucleotide sequence selected from the group consisting of: (1) sequences recited in SEQ ID NOS: 89-266 and 350-375; (2) complements of the sequences recited in SEQ ID NOS: 89-266 and 350-375; (3) reverse complements of the sequences recited in SEQ ID NOS: 89-266 and 350-375; (4) reverse sequences of the sequences recited in SEQ ID NOS: 89-266 and 350-375; (5) nucleotide sequences producing an Expectation ("E") value of 0.01 or less when compared to a sequence recited in (1) – (4) above; (6) nucleotide sequences having at least 50% identity to a nucleotide sequence recited in (1) – (4) above; (7) nucleotide sequences that hybridize to a sequence recited in (1) – (4) above under stringent hybridization conditions; (8) nucleotide sequences that are 200-mers of a sequence recited in (1) – (4) above; (9) nucleotide sequences that are 100-mers of a sequence recited in (1) – (4) above; (10) nucleotide sequences that are 40-mers of a sequence recited in (1) – (4) above; (11) nucleotide sequences that are 20-mers of a sequence recited in (1) – (4) above; (12) nucleotide sequences that are degeneratively equivalent to a sequence recited in (1) – (4) above; and (13) nucleotide sequences that are allelic variants of a sequence recited in (1) – (4) above.
2. An isolated oligonucleotide probe or primer comprising at least 10 contiguous residues complementary to 10 contiguous residues of a nucleotide sequence recited in claim 1.
3. A kit comprising a plurality of oligonucleotide probes or primers of claim 2.
4. A storage medium having recorded thereon a plurality of polynucleotides, at least one of the polynucleotides comprising a nucleotide sequence recited in claims 1 or 2.
5. A construct comprising a polynucleotide of claim 1.
6. A transgenic cell comprising a construct according to claim 5.
7. A construct comprising, in the 5'-3' direction:
 - (a) a gene promoter sequence;
 - (b) a polynucleotide sequence comprising at least one of the following: (1) a polynucleotide coding for at least a functional portion of a polypeptide encoded by a nucleotide sequence of claim 1; and (2) a polynucleotide

comprising a non-coding region of a gene coding for a polypeptide encoded by a nucleotide sequence selected from the group consisting of sequences recited in claim 1; and

(c) a gene termination sequence.

8. The construct of claim 7, wherein the polynucleotide is in a sense orientation.
9. The construct of claim 7, wherein the polynucleotide is in an antisense orientation.
10. The construct of claim 7, wherein the gene promoter sequence is functional in a plant host to provide for transcription in xylem.
11. A transgenic plant cell comprising a construct of claim 7.
12. A plant comprising a transgenic plant cell according to claim 11, or a part or propagule or progeny thereof.
13. A method for modulating one or more of the lignin content, the lignin composition and the lignin structure of a plant, comprising stably incorporating into the genome of the plant a polynucleotide of claim 1.
14. The method of claim 20 wherein the plant is selected from the group consisting of eucalyptus and pine species.
15. The method of claim 20 comprising stably incorporating into the genome of the plant a construct of claim 7.
16. A method for producing a plant having one or more of altered lignin content, altered lignin composition and altered lignin structure, comprising:
 - (a) transforming a plant cell with a construct of claim 7 to provide a transgenic cell; and
 - (b) cultivating the transgenic cell under conditions conducive to regeneration and mature plant growth.
17. A method for modifying the activity of a polypeptide involved in a lignin biosynthetic pathway in a plant comprising stably incorporating into the genome of the plant a construct of claim 7.
18. An isolated polypeptide comprising an amino acid sequence selected from the group consisting of: (a) sequences of SEQ ID NO: 267-349 and 376-401; (b) sequences having at least 50% identity to a sequence of (a); sequences having at least 70% identity to a sequence of (a); and sequences having at least 90% identity to a sequence of (a).

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19. An isolated polypeptide encoded by an isolated polynucleotide sequence of claim 1.

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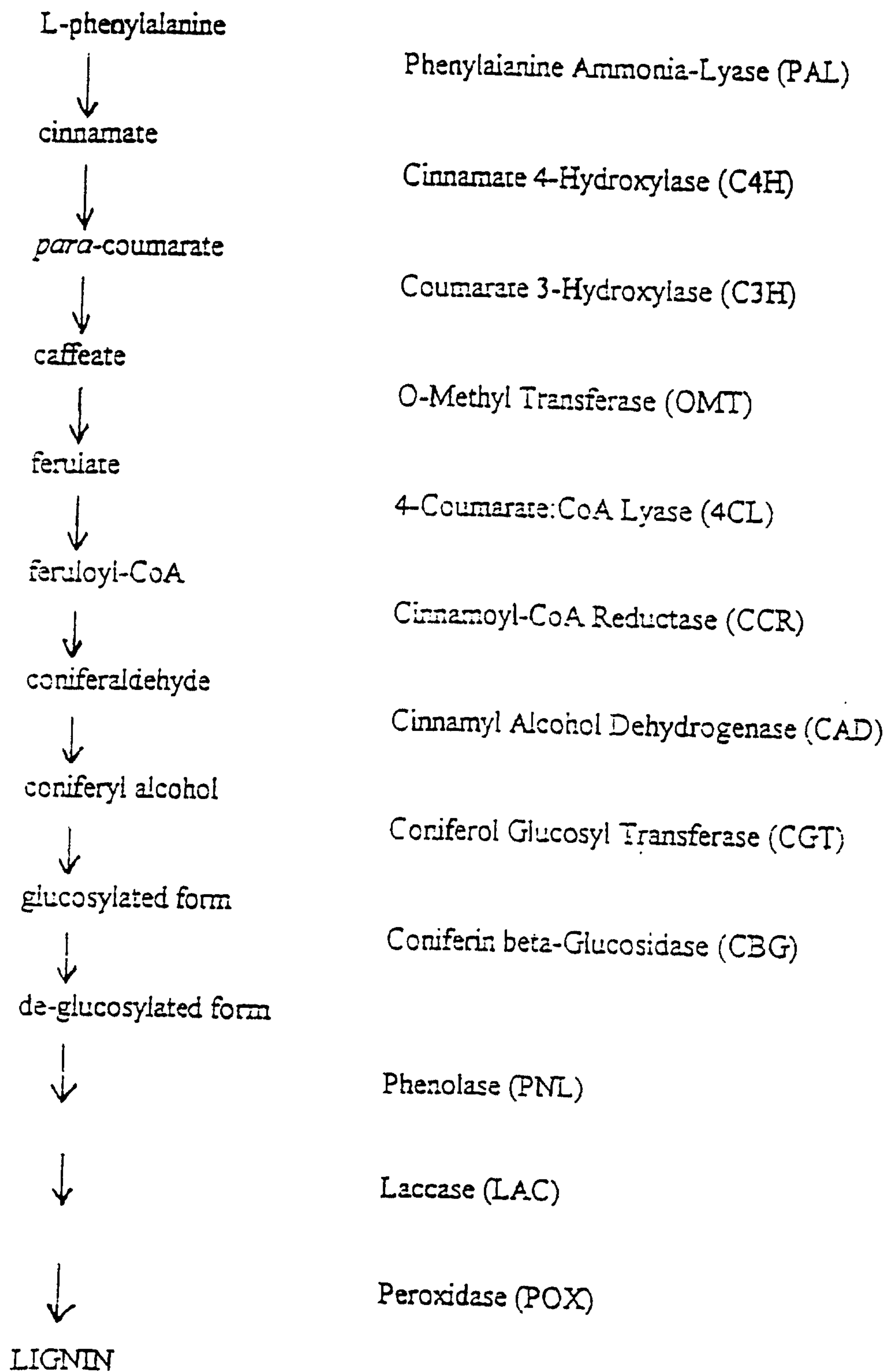


FIGURE 1

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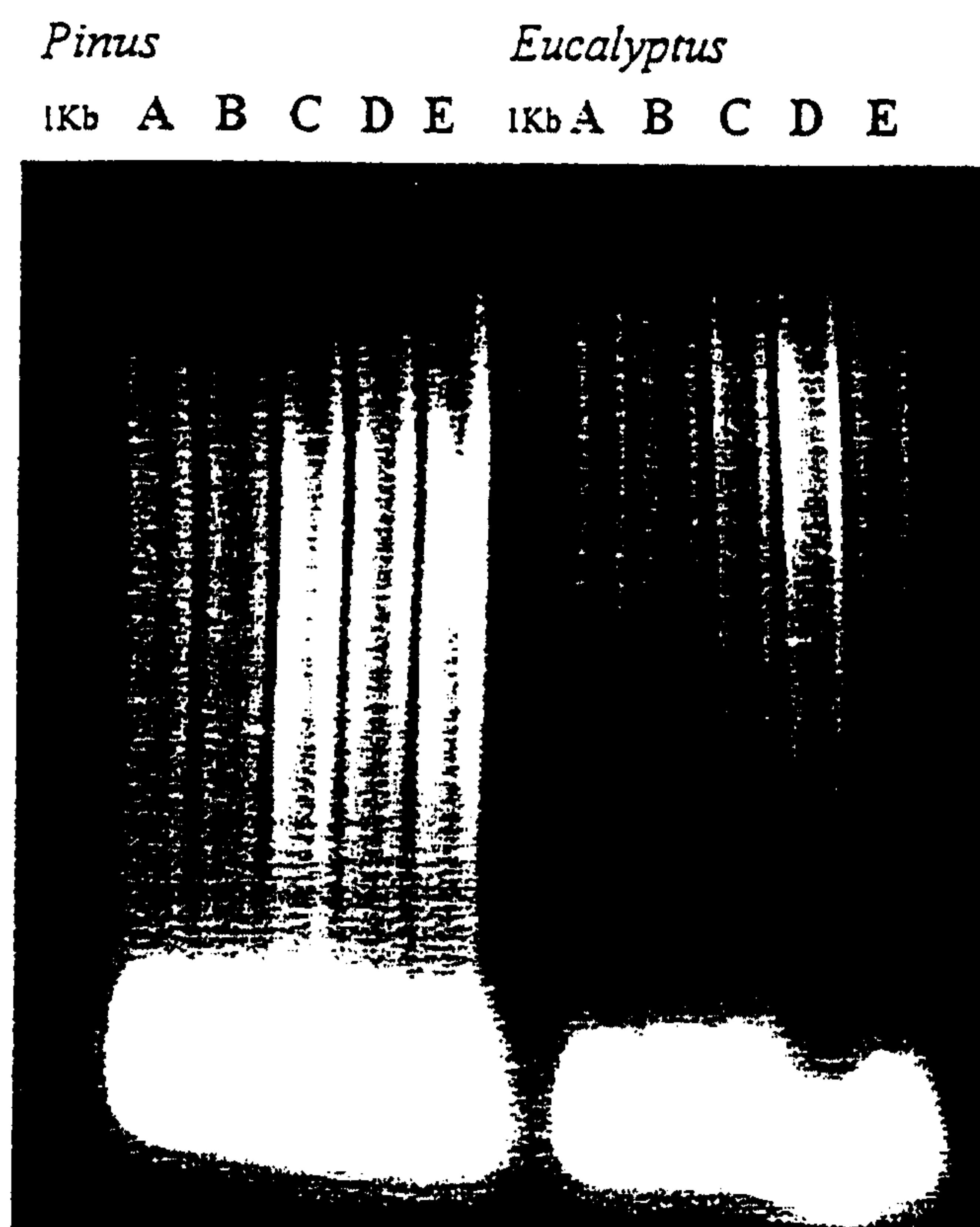


FIGURE 2

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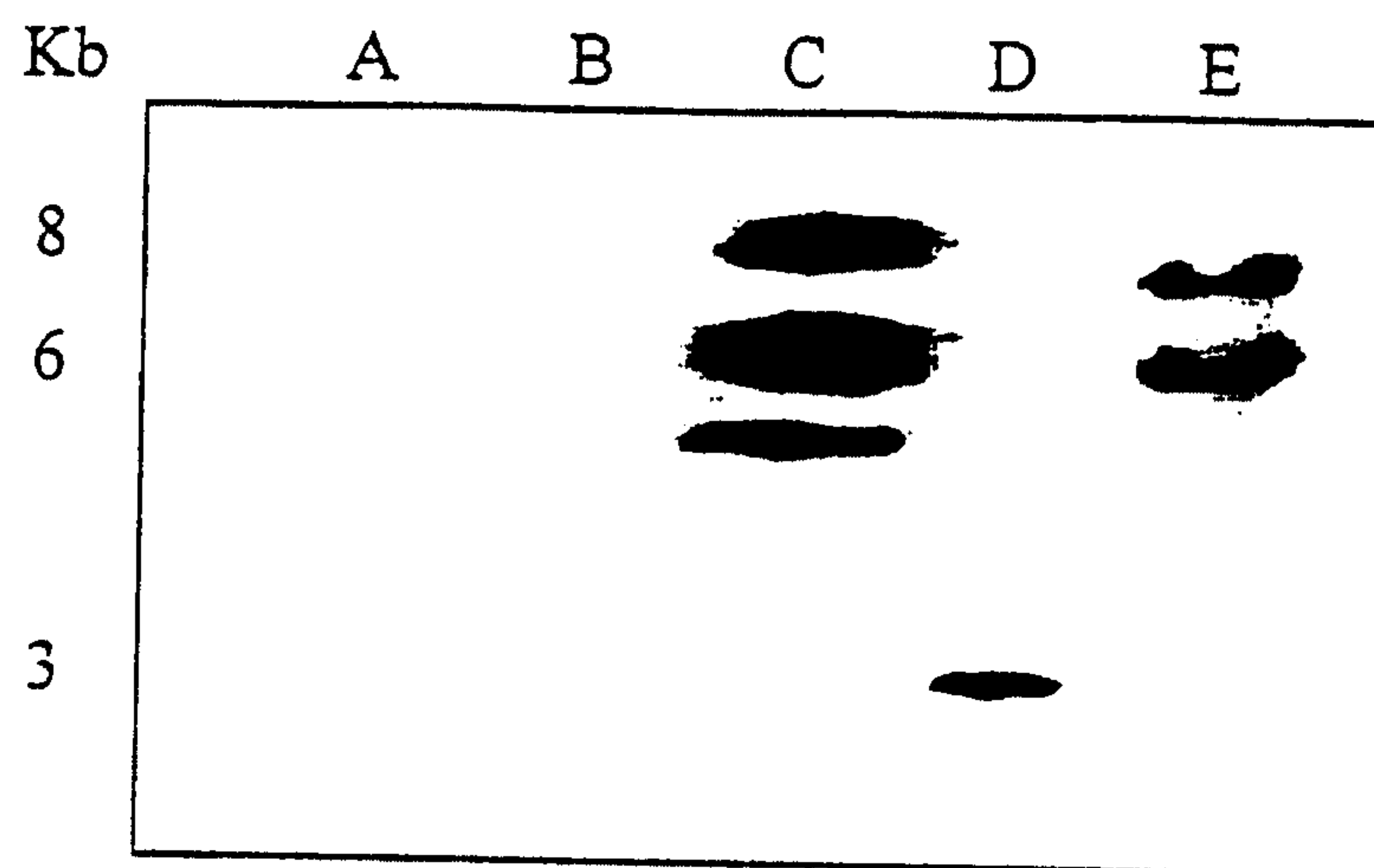


FIGURE 3

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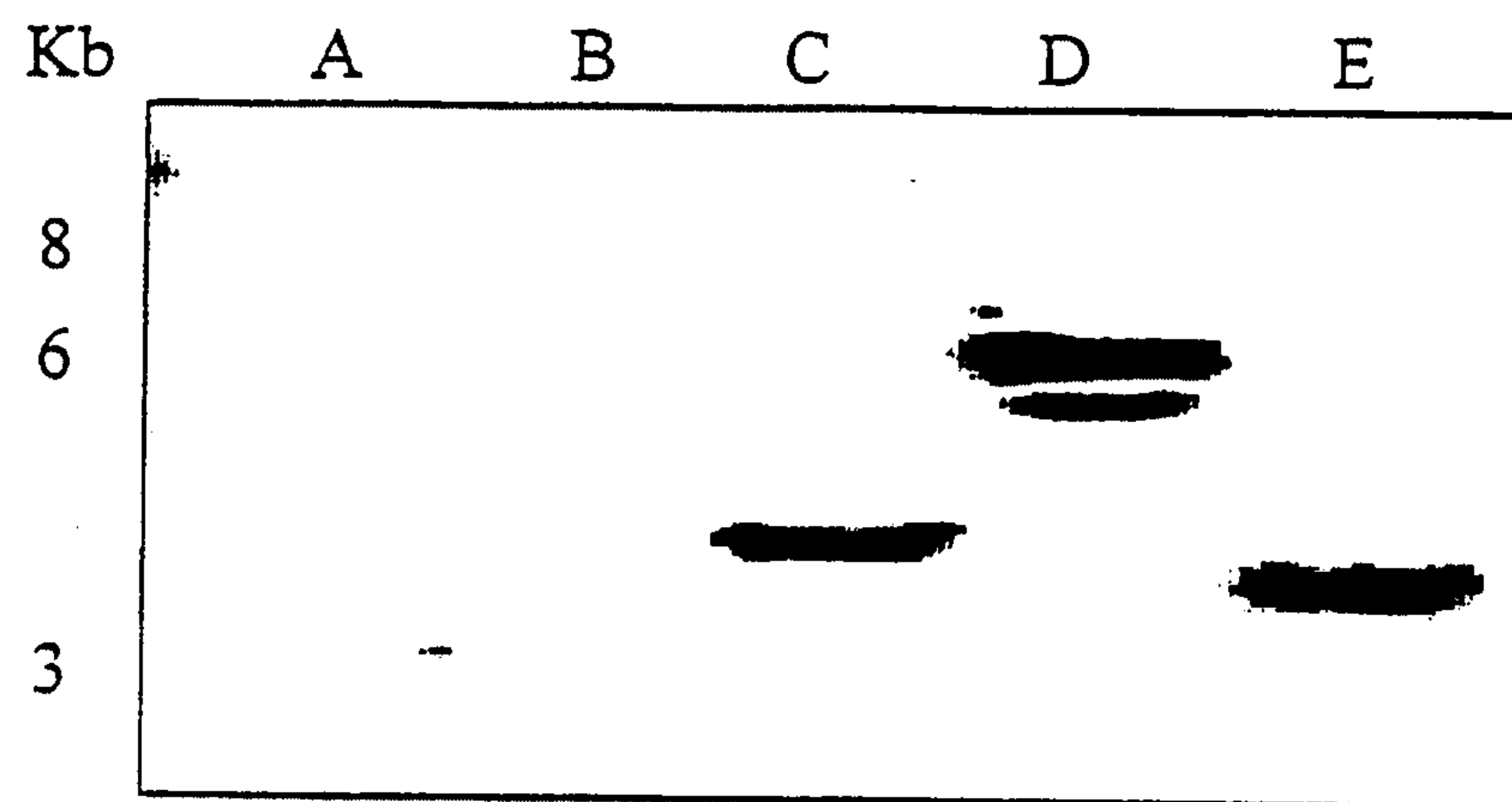


FIGURE 4

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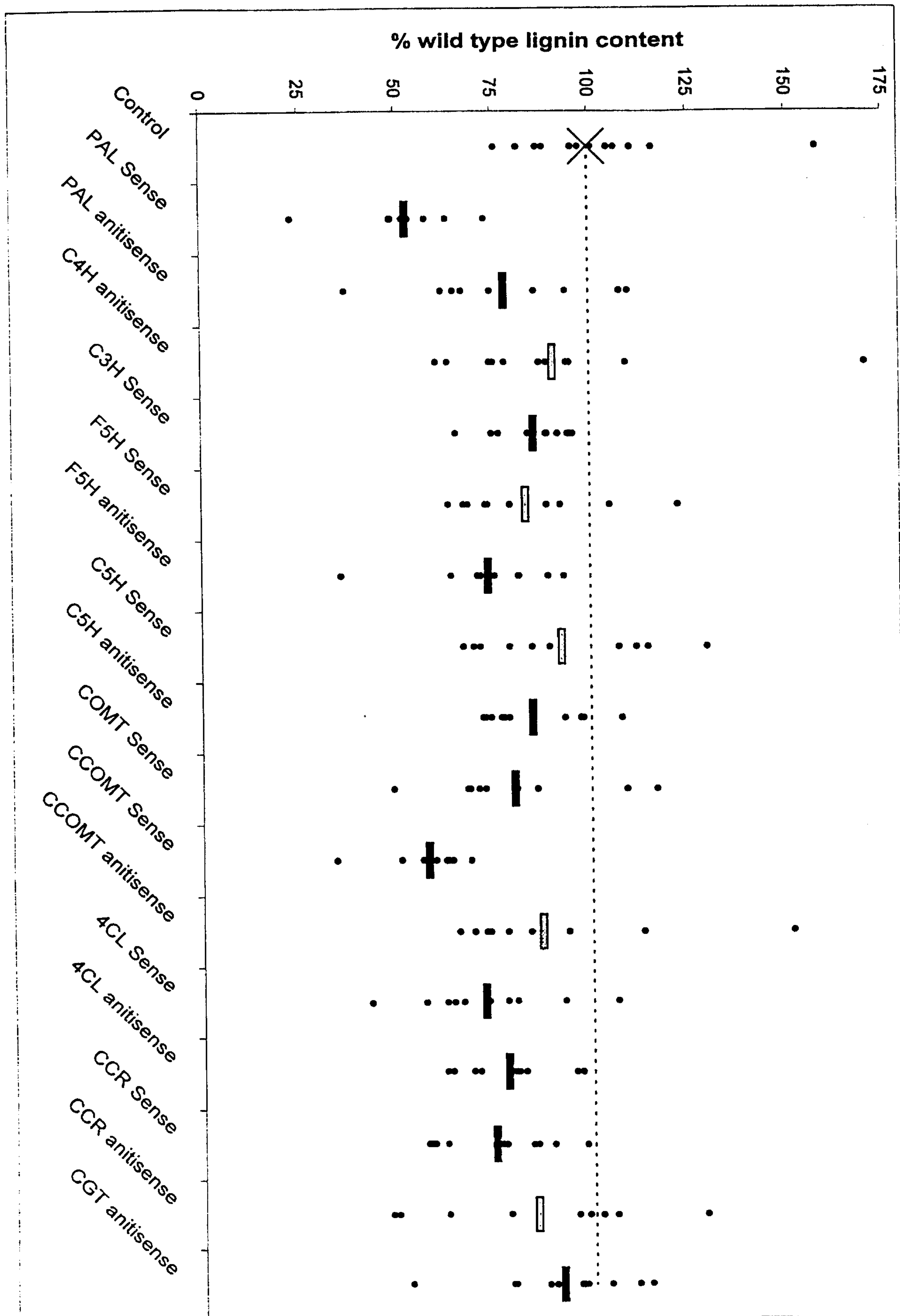


FIGURE 5