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(71) **Applicant** *(for all designated States except US)*: **BAYER CROPSCIENCE AG** [DE/DE]; Alfred-Nobel-Strasse 50, 40789 Monheim (DE).

(72) **Inventors; and**
(75) **Inventors/Applicants** *(for US only)*: **DAVIES , Peter , Howard** [GB/PH]; 112 Tanauan Street, Ayala Alabang Village, 1780 Muntinlupa City (PH). **GÖRTZ , Andreas** [DE/DE]; Am Steinacker 3, 41470 Neuss (DE). **EBBINGHAUS , Dirk** [DE/DE]; Dorner Weg 43c, 42119 Wuppertal (DE). **CARBONNE , Stephane** [FR/FR]; Les Lacets du Mont, 69480 Lucenay (FR).

(74) **Common Representative**: **BAYER CROPSCIENCE AG**; Business Planning and Administration, Law and Patents, Patents and Licensing, Alfred-Nobel-Str. 50, 40789 Monheim (DE).

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(54) **Title**: COMBINATIONS OF BIOLOGICAL CONTROL AGENTS AND INSECTICIDES

(57) **Abstract**: Compositions are provided that improve overall plant vigor and yield by combining agriculturally effective amounts of at least one environmentally friendly biological control agent and at least one chemical insect control agent. A composition of the present invention is particularly effective in the presence of fungal species. Use of a composition of the present invention leads to an overall reduction in crop losses caused by fungi and this reduction is much greater than would have been expected from application of either component alone. Methods for utilizing compositions of the present invention are also provided. Further the compositions according to this invention display a synergistic insecticidal, nematicidal, acaricidal or fungicidal activity.

Combinations of biological control agents and insecticides

The present invention generally relates to compositions and methods for reducing overall damage of plants and plant parts as well as losses in harvested fruits or vegetables caused by plant pathogenic fungi or other unwanted micro-organisms as well as by animal pests, in particular insects, acari or nematodes. Particularly it relates to compositions and methods for protecting fruits and vegetables during the growth phase, around harvesting and after harvesting against microorganisms and/or animal pests.

The yeast Metschnikowia fructicola, in particular the strain NRRL Y-30752, is known from US 6,994,849 B2. This yeast provides a good protection of plants and plant parts against plant pathogenic fungi. However, the performance of such yeast is still not fully satisfactory under conditions of severe disease pressure.

Surprisingly, it has been found that compositions comprising a) fungicidally active yeast (also in the context of this invention referred to as a biological control agent), particularly Metschnikowia fructicola, very particularly the strain Metschnikowia fructicola NRRL Y-30752, and b) at least one insect control agent, display a synergistically enhanced fungicidal activity.

The compositions of the present invention have the advantage of being either formulated into a single, stable composition with an agriculturally acceptable shelf life or being combined at the time of use (e.g., tank-mix).

Further, the compositions according to this invention display surprisingly high degrees of fungicidal and/or acaricidal, insecticidal or nematicidal activity in the treatment of plants, plant parts or plant propagation material, due to a synergistic effect between the biological control agent and insect control agents described in this invention.

Methods of treating a seed and/or plant or plant parts are also provided. The method comprises the steps of (a) providing a composition comprising an effective amount of at least one biological control agent and at least one insect control agent and (b) applying the composition to the plant. The present compositions may be applied in any desired manner, such as in the form of a seed coating, soil drench, and/or directly in-furrow and/or as a foliar spray and applied either pre-emergence, post-emergence or both. In other words, the composition can be applied to the seed, the plant or to the fruit of the plant or to the soil wherein the plant is growing or wherein it is desired to grow.

Preferably, the compositions according to this invention are particularly useful in the protection of fruits and vegetables and flowers.

The foregoing and other aspects of the present invention are explained in detail in the detailed description and examples set forth below.

The compositions of the present invention have also been found to provide a greater degree of plant vigor and yield in insect-, acari- or nematode- and/or fungal-infested environments than would be expected from application of either the biological control agent or the insect control agent alone. The biological control agent may be supplied in any physiologic state such as active or dormant. Dormant yeast may be supplied for example frozen, dried, or lyophilized.

The biological control agent, in particular Metschnikowia fructicola is biologically effective when delivered at a concentration in excess of 10^6 cfu/g (colony forming units per gram), preferably in excess of 10^7 cfu/g, more preferably 10^8 cfu/g and most preferably 10^9 cfu/g.

The amount of the at least one biological control agent employed in the compositions can vary depending on the final formulation as well as size or type of the plant or seed utilized. Preferably, the at least one biological control agent in the compositions is present in about 2 % w/w to about 80 % w/w of the entire formulation. More preferably, the at least one biological control agent employed in the compositions is about 5 % w/w to about 65 % w/w and most preferably about 10 % w/w to about 60 % w/w by weight of the entire formulation.

The amount of the at least one insect control agent employed in the compositions can vary depending on the final formulation as well as the size of the plant and seed to be treated. Preferably, the at least one insect control agent is about 0.1 % w/w to about 80 % w/w based on the entire formulation. More preferably, the insect control agent is present in an amount of about 1 % w/w to about 60 % w/w and most preferably about 10 % w/w to about 50 % w/w.

The ratios of the biological control agent to the insect control agent (s) used within this invention are as follows: Typically, the ratio of the biological control agent to the insect control agent is within the range of 1:100 to 250:1. Preferably, the ratio of the biological control agent to the insect control agent is within the range of 1:10 to 100:1. Even more preferred, this ratio is in the range of 1:5 to 50:1. All of these ratios refer to a yeast preparation with a minimum of 10^6 cfu/g.

The preferred application rate of the biological control agent, in particular the yeast, very particular Metschnikowia fructicola strain NRRL Y-30752 is within the range of 0.5 to 8 Kg/ha.

The compositions according to this invention contain one or more insect control agent. Suitable Insect control agents according to this invention are those compounds as defined in groups (1) to (29).

The active ingredients specified in this description by their "common name" are known, for example, from "The Pesticide Manual", 14th Ed., British Crop Protection Council 2006, and from the Web page http://www.alanwood.net/pesticides.

(1) Acetylcholinesterase (AChE) inhibitors, for example

carbamates, e.g. alanycarb, aldicarb, bendiocarb, benfuracarb, butocarboxim, butoxycarboxim, carbaryl, carbofuran, carbosulfan, ethiofencarb, fenobucarb, formetanate, furathiocarb, isoprocarb, methiocarb, methomyl, metolcarb, oxamyl, pirimicarb, propoxur, thiodicarb, thiofanox, triazamate, trimethacarb, XMC, and xylylcarb; or

organophosphates, e.g. acephate, azamethiphos, azinphos (-methyl, -ethyl), cadusafos, chlorethoxyfos, chlorfenvinphos, chlorfenvinphos, chlormephos, chlorpyrifos (-methyl), coumaphos, cyanophos, demeton-S-methyl, diazinon, dichlorvos/DDVP, dicrotophos, dimethoate, dimethylvinphos, disulfoton, EPN, ethion, ethoprophos, famphur, fenamiphos, fenitrothion, fenthion, fosthiazate, heptenophos, isofenphos, isopropyl *O*-(methoxyaminothio-phosphoryl) salicylate, isoxathion, malathion, mecarbam, methamidophos, methidathion, mevinphos, monocrotophos, naled, omethoate, oxydemeton-methyl, parathion (-methyl), phenthoate, phorate, phosalone, phosmet, phosphamidon, phoxim, pirimiphos (-methyl), profenofos, propetamphos, prothiofos, pyraclofos, pyridaphenthion, quinalphos, sulfotep, tebupirimfos, temephos, terbufos, tetrachlorvinphos, thiometon, triazophos, triclorfon, and vamidothion.

(2) GABA-gated chloride channel antagonists, for example

organochlorines, e.g. chlordane, endosulfan (alpha-); or

fiproles (phenylpyrazoles), e.g. ethiprole, fipronil, pyrafluprole, and pyriprole.

(3) Sodium channel modulators/voltage-dependent sodium channel blockers, for example

pyrethroids, e.g. acrinathrin, allethrin (d-cis-trans, d-trans), bifenthrin, bioallethrin, bioallethrin S-cyclopentenyl, bioresmethrin, cycloprothrin, cyfluthrin (beta-), cyhalothrin (gamma-, lambda-), cypermethrin (alpha-, beta-, theta-, zeta-), cyphenothrin [(1*R*)-*trans*-isomers], deltamethrin, dimefluthrin, empenthrin [(*EZ*)-(1*R*)-isomers), esfenvalerate, etofenprox, fenpropathrin, fenvalerate, flucythrinate, flumethrin, fluvalinate (tau-), halfenprox, imiprothrin, metofluthrin, permethrin, phenothrin [(1*R*)-*trans*-isomer), prallethrin, profluthrin, pyrethrin (pyrethrum), resmethrin, RU 15525, silafluofen, tefluthrin, tetramethrin [(1*R*)- isomers)], tralomethrin, transfluthrin and ZXI 8901; or

DDT; or methoxychlor.

(4) Nicotinergic acetylcholine receptor agonists, for example

chloronicotinyls, e.g. acetamiprid, clothianidin, dinotefuran, imidacloprid, nitenpyram, thiacloprid, thiamethoxam,; or

nicotine..

(5) Allosteric acetylcholine receptor modulators (agonists), for example

spinosyns, e.g. spinetoram and spinosad.

(6) Chloride channel activators, for example

avermectins/milbemycins, e.g. abamectin, emamectin benzoate, lepimectin, and milbemectin.

(7) Juvenile hormone mimics, e.g. hydroprene, kinoprene, methoprene; or fenoxycarb; pyriproxyfen.

(8) Miscellaneous non-specific (multi-site) inhibitors, for example

gassing agents, e.g. methyl bromide and other alkyl halides; or chloropicrin; sulfuryl fluoride; borax; tartar emetic.

(9) Selective homopteran feeding blockers, e.g. pymetrozine; or flonicamid.

(10) Mite growth inhibitors, e.g. clofentezine, diflovidazin, hexythiazox, etoxazole.

(11) Microbial disruptors of insect midgut membranes, e.g. *Bacillus thuringiensis* subspecies *israelensis*, *Bacillus sphaericus*, *Bacillus thuringiensis* subspecies *aizawai*, *Bacillus thuringiensis* subspecies *kurstaki*, *Bacillus thuringiensis* subspecies *tenebrionis*, and BT crop proteins: Cry1Ab, Cry1Ac, Cry1Fa, Cry2Ab, mCry3A, Cry3Ab, Cry3Bb, Cry34/35Ab1.

(12) Inhibitors of mitochondrial ATP synthase, for example

diafenthiuron; or

organotin miticides, e.g. azocyclotin, cyhexatin, and fenbutatin oxide; or

propargite; tetradifon.

(13) Uncouplers of oxidative phoshorylation via disruption of the proton gradient, for example chlorfenapyr, and DNOC.

(14) Nicotinic acetylcholine receptor channel blockers, for example bensultap, cartap hydrochloride, thiocyclam, and thiosultap-sodium.

(15) Inhibitors of chitin biosynthesis, type 0, for example benzoylureas, e.g. bistrifluron, chlorfluazuron, diflubenzuron, flucycloxuron, flufenoxuron, hexaflumuron, lufenuron, novaluron, noviflumuron, penfluron, teflubenzuron, and triflumuron.

(16) Inhibitors of chitin biosynthesis, type 1, for example buprofezin.

(17) Moulting disruptors, for example cyromazine.

(18) Ecdysone receptor agonists/disruptors, for example

diacylhydrazines, e.g. chromafenozide, halofenozide, methoxyfenozide, and tebufenozide.

(19) Octopamine receptor agonists, for example amitraz.

(20) Mitochondrial complex III electron transport inhibitors (Coupling site II), for example hydramethylnon; acequinocyl; fluacrypyrim; or cyflumetofen and cyenopyrafen.

(21) Mitochondrial complex I electron transport inhibitors, for example

METI acaricides, e.g. fenazaquin, fenpyroximate, pyrimidifen, pyridaben, tebufenpyrad, tolfenpyrad;

or rotenone.(Derris).

(22) Voltage-dependent sodium channel blockers, e.g. indoxacarb; metaflumizone.

(23) Inhibitors of acetyl CoA carboxylase, for example tetronic acid derivatives, e.g. spirodiclofen and spiromesifen; or

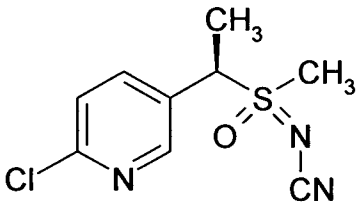
tetramic acid derivatives, e.g. spirotetramat.

(24) Mitochondrial complex IV electron inhibitors, for example phosphines, e.g. aluminium phosphide, calcium phosphide, phosphine, and zinc phosphide;

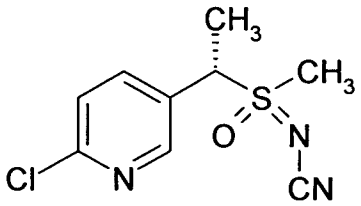
or cyanide.

(28) Ryanodine receptor modulators, for example diamides, e.g. chlorantraniliprole (Rynaxypyr), Cyantraniliprole (Cyazypyr), and flubendiamide.

(29) Further active ingredients with unknown or uncertain mode of action, for example azadirachtin, amidoflumet, benzoximate, bifenazate, chinomethionat, cryolite, dicofol, flufenerim, pyridalyl, and pyrifluquinazon; or one of the following known active compounds 4-{[(6-brompyrid-3-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/115644), 4-{[(6-fluorpyrid-3-yl)methyl](2,2-difluorethyl)amino}furan-2(5H)-on (known from WO 2007/115644), 4-{[(2-chlor-1,3-thiazol-5-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/115644), 4-{[(6-chlorpyrid-3-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/ 115644), 4-{[(6-chlorpyrid-3-yl)methyl](2,2-difluorethyl)amino}furan-2(5H)-on known from WO 2007/115644), 4-{[(6-chlor-5-fluorpyrid-3-yl)methyl](methyl)amino}furan-2(5H)-on (known from WO 2007/115643), 4-{[(5,6-dichlorpyrid-3-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/115646), 4-{[(6-chlor-5-fluorpyrid-3-yl)methyl](cyclopropyl)amino}furan-2(5H)-on (known from WO 2007/115643), 4-{[(6-chlorpyrid-3-yl)methyl](cyclopropyl)amino}furan-2(5H)-on (known from EP-A-0 539 588), 4-{[(6-chlorpyrid-3-yl)methyl](methyl)amino}furan-2(5H)-on (known from EP-A-0 539 588), [(6-chlorpyridin-3-yl)methyl](methyl)oxido-λ^4-sulfanylidencyanamid (known from WO 2007/149134), [1-(6-chlorpyridin-3-yl)ethyl](methyl)oxido-λ^4-sulfanylidencyanamid (known from WO 2007/149134) and its diastereomeres (A) and (B)



(A)



(B)

(also known from WO 2007/149134), [(6-trifluormethylpyridin-3-yl)methyl](methyl)oxido-λ^4-sulfanylidencyanamid (known from WO 2007/095229), or sulfoxaflor (also known from WO 2007/149134),

11-(4-chloro-2,6-dimethylphenyl)-12-hydroxy-1,4-dioxa-9-azadispiro[4.2.4.2]tetradec-11-en-10-one

(known from WO 2006/089633), 3-(4'-fluoro-2,4-dimethylbiphenyl-3-yl)-4-hydroxy-8-oxa-1-azaspiro[4.5]dec-3-en-2-one (known from WO 2008/067911), and 1-{2,4-dimethyl-5-[(2,2,2-trifluoroethyl)sulfinyl]phenyl}-3-(trifluoromethyl)-1H-1,2,4-triazole (known from WO 1999/55668).

Preferred insect control agents are defined by the group (P1)

(P1) Clothianidin, imidacloprid, thiacloprid, thiamethoxam, acetamiprid, methiocarb, thiodicarb, beta-cyfluthrin, cyfluthrin, deltamethrin, tefluthrin, transfluthrin, indoxacarb, spinosad, spinetoram, fipronil, ethiprole, emamectin-benzoate, avermectin, spirodiclofen, spiromesifen, spirotetramat, flubendiamide, (R),(S)-3-chloro-N^1-{2-methyl-4-[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]phenyl}-N^2-(1-methyl-2-methylsulphonylethyl)phthalamide, chlorantraniliprole (Rynaxypyr), or Cyantraniliprole (Cyazypyr), sulfoxaflor, Transfluthrin, 4-{[(6-brompyrid-3-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/115644), 4-{[(6-fluorpyrid-3-yl)methyl](2,2-difluorethyl)amino}furan-2(5H)-on (known from WO 2007/115644), 4-{[(2-chlor-1,3-thiazol-5-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/115644), 4-{[(6-chlorpyrid-3-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/ 115644), 4-{[(6-chlorpyrid-3-yl)methyl](2,2-difluorethyl)amino}furan-2(5H)-on known from WO 2007/115644), 4-{[(6-chlor-5-fluorpyrid-3-yl)methyl](methyl)amino}furan-2(5H)-on (known from WO 2007/115643), 4-{[(5,6-dichlorpyrid-3-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/115646), 4-{[(6-chlor-5-fluorpyrid-3-yl)methyl](cyclopropyl)amino}furan-2(5H)-on (known from WO 2007/115643), 4-{[(6-chlorpyrid-3-yl)methyl](cyclopropyl)amino}furan-2(5H)-on (known from EP-A-0 539 588), 4-{[(6-chlorpyrid-3-yl)methyl](methyl)amino}furan-2(5H)-on (known from EP-A-0 539 588), [(6-chlorpyridin-3-yl)methyl](methyl)oxido-λ^4-sulfanylidencyanamid (known from WO 2007/149134), [1-(6-chlorpyridin-3-yl)ethyl](methyl)oxido-λ^4-sulfanylidencyanamid (known from WO 2007/149134) and its diastereomeres (A) and (B).

Particularly preferred insect control agents are defined by the group (P2)

(P2) Clothianidin, imidacloprid, thiacloprid, thiamethoxam, acetamiprid, methiocarb, thiodicarb, beta-cyfluthrin, cyfluthrin, deltamethrin, tefluthrin, transfluthrin, indoxacarb, spinosad, spinetoram, fipronil, ethiprole, emamectin-benzoate, avermectin, spirodiclofen, spiromesifen, spirotetramat, flubendiamide, chlorantraniliprole (Rynaxypyr), Cyantraniliprole (Cyazypyr), sulfoxaflor, transfluthrin.

Preferred combinations comprising a biological control agent and at least one insect control agent are:

(C1) Combinations wherein the biological control agent is a biologically pure culture of Metschnikowia fructicola, strain NRRL Y-30752, and the insect control agent is selected from the list: Clothianidin, imidacloprid, thiacloprid, thiamethoxam, acetamiprid, methiocarb, thiodicarb, beta-cyfluthrin, cyfluthrin, deltamethrin, tefluthrin, transfluthrin, indoxacarb, spinosad, spinetoram, fipronil, ethiprole, emamectin-benzoate, avermectin, spirodiclofen, spiromesifen, spirotetramat, flubendiamide, (R),(S)-3-chloro-N^1-{2-methyl-4-[1,2,2,2-tetrafluoro-1-(trifluoro-

methyl)ethyl]phenyl}-N^2-(1-methyl-2-methylsulphonylethyl)phthalamide, chlorantraniliprole (Rynaxypyr), or Cyantraniliprole (Cyazypyr), sulfoxaflor, Transfluthrin, 4-{[(6-brompyrid-3-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/115644), 4-{[(6-fluorpyrid-3-yl)methyl](2,2-difluorethyl)amino}furan-2(5H)-on (known from WO 2007/115644), 4-{[(2-chlor-1,3-thiazol-5-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/115644), 4-{[(6-chlorpyrid-3-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/ 115644), 4-{[(6-chlorpyrid-3-yl)methyl](2,2-difluorethyl)amino}furan-2(5H)-on known from WO 2007/115644), 4-{[(6-chlor-5-fluorpyrid-3-yl)methyl](methyl)amino}furan-2(5H)-on (known from WO 2007/115643), 4-{[(5,6-dichlorpyrid-3-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/115646), 4-{[(6-chlor-5-fluorpyrid-3-yl)methyl](cyclopropyl)amino}furan-2(5H)-on (known from WO 2007/115643), 4-{[(6-chlorpyrid-3-yl)methyl](cyclopropyl)amino}furan-2(5H)-on (known from EP-A-0 539 588), 4-{[(6-chlorpyrid-3-yl)methyl](methyl)amino}furan-2(5H)-on (known from EP-A-0 539 588), [(6-chlorpyridin-3-yl)methyl](methyl)oxido-λ^4-sulfanylidencyanamid (known from WO 2007/149134), [1-(6-chlorpyridin-3-yl)ethyl](methyl)oxido-λ^4-sulfanylidencyanamid (known from WO 2007/149134) and its diastereomeres (A) and (B).

Further preferred compositions are those of table (I):

Table (I)

Biological control agent	**Insect control agent of group**
Metschnikowia fructicola strain NRRL Y-30752	(1)
Metschnikowia fructicola strain NRRL Y-30752	(2)
Metschnikowia fructicola strain NRRL Y-30752	(3)
Metschnikowia fructicola strain NRRL Y-30752	(4)
Metschnikowia fructicola strain NRRL Y-30752	(5)
Metschnikowia fructicola strain NRRL Y-30752	(6)
Metschnikowia fructicola strain NRRL Y-30752	(7)
Metschnikowia fructicola strain NRRL Y-30752	(8)
Metschnikowia fructicola strain NRRL Y-30752	(9)
Metschnikowia fructicola strain NRRL Y-30752	(10)
Metschnikowia fructicola strain NRRL Y-30752	(11)
Metschnikowia fructicola strain NRRL Y-30752	(12)
Metschnikowia fructicola strain NRRL Y-30752	(13)
Metschnikowia fructicola strain NRRL Y-30752	(14)
Metschnikowia fructicola strain NRRL Y-30752	(15)
Metschnikowia fructicola strain NRRL Y-30752	(16)
Metschnikowia fructicola strain NRRL Y-30752	(17)
Metschnikowia fructicola strain NRRL Y-30752	(18)
Metschnikowia fructicola strain NRRL Y-30752	(19)
Metschnikowia fructicola strain NRRL Y-30752	(20)
Metschnikowia fructicola strain NRRL Y-30752	(21)
Metschnikowia fructicola strain NRRL Y-30752	(22)

Biological control agent	Insect control agent of group
Metschnikowia fructicola strain NRRL Y-30752	(23)
Metschnikowia fructicola strain NRRL Y-30752	(24)
Metschnikowia fructicola strain NRRL Y-30752	(25)
Metschnikowia fructicola strain NRRL Y-30752	(26)
Metschnikowia fructicola strain NRRL Y-30752	(27)
Metschnikowia fructicola strain NRRL Y-30752	(28)
Metschnikowia fructicola strain NRRL Y-30752	(29)

According to further features in preferred embodiments of the invention described below, there is provided a composition comprising a biologically pure strain of Metschnikowia fructicola /having all of the identifying characteristics of the biologically pure culture of NRRL Y-30752.

According to still further features in the described preferred embodiments there is provided a composition comprising biologically pure mutant of Metschnikowia fructicola, having all of the identifying characteristics of the biologically pure culture of NRRL Y-30752.

According to still further features in the described preferred embodiments the yeast is supplied in a physiologic state selected from the group consisting of active and dormant.

According to still further features in the described preferred embodiments the yeast of the genus /Metschnikowia /has all of the identifying characteristics of the species /Metschnikowia fructicola /identified as NRRL Y-30752 or of any strain thereof or of any mutant of such a strain.

Particularly preferred is the treatment of citrus fruit, in particular orange, lemon, grapefruit, mandarin. Particularly preferred is the treatment of tropical fruit, in particular papaya, passion fruit, mango, carambola, pineapple, banana.

Particularly preferred is the treatment of grapevines.

Further preferred is the treatment of vegetables, in particular: Melons, Cucurbits, lettuce, potatoes

Further preferred is the treatment of flowers, bulbs, pot plants, trees

Besides the application of the compositions according to the invention on growing plants or plant parts, they can also be used to protect plants or plant parts after harvesting.

Within this application "post-harvest treatment" is to be understood in a very broad sense. On the one hand it means literally the treatment of fruit or vegetables after the fruit and vegetables have been harvested. For post-harvest treatment the fruit or vegetable is treated with (e.g. with using the method and apparatus disclosed in WO 2005/009474), dipped or tank dumped or drenched into a

liquid, brushed with, fumigated, painted, fogged (warm or cold), or the fruit may be coated with a waxy or other composition.

According to the invention, post-harvest and storage diseases may be caused for example by the following fungi:

Colletotrichum spp., e.g. Colletotrichum musae, Colletotrichum gloeosporioides, Colletotrichum coccodes; Fusarium spp., e.g. Fusarium semitectum, Fusarium moniliforme, Fusarium solani, Fusarium oxysporum; Verticillium spp., e.g. Verticillium theobromae; Nigrospora spp.; Botrytis spp., e.g. Botrytis cinerea; Geotrichum spp., e.g. Geotrichum candidum; Phomopsis spp., Phomopsis natalensis; Diplodia spp., e.g. Diplodia citri; Alternaria spp., e.g. Alternaria citri, Alternaria alternata; Phytophthora spp., e.g. Phytophthora citrophthora, Phytophthora fragariae, Phytophthora cactorum, Phytophthora parasitica; Septoria spp., e.g. Septoria depressa; Mucor spp., e.g. Mucor piriformis; Monilinia spp., e.g. Monilinia fructigena, Monilinia laxa; Venturia spp., e.g. Venturia inaequalis, Venturia pyrina; Rhizopus spp., e.g. Rhizopus stolonifer, Rhizopus oryzae; Glomerella spp., e.g. Glomerella cingulata; Sclerotinia spp., e.g. Sclerotinia fruiticola; Ceratocystis spp., e.g. Ceratocystis paradoxa; Penicillium spp., e.g. Penicillium funiculosum, Penicillium expansum, Penicillium digitatum, Penicillium italicum; Gloeosporium spp., e.g. Gloeosporium album, Gloeosporium perennans, Gloeosporium fructigenum, Gloeosporium singulata; Phlyctaena spp., e.g. Phlyctaena vagabunda; Cylindrocarpon spp., e.g. Cylindrocarpon mali; Stemphyllium spp., e.g. Stemphyllium vesicarium; Phacydiopycnis spp., e.g. Phacydiopycnis malirum; Thielaviopsis spp., e.g. Thielaviopsis paradoxy; Aspergillus spp., e.g. Aspergillus niger, Aspergillus carbonarius; Nectria spp., e.g. Nectria galligena; Pezicula spp.

Non-limiting examples for animal pests are

The active compound combinations, having good plant compatibility and favourable homeotherm toxicity, are suitable for controlling animal pests, in particular insects, arachnids and nematodes, encountered in agriculture, in forests, in the protection of stored products and materials and in the hygiene sector. They are preferably used as crop protection compositions for foliar and soil treatment.

They are effective against normally sensitive and resistant species and against all or individual stages of development. The abovementioned pests include:

From the order of the Isopoda, for example, Oniscus asellus, Armadillidium vulgare, Porcellio scaber. From the order of the Diplopoda, for example, Blaniulus guttulatus. From the order of the Chilopoda, for example, Geophilus carpophagus, Scutigera spp. From the order of the Symphyla,

for example, Scutigerella immaculata. From the order of the Thysanura, for example, Lepisma saccharina. From the order of the Collembola, for example, Onychiurus armatus. From the order of the Orthoptera, for example, Acheta domesticus, Gryllotalpa spp., Locusta migratoria migratorioides, Melanoplus spp., Schistocerca gregaria. From the order of the Blattaria, for example, Blatta orientalis, Periplaneta americana, Leucophaea maderae, Blattella germanica. From the order of the Dermaptera, for example, Forficula auricularia. From the order of the Isoptera, for example, Reticulitermes spp. From the order of the Phthiraptera, for example, Pediculus humanus corporis, Haematopinus spp., Linognathus spp., Trichodectes spp., Damalinia spp. From the order of the Thysanoptera, for example, Hercinothrips femoralis, Thrips tabaci, Thrips palmi, Frankliniella occidentalis. From the order of the Heteroptera, for example, Eurygaster spp., Dysdercus intermedius, Piesma quadrata, Cimex lectularius, Rhodnius prolixus, Triatoma spp. From the order of the Homoptera, for example, Aleurodes brassicae, Bemisia tabaci, Trialeurodes vaporariorum, Aphis gossypii, Brevicoryne brassicae, Cryptomyzus ribis, Aphis fabae, Aphis pomi, Eriosoma lanigerum, Hyalopterus arundinis, Phylloxera vastatrix, Pemphigus spp., Macrosiphum avenae, Myzus spp., Phorodon humuli, Rhopalosiphum padi, Empoasca spp., Euscelis bilobatus, Nephotettix cincticeps, Lecanium corni, Saissetia oleae, Laodelphax striatellus, Nilaparvata lugens, Aonidiella aurantii, Aspidiotus hederae, Pseudococcus spp., Psylla spp. From the order of the Lepidoptera, for example, Pectinophora gossypiella, Bupalus piniarius, Cheimatobia brumata, Lithocolletis blancardella, Hyponomeuta padella, Plutella xylostella, Malacosoma neustria, Euproctis chrysorrhoea, Lymantria spp., Bucculatrix thurberiella, Phyllocnistis citrella, Agrotis spp., Euxoa spp., Feltia spp., Earias insulana, Heliothis spp., Mamestra brassicae, Panolis flammea, Spodoptera spp., Trichoplusia ni, Carpocapsa pomonella, Pieris spp., Chilo spp., Pyrausta nubilalis, Ephestia kuehniella, Galleria mellonella, Tineola bisselliella, Tinea pellionella, Hofmannophila pseudospretella, Cacoecia podana, Capua reticulana, Choristoneura fumiferana, Clysia ambiguella, Homona magnanima, Tortrix viridana, Cnaphalocerus spp., Oulema oryzae. From the order of the Coleoptera, for example, Anobium punctatum, Rhizopertha dominica, Bruchidius obtectus, Acanthoscelides obtectus, Hylotrupes bajulus, Agelastica alni, Leptinotarsa decemlineata, Phaedon cochleariae, Diabrotica spp., Psylliodes chrysocephala, Epilachna varivestis, Atomaria spp., Oryzaephilus surinamensis, Anthonomus spp., Sitophilus spp., Otiorrhynchus sulcatus, Cosmopolites sordidus, Ceuthorrhynchus assimilis, Hypera postica, Dermestes spp., Trogoderma spp., Anthrenus spp., Attagenus spp., Lyctus spp., Meligethes aeneus, Ptinus spp., Niptus hololeucus, Gibbium psylloides, Tribolium spp., Tenebrio molitor, Agriotes spp., Conoderus spp., Melolontha melolontha, Amphimallon solstitialis, Costelytra zealandica, Lissorhoptrus oryzophilus. From the order of the Hymenoptera, for example, Diprion spp., Hoplocampa spp., Lasius spp., Monomorium pharaonis, Vespa spp. From the order of the Diptera, for example, Aedes spp., Anopheles spp., Culex spp., Drosophila melanogaster, Musca spp., Fannia

spp., Calliphora erythrocephala, Lucilia spp., Chrysomyia spp., Cuterebra spp., Gastrophilus spp., Hyppobosca spp., Stomoxys spp., Oestrus spp., Hypoderma spp., Tabanus spp., Tannia spp., Bibio hortulanus, Oscinella frit, Phorbia spp., Pegomyia hyoscyami, Ceratitis capitata, Dacus oleae, Tipula paludosa, Hylemyia spp., Liriomyza spp. From the order of the Siphonaptera, for example, Xenopsylla cheopis, Ceratophyllus spp. From the order of the Arachnida, for example, Scorpio maurus, Latrodectus mactans, Acarus siro, Argas spp., Ornithodoros spp., Dermanyssus gallinae, Eriophyes ribis, Phyllocoptruta oleivora, Boophilus spp., Rhipicephalus spp., Amblyomma spp., Hyalomma spp., Ixodes spp., Psoroptes spp., Chorioptes spp., Sarcoptes spp., Tarsonemus spp., Bryobia praetiosa, Panonychus spp., Tetranychus spp., Hemitarsonemus spp., Brevipalpus spp.

The plant-parasitic nematodes include, for example, Pratylenchus spp., Radopholus similis, Ditylenchus dipsaci, Tylenchulus semipenetrans, Heterodera spp., Globodera spp., Meloidogyne spp., Aphelenchoides spp., Longidorus spp., Xiphinema spp., Trichodorus spp., Bursaphelenchus spp.

According to the invention, post-harvest storage disorders are for example scald, scorch, softening, senescent breakdown, lenticel spots, bitter pit, browning, water core, vascular breakdown, CO_2 injury, CO_2 deficiency and O_2 deficiency.

Fruit, cutflower and vegetables to be treated according to the invention are particularly selected from

cereals, e.g. wheat, barley, rye, oats, rice, sorghum and the like; beets, e.g. sugar beet and fodder beet; pome and stone fruit and berries, e.g. apples, pears, plums, peaches, almonds, cherries, strawberries, raspberries and blackberries; leguminous plants, e.g. beans, lentils, peas, soy beans; oleaginous plants, e.g. rape, mustard, poppy, olive, sunflower, coconut, castor-oil plant, cocoa, ground-nuts; cucurbitaceae, e.g. pumpkins, gherkins, melons, cucumbers, squashes; fibrous plants, e.g. cotton, flax, hemp, jute; citrus fruit, e.g. orange, lemon, grapefruit, mandarin; tropical fruit, e.g. papaya, passion fruit, mango, carambola, pineapple, banana; vegetables, e.g. spinach, lettuce, asparagus, brassicaceae such as cabbages and turnips, carrots, onions, tomatoes, potatoes, hot and sweet peppers; laurel-like plants, e.g. avocado, cinnamon, camphor tree; or plants such as maize, tobacco, nuts, coffee, sugar-cane, tea, grapevines, hops, rubber plants, as well as ornamental plants, e.g. cutflowers, roses, gerbera and flower bulbs, shrubs, deciduous trees and evergreen trees such as conifers. This enumeration of culture plants is given with the purpose of illustrating the invention and not to delimiting it thereto.

The present invention also provides methods of treating a plant by application of any of a variety of customary formulations in an effective amount to either the soil (i.e. in-furrow), a portion of the

plant (i.e., drench) or on the seed before planting (i.e., seed coating or dressing). Customary formulations include solutions (SL), emulsifiable concentrate (EC), wettable powders (WP), suspension concentrate (SC and FS), wettable powder (WP), soluble powders (SP), granules (GR), suspension-emulsion concentrate (SE), natural and synthetic materials impregnated with active compound, and very fine control release (CR) capsules in polymeric substances. In one embodiment, the insect control agent and biological control agent are formulated in powders that are available in either a ready-to-use formulation or are mixed together at the time of use. In either embodiment, the powder may be admixed with the soil prior to or at the time of planting. In an alternative embodiment, one or both of either the biological control agent or insect control agent is a liquid formulation that is mixed together at the time of treating. One of ordinary skill in the art understands that an effective amount of the inventive compositions depends on the final formulation of the composition as well as the size of the plant or the size of the seed to be treated.

Depending on the final formulation and method of application, one or more suitable additives can also be introduced to the present compositions. Adhesives such as carboxymethylcellulose and natural and synthetic polymers in the form of powders, granules or latexes, such as gum arabic, chitin, polyvinyl alcohol and polyvinyl acetate, as well as natural phospholipids, such as cephalins and lecithins, and synthetic phospholipids, can be added to the present compositions.

In a preferred embodiment, the compositions are formulated in a single, stable solution, or emulsion, or suspension. For solutions, the active chemical compounds (i.e., the insect control agent) are dissolved in solvents before the biological control agent is added. Suitable liquid solvents include petroleum based aromatics, such as xylene, toluene or alkylnaphthalenes, aliphatic hydrocarbons, such as cyclohexane or paraffins, for example petroleum fractions, mineral and vegetable oils, alcohols, such as butanol or glycol as well as their ethers and esters, ketones, such as methyl ethyl ketone, methyl isobutyl ketone or cyclohexanone, strongly polar solvents, such as dimethylformamide and dimethyl sulphoxide. For emulsion or suspension, the liquid medium is water. In one embodiment, the insect control agent and biological control agent are suspended in separate liquids and mixed at the time of application. In a preferred embodiment of suspension, the insect control agent and biologic are combined in a ready-to-use formulation that exhibits a shelf-life of at least two years. In use, the liquid can be sprayed or atomized foliarly or in-furrow at the time of planting the crop. The liquid composition can be introduced to the soil before germination of the seed or directly to the soil in contact with the roots by utilizing a variety of techniques including, but not limited to, drip irrigation, sprinklers, soil injection or soil drenching.

Optionally, stabilizers and buffers can be added, including alkaline and alkaline earth metal salts and oganic acids, such as citric acid and ascorbic acid, inorganic acids, such as hydrochloric acid

or sulfuric acid. Biocides can also be added and can include formaldehydes or formaldehyde-releasing agents and derivatives of benzoic acid, such as p-hydroxybenzoic acid.

In one embodiment, the solid or liquid compositions further contain functional agents capable of protecting seeds from the harmful effects of selective herbicides such as activated carbon, nutrients (fertilizers), and other agents capable of improving the germination and quality of the products or a combination thereof.

In a particularly preferred embodiment, the compositions of the present invention are formulated as a seed treatment. The seed treatment comprises at least one insect control agent and at least one biological control agent. According to the present invention, the seeds are substantially uniformly coated with one or more layers of the compositions disclosed herein using conventional methods of mixing, spraying or a combination thereof through the use of treatment application equipment that is specifically designed and manufactured to accurately, safely, and efficiently apply seed treatment products to seeds. Such equipment uses various types of coating technology such as rotary coaters, drum coaters, fluidized bed techniques, spouted beds, rotary mists or a combination thereof. Liquid seed treatments such as those of the present invention can be applied via either a spinning "atomizer" disk or a spray nozzle which evenly distributes the seed treatment onto the seed as it moves though the spray pattern. Preferably, the seed is then mixed or tumbled for an additional period of time to achieve additional treatment distribution and drying. The seeds can be primed or unprimed before coating with the inventive compositions to increase the uniformity of germination and emergence. In an alternative embodiment, a dry powder formulation can be metered onto the moving seed and allowed to mix until completely distributed.

The seeds may be coated via a batch or continuous coating process. In a continuous coating embodiment, continuous flow equipment simultaneously meters both the seed flow and the seed treatment products. A slide gate, cone and orifice, seed wheel, or weighing device (belt or diverter) regulates seed flow. Once the seed flow rate through treating equipment is determined, the flow rate of the seed treatment is calibrated to the seed flow rate in order to deliver the desired dose to the seed as it flows through the seed treating equipment. Additionally, a computer system may monitor the seed input to the coating machine, thereby maintaining a constant flow of the appropriate amount of seed.

In a batch coating embodiment, batch treating equipment weighs out a prescribed amount of seed and places the seed into a closed treating chamber or bowl where the corresponding dose of seed treatment is then applied. This batch is then dumped out of the treating chamber in preparation for the treatment of the next batch. With computer control systems, this batch process is automated enabling it to continuously repeat the batch treating process.

In either embodiment, the seed coating machinery can optionally be operated by a programmable logic controller that allows various equipment to be started and stopped without employee intervention. The components of this system are commercially available through several sources such as Gustafson Equipment of Shakopee, MN.

A variety of additives can be added to the seed treatment formulations comprising the inventive compositions. Binders can be added and include those composed preferably of an adhesive polymer that can be natural or synthetic without phytotoxic effect on the seed to be coated. Any of a variety of colorants may be employed, including organic chromophores classified as nitroso, nitro, azo, including monoazo, bisazo and polyazo, diphenylmethane, triarylmethane, xanthene, methine, acridine, thiazole, thiazine, indamine, indophenol, azine, oxazine, anthraquinone and phthalocyanine. Other additives that can be added include trace nutrients such as salts of iron, manganese, boron, copper, cobalt, molybdenum and zinc. A polymer or other dust control agent can be applied to retain the treatment on the seed surface.

Other conventional seed treatment additives include, but are not limited to, coating agents, wetting agents, buffering agents, and polysaccharides. At least one agriculturally acceptable carrier can be added to the seed treatment formulation such as water, solids or dry powders. The dry powders can be derived from a variety of materials such as calcium carbonate, gypsum, vermiculite, talc, humus, activated charcoal, and various phosphorous compounds.

In one embodiment, the seed coating composition can comprise at least one filler which is an organic or inorganic, natural or synthetic component with which the active components are combined to facilitate its application onto the seed. Preferably, the filler is an inert solid such as clays, natural or synthetic silicates, silica, resins, waxes, solid fertilizers (for example ammonium salts), natural soil minerals, such as kaolins, clays, talc, lime, quartz, attapulgite, montmorillonite, bentonite or diatomaceous earths, or synthetic minerals, such as silica, alumina or silicates, in particular aluminium or magnesium silicates.

Any plant seed capable of germinating to form a plant that is susceptible to attack by nematodes and/or pathogenic fungi can be treated in accordance with the invention. Suitable seeds include those of cole crops, vegetables, fruits, trees, fiber crops, oil crops, tuber crops, coffee, flowers, legume, cereals, as well as other plants of the monocotyledonus, and dicotyledonous species. Preferably, crop seeds are be coated which include, but are not limited to, soybean, peanut, tobacco, grasses, wheat, barley, rye, sorghum, rice, rapeseed, sugarbeet, sunflower, tomato, pepper, bean, lettuce, potato, and carrot seeds. Most preferably, cotton or corn (sweet, field, seed, or popcorn) seeds are coated with the present compositions.

The compositions in accordance with the present invention exhibit unexpectedly improved overall plant vigor and yield by combining agriculturally effective amounts of at least one environmentally friendly biological control agent and at least one insect control agent. These unexpected results are attributed to the combination of the nematicidal and/or fungicidal properties of the biological control agent and the root-mass enhancing properties of the insect control agent.

A further advantage is the synergistic increase in insecticidal and/or fungicidal activity of the agents of the invention in comparison to the respective individual active compounds, which extends beyond the sum of the activity of both individually applied active compounds. In this way an optimization of the amount of active compound applied is made possible.

It is also be regarded as advantageous that the combinations of the invention can also be used in particular with transgenic seeds whereby the plants emerging from this seed are capable of the expression of a protein directed against pests and pathogens. By treatment of such seed with the agents of the invention certain pests and pathogens can already be controlled by expression of the, for example, insecticidal protein, and it is additionally surprising that a synergistic activity supplementation occurs with the agents of the invention, which improves still further the effectiveness of the protection from pest and pathogen infestation.

The agents of the invention are suitable for the protection of seed of plant varieties of all types as already described which are used in agriculture, in greenhouses, in forestry, in garden construction or in vineyards. In particular, this concerns seed of maize, peanut, canola, rape, poppy, olive, coconut, cacao, soy cotton, beet, (e.g. sugar beet and feed beet), rice, millet, wheat, barley, oats, rye, sunflower, sugar cane or tobacco. The agents of the invention are also suitable for the treatment of the seed of fruit plants and vegetables as previously described. Particular importance is attached to the treatment of the seed of maize, soy, cotton, wheat and canola or rape. Thus, for example, the combination of number (1) is particularly suitable for the treatment of maize seed.

As already described, the treatment of transgenic seed with an agent of the invention is of particular importance. This concerns the seeds of plants which generally contain at least one heterologous gene that controls the expression of a polypeptide with special insecticidal properties. The heterologous gene in transgenic seed can originate from microorganisms such as Bacillus, Rhizobium, Pseudomonas, Serratia, Trichoderma, Clavibacter, Glomus or Gliocladium. The present invention is particularly suitable for the treatment of transgenic seed that contains at least one heterologous gene that originates from Bacillus sp. and whose gene product exhibits activity against the European corn borer and/or western corn rootworm. Particularly preferred is a heterologous gene that originates from Bacillus thuringiensis.

The bacterial spores surprisingly not only retain their nematicidal and/or fungicidal properties in the presence of a chemical insect control agent but demonstrate an enhanced ability to colonize the plant's root system. This enhanced ability leads to the amplification of their nematicidal and/or fungicidal activity and thus the result is improved vigor which, in turn, results in improved yield.

Having disclosed the subject matter of the present invention, it should be apparent that many modifications, substitutions and variations of the present invention are possible in light thereof. It is to be understood that the present invention can be practiced other than as specifically described. Such modifications, substitutions and variations are intended to be within the scope of the present application. As used in the following claims, articles such as "a", "the" and so on can connote the singular or the plural of the object following.

Claims:

1. A composition comprising:

a) a biologically pure strain of Metschnikowia fructicola, and

b) at least one insect control agent selected from:

(1) Acetylcholinesterase (AChE) inhibitors, selected from the group:

carbamates, e.g. alanycarb, aldicarb, bendiocarb, benfuracarb, butocarboxim, butoxycarboxim, carbaryl, carbofuran, carbosulfan, ethiofencarb, fenobucarb, formetanate, furathiocarb, isoprocarb, methiocarb, methomyl, metolcarb, oxamyl, pirimicarb, propoxur, thiodicarb, thiofanox, triazamate, trimethacarb, XMC, and xylylcarb; or

organophosphates, e.g. acephate, azamethiphos, azinphos (-methyl, -ethyl), cadusafos, chlorethoxyfos, chlorfenvinphos, chlorfenvinphos, chlormephos, chlorpyrifos (-methyl), coumaphos, cyanophos, demeton-S-methyl, diazinon, dichlorvos/DDVP, dicrotophos, dimethoate, dimethylvinphos, disulfoton, EPN, ethion, ethoprophos, famphur, fenamiphos, fenitrothion, fenthion, fosthiazate, heptenophos, isofenphos, isopropyl *O*-(methoxyaminothio-phosphoryl) salicylate, isoxathion, malathion, mecarbam, methamidophos, methidathion, mevinphos, monocrotophos, naled, omethoate, oxydemeton-methyl, parathion (-methyl), phenthoate, phorate, phosalone, phosmet, phosphamidon, phoxim, pirimiphos (-methyl), profenofos, propetamphos, prothiofos, pyraclofos, pyridaphenthion, quinalphos, sulfotep, tebupirimfos, temephos, terbufos, tetrachlorvinphos, thiometon, triazophos, triclorfon, and vamidothion;

(2) GABA-gated chloride channel antagonists, selected from the group:

organochlorines, e.g. chlordane, endosulfan (alpha-); or

fiproles (phenylpyrazoles), e.g. ethiprole, fipronil, pyrafluprole, and pyriprole;

(3) Sodium channel modulators/voltage-dependent sodium channel blockers, selected from the group: pyrethroids, e.g. acrinathrin, allethrin (d-cis-trans, d-trans), bifenthrin, bioallethrin, bioallethrin S-cyclopentenyl, bioresmethrin, cycloprothrin, cyfluthrin (beta-), cyhalothrin (gamma-, lambda-), cypermethrin (alpha-, beta-, theta-, zeta-), cyphenothrin [(1*R*)-*trans*-isomers], deltamethrin, dimefluthrin, empenthrin [(*EZ*)-

(1*R*)-isomers), esfenvalerate, etofenprox, fenpropathrin, fenvalerate, flucythrinate, flumethrin, fluvalinate (tau-), halfenprox, imiprothrin, metofluthrin, permethrin, phenothrin [(1*R*)-*trans*-isomer), prallethrin, profluthrin, pyrethrin (pyrethrum), resmethrin, RU 15525, silafluofen, tefluthrin, tetramethrin [(1*R*)- isomers)], tralomethrin, transfluthrin and ZXI 8901; or

DDT; or methoxychlor;

(4) Nicotinergic acetylcholine receptor agonists, selected from the group;

chloronicotinyls, e.g. acetamiprid, clothianidin, dinotefuran, imidacloprid, nitenpyram, thiacloprid, thiamethoxam,; or nicotine;

(5) Allosteric acetylcholine receptor modulators (agonists), selected from the group: spinosyns, e.g. spinetoram and spinosad;

(6) Chloride channel activators, selected from the group:avermectins/milbemycins, e.g. abamectin, emamectin benzoate, lepimectin, and milbemectin;

(7) Juvenile hormone mimics, selected from the group:. hydroprene, kinoprene, methoprene; or fenoxycarb; pyriproxyfen;

(8) Miscellaneous non-specific (multi-site) inhibitors, selected from the group:

gassing agents, e.g. methyl bromide and other alkyl halides; or chloropicrin; sulfuryl fluoride; borax; tartar emetic;

(9) Selective homopteran feeding blockers, selected from the group: pymetrozine; or flonicamid;

(10) Mite growth inhibitors, selected from the group: clofentezine, diflovidazin, hexythiazox, etoxazole;

(11) Microbial disruptors of insect midgut membranes, selected from the group: *Bacillus thuringiensis* subspecies *israelensis*, *Bacillus sphaericus*, *Bacillus thuringiensis* subspecies *aizawai*, *Bacillus thuringiensis* subspecies *kurstaki*, *Bacillus thuringiensis* subspecies *tenebrionis*, and BT crop proteins: Cry1Ab, Cry1Ac, Cry1Fa, Cry2Ab, mCry3A, Cry3Ab, Cry3Bb, Cry34/35Ab1;

(12) Inhibitors of mitochondrial ATP synthase, selected from the group:diafenthiuron, azocyclotin, cyhexatin, fenbutatin oxide, propargite; tetradifon;

(13) Uncouplers of oxidative phoshorylation via disruption of the proton gradient, selected from the group: chlorfenapyr, and DNOC;

(14) Nicotinic acetylcholine receptor channel blocckers, selected from the group: bensultap, cartap hydrochloride, thiocyclam, and thiosultap-sodium;

(15) Inhibitors of chitin biosynthesis, type 0, selected from the group: bistrifluron, chlorfluazuron, diflubenzuron, flucycloxuron, flufenoxuron, hexaflumuron, lufenuron, novaluron, noviflumuron, penfluron, teflubenzuron, and triflumuron;

(16) Inhibitors of chitin biosynthesis, type 1, selected from the group: buprofezin;

(17) Moulting disruptors, selected from the group: cyromazine;

(18) Ecdysone receptor agonists/disruptors, selected from the group: chromafenozide, halofenozide, methoxyfenozide, and tebufenozide;

(19) Octopamine receptor agonists, selected from the group: amitraz;

(20) Mitochondrial complex III electron transport inhibitors (Coupling site II), selected from the group: hydramethylnon; acequinocyl; fluacrypyrim; or cyflumetofen and cyenopyrafen;

(21) Mitochondrial complex I electron transport inhibitors, selected from the group: fenazaquin, fenpyroximate, pyrimidifen, pyridaben, tebufenpyrad, tolfenpyrad or rotenone (Derris);

(22) Voltage-dependent sodium channel blockers, selected from the group: indoxacarb; metaflumizone;

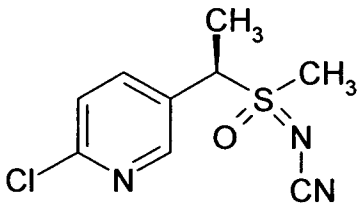
(23) Inhibitors of acetyl CoA carboxylase, selected from the group: spirodiclofen, spiromesifen, spirotetramat;

(24) Mitochondrial complex IV electron inhibitors, selected from the group: aluminium phosphide, calcium phosphide, phosphine, and zinc phosphide, cyanide;

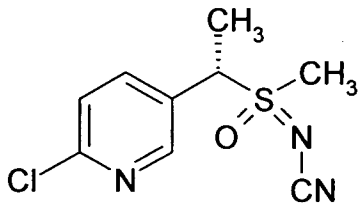
(28) Ryanodine receptor modulators, selected from the group: chlorantraniliprole (Rynaxypyr), Cyantraniliprole (Cyazypyr), and flubendiamide;

(29) azadirachtin, amidoflumet, benzoximate, bifenazate, chinomethionat, cryolite, dicofol, flufenerim, pyridalyl, and pyrifluquinazon; 4-{[(6-brompyrid-3-yl)methyl](2-

fluorethyl)amino}furan-2(5H)-on (known from WO 2007/115644), 4-{[(6-fluorpyrid-3-yl)methyl](2,2-difluorethyl)amino}furan-2(5H)-on (known from WO 2007/115644), 4-{[(2-chlor-1,3-thiazol-5-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/115644), 4-{[(6-chlorpyrid-3-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/ 115644), 4-{[(6-chlorpyrid-3-yl)methyl](2,2-difluorethyl)amino}furan-2(5H)-on known from WO 2007/115644), 4-{[(6-chlor-5-fluorpyrid-3-yl)methyl](methyl)amino}furan-2(5H)-on (known from WO 2007/115643), 4-{[(5,6-dichlorpyrid-3-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/115646), 4-{[(6-chlor-5-fluorpyrid-3-yl)methyl](cyclopropyl)amino}furan-2(5H)-on (known from WO 2007/115643), 4-{[(6-chlorpyrid-3-yl)methyl](cyclopropyl)amino}furan-2(5H)-on (known from EP-A-0 539 588), 4-{[(6-chlorpyrid-3-yl)methyl](methyl)amino}furan-2(5H)-on (known from EP-A-0 539 588), [(6-chlorpyridin-3-yl)methyl](methyl)oxido-λ^4-sulfanylidencyanamid (known from WO 2007/149134), [1-(6-chlorpyridin-3-yl)ethyl](methyl)oxido-λ^4-sulfanylidencyanamid (known from WO 2007/149134) and its diastereomeres (A) and (B)



(A)



(B)

(also known from WO 2007/149134), [(6-trifluormethylpyridin-3-yl)methyl](methyl)oxido-λ^4-sulfanylidencyanamid (known from WO 2007/095229), or sulfoxaflor (also known from WO 2007/149134), 11-(4-chloro-2,6-dimethylphenyl)-12-hydroxy-1,4-dioxa-9-azadispiro[4.2.4.2]tetradec-11-en-10-one, (known from WO 2006/089633), 3-(4'-fluoro-2,4-dimethylbiphenyl-3-yl)-4-hydroxy-8-oxa-1-azaspiro[4.5]dec-3-en-2-one (known from WO 2008/067911), and 1-{2,4-dimethyl-5-[(2,2,2-trifluoroethyl)sulfinyl]phenyl}-3-(trifluoromethyl)-1H-1,2,4-triazole (known from WO 1999/55668).

2. Acomposition according to claim 1, wherein component a) is a biologically pure culture of Metschnikowia fructicola strain NRRL Y-30752 or a mutant thereof.

3. Acomposition according to claim 1 or 2, wherein the insect control agent is selected from:

the group (P1)

(P1) Clothianidin, imidacloprid, thiacloprid, thiamethoxam, acetamiprid, methiocarb, thiodicarb, beta-cyfluthrin, cyfluthrin, deltamethrin, tefluthrin, transfluthrin, indoxacarb, spinosad, spinetoram, fipronil, ethiprole, emamectin-benzoate, avermectin, spirodiclofen, spiromesifen, spirotetramat, flubendiamide, (R),(S)-3-chloro-N^1-{2-methyl-4-[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]phenyl}-N^2-(1-methyl-2-methylsulphonylethyl)phthal-amide, chlorantraniliprole (Rynaxypyr), or Cyantraniliprole (Cyazypyr), sulfoxaflor, Transfluthrin, 4-{[(6-brompyrid-3-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/115644), 4-{[(6-fluorpyrid-3-yl)methyl](2,2-difluorethyl)amino}furan-2(5H)-on (known from WO 2007/115644), 4-{[(2-chlor-1,3-thiazol-5-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/115644), 4-{[(6-chlorpyrid-3-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/ 115644), 4-{[(6-chlorpyrid-3-yl)methyl](2,2-difluorethyl)amino}furan-2(5H)-on known from WO 2007/115644), 4-{[(6-chlor-5-fluorpyrid-3-yl)methyl](methyl)amino}furan-2(5H)-on (known from WO 2007/115643), 4-{[(5,6-dichlorpyrid-3-yl)methyl](2-fluorethyl)amino}furan-2(5H)-on (known from WO 2007/115646), 4-{[(6-chlor-5-fluorpyrid-3-yl)methyl](cyclopropyl)amino}furan-2(5H)-on (known from WO 2007/115643), 4-{[(6-chlorpyrid-3-yl)methyl](cyclopropyl)amino}furan-2(5H)-on (known from EP-A-0 539 588), 4-{[(6-chlorpyrid-3-yl)methyl](methyl)amino}furan-2(5H)-on (known from EP-A-0 539 588), [(6-chlorpyridin-3-yl)methyl](methyl)oxido-λ^4-sulfanylidencyanamid (known from WO 2007/149134), [1-(6-chlorpyridin-3-yl)ethyl](methyl)oxido-λ^4-sulfanyliden-cyanamid (known from WO 2007/149134) and its diastereomeres (A) and (B).

4. Acomposition according to claim 1 or 2, wherein the insect control agent is selected from the group (P2):

(P2) Clothianidin, imidacloprid, thiacloprid, thiamethoxam, acetamiprid, methiocarb, thiodicarb, beta-cyfluthrin, cyfluthrin, deltamethrin, tefluthrin, transfluthrin, indoxacarb, spinosad, spinetoram, fipronil, ethiprole, emamectin-benzoate, avermectin, spirodiclofen, spiromesifen, spirotetramat, flubendiamide, chlorantraniliprole (Rynaxypyr), Cyantraniliprole (Cyazypyr), sulfoxaflor, transfluthrin.

5. Use of a composition according to any of claims 1 to 4 for combating unwanted microorganisms on plants or plant parts.

6. Use of a composition according to any of claims 1 to 4 for combating animal pests on plants or plant parts.

7. Use of a composition according to any of claims 1 to 4 for combating unwanted microorganisms on plants or plant parts, wherein the unwanted microorganism is selcted from: Botrytis cinerea, Aspergillus niger, Penicillium digitatum, Penicillium expansum, Geotrichum candidum, Rhizopus stolonifer, Fusariurn spp and Molinilia spp.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/003818

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01N43/653 A01N63/04 A01P7/04
ADD.

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

B. FIELDS SEARCHED

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

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 994 849 B2 (DROBY SAMIR [IL]) 7 February 2006 (2006-02-07) cited in the application claims 2,8	1-7

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 July 2010	29/07/2010

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

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2010/003818

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6994849 B2	07-02-2006	US 2004115171 A1	17-06-2004