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(54) Title: METHOD FOR IMPROVING THE HEALTH OF A PLANT

(57) Abstract: Method for improving the health of a plant The present invention relates to a method for increasing the health of plants, wherein the plant, the locus where the plant is growing or is expected to grow or plant propagation material from which the plant grows is treated with an effective amount of an active ingredient, selected from the group of compound I, II, III and IV or a mixture as defined in the claims and description. The present invention also relates to specific mixtures.



WO 2012/022729 A2

Method for improving the health of a plant

Description

The present invention relates to a method for improving the health of a plant, wherein the plant, the locus where the plant is growing or is expected to grow or plant propagation material from which the plant grows is treated with an effective amount of an active ingredient, selected from the group of compound I, II, III and IV and, in each case, agriculturally acceptable salts thereof:

- I 2-[3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiranylmethyl]-2,4-dihydro-[1,2,4]triazol-3-thione;
- II 1-[3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiranylmethyl]-5-thiocyanato-1H-[1,2,4]triazole;
- III 5-Allylsulfanyl-1-[[3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiran-2-yl]methyl]-[1,2,4]triazole; and
- IV 2-[1-[3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione;

wherein each of said compounds may be fully or partially present in its tautomeric form.

The present invention further relates to the use of a mixture comprising an active ingredient, selected from the group of compound I, compound II, compound III and compound IV as component 1 and a specific herbicidal compound as component 2 for improving the health of a plant, preferably for synergistically increasing the health of a plant. The present invention also relates to a method for synergistically increasing the health of a plant, in particular the yield of a plant, wherein the plant, the locus where the plant is growing or is expected to grow or plant propagation material from which the plant grows is treated with a synergistically effective amount of said mixture.

The present invention further relates to a mixture comprising an active ingredient, selected from the group of compound I, compound II, compound III and compound IV as component 1 and a specific herbicidal compound as component 2 as defined below.

In crop protection, there is a continuous need for compounds and compositions that improve the health of plants. Healthier plants are desirable since they result among others in better yields and/or a better quality of the plants or crops. Healthier plants also better resist to biotic and/or abiotic stress. A high resistance against biotic stresses in turn allows the person skilled in the art to reduce the quantity of pesticides applied and consequently to slow down the development of resistances against the respective pesticides.

Another problem encountered concerns the need to have available pest control agents which are effective against a broad spectrum of pests (including undesirable vegetation) and pathogens such as phytopathogenic fungi. The combating of harmful phytopathogenic fungi is, however, not the only problem the farmer has to face. Also undesirable plants can cause great damage to crops which may result in a strong decrease in yield. An efficient combination of fungicidal and herbicidal activity is desirable to overcome these problems. Thus, it is a further object of the present invention to provide a mixture that, on the one hand, has good fungicidal activity, and, on the other hand, good herbicidal activity, resulting in a broader pesticidal spectrum of action.

It was therefore an object of the present invention to provide methods and pesticidal compositions which solve the problems outlined above, and which should, in particular, improve the health of plants, in particular the yield of plants.

We have found that these objects are in part or in whole achieved by using a compound selected from I, II, III and IV or the mixtures as defined herein.

Compounds I, II, III and IV as well as their pesticidal action and methods for producing them are known from WO 2009/077443 (PCT/EP2008/067394), EP09178224.3 and WO 2010/040718, wherein also certain mixtures with other active compounds and certain uses are mentioned.

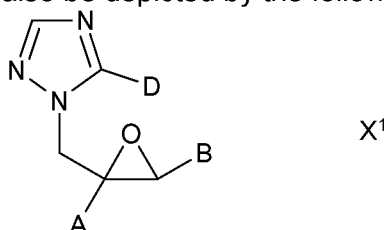
The compounds I, II, III and IV contain stereo centres and may therefore be present as different stereoisomers or as mixtures of stereoisomers. In particular, the compounds I, II, III, IV can be also described as compound Ia, compound Ib, compound IIa, compound IIb, compound IIIa, compound IIIb, compound IVa, compound IVb, compound IVc, compound IVd, compound IVe, compound IVf, compound IVg and compound IVh:

- Ia 2-[rel (2R,3S)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiranylmethyl]-2,4-dihydro-[1,2,4]triazol-3-thione;
- Ib 2-[rel (2R,3R)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiranylmethyl]-2,4-dihydro-[1,2,4]triazol-3-thione;
- IIa 1-[rel (2R,3S)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiranylmethyl]-5-thiocyanato-1H-[1,2,4]triazole;
- IIb 1-[rel (2R,3R)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiranylmethyl]-5-thiocyanato-1H-[1,2,4]triazole;
- IIIa 5-Allylsulfanyl-1-[[rel (2R,3S)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiran-2-yl]methyl]-[1,2,4]triazole;
- IIIb 5-Allylsulfanyl-1-[[rel (2R,3R)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiran-2-yl]methyl]-[1,2,4]triazole;

- IVa 2-[(1S,2S)-1-[(2S)-3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione;
- IVb 2-[(1S,2S)-1-[(2R)-3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione;
- IVc 2-[(1R,2R)-1-[(2R)-3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione;
- IVd 2-[(1R,2R)-1-[(2S)-3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione;
- IVe 2-[(1S,2R)-1-[(2S)-3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione;
- IVf 2-[(1S,2R)-1-[(2R)-3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione;
- IVg 2-[(1R,2S)-1-[(2R)-3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione; and
- IVh 2-[(1R,2S)-1-[(2S)-3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione;

wherein each of said compounds may be fully or partially present in its tautomeric form; and/or agriculturally acceptable salts thereof.

Compounds I, II and III can also be depicted by the following formula X¹



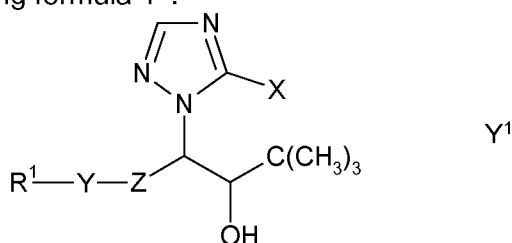
in which the variables have the following meanings:

A 2,4-difluorophenyl;

B 2-chlorophenyl; and

D S-H (compound I, in particular Ia and Ib), S-CN (compound II, in particular IIa and IIb) or S-CH₂CH=CH₂ (compound III, in particular IIIa and IIIb).

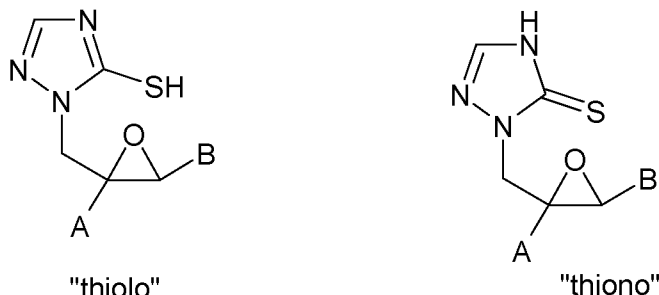
Compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh, can also be depicted by the following formula Y¹:



in which the variables have the following meanings:

X SH
 Y-Z CH₂CH(CH₃)CH₂; and
 R¹ 2,4-dichlorophenyl.

The compounds I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and compound IVh, may each be fully or partially present in their tautomeric form (as regards the thio-substituted triazole group), i.e. they may be present in the "thiol" or in the "thiono" form. This is exemplarily shown for compounds Ia/Ib:



in which A and B have the meaning defined above. Here, for the sake of simplicity, in each case only one of the two forms is given.

The compounds I, II, III and IV comprise chiral centers and are generally obtained in the form of racemates or as diastereomer mixtures of erythro and threo forms. The erythro and threo diastereomers of the compounds can be separated and isolated in pure form, for example, on the basis of their different solubilities or by column chromatography. Using known methods, such uniform pairs of diastereomers can be used to obtain uniform enantiomers. Suitable for use as antimicrobial agents are both the uniform diastereomers or enantiomers and mixtures thereof obtained in the synthesis. This applies correspondingly to the compositions.

According to one embodiment of the present invention, the active ingredient used in the inventive methods and of the inventive mixtures is a compound I, in particular Ia and/or Ib. Thereby, the enantiomer mixture of the "trans" isomers, i.e. compound Ia, wherein the phenyl rings are "trans" to each other, is particularly preferred. Thus, in the inventive methods and mixtures compound Ia (2-[rel (2R, 3S)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)oxiranylmethyl]-2,4-dihydro-[1,2,4]triazole-3-thione), which can also be present in its tautomeric form or as tautomeric mixture, is preferred. In particular, a racemic mixture is present. Furthermore, any other proportions of the trans-enantiomers may be present and also any one of the trans-enantiomers may also be present in pure form. On the other hand, also the "cis" isomers may be present, i.e. compound Ib (2-[rel (2R, 3R)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)oxiranylmethyl]-2,4-dihydro-[1,2,4]triazole-3-thione) and/or its tautomeric thiol-form. This applies to every method or use according to the present invention and to every binary or ternary mixture detailed herein.

According to a further embodiment of the present invention, the active ingredient used in the inventive methods and of the inventive mixtures is a compound II, in particular IIa and/or IIb. Thereby, the enantiomer mixture of the "trans" isomers, i.e. compound IIa, wherein the phenyl rings are "trans" to each other, is particularly preferred. Thus, in the inventive methods and mixtures compound IIa (1-[rel (2R,3S)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiranylmethyl]-5-thiocyanato-1H-[1,2,4]triazole), which can also be present in its tautomeric form or as tautomeric mixture, is preferred. In particular, a racemic mixture is present. Furthermore, any other proportions of the trans-enantiomers may be present and also any one of the trans-enantiomers may also be present in pure form. On the other hand, also the "cis" isomers may be present, i.e. compound IIb (1-[rel (2R,3R)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiranylmethyl]-5-thiocyanato-1H-[1,2,4]triazole) and/or its tautomeric thiol-form. This applies to every method or use according to the present invention and to every binary or ternary mixture detailed herein.

According to still a further embodiment of the present invention, the active ingredient used in the inventive methods and of the inventive mixtures is a compound III, in particular IIIa and/or IIIb. Thereby, the enantiomer mixture of the "trans" isomers, i.e. compound IIIa, wherein the phenyl rings are "trans" to each other, is particularly preferred. Thus, in the inventive methods and mixtures compound IIIa (5-Allylsulfanyl-1-[[rel (2R,3S)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiran-2-yl]methyl]-[1,2,4]triazole), which can also be present in its tautomeric form or as tautomeric mixture, is preferred. In particular, a racemic mixture is present. Furthermore, any other proportions of the trans-enantiomers may be present and also any one of the trans-enantiomers may also be present in pure form. On the other hand, also the "cis" isomers may be present, i.e. compound IIIb (5-Allylsulfanyl-1-[[rel (2R,3R)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiran-2-yl]methyl]-[1,2,4]triazole) and/or its tautomeric thiol-form. This applies to every method or use according to the present invention and to every binary or ternary mixture detailed herein.

According to still a further embodiment of the present invention, the active ingredient used in the inventive methods and of the inventive mixtures is a compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh. Thereby, it is preferred that the isomers IVa, IVb, IVc and IVd are in each case present alone or in a combination with one or more others of said isomers, in particular as combination of said two diastereomers (that are each enantiomeric pairs) in ratios of 5 : 1 to 1 : 5 or 4 : 1 to 1 : 4, in particular 2 : 1 to 1 : 2, specifically 1 : 1. In particular, a racemic mixture is present. Furthermore, any other proportions of the enantiomers may be present and also any one of the enantiomers may also be present in pure form. Any isomer may fully or partially be present in its respective tautomeric form. This applies to every

method or use according to the present invention and to every binary or ternary mixture detailed herein.

Owing to the basic character of their nitrogen atoms, the compounds I, II, III and IV are capable of forming salts or adducts with inorganic or organic acids or with metal ions, in particular salts with inorganic acids.

Examples of inorganic acids are hydrohalic acids, such as hydrogen fluoride, hydrogen chloride, hydrogen bromide and hydrogen iodide, carbonic acid, sulfuric acid, phosphoric acid and nitric acid.

Suitable organic acids are, for example, formic acid and alkanoic acids, such as acetic acid, trifluoroacetic acid, trichloroacetic acid and propionic acid, and also glycolic acid, thiocyanic acid, lactic acid, succinic acid, citric acid, benzoic acid and other arylcarboxylic acids, cinnamic acid, oxalic acid, alkylsulfonic acids (sulfonic acids having straight-chain or branched alkyl radicals of 1 to 20 carbon atoms), arylsulfonic acids or aryldisulfonic acids (aromatic radicals, such as phenyl and naphthyl, which carry one or two sulfonic acid groups), alkylphosphonic acids (phosphonic acids having straight-chain or branched alkyl radicals with 1 to 20 carbon atoms), arylphosphonic acids or aryldiphosphonic acids (aromatic radicals, such as phenyl and naphthyl, which carry one or two phosphoric acid radicals), where the alkyl or aryl radicals may carry further substituents, for example p-toluenesulfonic acid, salicylic acid, p-aminosalicylic acid, 2-phenoxybenzoic acid, 2-acetoxybenzoic acid etc.

Suitable metal ions are in particular the ions of the elements of the second main group, in particular calcium and magnesium, of the third and fourth main group, in particular aluminum, tin and lead, and also of the elements of transition groups one to eight, in particular chromium, manganese, iron, cobalt, nickel, copper, zinc, and others. Particular preference is given to the metal ions of the elements of transition groups of the fourth period. The metals can be present in the various valencies that they can assume.

The herbicidal compounds used in the mixtures detailed herein as well as their action and methods for producing them are generally known. For instance, the commercially available compounds can be found in "The Pesticide Manual, 15th Edition, British Crop Protection Council (2009)" among other publications.

Referring to imidazolinone herbicides or specific imidazolinone herbicide species in this application shall mean the compounds as mentioned above, as well as their a) salts, e.g. salts of alkaline or earth alkaline metals or ammonium or organoammonium salts, for instance, sodium, potassium, ammonium, preferably

isopropyl ammonium etc.; b) respective isomers, e.g. stereo isomers such as the respective enantiomers, in particular the respective R- or S-enantiomers (including salts, ester, amides), c) respective esters, e.g. carboxylic acid C₁-C₈-(branched or non-branched) alkyl esters, such as methyl esters, ethyl esters, iso propyl esters, d) respective amides, e.g. carboxylic acid amides or carboxylic acid C₁-C₈-(branched or non-branched) mono or di alkyl amides, such as dimethylamides, diethylamides, di isopropyl amides or e) any other derivative which contains the above imidazolinone structures as structural moiety.

The term "locus" is to be understood as any type of environment, soil, area or material where the 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 plant and/or its propagules.

The term "health of a plant" or "plant health" is defined as a condition of the 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. Each listed plant health indicator listed herein, and which is selected from the groups consisting of yield, plant vigor, 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.

It has to be emphasized that the above mentioned effects of the compounds I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh or the inventive mixtures, i.e. enhanced health of the 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 evident that a plant suffering from fungal or attack by weeds produces a smaller biomass and leads to a reduced yield as compared to a 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 methods according to the invention lead to an enhanced plant health even in the absence of any biotic stress. This means that the positive effects of the compounds I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh and the mixtures of the invention or used according to the invention cannot be explained just by the fungicidal and/or herbicidal activities of compounds I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh and component 2 and, if present, component 3, but are based on further activity profiles. Accordingly, the application of a compounds I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg or IVh or of the mixtures can also be effectively carried out in the absence of pest pressure.

Each listed plant health indicator listed below, and which is selected from the groups consisting of yield, plant vigor, 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 plant, in particular of an agricultural, silvicultural and/or horticultural plant means that the yield of a product of the respective plant is increased by a measurable amount over the yield of the same product of the plant produced under the same conditions, but without the application of the compound I or the inventive mixture or the mixture used according to the invention.

Increased yield can be characterized, among others, by the following improved properties of the plant: increased plant weight; and/or increased plant height; and/or increased biomass such as higher overall fresh weight (FW); and/or increased number of flowers per plant; and/or higher grain and/or fruit yield; and/or more tillers or side shoots (branches); and/or larger leaves; and/or increased shoot growth; and/or increased protein content; and/or increased oil content; and/or increased starch content; and/or increased pigment content; and/or increased chlorophyll content (chlorophyll content has a positive correlation with the plant's photosynthesis rate and accordingly, the higher the chlorophyll content the higher the yield of a plant).

"Grain" and "fruit" are to be understood as any plant product which is further utilized after harvesting, e.g. fruits in the proper sense, vegetables, nuts, grains, seeds, wood (e.g. in the case of silviculture plants), flowers (e.g. in the case of gardening plants, ornamentals) etc., that is anything of economic value that is produced by the plant.

According to the present invention, the yield is increased by at least 4 %, preferably at least 8 %, more preferably at least 15 %, even more preferably at least 25 %, even more preferably at least 35 %. In particular, the yield is increased preferably 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.

Improved plant vigor can be characterized, among others, by the following improved properties of the plant: improved vitality of the plant; and/or improved plant growth; and/or improved plant development; and/or improved visual appearance; and/or improved plant stand (less plant verse/lodging); and/or improved emergence; and/or enhanced root growth and/or more developed root system; and/or enhanced

nodulation, in particular rhizobial nodulation; and/or bigger leaf blade; and/or bigger size; and/or increased plant height; and/or increased tiller number; and/or increased number of side shoots; and/or increased number of flowers per plant; and/or increased shoot growth; and/or enhanced photosynthetic activity (e.g. based on increased stomatal conductance and/or increased CO₂ assimilation rate) ; and/or enhanced pigment content-; and/or earlier flowering; and/or earlier fruiting; and/or earlier and improved germination; and/or earlier grain maturity; and/or less non-productive tillers; and/or less dead basal leaves; and/or less input needed (such as fertilizers or water); and/or greener leaves; and/or complete maturation under shortened vegetation periods; and/or less seeds needed; and/or easier harvesting; and/or faster and more uniform ripening; and/or longer shelf-life; and/or longer panicles; and/or delay of senescence ; and/or stronger and/or more productive tillers; and/or better extractability of ingredients; and/or improved quality of seeds (for being seeded in the following seasons for seed production); and/or reduced production of ethylene and/or the inhibition of its reception by the plant.

Another indicator for the condition of the plant is the "quality" of a plant and/or its products. According to the present invention, enhanced quality means that certain 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 plant produced under the same conditions, but without the application of the compound I or the mixtures of the present invention or used according to the invention. Enhanced quality can be characterized, among others, by following improved properties of the plant or its product: increased nutrient content; and/or increased protein content; and/or increased content of fatty acids; and/or increased metabolite content; and/or increased carotenoid content; and/or increased sugar content; and/or increased amount of essential amino acids; and/or improved nutrient composition; and/or improved protein composition; and/or improved composition of fatty acids; and/or improved metabolite composition; and/or improved carotenoid composition; and/or improved sugar composition; and/or improved amino acids composition ; and/or improved or optimal fruit color; and/or improved leaf color; and/or higher storage capacity; and/or higher processability of the harvested products.

Another indicator for the condition of the plant is the plant's tolerance or resistance to biotic and/or abiotic stress factors. Biotic and abiotic stress, especially over longer terms, can have harmful effects on plants. Biotic stress is caused by living organisms while abiotic stress is caused for example by environmental extremes. According to the present invention, "enhanced tolerance or resistance to biotic and/or abiotic stress factors" means (1.) that certain negative factors caused by biotic and/or abiotic stress are diminished in a measurable or noticeable amount as compared to plants exposed to the same conditions, but without being treated with a compound I, II, III

and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg or IVh or an inventive mixture or the mixture used according to the invention and (2.) that the negative effects are not diminished by a direct action of a compound I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg or IVh or the inventive mixture or the mixture used according to the invention 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 can be caused by living organisms, such as competing plants (for example weeds), microorganisms (such as phytopathogenic 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); and/or strong variations in temperature; and/or temperatures unusual for the specific season; and/or drought (drought stress); and/or extreme wetness; and/or high salinity (salt stress); and/or radiation (for example by increased UV radiation due to the decreasing ozone layer); and/or increased ozone levels (ozone stress); and/or organic pollution (for example by phytotoxic amounts of pesticides); and/or 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 plants, their crops and fruits decrease. As far as quality is concerned, reproductive development is usually severely affected with consequences on the crops which are important for fruits or seeds. 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.

Advantageous properties, obtained especially from treated seeds, are e.g. improved germination and field establishment, better vigor and/or a more homogenous field establishment.

As pointed out above, the above identified indicators for the health condition of a 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 crops, 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.

According to a first aspect of the present invention, a compound I, in particular Ia and/or Ib, preferably Ia, is used in a method for increasing the health of plants, wherein the plant, the locus where the plant is growing or is expected to grow or plant propagation material from which the plant grows is treated with an effective amount of a compound I, in particular Ia and/or Ib, preferably Ia.

According to a further aspect of the present invention, a compound II, in particular IIa and/or IIb, preferably IIa, is used in a method for increasing the health of plants, wherein the plant, the locus where the plant is growing or is expected to grow or plant propagation material from which the plant grows is treated with an effective amount of a compound II, in particular IIa and/or IIb, preferably IIa.

According to still a further aspect of the present invention, a compound III, in particular IIIa and/or IIIb, preferably IIIa, is used in a method for increasing the health of plants, wherein the plant, the locus where the plant is growing or is expected to grow or plant propagation material from which the plant grows is treated with an effective amount of a compound III, in particular IIIa and/or IIIb, preferably IIIa.

According to still a further aspect of the present invention, a compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, preferably IVa, IVb, IVc and/or IVd, is used in a method for increasing the health of plants, wherein the plant, the locus where the plant is growing or is expected to grow or plant propagation material from which the plant grows is treated with an effective amount of a compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, preferably IVa, IVb, IVc and/or IVd.

In one embodiment the compound I, in particular Ia and/or Ib, preferably Ia, is used for increasing the yield of a plant or its product. In a preferred embodiment of the invention, compound I, in particular Ia and/or Ib, preferably Ia, is used for increasing the yield such as the plant weight and/or the plant biomass (e.g. overall fresh weight) and/or the grain yield and/or the number of tillers.

In another embodiment the compound II, in particular IIa and/or IIb, preferably IIa, is used for increasing the yield of a plant or its product. In a preferred embodiment of the invention, compound II, in particular IIa and/or IIb, preferably IIa, is used for increasing the yield such as the plant weight and/or the plant biomass (e.g. overall fresh weight) and/or the grain yield and/or the number of tillers.

In still another embodiment the compound III, in particular IIIa and/or IIIb, preferably Ia, is used for increasing the yield of a plant or its product. In a preferred embodiment of the invention, compound III, in particular IIIa and/or IIIb, preferably IIIa, is used for increasing the yield such as the plant weight and/or the plant biomass (e.g. overall fresh weight) and/or the grain yield and/or the number of tillers.

In still another embodiment the compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, preferably IVa, IVb, IVc and/or IVd, is used for increasing the yield of a plant or its product. In a preferred embodiment of the invention, compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, preferably IVa, IVb, IVc and/or IVd, is used for increasing the yield such as the plant weight and/or the plant biomass (e.g. overall fresh weight) and/or the grain yield and/or the number of tillers.

In still another embodiment the compound I, in particular Ia and/or Ib, preferably Ia, is used for increasing the vigor of a plant or its product or improvement of the plant vigor.

In still another embodiment the compound II, in particular IIa and/or IIb, preferably IIa, is used for increasing the vigor of a plant or its product or improvement of the plant vigor.

In still another embodiment the compound III, in particular IIIa and/or IIIb, preferably IIIa, is used for increasing the vigor of a plant or its product or improvement of the plant vigor.

In still another embodiment the compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, preferably IVa, IVb, IVc and/or IVd, is used for increasing the vigor of a plant or its product or improvement of the plant vigor.

In another embodiment the compound I, in particular Ia and/or Ib, preferably Ia, is used for increasing the quality of a plant or its product.

In another embodiment the compound II, in particular IIa and/or IIb, preferably IIa, is used for increasing the quality of a plant or its product.

In another embodiment the compound III, in particular IIIa and/or IIIb, preferably IIIa, is used for increasing the quality of a plant or its product.

In another embodiment the compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, preferably IVa, IVb, IVc and/or IVd, is used for increasing the quality of a plant or its product.

In yet another embodiment the compound I, in particular Ia and/or Ib, preferably Ia, is used for increasing the tolerance and/or resistance of a plant or its product against biotic stress.

In yet another embodiment the compound II, in particular IIa and/or IIb, preferably IIa, is used for increasing the tolerance and/or resistance of a plant or its product against biotic stress.

In yet another embodiment the compound III, in particular IIIa and/or IIIb, preferably IIIa, is used for increasing the tolerance and/or resistance of a plant or its product against biotic stress.

In yet another embodiment the compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, preferably IVa, IVb, IVc and/or IVd, is used for increasing the tolerance and/or resistance of a plant or its product against biotic stress.

In yet another embodiment the compound I, in particular Ia and/or Ib, preferably Ia, is used for increasing the tolerance and/or resistance of a plant or its product against abiotic stress.

In yet another embodiment the compound II, in particular IIa and/or IIb, preferably IIa, is used for increasing the tolerance and/or resistance of a plant or its product against abiotic stress.

In yet another embodiment the compound III, in particular IIIa and/or IIIb, preferably IIIa, is used for increasing the tolerance and/or resistance of a plant or its product against abiotic stress.

In yet another embodiment the compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, preferably IVa, IVb, IVc and/or IVd, is used for increasing the tolerance and/or resistance of a plant or its product against abiotic stress.

Any one of compounds I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh, given in the respective method or use of the invention is employed by treating the plant, plant propagation material (preferably seed), soil, area, material or environment in which a plant is growing or may grow with an effective amount of the active compounds. The application can be carried out in the absence of pest pressure and/or both before and after an infection of the materials, plants or plant propagation materials (preferably seeds) by pests.

In one embodiment of the invention, the active ingredient selected from I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein the active ingredient selected from I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh, is applied at a growth stage (GS) between GS 00 and GS 65 BBCH of the treated plant.

In a preferred embodiment of the invention, the active ingredient selected from I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein the active ingredient selected from I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh, is applied at a growth stage (GS) between GS 00 and GS 55 BBCH of the treated plant.

In an even more preferred embodiment of the invention, the active ingredient selected from I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein the active ingredient selected from I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh, is applied at a growth stage (GS) between GS 00 and GS 37 BBCH of the treated plant.

In a most preferred embodiment of the invention, the active ingredient selected from I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein the active ingredient selected from I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh, is applied at a growth stage (GS) between GS 00 and GS 21 BBCH of the treated plant.

In a preferred embodiment of the invention, the active ingredient selected from I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein the the active ingredient selected from I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh is applied at a growth stage (GS) between GS 13 and GS 37 BBCH of the treated plant.

According to a second aspect of the present invention, a mixture comprising an active ingredient selected from I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa,

IVb, IVc, IVd, IVe, IVf, IVg and IVh, as component 1 and at least one herbicide selected from imazamox, imazethapyr, imazapic, imazapyr, imazamethabenz-methyl and imazaquin; dicamba, saflufenacil, glyphosate and glufosinate as component 2 is used in a method for increasing the health of plants, wherein the plant, the locus where the plant is growing or is expected to grow or plant propagation material from which the plant grows is treated with an effective amount of said mixture.

The present invention further relates to a method for controlling undesirable vegetation in crops, wherein the plant, the locus where the plant is growing or is expected to grow or plant propagation material from which the plant grows is treated with an effective amount of a mixture as defined herein.

The present invention additionally relates to the use of a mixture defined herein for synergistically controlling undesirable vegetation in crops.

The present invention further relates to a method for controlling phytopathogenic fungi, wherein the plant, the locus where the plant is growing or is expected to grow or plant propagation material from which the plant grows is treated with an effective amount of a mixture as defined above. The present invention additionally relates to the use of a mixture comprising an active ingredient selected from I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh, as component 1 and a specific herbicidal compound as defined herein as component 2 for controlling phytopathogenic fungi in crops.

According to one embodiment, the mixture used in the inventive methods is a binary mixture. "Binary mixture" in the sense of the present invention means that only two active compounds are present. The mixture may, of course contain any kind of additive or the like as detailed below in order to provide a formulation suitable for use in agriculture. The following binary mixtures can be used in the methods of the present invention

1) Mixtures with compounds I

mixture (I+2-1):	compound I, in particular compound Ia and/or Ib, and imazamox
mixture (I+2-2):	compound I, in particular Ia and/or Ib, and imazethapyr
mixture (I+2-3):	compound I, in particular Ia and/or Ib, and imazapic
mixture (I+2-4):	compound I, in particular Ia and/or Ib, and imazapyr
mixture (I+2-5):	compound I, in particular Ia and/or Ib, and imazamethabenz-methyl
mixture (I+2-6):	compound I, in particular Ia and/or Ib, and imazaquin
mixture (I+2-7):	compound I, in particular Ia and/or Ib, and dicamba
mixture (I+2-8):	compound I, in particular Ia and/or Ib, and saflufenacil
mixture (I+2-9):	compound I, in particular Ia and/or Ib, and glyphosate

mixture (I+2-10):	compound I, in particular Ia and/or Ib, and glufosinate
mixture (Ia+2-1):	compound Ia and imazamox
mixture (Ia+2-2):	compound Ia and imazethapyr
mixture (Ia+2-3):	compound Ia and imazapic
mixture (Ia+2-4):	compound Ia and imazapyr
mixture (Ia+2-5):	compound Ia and imazamethabenz-methyl
mixture (Ia+2-6):	compound Ia and imazaquin
mixture (Ia+2-7):	compound Ia and dicamba
mixture (Ia+2-8):	compound Ia and saflufenacil
mixture (Ia+2-9):	compound Ia and glyphosate
mixture (Ia+2-10):	compound Ia and glufosinate

2) Mixtures with compounds II

mixture (II+2-1):	compound II, in particular IIa and/or IIb, and imazamox
mixture (II+2-2):	compound II, in particular IIa and/or IIb, and imazethapyr
mixture (II+2-3):	compound II, in particular IIa and/or IIb, and imazapic
mixture (II+2-4):	compound II, in particular IIa and/or IIb, and imazapyr
mixture (II+2-5):	compound II, in particular IIa and/or IIb, and imazamethabenz-methyl
mixture (II+2-6):	compound II, in particular IIa and/or IIb, and imazaquin
mixture (II+2-7):	compound II, in particular IIa and/or IIb, and dicamba
mixture (II+2-8):	compound II, in particular IIa and/or IIb, and saflufenacil
mixture (II+2-9):	compound II, in particular IIa and/or IIb, and glyphosate
mixture (II+2-10):	compound II, in particular IIa and/or IIb, and glufosinate
mixture (IIa+2-1):	compound IIa and imazamox
mixture (IIa+2-2):	compound IIa and imazethapyr
mixture (IIa+2-3):	compound IIa and imazapic
mixture (IIa+2-4):	compound IIa and imazapyr
mixture (IIa+2-5):	compound IIa and imazamethabenz-methyl
mixture (IIa+2-6):	compound IIa and imazaquin
mixture (IIa+2-7):	compound IIa and dicamba
mixture (IIa+2-8):	compound IIa and saflufenacil
mixture (IIa+2-9):	compound IIa and glyphosate
mixture (IIa+2-10):	compound IIa and glufosinate

3) Mixtures with compounds III

mixture (III+2-1):	compound III, in particular IIIa and/or IIIb, and imazamox
mixture (III+2-2):	compound III, in particular IIIa and/or IIIb, and imazethapyr
mixture (III+2-3):	compound III, in particular IIIa and/or IIIb, and imazapic
mixture (III+2-4):	compound III, in particular IIIa and/or IIIb, and imazapyr

mixture (III+2-5):	compound III, in particular IIIa and/or IIIb, and imazamethabenz-methyl
mixture (III+2-6):	compound III, in particular IIIa and/or IIIb, and imazaquin
mixture (III+2-7):	compound III, in particular IIIa and/or IIIb, and dicamba
mixture (III+2-8):	compound III, in particular IIIa and/or IIIb, and saflufenacil
mixture (III+2-9):	compound III, in particular IIIa and/or IIIb, and glyphosate
mixture (III+2-10):	compound III, in particular IIIa and/or IIIb, and glufosinate
mixture (IIIa+2-1):	compound IIIa and imazamox
mixture (IIIa+2-2):	compound IIIa and imazethapyr
mixture (IIIa+2-3):	compound IIIa and imazapic
mixture (IIIa+2-4):	compound IIIa and imazapyr
mixture (IIIa+2-5):	compound IIIa and imazamethabenz-methyl
mixture (IIIa+2-6):	compound IIIa and imazaquin
mixture (IIIa+2-7):	compound IIIa and dicamba
mixture (IIIa+2-8):	compound IIIa and saflufenacil
mixture (IIIa+2-9):	compound IIIa and glyphosate
mixture (IIIa+2-10):	compound IIIa and glufosinate

4) Mixtures with compounds IV

mixture (IV+2-1):	compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazamox
mixture (IV+2-2):	compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazethapyr
mixture (IV+2-3):	compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazapic
mixture (IV+2-4):	compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazapyr
mixture (IV+2-5):	compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazamethabenz-methyl
mixture (IV+2-6):	compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazaquin
mixture (IV+2-7):	compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and dicamba
mixture (IV+2-8):	compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and saflufenacil
mixture (IV+2-9):	compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and glyphosate
mixture (IV+2-10):	compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and glufosinate
mixture (IVabcd+2-1):	compound IVa, IVb, IVc and/or IVd and imazamox
mixture (IVabcd+2-2):	compound IVa, IVb, IVc and/or IVd and imazethapyr

mixture (IVabcd+2-3):	compound IVa, IVb, IVc and/or IVd and imazapic
mixture (IVabcd+2-4):	compound IVa, IVb, IVc and/or IVd and imazapyr
mixture (IVabcd+2-5):	compound IVa, IVb, IVc and/or IVd and imazamethabenz-methyl
mixture (IVabcd+2-6):	compound IVa, IVb, IVc and/or IVd and imazaquin
mixture (IVabcd+2-7):	compound IVa, IVb, IVc and/or IVd and dicamba
mixture (IVabcd+2-8):	compound IVa, IVb, IVc and/or IVd and saflufenacil
mixture (IVabcd+2-9):	compound IVa, IVb, IVc and/or IVd and glyphosate
mixture (IVabcd+2-10)	compound IVa, IVb, IVc and/or IVd and glufosinate

Herein, the weight ratios are calculated as the free acid, in case one or more compounds are used as agriculturally acceptable salt.

In particular, the weight ratio of the particular first active ingredient selected from I, II, III and IV, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh (component 1) to component 2 is in each case 1:100 to 100:1, preferably 1:50 to 50:1, even more preferably 1:20 to 20:1. Furthermore, a preferable weight ratio of component 1 to component 2 is 95:1 to 1:95, more preferable 90:1 to 1:90, even more preferable 85:1 to 1:85, even more preferable 80:1 to 1:80, even more preferable 75:1 to 1:75, even more preferable 70:1 to 1:70, even more preferable 65:1 to 1:65, 60:1 to 1:60, even more preferable 55:1 to 1:55, even more preferable 50:1 to 1:50, even more preferable 45:1 to 1:45, even more preferable 30:1 to 1:30, even more preferable 25:1 to 1:25, even more preferable 15:1 to 1:15, even more preferable 10:1 to 1:10, even more preferable 5:1 to 1:5, even more preferable 4:1 to 1:4, even more preferable 3:1 to 1:3, even more preferable 2:1 to 1:2. In particular, the component 1 and the component 2 are used in synergistically effective amount.

In one embodiment any one of the mixtures (I+2-1), (I+2-2), (I+2-3), (I+2-4), (I+2-5), (I+2-6), (I+2-7), (I+2-8), (I+2-9) and (I+2-10), preferably (Ia+2-1), (Ia+2-2), (Ia+2-3), (Ia+2-4), (Ia+2-5), (Ia+2-6), (Ia+2-7), (Ia+2-8), (Ia+2-9) and (Ia+2-10), is used for increasing the yield of a plant or its product. In a preferred embodiment of the invention, any one of the mixtures (I+2-1) to (I+2-10), preferably (Ia+2-1) to (Ia+2-10), is used for increasing the yield such as the plant weight and/or the plant biomass (e.g. overall fresh weight) and/or the grain yield and/or the number of tillers. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In another embodiment any one of the mixtures (I+2-1), (I+2-2), (I+2-3), (I+2-4), (I+2-5), (I+2-6), (I+2-7), (I+2-8), (I+2-9) and (I+2-10), preferably (Ia+2-1), (Ia+2-2), (Ia+2-3), (Ia+2-4), (Ia+2-5), (Ia+2-6), (Ia+2-7), (Ia+2-8), (Ia+2-9) and (Ia+2-10), is used for increasing the vigor of a plant or its product or improvement of the plant vigor. The

components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In another embodiment the any one of the mixtures (I+2-1), (I+2-2), (I+2-3), (I+2-4), (I+2-5), (I+2-6), (I+2-7), (I+2-8), (I+2-9) and (I+2-10), preferably (Ia+2-1), (Ia+2-2), (Ia+2-3), (Ia+2-4), (Ia+2-5), (Ia+2-6), (Ia+2-7), (Ia+2-8), (Ia+2-9) and (Ia+2-10), is used for increasing the quality of a plant or its product. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In yet another embodiment any one of the mixtures (I+2-1), (I+2-2), (I+2-3), (I+2-4), (I+2-5), (I+2-6), (I+2-7), (I+2-8), (I+2-9) and (I+2-10), preferably (Ia+2-1), (Ia+2-2), (Ia+2-3), (Ia+2-4), (Ia+2-5), (Ia+2-6), (Ia+2-7), (Ia+2-8), (Ia+2-9) and (Ia+2-10), is used for increasing the tolerance and/or resistance of a plant or its product against biotic stress. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In yet another embodiment any one of the mixtures (I+2-1), (I+2-2), (I+2-3), (I+2-4), (I+2-5), (I+2-6), (I+2-7), (I+2-8), (I+2-9) and (I+2-10), preferably (Ia+2-1), (Ia+2-2), (Ia+2-3), (Ia+2-4), (Ia+2-5), (Ia+2-6), (Ia+2-7), (Ia+2-8), (Ia+2-9) and (Ia+2-10), is used for increasing the tolerance and/or resistance of a plant or its product against abiotic stress. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

Any one of the mixtures (I+2-1), (I+2-2), (I+2-3), (I+2-4), (I+2-5), (I+2-6), (I+2-7), (I+2-8), (I+2-9) and (I+2-10), preferably (Ia+2-1), (Ia+2-2), (Ia+2-3), (Ia+2-4), (Ia+2-5), (Ia+2-6), (Ia+2-7), (Ia+2-8), (Ia+2-9) and (Ia+2-10), is used by treating the plant, plant propagation material (preferably seed), soil, area, material or environment in which a plant is growing or may grow with an effective amount of the active compounds. The application can be carried out in the absense of pest pressure and/or both before and after an infection of the materials, plants or plant propagation materials (preferably seeds) by pests. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In one embodiment of the invention, any one of the mixtures (I+2-1), (I+2-2), (I+2-3), (I+2-4), (I+2-5), (I+2-6), (I+2-7), (I+2-8), (I+2-9) and (I+2-10), preferably (Ia+2-1), (Ia+2-2), (Ia+2-3), (Ia+2-4), (Ia+2-5), (Ia+2-6), (Ia+2-7), (Ia+2-8), (Ia+2-9) and (Ia+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (I+2-1) to (I+2-10), preferably (Ia+2-1) to (Ia+2-10), is applied at a growth stage (GS) between GS 00 and GS 65 BBCH of the treated plant. The components of the binary

mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In a preferred embodiment of the invention, any one of the mixtures (I+2-1), (I+2-2), (I+2-3), (I+2-4), (I+2-5), (I+2-6), (I+2-7), (I+2-8), (I+2-9) and (I+2-10), preferably (Ia+2-1), (Ia+2-2), (Ia+2-3), (Ia+2-4), (Ia+2-5), (Ia+2-6), (Ia+2-7), (Ia+2-8), (Ia+2-9) and (Ia+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (I+2-1) to (I+2-10), preferably (Ia+2-1) to (Ia+2-10), is applied at a growth stage (GS) between GS 00 and GS 55 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In an even more preferred embodiment of the invention, any one of the mixtures (I+2-1), (I+2-2), (I+2-3), (I+2-4), (I+2-5), (I+2-6), (I+2-7), (I+2-8), (I+2-9) and (I+2-10), preferably (Ia+2-1), (Ia+2-2), (Ia+2-3), (Ia+2-4), (Ia+2-5), (Ia+2-6), (Ia+2-7), (Ia+2-8), (Ia+2-9) and (Ia+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (I+2-1) to (I+2-10), preferably (Ia+2-1) to (Ia+2-10), is applied at a growth stage (GS) between GS 00 and GS 37 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In a most preferred embodiment of the invention, any one of the mixtures (I+2-1), (I+2-2), (I+2-3), (I+2-4), (I+2-5), (I+2-6), (I+2-7), (I+2-8), (I+2-9) and (I+2-10), preferably (Ia+2-1), (Ia+2-2), (Ia+2-3), (Ia+2-4), (Ia+2-5), (Ia+2-6), (Ia+2-7), (Ia+2-8), (Ia+2-9) and (Ia+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (I+2-1) to (I+2-10), preferably (Ia+2-1) to (Ia+2-10), is applied at a growth stage (GS) between GS 00 and GS 21 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In a preferred embodiment of the invention, any one of the mixtures (I+2-1), (I+2-2), (I+2-3), (I+2-4), (I+2-5), (I+2-6), (I+2-7), (I+2-8), (I+2-9) and (I+2-10), preferably (Ia+2-1), (Ia+2-2), (Ia+2-3), (Ia+2-4), (Ia+2-5), (Ia+2-6), (Ia+2-7), (Ia+2-8), (Ia+2-9) and (Ia+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (I+2-1) to (I+2-10), preferably (Ia+2-1) to (Ia+2-10), is applied at a growth stage (GS) between GS 13 and GS 37 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In another embodiment any one of the mixtures (II+2-1), (II+2-2), (II+2-3), (II+2-4), (II+2-5), (II+2-6), (II+2-7), (II+2-8), (II+2-9) and (II+2-10), preferably (IIa+2-1), (IIa+2-2), (IIa+2-3), (IIa+2-4), (IIa+2-5), (IIa+2-6), (IIa+2-7), (IIa+2-8), (IIa+2-9) and (IIa+2-10), is used for increasing the yield of a plant or its product. In a preferred embodiment of the invention, any one of the mixtures (II+2-1) to (II+2-10), preferably (IIa+2-1) to (IIa+2-10), is used for increasing the yield such as the plant weight and/or the plant biomass (e.g. overall fresh weight) and/or the grain yield and/or the number of tillers. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In another embodiment any one of the mixtures (II+2-1), (II+2-2), (II+2-3), (II+2-4), (II+2-5), (II+2-6), (II+2-7), (II+2-8), (II+2-9) and (II+2-10), preferably (IIa+2-1), (IIa+2-2), (IIa+2-3), (IIa+2-4), (IIa+2-5), (IIa+2-6), (IIa+2-7), (IIa+2-8), (IIa+2-9) and (IIa+2-10), is used for increasing the vigor of a plant or its product or improvement of the plant vigor. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In another embodiment the any one of the mixtures (II+2-1), (II+2-2), (II+2-3), (II+2-4), (II+2-5), (II+2-6), (II+2-7), (II+2-8), (II+2-9) and (II+2-10), preferably (IIa+2-1), (IIa+2-2), (IIa+2-3), (IIa+2-4), (IIa+2-5), (IIa+2-6), (IIa+2-7), (IIa+2-8), (IIa+2-9) and (IIa+2-10), is used for increasing the quality of a plant or its product. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In yet another embodiment any one of the mixtures (II+2-1), (II+2-2), (II+2-3), (II+2-4), (II+2-5), (II+2-6), (II+2-7), (II+2-8), (II+2-9) and (II+2-10), preferably (IIa+2-1), (IIa+2-2), (IIa+2-3), (IIa+2-4), (IIa+2-5), (IIa+2-6), (IIa+2-7), (IIa+2-8), (IIa+2-9) and (IIa+2-10), is used for increasing the tolerance and/or resistance of a plant or its product against biotic stress. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In yet another embodiment any one of the mixtures (II+2-1), (II+2-2), (II+2-3), (II+2-4), (II+2-5), (II+2-6), (II+2-7), (II+2-8), (II+2-9) and (II+2-10), preferably (IIa+2-1), (IIa+2-2), (IIa+2-3), (IIa+2-4), (IIa+2-5), (IIa+2-6), (IIa+2-7), (IIa+2-8), (IIa+2-9) and (IIa+2-10), is used for increasing the tolerance and/or resistance of a plant or its product against abiotic stress. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

Any one of the mixtures (II+2-1), (II+2-2), (II+2-3), (II+2-4), (II+2-5), (II+2-6), (II+2-7), (II+2-8), (II+2-9) and (II+2-10), preferably (IIa+2-1), (IIa+2-2), (IIa+2-3), (IIa+2-4),

(IIa+2-5), (IIa+2-6), (IIa+2-7), (IIa+2-8), (IIa+2-9) and (IIa+2-10), is used by treating the plant, plant propagation material (preferably seed), soil, area, material or environment in which a plant is growing or may grow with an effective amount of the active compounds. The application can be carried out in the absence of pest pressure and/or both before and after an infection of the materials, plants or plant propagation materials (preferably seeds) by pests. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In one embodiment of the invention, any one of the mixtures (II+2-1), (II+2-2), (II+2-3), (II+2-4), (II+2-5), (II+2-6), (II+2-7), (II+2-8), (II+2-9) and (II+2-10), preferably (IIa+2-1), (IIa+2-2), (IIa+2-3), (IIa+2-4), (IIa+2-5), (IIa+2-6), (IIa+2-7), (IIa+2-8), (IIa+2-9) and (IIa+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (IIa+2-1) to (IIa+2-10), preferably (IIa+2-1) to (IIa+2-10), is applied at a growth stage (GS) between GS 00 and GS 65 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In a preferred embodiment of the invention, any one of the mixtures (II+2-1), (II+2-2), (II+2-3), (II+2-4), (II+2-5), (II+2-6), (II+2-7), (II+2-8), (II+2-9) and (II+2-10), preferably (IIa+2-1), (IIa+2-2), (IIa+2-3), (IIa+2-4), (IIa+2-5), (IIa+2-6), (IIa+2-7), (IIa+2-8), (IIa+2-9) and (IIa+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (II+2-1) to (II+2-10), preferably (IIa+2-1) to (IIa+2-10), is applied at a growth stage (GS) between GS 00 and GS 55 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In an even more preferred embodiment of the invention, any one of the mixtures (II+2-1), (II+2-2), (II+2-3), (II+2-4), (II+2-5), (II+2-6), (II+2-7), (II+2-8), (II+2-9) and (II+2-10), preferably (IIa+2-1), (IIa+2-2), (IIa+2-3), (IIa+2-4), (IIa+2-5), (IIa+2-6), (IIa+2-7), (IIa+2-8), (IIa+2-9) and (IIa+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (II+2-1) to (II+2-10), preferably (IIa+2-1) to (IIa+2-10), is applied at a growth stage (GS) between GS 00 and GS 37 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In a most preferred embodiment of the invention, any one of the mixtures (II+2-1), (II+2-2), (II+2-3), (II+2-4), (II+2-5), (II+2-6), (II+2-7), (II+2-8), (II+2-9) and (II+2-10), preferably (IIa+2-1), (IIa+2-2), (IIa+2-3), (IIa+2-4), (IIa+2-5), (IIa+2-6), (IIa+2-7),

(IIa+2-8), (IIa+2-9) and (IIa+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (II+2-1) to (II+2-10), preferably (IIa+2-1) to (IIa+2-10), is applied at a growth stage (GS) between GS 00 and GS 21 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In a preferred embodiment of the invention, any one of the mixtures (II+2-1), (II+2-2), (II+2-3), (II+2-4), (II+2-5), (II+2-6), (II+2-7), (II+2-8), (II+2-9) and (II+2-10), preferably (IIa+2-1), (IIa+2-2), (IIa+2-3), (IIa+2-4), (IIa+2-5), (IIa+2-6), (IIa+2-7), (IIa+2-8), (IIa+2-9) and (IIa+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (II+2-1) to (II+2-10), preferably (IIa+2-1) to (IIa+2-10), is applied at a growth stage (GS) between GS 13 and GS 37 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In another embodiment any one of the mixtures (III+2-1), (III+2-2), (III+2-3), (III+2-4), (III+2-5), (III+2-6), (III+2-7), (III+2-8), (III+2-9) and (III+2-10), preferably (IIIa+2-1), (IIIa+2-2), (IIIa+2-3), (IIIa+2-4), (IIIa+2-5), (IIIa+2-6), (IIIa+2-7), (IIIa+2-8), (IIIa+2-9) and (IIIa+2-10), is used for increasing the yield of a plant or its product. In a preferred embodiment of the invention, any one of the mixtures (III+2-1) to (III+2-10), preferably (IIIa+2-1) to (IIIa+2-10), is used for increasing the yield such as the plant weight and/or the plant biomass (e.g. overall fresh weight) and/or the grain yield and/or the number of tillers. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In another embodiment any one of the mixtures (III+2-1), (III+2-2), (III+2-3), (III+2-4), (III+2-5), (III+2-6), (III+2-7), (III+2-8), (III+2-9) and (III+2-10), preferably (IIIa+2-1), (IIIa+2-2), (IIIa+2-3), (IIIa+2-4), (IIIa+2-5), (IIIa+2-6), (IIIa+2-7), (IIIa+2-8), (IIIa+2-9) and (IIIa+2-10), is used for increasing the vigor of a plant or its product or improvement of the plant vigor. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In another embodiment the any one of the mixtures (III+2-1), (III+2-2), (III+2-3), (III+2-4), (III+2-5), (III+2-6), (III+2-7), (III+2-8), (III+2-9) and (III+2-10), preferably (IIIa+2-1), (IIIa+2-2), (IIIa+2-3), (IIIa+2-4), (IIIa+2-5), (IIIa+2-6), (IIIa+2-7), (IIIa+2-8), (IIIa+2-9) and (IIIa+2-10), is used for increasing the quality of a plant or its product. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In yet another embodiment any one of the mixtures (III+2-1), (III+2-2), (III+2-3), (III+2-4), (III+2-5), (III+2-6), (III+2-7), (III+2-8), (III+2-9) and (III+2-10), preferably (IIIa+2-1), (IIIa+2-2), (IIIa+2-3), (IIIa+2-4), (IIIa+2-5), (IIIa+2-6), (IIIa+2-7), (IIIa+2-8), (IIIa+2-9) and (IIIa+2-10), is used for increasing the tolerance and/or resistance of a plant or its product against biotic stress. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In yet another embodiment any one of the mixtures (III+2-1), (III+2-2), (III+2-3), (III+2-4), (III+2-5), (III+2-6), (III+2-7), (III+2-8), (III+2-9) and (III+2-10), preferably (IIIa+2-1), (IIIa+2-2), (IIIa+2-3), (IIIa+2-4), (IIIa+2-5), (IIIa+2-6), (IIIa+2-7), (IIIa+2-8), (IIIa+2-9) and (IIIa+2-10), is used for increasing the tolerance and/or resistance of a plant or its product against abiotic stress. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

Any one of the mixtures (III+2-1), (III+2-2), (III+2-3), (III+2-4), (III+2-5), (III+2-6), (III+2-7), (III+2-8), (III+2-9) and (III+2-10), preferably (IIIa+2-1), (IIIa+2-2), (IIIa+2-3), (IIIa+2-4), (IIIa+2-5), (IIIa+2-6), (IIIa+2-7), (IIIa+2-8), (IIIa+2-9) and (IIIa+2-10), is used by treating the plant, plant propagation material (preferably seed), soil, area, material or environment in which a plant is growing or may grow with an effective amount of the active compounds. The application can be carried out in the absence of pest pressure and/or both before and after an infection of the materials, plants or plant propagation materials (preferably seeds) by pests. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In one embodiment of the invention, any one of the mixtures (III+2-1), (III+2-2), (III+2-3), (III+2-4), (III+2-5), (III+2-6), (III+2-7), (III+2-8), (III+2-9) and (III+2-10), preferably (IIIa+2-1), (IIIa+2-2), (IIIa+2-3), (IIIa+2-4), (IIIa+2-5), (IIIa+2-6), (IIIa+2-7), (IIIa+2-8), (IIIa+2-9) and (IIIa+2-10) is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (IIIa+2-1) to (IIIa+2-10), preferably (IIIa+2-1) to (IIIa+2-10), is applied at a growth stage (GS) between GS 00 and GS 65 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In a preferred embodiment of the invention, any one of the mixtures (III+2-1), (III+2-2), (III+2-3), (III+2-4), (III+2-5), (III+2-6), (III+2-7), (III+2-8), (III+2-9) and (III+2-10), preferably (IIIa+2-1), (IIIa+2-2), (IIIa+2-3), (IIIa+2-4), (IIIa+2-5), (IIIa+2-6), (IIIa+2-7), (IIIa+2-8), (IIIa+2-9) and (IIIa+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (III+2-1) to (III+2-10), preferably (IIIa+2-1) to (IIIa+2-10), is

applied at a growth stage (GS) between GS 00 and GS 55 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In an even more preferred embodiment of the invention, any one of the mixtures (III+2-1), (III+2-2), (III+2-3), (III+2-4), (III+2-5), (III+2-6), (III+2-7), (III+2-8), (III+2-9) and (III+2-10), preferably (IIIa+2-1), (IIIa+2-2), (IIIa+2-3), (IIIa+2-4), (IIIa+2-5), (IIIa+2-6), (IIIa+2-7), (IIIa+2-8), (IIIa+2-9) and (IIIa+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (III+2-1) to (III+2-10), preferably (IIIa+2-1) to (IIIa+2-10), is applied at a growth stage (GS) between GS 00 and GS 37 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In a most preferred embodiment of the invention, any one of the mixtures (III+2-1), (III+2-2), (III+2-3), (III+2-4), (III+2-5), (III+2-6), (III+2-7), (III+2-8), (III+2-9) and (III+2-10), preferably (IIIa+2-1), (IIIa+2-2), (IIIa+2-3), (IIIa+2-4), (IIIa+2-5), (IIIa+2-6), (IIIa+2-7), (IIIa+2-8), (IIIa+2-9) and (IIIa+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (III+2-1) to (III+2-10), preferably (IIIa+2-1) to (IIIa+2-10), is applied at a growth stage (GS) between GS 00 and GS 21 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In a preferred embodiment of the invention, any one of the mixtures (III+2-1), (III+2-2), (III+2-3), (III+2-4), (III+2-5), (III+2-6), (III+2-7), (III+2-8), (III+2-9) and (III+2-10), preferably (IIIa+2-1), (IIIa+2-2), (IIIa+2-3), (IIIa+2-4), (IIIa+2-5), (IIIa+2-6), (IIIa+2-7), (IIIa+2-8), (IIIa+2-9) and (IIIa+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (III+2-1) to (III+2-10), preferably (IIIa+2-1) to (IIIa+2-10), is applied at a growth stage (GS) between GS 13 and GS 37 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In another embodiment any one of the mixtures (IV+2-1), (IV+2-2), (IV+2-3), (IV+2-4), (IV+2-5), (IV+2-6), (IV+2-7), (IV+2-8), (IV+2-9) and (IV+2-10), preferably (IVabcd+2-1), (IVabcd+2-2), (IVabcd+2-3), (IVabcd+2-4), (IVabcd+2-5), (IVabcd+2-6), (IVabcd+2-7), (IVabcd+2-8), (IVabcd+2-9) and (IVabcd+2-10), is used for increasing the yield of a plant or its product. In a preferred embodiment of the invention, any one of the mixtures (IV+2-1) to (IV+2-10), preferably (IVabcd+2-1) to (IVabcd+2-10), is used for increasing the yield such as the plant weight and/or the plant biomass (e.g. overall fresh weight) and/or the grain yield and/or the number of tillers. The

components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In another embodiment any one of the mixtures (IV+2-1), (IV+2-2), (IV+2-3), (IV+2-4), (IV+2-5), (IV+2-6), (IV+2-7), (IV+2-8), (IV+2-9) and (IV+2-10), preferably (IVabcd+2-1), (IVabcd+2-2), (IVabcd+2-3), (IVabcd+2-4), (IVabcd+2-5), (IVabcd+2-6), (IVabcd+2-7), (IVabcd+2-8), (IVabcd+2-9) and (IVabcd+2-10), is used for increasing the vigor of a plant or its product or improvement of the plant vigor. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In another embodiment the any one of the mixtures (IV+2-1), (IV+2-2), (IV+2-3), (IV+2-4), (IV+2-5), (IV+2-6), (IV+2-7), (IV+2-8), (IV+2-9) and (IV+2-10), preferably (IVabcd+2-1), (IVabcd+2-2), (IVabcd+2-3), (IVabcd+2-4), (IVabcd+2-5), (IVabcd+2-6), (IVabcd+2-7), (IVabcd+2-8), (IVabcd+2-9) and (IVabcd+2-10), is used for increasing the quality of a plant or its product. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In yet another embodiment any one of the mixtures (IV+2-1), (IV+2-2), (IV+2-3), (IV+2-4), (IV+2-5), (IV+2-6), (IV+2-7), (IV+2-8), (IV+2-9) and (IV+2-10), preferably (IVabcd+2-1), (IVabcd+2-2), (IVabcd+2-3), (IVabcd+2-4), (IVabcd+2-5), (IVabcd+2-6), (IVabcd+2-7), (IVabcd+2-8), (IVabcd+2-9) and (IVabcd+2-10), is used for increasing the tolerance and/or resistance of a plant or its product against biotic stress. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In yet another embodiment any one of the mixtures (IV+2-1), (IV+2-2), (IV+2-3), (IV+2-4), (IV+2-5), (IV+2-6), (IV+2-7), (IV+2-8), (IV+2-9) and (IV+2-10), preferably (IVabcd+2-1), (IVabcd+2-2), (IVabcd+2-3), (IVabcd+2-4), (IVabcd+2-5), (IVabcd+2-6), (IVabcd+2-7), (IVabcd+2-8), (IVabcd+2-9) and (IVabcd+2-10), is used for increasing the tolerance and/or resistance of a plant or its product against abiotic stress. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

Any one of the mixtures (IV+2-1), (IV+2-2), (IV+2-3), (IV+2-4), (IV+2-5), (IV+2-6), (IV+2-7), (IV+2-8), (IV+2-9) and (IV+2-10), preferably (IVabcd+2-1), (IVabcd+2-2), (IVabcd+2-3), (IVabcd+2-4), (IVabcd+2-5), (IVabcd+2-6), (IVabcd+2-7), (IVabcd+2-8), (IVabcd+2-9) and (IVabcd+2-10), is used by treating the plant, plant propagation material (preferably seed), soil, area, material or environment in which a plant is growing or may grow with an effective amount of the active compounds. The application can be carried out in the absense of pest pressure and/or both before and

after an infection of the materials, plants or plant propagation materials (preferably seeds) by pests. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In one embodiment of the invention, any one of the mixtures (IV+2-1), (IV+2-2), (IV+2-3), (IV+2-4), (IV+2-5), (IV+2-6), (IV+2-7), (IV+2-8), (IV+2-9) and (IV+2-10), preferably (IVabcd+2-1), (IVabcd+2-2), (IVabcd+2-3), (IVabcd+2-4), (IVabcd+2-5), (IVabcd+2-6), (IVabcd+2-7), (IVabcd+2-8), (IVabcd+2-9) and (IVabcd+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (IV+2-1) to (IV+2-10), preferably (IVabcd+2-1) to (IVabcd+2-10), is applied at a growth stage (GS) between GS 00 and GS 65 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In a preferred embodiment of the invention, any one of the mixtures (IV+2-1), (IV+2-2), (IV+2-3), (IV+2-4), (IV+2-5), (IV+2-6), (IV+2-7), (IV+2-8), (IV+2-9) and (IV+2-10), preferably (IVabcd+2-1), (IVabcd+2-2), (IVabcd+2-3), (IVabcd+2-4), (IVabcd+2-5), (IVabcd+2-6), (IVabcd+2-7), (IVabcd+2-8), (IVabcd+2-9) and (IVabcd+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (IV+2-1) to (IV+2-10), preferably (IVabcd+2-1) to (IVabcd+2-10), is applied at a growth stage (GS) between GS 00 and GS 55 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In an even more preferred embodiment of the invention, any one of the mixtures (IV+2-1), (IV+2-2), (IV+2-3), (IV+2-4), (IV+2-5), (IV+2-6), (IV+2-7), (IV+2-8), (IV+2-9) and (IV+2-10), preferably (IVabcd+2-1), (IVabcd+2-2), (IVabcd+2-3), (IVabcd+2-4), (IVabcd+2-5), (IVabcd+2-6), (IVabcd+2-7), (IVabcd+2-8), (IVabcd+2-9) and (IVabcd+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (IV+2-1) to (IV+2-10), preferably (IVabcd+2-1) to (IVabcd+2-10), is applied at a growth stage (GS) between GS 00 and GS 37 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In a most preferred embodiment of the invention, any one of the mixtures (IV+2-1), (IV+2-2), (IV+2-3), (IV+2-4), (IV+2-5), (IV+2-6), (IV+2-7), (IV+2-8), (IV+2-9) and (IV+2-10), preferably (IVabcd+2-1), (IVabcd+2-2), (IVabcd+2-3), (IVabcd+2-4), (IVabcd+2-5), (IVabcd+2-6), (IVabcd+2-7), (IVabcd+2-8), (IVabcd+2-9) and (IVabcd+2-10), is used for increasing the health, specifically for improving one or

more of the above mentioned particular characteristics, wherein any one of the mixtures (IV+2-1) to (IV+2-10), preferably (IVabcd+2-1) to (IVabcd+2-10), is applied at a growth stage (GS) between GS 00 and GS 21 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

In a preferred embodiment of the invention, any one of the mixtures (IV+2-1), (IV+2-2), (IV+2-3), (IV+2-4), (IV+2-5), (IV+2-6), (IV+2-7), (IV+2-8), (IV+2-9) and (IV+2-10), preferably (IVabcd+2-1), (IVabcd+2-2), (IVabcd+2-3), (IVabcd+2-4), (IVabcd+2-5), (IVabcd+2-6), (IVabcd+2-7), (IVabcd+2-8), (IVabcd+2-9) and (IVabcd+2-10), is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (IV+2-1) to (IV+2-10), preferably (IVabcd+2-1) to (IVabcd+2-10), is applied at a growth stage (GS) between GS 13 and GS 37 BBCH of the treated plant. The components of the binary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the binary mixtures.

Furthermore, the mixtures used according to the invention can further contain at least one additional compound selected from the group consisting of insecticides, fungicides, herbicides and plant growth regulators.

Accordingly, a further embodiment of the invention relates to the use of specific ternary mixtures, namely any one of the binary mixtures as given above and a component 3, in particular a mixture selected from (I+2-1), (I+2-2), (I+2-3), (I+2-4), (I+2-5), (I+2-6), (I+2-7), (I+2-8), (II+2-1), (II+2-2), (II+2-3), (II+2-4), (II+2-5), (II+2-6), (II+2-7), (II+2-8), (III+2-1), (III+2-2), (III+2-3), (III+2-4), (III+2-5), (III+2-6), (III+2-7), (III+2-8), (IV+2-1), (IV+2-2), (IV+2-3), (IV+2-4), (IV+2-5), (IV+2-6), (IV+2-7) and (IV+2-8), preferably selected from (Ia+2-1), (Ia+2-2), (Ia+2-3), (Ia+2-4), (Ia+2-5), (Ia+2-6), (Ia+2-7), (Ia+2-8), (IIa+2-1), (IIa+2-2), (IIa+2-3), (IIa+2-4), (IIa+2-5), (IIa+2-6), (IIa+2-7), (IIa+2-8), (IIIa+2-1), (IIIa+2-2), (IIIa+2-3), (IIIa+2-4), (IIIa+2-5), (IIIa+2-6), (IIIa+2-7), (IIIa+2-8), (IVabcd+2-1), (IVabcd+2-2), (IVabcd+2-3), (IVabcd+2-4), (IVabcd+2-5), (IVabcd+2-6), (IVabcd+2-7) and (IVabcd+2-8), and a component 3 selected from glyphosate and glufosinate, in the methods of the present invention. "Ternary mixture" in the sense of the present invention means that only three active compounds are present. The mixture may, of course contain any kind of additive or the like as detailed below in order to provide a formulation suitable for use in agriculture. The following ternary mixtures can be preferably used in the methods of the present invention:

1) mixtures of compound I

- mixture (I+2-1+3-1): compound I, in particular Ia and/or Ib, and imazamox and glyphosate
- mixture (I+2-1+3-2): compound I, in particular Ia and/or Ib, and imazamox and glufosinate
- mixture (I+2-2+3-1): compound I, in particular Ia and/or Ib, and imazethapyr and glyphosate
- mixture (I+2-2+3-2): compound I, in particular Ia and/or Ib, and imazethapyr and glufosinate
- mixture (I+2-3+3-1): compound I, in particular Ia and/or Ib, and imazapic and glyphosate
- mixture (I+2-3+3-2): compound I, in particular Ia and/or Ib, and imazapic and glufosinate
- mixture (I+2-4+3-1): compound I, in particular Ia and/or Ib, and imazapyr and glyphosate
- mixture (I+2-4+3-2): compound I, in particular Ia and/or Ib, and imazapyr and glufosinate
- mixture (I+2-5+3-1): compound I, in particular Ia and/or Ib, and imazamethabenz-methyl and glyphosate
- mixture (I+2-5+3-2): compound I, in particular Ia and/or Ib, and imazamethabenz-methyl and glufosinate
- mixture (I+2-6+3-1): compound I, in particular Ia and/or Ib, and imazaquin and glyphosate
- mixture (I+2-6+3-2): compound I, in particular Ia and/or Ib, and imazaquin and glufosinate
- mixture (I+2-7+3-1): compound I, in particular Ia and/or Ib, and dicamba and glyphosate
- mixture (I+2-7+3-2): compound I, in particular Ia and/or Ib, and dicamba and glufosinate
- mixture (I+2-8+3-1): compound I, in particular Ia and/or Ib, and saflufenacil and glyphosate
- mixture (I+2-8+3-2): compound I, in particular Ia and/or Ib, and saflufenacil and glufosinate
-
- mixture (Ia+2-1+3-1): compound Ia and imazamox and glyphosate
- mixture (Ia+2-1+3-2): compound Ia and imazamox and glufosinate
- mixture (Ia+2-2+3-1): compound Ia and imazethapyr and glyphosate
- mixture (Ia+2-2+3-2): compound Ia and imazethapyr and glufosinate
- mixture (Ia+2-3+3-1): compound Ia and imazapic and glyphosate
- mixture (Ia+2-3+3-2): compound Ia and imazapic and glufosinate
- mixture (Ia+2-4+3-1): compound Ia and imazapyr and glyphosate
- mixture (Ia+2-4+3-2): compound Ia and imazapyr and glufosinate
- mixture (Ia+2-5+3-1): compound Ia and imazamethabenz-methyl and glyphosate

mixture (Ia+2-5+3-2): compound Ia and imazamethabenz-methyl and glufosinate
mixture (Ia+2-6+3-1): compound Ia and imazaquin and glyphosate
mixture (Ia+2-6+3-2): compound Ia and imazaquin and glufosinate
mixture (Ia+2-7+3-1): compound Ia and dicamba and glyphosate
mixture (Ia+2-7+3-2): compound Ia and dicamba and glufosinate
mixture (Ia+2-8+3-1): compound Ia and saflufenacil and glyphosate
mixture (Ia+2-8+3-2): compound Ia and saflufenacil and glufosinate

2) mixtures of compound II

mixture (II+2-1+3-1): compound II, in particular IIa and/or IIb, and imazamox and glyphosate
mixture (II+2-1+3-2): compound II, in particular IIa and/or IIb, and imazamox and glufosinate
mixture (II+2-2+3-1): compound II, in particular IIa and/or IIb, and imazethapyr and glyphosate
mixture (II+2-2+3-2): compound II, in particular IIa and/or IIb, and imazethapyr and glufosinate
mixture (II+2-3+3-1): compound II, in particular IIa and/or IIb, and imazapic and glyphosate
mixture (II+2-3+3-2): compound II, in particular IIa and/or IIb, and imazapic and glufosinate
mixture (II+2-4+3-1): compound II, in particular IIa and/or IIb, and imazapyr and glyphosate
mixture (II+2-4+3-2): compound II, in particular IIa and/or IIb, and imazapyr and glufosinate
mixture (II+2-5+3-1): compound II, in particular IIa and/or IIb, and imazamethabenz-methyl and glyphosate
mixture (II+2-5+3-2): compound II, in particular IIa and/or IIb, and imazamethabenz-methyl and glufosinate
mixture (II+2-6+3-1): compound II, in particular IIa and/or IIb, and imazaquin and glyphosate
mixture (II+2-6+3-2): compound II, in particular IIa and/or IIb, and imazaquin and glufosinate
mixture (II+2-7+3-1): compound II, in particular IIa and/or IIb, and dicamba and glyphosate
mixture (II+2-7+3-2): compound II, in particular IIa and/or IIb, and dicamba and glufosinate
mixture (II+2-8+3-1): compound II, in particular IIa and/or IIb, and saflufenacil and glyphosate
mixture (II+2-8+3-2): compound II, in particular IIa and/or IIb, and saflufenacil and glufosinate

mixture (IIa+2-1+3-1): compound IIa and imazamox and glyphosate
mixture (IIa+2-1+3-2): compound IIa and imazamox and glufosinate
mixture (IIa+2-2+3-1): compound IIa and imazethapyr and glyphosate
mixture (IIa+2-2+3-2): compound IIa and imazethapyr and glufosinate
mixture (IIa+2-3+3-1): compound IIa and imazapic and glyphosate
mixture (IIa+2-3+3-2): compound IIa and imazapic and glufosinate
mixture (IIa+2-4+3-1): compound IIa and imazapyr and glyphosate
mixture (IIa+2-4+3-2): compound IIa and imazapyr and glufosinate
mixture (IIa+2-5+3-1): compound IIa and imazamethabenz-methyl and glyphosate
mixture (IIa+2-5+3-2): compound IIa and imazamethabenz-methyl and glufosinate
mixture (IIa+2-6+3-1): compound IIa and imazaquin and glyphosate
mixture (IIa+2-6+3-2): compound IIa and imazaquin and glufosinate
mixture (IIa+2-7+3-1): compound IIa and dicamba and glyphosate
mixture (IIa+2-7+3-2): compound IIa and dicamba and glufosinate
mixture (IIa+2-8+3-1): compound IIa and saflufenacil and glyphosate
mixture (IIa+2-8+3-2): compound IIa and saflufenacil and glufosinate

3) mixtures of compound III

mixture (III+2-1+3-1): compound III, in particular IIIa and/or IIIb, and imazamox and glyphosate
mixture (III+2-1+3-2): compound III, in particular IIIa and/or IIIb, and imazamox and glufosinate
mixture (III+2-2+3-1): compound III, in particular IIIa and/or IIIb, and imazethapyr and glyphosate
mixture (III+2-2+3-2): compound III, in particular IIIa and/or IIIb, and imazethapyr and glufosinate
mixture (III+2-3+3-1): compound III, in particular IIIa and/or IIIb, and imazapic and glyphosate
mixture (III+2-3+3-2): compound III, in particular IIIa and/or IIIb, and imazapic and glufosinate
mixture (III+2-4+3-1): compound III, in particular IIIa and/or IIIb, and imazapyr and glyphosate
mixture (III+2-4+3-2): compound III, in particular IIIa and/or IIIb, and imazapyr and glufosinate
mixture (III+2-5+3-1): compound III, in particular IIIa and/or IIIb, and imazamethabenz-methyl and glyphosate
mixture (III+2-5+3-2): compound III, in particular IIIa and/or IIIb, and imazamethabenz-methyl and glufosinate
mixture (III+2-6+3-1): compound III, in particular IIIa and/or IIIb, and imazaquin and glyphosate

mixture (III+2-6+3-2): compound III, in particular IIIa and/or IIIb, and imazaquin and glufosinate

mixture (III+2-7+3-1): compound III, in particular IIIa and/or IIIb, and dicamba and glyphosate

mixture (III+2-7+3-2): compound III, in particular IIIa and/or IIIb, and dicamba and glufosinate

mixture (III+2-8+3-1): compound III, in particular IIIa and/or IIIb, and saflufenacil and glyphosate

mixture (III+2-8+3-2): compound III, in particular IIIa and/or IIIb, and saflufenacil and glufosinate

mixture (IIIa+2-1+3-1):	compound IIIa and imazamox and glyphosate
mixture (IIIa+2-1+3-2):	compound IIIa and imazamox and glufosinate
mixture (IIIa+2-2+3-1):	compound IIIa and imazethapyr and glyphosate
mixture (IIIa+2-2+3-2):	compound IIIa and imazethapyr and glufosinate
mixture (IIIa+2-3+3-1):	compound IIIa and imazapic and glyphosate
mixture (IIIa+2-3+3-2):	compound IIIa and imazapic and glufosinate
mixture (IIIa+2-4+3-1):	compound IIIa and imazapyr and glyphosate
mixture (IIIa+2-4+3-2):	compound IIIa and imazapyr and glufosinate
mixture (IIIa+2-5+3-1):	compound IIIa and imazamethabenz-methyl and glyphosate
mixture (IIIa+2-5+3-2):	compound IIIa and imazamethabenz-methyl and glufosinate
mixture (IIIa+2-6+3-1):	compound IIIa and imazaquin and glyphosate
mixture (IIIa+2-6+3-2):	compound IIIa and imazaquin and glufosinate
mixture (IIIa+2-7+3-1):	compound IIIa and dicamba and glyphosate
mixture (IIIa+2-7+3-2):	compound IIIa and dicamba and glufosinate
mixture (IIIa+2-8+3-1):	compound IIIa and saflufenacil and glyphosate
mixture (IIIa+2-8+3-2):	compound IIIa and saflufenacil and glufosinate

4) mixtures of compound IV

mixture (IV+2-1+3-1): compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazamox and glyphosate

mixture (IV+2-1+3-2): compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazamox and glufosinate

mixture (IV+2-2+3-1): compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazethapyr and glyphosate

mixture (IV+2-2+3-2): compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazethapyr and glufosinate

mixture (IV+2-3+3-1): compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazapic and glyphosate

mixture (IV+2-3+3-2): compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazapic and glufosinate

mixture (IV+2-4+3-1): compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazapyr and glyphosate

mixture (IV+2-4+3-2): compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazapyr and glufosinate

mixture (IV+2-5+3-1): compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazamethabenz-methyl and glyphosate

mixture (IV+2-5+3-2): compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazamethabenz-methyl and glufosinate

mixture (IV+2-6+3-1): compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazaquin and glyphosate

mixture (IV+2-6+3-2): compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and imazaquin and glufosinate

mixture (IV+2-7+3-1): compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and dicamba and glyphosate

mixture (IV+2-7+3-2): compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and dicamba and glufosinate

mixture (IV+2-8+3-1): compound IV, in particular IVa, IVb, IVc, IVd, IVe, IVf, IVg and/or IVh, and saflufenacil and glyphosate

mixture (IV+2-8+3-2): compound IV and saflufenacil and glufosinate

mixture (IVabcd+2-1+3-1): compound IVa, IVb, IVc and/or IVd and imazamox and glyphosate

mixture (IVabcd+2-1+3-2): compound IVa, IVa, IVb, IVc and/or IVd and imazamox and glufosinate

mixture (IVabcd+2-2+3-1): compound IVa, IVb, IVc and/or IVd and imazethapyr and glyphosate

mixture (IVabcd+2-2+3-2): compound IVa, IVb, IVc and/or IVd and imazethapyr and glufosinate

mixture (IVabcd+2-3+3-1): compound IVa, IVb, IVc and/or IVd and imazapic and glyphosate

mixture (IVabcd+2-3+3-2): compound IVa, IVb, IVc and/or IVd and imazapic and glufosinate

mixture (IVabcd+2-4+3-1): compound IVa, IVb, IVc and/or IVd and imazapyr and glyphosate

mixture (IVabcd+2-4+3-2): compound IVa, IVb, IVc and/or IVd and imazapyr and glufosinate

mixture (IVabcd+2-5+3-1): compound IVa, IVb, IVc and/or IVd and imazamethabenz-methyl and glyphosate

mixture (IVabcd+2-5+3-2): compound IVa, IVb, IVc and/or IVd and imazamethabenz-methyl and glufosinate

mixture (IVabcd+2-6+3-1):	compound IVa, IVb, IVc and/or IVd and imazaquin and glyphosate
mixture (IVabcd+2-6+3-2):	compound IVa, IVb, IVc and/or IVd and imazaquin and glufosinate
mixture (IVabcd+2-7+3-1):	compound IVa, IVb, IVc and/or IVd and dicamba and glyphosate
mixture (IVabcd+2-7+3-2):	compound IVa, IVb, IVc and/or IVd and dicamba and glufosinate
mixture (IVabcd+2-8+3-1):	compound IVa, IVb, IVc and/or IVd and saflufenacil and glyphosate
mixture (IVabcd+2-8+3-2):	compound IVa, IVb, IVc and/or IVd and saflufenacil and glufosinate

In particular, in each case, the weight ratio of component 1 to component 2 is in each case 1:100 to 100:1, preferably 1:50 to 50:1, even more preferably 1:20 to 20:1.

Furthermore, a preferable weight ratio of component 1 to component 2 is 95:1 to 1:95, more preferable 90:1 to 1:90, even more preferable 85:1 to 1:85, even more preferable 80:1 to 1:80, even more preferable 75:1 to 1:75, even more preferable 70:1 to 1:70, even more preferable 65:1 to 1:65, 60:1 to 1:60, even more preferable 55:1 to 1:55, even more preferable 50:1 to 1:50, even more preferable 45:1 to 1:45, even more preferable 30:1 to 1:30, even more preferable 25:1 to 1:25, even more preferable 15:1 to 1:15, even more preferable 10:1 to 1:10, even more preferable 5:1 to 1:5, even more preferable 4:1 to 1:4, even more preferable 3:1 to 1:3, even more preferable 2:1 to 1:2. The weight ratio of component 1 to component 3 is in each case 1:100 to 100:1, preferably 1:50 to 50:1, even more preferably 1:20 to 20:1.

Furthermore, a preferable weight ratio of component 1 to component 3 is in each case 95:1 to 1:95, more preferable 90:1 to 1:90, even more preferable 85:1 to 1:85, even more preferable 80:1 to 1:80, even more preferable 75:1 to 1:75, even more preferable 70:1 to 1:70, even more preferable 65:1 to 1:65, 60:1 to 1:60, even more preferable 55:1 to 1:55, even more preferable 50:1 to 1:50, even more preferable 45:1 to 1:45, even more preferable 30:1 to 1:30, even more preferable 25:1 to 1:25, even more preferable 15:1 to 1:15, even more preferable 10:1 to 1:10, even more preferable 5:1 to 1:5, even more preferable 4:1 to 1:4, even more preferable 3:1 to 1:3, even more preferable 2:1 to 1:2. The weight ratio of component 2 to component 3 is in each case 1:100 to 100:1, preferably 1:50 to 50:1, even more preferably 1:20 to 20:1. Furthermore, a preferable weight ratio of component 2 to component 3 is in each case 95:1 to 1:95, more preferable 90:1 to 1:90, even more preferable 85:1 to 1:85, even more preferable 80:1 to 1:80, even more preferable 75:1 to 1:75, even more preferable 70:1 to 1:70, even more preferable 65:1 to 1:65, 60:1 to 1:60, even more preferable 55:1 to 1:55, even more preferable 50:1 to 1:50, even more preferable 45:1 to 1:45, even more preferable 30:1 to 1:30, even more preferable 25:1 to 1:25, even more preferable 15:1 to 1:15, even more preferable 10:1 to 1:10,

even more preferable 5:1 to 1:5, even more preferable 4:1 to 1:4, even more preferable 3:1 to 1:3, even more preferable 2:1 to 1:2. In particular, the components are used in synergistically effective amount.

In one embodiment any one of the mixtures (I+2-1+3-1), (I+2-1+3-2), (I+2-2+3-1), (I+2-2+3-2), (I+2-3+3-1), (I+2-3+3-2), (I+2-4+3-1), (I+2-4+3-2), (I+2-5+3-1), (I+2-5+3-2), (I+2-6+3-1), (I+2-6+3-2), (I+2-7+3-1), (I+2-7+3-2), (I+2-8+3-1) and (I+2-8+3-2), preferably any one of said mixtures wherein compound I is Ia, is used for increasing the yield of a plant or its product. In a preferred embodiment of the invention, any one of the mixtures (I+2-1+3-1) to (I+2-8+3-2), preferably said mixtures wherein compound I is Ia, is used for increasing the yield such as the plant weight and/or the plant biomass (e.g. overall fresh weight) and/or the grain yield and/or the number of tillers. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In another embodiment any one of the mixtures (I+2-1+3-1), (I+2-1+3-2), (I+2-2+3-1), (I+2-2+3-2), (I+2-3+3-1), (I+2-3+3-2), (I+2-4+3-1), (I+2-4+3-2), (I+2-5+3-1), (I+2-5+3-2), (I+2-6+3-1), (I+2-6+3-2), (I+2-7+3-1), (I+2-7+3-2), (I+2-8+3-1) and (I+2-8+3-2), preferably any one of said mixtures wherein compound I is Ia, is used for increasing the vigor of a plant or its product or improvement of the plant vigor. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In another embodiment the any one of the mixtures (I+2-1+3-1), (I+2-1+3-2), (I+2-2+3-1), (I+2-2+3-2), (I+2-3+3-1), (I+2-3+3-2), (I+2-4+3-1), (I+2-4+3-2), (I+2-5+3-1), (I+2-5+3-2), (I+2-6+3-1), (I+2-6+3-2), (I+2-7+3-1), (I+2-7+3-2), (I+2-8+3-1) and (I+2-8+3-2), preferably any one of said mixtures wherein compound I is Ia, is used for increasing the quality of a plant or its product. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In yet another embodiment any one of the mixtures (I+2-1+3-1), (I+2-1+3-2), (I+2-2+3-1), (I+2-2+3-2), (I+2-3+3-1), (I+2-3+3-2), (I+2-4+3-1), (I+2-4+3-2), (I+2-5+3-1), (I+2-5+3-2), (I+2-6+3-1), (I+2-6+3-2), (I+2-7+3-1), (I+2-7+3-2), (I+2-8+3-1) and (I+2-8+3-2), preferably any one of said mixtures wherein compound I is Ia, is used for increasing the tolerance and/or resistance of a plant or its product against biotic stress. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In yet another embodiment any one of the mixtures (I+2-1+3-1), (I+2-1+3-2), (I+2-2+3-1), (I+2-2+3-2), (I+2-3+3-1), (I+2-3+3-2), (I+2-4+3-1), (I+2-4+3-2), (I+2-5+3-1), (I+2-5+3-2), (I+2-6+3-1), (I+2-6+3-2), (I+2-7+3-1), (I+2-7+3-2), (I+2-8+3-1) and (I+2-

8+3-2), preferably any one of said mixtures wherein compound I is Ia, is used for increasing the tolerance and/or resistance of a plant or its product against abiotic stress. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

Any one of the mixtures (I+2-1+3-1), (I+2-1+3-2), (I+2-2+3-1), (I+2-2+3-2), (I+2-3+3-1), (I+2-3+3-2), (I+2-4+3-1), (I+2-4+3-2), (I+2-5+3-1), (I+2-5+3-2), (I+2-6+3-1), (I+2-6+3-2), (I+2-7+3-1), (I+2-7+3-2), (I+2-8+3-1) and (I+2-8+3-2), preferably any one of said mixtures wherein compound I is Ia, is used by treating the plant, plant propagation material (preferably seed), soil, area, material or environment in which a plant is growing or may grow with an effective amount of the active compounds. The application can be carried out in the absence of pest pressure and/or both before and after an infection of the materials, plants or plant propagation materials (preferably seeds) by pests. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In one embodiment of the invention, any one of the mixtures (I+2-1+3-1), (I+2-1+3-2), (I+2-2+3-1), (I+2-2+3-2), (I+2-3+3-1), (I+2-3+3-2), (I+2-4+3-1), (I+2-4+3-2), (I+2-5+3-1), (I+2-5+3-2), (I+2-6+3-1), (I+2-6+3-2), (I+2-7+3-1), (I+2-7+3-2), (I+2-8+3-1) and (I+2-8+3-2), preferably any one of said mixtures wherein compound I is Ia, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (I+2-1+3-1) to (I+2-8+3-2), preferably any one of said mixtures wherein compound I is Ia, is applied at a growth stage (GS) between GS 00 and GS 65 BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In a preferred embodiment of the invention, any one of the mixtures (I+2-1+3-1), (I+2-1+3-2), (I+2-2+3-1), (I+2-2+3-2), (I+2-3+3-1), (I+2-3+3-2), (I+2-4+3-1), (I+2-4+3-2), (I+2-5+3-1), (I+2-5+3-2), (I+2-6+3-1), (I+2-6+3-2), (I+2-7+3-1), (I+2-7+3-2), (I+2-8+3-1) and (I+2-8+3-2), preferably any one of said mixtures wherein compound I is Ia, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (I+2-1+3-1) to (I+2-8+3-2), preferably any one of said mixtures wherein compound I is Ia, is applied at a growth stage (GS) between GS 00 and GS 55 BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In an even more preferred embodiment of the invention, any one of the mixtures (I+2-1+3-1), (I+2-1+3-2), (I+2-2+3-1), (I+2-2+3-2), (I+2-3+3-1), (I+2-3+3-2), (I+2-4+3-1), (I+2-4+3-2), (I+2-5+3-1), (I+2-5+3-2), (I+2-6+3-1), (I+2-6+3-2), (I+2-7+3-1), (I+2-7+3-2), (I+2-8+3-1) and (I+2-8+3-2), preferably any one of said mixtures wherein

compound I is Ia, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (I+2-1+3-1) to (I+2-8+3-2), preferably any one of said mixtures wherein compound I is Ia, is applied at a growth stage (GS) between GS 00 and GS 37 BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In a most preferred embodiment of the invention, any one of the mixtures (I+2-1+3-1), (I+2-1+3-2), (I+2-2+3-1), (I+2-2+3-2), (I+2-3+3-1), (I+2-3+3-2), (I+2-4+3-1), (I+2-4+3-2), (I+2-5+3-1), (I+2-5+3-2), (I+2-6+3-1), (I+2-6+3-2), (I+2-7+3-1), (I+2-7+3-2), (I+2-8+3-1) and (I+2-8+3-2), preferably any one of said mixtures wherein compound I is Ia, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (I+2-1+3-1) to (I+2-8+3-2), preferably any one of said mixtures wherein compound I is Ia, is applied at a growth stage (GS) between GS 00 and GS 21 BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In a preferred embodiment of the invention, any one of the mixtures (I+2-1+3-1), (I+2-1+3-2), (I+2-2+3-1), (I+2-2+3-2), (I+2-3+3-1), (I+2-3+3-2), (I+2-4+3-1), (I+2-4+3-2), (I+2-5+3-1), (I+2-5+3-2), (I+2-6+3-1), (I+2-6+3-2), (I+2-7+3-1), (I+2-7+3-2), (I+2-8+3-1) and (I+2-8+3-2), preferably any one of said mixtures wherein compound I is Ia, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (I+2-1+3-1) to (I+2-8+3-2), preferably any one of said mixtures wherein compound I is Ia, is applied at a growth stage (GS) between GS 13 and GS 37 BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In one embodiment any one of the mixtures (II+2-1+3-1), (II+2-1+3-2), (II+2-2+3-1), (II+2-2+3-2), (II+2-3+3-1), (II+2-3+3-2), (II+2-4+3-1), (II+2-4+3-2), (II+2-5+3-1), (II+2-5+3-2), (II+2-6+3-1), (II+2-6+3-2), (II+2-7+3-1), (II+2-7+3-2), (II+2-8+3-1) and (II+2-8+3-2), preferably any one of said mixtures wherein compound II is IIa, is used for increasing the yield of a plant or its product. In a preferred embodiment of the invention, any one of the mixtures (II+2-1+3-1) to (II+2-8+3-2), preferably said mixtures wherein compound II is IIa, is used for increasing the yield such as the plant weight and/or the plant biomass (e.g. overall fresh weight) and/or the grain yield and/or the number of tillers. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In another embodiment any one of the mixtures (II+2-1+3-1), (II+2-1+3-2), (II+2-2+3-1), (II+2-2+3-2), (II+2-3+3-1), (II+2-3+3-2), (II+2-4+3-1), (II+2-4+3-2), (II+2-5+3-1),

(II+2-5+3-2), (II+2-6+3-1), (II+2-6+3-2), (II+2-7+3-1), (II+2-7+3-2), (II+2-8+3-1) and (II+2-8+3-2), preferably any one of said mixtures wherein compound II is IIa, is used for increasing the vigor of a plant or its product or improvement of the plant vigor. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In another embodiment the any one of the mixtures (II+2-1+3-1), (II+2-1+3-2), (II+2-2+3-1), (II+2-2+3-2), (II+2-3+3-1), (II+2-3+3-2), (II+2-4+3-1), (II+2-4+3-2), (II+2-5+3-1), (II+2-5+3-2), (II+2-6+3-1), (II+2-6+3-2), (II+2-7+3-1), (II+2-7+3-2), (II+2-8+3-1) and (II+2-8+3-2), preferably any one of said mixtures wherein compound II is IIa, is used for increasing the quality of a plant or its product. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In yet another embodiment any one of the mixtures (II+2-1+3-1), (II+2-1+3-2), (II+2-2+3-1), (II+2-2+3-2), (II+2-3+3-1), (II+2-3+3-2), (II+2-4+3-1), (II+2-4+3-2), (II+2-5+3-1), (II+2-5+3-2), (II+2-6+3-1), (II+2-6+3-2), (II+2-7+3-1), (II+2-7+3-2), (II+2-8+3-1) and (II+2-8+3-2), preferably any one of said mixtures wherein compound II is IIa, is used for increasing the tolerance and/or resistance of a plant or its product against biotic stress. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In yet another embodiment any one of the mixtures (II+2-1+3-1), (II+2-1+3-2), (II+2-2+3-1), (II+2-2+3-2), (II+2-3+3-1), (II+2-3+3-2), (II+2-4+3-1), (II+2-4+3-2), (II+2-5+3-1), (II+2-5+3-2), (II+2-6+3-1), (II+2-6+3-2), (II+2-7+3-1), (II+2-7+3-2), (II+2-8+3-1) and (II+2-8+3-2), preferably any one of said mixtures wherein compound II is IIa, is used for increasing the tolerance and/or resistance of a plant or its product against abiotic stress. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

Any one of the mixtures (II+2-1+3-1), (II+2-1+3-2), (II+2-2+3-1), (II+2-2+3-2), (II+2-3+3-1), (II+2-3+3-2), (II+2-4+3-1), (II+2-4+3-2), (II+2-5+3-1), (II+2-5+3-2), (II+2-6+3-1), (II+2-6+3-2), (II+2-7+3-1), (II+2-7+3-2), (II+2-8+3-1) and (II+2-8+3-2), preferably any one of said mixtures wherein compound II is IIa, is used by treating the plant, plant propagation material (preferably seed), soil, area, material or environment in which a plant is growing or may grow with an effective amount of the active compounds. The application can be carried out in the absense of pest pressure and/or both before and after an infection of the materials, plants or plant propagation materials (preferably seeds) by pests. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In one embodiment of the invention, any one of the mixtures (II+2-1+3-1), (II+2-1+3-2), (II+2-2+3-1), (II+2-2+3-2), (II+2-3+3-1), (II+2-3+3-2), (II+2-4+3-1), (II+2-4+3-2), (II+2-5+3-1), (II+2-5+3-2), (II+2-6+3-1), (II+2-6+3-2), (II+2-7+3-1), (II+2-7+3-2), (II+2-8+3-1) and (II+2-8+3-2), preferably any one of said mixtures wherein compound II is IIa, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (II+2-1+3-1) to (II+2-8+3-2), preferably any one of said mixtures wherein compound II is IIa, is applied at a growth stage (GS) between GS 00 and GS 65 BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In a preferred embodiment of the invention, any one of the mixtures (II+2-1+3-1), (II+2-1+3-2), (II+2-2+3-1), (II+2-2+3-2), (II+2-3+3-1), (II+2-3+3-2), (II+2-4+3-1), (II+2-4+3-2), (II+2-5+3-1), (II+2-5+3-2), (II+2-6+3-1), (II+2-6+3-2), (II+2-7+3-1), (II+2-7+3-2), (II+2-8+3-1) and (II+2-8+3-2), preferably any one of said mixtures wherein compound II is IIa, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (II+2-1+3-1) to (II+2-8+3-2), preferably any one of said mixtures wherein compound II is IIa, is applied at a growth stage (GS) between GS 00 and GS 55 BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In an even more preferred embodiment of the invention, any one of the mixtures (II+2-1+3-1), (II+2-1+3-2), (II+2-2+3-1), (II+2-2+3-2), (II+2-3+3-1), (II+2-3+3-2), (II+2-4+3-1), (II+2-4+3-2), (II+2-5+3-1), (II+2-5+3-2), (II+2-6+3-1), (II+2-6+3-2), (II+2-7+3-1), (II+2-7+3-2), (II+2-8+3-1) and (II+2-8+3-2), preferably any one of said mixtures wherein compound II is IIa, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (II+2-1+3-1) to (II+2-8+3-2), preferably any one of said mixtures wherein compound II is IIa, is applied at a growth stage (GS) between GS 00 and GS 37 BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In a most preferred embodiment of the invention, any one of the mixtures (II+2-1+3-1), (II+2-1+3-2), (II+2-2+3-1), (II+2-2+3-2), (II+2-3+3-1), (II+2-3+3-2), (II+2-4+3-1), (II+2-4+3-2), (II+2-5+3-1), (II+2-5+3-2), (II+2-6+3-1), (II+2-6+3-2), (II+2-7+3-1), (II+2-7+3-2), (II+2-8+3-1) and (II+2-8+3-2), preferably any one of said mixtures wherein compound II is IIa, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (II+2-1+3-1) to (II+2-8+3-2), preferably any one of said mixtures wherein compound II is IIa, is applied at a growth stage (GS) between GS 00 and GS 21

BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In a preferred embodiment of the invention, any one of the mixtures (II+2-1+3-1), (II+2-1+3-2), (II+2-2+3-1), (II+2-2+3-2), (II+2-3+3-1), (II+2-3+3-2), (II+2-4+3-1), (II+2-4+3-2), (II+2-5+3-1), (II+2-5+3-2), (II+2-6+3-1), (II+2-6+3-2), (II+2-7+3-1), (II+2-7+3-2), (II+2-8+3-1) and (II+2-8+3-2), preferably any one of said mixtures wherein compound II is IIa, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (II+2-1+3-1) to (II+2-8+3-2), preferably any one of said mixtures wherein compound II is IIa, is applied at a growth stage (GS) between GS 13 and GS 37 BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In one embodiment any one of the mixtures (III+2-1+3-1), (III+2-1+3-2), (III+2-2+3-1), (III+2-2+3-2), (III+2-3+3-1), (III+2-3+3-2), (III+2-4+3-1), (III+2-4+3-2), (III+2-5+3-1), (III+2-5+3-2), (III+2-6+3-1), (III+2-6+3-2), (III+2-7+3-1), (III+2-7+3-2), (III+2-8+3-1) and (III+2-8+3-2), preferably any one of said mixtures wherein compound III is IIIa, is used for increasing the yield of a plant or its product. In a preferred embodiment of the invention, any one of the mixtures (III+2-1+3-1) to (III+2-8+3-2), preferably said mixtures wherein compound III is IIIa, is used for increasing the yield such as the plant weight and/or the plant biomass (e.g. overall fresh weight) and/or the grain yield and/or the number of tillers. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In another embodiment any one of the mixtures (III+2-1+3-1), (III+2-1+3-2), (III+2-2+3-1), (III+2-2+3-2), (III+2-3+3-1), (III+2-3+3-2), (III+2-4+3-1), (III+2-4+3-2), (III+2-5+3-1), (III+2-5+3-2), (III+2-6+3-1), (III+2-6+3-2), (III+2-7+3-1), (III+2-7+3-2), (III+2-8+3-1) and (III+2-8+3-2), preferably any one of said mixtures wherein compound III is IIIa, is used for increasing the vigor of a plant or its product or improvement of the plant vigor. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In another embodiment the any one of the mixtures (III+2-1+3-1), (III+2-1+3-2), (III+2-2+3-1), (III+2-2+3-2), (III+2-3+3-1), (III+2-3+3-2), (III+2-4+3-1), (III+2-4+3-2), (III+2-5+3-1), (III+2-5+3-2), (III+2-6+3-1), (III+2-6+3-2), (III+2-7+3-1), (III+2-7+3-2), (III+2-8+3-1) and (III+2-8+3-2), preferably any one of said mixtures wherein compound III is IIIa, is used for increasing the quality of a plant or its product. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In yet another embodiment any one of the mixtures (III+2-1+3-1), (III+2-1+3-2), (III+2-2+3-1), (III+2-2+3-2), (III+2-3+3-1), (III+2-3+3-2), (III+2-4+3-1), (III+2-4+3-2), (III+2-5+3-1), (III+2-5+3-2), (III+2-6+3-1), (III+2-6+3-2), (III+2-7+3-1), (III+2-7+3-2), (III+2-8+3-1) and (III+2-8+3-2), preferably any one of said mixtures wherein compound III is IIIa, is used for increasing the tolerance and/or resistance of a plant or its product against biotic stress. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In yet another embodiment any one of the mixtures (III+2-1+3-1), (III+2-1+3-2), (III+2-2+3-1), (III+2-2+3-2), (III+2-3+3-1), (III+2-3+3-2), (III+2-4+3-1), (III+2-4+3-2), (III+2-5+3-1), (III+2-5+3-2), (III+2-6+3-1), (III+2-6+3-2), (III+2-7+3-1), (III+2-7+3-2), (III+2-8+3-1) and (III+2-8+3-2), preferably any one of said mixtures wherein compound III is IIIa, is used for increasing the tolerance and/or resistance of a plant or its product against abiotic stress. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

Any one of the mixtures (III+2-1+3-1), (III+2-1+3-2), (III+2-2+3-1), (III+2-2+3-2), (III+2-3+3-1), (III+2-3+3-2), (III+2-4+3-1), (III+2-4+3-2), (III+2-5+3-1), (III+2-5+3-2), (III+2-6+3-1), (III+2-6+3-2), (III+2-7+3-1), (III+2-7+3-2), (III+2-8+3-1) and (III+2-8+3-2), preferably any one of said mixtures wherein compound III is IIIa, is used by treating the plant, plant propagation material (preferably seed), soil, area, material or environment in which a plant is growing or may grow with an effective amount of the active compounds. The application can be carried out in the absence of pest pressure and/or both before and after an infection of the materials, plants or plant propagation materials (preferably seeds) by pests. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In one embodiment of the invention, any one of the mixtures (III+2-1+3-1), (III+2-1+3-2), (III+2-2+3-1), (III+2-2+3-2), (III+2-3+3-1), (III+2-3+3-2), (III+2-4+3-1), (III+2-4+3-2), (III+2-5+3-1), (III+2-5+3-2), (III+2-6+3-1), (III+2-6+3-2), (III+2-7+3-1), (III+2-7+3-2), (III+2-8+3-1) and (III+2-8+3-2), preferably any one of said mixtures wherein compound III is IIIa, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (III+2-1+3-1) to (III+2-8+3-2), preferably any one of said mixtures wherein compound III is IIIa, is applied at a growth stage (GS) between GS 00 and GS 65 BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In a preferred embodiment of the invention, any one of the mixtures (III+2-1+3-1), (III+2-1+3-2), (III+2-2+3-1), (III+2-2+3-2), (III+2-3+3-1), (III+2-3+3-2), (III+2-4+3-1), (III+2-4+3-2), (III+2-5+3-1), (III+2-5+3-2), (III+2-6+3-1), (III+2-6+3-2), (III+2-7+3-1),

(III+2-7+3-2), (III+2-8+3-1) and (III+2-8+3-2), preferably any one of said mixtures wherein compound III is IIIa, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (III+2-1+3-1) to (III+2-8+3-2), preferably any one of said mixtures wherein compound III is IIIa, is applied at a growth stage (GS) between GS 00 and GS 55 BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In an even more preferred embodiment of the invention, any one of the mixtures (III+2-1+3-1), (III+2-1+3-2), (III+2-2+3-1), (III+2-2+3-2), (III+2-3+3-1), (III+2-3+3-2), (III+2-4+3-1), (III+2-4+3-2), (III+2-5+3-1), (III+2-5+3-2), (III+2-6+3-1), (III+2-6+3-2), (III+2-7+3-1), (III+2-7+3-2), (III+2-8+3-1) and (III+2-8+3-2), preferably any one of said mixtures wherein compound III is IIIa, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (III+2-1+3-1) to (III+2-8+3-2), preferably any one of said mixtures wherein compound III is IIIa, is applied at a growth stage (GS) between GS 00 and GS 37 BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In a most preferred embodiment of the invention, any one of the mixtures (III+2-1+3-1), (III+2-1+3-2), (III+2-2+3-1), (III+2-2+3-2), (III+2-3+3-1), (III+2-3+3-2), (III+2-4+3-1), (III+2-4+3-2), (III+2-5+3-1), (III+2-5+3-2), (III+2-6+3-1), (III+2-6+3-2), (III+2-7+3-1), (III+2-7+3-2), (III+2-8+3-1) and (III+2-8+3-2), preferably any one of said mixtures wherein compound III is IIIa, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (III+2-1+3-1) to (III+2-8+3-2), preferably any one of said mixtures wherein compound III is IIIa, is applied at a growth stage (GS) between GS 00 and GS 21 BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In a preferred embodiment of the invention, any one of the mixtures (III+2-1+3-1), (III+2-1+3-2), (III+2-2+3-1), (III+2-2+3-2), (III+2-3+3-1), (III+2-3+3-2), (III+2-4+3-1), (III+2-4+3-2), (III+2-5+3-1), (III+2-5+3-2), (III+2-6+3-1), (III+2-6+3-2), (III+2-7+3-1), (III+2-7+3-2), (III+2-8+3-1) and (III+2-8+3-2), preferably any one of said mixtures wherein compound III is IIIa, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (III+2-1+3-1) to (III+2-8+3-2), preferably any one of said mixtures wherein compound III is IIIa, is applied at a growth stage (GS) between GS 13 and GS 37 BBCH of the treated plant. The components of the ternary mixture used are

present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In one embodiment any one of the mixtures (IV+2-1+3-1), (IV+2-1+3-2), (IV+2-2+3-1), (IV+2-2+3-2), (IV+2-3+3-1), (IV+2-3+3-2), (IV+2-4+3-1), (IV+2-4+3-2), (IV+2-5+3-1), (IV+2-5+3-2), (IV+2-6+3-1), (IV+2-6+3-2), (IV+2-7+3-1), (IV+2-7+3-2), (IV+2-8+3-1) and (IV+2-8+3-2), preferably any one of said mixtures wherein compound IV is IVa, IVb, IVc and/or IVd, is used for increasing the yield of a plant or its product. In a preferred embodiment of the invention, any one of the mixtures (IV+2-1+3-1) to (IV+2-8+3-2), preferably said mixtures wherein compound IV is IVa, IVb, IVc and/or IVd, is used for increasing the yield such as the plant weight and/or the plant biomass (e.g. overall fresh weight) and/or the grain yield and/or the number of tillers. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In another embodiment any one of the mixtures (IV+2-1+3-1), (IV+2-1+3-2), (IV+2-2+3-1), (IV+2-2+3-2), (IV+2-3+3-1), (IV+2-3+3-2), (IV+2-4+3-1), (IV+2-4+3-2), (IV+2-5+3-1), (IV+2-5+3-2), (IV+2-6+3-1), (IV+2-6+3-2), (IV+2-7+3-1), (IV+2-7+3-2), (IV+2-8+3-1) and (IV+2-8+3-2), preferably any one of said mixtures wherein compound IV is IVa, IVb, IVc and/or IVd, is used for increasing the vigor of a plant or its product or improvement of the plant vigor. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In another embodiment the any one of the mixtures (IV+2-1+3-1), (IV+2-1+3-2), (IV+2-2+3-1), (IV+2-2+3-2), (IV+2-3+3-1), (IV+2-3+3-2), (IV+2-4+3-1), (IV+2-4+3-2), (IV+2-5+3-1), (IV+2-5+3-2), (IV+2-6+3-1), (IV+2-6+3-2), (IV+2-7+3-1), (IV+2-7+3-2), (IV+2-8+3-1) and (IV+2-8+3-2), preferably any one of said mixtures wherein compound IV is IVa, IVb, IVc and/or IVd, is used for increasing the quality of a plant or its product. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In yet another embodiment any one of the mixtures (IV+2-1+3-1), (IV+2-1+3-2), (IV+2-2+3-1), (IV+2-2+3-2), (IV+2-3+3-1), (IV+2-3+3-2), (IV+2-4+3-1), (IV+2-4+3-2), (IV+2-5+3-1), (IV+2-5+3-2), (IV+2-6+3-1), (IV+2-6+3-2), (IV+2-7+3-1), (IV+2-7+3-2), (IV+2-8+3-1) and (IV+2-8+3-2), preferably any one of said mixtures wherein compound IV is IVa, IVb, IVc and/or IVd, is used for increasing the tolerance and/or resistance of a plant or its product against biotic stress. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In yet another embodiment any one of the mixtures (IV+2-1+3-1), (IV+2-1+3-2), (IV+2-2+3-1), (IV+2-2+3-2), (IV+2-3+3-1), (IV+2-3+3-2), (IV+2-4+3-1), (IV+2-4+3-2), (IV+2-5+3-1), (IV+2-5+3-2), (IV+2-6+3-1), (IV+2-6+3-2), (IV+2-7+3-1), (IV+2-7+3-2), (IV+2-8+3-1) and (IV+2-8+3-2), preferably any one of said mixtures wherein compound IV is IVa, IVb, IVc and/or IVd, is used for increasing the tolerance and/or resistance of a plant or its product against abiotic stress. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

Any one of the mixtures (IV+2-1+3-1), (IV+2-1+3-2), (IV+2-2+3-1), (IV+2-2+3-2), (IV+2-3+3-1), (IV+2-3+3-2), (IV+2-4+3-1), (IV+2-4+3-2), (IV+2-5+3-1), (IV+2-5+3-2), (IV+2-6+3-1), (IV+2-6+3-2), (IV+2-7+3-1), (IV+2-7+3-2), (IV+2-8+3-1) and (IV+2-8+3-2), preferably any one of said mixtures wherein compound IV is IVa, IVb, IVc and/or IVd, is used by treating the plant, plant propagation material (preferably seed), soil, area, material or environment in which a plant is growing or may grow with an effective amount of the active compounds. The application can be carried out in the absence of pest pressure and/or both before and after an infection of the materials, plants or plant propagation materials (preferably seeds) by pests. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In one embodiment of the invention, any one of the mixtures (IV+2-1+3-1), (IV+2-1+3-2), (IV+2-2+3-1), (IV+2-2+3-2), (IV+2-3+3-1), (IV+2-3+3-2), (IV+2-4+3-1), (IV+2-4+3-2), (IV+2-5+3-1), (IV+2-5+3-2), (IV+2-6+3-1), (IV+2-6+3-2), (IV+2-7+3-1), (IV+2-7+3-2), (IV+2-8+3-1) and (IV+2-8+3-2), preferably any one of said mixtures wherein compound IV is IVa, IVb, IVc and/or IVd, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (IV+2-1+3-1) to (IV+2-8+3-2), preferably any one of said mixtures wherein compound IV is IVa, IVb, IVc and/or IVd, is applied at a growth stage (GS) between GS 00 and GS 65 BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In a preferred embodiment of the invention, any one of the mixtures (IV+2-1+3-1), (IV+2-1+3-2), (IV+2-2+3-1), (IV+2-2+3-2), (IV+2-3+3-1), (IV+2-3+3-2), (IV+2-4+3-1), (IV+2-4+3-2), (IV+2-5+3-1), (IV+2-5+3-2), (IV+2-6+3-1), (IV+2-6+3-2), (IV+2-7+3-1), (IV+2-7+3-2), (IV+2-8+3-1) and (IV+2-8+3-2), preferably any one of said mixtures wherein compound IV is IVa, IVb, IVc and/or IVd, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (IV+2-1+3-1) to (IV+2-8+3-2), preferably any one of said mixtures wherein compound IV is IVa, IVb, IVc and/or IVd, is applied at a growth stage (GS) between GS 00 and GS 55 BBCH of the treated

plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In an even more preferred embodiment of the invention, any one of the mixtures (IV+2-1+3-1), (IV+2-1+3-2), (IV+2-2+3-1), (IV+2-2+3-2), (IV+2-3+3-1), (IV+2-3+3-2), (IV+2-4+3-1), (IV+2-4+3-2), (IV+2-5+3-1), (IV+2-5+3-2), (IV+2-6+3-1), (IV+2-6+3-2), (IV+2-7+3-1), (IV+2-7+3-2), (IV+2-8+3-1) and (IV+2-8+3-2), preferably any one of said mixtures wherein compound IV is IVa, IVb, IVc and/or IVd, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (IV+2-1+3-1) to (IV+2-8+3-2), preferably any one of said mixtures wherein compound IV is IVa, IVb, IVc and/or IVd, is applied at a growth stage (GS) between GS 00 and GS 37 BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In a most preferred embodiment of the invention, any one of the mixtures (IV+2-1+3-1), (IV+2-1+3-2), (IV+2-2+3-1), (IV+2-2+3-2), (IV+2-3+3-1), (IV+2-3+3-2), (IV+2-4+3-1), (IV+2-4+3-2), (IV+2-5+3-1), (IV+2-5+3-2), (IV+2-6+3-1), (IV+2-6+3-2), (IV+2-7+3-1), (IV+2-7+3-2), (IV+2-8+3-1) and (IV+2-8+3-2), preferably any one of said mixtures wherein compound IV is IVa, IVb, IVc and/or IVd, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (IV+2-1+3-1) to (IV+2-8+3-2), preferably any one of said mixtures wherein compound IV is IVa, IVb, IVc and/or IVd, is applied at a growth stage (GS) between GS 00 and GS 21 BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

In a preferred embodiment of the invention, any one of the mixtures (IV+2-1+3-1), (IV+2-1+3-2), (IV+2-2+3-1), (IV+2-2+3-2), (IV+2-3+3-1), (IV+2-3+3-2), (IV+2-4+3-1), (IV+2-4+3-2), (IV+2-5+3-1), (IV+2-5+3-2), (IV+2-6+3-1), (IV+2-6+3-2), (IV+2-7+3-1), (IV+2-7+3-2), (IV+2-8+3-1) and (IV+2-8+3-2), preferably any one of said mixtures wherein compound IV is IVa, IVb, IVc and/or IVd, is used for increasing the health, specifically for improving one or more of the above mentioned particular characteristics, wherein any one of the mixtures (IV+2-1+3-1) to (IV+2-8+3-2), preferably any one of said mixtures wherein compound IV is IVa, IVb, IVc and/or IVd, is applied at a growth stage (GS) between GS 13 and GS 37 BBCH of the treated plant. The components of the ternary mixture used are present in a weight ratio or preferred weight ratio as detailed above for the ternary mixtures.

The term "growth stage" as used herein 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. 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.

The present invention further relates to a method for controlling undesirable vegetation in crops, wherein the plant, the locus where the plant is growing or is expected to grow or plant propagation material from which the plant grows is treated with an effective amount of any one of the ternary mixtures as defined herein.

The present invention additionally relates to the use of any one of the ternary mixtures as defined herein for synergistically controlling undesirable vegetation in crops.

The present invention further relates to a method for controlling phytopathogenic fungi, wherein the plant, the locus where the plant is growing or is expected to grow or plant propagation material from which the plant grows is treated with an effective amount of a mixture as defined above. The present invention additionally relates to the use of any one of the ternary mixtures as defined for controlling phytopathogenic fungi in crops.

Some of the mixtures are novel. Therefore, a further aspect of the present invention are mixtures comprising compound selected from I, II, III and VI, in particular Ia, Ib, IIa, IIb, IIIa, IIIb, IVa, IVb, IVc, IVd, IVe, IVf, IVg and IVh, as component 1 and one herbicide selected from imazamox, imazethapyr, imazapic, imazapyr, imazamethabenz-methyl and imazaquin; dicamba, saflufenacil, glyphosate and glufosinate as component 2. In a preferred embodiment, the present invention relates to the binary mixtures (I+2-2), (I+2-3), (I+2-4), (I+2-5), (I+2-6), (I+2-7), (I+2-8) and (I+2-10), preferably (Ia+2-1), (Ia+2-2), (Ia+2-3), (Ia+2-4), (Ia+2-5), (Ia+2-6), (Ia+2-7), (Ia+2-8), (Ia+2-9) and (Ia+2-10), as defined above. In another embodiment, the present invention relates to the binary mixtures (II+2-1), (II+2-2), (II+2-3), (II+2-4), (II+2-5), (II+2-6), (II+2-7), (II+2-8), (II+2-9) and (II+2-10), preferably (IIa+2-1), (IIa+2-2), (IIa+2-3), (IIa+2-4), (IIa+2-5), (IIa+2-6), (IIa+2-7), (IIa+2-8), (IIa+2-9) and (IIa+2-10), as defined above. In still another embodiment, the present invention relates to the binary mixtures (III+2-1), (III+2-2), (III+2-3), (III+2-4), (III+2-5), (III+2-6), (III+2-7), (III+2-8), (III+2-9) and (III+2-10), preferably (IIIa+2-1), (IIIa+2-2), (IIIa+2-3), (IIIa+2-4), (IIIa+2-5), (IIIa+2-6), (IIIa+2-7), (IIIa+2-8), (IIIa+2-9) and (IIIa+2-10), as defined above. In still another embodiment, the present invention relates to the binary mixtures (IV+2-1), (IV+2-2), (IV+2-3), (IV+2-4), (IV+2-5), (IV+2-6), (IV+2-7), (IV+2-8), (IV+2-9) and (IV+2-10), preferably (IVabcd+2-1), (IVabcd+2-2), (IVabcd+2-3), (IVabcd+2-4), (IVabcd+2-5), (IVabcd+2-6), (IVabcd+2-7), (IVabcd+2-8), (IVabcd+2-9)

and (IVabcd+2-10) as defined above. In particular, the weight ratio of component 1 to component 2 is in each case 1:100 to 100:1, preferably 1:50 to 50:1, even more preferably 1:20 to 20:1. Furthermore, a preferable weight ratio is 95:1 to 1:95, more preferable 90:1 to 1:90, even more preferable 85:1 to 1:85, even more preferable 80:1 to 1:80, even more preferable 75:1 to 1:75, even more preferable 70:1 to 1:70, even more preferable 65:1 to 1:65, 60:1 to 1:60, even more preferable 55:1 to 1:55, even more preferable 50:1 to 1:50, even more preferable 45:1 to 1:45, even more preferable 30:1 to 1:30, even more preferable 25:1 to 1:25, even more preferable 15:1 to 1:15, even more preferable 10:1 to 1:10, even more preferable 5:1 to 1:5, even more preferable 4:1 to 1:4, even more preferable 3:1 to 1:3, even more preferable 2:1 to 1:2.

In a further preferred embodiment, the present invention relates to the ternary mixtures (I+2-1+3-1), (I+2-1+3-2), (I+2-2+3-1), (I+2-2+3-2), (I+2-3+3-1), (I+2-3+3-2), (I+2-4+3-1), (I+2-4+3-2), (I+2-5+3-1), (I+2-5+3-2), (I+2-6+3-1), (I+2-6+3-2), (I+2-7+3-1), (I+2-7+3-2), (I+2-8+3-1) and (I+2-8+3-2), preferably (Ia+2-1+3-1), (Ia+2-1+3-2), (Ia+2-2+3-1), (Ia+2-2+3-2), (Ia+2-3+3-1), (Ia+2-3+3-2), (Ia+2-4+3-1), (Ia+2-4+3-2), (Ia+2-5+3-1), (Ia+2-5+3-2), (Ia+2-6+3-1), (Ia+2-6+3-2), (Ia+2-7+3-1), (Ia+2-7+3-2), (Ia+2-8+3-1) and (Ia+2-8+3-2), as defined above. In still a further preferred embodiment, the present invention relates to the ternary mixtures (II+2-1+3-1), (II+2-1+3-2), (II+2-2+3-1), (II+2-2+3-2), (II+2-3+3-1), (II+2-3+3-2), (II+2-4+3-1), (II+2-4+3-2), (II+2-5+3-1), (II+2-5+3-2), (II+2-6+3-1), (II+2-6+3-2), (II+2-7+3-1), (II+2-7+3-2), (II+2-8+3-1) and (II+2-8+3-2), preferably (IIa+2-1+3-1), (IIa+2-1+3-2), (IIa+2-2+3-1), (IIa+2-2+3-2), (IIa+2-3+3-1), (IIa+2-3+3-2), (IIa+2-4+3-1), (IIa+2-4+3-2), (IIa+2-5+3-1), (IIa+2-5+3-2), (IIa+2-6+3-1), (IIa+2-6+3-2), (IIa+2-7+3-1), (IIa+2-7+3-2), (IIa+2-8+3-1) and (IIa+2-8+3-2), as defined above. In still a further preferred embodiment, the present invention relates to the ternary mixtures (III+2-1+3-1), (III+2-1+3-2), (III+2-2+3-1), (III+2-2+3-2), (III+2-3+3-1), (III+2-3+3-2), (III+2-4+3-1), (III+2-4+3-2), (III+2-5+3-1), (III+2-5+3-2), (III+2-6+3-1), (III+2-6+3-2), (III+2-7+3-1), (III+2-7+3-2), (III+2-8+3-1) and (III+2-8+3-2), preferably (IIIa+2-1+3-1), (IIIa+2-1+3-2), (IIIa+2-2+3-1), (IIIa+2-2+3-2), (IIIa+2-3+3-1), (IIIa+2-3+3-2), (IIIa+2-4+3-1), (IIIa+2-4+3-2), (IIIa+2-5+3-1), (IIIa+2-5+3-2), (IIIa+2-6+3-1), (IIIa+2-6+3-2), (IIIa+2-7+3-1), (IIIa+2-7+3-2), (IIIa+2-8+3-1) and (IIIa+2-8+3-2), as defined above. In still a further preferred embodiment, the present invention relates to the ternary mixtures (IV+2-1+3-1), (IV+2-1+3-2), (IV+2-2+3-1), (IV+2-2+3-2), (IV+2-3+3-1), (IV+2-3+3-2), (IV+2-4+3-1), (IV+2-4+3-2), (IV+2-5+3-1), (IV+2-5+3-2), (IV+2-6+3-1), (IV+2-6+3-2), (IV+2-7+3-1), (IV+2-7+3-2), (IV+2-8+3-1) and (IV+2-8+3-2), preferably (IVabcd+2-1+3-1), (IVabcd+2-1+3-2), (IVabcd+2-2+3-1), (IVabcd+2-2+3-2), (IVabcd+2-3+3-1), (IVabcd+2-3+3-2), (IVabcd+2-4+3-1), (IVabcd+2-4+3-2), (IVabcd+2-5+3-1), (IVabcd+2-5+3-2), (IVabcd+2-6+3-1), (IVabcd+2-6+3-2), (IVabcd+2-7+3-1), (IVabcd+2-7+3-2), (IVabcd+2-8+3-1) and (IVabcd+2-8+3-2), as defined above. In particular, the weight ratio of component 1 to component 2 is in each case 1:100 to

100:1, preferably 1:50 to 50:1, even more preferably 1:20 to 20:1. Furthermore, a preferable weight ratio of component 1 to component 2 is 95:1 to 1:95, more preferable 90:1 to 1:90, even more preferable 85:1 to 1:85, even more preferable 80:1 to 1:80, even more preferable 75:1 to 1:75, even more preferable 70:1 to 1:70, even more preferable 65:1 to 1:65, 60:1 to 1:60, even more preferable 55:1 to 1:55, even more preferable 50:1 to 1:50, even more preferable 45:1 to 1:45, even more preferable 30:1 to 1:30, even more preferable 25:1 to 1:25, even more preferable 15:1 to 1:15, even more preferable 10:1 to 1:10, even more preferable 5:1 to 1:5, even more preferable 4:1 to 1:4, even more preferable 3:1 to 1:3, even more preferable 2:1 to 1:2. The weight ratio of component 1 to component 3 is in each case 1:100 to 100:1, preferably 1:50 to 50:1, even more preferably 1:20 to 20:1. Furthermore, a preferable weight ratio of component 1 to component 3 is in each case 95:1 to 1:95, more preferable 90:1 to 1:90, even more preferable 85:1 to 1:85, even more preferable 80:1 to 1:80, even more preferable 75:1 to 1:75, even more preferable 70:1 to 1:70, even more preferable 65:1 to 1:65, 60:1 to 1:60, even more preferable 55:1 to 1:55, even more preferable 50:1 to 1:50, even more preferable 45:1 to 1:45, even more preferable 30:1 to 1:30, even more preferable 25:1 to 1:25, even more preferable 15:1 to 1:15, even more preferable 10:1 to 1:10, even more preferable 5:1 to 1:5, even more preferable 4:1 to 1:4, even more preferable 3:1 to 1:3, even more preferable 2:1 to 1:2. The weight ratio of component 2 to component 3 is in each case 1:100 to 100:1, preferably 1:50 to 50:1, even more preferably 1:20 to 20:1. Furthermore, a preferable weight ratio of component 2 to component 3 is in each case 95:1 to 1:95, more preferable 90:1 to 1:90, even more preferable 85:1 to 1:85, even more preferable 80:1 to 1:80, even more preferable 75:1 to 1:75, even more preferable 70:1 to 1:70, even more preferable 65:1 to 1:65, 60:1 to 1:60, even more preferable 55:1 to 1:55, even more preferable 50:1 to 1:50, even more preferable 45:1 to 1:45, even more preferable 30:1 to 1:30, even more preferable 25:1 to 1:25, even more preferable 15:1 to 1:15, even more preferable 10:1 to 1:10, even more preferable 5:1 to 1:5, even more preferable 4:1 to 1:4, even more preferable 3:1 to 1:3, even more preferable 2:1 to 1:2.

In the terms of the present invention "mixture" is not restricted to a physical mixture comprising component 1 and component 2 and, if present, component 3, but refers to any preparation form of the active compounds, the use of which is time- and locus-related.

According to one embodiment of this invention, applying the component 1 and component 2 and, if present, component 3, is to be understood to denote, that at least the component 1 and component 2 and, if present, component 3, occur simultaneously at the site of action (i.e. plant, plant propagation material (preferably seed), soil, area, material or environment in which a plant is growing or may grow) in an effective amount.

This can be obtained by applying the component 1 and component 2 and, if present, component 3, simultaneously, 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 is not essential for working of the present invention.

In one embodiment of the invention, component 1 and component 2 and, if present, component 3, are formulated separately but applied to the same plant, plant propagule or locus in a temporal relationship, i.e. simultaneously or subsequently, the subsequent application having a time interval which allows a combined action of the compounds.

In another embodiment of the invention, one component 1 and component 2 and optionally component 3 are applied simultaneously, either as a mixture or separately, or subsequently to plant propagules.

In a preferred embodiment of the invention, component 1 and component 2 and optionally component 3 are applied simultaneously, either as a mixture or separately, as foliar spray treatment.

The compounds of the inventive mixtures or the mixtures used according to the present invention can 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 one embodiment of the invention, the kits may include one or more, including all, components that may be used to prepare a subject agrochemical composition. E. g., kits may include the component 1 and component 2 and optionally component 3 and/or an adjuvant component and/or a further pesticidal compound (e.g. insecticide, fungicide or herbicide) 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 are 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. As such, 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 or the composition used according to the invention usually from a predosage device, a knapsack sprayer, a spray tank or a spray plane. Here, the agrochemical composition is 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. Usually, 50 to 500 liters of the ready-to-use spray liquid are applied per hectare of agricultural useful area, preferably 50 to 400 liters.

According to one embodiment, individual compounds of the inventive mixtures or the mixtures used according to the invention formulated as composition (or formulation) such as parts of a kit or parts of the inventive mixture or the mixtures used according to the invention 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 compounds of the inventive mixtures or the mixtures used according to the invention formulated as composition or partially premixed components, e.g. components comprising component 1 and component 2 and optionally component 3 may be mixed by the user in a spray tank and further auxiliaries and additives may be added, if appropriate (tank mix).

In a further embodiment, either individual components of the composition according to the invention or the composition used according to the invention or partially premixed components, e. g. components comprising component 1 and component 2 and optionally component 3, can be applied jointly (e. .g. after tankmix) or consecutively.

In another embodiment, the aforementioned methods for increasing the health of a plant and/or increasing the control of undesirable vegetation and/or increasing the control of phytopathogenic fungi comprises treating the plant propagules, preferably the seeds of an agricultural, horticultural, ornamental or silvicultural plant selected from the group consisting of transgenic or non-transgenic plants with a mixture according to the present invention or a mixture as used according to the present invention.

The term "plants" generally comprises all plants of economic importance and/or men-grown plants. They are preferably selected from agricultural, silvicultural and ornamental plants, more preferably agricultural plants and silvicultural plants, utmost preferably agricultural plants. The term "plant (or plants)" is a synonym of the term

“crop” which is to be understood as a plant of economic importance and/or a men-grown plant. The term “plant” as used herein includes all parts of a plant such as germinating seeds, emerging seedlings, herbaceous vegetation as well as established woody plants including all belowground portions (such as the roots) and aboveground portions.

The plants to be treated according to the invention are selected from the group consisting of agricultural, silvicultural, ornamental and horticultural plants, each in its natural or genetically modified form, more preferably from agricultural plants. According to one embodiment, any one of compounds I, II, III and IV as defined herein is used. According to another embodiment, any one of the mixtures as defined herein is used.

In one embodiment, the plant to be treated according to the method of the invention is a horticultural plant. The term “horticultural plants” are to be understood as plants which are commonly used in horticulture – e.g. the cultivation of ornamentals, vegetables and/or fruits. Examples for ornamentals are turf, geranium, pelargonium, petunia, begonia and fuchsia. Examples for vegetables are potatoes, tomatoes, peppers, cucurbits, cucumbers, melons, watermelons, garlic, onions, carrots, cabbage, beans, peas and lettuce and more preferably from tomatoes, onions, peas and lettuce. Examples for fruits are apples, pears, cherries, strawberry, citrus, peaches, apricots and blueberries. According to one embodiment, any one of compounds I, II, III and IV as defined herein is used. According to another embodiment, any one of the mixtures as defined herein is used.

In one embodiment, the plant to be treated according to the method of the invention is an ornamental plant. “Ornamental plants” are plants which are commonly used in gardening, e.g. in parks, gardens and on balconies. Examples are turf, geranium, pelargonium, petunia, begonia and fuchsia. According to one embodiment, any one of compounds I, II, III and IV as defined herein is used. According to another embodiment, any one of the mixtures as defined herein is used.

In one embodiment, the plant to be treated according to the method of the invention is a silvicultural plants. The term “silvicultural plant” is to be understood as trees, more specifically trees used in reforestation or industrial plantations. Industrial plantations generally serve for the commercial production of forest products, such as wood, pulp, paper, rubber tree, Christmas trees, or young trees for gardening purposes. Examples for silvicultural plants are conifers, like pines, in particular *Pinus* spec., fir and spruce, eucalyptus, tropical trees like teak, rubber tree, oil palm, willow (*Salix*), in particular *Salix* spec., poplar (cottonwood), in particular *Populus* spec., beech, in particular *Fagus* spec., birch, oil palm and oak. According to one

embodiment, any one of compounds I, II, III and IV as defined herein is used.
According to another embodiment, any one of the mixtures as defined herein is used.

In one embodiment, the plant to be treated according to the method of the invention is an agricultural plant. Agricultural plants are plants of which a part or all is harvested or cultivated on a commercial scale or which serve as an important source of feed, food, fibres (e.g. cotton, linen), combustibles (e.g. wood, bioethanol, biodiesel, biomass) or other chemical compounds. Agricultural plants also include the horticultural plants fruits and vegetables. Thus, the term agricultural plants include cereals, e.g. wheat, rye, barley, triticale, oats, sorghum or rice; beet, e.g. sugar beet or fodder beet; *fruits*, such as pomes, stone fruits or soft fruits, e.g. apples, pears, plums, peaches, peanuts, almonds, cherries, strawberries, raspberries, blackberries or gooseberries; leguminous plants, such as lentils, peas, alfalfa or soybeans; oil plants, such as rape, oil-seed rape, canola, juncea (*Brassica juncea*), linseed, mustard, olives, sunflowers, coconut, cocoa beans, castor oil plants, oil palms, ground nuts or soybeans; cucurbits, such as squashes, cucumber or melons; fiber plants, such as cotton, flax, hemp or jute; citrus fruit, such as oranges, lemons, grapefruits or mandarins; vegetables, such as cucumbers, spinach, lettuce, asparagus, cabbages, carrots, onions, tomatoes, potatoes, cucurbits or paprika; lauraceous plants, such as avocados, cinnamon or camphor; energy and raw material plants, such as corn, soybean, rape, canola, sugar cane or oil palm; corn; tobacco; nuts; coffee; tea; bananas; vines (table grapes and grape juice grape vines); hop; turf; natural rubber plants or ornamental and forestry plants, such as flowers, shrubs, broad-leaved trees or evergreens, e.g. conifers. According to one embodiment, any one of compounds I, II, III and IV as defined herein is used. According to another embodiment, any one of the mixtures as defined herein is used.

In a preferred embodiment, the plants to be treated in accordance with the method of the present invention are agricultural plants. According to one embodiment, any one of compounds I, II, III and IV as defined herein is used. According to another embodiment, any one of the mixtures as defined herein is used.

Preferred agricultural plants are field crops, sugar beets, cereals such as wheat, rye, barley, triticale, oats, sorghum, rice, corn, cotton, rape, sunflowers, oilseed rape, juncea and canola, vine, legumes such as soybeans, peas and beans (fieldbeans), lentil, sugar cane, turf; ornamentals; vegetables, such as vegetables, such as cucumbers, leeks, paprika spinach, lettuce, asparagus, cabbages, carrots, onions, tomatoes, potatoes, cucurbits (squashes, cucumber or melons); alfalfa, clover and fruits, such as pomes, stone fruits or soft fruits, e.g. apples, pears, plums, peaches, almonds, peanuts, cherries, strawberries, raspberries, blackberries or gooseberries and citrus fruit, such as oranges, lemons, grapefruits or mandarins; leguminous plants, such as lentils, peas, alfalfa or soybeans; oil plants, such as rape, oil-seed

rape, canola, juncea (*Brassica juncea*), linseed, mustard, olives, sunflowers, coconut, cocoa beans, castor oil plants, oil palms, ground nuts or soybeans; fiber plants, such as cotton, flax, hemp or jute. According to one embodiment, any one of compounds I, II, III and IV as defined herein is used. According to another embodiment, any one of the mixtures as defined herein is used.

More preferred agricultural plants are selected from soybean, wheat, sunflower, canola, oilseed rape, corn, cotton, sugar cane, juncea, peas, lentils, alfalfa, vine, and fruits (as defined above) and vegetables as defined above). Most preferred agricultural plants are selected from wheat, barley, corn, soybean, rice, canola, sunflower and fruits (as defined above) and vegetables as defined above). The utmost preferred plants are soybean, vine, and fruits (as defined above) and vegetables as defined above. According to one embodiment, any one of compounds I, II, III and IV as defined herein is used. According to another embodiment, any one of the mixtures as defined herein is used.

Particularly preferred agricultural plants are selected from wheat, barley soybean, corn, sugar beets, peanuts, oil seed rape, canola, rice, speciality crops, in particular specialty crops such as turf, potato, tomato, cucurbits, grapes, apples, bananas and ornamentals. According to one embodiment, any one of compounds I, II, III and IV as defined herein is used. According to another embodiment, any one of the mixtures as defined herein is used.

Particularly preferred agricultural plants to be treated with a compound selected from I, II, III and IV are selected from cereals, in particular wheat and barley, and soybeans, in a specific embodiment as foliar application such as foliar spray. According to another embodiment, any one of the mixtures as defined herein is used.

Particularly preferred agricultural plants to be treated with a compound selected from I, II, III and IV are selected from cereals, in particular wheat and barley, soybeans, corn, sweet corn, sorghum, sugar beet, potato, rice, sunflower, canola, pomefruit, stonefruit, legumes, dry bean and chickpea, tree nuts, peanuts, lentils, cotton, in a specific embodiment as foliar application such as foliar spray, for any one of the above explained plant health effects, for example cold tolerance. According to a further embodiment, said crops are treated by seed treatment in order to achieve the desired plant health effects. According to another embodiment, any one of the mixtures as defined herein is used.

Generally the term "plants" also includes plants which have been modified by breeding, mutagenesis or genetic engineering (transgenic and non-transgenic plants). Genetically modified plants are plants, which 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. According to one embodiment, any one of compounds I, II, III and IV as defined herein is used. According to another embodiment, any one of the mixtures as defined herein is used.

Plants as well as the propagation material of said plants, which can be treated with a compound selected from I, II, III and IV, or the inventive mixtures or mixtures used according to the invention, include all modified non-transgenic plants or transgenic plants, e.g. crops which tolerate the action of herbicides or fungicides or insecticides owing to breeding, including genetic engineering methods, or plants which have modified characteristics in comparison with existing plants, which can be generated for example by traditional breeding methods and/or the generation of mutants, or by recombinant procedures. According to one embodiment, any one of compounds I, II, III and IV as defined herein is used. According to another embodiment, any one of the mixtures as defined herein is used.

For example, a compound selected from I, II, III and IV as defined herein, or mixtures according to the present invention or used according to the present invention can be applied (as seed treatment, foliar spray treatment, in-furrow application or by any other means) also to plants which have been modified by breeding, mutagenesis or genetic engineering including but not limiting to agricultural biotech products on the market or in development (cf.

http://www.bio.org/speeches/pubs/er/agri_products.asp). Genetically modified plants are plants, which genetic material has been so modified by the use of recombinant DNA techniques that under natural circumstances cannot readily be obtained by cross breeding, mutations or natural recombination. Typically, one or more genes have been integrated into the genetic material of a genetically modified plant in order to improve certain properties of the 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.

Plants that have been modified by breeding, mutagenesis or genetic engineering, e.g. 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, and e.g. US7105724 for dicamba resistance in bean, maize (for maize see also WO2008051633), cotton (for cotton see also US5670454), pea, potato, sorghum, soybean (for soybean see also US5670454), sunflower, tobacco, tomato (for tomato see also US5670454)). Gene constructs can be obtained, for example, from micro-organism 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; *Arabidopsis*, *Daucus carota*, *Pseudomonas* ssp. or *Zea mays* with chimeric gene sequences coding for HDDL (see e.g. WO1996/38567, WO 2004/55191); *Arabidopsis thaliana* which is resistant to protox inhibitors (see e.g. US2002/0073443).

Examples of commercial available plants with tolerance to herbicides, are the corn varieties "Roundup Ready® Corn", "Roundup Ready 2®" (Monsanto), "Agrisure GT®", "Agrisure GT/CB/LL®", "Agrisure GT/RW®", "Agrisure 3000GT®" (Syngenta), "YieldGard VT Rootworm/RR2®" and "YieldGard VT Triple®" (Monsanto) with tolerance to glyphosate; the corn varieties "Liberty Link®" (Bayer), "Herculex I®", "Herculex RW®", "Herculex® Xtra" (Dow, Pioneer), "Agrisure GT/CB/LL®" and "Agrisure CB/LL/RW®" (Syngenta) with tolerance to glufosinate; the soybean varieties "Roundup Ready® Soybean" (Monsanto) and "Optimum GAT®" (DuPont, Pioneer) with tolerance to glyphosate; the cotton varieties "Roundup Ready® Cotton" and "Roundup Ready Flex®" (Monsanto) with tolerance to glyphosate; the cotton variety "FiberMax Liberty Link®" (Bayer) with tolerance to glufosinate; the cotton variety "BXN®" (Calgene) with tolerance to bromoxynil; the canola varieties "Navigator®" and "Compass®" (Rhone-Poulenc) with bromoxynil tolerance; the canola variety "Roundup Ready® Canola" (Monsanto) with glyphosate tolerance; the canola variety "InVigor®" (Bayer) with glufosinate tolerance; the rice variety "Liberty Link® Rice" (Bayer) with glufosinate tolerance and the alfalfa variety "Roundup Ready Alfalfa" with glyphosate tolerance. Further modified plants with herbicide are commonly known, for instance alfalfa, apple, eucalyptus, flax, grape, lentils, oil seed rape, peas, potato, rice, sugar beet, sunflower, tobacco, tomato, turf grass and wheat with tolerance to glyphosate (see e.g. US 5188642, US 4940835, US 5633435, US 5804425, US 5627061); beans, soybean, cotton, peas, potato, sunflower, tomato, tobacco, corn, sorghum and sugarcane with tolerance to dicamba (see e.g. US 2009/0105077, US 7105724 and US 5670454); pepper, apple, tomato, hirse, sunflower, tobacco, potato, corn, cucumber, wheat, soybean and sorghum with tolerance to 2,4-D (see e.g. US 6153401, US 6100446, WO 05/107437, US 5608147 and US 5670454); sugarbeet, potato, tomato and tobacco with tolerance to glufosinate (see e.g. US 5646024, US 5561236); canola, barley, cotton, juncea,

lettuce, lentils, melon, millet, oats, oilseed rapre, potato, rice, rye, sorghum, soybean, sugarbeet, sunflower, tobacco, tomato and wheat with tolerance to acetolactate synthase (ALS) inhibiting herbicides, such as triazolopyrimidine sulfonamides, growth inhibitors and imidazolinones (see e.g. US 5013659, WO 06/060634, US 4761373, US 5304732, US 6211438, US 6211439 and US 6222100); cereal, sugar cane, rice, corn, tobacco, soybean, cotton, rapeseed, sugar beet and potato with tolerance to HPPD inhibitor herbicides (see e.g. WO 04/055191, WO 96/38567, WO 97/049816 and US 6791014); wheat, soybean, cotton, sugar beet, rape, rice, corn, sorghum and sugar cane with tolerance to protoporphyrinogen oxidase (PPO) inhibitor herbicides (see e.g. US2002/0073443, US 20080052798, Pest Management Science, 61, 2005, 277-285). The methods of producing such herbicide resistant plants are generally known to the person skilled in the art and are described, for example, in the publications mentioned above. Further examples of commercial available modified plants with tolerance to herbicides "CLEARFIELD® Corn", "CLEARFIELD® Canola", "CLEARFIELD® Rice", "CLEARFIELD® Lentils", "CLEARFIELD® Sunlowers" (BASF) with tolerance to the imidazolinone herbicides.

Furthermore, plants are also covered that 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 *Streptomyces* 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). Further examples of such toxins or genetically modified plants capable of synthesizing such toxins are disclosed, e.g., in EP-A 374 753, WO 93/007278, WO 95/34656, EP-A 427 529, EP-A 451 878, WO 03/18810 und WO 03/52073. 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.

These insecticidal proteins contained in the genetically modified plants impart to the plants producing these proteins tolerance to harmful pests from all taxonomic groups of arthropods, especially to beetles (Coleoptera), two-winged insects (Diptera), and moths (Lepidoptera) and to nematodes (Nematoda). Genetically modified plants capable to synthesize one or more insecticidal proteins are, e.g., described in the publications mentioned above, and some of which are commercially available such as YieldGard® (corn cultivars producing the Cry1Ab toxin), YieldGard® Plus (corn cultivars producing Cry1Ab and Cry3Bb1 toxins), Starlink® (corn cultivars producing the Cry9c toxin), Herculex® RW (corn cultivars producing Cry34Ab1, Cry35Ab1 and the enzyme Phosphinothricin-N-Acetyltransferase [PAT]); NuCOTN® 33B (cotton cultivars producing the Cry1Ac toxin), Bollgard® I (cotton cultivars producing the Cry1Ac toxin), Bollgard® II (cotton cultivars producing Cry1Ac and Cry2Ab2 toxins); VIPCOT® (cotton cultivars producing a VIP-toxin); NewLeaf® (potato cultivars producing the Cry3A toxin); Bt-Xtra®, NatureGard®, KnockOut®, BiteGard®, Protecta®, Bt11 (e. g. Agrisure® CB) and Bt176 from Syngenta Seeds SAS, France, (corn cultivars producing the Cry1Ab toxin and PAT enzyme), MIR604 from Syngenta Seeds SAS, France (corn cultivars producing a modified version of the Cry3A toxin, c.f. WO 03/018810), MON 863 from Monsanto Europe S.A., Belgium (corn cultivars producing the Cry3Bb1 toxin), IPC 531 from Monsanto Europe S.A., Belgium (cotton cultivars producing a modified version of the Cry1Ac toxin) and 1507 from Pioneer Overseas Corporation, Belgium (corn cultivars producing the Cry1F toxin and PAT enzyme).

Furthermore, plants are also covered 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 amylovora*). 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.

Furthermore, plants are also covered 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.

Furthermore, plants are also covered that contain by the use of recombinant DNA techniques a modified amount of substances of content or new substances of content, specifically to improve human or animal nutrition, e.g. oil crops that produce health-promoting long-chain omega-3 fatty acids or unsaturated omega-9 fatty acids (e.g. Nexera® rape, DOW Agro Sciences, Canada).

Furthermore, plants are also covered that contain by the use of recombinant DNA techniques a modified amount of substances of content or new substances of content, specifically to improve raw material production, e.g. potatoes that produce increased amounts of amylopectin (e.g. Amflora® potato, BASF SE, Germany).

Particularly preferred modified plants suitable to be used in the methods of the present invention are those, which are resistant to herbicides, in particular resistant to glyphosate, glufosinate, dicamba and imidazolinones, selected from imazamox, imazapic, imazapyr, imazethapyr, imazaquin and imazamethabenz-methyl.

In a preferred embodiment of the invention, the plant to be treated is a herbicide tolerant plant. Within the herbicide tolerant plants, imidazolinone tolerant plants are especially preferred.

The term "plant propagation material" is to be understood to denote all the generative parts of the plant such as seeds and vegetative plant material such as cuttings and tubers (e.g. potatoes), 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 plants, including seedlings and young 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 plant can be obtained.

The term "propagules" or "plant propagules" is to be understood to denote any structure with the capacity to give rise to a new 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" denotes for seed.

Within the scope of the invention, the health of a plant is increased. In case a mixture as defined herein is used, the health of a plant is preferably increased synergistically. The term "synergistically" refers to the fact that the purely additive effect (in mathematical terms) of a simultaneous, that is joint or separate application of one component 1 and component 2 and, if present, component 3, or the successive application of one component 1 and component 2 and, if present, component 3, of the application of the individual compounds is surpassed by the application of the

inventive mixture or the mixture used according to the present invention. The synergistic increase of the health of a plant is more than surprising, since it can be assumed that fungicidal compounds and herbicides have completely different mode of actions. In particular, the components of the mixtures are used in synergistically effective amounts, particularly in the weight ratios as detailed herein.

Principally, the application rates of the compound selected from I, II, III and IV or the inventive mixtures or the mixtures used according to the invention, are from 0,3 g/ha to 2000 g/ha, preferably 5 g/ha to 2000 g/ha, more preferably from 50 to 900 g/ha, in particular from 50 to 900 g/ha. When used for increasing the health of a plant, the application rates of the compound selected from I, II, III and IV or the mixtures are in particular between 0,3 g/ha and 1500 g/ha, depending on various parameters such as the treated plant species or the mixture applied. In a preferred embodiment of the method according to the invention, the application rates of the compound selected from I, II, III and IV or the mixtures are between 5 g/ha and 750 g/ha. In an even more preferred embodiment of the method according to the invention, the application rates of the compound selected from I, II, III and IV or the mixtures are between 20 g/ha and 500 g/ha, in particular from 20 g/ha to 300 g/ha.

In the treatment of plant propagation material (preferably seed), amounts of from 0,01 g to 3 kg, in particular amounts from 0,01 g to 1 kg of the compound selected from I, II, III and IV or the inventive mixtures or the mixtures used according to the invention are generally required per 100 kg of plant propagation material (preferably seed). In a preferred embodiment of the method according to the invention, amounts of from 0,01 g to 250 g of the compound selected from I, II, III and IV or the inventive mixtures or the mixtures used according to the invention are required per 100 kg of plant propagation material (preferably seed). In another preferred embodiment of the method according to the invention, amounts of from 0,01 g to 150 g of the compound selected from I, II, III and IV or the inventive mixtures or the mixtures used according to the invention are required per 100 kg of plant.

When using glyphosate, the application rates are in the range of from 0,1 to 6,0 kg of active ingredient (acid equivalent) per hectare, depending on various parameters such as the weather conditions and the plant species.

As stated above, the compound selected from I, II, III and IV or the compounds in the inventive mixtures or the mixtures used according to the invention are used in "effective amounts". This means that they are used in a quantity which allows obtaining the desired effect which is a synergistic increase of the health of a plant but which does not give rise to any phytotoxic symptom on the treated plant.

All compounds selected from I, II, III and IV or the inventive mixtures or mixtures used according to the invention are typically applied as compositions comprising component 1 and component 2 and, if present, component 3. In a preferred embodiment, the pesticidal composition comprises a liquid or solid carrier and a mixture as described above.

For use according to the present invention, the compound selected from I, II, III and IV or the inventive mixtures or mixtures used according to the invention can be converted into the customary formulations, for example solutions, emulsions, suspensions, dusts, powders, pastes and granules. The use form 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 prepared in a known manner (cf. 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, US 4,144,050, US 3,920,442, US 5,180,587, US 5,232,701, US 5,208,030, GB 2,095,558, 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 Mollet, H. and Grubemann, A.: Formulation Technology (Wiley VCH Verlag, Weinheim, 2001).

The agrochemical formulations may also comprise auxiliaries which are customary in agrochemical formulations. 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 further solubilizers, protective colloids, surfactants and adhesion agents), organic and anorganic thickeners, bactericides, anti-freezing agents, anti-foaming agents, if appropriate colorants and tackifiers or binders (e.g. for seed treatment formulations).

Suitable solvents are water, organic solvents such as mineral oil fractions of medium to high boiling point, such as 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.

Solid carriers 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.

Suitable surfactants (adjuvants, wetters, tackifiers, dispersants or emulsifiers) are alkali metal, alkaline earth metal and ammonium salts of aromatic sulfonic acids, such as ligninsulfonic acid (Borresperse® types, Borregard, Norway) phenolsulfonic acid, naphthalenesulfonic acid (Morwet® types, Akzo Nobel, U.S.A.), dibutyl naphthalene-sulfonic acid (Nekal® types, BASF, Germany), and fatty acids, alkylsulfonates, alkylarylsulfonates, alkyl sulfates, lauryl ether sulfates, fatty alcohol sulfates, and sulfated hexa-, hepta- and octadecanates, 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 for 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).

Bactericides may be added for preservation and stabilization of the formulation. Examples for suitable bactericides are those 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 for suitable anti-freezing agents 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 are pigments of low water solubility and water-soluble dyes. Examples to be mentioned are 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 for tackifiers or binders are polyvinylpyrrolidons, polyvinylacetates, polyvinyl alcohols and cellulose ethers (Tylose®, Shin-Etsu, Japan).

Powders, materials for spreading and dusts can be prepared by mixing or concomitantly grinding compounds I and/or component 2 and/or, if present, component 3, if appropriate, further active substances, with at least one solid carrier.

Granules, e.g. coated granules, impregnated granules and homogeneous granules, can be prepared by binding the active substances to solid carriers. Examples of solid carriers 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.

Examples for formulation types are:

1. Composition types for dilution with water

i) Water-soluble concentrates (SL, LS)

10 parts by weight of the compound selected from I, II, III and IV or the compounds of the inventive mixtures or mixtures used according to the invention are dissolved in 90 parts by weight of water or in a water-soluble solvent. As an alternative, wetting agents or other auxiliaries are added. The active substance dissolves upon dilution with water. In this way, a formulation having a content of 10% by weight of active substance is obtained.

ii) Dispersible concentrates (DC)

20 parts by weight of compounds of the compound selected from I, II, III and IV or the inventive mixtures or mixtures used according to the invention 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 the compound selected from I, II, III and IV or the inventive mixtures or mixtures used according to the invention 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 the compound selected from I, II, III and IV or the inventive mixtures or mixtures used according to the invention 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 is 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 the compound selected from I, II, III and IV or the compounds of the inventive mixtures or mixtures used according to the invention 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 the compound selected from I, II, III and IV or the inventive mixtures or mixtures used according to the invention 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 the compound selected from I, II, III and IV or the inventive mixtures or mixtures used according to the invention 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 compound selected from I, II, III and IV or the compounds of the inventive mixtures or mixtures used according to the invention 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 the compound selected from I, II, III and IV or the inventive mixtures or mixtures used according to the invention 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 the compound selected from I, II, III and IV or the inventive mixtures or mixtures used according to the invention 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 the compound selected from I, II, III and IV or the inventive mixtures or mixtures used according to the invention 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 agrochemical formulations generally comprise between 0.01 and 95%, preferably between 0.1 and 90%, most preferably between 0.5 and 90%, by weight of active substances. The compound selected from I, II, III and IV or the compounds of the inventive mixtures or mixtures used according to the invention are employed in a purity of from 90% to 100%, preferably from 95% to 100% (according to NMR spectrum).

The compound selected from I, II, III and IV or the compounds of the inventive mixtures or mixtures used according to the invention 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 or mixtures used according to the invention.

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 the compound selected from I, II, III and IV or the compounds of the inventive mixtures or mixtures used according to the invention.

The compound selected from I, II, III and IV or the compounds of the inventive mixtures or mixtures used according to the invention 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, herbicides, fungicides, other 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 compound selected from I, II, III and IV or the compounds of the inventive mixtures in a weight ratio of 1:100 to 100:1, preferably 1:10 to 10:1.

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 plant(s) may be sprayed with a composition of this invention or composition used according to the invention either before or after being treated with the fertilizers.

The compounds 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.

As mentioned above, a variant of the present invention also comprises seed treatment with component 2 followed by foliar spraying with component 1.

Seed treatment can be made into the seedbox before planting into the field.

For seed treatment purposes, the weight ratio in the binary or ternary mixtures of the present invention or the mixtures used according to the invention generally depends on the properties of the compounds of the inventive mixtures.

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 agrochemical 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 the compound selected from I, II, III and IV or the inventive mixture or the mixtures used according to the invention are generally for the formulated product (which usually comprises from 10 to 750 g/l of the active(s)). Further suitable application rates see above.

The invention also relates to the propagation products of 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 inventive mixtures or the mixtures used according to the invention in an amount of from 0.01 g to 10 kg per 100 kg of plant propagation material (preferably seed).

The separate or joint application of the compounds of the inventive mixtures or the mixtures used according to the invention is 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.

The plant health action of the compositions according to the invention can be shown by the tests described below.

Example 1

Spring wheat was grown in the 2010/2011 growing season at the BASF Agricultural Research Station in Utrera, Spain. Two trials were setup in a randomized bloc design with 5 replications. The variety 'Yecora' was planted Dec 15, 2010 with a seeding rate of 200 kg seed per ha and a row spacing of 12 cm. Harvested plot size was 10.1 m².

Compound I was applied to the wheat plants at flag leaf stage (growth stage 39, BBCH). Compound I was applied using an experimental formulation (200 g ai/l, SC) with 0.75 l/ha.

To eliminate the impact of disease on the performance of Compound I as far as possible, plots were sprayed with epoxiconazole three times, except the untreated control plots, which were used to monitor the disease pressure in the trials. The application schedule for epoxiconazole is shown in table 1. Epoxiconazole was applied as epoxiconazole with 1 l/ha (125 g active ingredient/ha)

Total spray volume for the foliar applications were 300 l/ha. Spray applications were made using a pressurized backpack sprayer and a flat fan nozzle IDK 120-02 at 300 kPa pressure. *Septoria tritici* infection was assessed at the late milk stage (BBCH 78). At maturity the crop was harvested and grain yield and yield components were assessed. Haulms with ear per m row were counted. Grain yield was measured as t/ha (table 1). Grain weight was measured in g per 1000 grains (TGW), and number of grains per m², and single ear yield in g per ear was calculated (table 1).

Tab. 1: Mean values for, *Septoria tritici* infection, grain yield and yield components for the two trials setup at Utrera Agricultural Research Station, Spain

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Treatments	Product rate	Formulation concentration	Formulation type	Application time (BBCH)	Septoria tritici infection (%)	Grain Yield (t/ha)	Ears per m row	TGW (g)	Grains per m ²	Single ear yield
1. Untreated					48.5	4.66	60.7	45.0	10,041.4	0.902
2. Epoxiconazole	1.00 l/ha	125 g/l	SC	31/32	0.0	5.02	59.2	46.6	10,457.9	0.998
Epoxiconazole	1.00 l/ha	125 g/l	SC	39						
Epoxiconazole (Control)	1.00 l/ha	125 g/l	SC	55						
3. Epoxiconazole	1.00 l/ha	125 g/l	SC	12	1.0	5.16	59.0	46.7	10,722.8	1.026
Epoxiconazole	1.00 l/ha	125 g/l	SC	31/32						
Compound I	0.75 l/ha	200 g/l	SC	39						
Epoxiconazole	1.00 l/ha	125 g/l	SC	55						

The prevalent disease in both trials was *Septoria tritici*. The infection pressure was moderate, as it is shown in table 1. 48.5 % of the leaf area of the untreated control plots was infected. The epoxiconazole treatment took well care of the infection in the control and Compound I treated plots. It can be concluded that the impact of the disease on the yield performance of compound I is minimal and does not need to be considered when comparing results for yield and yield components of compound I treatment with the control treatment.

Compound I increased grain yield by 0.14 t/ha compared to the control (table 1). In this example, there were no difference in number of ears formed between both, control treatment and compound I treatment. There was also no difference in grain weight between both treatments. Compound I increased the number of grains that were formed per ear, as can be seen in the increased number of grains per m² and increased grain yield per ear in table 1.

Example 2

Spring wheat was grown in the 2010/2011 growing season at the BASF Agricultural Research Station in Dinuba, CA, USA. The trial was setup in a randomized bloc design with 4 replications. The variety 'Joaquin' was planted January 20, 2011 with a seeding rate of 157 kg seed per ha. Plot size was 18.5 m².

Compound I was applied to the wheat plants at flowering (growth stage 63/65, BBCH). Compound I was applied using an experimental formulation (200 g ai/l, SC) with 0.75 l/ha. Control plots were sprayed once at the same time with epoxiconazole. Epoxiconazole was applied as epoxiconazolee with 1 l/ha (125 g active ingredient/ha).

Total spray volume for the foliar applications were 200 l/ha. Spray applications were made using a pressurized sprayer and a 8001VS flat fan nozzle at 300 kPa pressure. At application time, the untreated plots showed 20-30% infection with yellow stripe rust (*Puccinia striiformis*).

Untreated plots received no fungicide treatment and were used to monitor disease in the trial. *P. striiformis* (yellow stripe rust) infection was assessed at the late milk to early dough stage (BBCH 79/83). At maturity the crop was harvested and grain yield was measured as t/ha and grain weight was measured in g per 1000 grains (TGW) (table 2).

Tab. 2: Mean values for yellow rust infection, grain yield and grain weight for the trial setup at Dinuba Agricultural Research Station, CA

Treatments	Product rate	Formulation concentration	Formulation type	Application time (BBCH)	<i>Puccinia striiformis</i> infection (%)	Grain Yield (t/ha)	TGW (g)
1. Untreated					81.3	4.26	23.7
2. Epoxiconazole (Control)	1.00 l/ha	125 g/l	SC	63	36.3	6.86	34.4
3. Compound I	0.75 l/ha	200 g/l	SC	63	38.8	6.99	35.6

The trial showed a high infection level with yellow stripe rust (table 2). However, there was no difference in yellow stripe rust infection between control plots and plots treated with compound I. Hence, it can be concluded that differences in yield performance between control and compound I treatment is not depending on the disease control by epoxiconazole and compound I, respectively, in both treatments.

Compound I increased grain yield in this example by 0.13 t/ha compared to the epoxiconazole treated control. It also increased weight per thousand grains by 1.2 g, which can explain the increase in grain yield.

Example 3

Winter wheat was grown in the 2010/2011 growing season at Ruchheim, Rhineland-Palatinate, Germany, close to the BASF Agricultural Center, Limburgerhof. The trial was setup in a randomized bloc design with 4 replications. The variety 'Akteur' was planted October, 2010. Plot size was 12 m².

Compound I was applied to the wheat plants at either flag leaf stage (BBCH 39/49), shooting and flag leaf stage (BBCH 31/32 and 39/49) or at shooting, flag leaf and heading (BBCH 31/32, 39/49 and 55). Compound I was applied using an experimental formulation (200 g ai/l, SC) with 0.75 l/ha.

Control plots were sprayed at the same timings with epoxiconazole. Epoxiconazole was applied as epoxiconazole with 1 l/ha (125 g active ingredient/ha). Treatments 7 and 8 received in addition 0.8 l/ha of pyraclostrobin (EC, 250 g/l pyraclostrobin) at the flag leaf stage.

Total spray volume for the foliar applications were 200 l/ha. Spray applications were made using a pressurized sprayer and a 8001VS flat fan nozzle at 300 kPa pressure. To eliminate the impact of disease, the whole trial was oversprayed using chlorothalonil at shooting, flag leaf stage, and heading with the recommended rate.

Tab. 3: Mean values for yellow rust infection, grain yield and grain weight for the trial setup at Dinuba Agricultural Research Station, CA

Treatments	Product rate	Formulation concentration	Formulation type	Application time (BBCH)	No. of ears per m row	Increase in No of ears per m row
1. Epoxiconazole (Control)	1.00 l/ha	125 g/l	SC	31/32	57,6	
2. Compound I	0.75 l/ha	200 g/l	SC	31/32	58,6	1
3. Epoxiconazole (Control)	1.00 l/ha	125 g/l	SC	31/32 39/49	56,8	
4. Compound I	0.75 l/ha	200 g/l	SC	31/32 39/49	57,1	0.3
5. Epoxiconazole (Control)	1.00 l/ha	125 g/l	SC	31/32 39/49 55	56,9	
6. Compound I	0.75 l/ha	200 g/l	SC	31/32 39/49 55	58,4	1.5
7. Epoxiconazole Epoxiconazole Pyraclostrobin (Control)	1.00 l/ha 1.00 l/ha 0.80 l/ha	125 g/l 125 g/l 250 g/l	SC SC EC	31/32 39/49 39/49	52,8	
8. Compound I Compound I Pyraclostrobin	0.75 l/ha 0.75 l/ha 0.80 l/ha	200 g/l 200 g/l 250 g/l	SC SC EC	31/32 39/49 39/49	61,1	8.3

Table 3 clearly shows that compound I increases the number of ears that are formed by the wheat crop. As the number of ears and the number of grains per ear are determining the final grain yield, it can be concluded that compound I increases the yield potential of treated plots.

Claims

1. A method for increasing the health of plants, wherein the plant, the locus where the plant is growing or is expected to grow or plant propagation material from which the plant grows is treated with an effective amount of an active ingredient, selected from the group of compound I, II, III and IV and, in each case, agriculturally acceptable salts thereof:
 - I 2-[3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiranylmethyl]-2,4-dihydro-[1,2,4]triazol-3-thione;
 - 10 II 1-[3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiranylmethyl]-5-thiocyanato-1H-[1,2,4]triazole;
 - III 5-Allylsulfanyl-1-[[3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiran-2-yl]methyl]-[1,2,4]triazole; and
 - IV 2-[1-[3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione;
 - 15 wherein each of said compounds may be fully or partially present in its tautomeric form.
2. The method of claim 1, wherein the active ingredient is selected from the group of compound Ia, compound Ib, compound IIa, compound IIb, compound IIIa, compound IIIb, compound IVa, compound IVb, compound IVc, compound IVd, compound IVe, compound IVf, compound IVg and compound IVh:
 - 20 Ia 2-[rel (2R,3S)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiranylmethyl]-2,4-dihydro-[1,2,4]triazol-3-thione;
 - 25 Ib 2-[rel (2R,3R)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiranylmethyl]-2,4-dihydro-[1,2,4]triazol-3-thione;
 - IIa 1-[rel (2R,3S)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiranylmethyl]-5-thiocyanato-1H-[1,2,4]triazole;
 - IIb 1-[rel (2R,3R)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiranylmethyl]-5-thiocyanato-1H-[1,2,4]triazole;
 - 30 IIIa 5-Allylsulfanyl-1-[[rel (2R,3S)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiran-2-yl]methyl]-[1,2,4]triazole;
 - IIIb 5-Allylsulfanyl-1-[[rel (2R,3R)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-oxiran-2-yl]methyl]-[1,2,4]triazole;
 - 35 IVa 2-[(1S,2S)-1-[(2S)-3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione;
 - IVb 2-[(1S,2S)-1-[(2R)-3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione;
 - IVc 2-[(1R,2R)-1-[(2R)-3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione;
 - 40 IVd 2-[(1R,2R)-1-[(2S)-3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione;

- IVe 2-[(1S,2R)-1-[(2S)-3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione;
- IVf 2-[(1S,2R)-1-[(2R)-3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione;
- 5 IVg 2-[(1R,2S)-1-[(2R)-3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione; and
- IVh 2-[(1R,2S)-1-[(2S)-3-(2,4-dichlorophenyl)-2-methyl-propyl]-2-hydroxy-3,3-dimethyl-butyl]-4H-1,2,4-triazol-3-thione; wherein each of said compounds may be fully or partially present in its tautomeric form; and/or agriculturally acceptable salts thereof.
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3. The method of claim 1 or 2, wherein said active ingredient is repeatedly applied.
4. The method of any one of claims 1 to 3, wherein the yield of the plant or its product is increased.
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5. The method of any one of claims 1 to 4, wherein in addition to said active ingredient at least one herbicide selected from imazamox, imazethapyr, imazapic, imazapyr, imazamethabenz-methyl and imazaquin; dicamba, saflufenacil, glyphosate and glufosinate is applied.
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6. The method of any one of claims 1 to 5, wherein the plant is selected from the group consisting of agricultural, silvicultural and horticultural plants, each in its natural or genetically modified form.
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7. The method of claim 6, wherein the plant is selected from soybean, sunflower, corn, cotton, canola, oil seed rape, sugar cane, sugar beet, pome fruit, peanuts, bananas, barley, oats, sorghum, rice, wheat and turf.
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8. The method of claim 6 or 7, wherein the plant is a herbicide tolerant plant.
9. A method of claim 8, wherein the plant is an imidazolinone tolerant plant.
10. A mixture comprising, as active ingredients, a compound I as defined in claim 1 or 2 and a component 2, selected from imazethapyr, imazapic, imazapyr, imazamethabenz-methyl and imazaquin, dicamba, saflufenacil and glufosinate.
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11. A mixture comprising, as active ingredients, a compound selected from the group of compounds II, III and IV as defined in claim 1 or claim 2 and a component 2, selected from imazamox, imazethapyr, imazapic, imazapyr, imazamethabenz-methyl and imazaquin; dicamba, saflufenacil, glyphosate and glufosinate.
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12. A pesticidal composition, comprising a liquid or solid carrier and a mixture as defined in claim 10 or 11.