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(54) Title: MATERIALS AND METHODS FOR THE MODIFICATION OF ISOPRENOID CONTENT, COMPOSITION AND METABOLISM (57) Abstract Novel isolated polynucleotides associated with plant isoprenoid biosynthetic pathways are provided, together with genetic constructs comprising such sequences. Methods for the modulation of the content, structure and metabolism of polypeptides involved in an isoprenoid biosynthetic pathway in target organisms are also disclosed, the methods comprising incorporating one or more of the polynucleotides or genetic constructs of the present invention into the genome of a target organism. Modulation of the content, structure and metabolism of such polypeptides produces modifications in the content, structure and metabolism of isoprenoids in the target organism.		

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MATERIALS AND METHODS FOR THE MODIFICATION OF ISOPRENOID CONTENT, COMPOSITION AND METABOLISM

Technical Field of the Invention

This invention relates materials and methods for modifying the content, composition and metabolism of isoprenoids in plants and other organisms. More particularly, this invention relates to polypeptides involved in the synthesis of isoprenoid compounds, such as terpenoid and steroid compounds, polynucleotides encoding such polypeptides, expression of such polypeptides, and methods for modulating the composition and/or expression levels of such polypeptides, thereby modulating isoprenoid content, composition, and metabolism.

Background of the Invention

Isoprenoids form a large family of naturally occurring compounds, with over 20,000 distinct compounds having been described. The isoprenoids include vitamins A, D, E, and K, first recognized as fatty materials essential to the normal growth of animals, and numerous biological pigments. In plants, isoprenoid compounds, including terpenoid and steroid compounds, include hormones such as gibberellic acid and abscisic acid, pigments, electron carriers, membrane components (phytosterols), phytotoxins, antibiotics, flavors such as menthol, vitamins, macromolecular compounds such as rubber and guttapercha, and others.

Isoprene compounds, or prenyl lipids, are composed of one or more basic isoprene skeleton(s) (C_5) formed by the decarboxylation of mevalonate-5-pyrophosphate. From the isopentenyl pyrophosphate ("active isoprene" or "IPP") and the isomeric dimethylallyl pyrophosphate, the geranyl pyrophosphate (C_{10}) may be formed by "head-tail" condensation. By linkage of a further C_5 unit, farnesyl pyrophosphate (C_{15}) is formed. Further extension by "head-tail" or "tail-tail" condensation leads to C_{20} , C_{30} and C_{40} compounds, as well as the higher molecular terpenoids. A schematic diagram of the basic biosynthetic pathways of isoprene compounds is shown in Fig. 1.

IPP is the branching point for a large variety of biologically significant molecules, including isoprenoids, carotenoids, and various sterols in different eukaryotic organisms

(mycosterols, phytosterols and zoosterols). In animals, cholesterol is a precursor for several hormones and bile acids. Fungal ergosterol and mammalian cholesterol arise from IPP via squalene oxide and lanosterol, while higher plant sterols, like campesterol and sitosterol, are produced by cyclization of squalene oxide to cycloartenol and by further
5 plant-specific enzymes.

Plant cells contain an intriguing diversity of a subclass of isoprenoids called terpenoids, most of which are cyclic with one or more rings. Terpenes in plants are divided into several classes, including sesquiterpenes, mono-, di-, triterpenes, etc. (Bohlmann *et al.*, *Proc. Natl. Acad. Sci. USA* 95:4126-4133, 1998). Terpenoids are formed by linking
10 isoprene units (C_5H_8) synthesized from acetate. Terpenoids include isoprene (C_5H_8) compounds, including isopentenylpyrophosphate and active isoprene; monoterpene ($C_{10}H_{16}$) compounds, including geraniol, and from which menthol, camphor, pinene and citronellal are derived; sesquiterpene ($C_{15}H_{24}$) compounds, including farnesol, from which zingiberene, ubiquinone, plastoquinone, abscisic acid and rishitin are derived; diterpene
15 ($C_{20}H_{32}$) compounds, such as geranylgeraniol, from which phytol, kaurene, gibberellins, gibberellic acid and fusicoccin are derived; triterpene ($C_{30}H_{48}$) compounds, including squalene, from which steroids and saponins are derived; tetraterpene ($C_{40}H_{64}$) compounds, including phytoene and carotenes; and polyterpene ($(C_5H_8)_n$) compounds, including rubber and guttapercha.

20 Synthase enzymes producing terpenes are thought to be of common evolutionary origin, lacking close similarity to other enzymes (except prenyltransferases). Most synthase enzymes have the ability to produce a variety of end-products from a single substrate. This may explain, in part, the enormous diversity of terpenoid compounds found in plants (Mitchell-Olds *et al.*, *Trends in Plant Science* 3(9):362-365, 1998). Complex
25 terpene mixtures are thought to be important plant defensive compounds, their diversity and synergistic action delaying development of resistance in herbivores and pathogens (Langenheim J, *J. Chem. Ecol.* 20:1223-1280, 1994).

Plant terpenoids also have many known medicinal effects, and some plant isoprenoid compounds are administered as drugs. Taxol, which has proven to be
30 efficacious in treating cancer, for example, is derived from terpenoid compounds. Dietary isoprenoids have been suggested to suppress mevalonate pathway, thereby affecting cancer and cardiovascular disease (Elson CE, *J. Nutr.* 125(6 Suppl):1666S-1672S, 1995). Farnesol, the last precursor common to all branches of the mevalonate pathway, has been

demonstrated to inhibit calcium channels in muscle cells (Roullette J-B, *J. Biol. Chem.* 51:32240-32246, 1997).

Ubiquinone and plastoquinone, which are also isoprenoid derivatives, function as electron carriers in the production of ATP in mitochondria and chloroplasts. In most mammalian tissues, ubiquinone (also called coenzyme Q) has ten isoprene units. Plastoquinone is the plant equivalent of ubiquinone. In their role as electron carriers, both ubiquinone and plastoquinone can accept either one or two electrons and either one or two protons to be reduced.

A remarkable role for isoprenyl intermediates has recently been discovered in studies of a protein that is implicated in human cancers and is known to associate with membranes through a covalently bound isoprenyl lipid. This protein, the RAS PROTEIN, is the product of the gene, a mutant version of a normal protein and a number of related GTP-binding proteins. The normal protein and the number of related GTP-binding proteins are known to art in signal transductions triggered by neurotransmitters, hormones, growth factors and other extracellular signals.

Quantitative and qualitative modifications in plant terpenoid content are known to be induced by external factors such as herbivore attack and wounding (Bohlmann J *et al.*, *Proc. Natl. Acad. Sci. USA* 95:6756-6761, 1998). Synthesis of cell terpenoids can also be induced by infection with pathogens. Even agricultural pest insects can be repelled by pine oil terpene compounds: monoterpenes carene, limonene and cymene deter onion flies (Ntiamoah Ya, *Entom. Exp. et Appl.* 79:219-226, 1996).

While the chemical diversity of isoprenoids is well known, and many of the metabolic pathways have been tentatively identified, few of the genes encoding enzymes responsible for the synthesis of isoprenoid compounds have been identified. The present invention is therefore directed to providing novel polynucleotides encoding polypeptides involved in the biosynthesis of isoprenoids, and providing methods for modifying the expression and composition of such polypeptides, thereby modulating isoprenoid content, composition, and metabolism.

Sequencing of the genomes, or portions of the genomes, of numerous biological materials, including humans, animals, microorganisms and various plant varieties, has been and is being carried out on a large scale. Polynucleotides identified using sequencing techniques may be partial or full-length genes, and may contain open reading frames, or portions of open reading frames, that encode polypeptides. Putative polypeptides may be

determined based on polynucleotide sequences. The sequencing data relating to polynucleotides thus represents valuable and useful information.

Polynucleotides may be analyzed for novelty by comparing identified sequences to sequences published in various public domain databases, such as EMBL. Newly
5 identified polynucleotides and putative polypeptides may also be compared to polynucleotides and polypeptides contained in databases to ascertain homology to known polynucleotides and polypeptides. In this way, the degree of similarity or identity or homology of polynucleotides and polypeptides having an unknown function may be determined relative to polynucleotides and polypeptides having known functions.

10 U.S. Patent 5,589,619 discloses materials and methods for increasing squalene and sterol accumulation in higher plants by modifying the copy number of a gene encoding a polypeptide having HMG-CoA reductase activity. Genetic materials, including polynucleotides, polypeptides, DNA molecules, and the like, relating to HMG-CoA reductase activity are disclosed, as well as methods for transforming plant cells and
15 producing transgenic plants.

U.S. Patent 5,689,047 discloses stilbene synthase genes derived from grapevines, as well as the use of those genes in vectors and transformed microorganisms, as well as transformed plant cells and plants.

U.S. Patent 5,753,507 discloses plant polynucleotides encoding geraniol/nerol 10 –
20 hydroxylase ($G_{10}H$), as well as methods for using complete and partial polynucleotides as probes, and methods for expressing $G_{10}H$ and enhancing levels of terpenoid indole alkaloid and iivoid insect pheromone produced by a plant.

The following U.S. Patents disclose isoprenoid compounds or related compounds, or methods for using such compounds: U.S. Patent 5,429,939; U.S. Patent 5,444,166; U.S.
25 Patent 5,460,949; U.S. Patent 5,470,832; U.S. Patent 5,474,925; U.S. Patent 5,495,070; U.S. Patent 5,521,078; U.S. Patent 5,545,816; U.S. Patent 5,547,856; U.S. Patent 5,569,832; U.S. Patent 5,580,963; U.S. Patent 5,597,718; U.S. Patent 5,670,349; U.S. Patent 5,674,485; U.S. Patent 5,684,238; U.S. Patent 5,689,056; U.S. Patent 5,691,147; U.S. Patent 5,693,476; and U.S. Patent 5,443,978. The U.S. Patents cited above are
30 incorporated by reference herein in their entireties.

Summary of the Invention

Briefly, the present invention provides isolated polynucleotides encoding polypeptides involved in the production and modification of isoprenoids. Genetic constructs comprising such sequences and methods for the use of such genetic constructs are also provided, together with transgenic cells and plants incorporating such genetic constructs and exhibiting modified isoprenoid content, composition, and metabolism.

In a first aspect, the present invention provides isolated polynucleotide sequences identified in the attached Sequence Listing as SEQ ID NOS: 1-53 and 78-164, variants of those sequences, extended sequences comprising the sequences set out in SEQ ID NOS: 1-53, 78-164 and their variants, probes and primers corresponding to the sequences set out in SEQ ID NOS: 1-53, 78-164 and their variants, polynucleotides comprising at least a specified number of contiguous residues of any of the polynucleotides identified as SEQ ID NOS: 1-53 and 78-164 (x-mers), and extended sequences comprising portions of the sequences set out in SEQ ID NOS: 1-53 and 78-164, all of which are referred to herein, collectively, as “polynucleotides of the present invention.”

The present invention also provides isolated polypeptide sequences identified in the attached Sequence Listing as SEQ ID NOS: 165-304, polypeptide variants of those sequences, polypeptides comprising the isolated polypeptide sequences and variants of those sequences, polypeptides comprising at least a specified number of contiguous residues of any of the polypeptides identified as SEQ ID NOS: 165-304; and polypeptides comprising portions of the sequences set out in SEQ ID NOS: 165-304.

The polynucleotide sequences identified as SEQ ID NOS: 1-53 and 78-164 were derived from plant sources, namely from *Eucalyptus grandis* and *Pinus radiata*. The polynucleotides of the present invention are primarily “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. The partial sequences identified as SEQ ID NOS: 1-53 and 78-164 may thus 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: 1-53 and 78-164 or a variant thereof, or a portion of one of the sequences of SEQ ID NOS: 1-53

and 78-164 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: 1-53 and 78-164 or a variant thereof. Similarly, RNA sequences, reverse sequences, complementary sequences, anti-sense sequences, and the like, corresponding to
5 the polynucleotides of the present invention, may be routinely ascertained and obtained using the cDNA sequences identified as SEQ ID NOS: 1-53 and 78-164.

The polynucleotides identified as SEQ ID NOS: 1-53 and 78-164 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
10 full length sequences corresponding to the sequences set out as SEQ ID NOS: 1-53 and 78-164. 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
15 <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, polynucleotides and
20 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 DNA constructs comprising the open reading frames and suitable promoters, initiators,
25 terminators, etc., which are well known in the art, may then be constructed. Such DNA 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.

Polypeptides encoded by the polynucleotides of the present invention may be
30 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 an organism, such methods involving, according to one embodiment, 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 plant, 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 an organism having an altered genotype or phenotype is provided, the method comprising transforming a host cell with a genetic construct of the present invention to provide a transgenic cell, and cultivating the transgenic cell under conditions conducive to growth and regeneration. Organisms having an altered genotype or phenotype as a result 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 organisms and progeny of such organisms, are contemplated by and encompassed within the present invention.

The isolated polynucleotides of the present invention have utility in genome mapping, in physical mapping, and in positional cloning of genes. Additionally, the polynucleotide sequences identified as SEQ ID NOS: 1-53, 78-164, 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, CA).

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 polynucleotides of the present invention encode polypeptides that have activity in an isoprenoid biosynthetic pathway. The isoprenoid metabolism-related polynucleotides were isolated from pine and eucalyptus, and putatively identified by DNA and protein similarity searches. Various isoprenoid compounds are well characterized and have useful properties. Methods of the present invention relating to modulating the polynucleotide and/or polypeptide content and composition of an organism and, thereby, modulating the isoprenoid content, composition and metabolism of an organism, are applicable to a wide range of activities. The novel materials and methods of the present invention have a multitude of potential uses: in forestry and agriculture for manipulation of isoprenoid metabolism; in medicine for therapeutic effects, including direct application in diseased organisms or indirect application by transgenic organisms; in fermentation and chemical processing industries involving isoprenoids; and in numerous other applications, some of which are described in the references cited above. In plant applications, manipulating isoprenoid pathways or isoprenoid composition may, for example, affect plant development, pest resistance, and the value of extractives (pinene, myrcene, etc.). In foodstuffs, various isoprenoids affect the nutritional quality and pharmacological properties of the ingested material, *e.g.* cholesterol or phytosterol composition of animal-derived and plant-derived foods for human or animal consumption. Additionally, isoprenoid pathways control the production of vitamins A, E, and K; plant pigments such as carotene and the phytol chain of chlorophyll; natural rubber; many essential oils, such as the fragrant principles of lemon oil, eucalyptus, and musk; insect juvenile hormone, which controls metamorphosis; dolichols, which serve as lipid-soluble carriers in complex polysaccharide synthesis; and ubiquinone and plastoquinone, electron carriers in mitochondria and chloroplasts. The ubiquitous and varied roles of isoprenoids thus make these compounds and the polynucleotides encoding them attractive targets for biotechnical applications in a variety of fields.

Briefly, the present invention provides isolated polynucleotides encoding polypeptides involved in the synthesis of isoprenoids. The polynucleotides and polypeptides of the present invention have demonstrated similarity to polypeptides that are known to be involved in the synthesis of isoprenoids as shown below in Table 1.

TABLE 1

POLYNUCLEOTIDE SEQ ID NO	POLYPEPTIDE SEQ. ID	POLYPEPTIDE IDENTITY
1	252	Acetylcholinesterase Precursor
2	253	Deoxyxylulosephosphate Synthase (DXPS)
3, 4, 44	254,255,295	Geranyltranstransferase
5, 6	256,266	Farnesyltranstransferase
7, 154	258 241	Squalene Synthetase
8-10, 155-157	259-261 242-244	Squalene Monooxygenase
11	262	Geranylgeranyl-Diphosphate Geranylgeranyltransferase
12	263	Trichodiene Synthase
13, 25, 84-88, 95 115-118	264,276 171-175, 182, 202-205	Pinene Synthase
14, 89, 90	265 176, 177	Abietadine Synthase
15, 91-94, 96-98, 131-135	266 178-181, 183-185, 218-222	Hydroxymethylglutaryl-Coa Reductase (NADPH)
16, 17, 18, 99-102	267,268,269, 186-189	Myrcene Synthase
19, 20, 103, 107, 108	270,271 190, 194, 195	Limonene Synthase
21-23, 109-111	272-274 196-198	Cadinene Synthase
24, 114	275 201	Bisabolene Synthase
26, 27	277,278	Pinene/Myrcene/Limonene Synthase
28, 119-122	279 206-209	Cycloartenol Synthase
29, 124-126	280 211-213	Obtusifoliol Demethylase
30	281	Lupeol Synthase
31, 158, 159	282 245, 246	Udp-Glucose:Sterol Glucosyltransferase
32	283	Hydroxymethylglutaryl-CoA Reductase (NADPH)
33, 34, 160-162	284,285 247-249	Sterolmethyltransferase
35, 136	286 223	Lecithin:Cholesterol Acyl Transferase
36, 137	287 224	Sterol Delta-7 Reductase
37, 38, 138-140	288,289 225-227	Methyl Sterol Oxidase
39	290	Deoxyxylulosephosphate Synthase (DXPS)
40	291	Phosphomevalonate Kinase
41, 50, 141, 142, 146	292,301 228, 229, 233	Diphosphomevalonate Decarboxylase
42, 43, 143	293,294 230	Isopentenyl-Diphosphate Delta- Isomerase

POLYNUCLEOTIDE SEQ ID NO	POLYPEPTIDE SEQ. ID	POLYPEPTIDE IDENTITY
45	296	Estradiol Dehydrogenase
46-49, 144, 145	297-300 231, 232	Furostanol Glucosidase
51, 52, 147-153	302,303 234-240	Oxysterol-Binding Protein
53	304	Sterol Carrier Protein
78, 79, 127-130	165, 166, 214-217	Sterol 14-demethylase
81	168	Sesquiterpene cyclase
82, 83	169, 170	Geranylgeranyl diphosphate
104-106, 164	191-193, 251	CXPS/transketolase
112, 113	199, 200	Sabinene synthase
123	210	Beta-amyrin synthase
163	250	Sterol desaturase

In one embodiment, the isolated polynucleotides comprise a sequence selected from the group consisting of: (a) sequences recited in SEQ ID NOS: 1-53 and 78-164; (b) complements of the sequences recited in SEQ ID NOS: 1-53 and 78-164; (c) reverse complements of the sequences recited in SEQ ID NOS: 1-53 and 78-164; (d) reverse sequences of the sequences recited in SEQ ID NOS: 1-53 and 78-164; and (e) sequences having either 40%, 60%, 75% or 90% 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 acid sequence encoded by polynucleotides of the present invention, including polynucleotides comprising a sequence set out in the group consisting of SEQ ID NOS: 1-53 and 78-164, as well as polypeptides comprising an amino acid sequence recited in SEQ ID NOS: 165- 304.

In another aspect, the invention provides genetic constructs comprising a polynucleotide of the present invention, either alone, in combination with one or more additional polynucleotides of the present invention, or in combination with one or more known polynucleotides, together with transgenic cells 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 an enzyme encoded by an inventive polynucleotide or a variant thereof; and a gene termination sequence. The open reading frame may be oriented in either a sense or antisense direction. Genetic constructs comprising a non-coding region

of a gene coding for an enzyme encoded by the above polynucleotide or a nucleotide sequence complementary to a non-coding region, together with a gene promoter sequence and a gene termination sequence, are also provided. Genetic constructs comprising, in the 5' – 3' direction, a promoter sequence; a polynucleotide sequence comprising at least one
5 of the following: (1) a polynucleotide comprising a polynucleotide of the present invention; or (2) a polynucleotide comprising a polynucleotide of the present invention and including a non-coding region of a gene coding for a polypeptide having activity in an isoprenoid biosynthetic pathway, are also contemplated. The genetic construct may further include a marker for the identification of transformed cells.

10 In a further aspect, transgenic host cells, such as transgenic plant cells, comprising the genetic constructs of the present invention are provided, together with plants comprising such transgenic cells, and fruits, seeds, and progeny of such plants. Other useful host cells include bacterial cells, insect cells, yeast cells and mammalian cells.

In yet another aspect, methods for modulating the isoprenoid content, composition,
15 and metabolism of an organism are provided, such methods including stably incorporating into the genome of the organism a genetic construct of the present invention. In a preferred embodiment, the target organism is a plant and the plant is a woody plant, preferably selected from the group consisting of eucalyptus, pine, acacia, poplar, sweetgum, teak and mahogany species, more preferably from the group consisting of pine
20 and eucalyptus species, and most preferably from the group consisting of *Eucalyptus grandis* and *Pinus radiata*. In a related aspect, a method for producing an organism having modified isoprenoid content is provided, the method comprising transforming a host cell with a genetic construct of the present invention to provide a transgenic cell and cultivating the transgenic cell under conditions conducive to growth and regeneration.

25 In yet a further aspect, the present invention provides methods for modifying the activity of a polypeptide in a target organism such as a plant, comprising stably incorporating into the genome of the organism a genetic construct of the present invention. In a preferred embodiment, the target organism is a plant, and the plant is a woody plant, preferably selected from the group consisting of eucalyptus, pine, acacia, poplar,
30 sweetgum, teak and mahogany species, more preferably from the group consisting of pine and eucalyptus species, and most preferably from the group consisting of *Eucalyptus grandis* and *Pinus radiata*.

In yet a further aspect, the present invention provides methods for modulating one or more of the content, the composition and the metabolism of an isoprenoid compound in an organism by administering an isolated polypeptide of the present invention to the organism. In applications in which the organism is a plant, administration of the polypeptide may be topical, such as by spraying or similar topical application. In applications in which the organism is mammalian, administration of the polypeptide may be systemic, such as by injection, intradermal delivery, oral delivery, delivery via nasal passageways or airways, or the like.

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.

Description of Drawings

Fig. 1 shows a schematic diagram illustrating basic biosynthetic pathways of isoprene compounds.

Fig. 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.

Fig. 3 illustrates 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: 76 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.

Fig. 4 illustrates 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: 77 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.

Detailed Description

As described above, isoprenoids are important components in a variety of eukaryotic functions. Modification of isoprenoid content, composition, and metabolism in the earlier parts of the pathway, especially the steps up to the formation of isopentenyl-diphosphate (IPP), geranyl-diphosphate (GPP), farnesyl-diphosphate (FPP) and squalene, may have a profound influence on the synthesis of the isoprenoid compounds deriving from these two precursors. Blocking one or more of the downstream steps branching from isopentenyl-diphosphate and squalene may also have a substantial effect on the pool of isopentenyl-diphosphate and squalene available for synthesis of terpenes or steroids. Hence, modifications in the synthesis, content, composition, and metabolism of any single enzyme in the isoprenoid biosynthetic pathway, and particularly in the early part of the pathway (IPP => GPP => FPP => squalene) of the isoprenoid synthesis, may affect the content, composition and metabolism of terpenoid and steroid compounds.

Using the methods and materials of the present invention, the isoprenoid content of a plant may be modified by incorporating sense or antisense copies of polynucleotides encoding polypeptides involved in the synthesis of isoprenoids into the genome of a target organism. In addition, the number of copies and combination of polynucleotides encoding for different enzymes in the biosynthetic pathway of isoprenoids may be manipulated to modify the relative amounts of isoprenoids synthesized, thereby producing biological materials having an altered composition and/or altered isoprenoid metabolism. Similarly, the alteration of isoprenoid composition, for direct application in a target organism, or for production of polypeptides for separate use, is advantageous for a variety of applications, as evidenced by the references cited above and incorporated herein by reference.

According to one embodiment, the present invention provides isolated polynucleotides encoding, or partially encoding, polypeptides having similarity to polypeptides known to be involved in isoprenoid synthesis and modification. The polynucleotides of the present invention were isolated from eucalyptus and pine species, but may alternatively be isolated from other plant sources and may be synthesized using conventional synthesis techniques. Specifically, isolated polynucleotides of the present invention comprise: the polynucleotides identified as SEQ ID NOS: 1-53 and 78-164; complements of the sequences identified as SEQ ID NOS: 1-53 and 78-164; reverse sequences of the sequences identified as SEQ ID NOS: 1-53 and 78-164; reverse complements of the sequences identified as SEQ ID NOS: 1-53 and 78-164; at least a

specified number of contiguous residues (*x*-mers) of any of the above-mentioned polynucleotides; polynucleotides complementary to any of the above polynucleotides; anti-sense sequences corresponding to any of the above polynucleotides; and variants of any of the above polynucleotides, as that term is described in this specification.

5 The isolated polynucleotides recited in SEQ ID NOS: 1-53 and 78-164 encode, or partially encode, polypeptides demonstrating sequence similarity to polypeptides known to be involved in an isoprenoid biosynthetic pathway, as indicated in Table 1 above. More specifically, the isolated polynucleotides listed in the first column of Table 1 encode, or partially encode the polypeptides listed in alignment in the second column of Table 1,
10 above. Predicted amino acid sequences corresponding to the polynucleotides set out in SEQ ID NOS: 1-53, 78-164, based on information available at the time of filing this application, are provided in SEQ ID NOS: 165-304, as indicated in Table 1.

 The term "polynucleotide(s)," as used herein, means a single or double-stranded polymer of deoxyribonucleotide or ribonucleotide bases and includes DNA and
15 corresponding RNA molecules, including HnRNA and mRNA molecules, both sense and anti-sense strands, and comprehends cDNA, genomic DNA and recombinant DNA, as well as 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
20 excised. A polynucleotide may consist of an entire gene, or any portion thereof. A gene is a polypeptide that codes for a functional polypeptide or RNA molecule. Operable anti-sense polynucleotides may comprise a fragment of the corresponding polynucleotide, and the definition of "polynucleotide" therefore includes all such operable anti-sense fragments. Anti-sense polynucleotides and techniques involving anti-sense
25 polynucleotides are well known in the art and are described, for example, in Robinson-Benion *et al.*, *Methods in Enzymol.* 254(23):363-375, 1995; and Kawasaki *et al.*, *Artific. Organs* 20(8):836-848, 1996. Polynucleotides of the present invention also encompass polynucleotide sequences that differ from the disclosed sequences but which, as a result of the degeneracy of genetic code, encode a polypeptide which is the same as that encoded
30 by a polynucleotide of the present invention.

 The definitions of the terms "complement," "reverse complement," and "reverse sequence," as used herein, are best illustrated by the following examples. For the

sequence 5' AGGACC 3', the complement, reverse complement, and reverse sequences are as follows:

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

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 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" 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 polypeptide or variant provided herein. In one embodiment, polypeptides of the present invention comprise an amino acid sequence selected from the group consisting of sequences provided in SEQ ID NOS: 165-304, as well as variants of such sequences. According to another embodiment, polypeptides of the present invention comprise at least a specified number of contiguous residues (x-mers) of any of the sequences provided in SEQ ID NOS: 165-304.

Polypeptides of the present invention may be produced recombinantly by inserting a polynucleotide 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 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 polypeptide encoding a recombinant polypeptide. Suitable host cells include prokaryotes, yeast and higher eukaryotic cells. Preferably, the host cells employed are *Escherichia coli*, insect, yeast or a mammalian cell line such as COS or CHO. The

polynucleotide(s) 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: 165-304, and variants thereof. As used herein, a “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 that are 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.* 85:2149-2154, 1963. Equipment for automated synthesis of polypeptides is commercially available from suppliers such as Perkin Elmer/Applied Biosystems, Inc. (Foster City, CA), 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 mutagenesis (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 polynucleotide or polypeptide 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 polynucleotide sequences preferably exhibit at least 40%; more preferably at least 60%; more preferably yet at least 75%; and most preferably at least 90% identity to a sequence of the present invention. Variant polypeptide sequences preferably exhibit at least 50%; more preferably at least 75%; more preferably yet at least 90%; and most preferably at least 95% 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 residues in a specified region may be determined against another polynucleotide or polypeptide, 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 percentage identity 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 [Sept-16-1998], set to the parameters described below, is preferred for use in the determination of polynucleotide variants according to the present invention. The BLASTP algorithm, set to the parameters

described below, 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, *et al.*, *Nucleic Acids Res.* 25: 3389-3402, 1997.

The computer algorithm FASTA is available on the Internet at the ftp site <ftp://ftp.virginia.edu/pub/fasta/>. Version 2.0u4 [February 1996], set to the default parameters described in the documentation and distributed with the algorithm, may be also used in the determination of variants according to the present invention. The use of the FASTA algorithm is described in Pearson and Lipman, *Proc. Natl. Acad. Sci. USA* 85:2444-2448, 1988; and Pearson WR, *Methods in Enzymol.* 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 polynucleotide sequences: Unix running command: `blastall -p blastn -d embldb -e 10 -G 0 -E 0 -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]; -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 swissprot -e 10 -G 0 -E 0 -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]; -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 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" 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 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% 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 comprise sequences 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 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 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.

Alternatively, variant polynucleotides or polypeptides of the present invention comprise a sequence exhibiting at least 40%; more preferably at least 60%; more preferably yet at least 75%; and most preferably at least 90% identity to a polynucleotide or polypeptide of the present invention, determined as described below. The percentage

identity is determined by aligning sequences using one of the BLASTN, FASTA, or BLASTP algorithms, set at the running parameters described above, and identifying the number of identical nucleic or amino acids over the aligned portions; dividing the number of identical nucleic or amino acids by the total number of nucleic or amino acids of the polynucleotide or polypeptide of the present invention; and then multiplying by 100 to determine the percentage identity. For example, a polynucleotide of the present invention having 220 nucleic acids has a hit to a polynucleotide sequence in the EMBL database having 520 nucleic acids over a stretch of 23 nucleotides in the alignment produced by the BLASTN algorithm using the parameters described above. The 23 nucleotide hit includes 21 identical nucleotides, one gap and one different nucleotide. The percentage identity of the polynucleotide of the present invention to the hit in the EMBL library is thus 21/220 times 100, or 9.5%. The polynucleotide sequence in the EMBL database is thus not a variant of a polynucleotide of the present invention.

Alternatively, variant polynucleotides of the present invention hybridize to the polynucleotide sequences recited in SEQ ID NOS: 1-53 and 78-164, 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 discrepancy of the genetic code, encode a polypeptide having similar enzymatic activity as a polypeptide encoded by a polynucleotide of the present invention. Thus, polynucleotides comprising sequences that differ from the polynucleotide sequences recited in SEQ ID NOS: 1-53 and 78-164, 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: 1-53 and 78-164, 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: 165-304 as a result of

amino acid substitutions, insertions, and/or deletions totaling less than 10% of the total sequence length are contemplated by an encompassed within the present invention, provided the variant polypeptide has activity in an isoprenoid biosynthetic pathway.

The polynucleotides of the present invention may be isolated from various
5 libraries, or may be synthesized using techniques that are well known in the art. The polynucleotides may 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
10 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.
15 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*.

Some of the polynucleotides identified as SEQ ID NOS: 1-53 and 78-164 are referred to as “partial” sequences, in that they do not represent the full coding portion of a
20 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
25 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: 1-53 and 78-164, or a variant of one of
30 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 yet 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
5 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 at least a specified number of contiguous residues (x -mers) of any of the polynucleotides identified as SEQ ID NOS: 1-53 and 78-164, complements, reverse
10 sequences, and reverse complements of such sequences, and their variants. Similarly, polypeptides of the present invention comprehend polypeptides comprising at least a specified number of contiguous residues (x -mers) of any of the polypeptides identified as SEQ ID NOS: 165-304, and their variants. As used herein, the term " x -mer," with reference to a specific value of " x ," refers to a sequence comprising at least a specified
15 number (" x ") of contiguous residues of any of the polynucleotides identified as SEQ ID NOS: 1-53 and 78-164, or the polypeptides identified as SEQ ID NOS: 165-304. 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 and polypeptides of the present invention comprise a 20-mer, a 40-
20 mer, a 60-mer, an 80-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 or polypeptide identified as SEQ ID NOS: 1-53, and 78-304, and variants thereof.

Polynucleotide probes and primers complementary to and/or corresponding to SEQ ID NOS: 1-53 and 78-164, and variants of those sequences, are also comprehended by the
25 present invention. Such oligonucleotide probes and primers are substantially complementary to the polynucleotide of interest. 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
30 chain reaction.

An oligonucleotide probe or primer is described as "corresponding to" a polynucleotide of the present invention, including one of the sequences set out as SEQ ID NOS: 1-53 and 78-164, 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: 1-53 and 78-164, 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 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 selectively hybridizes to a second DNA strand under stringent hybridization conditions. Stringent hybridization conditions for determining complementarity include salt conditions of less than about 1 M, more usually less than about 500 mM and preferably less than about 200 mM. Hybridization temperatures may 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 DNA from plants or samples or products containing plant material can be either genomic DNA or DNA derived by preparing cDNA from the RNA 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 mRNA 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 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 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 suitable for designing PCR primers, are available on the Internet, for example, at URL <http://www.horizonpress.com/pcr/>. Preferred techniques for designing PCR primers are also disclosed in Dieffenbach CW and Dykster GS, *PCR primer: a laboratory manual*. CSHL Press: Cold Spring Harbor, NY, 1995.

A plurality of oligonucleotide probes or primers corresponding to a polynucleotide of 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: 1-53 and 78-164.

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. Patent Nos. 5,412,087 and 5,545,531; and PCT Publication No. WO 95/00530, the disclosures of which are hereby incorporated by reference.

Probes, preferably in the form of an array, may be employed to screen for differences in organisms or samples or products containing genetic material using high throughput screening techniques that are well known in the art. The significance of using probes in 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 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, and agricultural and horticultural plants.

Another aspect of the present invention involves collections of a plurality of polynucleotides of the present invention. A collection of a plurality of the polynucleotides
5 of the present invention, particularly the polynucleotides identified as SEQ ID NOS: 1-53 and 78-164, and variants 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
10 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.

According to one embodiment, the storage medium includes a collection of at least
15 4, preferably at least 10, more preferably at least 15, and most preferably at least 20 of the polynucleotides of the present invention, preferably the polynucleotides identified as SEQ ID NOS: 1-53 and 78-164, and variants of those polynucleotides.

For applications where modulation of a polypeptide involved with isoprenoid biosynthesis and/or isoprenoid metabolism is desired, an open reading frame may be
20 inserted into a genetic construct in a sense or antisense orientation, such that transformation of a target plant with the genetic construct produces a change in the expression level of the polypeptide compared to the expression in a wild-type organism. Transformation with a genetic construct comprising an open reading frame in a sense orientation will generally result in modulation of expression of the selected gene, while
25 transformation with a genetic construct comprising an open reading frame in an antisense orientation generally produces reduced expression of the selected gene. A population of plants transformed with a genetic construct comprising an open reading frame of the present invention in either a sense or antisense orientation may be screened for increased or reduced expression of the gene in question using techniques well known to those of
30 skill in the art, and plants having the desired phenotypes may thus be isolated.

Alternatively, expression of a gene involved in the biosynthesis of isoprenoids may be inhibited by inserting a portion of an open reading frame of the present invention, in either sense or antisense orientation, in the genetic construct. Such portions need not be

full-length but preferably comprise at least 25, and more preferably, at least 50 residues of polynucleotide of the present invention. A much longer portion, or even the full length polynucleotide corresponding to the complete open reading frame, may be employed. The portion of the open reading frame does not need to be precisely the same as the
5 endogenous sequence, provided that there is sufficient sequence similarity to achieve inhibition of the target gene. Thus a sequence derived from one species may be used to inhibit expression of a gene in a different species.

According to another embodiment, the genetic constructs of the present invention comprise a polynucleotide including a non-coding region of a gene coding for a polypeptide encoded by a polynucleotide of the present invention, or a polynucleotide
10 complementary to such a non-coding region. Examples of non-coding regions which may be usefully employed in such constructs include introns and 5'-non-coding leader sequences. Transformation of a target plant with such a genetic construct may lead to a reduction in the amount of an isoprenoid compound 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.
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Alternatively, regulation may be achieved by inserting appropriate sequences or subsequences (e.g. DNA or RNA) in ribozyme constructs (McIntyre CL and Manners JM, *Transgenic Res.* 5(4):257-262, 1996). Ribozymes are synthetic RNA molecules that
20 comprise a hybridizing region complementary to two regions, each of which comprises at least 5 contiguous nucleotides in a mRNA molecule encoded by one of the inventive polynucleotides. Ribozymes possess highly specific endonuclease activity, which autocatalytically cleaves the mRNA.

The genetic constructs of the present invention further comprise a gene promoter
25 sequence and a gene termination sequence, operably linked to the polynucleotide to be transcribed, which control expression of the polypeptide. 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 5' non-coding region of a gene but they may exist downstream of the open
30 reading frame or in introns (Luehrsen KR, *Mol. Gen. Genet.* 225:81-93, 1991); or in the coding region, as for example in a plant defence gene (Douglas *et al.*, *EMBO J.* 10:1767-1775, 1991). When the construct includes an open reading frame in a sense orientation, the gene promoter sequence also initiates translation of the open reading frame. For

genetic 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.

Numerous gene promoter sequences that may be usefully employed in the genetic constructs of the present invention are well known in the art. The gene promoter 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 common to those of the polynucleotide being introduced.

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 with or without enhancers, such as the Kozak sequence or the Omega enhancer, and *Agrobacterium tumefaciens* nopaline synthase terminator, may be usefully employed in the present invention. Use of a tissue specific promoter will result in production of the desired sense or antisense RNA only in the tissue of interest. With genetic 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 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 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 that is effective in target cells, such as 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 Weissbach H, eds., *Methods for Plant Molecular Biology*, Academic Press Inc.: San Diego, CA, 1988). Transformed cells can thus be identified by their ability to grow in media containing the antibiotic in question. 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. A transcription initiation site may additionally included in the genetic construct when the sequence to be transcribed lacks such a site.

Techniques for operatively linking the components of the genetic constructs of the present invention are well known in the art and include the use of synthetic linkers containing one or more restriction endonuclease sites as described, for example, by Sambrook *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.

The genetic constructs of the present invention may be used to transform a variety of target organisms such as plants, both monocotyledonous (*e.g.*, grasses, corn, grains, oat, wheat and barley); dicotyledonous (*e.g.*, *Arabidopsis*, tobacco, legumes, alfalfa, oaks, eucalyptus, maple); gymnosperms (*e.g.*, Scots pine (Aronen, *Finnish Forest Res. Papers*, Vol. 595, 1996); white spruce (Ellis *et al.*, *Biotechnology* 11: 84-89, 1993); and larch (Huang *et al.*, *In Vitro Cell* 27:201-207, 1991). In a preferred embodiment, the inventive DNA 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. 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*. Other species which may be usefully transformed with the DNA constructs of the present invention include, but are not limited to: Pines, such as

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*; other gymnosperm, such as *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*, *Picea sitchensis*, *Pseudotsuga menziesii*, *Sequoia gigantea*, *Sequoia sempervirens*, *Taxodium distichum*, *Tsuga canadensis*, *Tsuga heterophylla*, *Tsuga mertensiana*, *Thuja occidentalis*, *Thuja plicata*; and Eucalypts, such as *Eucalyptus alba*, *Eucalyptus bancroftii*, *Eucalyptus botyroides*, *Eucalyptus bridgesiana*, *Eucalyptus calophylla*, *Eucalyptus camaldulensis*, *Eucalyptus citriodora*, *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*, *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*, *Eucalyptus viminalis*, *Eucalyptus viridis*, *Eucalyptus wandoo*, *Eucalyptus youmanni*.

Techniques for stably incorporating genetic 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 certain monocots and gymnosperms may be transformed by *Agrobacterium* Ti plasmid technology, as described, for example by Bevan, *Nucleic Acid Res.* 12:8711-8721, 1984. Targets for the introduction of the genetic constructs of the

present invention include tissues, such as leaf tissue, disseminated cells, protoplasts, seeds, embryos, meristematic regions; cotyledons, hypocotyls, and the like. The preferred method for transforming eucalyptus and pine is a biolistic method using pollen (*see*, for example, Aronen, *Finnish Forest Res. Papers* 595:53, 1996) or easily regenerable
5 embryonic tissues.

Once the cells are transformed, cells having the inventive genetic 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 regenerate whole plants, using techniques well known in the art.
10 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.*, in Thorpe TA, ed., *In vitro embryogenesis of plants*,
15 *Current Plant Science and Biotechnology in Agriculture*, 20(12):471-540, 1995. Specific protocols for the regeneration of spruce are discussed by Roberts., Somatic embryogenesis of spruce,” in Redenbaugh K, ed., *Synseed: applications of synthetic seed to crop improvement*, CRC Press: Ch. 23, pp. 427-449, 1993. The resulting transformed plants may be reproduced sexually or asexually, using methods well known in the art, to give
20 successive generations of transgenic plants.

As discussed above, the production of RNA in target plant cells can be controlled by choice of the promoter sequence, or by selecting the number of functional copies or the site of integration of the polynucleotides incorporated into the genome of the target plant host. A target plant may be transformed with more than one genetic constructs of the
25 present invention, thereby modulating the activity of more than one isoprenoid metabolism enzyme, affecting enzyme activity in more than one tissue, or affecting enzyme activity at more than one expression time. Similarly, a genetic construct may be assembled containing more than one open reading frame coding for an enzyme encoded by a polynucleotide of the present invention or more than one non-coding region of a gene
30 coding for such an enzyme. The polynucleotides of the present inventive may also be employed in combination with other known sequences encoding enzymes involved in the synthesis of isoprenoids.

Additionally, the polynucleotides of the present invention have particular application for use as non-disruptive tags for marking organisms, particularly plants. Genetic constructs comprising polynucleotides of the present invention may be stably introduced into an organism as heterologous, non-functional, non-disruptive tags. It is
5 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. Organisms other than plants may also be tagged with the polynucleotides of the present invention, including commercially valuable animals, fish, bacteria and yeasts.

Detection of the tag(s) may be accomplished using a variety of conventional
10 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 by Horn *et al.*, *Nucleic Acids Res.* 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
15 limitation.

Example 1

Isolation and Characterization of cDNA Clones from *Pinus radiata* and *Eucalyptus grandis*

Pinus radiata and *Eucalyptus grandis* cDNA expression libraries were constructed
20 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*3HCl) and extracted with chloroform:isoamyl alcohol, 24:1. mRNA was precipitated with
25 ethanol and the total RNA prepate 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
30 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, 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, the large majority contained an insert suitable for sequencing. Positive colonies were cultured in NZY broth with kanamycin and cDNA was purified by means of REAL DNA minipreps (Qiagen, Venlo, The Netherlands). Agarose gel at 1% was used to screen sequencing templates for chromosomal contamination. Dye terminator sequences were prepared using a Biomek 2000 robot (Beckman Coulter Inc, Fullerton CA for liquid handling and DNA amplification using a 9700 PCR machine (Perkin Elmer/Applied Biosystems, Foster City, CA) according to the manufacturer's protocol.

Polynucleotides for positive clones were obtained using a Perkin Elmer/Applied Biosystems Division 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 sequences were obtained using subcloned fragments. Subcloning was performed using standard procedures of restriction mapping and subcloning to pBluescript II SK+ vector and other standard sequencing vectors.

The determined cDNA sequences, including the polynucleotides of the present invention, were compared to and aligned with known sequences in the. Specifically, the polynucleotides identified in SEQ ID NOS. 1-53 were compared to polynucleotides in the EMBL database EMBL as of the end of August, 1998 using the BLASTN algorithm Version 2.0.4 [Feb-24-1998] set to the following running: Unix running command: blastall -p blastn -d embldb -e 10 -G 0 -E 0 -r 1 -v 30 -b 30 -i queryseq -o results. The polynucleotides identified in SEQ ID NOS: 78-164 were compared to polynucleotides in the EMBL database EMBL as of the end of May, 1999 using BLASTN algorithm Version 2.0.6 [Sep-16-1998], set to the following running parameters: Unix running command: blastall -p blastn -d embldb -e 10 -G 0 -E 0 -r 1 -v 30 -b 30 -i queryseq -o results. Multiple alignments of redundant sequences were used to build up reliable consensus sequences. Based on similarity to known sequences from other plant species, the isolated polynucleotides of the present invention identified as SEQ ID NOS. 1-53 and 78-164 were putatively identified as encoding polypeptides having similarity to the polypeptides shown above in Table 1.

The isolated cDNA sequences were compared to sequences in the EMBL DNA database using the computer algorithm BLASTN. The corresponding predicted

polypeptide sequences were determined and were compared to sequences in the SwissProt database using the computer algorithm BLASTP. Comparisons of DNA sequences provided in SEQ ID NOS: 78-164, to sequences in the EMBL DNA database (using BLASTN) and amino acid sequences provided in SEQ ID NOS: 165-304 to sequences in the SwissProt database (using BLASTP) were made as of May, 1999. Analysis of six-frame translations of the polynucleotides of SEQ ID NOS: 78-164, were also compared to and aligned with the six-frame translations of polynucleotides in the EMBL database using the TBLASTX program.

10 BLASTN Polynucleotide Analysis

The cDNA sequences of SEQ ID NOS: 1, 2, 4-6, 8-12, 15, 19, 21-23, 27-33, 35, 37-42, 44, 46-52, 78-80, 82, 83, 86, 89-92, 96-100, 104-113, 115, 117, 120, 122-130, 132-136, 138-158, 160, 163 and 164, were determined to have less than 40% identity, determined as described above, to sequences in the EMBL database using the computer algorithm BLASTN, as described above. The cDNA sequences of SEQ ID NOS: 3, 7, 14, 18, 20, 25, 34, 36, 53, 84, 85, 87, 88, 101, 114, 116, 118, 119, 131, 137, 159, 161 and 162 were determined to have less than 60% identity, determined as described above, to sequences in the EMBL database using BLASTN, as described above. The cDNA sequences of SEQ ID NOS: 16, 17, 26, 43, 45, 93, 94 and 121, were determined to have less than 75% identity, determined as described above, to sequences in the EMBL database using BLASTN, as described above. The cDNA sequences of SEQ ID NOS: 13, 24, 95, 102 and 103 were determined to have less than 90% identity, determined as described above, to sequences in the EMBL database using BLASTN, as described above.

25 BLASTP Amino Acid Analysis

The predicted amino acid sequences of SEQ ID NOS: 194-200, 202, 216, 223, 230, 235, 239, 240, 243, 250, 255, 259, 260, 263, 270, 272, 274, 278, 291, 292, 293, 296, 303 and 304 were determined to have less than 50% identity, determined as described above, to sequences in the SwissProt database using the BLASTP computer algorithm as described above. The predicted amino acid sequences of SEQ ID NOS: 166, 168-177, 179, 183-188, 192, 203-205, 207, 209-213, 218, 219, 221, 224, 225, 227-229, 231, 232, 234, 237, 242, 244, 245, 251, 253, 262, 267, 268, 269, 273, 276, 277, 279, 281, 282, 284, 286, 289, 290, 294, 295, 297, 298, 299, 300, 301 and 302 were determined to have less

than 75% identity, determined as described above, to sequences in the SwissProt database using the computer algorithm BLASTP, as described above. The predicted amino acid sequences of SEQ ID NOS: 165, 167, 178, 182, 189-191, 193, 201, 206, 208, 214, 215, 217, 220, 222, 226, 233, 238, 241, 246-250, 254, 256, 257, 258, 261, 264, 265, 266, 275, 280, 283, 285 and 288 were determined to have less than 90% identity, determined as described above, to sequences in the SwissProt database using the computer algorithm BLASTP, as described above. The predicted amino acid sequences of SEQ ID NOS: 180, 181 and 271, were determined to have less than 95% identity, determined as described above, to sequences in the SwissProt database using the computer algorithm BLASTP, as described above.

TBLASTX Analysis

The six-frame translations of the polynucleotide sequences of SEQ ID NOS: 78-164 were compared to and aligned with six-frame translations of polynucleotides in the EMBL database using the TBLASTX program version 2.0.6 [Sept-16-1998] set to the following running parameters: Unix running command: blastall -p blastn -d embldb -e 10 -G 0 -E 0 -v 30 -b 30 -i queryseq -o results. The translations of the polynucleotides of SEQ ID NOS: 82, 83, 90, 107-113, 115, 120, 122, 124-126, 129, 134-136, 142-144, 146-149, 152, 153, 155-158 and 164, were determined to have less than 50% identity, determined as described above, to translations of polynucleotides in the EMBL database using the computer algorithm TBLASTX. The translations of the polynucleotides of SEQ ID NOS: 79, 81, 84-89, 91, 92, 96-101, 103, 105, 114, 116-118, 123, 131, 132, 137-141, 145, 150, 154 and 160-162, were determined to have less than 75% identity, determined as described above, to translations of polynucleotides in the EMBL database using the computer algorithm TBLASTX. The translations of the polynucleotide sequences of SEQ ID NOS: 78, 80, 93, 95, 102, 104, 106, 119, 121, 127, 128, 130, 133, 151, 159 and 163, were determined to have less than 90% identity, determined as described above, to translations of polynucleotides in the EMBL database using the computer algorithm TBLASTX. The translations of the polynucleotide sequence of SEQ ID NO: 94 was determined to have less than 95% identity, determined as described above, to translations of polynucleotides in the EMBL database using the computer algorithm TBLASTX.

Example 2

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

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

– Genetic constructs comprising sense and anti-sense nucleotides containing a polynucleotide comprising the coding region of the enzyme O-methyltransferase (OMT) (SEQ ID NO: 54) from *Pinus radiata* were constructed and inserted into *Agrobacterium tumefaciens* by direct transformation using published methods (An *et al.*, “Binary
10 vectors,” in Gelvin SB and Schilperoort RA, eds., *Plant Molecular Biology Manual*, Kluwer Academic Publishers: Dordrecht, 1988). General methods for plant transformation are described in Horsch *et al.*, *Science* 227:1229-1231, 1985. The constructs of sense DNA were made by first cloning the PBK-CMV cDNA inserts into pART7 vectors. The pART7 vectors were then cut by restriction endonuclease *NotI* to remove the 35S-Insert-
15 OCS 3’UTR construct for cloning into the plant expression vector pART27 (Gleave A, *Plant Mol. Biol.* 20:1203-1207, 1992). 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 with the sense and anti-sense OMT constructs using the method of Horsch *et al.*, *Science*
20 227:1229-1231, 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 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
25 independent transformed lines.

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 analyzed in Northern
30 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 1 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 hybridization to RNA samples from empty vector-transformed control plants.

5 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, was analyzed 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,
10 1997. The data contained in the column labeled "Enzyme" in Table 2 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
15 enzyme activity was not estimated in sense plant line number 3.

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

 OMT is an enzyme involved in the biosynthesis of lignin. The concentration of lignin in the transformed tobacco plants was determined using the well-established
20 procedure of thioglycolic acid extraction (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
25 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 labeled "TGA" in Table 2 shows that the transformed plant lines containing the sense and the anti-sense OMT gene constructs all exhibited
30 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
	2	OMT	sense	+	na	162	58
	3	OMT	sense	+	4.1E+6	na	63
	4	OMT	sense	+	2.3E+6	142	66
10	5	OMT	sense	+	3.6E+5	199	75
	1	OMT	anti-sense	+	1.6E+4	189	66
	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
15	5	OMT	anti-sense	+	2.5E+4	87	78
	6	OMT	anti-sense	+	2.5E+4	58	84
	7	OMT	anti-sense	+	2.5E+4	97	92
	8	OMT	anti-sense	+	1.1E+4	151	94

20 These data clearly demonstrate that polynucleotides identified from isolated cDNA obtained as in Example 1 and encoding polypeptides, may be assembled in DNA constructs and used to transform plants. The data furthermore demonstrates that transformed plants comprising genetic constructs exhibit varied levels of such enzyme expression and activity, and that the modulation of the metabolism of such an enzyme, manipulated by either sense or anti-sense expression of a gene encoding the enzyme, such as OMT, affects end product concentrations, such as the lignin concentration in the transformed plants.

Example 3

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

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

35 Sense and anti-sense constructs containing a DNA sequence including the coding region of 4CL (SEQ ID NO: 55) from *Pinus radiata* were inserted into *Agrobacterium tumefaciens* LBA4301 by direct transformation as described above in Example 2. The presence and integrity of the transgenic constructs were verified by restriction digestion and DNA sequencing.

40 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
5 _ transformed lines.

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 analyzed in Northern
10 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 3 below shows that the 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
15 available at the time of the experiment. There was no detectable hybridization to RNA samples from empty vector-transformed control plants.

Modulation of 4CL enzyme activity in transformed plants

The total activity of 4CL enzyme, encoded by the *Pinus* 4CL gene and by the
20 endogenous tobacco 4CL gene in transformed tobacco plants, was analyzed for each transformed plant line created with the 4CL 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 2 shows that the transformed plant lines containing the 4CL sense
25 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 of 59%, relative to empty vector-transformed control plants.

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

30 The concentration of lignin in samples of transformed plant material was determined as described in Example 2. The data shown in the column labeled “TGA” in Table 3, below, shows 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 demonstrate that the polynucleotides identified from isolated cDNA as obtained in Example 1 may be assembled into DNA constructs and used to transform plants. Transformed plants comprising such genetic constructs exhibit modified levels of enzyme expression and activity. The metabolism of the biosynthetic pathway involving the enzyme is also affected.

TABLE 3

	plant line	transgene	orientation	Southern	Northern	Enzyme	TGA
10	1	control	na	+	blank	100	92
	2	control	na	+	blank	100	104
	1	4CL	sense	+	2.3E+4	169	64
15	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
20	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
25	7	4CL	anti-sense	+	1.8E+3	125	94
	8	4CL	anti-sense	+	1.7E+4	106	97

Example 4**Transformation of Tobacco using Lignin Biosynthetic Genes**

Sense and anti-sense constructs containing DNA sequences including the coding regions of coumarate 3-hydroxylase (C3H) (SEQ ID NO: 56), ferulate-5-hydroxylase (F5H) (SEQ ID NO: 57), cinnamoyl-CoA reductase (CCR) (SEQ ID NO: 58) and coniferyl glycosyl transferase (CGT) (SEQ ID NO: 59) from *Eucalyptus grandis*, and phenylalanine ammonia-lyase (PAL) (SEQ ID NOS: 60 and 61), cinnamate 4-hydroxylase (C4H) (SEQ ID NOS: 62 and 63), phenolase (PNL) (SEQ ID NO: 64) and laccase (LAC) (SEQ ID NO: 65) 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.

5 Tobacco (*Nicotiana tabacum* cv. Samsun) leaf sections were transformed as described in Example 2. 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 analyzed were confirmed as independent transformed lines. This demonstrates that transgenic plants with an expressed novel gene can be made, starting the whole process from an isolated cDNA
10 obtained as in Example 1.

Example 5

Manipulation of Lignin Content in Transformed Plants

Determination of transgene expression by Northern blot experiments

15 Total RNA was isolated from each independent transformed plant line described in Example 4. The RNA samples were analyzed in Northern blot experiments to determine the level of expression of the transgene in each transformed line. The column labeled "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 hybridization to RNA samples from empty vector-transformed control plants.

Determination of lignin concentration in transformed plants

25 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 labeled "TGA" in Table 3 shows the thioglycolic acid extractable lignins for all plant lines assayed, expressed as the average percentage of TGA extractable lignins in transformed
30 plants versus control plants. The range of variation is shown in parentheses.

TABLE 4

	transgene	orientation	no. of lines	Northern	TGA
5	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)
	F5H	anti-sense	9	5.8E+4	73 (35-93)
10	CCR	sense	1	na	74
	CCR	anti-sense	2	na	74 (62-86)
	transgene	orientation	no. of lines	Northern	TGA
	PAL	sense	5	1.9E+5	77 (71-86)
	PAL	anti-sense	4	1.5E+4	62 (37-77)
15	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)

20 Transformed plant lines containing the sense and the anti-sense lignin biosynthetic gene constructs all exhibited significantly decreased levels of lignin, relative to the empty vector-transformed control plant lines. The most dramatic effects on lignin concentration were seen in the F5H anti-sense plants with as little as 35% of the amount of lignin in control plants, and in the PAL anti-sense plants with as little as 37% of the amount of

25 lignin in control plants. These data clearly indicate that the concentration of a polynucleotide, such as lignin, 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, starting the whole process from an isolated cDNA obtained as in Example 1.

30

Example 6

Modulation of Lignin Enzyme Activity in Transformed Plants

35

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: 60), PNL (SEQ ID NO: 64) and LAC (SEQ ID NO: 65) from *Pinus radiata*, and CGT (SEQ ID NO: 59) from *Eucalyptus grandis*.

40

Enzyme assays were performed using published methods for PAL (Southerton SG and Deverall BJ, *Plant Path.* 39:223-230, 1990); CGT (Vellekoop *et al.*, *FEBS Lett.*

330:36-40, 1993); PNL (Espin *et al.*, *Phytochemistry* 44:17-22, 1997); and LAC (Bao *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

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

All of the transformed plant lines, except the PNL anti-sense transformed plant lines, showed average enzyme activities that 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 showed as little as 14% of the LAC activity in empty vector-transformed control plant lines. These results demonstrate that enzyme activity can be modulated by transforming plants with polynucleotides encoding an enzyme of interest, starting the whole process from polynucleotides encoding enzymes of interest isolated from cDNA as described in Example 1.

Example 7

Functional Identification of Lignin Biosynthetic Genes

Sense constructs containing DNA sequences including the coding regions for PAL (SEQ ID NO: 61), OMT (SEQ ID NO: 54), 4CL (SEQ ID NOS: 55 and 66) and POX (SEQ ID NO: 67) from *Pinus radiata*, and OMT (SEQ ID NOS: 68 and 69), CCR (SEQ ID NOS: 70 - 72), CGT (SEQ ID NOS: 59 and 73) and POX (SEQ ID NOS: 74 and 75)

from *Eucalyptus grandis* were inserted into the commercially available protein expression vector, pProEX-HT (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 *et al.*, *Proc. Natl. Acad. Sci. USA* 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: 55) and a *Pinus radiata* OMT gene (SEQ ID NO: 54), are shown below in Table 6. For the 4CL enzyme, one 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

transgene	purification step	total ml extract	total mg protein	total units activity	% yield activity	fold purification
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 demonstrate 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. Crude protein preparations from *E. coli* transformed with empty vector show no activity in either the 4CL or the OMT enzyme assay. This demonstrates that the function of an isolated novel cDNA with only a putative function can be confirmed, starting the whole process from an isolated cDNA obtained as in Example 1.

Example 8

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

5 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: 76, and *Eucalyptus grandis*, SEQ ID NO: 77. 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
10 published methods (An *et al.*, "Binary vectors," in Gelvin SB and 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
15 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 that lacked a unique sequence identifier.

The uniqueness of the sequence identifiers was assayed using Southern blot
20 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
25 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 MG and Thompson WF, *Nucleic Acids*
30 *Res.* 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: 76) and the restriction enzyme *XbaI* in the case of the plants transformed with the *Eucalyptus* unique sequence identifier (SEQ ID NO: 77). The DNA fragments

produced in the restriction digests were resolved on a 1% agarose gel; the left panel of Fig. 2 and the right panel of Fig. 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
5 Hybond-N+ nylon membranes (Amersham Life Science, Little Chalfont, Buckinghamshire, England) using methods established by Southern, *J. Mol. Biol.* 98:503-517, 1975. 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
10 minutes at 65°C). The hybridization of the probes to complementary sequences in the genomic DNA samples was detected using auto-radiography.

The results are shown in Figs. 3 and 4.

Fig. 3 (corresponding to the left panel of Fig. 2) shows the hybridization pattern detected in the Southern blot analysis using a probe derived from the *Pinus* sequence
15 identifier (SEQ ID NO: 76). 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: 76. There is no hybridization in Lanes A-B indicating that SEQ ID NO: 76 is not present in empty-vector transformed tobacco plants; that is, SEQ ID NO: 76 is a unique tag suitable for unambiguous marking of tobacco plants. There is strong
20 hybridization in Lanes C-E, indicating that the plants which received SEQ ID NO: 76 via transformation have been clearly and unambiguously tagged with the unique sequence contained in SEQ ID NO: 76.

Fig. 4 (corresponding to the right panel of Fig. 2) shows the hybridization pattern detected in the Southern blot analysis using a probe derived from the *Eucalyptus* sequence
25 identifier (SEQ ID NO: 77). 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: 77. There is no hybridization in Lanes A-B indicating that SEQ ID NO: 77 is not present in empty-vector transformed tobacco plants; that is, SEQ ID NO: 77 is a unique tag suitable for unambiguous marking of tobacco plants. There is strong
30 hybridization in Lanes C-E indicating that the plants which received SEQ ID NO: 77 via transformation have been clearly and unambiguously tagged with the unique sequence contained in SEQ ID NO: 77.

The data 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
5 _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
10 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
15 the tag detection techniques demonstrated in the present example.

SEQ ID NOS: 1-304 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
20 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 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
25 without departing from the basic principles of the invention.

Claims:

1. An isolated polynucleotide comprising a polynucleotide sequence selected from the group consisting of: (1) the sequences recited in SEQ ID NOS: 1-53 and 78-164; (2) complements of the sequences recited in SEQ ID NOS: 1-53 and 78-164;
5 - (3) reverse complements of the sequences recited in SEQ ID NOS: 1-53 and 78-164; (4) reverse sequences of the sequences recited in SEQ ID NOS: 1-53 and 78-164; (5) sequences comprising a polynucleotide sequence having at least 40% identity to a compare sequence selected from the polynucleotide sequences recited in SEQ ID NOS: 1, 2, 4-6, 8-12, 19, 21-23, 28-33, 35, 37-42, 44, 46-52, 78-80, 82,
10 83, 86, 89-92, 96-100, 104-113, 115, 117, 120, 122-130, 132-136, 138-158, 160, 163 and 164, the percentage identity determined by aligning the sequence and the compare sequences using the BLASTN algorithm version 2.04 set at the parameter values described herein, identifying the number of identical nucleic acids over aligned portions of the sequence and the compare sequences, dividing the number
15 of identical nucleic acids by the total number of nucleic acids of the compare sequence, and multiplying by 100 to determine the percentage identity; (6) sequences comprising a polynucleotide sequence having at least 60% identity to a compare sequence selected from the polynucleotide sequences recited in SEQ ID NOS: 3, 7, 14, 18, 20, 25, 34, 36, 53, 84, 85, 87, 88, 101, 114, 116, 118, 119, 131,
20 137, 159, 161 and 162, the percentage identity determined as described in (5) above; (7) sequences comprising a polynucleotide sequence having at least 75% identity to a compare sequence selected from the polynucleotide sequences recited in SEQ ID NOS: 16, 17, 26, 43, 45, 93, 94 and 121, the percentage identity determined as described in (5) above; (8) sequences comprising a polynucleotide
25 sequence having at least 90% identity to a compare sequence selected from the nucleotide sequences recited in SEQ ID NOS: 13, 24, 95, 102 and 103, the percentage identity determined as described in (5) above; (9) sequences comprising a polynucleotide sequence that hybridizes to a polynucleotide comprising a sequence recited in (1) – (8) above under stringent hybridization conditions; (10)
30 sequences comprising a polynucleotide sequence that is a 100-mer of a sequence recited in (1) – (8) above; (11) sequences comprising a polynucleotide sequence that is a 40-mer of a sequence recited in (1) – (8) above; and (12) sequences

comprising a polynucleotide sequence that is a 20-mer of a sequence recited in (1) – (8) above; and (13) sequences comprising a polynucleotide sequence differing from a sequence recited in (1) – (12), above, only by one or more conservative substitutions.

- 5 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 genetic construct comprising a polynucleotide described in claim 1.
4. A transgenic cell comprising a genetic construct according to claim 3.
- 10 5. A transgenic cell according to claim 4, wherein the cell is selected from one of the following: a bacterial cell; an insect cell; a yeast cell; a mammalian cell; and a plant cell.
6. A genetic construct comprising, in the 5'-3' direction:
 - (a) a gene promoter sequence;
 - 15 (b) a polynucleotide sequence comprising at least one of the following: (1) a polynucleotide comprising a nucleotide sequence of claim 1 coding for at least a functional portion of an enzyme having activity in an isoprenoid biosynthetic pathway; and (2) a polynucleotide comprising nucleotide sequence of claim 1 that includes a non-coding region of a polynucleotide encoding an enzyme having activity in an isoprenoid biosynthetic pathway;
20 and
 - (c) a gene termination sequence.
7. The construct of claim 6 wherein the polynucleotide is in a sense orientation.
8. The construct of claim 6 wherein the polynucleotide is in an antisense orientation.
- 25 9. The construct of claim 6 wherein the gene promoter sequence and gene termination sequences are functional in a plant host.
10. A transgenic cell comprising a construct of claim 6.
11. The transgenic cell of claim 10 wherein the polynucleotide is in a sense orientation.
- 30 12. The transgenic plant cell of claim 10 wherein the polynucleotide is in an antisense orientation.

13. A transgenic cell according to claim 10, wherein the cell is selected from one of the following: a bacterial cell; an insect cell; a yeast cell; a mammalian cell; and a plant cell.
14. A plant comprising a transgenic cell according to claim 9, or fruit or seeds or progeny thereof.
15. The plant of claim 14 wherein the plant is a woody plant.
16. The plant of claim 15 wherein the plant is selected from the group consisting of eucalyptus and pine species.
17. A method for modulating one or more of the content, the composition, and the metabolism of an enzyme involved in an isoprenoid biosynthetic pathway in an organism, comprising stably incorporating into the genome of the organism a construct of claim 3.
18. A method according to claim 17, wherein the organism is a plant.
19. A method for modulating one or more of the content, the composition, and the metabolism of an isoprenoid compound in an organism comprising stably incorporating into the genome of the organism a construct of claim 6.
20. A method according to claim 19, wherein the organism is a plant.
21. A method for producing an organism having one or more of altered isoprenoid content, altered isoprenoid composition and altered isoprenoid metabolism, comprising:
- (a) transforming a host cell with a construct of claim 3 to provide a transgenic host cell; and
- (b) cultivating the transgenic host cell under conditions conducive to growth and regeneration.
22. A method according to claim 21, wherein the organism is a plant and the host cell is a plant cell.
23. An isolated polypeptide encoded by a polynucleotide of claim 1.
24. A polypeptide of claim 23 having enzymatic activity in an isoprenoid biosynthetic pathway in a plant.
25. An isolated polypeptide comprising an amino acid sequence expressed from a polynucleotide that hybridizes to a nucleotide sequence set forth as SEQ ID NOS: 1-53 and 78-164 under stringent hybridization conditions.

26. An isolated polypeptide comprising a polypeptide sequence selected from the group consisting of: (1) the sequences set forth in SEQ ID NOS: 165-286 and 288-304; (2) sequences comprising a polypeptide sequence having at least 50% identity to a compare sequence selected from the polypeptide sequences recited in
5 SEQ ID NOS: 194-200, 202, 216, 223, 230, 235, 239, 240, 243, 250, 255, 259, 260, 263, 270, 272, 274, 278, 291, 292, 293, 296, 303 and 304; (3) sequences comprising a polypeptide sequence having at least 75% identity to a compare sequence selected from the polypeptide sequences recited in SEQ ID NOS: 166, 168-177, 179, 183-188, 192, 203-205, 207, 209-213, 218, 219, 221, 224, 225, 227-
10 229, 231, 232, 234, 237, 242, 244, 245, 251, 253, 262, 267, 268, 269, 273, 276, 277, 279, 281, 282, 284, 286, 289, 290, 294, 295, and 297-302; (4) sequences comprising a polypeptide sequence having at least 90% identity to a compare sequence selected from the polypeptide sequences recited in SEQ ID NOS: 165, 167, 178, 182, 189-191, 193, 201, 206, 208, 214, 215, 217, 220, 222, 226, 233,
15 238, 241, 246-250, 254, 256-258, 261, 264, 265, 266, 275, 280, 283, 285 and 288; (5) sequences comprising a polypeptide sequence having at least 95% identity to a compare sequence selected from the polypeptide sequences recited in SEQ ID NOS: 180, 181 and 271; (6) sequences comprising a polypeptide sequence that is a 100-mer of a sequence recited in (1) – (5) above having at least 100 residues; (7)
20 sequences comprising a polypeptide sequence that is a 40-mer of a sequence recited in (1) – (5) above having at least 40 residues; and (8) sequences comprising a polypeptide sequence that is a 20-mer of a sequence recited in (1) – (5) above.
27. A method for modulating one or more of the content, the composition and the metabolism of an isoprenoid compound in an organism, comprising administering
25 an isolated polypeptide of claim 26 to the organism.
28. A method according to claim 27, wherein the organism is a plant, and administration of the isolated polypeptide is topical.
29. A method according to claim 27, wherein the organism is a mammal, and administration of the isolated polypeptide is systemic.

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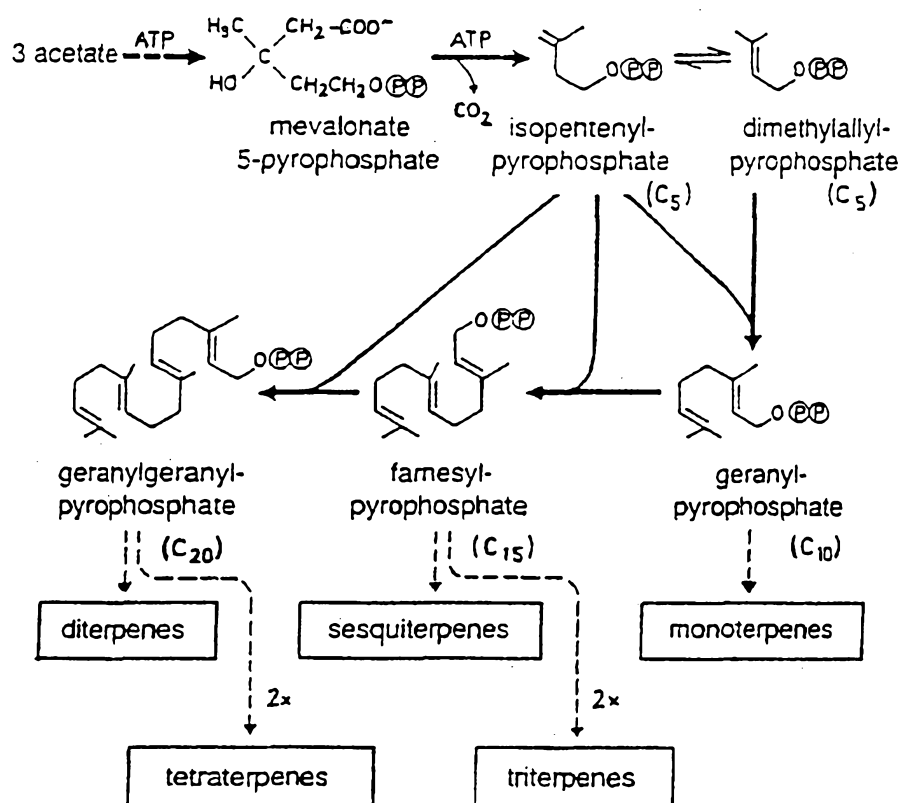


FIGURE 1

2/4

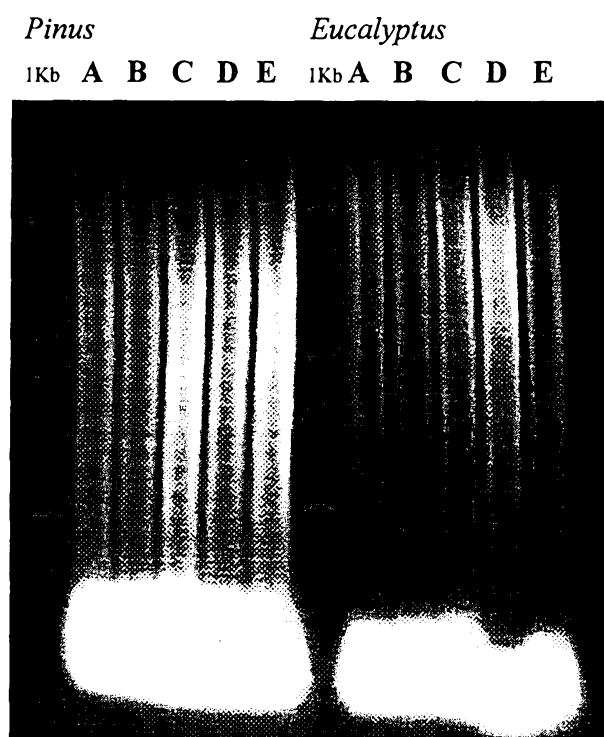


FIGURE 2

3/4

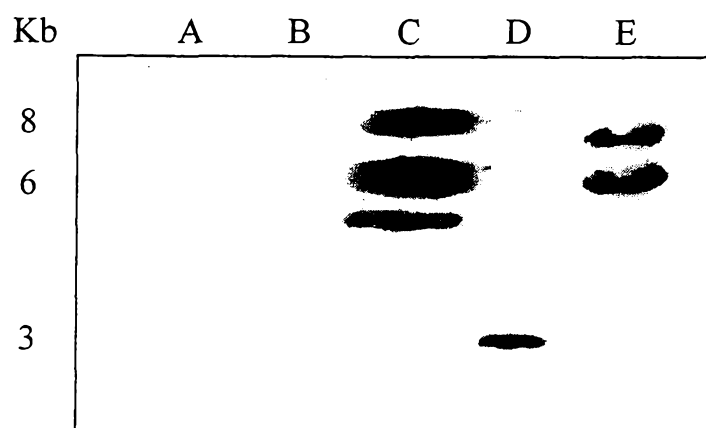


FIGURE 3

4/4

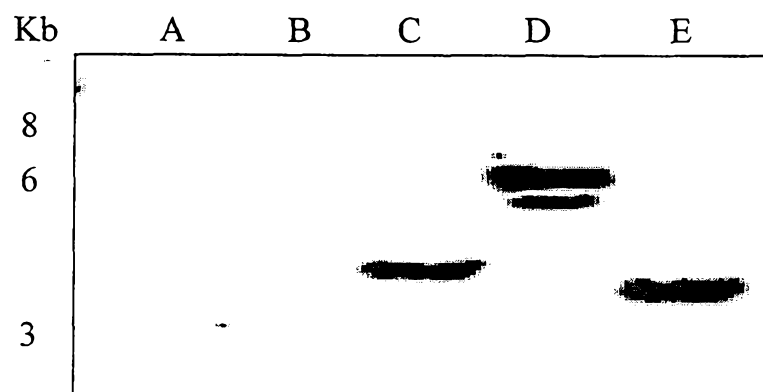


FIGURE 4

SEQUENCE LISTING

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ggacaacctt	gctggtttag	attgcccaag	gtcggaatga	ttgcagcaaa	tgatggagtt	480
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<210> 4

<211> 371

<212> DNA

<213> Eucalyptus grandis

<400> 4

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tgattcagca	aatgtcgcaa	aagtgaaggt	cctctaccac	gagatcaatc	ttcaggagata	300
ctgcaagagc	atttcaaaga	acaagaacat	tccgacggtg	aaggcaaagt	caaattcggg	360
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<210> 5

<211> 408

<212> DNA

<213> Pinus radiata

<400> 5

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aagggaagatt	tatcttgctt	cgacccaaaag	aaggccgcac	cgttgttggg	tattgcagag	360
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<210> 6

<211> 590

<212> DNA

<213> Eucalyptus grandis

<400> 6

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gttttgcaag	gtgtattggg	ttgttatttc	aagtgggtga	tgatattctg	gatctgaccc	480
agtcttctca	agaactgggt	aaaacggctg	gcaaggattt	ggtggctgac	aaagttacgt	540
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<210> 7

<211> 699

<212> DNA

<213> Eucalyptus grandis

<400> 7

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cagagaagcg	gatccctccg	cagccgcact	ggggattctg	ctactccatg	ctccacaagg	360
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ctgctttcct	ggagctgggg	aaaagttacc	aagaggcaat	tgatgatatt	actaaaagaa	660
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<210> 8

<211> 373

<212> DNA

<213> Pinus radiata

<400> 8

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gtggcgattg	cggtagccat	tggctttgtt	tctgtattat	tgctgtatta	tatagttttg	180
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<210> 9

<211> 373

<212> DNA

<213> Pinus radiata

<400> 9

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gctttgtttc	tgtattattg	tcgtattata	tagttttgag	cagggtggaag	cgcagatcca	240
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<210> 10

<211> 825

<212> DNA

<213> Eucalyptus grandis

<400> 10

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gttcaacatg	cgccatccat	tgacaggagg	aggaatgacc	gtggctcttt	ctgatatcgt	180
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cctctctcgt	agtagatgga	gaggcctgcc	agttatactg	cactcggaag	agaattgtgc	780
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<210> 11
 <211> 394
 <212> DNA
 <213> Eucalyptus grandis

<400> 11						
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<210> 12
 <211> 245
 <212> DNA
 <213> Eucalyptus grandis

<400> 12						
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atggatggat	taccagagta	tatgcaagct	tatttcaagg	agtttctcca	gctctatgaa	180
tatatggga	atcaattggc	cgcaaaagga	agatcgtacc	gccttatcta	cgcaaaagaa	240
gtgat						245

<210> 13
 <211> 375
 <212> DNA
 <213> Pinus radiata

<400> 13						
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<210> 14
 <211> 824
 <212> DNA
 <213> Pinus radiata

<400> 14						
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aagtccagct	agaagcatat	accaaagaag	cagaatggtc	tgagtgaga	tacgtgccat	180
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tcagcgctct	ttttactggg	gagattctta	cagatgacat	actctccaaa	attggtcgcg	300
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agattcaatt	cttaagtcca	aggtccttca	tgacgttata	ataacgcaag	gataggagtt	720
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<210> 15

<211> 1271

<212> DNA

<213> Eucalyptus grandis

<400> 15

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<210> 16

<211> 372

<212> DNA

<213> Pinus radiata

<400> 16

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tcgtacgggt	agcatgctga	cagacttatt	ggggaagtga	aggggatttt	caactcattt	360
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<210> 17

<211> 520

<212> DNA

<213> Pinus radiata

<400> 17

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gagaattaac	cagtcctgtc	aatgatctcc	ttcaacagct	ctggatggtc	gataatgttg	420
aacgtttggg	gatcgacaga	catttccaaa	ctgaaataaa	agttgctctt	gactatgggt	480
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<210> 18

<211> 435

<212> DNA

<213> Pinus radiata

<400> 18

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ttacagttat	tggagcgaaa	aaggcattgg	atatgggaga	gagagcgcta	ttactgatct	420
caacacaact	tcct					435

<210> 19

<211> 320

<212> DNA

<213> Pinus radiata

<400> 19

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<210> 20

<211> 626

<212> DNA

<213> Eucalyptus grandis

<400> 20

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<210> 21

<211> 490

<212> DNA

<213> Eucalyptus grandis

<400> 21

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acatggctgc	tctcatcttt	agattgctgc	gacaacatgg	ttacaatatt	tcatcagaga	480
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<210> 22

<211> 396

<212> DNA

<213> Eucalyptus grandis

<400> 22

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atccacaaaa	gttactctcg	acttgatcat	gaagatttta	aggtagatga	ccttcacaca	180
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<210> 23

<211> 396

<212> DNA

<213> Eucalyptus grandis

<400> 23

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tcagtgaagt	tcaaattcct	cgggaagagt	gagggacaaa	ttgaggaact	aaaaggagag	240
gtgaagaaga	tgctgactga	tatcatggat	aagcccttac	aaaagcttca	cttgatcgat	300
caaatccaac	gcttgggaat	tgagtaccat	tttgaacgtg	aaatagatga	gcaattagaa	360
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<210> 24

<211> 700

<212> DNA

<213> Pinus radiata

<400> 24

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tccttttctg	ttgagagaag	ctcaatcttt	ccaacttgaa	ctcccttatg	acctgcctta	660
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<210> 25

<211> 1513

<212> DNA

<213> Pinus radiata

<400> 25

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agcgcttccg	ccaatgatac	agagttgcag	ataagaagcg	tttttaattt	atttcgagct	180
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cttgcgaaat	tggagttcaa	tattttccat	tctctacaac	agaaagagtt	acaatgtctg	480
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gaattctaca	ctttgggtctc	tggcactgac	atgggtgctg	aacatgctgc	attcagactg	600
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<210> 26

<211> 295

<212> DNA

<213> Pinus radiata

<400> 26

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gagatggtgg	aaagaatcgg	gttcccctga	gctaaccctc	gctcgacatc	gttacgtgga	180
attctacact	ttggtctgtg	gcattgacat	ggagcctaaa	gatgccgcat	tcagactgag	240
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<210> 27

<211> 191

<212> DNA

<213> Pinus radiata

<400> 27

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gaaatggcga	aagaagcaca	gaaatcacia	ggccgagaca	cgctcggcta	tgttcgacag	120
gctgtaataa	caattgatat	gctatgcata	tatttgaaata	aacaaataact	cgttggccat	180
ctatatttatt	t					191

<210> 28

<211> 373

<212> DNA

<213> Pinus radiata

<400> 28

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gtcacaggtt	caagaaaatt	ctccccgtga	gtttagtacc	tggatatgcc	acatttctaa	120
gggtgcctgg	actttatcta	caagagatca	tggttgggtt	gtggctgact	gctctgctga	180
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accccagcaa	aggcttttctg	cttgtgtcaa	ttatctactt	tccatgcaga	atacagacgg	300
cggttatgca	acttatgact	tgacacgatc	ctataattgg	ctagggactt	tcaatcctgc	360
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<210> 29

<211> 1411

<212> DNA

<213> Eucalyptus grandis

<400> 29

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accagatgga	cacggacaac	aaactcttca	atgtggcgct	cttgctcgtg	gccactctcg	180
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aaataacgtt	cttcatcggc	cctgagggtt	ctgcgcactt	cttcaaggct	tccgagtcgg	420
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<210> 30

<211> 689

<212> DNA

<213> Eucalyptus grandis

<400> 30

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ccaaaaaagt	tgtaaagggtg	acgcaaaaag	agcgaggatg	tggaagctca	agattggaga	180
gggagcgaac	gacccctacc	tggtcagcct	gaacaacttc	gtggggaggc	agatatggga	240
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cctgaggggag	aagaacttca	agcagacgat	ccctccgggtc	aagatcgagg	atggcgagga	420
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gcagtccagc	catggccact	ggcctgccga	gaacgcgggc	cccattgcgt	tctacttccc	540
tcccctggtc	atgagtctct	acgtgactgg	acatctgaac	aacgttttcc	atgccgagca	600
tcgcaggggag	atcctccgct	acatttacta	ccatcagaac	gaagacgggtg	gctggggact	660
gcacattgaa	ggccacagca	cgatgatcg				689

<210> 31

<211> 393

<212> DNA

<213> Pinus radiata

<400> 31

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ccaaggcaat	ggagaacgaa	gatggagtgt	caggagcagt	aaaggcattt	cataaacatt	180
tacccaaaaa	aatgccacaa	ccactgccac	cacctacaga	tcatagtcta	attgattcct	240
tctttacagg	tgttggaag	gtttttgggt	gtggctgatt	gtaccttaat	ataacgttta	300
tcaactatta	ggctggtatg	ctttgaaggt	aaaaactgaa	aatcgagtgc	ttgaacttgt	360
acatatgaca	aattcagatt	ttgtttcctt	ttg			393

<210> 32

<211> 519

<212> DNA

<213> Pinus radiata

<400> 32

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tagcaaggtt	ttgaagacca	ccgttccagc	tttgtagaa	ttgaacatgc	tcaagaattt	120
gactggatct	gcactggctg	gtgccatggg	aggattcaat	gcccattgcat	ccaatatcgt	180
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tattacgatg	atggaggcat	ccaacgatgg	aaaggatctt	catgtatcag	tcacatgcc	300
ttgtattgag	gttggaacag	taggaggtgg	aacgcagttg	gcctcacaag	ctgcttgctt	360
gaatatgctc	ggagtgaag	gagcgaataa	ggaatcccc	ggagcgaatg	ctcagacttt	420
ggccagaatt	gtggcaggag	cagttttggc	tggagagctg	tctctcatgt	ctgccttagc	480
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<210> 33

<211> 302

<212> DNA

<213> Pinus radiata

<400> 33

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agaaagattc	actgaatcgc	ttactaaaac	tctgtttcag	gaatggcaac	aggaggagga	180
gcgttgatc	tggcctcagg	aatgggaggg	aacattgaga	aagaacaaat	gctgaccgct	240
gttgaagagt	acgaaaaata	tcacatgtac	tatggtggtg	atgaaggctc	gagaaaaatc	300
aa						302

<210> 34

<211> 508

<212> DNA

<213> Eucalyptus grandis

<400> 34

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cctgcattgt	cctcattctg	ggcgggggtg	ccacaatgtc	gaaagcagga	gcgatggatc	120
tggcgacggg	ccttggcggg	aagatggaca	agagcgagct	cctgtccgcc	gttgacaagt	180
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ctttccattt	tgccacaga	tggaaagggg	agtctctacg	agagagcatt	aagagacatg	360
aacactttct	tgcattacag	ctaggcttaa	aacctgggca	caagggtgctg	gatgtcgggt	420
gcggaattgg	tggaccgctt	agggaaatag	ctcgattcag	ctccgcatct	gttacaggat	480
taaacaacaa	tgagtaccag	ataacaag				508

<210> 35

<211> 353

<212> DNA

<213> Pinus radiata

<400> 35

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cagaataagc	ttgggtctatg	atccccacac	agatgaatac	tacaatgccc	ctgggggtgga	120
gactagagtg	ccttattttg	gttcaacaga	aggaatgaag	taccttgatc	cctgcttcaa	180
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cggtaaatcc	ctttttgggtg	caccctatga	tttccgttac	ggtcctggaa	caaagtcctc	300
ttctgtgggg	gcaaagtatt	tggaaaatct	gagaaaattg	gtggaggagg	cgt	353

<210> 36
 <211> 82
 <212> DNA
 <213> Eucalyptus grandis

ggctattgga	acacaatgga	tattgcacac	gatcgagctg	gcttctacat	ctgttgggga	60
tgcttggtat	gggtcccatc	ca				82

<210> 37
 <211> 474
 <212> DNA
 <213> Pinus radiata

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agaacaggcc	tgccgttgcc	ttccctgtgg	gaaatTTTTTg	cgcagcttgc	agtttatttc	120
atggttgaag	actatggcaa	ctattggata	cacaggtggc	tacattgcaa	atggggctat	180
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actcacagcg	gatatgactt	tccgtggact	cttaccaaat	taattccttt	ctatggaggc	420
gcggagtatc	atgactacca	tcattatgta	ggaggacaaa	gtcaaagcaa	cttt	474

<210> 38
 <211> 340
 <212> DNA
 <213> Eucalyptus grandis

gccatcattg	tgggagattc	tggcgcagct	cctgggtctat	ttcttgattg	aagactacac	60
caactactgg	ttgcacagat	tattgcactg	caaattggggg	tatgaaaaga	tccacagcgt	120
tcaccacgag	tacagcgctc	cgatcggttt	tgcggcgcca	tacgcgcact	gggctgaggt	180
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gttgtgggtg	tggattgctt	tgcggcagat	tgaggccatc	gactactcac	agcgggtacg	300
aattgccttg	gagtcttacg	aagtacattc	cattctatgg			340

<210> 39
 <211> 487
 <212> DNA
 <213> Eucalyptus grandis

ggttatgggt	caatgggttca	gaactgtgtc	aaagctcggg	cccttctttc	aaagctcggg	60
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cgcgaagctc	ttctgttgat	gtgctaggtt	ccctgcaatt	cttccgcccc	gattcctatc	420
gaaatgggct	cgtgctgatg	ccgcagttat	gataagccag	acatgttaat	gaagcttgag	480
caaagat						487

<210> 40

<211> 571
 <212> DNA
 <213> Pinus radiata

<400> 40
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 gctgccgagc tggagagcac cattcgcacc atatagagaa gggggttgat agattcctgg 180
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 ttaacatcgc ctgagcttgc aaaggaggcc atctacaagc tatctctgaa gactcttagc 480
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 tttgctgttg cagctgcaaa agaagccttt g 571

<210> 41
 <211> 512
 <212> DNA
 <213> Eucalyptus grandis

<400> 41
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 attccggcgc gcgctccggc gatcgctcgc tcgctcgcta gccggttctt ctctcgctcg 180
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 ccgccttcga gcaggaccgc atgtggctca atggcaagga gatatactct tctggagata 420
 gatttcagag ttgtttgaga gaaattcgag cccgtgctac tgacgttgag aataaggaaa 480
 aaggaattaa aatttcaaaag aaagattggg ag 512

<210> 42
 <211> 445
 <212> DNA
 <213> Pinus radiata

<400> 42
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 ggagaaaata gagtcagaga atctattgca tagagctttc agtgtgtttc tattcaatac 420
 aaaatatgaa ttgcttcttc agcaa 445

<210> 43
 <211> 412
 <212> DNA
 <213> Eucalyptus grandis

<400> 43
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 gccacaaagg taacattccc ccttggtgtg acaaacacct gctgcagcca tccattgtac 360
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<210> 44
 <211> 834
 <212> DNA
 <213> Pinus radiata

<400> 44
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 gattggaacc gacatcgaag acttcaagtg ctcttggttg gtggtgcaag cgcttgaacg 180
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 gggttacagca tagtcatatc tgaagtcgta ctgtaggaaa gtgttcacaa cagatggcac 780
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<210> 45
 <211> 389
 <212> DNA
 <213> Pinus radiata

<400> 45
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 gaacctaaat tgatctcggc agttcggaat tttcaaactc caaatctcgg gaggggttcc 120
 tgcgctttga tcgttcgaga tgggggaatc tgaggagagt ttgggtgcag gttcgaatct 180
 caagtcagct gctgtgttg agcaggcaaa gaaacacctt gccacagacg ctgccccaga 240
 cctcaagaag aagatcggcc ttgtctatca gctcaacatt tcaccaaga aaattggaat 300
 agctgaggag gtgttcggtt tggacctcaa gaatggcaaa gtcactaaag gaccatatga 360
 aggaaagcca gatgcaacat tttcctttg 389

<210> 46
 <211> 469
 <212> DNA
 <213> Pinus radiata

<400> 46
 gatacatcca agcggagaat ggaagagatt aatgggtgata acgcagtaag gaggagctgc 60
 tttcctccag gtttcatggt tgggatagca acttctgctt atcagtgtga aggagctgcc 120
 aacgaagggtg gaaaaggccc aagcatctgg gactcatttt cacgaacacc aggcaaaatt 180
 cttgatggaa gcaacggtga tgtagcagtg gatcagtatc atcgttataa ggaagatgta 240
 aaactgatga aagatatggg agtggtatcc tacagattct cgctttcatg gcctcgtata 300
 tttccaaagg gaaaaggaga gatcaatgag gaaggagtag cctattacaa taacctcatc 360
 aatgaactcc tccagaatgg aatccaagcg tctgtcactt tgtttctact ggatactccc 420
 cagtctctgg aggatgaata tggcggattt ctgaggccaa ccattgtga 469

<210> 47
 <211> 349
 <212> DNA
 <213> Pinus radiata

<400> 47
 ctgggtgtgat ggcaggaatt ccagtcctaa ggccattttg catctgtttg ctttcagtct 60
 acatgctgca cattgtagct gcagtagctt caccaaggct aggtagaagc agcttcccaa 120
 ggggtttcaa atttggtgca gggatcatctg cttatcaggc ggaaggagct gctcatgagg 180
 gtggcaaagg cccaagcatt tgggatacat tctcccacac tccaggtaaa atcgctgatg 240
 ggaagaatgg ggatgttgca gtagatcaat accaccgtta taaggagat gtgcagcttc 300

tcaaatacat gggaatggac gtctatcggt tctctatctc ctgggtcacg

349

<210> 48
 <211> 385
 <212> DNA
 <213> Pinus radiata

<400> 48
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 tcggagttgc gacctccgcc tatcaagttg aagggtgctgc aaaaggagga ggaagaggcc 180
 ctagtatttg ggatacattt tcatatacac cagggaaaat tattgatgga agaaatggtg 240
 atgttgcatg ggatcaatac catcggtaca aggaggatgt ggattttaata gcaaaaatgg 300
 gattcaatgt gtatcgtttc tcaatatctt ggtctcgaat ctttccagat ggatttggag 360
 ctgaagtga taaggaagga atagc 385

<210> 49
 <211> 417
 <212> DNA
 <213> Pinus radiata

<220>
 <221> unsure
 <222> (209)...(212)

<400> 49
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 tcatgttttg ggtagcaact tctgcttacc agtgtgaagg agctgcaaaa gaagggtgga 180
 gaggtccaag catctgggac tcatttttnn nncagacacc aggcaaaatt gttgatggga 240
 gcaacggtga ttagctgtg gaccagtacc atcggtataa ggaagatgta aaacttataa 300
 aagatatggg agtggatgtc tacagattct caatctcatg gtctcgaatg tttccaaaag 360
 gaaaagggga gatcaatgag gaaggagtag cctattacaa taacctcata aatgaac 417

<210> 50
 <211> 264
 <212> DNA
 <213> Pinus radiata

<400> 50
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 gatcaagtac tgggggaaaa gagatgaaaa gctgacatc cccatcaatg acagcatcag 180
 ctttactttg gatccagacc atctgtcagc cacaaccact gtagcagtta gcccatcatt 240
 cacatctgat agaatgtggc tcaa 264

<210> 51
 <211> 417
 <212> DNA
 <213> Eucalyptus grandis

<400> 51
 ctgttttatt atgggaaaga gacaagtacc tcaccaagac gaagatacaa tttgtctccg 60
 tttgcaatat ccctaaatga gcttacacca ggcttacaag aaaaactgcc tccaactgat 120
 tcaaggttga gacctgatca gagacactta gaaaatgggg aatatgagtt ggcaaatgcc 180
 gagaagttaa gactggaaca catacagaga caggcaagaa agttacagga gggaggttgg 240
 caaccgcgat gggttgggaa ggatgatgat ggatgttacc gctacatggg tgggtattgg 300
 gaagctcgag aagcatacga actgggatgg aatccctgac atattcgggc aaaaatgttg 360
 atgcttcaac ctggcactgt ggtaggatag atatgtcctc ctgcttgctt gaatata 417

<210> 52

<211> 305
 <212> DNA
 <213> Pinus radiata

<400> 52
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 ggagggatca catttatcgc agagcaggtc agccaccatc ctccaatggg ctcagcctat 120
 gcagaaaatg aacattttac atacagtctg tctcctaaaag taaaaaccaa gtttcttggtc 180
 aactctgtgg atattttaccc acttggaagg acacgtgtgg tgctaaagaa atccggagac 240
 gttctagatt tgggtgccgcc tccatctaaa gttcataacc taatttttgg acgaacttgg 300
 attga 305

<210> 53
 <211> 474
 <212> DNA
 <213> Eucalyptus grandis

<400> 53
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 cggaagcaag cggccatggc gagcgactcg agcgcgaccc agctcaaadc cgacgccttg 120
 atggagcaga tgaagcagca cctctccacc gacgccggca aggcgggtcac caagaagatc 180
 ggctcgtct accagatcaa catcgccccc aagaaaattg ggttcgacga ggtggtctac 240
 atcgtcgatc tgaagaaggg agaggtcact aaaggaccat atgaagggtg aaaacctgat 300
 gctacctttt ccttcaaaga tgatgatttt atcaagggtg ccacaggaaa aatgaatcct 360
 caaattgctt ttatgagggg agcaatgaag attaagggaa gcctgagtgc agcgcagaaa 420
 ttcactcctg acatattccc aaagccatcg aagatgtgag cattttgaaa aggg 474

<210> 54
 <211> 562
 <212> DNA
 <213> Pinus radiata

<400> 54
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 aactagtggt atccaaagaa ttcggcacga gctttgaggg aacctacatt cattgaatcc 120
 caggatttct tcttggtcaa acaggtttta ggaaatggca ggcacaagtg ttgctgcagc 180
 agaggtgaag gctcagacaa cccaagcaga ggagccggtt aaggttggtc gccatcaaga 240
 agtgggacac aaaagtcttt tgcagagcga tgccctctat cagtatatat tggaaacgag 300
 cgtgtaccct cgtgagcccg agccaatgaa ggagctccgc gaagtgactg ccaagcatcc 360
 ctggaacctc atgactactt ctgccgatga ggttcaattt ctgggcctcc tgctgaagct 420
 cattaacgcc aagaacacca tggagattgg ggtgtacact ggttactcgc ttctcagcac 480
 agcccttgca ttgcccgatg atggaaagat tctagccatg gacatcaaca gagagaacta 540
 tgatatcgga ttgcctataa tt 562

<210> 55
 <211> 1961
 <212> DNA
 <213> Pinus radiata

<400> 55
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 aatcaattga aaggttttta ttttcagtat ttcgatcgcc atggccaacg gaatcaagaa 120
 ggtcgagcat ctgtacagat cgaagcttcc cgatatcgag atctccgacc atctgcctct 180
 tcattcgtat tgctttgaga gagtagcgga attcgcagac agaccctgtc tgatcgatgg 240
 ggcgacagac agaacttatt gcttttcaga ggtggaactg atttctcgca aggtcgctgc 300
 cggctctggcg aagctcgggt tgcagcaggg gcaggttgtc atgcttctcc ttccgaattg 360
 catcgaattt gcgtttgtgt tcatgggggc ctctgtccgg ggcgccattg tgaccacggc 420
 caatcctttc tacaagccgg gcgagatcgc caaacaggcc aaggccgcgg gcgcgcgcga 480
 tcatagttac cctggcagct tatgtggaga aactggccga tctgcagagc cacgatgtgc 540
 tcgtcatcac aatcgatgat gctcccaagg aaggttgcca acatatttcc gttctgaccg 600
 aagccgacga aaccaatgc ccggccgtga caatccaccc ggacgatgtc gtggcggttcg 660

cctattcttc	cggaaccacg	gggctcccca	agggcgtgat	gttaacgcac	aaaggcctgg	720
tgtccagcgt	tgccagcag	gtcgatgggtg	aaaatcccaa	tctgtatttc	cattccgatg	780
acgtgatact	ctgtgtcttg	cctcttttcc	acatctattc	tctcaattcg	gttctcctct	840
gcgcgctcag	agccggggct	gcgaccctga	ttatgcagaa	attcaacctc	acgacctgtc	900
tggagctgat	tcagaaatac	aaggttaccg	ttgccccaat	tgtgcctcca	attgtcctgg	960
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gtgcagagta	agcgccttat	aaggagagag	agagcttata	aattgtatca	tatggattgt	1860
caacgccta	cactcttgcg	atcgctttca	atatgcatat	tactataaac	gatatatgtt	1920
ttttttataa	atttactgca	cttctcgttc	aaaaaaaaaa	a		1961

<210> 56

<211> 414

<212> DNA

<213> Eucalyptus grandis

<400> 56

cacgctcgac	gaattcggta	ccccgggttc	gaaatcgata	agcttggatc	caaagcaaca	60
cattgaactc	tctctctctc	tctctctctc	tctctctctc	tccccaccc	ccccttccca	120
acccaccca	catacagaca	agtagatacg	cgcacacaga	agaagaaaag	atgggggttt	180
caatgcagtc	aatcgacta	gcgacgggtc	tggccgtcct	aacgacatgg	gcgtggaggg	240
cgggtgaactg	ggtgtggctg	aggccgaaga	ggctcgagag	gcttctgaga	cagcaagggtc	300
tctccggcaa	gtcctacacc	ttcctggctg	gcgacctcaa	ggagaacctg	cggatgctca	360
aggaagccaa	gtccaagccc	atcgccgtct	ccgatgacat	caagcctcgt	ctct	414

<210> 57

<211> 469

<212> DNA

<213> Eucalyptus grandis

<400> 57

gaattcggca	cgagtgtctc	tctctctctc	tctctctgta	aaccaccatg	ctcttctctca	60
ctcatctcct	agcagttcta	ggggttgtgt	tgctcctgct	aattctatgg	agggcaagat	120
cttctccgaa	caaaccctaa	ggtactgcct	tacccccgga	gctgccgggc	gcatggccga	180
tcataggcca	catccacttg	ctggggcgcg	agaccccgct	ggccaggacc	ctggccgcca	240
tggcggacaa	gcaggggccc	atgtttcgga	tccgtctcgg	agtccacccg	gcgaccatca	300
taagcagccg	tgaggcggtc	cgggagtget	tcaccaccca	cgacaaggac	ctcgcttctc	360
gccccaaatc	caaggcgggg	atccacttgg	gctacgggta	tgccggtttt	ggcttcgtag	420
aatacggggg	cttttggcgc	gagatgagga	agatcaccat	gctcgagct		469

<210> 58

<211> 760

<212> DNA

<213> Eucalyptus grandis

<400> 58

ggaagaagcc	gagcaaacga	attgcagacg	ccattgaaaa	aagacacgaa	agagatcaag	60
aaggagctta	agaagcatca	tcaatggcag	ccaacgcaga	gcctcagcag	acccaaccag	120
cgaagcattc	ggaagtcggc	cacaagagcc	tcttgcagag	cgatgctctc	taccagtata	180

tattggagac	cagcgtctac	ccaagagagc	cagagcccat	gaaggagctc	agggaataa	240
cagccaaaca	tccatggaac	ctgatgacca	catcggcgga	tgaagggcag	ttcctgaaca	300
tgtcctcaa	gctcatcaac	gccaagaaca	ccatggagat	cggcgtctac	accggctact	360
ctctcctcgc	aaccgccctt	gctcttccc	atgacggaaa	gatcttggcc	atggccatca	420
ataggagaa	cttcgagatc	gggctgccc	tcattccagaa	ggcggcctt	gccacaaga	480
tcgatttcag	agaaggccct	gccctgccc	tccttgatca	gctcgtgcaa	gatgagaaga	540
accatggaac	gtacgacttc	ttctcaatcc	ttaatcgttc	atttgaatac	aaatacatgc	600
tcaatggttc	aaagacaaca	taagacagaa	gatggaaaaa	atagaaagga	aggaaagtat	660
taagggtagt	ttctcatttc	atcaatgctt	gattttgaga	tctcctttct	ggtgcgatca	720
gctgaccg	cggcacaggt	gatgccatcc	ccgacgggaa			760

<210> 59

<211> 468

<212> DNA

<213> *Eucalyptus grandis*

<400> 59

gaattcggca	cgagaactca	tcttgaaatg	tcattggagt	catcatcctc	tagtgagaag	60
aaacaaatgg	gttcgcgcg	attcgaatcg	gccacaaagc	cgcacgccgt	ttgcattccc	120
taccctgcac	aaagccacat	tggcgccatg	ctcaagctag	caaagctcct	ccatcacaag	180
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aactatatgg	tcagcccat	caacgatctt	gtatcgagcc	tgggctcgaa	cccgagcgtc	420
cctccggtga	cttgcacaa	tctcggatgg	tttcatgaca	ctcgtgac		468

<210> 60

<211> 684

<212> DNA

<213> *Pinus radiata*

<400> 60

gaattcctgc	agcccgggg	atccactagt	tctagagcgg	ccgccaccgc	ggtggagctc	60
gcgcgcctgc	aggtcgacac	tagtggatcc	aaagaattcg	gcacgaggcc	cgacggccac	120
ttgttgagcg	ccatggaagc	tctccggaaa	gccgggattc	tggaaaccgtt	taaactgcag	180
cccaaggaag	gactggctct	cgtcaaccgc	acagcgggtg	gatccgccgt	ggccgcgtcc	240
gtctgttttg	acgccaacgt	gctgggcgtg	ctggctgaga	ttctgtctgc	gctcttctgc	300
gaggtgatgc	aagggaacc	ggagttcgta	gatccgttaa	cccaccagt	gaagcaccac	360
ccagggcaga	tcgaagccgc	ggcgcgtcatg	gagttcctcc	tcgacggtag	cgactacgtg	420
aaagaagcag	cgcggttca	cgagaaagac	ccgttgagca	aaccgaaaca	agaccgctac	480
gctctgcaaa	catcgccaca	gtgggtgggg	cctccgatcg	aagtcacccg	cgctgctact	540
cactccatcg	agcgggagat	caattccgtc	aacgacaatc	cgtaaatcga	tgtctccagg	600
gacatggctc	tccacggcgg	caacttccag	ggaacaccca	tcggagtttc	catggacaac	660
atgcgaatct	ctttggcagc	cgtc				684

<210> 61

<211> 479

<212> DNA

<213> *Pinus radiata*

<400> 61

gatatcccaa	cgaccgaaaa	cctgtatttt	cagggcgcca	tggggatccg	gaattcggca	60
cgagcaagga	agaaaaatatg	gttgacgacg	cagaaattac	gcaggccaat	gaagttcaag	120
ttaaaagcac	tgggctgtgc	acggacttcg	gctcgtctgg	cagcgatcca	ctgaactggg	180
ttcgagcagc	caaggccatg	gaaggaagtc	actttgaaga	agtgaagcgc	atgggtggatt	240
cgtatttggg	agccaaggag	atttccattg	aagggaaatc	tctgacaatc	tcagacgttg	300
ctgccgttgc	tcgaagatcg	caagtgaag	tgaaattgga	tgctgcggct	gccaaatcta	360
gggtcgagga	gagttcaaac	tgggttctca	cccagatgac	caaggggacg	gatacctatg	420
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<210> 62

<211> 1785

<212> DNA

<213> Pinus radiata

<400> 62

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cacgaggttg	caggtcgggg	atgatttgaa	tcacagaaac	ctcagcgatt	ttgccaagaa	180
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tcaacgttgc	agcaattgag	acaacgctgt	ggtcgatgga	atggggaata	gcggagctgg	960
tgaaccacca	ggacattcag	agcaaggtgc	gcgcagagct	ggacgctgtt	cttggaccag	1020
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aaacactcca	tctatcatga	ctgtgtgtgc	gtgtccactg	tcgagtctac	taagagctca	1620
tagcatttca	aaagtttgct	aggatttcaa	taacagacac	cgtcaattat	gtcatgtttc	1680
aataaaagtt	tgcataaatt	aaatgatatt	tcaatatact	atthttgactc	tccaccaatt	1740
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<210> 63

<211> 475

<212> DNA

<213> Pinus radiata

<400> 63

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taggaacctg	ccgccaggac	ccccggcatg	gccgatcgta	gggaacgtcc	ttcagattgg	180
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cgaggcgctc	gtacagaagg	gctccgtctt	cgtgaccg	ccgcccgc	tcgggatgca	360
gaaaatcttc	agtagcaacc	agcacaacat	cacttcgggt	gaatacggcc	cgctgtggcg	420
gagccttcgc	aggaatctgg	ttaaagaagc	cctgagactt	cggcgatgaa	ggctt	475

<210> 64

<211> 957

<212> DNA

<213> Pinus radiata

<400> 64

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ctttaactgc	aataactgtg	gaagcgtaca	aaaagtttgt	cctagtttct	ctcattcaga	120
ctggtcaggt	tccagcattt	ccaaaataca	cacctgctgt	tgtccaaaga	aatttgaaat	180
cttgactca	gccctacatt	gatttagcaa	acaactacag	tagtgggaaa	atthttgtat	240

tggaagcttg	tgtcaacacg	aacacagaga	agttcaagaa	tgatagtaat	ttgggggttag	300
tcaagcaagt	tttgtcatct	ctttataaac	ggaatattca	gagattgaca	cagacatatc	360
tgacctctc	tcttcaagac	atagcaagta	cggtagagtt	ggagactgct	aagcaggctg	420
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
tagtactgtg	gctgagtcca	gaaaggatct	ctcggtagta	tcacttgaca	tgccatcaaa	840
aaaatctcaa	atctctcgat	gtctagtctt	gatttttgatt	atgaatgcga	cttttagttg	900
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<210> 65

<211> 471

<212> DNA

<213> Pinus radiata

<400> 65

gaattcggca	cgagaaaacc	ttttcagacg	aatgtttctga	tgctcggccc	cgccagaca	60
acagacatac	ttctcactgc	caatcaggct	acaggtagat	actacatggc	tgctcgagca	120
tattccaacg	ggcaaggagt	tcccttcgat	aacaccacta	ccactgccat	tttagaatac	180
gagggaagct	ctaagacttc	aactccagtc	atgcctaata	ttccattcta	taacgacacc	240
aacagtgtta	ctagcttcgc	taatgggtctt	agaagcttgg	gctcacacga	ccaccagtc	300
ttcgttcttc	agagtgtgga	ggagaatctg	ttctacacca	tcggtttggg	gttgatcaaa	360
tgctcggggc	agtcttggg	aggtccaacg	gatcaagatt	tgagcaagt	atgaatacat	420
atcatttgtc	ccgaaccac	ttcttccaat	ccttcaagct	cagcattttg	g	471

<210> 66

<211> 1010

<212> DNA

<213> Pinus radiata

<400> 66

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ttgcagcatt	aagcaaagaa	gatgagttca	tttttcacag	cccttttcct	gcagtacctg	120
ttccagagaa	tataagtctt	ttccagtttg	ttctggaagg	tgctgagaaa	taccgtgata	180
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gcgcagtgtt	ttctggggca	aatccttctg	cacacatcaa	tgaagttgaa	aaacatatcc	420
aggattctgg	agcaaagatt	gttgtgacag	ttgggtctgc	ttatgagaag	gtgaggcaag	480
tgaaactgcc	tggtattatt	gcagataacg	agcatgtcat	gaacacaatt	ccattgcagg	540
aaatttttga	gagaaactat	gaggccgcag	ggccttttgt	acaaatttgt	caggatgatc	600
tgtgtgcact	cccttattcc	tctggcacca	caggggcctc	taaagggtgc	atgctcactc	660
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gaaatttcac	cacgttgggg	ctgatgccat	tctttcacat	atatggcatc	acgggcatct	780
gttgcgccac	tcttcgcaac	ggaggcaagg	tcgtgggtcat	gtccagattc	gatctccgac	840
actttatcag	ttctttgatt	acttatgagg	tcaacttcgc	gcctattgtc	ccgcctataa	900
tgctctccct	ccggttttaa	aatcctatcg	ttaacgagtt	cgatctcagc	cgcttgaaac	960
tccaaagctg	ttcatgactg	cggctgctcc	actggcgccg	gatctactgc		1010

<210> 67

<211> 1410

<212> DNA

<213> Pinus radiata

<400> 67

gaagatgggg	ctgtgggtgg	tgctggcttt	ggcgctcagt	gcgcactatt	gcagtctcag	60
gcttacaatg	tggttaagttc	aagcaatgct	actgggagtt	acagtgagaa	tggttggtg	120
atgaattact	atggggactc	ttgccctcag	gctgaagaga	tcattgtctg	acaagtacgc	180

ctgttggtaca	aaagacacaa	gaacactgca	ttctcatggc	ttagaaatat	tttccatgac	240
tgtgctgtgg	agtcattgtga	tgcacgcgtt	ctgttggtgact	caacaaggaa	cagcatatca	300
gaaaaggaca	ctgacaggag	cttcggcctc	cgcaacttta	ggtatttgga	taccatcaag	360
gaagccgtgg	agagggagt	ccccggggtc	gtttcctgtg	cagatatact	cgttctctct	420
gccagagatg	gcgttggtatc	gttgggagga	ccatacatte	ccctgaagac	gggaagaaga	480
gatggacgga	agagcagagc	agatgtggtg	gagaattacc	tgcccgatca	caatgagagc	540
atctccactg	ttctgtctcg	cttcaaagcc	atgggaatcg	acaccctgtg	ggttgttgca	600
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cagcaactgt	atgcagattc	gaggaccagg	ccgtatgtga	agaagatggc	aaaaagccag	900
gaatacttct	tcaataactt	ctcccgggcg	ctcaccatcc	tctctgagaa	caatcctctc	960
accggcgctc	gaggagaaat	ccgtcggcag	tgctcgctca	aaaacaaatt	gcacacaaaa	1020
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tgggtggcat	ttcatatata	aattgcagtt	tgcgttttta	ttagataatc	ataatggtgt	1140
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cttattccct	tatgtaagca	gaacctttta	ttataagcaa	aaaagacaat	cctgtctgtt	1260
attctagtag	aattttgtca	tcagttaaag	ttgctcatct	gataataact	ggaaacggta	1320
aaatatgaca	actacgtatc	ttctttggtc	atctgataat	aaccggaaac	gataaaatat	1380
gacaactaca	tatattcttt	aaaaaaaaaa				1410

<210> 68

<211> 607

<212> DNA

<213> Eucalyptus grandis

<400> 68

gaattcggca	cgagccaacc	ctggaccagg	tacttttggc	aggcgggtcca	ttgcccttca	60
aaccgggtcca	aaccggacca	tcactgtcct	tatatacgtt	gcacatgcc	tgctcataga	120
acttaggtca	actgcaacat	ttcttgatca	caacatatta	caatattcct	aagcagagag	180
agagagagag	agagagagag	agagagagag	agagtttgaa	tcaatggcca	ccgccggaga	240
ggagagccag	acccaagccg	ggaggcacca	ggagggtggc	cacaagtctc	tccttcagag	300
tgatgtctct	taccaatata	ttttggagac	cagcgtgtac	ccaagagagc	ctgagcccat	360
gaaggagctc	agggaaataa	cagcaaaaaca	tccatggaac	ataatgacaa	catcagcaga	420
cgaagggcag	ttcttgaaca	tgcttctcaa	gctcatcaaa	gccaagaaca	ccatggagat	480
tgggtgtcttc	actggctact	ctctcctcgc	caccgctctt	gctcttcctg	atgacggaaa	540
gattttggct	atggacatta	acagagagag	ctatgaactt	ggcctgccgg	catccaaaaa	600
gccgggtg						607

<210> 69

<211> 421

<212> DNA

<213> Eucalyptus grandis

<400> 69

gaattcggca	cgagccgttt	tatttctctt	gatttctctt	gctcgagtct	cgcggaagag	60
agagaagaga	ggagaggaga	gaatgggttc	gaccggatcc	gagacccaga	tgaccccgac	120
ccaagtctcg	gacgaggagg	cgaacctctt	cgccatgcag	ctggcgagcg	cctccgtgct	180
ccccatggtc	ctcaaggccg	ccatcgagct	cgacctcttc	gagatcatgg	ccaaggccgg	240
gccggggcgc	ttcctctccc	cgggggaagt	cgcggcccag	ctcccgaacc	agaaccccgga	300
ggcaccgcta	atgctcgacc	ggatcttccg	gctgctggcc	agctactccg	tgctcacgtg	360
cacctctcgc	gacctccccg	atggcaagg	cgagcggctc	tacggcttag	cgccgggtgtg	420
c						421

<210> 70

<211> 508

<212> DNA

<213> Eucalyptus grandis

<400> 70

gaattcggta	cccgggttcg	aaatcgataa	gcttggatcc	aaagaattcg	gcacgagatc	60
actaaccatc	tgcctttctt	catcttcttt	cttctgcttc	tcctccgttt	cctcgtttcg	120
atatcgtgaa	aggagtcctg	cgacgacaat	ggccgagaag	agcaagggtc	tgatcatcgg	180
agggacgggc	tacgtcggca	agttcatcgt	ggaagcgagt	gcaaaagcag	ggcatccac	240
gttcgcgctg	gttaggcaga	gcacgggtctc	cgaccccgtc	aagggccagc	tcgtcgagag	300
cttcaagaac	ttgggcgtca	ctctgctcat	cggtgatctg	tacgatcatg	agagcttggt	360
gaaggcaatc	aagcaagccg	acgtgggtgat	atcgacagtg	gggcacatgc	aaatggcgga	420
tcagaccaaa	gaatcgtcga	cgccattaaa	ggaagctggc	aacgttaagg	tttgttggtt	480
ggttcatttg	atctggtttg	gggggggtc				508

<210> 71

<211> 495

<212> DNA

<213> Eucalyptus grandis

<400> 71

gaattcggca	cgagggttaat	ggcagtgcag	cctcaacacc	accacacctc	ctccatctct	60
ctcctccctt	cttctttctc	tgacttcaat	ggcagccgac	tcctatgctt	cgttcagtat	120
aagaggaagg	tggggcagcc	taaaggggca	ctgcgggtca	ctgcatcaag	caataagaag	180
atcctcatca	tgggaggcac	ccgtttcatc	ggtgtgtttt	tgtcgagact	acttgtcaaa	240
gaaggtcac	aggtcacttt	gtttaccaga	ggaaaagcac	ccatcactca	acaattgcct	300
ggtgagtcgg	acaaggactt	cgctgatttt	tcattccaaga	tcctgcattt	gaaaggagac	360
agaaaggatt	ttgattttgt	taaatctagt	cttgctgcag	aaggctttga	cgttgtttat	420
gacattaacg	gcgagaggcg	gatgaagtcg	caccaatttt	ggatgcctgc	caaaccttga	480
accagtcaac	tactg					495

<210> 72

<211> 472

<212> DNA

<213> Eucalyptus grandis

<400> 72

gaattcggca	cgagcataag	ctctcccgtg	atcctcacat	cacatggcga	agagcaagggt	60
cctcgctcgt	ggcggcactg	gctacctcgg	gcggagggtc	gtgagggcga	gcctggacca	120
gggccacccc	acgtacgtcc	tccagcgctc	ggagaccggc	ctcgacattg	agaagctcca	180
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ccacttcggg	agccacaaca	tcctgatgca	gctcaaagctc	gtggaggcta	tcaaagaagc	360
tggaaatgtc	aagcggtttt	tgccgtcaga	gttcgggaatg	gaccggcccc	tcatgggtca	420
tgcaattgag	ccgggaaggg	tcacgttcga	tgagaaatgg	aggtgagaaa	ag	472

<210> 73

<211> 380

<212> DNA

<213> Eucalyptus grandis

<400> 73

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tcgagagctt	gtcgagcagt	ggcattcagt	cgatcccgcg	ggagtatgtg	aggccgaagg	120
aggagctcac	aagcattggc	gacatcttcg	aggaggagaa	gaagcatgag	ggccctcagg	180
tcccgaacct	cgacctcgag	gacatagcgt	ctaaagaccc	cgtgggtgag	gagaggtgcc	240
acgaggagct	caggaaggct	gccaccgact	ggggcgctcat	gcacctcgte	aaccatggga	300
tcccacacga	cctgattgag	cgtgtaaaga	aggctggcga	ggtgttcttc	aacctcccg	360
tcgaggagaa	ggacaagcat					380

<210> 74

<211> 515

<212> DNA

<213> Eucalyptus grandis

<400> 74

ctctctctct	ctctctctct	gtgtgttcat	tctcgttgag	ctcgtggtcg	cctcccccca	60
tggatccgca	caagtaccgt	ccatccagtg	ctttcaacac	ttctttctgg	actacgaact	120
ctggtgctcc	tgtctggaac	aataactctt	cgttgactgt	tggaagcaga	ggccaatttc	180
ttcttgagga	ttatcacctc	gtggagaaac	ttgccaactt	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
ctgtcttctt	tgtccgtaat	gggataaatt	ccccg			515

<210> 75

<211> 487

<212> DNA

<213> Eucalyptus grandis

<400> 75

gaattcggca	cgagctccca	cttctgtctc	gccaccatta	ctagcttcaa	agcccagatc	60
tcagtttctg	gctctcttcg	tcattctctgc	ctcttgccat	ggatccgtac	aagtatcgcc	120
cgtccagcgc	ttacgattcc	agcttttgga	caaccaacta	cgggtgctcc	gtctggaaca	180
atgactcatc	gctgactgtt	ggaactagag	gtccgattct	cctggaggac	taccatctga	240
ttgagaaact	tgccaacttc	gagagagaga	ggattcctga	gcgggtgggtc	catgcacggg	300
gagccagcgc	gaaaggggttc	ttcgaggtca	cccacgacat	ctctcacttg	acctgtgctg	360
atttcctccg	ggctcctgga	gtccagacgc	ccgtaatcgt	ccgtttctcc	accgtcatcc	420
acgagcgcgg	cagcccgaac	ctcagggacc	ctcgtggttt	tgcagtgaag	ttctacacca	480
gagaggg						487

<210> 76

<211> 1474

<212> DNA

<213> Pinus radiata

<400> 76

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agccagacga	tcgaatcctg	tgaagtgggt	ctgaagtgat	gggaagcttg	gaatctgaaa	120
aaactgttac	aggatatgca	gctcgggact	ccagtggcca	cttgtccctt	tacacttaca	180
atctcagaaa	gaaaggacct	gaggatgtaa	ttgtaaaggt	catttactgc	ggaatctgcc	240
actctgattt	agttcaaatg	cgtaatgaaa	tggacatgtc	tcattaccca	atggtccttg	300
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gcacacctac	tcagggcgga	tttgcaagca	gtatgggtgg	tgatcagatg	tttgtgggttc	540
gaatcccgga	gaatcttcct	ctggaacaag	cggccctctt	gttatgtgca	ggggttacag	600
ttttcagccc	aatgaagcat	ttcgccatga	cagagcccgg	gaagaaatgt	gggatttttg	660
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ttcagatgtt	tttttaactt	gtatatgtaa	agatcaattt	ctcgtgacag	taaataataa	1380
tccaatgtct	tctgccaaat	taatatatgt	attcgtattt	ttatatgaaa	aaaaaaaaaa	1440
aaaaaaaaaa	aaaaaaaaaa	aaaaaaaaaa	aaaa			1474

<210> 77

<211> 414

<212> DNA

<213> Eucalyptus grandis

<400> 77

cacgctcgac	gaattcggta	ccccgggttc	gaaatcgata	agcttggatc	caaagcaaca	60
cattgaactc	tctctctctc	tctctctctc	tctctctctc	tccccaccc	ccccttccca	120
acccaccca	catacagaca	agtagatacg	cgcacacaga	agaagaaaag	atggggggtt	180
caatgcagtc	aatcgcaacta	gcgacgggtc	tggccgtcct	aacgacatgg	gcgtggaggg	240
cgggtgaactg	gggtgtggctg	aggccgaaga	ggctcgagag	gcttctgaga	cagcaaggtc	300
tctccggcaa	gtcctacacc	ttcctggctg	gcgacctcaa	ggagaacctg	cggatgctca	360
aggaagccaa	gtccaagccc	atcgccgtct	ccgatgacat	caagcctcgt	ctct	414

<210> 78

<211> 273

<212> DNA

<213> Eucalyptus grandis

<400> 78

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catcttcccc	tacctgccc	tcccagctca	ccatcgctcg	gataaggctc	ggaagaagct	120
ttctgagatt	tttgcaaca	tcatttcttc	acgaaaatgt	gctggcaaat	cagaagaaga	180
catgttgtag	tgcttcattg	actccaagta	caaaaatggt	cgcccgacaa	ctgaggccga	240
ggctcactggt	ctgcttattg	cggctctctt	tgc			273

<210> 79

<211> 121

<212> DNA

<213> Eucalyptus grandis

<400> 79

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ggagaagcat	gggaacaatg	ttgatcatga	tggtctttct	gaaatggatg	tcctgtatcg	120
g						121

<210> 80

<211> 505

<212> DNA

<213> Eucalyptus grandis

<400> 80

ggaggctgaa	gatagcagaa	ggagaggacg	gtccctacct	gtacagcacc	aacaactacg	60
tggggagaca	gatttgggag	ttcgatccgg	aggctggcac	cgctgaggag	cgcgcgagg	120
tcgaggctgc	tcgccagcac	ttctacgacc	accgccacca	agtcaagccc	tgtggcgacc	180
tcctctggcg	catgcagttc	ctgagggaga	aggagttcaa	gcagacgatt	ccgccagtga	240
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ctctcttctt	cctccctccc	ctggctcatgt	gcgtctacat	caccggccac	cttgacgccg	420
tcttccccgc	cgagcatcgc	aaagagattc	tccgctacat	ctacaaccac	cagaatgaag	480
atgggtggatg	gggcttgcac	atcga				505

<210> 81

<211> 270

<212> DNA

<213> Eucalyptus grandis

<400> 81

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ggagttgctc	ataaaatata	gtggtgtctc	ggagcaggaa	gctgtggagg	aactccagaa	120
acgagtcatt	gatgcattga	aggacaccaa	tgaagagttt	ctccgtccaa	ttgcgggtccc	180
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tggggataat	tacaccatt	ctgaaaccaa				270

<210> 82
 <211> 441
 <212> DNA
 <213> Eucalyptus grandis

<400> 82
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 ccatggagga tgatcgagat cgggggcttc tttacgattc agatccgccg tctccatcgc 120
 tctccccgcc actctccccg ccggggccgt tcgcgctcac cttcttcgac agggagaggc 180
 acgtgacgtt cctggagatg atgtaccaca tgctccctcg cccctaccag tcgcaggaga 240
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 atcgcgtaga caaagatgag gttgctgact ggggtttatc tttccaagct catccgagga 360
 gtaaagctga tctagacaat ggacaatttt atgggtttca tggttccaga agctcacagt 420
 tcccttcaaa agataatgcg a 441

<210> 83
 <211> 467
 <212> DNA
 <213> Eucalyptus grandis

<400> 83
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 atcgagatcg ggggcttctt tacgattcag atccgtcgtc tccatcgctc tccccgccgc 180
 ggccggttcg gctcaccttc ttcgacaggg agaggcacgt gacgttcctg gagatgatgt 240
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 tcgtcatctc cggcctcgac atcctcgacg ccctcgatcg cgtacacaaa gatgcggttg 360
 ctgactgggt tttatctttc caagctcatc cgaggagtaa agctgatcta gacaatggac 420
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<210> 84
 <211> 396
 <212> DNA
 <213> Pinus radiata

<400> 84
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 atggaatatg gttggcatat aaatttgcca agattggaag caaggaaacta catcgacgtg 180
 tttggacagg accccattta tttgatgcca aatatgaaga cccaaaaact tctagaactc 240
 gcaaagtgg agttcaatat gtttcaactt ttacaacagc aagagctaaa acttctctcc 300
 agatggtgga aagattcggg tttctctcaa atgaccttcc ctggcatcg tcacgtggaa 360
 tattacactt tggcatcttg cattgatagt gaacct 396

<210> 85
 <211> 462
 <212> DNA
 <213> Pinus radiata

<400> 85
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 ctcaatttat ttcgggctc cctcggtgcc tttccggggg agaattgtct gggagaggct 180
 gaaatattct ctacaacata tttaaaagaa gccctgaaaa cggttccgat ttccagtgcc 240
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 ttggaagcaa ggaattacat tgacctatct ggaaacgaca gtaatccatc gcttgagagg 360
 accaagaaag agaagctttt agaactcgca aaattagagt tcaatatctt tcaactcctg 420
 caacagaaag agttaagca tgtgtccaga tgggtggaaa at 462

<210> 86
 <211> 247

<212> DNA

<213> Pinus radiata

<400> 86

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caaataattct	gcacatcata	tttaaaggaa	gccctaaaaa	cggttccgat	ctccaatggt	120
agtctttcag	gagagattga	atacgttatt	gaatatgggt	ggctcacaaa	tttcccagaga	180
ttggaagcac	gaaattatat	cgacgtattt	ggaaaggaca	ccattccctg	tgtaagacg	240
acgacca						247

<210> 87

<211> 426

<212> DNA

<213> Pinus radiata

<400> 87

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tgcaaaattg	gagttcaata	tctttcactc	cttacagcaa	aaagagttaa	aacagctgtc	180
cagatgggtg	aaagattcgg	gtttctctca	actgacattc	actcggcatc	gtcacgtgga	240
attctacact	ttggcctcct	gcattgccac	tgagcccaaa	cattcagcat	tcagattggg	300
ctttgccaaa	acgtgttatc	ttggaatagt	tctggacgac	atctatgaca	ctttcggaac	360
gatggaggag	ctcgaactct	tcacagccgc	aattaagaga	tgggatccgt	ccgccaggga	420
gttcct						426

<210> 88

<211> 488

<212> DNA

<213> Pinus radiata

<400> 88

ctcacaaatt	ttccgagatt	ggaagcaagg	aattacatcg	acgttttttg	aaaggacact	60
agtccctgca	ttaagacgac	caccaccacc	accatgaccg	agaagctctt	agaacttgca	120
aaattggagt	tcaatatctt	tcactcctta	caacaaaaag	agttaaaaca	gctctccaga	180
tggtggaaaag	attcgggttt	ctctcgactc	acattcactc	ggcatcgtca	cgtggaattc	240
tacacttttg	cctcctgcat	tgccactgag	cccaaacatt	cagcatttag	attgggcttt	300
gccaaaacgt	gttatcttgg	aatagttctg	gacgacatct	atgacacttt	cggaacgatg	360
gaggagctcg	aactcttcac	agccgcaatt	aagagatggg	atccttccgc	cagggagtgc	420
cttccagaat	atatgaaagg	catatatatg	gtgttttacg	atgcgttaat	caaatggctc	480
gagaggcg						488

<210> 89

<211> 223

<212> DNA

<213> Pinus radiata

<400> 89

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cacatactct	gccaaataga	ttatcgatcc	aaatttgcac	atctcatagg	tttgataggg	180
cgtttgctga	atgataccaa	aacttaccag	gcggagcgag	gtc		223

<210> 90

<211> 318

<212> DNA

<213> Pinus radiata

<400> 90

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cggaaaattg	cagaagactg	gtttttgaca	atgcaagatc	atcgcaactg	ttttgcatgg	120
aaaatgacgg	tttcacacat	tcacatgaaa	cggaaaattaa	agagcatgtc	aaaaagatac	180

tgttcgaacc	agttgcgtag	aatacgtttac	tcaaataaag	gcccggcact	ttcattttgt	240
actgtttacca	cacatacttg	ctcagagggt	attatgaccg	ttctgttatt	cgtattttct	300
aatgcccgcga	atgaaatt					318

<210> 91
 <211> 1695
 <212> DNA
 <213> Eucalyptus grandis

<400> 91

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atcaagtcgg	tcgtcgaggg	aaagatgccg	tcgtactcgc	tcgagtccaa	gcttggggac	180
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ccggttggtg	atgtgcagat	accggtgggg	attgccgggc	cgctgttgct	cgacggggagg	360
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<210> 92
 <211> 315
 <212> DNA
 <213> Eucalyptus grandis

<400> 92

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gccacggctg	tgtecggcgc	cgtecttgcc	gccgagctct	ccctcatgtc	cgctatcgcg	180
gcggggcagc	tcgtgaagag	ccacatgaag	tacaacaggt	ccagcaaaga	cgttaccaag	240
gtctcctctt	aaattataaa	cacgagaaaa	aatcacgat	gcgtcccga	aggaaggagg	300
ggccacggaa	gaatc					315

<210> 93
 <211> 244
 <212> DNA
 <213> Eucalyptus grandis

<400> 93

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ggatctccgg aaacttctgc tcggataaga agcccgagc tgtgaactgg attgagggga	180
ggggcaagtc ggttgtgtgc gaggccgtga tcaagggcga cgtggtgagg aaggtgctca	240
agac	244

<210> 94
 <211> 244
 <212> DNA
 <213> Eucalyptus grandis

<400> 94	
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gaaggacttc cccgacatgg acgtgatggg gatctccgga aacttctgct cggataagaa	180
gcccgcagct gtgaactgga ttgaggggag gggcaagtcg gttgtgtgcg aggccgtgat	240
caag	244

<210> 95
 <211> 419
 <212> DNA
 <213> Pinus radiata

<400> 95	
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gccggtgctc ttggtgggtt taatgcccac gcaagcaaca tagtctctgc aatatatata	180
gcaactggac aggatccagc tcagaatggt gagagtctc attgcatcac catgatggaa	240
gctgttaatg agggaaggga tcttcacata tctgtcacca tgccttccat agaggttggc	300
actgttggag gtggtactca gcttgctgtc cagtctgctt gcctgaacat gcttggcgct	360
aagggtgcaa acaaagagtt ccctggagct aatgcgaggc tcctggcgac cattgtacc	419

<210> 96
 <211> 856
 <212> DNA
 <213> Eucalyptus grandis

<400> 96	
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cggacgcgct cccgctgccc ctgtacctca cgaacgcgct cttcttcacg ctcttctctc	240
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<210> 97
 <211> 863
 <212> DNA
 <213> Eucalyptus grandis

<400> 97	
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<210> 98

<211> 668

<212> DNA

<213> Eucalyptus grandis

<400> 98

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<210> 99

<211> 430

<212> DNA

<213> Pinus radiata

<400> 99

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<210> 100

<211> 478

<212> DNA

<213> Pinus radiata

<400> 100

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<210> 101
 <211> 204
 <212> DNA
 <213> Pinus radiata

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 gtgatacagt ttctgtcaac gccttatggg gaactcgctt accgtgaacg tgctgagcga 180
 ctgattgatg aagtaaggaa cata 204

<210> 102
 <211> 299
 <212> DNA
 <213> Pinus radiata

<400> 102
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 catacagtcc ctttccgcgc cttatgggga accttcttac cttgaacgtg cggagagact 120
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 tcccctgaat gatctgattc aacgcctttg gatggctgcac agtggttgaa gtttggggat 240
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<210> 103
 <211> 399
 <212> DNA
 <213> Pinus radiata

<400> 103
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 cacaacctgc tcaaccagga gatgcgttcc atcagatttt gaatggtcta gcccgcaaat 180
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<210> 104
 <211> 672
 <212> DNA
 <213> Pinus radiata

<400> 104
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<210> 105
 <211> 971
 <212> DNA
 <213> Pinus radiata

<400> 105
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tgacagctgg gcaagccttt gaagctatga acaatgcagg atatttggat tccaacatga 720
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taccaccagt ggggtgcactc agcagtgcac tgagtaagct tcaatcaagt aaacctttgc 840
gtgaactaag agaggttgcc aagggtgtta ccaaacaact cggtgcccc atgcatgaac 900
tggcagcaaa agtggacgag tatgcacgag gtatgatcag tggttcccg tccacgctgt 960
ttgaggagct g 971

<210> 106
<211> 265
<212> DNA
<213> *Eucalyptus grandis*

<400> 106
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tttcaatgcc ccagaagaca aaatcgatg ggacgtggga catcagacat acccccacaa 120
gattctgacc ggacggcgga ctcgatgca cacgattagg aagacctcgg ggcttgcggt 180
gtttcccaag agggatgaga gcgtttatga tacatttggc gtgggacaca gttctacgag 240
catctccgcc ggtctcggtg tggcg 265

<210> 107
<211> 295
<212> DNA
<213> *Eucalyptus grandis*

<400> 107
ccctgtccg ggaaaagctt gtcaaagcat ggagaaatga ctctgagatc tttgtcact 60
atggccggct caccacgcca tactctgatg agcttctcgg gagcaaattt tgctccatg 120
tcaaaggtt tgaagtaaac acagcccgca ttgcagattc attgtattat ggctgtgtcc 180
ctgtgataat cgccaatcac tatgatctcc cattcgcgga catattgaac tggaagagct 240
tctcggctcgt ggttgccact ttggacattc cattgcttaa gagaatcctc aaggg 295

<210> 108
<211> 456
<212> DNA
<213> *Eucalyptus grandis*

<400> 108
gggatgcata catccaagtt ctgtctcaac cctgctggcg ataccaccatc ggctgcccgt 60
ctttttgatg ctatagttag cttgtgcac ccagttatcg tcagtgcag tatcagattg 120
ccatttgaag atgtcataga ctaccggaaa attgcaatat ttgtagatac tgccacttct 180
ctgaagcgag gatttttggg gaaacttctg agaaaagtac ggacagaaaa gattctggaa 240
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gtcaaggaaa tttggcgcca aatatcgag aagctacccc ttattaaact gatgattaac 360
cgtgacaaga ggattgtcaa gagggacatg agtgaaccag actgttccctg tatctgttcg 420
aaccagacgg gggatcatct cactctatga cacgag 456

<210> 109
<211> 640

<212> DNA

<213> Eucalyptus grandis

<400> 109

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ccgcgggtta	tcacccagc	gtatgggggg	actacttctt	taaatatgat	tctccctcca	180
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atcaaattcca	acgcttgagg	attgagtacc	atthttgaacg	tgaagtagat	gagcaattgg	360
aacaaattcca	caaaagttac	tctcgactcg	atcatgaaga	ttttaaggta	gatgaccttc	420
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tctttgacaa	attcaaagat	agcaacggga	acttccgaga	gtcgctcata	agtgatgtgc	540
ggggattgct	gagcctatat	gaagcttgcc	atttaagggtg	tcattggcgat	tcaatcttgg	600
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<210> 110

<211> 396

<212> DNA

<213> Eucalyptus grandis

<400> 110

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tcagcaactc	catgcgcctc	ttcgaataaa	ggaacaggcc	atgtgatcga	acgcggctcg	120
gcgggttatc	acccagcgt	atggggggat	tatttcctta	aatatgattc	tccctccaac	180
tcagtgaagt	tcaaattcct	cggaagagtg	gagggacaaa	ttgaggaact	aaaaggagag	240
gtgaagaaga	tgctgactga	tatcatggat	aagcccttac	aaaagcttca	cttgatcgat	300
caaattccaac	gcttggggat	tgagtacat	tttgaacgtg	aaatagatga	gcaattagaa	360
caaattccaca	aaagttactc	tcgacttgat	catgaa			396

<210> 111

<211> 348

<212> DNA

<213> Eucalyptus grandis

<400> 111

gttcttcagc	tacctagatc	tagaaagtag	caaaaaaaga	aatgtctctt	ccgatttcaa	60
gagtcaccatc	ttcttctcct	gctgaaaaaa	caagcctggg	ccctgaaggc	ggatcggcaa	120
tttttcatcc	aaccatatgg	gcggattact	ttctcaaaca	tgcttccaac	tccaactcga	180
cgagttctga	tggcgtagta	gaggaacata	ttgagagatt	gaaaggagaa	gtgaggaaga	240
tggttgatggg	tgctatggat	aagccatcgc	aaaagttgaa	cttgattgat	cagatccaac	300
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<210> 112

<211> 508

<212> DNA

<213> Eucalyptus grandis

<400> 112

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atgcactttg	aagattgaag	ctcaagagat	cgggagacgg	tcggcggaatt	ggcaacctaa	180
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gacggagatc	aagaacgctc	taagttccat	ctataacaac	gccgaagatg	ctcaactttt	420
ggatgatctc	tatgccgttt	cccttcgatt	ccggctactt	agacaacatg	gattcaacat	480
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<210> 113

<211> 398

<212> DNA

<213> Eucalyptus grandis

<400> 113

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atgaagatac	cgcgagacgt	tcggcgaatt	ggaagcctag	cgtttgggac	tatggctttg	180
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ttgacgtggt	tcaaagatta	ggactaggat	accattttga	gacggagatc	aataactctc	360
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<210> 114

<211> 432

<212> DNA

<213> Pinus radiata

<400> 114

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ctgtgtcttg	tgggttggcc	agcaacaact	tgatccgaag	gacggccaat	cctcatccca	180
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cagaacgtgc	ggagacactt	attggccagc	ttaagggtgat	gcttagtgct	gcgattggag	300
gtggagaatc	aatgattact	ccatctgctt	atgacacagc	atgggtagcc	aggggtgcctt	360
ccattgatgg	ctctgcttgc	cctcaatttc	cccagacagt	tgaatggatt	ttgaaaaatc	420
aattaaaaa	ga tg					432

<210> 115

<211> 363

<212> DNA

<213> Pinus radiata

<400> 115

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tcatcactca	taccatggc	ctccgtcgtc	gaccaagccg	agctgtgcag	caaactctgtg	120
agcatgagtt	cacctgggtg	acaaagacgc	acaggcgatt	accattccaa	tctctgggac	180
gacgagttca	tccagtcctt	ctcaacgcct	tatggggcac	cttcttaccg	cgaacgtgct	240
gatagacttg	ttggggaagt	aaaggagatg	ttcaattcac	ttacagtact	cactccccac	300
aatgatctcc	ttgagcaact	ttggatggtg	gatagcgttg	aacgtttggg	aatcgatagg	360
cat						363

<210> 116

<211> 779

<212> DNA

<213> Pinus radiata

<400> 116

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accaagccga	gctgtgtagc	aaatctgtga	gcatgagttc	acctgggtgta	caaagacgca	120
caggcgatta	ccattccaat	ctctgggacg	acgatttcat	ccagtcactc	tcaacgcctt	180
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actacgttta	cagctattgg	agcgaaaaag	gcattggatg	tggtagagag	agtgttggtta	420
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cctttcctgg	ggagaaaagtc	atggaagagg	ctcaaacatt	ctgtacgtca	tatttacaag	660
aagccctaaa	aactgttccg	atctccaatg	atagtctttc	acgagagatt	gaatacgtta	720
ttgaatatgg	ttggctcaca	aatttttccg	agattggaag	caaggaatta	catcgacgt	779

<210> 117
 <211> 1173
 <212> DNA
 <213> Pinus radiata

<400> 117

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tgtagagct	tgcaaaactg	gaattcaaca	tttttcactc	tctagtaaag	agagaattac	120
aatctctctt	gagatggtgg	aaagattatg	gattccctga	aataacattc	tcacggcatc	180
gtcacgtgga	atactacact	ttagcagctt	gcattgcaaa	tgatcctaaa	cattctgcgt	240
ttcgactagg	atttggtaaa	ataagtcata	tgatcacgat	tctcgacgat	atctacgaca	300
ccttcggaac	aatggaggag	ctcgaactct	taaccgcagc	gtttaagaga	tgggatccgt	360
cttcgataga	gtgtcttcca	gattatatga	aaggagtgtg	catggcggtt	tacgacaaca	420
tcaacgaaat	ggcacgagag	gcgcaaaaa	ttcaaggctg	ggatacagtc	agctatgctc	480
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gttatcttcc	cacgttcgac	gagtacctcg	agaatgggaa	ggtcagcttc	ggctctcgca	600
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ctacctagac	ctggagattg	cctacggatg	tcaggttcgt	tggtcagcta	ataaaaaacat	1140
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<210> 118
 <211> 1634
 <212> DNA
 <213> Pinus radiata

<400> 118

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agcgcttccg	ccaatgatac	agagttgcag	ataagaagcg	tttttaattt	atttcgagct	180
tctctcattg	cttttcccga	ggaaaaagt	ctggaagagg	ctgaaaattt	cgtcgtcgca	240
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cttgcgaaat	tggagttcaa	tattttccat	tctctacaac	agaaagagtt	acaatgtctg	480
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gaattctaca	ctttggtctc	tggcactgac	atggtgcctg	aacatgctgc	attcagactg	600
agctttgtta	aaacgtgtca	tcttatcacg	attctggatg	atatgtacga	caccttcgga	660
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aaaaaaaaaa	aaaa					1634

<210> 119
 <211> 301
 <212> DNA
 <213> Eucalyptus grandis

<400> 119
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 tttttcgaca gcagatcacg gatggcccat ttcagactgc acagcagaag gattaaaagc 240
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 g 301

<210> 120
 <211> 433
 <212> DNA
 <213> Eucalyptus grandis

<400> 120
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 tgcaaaattc ttaaagcatc ggtttgagaa gaagcacagc tcagatttga tgatgcgaat 360
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 ggatgaaatc aca 433

<210> 121
 <211> 596
 <212> DNA
 <213> Eucalyptus grandis

<400> 121
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 gatggacaag gggctatgga gaaggcacga aaatggattc tggaccatgg cagtgtact 360
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 aataacccat tgccccctga gatattggctt ctcccttaca tgcttccgat tcatccagga 480
 agaatgtggg gccactgccg gatggtttat ttgccgatgt catacttgta tgggaagagg 540
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<210> 122
 <211> 332
 <212> DNA
 <213> Eucalyptus grandis

<400> 122
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 agggcgggcc gtggctgacc agcgtgaaca accacgtcgg gcggcagcat tgggagtttg 180
 accctgacgc cgggacaccg gaggagaggg cggaggtgga gagggtccga gatgagttca 240
 cgaggaaccg gttccgaatc aagcagagcg ctgatctttt gatgaggatg cagctcacia 300
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<210> 123
 <211> 293

<212> DNA

<213> Eucalyptus grandis

<400> 123

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<210> 124

<211> 604

<212> DNA

<213> Eucalyptus grandis

<400> 124

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ccgtaccaga	tggacacgga	caacaaactc	ttcaatgtgg	gcgtcttgct	cgtggccact	180
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aggattaata	agctcaaggg	gtatgtcaat	cagatggtta	tggaagccga	ggactacttc	600
tcaa						604

<210> 125

<211> 515

<212> DNA

<213> Eucalyptus grandis

<400> 125

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aacgttcttc	atcggccctg	aggtttctgc	gcacttcttc	aagggttccg	agtccgattt	420
gagccagcaa	gaagtgtacc	aattcaatgt	gccgactttc	ggacctggag	ttgtattcga	480
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<210> 126

<211> 366

<212> DNA

<213> Eucalyptus grandis

<400> 126

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ccggaaagcg	cctccctccc	gtcgttagga	catggccggg	ggttggtggg	ctgctccggg	180
tcttgaaggg	tccgatggtg	atgctgcggg	aagagtaccc	caagcttggg	agcgtattca	240
ctctgaatct	gttgaacaag	aaaataacgt	tcttcatcgg	ccctgaggtt	tctgcgcact	300
tcttcaaggc	ttctgagtc	gatttgagcc	agcaagaagt	gtaccaattc	aatgtgccga	360
ctttcg						366

<210> 127

<211> 458

<212> DNA

<213> Eucalyptus grandis

<400> 127

ttcttgaagg	gtccgatggg	gatgctgcgg	gaagagtacc	ccaagcttgg	gagcgtattc	60
actctgaatc	tgttgaacaa	gaaaataacg	ttcttcacgc	gccctgaggt	ttctgcgcac	120
ttcttcaagg	cttccgagtc	cgatttgagc	cagcaagaag	tgtaccaatt	caatgtgccg	180
actttcggac	ctggagttgt	attcgacgtc	gattacacca	tcaggcaaga	gcagtttcgg	240
ttttttactg	aggctctgag	gattaataag	ctcaaggggt	atgtcaatca	gatggttatg	300
gaagcggagg	actactttct	aaaatgggga	gatagtggcg	aggtggacct	aaagtatgag	360
cttgagcaat	tgaccatatt	gacagcgagc	agatgtcttt	tgggtcgaga	ggttcgtgag	420
aagctctttg	atgatgtgtc	agccctcttc	cacgacct			458

<210> 128

<211> 442

<212> DNA

<213> Eucalyptus grandis

<400> 128

ctttgatgat	gtgtcagccc	tcttccacga	ccttgacaat	ggaatgctac	cgatcagtgt	60
catcttcccc	tacctgcccc	tcccagctca	ccatcgctcg	gataaggctc	ggaagaagct	120
ttctgagatt	tttgcaaaca	tcattttctt	acgaaaatgt	gctggcaaat	cagaagaaga	180
catgttgacg	tgtttcattg	actccaagta	caaaaatggt	cgcccgcaca	ctgaggccga	240
ggtcactggg	ctgcttattg	cggctctctt	tgcagggcag	cacaccagtt	ctatcacttc	300
cgtgtggact	ggggcctacc	tcctcaccaa	caagaagtac	ctctctgctg	tctctaataa	360
acagaagcac	ctgatggaga	agcatgggaa	caatgttgat	catgatgttc	tttctgaaat	420
ggatgtcctg	tatcggtcca	tc				442

<210> 129

<211> 392

<212> DNA

<213> Eucalyptus grandis

<400> 129

tacctctca	ccaacaagaa	gtacctctct	gccgtctcta	atgaacagaa	gcacctgatg	60
gagaagcatg	ggaacaatgt	tgatcatgat	gttctttctg	aaatggatgt	cctgtatcgg	120
tccatcaagg	aagcactgag	acttcaccca	cctctaatta	tgtgtctccg	aagctcgcat	180
agtgatttca	gtgtcaaaac	acgggatggc	aaggaatatg	aggtgggtga	agtctcagtg	240
cttccttgat	ggacccttga	ggcaaggaaa	gggtgcggca	aggcttttat	caactgcattc	300
aggtcgggtg	ccgtaatggg	cttccttctt	gctgcgaatg	gtcttctggg	cctttacatt	360
gccatcaacc	tattcaagat	ttacctatgg	gt			392

<210> 130

<211> 354

<212> DNA

<213> Eucalyptus grandis

<400> 130

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ttctcaaaat	ggggagatag	tggcgagggtg	gacctaaagt	atgagcttga	gcacttgacc	180
atattgacag	cgagcagatg	tcttttgggt	cgagagggtc	gtgagaagct	ctttgatgat	240
gtgtcagccc	tattccacga	ccttgacaat	ggaatgctac	cgatcagtgt	catcttcccc	300
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<210> 131

<211> 442

<212> DNA

<213> Eucalyptus grandis

<400> 131

cttccgtgag	aagaagggtg	ttggagatga	caactggcag	atgtctggat	gggttgcctt	60
------------	------------	------------	------------	------------	------------	----

tggatggatt	tgattatgga	tccatccttg	gccaatgctg	tgaactgcct	attggggtatg	120
tgcagattcc	tgtgggtggt	gcagggcctc	ttctgcttga	tgggaattgaa	aacatgggttc	180
ccatggccac	taccgagggc	tgcctggtgg	ccagcaccaa	cagaggttgt	aaggccattc	240
atatgtctgg	gggtgctaca	agcgttcttc	ttagagatgg	catgaccagg	gtcctgtcgc	300
ttcgattccc	cactgctagg	agagctgcac	aactcaagtt	ttacttggaa	gccccataa	360
ctacgaaagc	ttgtctctca	tcttcaacag	caccagcaa	ggtttgccag	gcttgcaaag	420
gaattcaagt	gccgccaatt	gg				442

<210> 132

<211> 984

<212> DNA

<213> *Eucalyptus grandis*

<400> 132

gtggcttctt	attccctgga	atcggtcttt	gggggagatt	gcaggagagc	tgctttgggtg	60
agaagaagg	ctttggagat	tagaactggg	agatgtctgg	atggggttgcc	cttggtatgga	120
tttgattatg	gatccattct	cggccaatgc	tgtgaactgc	ctggtgggta	tgtgcagatc	180
cctgtgggtg	ttgtagggcc	tcttctgctt	gatggccttg	aaaacatggg	tcccatggcc	240
accaccgagg	gctgcctggt	ggccagcgct	aacagaggtt	gtaaggccat	tcatatgtct	300
ggtggtgcta	caagcgttct	tcttagagat	ggcatgacca	gagctcctgt	agttcgattc	360
cccactgccg	agagagctgc	acatctcaag	tcttacttgg	aacatcccaa	gaacttcgac	420
agcttgtctc	tcatcttcaa	cagcacaagc	agatttgcaa	ggctgcaaac	catcaagtgt	480
gcaattgcag	ggaggaatct	gtacataaga	ttttcctgct	tactggaga	tgccatggga	540
atgaatatgg	tgtccaagg	tgtgcagaat	gttttagact	tccttcagaa	tgaaaatcct	600
gatattggatg	ttattgctgt	ttctggtaat	ttctgtgccg	acaagaaacc	cacagctgtg	660
aactggattg	aagggcggtg	aaaatccgta	gtttgcgagg	caattatcac	tgaagcagtt	720
gttagcaagg	ttttgaagac	caccgttcca	gctttgttag	aattgaacat	gtcagaat	780
ttgactggat	ctgcactggc	tgggtgccatg	ggaggattca	atgccatgc	atccaatatc	840
gtctcagctg	tatttattgc	aacaggtaaa	gatcctgccc	agaacattga	agctctcat	900
tgtattacga	tgatggaggc	atccaacgat	ggaaaggatc	ttcatgtatc	agtcaccatg	960
ccttgatttg	aggttgga	cagt				984

<210> 133

<211> 527

<212> DNA

<213> *Eucalyptus grandis*

<400> 133

ctcttggggg	agactgcagg	agagctgctt	cggtgagaag	aagggtcttg	gagatgacaa	60
ctggcagatg	tctggatggg	ttgcccttgg	atggatttga	ttatggatcc	atcctcgggc	120
aatgctgtga	attgcctggt	ggatatgtgc	agattcctgt	gggtgttgca	gggcctcttc	180
tgctcgatgg	ctttgaaatc	atggttccga	tggccaccac	cgagggtgct	ctggtggcca	240
gcaccaacag	aggttgtaag	gccattcata	tgtctggggg	tgctacaagc	gttcttctta	300
gagatggcat	gaccagggct	cctgttggtc	gattctccac	tgctaggaga	gctgcacaac	360
tcaagtttta	cttgaacat	cccaataact	acaaaagctt	gtctctcatc	ttcaacagca	420
ccagcagatt	tgccaggctg	caaggatca	agtgcgcaat	tgagggaagg	aatctgtaca	480
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<210> 134

<211> 965

<212> DNA

<213> *Pinus radiata*

<400> 134

aaacaaccag	ccgagttcga	aggtgggtcaa	cccacgtgta	ccatcatggc	acgtaagtag	60
atggcgaaaa	tgttggaagg	ccagttgttag	tgaccagggg	aattttaa	tattaatacg	120
ggactataaa	taactagcag	caatctctgg	cttttccact	gcattcatac	cgggagtttg	180
gggggattcc	aaaggatttc	ttctctcttc	tctccagtc	tcaatggatg	gccttggtgct	240
gaggaataca	agaaaattta	gtggagaaat	ggattgtgtg	tccaacaaga	agatggagga	300
ttgtatggag	agttgtgggt	ctggattttc	tgggactgga	aagaagatga	aaaattcaag	360
gacattggca	tctgatgcct	tgccattgcc	tgtgggacta	accaacaagg	ttttctttat	420

cttgtttttc	actgcttcct	attttctgat	gaggagatgg	agggaaaaga	ttaggacttc	480
aacgcccctt	catgtgctga	gcttagggga	gttggtcgcc	attgtggctc	agcttgcttc	540
attcatatat	ttgcttggtg	tctttggcat	cgattatgtc	cagaatttca	tcaactgggg	600
caatgatgat	gatgatgca	gggaagacga	taaactgagg	agccctgttc	ccaaggaagc	660
agttgcaatt	aggcccagtg	ctccgcaagt	ccagctgaac	gggatttcgt	tgggggataa	720
taaagatgat	gatattgcag	cagctgtctg	caatgggact	gtggcttctt	attctctcga	780
gtcgtctctt	ggggattgta	tgagatctgc	ccgggtgagg	aggaggtcct	tggagatgat	840
gactggcaga	tctttggatg	ggttgccctt	ggagggattc	gattatggat	ccattcttgg	900
ccaatgctgt	gaactgcctg	ttgggtatgt	gcagattcct	gtgggagttg	caggacctct	960
tcttc						965

<210> 135
 <211> 503
 <212> DNA
 <213> Pinus radiata

<400> 135						
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cagttggcat	cacaatctgc	ttgcttgaat	ttgatcggag	taaagggagc	gaatgtgcaa	120
tctcccggag	cgaatgctcg	gctcttggcc	aggattgtag	caggagcagt	tttggctgga	180
gagctctctc	tcatgtctgc	tttggtctga	ggccagctgg	tcaagagcca	tatgaagtac	240
aacagatcaa	tcaaggatat	caaagcaatc	tcctgaacct	catggtcctt	agaatccaag	300
aaagtcagca	tggtttttct	ccattgcgta	tctttactat	agcaatagac	ttatttgatc	360
aagctagggt	cctccaaaag	aaagtttcgt	acctgttacc	tgttttgcat	tgcataatgtt	420
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atttgatttt	catccaagtt	cta				503

<210> 136
 <211> 563
 <212> DNA
 <213> Pinus radiata

<400> 136						
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acagcaaaac	aacaacatat	ttacaagcag	taaaatccac	cctgtagtga	tagtcccagg	120
cacaggagga	aatcagggtt	aagcaaggct	aactgcagac	tataaaccca	gtgggctggt	180
gtgcagaagg	tgaattggg	agagggagtg	gttcagaata	tggtttgatg	ttcctgtcgt	240
tcttcctcca	ttgacacaa	gctttgctga	cagaataagc	ttggtctatg	atccccacac	300
agatgaatac	tacaatgccc	ctgggggtgga	gactagagtg	ccttattttg	gttcaacaga	360
aggaatgaag	taccttgatc	cctgcttcaa	gtatataacg	ccatacatgt	catccttggt	420
gaaatctctt	gaggatgttg	gatatgttga	cggtaaatcc	ctttttggtg	caccctatga	480
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gagaaaattg	gtggaggagg	cgt				563

<210> 137
 <211> 354
 <212> DNA
 <213> Pinus radiata

<400> 137						
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tgcaccgtct	tcgactgatt	caggctcctc	tggaaatgta	gttattgatt	tctattgggg	120
tatggagctt	tatcctcgaa	taggtaaaaa	ctttgacatc	aaggctcttca	caaattgtcg	180
gtttggaatg	atgtcttggg	cagttcttgc	agtaacatac	agcataaaac	agtatgaaga	240
gtatggaaga	gtagcggatt	ccatgttagt	aagcagtata	ttgatgggtg	tgtatgtaac	300
aaaagttctt	cttgtgggaa	tctggctact	ggaacaccat	ggatataact	catg	354

<210> 138
 <211> 631
 <212> DNA
 <213> Pinus radiata

<400> 138

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agaacaggcc	tgccgttgcc	ttccctgtgg	gaaatTTTTg	cgcagcttgc	agtttatttc	120
atggttgaag	actatggcaa	ctattggata	cacaggtggc	tacattgcaa	atggggctat	180
gagaagatcc	atcatgttca	ccatgagttc	actgctccaa	tgggttttgc	tgctccatat	240
gcacattggt	cagaggtggt	gatattgggg	atccctacgt	ttgtcggacc	ggcaattgct	300
ccaggacaca	tgattacatt	ctggtgctgg	gttgtgctgc	gccaaagtga	agcgattgaa	360
actcacagcg	gatatgactt	tccgtggact	cttaccaaat	taattccttt	ctatggaggc	420
gcggagtatc	atgactacca	tcattatgta	ggaggacaaa	gtcaaagcaa	ctttgcctca	480
gtgttcacat	actgtgatta	tttatacggg	actgataagg	gttaccgcta	tcgtaaggag	540
catcttttga	aggcacgtga	gtttgaatat	aggttaaagc	agatgatttt	aagaaagaaa	600
acggcaatgg	agcagtttca	gataagtttg	t			631

<210> 139

<211> 362

<212> DNA

<213> Pinus radiata

<400> 139

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ggcacattgt	ggttatgatt	ttccttggag	cattttcaaag	ctattcccgt	tgtatggagg	120
agctgatttc	catgattatc	atcatcgact	gctctataca	aagtctggga	attactcatc	180
gactttcact	tacatggact	ggttatTTTg	gactgataaa	gggtaccgga	agctaaaagg	240
tctccagaaa	gattctaaat	gataacccaa	gagtgccatc	aaacatttgt	gtatgtgtgt	300
atcaattggg	tgaagggaaga	gaacagcaca	gacaggccta	gatcactctc	agtgagttcc	360
ag						362

<210> 140

<211> 504

<212> DNA

<213> Pinus radiata

<400> 140

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tcaccagatt	gggatttgtc	atggcgacat	tgggtggaaag	aggctggctg	tatctgatca	120
caaatTTTcac	tgatttttcaa	ctggcttcca	taggcagttt	tcttcttcat	gagagcatct	180
tctacttgtc	tgggcttctc	ttcatattac	ttgagactac	aggcttggtg	agcaagtaca	240
aaattcagag	caagacgaac	acagttgctg	cacaagaaaa	atgtattact	cgactgctgc	300
tatatcattt	ttgtgtcaac	ctgccagtca	tgggtggtttc	ctatcctgta	ttcagattta	360
tgggcatgac	aagcgtgcta	ccactaccat	cctggaaagt	agttgtatcc	caactggttt	420
gttatttcat	tttggaggat	tttgttttct	actggggcca	cagaatttta	cattcaaaat	480
ggctgtacaa	gcatgttcac	agtg				504

<210> 141

<211> 1293

<212> DNA

<213> Pinus radiata

<400> 141

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gtaaactatt	cctgagaagt	gtgtctgtta	cacaattctc	aaatatcatt	gatcttcagg	120
atTTTggatc	acatctgaga	accaggtat	gggagaagag	ttgcagacat	ggatattaat	180
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caaggaggtc	tctcttggag	gggagagata	tcagaattgt	ctgagggaaa	tcagaagcag	420
gggaaatgat	gtagtggacg	agaagaaggg	aattgttatc	aggaaagagg	attggcagag	480
gcttcaactt	catattgctt	cgtataataa	tttcccaact	gcagctggct	tggcttcttc	540
ggctgctgga	ttcgttTgtc	tagtttatgg	tctggcaaaa	ttaatggacg	tcaaggaaaa	600
atatcagggg	gaactttcag	ccattgcccg	ccgaggttca	gggagtgcac	gccgtagcct	660

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aattgcaa	catgattttg	gatcctttgc	gaagattact	tgtgcagaca	gtaaccagtt	960
ccatgcagtt	tgccttgaca	catctcctcc	aatattctac	atgaatgaca	catcacacag	1020
gattattaac	tgtattgaaa	gatggaatcg	gtctgaagga	actccacagg	ttgcatatac	1080
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gataggcgac	acctcaatac	taggagaaat	cggcggtggac	tcaatgaagg	atgttgaatc	1260
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<210> 142

<211> 389

<212> DNA

<213> Pinus radiata

<400> 142

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tggatcacat	ctgagaaccc	aggtatggga	gaagagttgc	agacatggat	attaatggtc	180
actgcaagag	ctcctacaaa	tatagcagtg	atcaagtact	gggggaaaag	agatgaaaag	240
ctgatccttc	ccatcaatga	cagcatcagc	tttacttttg	atccagacca	tctgtcagcc	300
acaaccactg	tagcagttag	cccatcattc	acatctgata	gaatgtggct	caacggcaag	360
gaggtctctc	ttggagggga	gagatatca				389

<210> 143

<211> 693

<212> DNA

<213> Pinus radiata

<400> 143

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tagctatgcc	tctcactctt	ctattggcga	atacatgggc	atcgtctgcc	atagttcca	180
ggagggatc	gctctttgtg	gcttgctcaa	caactgtagt	ctctcgttca	ttcagtaaga	240
gctgctccgg	tgctataccc	cgggaagccc	aatctgctca	tcccgcactc	actgggagca	300
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tcaatacaaa	atatgaattg	cttcttcagc	aacgttctgc	aacaaagggtg	acattccctt	600
tggtatggac	aaatacctgc	tgcagccatc	ctctctacag	ggagtctgag	ctcattgagg	660
agaacaattt	agggtcagaa	atgcagccca	aag			693

<210> 144

<211> 385

<212> DNA

<213> Pinus radiata

<400> 144

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tcctaaggcc	atdddgcac	tgtttgcttt	cagtctacat	gctgcacatt	gtagctgcag	120
tagcttcacc	aaggctaggt	agaagcagct	tcccaagggg	tttcaaattt	ggtgcagggt	180
catctgctta	tcaggcgga	ggagctgctc	atgaggggtg	caaaggccca	agcatttggg	240
atacattctc	ccacactcca	ggtaaaatcg	ctgatgggaa	gaatggggat	gttgtagtag	300
atcaatacca	ccgtttata	gaagatgtgc	agcttctcaa	atacatggga	atggacgtct	360
atcgtttctc	tatctcctgg	tcacg				385

<210> 145

<211> 385

<212> DNA

<213> Pinus radiata

<400> 145

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atggggacgt	tgcagtagac	caataccacc	gttataagga	agatgtgcag	cttctcaaaa	120
acatgggaat	ggacgtctat	cgtttctcta	tctcctgggc	acgcataatt	cctaaggggt	180
cgccaagaca	cggaccagtc	aataaagtgg	gaatcgttta	ttacaataat	ttcatcaacg	240
agctgctcag	gaatgggtata	gagccttttg	tcacactggt	tcactgggac	atgccacaag	300
ctctggaaga	tgagtacggg	ggattccgta	acaaaagagt	cgtggaggac	tttaacatat	360
ttgcagaagc	atgctttcga	gcctt				385

<210> 146

<211> 546

<212> DNA

<213> Eucalyptus grandis

<400> 146

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<211> 786

<212> DNA

<213> Pinus radiata

<400> 147

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<211> 1748

<212> DNA

<213> Pinus radiata

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<211> 419

<212> DNA

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<211> 401

<212> DNA

<213> Eucalyptus grandis

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<211> 349

<212> DNA

<213> Eucalyptus grandis

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<213> Pinus radiata

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<213> Pinus radiata

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<211> 522

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<211> 898

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<213> Eucalyptus grandis

BUSINESS CONTINUITY PLAN

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DOCUMENT AND INFORMATION SERVICE
CENTRE

<211> 90

<212> PRT

<213> Eucalyptus grandis

17 TOOP ST

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 35 40 45
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<210>	167
<211>	167
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<213>	Eucalyptus grandis
1.	INTRODUCTION
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Gln Phe Leu Arg Glu Lys Glu Phe Lys Gln Thr Ile Pro Pro Val Arg	
65	70
Val Glu Asp Gly Glu Glu Ile Thr Tyr Asp Lys Ala Ser Thr Ala Leu	
3.4. Building Access no IT	90
Lys Arg Ala Val His Phe Phe Ser Ala Leu Gln Ala Ser Asp Gly His	
3.5. Building Access no IPOL	105
Trp Pro Ala Glu Asn Ala Gly Pro Leu Phe Phe Leu Pro Pro Leu Val	
3.6. No Mail Delivery	120
Met Cys Val Tyr Ile Thr Gly His Leu Asp Ala Val Phe Pro Ala Glu	
4.3. PLAN SUMMARY	135
His Arg Lys Glu Ile Leu Arg Tyr Ile Tyr Asn His Gln Asn Glu Asp	
145	150
Gly Gly Trp Gly Leu His Ile	
4.2. Pre 24 December 1999	165
<210>	168
<211>	168
<212>	PRT
5.	STAFFING / SUPPORT
<213>	Eucalyptus grandis
6.	INVOKING THE PLAN
Met Asp Asp Ile Val Ser His Glu Phe Glu Gln Lys Arg Gly His Val	
1	10
Val Ser Ala Val Glu Leu Leu Ile Lys Tyr Arg Gly Val Ser Glu Gln	
6.2. Implement Manual System	25
Glu Ala Val Glu Glu Leu Lys Arg Val Ile Asp Ala Trp Lys Asp	
7. RETURN TO NORMAL	40
Thr Asn Glu Glu Phe Leu Arg Pro Ile Ala Val Pro Met Pro Ile Leu	
8. TEST & REVIEW	55
Thr Arg Val Leu Asn Leu Ser Arg Val Ile Asp Val Leu Tyr Ser Asp	
65	70
9. COMMUNICATION PLAN	75
Gly Asp Asn Tyr Thr His Ser Glu Thr	
85	
10.	APPENDIX
<210>	169
<211>	169
<212>	PRT
<213>	Telephone Tree Details
11.	Report on Testing
Met Glu Asp Asp Arg Asp Arg Gly Leu Leu Tyr Asp Ser Asp Pro Pro	

1 5 10 15
 Ser Pro Ser Leu Ser Pro Pro Leu Ser Pro Pro Arg Pro Phe Ala Leu
 20 25 30
 Thr Phe Phe Asp Arg Glu Arg His Val Thr Phe Leu Glu Met Met Tyr
 35 40 45
 His Met Leu Pro Arg Pro Tyr Gln Ser Gln Glu Ile Asn His Leu Thr
 50 55 60
 Leu Ala Tyr Phe Val Ile Ser Gly Leu Asp Phe Leu Asp Ala Leu Thr
 65 The Intellectual Property Office is part of the Business and Registrar Branch. The Intellectual
 Property Office administers legislation for providing the protection of intellectual property rights
 Arg by granting patents under the Patents Act 1953, and registering trademarks and designs under the
 Trademarks Act 1953 and the Designs Act 1953. 95
 His The Intellectual Property Office covers two sites: Document and Information Service Centre
 (DISC) in Sea View and Intellectual Property Office (IPONZ) in Lower Hutt.
 His The DISC site provides inward and outward mail management, lodgement and cashing
 functions, operational processes for the registers and records storage facility for IPONZ.

<210> 170
 This Business Continuity Plan has been developed to ensure an effective response to situations
 that may arise as a result of Y2K failure and in particular:
 <211> 119
 <212> PRI

- <213> Eucalyptus grandis
 • No access to the building or primary site,
 <400> 170
 Met Glu Asp Asp Arg Asp Arg Gly Leu Tyr Asp Ser Asp Pro Ser
 1 Access to building, limited IT, 10 15
 Ser Pro Ser Leu Ser Pro Pro Arg Pro Phe Ala Leu Thr Phe Phe Asp
 • Access but no infrastructure 25 30
 • No Mail Delivery
 Arg Glu Arg His Val Thr Phe Leu Glu Met Met Tyr His Met Leu Pro
 The primary objective of this plan is to meet any legal requirements, relating particularly to the
 Arg care and nature of services provided over the critical period. 50 55 60
 Val The specific objectives of this plan are:
 65 1. Date stamp all incoming mail and secure until processing functions are available.
 Asp Ala Val Ala Asp Trp Val Leu Ser Phe Gln Ala His Pro Arg Ser
 85 90 95
 Lys Ala Asp Leu Asp Asn Gly Gln Phe Tyr Gly Phe His Gly Ser Arg
 100 105 110
 Ser Ser Gln Phe Pro Ser Lys
 3. Permit an orderly transition to normal operations when the damaged or affected facility is
 restored.
 <210> 171
 4. Assign responsibilities for the direction of all phases of the Recovery Operation to ensure
 appropriate staff are informed of progress during each stage of the Recovery Operation,
 from the time the primary site and/or functions are unavailable until full restoration or
 alternatives are fully operational.
 <400> 171

Leu Ala Phe Pro Gly Glu Lys Val Leu Glu Glu Ala Glu Ile Phe
 1 This plan documents the procedures to be followed by the Impact Assessment and Recovery
 Teams. 5 10 15

Ser Thr Lys Tyr Leu Lys Glu Ala Ile Leu Lys Leu Pro Val Cys Thr
 20 25 30

Leu Ser Arg Glu Ile Ser Tyr Val Met Glu Tyr Gly Trp His Ile Asn
 35 40 45

Leu Pro Arg Leu Glu Ala Arg Asn Tyr Ile Asp Val Phe Gly Gln Asp
 50 55 60

Pro Ile Tyr Leu Met Pro Asn Met Lys Thr Gln Lys Leu Leu Glu Leu
 65 70 75 80

Ala Responsibility and ownership of this plan remains within Document & Information Service
 Centre. The Manager, Janet Dobbie, will be responsible for ensuring the plan is reviewed and
 updated on a regular basis. 85 90 95
 Lys Leu Leu Ser Arg Trp Trp Lys Asp Ser Gly Phe Ser Gln Met Thr
 100 105 110

Area of responsibility	Primary	Alternate
Person responsible for this plan is:	Janet Dobbie Manager, Document and Information	Diane Imus National Manager,

Asp Ser Glu Pro
130

	Service Centre	Corporate Services
Person responsible for overall management of response <211> 154	Janet Dobbie	Gary Jones or Shirley Herewini
Other Management Team Members (and roles) <400> 172	Shirley Herewini Team Leader Records Acceptance Sue Whiteman Support Services Theresa King Revenue & Lodgement	
Arg Thr Leu Arg Leu His Gly 1 1 5	Val Leu Lys Ser Ala Asn Ile Gln Members: 30 Shirley Herewini 45 Gary Jones 45 Sue Whiteman	
Val Phe Lys Ser Ala Asn Ile Gln (Also Review Team) Thr Glu Gly Glu Ile Arg Gly 35 Val Ala Phe Pro Gly Glu Asn 55	Leader: Janet Dobbie 60 Members: 75 Shirley Herewini 80 Gary Jones 95 Sue Whiteman	
Thr Tyr Leu Lys Glu Ala 65 70 Ser Leu Ser Arg Glu Ile Glu Tyr 85	Leader: Janet Dobbie 60 Members: 75 Shirley Herewini 80 Gary Jones 95 Sue Whiteman	
Asn Phe Pro Arg Leu Glu Ala 145	Arg Asn Tyr Trp Arg Leu Phe Gly Asn Tania McConnochie 110 Theresa King Lys Lys Glu Lys Leu Glu Jenny Spaans 125 Margaret Newton Ser Leu Gln Gln Lys Glu Joanne Sexton 140 John Apin William Rodrigues	
Media Contacts <210> 173	Janet Dobbie	Diane Imus

Key external Contacts:

Power <13> Pinus radiata Gas (not supplied to Toop St) Water/Effluent Floodings Suppliers Others Val 35 Val 50 Asn 65 Thr Thr	TransAlta TransAlta Hunt City Council After Hours Leu Leu Ala Phe Pro Gly Emergency Service DX Cys Thr Ser Tyr Leu Lys Post Haste Couriers ABS (Cleaners) Leu Ser Gly Glu Tyr 40 45 Phone: (04) 564 3249 Armour Guard Security Arg Leu Glu Ala Arg 55 Monitoring Centre 60 Phone: (04) 478 1226 Nedax Security 75 Phone: (04) 499 2836 Building Manager Melanie Lambert Phone: (04) 499 9133 After Hours (04) 934 2552 or (025) 262 3146	Phone: (04) 568 8800 Phone: (04) 568 8800 Phone: (04) 567 2003 Phone: (04) 473 9510 Phone: (04) 499 2121 Eric Rodda Phone: (04) 564 3249 Phone: (04) 478 1226 Phone: (04) 499 2836 Phone: (04) 499 9133 After Hours (04) 934 2552 or (025) 262 3146
--	--	--

* <212> PRT

Emergency Services:	
Fire <400> 174	111 or Petone Fire Brigade (04) 568 6857
Ambulance Glu Tyr Gly Trp Leu Thr Asn 1 5	11 or Wellington Free Ambulance (04) 472 2999
Police Ile Asp Ile Phe Gly Lys Asp 20	111 or Petone Police Station (04) 568 7333 Urgent (03) 474 7000 Non Urgent (03) 479 1200 30
Occupational Health Centre Lys Glu	OK Health Phone: (04) 568 7128
Accident and Medical Centre	Hutt Hospital Phone: (04) 566 6999
Lower Hutt Civil Defence	Brian Toomey or Bill Flemming Phone: (04) 570 6666

His Ser Leu Gln Gln Lys Glu Leu Lys Gln Leu Ser Arg Trp Trp Lys
 50 55 60
 Asp Ser Gly Phe Ser Gln Leu Thr Phe Thr Arg His Arg His Val Glu
 65 70 75 80
 Phe Tyr Thr Leu Ala Ser Cys Ile **IMPACT ASSESSMENT** Lys His Ser Ala
 85 90 95

Phe Arg Leu Gly Phe Ala Lys Thr Cys Tyr Leu Gly Ile Val Leu Asp
 100 105 110
 Asp Ile Tyr Asp Thr Phe Gly Thr Met Glu Glu Leu Glu Leu Phe Thr
 115 120 125

Scenario Presented	Invoke Plan Decision
No access to Seaview area	No
No building access	Yes
Building access, no utilities	Yes
Building access, no IT	Yes
Building access, no IPOL	Yes
No Mail Delivery	Yes

<400> 175
 Leu Thr Asn Phe Pro Arg Leu Glu Ala Arg Asn Tyr Ile Asp Val Phe
 1 5 10 15

Gly In the event that Seaview suffers major infrastructure problems the Impact Assessment Team will:
 20 25 30

Thr • Contact staff by phone tree
 35 40 45

Ser • Leave recorded phone message on (04) 568 0744 for staff information and (04) 568 0720 for
 50 Clients' information. 55 60

Ser Gly Phe Ser Arg Leu Thr Phe Thr Arg His Arg His Val Glu Phe
 65 70 75 80

Tyr 3.2 No Building Access
 85 90 95

Arg In the event the Document & Information Service Centre remains closed the Impact Assessment Team will:
 100 105 110

Ile • Contact staff by phone tree
 115 120 125

Ala • Leave recorded phone message on (04) 568 0744 for staff information and (04) 568 0720 for
 130 Clients' information. 135 140

Met Lys Gly Ile Tyr Met Val Phe Tyr Asp Ala Leu Ile Lys Trp Leu
 145 150 155 160

Glu 3.3 Building Access no Utilities

If the building is open but there is no power, water or sewerage the Impact Assessment Team will:
 <210> 176

- If staff not present, contact by phone tree.
- If staff already present, consider sending staff home.
- If no power, the leader will contact Manager IT Operations.
- Leave recorded phone message on (04) 568 0744 for staff information and (04) 568 0720 for Clients' information.

Trp Ser Gly Phe Val Pro Ser Phe His Glu Tyr Ile Ala Thr
 1 5 10 15

Ala Ser Ile Ser Val Ser Gly Pro Thr Leu Ile Leu Ile Cys Val Leu
 20 25 30

3.4 Building Access no IT
 Phe Thr Gly Glu Leu Leu Thr Asp His Ile Leu Cys Gln Ile Asp Tyr
 35 40 45

Arg If all services are available except IT systems the Impact Assessment Team will:
 50 Re-assign staff to other work. 60

Asp Thr Lys Thr Tyr Gln Ala Glu Arg Gly
 65 70

3.5 Building Access but no IPOL

<210> 177

If the IPOL system is not available the Impact Assessment Team will:

- Re-assign staff to other work.

<212> PRT

<213> Eucalyptus grandis

<400> 177

Leu 1.6 No Mail Delivery Ala Asp Leu Lys Gly Glu Phe Leu Asn Arg
 1 5 10 15
 Lys If mail is unable to be delivered NZ Post will store the mail until collection can be organised
 20 25 30
 either by DX Courier or ourselves.
 Ser Ser Gln Leu Phe Cys Met Glu Asn Asp Gly Phe Thr His Ser His
 35 40 45
 Glu Thr Glu Ile Lys Glu His Val Lys Lys Ile Leu Phe Glu Pro Val
 50 55 60
 Ala 4. PLAN SUMMARY
 65

4.1 Objectives

<210> 178

This plan outlines the steps necessary to determine the ability of the Document and Information Service Centre to provide services to IPONZ and its external clients beyond 1 January 2000.

<212> PRT

<213> Eucalyptus grandis

<400> 178

4.2 Before 24 December 1999

Task	Responsibility	Target Date	Completed
1. Seek assurances from suppliers for Y2K compliance	Sue Whiteman	13 July 1999	Yes
2. Test all software and hardware for Y2K compliance	IBBMs	13 July 1999	Yes
3. Discuss with Support Services arrangements for alternative accommodation.	Shirley Herewini	30 September 1999	Yes
4. Contact key suppliers to obtain and confirm contact names	Shirley Herewini	31 October 1999	Yes
5. Distribute copies of BCP plan to all Staff for home and work	Sue Whiteman	15 November 1999	Yes
6. Inform Clients and Staff of Holiday Period telephone number on which messages will be left	Glenn Dobbin	1 December 1999	Yes
7. Arrange necessary stationery for date stamping.	Shirley Herewini	15 December 1999	Yes
8. Arrange storage for mail and cheques	Shirley Herewini	15 December 1999	Yes
9. Arrange van to be full of petrol.	Shirley Herewini	24 December 1999	

Lys Phe Phe Val Glu Asn Pro Ala Asn Phe Glu Ser Leu Ala Val Ile
 180 185 190
 Phe 4.3 After 1 January 2000 Phe Ala Arg Leu Gln Ser Ile Lys Cys Ala
 195 200 205

Task	Responsibility	Target Date
1. Check that location is accessible	Armourguard	12:30 am - Armourguard
2. Make Gly Met Asn Met Val Ser building secure, power on	Lys Gly Val Gln Asn Val Leu Asp	Security to contact Neville Harris (Diane Imus as backup to Neville)
3. If no power or access to office	Met Asp Val Leu Gly	By Jan 1 1am
4. Gly Lys Ser Val Val Cys Glu BRB testing of IT LAN/WAN	Neville Harris to contact Mike Brosnahan	270
5. Arg Gly Lys Ser Val Val Cys Glu BRB testing of IT LAN/WAN	Michael Brosnahan	285 Jan 1 6am (initial IT ck) Joe Flynn report to Kathryn
6. Arg Gly Lys Ser Val Val Cys Glu BRB testing of IT LAN/WAN	Joe Flynn (can initial check)	300 McInteer 11am 1 Jan
7. Leu Lys Asn Leu Thr Gly Ser Ala	Met Ala Gly Ala Leu	Full BRB test start by 1pm 1 Jan. MB to report to Kathryn McInteer by 3pm

Asn Ala His Ala Ser Asn Ile Val Ala Ala Ile Phe Ile Ala Thr Gly		
325	330	335
Gln 340	Michael Brosnahan to	Testing of Applications and
Glu Ala Ile Asn Asp Gly Lys Asp	notify only if systems	completed by 3pm (see above)
355	Leu His Val Ser Val Thr Met Pro	
Ser Val Glu Val Gly Thr Val Gly	Joe Flynn -	Hamilton server rebooted to
370	REGIS/MVSR	test OASIS application by
Ser Ala Cys Leu Asn Leu Leu Gly	Les Currie - OASIS	David Cole 1.30pm 1 Jan
385	Andrew Wagg - WEB	
Ala Gly Ala Asn Ser Arg Leu Leu	Debbie Monahan-	
405	IPO	
Leu Ala Ala Glu Leu Ser Leu Met	Lawrence Wells-	
420	CABS	
Val Full Office site assessment, Tyr Asn	Diane Imus (both	Report to Brian Hill by 3pm
Complete checklist from Ministry 440	sites)	1 Jan. Janet Dobbie backup
Val Ser Ser	Bill Vella	By 8am 5 Jan - refer IT BCP
450		
Testing of Applications and	Sponsors:	Jan
processing and Application sponsor	Joe Flynn- MVSR	• 11am-Office tester to
report back to Michael Brosnahan	Justin Hygate -	application sponsor.
with sign-off	REGIS	• 12noon -Appl sponser
<213> Eucalyptus grandis	Les Currie- OASIS	report to MB.
<400> 179	Andrew Wagg- WEB	• 2pm MB report to KI
Ser Arg Asn Arg Glu Ala Asp Ala	Debbie Monahan-	
1	IPO	
Gln Ser Ala Cys Leu Asn Leu Leu	Lawrence Wells-	
20	CABS	
Ala Gly Ala Asn Ser Arg Leu Leu	Office tester:	
35	Gary Jones (DISC)	
Leu Ala Ala Glu Leu Ser Leu Met	Debbie Monahan-	
50	(IPO)	
Val Full Office site assessment, Complete	Gary Jones (DISC)	Report to Diane Imus by
65 checklist from Ministry 1pm 1 Jan.	Debbie Monahan	1pm Jan. Diso report to
Val Ser Ser	(IPO)	Brian Hill by 3:30pm.
Conduct post disaster audit appraisal	Y2K committee	Within 14 working days of
and document results. Amend plan		return to normal status
where necessary		
<211> 80		
Implement Below Only If Problem Identified		
<213> Eucalyptus grandis	Janet Dobbie	After 2nd January 2000
Check outcome of testing on 1		
January 2000 and prepare Recovery		
Team to mobilise if necessary		
Leu 1	Thr Gly Asp Ala Met Gly Met Asn	
Invoke Telephone tree	Janet Dobbie	4 January 2000
Met Inform key personnel of situation and	Impact Assessment	4 January 2000
invoke appropriate action plans	2 Team	30
Phe Carry out PMT	I A Team	45
40		
Lys Monitor situation	I A Team	4 hour intervals
Conduct post disaster audit appraisal	Recovery Team	Within 14 working days of
and document results. Amend plan		return to normal status
Val Cys Glu Ala Val Ile Lys Gly	Asp Val Val Arg Lys	
65 where necessary		

<210> 181

<211> 81

<212> PRT

<213> Eucalyptus grandis

<400> 181

Ser Ile Lys Cys Ala Ile Ala Gly Lys Asn Leu Tyr Leu Arg Phe Ser
 1 5 10 15
 Cys Ser Thr Gly Asp Ala Met Gly Met Asn Met Ile Ser Lys Gly Val
 20 25 30

Gln Asn Val Met Asp Phe Leu Gln Lys Asp Phe Pro Asp Met Asp Val
 35 40 45 50 55 60

Met Gly Ile Ser Gly Asn Phe Cys Ser Asp Lys Lys Pro Ala Ala Val
 50 55 60

Asn Trp Ile Glu Gly Arg Gly Lys Ser Val Val Cys Glu Ala Val Ile
 65 The Impact Assessment Team is required to be on call to assess the situation after Computer
 Services BRB IT have completed testing on 2 January 2000. Leader, Janet Dobbie will be
 responsible for informing the rest of the Team.

Those on-call on 1 January 2000 need only be contacted for a progress report on the outcome of
 IT services availability. They will be required to make preparations to return to Wellington if the
 need arises. PRT

<213> Pinus radiata

Person	Availability	Date & Time	Back-up Resource
Janet Dobbie	On call		Diane Imus
Sue Whiteman	On call		
Gly 1	On call		
Gly 1	On call		
Shirley Hereyoni	On call		
Lys 35	On call		

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

Asp Pro Ala Gln Asn Val Glu Ser Ile Thr Met Met Glu
 65 70 75 80

Ala Val Asn Glu Gly Arg Asp Leu His Ile Ser Val Thr Met Pro Ser
 85 90 95

Ile Glu Val Gly Thr Val Gly Gly Thr Gln Leu Ala Ser Gln Ser
 100 105 110

Ala The Impact Assessment Team are responsible for determining the operational status of DISC
 and the impact on IPONZ operations 125

Gly Ala Asn Ala Arg Leu Leu Ala Thr Ile Val

On or by 2 January 2000 Janet Dobbie will check:

- Power is OK (Armourguard to report back to Neville).
- Access to IPOL is available - Mike Brosnahan by 4pm 1 Jan
- If IPOL or IT is not available BRB IT will be called to assess the problem and make an assessment call on how to proceed.
- If all IT and IPOL OK - Diane Imus to contact Janet and keep informed.
- If the system is still unavailable at 5.30pm on 4 January 2000, Janet Dobbie will inform Impact Assessment Team and staff using the telephone call tree.

Met Asp Val Arg Arg Arg Gln Pro Lys Pro Pro Arg Pro Ala Ala Gly
 1 5 10 15

Asp Pro Arg Arg Arg Gln Lys Ser Leu Arg Leu Pro Ala Pro Gly Val
 20 25 30 35 40 45 50 55 60

Asp Arg Arg Glu Pro Ser Pro Ser Pro Lys Ala Ser Asp Ala Leu
 50 55 60 65 70 75 80

Pro Leu Pro Leu Tyr Leu Thr Asn Ala Val Phe Phe Thr Leu Phe Phe
 50 55 60 65 70 75 80

Ser Val Ala Tyr Tyr Leu Leu His Arg Trp Arg Asp Lys Ile Arg Ser
 65 70 75 80 85 90 95

Ser Val Leader - Notify staff and clients by recorded message on phones.
 Leader - Notify BRB Impact team.

Ser Leu Ile Ala Ser Phe Ile Tyr Leu Leu Gly Phe Phe Gly Ile Gly
 100 105 110

Phe Val Gln Ser Phe Leu Ser Arg Ala Ser His Asp Ala Trp Asp Val
 115 120 125

Leu Asp Asp Glu Val Ala Val Gly Gly Asp Gly Phe Leu Pro Glu Asp

If a manual system is required the Team will:

130 135 140
 Asp Gly Pro Pro Cys Ala Ala Ile Ala Cys Ala Pro Pro Lys Leu Ala
 145 1. Decide site to be used. 155 160
 Glu Arg Gln Note: The above stationery will already be on site as part of the pre 24 December 1999
 preparations. 165 170 175
 Val Val Lys Ser Val Thr Asp Gly Lys Ile Pro Ser Tyr Ser Leu Glu
 180 2. Assign Records personnel to the site to: 185 190
 Ser Met Leu Gly Asp Cys Lys Arg Ala Thr Ser Ile Arg Arg Glu Ala
 195 200 205
 Leu Gln Arg Met Date stamp all mail appropriately. Gly Leu Pro Leu Glu Gly
 210 • Put all mail and cheques in date order and deposit in safe.
 Phe Asp Tyr Glu Ser Ile Leu Gly Gln Cys Cys Glu Met Pro Val Gly
 225 3. If in usual building and can work, cashiers will: 240
 Tyr Val Gln Ile Arg Trp Gly Ser Pro Val Arg Cys Cys Ser Thr Gly
 245 250
 Trp Ser Ile • Date stamp all abstracts and cheques.
 260 • Write up abstracts for private applicants,
 • Balance and check all abstracts and cheques,
 <210> 184 All cheques and abstracts in date order and put in safe.
 <211> 279
 <212> PRT
 <213> Eucalyptus grandis

7. RETURN TO NORMAL

<400> 184
 Met Asp Val Ser Arg Arg Pro Ser Lys Pro Ala Ala Ala Ala Gly Ser
 1 5 10 15
 Ser Leu Asp Ala Lys Ser Cys His Ser Pro Ser Tyr Tyr
 20 25 30
 Ala 1. Primary site, the building at 47 Toop Street is usable. Phe Leu Tyr Leu Val
 2. IT link to Toop Street is working and, 45
 Asn 3. IPO is fully functional at Toop Street. Phe Thr Leu Leu Tyr Tyr Leu Leu
 50 55 60
 Ser Arg Trp Arg Glu Lys Ile Arg Ser Ala Ser Pro Leu His Val Leu
 65 70 75 80
 Ser Ala Pro Glu Leu Ala Ala Ble TEST AND PREVIEW Ala Ser Ser Val
 85 90 95
 Tyr Leu Leu Gly Phe Phe Gly Val Glu Phe Phe Gln Ser Leu Leu Leu
 100 105 110
 Arg Pro Pro Asp Ile Trp Ala Asp Asp Gly Ser Ser Ser Arg Val
 The BCP Review Team will review the plan on a monthly basis to ensure all information
 continues to be correct. 120 125
 Val Ser Val Val Ala Glu Glu Gly Ala Leu Lys Ala Pro Cys Gly Gln
 The plan will be discussed with all staff to ensure: 140
 Ala • All staff know whom to contact if necessary, 150
 145 • All staff are aware of the tasks expected of them before and after the event, 155
 Ala • That all pre-arrangements have been completed by the dates specified, 160
 165
 Ile • That all contact information is up to date. Val Ile Ala Ser Val Val Ala
 180 185 190
 Gly In the event this plan has been invoked the Impact Assessment Team will be required to conduct
 a Post Disaster Appraisal within 14 working days of return to normal. Comments and criticism
 Arg will be sought from other parties where appropriate to determine what improvements can be
 210 made to the plan. 215 220
 Ser Leu Ala Gly Leu Pro Leu Glu Gly Leu Asp Tyr Asp Ser Ile Leu
 225 230 235 240
 Gly Gln Cys Cys Glu Met Pro Val Gly Tyr Val Gln Ile Pro Val Gly
 completed. 245 250 255
 Ile Ala Gly Pro Leu Val Leu Asp Gly Arg Glu Tyr Ser Val Pro Met
 260 265 270
 Ala Thr Thr Glu Gly Cys Leu
 275

<210> 185

<211> 194

<212> PRT

<213> Eucalyptus grandis COMMUNICATION PLAN

Sue Whiteman will be responsible for ensuring copies of the plan are distributed via e-mail to all staff.

Met 1 185
 1 5 10 15
 Arg Gly Gly Gly Arg Gly Pro Ala Ser Ser Ser Pro Pro Leu Glu Pro
 Each staff member will be required to have one paper copy at home.

Pro Lys Ala Ser Asp Ala Leu Pro Leu Pro Leu Tyr Leu Thr Asn Ala
 A further copy will be distributed to all staff on the 22nd December 1999.

Val Phe Phe Thr Leu Phe Phe Ser Val Ala Tyr Tyr Leu Leu His Arg
 Communicating to staff of developments - phone message on a particular number (04 568 0744)

Trp 65 70 75 80
 that they can ring in the phone message will be updated by Janet Dobbie.

Pro 65 70 75 80
 Communicating to clients and BRB, MOCU phone message (04 568 0720) to be changed by Janet Dobbie.

Leu Gly Phe Phe Gly Ile Asp Phe Val Gln Thr Phe Ile Ala Arg Ala
 100 105 110
 Poster on door if the building is not in use.

Ser His Asp Ala Trp Glu Asp Leu Asp Asp Asp Val Asn Arg Gly Phe
 115 120 125
 Media release (if necessary) to be done by the Ministry Communications Unit ONLY

Gly Cys Thr Asp Ile Val Ala Pro Leu Pro Lys Ser Gly Asp Pro Ala
 130 135 140
 Pro Val Ile Ser Ala Leu Ser Ser Ala Glu Asp Glu Glu Ile Val Lys
 145 150 155 160
 Ser Val Val Asp Gly Thr Ile Pro Ser Tyr Ser Leu Glu Ser Lys Leu
 165 170 175

10. APPENDIX

Gly 180 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

Gly 180 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

Name	Position	Contact Number
Janet Dobbie 138 Cockayne Road Ngairi Wellington	Manager, Document & Information Service Centre	(04) 568 0720 work (04) 479 7539 home 021 362 898 mobile
Gary Jones PRT 28 Exploration Way Whitby	Team Leader Post Acceptance	(04) 568 0726 work (04) 234 1400 home
Shirley Pieroni 100 Shirley Bay Road Shelly Bay	Team Leader Records Ser Leu Pro Ser Asp Phe	(04) 568 0731 work (04) 380 9028 home 025 409 957 mobile
Sue Whiteman State Highway 1 McKays Crossing, Paekakariki	Support Services Duty Manager for Building	(04) 568 0744 work (04) 292 8018 home 025 411 812 mobile
Diane Jones 385c Karori Road Karori Wellington	National Manager Corporate Services Business & Register Branch	(04) 470 2514 work (04) 476 3459 home 021 342 634 mobile
Janette Campbell 85 Debbie Monahan	Support Services Manager IPONZ Manager, IPONZ	(04) 560 1601 work (04) 938 7078 home (04) 560 1613 work 021 306 098 mobile
Michael Grosnahan 113 Glas McKenzie	Ther Pro Leu Asp Asp Leu Operations, BRB BRB IT System Administrator	(09) 913 4221 025 443 702 mobile 021 532 689 mobile
Nedax Security	Mark Eden	(04) 471 2836
Armourguard Security	Monitoring Centre	(04) 478 1226
DX-211		Phone: (04) 473 9510
Post Fast Couriers		Phone: (04) 499 2121
ASB Cleaners	Eric Reille	(04) 564 3249

<213> Pinus radiata

<400> 187		025 454 162
Met Val Phe Thr Val Pro Leu Ser Lys Leu Cys Leu Cys		
1	Name	Address
Arg	Diane Innes	385C Karon Rd
Val	Pro Asn Leu Gly Met Cys	Karon, Wellington
Met	Neville Harris	48 Pennrose St
Arg	Arg Ile Ala Gly His His	Lower Hutt
65	Andrew Bridgman	3 Fettes Cres
Ala	Ser Leu Ser Thr Ser Tyr	Seaton Heights
Asp	Adam Feeley	36 Fortification Rd
Glu	Rodney Grindley	26 Taupo Cres
Trp	Karrina Bach	102 Heke Street
		Ngao

<210> 188

<211> 68

<212> PRT

<213> Pinus radiata

<400> 188

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

<210> 189

<211> 99

<212> PRT

<213> Pinus radiata

<400> 189

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

<210> 190

<211> 88
 <212> PRT
 <213> Pinus radiata

10.2 Telephone Tree Details

• Leader of Impact Assessment Team will ring the three members of Impact Assessment Team who will in turn telephone their staff informing them of the situation.
 • Leader (Janet Dobbie) will record phone messages.
 For staff on (04) 568 0744
 For clients on (04) 568 0720 for people requiring further information.
 • Leader will inform BRB Impact Assessment Team of situation.
 Latest telephone List for DISC staff follows:
 To access office update message: Clients: (04) 568 0720 / Staff: (04) 568 0744

By	Name	Team	Home Phone Number	Internal Extension
<210> 191				
<211> 223	Janet Dobbie	Manager	(04) 479 7539	8720
<212> PRT <213> Pinus radiata	Sue Whiteman	Administration	(04) 292 8018	8744
Janet Dobbie	Gary Jones	Post Acceptance Team Leader	(04) 234 1400	8738
<400> 191	Shirley Herewini	Records Team Leader	(04) 380 9026	8731
Janet Dobbie	Christine Edney	Records Centre Advisor	(04) 970 2365	8745
Gary Jones	Jenny Larkin	Post Acceptance	(04) 526 7897	8734
Gary Jones	Jenny Spaans	Post Acceptance	(04) 569 6814	8728
Gary Jones	Margaret Newton	Post Acceptance	(04) 564 7114	8735
Gary Jones	Maria Nigay	Post Acceptance	(04) 438 5658	8721
Gary Jones	Morna Macdonald	Post Acceptance	(04) 564 8969	8737
Gary Jones	Suzette Leitner	Post Acceptance	(04) 526 4098	8743
Gary Jones	Thelma Paranihi	Post Acceptance	(04) 563 7205	8727
Shirley Herewini	Joanne Sexton	Records	(04) 560 3564	8736
Shirley Herewini	John Appleby	Records	(04) 564 8969	8761
Shirley Herewini	Lorna Macdonald	Records	(04) 569 9219	8746
Shirley Herewini	William Rodriguez	Records	(04) 438 0569	8760
Sue Whiteman	Indy Auger	DISC Records Support	(04) 567 7549	8745
Sue Whiteman	Basil Isaac	Revenue & Lodgements	(04) 567 9235	8723
Sue Whiteman	Theresa King	Revenue & Lodgements	(04) 564 4301	8724
Sue Whiteman	Marie McLellan	Revenue & Lodgements	(04) 589 1420	8725
Bob Sykes	Hanley Hoffmann	Hearings Office	(04) 934 3276 or (04) 904 3276	8739
Janet Dobbie	Bob Sykes	Hearings Office	(04) 528 3003	8750
Bob Sykes	Hearther Stansfield	Hearings Office	(04) 567 0705	8751
Janet Dobbie	Cath Jones	Searchlink	(025) 985 362	
Janet Dobbie	Diana Innes	Corporate Office	(04) 476 3459	

Ser Asn Ala Asn Gln Leu Ser Ser Met Gly Phe Ala Phe Ser Ser Gly
 20 25 30
 Ser Leu Gly His Glu Val Met Ser Thr Lys Leu Gln Ser Met (04) 560 1679
 35 40 45
 • Enter your mailbox number
 Gly Arg Arg Val Gly Lys Ala Tyr Ala Ser Ala Leu Ser Asp Gln Gly
 50 Enter your password number 60
 Glu Tyr Tyr Ser Ser Ser Ser Pro Thr Pro Leu Leu Asp Thr Ile Asn
 65 • For an external greeting press 1 and then 5 to start recording your greeting. 80
 Tyr Pro Ile His Met Lys Asn Leu Ser Thr Arg Gln Leu Lys Gln Leu
 85 90 95
 • Press 2 to review your greeting and if you wish to re-record your greeting press 76 which will
 delete your existing greeting, then press 5 to re-record. Press the # key to stop recording.
 Ser Asn Gln Leu Arg Ser Asp Ile Ile Phe Glu Val Ser Arg Thr Gly
 100 105 110
 Gly His Leu Gly Ser Ser Leu Gly Val Val Glu Leu Thr Val Ala Leu
 115
 112 REPORT ON TESTING 125
 His Tyr Val Phe Asp Ala Pro Glu Asp Lys Ile Leu Trp Asp Val Gly
 130 135 140
 His Gln Tested on Thursday 30 September and Sunday 3 October 1999 Asp Lys Met
 145 150 155 160
 Pro Thr • Tested Telephone Messaging for Staff to advise of scenario's for: No Access to Seaview,
 165 170
 No Building Access, Building Access no Utilities, Building Access no IT, Building
 Glu Ser Glu Tyr Asp Lys Phe Gly Ala Gly His Ser Ser Thr Ser Ile
 175 180 185 190
 Access no IPOL. Staff rang in to 568 0744 to receive message of availability. Calls
 logged on voice mail
 Ser Ala Gly Leu Gly Met Ala Val Gly Arg Asp Leu Lys Gly Glu Asn
 195 200 205
 Tested on Monday 4 October 1999
 Asn His Val Ile Ser Val Ile Gly Asp Gly Ala Met Thr Ala Gly Gln
 210 215 220
 Ala Phe • Tested Telephone scenario by placing a sign as close to advise staff of IT availability.
 225 No IPOL available. All date stamping done manually, no problems. 240
 Val Ile Leu Asn Asp Asn Lys Gln Val Ser Leu Pro Thr Ala Asn Leu
 245 250 255
 Asp Gly Pro Ile Pro Pro Val Gly Ala Leu Ser Ser Ala Leu Ser Lys
 260 265 270
 • 30 November 1999: Armourguard given specific instructions for manual locking of Main
 Leu Gln Ser Ser Lys Pro Leu Arg Glu Leu Arg Glu Val Ala Lys Gly
 275 280
 Entrance and Rear Courtyard door at 12.01am on 1 January 2000. Also instructions for
 Val Thr Lys Gln Leu Gly Ala Pro Met His Glu Leu Ala Ala Lys Val
 285 290 300
 check Electricity Status and ringing result through to Neville Harris before 12.30am on 1
 January 2000.
 Asp Glu Tyr Ala Arg Gly Met Ile Ser Gly Ser Arg Ser Thr Leu Phe
 305 310 315 320
 Glu Glu Leu

<210> 193
 <211> 88
 <212> PRT
 <213> Eucalyptus grandis

<400> 193
 Gly Gly His Leu Ser Ala Ser Leu Gly Val Val Glu Leu Thr Val Ala
 1 5 10 15
 Leu His Asn Val Phe Asn Ala Pro Glu Asp Lys Ile Val Trp Asp Val
 20 25 30
 Gly His Gln Thr Tyr Pro His Lys Ile Leu Thr Gly Arg Arg Thr Arg
 35 40 45
 Met His Thr Ile Arg Lys Thr Ser Gly Leu Ala Gly Phe Pro Lys Arg
 50 55 60
 Asp Glu Ser Val Tyr Asp Thr Phe Gly Val Gly His Ser Ser Thr Ser
 65 70 75 80
 Ile Ser Ala Gly Leu Gly Met Ala
 85

<210> 194

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

<400> 194
 Pro Val Arg Glu Lys Leu Val Lys Ala Trp Arg Asn Asp Ser Glu Ile
 1 5 10 15
 Phe Ala His Tyr Gly Arg Leu Thr Thr Pro Tyr Ser Asp Glu Leu Leu
 20 25 30
 Gly Ser Lys Phe Cys Leu His Val Lys Gly Phe Glu Val Asn Thr Ala
 35 40 45
 Arg Ile Ala Asp Ser Leu Tyr Tyr Gly Cys Val Pro Val Ile Ile Ala
 50 55 60
 Asn His Tyr Asp Leu Pro Phe Ala Asp Ile Leu Asn Trp Lys Ser Phe
 65 70 75 80
 Ser Val Val Val Ala Thr Leu Asp Ile Pro Leu Leu Lys Arg Ile Leu
 85 90 95
 Lys

<210> 195
 <211> 149
 <212> PRT
 <213> Eucalyptus grandis

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

<210> 196
 <211> 196
 <212> PRT
 <213> Eucalyptus grandis

<400> 196
 Met Ser Gln Val Ser Ala Thr Pro Cys Ala Pro Pro Asn Lys Glu Thr
 1 5 10 15
 Gly His Val Ile Glu Arg Arg Ser Ala Gly Tyr His Pro Ser Val Trp
 20 25 30
 Gly Asp Tyr Phe Leu Lys Tyr Asp Ser Pro Ser Asn Ser Val Lys Phe
 35 40 45
 Lys Phe Leu Gly Arg Val Glu Gly Gln Ile Glu Glu Leu Lys Gly Glu
 50 55 60

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

<210> 197
<211> 116
<212> PRT
<213> Eucalyptus grandis

<400> 197
Met Ser Gln Val Ser Ala Thr Pro Cys Ala Pro Ser Asn Lys Gly Thr
1 5 10 15
Gly His Val Ile Glu Arg Arg Ser Ala Gly Tyr His Pro Ser Val Trp
20 25 30
Gly Asp Tyr Phe Leu Lys Tyr Asp Ser Pro Ser Asn Ser Val Lys Phe
35 40 45
Lys Phe Leu Gly Arg Val Glu Gly Gln Ile Glu Glu Leu Lys Gly Glu
50 55 60
Val Lys Lys Met Leu Thr Asp Ile Met Asp Lys Pro Leu Gln Lys Leu
65 70 75 80
His Leu Ile Asp Gln Ile Gln Arg Leu Gly Ile Glu Tyr His Phe Glu
85 90 95
Arg Glu Ile Asp Glu Gln Leu Glu Gln Ile His Lys Ser Tyr Ser Arg
100 105 110
Leu Asp His Glu
115

<210> 198
<211> 102
<212> PRT
<213> Eucalyptus grandis

<400> 198
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Thr Ser Leu Val Pro Glu Gly Gly Ser Ala Ile Phe His Pro Thr Ile
20 25 30
Trp Ala Asp Tyr Phe Leu Lys His Ala Ser Asn Ser Asn Ser Thr Ser
35 40 45
Ser Asp Gly Val Val Glu Glu His Ile Glu Arg Leu Lys Gly Glu Val
50 55 60
Arg Lys Met Leu Met Gly Ala Met Asp Lys Pro Ser Gln Lys Leu Asn
65 70 75 80
Leu Ile Asp Gln Ile Gln Arg Leu Gly Phe Ala Tyr His Phe Glu His
85 90 95
Glu Ile Asp Glu Gln Leu

100

<210> 199

<211> 169

<212> PRT

<213> Eucalyptus grandis

<400> 199

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

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<210> 200

<211> 132

<212> PRT

<213> Eucalyptus grandis

<400> 200

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

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<210> 201

<211> 116

<212> PRT

<213> Pinus radiata

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

<210> 202
 <211> 121
 <212> PRT
 <213> Pinus radiata

<400> 202
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 Ala Glu Leu Cys Ser Lys Ser Val Ser Met Ser Ser Pro Gly Val Gln
 35 40 45
 Arg Arg Thr Gly Asp Tyr His Ser Asn Leu Trp Asp Asp Glu Phe Ile
 50 55 60
 Gln Ser Leu Ser Thr Pro Tyr Gly Ala Pro Ser Tyr Arg Glu Arg Ala
 65 70 75 80
 Asp Arg Leu Val Gly Glu Val Lys Glu Met Phe Asn Ser Leu Thr Val
 85 90 95
 Leu Thr Pro His Asn Asp Leu Leu Glu Gln Leu Trp Met Val Asp Ser
 100 105 110
 Val Glu Arg Leu Gly Ile Asp Arg His
 115 120

<210> 203
 <211> 259
 <212> PRT
 <213> Pinus radiata

<400> 203
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 Ser Pro Gly Val Gln Arg Arg Thr Gly Asp Tyr His Ser Asn Leu Trp
 35 40 45
 Asp Asp Asp Phe Ile Gln Ser Leu Ser Thr Pro Tyr Gly Ala Pro Ser
 50 55 60
 Tyr Arg Glu Arg Ala Asp Arg Leu Val Gly Glu Val Lys Glu Met Phe
 65 70 75 80
 Asn Ser Leu Thr Leu Leu Thr Pro Leu Asn Asp Leu Leu Gln Arg Leu
 85 90 95
 Trp Met Val Asp Thr Val Glu Arg Leu Glu Ile Asp Arg His Phe Arg
 100 105 110

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

<210> 204
 <211> 344
 <212> PRT
 <213> Pinus radiata

<400> 204
 Ile Asp Val Phe Gly Glu Asp Thr Thr Phe Glu Thr Pro Tyr Leu Ile
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 Arg Glu Lys Leu Leu Glu Leu Ala Lys Leu Glu Phe Asn Ile Phe His
 20 25 30
 Ser Leu Val Lys Arg Glu Leu Gln Ser Leu Leu Arg Trp Trp Lys Asp
 35 40 45
 Tyr Gly Phe Pro Glu Ile Thr Phe Ser Arg His Arg His Val Glu Tyr
 50 55 60
 Tyr Thr Leu Ala Ala Cys Ile Ala Asn Asp Pro Lys His Ser Ala Phe
 65 70 75 80
 Arg Leu Gly Phe Gly Lys Ile Ser His Met Ile Thr Ile Leu Asp Asp
 85 90 95
 Ile Tyr Asp Thr Phe Gly Thr Met Glu Glu Leu Glu Leu Leu Thr Ala
 100 105 110
 Ala Phe Lys Arg Trp Asp Pro Ser Ser Ile Glu Cys Leu Pro Asp Tyr
 115 120 125
 Met Lys Gly Val Tyr Met Ala Val Tyr Asp Asn Ile Asn Glu Met Ala
 130 135 140
 Arg Glu Ala Gln Lys Ile Gln Gly Trp Asp Thr Val Ser Tyr Ala Arg
 145 150 155 160
 Lys Ser Trp Glu Ala Phe Ile Gly Ala Tyr Ile Gln Glu Ala Lys Trp
 165 170 175
 Ile Ser Ser Gly Tyr Leu Pro Thr Phe Asp Glu Tyr Leu Glu Asn Gly
 180 185 190
 Lys Val Ser Phe Gly Ser Arg Ile Thr Thr Leu Glu Pro Met Leu Thr
 195 200 205
 Leu Gly Phe Pro Leu Pro Pro Arg Ile Leu Gln Glu Ile Asp Phe Pro
 210 215 220
 Pro Lys Phe Asn Asp Leu Ile Cys Ala Ile Leu Arg Leu Lys Gly Asp
 225 230 235 240
 Thr Gln Cys Tyr Lys Ala Asp Arg Ala Arg Gly Glu Glu Ala Ser Ala
 245 250 255
 Val Ser Cys Tyr Met Lys Asp His Pro Gly Ile Thr Glu Glu Asp Ala
 260 265 270

Val Asn Gln Val Asn Ala Met Val Asp Asn Leu Thr Lys Glu Leu Asn
 275 280 285
 Trp Glu Leu Leu Arg Pro Asp Ser Gly Val Pro Ile Ser Tyr Lys Lys
 290 295 300
 Val Ala Phe Asp Ile Cys Arg Val Phe His Tyr Gly Tyr Lys Tyr Arg
 305 310 315 320
 Asp Gly Phe Ser Val Ala Ser Ile Glu Ile Lys Asn Leu Val Thr Arg
 325 330 335
 Thr Val Val Glu Thr Val Pro Leu
 340

<210> 205

<211> 462

<212> PRT

<213> Pinus radiata

<400> 205

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

Leu Arg Leu Arg Gly Asp Thr Arg Cys Tyr Lys Ala Asp Ser Ala Arg
 355 360 365
 Gly Glu Glu Ala Ser Cys Ile Ser Cys Tyr Met Lys Glu Asn Pro Gly
 370 375 380
 Ser Thr Gln Glu Asp Ala Leu His His Ile Asn Gly Met Ile Glu Asp
 385 390 395 400
 Met Ile Lys Lys Leu Asn Trp Glu Phe Leu Lys Pro Asp Asn Asn Ala
 405 410 415
 Pro Ile Ser Ser Lys Lys Asn Ala Phe Asn Ile Ser Arg Gly Leu His
 420 425 430
 His Phe Tyr Asn Tyr Arg Asp Gly Tyr Ser Val Ala Ser Asn Glu Thr
 435 440 445
 Lys Asp Leu Val Ile Lys Thr Val Leu Glu Pro Val Leu Met
 450 455 460

<210> 206
 <211> 100
 <212> PRT
 <213> Eucalyptus grandis

<400> 206
 Gly Ser Gln Leu Trp Asp Thr Ala Phe Ala Thr Gln Ala Ile Ile Ser
 1 5 10 15
 Thr Asn Leu Ile Glu Glu Phe Gly Ser Thr Leu Gln Lys Ala His Thr
 20 25 30
 Tyr Ile Lys Asn Ser Gln Val Leu Glu Asp Cys Pro Gly Asp Leu Asn
 35 40 45
 Phe Trp Tyr Arg His Ile Ser Lys Gly Ala Trp Pro Phe Ser Thr Ala
 50 55 60
 Asp His Gly Trp Pro Ile Ser Asp Cys Thr Ala Glu Gly Leu Lys Ala
 65 70 75 80
 Ala Leu Val Leu Ser Lys Ile Pro Leu Glu Ile Val Gly Gln Pro Phe
 85 90 95
 Arg Ser Tyr Gly
 100

<210> 207
 <211> 89
 <212> PRT
 <213> Eucalyptus grandis

<400> 207
 Met Trp Lys Leu Lys Val Ala Glu Gly Ala Asn Pro Trp Leu Arg Ser
 1 5 10 15
 Leu Asn Asn His Val Gly Arg Gln Ile Trp Glu Phe Asp Pro Asn Cys
 20 25 30
 Gly Ser Pro Glu Glu Ile Gln Glu Ile Glu Glu Ala Arg Ala Asn Phe
 35 40 45
 Leu Lys His Arg Phe Glu Lys Lys His Ser Ser Asp Leu Met Met Arg
 50 55 60
 Ile Gln Phe Ser Lys Glu Asn Thr Gly Arg Val Val Leu Pro Pro Val
 65 70 75 80
 Lys Val Lys Asp Leu Asp Glu Ile Thr
 85

<210> 208
 <211> 198
 <212> PRT
 <213> Eucalyptus grandis

<400> 208

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

<210> 209

<211> 78

<212> PRT

<213> Eucalyptus grandis

<400> 209

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

<210> 210

<211> 97

<212> PRT

<213> Eucalyptus grandis

<400> 210

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

Val 85 90 95

<210> 211
 <211> 158
 <212> PRT
 <213> Eucalyptus grandis

<400> 211
 Met Asp Thr Asp Asn Lys Leu Phe Asn Val Gly Val Leu Leu Val Ala
 1 5 10 15
 Thr Leu Val Val Ala Lys Leu Ile Ser Ala Leu Leu Ile Pro Arg Ser
 20 25 30
 Gly Lys Arg Leu Pro Pro Val Val Arg Thr Trp Pro Val Val Gly Gly
 35 40 45
 Leu Leu Arg Phe Leu Lys Gly Pro Met Val Met Leu Arg Glu Glu Tyr
 50 55 60
 Pro Lys Leu Gly Ser Val Phe Thr Leu Asn Leu Leu Asn Lys Lys Ile
 65 70 75 80
 Thr Phe Phe Ile Gly Pro Glu Val Ser Ala His Phe Phe Lys Ala Ser
 85 90 95
 Glu Ser Asp Leu Ser Gln Gln Glu Val Tyr Gln Phe Asn Val Pro Thr
 100 105 110
 Phe Gly Pro Gly Val Val Phe Asp Val Asp Tyr Thr Ile Arg Gln Glu
 115 120 125
 Gln Phe Arg Phe Phe Thr Glu Ala Leu Arg Ile Asn Lys Leu Lys Gly
 130 135 140
 Tyr Val Asn Gln Met Val Met Glu Ala Glu Asp Tyr Phe Ser
 145 150 155

<210> 212
 <211> 131
 <212> PRT
 <213> Eucalyptus grandis

<400> 212
 Met Asp Thr Asp Asn Lys Leu Phe Asn Val Gly Val Leu Leu Val Ala
 1 5 10 15
 Thr Leu Val Val Ala Lys Leu Ile Ser Ala Leu Leu Ile Pro Arg Ser
 20 25 30
 Gly Lys Arg Leu Pro Pro Val Val Arg Thr Trp Pro Val Val Gly Gly
 35 40 45
 Leu Leu Arg Phe Leu Lys Gly Pro Met Val Met Leu Arg Glu Glu Tyr
 50 55 60
 Pro Lys Leu Gly Ser Val Phe Thr Leu Asn Leu Leu Asn Lys Lys Ile
 65 70 75 80
 Thr Phe Phe Ile Gly Pro Glu Val Ser Ala His Phe Phe Lys Ala Ser
 85 90 95
 Glu Ser Asp Leu Ser Gln Gln Glu Val Tyr Gln Phe Asn Val Pro Thr
 100 105 110
 Phe Gly Pro Gly Val Val Phe Asp Val Asp Tyr Thr Ile Arg Gln Glu
 115 120 125
 Gln Phe Arg
 130

<210> 213
 <211> 112
 <212> PRT
 <213> Eucalyptus grandis

<400> 213
 Met Asp Thr Asp Asn Lys Leu Phe Asn Val Gly Val Leu Leu Val Ala
 1 5 10 15
 Thr Leu Val Val Ala Lys Leu Ile Ser Ala Ser Ile Pro Arg Ser Gly
 20 25 30
 Lys Arg Leu Pro Pro Val Val Arg Thr Trp Pro Val Val Gly Gly Leu
 35 40 45
 Leu Arg Phe Leu Lys Gly Pro Met Val Met Leu Arg Glu Glu Tyr Pro
 50 55 60
 Lys Leu Gly Ser Val Phe Thr Leu Asn Leu Leu Asn Lys Lys Ile Thr
 65 70 75 80
 Phe Phe Ile Gly Pro Glu Val Ser Ala His Phe Phe Lys Ala Ser Glu
 85 90 95
 Ser Asp Leu Ser Gln Gln Glu Val Tyr Gln Phe Asn Val Pro Thr Phe
 100 105 110

<210> 214
 <211> 152
 <212> PRT
 <213> Eucalyptus grandis

<400> 214
 Phe Leu Lys Gly Pro Met Val Met Leu Arg Glu Glu Tyr Pro Lys Leu
 1 5 10 15
 Gly Ser Val Phe Thr Leu Asn Leu Leu Asn Lys Lys Ile Thr Phe Phe
 20 25 30
 Ile Gly Pro Glu Val Ser Ala His Phe Phe Lys Ala Ser Glu Ser Asp
 35 40 45
 Leu Ser Gln Gln Glu Val Tyr Gln Phe Asn Val Pro Thr Phe Gly Pro
 50 55 60
 Gly Val Val Phe Asp Val Asp Tyr Thr Ile Arg Gln Glu Gln Phe Arg
 65 70 75 80
 Phe Phe Thr Glu Ala Leu Arg Ile Asn Lys Leu Lys Gly Tyr Val Asn
 85 90 95
 Gln Met Val Met Glu Ala Glu Asp Tyr Phe Ser Lys Trp Gly Asp Ser
 100 105 110
 Gly Glu Val Asp Leu Lys Tyr Glu Leu Glu His Leu Thr Ile Leu Thr
 115 120 125
 Ala Ser Arg Cys Leu Leu Gly Arg Glu Val Arg Glu Lys Leu Phe Asp
 130 135 140
 Asp Val Ser Ala Leu Phe His Asp
 145 150

<210> 215
 <211> 147
 <212> PRT
 <213> Eucalyptus grandis

<400> 215
 Phe Asp Asp Val Ser Ala Leu Phe His Asp Leu Asp Asn Gly Met Leu
 1 5 10 15
 Pro Ile Ser Val Ile Phe Pro Tyr Leu Pro Ile Pro Ala His His Arg
 20 25 30
 Arg Asp Lys Ala Arg Lys Lys Leu Ser Glu Ile Phe Ala Asn Ile Ile
 35 40 45
 Ser Ser Arg Lys Cys Ala Gly Lys Ser Glu Glu Asp Met Leu Gln Cys
 50 55 60
 Phe Ile Asp Ser Lys Tyr Lys Asn Gly Arg Pro Thr Thr Glu Ala Glu
 65 70 75 80
 Val Thr Gly Leu Leu Ile Ala Ala Leu Phe Ala Gly Gln His Thr Ser
 85 90 95

Ser Ile Thr Ser Val Trp Thr Gly Ala Tyr Leu Leu Thr Asn Lys Lys
 100 105 110
 Tyr Leu Ser Ala Val Ser Asn Glu Gln Lys His Leu Met Glu Lys His
 115 120 125
 Gly Asn Asn Val Asp His Asp Val Leu Ser Glu Met Asp Val Leu Tyr
 130 135 140
 Arg Ser Ile
 145

<210> 216
 <211> 129
 <212> PRT
 <213> Eucalyptus grandis

<400> 216
 Tyr Leu Leu Thr Asn Lys Lys Tyr Leu Ser Ala Val Ser Asn Glu Gln
 1 5 10 15
 Lys His Leu Met Glu Lys His Gly Asn Asn Val Asp His Asp Val Leu
 20 25 30
 Ser Glu Met Asp Val Leu Tyr Arg Ser Ile Lys Glu Ala Leu Arg Leu
 35 40 45
 His Pro Pro Leu Ile Met Leu Leu Arg Ser Ser His Ser Asp Phe Ser
 50 55 60
 Val Lys Thr Arg Asp Gly Lys Glu Tyr Glu Val Gly Glu Val Ser Val
 65 70 75 80
 Leu Pro Trp Thr Leu Glu Ala Arg Lys Gly Val Gly Lys Ala Phe Ile
 85 90 95
 Thr Ala Phe Arg Ser Gly Ala Val Met Gly Phe Leu Leu Ala Ala Asn
 100 105 110
 Gly Leu Leu Val Leu Tyr Ile Ala Ile Asn Leu Phe Lys Ile Tyr Leu
 115 120 125
 Trp

<210> 217
 <211> 118
 <212> PRT
 <213> Eucalyptus grandis

<400> 217
 Val Val Phe Asp Val Asp Tyr Thr Ile Arg Gln Glu Gln Phe Arg Phe
 1 5 10 15
 Phe Thr Glu Ala Leu Arg Ile Asn Lys Leu Lys Gly Tyr Val Asn Gln
 20 25 30
 Met Val Met Glu Ala Glu Asp Tyr Phe Ser Lys Trp Gly Asp Ser Gly
 35 40 45
 Glu Val Asp Leu Lys Tyr Glu Leu Glu His Leu Thr Ile Leu Thr Ala
 50 55 60
 Ser Arg Cys Leu Leu Gly Arg Glu Val Arg Glu Lys Leu Phe Asp Asp
 65 70 75 80
 Val Ser Ala Leu Phe His Asp Leu Asp Asn Gly Met Leu Pro Ile Ser
 85 90 95
 Val Ile Phe Pro Tyr Leu Pro Ile Pro Ala His His Arg Arg Asp Lys
 100 105 110
 Ala Arg Lys Lys Leu Ala
 115

<210> 218
 <211> 146
 <212> PRT
 <213> Eucalyptus grandis

<400> 218
 Ser Val Arg Arg Arg Ala Leu Glu Met Thr Thr Gly Arg Cys Leu Asp
 1 5 10 15
 Gly Leu Pro Leu Asp Gly Phe Asp Tyr Gly Ser Ile Leu Gly Gln Cys
 20 25 30
 Cys Glu Leu Pro Ile Gly Tyr Val Gln Ile Pro Val Gly Val Ala Gly
 35 40 45
 Pro Leu Leu Leu Asp Gly Ile Glu Asn Met Val Pro Met Ala Thr Thr
 50 55 60
 Glu Gly Cys Leu Val Ala Ser Thr Asn Arg Gly Cys Lys Ala Ile His
 65 70 75 80
 Met Ser Gly Gly Ala Thr Ser Val Leu Leu Arg Asp Gly Met Thr Arg
 85 90 95
 Ala Pro Val Val Arg Phe Pro Thr Ala Arg Arg Ala Ala Gln Leu Lys
 100 105 110
 Phe Tyr Leu Glu Ala Pro Ile Thr Thr Lys Ala Cys Leu Ser Ser Ser
 115 120 125
 Thr Ala Pro Ser Lys Val Cys Gln Ala Cys Lys Gly Ile Gln Val Pro
 130 135 140
 Pro Ile
 145

<210> 219
 <211> 328
 <212> PRT
 <213> Eucalyptus grandis

<400> 219
 Val Ala Ser Tyr Ser Leu Glu Ser Ala Leu Gly Gly Asp Cys Arg Arg
 1 5 10 15
 Ala Ala Leu Val Arg Arg Arg Ala Leu Glu Ile Arg Thr Gly Arg Cys
 20 25 30
 Leu Asp Gly Leu Pro Leu Asp Gly Phe Asp Tyr Gly Ser Ile Leu Gly
 35 40 45
 Gln Cys Cys Glu Leu Pro Val Gly Tyr Val Gln Ile Pro Val Gly Val
 50 55 60
 Val Gly Pro Leu Leu Leu Asp Gly Leu Glu Asn Met Val Pro Met Ala
 65 70 75 80
 Thr Thr Glu Gly Cys Leu Val Ala Ser Ala Asn Arg Gly Cys Lys Ala
 85 90 95
 Ile His Met Ser Gly Gly Ala Thr Ser Val Leu Leu Arg Asp Gly Met
 100 105 110
 Thr Arg Ala Pro Val Val Arg Phe Pro Thr Ala Glu Arg Ala Ala His
 115 120 125
 Leu Lys Ser Tyr Leu Glu His Pro Lys Asn Phe Asp Ser Leu Ser Leu
 130 135 140
 Ile Phe Asn Ser Thr Ser Arg Phe Ala Arg Leu Gln Thr Ile Lys Cys
 145 150 155 160
 Ala Ile Ala Gly Arg Asn Leu Tyr Ile Arg Phe Ser Cys Phe Thr Gly
 165 170 175
 Asp Ala Met Gly Met Asn Met Val Ser Lys Gly Val Gln Asn Val Leu
 180 185 190
 Asp Phe Leu Gln Asn Glu Asn Pro Asp Met Asp Val Ile Ala Val Ser
 195 200 205
 Gly Asn Phe Cys Ala Asp Lys Lys Pro Thr Ala Val Asn Trp Ile Glu
 210 215 220
 Gly Arg Gly Lys Ser Val Val Cys Glu Ala Ile Ile Thr Glu Ala Val
 225 230 235 240
 Val Ser Lys Val Leu Lys Thr Thr Val Pro Ala Leu Leu Glu Leu Asn
 245 250 255

Met Leu Lys Asn Leu Thr Gly Ser Ala Leu Ala Gly Ala Met Gly Gly
 260 265 270
 Phe Asn Ala His Ala Ser Asn Ile Val Ser Ala Val Phe Ile Ala Thr
 275 280 285
 Gly Gln Asp Pro Ala Gln Asn Ile Glu Ser Ser His Cys Ile Thr Met
 290 295 300
 Met Glu Ala Ser Asn Asp Gly Lys Asp Leu His Val Ser Val Thr Met
 305 310 315 320
 Pro Cys Ile Glu Val Gly Asn Ser
 325

<210> 220

<211> 175

<212> PRT

<213> Eucalyptus grandis

<400> 220

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

<210> 221

<211> 220

<212> PRT

<213> Pinus radiata

<400> 221

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

115	120	125
Val Gln Leu Asn Gly Ile Ser	Leu Gly Asp Asn Lys	Asp Asp Asp Ile
130	135	140
Ala Ala Ala Val Cys Asn Gly Thr Val	Ala Ser Tyr Ser Leu Glu Ser	
145	150	155
Ser Leu Gly Asp Cys Met Arg Ser	Ala Arg Val Arg Arg Arg Ser Leu	
	165	170
Glu Met Met Thr Gly Arg Ser	Leu Asp Gly Leu Pro Leu Glu Gly Phe	
	180	185
Asp Tyr Gly Ser Ile Leu Gly	Gln Cys Cys Glu Leu Pro Val Gly Tyr	
195	200	205
Val Gln Ile Pro Val Gly Val	Ala Gly Pro Leu Leu	
210	215	220

<210> 222
 <211> 91
 <212> PRT
 <213> Pinus radiata

<400> 222
Asp Leu His Ile Ser Val Thr Met Pro Cys Ile Glu Val Gly Thr Val
1 5 10 15
Gly Gly Gly Thr Gln Leu Ala Ser Gln Ser Ala Cys Leu Asn Leu Ile
20 25 30
Gly Val Lys Gly Ala Asn Val Gln Ser Pro Gly Ala Asn Ala Arg Leu
35 40 45
Leu Ala Arg Ile Val Ala Gly Ala Val Leu Ala Gly Glu Leu Ser Leu
50 55 60
Met Ser Ala Leu Ala Ala Gly Gln Leu Val Lys Ser His Met Lys Tyr
65 70 75 80
Asn Arg Ser Ile Lys Asp Ile Lys Ala Ile Ser
85 90

<210> 223
 <211> 187
 <212> PRT
 <213> Pinus radiata

<400> 223
Ser Phe Glu Ile His Thr Gly Lys Ser Ala Asp Ile Ser Arg Ala Gln
1 5 10 15
Ser Ala Tyr Thr Gln Gln Asn Asn Asn Ile Phe Thr Ser Ser Lys Ile
20 25 30
His Pro Val Val Ile Val Pro Gly Thr Gly Gly Asn Gln Val Glu Ala
35 40 45
Arg Leu Thr Ala Asp Tyr Lys Pro Ser Gly Leu Leu Cys Arg Arg Trp
50 55 60
Asn Trp Glu Arg Glu Trp Phe Arg Ile Trp Phe Asp Val Pro Val Val
65 70 75 80
Leu Pro Pro Leu Thr Gln Cys Phe Ala Asp Arg Ile Ser Leu Val Tyr
85 90 95
Asp Pro His Thr Asp Glu Tyr Tyr Asn Ala Pro Gly Val Glu Thr Arg
100 105 110
Val Pro Tyr Phe Gly Ser Thr Glu Gly Met Lys Tyr Leu Asp Pro Cys
115 120 125
Phe Lys Tyr Ile Thr Pro Tyr Met Ser Ser Leu Val Lys Ser Leu Glu
130 135 140
Asp Val Gly Tyr Val Asp Gly Lys Ser Leu Phe Gly Ala Pro Tyr Asp
145 150 155 160
Phe Arg Tyr Gly Pro Gly Thr Lys Ser Ser Val Gly Ala Lys Tyr
165 170 175

Leu Glu Asn Leu Arg Lys Leu Val Glu Glu Ala
180 185

<210> 224
<211> 117
<212> PRT
<213> Pinus radiata

<400> 224
Ser Ala Leu Ile Ile Gly Ser Phe Ile Phe Cys Ile Phe Leu Tyr Ile
1 5 10 15
Lys Gly His Val Ala Pro Ser Ser Thr Asp Ser Gly Ser Ser Gly Asn
20 25 30
Val Val Ile Asp Phe Tyr Trp Gly Met Glu Leu Tyr Pro Arg Ile Gly
35 40 45
Lys Asn Phe Asp Ile Lys Val Phe Thr Asn Cys Arg Phe Gly Met Met
50 55 60
Ser Trp Ala Val Leu Ala Val Thr Tyr Ser Ile Lys Gln Tyr Glu Glu
65 70 75 80
Tyr Gly Arg Val Ala Asp Ser Met Leu Val Ser Ser Ile Leu Met Val
85 90 95
Val Tyr Val Thr Lys Val Leu Leu Val Gly Ile Trp Leu Leu Glu His
100 105 110
His Gly Tyr Asn Ser
115

<210> 225
<211> 210
<212> PRT
<213> Pinus radiata

<400> 225
Phe Ala Val Val Gly Pro Leu Gln Leu Thr Ser Tyr Pro Leu Ile Lys
1 5 10 15
Leu Val Gly Ile Arg Thr Gly Leu Pro Leu Pro Ser Leu Trp Glu Ile
20 25 30
Phe Ala Gln Leu Ala Val Tyr Phe Met Val Glu Asp Tyr Gly Asn Tyr
35 40 45
Trp Ile His Arg Trp Leu His Cys Lys Trp Gly Tyr Glu Lys Ile His
50 55 60
His Val His His Glu Phe Thr Ala Pro Met Gly Phe Ala Ala Pro Tyr
65 70 75 80
Ala His Trp Ser Glu Val Leu Ile Leu Gly Ile Pro Thr Phe Val Gly
85 90 95
Pro Ala Ile Ala Pro Gly His Met Ile Thr Phe Trp Cys Trp Val Val
100 105 110
Leu Arg Gln Val Glu Ala Ile Glu Thr His Ser Gly Tyr Asp Phe Pro
115 120 125
Trp Thr Leu Thr Lys Leu Ile Pro Phe Tyr Gly Gly Ala Glu Tyr His
130 135 140
Asp Tyr His His Tyr Val Gly Gly Gln Ser Gln Ser Asn Phe Ala Ser
145 150 155 160
Val Phe Thr Tyr Cys Asp Tyr Leu Tyr Gly Thr Asp Lys Gly Tyr Arg
165 170 175
Tyr Arg Lys Glu His Leu Leu Lys Ala Arg Glu Phe Glu Tyr Arg Leu
180 185 190
Lys Gln Met Ile Leu Arg Lys Lys Thr Ala Met Glu Gln Phe Gln Ile
195 200 205
Ser Leu
210

<210> 226
 <211> 86
 <212> PRT
 <213> Pinus radiata

<400> 226
 Gly Pro His Leu Phe Thr Leu Trp Leu Trp Met Ser Leu Arg Val Leu
 1 5 10 15
 Glu Thr Val Glu Ala His Cys Gly Tyr Asp Phe Pro Trp Ser Ile Ser
 20 25 30
 Lys Leu Phe Pro Leu Tyr Gly Gly Ala Asp Phe His Asp Tyr His His
 35 40 45
 Arg Leu Leu Tyr Thr Lys Ser Gly Asn Tyr Ser Ser Thr Phe Thr Tyr
 50 55 60
 Met Asp Trp Leu Phe Gly Thr Asp Lys Gly Tyr Arg Lys Leu Lys Gly
 65 70 75 80
 Leu Gln Lys Asp Ser Lys
 85

<210> 227
 <211> 141
 <212> PRT
 <213> Pinus radiata

<400> 227
 Met Ala Thr Leu Val Glu Arg Gly Trp Leu Tyr Leu Ile Thr Asn Phe
 1 5 10 15
 Thr Asp Phe Gln Leu Ala Ser Ile Gly Ser Phe Leu Leu His Glu Ser
 20 25 30
 Ile Phe Tyr Leu Ser Gly Leu Pro Phe Ile Leu Leu Glu Thr Thr Gly
 35 40 45
 Leu Leu Ser Lys Tyr Lys Ile Gln Ser Lys Thr Asn Thr Val Ala Ala
 50 55 60
 Gln Glu Lys Cys Ile Thr Arg Leu Leu Leu Tyr His Phe Cys Val Asn
 65 70 75 80
 Leu Pro Val Met Val Val Ser Tyr Pro Val Phe Arg Phe Met Gly Met
 85 90 95
 Thr Ser Val Leu Pro Leu Pro Ser Trp Lys Val Val Val Ser Gln Leu
 100 105 110
 Val Cys Tyr Phe Ile Leu Glu Asp Phe Val Phe Tyr Trp Gly His Arg
 115 120 125
 Ile Leu His Ser Lys Trp Leu Tyr Lys His Val His Ser
 130 135 140

<210> 228
 <211> 381
 <212> PRT
 <213> Pinus radiata

<400> 228
 Met Gly Glu Glu Leu Gln Thr Trp Ile Leu Met Val Thr Ala Arg Ala
 1 5 10 15
 Pro Thr Asn Ile Ala Val Ile Lys Tyr Trp Gly Lys Arg Asp Glu Lys
 20 25 30
 Leu Ile Leu Pro Ile Asn Asp Ser Ile Ser Phe Thr Leu Asp Pro Asp
 35 40 45
 His Leu Ser Ala Thr Thr Thr Val Ala Val Ser Pro Ser Phe Thr Ser
 50 55 60
 Asp Arg Met Trp Leu Asn Gly Lys Glu Val Ser Leu Gly Gly Glu Arg
 65 70 75 80
 Tyr Gln Asn Cys Leu Arg Glu Ile Arg Ser Arg Gly Asn Asp Val Val

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<210> 229
<211> 81
<212> PRT
<213> Pinus radiata
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<210> 230
<211> 189
<212> PRT
<213> Pinus radiata
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<400> 230
 Met Pro Leu Thr Leu Leu Leu Ala Asn Thr Trp Ala Ser Ser Ala Ile
 1 5 10 15
 Val Ser Arg Arg Val Ser Leu Phe Val Ala Cys Ser Thr Thr Val Val
 20 25 30
 Ser Arg Ser Phe Ser Lys Ser Cys Ser Gly Ala Ile Pro Arg Lys Pro
 35 40 45
 Lys Ser Ala His Pro Ala Leu Thr Gly Ser Arg Thr Cys Phe Ser Arg
 50 55 60
 Asn Pro Ile Val Arg Asn Leu Ile Gly Ser Ala Ser Lys Met Gly Ala
 65 70 75 80
 Thr Val Glu Asp Thr Thr Met Asp Ala Val Gln Arg Arg Leu Met Phe
 85 90 95
 Glu Asp Glu Cys Ile Leu Val Asp Glu Glu Asp His Val Ile Gly His
 100 105 110
 Asp Ser Lys Tyr Asn Cys His Leu Met Glu Lys Ile Glu Ser Glu Asn
 115 120 125
 Leu Leu His Arg Ala Phe Ser Val Phe Leu Phe Asn Thr Lys Tyr Glu
 130 135 140
 Leu Leu Leu Gln Gln Arg Ser Ala Thr Lys Val Thr Phe Pro Leu Val
 145 150 155 160
 Trp Thr Asn Thr Cys Cys Ser His Pro Leu Tyr Arg Glu Ser Glu Leu
 165 170 175
 Ile Glu Glu Asn Asn Leu Gly Ser Glu Met Gln Pro Lys
 180 185

<210> 231
 <211> 113
 <212> PRT
 <213> Pinus radiata

<400> 231
 Met Ala Gly Ile Pro Val Leu Arg Pro Phe Cys Ile Cys Leu Leu Ser
 1 5 10 15
 Val Tyr Met Leu His Ile Val Ala Ala Val Ala Ser Pro Arg Leu Gly
 20 25 30
 Arg Ser Ser Phe Pro Arg Gly Phe Lys Phe Gly Ala Gly Ser Ser Ala
 35 40 45
 Tyr Gln Ala Glu Gly Ala Ala His Glu Gly Gly Lys Gly Pro Ser Ile
 50 55 60
 Trp Asp Thr Phe Ser His Thr Pro Gly Lys Ile Ala Asp Gly Lys Asn
 65 70 75 80
 Gly Asp Val Ala Val Asp Gln Tyr His Arg Tyr Lys Glu Asp Val Gln
 85 90 95
 Leu Leu Lys Tyr Met Gly Met Asp Val Tyr Arg Phe Ser Ile Ser Trp
 100 105 110
 Ser

<210> 232
 <211> 127
 <212> PRT
 <213> Pinus radiata

<400> 232
 Gly Pro Ser Ile Trp Asp Thr Phe Ser His Thr Pro Gly Lys Ile Ala
 1 5 10 15
 Asp Gly Lys Asn Gly Asp Val Ala Val Asp Gln Tyr His Arg Tyr Lys
 20 25 30
 Glu Asp Val Gln Leu Leu Lys Asn Met Gly Met Asp Val Tyr Arg Phe

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

<210> 233
 <211> 118
 <212> PRT
 <213> Eucalyptus grandis

<400> 233
 Met Ala Gly Glu Trp Ile Leu Thr Leu Thr Ala Gln Thr Pro Thr Asn
 1 5 10 15
 Ile Ala Val Ile Lys Tyr Trp Gly Lys Arg Asp Glu Ser Leu Ile Leu
 20 25 30
 Pro Val Asn Asp Ser Ile Ser Val Thr Leu Asp Pro Gly His Leu Cys
 35 40 45
 Thr Thr Thr Thr Val Ala Val Ser Pro Ala Phe Glu Gln Asp Arg Met
 50 55 60
 Trp Leu Asn Gly Lys Glu Ile Ser Leu Ser Gly Asp Arg Phe Gln Ser
 65 70 75 80
 Cys Leu Arg Glu Ile Arg Ala Arg Ala Thr Asp Val Glu Asn Lys Glu
 85 90 95
 Lys Gly Ile Lys Ile Ser Lys Lys Asp Trp Glu Lys Leu His Leu His
 100 105 110
 Ile Ser Phe Phe Thr Phe
 115

<210> 234
 <211> 111
 <212> PRT
 <213> Pinus radiata

<400> 234
 Met Met Gln Lys Tyr Ile Gly Ala Asp Val Thr Ser Met Val Thr Leu
 1 5 10 15
 Pro Val Ile Ile Phe Glu Pro Met Thr Met Leu Gln Lys Ser Ala Glu
 20 25 30
 Leu Met Glu Tyr Thr Tyr Leu Leu Asp Met Ala Asp Glu Cys Glu Asp
 35 40 45
 Pro Tyr Leu Lys Met Ala Tyr Ala Ala Ser Trp Ala Ile Ser Val Tyr
 50 55 60
 Pro Ala Tyr Gln Arg Ser Trp Lys Pro Phe Asn Pro Ile Leu Gly Glu
 65 70 75 80
 Thr Tyr Glu Met Val Asn His Gly Gly Ile Thr Phe Ile Ala Glu Gln
 85 90 95
 Val Ser His His Pro Pro Trp Ala Gln Pro Met Pro Glu Met Thr
 100 105 110

<210> 235
 <211> 391
 <212> PRT
 <213> Pinus radiata

<400> 235

```

Met Met Gln Lys Tyr Ile Gly Ala Asp Val Thr Ser Met Val Thr Leu
 1          5          10          15
Pro Val Ile Ile Phe Glu Pro Met Thr Met Leu Gln Lys Ser Ala Glu
          20          25          30
Leu Met Glu Tyr Thr Tyr Leu Leu Asp Met Ala Asp Glu Cys Glu Asp
          35          40          45
Pro Tyr Leu Lys Met Ala Tyr Ala Ala Ser Trp Ala Ile Ser Val Tyr
          50          55          60
Pro Ala Tyr Gln Arg Ser Trp Lys Pro Phe Asn Pro Ile Leu Gly Glu
65          70          75          80
Thr Tyr Glu Met Val Asn His Gly Gly Ile Thr Phe Ile Ala Glu Gln
          85          90          95
Val Ser His His Pro Pro Met Gly Ser Ala Tyr Ala Glu Asn Glu His
          100          105          110
Phe Thr Tyr Ser Leu Ser Ser Lys Val Lys Thr Lys Phe Leu Gly Asn
          115          120          125
Ser Val Asp Ile Tyr Pro Leu Gly Arg Thr Arg Val Val Leu Lys Lys
          130          135          140
Ser Gly Asp Val Leu Asp Leu Val Pro Pro Pro Ser Lys Val His Asn
145          150          155          160
Leu Ile Phe Gly Arg Thr Trp Ile Asp Ser Pro Gly Glu Met Val Leu
          165          170          175
Thr Asn Leu Thr Thr Gly Asp Lys Val Leu Tyr Phe Gln Pro Cys
          180          185          190
Gly Trp Phe Gly Ala Gly Arg Tyr Glu Val Asp Gly Tyr Val Tyr Asp
          195          200          205
Ser Lys Glu Glu Pro Lys Ile Leu Met Thr Gly Lys Trp Asn Arg Ser
          210          215          220
Met Gly Tyr Gln Pro Cys Asp Ala Glu Gly Glu Pro Leu Pro Gly Thr
225          230          235          240
Glu Leu Lys Glu Val Trp Arg Val Ala Asp Leu Pro Lys Asn Asp Lys
          245          250          255
Phe Gln Tyr Thr Tyr Phe Ala His Lys Ile Asn Ser Phe Asp Thr Ala
          260          265          270
Pro Lys Lys Leu Leu Ala Ser Asp Ser Arg Leu Arg Pro Asp Arg Ser
          275          280          285
Ala Leu Glu Met Gly Asp Leu Ser Lys Ala Gly Ala Glu Lys Ser Asn
          290          295          300
Leu Glu Glu Arg Gln Arg Ala Glu Lys Arg Cys Arg Glu Glu Lys Asn
305          310          315          320
Gln Pro Phe Thr Pro Arg Trp Phe Thr Val Thr Gly Glu Val Ala Thr
          325          330          335
Thr Pro Trp Gly Asp Leu Glu Val Tyr Glu Tyr Asn Gly Lys Tyr Ser
          340          345          350
Glu His Arg Ala Ser Val Asp Asp Ser Asn Phe Asp Asp Gly Thr Asp
          355          360          365
Ser Lys Ser Met Glu Phe Asn Pro Trp Gln Tyr Gly Asn Ile Glu Ser
          370          375          380
Gly Ser Asn Lys Lys Val Glu
385          390

```

<210> 236

<211> 27

<212> PRT

<213> Pinus radiata

<400> 236

```

Met Met Gln Lys Tyr Ile Gly Ala Asp Val Thr Ser Met Val Thr Leu
 1          5          10          15
Pro Val Ile Ile Phe Glu Pro Met Thr Met Leu

```

20

25

<210> 237
 <211> 134
 <212> PRT
 <213> Pinus radiata

<400> 237
 Tyr Leu Val Leu Ile Ser Gln Leu Arg Val Gly Met Asp Leu Ser Lys
 1 5 10 15
 Val Thr Phe Pro Thr Phe Val Leu Glu Pro Arg Ser Met Leu Glu Arg
 20 25 30
 Ile Thr Asp Phe Met Ser His Pro Asp Leu Ile Phe Gly Ala Glu Asn
 35 40 45
 Ser Asn Asp Pro Glu Glu Arg Phe Met Arg Val Leu Ser Tyr Tyr Leu
 50 55 60
 Ala Gly Trp His Ile Lys Pro Lys Gly Val Lys Lys Pro Tyr Asn Pro
 65 70 75 80
 Val Leu Gly Glu Phe Phe Arg Cys Arg Tyr Asp Tyr Ser Asn Asn Thr
 85 90 95
 Gln Gly Phe Tyr Ile Ala Glu Gln Val Ser His His Pro Pro Ile Ser
 100 105 110
 Ala Phe Phe Tyr Ile Ser Pro Ala Asn Arg Val Ser Ile Ile Gly Glu
 115 120 125
 Leu Arg Pro Lys Ser Lys
 130

<210> 238
 <211> 133
 <212> PRT
 <213> Eucalyptus grandis

<400> 238
 Ser Ser Lys Gly Arg His Cys Lys Pro Phe Asn Pro Leu Leu Gly Glu
 1 5 10 15
 Thr Tyr Glu Ala Asp Tyr Pro Glu Arg Gly Val His Phe Phe Ser Glu
 20 25 30
 Lys Val Ser His His Pro Thr Leu Ile Ala Cys His Cys Glu Gly Arg
 35 40 45
 Gly Trp Lys Phe Trp Ala Asp Ser Asn Leu Arg Thr Lys Phe Trp Gly
 50 55 60
 Gln Ser Ile Gln Leu Asp Pro Val Gly Ala Leu Thr Leu Glu Phe Asp
 65 70 75 80
 Asp Gly Glu Ile Phe Gln Trp Asn Lys Val Thr Thr Ser Ile Asn Asn
 85 90 95
 Leu Ile Ile Gly Lys Val Tyr Cys Asp His His Gly Val Met Asn Ile
 100 105 110
 His Gly Asn His Gln Tyr Ser Cys Lys Leu Lys Phe Lys Glu Pro Ser
 115 120 125
 Ile Leu Ala Glu Leu
 130

<210> 239
 <211> 116
 <212> PRT
 <213> Eucalyptus grandis

<400> 239
 Arg Thr Cys Asp Trp Ser Met Arg Ala Ser Trp Ala Ile Ser Val Tyr
 1 5 10 15
 Tyr Ala Tyr Gln Arg Thr Trp Lys Pro Phe Asn Pro Ile Leu Gly Glu

```

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

```

<210> 240
 <211> 105
 <212> PRT
 <213> Eucalyptus grandis

```

      <400> 240
Ser Arg Leu Arg Pro Asp Arg Tyr Ala Leu Glu Pro Gly Asp Leu Pro
1      5      10      15
Lys Ala Gly Ala Glu Lys Ser Ser Leu Glu Glu Arg Gln Arg Gly Glu
      20      25      30
Lys Lys Asn Arg Glu Met Lys Gly Gln Lys Phe Thr Pro Arg Trp Phe
      35      40      45
Asp Leu Thr Asp Glu Ile Ser Pro Thr Pro Trp Gly Asp Leu Glu Val
      50      55      60
Tyr Arg Tyr Asn Gly Lys Tyr Thr Glu His Arg Ala Val Val Asp Ser
65      70      75      80
Leu Asp Thr Ile Glu Glu Ser Asp Ile Gln Ser Thr Glu Phe Asn Pro
      85      90      95
Trp Gln Tyr Glu Ala Thr Phe Ala Glu
      100      105

```

<210> 241
 <211> 117
 <212> PRT
 <213> Pinus radiata

```

      <400> 241
Val Leu Arg Gly Leu Asp Thr Val Glu Asp Asp Thr Ser Ile Pro Leu
1      5      10      15
Asp Thr Lys Leu Pro Ile Leu Lys Ala Phe Tyr Lys His Ile Tyr Asp
      20      25      30
Pro Ser Trp His Phe Ser Cys Gly Val Glu His Tyr Lys Glu Leu Met
      35      40      45
Glu Lys Phe His His Val Ser Thr Thr Phe Leu Arg Leu Gly Arg Gly
      50      55      60
Tyr Gln Glu Ala Ile Glu Glu Ile Thr Lys Lys Met Gly Ala Gly Met
65      70      75      80
Ala Lys Phe Ile Cys Lys Glu Val Glu Ser Val Glu Asp Tyr Asp Glu
      85      90      95
Tyr Cys His Tyr Val Ala Gly Leu Val Gly Phe Gly Leu Ser Arg Leu
      100      105      110
Phe His Ala Ala Gln
      115

```

<210> 242
 <211> 190
 <212> PRT

<213> Pinus radiata

<400> 242

```

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

```

<210> 243

<211> 124

<212> PRT

<213> Pinus radiata

<400> 243

```

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

```

<210> 244

<211> 123

<212> PRT

<213> Eucalyptus grandis

<400> 244

```

Met Asp Gly Gln Tyr Leu Val Ser Gly Val Leu Ala Leu Phe Leu Gly
 1           5           10           15
Ile Phe Leu Leu Tyr Lys Gly Leu Gly Lys Gln Lys Arg Arg Leu Ser
          20           25           30

```

Lys Lys Gly Arg Gly Asp Asp Tyr Val Lys Ser Ser Val Asp Gly Gly
 35 40 45
 Phe Val Pro Gly Gly Val Asp Gly Ser Thr Asp Ile Val Ile Val Gly
 50 55 60
 Ala Gly Val Ala Gly Ala Ala Leu Ala Tyr Ala Leu Gly Lys Asp Gly
 65 70 75 80
 Arg Arg Val Arg Val Ile Glu Arg Asp Leu Thr Glu Gln Asp Arg Ile
 85 90 95
 Val Gly Glu Leu Leu Gln Pro Gly Gly Tyr Leu Lys Leu Met Glu Leu
 100 105 110
 Asp Leu Ala Asp Cys Val Gln Thr Ile Asp Ala
 115 120

<210> 245
 <211> 221
 <212> PRT
 <213> Eucalyptus grandis

<400> 245
 Leu Gly Ser Lys Tyr Lys Pro Gln Glu Glu Phe Val Glu Trp Ile Gln
 1 5 10 15
 Lys Gly Thr Lys Pro Ile Tyr Ile Gly Phe Gly Ser Met Pro Leu Glu
 20 25 30
 Asp Pro Lys Lys Thr Thr Asp Ile Ile Ile Lys Ala Leu Thr Asp Thr
 35 40 45
 Gly Gln Arg Gly Ile Val Gly Arg Gly Trp Gly Asp Leu Gly Thr Leu
 50 55 60
 Leu Asp Val Pro Asp Ser Val Phe Leu Leu Glu Asp Cys Pro His Asp
 65 70 75 80
 Trp Leu Phe Pro Gln Cys Ser Ala Val Val His His Gly Gly Ala Gly
 85 90 95
 Thr Thr Ala Thr Gly Leu Lys Ala Gly Cys Pro Thr Thr Ile Val Pro
 100 105 110
 Phe Phe Gly Asp Gln Phe Phe Trp Gly Asp Arg Val His Gln Arg Gly
 115 120 125
 Leu Gly Pro Ala Pro Ile Pro Ile Ser Gln Leu Ser Val Glu Asn Leu
 130 135 140
 Ser Asp Ala Ile Arg Phe Met Leu Gln Pro Glu Val Lys Ser Gln Ala
 145 150 155 160
 Met Glu Met Ala Lys Leu Ile Glu Asn Glu Asp Gly Val Ala Ala Ala
 165 170 175
 Val Asp Ala Phe His Arg His Leu Pro Glu Glu Phe Pro Ser Ser Ser
 180 185 190
 Val Ser Ser Asp Gly Glu Glu His Pro Asn Pro Phe Leu Trp Leu Phe
 195 200 205
 Leu Gln Val Glu Lys Trp Cys Cys Leu Pro Cys Ser Lys
 210 215 220

<210> 246
 <211> 114
 <212> PRT
 <213> Eucalyptus grandis

<400> 246
 Leu Asp Asn Cys Pro His Asp Trp Leu Phe Leu Arg Cys Ser Ala Val
 1 5 10 15
 Val His His Gly Gly Ala Gly Thr Thr Ala Ala Gly Leu Lys Ala Ala
 20 25 30
 Cys Pro Thr Thr Val Val Pro Phe Phe Gly Asp Gln Pro Phe Trp Gly
 35 40 45
 Glu Arg Val His Ala Arg Gly Val Gly Pro Val Pro Ile Pro Val Asp

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

<210> 247

<211> 140

<212> PRT

<213> Pinus radiata

<400> 247

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

<210> 248

<211> 152

<212> PRT

<213> Eucalyptus grandis

<400> 248

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

<210> 249
 <211> 100
 <212> PRT
 <213> Eucalyptus grandis

<400> 249
 Met Ser Lys Ala Gly Ala Met Asp Leu Ala Thr Gly Leu Gly Gly Lys
 1 5 10 15
 Met Asp Lys Ser Asp Val Leu Ser Ala Val Asp Lys Tyr Glu Lys Tyr
 20 25 30
 His Val Cys Tyr Gly Gly Asp Glu Glu Glu Arg Arg Ala Asn Tyr Ser
 35 40 45
 Asp Met Val Asn Lys Tyr Tyr Asp Leu Ala Thr Ser Phe Tyr Glu Phe
 50 55 60
 Gly Trp Gly Glu Ser Phe His Phe Ala His Arg Trp Lys Gly Glu Ser
 65 70 75 80
 Leu Arg Glu Ser Ile Lys Arg His Glu His Phe Leu Ala Leu Gln Leu
 85 90 95
 Gly Leu Lys Pro
 100

<210> 250
 <211> 148
 <212> PRT
 <213> Eucalyptus grandis

<400> 250
 Ala Met Pro Trp Tyr Cys Ala Leu Pro Thr Leu Ser Glu Tyr Met Val
 1 5 10 15
 Glu Asn Gly Trp Thr Lys Cys Phe Ser Arg Ile Ser Asp Val Gly Trp
 20 25 30
 Leu Ala Tyr Leu Val Tyr Leu Ser Ile Tyr Leu Val Met Ala Glu Phe
 35 40 45
 Gly Ile Tyr Trp Met His Arg Glu Leu His Asp Ile Lys Pro Leu Tyr
 50 55 60
 Lys His Leu His Ala Thr His His Ile Tyr Asn Lys Gln Asn Thr Leu
 65 70 75 80
 Ser Pro Phe Ala Gly Leu Ala Phe His Pro Leu Asp Gly Ile Leu Gln
 85 90 95
 Ala Val Pro His Val Met Ala Leu Phe Leu Val Pro Thr His Phe Thr
 100 105 110
 Thr His Ile Ala Leu Leu Phe Leu Glu Ala Ile Trp Thr Ala Asn Ile
 115 120 125
 His Asp Cys Ile His Gly Lys Leu Trp Pro Val Met Gly Ala Gly Tyr
 130 135 140
 His Thr Ile His
 145

<210> 251
 <211> 201
 <212> PRT
 <213> Eucalyptus grandis

<400> 251
 Phe Met Ser Cys Leu Pro Asn Met Ile Val Met Ala Pro Ser Asp Glu
 1 5 10 15
 Asp Glu Leu Val Asp Met Val Glu Thr Ala Ala Ile Val Asp Asp Arg
 20 25 30
 Pro Ile Cys Phe Arg Tyr Pro Arg Gly Ala Ile Val Arg Thr Asp Lys
 35 40 45

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

<210> 252

<211> 138

<212> PRT

<213> Eucalyptus grandis

<400> 252

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

<210> 253

<211> 610

<212> PRT

<213> Pinus radiata

<400> 253

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

65					70					75				80	
Asp	Gly	Glu	Asn	Gly	Lys	Asn	Val	Lys	Ala	Ala	Val	Glu	Ile	Ala	Ser
				85					90					95	
Lys	Ser	Gly	Phe	Pro	Ala	Glu	Lys	Pro	Pro	Thr	Pro	Leu	Leu	Asp	Thr
			100					105					110		
Val	Asn	Tyr	Pro	Val	His	Leu	Lys	Asn	Leu	Ser	Ile	Gln	Asp	Leu	Glu
		115					120					125			
Gln	Leu	Ala	Thr	Glu	Ile	Arg	Ala	Glu	Leu	Val	Phe	Gly	Val	Ala	Lys
	130					135					140				
Thr	Gly	Gly	His	Leu	Gly	Gly	Ser	Leu	Gly	Val	Val	Asp	Leu	Thr	Val
145					150					155					160
Ala	Leu	His	His	Val	Phe	Asp	Ser	Pro	Glu	Asp	Arg	Ile	Ile	Trp	Asp
				165					170					175	
Val	Gly	His	Gln	Ser	Tyr	Pro	His	Lys	Ile	Leu	Thr	Gly	Arg	Arg	Ser
			180					185					190		
Lys	Met	His	Thr	Ile	Arg	Gln	Thr	Ser	Gly	Leu	Ala	Gly	Phe	Pro	Lys
	195						200					205			
Arg	Asp	Glu	Ser	Lys	Tyr	Asp	Ala	Phe	Gly	Ala	Gly	His	Ser	Ser	Thr
	210					215					220				
Ser	Ile	Ser	Ala	Gly	Leu	Gly	Met	Ala	Val	Gly	Arg	Asp	Leu	Leu	Lys
225					230					235					240
Lys	Asn	Asn	His	Val	Val	Ala	Val	Ile	Gly	Asp	Gly	Ala	Met	Thr	Ala
				245					250					255	
Gly	Gln	Ala	Tyr	Glu	Ala	Met	Asn	Asn	Ser	Gly	Tyr	Leu	Glu	Ser	Asn
		260					265					270			
Leu	Ile	Ile	Ile	Leu	Asn	Asp	Asn	Lys	Gln	Val	Ser	Leu	Pro	Thr	Ala
	275						280					285			
Thr	Leu	Asp	Gly	Ala	Ala	Pro	Pro	Val	Gly	Ala	Leu	Thr	Arg	Ala	Leu
	290					295					300				
Thr	Lys	Leu	Gln	Ser	Ser	Lys	Lys	Leu	Arg	Lys	Leu	Arg	Glu	Ala	Ala
305					310					315					320
Lys	Gly	Leu	Thr	Lys	Gln	Ile	Gly	Gly	Pro	Thr	His	Glu	Val	Ala	Ser
				325					330					335	
Lys	Val	Asp	Lys	Tyr	Ala	Arg	Gly	Leu	Ile	Ser	Pro	Ala	Ser	Ser	Ser
			340					345					350		
Leu	Phe	Asp	Glu	Leu	Gly	Leu	Tyr	Tyr	Ile	Gly	Pro	Val	Asp	Gly	His
	355						360					365			
Asn	Ile	Glu	Asp	Met	Val	Thr	Ile	Leu	Glu	Lys	Ile	Lys	Ser	Met	Pro
	370					375					380				
Ala	Thr	Gly	Pro	Val	Leu	Ile	His	Leu	Val	Thr	Glu	Lys	Gly	Lys	Gly
385					390					395					400
Tyr	Pro	Pro	Ala	Glu	Glu	Ala	Ala	Asp	Lys	Leu	His	Gly	Val	Val	Lys
			405						410					415	
Phe	Asp	Pro	Val	Thr	Gly	Lys	Gln	Phe	Lys	Ser	Lys	Ser	Ser	Val	Leu
			420					425				430			
Ser	Tyr	Thr	Gln	Tyr	Phe	Ala	Glu	Ala	Leu	Ile	Ala	Glu	Ala	Glu	Val
	435					440					445				
Asp	Ser	Lys	Ile	Val	Ala	Ile	His	Ala	Ala	Met	Gly	Gly	Gly	Thr	Gly
	450					455					460				
Leu	Asn	Tyr	Phe	Gln	Lys	Lys	Phe	Pro	Glu	Arg	Cys	Phe	Asp	Val	Gly
465					470					475					480
Ile	Ala	Glu	Gln	His	Ala	Val	Thr	Phe	Ala	Ala	Gly	Leu	Ala	Thr	Glu
				485					490					495	
Gly	Leu	Lys	Pro	Phe	Cys	Ala	Ile	Tyr	Ser	Thr	Phe	Leu	Gln	Arg	Gly
			500					505					510		
Tyr	Asp	Gln	Val	Val	His	Asp	Val	Asp	Leu	Gln	Lys	Leu	Pro	Val	Arg
			515					520					525		
Phe	Ala	Met	Asp	Arg	Ala	Gly	Leu	Val	Gly	Ala	Asp	Gly	Pro	Thr	His
	530					535					540				
Cys	Gly	Ser	Phe	Asp	Val	Ala	Tyr	Met	Ala	Cys	Leu	Pro	Asn	Met	Ile
545					550					555					560

Val Met Ala Pro Ser Asp Glu Val Glu Leu Met His Ile Val Ala Thr
 565 570 575
 Ala Ala Ala Ile Asp Asp Arg Pro Ser Cys Phe Arg Phe Pro Arg Gly
 580 585 590
 Asn Gly Val Gly Leu Ser Asn Leu Pro Leu Asn Asn Lys Gly Val Pro
 595 600 605
 Leu Glu
 610

<210> 254
 <211> 147
 <212> PRT
 <213> Eucalyptus grandis

<400> 254
 Met Ala Asp Leu Lys Ser Lys Phe Met Glu Ala Tyr Ala Val Leu Lys
 1 5 10 15
 Lys Glu Leu Leu Ala Asp Pro Ala Phe Glu Phe Ser Asp Glu Ser Arg
 20 25 30
 Gln Trp Val Asp Arg Met Leu Asp Tyr Asn Val Pro Gly Gly Lys Leu
 35 40 45
 Asn Arg Gly Leu Ser Val Ile Asp Ser Tyr Lys Leu Leu Lys Glu Gly
 50 55 60
 Lys Glu Leu Thr Glu Glu Glu Ile Phe Leu Ala Ser Ala Leu Gly Trp
 65 70 75 80
 Cys Ile Glu Trp Leu Gln Ala Tyr Phe Leu Val Leu Asp Asp Ile Met
 85 90 95
 Asp Ser Ser His Thr Arg Arg Gly Gln Pro Cys Trp Phe Arg Leu Pro
 100 105 110
 Lys Val Gly Met Ile Ala Ala Asn Asp Gly Val Leu Leu Arg Asn His
 115 120 125
 Ile Pro Arg Ile Leu Lys Asn His Phe Arg Gly Lys Pro Tyr Tyr Val
 130 135 140
 Asp Leu Leu
 145

<210> 255
 <211> 123
 <212> PRT
 <213> Eucalyptus grandis

<400> 255
 Phe Pro Leu Ser Ser Ser Ser Leu Cys Ser Glu Phe Pro Phe Cys Val
 1 5 10 15
 Ala Gly Arg Ala Arg Gln Ala Gly Ala Gly Gly Trp Ala Gly Glu Ser
 20 25 30
 Ser Val Val Ala Ser Met Ala Asp Leu Asn Ser Lys Leu Leu Glu Ala
 35 40 45
 Asn Ala Val Leu Lys Lys Glu Leu Pro Glu Asp Pro Ala Phe Glu Phe
 50 55 60
 Ser Asp Asp Ser Arg Gln Trp Val Glu Arg Glu Asn Tyr Gly Lys Pro
 65 70 75 80
 Asp Ser Ala Asn Val Ala Lys Val Lys Val Leu Tyr His Glu Ile Asn
 85 90 95
 Leu Gln Gly Tyr Cys Lys Ser Ile Ser Lys Asn Lys Asn Ile Pro Thr
 100 105 110
 Val Lys Ala Asn Ala Asn Ser Val Glu Ala Thr
 115 120

<210> 256
 <211> 127

<212> PRT

<213> Pinus radiata

<400> 256

```

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

```

<210> 257

<211> 196

<212> PRT

<213> Eucalyptus grandis

<400> 257

```

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

```

<210> 258

<211> 159

<212> PRT

<213> Eucalyptus grandis

<400> 258

```

Met Gly Ser Leu Gly Ala Ile Leu Lys His Pro Asp Asp Phe Tyr Pro

```

```

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

```

<210> 259
 <211> 106
 <212> PRT
 <213> Pinus radiata

```

<400> 259
Met Ala Ile Tyr Thr Pro Gln Pro Ala His Arg Leu Ile Ser Trp Ser
1           5           10           15
Thr Met Glu Asn His Thr Val Ala Ile Ala Val Ala Ile Gly Phe Val
20           25           30
Ser Val Leu Leu Ser Tyr Tyr Ile Val Leu Asn Arg Trp Lys Arg Arg
35           40           45
Ser Asn Gly Leu Arg Gly Ile Gln Ser Lys Ser Phe Glu Lys Ser Thr
50           55           60
Asp Asp Asn Gly Ile Ala Ile Glu Ala Ala Gly Gly Thr Asp Val Ile
65           70           75           80
Ile Val Gly Ala Gly Val Ala Gly Ser Ala Leu Ala Tyr Thr Leu Gly
85           90           95
Lys Asp Gly Arg Arg Ile His Val Ile Glu
100          105

```

<210> 260
 <211> 93
 <212> PRT
 <213> Pinus radiata

```

<400> 260
Met Ala Ile Tyr Thr Pro Gln Pro Ala His Arg Leu Ile Ser Trp Ser
1           5           10           15
Thr Met Glu Asn His Thr Val Val Ile Ala Ala Ala Ile Ser Phe Val
20           25           30
Ser Val Leu Leu Ser Tyr Tyr Ile Val Leu Ser Arg Trp Lys Arg Arg
35           40           45
Ser Asn Gly Leu Arg Gly Ile Gln Ser Lys Ser Phe Glu Lys Ser Thr
50           55           60
Asp Asp Asn Gly Ile Ala Ile Glu Ala Ala Gly Gly Thr Asp Val Ile
65           70           75           80
Ile Val Gly Ala Gly Val Ala Gly Ser Ala Leu Ala Tyr
85           90

```

<210> 261

<211> 217
 <212> PRT
 <213> Eucalyptus grandis

<400> 261
 Pro Gln Leu Tyr Lys Ala Phe Ile Ala Ala Ile Asp Lys Gly Asn Ile
 1 5 10 15
 Lys Ser Met Pro Asn Arg Ser Met Pro Ala Asn Pro Gln Pro Thr Pro
 20 25 30
 Gly Ala Leu Leu Met Gly Asp Ala Phe Asn Met Arg His Pro Leu Thr
 35 40 45
 Gly Gly Gly Met Thr Val Ala Leu Ser Asp Ile Val Leu Leu Arg Asn
 50 55 60
 Leu Leu Arg Pro Leu Gln Asp Leu Asn Asp Ala Ser Ala Leu Cys Lys
 65 70 75 80
 Tyr Leu Glu Ser Phe Tyr Thr Leu Arg Lys Pro Val Ala Ser Thr Ile
 85 90 95
 Asn Thr Leu Ala Gly Ala Leu Tyr Lys Val Phe Cys Ala Ser Pro Asp
 100 105 110
 Pro Ala Arg Lys Glu Met Arg Gln Ala Cys Phe Asp Tyr Leu Ser Leu
 115 120 125
 Gly Gly Leu Cys Ser Thr Gly Pro Val Ser Leu Leu Ser Gly Leu Asn
 130 135 140
 Pro Arg Pro Met His Leu Val Cys His Phe Phe Ala Val Ala Val Tyr
 145 150 155 160
 Gly Val Gly Arg Leu Cys Leu Pro Phe Pro Ser Pro Lys Arg Met Trp
 165 170 175
 Leu Gly Ala Arg Leu Val Lys Gly Ala Ser Gly Ile Ile Phe Pro Ile
 180 185 190
 Ile Arg Asp Glu Gly Val Arg Gln Met Phe Phe Pro Ala Thr Val Pro
 195 200 205
 Ala Tyr His Arg Ala Pro Pro Val His
 210 215

<210> 262
 <211> 94
 <212> PRT
 <213> Eucalyptus grandis

<400> 262
 Met Glu Asp Asp Arg Asp Arg Gly Leu Leu Tyr Asp Ser Asp Pro Ser
 1 5 10 15
 Ser Ser Ser Leu Ser Pro Pro Arg Pro Phe Ala Leu Thr Phe Phe Asp
 20 25 30
 Arg Glu Arg His Val Thr Phe Leu Glu Met Met Tyr His Met Leu Pro
 35 40 45
 Arg Pro Tyr Gln Ser Gln Glu Ile Asn His Leu Thr Leu Ala Tyr Phe
 50 55 60
 Val Ile Ser Gly Leu Asp Ile Leu Asp Ala Leu Asp Arg Val His Lys
 65 70 75 80
 Asp Ala Val Ala Asp Trp Val Leu Ser Phe Gln Ala His Phe
 85 90

<210> 263
 <211> 81
 <212> PRT
 <213> Eucalyptus grandis

<400> 263
 Glu Ile Leu Thr Lys Val Ile Ser Leu Ala Ser Ile Met Asp Asp Ile
 1 5 10 15

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

<210> 264
 <211> 125
 <212> PRT
 <213> Pinus radiata

<400> 264
 Leu Tyr Arg Ala Ser Leu Ile Ala Phe Pro Gly Glu Lys Val Met Asp
 1 5 10 15
 Glu Ala Glu Thr Phe Ser Ala Lys Tyr Leu Lys Glu Ala Leu Gln Lys
 20 25 30
 Ile Pro Val Ser Ser Leu Ser Arg Glu Ile Gly Asp Val Leu Glu Tyr
 35 40 45
 Gly Trp His Thr Tyr Leu Pro Arg Leu Glu Ala Arg Asn Tyr Ile Asp
 50 55 60
 Val Phe Gly Gln Asp Thr Glu Asn Ser Lys Ser Tyr Met Lys Thr Glu
 65 70 75 80
 Lys Leu Leu Glu Leu Ala Lys Leu Glu Phe Asn Ile Phe His Ala Leu
 85 90 95
 Gln Lys Arg Glu Leu Glu Tyr Leu Val Arg Trp Trp Lys Gly Ser Gly
 100 105 110
 Ser Pro Gln Met Thr Phe Cys Arg His Arg His Val Glu
 115 120 125

<210> 265
 <211> 219
 <212> PRT
 <213> Pinus radiata

<400> 265
 Met Pro Gln Asp Met Lys Ile Cys Phe Lys Gly Phe Tyr Asn Thr Phe
 1 5 10 15
 Asn Glu Ile Ala Glu Glu Gly Arg Lys Arg Gln Gly Arg Asp Val Leu
 20 25 30
 Ser Tyr Ile Gln Lys Val Trp Glu Val Gln Leu Glu Ala Tyr Thr Lys
 35 40 45
 Glu Ala Glu Trp Ser Ala Val Arg Tyr Val Pro Ser Tyr Asp Glu Tyr
 50 55 60
 Ile Gly Asn Ala Ser Val Ser Ile Ala Leu Gly Thr Val Val Leu Ile
 65 70 75 80
 Ser Ala Leu Phe Thr Gly Glu Ile Leu Thr Asp Asp Ile Leu Ser Lys
 85 90 95
 Ile Gly Arg Asp Ser Arg Phe Leu Tyr Leu Met Gly Leu Thr Gly Arg
 100 105 110
 Leu Val Asn Asp Thr Lys Thr Tyr Gln Ala Glu Arg Gly Gln Gly Glu
 115 120 125
 Val Ala Ser Ala Val Gln Cys Tyr Met Lys Asp His Pro Glu Ile Ser
 130 135 140
 Glu Glu Glu Ala Leu Lys His Val Tyr Thr Ile Met Asp Asn Ala Leu
 145 150 155 160
 Asp Glu Leu Asn Arg Glu Phe Val Asn Asn Arg Asp Val Pro Asp Thr

165 170 175
 Cys Arg Arg Leu Val Phe Glu Thr Ala Arg Ile Met Gln Leu Phe Tyr
 180 185 190
 Met Asp Gly Asp Gly Leu Thr Leu Ser His Asn Met Glu Ile Lys Glu
 195 200 205
 His Val Lys Asn Cys Leu Phe Gln Pro Val Ala
 210 215

<210> 266

<211> 423

<212> PRT

<213> Eucalyptus grandis

<400> 266

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

[illegible]

```
<210> 267
<211> 112
<212> PRT
<213> Pinus radiata
```

<400> 267															
Met	Ser	Leu	Ile	Ser	Ala	Val	Pro	Leu	Ala	Ser	Ser	Cys	Val	Ser	Lys
1				5					10					15	
Ser	Leu	Ile	Ser	Ser	Val	Arg	Glu	His	Lys	Ala	Leu	Arg	Arg	Ala	Ile
			20				25						30		
Ala	Thr	Leu	Gln	Met	Ser	Arg	Pro	Gly	Lys	Ser	Val	Ala	Ala	Ser	Thr
		35					40					45			
Arg	Met	Ser	Ser	Ala	Thr	Ala	Gly	Ser	Asp	Asp	Gly	Val	Lys	Arg	Arg
	50					55					60				
Ile	Gly	Asp	Tyr	His	Ser	Asn	Leu	Trp	Glu	Asp	Asn	Phe	Ile	Gln	Ser
65				70						75				80	
Leu	Ser	Ser	Pro	Tyr	Gly	Ala	Ser	Ser	Tyr	Gly	Glu	His	Ala	Asp	Arg
				85					90					95	
Leu	Ile	Gly	Glu	Val	Lys	Gly	Ile	Phe	Asn	Ser	Phe	Ser	Ile	Ala	Asp
			100					105					110		

```
<210> 268
<211> 165
<212> PRT
<213> Pinus radiata
```

<400> 268															
Met 1	Ser	Leu	Ile	Ser 5	Ala	Val	Pro	Leu	Ala 10	Ser	Ser	Ser	Val	Ser 15	Lys
Ser	Leu	Ile	Ser	Ser	Val	Arg	Glu	His	Lys	Ala	Leu	Arg	Arg	Ala	Ile
20				25				30							
Ala	Thr	Leu	Gln	Met	Ser	Arg	Pro	Gly	Lys	Ser	Val	Ala	Ala	Ser	Thr
35				40				45							
Lys	Met	Ser	Ser	Ala	Thr	Ala	Gly	Ser	Asp	Asp	Gly	Val	Lys	Arg	Arg
50				55				60							
Ile	Gly	Asp	Tyr	His	Ser	Asn	Leu	Trp	Asp	Asn	Val	Ile	Gln	Ser	
65	70				75				80						
Leu	Ser	Ser	Pro	Tyr	Gly	Ala	Ser	Ser	Tyr	Gly	Glu	His	Ala	Asp	Arg
85				90				95							
Leu	Ile	Gly	Glu	Val	Lys	Glu	Ile	Phe	Asn	Ser	Phe	Ser	Ile	Ala	Asp
100				105				110							
Gly	Glu	Leu	Thr	Ser	Pro	Val	Asn	Asp	Leu	Leu	Gln	Gln	Leu	Trp	Met
115				120				125							
Val	Asp	Asn	Val	Glu	Arg	Leu	Gly	Ile	Asp	Arg	His	Phe	Gln	Thr	Glu
130				135				140							
Ile	Lys	Val	Ala	Leu	Asp	Tyr	Gly	Tyr	Arg	Tyr	Trp	Ser	Glu	Lys	Gly
145	150				155				160						
Ile	Glu	Cys	Gly	Glu											
165															

```
<210> 269
<211> 144
<212> PRT
```

<213> Pinus radiata

<400> 269

```

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

```

<210> 270

<211> 106

<212> PRT

<213> Pinus radiata

<400> 270

```

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

```

<210> 271

<211> 169

<212> PRT

<213> Eucalyptus grandis

<400> 271

```

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

```

Ile Ser Pro Glu Val Ile Leu Arg Lys Gln Arg Leu Leu Ala Asn Pro
 100 105 110
 Ser Met Lys Arg Ala Met Leu Phe Pro Gln Pro Ala Gln Ser Gly Asp
 115 120 125
 Ala Phe His Gln Ile Leu Asn Gly Leu Ala Arg Lys Leu Pro His His
 130 135 140
 Arg Ser Val Tyr Leu Lys Pro Gly Glu Lys Val Leu Asn Trp Thr Ala
 145 150 155 160
 Gly Pro Val Gly Asp Leu Lys Pro Trp
 165

<210> 272

<211> 146

<212> PRT

<213> Eucalyptus grandis

<400> 272

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

<210> 273

<211> 132

<212> PRT

<213> Eucalyptus grandis

<400> 273

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

130

<210> 274

<211> 116

<212> PRT

<213> Eucalyptus grandis

<400> 274

```

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

```

<210> 275

<211> 214

<212> PRT

<213> Pinus radiata

<400> 275

```

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

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<210> 276

<211> 462

<212> PRT

<213> Pinus radiata

<400> 276

Arg Asp Ser Ala Phe Thr Asp Leu Asn Thr Thr Ala Leu Gly Phe Arg
 1 5 10 15
 Ile Phe Arg Leu His Gly Tyr Thr Val Ser Ser Asp Ala Phe Glu His
 20 25 30
 Phe Lys Asp Gln Met Gly Gln Phe Ser Ala Ser Ala Asn Asp Thr Glu
 35 40 45
 Leu Gln Ile Arg Ser Val Phe Asn Leu Phe Arg Ala Ser Leu Ile Ala
 50 55 60
 Phe Pro Glu Glu Lys Val Leu Glu Glu Ala Glu Asn Phe Ala Ala Ala
 65 70 75 80
 Tyr Leu Lys Ala Ala Leu Gln Thr Leu Pro Val Ser Gly Leu Ser Arg
 85 90 95
 Glu Ile Gln Tyr Val Phe Asp Tyr Arg Trp His Ser Asn Leu Pro Arg
 100 105 110
 Leu Glu Ala Arg Ser Tyr Val Asp Ile Leu Ala Asp Asn Thr Ile Ser
 115 120 125
 Gly Thr Pro Asp Ala Asn Thr Lys Lys Leu Leu Glu Leu Ala Lys Leu
 130 135 140
 Glu Phe Asn Ile Phe His Ser Leu Gln Gln Lys Glu Leu Gln Cys Leu
 145 150 155 160
 Trp Arg Trp Trp Lys Glu Trp Gly Cys Pro Glu Leu Thr Phe Val Arg
 165 170 175
 His Arg Tyr Val Glu Phe Tyr Thr Leu Val Ser Gly Thr Asp Met Val
 180 185 190
 Pro Glu His Ala Ala Phe Arg Leu Ser Phe Val Lys Thr Cys His Leu
 195 200 205
 Ile Thr Ile Leu Asp Asp Met Tyr Asp Thr Phe Gly Thr Ile Asp Glu
 210 215 220
 Leu Arg Leu Phe Thr Ala Ala Val Lys Arg Trp Asp Pro Ser Ala Thr
 225 230 235 240
 Glu Cys Leu Pro Glu Tyr Met Lys Gly Val Tyr Met Val Leu Tyr Glu
 245 250 255
 Thr Val Asn Glu Met Ala Lys Glu Ala Gln Lys Ser Gln Gly Arg Asp
 260 265 270
 Thr Leu Gly Tyr Val Arg Gln Ala Leu Glu Asp Tyr Ile Gly Ser Tyr
 275 280 285
 Leu Lys Glu Ala Glu Trp Ile Ala Thr Gly Tyr Val Pro Thr Phe Gln
 290 295 300
 Glu Tyr Phe Glu Asn Gly Lys Leu Ser Ser Gly His Arg Ile Ala Thr
 305 310 315 320
 Leu Gln Pro Ile Leu Thr Leu Ser Ile Pro Phe Pro His His Ile Leu
 325 330 335
 Gln Glu Ile Asp Phe Pro Ser Lys Phe Asn Asp Tyr Ala Cys Ser Ile
 340 345 350
 Leu Arg Leu Arg Gly Asp Thr Arg Cys Tyr Lys Ala Asp Ser Ala Arg
 355 360 365
 Gly Glu Glu Ala Ser Cys Ile Ser Cys Tyr Met Lys Glu Asn Pro Gly
 370 375 380
 Ser Thr Gln Glu Asp Ala Leu His His Ile Asn Gly Met Ile Glu Asp
 385 390 395 400
 Met Ile Lys Lys Leu Asn Trp Glu Phe Leu Lys Pro Asp Asn Asn Ala
 405 410 415
 Pro Ile Ser Ser Lys Lys Asn Ala Phe Asn Ile Ser Arg Gly Leu His
 420 425 430
 His Phe Tyr Asn Tyr Arg Asp Gly Tyr Ser Val Ala Ser Asn Glu Thr
 435 440 445

Lys Asp Leu Val Ile Lys Thr Val Leu Glu Pro Val Leu Met
 450 455 460

<210> 277
 <211> 98
 <212> PRT
 <213> Pinus radiata

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

<210> 278
 <211> 63
 <212> PRT
 <213> Pinus radiata

<400> 278
 Thr Glu Cys Leu Pro Glu Tyr Met Lys Gly Val Tyr Met Val Leu Tyr
 1 5 10 15
 Glu Thr Val Asn Glu Met Ala Lys Glu Ala Gln Lys Ser Gln Gly Arg
 20 25 30
 Asp Thr Leu Gly Tyr Val Arg Gln Ala Val Ile Thr Ile Asp Met Leu
 35 40 45
 Cys Ile Tyr Leu Asn Lys Gln Ile Leu Val Gly His Leu Phe Tyr
 50 55 60

<210> 279
 <211> 124
 <212> PRT
 <213> Pinus radiata

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

<210> 280
 <211> 380
 <212> PRT
 <213> Eucalyptus grandis

<400> 280
 Met Asp Thr Asp Asn Lys Leu Phe Asn Val Gly Val Leu Leu Val Ala
 1 5 10 15
 Thr Leu Val Val Ala Lys Leu Ile Ser Ala Leu Leu Ile Pro Arg Ser
 20 25 30
 Gly Lys Arg Leu Pro Pro Val Val Arg Thr Trp Pro Val Val Gly Gly
 35 40 45
 Leu Leu Arg Phe Leu Lys Gly Pro Met Val Met Leu Arg Glu Glu Tyr
 50 55 60
 Pro Lys Leu Gly Ser Val Phe Thr Leu Asn Leu Leu Asn Lys Lys Ile
 65 70 75 80
 Thr Phe Phe Ile Gly Pro Glu Val Ser Ala His Phe Phe Lys Ala Ser
 85 90 95
 Glu Ser Asp Leu Ser Gln Gln Glu Val Tyr Gln Phe Asn Val Pro Thr
 100 105 110
 Phe Gly Pro Gly Val Val Phe Asp Val Asp Tyr Thr Ile Arg Gln Glu
 115 120 125
 Gln Phe Arg Phe Phe Thr Glu Ala Leu Arg Ile Asn Lys Leu Lys Gly
 130 135 140
 Tyr Val Asn Gln Met Val Met Glu Ala Glu Asp Tyr Phe Ser Lys Trp
 145 150 155 160
 Gly Asp Ser Gly Glu Val Asp Leu Lys Tyr Glu Leu Glu His Leu Thr
 165 170 175
 Ile Leu Thr Ala Ser Arg Cys Leu Leu Gly Arg Glu Val Arg Glu Lys
 180 185 190
 Leu Phe Asp Asp Val Ser Ala Leu Phe His Asp Leu Asp Asn Gly Met
 195 200 205
 Leu Pro Ile Ser Val Ile Phe Pro Tyr Leu Pro Ile Pro Ala His His
 210 215 220
 Arg Arg Asp Lys Ala Arg Lys Lys Leu Ser Glu Ile Phe Ala Asn Ile
 225 230 235 240
 Ile Ser Ser Arg Lys Cys Ala Gly Lys Ser Glu Glu Asp Met Leu Gln
 245 250 255
 Cys Phe Ile Asp Ser Lys Tyr Lys Asn Gly Arg Pro Thr Thr Glu Ala
 260 265 270
 Glu Val Thr Gly Leu Leu Ile Ala Ala Leu Phe Ala Gly Gln His Thr
 275 280 285
 Ser Ser Ile Thr Ser Val Trp Thr Gly Ala Tyr Leu Leu Thr Asn Lys
 290 295 300
 Lys Tyr Leu Ser Ala Val Ser Asn Glu Gln Lys His Leu Met Glu Lys
 305 310 315 320
 His Gly Asn Asn Val Asp His Asp Val Leu Ser Glu Met Asp Val Leu
 325 330 335
 Tyr Arg Ser Ile Lys Glu Ala Leu Arg Leu His Pro Pro Leu Ile Met
 340 345 350
 Leu Leu Arg Ser Ser His Ser Asp Phe Ser Val Lys Thr Arg Asp Gly
 355 360 365
 Lys Glu Tyr Glu Val Gly Glu Val Ser Val Leu Pro
 370 375 380

<210> 281
 <211> 177
 <212> PRT
 <213> Eucalyptus grandis

<400> 281
 Met Trp Lys Leu Lys Ile Gly Glu Gly Ala Asn Asp Pro Tyr Leu Phe
 1 5 10 15
 Ser Leu Asn Asn Phe Val Gly Arg Gln Ile Trp Glu Phe Asp Pro Glu
 20 25 30
 Ala Gly Thr Pro Glu Glu Arg Ala Glu Val Glu Ala Ala Arg Gln Asn
 35 40 45
 Phe Tyr Asn Asn Arg Phe Lys Val Arg Pro Ser Ser Asp Leu Phe Trp
 50 55 60
 Arg Phe Gln Phe Leu Arg Glu Lys Asn Phe Lys Gln Thr Ile Pro Pro
 65 70 75 80
 Val Lys Ile Glu Asp Gly Glu Asp Ile Thr Tyr Glu Lys Ala Thr Ala
 85 90 95
 Ala Val Lys Arg Cys Val Ser Phe Trp Ser Thr Leu Gln Ser Ser His
 100 105 110
 Gly His Trp Pro Ala Glu Asn Ala Gly Pro Ile Ala Phe Tyr Phe Pro
 115 120 125
 Pro Leu Val Met Ser Leu Tyr Val Thr Gly His Leu Asn Asn Val Phe
 130 135 140
 His Ala Glu His Arg Arg Glu Ile Leu Arg Tyr Ile Tyr Tyr His Gln
 145 150 155 160
 Asn Glu Asp Gly Gly Trp Gly Leu His Ile Glu Gly His Ser Thr Met
 165 170 175
 Ile

<210> 282
 <211> 91
 <212> PRT
 <213> Pinus radiata

<400> 282
 His Ala Arg Gly Leu Gly Pro Pro Pro Ile Pro Val Asp Gln Phe Ser
 1 5 10 15
 Leu Ala Lys Leu Val Asp Ala Ile Gln Ile Met Leu Asn Pro Gln Val
 20 25 30
 Lys Asn Asn Ala Asp Ala Ile Ala Lys Ala Met Glu Asn Glu Asp Gly
 35 40 45
 Val Ser Gly Ala Val Lys Ala Phe His Lys His Leu Pro Lys Lys Met
 50 55 60
 Pro Gln Pro Leu Pro Pro Thr Asp His Ser Leu Ile Asp Ser Phe
 65 70 75 80
 Phe Thr Gly Val Gly Lys Val Phe Gly Cys Gly
 85 90

<210> 283
 <211> 172
 <212> PRT
 <213> Pinus radiata

<400> 283
 Trp Ile Glu Gly Arg Gly Lys Ser Val Val Cys Glu Ala Ile Ile Thr
 1 5 10 15
 Glu Ala Val Val Ser Lys Val Leu Lys Thr Thr Val Pro Ala Leu Leu
 20 25 30
 Glu Leu Asn Met Leu Lys Asn Leu Thr Gly Ser Ala Leu Ala Gly Ala
 35 40 45
 Met Gly Gly Phe Asn Ala His Ala Ser Asn Ile Val Ser Ala Val Phe
 50 55 60
 Ile Ala Thr Gly Gln Asp Pro Ala Gln Asn Ile Glu Ser Ser His Cys
 65 70 75 80

Ile Thr Met Met Glu Ala Ser Asn Asp Gly Lys Asp Leu His Val Ser
 85 90 95
 Val Thr Met Pro Cys Ile Glu Val Gly Thr Val Gly Gly Gly Thr Gln
 100 105 110
 Leu Ala Ser Gln Ala Ala Cys Leu Asn Met Leu Gly Val Lys Gly Ala
 115 120 125
 Asn Lys Glu Ser Pro Gly Ala Asn Ala Gln Thr Leu Ala Arg Ile Val
 130 135 140
 Ala Gly Ala Val Leu Ala Gly Glu Leu Ser Leu Met Ser Ala Leu Ala
 145 150 155 160
 Ala Gly Gln Leu Val Asn Ser His Met Lys Phe Asn
 165 170

<210> 284
 <211> 46
 <212> PRT
 <213> Pinus radiata

<400> 284
 Met Ala Thr Gly Gly Gly Ala Leu Asp Leu Ala Ser Gly Met Gly Gly
 1 5 10 15
 Asn Ile Glu Lys Glu Gln Met Leu Thr Ala Val Glu Glu Tyr Glu Lys
 20 25 30
 Tyr His Met Tyr Tyr Gly Gly Asp Glu Gly Ser Arg Lys Ser
 35 40 45

<210> 285
 <211> 137
 <212> PRT
 <213> Eucalyptus grandis

<400> 285
 Met Ser Lys Ala Gly Ala Met Asp Leu Ala Thr Gly Leu Gly Gly Lys
 1 5 10 15
 Met Asp Lys Ser Asp Val Leu Ser Ala Val Asp Lys Tyr Glu Lys Tyr
 20 25 30
 His Val Cys Tyr Gly Gly Asp Glu Glu Arg Arg Ala Asn Tyr Ser
 35 40 45
 Asp Met Val Asn Lys Tyr Tyr Asp Leu Ala Thr Ser Phe Tyr Glu Phe
 50 55 60
 Gly Trp Gly Glu Ser Phe His Phe Ala His Arg Trp Lys Gly Glu Ser
 65 70 75 80
 Leu Arg Glu Ser Ile Lys Arg His Glu His Phe Leu Ala Leu Gln Leu
 85 90 95
 Gly Leu Lys Pro Gly His Lys Val Leu Asp Val Gly Cys Gly Ile Gly
 100 105 110
 Gly Pro Leu Arg Glu Ile Ala Arg Phe Ser Ser Ala Ser Val Thr Gly
 115 120 125
 Leu Asn Asn Asn Glu Tyr Gln Ile Thr
 130 135

<210> 286
 <211> 117
 <212> PRT
 <213> Pinus radiata

<400> 286
 Phe Arg Ile Trp Phe Asp Val Pro Val Val Leu Pro Pro Leu Thr Gln
 1 5 10 15
 Cys Phe Ala Asp Arg Ile Ser Leu Val Tyr Asp Pro His Thr Asp Glu
 20 25 30

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

<210> 287
 <211> 27
 <212> PRT
 <213> Eucalyptus grandis

<400> 287
 Gly Tyr Trp Asn Thr Met Asp Ile Ala His Asp Arg Ala Gly Phe Tyr
 1 5 10 15
 Ile Cys Trp Gly Cys Leu Val Trp Val Pro Ser
 20 25

<210> 288
 <211> 158
 <212> PRT
 <213> Pinus radiata

<400> 288
 Phe Ala Val Val Gly Pro Leu Gln Leu Thr Ser Tyr Pro Leu Ile Lys
 1 5 10 15
 Leu Val Gly Ile Arg Thr Gly Leu Pro Leu Pro Ser Leu Trp Glu Ile
 20 25 30
 Phe Ala Gln Leu Ala Val Tyr Phe Met Val Glu Asp Tyr Gly Asn Tyr
 35 40 45
 Trp Ile His Arg Trp Leu His Cys Lys Trp Gly Tyr Glu Lys Ile His
 50 55 60
 His Val His His Glu Phe Thr Ala Pro Met Gly Phe Ala Ala Pro Tyr
 65 70 75 80
 Ala His Trp Ser Glu Val Leu Ile Leu Gly Ile Pro Thr Phe Val Gly
 85 90 95
 Pro Ala Ile Ala Pro Gly His Met Ile Thr Phe Trp Cys Trp Val Val
 100 105 110
 Leu Arg Gln Val Glu Ala Ile Glu Thr His Ser Gly Tyr Asp Phe Pro
 115 120 125
 Trp Thr Leu Thr Lys Leu Ile Pro Phe Tyr Gly Gly Ala Glu Tyr His
 130 135 140
 Asp Tyr His His Tyr Val Gly Gly Gln Ser Gln Ser Asn Phe
 145 150 155

<210> 289
 <211> 113
 <212> PRT
 <213> Eucalyptus grandis

<400> 289
 Pro Ser Leu Trp Glu Ile Leu Ala Gln Leu Leu Val Tyr Phe Leu Ile
 1 5 10 15
 Glu Asp Tyr Thr Asn Tyr Trp Leu His Arg Leu Leu His Cys Lys Trp
 20 25 30

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

<210> 290
 <211> 128
 <212> PRT
 <213> Eucalyptus grandis

<400> 290
 Gly Tyr Gly Ser Met Val Gln Asn Cys Val Lys Ala Arg Ser Leu Leu
 1 5 10 15
 Ser Lys Leu Gly Ile Glu Val Thr Val Ala Asp Ala Arg Phe Cys Lys
 20 25 30
 Pro Leu Asp Ile Gly Leu Leu Arg Glu Leu Cys Glu Asn His Ala Phe
 35 40 45
 Leu Val Thr Val Glu Glu Gly Ser Ile Gly Gly Phe Gly Ser His Val
 50 55 60
 Ala Gln Phe Ile Ala Leu Asp Gly Arg Leu Asp Gly Arg Ile Lys Trp
 65 70 75 80
 Arg Pro Ile Val Leu Pro Asp Ala Tyr Val Glu His Thr Ser Pro Asn
 85 90 95
 Glu Gln Leu Ser Leu Ala Gly Leu Thr Gly His His Ile Ala Ala Thr
 100 105 110
 Val Leu Ser Leu Leu Gly Arg Thr Arg Glu Ala Leu Leu Leu Met Cys
 115 120 125

<210> 291
 <211> 109
 <212> PRT
 <213> Pinus radiata

<400> 291
 Met Ala Val Val Val Ser Ala Pro Gly Lys Val Leu Ile Thr Gly Ala
 1 5 10 15
 Tyr Leu Ile Leu Glu Lys Pro Asn Pro Gly Leu Val Leu Thr Thr Thr
 20 25 30
 Ala Arg Phe Tyr Ala Ile Val Lys Pro Leu Arg Thr Ser Thr Asp Ser
 35 40 45
 Ser Ser Trp Ala Trp Leu Trp Thr Asp Val Lys Leu Thr Ser Pro Gln
 50 55 60
 Leu Ala Lys Glu Ala Ile Tyr Lys Leu Ser Leu Lys Thr Leu Ser Leu
 65 70 75 80
 Gln Asn Val Ala Ser Ser Ser Ser Asn Gly Asn Pro Phe Val Glu Gln
 85 90 95
 Ala Val Gln Phe Ala Val Ala Ala Ala Lys Glu Ala Phe
 100 105

<210> 292
 <211> 107
 <212> PRT
 <213> Eucalyptus grandis

<400> 292
 Met Ala Gly Glu Trp Ile Leu Thr Leu Thr Ala Gln Thr Pro Thr Asn
 1 5 10 15
 Ile Ala Val Ile Lys Tyr Trp Gly Lys Arg Asp Glu Ser Leu Ile Leu
 20 25 30
 Pro Val Asn Asp Ser Ile Ser Val Thr Leu Asp Pro Gly His Leu Cys
 35 40 45
 Thr Thr Thr Thr Val Ala Val Ser Pro Ala Phe Glu Gln Asp Arg Met
 50 55 60
 Trp Leu Asn Gly Lys Glu Ile Ser Leu Ser Gly Asp Arg Phe Gln Ser
 65 70 75 80
 Cys Leu Arg Glu Ile Arg Ala Arg Ala Thr Asp Val Glu Asn Lys Glu
 85 90 95
 Lys Gly Ile Lys Ile Ser Lys Lys Asp Trp Glu
 100 105

<210> 293
 <211> 148
 <212> PRT
 <213> Pinus radiata

<400> 293
 Pro Leu Thr Leu Leu Leu Ala Asn Thr Trp Ala Ser Ser Ala Ile Val
 1 5 10 15
 Ser Arg Arg Val Ser Leu Phe Val Ala Cys Ser Thr Thr Val Val Ser
 20 25 30
 Arg Ser Phe Ser Lys Ser Cys Ser Gly Ala Ile Pro Arg Lys Pro Lys
 35 40 45
 Ser Ala His Pro Ala Leu Thr Gly Ser Arg Thr Cys Phe Ser Arg Asn
 50 55 60
 Pro Ile Val Arg Asn Leu Ile Gly Ser Ala Ser Lys Met Gly Ala Thr
 65 70 75 80
 Val Glu Asp Thr Thr Met Asp Ala Val Gln Arg Arg Leu Met Phe Glu
 85 90 95
 Asp Glu Cys Ile Leu Val Asp Glu Glu Asp His Val Ile Gly His Asp
 100 105 110
 Ser Lys Tyr Asn Cys His Leu Met Glu Lys Ile Glu Ser Glu Asn Leu
 115 120 125
 Leu His Arg Ala Phe Ser Val Phe Leu Phe Asn Thr Lys Tyr Glu Leu
 130 135 140
 Leu Leu Gln Gln
 145

<210> 294
 <211> 137
 <212> PRT
 <213> Eucalyptus grandis

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

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

<210> 295
 <211> 136
 <212> PRT
 <213> Pinus radiata

<400> 295

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

<210> 296
 <211> 83
 <212> PRT
 <213> Pinus radiata

<400> 296

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

<210> 297
 <211> 156
 <212> PRT
 <213> Pinus radiata

<400> 297

Asp	Thr	Ser	Lys	Arg	Arg	Met	Glu	Glu	Ile	Asn	Gly	Asp	Asn	Ala	Val		
1			5						10					15			
Arg	Arg	Ser	Cys	Phe	Pro	Pro	Gly	Phe	Met	Phe	Gly	Ile	Ala	Thr	Ser		

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

<210> 298

<211> 115

<212> PRT

<213> Pinus radiata

<400> 298

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

<210> 299

<211> 127

<212> PRT

<213> Pinus radiata

<400> 299

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

Ile Phe Pro Asp Gly Phe Gly Ala Glu Val Asn Lys Glu Gly Ile
 115 120 125

<210> 300
 <211> 120
 <212> PRT
 <213> Pinus radiata

<400> 300
 Met Glu Asn His Ser Leu Val Asn Asp His Arg Gly Leu Arg Arg Ser
 1 5 10 15
 Asn Phe Pro Pro Gly Phe Met Phe Gly Val Ala Thr Ser Ala Tyr Gln
 20 25 30
 Cys Glu Gly Ala Ala Lys Glu Gly Arg Gly Pro Ser Ile Trp Asp
 35 40 45
 Ser Phe Xaa Xaa Gln Thr Pro Gly Lys Ile Val Asp Gly Ser Asn Gly
 50 55 60
 Asp Val Ala Val Asp Gln Tyr His Arg Tyr Lys Glu Asp Val Lys Leu
 65 70 75 80
 Ile Lys Asp Met Gly Val Asp Val Tyr Arg Phe Ser Ile Ser Trp Ser
 85 90 95
 Arg Met Phe Pro Lys Gly Lys Gly Glu Ile Asn Glu Glu Gly Val Ala
 100 105 110
 Tyr Tyr Asn Asn Leu Ile Asn Glu
 115 120

<210> 301
 <211> 69
 <212> PRT
 <213> Pinus radiata

<400> 301
 Met Gly Glu Glu Leu Gln Thr Trp Ile Leu Met Val Thr Ala Arg Ala
 1 5 10 15
 Pro Thr Asn Ile Ala Val Ile Lys Tyr Trp Gly Lys Arg Asp Glu Lys
 20 25 30
 Leu Ile Leu Pro Ile Asn Asp Ser Ile Ser Phe Thr Leu Asp Pro Asp
 35 40 45
 His Leu Ser Ala Thr Thr Thr Val Ala Val Ser Pro Ser Phe Thr Ser
 50 55 60
 Asp Arg Met Trp Leu
 65

<210> 302
 <211> 112
 <212> PRT
 <213> Eucalyptus grandis

<400> 302
 Leu Phe Tyr Tyr Gly Lys Glu Thr Ser Thr Ser Pro Arg Arg Arg Tyr
 1 5 10 15
 Asn Leu Ser Pro Phe Ala Ile Ser Leu Asn Glu Leu Thr Pro Gly Leu
 20 25 30
 Gln Glu Lys Leu Pro Pro Thr Asp Ser Arg Leu Arg Pro Asp Gln Arg
 35 40 45
 His Leu Glu Asn Gly Glu Tyr Glu Leu Ala Asn Ala Glu Lys Leu Arg
 50 55 60
 Leu Glu His Ile Gln Arg Gln Ala Arg Lys Leu Gln Glu Gly Gly Trp
 65 70 75 80
 Gln Pro Arg Trp Phe Gly Lys Asp Asp Asp Gly Cys Tyr Arg Tyr Met
 85 90 95

Gly Gly Tyr Trp Glu Ala Arg Glu Ala Tyr Glu Leu Gly Trp Asn Pro
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 <213> Pinus radiata

<400> 303
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 His Pro Pro Met Gly Ser Ala Tyr Ala Glu Asn Glu His Phe Thr Tyr
 35 40 45
 Ser Leu Ser Ser Lys Val Lys Thr Lys Phe Leu Gly Asn Ser Val Asp
 50 55 60
 Ile Tyr Pro Leu Gly Arg Thr Arg Val Val Leu Lys Lys Ser Gly Asp
 65 70 75 80
 Val Leu Asp Leu Val Pro Pro Pro Ser Lys Val His Asn Leu Ile Phe
 85 90 95
 Gly Arg Thr Trp Ile
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<210> 304
 <211> 152
 <212> PRT
 <213> Eucalyptus grandis

<400> 304
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 Pro Ser Arg Thr Arg Lys Gln Ala Ala Met Ala Ser Asp Ser Ser Ala
 20 25 30
 Thr Gln Leu Lys Ser Asp Ala Leu Met Glu Gln Met Lys Gln His Leu
 35 40 45
 Ser Thr Asp Ala Gly Lys Ala Val Thr Lys Lys Ile Gly Leu Val Tyr
 50 55 60
 Gln Ile Asn Ile Ala Pro Lys Lys Ile Gly Phe Asp Glu Val Val Tyr
 65 70 75 80
 Ile Val Asp Leu Lys Lys Gly Glu Val Thr Lys Gly Pro Tyr Glu Gly
 85 90 95
 Gly Lys Pro Asp Ala Thr Phe Ser Phe Lys Asp Asp Asp Phe Ile Lys
 100 105 110
 Val Ala Thr Gly Lys Met Asn Pro Gln Ile Ala Phe Met Arg Gly Ala
 115 120 125
 Met Lys Ile Lys Gly Ser Leu Ser Ala Ala Gln Lys Phe Thr Pro Asp
 130 135 140
 Ile Phe Pro Lys Pro Ser Lys Met
 145 150