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(71) Applicant: **BASF SE** [DE/DE]; 67056 Ludwigshafen (DE).

(72) Inventors: **BARRETO, Rodrigo, Brandao, Mena**; Professor José Leite Oiticica, 04705-080 Sao Paulo Moema (BR). **MEIRELLES, Ana-Paula**; 356 Cândido Bueno St., 13820-000 Jaguariuna/SP (BR).

(74) Agent: **MAIWALD PATENTANWALTS GMBH**; Dr. Dirk Bühler, Postfach 33 05 23, 80065 München (DE).

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(54) Title: USE OF A MIXTURE COMPRISING AT LEAST ONE STROBILURINE AND AT LEAST ONE DITHIOCARBAMATE FOR INCREASING THE HEALTH OF SILVICULTURAL PLANTS

(57) Abstract: The present invention relates to the use of a mixture, comprising as active compounds in synergistically effective amounts at least a fungicide (compound I) of the group of strobilurines; and a further fungicide (compound II) of the group of dithiocarbamates for synergistically increasing the health of a silvicultural plant, in particular Eucalyptus. The invention further relates to a method for synergistically increasing the health of a silvicultural plant, comprising applying to silvicultural plant propagation material; and/or applying to the locus where the silvicultural plant or plant seedling is growing or expected to grow; and/or applying to the substrate in which the silvicultural plant or plant seedling is growing or expected to grow; and/or applying to the silvicultural plant, or part of the silvicultural plant, preferably the leaves (foliar application), at any time during the vegetative and/or reproductive growth stage at least once a mixture comprising at least a fungicide (compound I) of the group of strobilurines and a further fungicide (compound II) of the group of dithiocarbamates, in particular pyraclostrobin and metiram.

Use of a mixture comprising at least one strobilurine and at least one dithiocarbamate for increasing the health of silvicultural plants

FIELD OF THE INVENTION

The present invention relates to the use of a mixture, comprising as active compounds in synergistically effective amounts at least a fungicide (compound I) of the group of strobilurines; and a further fungicide (compound II) of the group of dithiocarbamates for synergistically increasing the health of a silvicultural plant, in particular Eucalyptus. The invention further relates to a method for synergistically increasing the health of a silvicultural plant, comprising applying to silvicultural plant propagation material; and/or applying to the locus where the silvicultural plant or plant seedling is growing or expected to grow; and/or applying to the substrate in which the silvicultural plant or plant seedling is growing or expected to grow; and/or applying to the silvicultural plant, or part of the silvicultural plant, preferably the leaves (foliar application), at any time during the vegetative and/or reproductive growth stage at least once a mixture comprising at least a fungicide (compound I) of the group of strobilurines and a further fungicide (compound II) of the group of dithiocarbamates, in particular pyraclostrobin and metiram.

BACKGROUND

According to the FAO (2009), the world population will continue to grow from currently 7.1 billion to 9.1 billion in 2050. Highest growth rates are expected in the developing countries. Obviously, the more people there are on earth, the more resources are needed to meet their basic needs. Besides food and water, there is a growing demand for energy and construction material. This demand can be satisfied by cultivating fast growing and robust tree species, which are adapted to different soil and climate conditions, which are relatively pathogen resistant and easy to manage. Examples of such trees include pine, birch, eucalyptus, fir, poplar, spruce, rubber tree, wattle, oil-palm and willow.

In particular, eucalyptus has become a popular silvicultural plant with the status of a commodity crop with a multitude of end uses. It is produced in quantity, like maize, cassava or Christmas trees. It is commonly cultivated as a monocultural crop in short rotations of three years for biomass crops to twice that or more for pulp and timber use. Eucalyptus is particularly useful in domestic and industrial energy generation as fuel or charcoal; it has a multitude of round timber uses as scaffolding, posts, piling and poles. In addition, it provides standard construction and furniture timber and railway sleepers. Moreover eucalypt serves as pulp wood raw material supply base and may be used for paper and pulp, its bark finds use in tanning and dye

industries and the flowers provide substantial honey nectar (FAO, K.J. White, 1996; http://www.fao.org/docrep/ 005/ac777e/ ac777e00.htm)

However, even though there has been a significant increase in silvicultural efficiency and production, which can be attributed, for example, to the development of improved, disease-resistant varieties of plants and the increased use of fertilizers and pesticides, the silvicultural production may not keep up with the rapid population growth and may further not be able to compensate for the problems caused by intensive deforestation programs.

Thus, the increase of silvicultural efficiency must be regarded as a global challenge.

Factors, which influence the development and yield of tree plants include the genetic background of the plants, the optimal nutrition as well as the presence (or absence) of abiotic and biotic stress factors. In particular, there is a continuous need for elements which specifically improve the health of plants. Generally, healthier plants are desirable since they result in better yield and/or better quality of plants. Healthier plants are further better protected against biotic and/or abiotic stress. Moreover, a high resistance to biotic stresses ultimately allows the skilled person to reduce the quantity of pesticides applied and thus to slow down the development of resistances against said pesticides.

Koehle et al., 1997, Gesunde Pflanze, 49, 267-271 already disclosed that strobilurines are capable of bringing about increased yields in crop plants in addition to their fungicidal action.

Further, document WO 01/82701 discloses the use of a strobilurine (pyraclostrobin) for inducing viral resistance in plants.

Document WO 03/075663 additionally discloses the use of pyraclostrobin for immunizing plants against bacterioses.

In WO 07/104660 the use of pyraclostrobin for improving the tolerance of plants to chilling temperatures and/or frost is disclosed and document WO 081059053 teaches the use of strobilurines for increasing the dry biomass and CO_2 sequestration of plants.

Document WO 2009/126462 describes methods and compositions for improving plant health, increasing the germination rate of seed, and producing doubled haploid tissue by the application of dicamba or metabolites thereof to a plant.

A synergistic effect of pyraclostrobin, fipronil and thiophanate-methyl on plant health is further derivable from WO 2011/151261.

However, there is a continuous need for the provision of additional, effective means and methods which allow to specifically increase the health of silvicultural plants.

OBJECTS AND SUMMARY OF THE INVENTION

The present invention addresses this need and presents the use of a mixture comprising a strobilurine and a dithiocarbamate for synergistically increasing the health of a silvicultural plant.

Accordingly, the present invention provides in a first aspect a use of a mixture, comprising as active compounds in synergistically effective amounts at least a fungicide (compound I) of the group of strobilurines; and a further fungicide (compound II) of the group of dithiocarbamates for synergistically increasing the health of a silvicultural plant.

The inventors surprisingly found that by combining a strobilurine and a dithiocarbamate the health of a silvicultural plant could be significantly increased. In particular, it could be shown that by combining a strobilurine such as pyraclostrobine and a dithiocarbamate such as metiram an increase of root and shoot, as well as an increased productivity through shortening of nursery stages, a lower seedling discard and a faster and more efficient development through considerable higher dry matter weight of seedlings of silvicultural species, in particular of Eucalyptus species, becomes possible. These findings show a synergistic effect of the mixture of a strobilurine such as pyraclostrobine and a dithiocarbamate such as metiram in comparison to the use of both components alone.

In a preferred embodiment of the present invention said fungicide (compound I) of the group of strobilurines is selected from the group comprising pyraclostrobin (I-1), azoxystrobin (I-2), dimoxystrobin (I-3), enestroburin (I-4), fluoxastrobin (I-5), kresoxim-methyl (I-6), metominostrobin (I-7), orysastrobin (I-8), picoxystrobin (I-9), pyribencarb (I-10), trifloxystrobin (I-11), pyrametostrobin (I-12), pyraoxystrobin (I-13), coumoxystrobin (I-14), coumethoxystrobin (I-15), triclopyricarb (chlorodincarb) (I-16), fenaminstrobin (diclofenoxystrobin) (I-17), fenoxystrobin (I-18), 2-(2-(6-(3-chloro-2-methyl-phenoxy)-5-fluoro-pyrimidin-4-yloxy)-phenyl)-2-methoxyimino-N-methyl-acetamide (I-19), 3-methoxy-2-(2-(N-(4-methoxy-phenyl)-cyclopropane-carboximidoylsulfanylmethyl)-phenyl)-acrylic acid methyl ester (I-20), methyl (2-chloro-5-[1-(3-

methylbenzyloxyimino)-ethyl]benzyl)-carbamate (I-21) and 2-(2-(3-(2,6-dichlorophenyl)-1-methyl-allylideneaminooxymethyl)-phenyl)-2-methoxyimino-N methyl-acetamide (I-22); or a silviculturally acceptable salt thereof.

In a further preferred embodiment said fungicide (compound II) of the group of dithiocarbamates is selected from the group comprising metiram (II-1), dazomet (II-2), ferbam (II-3), mancozeb (II-4), maneb (II-5), metam (II-6), nabam (II-7), poly-carbamate (II-8), propineb (II-9), thiram (II-10), zineb (II-11), Na-Dimethyl-dithiocarbmate (II-12) and ziram (II-13); or a silviculturally acceptable salt thereof.

In yet another preferred embodiment, said mixture additionally comprises an insecticide (compound III), and/or an herbicide (compound IV), and/or a biological, and/or an inoculant.

It is further preferred that said insecticide (compound III) is selected from the group of insecticides comprising: (i) organo(thio)phosphate compounds selected from chlorpyrifos, chlorpyrifos-methyl and pyraclofos; or a silviculturally acceptable salt thereof; (ii) carbamate compounds selected from aldicarb, methomyl, thiodicarb and triazamate; or a silviculturally acceptable salt thereof; (iii) pyrethroid compounds selected from bifenthrin, bioethanomethrin, beta-cyfluthrin, biopermethrin, lambda-cyhalothrin, gamma-cyhalothrin, cypermethrin, alpha-cypermethrin, beta-cypermethrin, zeta-cypermethrin, deltamethrin, esfenvalerate, fenvalerate, sulfoxime and thiofluoximate; or a silviculturally acceptable salt thereof;(iv) juvenile hormone mimics selected from fenoxycarb and pyriproxyfen; or a silviculturally acceptable salt thereof; (v) nicotinic receptor agonists/antagonists compounds selected from acetamiprid, clothianidin, dinotefuran, imidacloprid, imidaclothiz, thiamethoxam, nitenpyram, paichongding, thiacloprid and tazimcarb; or a silviculturally acceptable salt thereof; (vi) GABA gated chloride channel antagonist compounds selected from acetoprole, ethiprole, fipronil, pyrafluprole, pyriprole and vaniliprole; or a silviculturally acceptable salt thereof; (vii) METI I compounds selected from pyridaben, tebufenpyrad and tolfenpyrad; or a silviculturally acceptable salt thereof; (viii) hydramethylnon; or a silviculturally acceptable salt thereof; (ix) chlorfenapyr; or a silviculturally acceptable salt thereof;(x) diafenthiuron; or a silviculturally acceptable salt thereof; (xi) molting disruptors selected from cyromazine, furan tebufenozide, methoxyfenozide and tebufenozide; or a silviculturally acceptable salt thereof; (xii) molting hormones selected from a-ecdysone and ecdysterone; or a silviculturally acceptable salt thereof; (xiii) sodium channel blocker compounds selected from indoxacarb and metaflumizone; or a silviculturally acceptable salt thereof; (xiv) flonicamid; or a silviculturally acceptable salt thereof; (xv) flucofuron; or a silviculturally acceptable salt thereof; (xvi) chitin synthesis inhibitors selected from buprofezin, bistrifluron, chlorbenzuron, chlorfluazuron, diflubenzuron, dichlorbenzuron, flucycloxuron, flufenoxuron, hexaflumuron, lufenuron, novaluron, noviflumuron, penfluron, teflubenzuron and

triflumuron; or a silviculturally acceptable salt thereof; (xvii) lipid biosynthesis inhibitors selected from spiromesifen and spirotetramat; or a silviculturally acceptable salt thereof; (xviii) flubendiamide; or an silviculturally acceptable salt thereof; (xix) anthranilamide compounds selected from chloranthraniliprole and cyantraniliprole; or a silviculturally acceptable salt thereof; (xx) various compounds selected from dicyclanil, metoxadiazone, dimetilan, isoprothiolane, malonoben, sulfoxaflor and triarathene; or a silviculturally acceptable salt thereof.

In another preferred embodiment said herbicide (compound IV) is selected from the group of herbicides comprising: (i) phenoxy-carboxylic-acids selected from clomeprop, 2,4-d, 2,4-db, dichlorprop, mcpa, mcpb and mecoprop; or a silviculturally acceptable salt thereof; (ii) benzoic acids selected from chloramben, dicamba and 2,3,6-tba; or a silviculturally acceptable salt thereof; (iii) pyridine carboxylic acids selected from aminopyralid, clopyralid, fluroxypyr, picloram and triclopyr; or a silviculturally acceptable salt thereof; (iv) quinoline carboxylic acids selected from quinclorac and quinmerac; (v) imidazolinones selected from imazamethabenz-methyl, imazamox, imazapic, imazapyr, imazaquin and imazethapyr; or a silviculturally acceptable salt thereof; (vi) benazolin-ethyl; or a silviculturally acceptable salt thereof; (vii) amino-cylopyrachlor; or a silviculturally acceptable salt thereof; (viii) glyphosate; or a silviculturally acceptable salt thereof; (ix) glufosinate or a silviculturally acceptable salt thereof; or (x) PROTOX enzyme inhibitors selected from saflufenacil, oxyfluorfen, flumioxazin, carfentrazone, sulfrentrazone, lactofen and flumiclorac; or a silviculturally acceptable salt thereof.

In another preferred embodiment, the present invention said biological is a bio-insecticide or a bio-fungicide. In a particularly preferred embodiment said bio-insecticide is *Bacillus thuringiensis*, a Baculovirus or *Zoophthora radicans.* In another preferred embodiment said bio-fungicide is *Bacillus subtilis* or *Trichoderma harzianum.*

In another preferred embodiment said inoculant is a bacterium. In a further preferred embodiment, said bacterium is a bacterium capable of infecting a silvicultural plant. Particularly preferred inoculants are the bacteria *Azospirilum brasiliense; Rhizobium* and *Agrobacterium radibacter.*

In a further preferred embodiment said inoculant is a bacterium. Particularly preferred is a bacterium capable of infecting a silvicultural plant. Most preferred is the bacterium *Azospirilum brasiliense, Rhizobium* or *Agrobacterium radibacter.*

In yet another preferred embodidment of the present invention said strobilurine fungicide (compound I) is pyraclostrobin (I-1); and/or said dithiocarbamate fungicide (compound II) is

metiram (II-1); and/or said strobilurine fungicide (compound I) is pyraclostrobin (I-1) and said dithiocarbamate fungicide (compound II) is metiram (II-1).

In a further preferred embodiment of the present invention (i) said insecticide (compound III) is fipronil; and/or (ii) said herbicide (compound IV) is dicamba, glyphosate, saflufenacil or glufosinate; and/or (iii) said insecticide (compound III) is fipronil and said herbicide (compound IV) is dicamba, glyphosate, saflufenacil or glufosinate.

In a further aspect the present invention relates to a method for synergistically increasing the health of a silvicultural plant, comprising: (i) applying to silvicultural plant propagation material; and/or (ii) applying to the locus where the silvicultural plant or plant seedling is growing or expected to grow; and/or (iii) applying to the substrate in which the silvicultural plant or plant seedling is growing or expected to grow; and/or (iv) applying to the silvicultural plant, or part of the silvicultural plant, preferably the leaves (foliar application), at any time during the vegetative and/or reproductive growth stage at least once a mixture as mentioned herein above.

In a preferred embodiment of said method the application is a single or repeated application.

In a preferred embodiment of the use or method as described herein above, said silvicultural plant is selected from the group comprising beech (*Fagus* spec.), birch, eucalyptus, fir, oak, oil-palm, pine (*Pinus* spec.), poplar (*Populus* spec.), rubber tree, wattle, spruce, teak and willow (*Salix* spec.).

In a further preferred embodiment of the use or method as described herein above said silvicultural plant is a modified plant, preferably a genetically modified plant.

In yet another preferred embodiment of the use or method as described herein above said silvicultural plant is an herbicide tolerant plant. In a particularly preferred embodiment said herbicide tolerant silvicultural plant a dicamba tolerant plant and/or a glyphosate tolerant plant and/or a saflufenacil tolerant plant and/or a glufosinate tolerant plant.

In yet another preferred embodiment of the use or method as described herein above the health of the silvicultural plant is increased by the tolerance to biotic and/or abiotic stress factors, increased yield, increased plant vigor and/or increased plant quality.

In particularly preferred embodiment of the present invention said increase of the health of the silvicultural plant is reflected by an increase in growth of root and shoot, an overall increase in

productivity and/or a lower seedling discard and/or a faster and more efficient development of the plant.

FIGURE LEGENDS

Fig. 1 depicts results of a 1st trial to evaluate the potential of BASF pyraclostrobin-based products when applied to the substrate (around 40 g) of seedlings of Eucalyptus clone SP 519 in a diagram.

Fig. 2 shows results of the 1st trial to evaluate the potential of BASF pyraclostrobin-based products when applied to the substrate (around 40 g) of seedlings of Eucalyptus clone SP 519 in numerical values.

Fig. 3 shows results of a 2nd trial to evaluate the potential of different concentrations of Cabrio Top when applied to the substrate of seedlings of Eucalyptus clone C-041 in a diagram. The trial included the use of SERENADE ASO due to its effect of rooting increase in other crops.

Fig. 4 shows results of the 2nd trial to evaluate the potential of different concentrations of Cabrio Top when applied to the substrate of seedlings of Eucalyptus clone C-041 in numerical values.

Fig. 5 depicts results of the 2nd trial to evaluate the potential of different concentrations of Cabrio Top when applied to the substrate of seedlings of Eucalyptus clone C-041 in terms of height (left) and diameter (right) of the plants.

Fig. 6 shows results of a 3rd trial to evaluate the potential of Cabrio Top when applied in different concentrations to the substrate of seedlings of Eucalyptus clone SP 519 in a diagram.

Fig. 7 shows results of the 3rd trial to evaluate potential of Cabrio Top when applied in different concentrations to the substrate of seedlings of Eucalyptus clone SP 519 in numerical values.

Fig. 8 shows results of a 4th trial to evaluate the potential of Cabrio Top when applied in different concentrations to the substrate of seedlings of Eucalyptus clone I144 in a diagram.

Fig. 9 shows results of the 4th trial to evaluate the potential of Cabrio Top when applied in different concentrations to the substrate of seedlings of Eucalyptus clone I144 in numerical values.

Fig. 10 shows results of a 5th trial to evaluate the potential of Cabrio Top when applied to the seedlings of Eucalyptus clone I144 by a spray method in in a diagram. The experiment was performed with different concentrations of Cabrio Top.

Fig. 11 shows photos of the seedlings in the 5th trial to evaluate the potential of Cabrio Top when applied to the seedlings of Eucalyptus clone I144 by a spray method at 27 DAA. The experiment was performed with different concentrations of Cabrio Top.

Fig. 12 shows results of the 5th trial to evaluate the potential of Cabrio Top when applied to the seedlings of Eucalyptus clone I144 by a spray method in numerical values. The experiment was performed with different concentrations of Cabrio Top.

Fig. 13 shows photos of the seedlings in the 5th trial to evaluate the potential of Cabrio Top when applied to the seedlings of Eucalyptus clone I144 by a spray method at 83 DAA. The experiment was performed with different concentrations of Cabrio Top.

Fig. 14 shows results of a 6th trial to reevaluate the physiological effects using intermediate concentrations of Cabrio Top when applied to Eucalyptus clone I144 in a diagram.

Fig. 15 shows results of the 6th trial to reevaluate the physiological effects using intermediate concentrations of Cabrio Top when applied to Eucalyptus clone I144 in numerical values.

Fig. 16 shows results of a 7th trial to evaluate possible products and other formulations with pyraclostrobin and with the same a.i. concentration when applied to Eucalyptus clone I144 in a diagram.

Fig. 17 shows results of the 7th trial to evaluate possible products and other formulations with pyraclostrobin and with the same a.i. concentration when applied to Eucalyptus clone I144 in numerical values.

Fig. 18 shows results of an 8th trial to evaluate *Rhizoctonia solani* control with Cabrio Top when applied to Eucalyptus clone I144 in a diagram. The experiment was performed with different concentrations of Cabrio Top

Fig. 19 shows photos of the seedlings in the 8th trial to evaluate *Rhizoctonia solani* control with Cabrio Top when applied to Eucalyptus clone I144 at 28 DAA. The experiment was performed with different concentrations of Cabrio Top.

Fig. 20 shows results of the 8th trial to evaluate *Rhizoctonia solani* control with Cabrio Top when applied to Eucalyptus clone I144 in numerical values. The experiment was performed with different concentrations of Cabrio Top.

Fig. 21 shows results of the 9th trial to evaluate *Rhizoctonia solani* control with Cabrio Top compared to active pyraclostrobin and Metiram to prove the synergism between both compounds. This trial was carried out in *Eucalyptus* clone I144.

Fig. 22 depicts calculations on the synergism pyraclostrobin and Metiram based on the trial results shown in Fig. 21.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to effective means and methods which allow to specifically increase the health of silvicultural plants

Although the present invention will be described with respect to particular embodiments, this description is not to be construed in a limiting sense.

Before describing in detail exemplary embodiments of the present invention, definitions important for understanding the present invention are given. As used in this specification and in the appended claims, the singular forms of "a" and "an" also include the respective plurals unless the context clearly dictates otherwise.

In the context of the present invention, the terms "about" and "approximately" denote an interval of accuracy that a person skilled in the art will understand to still ensure the technical effect of the feature in question. The term typically indicates a deviation from the indicated numerical value of ±20 %, preferably ±15 %, more preferably ±10 %, and even more preferably ±5 %.

It is to be understood that the term "comprising" is not limiting. For the purposes of the present invention the term "consisting of" is considered to be a preferred embodiment of the term "comprising of". If hereinafter a group is defined to comprise at least a certain number of

embodiments, this is meant to also encompass a group which preferably consists of these embodiments only.

Furthermore, the terms "first", "second", "third" or "(a)", "(b)", "(c)", "(d)" etc. and the like in the description and in the claims, are used for distinguishing between similar elements and not necessarily for describing a sequential or chronological order. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other sequences than described or illustrated herein. In case the terms "first", "second", "third" or "(a)", "(b)", "(c)", "(d)", "i", "ii" etc. relate to steps of a method or use or assay there is no time or time interval coherence between the steps, i.e. the steps may be carried out simultaneously or there may be time intervals of seconds, minutes, hours, days, weeks, months or even years between such steps, unless otherwise indicated in the application as set forth herein above or below.

It is to be understood that this invention is not limited to the particular methodology, protocols, reagents etc. described herein as these may vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to limit the scope of the present invention that will be limited only by the appended claims. Unless defined otherwise, all technical and scientific terms used herein have the same meanings as commonly understood by one of ordinary skill in the art.

As has been set out above, the present invention concerns in one aspect the use of a mixture, comprising as active compounds in synergistically effective amounts at least a fungicide (compound I) of the group of strobilurines; and a further fungicide (compound II) of the group of dithiocarbamates for synergistically increasing the health of a silvicultural plant.

The term "mixture" as used in the contest of the present invention means a combination of at least two compounds (active compounds or active ingredients). The mixture may comprise, in certain embodiments, more than two compounds, e.g. 3, 4, 5, 6, 7, 8, 9, 10 or more compounds. In further embodiments, the mixture may consist of 2, 3, 4, 5, 6, 7, 8, 9, 10 or more compounds. According to preferred embodiments of the invention, the mixture comprises at least a fungicide (compound I) of the group of strobilurines and a fungicide (compound II) of the group of dithiocarbamates. In further embodiments, the mixture may comprise or consist of two or more (e.g. 3, 4, 5, 6 etc.) different compounds of the group of strobilurines. In alternative embodiments, the mixture may comprise or consist of two or more (e.g. 3, 4, 5, 6 etc.) different compounds of the group of dithiocarbamates. In yet another group of embodiments, the mixture may comprise or consist of two or more (e.g. 3, 4, 5, 6 etc.) different compounds of the group of

strobilurines and two or more (e.g. 3, 4, 5, 6 etc.) different compounds of the group of dithiocarbamates.

The term "synergistically effective amount" as used herein means that the purely additive effect (in mathematical terms) of the application of the individual compounds is surpassed by the application an effective amount of the inventive mixture, or a certain proportion of an effective amount of the active compounds.

The term "effective amount" denotes an amount of the inventive mixtures or the active compounds, which is sufficient for achieving the desired effect which is a synergistic increase of the health of a silvicultural plant, but which does not give rise to any phytotoxic symptom on the treated silvicultural plant, in particular the yield or growth effects as defined herein. Further illustrative details concerning exact amounts, ways of application and suitable ratios to be used are provided herein below. It is understood that an effective amount as defined above may vary in a broad range according to several factors, as would be known to the skilled person. Such factors may include the treated silvicultural plant, the climatic conditions or the soil conditions etc. Accordingly, the effective amount may be adapted to such conditions and factors according to the skilled person's common general knowledge.

A fungicidal compound (compound I) of the group of "strobilurines" as used herein refers to a structural derivative of the natural compound strobilurine A. All members of the group of strobilurine are related to the strobilurine A compound by the same mode of action (an inhibition of the cytochrome bc1 at Qo site of complex III of the respiration chain), a similar chemical structure and the same sub-structural elements, i.e. pharmacophores and side-chains. The group particularly comprises sub-groups such as methoxy-acrylates, oximinoacetamides or benzyl-carbamates. In specific embodiments of the present invention, compound I may be a methoxy-acrylates strobilurine, an oximinoacetamides strobilurine or a benzyl-carbamates strobilurine. Further details on strobilurines, their chemistry, structure and mode of action would be known to the skilled person or can be derived from suitable literature sources such as "The Pesticide Manual, 15th Edition, British Crop Protection Council (2009)", the FRAC Code List of the FRAC (Fungicide Resistance Action Committee) i.e. a Specialist Technical Group of CropLife International (Formerly Global Crop Protection Federation, GCPF).

A fungicidal compound (compound II) of the group of "dithiocarbamates" as used herein refers to di-sulfur analogs of carbamates of the general formula R–N(–R″)–C(=S)–S–R′. Dithiocarbmates may be classified as EBDC's = Ethylene-(bis)-dthiocarbamates. DMDTC's = Dimethyldithiocarbamates and MMDTC's=monomethyldithiocarbamates. The EBDC's comprise mancozeb, maneb and metiram, the DMDTC's comprise Na-Dimethyl-dithiocarbamate, ziram,

ferbam and thiram and the MMDTC's comprise metam. The dithiocarbamates show a common mechanism of action, which is the inhibition of metal-dependant and sulfhydryl enzyme systems, inter alia, in fungi. In specific embodiments of the present invention, compound II may be an EBDC, a DMDTC or a MMDTC. Further details on dithiocarbamates, their chemistry, structure and mode of action would be known to the skilled person or can be derived from suitable literature sources such as "The Pesticide Manual, 15th Edition, British Crop Protection Council (2009)

The term "health of a silvicultural plant" or "silvicultural plant health" as used herein refers to a condition of a silvicultural plant and/or its products which is determined by several aspects alone or in combination with each other such as increased yield, plant vigor, quality and tolerance to abiotic and/or biotic stress. According to specific embodiments of the present invention, effects of the inventive mixtures such as an increased health of a silvicultural plant, are also present when the plant is not under biotic stress and in particular when the plant is not under pest pressure.

It is understood that a silvicultural plant suffering from fungal attacks (or any other type of attack) produces a smaller biomass and leads to a reduced yield as compared to a silvicultural plant which has been subjected to curative or preventive treatment against the pathogenic fungus (or any other relevant pest) and which can grow without the damage caused by the biotic stress factor. However, the means and methods according to the present invention lead to an increased plant health also in the absence of any biotic stress. This means that the positive effects of the mixtures of the invention cannot be explained just by the fungicidal activities of the compounds (I) and (II), but are based on further activity profiles. As a result, the application of the inventive mixtures can also be carried out in the absence of pest pressure.

A silvicultural plant health indicator such as increased yield, increased plant vigor, increased quality and tolerance to abiotic and/or biotic stress, is to be understood as a preferred embodiment of the present invention either each on its own or preferably in combination with each other.

According to the present invention, "increased yield" of a silvicultural plant means that the yield of the plant is increased by a measurable amount over the yield of the same plant produced under the same conditions, but without the application of the inventive mixture. Increased yield can be characterized, among others, by the following improved properties of the silvicultural plant:

- increased silvicultural plant weight

- increased biomass such as higher overall fresh and dry weight (FW/DW)
- increased number of flowers per silvicultural plant
- higher fruit yield
- more tillers or side shoots (branches)
- larger leaves
- increased shoot growth
- increased protein content
- increased oil content
- increased production of wood per growth period
- increased pigment content
- increased chlorophyll content (chlorophyll content has a positive correlation with the silvicultural plant's photosynthesis rate and accordingly, the higher the chlorophyll content the higher the yield of a plant)

In a preferred embodiment, the term "yield" refers to seeds. "Fruit" is to be understood as any silvicultural plant product which is further utilized after harvesting, e.g. wood, resin, flowers etc., i.e. anything of economic value that is produced by the silvicultural plant.

According to specific embodiments of the present invention, the yield of a silvicultural plant may be increased by at least 5 %, preferable by 5 to 10 %, more preferable by 10 to 20 %, or even 20 to 30 %. In general, the yield increase may even be higher.

Another indicator for the condition of the plant is the plant vigor. The plant vigor becomes manifest in several aspects such as the general visual appearance. An "increased plant vigor" as used herein refers to one or more of the following improved properties of a silvicultural plant:

- increased vitality of the silvicultural plant
- increased silvicultural plant growth
- increased silvicultural plant development
- increased visual appearance
- increased silvicultural plant stand (less plant verse/lodging)
- increased emergence
- increased root growth and/or more developed root system
- increased nodulation, in particular rhizobial nodulation
- bigger leaf blade
- bigger size
- increased silvicultural plant height
- increased tiller number

- increased number of side shoots
- increased number of flowers per plant
- increased shoot growth
- increased root growth (extensive root system)
- enhanced photosynthetic activity (e.g. based on increased stomatal conductance and/or increased CO_2 assimilation rate)
- enhanced pigment content
- earlier flowering
- earlier fruiting
- earlier and improved germination
- earlier grain maturity
- less non-productive tillers
- shorter nursery stage
- lower seedling discard
- less dead basal leaves
- less input needed (such as fertilizers or water)
- greener leaves
- complete maturation under shortened vegetation periods
- less fertilizers needed
- less seeds needed
- longer panicles
- delay of senescence
- stronger and/or more productive tillers
- better extractability of ingredients
- improved quality of seeds (for being seeded in the following seasons for seed production)
- reduced production of ethylene and/or the inhibition of its reception by the plant.

According to specific embodiments of the present invention, the silvicultural plant vigor may be increased by at least 5 %, preferable by 5 to 10 %, more preferable by 10 to 20 %, or even 20 to 30 %. In general, the silvicultural plant vigor increase may even be higher.

Another indicator for the condition of the plant is the "quality" of a plant and/or its products. The term "increased quality" as used herein thus means that certain silvicultural plant characteristics such as the content or composition of certain ingredients are increased or improved by a measurable or noticeable amount over the same factor of the silvicultural plant produced under the same conditions, but without the application of the mixtures of the present invention as

defined herein above or below. Increased quality can be characterized, among others, by one or more of the following improved properties of the silvicultural plant or its product:

- increased protein content
- increased content of fatty acids
- increased metabolite content
- increased carotenoid content
- increased cellulose content
- increased amount of essential amino acids
- improved nutrient composition
- improved protein composition
- improved composition of fatty acids
- improved metabolite composition
- improved carotenoid composition
- improved cellulose composition
- improved amino acids composition
- improved or optimal plant color
- improved leaf color
- higher storage capacity
- higher processability of the harvested products.

According to specific embodiments of the present invention, the quality of a silvicultural plant and/or its products is increased by at least 5 %, preferable by 5 to 10 %, more preferable by 10 to 20 %, or even 20 to 30 %. In general, the quality of a silvicultural plant and/or its products increase may even be higher.

Another indicator for the condition of the silvicultural plant may be its tolerance or resistance to biotic and/or abiotic stress factors. Biotic and abiotic stress, especially over longer terms, may have harmful effects on silvicultural plants. Biotic stress may be caused by living organisms while abiotic stress is typically caused by environmental extremes. According to the present invention, the term "increased tolerance or resistance to biotic and/or abiotic stress factors" as used herein means (i) that certain negative factors caused by biotic and/or abiotic stress are diminished in a measurable or noticeable amount as compared to silvicultural plants exposed to the same conditions, but without being treated with an inventive mixture as defined herein above or below and (ii) that the negative effects are not diminished by a direct action of the inventive mixture as defined herein above or below on the stress factors, e.g. by its fungicidal or insecticidal action which directly destroys the microorganisms or pests, but rather by a stimulation of the plants' own defensive reactions against said stress factors.

Negative factors caused by biotic stress such as pathogens and pests are widely known and range from dotted leaves to total destruction of the plant. Biotic stress may be caused by a multitude of living organisms including pests (for example insects, arachnides, nematodes) competing plants (for example weeds), microorganisms (such as phythopathogenic fungi and/or bacteria) and/or viruses.

Negative factors caused by abiotic stress are also well-known and can often be observed as reduced plant vigor (see above), for example: dotted leaves, "burned leaves", reduced growth, less flowers, less biomass, less crop yields, reduced nutritional value of the crops, later crop maturity, to give just a few examples. Abiotic stress can be caused for example by:

- extremes in temperature such as heat or cold (heat stress / cold stress)
- strong variations in temperature
- temperatures unusual for the specific season
- drought (drought stress)
- extreme wetness
- high salinity (salt stress)
- radiation (for example by increased UV radiation due to the decreasing ozone layer)
- increased ozone levels (ozone stress)
- organic pollution (for example by phythotoxic amounts of pesticides)
- inorganic pollution (for example by heavy metal contaminants).

As a result of biotic and/or abiotic stress factors, the quantity and the quality of the stressed silvicultural plants decrease. As far as quality is concerned, reproductive development is usually severely affected. Synthesis, accumulation and storage of proteins are mostly affected by temperature; growth is slowed by almost all types of stress; polysaccharide synthesis, both structural and storage is reduced or modified: these effects result in a decrease in biomass (yield) and in changes in the nutritional value of the product.

According to specific embodiments of the present invention, the silvicultural plant's tolerance or resistance to biotic and/or abiotic stress is increased by at least 5 %, preferable by 5 to 10 %, more preferable by 10 to 20 %, or even 20 to 30 %. In general, the plant's tolerance or resistance to biotic and/or abiotic stress increase may even be higher.

Advantageous properties, obtained especially from treated seeds, are e.g. improved germination and field establishment, better vigor and/or a more homogenous field establishment. Further typical advantageous properties of a silvicultural plant, which reflect the

plant's increased health, are an increase in growth of root, an increase in growth of shoot, a lower seedling discard, an overall increase in productivity and/or a faster and more efficient development of the plant. In a particularly preferred embodiment the fast and efficient development, the increase in growth of root and shoot, a lower seedling discard and the overall increase in productivity are those of a germinating seed or seedling. One of the most important factors for the increased resistance against biotic and abiotic stress and thus preferred is the stimulation of the plant's natural defense reactions after the application of the inventive mixtures according to the invention.

According to further embodiments of the present invention the above identified indicators for the health condition of a silvicultural plant may be interdependent and may result from each other. For example, an increased resistance to biotic and/or abiotic stress may lead to a better plant vigor, e.g. to better and bigger trees, and thus to an increased yield. Inversely, a more developed root system may result in an increased resistance to biotic and/or abiotic stress. However, these interdependencies and interactions are neither all known nor fully understood and therefore the different indicators are described separately. Yet, a skilled person, based the common general knowledge, would be aware of this interdependency and be able to correctly identify and characterize any increase of indicators of plant health.

In one embodiment the mixture as defined herein above comprises as fungicide (compound I) of the group of strobilurines at least one compound selected from a group comprising or consisting of the following elements: pyraclostrobin (I-1), azoxystrobin (I-2), dimoxystrobin (I-3), enestroburin (I-4), fluoxastrobin (I-5), kresoxim-methyl (I-6), metominostrobin (I-7), orysastrobin (I-8), picoxystrobin (I-9), pyribencarb (I-10), trifloxystrobin (I-11), pyrametostrobin (I-12), pyraoxystrobin (I-13), coumoxystrobin (I-14), coumethoxystrobin (I-15), triclopyricarb (chlorodincarb) (I-16), fenaminstrobin (diclofenoxystrobin) (I-17), fenoxystrobin (I-18), 2-(2-(6-(3-chloro-2-methyl-phenoxy)-5-fluoro-pyrimidin-4-yloxy)-phenyl)-2-methoxyimino-N-methyl-acetamide (I-19), 3-methoxy-2-(2-(N-(4-methoxy-phenyl)-cyclopropane-carboximidoylsulfanylmethyl)-phenyl)-acrylic acid methyl ester (I-20), methyl (2-chloro-5-[1-(3-methylbenzyloxyimino)-ethyl]benzyl)-carbamate (I-21) and 2-(2-(3-(2,6-dichlorophenyl)-1-methyl-allylideneaminooxymethyl)-phenyl)-2-methoxyimino-N methyl-acetamide (I-22); or a silviculturally acceptable salt thereof. In a further embodiment of the present invention, the mixture as defined herein above comprises as fungicide (compound I) of the group of strobilurines at least one compound selected from a group comprising or consisting of the following elements: pyraclostrobin (I-1), azoxystrobin (I-2), dimoxystrobin (I-3), enestroburin (I-4), fluoxastrobin (I-5), kresoxim-methyl (I-6), metominostrobin (I-7), orysastrobin (I-8), picoxystrobin (I-9), trifloxystrobin (I-11), pyrametostrobin (I-12), pyraoxystrobin (I-13), coumoxystrobin (I-14), coumethoxystrobin (I-15), triclopyricarb (chlorodincarb) (I-16),

fenaminstrobin (diclofenoxystrobin) (I-17), fenoxystrobin (I-18), 2-(2-(6-(3-chloro-2-methyl-phenoxy)-5-fluoro-pyrimidin-4-yloxy)-phenyl)-2-methoxyimino-N-methyl-acetamide (I-19), methyl (2-chloro-5-[1-(3-methylbenzyloxyimino)-ethyl]benzyl)-carbamate (I-21) and 2-(2-(3-(2,6-dichlorophenyl)-1-methyl-allylideneaminooxymethyl)-phenyl)-2-methoxyimino-N methyl-acetamide (I-22); or a silviculturally acceptable salt thereof. In yet another embodiment of the present invention the mixture as defined herein above comprises as fungicide (compound I) of the group of strobilurines at least one compound selected from a group comprising or consisting of the following elements: pyraclostrobin (I-1), azoxystrobin (I-2), dimoxystrobin (I-3), enestroburin (I-4), fluoxastrobin (I-5), kresoxim-methyl (I-6), metominostrobin (I-7), orysastrobin (I-8), picoxystrobin (I-9), trifloxystrobin (I-11), pyrametostrobin (I-12), pyraoxystrobin (I-13), coumoxystrobin (I-14), coumethoxystrobin (I-15), 2-(2-(6-(3-chloro-2-methyl-phenoxy)-5-fluoro-pyrimidin-4-yloxy)-phenyl)-2-methoxyimino-N-methyl-acetamide (I-19), methyl (2-chloro-5-[1-(3-methylbenzyloxyimino)-ethyl]benzyl)-carbamate (I-21) and 2-(2-(3-(2,6-dichlorophenyl)-1-methyl-allylideneaminooxymethyl)-phenyl)-2-methoxyimino-N methyl-acetamide (I-22), or a silviculturally acceptable salt thereof. It is particularly preferred that the strobilurine fungicide (compound I) is pyraclostrobin (I-1).

In specific embodiments, the mixture may comprise more than one strobilurine compound selected from I-1 to I-21 as defined herein above, e.g. 2, 3, 4, 5, 6 or more. The combination of such strobilurine compounds may be I-1 with I-2, I-1 with I-3, I-1 with I-4, I-1 with I-5, I-1 with I-6, I-1 with I-7, I-1 with I-8, I-1 with I-9, I-1 with I-10, I-1 with I-11, I-1 with I-12, I-1 with I-13, I-1 with I-14, I-1 with I-15, I-1 with I-16, I-1 with I-17, I-1 with I-18, I-1 with I-19, I-1 with I-20 or I-1 with I-21, or alternatively I-2 with I-3, I-2 with I-4, I-2 with I-5, I-2 with I-6, I-2 with I-7, I-2 with I-8, I-2 with I-9, I-2 with I-10, I-2 with I-11, I-2 with I-12, I-2 with I-13, I-2 with I-14, I-2 with I-15, I-2 with I-16, I-2 with I-17, I-2 with I-18, I-2 with I-19, I-2 with I-20 or I-2 with I-21. Also envisaged are any other combinations of I-3 with I-1 to I-21, I-4 with I-1 to I-21, I-5 with I-1 to I-21, I-6 I-1 to I-21, I-7 with I-1 to I-21, I-8 with I-1 to I-21, I-9 with I-1 to I-21, I-10 with I-1 to I-21, I-11 with I-1 to I-21, I-12 with I-1 to I-21, I-13 with I-1 to I-21, I-14 with I-1 to I-21, I-15 with I-1 to I-21, I-16 with I-1 to I-21, I-17 with I-1 to I-21, I-18 with I-1 to I-21, I-19 with I-1 to I-21, I-20 with I-1 to I-21, or I-21 with I-1 to I-21. Also envisaged are triple, 4fold, 5fold, 6fold or higher fold combinations of any one of I-1 to I-21 according to the above scheme, e.g. I-1, I-2 and I-3; or I-1, I-2 and I-4; I-1, I-2 and I-5 etc., I-1, I-3 and I-4; or I-1, I-3 and I-5 etc.

In a further embodiment the mixture as defined herein above, including for example any of the strobilurine compounds as mentioned, e.g. (I-1 to I-21) comprises as fungicide (compound II) of the group of dithiocarbamates at least one compound selected from the group comprising or consisting of metiram (II-1), dazomet (II-2), ferbam (II-3), mancozeb (II-4), maneb (II-5), metam (II-6), nabam (II-7), poly-carbamate (II-8), propineb (II-9), thiram (II-10), zineb (II-11), Na-

Dimethyl-dithiocarbmate (II-12) and ziram (II-13); or a silviculturally acceptable salt thereof. In a further embodiment of the present invention, the mixture as defined herein above comprises as fungicide (compound II) of the group of dithiocarbamates at least one compound selected from the group comprising or consisting of metiram (II-1), ferbam (II-3), mancozeb (II-4), maneb (II-5), metam (II-6), thiram (II-10), zineb (II-11), Na-Dimethyl-dithiocarbmate (II-12) and ziram (II-13); or a silviculturally acceptable salt thereof. In yet another embodiment of the present invention the mixture as defined herein above comprises as fungicide (compound II) of the group of dithiocarbamates at least one compound selected from the group comprising or consisting of metiram (II-1), ferbam (II-3), mancozeb (II-4), maneb (II-5), metam (II-6), thiram (II-10) and ziram (II-13); or a silviculturally acceptable salt thereof. It is particularly preferred that the dithiocarbamate fungicide (compound II) is metiram.

In specific embodiments, the mixture may comprise more than one dithiocarbamate compound selected from II-1 to II-13 as defined herein above, e.g. 2, 3, 4, 5, 6 or more. The combination of such dithiocarbamate compounds may be II-1 with II-2, II-1 with II-3, II-1 with II-4, II-1 with II-5, II-1 with II-6, II-1 with II-7, II-1 with II-8, II-1 with II-9, II-1 with II-10, II-1 with II-11, II-1 with II-12, II-1 with II-13, or alternatively II-2 with II-3, II-2 with II-4, II-2 with II-5, II-2 with II-6, II-2 with II-7, II-2 with II-8, II-2 with II-9, II-2 with II-10, II-2 with II-11, II-2 with II-12, II-2 with II-13. Also envisaged are any other combinations of II-3 with II-1 to II-13, II-4 with II-1 to II-13, II-5 with II-1 to II-13, II-6 II-1 to II-13, II-7 with II-1 to II-13, II-8 with II-1 to II-13, II-9 with II-1 to II-13, II-10 with II-1 to II-13, II-11 with II-1 to II-13, II-12 with II-1 to II-13, II-13 with II-1 to II-12. Also envisaged are triple, 4fold, 5fold, 6fold or higher fold combinations of any one of II-1 to II-21 according to the above scheme, e.g. II-1, II-2 and II-3, II-1, II-2 and II-4; II-1, II-2 and II-5 etc., II-1, II-3 and II-4, II-1, II-3 and II-5 etc.

In preferred embodiments, the mixture may comprise at least one strobilurine compound selected from I-1 to I-21 as defined herein above and at least one dithiocarbamate compound selected from II-1 to II-13 as defined herein above. Also envisaged is the combination of 2, 3, 4, 5 or more strobilurine compounds selected from I-1 to I-21 and 2, 3, 4, 5 or more dithiocarbamate compounds selected from II-1 to II-13.

In specific embodiments, the mixture may comprise one of the following combinations of a strobilurine and a dithiocarbamate as defined herein above (I-1 to I-21 and II-1 to II-13):

I-1 with II-1, I-1 with II-2, I-1 with II-3, I-1 with II-4, I-1 with II-5, I-1 with II-6, I-1 with II-7, I-1 with II-8, I-1 with II-9, I-1 with II-10, I-1 with II-11, I-1 with II-12, or I-1 with II-13; or

I-2 with II-1, I-2 with II-2, I-2 with II-3, I-2 with II-4, I-2 with II-5, I-2 with II-6, I-2 with II-7, I-2 with II-8, I-2 with II-9, I-2 with II-10, I-2 with II-11, I-2 with II-12, or I-2 with II-13; or

I-3 with II-1, I-3 with II-2, I-3 with II-3, I-3 with II-4, I-3 with II-5, I-3 with II-6, I-3 with II-7, I-3 with II-8, I-3 with II-9, I-3 with II-10, I-3 with II-11, I-3 with II-12, or I-3 with II-13; or

I-4 with II-1, I-4 with II-2, I-4 with II-3, I-4 with II-4, I-4 with II-5, I-4 with II-6, I-4 with II-7, I-4 with II-8, I-4 with II-9, I-4 with II-10, I-4 with II-11, I-4 with II-12, or I-4 with II-13; or

I-5 with II-1, I-5 with II-2, I-5 with II-3, I-5 with II-4, I-5 with II-5, I-5 with II-6, I-5 with II-7, I-5 with II-8, I-5 with II-9, I-5 with II-10, I-5 with II-11, I-5 with II-12, or I-5 with II-13; or

I-6 with II-1, I-6 with II-2, I-6 with II-3, I-6 with II-4, I-6 with II-5, I-6 with II-6, I-6 with II-7, I-6 with II-8, I-6 with II-9, I-6 with II-10, I-6 with II-11, I-6 with II-12, or I-6 with II-13; or

I-7 with II-1, I-7 with II-2, I-7 with II-3, I-7 with II-4, I-7 with II-5, I-7 with II-6, I-7 with II-7, I-7 with II-8, I-7 with II-9, I-7 with II-10, I-7 with II-11, I-7 with II-12, or I-7 with II-13; or

I-8 with II-1, I-8 with II-2, I-8 with II-3, I-8 with II-4, I-8 with II-5, I-8 with II-6, I-8 with II-7, I-8 with II-8, I-8 with II-9, I-8 with II-10, I-8 with II-11, I-8 with II-12, or I-8 with II-13; or

I-9 with II-1, I-9 with II-2, I-9 with II-3, I-9 with II-4, I-9 with II-5, I-9 with II-6, I-9 with II-7, I-9 with II-8, I-9 with II-9, I-9 with II-10, I-9 with II-11, I-9 with II-12, or I-9 with II-13; or

I-10 with II-1, I-10 with II-2, I-10 with II-3, I-10 with II-4, I-10 with II-5, I-10 with II-6, I-10 with II-7, I-10 with II-8, I-10 with II-9, I-10 with II-10, I-10 with II-11, I-10 with II-12, or I-10 with II-13; or

I-11 with II-1, I-11 with II-2, I-11 with II-3, I-11 with II-4, I-11 with II-5, I-11 with II-6, I-11 with II-7, I-11 with II-8, I-11 with II-9, I-11 with II-10, I-11 with II-11, I-11 with II-12, or I-11 with II-13; or

I-12 with II-1, I-12 with II-2, I-12 with II-3, I-12 with II-4, I-12 with II-5, I-12 with II-6, I-12 with II-7, I-12 with II-8, I-12 with II-9, I-12 with II-10, I-12 with II-11, I-12 with II-12, or I-12 with II-13; or

I-13 with II-1, I-13 with II-2, I-13 with II-3, I-13 with II-4, I-13 with II-5, I-13 with II-6, I-13 with II-7, I-13 with II-8, I-13 with II-9, I-13 with II-10, I-13 with II-11, I-13 with II-12, or I-13 with II-13; or

I-14 with II-1, I-14 with II-2, I-14 with II-3, I-14 with II-4, I-14 with II-5, I-14 with II-6, I-14 with II-7, I-14 with II-8, I-14 with II-9, I-14 with II-10, I-14 with II-11, I-14 with II-12, or I-14 with II-13; or

I-15 with II-1, I-15 with II-2, I-15 with II-3, I-15 with II-4, I-15 with II-5, I-15 with II-6, I-15 with II-7, I-15 with II-8, I-15 with II-9, I-15 with II-10, I-15 with II-11, I-15 with II-12, or I-15 with II-13; or

I-16 with II-1, I-16 with II-2, I-16 with II-3, I-16 with II-4, I-16 with II-5, I-16 with II-6, I-16 with II-7, I-16 with II-8, I-16 with II-9, I-16 with II-10, I-16 with II-11, I-16 with II-12, or I-16 with II-13; or

I-17 with II-1, I-17 with II-2, I-17 with II-3, I-17 with II-4, I-17 with II-5, I-17 with II-6, I-17 with II-7, I-17 with II-8, I-17 with II-9, I-17 with II-10, I-17 with II-11, I-17 with II-12, or I-17 with II-13; or

I-18 with II-1, I-18 with II-2, I-18 with II-3, I-18 with II-4, I-18 with II-5, I-18 with II-6, I-18 with II-7, I-18 with II-8, I-18 with II-9, I-18 with II-10, I-18 with II-11, I-18 with II-12, or I-18 with II-13; or

I-19 with II-1, I-19 with II-2, I-19 with II-3, I-19 with II-4, I-19 with II-5, I-19 with II-6, I-19 with II-7, I-19 with II-8, I-19 with II-9, I-19 with II-10, I-19 with II-11, I-19 with II-12, or I-19 with II-13; or

I-20 with II-1, I-20 with II-2, I-20 with II-3, I-20 with II-4, I-20 with II-5, I-20 with II-6, I-20 with II-7, I-20 with II-8, I-20 with II-9, I-20 with II-10, I-20 with II-11, I-20 with II-12, or I-20 with II-13; or

I-21 with II-1, I-21 with II-2, I-21 with II-3, I-21 with II-4, I-21 with II-5, I-21 with II-6, I-21 with II-7, I-21 with II-8, I-21 with II-9, I-21 with II-10, I-21 with II-11, I-21 with II-12, or I-21 with II-13.

Particularly preferred is the mixture of I-1 and II-1, i.e. of pyraclostrobin and metiram.

In further embodiments of the invention, said mixtures as defined herein above may comprise at least one additional compound. Said at least one additional compound may be a further fungicide, e.g. of a different class or chemical group, an acaricide, an algicide, an antifeedant, an avicide, a bactericide, a bird repellent, a chemosterilant, a herbicide, an insect attractants, an insect repellent, an insecticide, a mammal repellent, a mating disrupter, a molluscicide, a nematicide, a plant activator, a plant growth regulator, or a rodenticide. Also envisaged is the additional presence of any combination of 2, 3, 4 or more of these compounds.

Preferred is that a mixture as defined herein above additionally comprises an insecticide (compound III). Also preferred is that a mixture as defined herein above additionally comprises a herbicide (compound IV). Further preferred is that a mixture as defined herein above additionally comprises an insecticide (compound III) and a herbicide (compound IV).
In one embodiment the mixture as defined herein above comprises as insecticide (compound III) at least one compound which is selected from the group of insecticides comprising: (i)

organo (thio-) phosphate compounds (ii) carbamate compounds; (iii) pyrethroid compounds; (iv) juvenile hormone mimic; (v) nicotinic receptor agonists/antagonists; (vi) GABA gated chloride channel antagonist compounds; (vii) METI I compounds; (viii) hydramethylnon;(ix) chlorfenapyr; (x) diafenthiuron (xi) molting disruptors; (xii) molting hormones; (xiii) sodium channel blocker compounds; (xiv) flonicamid;(xv) flucofuron; (xvi) chitin synthesis inhibitors; (xvii) lipid biosynthesis inhibitors; (xviii) flubendiamide; (xix) anthranilamide compounds; (xx) dicyclanil, (xxi) metoxadiazone, (xxii) dimetilan, (xxiii) isoprothiolane, (xxiv) malonoben, (xxv) sulfoxaflor or (xxvi) triarathene.

In a preferred embodiment said (thio)-phosphate compound may be selected from the group comprising or consisting of chlorpyrifos, chlorpyrifos-methyl and pyraclofos.

In a preferred embodiment said carbamate compound may be selected from the group comprising or consisting of aldicarb, methomyl, thiodicarb and triazamate.

In a preferred embodiment said pyrethroid compound may be selected from the group comprising or consisting of bifenthrin, bioethanomethrin, beta-cyfluthrin, biopermethrin, lambda-cyhalothrin, gamma-cyhalothrin, cypermethrin, alpha-cypermethrin, beta-cypermethrin, zeta-cypermethrin, deltamethrin, esfenvalerate, fenvalerate, sulfoxime and thiofluoximate.

In a preferred embodiment said juvenile hormone mimic may be selected from the group comprising or consisting of fenoxycarb and pyriproxyfen.

In a preferred embodiment said nicotinic receptor agonists/antagonists compounds may be selected from the group comprising or consisting of acetamiprid, clothianidin, dinotefuran, imidacloprid, imidaclothiz, thiamethoxam, nitenpyram, paichongding, thiacloprid and tazimcarb.

In a preferred embodiment said GABA gated chloride channel antagonist compounds may be selected from the group comprising or consisting of acetoprole, ethiprole, fipronil, pyrafluprole, pyriprole and vaniliprole.

In a preferred embodiment said METI I compounds may be selected from the group comprising or consisting of pyridaben, tebufenpyrad and tolfenpyrad.

In a preferred embodiment said molting disruptor may be selected from the group comprising or consisting of cyromazine, furan tebufenozide, methoxyfenozide and tebufenozid.

In a preferred embodiment said molting hormone may be selected from the group comprising or consisting of a-ecdysone and ecdysterone.

In a preferred embodiment said sodium channel blocker compound may be selected from the group comprising or consisting of indoxacarb and metaflumizone.

In a preferred embodiment said chitin synthesis inhibitor may be selected from the group comprising or consisting of buprofezin, bistrifluron, chlorbenzuron, chlorfluazuron, diflubenzuron, dichlorbenzuron, flucycloxuron, flufenoxuron, hexaflumuron, lufenuron, novaluron, noviflumuron, penfluron, teflubenzuron and triflumuron.

In a preferred embodiment said lipid biosynthesis inhibitor may be selected from the group comprising or consisting of spiromesifen and spirotetramat.

In a preferred embodiment said anthranilamide compound may be selected from the group comprising or consisting of chloranthraniliprole and cyantraniliprole.

In a particularly preferred embodiment the mixture as defined herein above additionally comprises as insecticide (compound III) a compound of group (vi), i.e. a GABA gated chloride channel antagonist. More preferably, the mixture as defined herein above additionally comprises as insecticide (compound III) acetoprole, ethiprole, fipronil, pyrafluprole, pyriprole or vaniliprole. Even more preferably, the mixture as defined herein above additionally comprises as insecticide (compound III) fipronil.

In further specific embodiments a mixture according to the present invention as defined herein above, in particular a mixture comprising a compound I and a compound II as defined herein above, may comprise 1, 2, 3, 4, 5, 6 or more of the insecticides (i) to (xxvi) as defined herein above.

The present invention accordingly envisages the use any one of the following combination of compounds within a synergistically working mixture:

I-1 with II-1, I-1 with II-2, I-1 with II-3, I-1 with II-4, I-1 with II-5, I-1 with II-6, I-1 with II-7, I-1 with II-8, I-1 with II-9, I-1 with II-10, I-1 with II-11, I-1 with II-12, or I-1 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-2 with II-1, I-2 with II-2, I-2 with II-3, I-2 with II-4, I-2 with II-5, I-2 with II-6, I-2 with II-7, I-2 with II-8, I-2 with II-9, I-2 with II-10, I-2 with II-11, I-2 with II-12, or I-2 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-3 with II-1, I-3 with II-2, I-3 with II-3, I-3 with II-4, I-3 with II-5, I-3 with II-6, I-3 with II-7, I-3 with II-8, I-3 with II-9, I-3 with II-10, I-3 with II-11, I-3 with II-12, or I-3 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-4 with II-1, I-4 with II-2, I-4 with II-3, I-4 with II-4, I-4 with II-5, I-4 with II-6, I-4 with II-7, I-4 with II-8, I-4 with II-9, I-4 with II-10, I-4 with II-11, I-4 with II-12, or I-4 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-5 with II-1, I-5 with II-2, I-5 with II-3, I-5 with II-4, I-5 with II-5, I-5 with II-6, I-5 with II-7, I-5 with II-8, I-5 with II-9, I-5 with II-10, I-5 with II-11, I-5 with II-12, or I-5 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-6 with II-1, I-6 with II-2, I-6 with II-3, I-6 with II-4, I-6 with II-5, I-6 with II-6, I-6 with II-7, I-6 with II-8, I-6 with II-9, I-6 with II-10, I-6 with II-11, I-6 with II-12, or I-6 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-7 with II-1, I-7 with II-2, I-7 with II-3, I-7 with II-4, I-7 with II-5, I-7 with II-6, I-7 with II-7, I-7 with II-8, I-7 with II-9, I-7 with II-10, I-7 with II-11, I-7 with II-12, or I-7 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-8 with II-1, I-8 with II-2, I-8 with II-3, I-8 with II-4, I-8 with II-5, I-8 with II-6, I-8 with II-7, I-8 with II-8, I-8 with II-9, I-8 with II-10, I-8 with II-11, I-8 with II-12, or I-8 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-9 with II-1, I-9 with II-2, I-9 with II-3, I-9 with II-4, I-9 with II-5, I-9 with II-6, I-9 with II-7, I-9 with II-8, I-9 with II-9, I-9 with II-10, I-9 with II-11, I-9 with II-12, or I-9 with II-13; and in addition to any

one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-10 with II-1, I-10 with II-2, I-10 with II-3, I-10 with II-4, I-10 with II-5, I-10 with II-6, I-10 with II-7, I-10 with II-8, I-10 with II-9, I-10 with II-10, I-10 with II-11, I-10 with II-12, or I-10 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-11 with II-1, I-11 with II-2, I-11 with II-3, I-11 with II-4, I-11 with II-5, I-11 with II-6, I-11 with II-7, I-11 with II-8, I-11 with II-9, I-11 with II-10, I-11 with II-11, I-11 with II-12, or I-11 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-12 with II-1, I-12 with II-2, I-12 with II-3, I-12 with II-4, I-12 with II-5, I-12 with II-6, I-12 with II-7, I-12 with II-8, I-12 with II-9, I-12 with II-10, I-12 with II-11, I-12 with II-12, or I-12 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-13 with II-1, I-13 with II-2, I-13 with II-3, I-13 with II-4, I-13 with II-5, I-13 with II-6, I-13 with II-7, I-13 with II-8, I-13 with II-9, I-13 with II-10, I-13 with II-11, I-13 with II-12, or I-13 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-14 with II-1, I-14 with II-2, I-14 with II-3, I-14 with II-4, I-14 with II-5, I-14 with II-6, I-14 with II-7, I-14 with II-8, I-14 with II-9, I-14 with II-10, I-14 with II-11, I-14 with II-12, or I-14 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-15 with II-1, I-15 with II-2, I-15 with II-3, I-15 with II-4, I-15 with II-5, I-15 with II-6, I-15 with II-7, I-15 with II-8, I-15 with II-9, I-15 with II-10, I-15 with II-11, I-15 with II-12, or I-15 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-16 with II-1, I-16 with II-2, I-16 with II-3, I-16 with II-4, I-16 with II-5, I-16 with II-6, I-16 with II-7, I-16 with II-8, I-16 with II-9, I-16 with II-10, I-16 with II-11, I-16 with II-12, or I-16 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-17 with II-1, I-17 with II-2, I-17 with II-3, I-17 with II-4, I-17 with II-5, I-17 with II-6, I-17 with II-7, I-17 with II-8, I-17 with II-9, I-17 with II-10, I-17 with II-11, I-17 with II-12, or I-17 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-18 with II-1, I-18 with II-2, I-18 with II-3, I-18 with II-4, I-18 with II-5, I-18 with II-6, I-18 with II-7, I-18 with II-8, I-18 with II-9, I-18 with II-10, I-18 with II-11, I-18 with II-12, or I-18 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-19 with II-1, I-19 with II-2, I-19 with II-3, I-19 with II-4, I-19 with II-5, I-19 with II-6, I-19 with II-7, I-19 with II-8, I-19 with II-9, I-19 with II-10, I-19 with II-11, I-19 with II-12, or I-19 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-20 with II-1, I-20 with II-2, I-20 with II-3, I-20 with II-4, I-20 with II-5, I-20 with II-6, I-20 with II-7, I-20 with II-8, I-20 with II-9, I-20 with II-10, I-20 with II-11, I-20 with II-12, or I-20 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

I-21 with II-1, I-21 with II-2, I-21 with II-3, I-21 with II-4, I-21 with II-5, I-21 with II-6, I-21 with II-7, I-21 with II-8, I-21 with II-9, I-21 with II-10, I-21 with II-11, I-21 with II-12, or I-21 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above.

Particularly preferred is the mixture of pyraclostrobin (I-1), metiram (II-1) and fipronil.

In a further embodiment the mixture of compound I and compound II as defined herein above comprises as herbicide (compound IV) at least one compound which is selected from the group of herbicides comprising: (i) phenoxy-carboxylic-acids; (ii) benzoic acids; (iiii) pyridine carboxylic acids (iv) quinoline carboxylic acids; (v) imidazolinones; (vi) benazolin-ethyl; (vii) amino-cylopyrachlor; (viii) glyphosate; (ix) glufosinate or (x) PROTOX enzyme inhibitors.

In a preferred embodiment said phenoxy-carboxylic-acid may be selected from the group comprising or consisting of clomeprop, 2,4-d, 2,4-db, dichlorprop, mcpa, mcpb and mecoprop.

In a preferred embodiment said benzoic acids may be selected from the group comprising or consisting of chloramben, dicamba and 2,3,6-tba.

In a preferred embodiment said pyridine carboxylic acid may be selected from the group comprising or consisting of aminopyralid, clopyralid, fluroxypyr, picloram and triclopyr.

In a preferred embodiment said quinoline carboxylic acid may be selected from the group comprising or consisting of quinclorac and quinmerac.

In a preferred embodiment said imidazolinone may be selected from the group comprising or consisting of imazamethabenz-methyl, imazamox, imazapic, imazapyr, imazaquin and imazethapyr.

In a preferred embodiment said PROTOX enzyme inhibitors may be selected from the group comprising or consisting of saflufenacil, oxyfluorfen, flumioxazin, carfentrazone, sulfrentrazone, lactofen and flumiclorac.

In a particularly preferred embodiment the mixture of the invention as defined herein above, i.e. the mixture of compound I and II as defined herein above, as well as the mixture of compound I, II and III as defined herein above additionally comprises as herbicide (compound IV) a compound of group (ii), i.e. a benzoic acid, a compound of group (viii), i.e. glyphosate, or a compound of group (ix), i.e. glufosinate, or a compound of group (x), i.e. saflufenacil.

More preferably, the mixture of the invention as defined herein above, i.e. the mixture of compound I and II as defined herein above, as well as the mixture of compound I, II and III as defined herein above additionally comprises as herbicide dicamba, glyphosate, saflufenacil or glufosinate. Even more preferably, the mixture of the invention as defined herein above, i.e. the mixture of compound I and II as defined herein above, as well as the mixture of compound I, II and III as defined herein above additionally comprises as herbicide dicamba or glyphosate.

In further specific embodiments a mixture according to the present invention as defined herein above, in particular a mixture comprising a compound I and a compound II, or a mixture comprising a compound I, II and III as defined herein above, may comprise 1, 2, 3, 4, 5, 6 or more of the herbicides (compound IV) of (i) to (x) as defined herein above.

The present invention accordingly envisages the use any one of the following combination of compounds within a synergistically working mixture:

I-1 with II-1, I-1 with II-2, I-1 with II-3, I-1 with II-4, I-1 with II-5, I-1 with II-6, I-1 with II-7, I-1 with II-8, I-1 with II-9, I-1 with II-10, I-1 with II-11, I-1 with II-12, or I-1 with II-13; and in addition to any

one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-2 with II-1, I-2 with II-2, I-2 with II-3, I-2 with II-4, I-2 with II-5, I-2 with II-6, I-2 with II-7, I-2 with II-8, I-2 with II-9, I-2 with II-10, I-2 with II-11, I-2 with II-12, or I-2 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-3 with II-1, I-3 with II-2, I-3 with II-3, I-3 with II-4, I-3 with II-5, I-3 with II-6, I-3 with II-7, I-3 with II-8, I-3 with II-9, I-3 with II-10, I-3 with II-11, I-3 with II-12, or I-3 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-4 with II-1, I-4 with II-2, I-4 with II-3, I-4 with II-4, I-4 with II-5, I-4 with II-6, I-4 with II-7, I-4 with II-8, I-4 with II-9, I-4 with II-10, I-4 with II-11, I-4 with II-12, or I-4 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-5 with II-1, I-5 with II-2, I-5 with II-3, I-5 with II-4, I-5 with II-5, I-5 with II-6, I-5 with II-7, I-5 with II-8, I-5 with II-9, I-5 with II-10, I-5 with II-11, I-5 with II-12, or I-5 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-6 with II-1, I-6 with II-2, I-6 with II-3, I-6 with II-4, I-6 with II-5, I-6 with II-6, I-6 with II-7, I-6 with II-8, I-6 with II-9, I-6 with II-10, I-6 with II-11, I-6 with II-12, or I-6 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-7 with II-1, I-7 with II-2, I-7 with II-3, I-7 with II-4, I-7 with II-5, I-7 with II-6, I-7 with II-7, I-7 with II-8, I-7 with II-9, I-7 with II-10, I-7 with II-11, I-7 with II-12, or I-7 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-8 with II-1, I-8 with II-2, I-8 with II-3, I-8 with II-4, I-8 with II-5, I-8 with II-6, I-8 with II-7, I-8 with II-8, I-8 with II-9, I-8 with II-10, I-8 with II-11, I-8 with II-12, or I-8 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-9 with II-1, I-9 with II-2, I-9 with II-3, I-9 with II-4, I-9 with II-5, I-9 with II-6, I-9 with II-7, I-9 with II-8, I-9 with II-9, I-9 with II-10, I-9 with II-11, I-9 with II-12, or I-9 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-10 with II-1, I-10 with II-2, I-10 with II-3, I-10 with II-4, I-10 with II-5, I-10 with II-6, I-10 with II-7, I-10 with II-8, I-10 with II-9, I-10 with II-10, I-10 with II-11, I-10 with II-12, or I-10 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-11 with II-1, I-11 with II-2, I-11 with II-3, I-11 with II-4, I-11 with II-5, I-11 with II-6, I-11 with II-7, I-11 with II-8, I-11 with II-9, I-11 with II-10, I-11 with II-11, I-11 with II-12, or I-11 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-12 with II-1, I-12 with II-2, I-12 with II-3, I-12 with II-4, I-12 with II-5, I-12 with II-6, I-12 with II-7, I-12 with II-8, I-12 with II-9, I-12 with II-10, I-12 with II-11, I-12 with II-12, or I-12 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-13 with II-1, I-13 with II-2, I-13 with II-3, I-13 with II-4, I-13 with II-5, I-13 with II-6, I-13 with II-7, I-13 with II-8, I-13 with II-9, I-13 with II-10, I-13 with II-11, I-13 with II-12, or I-13 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-14 with II-1, I-14 with II-2, I-14 with II-3, I-14 with II-4, I-14 with II-5, I-14 with II-6, I-14 with II-7, I-14 with II-8, I-14 with II-9, I-14 with II-10, I-14 with II-11, I-14 with II-12, or I-14 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-15 with II-1, I-15 with II-2, I-15 with II-3, I-15 with II-4, I-15 with II-5, I-15 with II-6, I-15 with II-7, I-15 with II-8, I-15 with II-9, I-15 with II-10, I-15 with II-11, I-15 with II-12, or I-15 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-16 with II-1, I-16 with II-2, I-16 with II-3, I-16 with II-4, I-16 with II-5, I-16 with II-6, I-16 with II-7, I-16 with II-8, I-16 with II-9, I-16 with II-10, I-16 with II-11, I-16 with II-12, or I-16 with II-13; and in

addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-17 with II-1, I-17 with II-2, I-17 with II-3, I-17 with II-4, I-17 with II-5, I-17 with II-6, I-17 with II-7, I-17 with II-8, I-17 with II-9, I-17 with II-10, I-17 with II-11, I-17 with II-12, or I-17 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-18 with II-1, I-18 with II-2, I-18 with II-3, I-18 with II-4, I-18 with II-5, I-18 with II-6, I-18 with II-7, I-18 with II-8, I-18 with II-9, I-18 with II-10, I-18 with II-11, I-18 with II-12, or I-18 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-19 with II-1, I-19 with II-2, I-19 with II-3, I-19 with II-4, I-19 with II-5, I-19 with II-6, I-19 with II-7, I-19 with II-8, I-19 with II-9, I-19 with II-10, I-19 with II-11, I-19 with II-12, or I-19 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-20 with II-1, I-20 with II-2, I-20 with II-3, I-20 with II-4, I-20 with II-5, I-20 with II-6, I-20 with II-7, I-20 with II-8, I-20 with II-9, I-20 with II-10, I-20 with II-11, I-20 with II-12, or I-20 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-21 with II-1, I-21 with II-2, I-21 with II-3, I-21 with II-4, I-21 with II-5, I-21 with II-6, I-21 with II-7, I-21 with II-8, I-21 with II-9, I-21 with II-10, I-21 with II-11, I-21 with II-12, or I-21 with II-13; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-1 with II-1, I-1 with II-2, I-1 with II-3, I-1 with II-4, I-1 with II-5, I-1 with II-6, I-1 with II-7, I-1 with II-8, I-1 with II-9, I-1 with II-10, I-1 with II-11, I-1 with II-12, or I-1 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-2 with II-1, I-2 with II-2, I-2 with II-3, I-2 with II-4, I-2 with II-5, I-2 with II-6, I-2 with II-7, I-2 with II-8, I-2 with II-9, I-2 with II-10, I-2 with II-11, I-2 with II-12, or I-2 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi)

as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-3 with II-1, I-3 with II-2, I-3 with II-3, I-3 with II-4, I-3 with II-5, I-3 with II-6, I-3 with II-7, I-3 with II-8, I-3 with II-9, I-3 with II-10, I-3 with II-11, I-3 with II-12, or I-3 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-4 with II-1, I-4 with II-2, I-4 with II-3, I-4 with II-4, I-4 with II-5, I-4 with II-6, I-4 with II-7, I-4 with II-8, I-4 with II-9, I-4 with II-10, I-4 with II-11, I-4 with II-12, or I-4 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-5 with II-1, I-5 with II-2, I-5 with II-3, I-5 with II-4, I-5 with II-5, I-5 with II-6, I-5 with II-7, I-5 with II-8, I-5 with II-9, I-5 with II-10, I-5 with II-11, I-5 with II-12, or I-5 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-6 with II-1, I-6 with II-2, I-6 with II-3, I-6 with II-4, I-6 with II-5, I-6 with II-6, I-6 with II-7, I-6 with II-8, I-6 with II-9, I-6 with II-10, I-6 with II-11, I-6 with II-12, or I-6 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-7 with II-1, I-7 with II-2, I-7 with II-3, I-7 with II-4, I-7 with II-5, I-7 with II-6, I-7 with II-7, I-7 with II-8, I-7 with II-9, I-7 with II-10, I-7 with II-11, I-7 with II-12, or I-7 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-8 with II-1, I-8 with II-2, I-8 with II-3, I-8 with II-4, I-8 with II-5, I-8 with II-6, I-8 with II-7, I-8 with II-8, I-8 with II-9, I-8 with II-10, I-8 with II-11, I-8 with II-12, or I-8 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-9 with II-1, I-9 with II-2, I-9 with II-3, I-9 with II-4, I-9 with II-5, I-9 with II-6, I-9 with II-7, I-9 with II-8, I-9 with II-9, I-9 with II-10, I-9 with II-11, I-9 with II-12, or I-9 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-10 with II-1, I-10 with II-2, I-10 with II-3, I-10 with II-4, I-10 with II-5, I-10 with II-6, I-10 with II-7, I-10 with II-8, I-10 with II-9, I-10 with II-10, I-10 with II-11, I-10 with II-12, or I-10 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-11 with II-1, I-11 with II-2, I-11 with II-3, I-11 with II-4, I-11 with II-5, I-11 with II-6, I-11 with II-7, I-11 with II-8, I-11 with II-9, I-11 with II-10, I-11 with II-11, I-11 with II-12, or I-11 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-12 with II-1, I-12 with II-2, I-12 with II-3, I-12 with II-4, I-12 with II-5, I-12 with II-6, I-12 with II-7, I-12 with II-8, I-12 with II-9, I-12 with II-10, I-12 with II-11, I-12 with II-12, or I-12 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-13 with II-1, I-13 with II-2, I-13 with II-3, I-13 with II-4, I-13 with II-5, I-13 with II-6, I-13 with II-7, I-13 with II-8, I-13 with II-9, I-13 with II-10, I-13 with II-11, I-13 with II-12, or I-13 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-14 with II-1, I-14 with II-2, I-14 with II-3, I-14 with II-4, I-14 with II-5, I-14 with II-6, I-14 with II-7, I-14 with II-8, I-14 with II-9, I-14 with II-10, I-14 with II-11, I-14 with II-12, or I-14 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from

insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-15 with II-1, I-15 with II-2, I-15 with II-3, I-15 with II-4, I-15 with II-5, I-15 with II-6, I-15 with II-7, I-15 with II-8, I-15 with II-9, I-15 with II-10, I-15 with II-11, I-15 with II-12, or I-15 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-16 with II-1, I-16 with II-2, I-16 with II-3, I-16 with II-4, I-16 with II-5, I-16 with II-6, I-16 with II-7, I-16 with II-8, I-16 with II-9, I-16 with II-10, I-16 with II-11, I-16 with II-12, or I-16 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-17 with II-1, I-17 with II-2, I-17 with II-3, I-17 with II-4, I-17 with II-5, I-17 with II-6, I-17 with II-7, I-17 with II-8, I-17 with II-9, I-17 with II-10, I-17 with II-11, I-17 with II-12, or I-17 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-18 with II-1, I-18 with II-2, I-18 with II-3, I-18 with II-4, I-18 with II-5, I-18 with II-6, I-18 with II-7, I-18 with II-8, I-18 with II-9, I-18 with II-10, I-18 with II-11, I-18 with II-12, or I-18 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-19 with II-1, I-19 with II-2, I-19 with II-3, I-19 with II-4, I-19 with II-5, I-19 with II-6, I-19 with II-7, I-19 with II-8, I-19 with II-9, I-19 with II-10, I-19 with II-11, I-19 with II-12, or I-19 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-20 with II-1, I-20 with II-2, I-20 with II-3, I-20 with II-4, I-20 with II-5, I-20 with II-6, I-20 with II-7, I-20 with II-8, I-20 with II-9, I-20 with II-10, I-20 with II-11, I-20 with II-12, or I-20 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

I-21 with II-1, I-21 with II-2, I-21 with II-3, I-21 with II-4, I-21 with II-5, I-21 with II-6, I-21 with II-7, I-21 with II-8, I-21 with II-9, I-21 with II-10, I-21 with II-11, I-21 with II-12, or I-21 with II-13; and in addition to any one of these combinations an insecticide compound (III) selected from insecticides (i) to (xxvi) as defined herein above; and in addition to any one of these combinations an herbicide compound (IV) selected from herbicides (i) to (x) as defined herein above.

It is also preferred that a mixture as defined herein above (comprising a fungicide (compound I) of the group of strobilurines; and a further fungicide (compound II) of the group of dithiocarbamates) additionally comprises a biological. In further preferred embodiments a mixture as defined herein above (comprising a fungicide (compound I) of the group of strobilurines; and a further fungicide (compound II) of the group of dithiocarbamates) may comprise an inoculant. Further preferred is that a mixture as defined herein above (comprising a fungicide (compound I) of the group of strobilurines; and a further fungicide (compound II) of the group of dithiocarbamates) comprises a biological and an inoculant. Further preferred is that a mixture as defined herein above (comprising a fungicide (compound I) of the group of strobilurines; and a further fungicide (compound II) of the group of dithiocarbamates) comprises an insecticide (compound III) and a herbicide (compound IV) and a biological. Further preferred is that a mixture as defined herein above (comprising a fungicide (compound I) of the group of strobilurines; and a further fungicide (compound II) of the group of dithiocarbamates) comprises an insecticide (compound III) and a herbicide (compound IV) and an inoculant. Also envisaged is that a mixture as defined herein above (comprising a fungicide (compound I) of the group of strobilurines; and a further fungicide (compound II) of the group of dithiocarbamates) comprises an insecticide (compound III) and a herbicide (compound IV) and a biological and an inoculant.

The term "biological" as used herein refers to any biological compound or effector, which can be mixed with a fungicide (compound I) of the group of strobilurines; and a further fungicide (compound II) of the group of dithiocarbamates, or with an insecticide (compound III) and a herbicide (compound IV). The biological may, for example, be a bio-insecticide or a bio-fungicide or a bio-pesticide. In a particularly preferred embodiment, said bio-pesticides may be

specific types of pesticides derived from natural materials, e.g. from animals, plants, bacteria, and certain minerals and which are capable of controlling pests, e.g. insects (bio-insecticide) or of controlling diseases, e.g. fungal infections (bio-fungicide).

Bio-pesticides typically fall into three major classes:
1) Microbial pesticides, which may comprise a microorganism (e.g., a bacterium, a fungus, a virus or a protozoan) as active ingredient. Microbial pesticides can control many different kinds of pests. Active ingredients may also be relatively specific for certain target pest[s]. The most widely used and and preferred microbial pesticides are subspecies and strains of *Bacillus thuringiensis* (Bt). Each strain of this bacterium typically produces a different mix of proteins, and is specifically able to kill one or more related species of insect larvae.
2) Plant-Incorporated-Protectants (PIPs), which are substances that plants produce from genetic material that has been introduced into the plants.
3) Biochemical pesticides, which are substances that are naturally occurring and which control pests by non-toxic mechanisms. Biochemical pesticides may include substances, such as insect sex pheromones that interfere with mating, or various scented plant extracts that attract insect pests to traps.

The biological may in particularly preferred embodiment be a bio-insecticide or a bio-fungicide. Examples of bio-insecticides which may be used in the context of the present invention are: *Bacillus thuringiensis* which produces toxins that are detrimental to certain insect pests when ingested, such as Lepidopterans; Baculoviruses which control insects when ingested, and e.g. kill Lepidopteran and Hymenopteran; *Zoophthora radicans* which controls insects by growing on them, secreting enzymes that weaken the insect's outer coat, and then getting inside the insect and continuing to grow, eventually killing the infected pest and may, for example control Aphids. In further embodiments, the biological may be a bio-fungicide.

Examples of bio-fungicides which may be used in the context of the present invention are: *Bacillus subtilis* which may control pathogens such as *Pythium, Rhizoctonia, Phytophthora* and *Fusarium*; or *Trichoderma harzianum,* which controls *Rhizoctonia, Fusarium, Sclerotinia, Pythium* in trees, shrubs, transplants, ornamentals or tomato.

The term "inoculant" as used herein refers to a microorganism, which is capable of infecting a plant, preferably a silvicultural plant. In a preferred embodiment, the inoculant is a bacterium. Particularly preferred is the use of bacteria of the genus *Azospirilum*. Suitable examples of species of this genus include *Azospirilum brasiliense* that has been demonstrated to be beneficial due to nitrogen fixation and may be helpful for plant nutrition in case of non-leguminous crops; *Rhizobium* which is a nitrogen-fixing bacterium forming symbiotic

associations within nodules on the roots of legumes; or *Agrobacterium radiobacter* which may improve phosphorus nutrition.

In a particularly preferred embodiment of the present invention the mixture comprises pyraclostrobin, metiram, fipronil and (i) dicamba, or (ii) glyphosate, or (iii) glufosinate or (iv) saflufenacil.

The mixtures as defined herein above may comprise the compounds in all suitable chemical forms, e.g. as crystals, in particular in polymorphic crystal forms, or as hydrates etc. or provided as suitable silviculturally acceptable salts. The term "silviculturally acceptable salt" as used herein refers to salts which allow for a rapid dissolution of the compound, e.g. in liquids such as water, and which do not provide any phytotoxic effect on the treated plant.

In a further aspect the present invention relates to a method for synergistically increasing the health of a silvicultural plant. The method may be performed by applying to a silvicultural plant propagation material at any time during the vegetative and/or reproductive growth stage at least once any mixture as defined herein above (e.g. comprising compounds I and II, or I and II and III, or I and II and IV, or I and II and III and IV).

Additionally or alternatively, the method may be performed by applying to the locus where the silvicultural plant or plant seedling is growing or expected to grow at any time during the vegetative and/or reproductive growth stage at least once any mixture as defined herein above (e.g. comprising compounds I and II, or I and II and III, or I and II and IV, or I and II and III and IV).

Additionally or alternatively, the method may be performed by applying to the substrate in which the silvicultural plant or plant seedling is growing or expected to grow at any time during the vegetative and/or reproductive growth stage at least once any mixture as defined herein above (e.g. comprising compounds I and II, or I and II and III, or I and II and IV, or I and II and III and IV).

Additionally or alternatively, the method may be performed by applying to the silvicultural plant, or part of the silvicultural plant, preferably the leaves (foliar application) at any time during the vegetative and/or reproductive growth stage at least once any mixture as defined herein above (e.g. comprising compounds I and II, or I and II and III, or I and II and IV, or I and II and III and IV).

The term "plant propagation material" as used in the context of the above defined method according to the present invention refers to all the generative parts of the plant such as seeds and vegetative silvicultural plant material such as cuttings and tubers, which can be used for the multiplication of the plant. This includes seeds, grains, roots, fruits, tubers, bulbs, rhizomes, cuttings, spores, offshoots, shoots, sprouts and other parts of silvicultural plants, including seedlings and young silvicultural plants, which are to be transplanted after germination or after emergence from soil, meristem tissues, single and multiple plant cells and any other plant tissue from which a complete silvicultural plant can be obtained. In preferred embodiment the silvicultural plant propagation material is a seed or seedling. Particularly preferred is a method to be performed on or with silvicultural plant seedlings.

The term "propagules" or "plant propagules" is to be understood to denote any structure with the capacity to give rise to a new silvicultural plant, e.g. a seed, a spore, or a part of the vegetative body capable of independent growth if detached from the parent. In a preferred embodiment, the term "propagules" or "plant propagules" means seed.

The term "locus" as used herein is to be understood as any type of environment, soil, area or material where the silvicultural plant is growing or intended to grow as well as the environmental conditions (such as temperature, water availability, radiation) that have an influence on the growth and development of the silvicultural plant and/or its propagules.

The term "application" or "applying" as used herein refers to the treatment of silvicultural plant propagation material, the locus of silvicultural plants or parts thereof, the substrate of silvicultural plants, or silvicultural plants, or parts thereof with a mixture as defined herein above. The treatment or application may be a single application or a repeated application or treatment. A repeated treatment may include 2, 3, 4, 5, 6, 7, 8, 9, 10 or more applications of the inventive mixture to the silvicultural plant. The application form or technique may either be identical or different, e.g. first a mixture with substrate may be carried out, later on a spraying or watering application may be used. In case of a repeated application or treatment, the treatment may be carried out in flexible time intervals, or in fixed time intervals, e.g. every day, every 2^{nd}, 3^{rd}, 4^{th}, 5^{th}, 6^{th}, 7^{th}, 8^{th}, 9^{th}, 10^{th}, 11^{th}, 12^{th}, 13^{th}, 14^{th}, 15^{th}, 16^{th}, 17^{th}, 18^{th}, 19^{th}, 20^{th}, 21^{st}, 22^{nd}, 23^{rd}, 24^{th}, 25^{th}, 26^{th}, 28^{th}, 29^{th}, or 30^{th} day, every month, 2^{nd} month, 3^{rd} month, 4^{th} month, 5^{th} month, 6^{th} month 7^{th} month, 8^{th} month, 9^{th} month, 10^{th} month, 11^{th} month, 12 month or at any interval in between the mentioned intervals. Repeated treatments may be carried out for any suitable period of time, e.g. for one day, 2 days, 3 days, 4 days, 5 days, 6 days, 7 days, 1 week, 2 weeks, 3 weeks, 4 weeks, 2 months, 3 months, 4 months, 5 months, 6 months, 7 months, 8 months, 9 months, 10 months, 11 months, 12 months, 2 years, 3 years, 4 years, 5 years or more on any time period in between the mentioned time periods. Also envisaged are any

combinations of time intervals and time periods and repetitions as defined herein above. Furthermore, during the repetition of an application, the concentration of the fungicide, insecticide or herbicide may be changed, e.g. adapted to the size or form of the plant. Also the proportion of compound I and II, or of I and II and III, or of I and II and IV, or of I and II and III and IV may be changed, e.g. adapted to the size or form of the plant, different soil or climate situations (e.g. inside and outside of the greenhouse), different biotic and abiotic stresses etc.

In further embodiments, the application or treatment of the silvicultural plant may depend on the material to be treated, and/or the form or growth stage of the silvicultural plant.

In one embodiment of the present invention, the treatment or application is carried out spraying the mixture or parts of the mixture to the plant or plant parts, e.g. by using a pre-dosage device, a knapsack sprayer, a portable sprinkler, a CO_2 pressurized sprayer, a spray tank or a spray plane. Also envisaged are any other types of spraying.

In another embodiment, the inventive mixture is applied to the plant by mixing it with substrate in which the plant, in particular the seedling is growing or about to grow. The term "substrate" as used herein refers to any suitable vegetal and mineral raw materials comprising, for example, Pinus tree skin, vermiculite, rice stalks, charcoal, peat and/or sand types. The substrate may additionally be mixed or treated with an effective amount of mixture as defined herein above.

In further embodiments the application of the inventive mixture to the silvicultural plant may be carried out by foliar application. The term "foliar application" as used herein refers to the treatment of the plant's leaves. This can be done by spraying the leaves with any suitable technique, or by brushing the leaves, e.g. in a greenhouse, or by spreading the mixture with the help of further auxiliary ingredients, e.g. hydrophobines.

In further embodiments the application of the inventive mixture to the silvicultural plant may be carried out by adding them to water or liquids to be applied directly to the silvicultural plants. The watering process may accordingly lead to a providing of the mixtures to the silvicultural plant's roots or lower portions.

Any of the above described application or treatment techniques may be combined with each other. Thus, during the life cycle of one silvicultural plant, one, two, three or more different application techniques may be used.

The application can further be carried out in the absence of pest pressure and/or both before and after an infection of the materials, silvicultural plants or silvicultural plant propagation materials (preferably seeds) by pests.

The term "at any time during the vegetative and/or reproductive growth stage" as used herein refers to all growth stages of the extended BBCH scale, in particular to growth stages 00 to 97 of the BBCH scale. According the term "growth stage" (GS) refers to the extended BBCH-scale which is a system for a uniform coding of phenologically similar growth stages of all mono- and dicotyledonous plant species in which the entire developmental cycle of the plants is subdivided into clearly recognizable and distinguishable longer-lasting developmental phases, starting with phase 00 and ending with phase 97. The BBCH-scale uses a decimal code system, which is divided into principal and secondary growth stages. The abbreviation BBCH derives from the Federal Biological Research Centre for Agriculture and Forestry (Germany), the Bundessortenamt (Germany) and the chemical industry.

In specific embodiment of the invention, a mixture for increasing the health of a plant as defined herein above may be applied at a growth stage (GS) between GS 00 and GS 73 BBCH of the treated silvicultural plant. In a preferred embodiment of the invention, a mixture for increasing the health of a silvicultural plant as defined herein above may be applied at a growth stage (GS) between GS 00 and GS 71 BBCH of the treated silvicultural plant. In another preferred embodiment of the invention, a mixture for increasing the health of a plant as defined herein above may be applied at a growth stage (GS) between GS 12 and GS 49 BBCH of the treated silvicultural plant. In yet another preferred embodiment of the invention, a mixture for increasing the health of a plant as defined herein above may be applied at a growth stage (GS) between GS 12 and GS 16 BBCH of the treated silvicultural plant. In yet another preferred embodiment of the invention, a mixture for increasing the health of a plant as defined herein above may be applied at a growth stage (GS) between GS 01 and GS 19 BBCH of the treated silvicultural plant. Further preferred is the application of the mixture between GS 01 and 09. The present invention, however, envisages also the treatment of silvicultural plants at any other GS according to the extended BBCH scale.

For uses or methods according to the present invention, the inventive mixtures as defined herein above can be converted into suitable formulations. Recipes and details for the preparation of such formulation would be known to the skilled person, or can be derived from any suitable literature source. In preferred examples, the formulation may be, for example, a solution, an emulsions, a suspension, a dust, a powder, a paste or a granule. The use form typically depends on the particular intended purpose; in each case, it should ensure a fine and even distribution of the mixtures according to the present invention. The formulations are, for

example, prepared according to the teaching of US 3,060,084, EP-A 707 445 (for liquid concentrates), Browning: "Agglomeration", Chemical Engineering, Dec. 4, 1967, 147-48, Perry's Chemical Engineer's Handbook, 4th Ed., McGraw-Hill, New York, 1963, S. 8-57 und ff. WO 91/13546, US 4,172,714, US4,144,050, US3,920,442, US 5,180,587, US 5,232,701, US 5,208,030, GB2,095,558, US 3,299,566, Klingman: Weed Control as a Science (J. Wiley & Sons, New York, 1961), Hance et al.: Weed Control Handbook (8th Ed., Blackwell Scientific, Oxford, 1989) and/or Mollet, H. and Grubemann, A.: Formulation Technology (Wiley VCH Verlag, Weinheim, 2001).

The formulations according to the present invention may, in addition to the mixture of compounds I and II, or I and II and III, or I and II and IV, or I and II and III and IV additionally comprise suitable auxiliaries. The auxiliaries used depend on the particular application form and active substance, respectively. Examples for suitable auxiliaries are solvents, solid carriers, dispersants or emulsifiers (such as solubilizers, protective colloids, surfactants and adhesion agents), organic and inorganic thickeners, bactericides, anti-freezing agents, anti-foaming agents, optionally colorants and tackifiers or binders (e.g. for seed treatment formulations).

Suitable solvents as envisaged by the present invention are water, organic solvents such as mineral oil fractions of medium to high boiling point, e.g. kerosene or diesel oil, furthermore coal tar oils and oils of vegetable or animal origin, aliphatic, cyclic and aromatic hydrocarbons, e.g. toluene, xylene, paraffin, tetrahydronaphthalene, alkylated naphthalenes or their derivatives, alcohols such as methanol, ethanol, propanol, butanol and cyclohexanol, glycols, ketones such as cyclohexanone and gamma-butyrolactone, fatty acid dimethylamides, fatty acids and fatty acid esters and strongly polar solvents, e.g. amines such as N-methylpyrrolidone.

Examples of suitable solid carriers to be used in the context of the present invention are mineral earths such as silicates, silica gels, talc, kaolins, limestone, lime, chalk, bole, loess, clays, dolomite, diatomaceous earth, calcium sulfate, magnesium sulfate, magnesium oxide, ground synthetic materials, fertilizers, such as, e.g. ammonium sulfate, ammonium phosphate, ammonium nitrate, ureas, and products of vegetable origin, such as cereal meal, tree bark meal, wood meal and nutshell meal, cellulose powders and other solid carriers.

Examples of suitable surfactants, adjuvants, wetters, tackifiers, dispersants or emulsifiers to be used in the context of the present invention include alkali metals, alkaline earth metals and ammonium salts of aromatic sulfonic acids, such as ligninsoulfonic acid (Borresperse® types, Borregard, Norway) phenolsulfonic acid, naphthalenesulfonic acid (Morwet® types, Akzo Nobel, U.S.A.), dibutylnaphthalene-sulfonic acid (Nekal® types, BASF, Germany),and fatty acids, alkylsulfonates, alkylarylsulfonates, alkyl sulfates, laurylether sulfates, fatty alcohol sulfates, and

sulfated hexa-, hepta- and octadecanolates, sulfated fatty alcohol glycol ethers, furthermore condensates of naphthalene or of naphthalenesulfonic acid with phenol and formaldehyde, polyoxy-ethylene octylphenyl ether, ethoxylated isooctylphenol, octylphenol, nonylphenol, alkylphenyl polyglycol ethers, tributylphenyl polyglycol ether, tristearylphenyl polyglycol ether, alkylaryl polyether alcohols, alcohol and fatty alcohol/ethylene oxide condensates, ethoxylated castor oil, polyoxyethylene alkyl ethers, ethoxylated polyoxypropylene, lauryl alcohol polyglycol ether acetal, sorbitol esters, lignin-sulfite waste liquid and proteins, denatured proteins, polysaccharides (e.g. methylcellulose), hydrophobically modified starches, polyvinyl alcohols (Mowiol® types, Clariant, Switzerland), polycarboxylates (Sokolan® types, BASF, Germany), polyalkoxylates, polyvinylamines (Lupasol® types, BASF, Germany), polyvinylpyrrolidone and the copolymers thereof.

Examples of suitable thickeners (i.e. compounds that impart a modified flowability to formulations, i.e. high viscosity under static conditions and low viscosity during agitation) are polysaccharides and organic and anorganic clays such as Xanthan gum (Kelzan®, CP Kelco, U.S.A.), Rhodopol® 23 (Rhodia, France), Veegum® (R.T. Vanderbilt, U.S.A.) or Attaclay® (Engelhard Corp., NJ, USA).

In specific embodiments bactericides may be added for preservation and stabilization of a formulation. Examples of suitable bactericides to be used in the context of the present invention are compounds based on dichlorophene and benzylalcohol hemi formal (Proxel® from ICI or Acticide® RS from Thor Chemie and Kathon® MK from Rohm & Haas) and isothiazolinone derivatives such as alkylisothiazolinones and benzisothiazolinones (Acticide® MBS from Thor Chemie).

Examples of suitable anti-freezing agents to be used in the context of the present invention are ethylene glycol, propylene glycol, urea and glycerin. Examples for anti-foaming agents are silicone emulsions (such as e.g. Silikon® SRE, Wacker, Germany or Rhodorsil®, Rhodia, France), long chain alcohols, fatty acids, salts of fatty acids, fluoroorganic compounds and mixtures thereof.

Suitable colorants which may be used in the context of the present invention are pigments of low water solubility and water-soluble dyes. Examples to be mentioned und the designations rhodamin B, C. I. pigment red 112, C. I. solvent red 1, pigment blue 15:4, pigment blue 15:3, pigment blue 15:2, pigment blue 15:1, pigment blue 80, pigment yellow 1, pigment yellow 13, pigment red 112, pigment red 48:2, pigment red 48:1, pigment red 57:1, pigment red 53:1, pigment orange 43, pigment orange 34, pigment orange 5, pigment green 36, pigment green 7,

pigment white 6, pigment brown 25, basic violet 10, basic violet 49, acid red 51, acid red 52, acid red 14, acid blue 9, acid yellow 23, basic red 10, basic red 108.

Examples of suitable tackifiers or binders include polyvinylpyrrolidons, polyvinylacetates, polyvinyl alcohols and cellulose ethers (Tylose®, Shin-Etsu, Japan).

In specific embodiments, powders, materials for spreading and dusts can be prepared by mixing or concomitantly grinding the compounds (I) and/or (II) and/or (III) and/or (IV) and, if appropriate, further active substances, with at least one solid carrier.

Granules, e.g. coated granules, impregnated granules and homogeneous granules, may be prepared by binding the active substances to solid carriers. Suitable examples of solid carriers to be used in the context of the present invention are mineral earths such as silica gels, silicates, talc, kaolin, attaclay, limestone, lime, chalk, bole, loess, clay, dolomite, diatomaceous earth, calcium sulfate, magnesium sulfate, magnesium oxide, ground synthetic materials, fertilizers, such as, e.g., ammonium sulfate, ammonium phosphate, ammonium nitrate, ureas, and products of vegetable origin, such as cereal meal, tree bark meal, wood meal and nutshell meal, cellulose powders and other solid carriers.

In specific embodiments of the present invention several formulation types may be provided. Suitable examples of formulation types which can employed in the context of the present invention are:

1. Composition types for dilution with water

i) Water-soluble concentrates (SL, LS)

10 parts by weight of compounds of a mixture as defined herein above are dissolved in 90 parts by weight of water or in a water-soluble solvent. Optionally, wetting agents or other auxiliaries may be added. The active substance dissolves upon dilution with water. In this way, a formulation having a content of 10% by weight of active substances may be obtained.

ii) Dispersible concentrates (DC)

20 parts by weight of compounds of a mixture as defined herein above are dissolved in 70 parts by weight of cyclohexanone with addition of 10 parts by weight of a dispersant, e. g. polyvinylpyrrolidone. Dilution with water gives a dispersion. The active substance content is 20% by weight.

iii) Emulsifiable concentrates (EC)

15 parts by weight of compounds of a mixture as defined herein above are dissolved in 75 parts by weight of xylene with addition of calcium dodecylbenzenesulfonate and castor oil ethoxylate (in each case 5 parts by weight). Dilution with water gives an emulsion. The composition has an active substance content of 15% by weight.

iv) Emulsions (EW, EO, ES)

25 parts by weight of compounds of a mixture as defined herein above are dissolved in 35 parts by weight of xylene with addition of calcium dodecylbenzenesulfonate and castor oil ethoxylate (in each case 5 parts by weight). This mixture may be introduced into 30 parts by weight of water by means of an emulsifying machine (Ultraturrax) and made into a homogeneous emulsion. Dilution with water gives an emulsion. The composition has an active substance content of 25% by weight.

v) Suspensions (SC, OD, FS)

In an agitated ball mill, 20 parts by weight of compounds of a mixture as defined herein above are comminuted with addition of 10 parts by weight of dispersants and wetting agents and 70 parts by weight of water or an organic solvent to give a fine active substance suspension. Dilution with water gives a stable suspension of the active substance. The active substance content in the composition is 20% by weight.

vi) Water-dispersible granules and water-soluble granules (WG, SG)

50 parts by weight of compounds of a mixture as defined herein above are ground finely with addition of 50 parts by weight of dispersants and wetting agents and prepared as water-dispersible or water-soluble granules by means of technical appliances (e. g. extrusion, spray tower, fluidized bed). Dilution with water gives a stable dispersion or solution of the active substance. The composition has an active substance content of 50% by weight.

vii) Water-dispersible powders and water-soluble powders (WP, SP, SS, WS)

75 parts by weight of compounds of a mixture as defined herein above are ground in a rotor-stator mill with addition of 25 parts by weight of dispersants, wetting agents and silica gel. Dilution with water gives a stable dispersion or solution of the active substance. The active substance content of the composition is 75% by weight.

viii) Gel (GF)

In an agitated ball mill, 20 parts by weight of compounds of a mixture as defined herein above are comminuted with addition of 10 parts by weight of dispersants, 1 part by weight of a gelling agent wetters and 70 parts by weight of water or of an organic solvent to give a fine suspension of the active substance. Dilution with water gives a stable suspension of the active substance, whereby a composition with 20% (w/w) of active substance is obtained.

2. Composition types to be applied undiluted

ix) Dustable powders (DP, DS)

5 parts by weight of compounds of a mixture as defined herein above are ground finely and mixed intimately with 95 parts by weight of finely divided kaolin. This gives a dustable composition having an active substance content of 5% by weight.

x) Granules (GR, FG, GG, MG)

0.5 parts by weight of compounds of a mixture as defined herein above is ground finely and associated with 99.5 parts by weight of carriers. Current methods are extrusion, spray-drying or

the fluidized bed. This gives granules to be applied undiluted having an active substance content of 0.5% by weight.

xi) ULV solutions (UL)

10 parts by weight of compounds of a mixture as defined herein above are dissolved in 90 parts by weight of an organic solvent, e. g. xylene. This gives a composition to be applied undiluted having an active substance content of 10% by weight.

The formulations according to the present invention may generally comprise between 0.01 and 95%, preferably between 0.1 and 90%, more preferably between 0.5 and 90%, by weight of active substances. The compounds of the inventive mixtures may be employed in any suitable purity, e.g. in a purity of 90% to 100%, preferably from 95% to 100% (according to NMR spectrum).

The compounds a mixture as defined herein above can be used as such or in the form of their compositions, e.g. in the form of directly sprayable solutions, powders, suspensions, dispersions, emulsions, oil dispersions, pastes, dustable products, materials for spreading, or granules, by means of spraying, atomizing, dusting, spreading, brushing, immersing or pouring. The application forms depend entirely on the intended purposes; it is intended to ensure in each case the finest possible distribution of the compounds present in the inventive mixtures.

Aqueous application forms can be prepared from emulsion concentrates, pastes or wettable powders (sprayable powders, oil dispersions) by adding water. To prepare emulsions, pastes or oil dispersions, the substances, as such or dissolved in an oil or solvent, can be homogenized in water by means of a wetter, tackifier, dispersant or emulsifier. Alternatively, it is possible to prepare concentrates composed of active substance, wetter, tackifier, dispersant or emulsifier and, if appropriate, solvent or oil, and such concentrates are suitable for dilution with water.

The active substance concentrations in the ready-to-use preparations can be varied within relatively wide ranges. In general, they are from 0.0001 to 10%, preferably from 0.001 to 1% by weight of compounds of the inventive mixtures.

The compounds of a mixture as defined herein above may also be used successfully in the ultra-low-volume process (ULV), it being possible to apply compositions comprising over 95% by weight of active substance, or even to apply the active substance without additives.

Various types of oils, wetters, adjuvants, further pesticides, or bactericides may be added to the active compounds, if appropriate not until immediately prior to use (tank mix). These agents can

be admixed with the compounds of the a mixture according to the present invention in a weight ratio of 1:100 to 100:1, preferably 1:10 to 10:1.

In specific embodiments compositions of this invention may also contain fertilizers such as ammonium nitrate, urea, potash, and superphosphate, phytotoxicants and plant growth regulators and safeners. These may be used sequentially or in combination with the above-described compositions, if appropriate also added only immediately prior to use (tank mix). For example, the silvicultural plant(s) may be sprayed with a composition of this invention either before or after being treated with the fertilizers.

The compounds (I) and (II), or (I) and (II) and (III), or (I) and (II) and (IV), or (I) and (II) and (III) and (IV) contained in the mixtures as defined above can be applied simultaneously, that is jointly or separately, or in succession, the sequence, in the case of separate application, generally not having any effect on the result of the control measures.

According to this invention, applying the compounds (I) and (II), or (I) and (II) and (III), or (I) and (II) and (IV), or (I) and (II) and (III) and (IV) is to be understood to denote, that the compounds (I) and (II) and optionally (III) and (IV) are provided simultaneously at the site of action (i.e. silvicultural plant, silvicultural plant propagation material (preferably seed or seedling), soil, area, material or environment in which a plant is growing or may grow) in an effective amount. Compounds (I) and (II), or (I) and (II) and (III), or (I) and (II) and (IV), or (I) and (II) and (III) and (IV) may further be applied either jointly (e.g. as tank-mix) or separately, or in succession, wherein the time interval between the individual applications is selected to ensure that the active substance applied first still occurs at the site of action in a sufficient amount at the time of application of the further active substance(s). The order of application may be varied, but is generally considered to be not essential for working of the present invention.

In the mixtures of the present invention as defined and characterized herein above, i.e. comprising compounds (I) and (II), or (I) and (II) and (III), or (I) and (II) and (IV), or (I) and (II) and (III) and (IV), the weight ratio of the compounds generally depends from the properties of the compounds of the inventive mixtures.

The compounds of the mixtures as defined herein above may be used individually or already partially or completely mixed with one another to prepare the composition according to the invention. It is also possible for them to be packaged and used further as combination composition such as a kit of parts.

In a specific embodiment of the invention, the kits may include one or more, including all, components that may be used to prepare a composition comprising the mixtures as defined herein above. For example, kits may include the compounds (I) and (II), or (I) and (II) and (III), or (I) and (II) and (IV), or (I) and (II) and (III) and (IV) and/or an adjuvant component and/or a further pesticidial compound and/or a growth regulator component). One or more of the components may already be combined together or pre-formulated. In those embodiments where more than two components are provided in a kit, the components may already be combined together and as such may be packaged in a single container such as a vial, bottle, can, pouch, bag or canister. In other embodiments, two or more components of a kit may be packaged separately, i.e., not pre-formulated. According to further specific embodiments, kits may include one or more separate containers such as vials, cans, bottles, pouches, bags or canisters, each container containing a separate component for an agrochemical composition. In both forms, a component of the kit may be applied separately from or together with the further components or as a component of a combination composition according to the invention for preparing the composition according to the invention.

The user applies the composition according to the invention from any suitable device. Examples of such devices are a pre-dosage device, a knapsack sprayer, a spray tank or a spray plane. In this context, the composition may be made up with water and/or buffer to the desired application concentration, it being possible, if appropriate, to add further auxiliaries, and the ready-to-use spray liquid or the agrochemical composition according to the invention is thus obtained. In typical embodiments, 50 to 500 liters of a ready-to-use spray liquid may be applied per hectare of agricultural useful area, preferably 50 to 400 liters. Further amounts of spray liquids are, however, also envisaged by the present invention.

According to a further embodiment, individual compounds of a mixture according to the present invention as defined herein above may be formulated as composition (or formulation) or partially premixed components in a way that parts of a kit or parts of the inventive mixture may be mixed by the user himself in a spray tank and further auxiliaries may be added, if appropriate (tank mix).

In a further embodiment, either individual components of the composition according to the invention or partially premixed components can be applied jointly (e.g. after tankmix) or consecutively.

In a further embodiment of the envisaged method according to the invention, the silvicultural plants and/or plant propagules or seedlings are treated simultaneously (together or separately) or subsequently with a mixture as described above. Such subsequent application can be carried

out with a time interval which allows a combined action of the applied compounds. Preferably, the time interval for a subsequent application of compounds (I) and (II), or (I) and (II) and (III), or (I) and (II) and (IV), or (I) and (II) and (III) and (IV) ranges from a few seconds up to 3 months, preferably, from a few seconds up to 1 month, more preferably from a few seconds up to 2 weeks, even more preferably from a few seconds up to 3 days and in particular from 1 second up to 24 hours.

With respect to ratios of compounds in the mixtures, the weight ratio of compound (I) (= component 1) to compound (II) (= component 2) may be any suitable ratio, ranging preferably from 100:1 to 1:100, more preferably from 50:1 to 1:50, more preferably from 20:1 to 1:20 and in particular from 10:1 to 1:10. The utmost preferred ratio is 1:5 to 5:1.

Within the mixtures, the weight ratio of compound (I) (= component 1) to the further compound (III) (= component 3) may be any suitable ratio, ranging preferably from 100:1 to 1:100, more preferably from 50:1 to 1:50, more preferably from 20:1 to 1:20 and in particular from 10:1 to 1:10. The utmost preferred ratio is 1:5 to 5:1.

Within the mixtures, the weight ratio of compound (II) (= component 2) to the further compound (III) (= component 3) may be any suitable ratio, ranging preferably from 100:1 to 1:100, more preferably from 50:1 to 1:50, more preferably from 20:1 to 1:20 and in particular from 10:1 to 1:10. The utmost preferred ratio is 1:5 to 5:1.

Within the mixtures, the weight ratio of compound (I) (= component 1) to the further compound (IV) (= component 4) may be any suitable ratio, ranging preferably from 100:1 to 1:100, more preferably from 50:1 to 1:50, more preferably from 20:1 to 1:20 and in particular from 10:1 to 1:10. The utmost preferred ratio is 1:5 to 5:1.

Within the mixtures, the weight ratio of compound (II) (= component 2) to the further compound (IV) (= component 4) may be any suitable ratio, ranging preferably from 100:1 to 1:100, more preferably from 50:1 to 1:50, more preferably from 20:1 to 1:20 and in particular from 10:1 to 1:10. The utmost preferred ratio is 1:5 to 5:1.

Compositions, which are especially useful for seed treatment are e.g.:

A Soluble concentrates (SL, LS)
D Emulsions (EW, EO, ES)
E Suspensions (SC, OD, FS)
F Water-dispersible granules and water-soluble granules (WG, SG)

G Water-dispersible powders and water-soluble powders (WP, SP, WS)

H Gel-formulations (GF)

I Dustable powders (DP, DS)

These compositions can be applied to plant propagation materials, particularly seeds, diluted or undiluted. The compositions in question give, after two-to-tenfold dilution, active substance concentrations of from 0.01 to 60% by weight, preferably from 0.1 to 40% by weight, in the ready-to-use preparations. Application can be carried out before or during sowing. Methods for applying or treating compounds and compositions thereof, respectively, on to plant propagation material, especially seeds, are known in the art, and include dressing, coating, pelleting, dusting and soaking application methods of the propagation material (and also in furrow treatment). In a preferred embodiment, the compounds or the compositions thereof, respectively, are applied on to the plant propagation material by a method such that germination is not induced, e. g. by seed dressing, pelleting, coating and dusting.

In the treatment of plant propagation material (preferably seed), the application rates of mixture as defined herein above are generally for the formulated product (which usually comprises from 10 to 750 g/l of the active(s)).

In specific embodiments, the invention also relates to the propagation products of silvicultural plants, and especially the seed comprising, that is, coated with and/or containing, a mixture as defined above or a composition containing the mixture of two or more active ingredients or a mixture of two or more compositions each providing one of the active ingredients. The plant propagation material (preferably seed) comprises the mixture as defined herein above in an amount of from 0.01 g to 10 kg per 100 kg of plant propagation material (preferably seed).

In further preferred embodiments, the mixture according to the present invention, in particular the mixture comprising compound I and II, e.g. pyraclostrobin and metiram, may be provided in any suitable dosage or concentration to the silvicultural plant. Envisaged concentrations are between about 0.01 kg/ha to 10.0 kg/ha. For example, concentrations of 0.01, 0.02, 0.03, 0.04, 0.05, 0.06, 0.07, 0.08. 0.09. 0.1, 0.11, 0.12, 0.13, 0.14, 0.15, 0.16, 0.17, 0.18, 0.19, 0.2, 0.21, 0.22, 0.23, 024, 025, 0.26, 027, 028, 0.29, 0.3, 0.31, 0.32, 0.33, 0.34, 0.35, 0.36, 0.37, 0.38, 0.39, 0.4, 0.41, 0.42, 0.43, 0.44, 0.45, 0.46, 0.47, 0.48, 0.49, 0.5, 0.6, 0.7. 0.8, 0.9, 1.0, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2, 3, 4, 5, 6, 7, 8, 9 or 10 kg/ha may be used. For example, concentration ranges of 0.02 to 5 kg/ha, 0.05 to 3 kg/ha, 0.1 to 0.8 kg/ha, 0.15 to 0.5 kg/ha, 0.15 to 0.3 kg/ha etc. may be used. A further preferred range is a concentration of 0.2 kg/ha or 0.4 kg/ha. In further embodiments, the concentration ranges may be of 0.02 to 5 kg/100 liter water, 0.05 to 3 kg/100 liter water, 0.1 to 0.8 kg/100 liter water, 0.15 to 0.5 kg/100 liter water, 0.15 to

0.3 kg/ 100 liter water. Particularly preferred is the employment of a concentration of 0.2 kg/100 liter water or 0.4 kg/100 liter water.

The separate or joint application of the compounds of a mixture as defined herein above may preferably be carried out by spraying or dusting the seeds, the seedlings, the plants or the soils before or after sowing of the plants or before or after emergence of the plants.

In a further embodiment of the present invention the silvicultural plant as mentioned herein is any suitable silvicultural plant. The plant may accordingly be a tropical silvicultural plant, or a temperate silvicultural plant. Preferred examples of silvicultural plants to be treated with mixtures as defined herein above are beech (*Fagus* spec.), birch, eucalyptus, fir, oak, oil-palm, pine (*Pinus* spec.), poplar (*Populus* spec.), rubber tree, wattle, spruce, teak and willow (*Salix* spec.). Particularly preferred is the use of plants of the genus Eucalyptus. Examples of suitable Eucalyptus species include *Eucalyptus grandis, Eucalyptus urograndis, Eucalyptus pellita, Eucalyptus urophylla* and *Eucalyptus camaldulensis*. The current invention further envisages the employment of hybrid Eucalyptus plants, or any suitable Eucalyptus species variant or clone known to the skilled person. Examples of such clones include clone SP 519, clone C-041 (both *Eucalyptus urograndis*: hybrid of *Eucalyptus grandis* x *Eucalyptus urophylla*), or clone I144 (*Eucalyptus urophylla*).

In a further embodiment of the present invention the silvicultural plant as characterized herein above may be a modified plant. The term "modified plant" as used herein refers to a modification of Wildtype plant forms by breeding, mutagenesis and/or genetic engineering (transgenic and non-transgenic plants).

In a preferred embodiment of the present invention, a silvicultural plant as defined herein above is a genetically modified silvicultural plant.

The term "genetically modified silvicultural plant" refers to silvicultural plants, whose genetic material has been modified by the use of recombinant DNA techniques in a way that it cannot readily be obtained by cross breeding under natural circumstances, mutations or natural recombination. Typically, one or more genes have been integrated into the genetic material of a genetically modified silvicultural plant in order to improve certain properties of said plant. Such genetic modifications also include but are not limited to targeted post-translational modification of protein(s), oligo- or polypeptides e.g. by glycosylation or polymer additions such as prenylated, acetylated or farnesylated moieties or PEG moieties.

Silvicultural plants as well as the propagation material of said plants, which can be treated with the mixtures as defined herein above include all modified non-transgenic plants or transgenic plants. In specific embodiments, such plants include silvicultural plants which tolerate the action of fungicides and/or herbicides and/or insecticides owing to breeding, including genetic engineering methods. In further embodiments, the silvicultural plants may have modified characteristics in comparison to existing or Wildtype plants, which can be generated for example by traditional breeding methods and/or the generation of mutants, or by recombinant procedures.

In specific embodiments, the mixtures as defined herein above may also be applied to plants which have been modified by breeding, mutagenesis or genetic engineering including but not limiting to biotech products on the market or in development (see, for example, http://www.gmo-compass.org/eng/database/plants).

Silvicultural plants that have been modified by breeding, mutagenesis or genetic engineering may, for example, have been rendered tolerant to applications of specific classes of herbicides. Tolerance to herbicides can be obtained by creating insensitivity at the site of action of the herbicide by expression of a target enzyme which is resistant to herbicide; rapid metabolism (conjugation or degradation) of the herbicide by expression of enzymes which inactivate herbicide; or poor uptake and translocation of the herbicide. Examples are the expression of enzymes which are tolerant to the herbicide in comparison to wild-type enzymes, such as the expression of 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS), which is tolerant to glyphosate (see e.g. Heck et.al, Crop Sci. 45, 2005, 329-339; Funke et al., PNAS 103, 2006, 13010-13015; US5188642, US4940835, US5633435, US5804425, US5627061), the expression of glutamine synthase which is tolerant to glufosinate and bialaphos (see e.g. US5646024, US5561236) and DNA constructs coding for dicamba-degrading enzymes (see e.g. for general reference US 2009/0105077). Gene constructs may be obtained, for example, from microorganism or plants, which are tolerant to said herbicides, such as the Agrobacterium strain CP4 EPSPS which is resistant to glyphosate; Streptomyces bacteria which are resistance to glufosinate; or Pseudomonas ssp. with chimeric gene sequences coding for HDDP (see e.g. WO1996/38567, WO 2004/55191).

In a particularly preferred embodiment, the genetically modified plant may be an Eucalyptus species which has been genetically engineered by the introduction of the phosphinothricin acetyltransferase (bar) gene, which confers resistance to the herbicide glufosinate (see Gonzalez et al., 2011, BMC Proceedings, 5 (Suppl 7):P135).

Examples of commercial available silvicultural plants with tolerance to herbicides, are

eucalyptus with tolerance to glyphosate (see e.g. US 5188642, US 4940835, US 5633435, US 5804425, US 5627061.

Methods of producing such herbicide resistant plants are generally known to the person skilled in the art and are described suitable literature sources or textbook, e.g. the literature sources as indicated herein above.

In further embodiments, silvicultural plants as mentioned herein may also comprise plants which are by the use of recombinant DNA techniques capable to synthesize one or more insecticidal proteins, especially those known from the bacterial genus Bacillus, particularly from *Bacillus thuringiensis*, such as δ-endotoxins, e.g. CryIA(b), CryIA(c), CryIF, CryIF(a2), CryIIA(b), CryIIIA, CryIIIB(b1) or Cry9c; vegetative insecticidal proteins (VIP), e.g. VIP1, VIP2, VIP3 or VIP3A; insecticidal proteins of bacteria colonizing nematodes, e.g. Photorhabdus spp. or Xenorhabdus spp.; toxins produced by animals, such as scorpion toxins, arachnid toxins, wasp toxins, or other insect-specific neurotoxins; toxins produced by fungi, such Streptomycetes toxins, plant lectins, such as pea or barley lectins; agglutinins; proteinase inhibitors, such as trypsin inhibitors, serine protease inhibitors, patatin, cystatin or papain inhibitors; ribosome-inactivating proteins (RIP), such as ricin, maize-RIP, abrin, luffin, saporin or bryodin; steroid metabolism enzymes, such as 3-hydroxysteroid oxidase, ecdysteroid-IDP-glycosyl-transferase, cholesterol oxidases, ecdysone inhibitors or HMG-CoA-reductase; ion channel blockers, such as blockers of sodium or calcium channels; juvenile hormone esterase; diuretic hormone receptors (helicokinin receptors); stilben synthase, bibenzyl synthase, chitinases or glucanases. In the context of the present invention these insecticidal proteins or toxins are to be understood expressly also as pre-toxins, hybrid proteins, truncated or otherwise modified proteins. Hybrid proteins are characterized by a new combination of protein domains (see, e. g. WO 02/015701).

Typically, the insecticidal proteins as mentioned above, which are contained in the genetically modified plants impart to the plants producing these proteins tolerance to harmful pests from all taxonomic groups of athropods, especially to beetles (Coeloptera), two-winged insects (Diptera), and moths (Lepidoptera) and to nematodes (Nematoda).

In further embodiments, silvicultural plants as mentioned herein may also comprise plants that are by the use of recombinant DNA techniques capable to synthesize one or more proteins to increase the resistance or tolerance of those plants to bacterial, viral or fungal pathogens. Examples of such proteins are the so-called “pathogenesis-related proteins” (PR proteins, see, e.g. EP-A 392225), plant disease resistance genes (e.g. potato cultivars, which express resistance genes acting against *Phytophthora infestans* derived from the mexican wild potato *Solanum bulbocastanum*) or T4-lysozym (e.g. potato cultivars capable of synthesizing these

proteins with increased resistance against bacteria such as *Erwinia amylvora*). Additional plant diseases, against which resistance or tolerance may be increased in silvicultural plants according to the present invention, are oil palm diseases. Examples of pathogens responsible for oil palm diseases are *Cercospora elaeidis*, *Pythium splendens*, *Rhizoctonia lamellifera*, *Fusarium oxysporum* f.sp. *Elaeidis*, *Ganoderma* spp., *Armillariella mellea*, *Corticium solani* and *Marasmius palmivora*. Silvicultural plants may accordingly be provided with a resistance or tolerance against one or more of these pathogens, preferably against *Ganoderma* spp. The methods for producing such genetically modified plants are generally known to the person skilled in the art and are described, e.g. in the publications mentioned above.

In further embodiments silvicultural plants as mentioned herein may also comprise plants that are by the use of recombinant DNA techniques capable to synthesize one or more proteins to increase the productivity (e.g. bio mass production, grain yield, starch content, oil content or protein content), tolerance to drought, salinity or other growth-limiting environmental factors or tolerance to pests and fungal, bacterial or viral pathogens of those plants.

Particularly preferred modified plants suitable to be used within the methods of the present invention are those, which are rendered tolerant to at least one herbicide. Particularly preferred modified plants suitable to be used within the methods of the present invention are those, which are resistant to at least one herbicide selected from dicamba, glyphosate, saflufenacil and glufosinate. Most preferred is an Eucalyptus plant, which is resistant to glufosinate.

The following examples and figures are provided for illustrative purposes. It is thus understood that the examples and figures are not to be construed as limiting. The skilled person in the art will clearly be able to envisage further modifications of the principles laid out herein.

EXAMPLES

Example 1

1st trial to evaluate the potential of BASF pyraclostrobin-based products

In a 1st trial the potential of BASF pyraclostrobin-based products when applied to the seedlings substrate (around 40 g) of Eucalyptus clone SP 519 (Eucalyptus urograndis) was tested. The test was started on 23 January 2012.

The products tested were:

- STANDAK, Fipronil, 250 g i.a/L, SC;
- STANDAK TOP, Pyraclostrobin + Fipronil + Methyl Thiophanate, 25 + 250 + 225 g/L, SC;
- COMET, Pyraclostrobin, 250 g/L, EC;
- OPERA, Pyraclostrobin + Epoxiconazol, 133 + 50 g/L, SE;
- OPERA ULTRA, Pyraclostrobin + Metconazol, 130 + 80 g/L, SE; and
- CABRIO TOP, Pyraclostrobin + Metiram, 50 + 550 g a.i./Kg, WG.

The results of the 1st trial are depicted in Figs. 1 and 2. The properties tested were:

- Root out of the tube (%): units presenting plant roots out of tubes in shadowing phase (20-30 days), which indicates better or increased root development;
- Discard (%): percentage of seedlings that had any problem in the process and were not used; and
- Classification: number expressing seedlings with better features.

Example 2

2nd trial to evaluate the potential of Cabrio Top

In a 2nd trial the potential of different concentrations of Cabrio Top when applied to the substrate of seedlings of Eucalyptus clone C-041(Eucalyptus urograndis) was evaluated. The trial included the use of Serenade Aso due to its effect of rooting increase in other crops. The test was started on 16 May 2012.

The products tested were:

- CABRIO TOP, Pyraclostrobin + Metiram, 50 + 550 g a.i./Kg, WG; and
- SERENADE ASO, Bacillus subtilis, QST 733, 1.34 g a.i./L, SC.

The results of the 2nd trial are depicted in Figs. 3 to 5. The properties tested were:

- Discard (%): percentage of seedlings that had any problem in the process and were not used;
- Classification: number expressing seedlings with better features;
- Height (cm): height of the seedlings' shoot (n=10); and
- Diameter (mm): diameter of the seedlings' collar (n=10).

Example 3

3rd trial to evaluate the potential of Cabrio Top

In a 3rd trial the potential of Cabrio Top when applied in different concentrations to the substrate of seedlings of Eucalyptus clone SP 519 (Eucalyptus urograndis) was tested. The test was started on 31 July 2012.

The product tested was:

- CABRIO TOP, Pyraclostrobin + Metiram, 50 + 550 g a.i./Kg, WG.

The results of the 3rd trial are depicted in Figs. 6 and 7. The properties tested were:

- Root out of the tube (%): units presenting plant roots out of tubes in shadowing phase (20-30 days), which indicates better or increased root development;
- Discard (%): percentage of seedlings that had any problem in the process and were not used;
- Classification: number expressing seedlings with better features;
- Height (cm): height of the seedlings' shoot (n=10);
- Diameter (mm): diameter of the seedlings' collar (n=10); and
- Dry matter (g): weight of dry matter roots and shoots.

Example 4

4th trial to evaluate the potential of Cabrio Top

In a 4th trial the potential of Cabrio Top when applied in different concentrations to the substrate of seedlings of Eucalyptus clone I144 (Eucalyptus urophylla) was tested. The test was started on 31 July 2012.

The product tested was:

- CABRIO TOP, Pyraclostrobin + Metiram, 50 + 550 g a.i./Kg, WG.

The results of the 4th trial are depicted in Figs. 8 and 9. The properties tested were:

- Root out of the tube (%): units presenting plant roots out of tubes in shadowing phase (20-30 days), which indicates better or increased root development;
- Discard (%): percentage of seedlings that had any problem in the process and were not used;
- Classification: number expressing seedlings with better features;
- Height (cm): height of the seedlings' shoot (n=10);
- Diameter (mm): diameter of the seedlings' collar (n=10); and
- Dry matter (g): weight of dry matter roots and shoots.

Example 5

5th trial to evaluate the potential of Cabrio Top

In a 5th trial the potential of Cabrio Top when applied to the seedlings of Eucalyptus clone I144 (Eucalyptus urophylla) by a spray method was evaluated. The test was started on 18 July 2012.

The product tested was:

- CABRIO TOP, Pyraclostrobin + Metiram, 50 + 550 g a.i./Kg, WG.

The results of the 5th trial are depicted in Figs. 10 to 13. The properties tested were:

- Root out of the tube (%): units presenting plant roots out of tubes in shadowing phase (20-30 days), which indicates better or increased root development;
- Discard (%): percentage of seedlings that had any problem in the process and were not used;
- Classification: number expressing seedlings with better features;
- Height (cm): height of the seedlings' shoot (n=10);
- Diameter (mm): diameter of the seedlings' collar (n=10); and
- Dry matter (g): weight of dry matter roots and shoots.

Example 6

6th trial to reevaluate the physiological effects using intermediate concentrations of Cabrio Top

In a 6th trial the physiological effects using intermediate concentrations of Cabrio Top when applied to Eucalyptus clone I144 (Eucalyptus urophylla) was evaluated. The test was started on 29 August 2012.

The product tested was:

- CABRIO TOP, Pyraclostrobin + Metiram, 50 + 550 g a.i./Kg, WG.

The results of the 6th trial are shown in Figs. 14 and 15. The properties tested were:

- Root out of the tube (%): units presenting plant roots out of tubes in shadowing phase (20-30 days), which indicates better or increased root development;
- Discard (%): percentage of seedlings that had any problem in the process and were not used;
- Classification: number expressing seedlings with better features;
- Height (cm): height of the seedlings' shoot (n=10);
- Diameter (mm): diameter of the seedlings' collar (n=10); and
- Dry matter (g): weight of dry matter roots and shoots.

Example 7

7th trial to evaluate products and other formulations with pyraclostrobin and with the same a.i. *concentration*

In a 7th trial products and other formulations with pyraclostrobin and with the same a.i. concentration, which were applied to Eucalyptus clone I144 (Eucalyptus urophylla), were evaluated. The test was started on 13 December 2012.

The products tested were

- CABRIO TOP, Pyraclostrobin + Metiram, 50 + 550 g a.i./Kg, WG.
- COMET, Pyraclostrobin, 250 g/L, EC;
- OPERA ULTRA, Pyraclostrobin + Metconazol, 130 + 80 g/L, SE;
- INSIGNIA, Pyraclostrobin, 200 g/kg, WG; and
- CANTUS, Boscalida, 500 g/kg, WG.

The results of the 7th trial are shown in Figs. 16 and 17. The properties tested were:

- Root out of the tube (%): units presenting plant roots out of tubes in shadowing phase (20-30 days), which indicates better or increased root development;

- Discard (%): percentage of seedlings that had any problem in the process and were not used;
- Classification: number expressing seedlings with better features;
- Height (cm): height of the seedlings' shoot (n=10);
- Diameter (mm): diameter of the seedlings' collar (n=10); and
- Dry matter (g): weight of dry matter roots and shoots.

Example 8

8th trial to evaluate Rhizoctonia solani control with Cabrio Top

In an 8th trial *Rhizoctonia solani* controls with Cabrio Top were performed. The plants used were Eucalyptus I144 (Eucalyptus urophylla) clones. The experiment was performed with different concentrations of Cabrio Top. The test was started on 4 March 2012.

The product tested was:

- CABRIO TOP, Pyraclostrobin + Metiram, 50 + 550 g a.i./Kg, WG.

The results and further details of the 8th trial are shown in Figs. 18 to 20. The properties tested were:

- Root out of the tube (%): units presenting plant roots out of tubes in shadowing phase (20-30 days), which indicates better or increased root development;
- Discard (%): percentage of seedlings that had any problem in the process and were not used;
- Dead plants: percentage of plants that was killed by *Rhizoctonia solani*.

Example 9

9th trial to evaluate Rhizoctonia solani control and to prove the synergism between pyraclostrobin and metiram

In a 9th trial *Rhizoctonia solani* controls with Cabrio Top compared to the single compounds pyraclostrobin and metiram were performed in order to prove potential synergism effects. The crop used were Eucalyptus I144 (*Eucalyptus urophylla*) clones. The trial was carried out with 400 g/100 L of Cabrio Top (20 g of Pyraclostrobin and 220 g of Metiram) and the correspondening amount of compounds pyraclostrobin and Metiram. The mixture was sprayed. The test was started on 22 November 2013.

The disease parameters used were frequency of attack and severity at 7, 14 and 21 days after application (DAA). Frequency of attack was evaluated counting the seedling that presented any symptoms of *R. solani* and these data was transformed in percentage. It was also evaluated in severity, i.e. a visual assessment of the infection was made in percent (0-100%: 0% - no infection and 100% - plant death) for the plot as a whole. A percentage was estimated which gives the intensity of the infection.

After obtaining these data through assessments, the relative efficacy was calculated using Abbott's formula (1925):

$$\%E = (T - F / T) * 100$$

T = percentage of frequency of attack or severity in check (treatment 1)

F = percentage of frequency of attack or severity when applied fungicides

The expected efficacies of active compound mixtures were determined using Colby's formula. Accordingly, synergism is understood as an interaction where the combined effect of two or more compounds is greater than the sum of the individual effects of each of the compounds. The presence of a synergistic effect in terms of percent control, between two mixing partners (X and Y) was thus calculated using the Colby equation as derivable from Colby, S. R., 1967, Calculating Synergistic and Antagonistic Responses in Herbicide Combinations, Weeds, 15, 20-22. Since the observed combined control effect was greater than the expected combined control effect (E), the combined effect was found to be synergistic.

The products tested were:

- CABRIO TOP, Pyraclostrobin + Metiram, 50 + 550 g a.i./Kg, WG.
- INSIGNIA, Pyraclostrobin, 200 g a.i./kg, WG
- POLYRAM DF, Metiram, 700 g a.i./kg, WG

The results and further details of the 9th trial are shown in Figs. 21 to 22. The properties tested were:

- Frequency of attack (%): percentage of seedlings infected;
- Severity (%): percentage of seedlings that gives the intensity (area infected) of the infection.

5

CLAIMS

1. Use of a mixture, comprising as active compounds in synergistically effective amounts at least
(i) a fungicide (compound I) of the group of strobilurines;
and
(ii) a further fungicide (compound II) of the group of dithiocarbamates
for synergistically increasing the health of a silvicultural plant.

2. The use of claim 1, wherein said fungicide (compound I) of the group of strobilurines is selected from the group comprising pyraclostrobin (I-1), azoxystrobin (I-2), dimoxystrobin (I-3), enestroburin (I-4), fluoxastrobin (I-5), kresoxim-methyl (I-6), metominostrobin (I-7), orysastrobin (I-8), picoxystrobin (I-9), pyribencarb (I-10), trifloxystrobin (I-11), pyrametostrobin (I-12), pyraoxystrobin (I-13), coumoxystrobin (I-14), coumethoxystrobin (I-15), triclopyricarb (chlorodincarb) (I-16), fenaminstrobin (diclofenoxystrobin) (I-17), fenoxystrobin (I-18), 2-(2-(6-(3-chloro-2-methyl-phenoxy)-5-fluoro-pyrimidin-4-yloxy)-phenyl)-2-methoxyimino-N-methyl-acetamide (I-19), 3-methoxy-2-(2-(N-(4-methoxy-phenyl)-cyclopropane-carboximidoylsulfanylmethyl)-phenyl)-acrylic acid methyl ester (I-20), methyl (2-chloro-5-[1-(3-methylbenzyloxyimino)-ethyl]benzyl)-carbamate (I-21) and 2-(2-(3-(2,6-dichlorophenyl)-1-methyl-allylideneaminooxymethyl)-phenyl)-2-methoxyimino-N methyl-acetamide (I-22).

3. The use of claim 1 or 2, wherein said fungicide (compound II) of the group of dithiocarbamates is selected from the group comprising metiram (II-1), dazomet (II-2), ferbam (II-3), mancozeb (II-4), maneb (II-5), metam (II-6), nabam (II-7), poly-carbamate (II-8), propineb (II-9), thiram (II-10), zineb (II-11), Na-Dimethyl-dithiocarbmate (II-12) and ziram (II-13); or a silviculturally acceptable salt thereof.

4. The use of any one of claims 1 to 3, wherein said mixture additionally comprises an insecticide (compound III), and/or an herbicide (compound IV), and/or a biological, and/or an inoculant.

5. The use of claim 4, wherein said insecticide (compound III) is selected from the group of insecticides comprising:
(i) organo(thio)phosphate compounds selected from chlorpyrifos, chlorpyrifos-methyl and pyraclofos; or a silviculturally acceptable salt thereof;
(ii) carbamate compounds selected from aldicarb, methomyl, thiodicarb and triazamate; or a silviculturally acceptable salt thereof;

(iii) pyrethroid compounds selected from bifenthrin, bioethanomethrin, beta-cyfluthrin, biopermethrin, lambda-cyhalothrin, gamma-cyhalothrin, cypermethrin, alpha-cypermethrin, beta-cypermethrin, zeta-cypermethrin, deltamethrin, esfenvalerate, fenvalerate, sulfoxime and thiofluoximate; or a silviculturally acceptable salt thereof;

(iv) juvenile hormone mimics selected from fenoxycarb and pyriproxyfen; or a silviculturally acceptable salt thereof;

(v) nicotinic receptor agonists/antagonists compounds selected from acetamiprid, clothianidin, dinotefuran, imidacloprid, imidaclothiz, thiamethoxam, nitenpyram, paichongding, thiacloprid and tazimcarb; or a silviculturally acceptable salt thereof;

(vi) GABA gated chloride channel antagonist compounds selected from acetoprole, ethiprole, fipronil, pyrafluprole, pyriprole and vaniliprole; or a silviculturally acceptable salt thereof;

(vii) METI I compounds selected from pyridaben, tebufenpyrad and tolfenpyrad; or a silviculturally acceptable salt thereof;

(viii) hydramethylnon; or a silviculturally acceptable salt thereof;

(ix) chlorfenapyr; or a silviculturally acceptable salt thereof;

(x) diafenthiuron; or a silviculturally acceptable salt thereof;

(xi) molting disruptors selected from cyromazine, furan tebufenozide, methoxyfenozide and tebufenozide; or a silviculturally acceptable salt thereof;

(xii) molting hormones selected from a-ecdysone and ecdysterone; or a silviculturally acceptable salt thereof;

(xiii) sodium channel blocker compounds selected from indoxacarb and metaflumizone; or a silviculturally acceptable salt thereof;

(xiv) flonicamid; or a silviculturally acceptable salt thereof;

(xv) flucofuron; or a silviculturally acceptable salt thereof;

(xvi) chitin synthesis inhibitors selected from buprofezin, bistrifluron, chlorbenzuron, chlorfluazuron, diflubenzuron, dichlorbenzuron, flucycloxuron, flufenoxuron, hexaflumuron, lufenuron, novaluron, noviflumuron, penfluron, teflubenzuron and triflumuron; or a silviculturally acceptable salt thereof;

(xvii) lipid biosynthesis inhibitors selected from spiromesifen and spirotetramat; or a silviculturally acceptable salt thereof;

(xviii) flubendiamide; or an silviculturally acceptable salt thereof;

(xix) anthranilamide compounds selected from chloranthraniliprole and cyantraniliprole; or a silviculturally acceptable salt thereof; and

(xx) various compounds selected from dicyclanil, metoxadiazone, dimetilan, isoprothiolane, malonoben, sulfoxaflor and triarathene; or a silviculturally acceptable salt thereof.

6. The use of claim 4 or 5, wherein said herbicide (compound IV) is selected from the group of herbicides comprising:

(i) phenoxy-carboxylic-acids selected from clomeprop, 2,4-d, 2,4-db, dichlorprop, mcpa, mcpb and mecoprop; or a silviculturally acceptable salt thereof;

(ii) benzoic acids selected from chloramben, dicamba and 2,3,6-tba; or a silviculturally acceptable salt thereof;

(iii) pyridine carboxylic acids selected from aminopyralid, clopyralid, fluroxypyr, picloram and triclopyr; or a silviculturally acceptable salt thereof;

(iv) quinoline carboxylic acids selected from quinclorac and quinmerac;

(v) imidazolinones selected from imazamethabenz-methyl, imazamox, imazapic, imazapyr, imazaquin and imazethapyr; or a silviculturally acceptable salt thereof;

(vi) benazolin-ethyl; or a silviculturally acceptable salt thereof;

(vii) amino-cylopyrachlor; or a silviculturally acceptable salt thereof;

(viii) glyphosate; or a silviculturally acceptable salt thereof;

(ix) glufosinate or a silviculturally acceptable salt thereof; and

(x) PROTOX enzyme inhibitors selected from saflufenacil, oxyfluorfen, flumioxazin, carfentrazone, sulfrentrazone, lactofen and flumiclorac; or a silviculturally acceptable salt thereof.

7. The use of any one of claims 4 to 6, wherein said biological is a bio-insecticide or a bio-fungicide.

8. The use of claim 7, wherein said bio-insecticide is *Bacillus thuringiensis*, a Baculovirus or *Zoophthora radicans.*

9. The use of claim 7, wherein said bio-fungicide is *Bacillus subtilis* or *Trichoderma harzianum.*

10. The use of any one of claims 4 to 9, wherein said inoculant is a bacterium, preferably a bacterium capable of infecting a silvicultural plant.

11. The use of claim 10, wherein said bacterium is *Azospirilum brasiliense; Rhizobium* or *Agrobacterium radibacter.*

12. The use of any one of claims 1 to 11, wherein
(i) said strobilurine fungicide (compound I) is pyraclostrobin (I-1); and/or
(ii) said dithiocarbamate fungicide (compound II) is metiram (ii-1); and/or
(iii) said strobilurine fungicide (compound I) is pyraclostrobin (I-1) and said dithiocarbamate fungicide (compound II) is metiram (II-1).

13. The use of any one of claims 4 to 12, wherein
(i) said insecticide (compound III) is fipronil; and/or
(ii) said herbicide (compound IV) is dicamba, glyphosate, saflufenacil or glufosinate; and/or
(iii) said insecticide (compound III) is fipronil and said herbicide (compound IV) is dicamba, glyphosate, saflufenacil or glufosinate.

14. A method for synergistically increasing the health of a silvicultural plant, comprising:
(i) applying to silvicultural plant propagation material; and/or
(ii) applying to the locus where the silvicultural plant or plant seedling is growing or expected to grow; and/or
(iii) applying to the substrate in which the silvicultural plant or plant seedling is growing or expected to grow; and/or
(iv) applying to the silvicultural plant, or part of the silvicultural plant, preferably the leaves (foliar application), at any time during the vegetative and/or reproductive growth stage
at least once a mixture as defined in any one of claims 1 to 13.

15. The method of claim 14, wherein said application is a single or repeated application.

16. The use of any one of claims 1 to 13, or the method of claim 14 or 15, wherein said silvicultural plant is selected from the group comprising beech (*Fagus* spec.), birch, eucalyptus, fir, oak, oil-palm, pine (*Pinus* spec.), poplar (*Populus* spec.), rubber tree, wattle, spruce, teak and willow (*Salix* spec.).

17. The use of any one of claims 1 to 13 or 16, or the method of any one of claims 14 to 16, wherein said silvicultural plant is a modified plant, preferably a genetically modified plant.

18. The use of any one of claims 1 to 13, 16 or 17, or the method of any one of claims 14 to 17, wherein said silvicultural plant is an herbicide tolerant plant, preferably a dicamba and/or glyphosate and/or saflufenacil and/or glufosinate tolerant plant.

19. The use of any one of claims 1 to 13, or 16 to 18, or the method of any one of claims 14 to 18, wherein the health of the silvicultural plant is increased by the tolerance to biotic and/or abiotic stress factors, increased yield, increased plant vigor and/or increased plant quality.

20. The use or method of claim 19, wherein said increase of the health of the silvicultural plant is reflected by an increase in growth of root and shoot, an overall increase in productivity and/or a lower seedling discard and/or a faster and more efficient development of the plant.

FIGURES

FIGURE 1

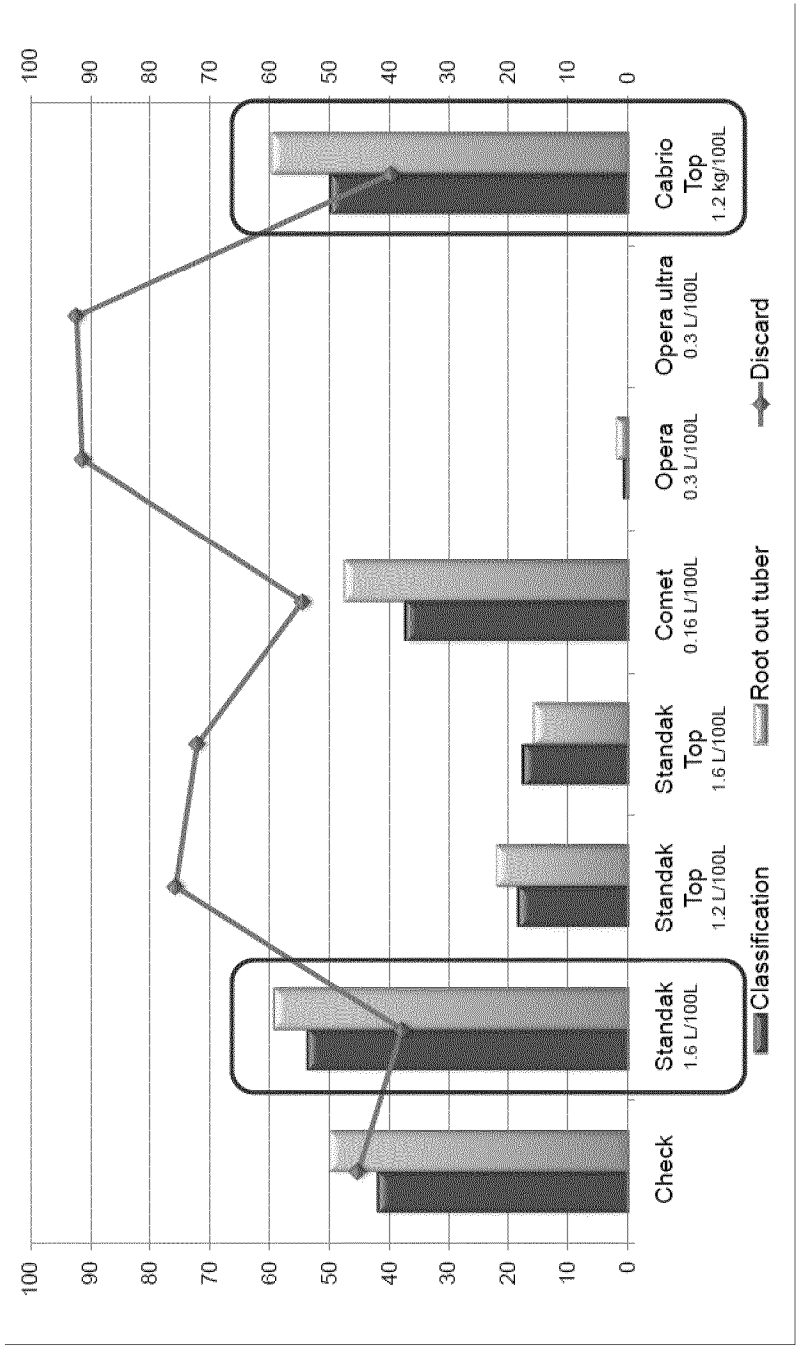


FIGURE 2

Products	Rate (L or Kg/100 L)	Discard (%)	Classification	Root out tube (%)
Check		45	42	50
Standak	**1.6**	**38**	**54**	**59**
Standak top	1.2	76	19	22
Standak top	1.6	72	18	16
Comet	0.16	54	37	48
Opera	0.3	91	1	2
Opera ultra	0.3	92	0	0
Cabrio Top	**0.8**	**40**	**50**	**60**

FIGURE 3

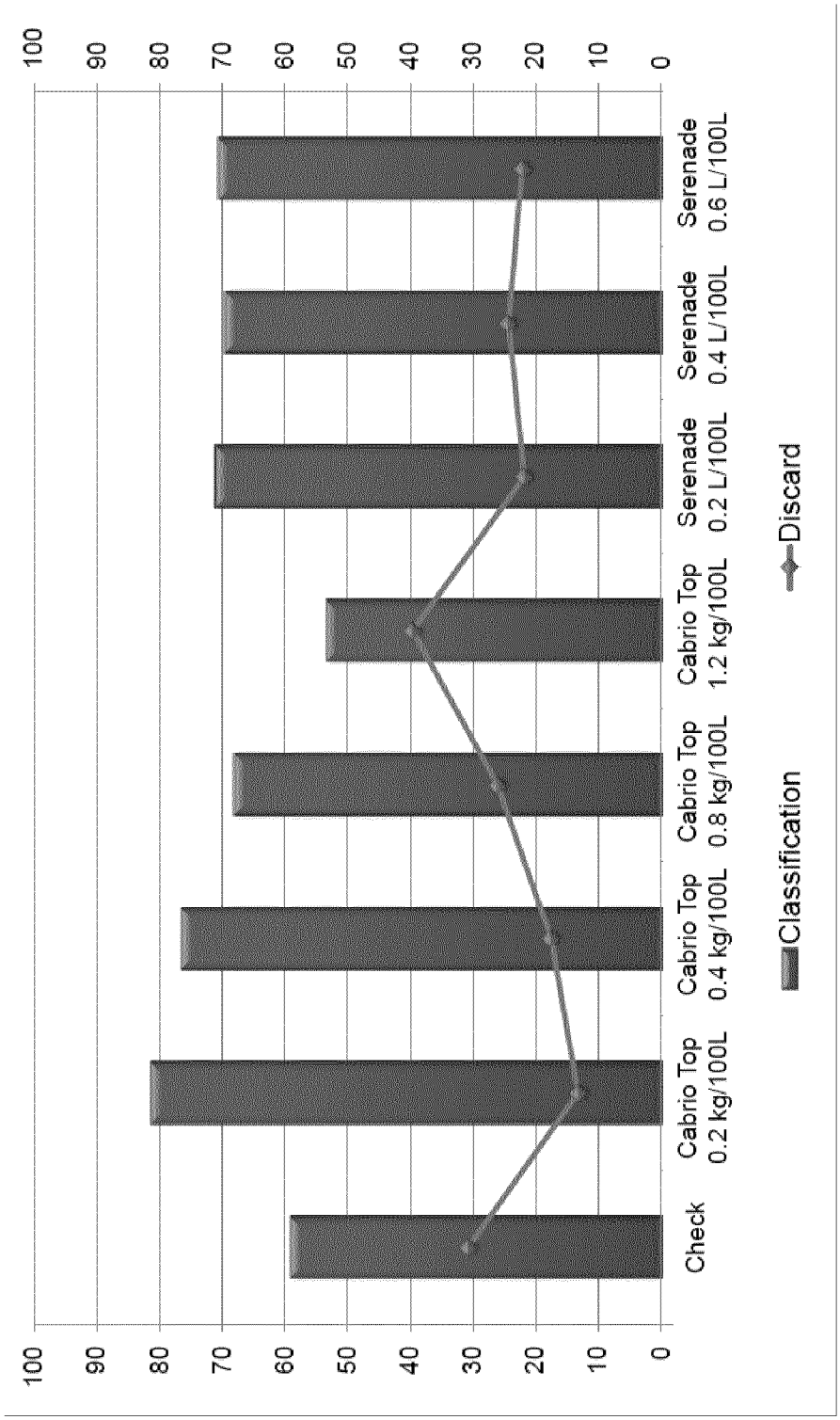
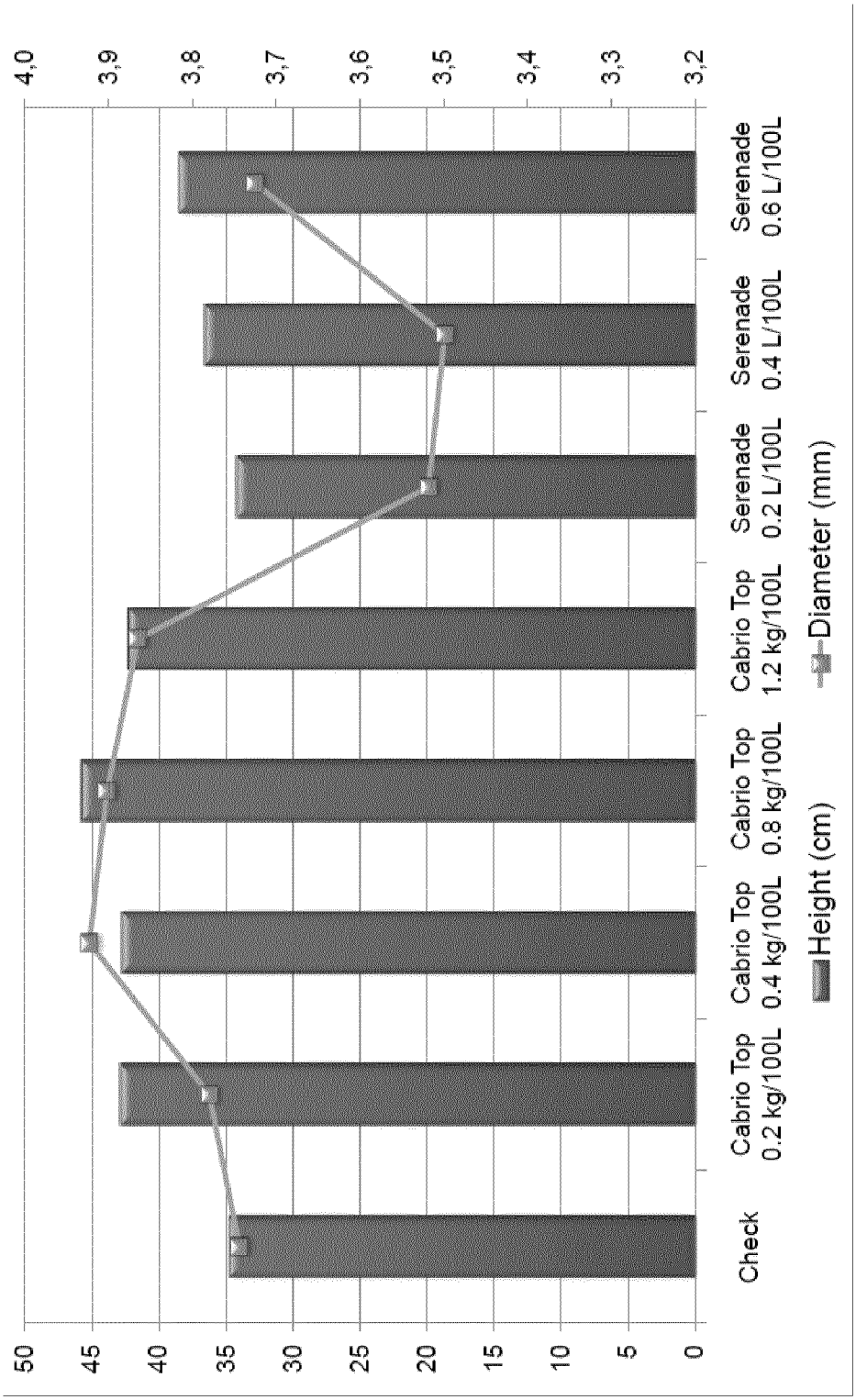

100
90
80
70
60
50
40
30
20
10
0
Check
Cabrio Top 0.2 kg/100L
Cabrio Top 0.4 kg/100L
Cabrio Top 0.8 kg/100L
Cabrio Top 1.2 kg/100L
Serenade 0.2 L/100L
Serenade 0.4 L/100L
Serenade 0.6 L/100L
Classification
Discard

FIGURE 4

Products	Rates (L or Kg/100 L)	Discard (%)	Classification	Height (cm) 112 DAA	Diameter (mm) 112 DAA
Check	0	30.71	59.24	34.8	3.74
Cabrio Top	**0.2**	**13.21**	**81.52**	**42.9**	**3.78**
Cabrio Top	**0.4**	**17.50**	**76.62**	**42.8**	**3.92**
Cabrio Top	**0.8**	**26.07**	**68.20**	**45.8**	**3.90**
Cabrio Top	1.2	39.64	53.47	42.3	3.87
Serenade ASO	0.2	21.79	71.25	34.2	3.52
Serenade ASO	0.4	24.29	69.66	36.6	3.50
Serenade ASO	0.6	22.14	70.73	38.6	3.73

FIGURE 5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3,9
3,8
3,7
3,6
3,5
3,4
3,3
3,2
50
45
40
35
30
25
20
15
10
5
0
Check
Cabrio Top 0.2 kg/100L
Cabrio Top 0.4 kg/100L
Cabrio Top 0.8 kg/100L
Cabrio Top 1.2 kg/100L
Serenade 0.2 L/100L
Serenade 0.4 L/100L
Serenade 0.6 L/100L
Height (cm)
Diameter (mm)

FIGURE 6

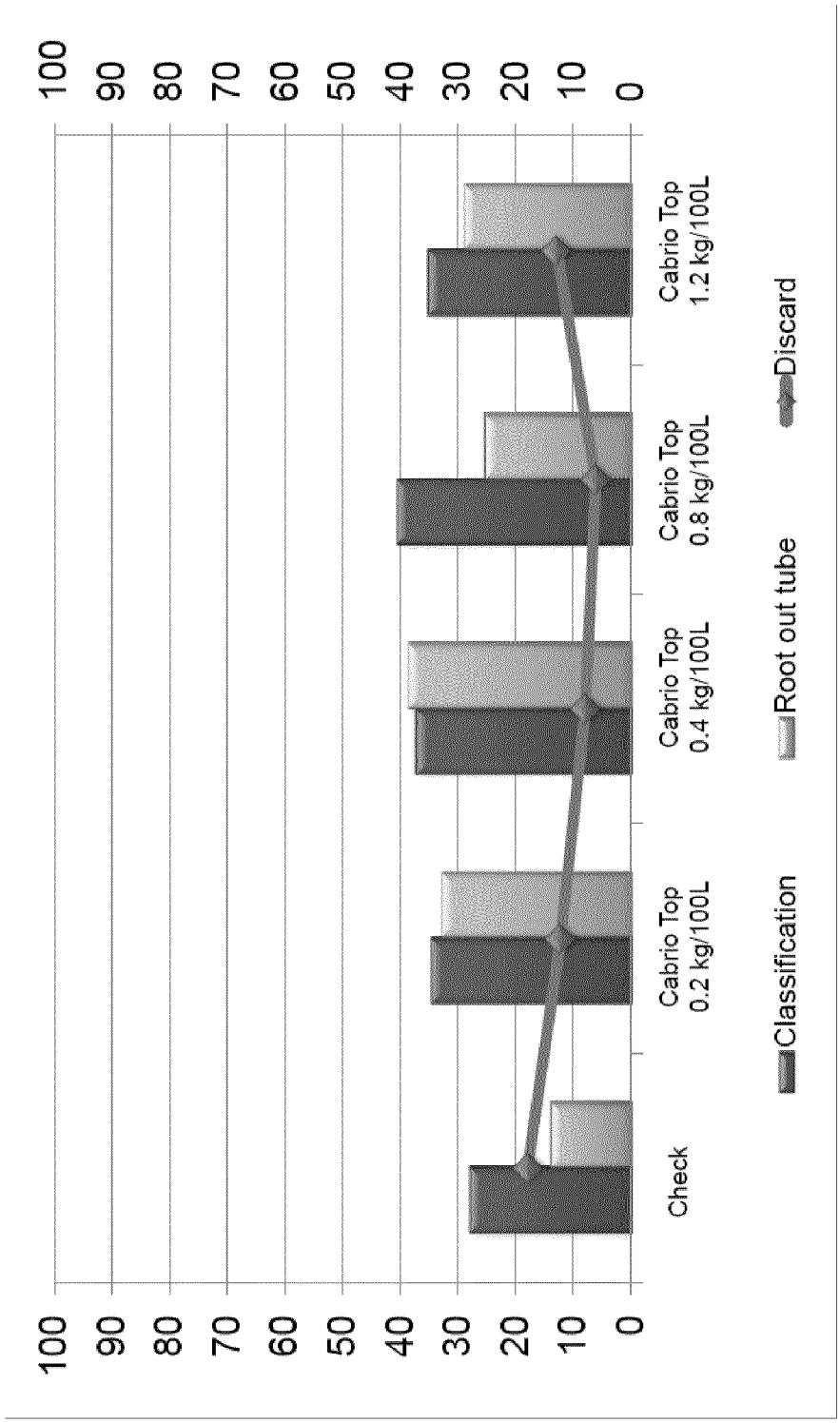

100
90
80
70
60
50
40
30
20
10
0
Check
Cabrio Top 0.2 kg/100L
Cabrio Top 0.4 kg/100L
Cabrio Top 0.8 kg/100L
Cabrio Top 1.2 kg/100L
Classification
Root out tube
Discard

FIGURE 7

Products	Rate (Kg/100 L)	Root out tube (%)	Discard (%)	Classification	Height (cm) 68 DAA	Diameter (mm) 68 DAA	Height (cm) 86 DAA	Diameter (mm) 86 DAA	Dry shoot	Dry root
Check		22.14	27.1	19.19	19.48	2.46	24.62	3.18	1.54	0.53
Cabrio Top	0.2	23.93	18.6	27.53	23.41	2.56	31.55	3.49	1.95	0.66
Cabrio Top	0.4	28.93	25.0	22.29	30.97	2.58	33.31	3.54	2.33	0.69
Cabrio Top	0.8	23.57	23.6	25.86	31.55	2.63	34.40	3.66	2.47	0.73
Cabrio Top	1.2	32.50	21.1	28.13	31.24	2.91	37.20	3.93	2.85	0.86

FIGURE 8

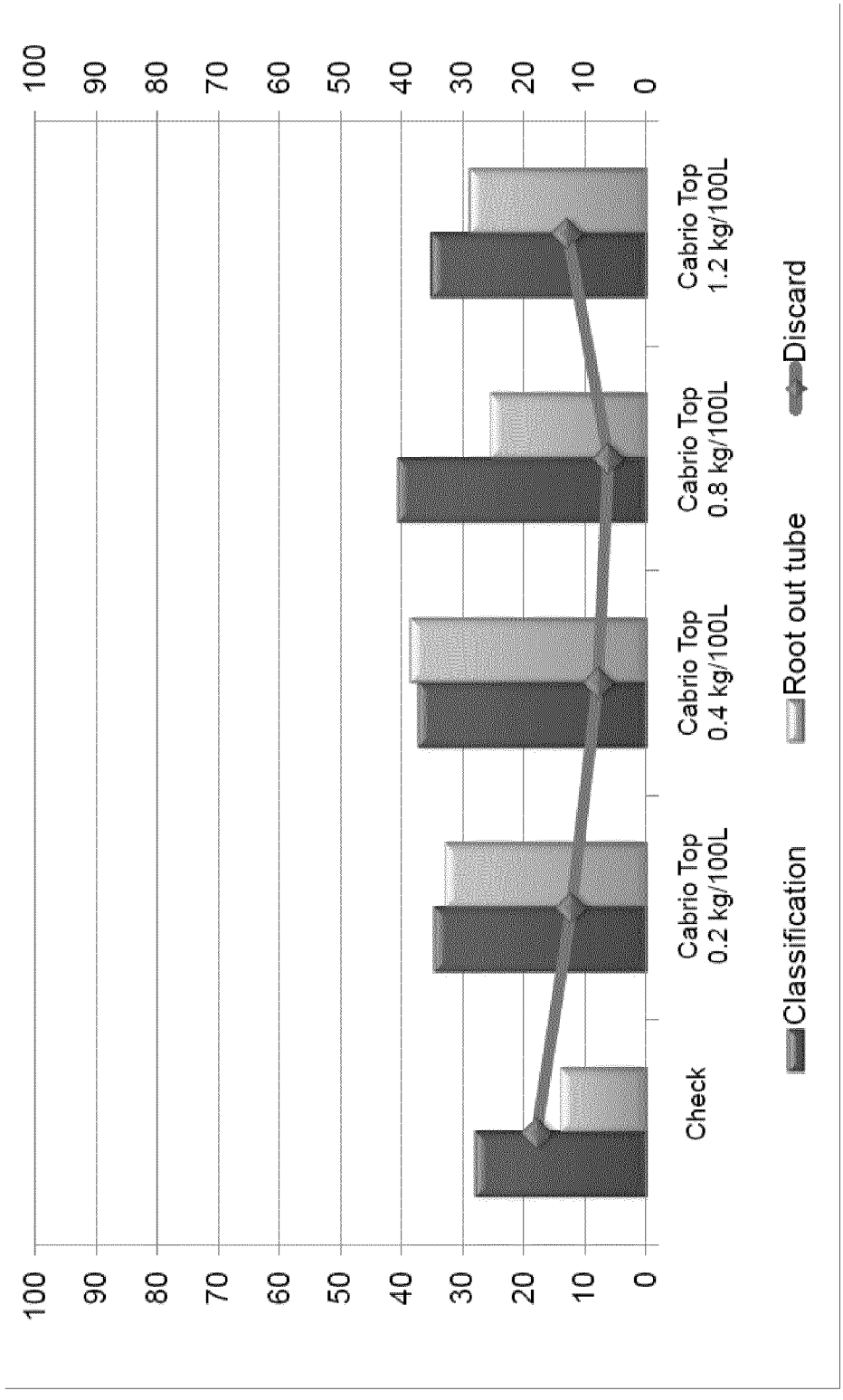

100
90
80
70
60
50
40
30
20
10
0
Check
Cabrio Top 0.2 kg/100L
Cabrio Top 0.4 kg/100L
Cabrio Top 0.8 kg/100L
Cabrio Top 1.2 kg/100L
Classification
Root out tube
Discard

FIGURE 9

Products	Rate (Kg/100 L)	Root out tube (%)	Discard (%)	Classification	Height (cm) 68 DAA	Diameter (mm) 68 DAA	Height (cm) 68 DAA	Diameter (mm) 68 DAA	Dry shoot	Dry root
Check		13.93	17.86	28.01	25.95	2.69	27.28	3.02	1.69	0.58
Cabrio Top	0.2	32.86	12.14	34.69	30.08	2.91	33.05	3.36	2.34	0.69
Cabrio Top	0.4	38.57	7.86	37.32	31.28	2.99	34.18	3.40	2.42	0.78
Cabrio Top	0.8	25.36	6.07	40.70	33.03	3.02	36.71	3.51	2.45	0.72
Cabrio Top	1.2	28.93	12.86	35.24	31.20	2.89	35.38	3.33	2.34	0.74

FIGURE 10

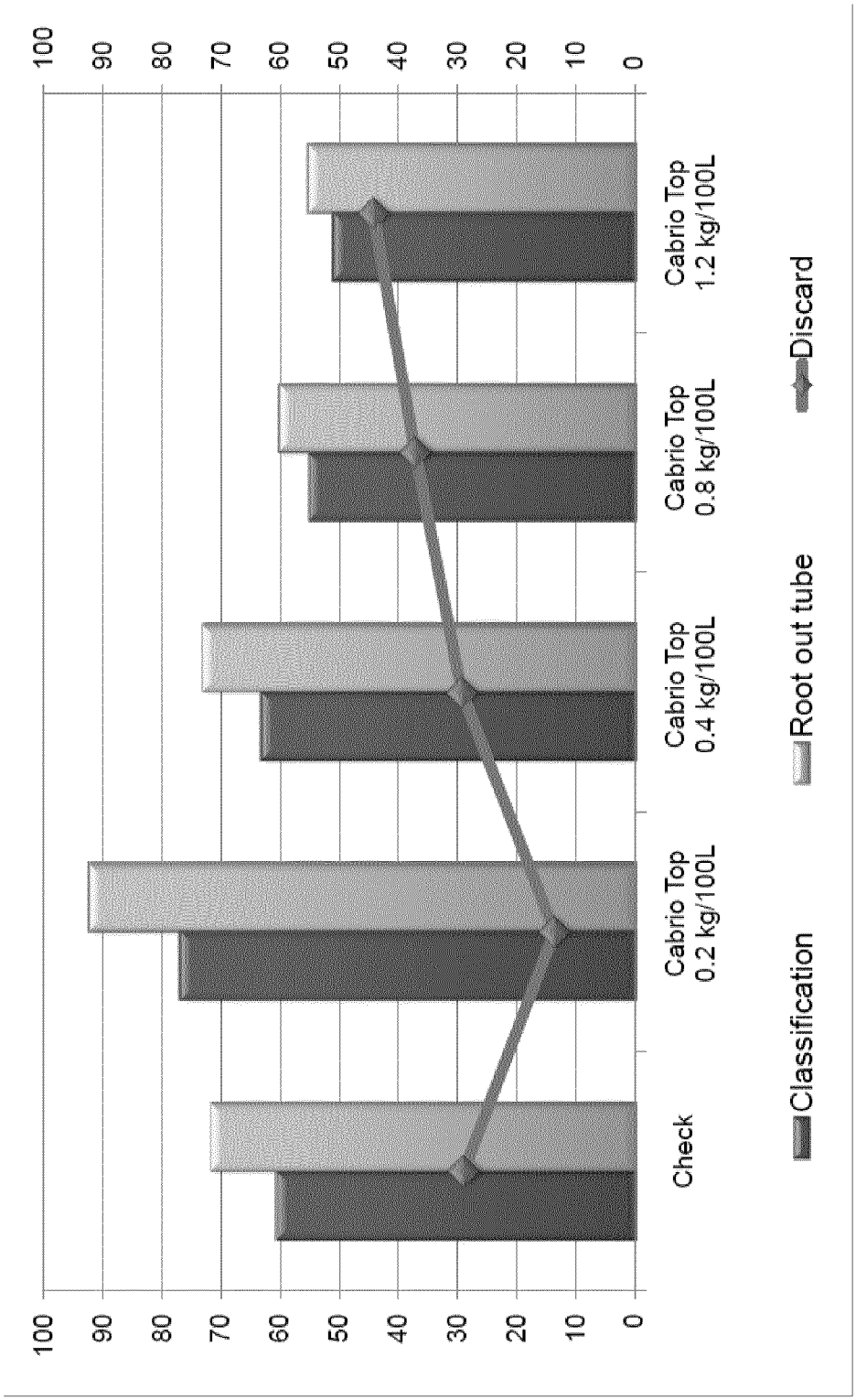

100
90
80
70
60
50
40
30
20
10
0
Check
Cabrio Top 0.2 kg/100L
Cabrio Top 0.4 kg/100L
Cabrio Top 0.8 kg/100L
Cabrio Top 1.2 kg/100L
Classification
Root out tube
Discard

FIGURE 11

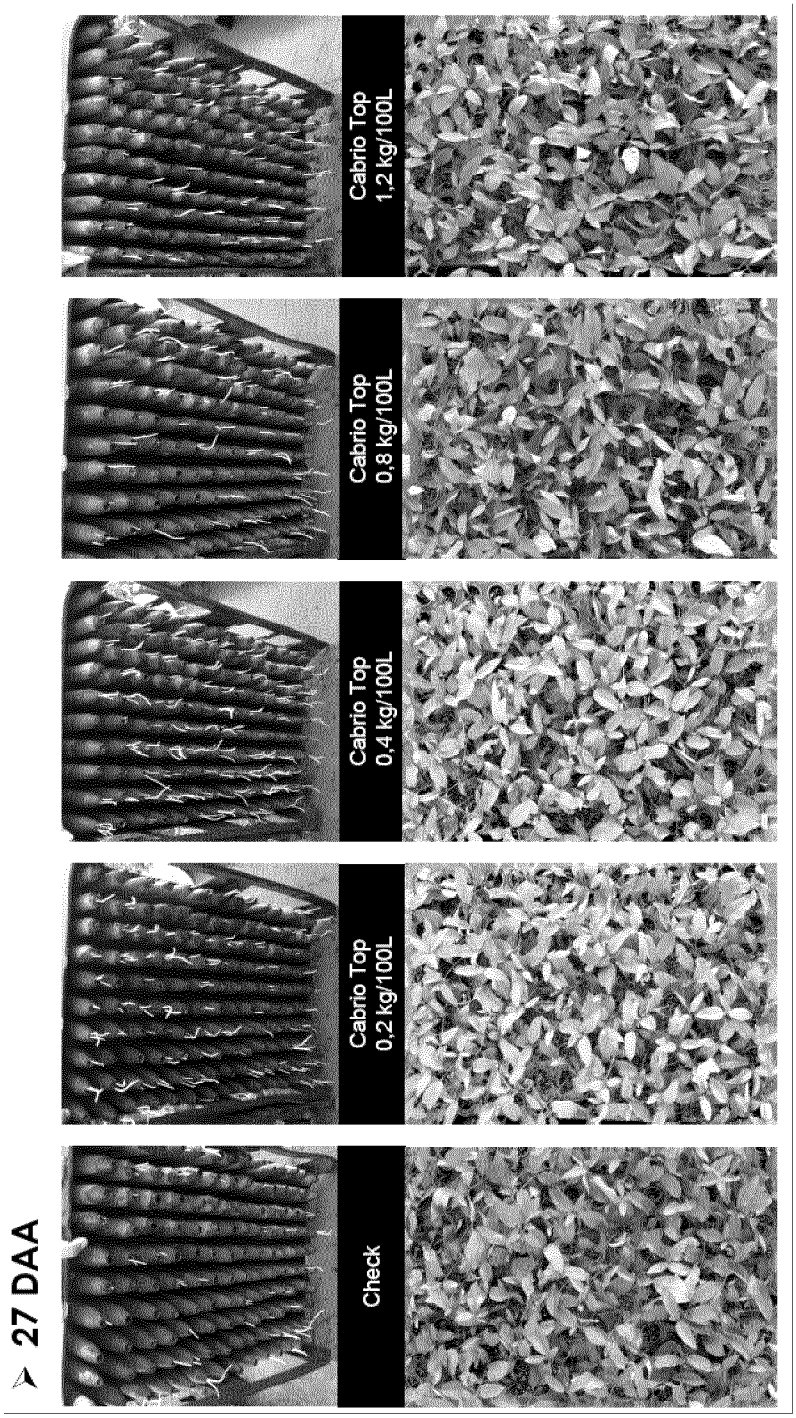
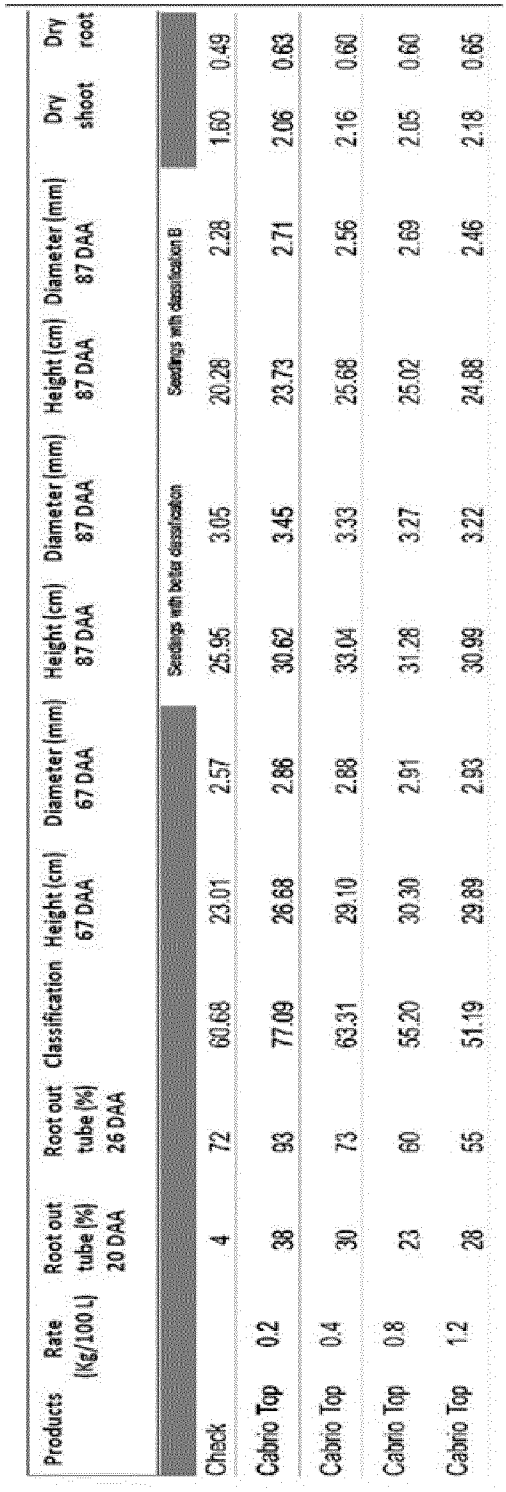

Cabrio Top 1,2 kg/100L
Cabrio Top 0,8 kg/100L
Cabrio Top 0,4 kg/100L
Cabrio Top 0,2 kg/100L
Check
27 DAA

FIGURE 12



Products	Rate (Kg/100 L)	Root out tube (%) 20 DAA	Root out tube (%) 26 DAA	Classification	Height (cm) 67 DAA	Diameter (mm) 67 DAA	Height (cm) 87 DAA	Diameter (mm) 87 DAA	Height (cm) 87 DAA	Diameter (mm) 87 DAA	Dry shoot	Dry root
							Seedlings with better classification		Seedlings with classification B			
Check		4	72	60.68	23.01	2.57	25.95	3.05	20.28	2.28	1.60	0.49
Cabrio Top	0.2	38	93	77.09	26.68	2.86	30.62	3.45	23.73	2.71	2.06	0.63
Cabrio Top	0.4	30	73	63.31	29.10	2.88	33.04	3.33	25.68	2.56	2.16	0.60
Cabrio Top	0.8	23	60	55.20	30.30	2.91	31.28	3.27	25.02	2.69	2.05	0.60
Cabrio Top	1.2	28	55	51.19	29.89	2.93	30.99	3.22	24.88	2.46	2.18	0.65

FIGURE 13

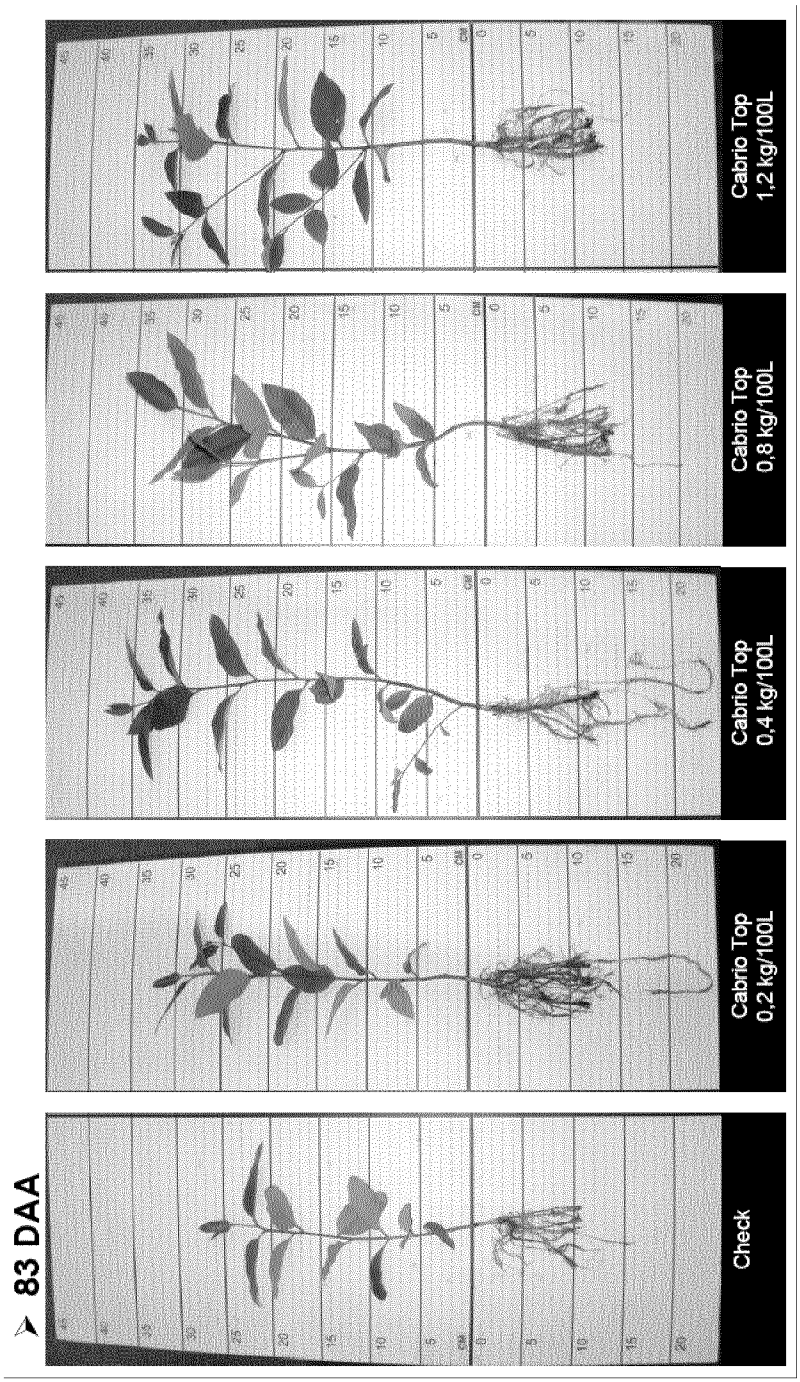

83 DAA
Check
Cabrio Top 0,2 kg/100L
Cabrio Top 0,4 kg/100L
Cabrio Top 0,8 kg/100L
Cabrio Top 1,2 kg/100L

FIGURE 14

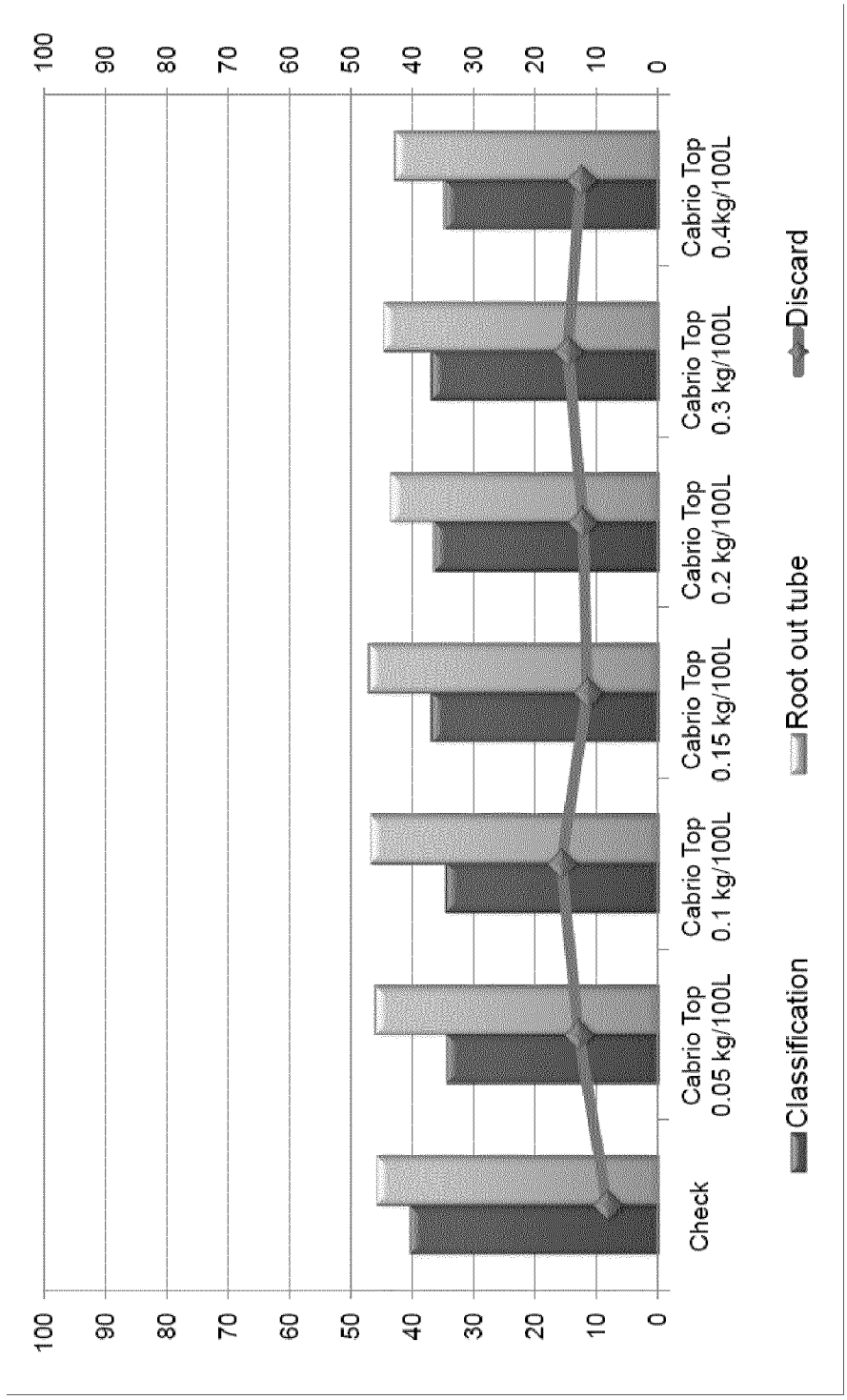

100
90
80
70
60
50
40
30
20
10
0
Check
Cabrio Top 0.05 kg/100L
Cabrio Top 0.1 kg/100L
Cabrio Top 0.15 kg/100L
Cabrio Top 0.2 kg/100L
Cabrio Top 0.3 kg/100L
Cabrio Top 0.4kg/100L
Classification
Root out tube
Discard

FIGURE 15

Products	Rate (Kg/100 L)	Root out tube (%)	Discard (%)	Classification	Height (cm) 41 DAA	Diameter (mm) 41 DAA	Height (cm) 57 DAA	Diameter (mm) 57 DAA	Dry shoot	Dry root
Check		45.71	8.21	40.41	16.78	1.96	23.36	2.71	1.51	0.52
Cabrio Top	0.05	46.07	12.86	34.47	19.15	1.98	28.28	3.04	1.71	0.60
Cabrio Top	0.10	46.79	15.71	34.56	18.53	2.06	28.27	2.81	1.93	0.60
Cabrio Top	0.15	47.14	11.43	36.95	18.06	1.90	27.10	2.82	1.93	0.61
Cabrio Top	0.20	43.57	12.14	36.44	20.23	2.19	30.49	2.91	2.04	0.62
Cabrio Top	0.30	44.64	14.64	36.94	17.56	1.81	26.53	2.43	1.93	0.62
Cabrio Top	0.40	42.86	12.50	34.72	17.73	1.89	26.36	2.63	1.94	0.62

FIGURE 16

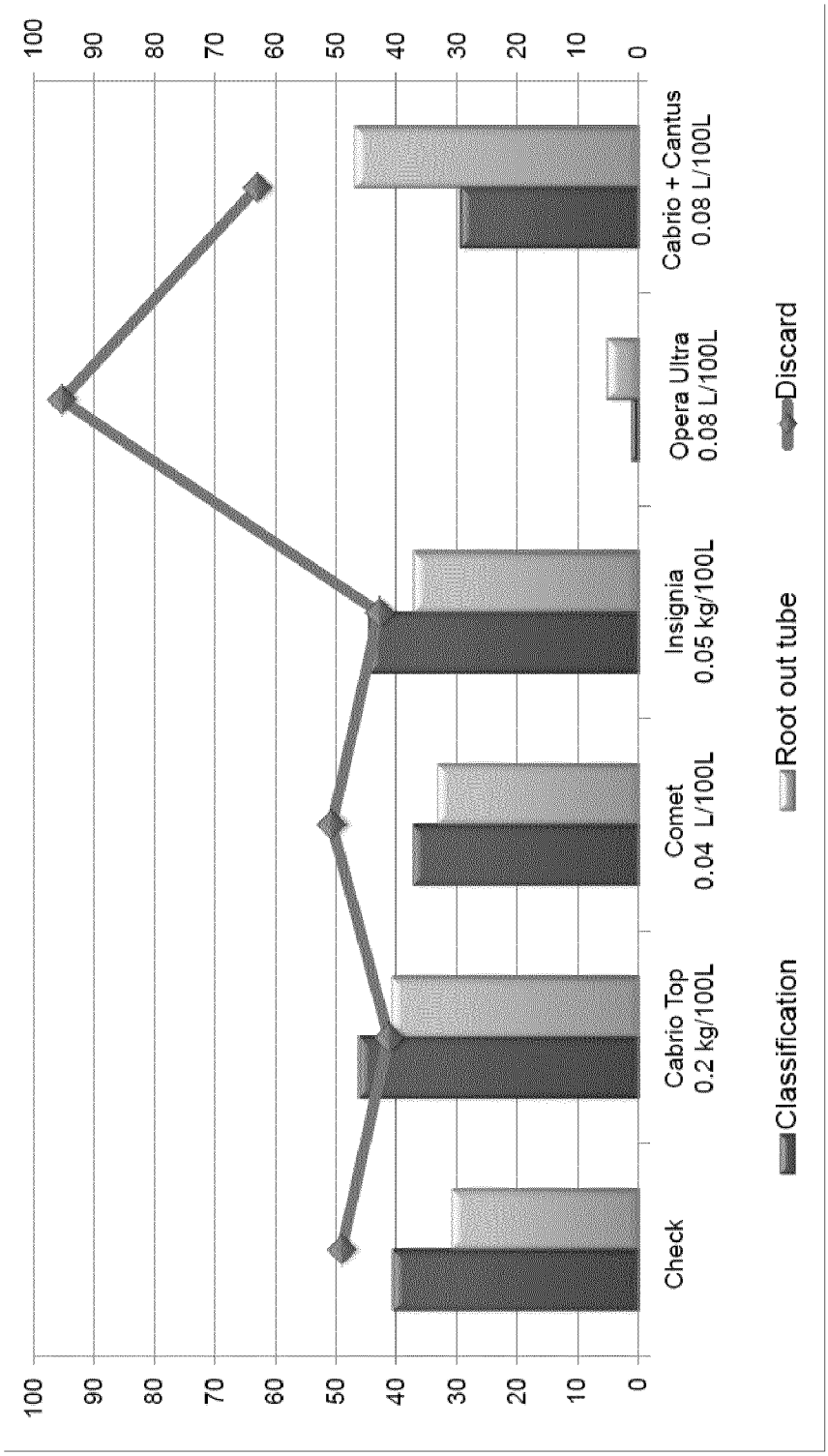

100
90
80
70
60
50
40
30
20
10
0
Check
Cabrio Top 0.2 kg/100L
Comet 0.04 L/100L
Insignia 0.05 kg/100L
Opera Ultra 0.08 L/100L
Cabrio + Cantus 0.08 L/100L
Classification
Root out tube
Discard

FIGURE 17

Products	Rate (Kg/100 L)	Root out tube (%)	Discard (%)	Classification	Height (cm) 27 DAA	Diameter (mm) 27 DAA	Height (cm) 35 DAA	Diameter (mm) 35 DAA	Height (cm) 42 DAA	Diameter (mm) 42 DAA	Dry shoot 1	Dry root 1
Check		30.89	49.11	40.66	11.93	1.38	13.40	1.63	17.25	1.94	0.41	0.09
Cabrio top	0.2	40.71	41.25	46.22	16.13	1.71	18.12	2.10	21.02	2.53	0.60	0.12
Comet	0.04	33.21	50.71	37.27	12.18	1.36	13.60	1.58	16.70	1.95	0.34	0.08
Insignia	0.05	37.14	42.86	44.58	12.36	1.45	14.45	1.73	17.60	2.04	0.45	0.10
Opera ultra	0.077	5.18	95.36	1.10	9.77	1.32	10.68	1.50	12.41	1.72	0.29	0.06
Cabrio top + Cantus	0.2+0.03	46.96	63.04	29.51	14.05	1.63	16.22	1.96	19.63	2.27	0.45	0.09

Products	Rate (Kg/100 L)	Height (cm) 56 DAA	Diameter (mm) 56 DAA	Height (cm) 63 DAA	Diameter (mm) 63 DAA	Height (cm) 70 DAA	Diameter (mm) 70 DAA	Height (cm) 70 DAA	Diameter (mm) 70 DAA	Dry shoot 2	Dry root 2
						Seedlings with better classification		Seedlings with classification B			
Check		25.54	2.55	28.14	2.88	29.45	3.02	26.38	2.61	1.74	0.59
Cabrio top	0.2	29.24	2.88	31.84	3.23	33.47	3.42	28.96	2.84	1.85	0.70
Comet	0.04	24.41	2.41	26.84	2.69	27.75	2.86	25.37	2.57	1.33	0.46
Insignia	0.05	24.40	2.58	27.27	2.85	28.60	3.05	26.71	2.62	1.54	0.50
Opera ultra	0.077	12.82	1.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cabrio top + Cantus	0.2+0.03	26.57	2.70	28.89	3.06	30.33	3.23	27.13	2.83	1.65	0.58

FIGURE 18

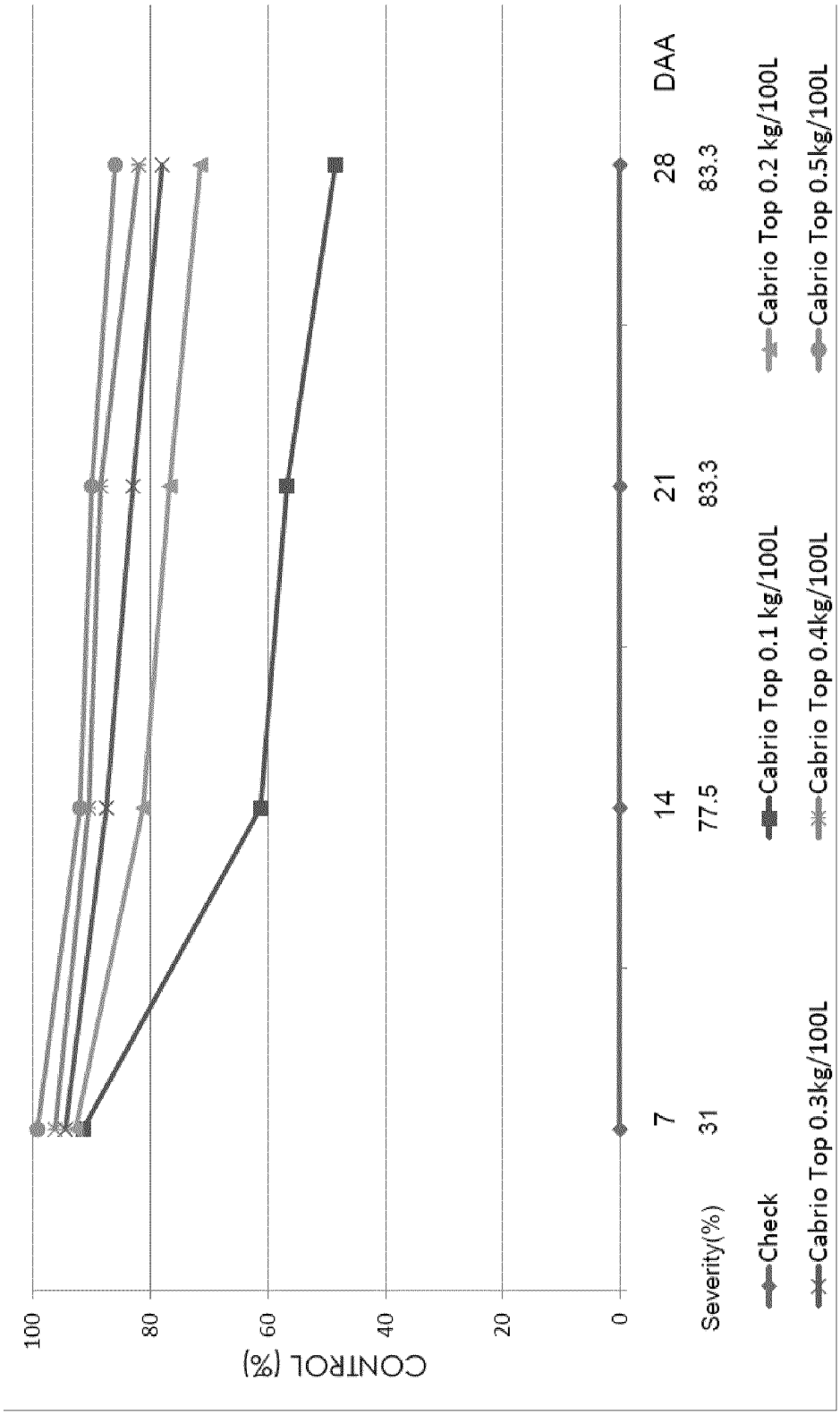

CONTROL (%)
100
80
60
40
20
0
7
14
21
28
DAA
Severity(%)
31
77.5
83.3
83.3
Check
Cabrio Top 0.1 kg/100L
Cabrio Top 0.2 kg/100L
Cabrio Top 0.3kg/100L
Cabrio Top 0.4kg/100L
Cabrio Top 0.5kg/100L

FIGURE 19

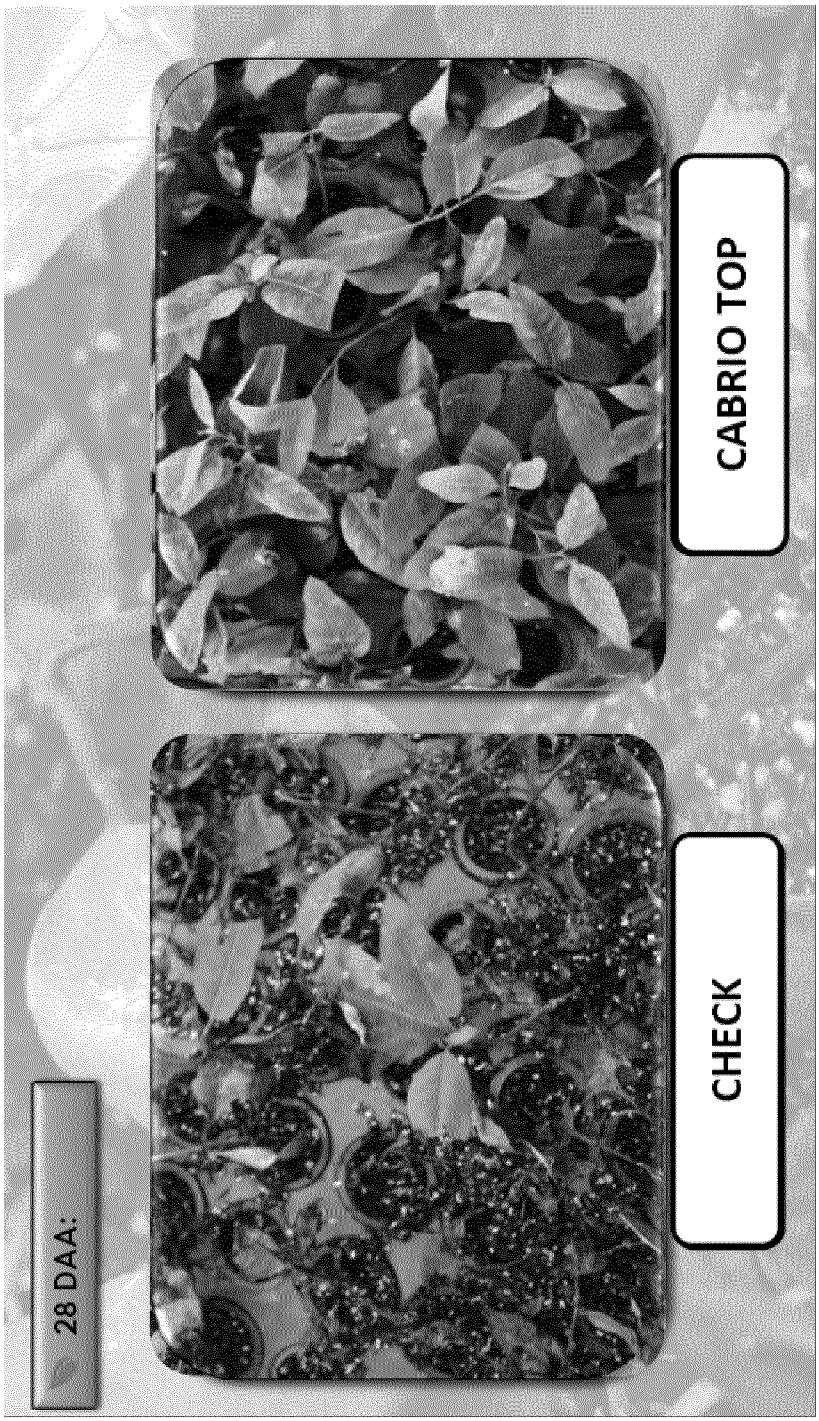


FIGURE 20

Products	Rate (Kg/100 L)	Control 7 DAA	Control 14 DAA	Control 21 DAA	Control 28 DAA	Dead plants (%) 14 DAA	Dead plants (%) 21 DAA	Root out tube (%) 21 DAA	Dead plants (%) 28 DAA	Root out tube (%) 28 DAA	Discard
Check		0	0	0	0	13.57	45.00	2.14	62	6	100
Cabrio Top	0.1	92	61	57	49	0	7.86	50.71	13	59	79
Cabrio Top	0.2	93	81	77	72	0	5.00	55.71	9	65	56
Cabrio Top	0.3	95	88	83	78	0	0.71	55.00	3	64	63
Cabrio Top	0.4	96	91	89	82	0	0.71	67.86	1	78	58
Cabrio Top	0.5	99	92	90	86	0	0.00	66.43	1	73	54

FIGURE 21

Products	Rate (g a.i./100L)	Frequency (%) 7 DAA	Severity (%) 7 DAA	Frequency (%) 14 DAA	Severity (%) 14 DAA	Frequency (%) 21 DAA	Severity (%) 21 DAA
Check	*	100.0	32.5	100.0	72.5	100.0	87.5
CABRIO TOP[1]	20+220	34.3	3.0	57.1	10.5	66.4	25.0
INSIGNIA[2]	20	45.7	9.0	69.3	22.5	93.6	43.8
POLYRAM DF[3]	220	77.9	23.8	100.0	62.5	100.0	78.3

[1] Pyraclostrobin + Metiram; [2] Pyraclostrobin; [3] Metiram

FIGURE 22

5

7 DAA

Doses (g ai/100L)	X = Pyra	Y = Metiram	E*	Pyra + Metiram	Synergism (Y/N)	
%E $_{Frequency}$						
20 + 220	54.3	22.1	64.4	65.7	65.7 > 64.4	YES
%E $_{Severity}$						
20 + 220	72.3	26.9	79.8	90.8	90.8 > 79.8	YES

14 DAA

Doses (g ai/100L)	X = Pyra	Y = Metiram	E*	Pyra + Metiram	Synergism (Y/N)	
%E $_{Frequency}$						
20 + 220	30.7	0	30.7	42.9	42.9 > 30.7	YES
Severity						
20 + 220	69	13.8	73.3	85.5	85.5 > 73.3	YES

21 DAA

Doses (g ai/100L)	X = Pyra	Y = Metiram	E*	Pyra + Metiram	Synergism (Y/N)	
%E $_{Frequency}$						
20 + 220	6.4	0	6.4	33.6	33.6 > 6.4	YES
%E $_{Severity}$						
20 + 220	50	10.6	55.3	71.4	71.4 > 55.3	YES

* E = X+Y -((X*Y)/100)

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/067787

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01P21/00 A01N47/24 A01N47/14 A01N43/88 A01N47/26
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A01N

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 102 239 863 A (SHAANXI TANGPUSEN BIOTECH CO) 16 November 2011 (2011-11-16) claims 1-9 table 9	1-20
Y	WO 2012/084766 A1 (BASF SE [DE]; REDDIG ACHIM [DE]; BRAHM LUTZ [DE]; GLADWIN ROBERT JOHN) 28 June 2012 (2012-06-28) claim 1; tables 1-3 claim 19	1-20
Y	WO 2007/104669 A2 (BASF AG [DE]; KOEHLE HARALD [DE]; BARDINELLI TED R [US]; TAVARES-RODRI) 20 September 2007 (2007-09-20) claims 1-4,8 page 23	1-20

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 October 2014	23/10/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Kamdzhilov, Yavor

1

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/067787

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2011/012458 A1 (BASF SE [DE]; KOEHLE HARALD [DE]; WISSEMEIER ALEXANDER [DE]; GLADWIN R) 3 February 2011 (2011-02-03)	1-3,12, 14,19,20
Y	claims 3-4,8; example 1 last sentence on p.19 bridging p.20 ast paragraph, p.13 to p.14 -----	1-20
Y	WO 2012/076563 A1 (BASF SE [DE]; GEWEHR MARKUS [DE]; HAASE ANDREAS [RU]; HADEN EGON [DE]) 14 June 2012 (2012-06-14) tables 1,2 -----	1-20

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2014/067787

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WO 2012084766 A1	28-06-2012	CA 2819301 A1	28-06-2012
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		KR 20080111057 A	22-12-2008
		PE 12862007 A1	02-03-2008
		TW 200812495 A	16-03-2008
		US 2009233916 A1	17-09-2009
		UY 30210 A1	31-07-2007
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		AU 2010277748 A1	08-03-2012
		CN 102469791 A	23-05-2012
		CR 20120039 A	22-03-2012
		EP 2458994 A1	06-06-2012
		JP 2013500297 A	07-01-2013
		KR 20120107068 A	28-09-2012
		NZ 597649 A	28-03-2013
		PE 11282012 A1	16-08-2012
		US 2012129696 A1	24-05-2012
		WO 2011012458 A1	03-02-2011
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		WO 2012076563 A1	14-06-2012
		WO 2012077061 A1	14-06-2012