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(54) Title: FUNGICIDAL COMPOSITIONS

(57) Abstract: A fungicidal composition comprising a mixture of components (A) and (B), wherein components (A) and (B) are as defined in claim 1, and use of the compositions in agriculture or horticulture for controlling or preventing infestation of plants by phytopathogenic microorganisms, preferably fungi.

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Fungicidal Compositions

The present invention relates to novel fungicidal compositions, to their use in agriculture or horticulture for controlling diseases caused by phytopathogens, especially phytopathogenic fungi, and to methods of controlling diseases on useful plants.

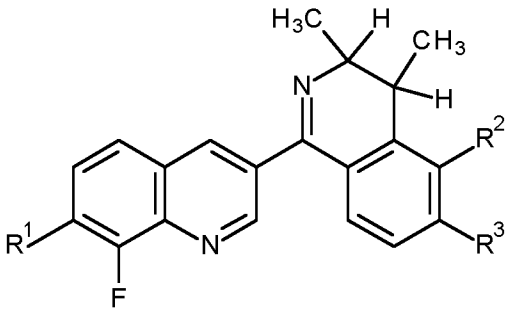
Whilst many fungicidal compounds and compositions, belonging to various different chemical classes, have been/are being developed for use as fungicides in crops of useful plants, crop tolerance and activity against particular phytopathogenic fungi do not always satisfy the needs of agricultural practice in many respects. Therefore, there is a continuing need to find new compounds and compositions having superior biological properties for use in controlling or preventing infestation of plants by phytopathogenic fungi. For example, compounds possessing a greater biological activity, an advantageous spectrum of activity, an increased safety profile, improved physico-chemical properties, increased biodegradability. Or else, compositions possessing a broader spectrum of activity, improved crop tolerance, synergistic interactions or potentiating properties, or compositions which display a more rapid onset of action or which have longer lasting residual activity or which enable a reduction in the number of applications and/or a reduction in the application rate of the compounds and compositions required for effective control of a phytopathogen, thereby enabling beneficial resistance-management practices, reduced environmental impact and reduced operator exposure.

Wheat is a grass cultivated for its seed, a cereal grain which is a worldwide staple food. The many species of wheat together make up the genus Triticum; the most widely grown is common wheat (*T. aestivum*). However, many challenges exist in the cultivation of wheat. *Septoria tritici* blotch is caused by the ascomycete fungus *Mycosphaerella graminicola* (asexual stage: *Septoria tritici*) and is one of the most important diseases of wheat - it is one of the most economically damaging diseases of this crop (being currently the most economically relevant disease in Europe). There exists therefore, in particular, an on-going need for the development of new methods for controlling or preventing infestation of fungal phytopathogens on cereal crops, eg, *Mycosphaerella graminicola* on cereals, in particular wheat.

Certain fungicidal quinoline compounds are described in WO 2007/011022 and WO 2022/223376.

The use of compositions comprising mixtures of different fungicidal compounds possessing different modes of action can address some of these outstanding needs (eg, by combining fungicides with differing spectrums of activity).

According to the present invention, there is provided a fungicidal composition comprising a mixture of components (A) and (B) as active ingredients, wherein component (A) is a compound of formula (I):



(I)

wherein

R^1 is fluoro or hydrogen;

R^2 is chloro, bromo, cyano, difluoromethyl or methoxy

R^3 is methyl or hydrogen.

or a salt, tautomer and/or an N-oxide thereof,

and

component (B) is a compound selected from the group consisting of:

I. difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin;

II. isopyrazam, fluopyram, penthiopyrad, sedaxane, bixafen, boscalid, cyproconazole, tebuconazole, hexaconazole, propiconazole, epoxiconazole, flutriafol, fluindapyr, ipconazole, inpyrfluxam, paclobutrazol, trifloxystrobin, thiabendazole, picoxystrobin, pyraclostrobin, kresoxim methyl, metalaxyl-M, fenpropimorph, spiroxamine, mancozeb, chlorothalonil, oxathiapiprolin, mandipropamid, metrafenone, fenpicoxamid, fluazinam, fludioxinil, fluoxastrobin, fosetyl-aluminium, acibenzolar-S-methyl, procymidone, penconazole, carbendazim, fenhexamid, prochloraz, penthiopyrad, propineb, maneb, prohexadione-calcium, sulfur, calcium phosphonate, Timorex GoldTM (plant extract comprising tea tree oil);

III. N'-[5-bromo-2-methyl-6-[(1S)-1-methyl-2-propoxy-ethoxy]-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-bromo-2-methyl-6-[(1R)-1-methyl-2-propoxy-ethoxy]-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-cyano-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-(difluoromethyl)-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[2,5-dimethyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-bromo-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[6-(2-allyloxy-1-methyl-ethoxy)-5-chloro-2-methyl-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-chloro-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-bromo-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-isopropyl-N-methyl-

formamidine and N-isopropyl-N'-[5-methoxy-2-methyl-4-(2,2,2-trifluoro-1-hydroxy-1-phenyl-ethyl)phenyl]-N-methyl-formamidine;

IV. N-methoxy-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]cyclopropanecarboxamide, N,2-dimethoxy-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propenamide, N-ethyl-2-methyl-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propenamide, 1-methoxy-3-methyl-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea, 1,3-dimethoxy-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea, 3-ethyl-1-methoxy-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea, N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propanamide, 4,4-dimethyl-2-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]isoxazolidin-3-one, 5,5-dimethyl-2-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]isoxazolidin-3-one, ethyl 1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]pyrazole-4-carboxylate, N,N-dimethyl-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]-1,2,4-triazol-3-amine, (3-methylisoxazol-5-yl)-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methanone, (5-methyl-2-pyridyl)-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methanone, 2-oxo-N-propyl-2-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]acetamide and ethyl 1-[[5-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]-2-thienyl]methyl]pyrazole-4-carboxylate;

V. methyl (Z)-3-methoxy-2-[2-methyl-5-[3-(trifluoromethyl)pyrazol-1-yl]phenoxy]prop-2-enoate, methyl (Z)-3-methoxy-2-[2-methyl-5-(3-propylpyrazol-1-yl)phenoxy]prop-2-enoate, methyl (Z)-2-(5-cyclohexyl-2-methyl-phenoxy)-3-methoxy-prop-2-enoate, methyl (Z)-2-(5-cyclopentyl-2-methyl-phenoxy)-3-methoxy-prop-2-enoate, methyl (Z)-2-[5-(3-isopropylpyrazol-1-yl)-2-methyl-phenoxy]-3-methoxy-prop-2-enoate, methyl (Z)-3-methoxy-2-[2-methyl-5-(4-propyltriazol-2-yl)phenoxy]prop-2-enoate, methyl (Z)-3-methoxy-2-[2-methyl-5-[4-(trifluoromethyl)triazol-2-yl]phenoxy]prop-2-enoate, methyl (Z)-2-[5-(4-cyclohexylthiazol-2-yl)-2-methyl-phenoxy]-3-methoxy-prop-2-enoate, methyl (Z)-2-[5-[4-(ethoxymethyl)thiazol-2-yl]-2-methyl-phenoxy]-3-methoxy-prop-2-enoate, methyl (Z)-2-[5-(4-bromothiazol-2-yl)-2-methyl-phenoxy]-3-methoxy-prop-2-enoate, methyl (Z)-3-methoxy-2-[2-methyl-5-[5-(trifluoromethyl)thiazol-2-yl]phenoxy]prop-2-enoate;

VI. 2-[cyano-(2,6-difluoro-4-pyridyl)amino]-5-methyl-N-spiro[3.4]octan-3-yl-thiazole-4-carboxamide, 2-[cyano-(2,6-difluoro-4-pyridyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[cyano-(2,6-difluoro-4-pyridyl)amino]-N-hexyl-5-methyl-thiazole-4-carboxamide, 2-[(2,6-difluoro-4-pyridyl)-(2-methoxyacetyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[(2,6-difluoro-4-pyridyl)-(tetrahydropyran-4-carbonyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[(2,6-difluoro-4-pyridyl)-(oxetane-3-carbonyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[(2,6-difluoro-4-pyridyl)-(tetrahydrofuran-3-carbonyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[acetyl-(2,6-difluoro-4-pyridyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[(2,6-difluoro-4-pyridyl)-(2-methylpropanoyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-;

VII. methyl 3-[(4-chlorophenyl)methyl]-2-hydroxy-1-methyl-2-(1,2,4-triazol-1-ylmethyl)cyclopentanecarboxylate, 4-[[6-[2-(2,4-difluorophenyl)-1,1-difluoro-2-hydroxy-3-(tetrazol-1-

yl)propyl]-3-pyridyl]oxy]benzonitrile, methyl 2-[4-(4-chlorophenoxy)-2-(trifluoromethyl)phenyl]-2-hydroxy-3-(1,2,4-triazol-1-yl)propanoate.

In general, the weight ratio of component (A) to component (B) may preferably be from 100:1 to 1:100, from 50:1 to 1:50, from 20:1 to 1:20, from 15:1 to 1:15, from 12:1 to 1:12, from 10:1 to 1:10, from 5:1 and 1:5, from 3:1 to 1:3 or from 2:1 to 1:2.

Further according to the invention, there is provided a method of controlling or preventing phytopathogenic diseases, especially phytopathogenic fungi, on useful plants or on propagation material thereof, which comprises applying to the useful plants, the locus thereof or propagation material thereof a fungicidal composition according to the invention. Preferably, the phytopathogenic fungi is (i) *Mycosphaerella graminicola,* (ii) *Monographella nivalis* (*Microdochium nivale*), (iii) *Gibberella zeae* (anamorph: *Fusarium graminearum*) or (iv) *Fusarium culmorum*. Preferably, the useful plant is cereals, in particular, wheat.

The benefits provided by certain fungicidal mixture compositions according to the invention may also include, *inter alia*, advantageous levels of biological activity for protecting plants against diseases that are caused by fungi or superior properties for use as agrochemical active ingredients (for example, greater biological activity, an advantageous spectrum of activity, an increased safety profile, improved physico-chemical properties, or increased biodegradability).

The present invention includes all those possible isomeric forms (e.g. geometric isomers) and mixtures thereof for a compound of formula (I). The present invention includes all possible tautomeric forms for a compound of formula (I), and also a racemic compound, i.e., a mixture of at least two enantiomers in a ratio of substantially 50:50.

In each case, the compounds of formula (I) according to the invention are in free form, in oxidized form as a N-oxide or in salt form, e.g. an agronomically usable salt form.

N-oxides are oxidized forms of tertiary amines or oxidized forms of nitrogen containing heteroaromatic compounds. They are described for instance in the book “Heterocyclic N-oxides” by A. Albini and S. Pietra, CRC Press, Boca Raton 1991.

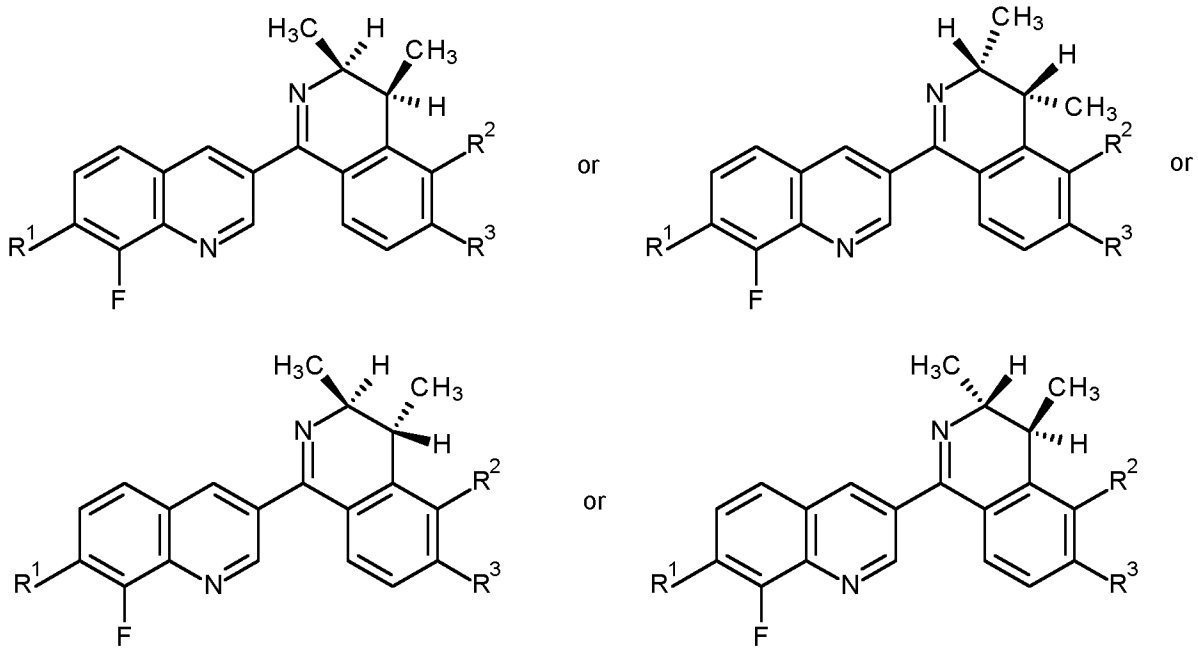
Preferred groups and values for the substituents R^1, R^2, and R^3 in the compounds of formula (I) are, in any combination thereof, as set out below.

Preferably, R^1 is fluoro or hydrogen;

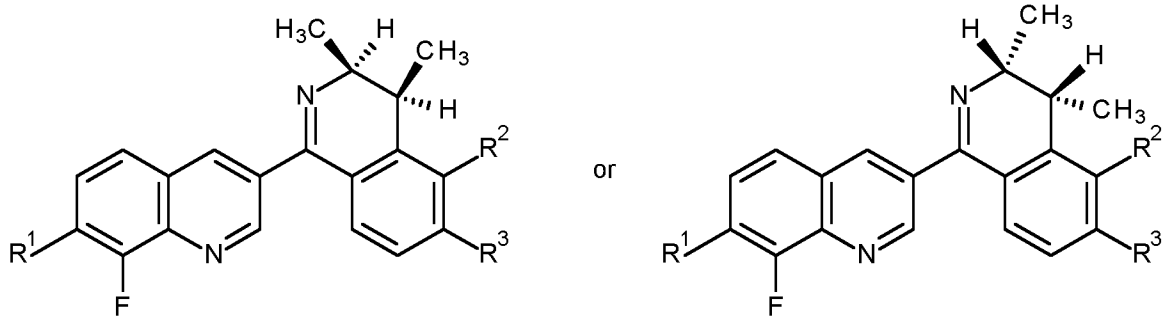
Preferably, R^2 is cyano;

Preferably, R^3 is methyl.

In certain embodiments of the invention, the compound of Formula (I) may be a racemic mixture of enantiomers. Otherwise, the compound of Formula (I) may be an individual enantiomer as follows.



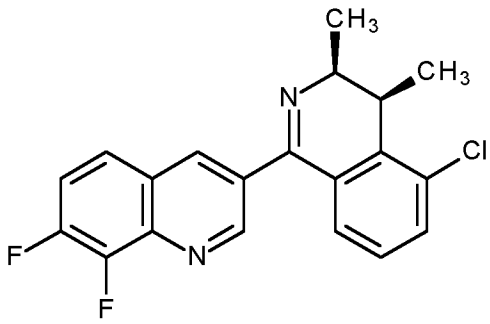
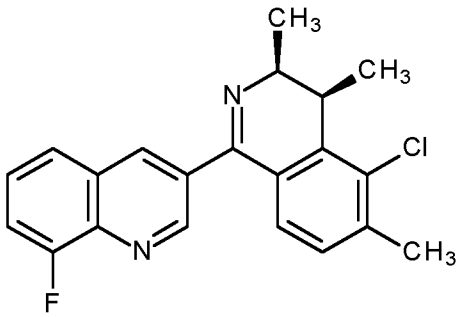
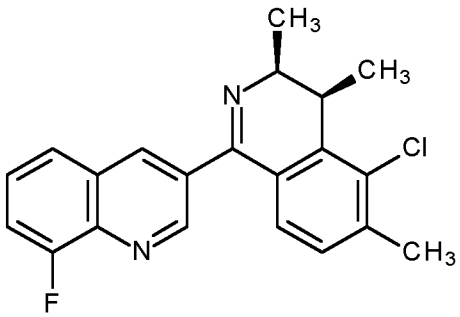
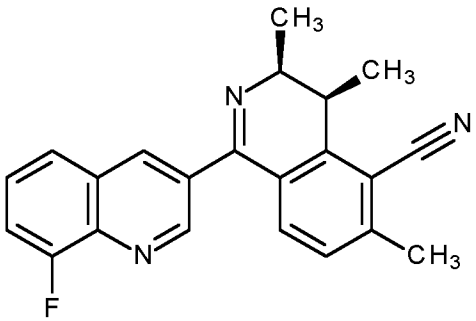
Preferably, in the compounds of formula (I), both methyl substituents possess a *cis* relationship as follows.

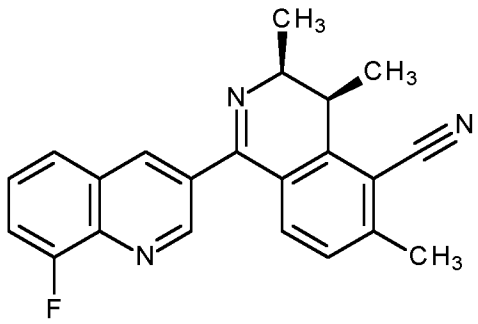
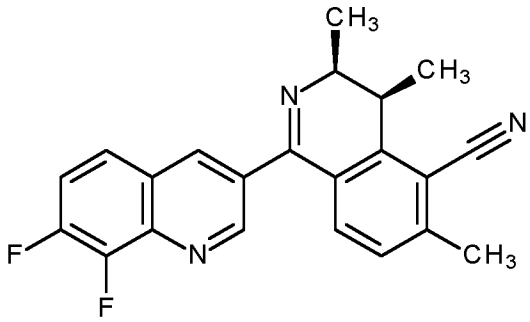
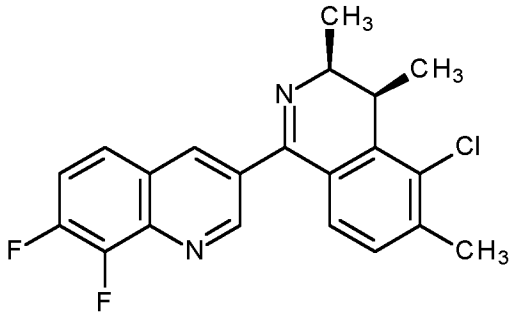
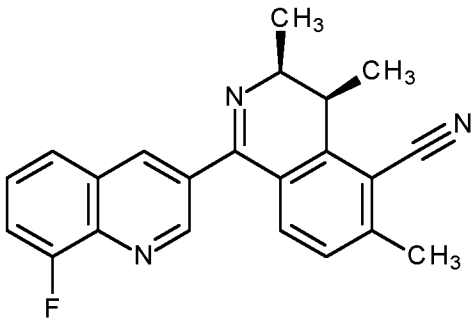


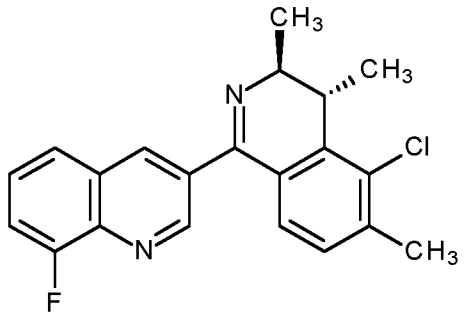
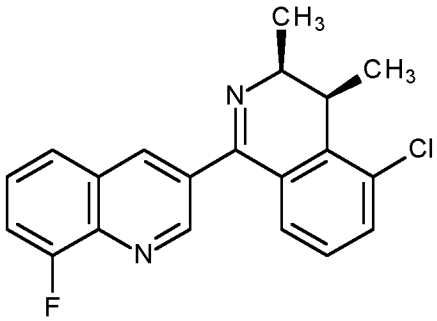
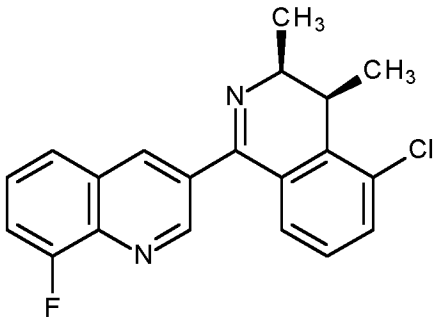
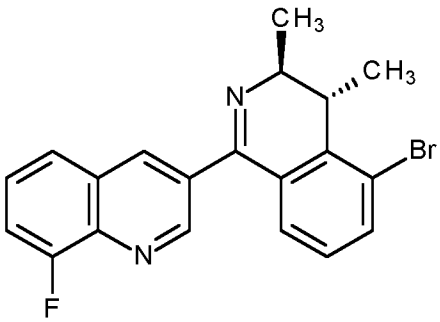
Preferably, component (A) is a compound selected from compound no. E.01, E.02, E.03, E.04, E.05, E.06, E.07, E.08, E.09, E.10, E.11, E.12, E.13, E.14, E.15, E.16, or E.17 as defined in the Table E below. More preferably, component (A) is a compound selected from compound no. E.05, E.06, and E.08 as defined in the Table E below.

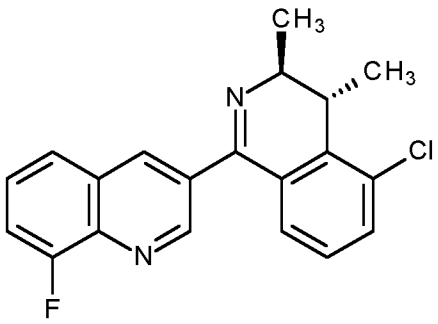
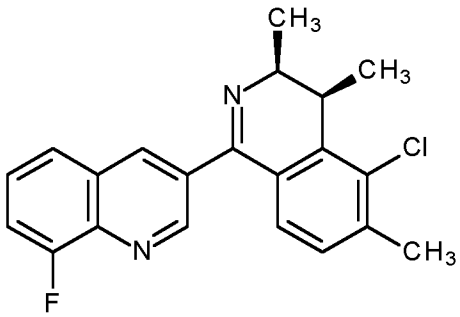
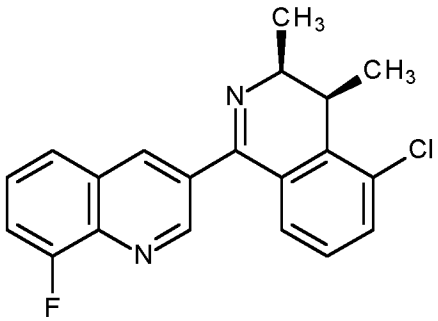
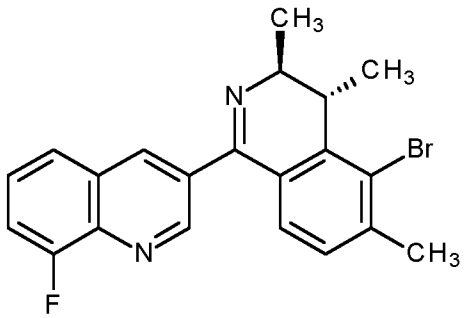
Table E

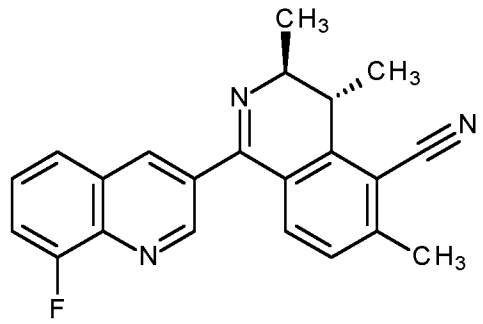
Compound number	Compound structure

E.01	 (racemic)
E.02	 (enantiomer 1 of 2)
E.03	 (enantiomer 2 of 2)
E.04	 (enantiomer 1 of 2)

E.05	 (enantiomer 2 of 2)
E.06	 (racemic)
E.07	 (racemic)
E.08	 (racemic)

E.09	 (racemic)
E.10	 (enantiomer 1 of 2)
E.11	 (enantiomer 2 of 2)
E.12	 (racemic)

E.13	 (racemic)
E.14	 (racemic)
E.15	 (racemic)
E.16	 (racemic)

E.17	 (racemic)

Preferably, component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin.

More preferably, component (B) is a compound selected from the group consisting of florylpicoxamid, prothioconazole, fenpropidin, azoxystrobin, cyprodinil, folpet, pydiflumetofen.

In certain embodiments of the invention, component (B) is difenoconazole.
In certain embodiments of the invention, component (B) is mefentrifluconazole.
In certain embodiments of the invention, component (B) is prothioconazole.
In certain embodiments of the invention, component (B) is metconazole.
In certain embodiments of the invention, component (B) is folpet.
In certain embodiments of the invention, component (B) is pydiflumetofen.
In certain embodiments of the invention, component (B) is isoflucypram.
In certain embodiments of the invention, component (B) is benzovindiflupyr.
In certain embodiments of the invention, component (B) is fluxapyroxad.
In certain embodiments of the invention, component (B) is metyltetraprole.
In certain embodiments of the invention, component (B) is azoxystrobin.
In certain embodiments of the invention, component (B) is cyprodinil.
In certain embodiments of the invention, component (B) is florylpicoxamid.
In certain embodiments of the invention, component (B) is fenpropidin.

The component (B) compounds are referred to herein and above by a so-called "ISO common name" or another "common name" being used in individual cases or a trademark name. The component (B) compounds are known and are commercially available and/or can be prepared using procedures known in the art and/or procedures reported in the literature.

In a preferred composition according to the invention component (A) is compound no. E.01 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen,

isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 15:1 to 1:30.

In a preferred composition according to the invention component (A) is compound no. E.02 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 15:1 to 1:30.

In a preferred composition according to the invention component (A) is compound no. E.03 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 15:1 to 1:30.

In a preferred composition according to the invention component (A) is compound no. E.04 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 15:1 to 1:30.

In a preferred composition according to the invention component (A) is compound no. E.05 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 15:1 to 1:30.

In a preferred composition according to the invention component (A) is compound no. E.06 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 15:1 to 1:30.

In a preferred composition according to the invention component (A) is compound no. E.07 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 15:1 to 1:30.

In a preferred composition according to the invention component (A) is compound no. E.08 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 15:1 to 1:30.

In a preferred composition according to the invention component (A) is compound no. E.09 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 15:1 to 1:30.

In a preferred composition according to the invention component (A) is compound no. E.10 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 15:1 to 1:30.

In a preferred composition according to the invention component (A) is compound no. E.11 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 15:1 to 1:30.

In a preferred composition according to the invention component (A) is compound no. E.12 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 15:1 to 1:30.

In a preferred composition according to the invention component (A) is compound no. E.13 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 15:1 to 1:30.

In a preferred composition according to the invention component (A) is compound no. E.14 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen,

isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 15:1 to 1:30.

In a preferred composition according to the invention component (A) is compound no. E.15 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 15:1 to 1:30.

In a preferred composition according to the invention component (A) is compound no. E.16 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 15:1 to 1:30.

In a preferred composition according to the invention component (A) is compound no. E.17 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 15:1 to 1:30.

In a preferred composition according to the invention component (A) is compound no. E.01 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 10:1 to 1:10 (or even more preferably, 5:1 to 1:5).

In a preferred composition according to the invention component (A) is compound no. E.02 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 10:1 to 1:10 (or even more preferably, 5:1 to 1:5).

In a preferred composition according to the invention component (A) is compound no. E.03 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid,

fenpropidin, wherein the weight ratio of component (A) to component (B) is from 10:1 to 1:10 (or even more preferably, 5:1 to 1:5).

In a preferred composition according to the invention component (A) is compound no. E.04 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 10:1 to 1:10 (or even more preferably, 5:1 to 1:5).

In a preferred composition according to the invention component (A) is compound no. E.05 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 10:1 to 1:10 (or even more preferably, 5:1 to 1:5).

In a preferred composition according to the invention component (A) is compound no. E.06 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 10:1 to 1:10 (or even more preferably, 5:1 to 1:5).

In a preferred composition according to the invention component (A) is compound no. E.07 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 10:1 to 1:10 (or even more preferably, 5:1 to 1:5).

In a preferred composition according to the invention component (A) is compound no. E.08 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 10:1 to 1:10 (or even more preferably, 5:1 to 1:5).

In a preferred composition according to the invention component (A) is compound no. E.09 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting

of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 10:1 to 1:10 (or even more preferably, 5:1 to 1:5).

In a preferred composition according to the invention component (A) is compound no. E.10 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 10:1 to 1:10 (or even more preferably, 5:1 to 1:5).

In a preferred composition according to the invention component (A) is compound no. E.11 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 10:1 to 1:10 (or even more preferably, 5:1 to 1:5).

In a preferred composition according to the invention component (A) is compound no. E.12 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 10:1 to 1:10 (or even more preferably, 5:1 to 1:5).

In a preferred composition according to the invention component (A) is compound no. E.13 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 10:1 to 1:10 (or even more preferably, 5:1 to 1:5).

In a preferred composition according to the invention component (A) is compound no. E.14 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 10:1 to 1:10 (or even more preferably, 5:1 to 1:5).

In a preferred composition according to the invention component (A) is compound no. E.15 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 10:1 to 1:10 (or even more preferably, 5:1 to 1:5).

In a preferred composition according to the invention component (A) is compound no. E.16 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 10:1 to 1:10 (or even more preferably, 5:1 to 1:5).

In a preferred composition according to the invention component (A) is compound no. E.17 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is from 10:1 to 1:10 (or even more preferably, 5:1 to 1:5).

In a preferred composition according to the invention component (A) is compound no. E.01 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is 2:1 to 1:2.

In a preferred composition according to the invention component (A) is compound no. E.02 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is 2:1 to 1:2.

In a preferred composition according to the invention component (A) is compound no. E.03 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is 2:1 to 1:2.

In a preferred composition according to the invention component (A) is compound no. E.04 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is 2:1 to 1:2.

In a preferred composition according to the invention component (A) is compound no. E.05 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is 2:1 to 1:2.

In a preferred composition according to the invention component (A) is compound no. E.06 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is 2:1 to 1:2.

In a preferred composition according to the invention component (A) is compound no. E.07 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is 2:1 to 1:2.

In a preferred composition according to the invention component (A) is compound no. E.08 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is 2:1 to 1:2.

In a preferred composition according to the invention component (A) is compound no. E.09 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is 2:1 to 1:2.

In a preferred composition according to the invention component (A) is compound no. E.10 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen,

isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is 2:1 to 1:2.

In a preferred composition according to the invention component (A) is compound no. E.11 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is 2:1 to 1:2.

In a preferred composition according to the invention component (A) is compound no. E.12 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is 2:1 to 1:2.

In a preferred composition according to the invention component (A) is compound no. E.13 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is 2:1 to 1:2.

In a preferred composition according to the invention component (A) is compound no. E.14 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is 2:1 to 1:2.

In a preferred composition according to the invention component (A) is compound no. E.15 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is 2:1 to 1:2.

In a preferred composition according to the invention component (A) is compound no. E.16 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is 2:1 to 1:2.

In a preferred composition according to the invention component (A) is compound no. E.17 or a salt, tautomer or N-oxide thereof, and component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, wherein the weight ratio of component (A) to component (B) is 2:1 to 1:2.

In certain embodiments of the present disclosure, component (B) is cyflufenamid.

In certain embodiments of the present disclosure, component (B) is disodium phosphonate.

In certain embodiments of the present disclosure, component (B) is Aureobasidin A.

In certain embodiments of the present disclosure, component (B) is Jawsamycin.

The term “fungicide” as used herein means a compound that controls, modifies, or prevents the growth of fungi. The term “fungicidally effective amount” means the quantity of such a compound or combination of such compounds that is capable of producing an effect on the growth of fungi. Controlling or modifying effects include all deviation from natural development, such as killing, retardation and the like, and prevention includes barrier or other defensive formation in or on a plant to prevent fungal infection.

The term “plants” refers to all physical parts of a plant, including seeds, seedlings, saplings, roots, tubers, stems, stalks, foliage, and fruits.

The term "plant propagation material” denotes all generative parts of a plant, for example seeds or vegetative parts of plants such as cuttings and tubers. It includes seeds in the strict sense, as well as roots, fruits, tubers, bulbs, rhizomes, and parts of plants.

The term “locus” as used herein means fields in or on which plants are growing, or where seeds of cultivated plants are sown, or where seed will be placed into the soil. It includes soil, seeds, and seedlings, as well as established vegetation.

Throughout this document the expression “composition” stands for the various mixtures or combinations of components (A) and (B) (including the above-defined embodiments), for example in a single “ready-mix” form, in a combined spray mixture composed from separate formulations of the single active ingredient components, such as a “tank-mix”, and in a combined use of the single active ingredients when applied in a sequential manner, i.e. one after the other with a reasonably short period, such as a few hours or days. The order of applying the components (A) and (B) is not essential for working the present invention.

The composition according to the invention is effective against harmful microorganisms, such as microorganisms, that cause phytopathogenic diseases, in particular against phytopathogenic fungi and bacteria.

The composition of the invention may be used to control plant diseases caused by a broad spectrum of fungal plant pathogens in the Basidiomycete, Ascomycete, Oomycete and/or Deuteromycete, Blasocladiomycete, Chrytidiomycete, Glomeromycete and/or Mucoromycete classes.

The composition is effective in controlling a broad spectrum of plant diseases, such as foliar pathogens of ornamental, turf, vegetable, field, cereal, and fruit crops.

These pathogens may include:

Oomycetes, including Phytophthora diseases such as those caused by *Phytophthora capsici*, *Phytophthora infestans*, *Phytophthora sojae*, *Phytophthora fragariae*, *Phytophthora nicotianae*, *Phytophthora cinnamomi*, *Phytophthora citricola*, *Phytophthora citrophthora* and *Phytophthora erythroseptica*; Pythium diseases such as those caused by *Pythium aphanidermatum*, *Pythium arrhenomanes, Pythium graminicola, Pythium irregulare* and *Pythium ultimum*; diseases caused by Peronosporales such as *Peronospora destructor*, *Peronospora parasitica*, *Plasmopara viticola, Plasmopara halstedii, Pseudoperonospora cubensis*, *Albugo candida*, *Sclerophthora macrospora* and *Bremia lactucae*; and others such as *Aphanomyces cochlioides*, *Labyrinthula zosterae*, *Peronosclerospora sorghi* and *Sclerospora graminicola*;

Ascomycetes, including blotch, spot, blast or blight diseases and/or rots for example those caused by Pleosporales such as *Stemphylium solani*, *Stagonospora tainanensis*, *Spilocaea oleaginea*, *Setosphaeria turcica*, *Pyrenochaeta lycoperisici*, *Pleospora herbarum*, *Phoma destructiva*, *Phaeosphaeria herpotrichoides*, *Phaeocryptocus gaeumannii*, *Ophiosphaerella graminicola*, *Ophiobolus graminis*, *Leptosphaeria maculans*, *Hendersonia creberrima*, *Helminthosporium triticirepentis*, *Setosphaeria turcica*, *Drechslera glycines*, *Didymella bryoniae*, *Cycloconium oleagineum*, *Cochliobolus sativus*, *Bipolaris cactivora*, *Venturia inaequalis*, *Pyrenophora teres*, *Pyrenophora tritici-repentis*, *Alternaria alternata*, *Alternaria brassicicola*, *Alternaria solani* and *Alternaria tomatophila*, Capnodiales such as *Septoria tritici*, *Septoria nodorum*, *Cercospora arachidicola*, *Cercosporella capsellae* and *Cercosporella herpotrichoides*, *Cladosporium carpophilum*, *Cladosporium effusum*, *Passalora fulva*, *Cladosporium oxysporum*, *Dothistroma septosporum*, *Isariopsis clavispora*, *Mycosphaerella graminicola*, *Mycovellosiella koepkeii, Phaeoisariopsis bataticola*, *Pseudocercospora vitis*, *Pseudocercosporella herpotrichoides*, *Ramularia beticola*, *Ramularia collo-cygni*, Magnaporthales such as *Gaeumannomyces graminis*, *Magnaporthe grisea*, *Pyricularia oryzae,* Diaporthales such as *Anisogramma anomala*, *Apiognomonia errabunda*, *Cytospora platani*, *Diaporthe phaseolorum*, *Discula destructiva*, *Gnomonia fructicola*, *Greeneria uvicola*, *Melanconium juglandinum*, *Phomopsis viticola*, *Sirococcus clavigignenti-juglandacearum*, *Tubakia dryina*, *Dicarpella* spp., *Valsa ceratosperma*, and others such as *Actinothyrium graminis*, *Ascochyta pisi*, *Aspergillus flavus*, *Aspergillus fumigatus*, *Aspergillus nidulans*, *Asperisporium caricae*, *Blumeriella jaapii*, *Candida* spp., *Capnodium ramosum*, *Cephaloascus* spp., *Cephalosporium gramineum*, *Ceratocystis paradoxa*, *Chaetomium* spp., *Hymenoscyphus pseudoalbidus*, *Coccidioides* spp., *Cylindrosporium padi*, *Diplocarpon malae*, *Drepanopeziza campestris*, *Elsinoe ampelina*, *Epicoccum nigrum*, *Epidermophyton* spp., *Eutypa lata*, *Geotrichum candidum*, *Gibellina cerealis*, *Gloeocercospora sorghi*, *Gloeodes pomigena*, *Gloeosporium perennans*; *Gloeotinia temulenta*, *Griphospaeria corticola*, *Kabatiella lini*, *Leptographium microsporum*, *Leptosphaerulinia crassiasca*, *Lophodermium seditiosum*, *Marssonina graminicola*, *Microdochium nivale*, *Monilinia fructicola*, *Monographella albescens*, *Monosporascus cannonballus*, *Naemacyclus* spp., *Ophiostoma novo-ulmi*, *Paracoccidioides brasiliensis*, *Penicillium expansum*, *Pestalotia rhododendri*, *Petriellidium* spp., *Pezicula* spp., *Phialophora gregata*, *Phyllachora pomigena*, *Phymatotrichum omnivora*, *Physalospora abdita*, *Plectosporium tabacinum*, *Polyscytalum pustulans*, *Pseudopeziza medicaginis*, *Pyrenopeziza brassicae*, *Ramulispora sorghi*, *Rhabdocline pseudotsugae*,

Rhynchosporium secalis, *Sacrocladium oryzae*, *Scedosporium* spp., *Schizothyrium pomi*, *Sclerotinia minor*; *Sclerotium* spp., *Typhula ishikariensis*, *Seimatosporium mariae*, *Lepteutypa cupressi*, *Septocyta ruborum*, *Sphaceloma perseae*, *Sporonema phacidioides*, *Stigmina palmivora*, *Tapesia yallundae*, *Taphrina bullata*, *Thielviopsis basicola*, *Trichoseptoria fructigena*, *Zygophiala jamaicensis*; powdery mildew diseases for example those caused by Erysiphales such as *Blumeria graminis*, *Erysiphe polygoni*, *Uncinula necator*, *Sphaerotheca fuligena*, *Podosphaera leucotricha*, *Podospaera macularis Golovinomyces cichoracearum*, *Leveillula taurica*, *Microsphaera diffusa*, *Oidiopsis gossypii*, *Phyllactinia guttata* and *Oidium arachidis*; molds for example those caused by Botryosphaeriales such as *Dothiorella aromatica*, *Diplodia seriata*, *Guignardia bidwellii*, *Botrytis cinerea*, *Botryotinia allii*, *Botryotinia fabae*, *Fusicoccum amygdali*, *Lasiodiplodia theobromae*, *Macrophoma theicola*, *Macrophomina phaseolina*, *Phyllosticta cucurbitacearum*; anthracnoses for example those caused by Glommerelales such as *Colletotrichum gloeosporioides*, *Colletotrichum lagenarium*, *Colletotrichum gossypii*, *Glomerella cingulata*, and *Colletotrichum graminicola*; and wilts or blights for example those caused by Hypocreales such as *Acremonium strictum*, *Claviceps purpurea*, *Fusarium culmorum*, *Fusarium graminearum*, *Fusarium virguliforme*, *Fusarium oxysporum*, *Fusarium subglutinans*, *Fusarium oxysporum* f.sp. *cubense*, *Gerlachia nivale*, *Gibberella fujikuroi*, *Gibberella zeae*, *Gliocladium* spp., *Myrothecium verrucaria*, *Nectria ramulariae*, *Trichoderma viride*, *Trichothecium roseum*, and *Verticillium theobromae*;

Basidiomycetes, including smuts for example those caused by Ustilaginales such as *Ustilaginoidea virens*, *Ustilago nuda*, *Ustilago tritici*, *Ustilago zeae*, rusts for example those caused by Pucciniales such as *Cerotelium fici*, *Chrysomyxa arctostaphyli*, *Coleosporium ipomoeae*, *Hemileia vastatrix*, *Puccinia arachidis*, *Puccinia cacabata*, *Puccinia graminis*, *Puccinia recondita*, *Puccinia sorghi*, *Puccinia hordei*, *Puccinia striiformis* f.sp. Hordei, *Puccinia striiformis* f.sp. Secalis, *Pucciniastrum coryli*, or Uredinales such as *Cronartium ribicola*, *Gymnosporangium juniperi-viginianae*, *Melampsora medusae*, *Phakopsora pachyrhizi*, *Phragmidium mucronatum*, *Physopella ampelosidis*, *Tranzschelia discolor* and *Uromyces viciae-fabae*; and other rots and diseases such as those caused by *Cryptococcus* spp., *Exobasidium vexans*, *Marasmiellus inoderma*, *Mycena* spp., *Sphacelotheca reiliana*, *Typhula ishikariensis*, *Urocystis agropyri*, *Itersonilia perplexans*, *Corticium invisum*, *Laetisaria fuciformis*, *Waitea circinata*, *Rhizoctonia solani*, *Thanetephorus cucurmeris*, *Entyloma dahliae*, *Entylomella microspora*, *Neovossia moliniae* and *Tilletia caries*;

Blastocladiomycetes, such as *Physoderma maydis*;

Mucoromycetes, such as *Choanephora cucurbitarum*.; *Mucor* spp.; *Rhizopus arrhizus*;

as well as diseases caused by other species and genera closely related to those listed above.

In addition to their fungicidal activity, the compositions may also have activity against bacteria such as *Erwinia amylovora*, *Erwinia caratovora*, *Xanthomonas campestris, Pseudomonas syringae*, *Strptomyces scabies* and other related species as well as certain protozoa.

The composition according to the invention is particularly effective against phytopathogenic fungi belonging to the following classes: Ascomycetes (e.g. Venturia, Podosphaera, Erysiphe, Monilinia, Mycosphaerella, Uncinula); Basidiomycetes (e.g. the genus Hemileia, Rhizoctonia, Phakopsora, Puccinia, Ustilago, Tilletia); Fungi imperfecti (also known as Deuteromycetes; e.g. Botrytis, Helminthosporium, Rhynchosporium, Fusarium, Septoria, Cercospora, Alternaria, Pyricularia and

Pseudocercosporella); Oomycetes (e.g. Phytophthora, Peronospora, Pseudoperonospora, Albugo, Bremia, Pythium, Pseudosclerospora, Plasmopara).

Crops of useful plants in which the composition according to the invention can be used include perennial and annual crops, such as berry plants for example blackberries, blueberries, cranberries, raspberries and strawberries; cereals for example barley, maize (corn), millet, oats, rice, rye, sorghum triticale and wheat; fibre plants for example cotton, flax, hemp, jute and sisal; field crops for example sugar and fodder beet, coffee, hops, mustard, oilseed rape (canola), poppy, sugar cane, sunflower, tea and tobacco; fruit trees for example apple, apricot, avocado, banana, cherry, citrus, nectarine, peach, pear and plum; grasses for example Bermuda grass, bluegrass, bentgrass, centipede grass, fescue, ryegrass, St. Augustine grass and Zoysia grass; herbs such as basil, borage, chives, coriander, lavender, lovage, mint, oregano, parsley, rosemary, sage and thyme; legumes for example beans, lentils, peas; nuts for example almond, cashew, ground nut, hazelnut, peanut, pecan, pistachio and walnut; palms for example oil palm; ornamentals for example flowers, shrubs and trees; other trees, for example cacao, coconut, olive and rubber; vegetables for example asparagus, aubergine, broccoli, cabbage, carrot, cucumber, garlic, lettuce, marrow, melon, okra, onion, pepper, potato, pumpkin, rhubarb, spinach and tomato; and vines for example grapes.

Crops are to be understood as being those which are naturally occurring, obtained by conventional methods of breeding, or obtained by genetic engineering. They include crops which contain so-called output traits (e.g. improved storage stability, higher nutritional value and improved flavour).

Crops are to be understood as also including those crops which have been rendered tolerant to herbicides like bromoxynil or classes of herbicides such as ALS-, EPSPS-, GS-, HPPD- and PPO-inhibitors. An example of a crop that has been rendered tolerant to imidazolinones, e.g. imazamox, by conventional methods of breeding is Clearfield® summer canola. Examples of crops that have been rendered tolerant to herbicides by genetic engineering methods include e.g. glyphosate- and glufosinate-resistant maize varieties commercially available under the trade names RoundupReady®, Herculex I® and LibertyLink®.

Crops are also to be understood as being those which naturally are or have been rendered resistant to harmful insects. This includes plants transformed by the use of recombinant DNA techniques, for example, to be capable of synthesising one or more selectively acting toxins, such as are known, for example, from toxin-producing bacteria. Examples of toxins which can be expressed include δ-endotoxins, vegetative insecticidal proteins (Vip), insecticidal proteins of bacteria colonising nematodes, and toxins produced by scorpions, arachnids, wasps and fungi.

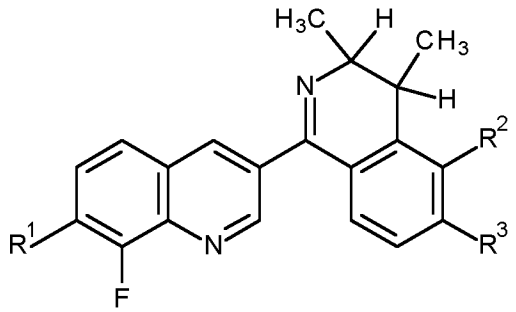
An example of a crop that has been modified to express the *Bacillus thuringiensis* toxin is the Bt maize KnockOut® (Syngenta Seeds). An example of a crop comprising more than one gene that codes for insecticidal resistance and thus expresses more than one toxin is VipCot® (Syngenta Seeds). Crops or seed material thereof can also be resistant to multiple types of pests (so-called stacked transgenic events when created by genetic modification). For example, a plant can have the ability to express an

insecticidal protein while at the same time being herbicide tolerant, for example Herculex I® (Dow AgroSciences, Pioneer Hi-Bred International).

The compounds of Formula (I) (including any one of compounds E.01 to E.17) or fungicidal compositions according to the present invention comprising a compound of Formula (I) may be used in controlling or preventing phytopathogenic diseases, especially phytopathogenic fungi (such as *Mycosphaerella graminicola*) on cereals, in particular, wheat.

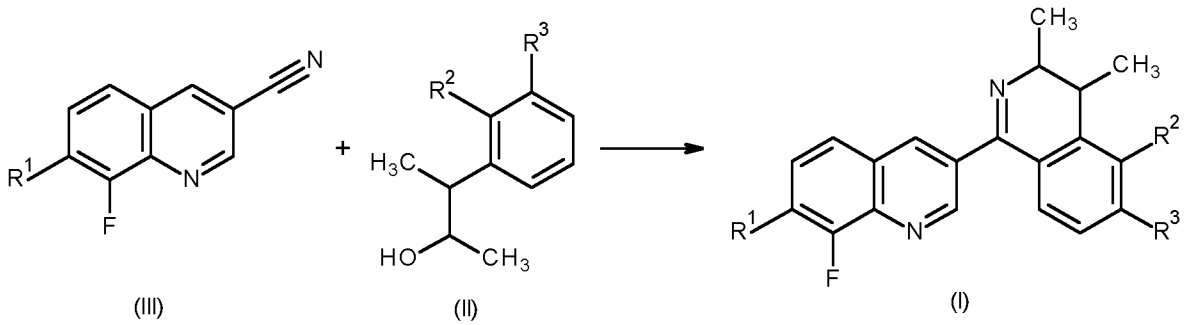
Under certain circumstances, fungicidal compositions according to the present invention comprising a compound of Formula (I) when used in controlling or preventing phytopathogenic diseases, especially phytopathogenic fungi (such as *Mycosphaerella graminicola*) on cereals (in particular wheat), may display a synergistic interaction between the active ingredients.

Compounds of the present invention can be made as shown in the following schemes, in which, unless otherwise stated, the definition of each variable is as defined above for a compound of formula (I).



(I)

As shown in scheme 1, compounds of general formula (I) can be prepared from nitriles of formula (III) and alcohols of formula (II) in the presence of dehydrating agents or Brönsted acids such as sulphuric acid or trifluoromethane sulfonic anhydride, in the presence or absence of an inert solvent at temperatures from -70°C to +50°C.

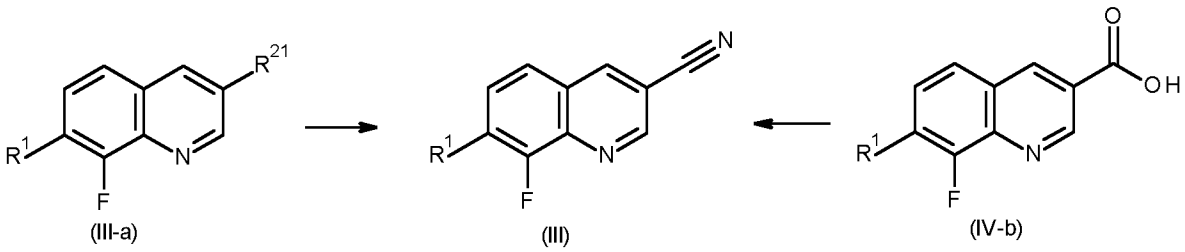


(III) (II) (I)

Scheme 1.

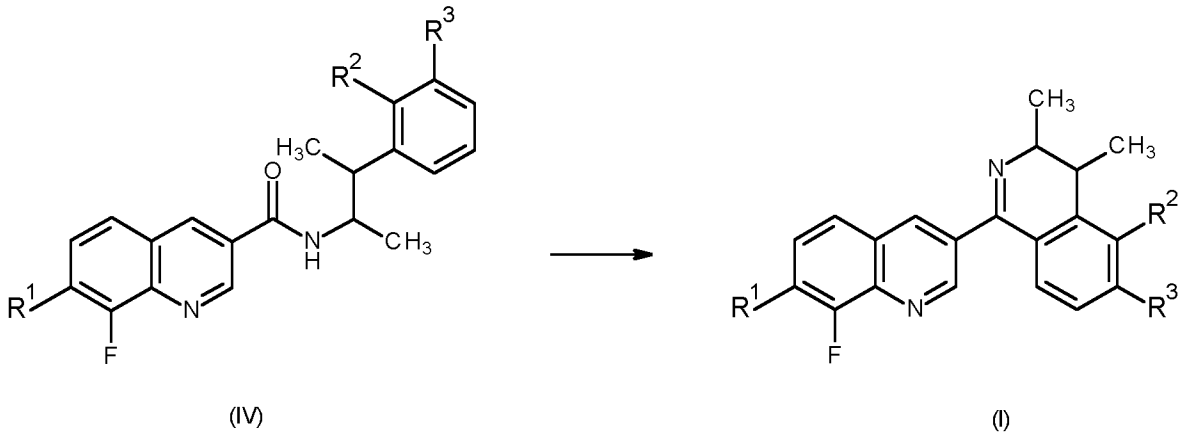
Nitriles of formula (III) can be prepared from compounds of formula (III-a), wherein R_{21} is chloro, bromo or iodo, in the presence of a transition metal catalyst such as a Cu- or Pd-salt stabilized by suitable supporting ligands, and a cyanide source such as KCN, $Zn(CN)_2$ or potassium ferrocyanide, in an inert solvent such as N,N-dimethylacetamide at temperatures between 20°C and 150°C. Representative conditions are described in *Org. Process Res. Dev.* **2014**, p.693–698. Alternatively, nitriles of formula (III)

can be prepared by functional group interconversion from carboxylic acids of formula (IV-b) by methods well known to a person skilled in the art. This is shown in scheme 2.



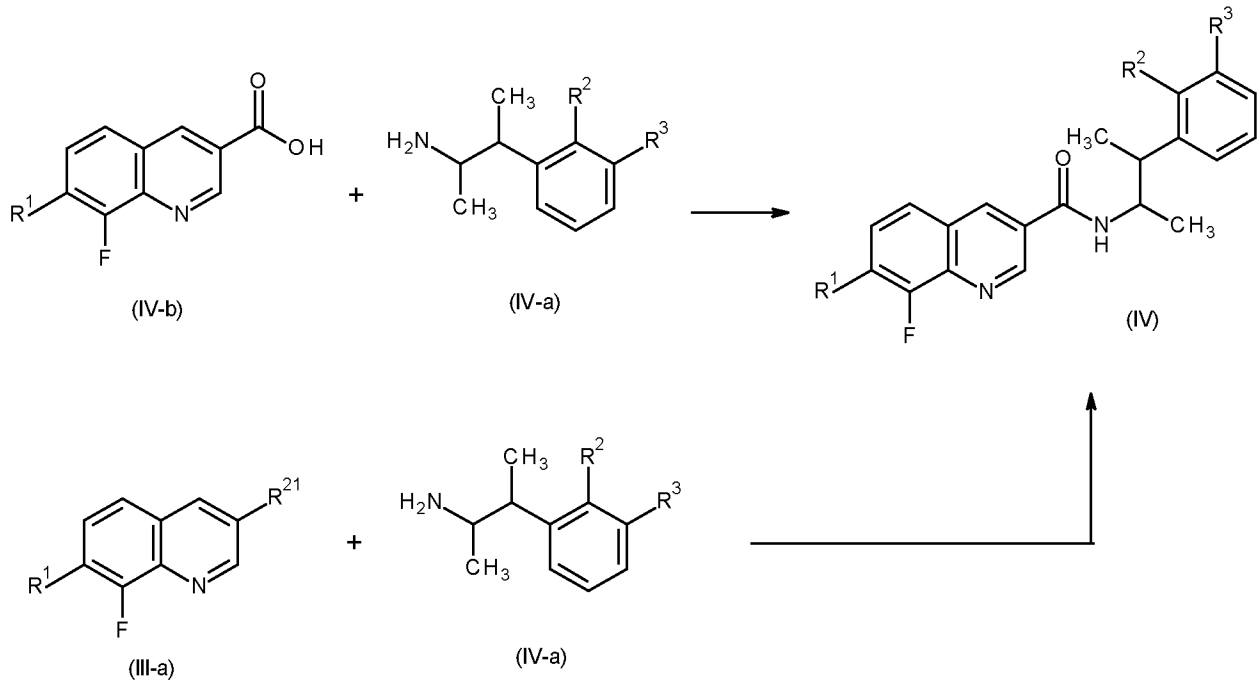
Scheme 2.

Alternatively, compounds of general formula (I) can be prepared from amides of formula (IV) in the presence of a dehydrating agent such as trifluoromethanesulfonic anhydride or chloromethylene(dimethyl)ammonium chloride and a base such as 2,6-lutidine in an inert solvent such as dichloromethane or chlorobenzene at temperatures between -70°C to 150°C. This is shown in scheme 3.



Scheme 3.

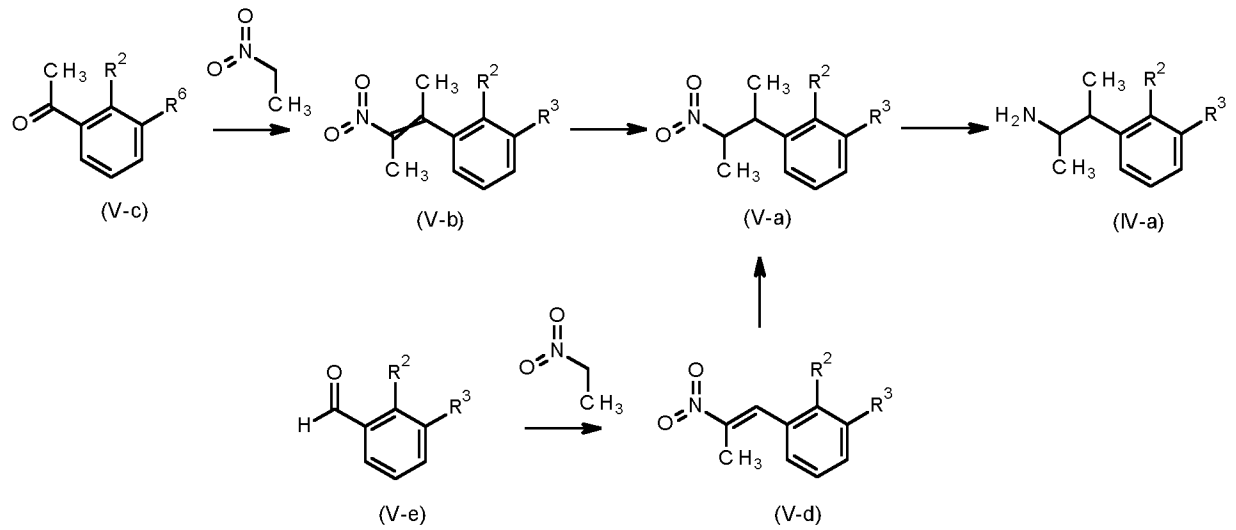
Compounds of formula (IV) can be prepared from carboxylic acids of formula (IV-b) and amines of formula (IV-a) in the presence of a dehydrating agent such as propylphosphonic anhydride or phosgene and a base such as triethylamine in an inert solvent such as toluene. Alternatively, compounds of formula (IV) can be prepared from compounds of formula (III-a), wherein R_{21} is chloro, bromo or iodo, and (IV-a) in the presence of a transition metal salt such as palladium(II)acetate, a phosphine ligand such as 1,1'-bis(diphenylphosphino)-ferrocene and a base such as triethyl amine in a solvent such as toluene under carbon monoxide atmosphere. This is shown in Scheme 4.



Scheme 4.

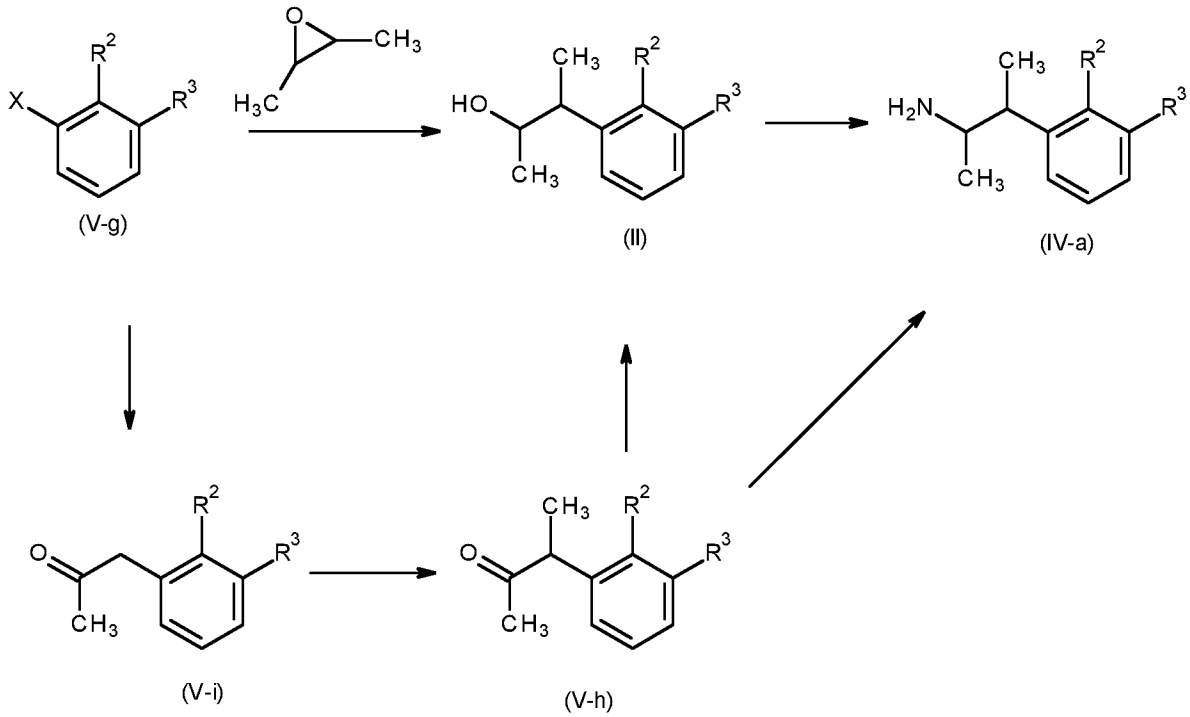
Amines of formula (IV-a) can be prepared by numerous independent methods, a representative but non-exhaustive selection is described below:

I. Amines of formula (IV-a) can be prepared by reduction of nitro compounds of formula (V-a) by treatment with a suitable reducing agent such as $SnCl_2$ or a transition metal catalyst such as Pd black under an atmosphere of H_2. Nitro compounds of formula (V-a) can be prepared from nitro alkenes of formula (V-b) and reducing agent such as NaBH4 in a solvent such as methanol. Nitro alkenes of formula (V-b) can be prepared from nitro ethane and an acetophenone derivative of formula (V-c) in the presence of an amine catalyst such as ammonium acetate. Alternatively, nitro alkanes of formula (V-a) can be prepared from nitro alkenes of formula (V-d) by treatment with a methane derivative such as trimethyl aluminium or methyl magnesium bromide in an inert solvent such as toluene or THF. Nitro alkenes of formula (V-d) can be prepared from nitro ethane and a benzaldehyde derivative of formula (V-e) in the presence of an amine catalyst such as ammonium acetate. A person skilled in the art will recognize that nitro alkanes of formula (V-a) contain two stereogenic centers which lead to 4 possible stereoisomers. The stereoselective transformation of nitroalkenes of formula (V-b) and (V-d) to nitroalkanes of formula (V-a) is possible with some exemplary conditions described in *Org. Lett.* **2004**, p. 2829–2832, *Org. Lett.* **2009**, p.4196–4198 and *Chem. Commun.* **2014**, p.8878-8881. This is shown in scheme 5.



Scheme 5.

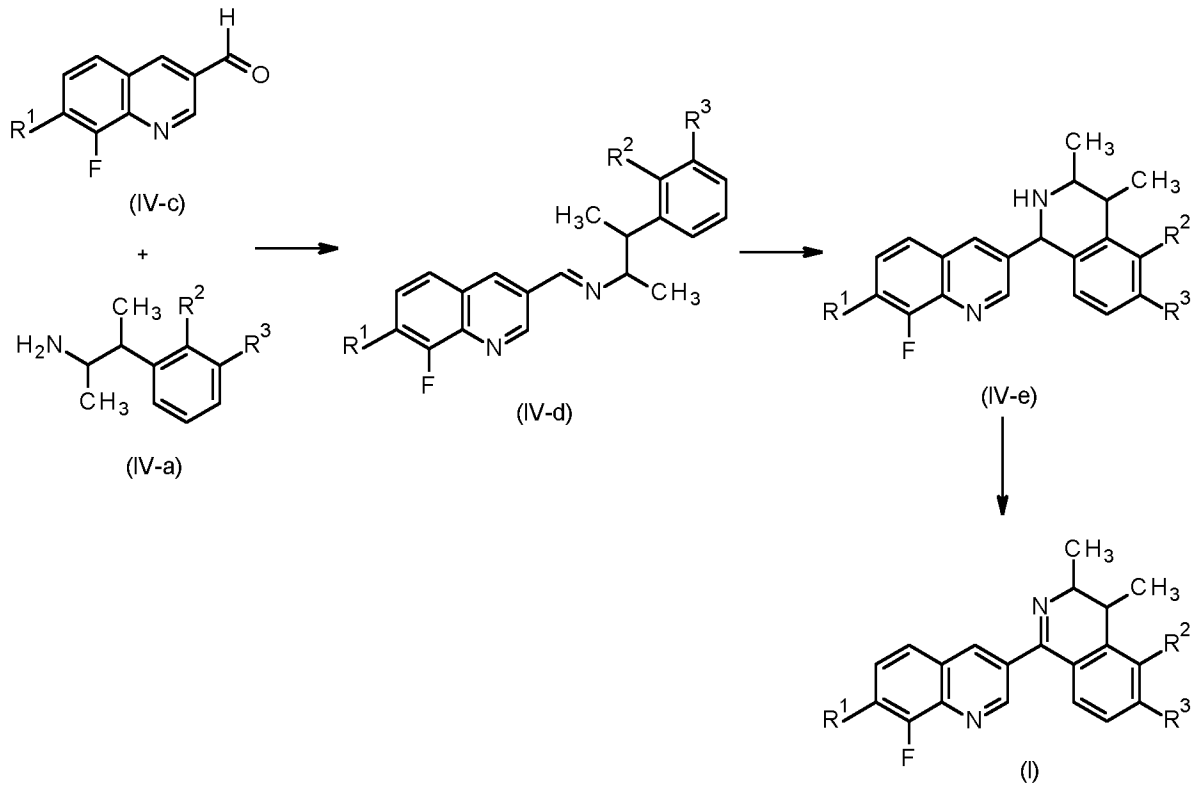
II. Amines of formula (IV-a) can be prepared from alcohols of formula (II) by functional group interconversions as described in *Chem. Rev.* **2009**, p.2551–2651. Alcohols of formula (II) can be prepared from 2,3-epoxybutane and aryl halides of formula (V-g), wherein X is bromo or iodo, in the presence of a reducing agent such as isopropyl magnesium chloride and copper salt such as CuI, in an inert solvent such as THF or toluene. Alternatively, alcohols of formula (II) can be prepared from ketones of formula (V-h) by reduction using a borohydride reagent such as L-selectride in an inert solvent such as THF. Ketones of formula (V-h) can be prepared from aryl acetone derivatives of formula (V-i) in the presence of a methylating agent such methyl iodide and a base such as sodium tertbutoxide. Alternatively, amines of formula (IV-a) can be prepared from ketones of formula (V-h) by treatment with ammonia, or a surrogate thereof, and a reducing agent such as sodium cyano borohydride. A person skilled in the art will recognize that alcohols of formula (II) and amines of formula (IV-a) contain two stereogenic centers, which lead to 4 possible stereoisomers. The person skilled in the art will also recognize that certain stereoisomers can be selectively prepared by choosing a single stereoisomer of 2,3-epoxybutane for the epoxide opening or appropriate choice of reducing agent and reaction conditions in the reductive amination and ketone reduction, some exemplary conditions being described in *Synthesis* **2019**; p. 2667-2677 and *J. Org. Chem.* **2015**, p. 8134–8141. This is shown in scheme 6.



Scheme 6.

The preparation of compounds of aryl halides of formula (V-g) and aryl acetone derivatives of formula (V-i) from commercially available building blocks is well precedented in the scientific literature and the corresponding methods are well known to a person skilled in the art.

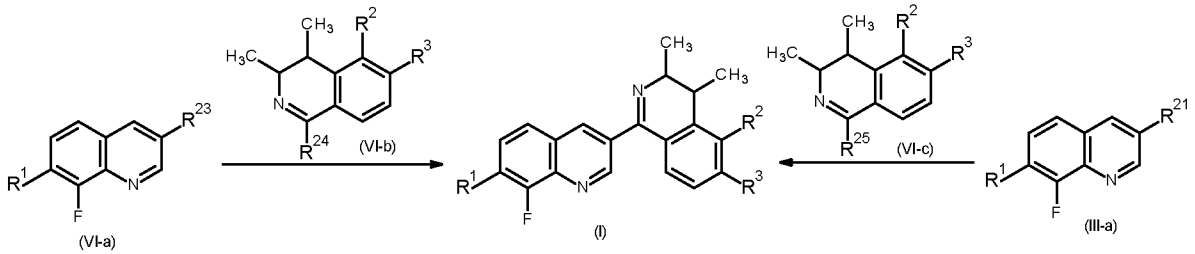
Alternatively, compounds of formula (I) can be prepared from aldehydes of formula (IV-c) and amines of formula (IV-a) in the presence of a dehydrating agent such as $MgSO_4$ and an optional Lewis or Brönsted acid catalyst, followed by oxidation of intermediates amines of formula (V-e) with oxidizing agents such as MnO_2 or NaOCl. This is shown in scheme 7.



Scheme 7.

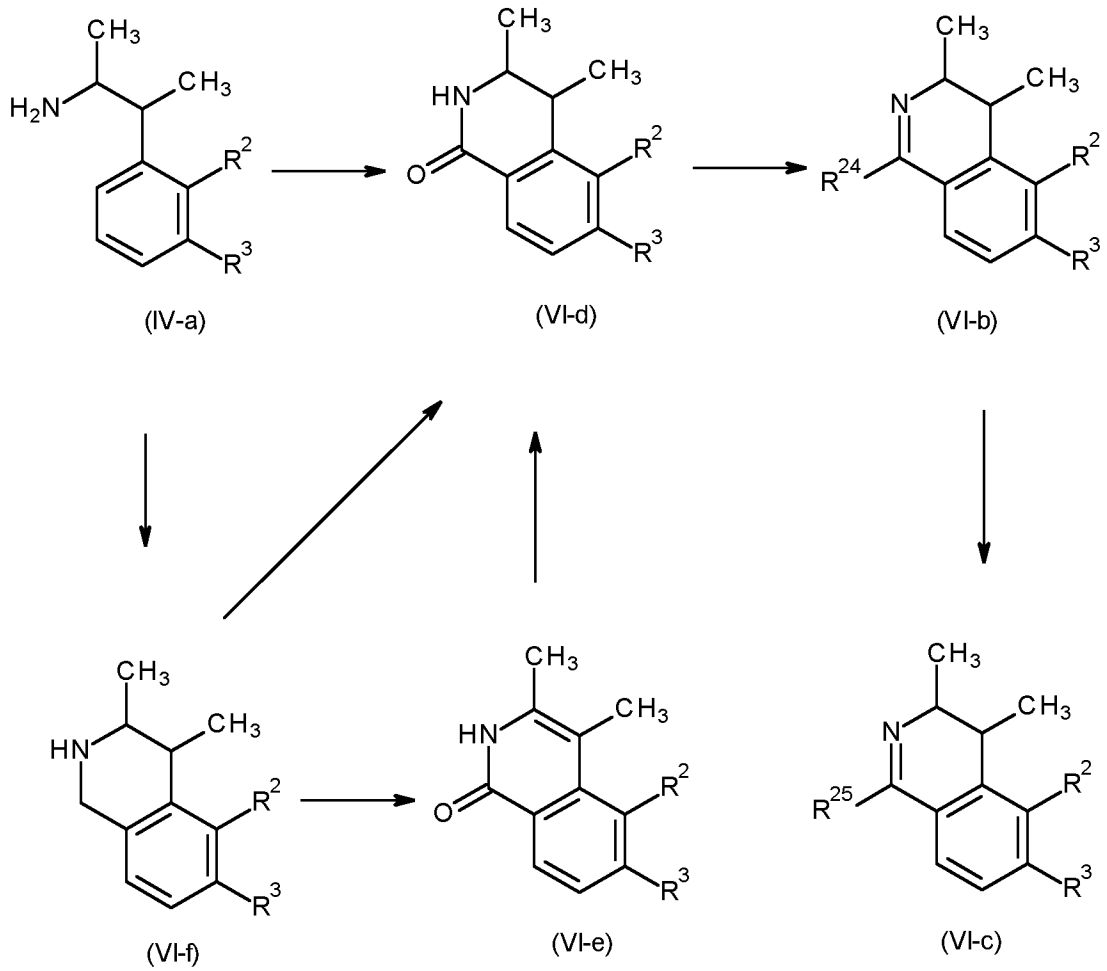
Alternatively, compounds of general formula (I) can be prepared from compounds of formula (VI-a), wherein R^{23} is -$B(OH)_2$, -$B(OC(CH_3)_2C(CH_3)_2O)$, -$Sn(C_1$-C_4alkyl$)_3$, -SO_2Na, -MgBr, -ZnBr or -Zn(pivalate), and compounds of formula (VI-b), wherein R_{24} is chloro, bromo, iodo or -OSO_2CF_3, in the presence of a transition metal salt such as palladium(II)acetate or $NiCl_2$, a phosphine ligand such as 1,1′-Bis(di-*tert*-butylphosphino)ferrocene and a base such as K_3PO_4 in a solvent such as THF or *N*,*N*-dimethylformamide at temperatures between -20°C and 150°C.

Alternatively, compounds of general formula (I) can be prepared from compounds of formula (III-a), wherein R^{21} chloro, bromo or iodo, and compounds formula (VI-c), wherein R^{25} is -$B(OH)_2$, -$Sn(C_1$-C_4alkyl$)_3$, -CO_2H or -SO_2Na, in the presence of a transition metal salt such as palladium(II)acetate or $NiCl_2$, a phosphine ligand such as 1,1′-bis(di-tert-butylphosphino)ferrocene, additional catalytically additives such as CuI and a base such as K_3PO_4 in a solvent such as THF or *N*,*N*-dimethylformamide at temperatures between -20°C and 150°C. This is shown in scheme 8.



Scheme 8.

Compounds of formula (VI-b), wherein R_{24} is chloro, bromo, iodo or $-OSO_2CF_3$, can be prepared from compounds of formula (VI-d) by treatment with an appropriate dehydrating agent such as chloromethylene(dimethyl)ammonium chloride or trifluoromethanesulfonic anhydride in an inert solvent such as toluene or DCM. Compounds of formula (VI-d) can be obtained from compounds of formula (IV-a) in the presence of palladium(II)acetate and benzoquinone as described in *Organometallics* **2013**, p. 649−659. Alternatively, compounds of formula (VI-d) can be obtained from compounds of formula (VI-e) by catalytic hydrogenation in the presence of a suitably supported transition metal catalyst. Alternatively, compounds of formula (VI-d) can be prepared from compounds of formula (IV-a) by treatment with formaldehyde or an equivalent thereof, and a Lewis or Brönsted acid to form tetrahydroisoquinolines of formula (VI-f). Compounds of formula (VI-f) can then be oxidized to compounds of formula (VI-d) in the presence oxidizing agents such as of sodium chlorite or sodium hypochloride. This is shown in scheme 9.



Scheme 9

Alternatively, compounds of formula (I) can be obtained by transformation of another, closely related, compound of formula (I) (or analogue thereof) using standard synthesis techniques known to the

person skilled in the art. Non-exhaustive examples include oxidation reactions, oxygenation reactions, reduction reactions, hydrogenation reactions, hydrolysis reactions, coupling reactions, aromatic nucleophilic or electrophilic substitution reactions, nucleophilic substitution reactions, deoxyfluorination reactions, alkylation reactions, radical additions, nucleophilic addition reactions, condensation and halogenation reactions.

Certain intermediates described in the above schemes and detailed in figures 1 to 5 are novel and as such form a further aspect of the invention.

Compositions of this invention, including all of the above disclosed embodiments and preferred examples thereof, can be mixed with one or more further pesticides including further fungicides, insecticides, nematocides, bactericides, acaricides, growth regulators, chemosterilants, semiochemicals, repellents, attractants, pheromones, feeding stimulants or other biologically active compounds to form a multi-component pesticide giving an even broader spectrum of agricultural protection.

Examples of such agricultural protectants with which the compositions of this invention may be formulated are:

Examples of suitable additional active ingredients also include the following: a compound selected from the group of substances consisting of petroleum oils, 1,1-bis(4-chlorophenyl)-2-ethoxyethanol, 2,4-dichlorophenyl benzenesulfonate, 2-fluoro-N-methyl-N-1-naphthylacetamide, 4-chlorophenyl phenyl sulfone, acetoprole, aldoxycarb, amidithion, amidothioate, amiton, amiton hydrogen oxalate, amitraz, aramite, arsenous oxide, azobenzene, azothoate, benomyl, benoxafos, benzyl benzoate, bixafen, brofenvalerate, bromo-cyclen, bromophos, bromopropylate, buprofezin, butocarboxim, butoxycarboxim, butylpyridaben, calcium polysulfide, camphechlor, carbanolate, carbophenothion, cymiazole, chino-methionat, chlorbenside, chlordimeform, chlordimeform hydrochloride, chlorfenethol, chlorfenson, chlorfensulfide, chlorobenzilate, chloromebuform, chloromethiuron, chloropropylate, chlorthiophos, cinerin I, cinerin II, cinerins, closantel, coumaphos, crotamiton, crotoxyphos, cufraneb, cyanthoate, DCPM, DDT, demephion, demephion-O, demephion-S, demeton-methyl, demeton-O, demeton-O-methyl, demeton-S, demeton-S-methyl, demeton-S-methylsulfon, dichlofluanid, dichlorvos, dicliphos, dienochlor, dimefox, dinex, dinex-diclexine, dinocap-4, dinocap-6, dinocton, dinopenton, dinosulfon, dinoterbon, dioxathion, diphenyl sulfone, disulfiram, DNOC, dofenapyn, doramectin, endothion, eprinomectin, ethoate-methyl, etrimfos, fenazaflor, fenbutatin oxide, fenothiocarb, fenpyrad, fen-pyroximate, fenpyrazamine, fenson, fentrifanil, flubenzimine, flucycloxuron, fluenetil, fluorbenside, FMC 1137, formetanate, formetanate hydrochloride, formparanate, gamma-HCH, glyodin, halfenprox, hexadecyl cyclopropanecarboxylate, isocarbophos, jasmolin I, jasmolin II, jodfenphos, lindane, malonoben, mecarbam, mephosfolan, mesulfen, methacrifos, methyl

bromide, metolcarb, mexacarbate, milbemycin oxime, mipafox, monocrotophos, morphothion, moxidectin, naled, 4-chloro-2-(2-chloro-2-methyl-propyl)-5-[(6-iodo-3-pyridyl)methoxy]pyridazin-3-one, nifluridide, nikkomycins, nitrilacarb, nitrilacarb 1:1 zinc chloride complex, omethoate, oxydeprofos, oxydisulfoton, pp'-DDT, parathion, permethrin, phenkapton, phosalone, phosfolan, phosphamidon, polychloroterpenes, polynactins, proclonol, promacyl, propoxur, prothidathion, prothoate, pyrethrin I, pyrethrin II, pyrethrins, pyridaphenthion, pyrimitate, quinalphos, quintiofos, R-1492, phosglycin, rotenone, schradan, sebufos, selamectin, sophamide, SSI-121, sulfiram, sulfluramid, sulfotep, sulfur, diflovidazin, tau-fluvalinate, TEPP, terbam, tetradifon, tetrasul, thiafenox, thiocarboxime, thiofanox, thiometon, thioquinox, thuringiensin, triamiphos, triarathene, triazophos, triazuron, trifenofos, trinactin, vamidothion, vaniliprole, bethoxazin, copper dioctanoate, copper sulfate, cybutryne, dichlone, dichlorophen, endothal, fentin, hydrated lime, nabam, quinoclamine, quinonamid, simazine, triphenyltin acetate, triphenyltin hydroxide, crufomate, piperazine, thiophanate, chloralose, fenthion, pyridin-4-amine, strychnine, 1-hydroxy-1H-pyridine-2-thione, 4-(quinoxalin-2-ylamino)benzenesulfonamide, 8-hydroxyquinoline sulfate, bronopol, copper hydroxide, cresol, dipyrithione, dodicin, fenaminosulf, formaldehyde, hydrargaphen, kasugamycin, kasugamycin hydrochloride hydrate, nickel bis(dimethyldithiocarbamate), nitrapyrin, octhilinone, oxolinic acid, oxytetracycline, potassium hydroxyquinoline sulfate, probenazole, streptomycin, streptomycin sesquisulfate, tecloftalam, thiomersal, Adoxophyes orana GV,
Agrobacterium radiobacter, Amblyseius spp., Anagrapha falcifera NPV, Anagrus atomus, Aphelinus ab dominalis, Aphidius colemani, Aphidoletes aphidimyza, Autographa californica NPV,
Bacillus sphaericus Neide, Beauveria brongniartii, Chrysoperla carnea, Cryptolaemus montrouzieri, Cydia pomonella GV, Dacnusa sibirica, Diglyphus isaea, Encarsia formosa, Eretmocerus eremicus, Heterorhabditis bacteriophora and H. megidis, Hippodamia convergens, Leptomastix dactylopii, Macrolophus caliginosus, Mamestra brassicae NPV, Metaphycus helvolus, Metarhizium anisopliae var. acridum, Metarhizium anisopliae var. anisopliae, Neodiprion sertifer NPV and N. lecontei NPV, Orius spp., Paecilomyces fumosoroseus, Phytoseiulus persimilis, Steinernema bibionis, Steinernema carpocapsae, Steinernema feltiae, Steinernema glaseri, Steinernema riobrave, Steinernema riobravis, Steinernema scapterisci, Steinernema spp., Trichogramma spp., Typhlodromus occidentalis, Verticillium lecanii, apholate, bisazir, busulfan, dimatif, hemel, hempa, metepa, methiotepa, methyl apholate, morzid, penfluron, tepa, thiohempa, thiotepa, tretamine, uredepa, (E)-dec-5-en-1-yl acetate with (E)-dec-5-en-1-ol, (E)-tridec-4-en-1-yl acetate, (E)-6-methylhept-2-en-4-ol, (E,Z)-tetradeca-4,10-dien-1-yl acetate, (Z)-dodec-7-en-1-yl acetate, (Z)-hexadec-11-enal, (Z)-hexadec-11-en-1-yl acetate, (Z)-hexadec-13-en-11-yn-1-yl acetate, (Z)-icos-13-en-10-one, (Z)-tetradec-7-en-1-al, (Z)-tetradec-9-en-1-ol, (Z)-tetradec-9-en-1-yl acetate, (7E,9Z)-dodeca-7,9-dien-1-yl acetate, (9Z,11E)-tetradeca-9,11-dien-1-yl acetate, (9Z,12E)-tetradeca-9,12-dien-1-yl acetate, 14-methyloctadec-1-ene, 4-methylnonan-5-ol with 4-methylnonan-5-one, alpha-multistriatin, brevicomin, codlelure, codlemone, cuelure, disparlure, dodec-8-en-1-yl acetate, dodec-9-en-1-yl acetate, dodeca-8, 10-dien-1-yl acetate, dominicalure, ethyl 4-

methyloctanoate,
eugenol, frontalin, grandlure, grandlure I, grandlure II, grandlure III, grandlure IV, hexalure, ipsdienol, ipsenol, japonilure, lineatin, litlure, looplure, medlure, megatomoic acid, methyl eugenol, muscalure, octadeca-2,13-dien-1-yl acetate, octadeca-3,13-dien-1-yl acetate, orfralure, oryctalure, ostramone, siglure, sordidin, sulcatol, tetradec-11-en-1-yl acetate, trimedlure, trimedlure A, trimedlure B_1, trimedlure B_2, trimedlure C, trunc-call, 2-(octylthio)-ethanol, butopyronoxyl, butoxy(polypropylene glycol), dibutyl adipate, dibutyl phthalate, dibutyl succinate, diethyltoluamide, dimethyl carbate, dimethyl phthalate, ethyl hexanediol, hexamide, methoquin-butyl, methylneodecanamide, oxamate, picaridin, 1-dichloro-1-nitroethane, 1,1-dichloro-2,2-bis(4-ethylphenyl)ethane, 1,2-dichloropropane with 1,3-dichloropropene, 1-bromo-2-chloroethane, 2,2,2-trichloro-1-(3,4-dichlorophenyl)ethyl acetate, 2,2-dichlorovinyl 2-ethylsulfinylethyl methyl phosphate, 2-(1,3-dithiolan-2-yl)phenyl dimethylcarbamate, 2-(2-butoxyethoxy)ethyl thiocyanate, 2-(4,5-dimethyl-1,3-dioxolan-2-yl)phenyl methylcarbamate, 2-(4-chloro-3,5-xylyloxy)ethanol, 2-chlorovinyl diethyl phosphate, 2-imidazolidone, 2-isovalerylindan-1,3-dione, 2-methyl(prop-2-ynyl)aminophenyl methylcarbamate, 2-thiocyanatoethyl laurate, 3-bromo-1-chloroprop-1-ene, 3-methyl-1-phenylpyrazol-5-yl dimethylcarbamate, 4-methyl(prop-2-ynyl)amino-3,5-xylyl methylcarbamate, 5,5-dimethyl-3-oxocyclohex-1-enyl dimethylcarbamate, acethion, acrylonitrile, aldrin, allosamidin, allyxycarb, alpha-ecdysone, aluminium phosphide, aminocarb, anabasine, athidathion, azamethiphos, Bacillus thuringiensis delta endotoxins, barium hexafluorosilicate, barium polysulfide, barthrin, Bayer 22/190, Bayer 22408, beta-cyfluthrin, beta-cypermethrin, bioethanomethrin, biopermethrin, bis(2-chloroethyl) ether, borax, bromfenvinfos, bromo-DDT, bufencarb, butacarb, butathiofos, butonate, calcium arsenate, calcium cyanide, carbon disulfide, carbon tetrachloride, cartap hydrochloride, cevadine, chlorbicyclen, chlordane, chlordecone, chloroform, chloropicrin, chlorphoxim, chlorprazophos, cis-resmethrin, cismethrin, clocythrin, copper acetoarsenite, copper arsenate, copper oleate, coumithoate, cryolite, CS 708, cyanofenphos, cyanophos, cyclethrin, cythioate, d-tetramethrin, DAEP, dazomet, decarbofuran, diamidafos, dicapthon, dichlofenthion, dicresyl, dicyclanil, dieldrin, diethyl 5-methylpyrazol-3-yl
phosphate, dilor, dimefluthrin, dimetan, dimethrin, dimethylvinphos, dimetilan, dinoprop, dinosam, dinoseb, diofenolan, dioxabenzofos, dithicrofos, DSP, ecdysterone, EI 1642, EMPC, EPBP, etaphos, ethiofencarb, ethyl formate, ethylene dibromide, ethylene dichloride, ethylene oxide, EXD, fenchlorphos, fenethacarb, fenitrothion, fenoxacrim, fenpirithrin, fensulfothion, fenthion-ethyl, flucofuron, fosmethilan, fospirate, fosthietan, furathiocarb, furethrin, guazatine, guazatine acetates, sodium tetrathiocarbonate, halfenprox, HCH, HEOD, heptachlor, heterophos, HHDN, hydrogen cyanide, hyquincarb, IPSP, isazofos, isobenzan, isodrin, isofenphos, isolane, isoprothiolane, isoxathion, juvenile hormone I, juvenile hormone II, juvenile hormone III, kelevan, kinoprene, lead arsenate, leptophos, lirimfos, lythidathion, m-cumenyl methylcarbamate, magnesium phosphide, mazidox, mecarphon, menazon, mercurous chloride, mesulfenfos, metam, metam-potassium, metam-sodium, methanesulfonyl fluoride, methocrotophos, methoprene, methothrin, methoxychlor, methyl

isothiocyanate, methylchloroform, methylene chloride, metoxadiazone, mirex, naftalofos, naphthalene, NC-170, nicotine, nicotine sulfate, nithiazine, nornicotine, O-5-dichloro-4-iodophenyl O-ethyl ethylphosphonothioate, O,O-diethyl O-4-methyl-2-oxo-2H-chromen-7-yl phosphorothioate, O,O-diethyl O-6-methyl-2-propylpyrimidin-4-yl phosphorothioate, O,O,O',O'-tetrapropyl dithiopyrophosphate, oleic acid, para-dichlorobenzene, parathion-methyl, pentachlorophenol, pentachlorophenyl laurate, PH 60-38, phenkapton, phosnichlor, phosphine, phoxim-methyl, pirimetaphos, polychlorodicyclopentadiene isomers, potassium arsenite, potassium thiocyanate, precocene I, precocene II, precocene III, primidophos, profluthrin, promecarb, prothiofos, pyrazophos, pyresmethrin, quassia, quinalphos-methyl, quinothion, rafoxanide, resmethrin, rotenone, kadethrin, ryania, ryanodine, sabadilla), schradan, sebufos, SI-0009, thiapronil, sodium arsenite, sodium cyanide, sodium fluoride, sodium hexafluorosilicate, sodium pentachlorophenoxide, sodium selenate, sodium thiocyanate, sulcofuron, sulcofuron-sodium, sulfuryl fluoride, sulprofos, tar oils, tazimcarb, TDE, tebupirimfos, temephos, terallethrin, tetrachloroethane, thicrofos, thiocyclam, thiocyclam hydrogen oxalate, thionazin, thiosultap, thiosultap-sodium, tralomethrin, transpermethrin, triazamate, trichlormetaphos-3, trichloronat, trimethacarb, tolprocarb, triclopyricarb, triprene, veratridine, veratrine, XMC, zetamethrin, zinc phosphide, zolaprofos, and meperfluthrin, tetramethylfluthrin, bis(tributyltin) oxide, bromoacetamide, ferric phosphate, niclosamide-olamine, tributyltin oxide, pyrimorph, trifenmorph, 1,2-dibromo-3-chloropropane, 1,3-dichloropropene, 3,4-dichlorotetrahydrothiophene 1,1-dioxide, 3-(4-chlorophenyl)-5-methylrhodanine, 5-methyl-6-thioxo-1,3,5-thiadiazinan-3-ylacetic acid, 6-isopentenylaminopurine, 2-fluoro-N-(3-methoxyphenyl)-9H-purin-6-amine, benclothiaz, cytokinins, DCIP, furfural, isamidofos, kinetin, Myrothecium verrucaria composition, tetrachlorothiophene, xylenols, zeatin, potassium ethylxanthate, acibenzolar, acibenzolar-S-methyl, Reynoutria sachalinensis extract, alpha-chlorohydrin, antu, barium carbonate, bisthiosemi, brodifacoum, bromadiolone, bromethalin, chlorophacinone, chloroinconazide, cholecalciferol, coumachlor, coumafuryl, coumatetralyl, crimidine, difenacoum, difethialone, diphacinone, ergocalciferol, flocoumafen, fluoroacetamide, flupropadine, flupropadine hydrochloride, norbormide, phosacetim, phosphorus, pindone, pyrinuron, scilliroside, sodium fluoroacetate, thallium sulfate, warfarin, 2-(2-butoxyethoxy)-ethyl piperonylate, 5-(1,3-benzodioxol-5-yl)-3-hexylcyclohex-2-enone, farnesol with nerolidol, verbutin, MGK 264, piperonyl butoxide, piprotal, propyl isomer, S421, sesamex, sesasmolin, sulfoxide, anthraquinone, copper naphthenate, copper oxychloride, dicyclopentadiene, thiram, zinc naphthenate, ziram, imanin, ribavirin, mercuric oxide, thiophanate-methyl, azaconazole, bitertanol, bromuconazole, cyproconazole, difenoconazole, diniconazole, epoxiconazole, fenbuconazole, fluquinconazole, flusilazole, flutriafol, furametpyr, hexaconazole, imazalil, imibenconazole, ipconazole, metconazole, myclobutanil, paclobutrazole, pefurazoate, penconazole, prothioconazole, pyrifenox, prochloraz, propiconazole, pyrisoxazole, simeconazole, tebuconazole, tetraconazole, triadimefon, triadimenol, triflumizole, triticonazole, ancymidol, fenarimol, nuarimol, bupirimate, dimethirimol, ethirimol, dodemorph, fenpropidin, fenpropimorph, spiroxamine, tridemorph, cyprodinil, mepanipyrim, pyrimethanil, fenpiclonil, fludioxonil, benalaxyl, furalaxyl, metalaxyl, R-metalaxyl, ofurace, oxadixyl,

carbendazim, debacarb, fuberidazole, thiabendazole, chlozolinate, dichlozoline, myclozoline, procymidone, vinclozoline, boscalid, carboxin, fenfuram, flutolanil, mepronil, oxycarboxin, penthiopyrad, thifluzamide, dodine, iminoctadine, azoxystrobin, dimoxystrobin, enestroburin, fenaminstrobin, flufenoxystrobin, fluoxastrobin, kresoxim-methyl, metominostrobin, trifloxystrobin, orysastrobin, picoxystrobin, pyraclostrobin, pyrametostrobin, pyraoxystrobin, ferbam, mancozeb, maneb, metiram, propineb, zineb, captafol, captan, fluoroimide, folpet, tolylfluanid, bordeaux mixture, copper oxide, mancopper, oxine-copper, nitrothal-isopropyl, edifenphos, iprobenphos, phosdiphen, tolclofos-methyl, anilazine, benthiavalicarb, blasticidin-S, chloroneb, chlorothalonil, cyflufenamid, cymoxanil, cyclobutrifluram, diclocymet, diclomezine, dicloran, diethofencarb, dimethomorph, flumorph, dithianon, ethaboxam, etridiazole, famoxadone, fenamidone, fenoxanil, ferimzone, fluazinam, fluopicolide, flusulfamide, fluxapyroxad, fenhexamid, fosetyl-aluminium, hymexazol, iprovalicarb, cyazofamid, methasulfocarb, metrafenone, pencycuron, phthalide, polyoxins, propamocarb, pyribencarb, proquinazid, pyroquilon, pyriofenone, quinoxyfen, quintozene, tiadinil, triazoxide, tricyclazole, triforine, validamycin, valifenalate, zoxamide, mandipropamid, flubeneteram, isopyrazam, sedaxane, benzovindiflupyr, pydiflumetofen, 3-difluoromethyl-1-methyl-1H-pyrazole-4-carboxylic acid (3',4',5'-trifluoro-biphenyl-2-yl)-amide, isoflucypram, isotianil, dipymetitrone, 6-ethyl-5,7-dioxo-pyrrolo[4,5][1,4]dithiino[1,2-c]isothiazole-3-carbonitrile, 2-(difluoromethyl)-N-[3-ethyl-1,1-dimethyl-indan-4-yl]pyridine-3-carboxamide, 4-(2,6-difluorophenyl)-6-methyl-5-phenyl-pyridazine-3-carbonitrile, (R)-3-(difluoromethyl)-1-methyl-N-[1,1,3-trimethylindan-4-yl]pyrazole-4-carboxamide, 4-(2-bromo-4-fluoro-phenyl)-N-(2-chloro-6-fluoro-phenyl)-2,5-dimethyl-pyrazol-3-amine, 4- (2- bromo- 4- fluorophenyl) - N- (2- chloro- 6- fluorophenyl) - 1, 3- dimethyl- 1H- pyrazol- 5- amine, fluindapyr, coumethoxystrobin (jiaxiangjunzhi), lvbenmixianan, dichlobentiazox, mandestrobin, 3-(4,4-difluoro-3,4-dihydro-3,3-dimethylisoquinolin-1-yl)quinolone, 2-[2-fluoro-6-[(8-fluoro-2-methyl-3-quinolyl)oxy]phenyl]propan-2-ol, oxathiapiprolin, tert-butyl N-[6-[[[(1-methyltetrazol-5-yl)-phenyl-methylene]amino]oxymethyl]-2-pyridyl]carbamate, pyraziflumid, inpyrfluxam, trolprocarb, mefentrifluconazole, ipfentrifluconazole, 2-(difluoromethyl)-N-[(3R)-3-ethyl-1,1-dimethyl-indan-4-yl]pyridine-3-carboxamide, N'-(2,5-dimethyl-4-phenoxy-phenyl)-N-ethyl-N-methyl-formamidine, N'-[4-(4,5-dichlorothiazol-2-yl)oxy-2,5-dimethyl-phenyl]-N-ethyl-N-methyl-formamidine, [2-[3-[2-[1-[2-[3,5-bis(difluoromethyl)pyrazol-1-yl]acetyl]-4-piperidyl]thiazol-4-yl]-4,5-dihydroisoxazol-5-yl]-3-chloro-phenyl] methanesulfonate, but-3-ynyl N-[6-[[(Z)-[(1-methyltetrazol-5-yl)-phenyl-methylene]amino]oxymethyl]-2-pyridyl]carbamate, methyl N-[[5-[4-(2,4-dimethylphenyl)triazol-2-yl]-2-methyl-phenyl]methyl]carbamate, 3-chloro-6-methyl-5-phenyl-4-(2,4,6-trifluorophenyl)pyridazine, pyridachlometyl, 3-(difluoromethyl)-1-methyl-N-[1,1,3-trimethylindan-4-yl]pyrazole-4-carboxamide, 1-[2-[[1-(4-chlorophenyl)pyrazol-3-yl]oxymethyl]-3-methyl-phenyl]-4-methyl-tetrazol-5-one, 1-methyl-4-[3-methyl-2-[[2-methyl-4-(3,4,5-trimethylpyrazol-1-yl)phenoxy]methyl]phenyl]tetrazol-5-one, aminopyrifen, ametoctradin, amisulbrom, penflufen, (Z,2E)-5-[1-(4-chlorophenyl)pyrazol-3-yl]oxy-2-methoxyimino-N,3-dimethyl-pent-3-enamide, florylpicoxamid, fenpicoxamid, tebufloquin, ipflufenoquin, quinofumelin, isofetamid, N-[2-[2,4-dichloro-phenoxy]phenyl]-3-(difluoromethyl)-1-methyl-pyrazole-4-carboxamide, N-[2-[2-chloro-4-(trifluoromethyl)phenoxy]phenyl]-3-(difluoromethyl)-

1-methyl-pyrazole-4-carboxamide, benzothiostrobin, phenamacril, 5-amino-1,3,4-thiadiazole-2-thiol zinc salt (2:1), fluopyram, flutianil, fluopimomide, pyrapropoyne, picarbutrazox, 2-(difluoromethyl)-N-(3-ethyl-1,1-dimethyl-indan-4-yl)pyridine-3-carboxamide, 2- (difluoromethyl) - N- ((3R) - 1, 1, 3- trimethylindan- 4- yl) pyridine- 3- carboxamide, 4-[[6-[2-(2,4-difluorophenyl)-1,1-difluoro-2-hydroxy-3-(1,2,4-triazol-1-yl)propyl]-3-pyridyl]oxy]benzonitrile, metyltetraprole, 2- (difluoromethyl) - N- ((3R) - 1, 1, 3- trimethylindan- 4- yl) pyridine- 3- carboxamide, α- (1, 1- dimethylethyl) - α- [4'- (trifluoromethoxy) [1, 1'- biphenyl] - 4- yl] -5- pyrimidinemethanol, fluoxapiprolin, enoxastrobin, 4-[[6-[2-(2,4-difluorophenyl)-1,1-difluoro-2-hydroxy-3-(1,2,4-triazol-1-yl)propyl]-3-pyridyl]oxy] benzonitrile, 4-[[6-[2-(2,4-difluorophenyl)-1,1-difluoro-2-hydroxy-3-(5-sulfanyl-1,2,4-triazol-1-yl)propyl]-3-pyridyl]oxy] benzonitrile, 4-[[6-[2-(2,4-difluorophenyl)-1,1-difluoro-2-hydroxy-3-(5-thioxo-4H-1,2,4-triazol-1-yl)propyl]-3-pyridyl]oxy]benzonitrile, trinexapac, coumoxystrobin, zhongshengmycin, thiodiazole copper, zinc thiazole, amectotractin, iprodione, N-octyl-N'-[2-(octylamino)ethyl]ethane-1,2-diamine, N'-[5-bromo-2-methyl-6-[(1S)-1-methyl-2-propoxy-ethoxy]-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-bromo-2-methyl-6-[(1R)-1-methyl-2-propoxy-ethoxy]-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-bromo-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-chloro-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-bromo-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-isopropyl-N-methyl-formamidine (these compounds may be prepared from the methods described in WO2015/155075); N'-[5-bromo-2-methyl-6-(2-propoxypropoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine (this compound may be prepared from the methods described in IPCOM000249876D); N-isopropyl-N'-[5-methoxy-2-methyl-4-(2,2,2-trifluoro-1-hydroxy-1-phenyl-ethyl)phenyl]-N-methyl-formamidine, N'-[4-(1-cyclopropyl-2,2,2-trifluoro-1-hydroxy-ethyl)-5-methoxy-2-methyl-phenyl]-N-isopropyl-N-methyl-formamidine (these compounds may be prepared from the methods described in WO2018/228896); N-ethyl-N'-[5-methoxy-2-methyl-4-[2-trifluoromethyl)oxetan-2-yl]phenyl]-N-methyl-formamidine, N-ethyl-N'-[5-methoxy-2-methyl-4-[2-trifuoromethyl)tetrahydrofuran-2-yl]phenyl]-N-methyl-formamidine (these compounds may be prepared from the methods described in WO2019/110427); N-[(1R)-1-benzyl-3-chloro-1-methyl-but-3-enyl]-8-fluoro-quinoline-3-carboxamide, N-[(1S)-1-benzyl-3-chloro-1-methyl-but-3-enyl]-8-fluoro-quinoline-3-carboxamide, N-[(1R)-1-benzyl-3,3,3-trifluoro-1-methyl-propyl]-8-fluoro-quinoline-3-carboxamide, N-[(1S)-1-benzyl-3,3,3-trifluoro-1-methyl-propyl]-8-fluoro-quinoline-3-carboxamide, N-[(1R)-1-benzyl-1,3-dimethyl-butyl]-7,8-difluoro-quinoline-3-carboxamide,
N-[(1S)-1-benzyl-1,3-dimethyl-butyl]-7,8-difluoro-quinoline-3-carboxamide, 8-fluoro-N-[(1R)-1-[(3-fluorophenyl)methyl]-1,3-dimethyl-butyl]quinoline-3-carboxamide, 8-fluoro-N-[(1S)-1-[(3-fluorophenyl)methyl]-1,3-dimethyl-butyl]quinoline-3-carboxamide, N-[(1R)-1-benzyl-1,3-dimethyl-butyl]-8-fluoro-quinoline-3-carboxamide, N-[(1S)-1-benzyl-1,3-dimethyl-butyl]-8-fluoro-quinoline-3-carboxamide,
N-((1R)-1-benzyl-3-chloro-1-methyl-but-3-enyl)-8-fluoro-quinoline-3-carboxamide, N-((1S)-1-benzyl-3-chloro-1-methyl-but-3-enyl)-8-fluoro-quinoline-3-carboxamide (these compounds may be prepared from the methods described in WO2017/153380); 1-(6,7-dimethylpyrazolo[1,5-a]pyridin-3-yl)-4,4,5-trifluoro-3,3-dimethyl-isoquinoline, 1-(6,7-dimethylpyrazolo[1,5-a]pyridin-3-yl)-4,4,6-trifluoro-3,3-dimethyl-isoquinoline, 4,4-difluoro-3,3-dimethyl-1-(6-methylpyrazolo[1,5-a]pyridin-3-yl)isoquinoline, 4,4-difluoro-

3,3-dimethyl-1-(7-methylpyrazolo[1,5-a]pyridin-3-yl)isoquinoline, 1-(6-chloro-7-methyl-pyrazolo[1,5-a]pyridin-3-yl)-4,4-difluoro-3,3-dimethyl-isoquinoline (these compounds may be prepared from the methods described in WO2017/025510); 1-(4,5-dimethylbenzimidazol-1-yl)-4,4,5-trifluoro-3,3-dimethyl-isoquinoline, 1-(4,5-dimethylbenzimidazol-1-yl)-4,4-difluoro-3,3-dimethyl-isoquinoline, 6-chloro-4,4-difluoro-3,3-dimethyl-1-(4-methylbenzimidazol-1-yl)isoquinoline, 4,4-difluoro-1-(5-fluoro-4-methyl-benzimidazol-1-yl)-3,3-dimethyl-isoquinoline, 3-(4,4-difluoro-3,3-dimethyl-1-isoquinolyl)-7,8-dihydro-6H-cyclopenta[e]benzimidazole (these compounds may be prepared from the methods described in WO2016/156085); N-methoxy-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]cyclopropanecarboxamide, N,2-dimethoxy-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propanamide, N-ethyl-2-methyl-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propanamide, 1-methoxy-3-methyl-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea, 1,3-dimethoxy-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea, 3-ethyl-1-methoxy-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea, N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propanamide, 4,4-dimethyl-2-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]isoxazolidin-3-one, 5,5-dimethyl-2-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]isoxazolidin-3-one, ethyl 1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]pyrazole-4-carboxylate, N,N-dimethyl-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]-1,2,4-triazol-3-amine (these compounds may be prepared from the methods described in WO 2017/055473, WO 2017/055469, WO 2017/093348 and WO 2017/118689); 2-[6-(4-chlorophenoxy)-2-(trifluoromethyl)-3-pyridyl]-1-(1,2,4-triazol-1-yl)propan-2-ol (this compound may be prepared from the methods described in WO 2017/029179); 2-[6-(4-bromophenoxy)-2-(trifluoromethyl)-3-pyridyl]-1-(1,2,4-triazol-1-yl)propan-2-ol (this compound may be prepared from the methods described in WO 2017/029179); 3-[2-(1-chlorocyclopropyl)-3-(2-fluorophenyl)-2-hydroxy-propyl]imidazole-4-carbonitrile (this compound may be prepared from the methods described in WO 2016/156290); 3-[2-(1-chlorocyclopropyl)-3-(3-chloro-2-fluoro-phenyl)-2-hydroxy-propyl]imidazole-4-carbonitrile (this compound may be prepared from the methods described in WO 2016/156290); (4-phenoxyphenyl)methyl 2-amino-6-methyl-pyridine-3-carboxylate (this compound may be prepared from the methods described in WO 2014/006945); 2,6-Dimethyl-1H,5H-[1,4]dithiino[2,3-c:5,6-c']dipyrrole-1,3,5,7(2H,6H)-tetrone (this compound may be prepared from the methods described in WO 2011/138281) N-methyl-4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]benzenecarbothioamide; N-methyl-4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]benzamide; (Z,2E)-5-[1-(2,4-dichlorophenyl)pyrazol-3-yl]oxy-2-methoxyimino-N,3-dimethyl-pent-3-enamide (this compound may be prepared from the methods described in WO 2018/153707); N'-(2-chloro-5-methyl-4-phenoxy-phenyl)-N-ethyl-N-methyl-formamidine; N'-[2-chloro-4-(2-fluorophenoxy)-5-methyl-phenyl]-N-ethyl-N-methyl-formamidine (this compound may be prepared from the methods described in WO 2016/202742); 2-(difluoromethyl)-N-[(3S)-3-ethyl-1,1-dimethyl-indan-4-yl]pyridine-3-carboxamide (this compound may be prepared from the methods described in WO 2014/095675); (5-methyl-2-pyridyl)-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methanone, (3-methylisoxazol-5-yl)-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methanone (these compounds may be prepared from the methods described in WO 2017/220485); 2-oxo-N-propyl-2-[4-[5-(trifluoromethyl)-1,2,4-

oxadiazol-3-yl]phenyl]acetamide (this compound may be prepared from the methods described in WO 2018/065414); ethyl 1-[[5-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]-2-thienyl]methyl]pyrazole-4-carboxylate (this compound may be prepared from the methods described in WO 2018/158365); 2,2-difluoro-N-methyl-2-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]acetamide, N-[(E)-methoxyiminomethyl]-4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]benzamide, N-[(Z)-methoxyiminomethyl]-4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]benzamide, N-[N-methoxy-C-methyl-carbonimidoyl]-4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]benzamide (these compounds may be prepared from the methods described in WO 2018/202428).

The compounds of the invention may also be used in combination with anthelmintic agents. Such anthelmintic agents include, compounds selected from the macrocyclic lactone class of compounds such as ivermectin, avermectin, abamectin, emamectin, eprinomectin, doramectin, selamectin, moxidectin, nemadectin and milbemycin derivatives as described in EP- 357460, EP-444964 and EP-594291. Additional anthelmintic agents include semisynthetic and biosynthetic avermectin/milbemycin derivatives such as those described in US-5015630, WO-9415944 and WO-9522552. Additional anthelmintic agents include the benzimidazoles such as albendazole, cambendazole, fenbendazole, flubendazole, mebendazole, oxfendazole, oxibendazole, parbendazole, and other members of the class. Additional anthelmintic agents include imidazothiazoles and tetrahydropyrimidines such as tetramisole, levamisole, pyrantel pamoate, oxantel or morantel. Additional anthelmintic agents include flukicides, such as triclabendazole and clorsulon and the cestocides, such as praziquantel and epsiprantel.

The compounds of the invention may be used in combination with derivatives and analogues of the paraherquamide/marcfortine class of anthelmintic agents, as well as the antiparasitic oxazolines such as those disclosed in US-5478855, US- 4639771 and DE-19520936.

The compounds of the invention may be used in combination with derivatives and analogues of the general class of dioxomorpholine antiparasitic agents as described in WO 96/15121 and also with anthelmintic active cyclic depsipeptides such as those described in WO 96/11945, WO 93/19053, WO 93/25543, EP 0 626 375, EP 0 382 173, WO 94/19334, EP 0 382 173, and EP 0 503 538.

The compounds of the invention may be used in combination with other ectoparasiticides; for example, fipronil; pyrethroids; organophosphates; insect growth regulators such as lufenuron; ecdysone agonists such as tebufenozide and the like; neonicotinoids such as imidacloprid and the like.

The compounds of the invention may be used in combination with terpene alkaloids, for example those described in International Patent Application Publication Numbers WO 95/19363 or WO 04/72086, particularly the compounds disclosed therein.

Other examples of such biologically active compounds that the compounds of the invention may be used in combination with include but are not restricted to the following:

Organophosphates: acephate, azamethiphos, azinphos-ethyl, azinphos- methyl, bromophos, bromophos-ethyl, cadusafos, chlorethoxyphos, chlorpyrifos, chlorfenvinphos, chlormephos, demeton, demeton-S-methyl, demeton-S-methyl sulphone, dialifos, diazinon, dichlorvos, dicrotophos, dimethoate, disulfoton, ethion, ethoprophos, etrimfos, famphur, fenamiphos, fenitrothion, fensulfothion, fenthion,

flupyrazofos, fonofos, formothion, fosthiazate, heptenophos, isazophos, isothioate, isoxathion, malathion, methacriphos, methamidophos, methidathion, methyl-parathion, mevinphos, monocrotophos, naled, omethoate, oxydemeton-methyl, paraoxon, parathion, parathion-methyl, phenthoate, phosalone, phosfolan, phosphocarb, phosmet, phosphamidon, phorate, phoxim, pirimiphos, pirimiphos-methyl, profenofos, propaphos, proetamphos, prothiofos, pyraclofos, pyridapenthion, quinalphos, sulprophos, temephos, terbufos, tebupirimfos, tetrachlorvinphos, thimeton, triazophos, trichlorfon, vamidothion.

Carbamates: alanycarb, aldicarb, 2-sec-butylphenyl methylcarbamate, benfuracarb, carbaryl, carbofuran, carbosulfan, cloethocarb, ethiofencarb, fenoxycarb, fenthiocarb, furathiocarb, HCN-801, isoprocarb, indoxacarb, methiocarb, methomyl, 5-methyl-m-cumenylbutyryl(methyl)carbamate, oxamyl, pirimicarb, propoxur, thiodicarb, thiofanox, triazamate, UC-51717.

Pyrethroids: acrinathin, allethrin, alphametrin, 5-benzyl-3-furylmethyl (E)-(1 R)-cis-2,2-dimethyl-3-(2-oxothiolan-3-ylidenemethyl)cyclopropanecarboxylate, bifenthrin, beta-cyfluthrin, cyfluthrin, a-cypermethrin, beta-cypermethrin, bioallethrin, bioallethrin((S)-cyclopentylisomer), bioresmethrin, bifenthrin, NCI-85193, cycloprothrin, cyhalothrin, cythithrin, cyphenothrin, deltamethrin, empenthrin, esfenvalerate, ethofenprox, fenfluthrin, fenpropathrin, fenvalerate, flucythrinate, flumethrin, fluvalinate (D isomer), imiprothrin, cyhalothrin, lambda-cyhalothrin, permethrin, phenothrin, prallethrin, pyrethrins (natural products), resmethrin, tetramethrin, transfluthrin, theta-cypermethrin, silafluofen, t-fluvalinate, tefluthrin, tralomethrin, Zeta-cypermethrin.

Arthropod growth regulators: a) chitin synthesis inhibitors: benzoylureas: chlorfluazuron, diflubenzuron, fluazuron, flucycloxuron, flufenoxuron, hexaflumuron, lufenuron, novaluron, teflubenzuron, triflumuron, buprofezin, diofenolan, hexythiazox, etoxazole, chlorfentazine; b) ecdysone antagonists: halofenozide, methoxyfenozide, tebufenozide; c) juvenoids: pyriproxyfen, methoprene (including S-methoprene), fenoxycarb; d) lipid biosynthesis inhibitors: spirodiclofen.

Other antiparasitics: acequinocyl, amitraz, AKD-1022, ANS-118, azadirachtin, Bacillus thuringiensis, bensultap, bifenazate, binapacryl, bromopropylate, BTG-504, BTG-505, camphechlor, cartap, chlorobenzilate, chlordimeform, chlorfenapyr, chromafenozide, clothianidine, cyromazine, diacloden, diafenthiuron, DBI-3204, dinactin, dihydroxymethyldihydroxypyrrolidine, dinobuton, dinocap, endosulfan, ethiprole, ethofenprox, fenazaquin, flumite, MTI- 800, fenpyroximate, fluacrypyrim, flubenzimine, flubrocythrinate, flufenzine, flufenprox, fluproxyfen, halofenprox, hydramethylnon, IKI-220, kanemite, NC-196, neem guard, nidinorterfuran, nitenpyram, SD-35651, WL-108477, pirydaryl, propargite, protrifenbute, pymethrozine, pyridaben, pyrimidifen, NC-1111, R-195,RH-0345, RH-2485, RYI-210, S-1283, S-1833, SI-8601, silafluofen, silomadine, spinosad, tebufenpyrad, tetradifon, tetranactin, thiacloprid, thiocyclam, thiamethoxam, tolfenpyrad, triazamate, triethoxyspinosyn, trinactin, verbutin, vertalec, YI-5301.

Biological agents: Bacillus thuringiensis ssp aizawai, kurstaki, Bacillus thuringiensis delta endotoxin, baculovirus, entomopathogenic bacteria, virus and fungi.

Bactericides: chlortetracycline, oxytetracycline, streptomycin.

Other biological agents: enrofloxacin, febantel, penethamate, moloxicam, cefalexin, kanamycin, pimobendan, clenbuterol, omeprazole, tiamulin, benazepril, pyriprole, cefquinome, florfenicol, buserelin,

cefovecin, tulathromycin, ceftiour, carprofen, metaflumizone, praziquarantel, triclabendazole, flumetylsulforim, fluoxytioconazole, flufenoxadiazam, metarylpicoxamid; and

Biological agents such as *Bacillus thuringiensis*, *Bacillus thuringiensis* delta endotoxin, baculovirus, and entomopathogenic bacteria, virus and fungi.

Other examples of "reference" mixture compositions are as follows (wherein the term "TX" represents a compound (according to the definition of component (A) of the compositions of the present invention) selected from compound no. E.01, E.02, E.03, E.04, E.05, E.06, E.07, E.08, E.09, E.10, E.11, E.12, E.13, E.14, E.15, E.16, or E.17 as defined in the Table E above:

a compound selected from the group of substances consisting of petroleum oils + TX, 1,1-bis(4-chlorophenyl)-2-ethoxyethanol + TX, 2,4-dichlorophenyl benzenesulfonate + TX, 2-fluoro-N-methyl-N-1-naphthylacetamide + TX, 4-chlorophenyl phenyl sulfone + TX, acetoprole + TX, aldoxycarb + TX, amidithion + TX, amidothioate + TX, amiton + TX, amiton hydrogen oxalate + TX, amitraz + TX, aramite + TX, arsenous oxide + TX, azobenzene + TX, azothoate + TX, benomyl + TX, benoxafos + TX, benzyl benzoate + TX, bixafen + TX, brofenvalerate + TX, bromocyclen + TX, bromophos + TX, bromopropylate + TX, buprofezin + TX, butocarboxim + TX, butoxycarboxim + TX, butylpyridaben + TX, calcium polysulfide + TX, camphechlor + TX, carbanolate + TX, carbophenothion + TX, cymiazole + TX, chinomethionat + TX, chlorbenside + TX, chlordimeform + TX, chlordimeform hydrochloride + TX, chlorfenethol + TX, chlorfenson + TX, chlorfensulfide + TX, chlorobenzilate + TX, chloromebuform + TX, chloromethiuron + TX, chloropropylate + TX, chlorthiophos + TX, cinerin I + TX, cinerin II + TX, cinerins + TX, closantel + TX, coumaphos + TX, crotamiton + TX, crotoxyphos + TX, cufraneb + TX, cyanthoate + TX, DCPM + TX, DDT + TX, demephion + TX, demephion-O + TX, demephion-S + TX, demeton-methyl + TX, demeton-O + TX, demeton-O-methyl + TX, demeton-S + TX, demeton-S-methyl + TX, demeton-S-methylsulfon + TX, dichlofluanid + TX, dichlorvos + TX, dicliphos + TX, dienochlor + TX, dimefox + TX, dinex + TX, dinex-diclexine + TX, dinocap-4 + TX, dinocap-6 + TX, dinocton + TX, dinopenton + TX, dinosulfon + TX, dinoterbon + TX, dioxathion + TX, diphenyl sulfone + TX, disulfiram + TX, DNOC + TX, dofenapyn + TX, doramectin + TX, endothion + TX, eprinomectin + TX, ethoate-methyl + TX, etrimfos + TX, fenazaflor + TX, fenbutatin oxide + TX, fenothiocarb + TX, fenpyrad + TX, fenpyroximate + TX, fenpyrazamine + TX, fenson + TX, fentrifanil + TX, flubenzimine + TX, flucycloxuron + TX, fluenetil + TX, fluorbenside + TX, FMC 1137 + TX, formetanate + TX, formetanate hydrochloride + TX, formparanate + TX, gamma-HCH + TX, glyodin + TX, halfenprox + TX, hexadecyl cyclopropanecarboxylate + TX, isocarbophos + TX, jasmolin I + TX, jasmolin II + TX, jodfenphos + TX, lindane + TX, malonoben + TX, mecarbam + TX, mephosfolan + TX, mesulfen + TX, methacrifos + TX, methyl bromide + TX, metolcarb + TX, mexacarbate + TX, milbemycin oxime + TX, mipafox + TX, monocrotophos + TX, morphothion + TX, moxidectin + TX, naled + TX, 4-chloro-2-(2-chloro-2-methyl-propyl)-5-[(6-iodo-3-pyridyl)methoxy]pyridazin-3-one + TX, nifluridide + TX, nikkomycins + TX, nitrilacarb + TX, nitrilacarb 1:1 zinc chloride complex + TX, omethoate + TX, oxydeprofos + TX, oxydisulfoton + TX, pp'-DDT + TX, parathion + TX, permethrin + TX, phenkapton + TX, phosalone + TX, phosfolan + TX, phosphamidon + TX, polychloroterpenes + TX, polynactins + TX, proclonol + TX, promacyl + TX, propoxur + TX, prothidathion + TX, prothoate + TX, pyrethrin I + TX, pyrethrin II + TX,

pyrethrins + TX, pyridaphenthion + TX, pyrimitate + TX, quinalphos + TX, quintiofos + TX, R-1492 + TX, phosglycin + TX, rotenone + TX, schradan + TX, sebufos + TX, selamectin + TX, sophamide + TX, SSI-121 + TX, sulfiram + TX, sulfluramid + TX, sulfotep + TX, sulfur + TX, diflovidazin + TX, tau-fluvalinate + TX, TEPP + TX, terbam + TX, tetradifon + TX, tetrasul + TX, thiafenox + TX, thiocarboxime + TX, thiofanox + TX, thiometon + TX, thioquinox + TX, thuringiensin + TX, triamiphos + TX, triarathene + TX, triazophos + TX, triazuron + TX, trifenofos + TX, trinactin + TX, vamidothion + TX, vaniliprole + TX, bethoxazin + TX, copper dioctanoate + TX, copper sulfate + TX, cybutryne + TX, dichlone + TX, dichlorophen + TX, endothal + TX, fentin + TX, hydrated lime + TX, nabam + TX, quinoclamine + TX, quinonamid + TX, simazine + TX, triphenyltin acetate + TX, triphenyltin hydroxide + TX, crufomate + TX, piperazine + TX, thiophanate + TX, chloralose + TX, fenthion + TX, pyridin-4-amine + TX, strychnine + TX, 1-hydroxy-1H-pyridine-2-thione + TX, 4-(quinoxalin-2-ylamino)benzenesulfonamide + TX, 8-hydroxyquinoline sulfate + TX, bronopol + TX, copper hydroxide + TX, cresol + TX, dipyrithione + TX, dodicin + TX, fenaminosulf + TX, formaldehyde + TX, hydrargaphen + TX, kasugamycin + TX, kasugamycin hydrochloride hydrate + TX, nickel bis(dimethyldithiocarbamate) + TX, nitrapyrin + TX, octhilinone + TX, oxolinic acid + TX, oxytetracycline + TX, potassium hydroxyquinoline sulfate + TX, probenazole + TX, streptomycin + TX, streptomycin sesquisulfate + TX, tecloftalam + TX, thiomersal + TX, Adoxophyes orana GV + TX, Agrobacterium radiobacter + TX, Amblyseius spp. + TX, Anagrapha falcifera NPV + TX, Anagrus atomus + TX, Aphelinus abdominalis + TX, Aphidius colemani + TX, Aphidoletes aphidimyza + TX, Autographa californica NPV + TX, Bacillus sphaericus Neide + TX, Beauveria brongniartii + TX, Chrysoperla carnea + TX, Cryptolaemus montrouzieri + TX, Cydia pomonella GV + TX, Dacnusa sibirica + TX, Diglyphus isaea + TX, Encarsia formosa + TX, Eretmocerus eremicus + TX, Heterorhabditis bacteriophora and H. megidis + TX, Hippodamia convergens + TX, Leptomastix dactylopii + TX, Macrolophus caliginosus + TX, Mamestra brassicae NPV + TX, Metaphycus helvolus + TX, Metarhizium anisopliae var. acridum + TX, Metarhizium anisopliae var. anisopliae + TX, Neodiprion sertifer NPV and N. lecontei NPV + TX, Orius spp. + TX, Paecilomyces fumosoroseus + TX, Phytoseiulus persimilis + TX, Steinernema bibionis + TX, Steinernema carpocapsae + TX, Steinernema feltiae + TX, Steinernema glaseri + TX, Steinernema riobrave + TX, Steinernema riobravis + TX, Steinernema scapterisci + TX, Steinernema spp. + TX, Trichogramma spp. + TX, Typhlodromus occidentalis + TX , Verticillium lecanii + TX, apholate + TX, bisazir + TX, busulfan + TX, dimatif + TX, hemel + TX, hempa + TX, metepa + TX, methiotepa + TX, methyl apholate + TX, morzid + TX, penfluron + TX, tepa + TX, thiohempa + TX, thiotepa + TX, tretamine + TX, uredepa + TX, (E)-dec-5-en-1-yl acetate with (E)-dec-5-en-1-ol + TX, (E)-tridec-4-en-1-yl acetate + TX, (E)-6-methylhept-2-en-4-ol + TX, (E,Z)-tetradeca-4,10-dien-1-yl acetate + TX, (Z)-dodec-7-en-1-yl acetate + TX, (Z)-hexadec-11-enal + TX, (Z)-hexadec-11-en-1-yl acetate + TX, (Z)-hexadec-13-en-11-yn-1-yl acetate + TX, (Z)-icos-13-en-10-one + TX, (Z)-tetradec-7-en-1-al + TX, (Z)-tetradec-9-en-1-ol + TX, (Z)-tetradec-9-en-1-yl acetate + TX, (7E,9Z)-dodeca-7,9-dien-1-yl acetate + TX, (9Z,11E)-tetradeca-9,11-dien-1-yl acetate + TX, (9Z,12E)-tetradeca-9,12-dien-1-yl acetate + TX, 14-methyloctadec-1-ene + TX, 4-methylnonan-5-ol with 4-methylnonan-5-one + TX, alpha-multistriatin + TX, brevicomin + TX, codlelure + TX, codlemone + TX, cuelure + TX, disparlure + TX, dodec-8-en-1-yl acetate + TX, dodec-9-en-1-yl acetate + TX, dodeca-8 + TX, 10-dien-1-yl acetate + TX, dominicalure + TX, ethyl 4-methyloctanoate +

TX, eugenol + TX, frontalin + TX, grandlure + TX, grandlure I + TX, grandlure II + TX, grandlure III + TX, grandlure IV + TX, hexalure + TX, ipsdienol + TX, ipsenol + TX, japonilure + TX, lineatin + TX, litlure + TX, looplure + TX, medlure + TX, megatomoic acid + TX, methyl eugenol + TX, muscalure + TX, octadeca-2,13-dien-1-yl acetate + TX, octadeca-3,13-dien-1-yl acetate + TX, orfralure + TX, oryctalure + TX, ostramone + TX, siglure + TX, sordidin + TX, sulcatol + TX, tetradec-11-en-1-yl acetate + TX, trimedlure + TX, trimedlure A + TX, trimedlure B_1 + TX, trimedlure B_2 + TX, trimedlure C + TX, trunc-call + TX, 2-(octylthio)ethanol + TX, butopyronoxyl + TX, butoxy(polypropylene glycol) + TX, dibutyl adipate + TX, dibutyl phthalate + TX, dibutyl succinate + TX, diethyltoluamide + TX, dimethyl carbate + TX, dimethyl phthalate + TX, ethyl hexanediol + TX, hexamide + TX, methoquin-butyl + TX, methylneodecanamide + TX, oxamate + TX, picaridin + TX, 1-dichloro-1-nitroethane + TX, 1,1-dichloro-2,2-bis(4-ethylphenyl)ethane + TX, 1,2-dichloropropane with 1,3-dichloropropene + TX, 1-bromo-2-chloroethane + TX, 2,2,2-trichloro-1-(3,4-dichlorophenyl)ethyl acetate + TX, 2,2-dichlorovinyl 2-ethylsulfinylethyl methyl phosphate + TX, 2-(1,3-dithiolan-2-yl)phenyl dimethylcarbamate + TX, 2-(2-butoxyethoxy)ethyl thiocyanate + TX, 2-(4,5-dimethyl-1,3-dioxolan-2-yl)phenyl methylcarbamate + TX, 2-(4-chloro-3,5-xylyloxy)ethanol + TX, 2-chlorovinyl diethyl phosphate + TX, 2-imidazolidone + TX, 2-isovalerylindan-1,3-dione + TX, 2-methyl(prop-2-ynyl)aminophenyl methylcarbamate + TX, 2-thiocyanatoethyl laurate + TX, 3-bromo-1-chloroprop-1-ene + TX, 3-methyl-1-phenylpyrazol-5-yl dimethylcarbamate + TX, 4-methyl(prop-2-ynyl)amino-3,5-xylyl methylcarbamate + TX, 5,5-dimethyl-3-oxocyclohex-1-enyl dimethylcarbamate + TX, acethion + TX, acrylonitrile + TX, aldrin + TX, allosamidin + TX, allyxycarb + TX, alpha-ecdysone + TX, aluminium phosphide + TX, aminocarb + TX, anabasine + TX, athidathion + TX, azamethiphos + TX, Bacillus thuringiensis delta endotoxins + TX, barium hexafluorosilicate + TX, barium polysulfide + TX, barthrin + TX, Bayer 22/190 + TX, Bayer 22408 + TX, beta-cyfluthrin + TX, beta-cypermethrin + TX, bioethanomethrin + TX, biopermethrin + TX, bis(2-chloroethyl) ether + TX, borax + TX, bromfenvinfos + TX, bromo-DDT + TX, bufencarb + TX, butacarb + TX, butathiofos + TX, butonate + TX, calcium arsenate + TX, calcium cyanide + TX, carbon disulfide + TX, carbon tetrachloride + TX, cartap hydrochloride + TX, cevadine + TX, chlorbicyclen + TX, chlordane + TX, chlordecone + TX, chloroform + TX, chloropicrin + TX, chlorphoxim + TX, chlorprazophos + TX, cis-resmethrin + TX, cismethrin + TX, clocythrin + TX, copper acetoarsenite + TX, copper arsenate + TX, copper oleate + TX, coumithoate + TX, cryolite + TX, CS 708 + TX, cyanofenphos + TX, cyanophos + TX, cyclethrin + TX, cythioate + TX, d-tetramethrin + TX, DAEP + TX, dazomet + TX, decarbofuran + TX, diamidafos + TX, dicapthon + TX, dichlofenthion + TX, dicresyl + TX, dicyclanil + TX, dieldrin + TX, diethyl 5-methylpyrazol-3-yl phosphate + TX, dilor + TX, dimefluthrin + TX, dimetan + TX, dimethrin + TX, dimethylvinphos + TX, dimetilan + TX, dinoprop + TX, dinosam + TX, dinoseb + TX, diofenolan + TX, dioxabenzofos + TX, dithicrofos + TX, DSP + TX, ecdysterone + TX, EI 1642 + TX, EMPC + TX, EPBP + TX, etaphos + TX, ethiofencarb + TX, ethyl formate + TX, ethylene dibromide + TX, ethylene dichloride + TX, ethylene oxide + TX, EXD + TX, fenchlorphos + TX, fenethacarb + TX, fenitrothion + TX, fenoxacrim + TX, fenpirithrin + TX, fensulfothion + TX, fenthion-ethyl + TX, flucofuron + TX, fosmethilan + TX, fospirate + TX, fosthietan + TX, furathiocarb + TX, furethrin + TX, guazatine + TX, guazatine acetates + TX, sodium tetrathiocarbonate + TX, halfenprox + TX, HCH + TX, HEOD + TX, heptachlor + TX, heterophos + TX, HHDN + TX, hydrogen cyanide + TX, hyquincarb + TX, IPSP +

TX, isazofos + TX, isobenzan + TX, isodrin + TX, isofenphos + TX, isolane + TX, isoprothiolane + TX, isoxathion + TX, juvenile hormone I + TX, juvenile hormone II + TX, juvenile hormone III + TX, kelevan + TX, kinoprene + TX, lead arsenate + TX, leptophos + TX, lirimfos + TX, lythidathion + TX, m-cumenyl methylcarbamate + TX, magnesium phosphide + TX, mazidox + TX, mecarphon + TX, menazon + TX, mercurous chloride + TX, mesulfenfos + TX, metam + TX, metam-potassium + TX, metam-sodium + TX, methanesulfonyl fluoride + TX, methocrotophos + TX, methoprene + TX, methothrin + TX, methoxychlor + TX, methyl isothiocyanate + TX, methylchloroform + TX, methylene chloride + TX, metoxadiazone + TX, mirex + TX, naftalofos + TX, naphthalene + TX, NC-170 + TX, nicotine + TX, nicotine sulfate + TX, nithiazine + TX, nornicotine + TX, O-5-dichloro-4-iodophenyl O-ethyl ethylphosphonothioate + TX, O,O-diethyl O-4-methyl-2-oxo-2H-chromen-7-yl phosphorothioate + TX, O,O-diethyl O-6-methyl-2-propylpyrimidin-4-yl phosphorothioate + TX, O,O,O',O'-tetrapropyl dithiopyrophosphate + TX, oleic acid + TX, para-dichlorobenzene + TX, parathion-methyl + TX, pentachlorophenol + TX, pentachlorophenyl laurate + TX, PH 60-38 + TX, phenkapton + TX, phosnichlor + TX, phosphine + TX, phoxim-methyl + TX, pirimetaphos + TX, polychlorodicyclopentadiene isomers + TX, potassium arsenite + TX, potassium thiocyanate + TX, precocene I + TX, precocene II + TX, precocene III + TX, primidophos + TX, profluthrin + TX, promecarb + TX, prothiofos + TX, pyrazophos + TX, pyresmethrin + TX, quassia + TX, quinalphos-methyl + TX, quinothion + TX, rafoxanide + TX, resmethrin + TX, rotenone + TX, kadethrin + TX, ryania + TX, ryanodine + TX, sabadilla) + TX, schradan + TX, sebufos + TX, SI-0009 + TX, thiapronil + TX, sodium arsenite + TX, sodium cyanide + TX, sodium fluoride + TX, sodium hexafluorosilicate + TX, sodium pentachlorophenoxide + TX, sodium selenate + TX, sodium thiocyanate + TX, sulcofuron + TX, sulcofuron-sodium + TX, sulfuryl fluoride + TX, sulprofos + TX, tar oils + TX, tazimcarb + TX, TDE + TX, tebupirimfos + TX, temephos + TX, terallethrin + TX, tetrachloroethane + TX, thicrofos + TX, thiocyclam + TX, thiocyclam hydrogen oxalate + TX, thionazin + TX, thiosultap + TX, thiosultap-sodium + TX, tralomethrin + TX, transpermethrin + TX, triazamate + TX, trichlormetaphos-3 + TX, trichloronat + TX, trimethacarb + TX, tolprocarb + TX, triclopyricarb + TX, triprene + TX, veratridine + TX, veratrine + TX, XMC + TX, zetamethrin + TX, zinc phosphide + TX, zolaprofos + TX, and meperfluthrin + TX, tetramethylfluthrin + TX, bis(tributyltin) oxide + TX, bromoacetamide + TX, ferric phosphate + TX, niclosamide-olamine + TX, tributyltin oxide + TX, pyrimorph + TX, trifenmorph + TX, 1,2-dibromo-3-chloropropane + TX, 1,3-dichloropropene + TX, 3,4-dichlorotetrahydrothiophene 1,1-dioxide + TX, 3-(4-chlorophenyl)-5-methylrhodanine + TX, 5-methyl-6-thioxo-1,3,5-thiadiazinan-3-ylacetic acid + TX, 6-isopentenylaminopurine + TX, 2-fluoro-N-(3-methoxyphenyl)-9H-purin-6-amine + TX, benclothiaz + TX, cytokinins + TX, DCIP + TX, furfural + TX, isamidofos + TX, kinetin + TX, Myrothecium verrucaria composition + TX, tetrachlorothiophene + TX, xylenols + TX, zeatin + TX, potassium ethylxanthate + TX ,acibenzolar + TX, acibenzolar-S-methyl + TX, Reynoutria sachalinensis extract + TX, alpha-chlorohydrin + TX, antu + TX, barium carbonate + TX, bisthiosemi + TX, brodifacoum + TX, bromadiolone + TX, bromethalin + TX, chlorophacinone + TX, cholecalciferol + TX, coumachlor + TX, coumafuryl + TX, coumatetralyl + TX, crimidine + TX, difenacoum + TX, difethialone + TX, diphacinone + TX, ergocalciferol + TX, flocoumafen + TX, fluoroacetamide + TX, flupropadine + TX, flupropadine hydrochloride + TX, norbormide + TX, phosacetim + TX, phosphorus + TX, pindone + TX, pyrinuron + TX, scilliroside + TX, sodium fluoroacetate + TX, thallium

sulfate + TX, warfarin + TX, 2-(2-butoxyethoxy)ethyl piperonylate + TX, 5-(1,3-benzodioxol-5-yl)-3-hexylcyclohex-2-enone + TX, farnesol with nerolidol + TX, verbutin + TX, MGK 264 + TX, piperonyl butoxide + TX, piprotal + TX, propyl isomer + TX, S421 + TX, sesamex + TX, sesasmolin + TX, sulfoxide + TX, anthraquinone + TX, copper naphthenate + TX, copper oxychloride + TX, dicyclopentadiene + TX, thiram + TX, zinc naphthenate + TX, ziram + TX, imanin + TX, ribavirin + TX, mercuric oxide + TX, thiophanate-methyl + TX, azaconazole + TX, bitertanol + TX, bromuconazole + TX, cyproconazole + TX, difenoconazole + TX, diniconazole + TX, epoxiconazole + TX, fenbuconazole + TX, fluquinconazole + TX, flusilazole + TX, flutriafol + TX, furametpyr + TX, hexaconazole + TX, imazalil + TX, imibenconazole + TX, ipconazole + TX, metconazole + TX, myclobutanil + TX, paclobutrazole + TX, pefurazoate + TX, penconazole + TX, prothioconazole + TX, pyrifenox + TX, prochloraz + TX, propiconazole + TX, pyrisoxazole + TX, simeconazole + TX, tebuconazole + TX, tetraconazole + TX, triadimefon + TX, triadimenol + TX, triflumizole + TX, triticonazole + TX, ancymidol + TX, fenarimol + TX, nuarimol + TX, bupirimate + TX, dimethirimol + TX, ethirimol + TX, dodemorph + TX, fenpropidin + TX, fenpropimorph + TX, spiroxamine + TX, tridemorph + TX, cyprodinil + TX, mepanipyrim + TX, pyrimethanil + TX, fenpiclonil + TX, fludioxonil + TX, benalaxyl + TX, furalaxyl + TX, metalaxyl -+ TX, Rmetalaxyl + TX, ofurace + TX, oxadixyl + TX, carbendazim + TX, debacarb + TX, fuberidazole + TX, thiabendazole + TX, chlozolinate + TX, dichlozoline + TX, myclozoline + TX, procymidone + TX, vinclozoline + TX, boscalid + TX, carboxin + TX, fenfuram + TX, flutolanil + TX, mepronil + TX, oxycarboxin + TX, penthiopyrad + TX, thifluzamide + TX, dodine + TX, iminoctadine + TX, azoxystrobin + TX, dimoxystrobin + TX, enestroburin + TX, fenaminstrobin + TX, flufenoxystrobin + TX, fluoxastrobin + TX, kresoxim-methyl + TX, metominostrobin + TX, trifloxystrobin + TX, orysastrobin + TX, picoxystrobin + TX, pyraclostrobin + TX, pyrametostrobin + TX, pyraoxystrobin + TX, ferbam + TX, mancozeb + TX, maneb + TX, metiram + TX, propineb + TX, zineb + TX, captafol + TX, captan + TX, fluoroimide + TX, folpet + TX, tolylfluanid + TX, bordeaux mixture + TX, copper oxide + TX, mancopper + TX, oxine-copper + TX, nitrothal-isopropyl + TX, edifenphos + TX, iprobenphos + TX, phosdiphen + TX, tolclofos-methyl + TX, anilazine + TX, benthiavalicarb + TX, blasticidin-S + TX, chloroneb + TX, chlorothalonil + TX, cyflufenamid + TX, cymoxanil + TX, cyclobutrifluram + TX, diclocymet + TX, diclomezine + TX, dicloran + TX, diethofencarb + TX, dimethomorph + TX, flumorph + TX, dithianon + TX, ethaboxam + TX, etridiazole + TX, famoxadone + TX, fenamidone + TX, fenoxanil + TX, ferimzone + TX, fluazinam + TX, fluopicolide + TX, flusulfamide + TX, fluxapyroxad + TX, fenhexamid + TX, fosetyl-aluminium + TX, hymexazol + TX, iprovalicarb + TX, cyazofamid + TX, methasulfocarb + TX, metrafenone + TX, pencycuron + TX, phthalide + TX, polyoxins + TX, propamocarb + TX, pyribencarb + TX, proquinazid + TX, pyroquilon + TX, pyriofenone + TX, quinoxyfen + TX, quintozene + TX, tiadinil + TX, triazoxide + TX, tricyclazole + TX, triforine + TX, validamycin + TX, valifenalate + TX, zoxamide + TX, mandipropamid + TX, flubeneteram + TX, isopyrazam + TX, sedaxane + TX, benzovindiflupyr + TX, pydiflumetofen + TX, 3-difluoromethyl-1-methyl-1H-pyrazole-4-carboxylic acid (3',4',5'-trifluoro-biphenyl-2-yl)-amide + TX, isoflucypram + TX, isotianil + TX, dipymetitrone + TX, 6-ethyl-5,7-dioxo-pyrrolo[4,5][1,4]dithiino[1,2-c]isothiazole-3-carbonitrile + TX, 2-(difluoromethyl)-N-[3-ethyl-1,1-dimethyl-indan-4-yl]pyridine-3-carboxamide + TX, 4-(2,6-difluorophenyl)-6-methyl-5-phenyl-pyridazine-3-carbonitrile + TX, (R)-3-(difluoromethyl)-1-methyl-N-[1,1,3-trimethylindan-4-yl]pyrazole-4-carboxamide

+ TX, 4-(2-bromo-4-fluoro-phenyl)-N-(2-chloro-6-fluoro-phenyl)-2,5-dimethyl-pyrazol-3-amine + TX, 4-(2- bromo- 4- fluorophenyl) - N- (2- chloro- 6- fluorophenyl) - 1, 3- dimethyl- 1H- pyrazol- 5- amine + TX, fluindapyr + TX, coumethoxystrobin (jiaxiangjunzhi) + TX, Ivbenmixianan + TX, dichlobentiazox + TX, mandestrobin + TX, 3-(4,4-difluoro-3,4-dihydro-3,3-dimethylisoquinolin-1-yl)quinolone + TX, 2-[2-fluoro-6-[(8-fluoro-2-methyl-3-quinolyl)oxy]phenyl]propan-2-ol + TX, oxathiapiprolin + TX, tert-butyl N-[6-[[[(1-methyltetrazol-5-yl)-phenyl-methylene]amino]oxymethyl]-2-pyridyl]carbamate + TX, pyraziflumid + TX, inpyrfluxam + TX, trolprocarb + TX, mefentrifluconazole + TX, ipfentrifluconazole+ TX, 2-(difluoromethyl)-N-[(3R)-3-ethyl-1,1-dimethyl-indan-4-yl]pyridine-3-carboxamide + TX, N'-(2,5-dimethyl-4-phenoxy-phenyl)-N-ethyl-N-methyl-formamidine + TX, N'-[4-(4,5-dichlorothiazol-2-yl)oxy-2,5-dimethyl-phenyl]-N-ethyl-N-methyl-formamidine + TX, [2-[3-[2-[1-[2-[3,5-bis(difluoromethyl)pyrazol-1-yl]acetyl]-4-piperidyl]thiazol-4-yl]-4,5-dihydroisoxazol-5-yl]-3-chloro-phenyl] methanesulfonate + TX, but-3-ynyl N-[6-[[(Z)-[(1-methyltetrazol-5-yl)-phenyl-methylene]amino]oxymethyl]-2-pyridyl]carbamate + TX, methyl N-[[5-[4-(2,4-dimethylphenyl)triazol-2-yl]-2-methyl-phenyl]methyl]carbamate + TX, 3-chloro-6-methyl-5-phenyl-4-(2,4,6-trifluorophenyl)pyridazine + TX, pyridachlometyl + TX, 3-(difluoromethyl)-1-methyl-N-[1,1,3-trimethylindan-4-yl]pyrazole-4-carboxamide + TX, 1-[2-[[1-(4-chlorophenyl)pyrazol-3-yl]oxymethyl]-3-methyl-phenyl]-4-methyl-tetrazol-5-one + TX, 1-methyl-4-[3-methyl-2-[[2-methyl-4-(3,4,5-trimethylpyrazol-1-yl)phenoxy]methyl]phenyl]tetrazol-5-one + TX, aminopyrifen + TX, ametoctradin + TX, amisulbrom + TX, penflufen + TX, (Z,2E)-5-[1-(4-chlorophenyl)pyrazol-3-yl]oxy-2-methoxyimino-N,3-dimethyl-pent-3-enamide + TX, florylpicoxamid + TX, fenpicoxamid + TX, tebufloquin + TX, ipflufenoquin + TX, quinofumelin + TX, isofetamid + TX, N-[2-[2,4-dichloro-phenoxy]phenyl]-3-(difluoromethyl)-1-methyl-pyrazole-4-carboxamide + TX, N-[2-[2-chloro-4-(trifluoromethyl)phenoxy]phenyl]-3-(difluoromethyl)-1-methyl-pyrazole-4-carboxamide + TX, benzothiostrobin + TX, phenamacril + TX, 5-amino-1,3,4-thiadiazole-2-thiol zinc salt (2:1) + TX, fluopyram + TX, flutianil + TX, fluopimomide + TX, pyrapropoyne + TX, picarbutrazox + TX, 2-(difluoromethyl)-N-(3-ethyl-1,1-dimethyl-indan-4-yl)pyridine-3-carboxamide + TX, 2- (difluoromethyl) - N- ((3R) - 1, 1, 3- trimethylindan- 4- yl) pyridine- 3- carboxamide + TX, 4-[[6-[2-(2,4-difluorophenyl)-1,1-difluoro-2-hydroxy-3-(1,2,4-triazol-1-yl)propyl]-3-pyridyl]oxy]benzonitrile + TX, metyltetraprole + TX, 2-(difluoromethyl) - N- ((3R) - 1, 1, 3- trimethylindan- 4- yl) pyridine- 3- carboxamide + TX, α- (1, 1-dimethylethyl) - α- [4'- (trifluoromethoxy) [1, 1'- biphenyl] - 4- yl] -5- pyrimidinemethanol + TX, fluoxapiprolin + TX, enoxastrobin + TX, 4-[[6-[2-(2,4-difluorophenyl)-1,1-difluoro-2-hydroxy-3-(1,2,4-triazol-1-yl)propyl]-3-pyridyl]oxy] benzonitrile + TX, 4-[[6-[2-(2,4-difluorophenyl)-1,1-difluoro-2-hydroxy-3-(5-sulfanyl-1,2,4-triazol-1-yl)propyl]-3-pyridyl]oxy] benzonitrile + TX, 4-[[6-[2-(2,4-difluorophenyl)-1,1-difluoro-2-hydroxy-3-(5-thioxo-4H-1,2,4-triazol-1-yl)propyl]-3-pyridyl]oxy]benzonitrile + TX, trinexapac + TX, coumoxystrobin + TX, zhongshengmycin + TX, thiodiazole copper + TX, zinc thiazole + TX, amectotractin + TX, iprodione + TX, N-octyl-N'-[2-(octylamino)ethyl]ethane-1,2-diamine + TX; N'-[5-bromo-2-methyl-6-[(1S)-1-methyl-2-propoxy-ethoxy]-3-pyridyl]-N-ethyl-N-methyl-formamidine + TX, N'-[5-bromo-2-methyl-6-[(1R)-1-methyl-2-propoxy-ethoxy]-3-pyridyl]-N-ethyl-N-methyl-formamidine + TX, N'-[5-bromo-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine + TX, N'-[5-chloro-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine + TX, N'-[5-bromo-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-isopropyl-N-methyl-formamidine +

TX (these compounds may be prepared from the methods described in WO2015/155075); N'-[5-bromo-2-methyl-6-(2-propoxypropoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine + TX (this compound may be prepared from the methods described in IPCOM000249876D); N-isopropyl-N'-[5-methoxy-2-methyl-4-(2,2,2-trifluoro-1-hydroxy-1-phenyl-ethyl)phenyl]-N-methyl-formamidine+ TX, N'-[4-(1-cyclopropyl-2,2,2-trifluoro-1-hydroxy-ethyl)-5-methoxy-2-methyl-phenyl]-N-isopropyl-N-methyl-formamidine + TX (these compounds may be prepared from the methods described in WO2018/228896); N-ethyl-N'-[5-methoxy-2-methyl-4-[2-trifluoromethyl)oxetan-2-yl]phenyl]-N-methyl-formamidine + TX, N-ethyl-N'-[5-methoxy-2-methyl-4-[2-trifuoromethyl)tetrahydrofuran-2-yl]phenyl]-N-methyl-formamidine + TX (these compounds may be prepared from the methods described in WO2019/110427); N-[(1R)-1-benzyl-3-chloro-1-methyl-but-3-enyl]-8-fluoro-quinoline-3-carboxamide + TX, N-[(1S)-1-benzyl-3-chloro-1-methyl-but-3-enyl]-8-fluoro-quinoline-3-carboxamide + TX, N-[(1R)-1-benzyl-3,3,3-trifluoro-1-methyl-propyl]-8-fluoro-quinoline-3-carboxamide + TX, N-[(1S)-1-benzyl-3,3,3-trifluoro-1-methyl-propyl]-8-fluoro-quinoline-3-carboxamide + TX, N-[(1R)-1-benzyl-1,3-dimethyl-butyl]-7,8-difluoro-quinoline-3-carboxamide + TX, N-[(1S)-1-benzyl-1,3-dimethyl-butyl]-7,8-difluoro-quinoline-3-carboxamide + TX, 8-fluoro-N-[(1R)-1-[(3-fluorophenyl)methyl]-1,3-dimethyl-butyl]quinoline-3-carboxamide + TX, 8-fluoro-N-[(1S)-1-[(3-fluorophenyl)methyl]-1,3-dimethyl-butyl]quinoline-3-carboxamide + TX, N-[(1R)-1-benzyl-1,3-dimethyl-butyl]-8-fluoro-quinoline-3-carboxamide + TX, N-[(1S)-1-benzyl-1,3-dimethyl-butyl]-8-fluoro-quinoline-3-carboxamide + TX, N-((1R)-1-benzyl-3-chloro-1-methyl-but-3-enyl)-8-fluoro-quinoline-3-carboxamide + TX, N-((1S)-1-benzyl-3-chloro-1-methyl-but-3-enyl)-8-fluoro-quinoline-3-carboxamide + TX (these compounds may be prepared from the methods described in WO2017/153380);

1-(6,7-dimethylpyrazolo[1,5-a]pyridin-3-yl)-4,4,5-trifluoro-3,3-dimethyl-isoquinoline + TX, 1-(6,7-dimethylpyrazolo[1,5-a]pyridin-3-yl)-4,4,6-trifluoro-3,3-dimethyl-isoquinoline + TX, 4,4-difluoro-3,3-dimethyl-1-(6-methylpyrazolo[1,5-a]pyridin-3-yl)isoquinoline + TX, 4,4-difluoro-3,3-dimethyl-1-(7-methylpyrazolo[1,5-a]pyridin-3-yl)isoquinoline + TX, 1-(6-chloro-7-methyl-pyrazolo[1,5-a]pyridin-3-yl)-4,4-difluoro-3,3-dimethyl-isoquinoline + TX (these compounds may be prepared from the methods described in WO2017/025510); 1-(4,5-dimethylbenzimidazol-1-yl)-4,4,5-trifluoro-3,3-dimethyl-isoquinoline + TX, 1-(4,5-dimethylbenzimidazol-1-yl)-4,4-difluoro-3,3-dimethyl-isoquinoline + TX, 6-chloro-4,4-difluoro-3,3-dimethyl-1-(4-methylbenzimidazol-1-yl)isoquinoline + TX, 4,4-difluoro-1-(5-fluoro-4-methyl-benzimidazol-1-yl)-3,3-dimethyl-isoquinoline + TX, 3-(4,4-difluoro-3,3-dimethyl-1-isoquinolyl)-7,8-dihydro-6H-cyclopenta[e]benzimidazole + TX (these compounds may be prepared from the methods described in WO2016/156085); N-methoxy-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]cyclopropanecarboxamide + TX, N,2-dimethoxy-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propanamide + TX, N-ethyl-2-methyl-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propanamide + TX, 1-methoxy-3-methyl-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea + TX, 1,3-dimethoxy-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea + TX, 3-ethyl-1-methoxy-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea + TX, N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propanamide + TX, 4,4-dimethyl-2-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]isoxazolidin-3-one + TX, 5,5-dimethyl-2-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-

yl]phenyl]methyl]isoxazolidin-3-one + TX, ethyl 1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]pyrazole-4-carboxylate + TX, N,N-dimethyl-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]-1,2,4-triazol-3-amine + TX. The compounds in this paragraph may be prepared from the methods described in WO 2017/055473, WO 2017/055469, WO 2017/093348 and WO 2017/118689; 2-[6-(4-chlorophenoxy)-2-(trifluoromethyl)-3-pyridyl]-1-(1,2,4-triazol-1-yl)propan-2-ol + TX (this compound may be prepared from the methods described in WO 2017/029179); 2-[6-(4-bromophenoxy)-2-(trifluoromethyl)-3-pyridyl]-1-(1,2,4-triazol-1-yl)propan-2-ol + TX (this compound may be prepared from the methods described in WO 2017/029179); 3-[2-(1-chlorocyclopropyl)-3-(2-fluorophenyl)-2-hydroxy-propyl]imidazole-4-carbonitrile + TX (this compound may be prepared from the methods described in WO 2016/156290); 3-[2-(1-chlorocyclopropyl)-3-(3-chloro-2-fluoro-phenyl)-2-hydroxy-propyl]imidazole-4-carbonitrile + TX (this compound may be prepared from the methods described in WO 2016/156290); (4-phenoxyphenyl)methyl 2-amino-6-methyl-pyridine-3-carboxylate + TX (this compound may be prepared from the methods described in WO 2014/006945); 2,6-Dimethyl-1H,5H-[1,4]dithiino[2,3-c:5,6-c']dipyrrole-1,3,5,7(2H,6H)-tetrone + TX (this compound may be prepared from the methods described in WO 2011/138281); N-methyl-4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]benzenecarbothioamide + TX; N-methyl-4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]benzamide + TX; (Z,2E)-5-[1-(2,4-dichlorophenyl)pyrazol-3-yl]oxy-2-methoxyimino-N,3-dimethyl-pent-3-enamide + TX (this compound may be prepared from the methods described in WO 2018/153707); N'-(2-chloro-5-methyl-4-phenoxy-phenyl)-N-ethyl-N-methyl-formamidine + TX; N'-[2-chloro-4-(2-fluorophenoxy)-5-methyl-phenyl]-N-ethyl-N-methyl-formamidine + TX (this compound may be prepared from the methods described in WO 2016/202742); 2-(difluoromethyl)-N-[(3S)-3-ethyl-1,1-dimethyl-indan-4-yl]pyridine-3-carboxamide + TX (this compound may be prepared from the methods described in WO 2014/095675); (5-methyl-2-pyridyl)-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methanone + TX, (3-methylisoxazol-5-yl)-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methanone + TX (these compounds may be prepared from the methods described in WO 2017/220485); 2-oxo-N-propyl-2-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]acetamide + TX (this compound may be prepared from the methods described in WO 2018/065414); ethyl 1-[[5-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]-2-thienyl]methyl]pyrazole-4-carboxylate + TX (this compound may be prepared from the methods described in WO 2018/158365) ; 2,2-difluoro-N-methyl-2-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]acetamide + TX, N-[(E)-methoxyiminomethyl]-4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]benzamide + TX, N-[(Z)-methoxyiminomethyl]-4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]benzamide + TX, N-[N-methoxy-C-methyl-carbonimidoyl]-4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]benzamide + TX (these compounds may be prepared from the methods described in WO 2018/202428), chloroinconazide + TX, flumetylsulforim + TX, fluoxytioconazole + TX, flufenoxadiazam +TX, metarylpicoxamid +TX.

The above-described mixing partners are known. Where the active ingredients are included in "The Pesticide Manual" [The Pesticide Manual - A World Compendium; Thirteenth Edition; Editor: C. D. S. TomLin; The British Crop Protection Council], they are described therein under the entry number given in round brackets hereinabove for the particular compound; for example, the compound "abamectin" is described under entry number (1). Where "[CCN]" is added hereinabove to the particular

compound, the compound in question is included in the "Compendium of Pesticide Common Names", which is accessible on the internet [A. Wood; Compendium of Pesticide Common Names, Copyright © 1995-2004]; for example, the compound "acetoprole" is described under the internet address http://www.alanwood.net/pesticides/acetoprole.html

Most of the active ingredients described above are referred to hereinabove by a so-called "common name", the relevant "ISO common name" or another "common name" being used in individual cases. If the designation is not a "common name", the nature of the designation used instead is given in round brackets for the particular compound; in that case, the IUPAC name, the IUPAC/Chemical Abstracts name, a "chemical name", a "traditional name", a "compound name" or a "develoment code" is used or, if neither one of those designations nor a "common name" is used, an "alternative name" is employed. “CAS Reg. No” means the Chemical Abstracts Registry Number.

In the “reference” mixture compositions the mixtures of compounds of formula (I) (selected from Table E (above)) with active ingredients described above comprise a compound selected from Table E (above) and an active ingredient as described above preferably in a mixing ratio of from 100:1 to 1:100, especially from 50:1 to 1:50, more especially in a ratio of from 20:1 to 1:20, even more especially from 10:1 to 1:10, very especially from 5:1 and 1:5, special preference being given to a ratio of from 2:1 to 1:2, and a ratio of from 4:1 to 2:1 being likewise preferred, above all in a ratio of 1:1, or 5:1, or 5:2, or 5:3, or 5:4, or 4:1, or 4:2, or 4:3, or 3:1, or 3:2, or 2:1, or 1:5, or 2:5, or 3:5, or 4:5, or 1:4, or 2:4, or 3:4, or 1:3, or 2:3, or 1:2, or 1:600, or 1:300, or 1:150, or 1:35, or 2:35, or 4:35, or 1:75, or 2:75, or 4:75, or 1:6000, or 1:3000, or 1:1500, or 1:350, or 2:350, or 4:350, or 1:750, or 2:750, or 4:750. Those mixing ratios are by weight.

The mixture compositions as described above (both according to the invetion and the “reference” mixture compositions) can be used in a method for controlling pests, which comprises applying a composition comprising a mixture as described above to the pests or their environment.

The mixtures comprising a compound of formula (I) selected from Table E (above) and one or more active ingredients as described above can be applied, for example, in a single “ready-mix” form, in a combined spray mixture composed from separate formulations of the single active ingredient components, such as a “tank-mix”, and in a combined use of the single active ingredients when applied in a sequential manner, i.e. one after the other with a reasonably short period, such as a few hours or days. The order of applying the compounds of formula (I) selected from Table E (above) and the active ingredients as described above is not essential for working the present invention.

The compositions of the present invention may also be used in crop enhancement. According to the present invention, ‘crop enhancement’ means an improvement in plant vigour, an improvement in plant quality, improved tolerance to stress factors, and/or improved input use efficiency.

According to the present invention, an ‘improvement in plant vigour’ means that certain traits are improved qualitatively or quantitatively when compared with the same trait in a control plant which has been grown under the same conditions in the absence of the method of the invention. Such traits include, but are not limited to, early and/or improved germination, improved emergence, the ability to

use less seeds, increased root growth, a more developed root system, increased root nodulation, increased shoot growth, increased tillering, stronger tillers, more productive tillers, increased or improved plant stand, less plant verse (lodging), an increase and/or improvement in plant height, an increase in plant weight (fresh or dry), bigger leaf blades, greener leaf colour, increased pigment content, increased photosynthetic activity, earlier flowering, longer panicles, early grain maturity, increased seed, fruit or pod size, increased pod or ear number, increased seed number per pod or ear, increased seed mass, enhanced seed filling, less dead basal leaves, delay of senescence, improved vitality of the plant, increased levels of amino acids in storage tissues and/or less inputs needed (e.g. less fertiliser, water and/or labour needed). A plant with improved vigour may have an increase in any of the aforementioned traits or any combination or two or more of the aforementioned traits.

According to the present invention, an 'improvement in plant quality' means that certain traits are improved qualitatively or quantitatively when compared with the same trait in a control plant which has been grown under the same conditions in the absence of the method of the invention. Such traits include, but are not limited to, improved visual appearance of the plant, reduced ethylene (reduced production and/or inhibition of reception), improved quality of harvested material, e.g. seeds, fruits, leaves, vegetables (such improved quality may manifest as improved visual appearance of the harvested material), improved carbohydrate content (e.g. increased quantities of sugar and/or starch, improved sugar acid ratio, reduction of reducing sugars, increased rate of development of sugar), improved protein content, improved oil content and composition, improved nutritional value, reduction in anti-nutritional compounds, improved organoleptic properties (e.g. improved taste) and/or improved consumer health benefits (e.g. increased levels of vitamins and anti-oxidants)), improved post-harvest characteristics (e.g. enhanced shelf-life and/or storage stability, easier processability, easier extraction of compounds), more homogenous crop development (e.g. synchronised germination, flowering and/or fruiting of plants), and/or improved seed quality (e.g. for use in following seasons). A plant with improved quality may have an increase in any of the aforementioned traits or any combination or two or more of the aforementioned traits.

According to the present invention, an 'improved tolerance to stress factors' means that certain traits are improved qualitatively or quantitatively when compared with the same trait in a control plant which has been grown under the same conditions in the absence of the method of the invention. Such traits include, but are not limited to, an increased tolerance and/or resistance to abiotic stress factors which cause sub-optimal growing conditions such as drought (e.g. any stress which leads to a lack of water content in plants, a lack of water uptake potential or a reduction in the water supply to plants), cold exposure, heat exposure, osmotic stress, UV stress, flooding, increased salinity (e.g. in the soil), increased mineral exposure, ozone exposure, high light exposure and/or limited availability of nutrients (e.g. nitrogen and/or phosphorus nutrients). A plant with improved tolerance to stress factors may have an increase in any of the aforementioned traits or any combination or two or more of the aforementioned traits. In the case of drought and nutrient stress, such improved tolerances may be due to, for example, more efficient uptake, use or retention of water and nutrients.

According to the present invention, an 'improved input use efficiency' means that the plants are able to grow more effectively using given levels of inputs compared to the grown of control plants which

are grown under the same conditions in the absence of the method of the invention. In particular, the inputs include, but are not limited to fertiliser (such as nitrogen, phosphorous, potassium, micronutrients), light and water. A plant with improved input use efficiency may have an improved use of any of the aforementioned inputs or any combination of two or more of the aforementioned inputs.

Other crop enhancements of the present invention include a decrease in plant height, or reduction in tillering, which are beneficial features in crops or conditions where it is desirable to have less biomass and fewer tillers.

Any or all of the above crop enhancements may lead to an improved yield by improving e.g. plant physiology, plant growth and development and/or plant architecture. In the context of the present invention 'yield' includes, but is not limited to, (i) an increase in biomass production, grain yield, starch content, oil content and/or protein content, which may result from (a) an increase in the amount produced by the plant *per se* or (b) an improved ability to harvest plant matter, (ii) an improvement in the composition of the harvested material (e.g. improved sugar acid ratios, improved oil composition, increased nutritional value, reduction of anti-nutritional compounds, increased consumer health benefits) and/or (iii) an increased/facilitated ability to harvest the crop, improved processability of the crop and/or better storage stability/shelf life. Increased yield of an agricultural plant means that, where it is possible to take a quantitative measurement, 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 application of the present invention. According to the present invention, it is preferred that the yield be increased by at least 0.5%, more preferred at least 1%, even more preferred at least 2%, still more preferred at least 4%, preferably 5% or even more.

Any or all of the above crop enhancements may also lead to an improved utilisation of land, i.e. land which was previously unavailable or sub-optimal for cultivation may become available. For example, plants which show an increased ability to survive in drought conditions, may be able to be cultivated in areas of sub-optimal rainfall, e.g. perhaps on the fringe of a desert or even the desert itself.

In one aspect of the present invention, crop enhancements are made in the substantial absence of pressure from pests and/or diseases and/or abiotic stress. In a further aspect of the present invention, improvements in plant vigour, stress tolerance, quality and/or yield are made in the substantial absence of pressure from pests and/or diseases. For example, pests and/or diseases may be controlled by a pesticidal treatment that is applied prior to, or at the same time as, the method of the present invention. In a still further aspect of the present invention, improvements in plant vigour, stress tolerance, quality and/or yield are made in the absence of pest and/or disease pressure. In a further embodiment, improvements in plant vigour, quality and/or yield are made in the absence, or substantial absence, of abiotic stress.

The compositions of the present invention may also be used in the field of protecting storage goods against attack of fungi. According to the present invention, the term "storage goods" is understood to denote natural substances of vegetable and/or animal origin and their processed forms, which have been taken from the natural life cycle and for which long-term protection is desired. Storage goods of vegetable origin, such as plants or parts thereof, for example stalks, leafs, tubers, seeds, fruits or grains, can be protected in the freshly harvested state or in processed form, such as pre-dried, moistened,

comminuted, ground, pressed or roasted. Also falling under the definition of storage goods is timber, whether in the form of crude timber, such as construction timber, electricity pylons and barriers, or in the form of finished articles, such as furniture or objects made from wood. Storage goods of animal origin are hides, leather, furs, hairs and the like. The composition according the present invention can prevent disadvantageous effects such as decay, discoloration or mold. Preferably “storage goods” is understood to denote natural substances of vegetable origin and/or their processed forms, more preferably fruits and their processed forms, such as pomes, stone fruits, soft fruits and citrus fruits and their processed forms. In another preferred embodiment of the invention “storage goods” is understood to denote wood.

Therefore, a further aspect of the present invention is a method of protecting storage goods, which comprises applying to the storage goods a composition according to the invention.

The composition of the present invention may also be used in the field of protecting technical material against attack of fungi. According to the present invention, the term “technical material” includes paper; carpets; constructions; cooling and heating systems; wall-boards; ventilation and air conditioning systems and the like; preferably “technical material” is understood to denote wall-boards. The composition according the present invention can prevent disadvantageous effects such as decay, discoloration or mold.

The composition according to the invention is generally formulated in various ways using formulation adjuvants, such as carriers, solvents and surface-active substances. The formulations can be in various physical forms, e.g. in the form of dusting powders, gels, wettable powders, water-dispersible granules, water-dispersible tablets, effervescent pellets, emulsifiable concentrates, micro-emulsifiable concentrates, oil-in-water emulsions, oil-flowables, aqueous dispersions, oily dispersions, suspo-emulsions, capsule suspensions, emulsifiable granules, soluble liquids, water-soluble concentrates (with water or a water-miscible organic solvent as carrier), impregnated polymer films or in other forms known e.g. from the Manual on Development and Use of FAO and WHO Specifications for Pesticides, United Nations, First Edition, Second Revision (2010). Such formulations can either be used directly or diluted prior to use. The dilutions can be made, for example, with water, liquid fertilisers, micronutrients, biological organisms, oil or solvents.

The formulations can be prepared e.g. by mixing the active ingredient with the formulation adjuvants in order to obtain compositions in the form of finely divided solids, granules, solutions, dispersions or emulsions. The active ingredients can also be formulated with other adjuvants, such as finely divided solids, mineral oils, oils of vegetable or animal origin, modified oils of vegetable or animal origin, organic solvents, water, surface-active substances or combinations thereof.

The active ingredients can also be contained in microcapsules. Microcapsules contain the active ingredients in a porous carrier. This enables the active ingredients to be released into the environment in controlled amounts (e.g. slow-release). Microcapsules usually have a diameter of from 0.1 to 500 microns. They contain active ingredients in an amount of about from 25 to 95 % by weight of the capsule weight. The active ingredients can be in the form of a monolithic solid, in the form of fine particles in solid or liquid dispersion or in the form of a suitable solution. The encapsulating membranes can comprise, for example, natural or synthetic rubbers, cellulose, styrene/butadiene copolymers, polyacrylonitrile, polyacrylate, polyesters, polyamides, polyureas, polyurethane or chemically modified

polymers and starch xanthates or other polymers that are known to the person skilled in the art. Alternatively, very fine microcapsules can be formed in which the active ingredient is contained in the form of finely divided particles in a solid matrix of base substance, but the microcapsules are not themselves encapsulated.

The formulation adjuvants that are suitable for the preparation of the formulations according to the invention are known *per se*. As liquid carriers there may be used: water, toluene, xylene, petroleum ether, vegetable oils, acetone, methyl ethyl ketone, cyclohexanone, acid anhydrides, acetonitrile, acetophenone, amyl acetate, 2-butanone, butylene carbonate, chlorobenzene, cyclohexane, cyclohexanol, alkyl esters of acetic acid, diacetone alcohol, 1,2-dichloropropane, diethanolamine, p-diethylbenzene, diethylene glycol, diethylene glycol abietate, diethylene glycol butyl ether, diethylene glycol ethyl ether, diethylene glycol methyl ether, *N,N*-dimethylformamide, dimethyl sulfoxide, 1,4-dioxane, dipropylene glycol, dipropylene glycol methyl ether, dipropylene glycol dibenzoate, diproxitol, alkylpyrrolidone, ethyl acetate, 2-ethylhexanol, ethylene carbonate, 1,1,1-trichloroethane, 2-heptanone, alpha-pinene, d-limonene, ethyl lactate, ethylene glycol, ethylene glycol butyl ether, ethylene glycol methyl ether, gamma-butyrolactone, glycerol, glycerol acetate, glycerol diacetate, glycerol triacetate, hexadecane, hexylene glycol, isoamyl acetate, isobornyl acetate, isooctane, isophorone, isopropylbenzene, isopropyl myristate, lactic acid, laurylamine, mesityl oxide, methoxypropanol, methyl isoamyl ketone, methyl isobutyl ketone, methyl laurate, methyl octanoate, methyl oleate, methylene chloride, m-xylene, *n*-hexane, *n*-octylamine, octadecanoic acid, octylamine acetate, oleic acid, oleylamine, o-xylene, phenol, polyethylene glycol, propionic acid, propyl lactate, propylene carbonate, propylene glycol, propylene glycol methyl ether, p-xylene, toluene, triethyl phosphate, triethylene glycol, xylenesulfonic acid, paraffin, mineral oil, trichloroethylene, perchloroethylene, ethyl acetate, amyl acetate, butyl acetate, propylene glycol methyl ether, diethylene glycol methyl ether, methanol, ethanol, isopropanol, and alcohols of higher molecular weight, such as amyl alcohol, tetrahydrofurfuryl alcohol, hexanol, octanol, ethylene glycol, propylene glycol, glycerol, *N*-methyl-2-pyrrolidone and the like.

Suitable solid carriers are, for example, talc, titanium dioxide, pyrophyllite clay, silica, attapulgite clay, kieselguhr, limestone, calcium carbonate, bentonite, calcium montmorillonite, cottonseed husks, wheat flour, soybean flour, pumice, wood flour, ground walnut shells, lignin and similar substances.

A large number of surface-active substances can advantageously be used in both solid and liquid formulations, especially in those formulations which can be diluted with a carrier prior to use. Surface-active substances may be anionic, cationic, non-ionic or polymeric and they can be used as emulsifiers, wetting agents or suspending agents or for other purposes. Typical surface-active substances include, for example, salts of alkyl sulfates, such as diethanolammonium lauryl sulfate; salts of alkylarylsulfonates, such as calcium dodecylbenzenesulfonate; alkylphenol/alkylene oxide addition products, such as nonylphenol ethoxylate; alcohol/alkylene oxide addition products, such as tridecylalcohol ethoxylate; soaps, such as sodium stearate; salts of alkylnaphthalenesulfonates, such as sodium dibutylnaphthalenesulfonate; dialkyl esters of sulfosuccinate salts, such as sodium di(2-ethylhexyl)sulfosuccinate; sorbitol esters, such as sorbitol oleate; quaternary amines, such as lauryltrimethylammonium chloride, polyethylene glycol esters of fatty acids, such as polyethylene glycol stearate; block copolymers of ethylene oxide and propylene oxide; and salts of mono- and di-

alkylphosphate esters; and also further substances described e.g. in McCutcheon's Detergents and Emulsifiers Annual, MC Publishing Corp., Ridgewood New Jersey (1981).

Further adjuvants that can be used in pesticidal formulations include crystallisation inhibitors, viscosity modifiers, suspending agents, dyes, anti-oxidants, foaming agents, light absorbers, mixing auxiliaries, antifoams, complexing agents, neutralising or pH-modifying substances and buffers, corrosion inhibitors, fragrances, wetting agents, take-up enhancers, micronutrients, plasticisers, glidants, lubricants, dispersants, thickeners, antifreezes, microbicides, and liquid and solid fertilisers.

The formulations according to the invention can include an additive comprising an oil of vegetable or animal origin, a mineral oil, alkyl esters of such oils or mixtures of such oils and oil derivatives. The amount of oil additive in the formulation according to the invention is generally from 0.01 to 10 %, based on the mixture to be applied. For example, the oil additive can be added to a spray tank in the desired concentration after a spray mixture has been prepared. Preferred oil additives comprise mineral oils or an oil of vegetable origin, for example rapeseed oil, olive oil or sunflower oil, emulsified vegetable oil, alkyl esters of oils of vegetable origin, for example the methyl derivatives, or an oil of animal origin, such as fish oil or beef tallow. Preferred oil additives comprise alkyl esters of C_8-C_{22} fatty acids, especially the methyl derivatives of C_{12}-C_{18} fatty acids, for example the methyl esters of lauric acid, palmitic acid and oleic acid (methyl laurate, methyl palmitate and methyl oleate, respectively). Many oil derivatives are known from the Compendium of Herbicide Adjuvants, 10th Edition, Southern Illinois University, 2010.

The formulations generally comprise from 0.1 to 99 % by weight, especially from 0.1 to 95 % by weight, of compounds of component (A) and component (B) and from 1 to 99.9 % by weight of a formulation adjuvant which preferably includes from 0 to 25 % by weight of a surface-active substance. Whereas commercial products may preferably be formulated as concentrates, the end user will normally employ dilute formulations.

The rates of application vary within wide limits and depend on the nature of the soil, the method of application, the crop plant, the pest to be controlled, the prevailing climatic conditions, and other factors governed by the method of application, the time of application and the target crop. As a general guideline, compounds may be applied at a rate of from 1 to 2000 l/ha, especially from 10 to 1000 l/ha.

Certain mixture compositions comprising a compound of formula (I) described above may show a synergistic effect. This occurs whenever the action of an active ingredient combination is greater than the sum of the actions of the individual components. The action to be expected E for a given active ingredient combination obeys the so-called COLBY formula and can be calculated as follows (COLBY, S.R. "Calculating synergistic and antagonistic responses of herbicide combination". Weeds, Vol. 15, pages 20-22; 1967):

ppm = milligrams of active ingredient (= a.i.) per liter of spray mixture

X = % action by active ingredient A) using p ppm of active ingredient

Y = % action by active ingredient B) using q ppm of active ingredient.

According to COLBY, the expected (additive) action of active ingredients A)+B) using p+q ppm of active ingredient is:

$$E = X + Y - \frac{X \cdot Y}{100} .$$

If the action actually observed (O) is greater than the expected action (E), then the action of the combination is super-additive, i.e. there is a synergistic effect. In mathematical terms, synergism corresponds to a positive value for the difference of (O-E). In the case of purely complementary addition of activities (expected activity), said difference (O-E) is zero. A negative value of said difference (O-E) signals a loss of activity compared to the expected activity.

However, besides the actual synergistic action with respect to fungicidal activity, the composition according to the invention may also have further surprising advantageous properties. Examples of such advantageous properties that may be mentioned are: more advantageous degradability; improved toxicological and/or ecotoxicological behaviour; or improved characteristics of the useful plants including: emergence, crop yields, more developed root system, tillering increase, increase in plant height, bigger leaf blade, less dead basal leaves, stronger tillers, greener leaf colour, less fertilizers needed, less seeds needed, more productive tillers, earlier flowering, early grain maturity, less plant verse (lodging), increased shoot growth, improved plant vigor, and early germination.

The composition according to the invention can be applied to the phytopathogenic microorganisms, the useful plants, the locus thereof, the propagation material thereof, storage goods or technical materials threatened by microorganism attack.

The composition according to the invention may be applied before or after infection of the useful plants, the propagation material thereof, storage goods or technical materials by the microorganisms.

The amount of a composition according to the invention to be applied, will depend on various factors, such as the compounds employed; the subject of the treatment, such as, for example plants, soil or seeds; the type of treatment, such as, for example spraying, dusting or seed dressing; the purpose of the treatment, such as, for example prophylactic or therapeutic; the type of fungi to be controlled or the application time.

When applied to the useful plants component (A) is typically applied at a rate of 5 to 2000 g a.i./ha, particularly 10 to 1000 g a.i./ha, e.g. 50, 75, 100 or 200 g a.i./ha, typically in association with 1 to 5000 g a.i./ha, particularly 2 to 2000 g a.i./ha, e.g. 100, 250, 500, 800, 1000, 1500 g a.i./ha of component (B).

In agricultural practice the application rates of the composition according to the invention depend on the type of effect desired, and typically range from 20 to 4000 g of total composition per hectare.

When the composition according to the invention is used for treating seed, rates of 0.001 to 50 g of a compound of component (A) per kg of seed, preferably from 0.01 to 10g per kg of seed, and 0.001 to 50 g of a compound of component (B), per kg of seed, preferably from 0.01 to 10g per kg of seed, are generally sufficient.

For the avoidance of doubt, where a literary reference, patent application, or patent, is cited within the text of this application, the entire text of said citation is herein incorporated by reference.

EXAMPLES

The Examples which follow serve to illustrate the invention.

The compounds (and compositions) of the invention may be distinguished from known compounds (and compositions) by virtue of greater efficacy at low application rates, which can be verified by the person skilled in the art using the experimental procedures outlined in the Examples, using lower application rates if necessary, for example 50 ppm, 12.5 ppm, 6 ppm, 3 ppm, 1.5 ppm or 0.2 ppm of active ingredient(s).

Compounds of Formula (I) may possess any number of benefits including, *inter alia*, advantageous levels of biological activity for protecting plants against diseases that are caused by fungi or superior properties for use as agrochemical active ingredients (for example, greater biological activity, an advantageous spectrum of activity, an increased safety profile (including improved crop tolerance), improved physico-chemical properties, or increased biodegradability).

Throughout this description, temperatures are given in degrees Celsius (°C) and "mp." means melting point. LC/MS means Liquid Chromatography Mass Spectrometry and the description of the apparatus and the method is as follows:

The description of the LC/MS apparatus and the methods is:

Method G:

Spectra were recorded on a Mass Spectrometer from Waters (SQD, SQDII Single quadrupole mass spectrometer) equipped with an electrospray source (Polarity: positive and negative ions), Capillary: 3.00 kV, Cone range: 30 V, Extractor: 2.00 V, Source Temperature: 150°C, Desolvation Temperature: 350°C, Cone Gas Flow: 50 l/h, Desolvation Gas Flow: 650 l/h, Mass range: 100 to 900 Da) and an Acquity UPLC from Waters: Binary pump, heated column compartment , diode-array detector and ELSD detector. Column: Waters UPLC HSS T3, 1.8 µm, 30 x 2.1 mm, Temp: 60 °C, DAD Wavelength range (nm): 210 to 500, Solvent Gradient: A = water + 5% MeOH + 0.05 % HCOOH, B = Acetonitrile + 0.05 % HCOOH, gradient: 10-100% B in 1.2 min; Flow (mL/min) 0.85.

Method G1:

Spectra were recorded on a Mass Spectrometer from Waters (SQD, SQDII Single quadrupole mass spectrometer) equipped with an electrospray source (Polarity: positive and negative ions), Capillary: 0.8 kV, Cone range: 25 V, Source Temperature: 120°C, Desolvation Temperature: 600°C, Cone Gas Flow: 50 l/h, Desolvation Gas Flow: 1000 l/h, Mass range: 110 to 850 Da) and an Acquity UPLC from Waters: Binary pump, heated column compartment , diode-array detector and ELSD detector. Column: Waters UPLC HSS T3 C18, 1.8 µm, 30 x 2.1 mm, Temp: 40 °C, DAD Wavelength range (nm): 230 to 400, Solvent Gradient: A = water + 0.05 % HCOOH, B = Acetonitrile + 0.05 % HCOOH, gradient: 10-100% B in 1.6 min; Flow (mL/min) 0.60.

Method H1:

Spectra were recorded on a SFC Waters Acquity UPC²/QDa with detection on a PDA Detector Waters Acquity UPC². Column: Daicel SFC CHIRALPAK® IC, 3mm, 0.3cm x 10cm, 40°C, Mobile phase:

A: CO_2 B: 2-propanol, isocratic: 30% B in 4.8 min, ABPR: 1800 psi, Flow rate: 2.0 ml/min, Detection: 240 nm, Sample concentration: 1 mg/mL in acetonitrile, Injection: 1 mL

Formulation Examples

Wettable powders	a)	b)	c)
active ingredients [components (A) and (B)]	25 %	50 %	75 %
sodium lignosulfonate	5 %	5 %	-
sodium lauryl sulfate	3 %	-	5 %
sodium diisobutylnaphthalenesulfonate	-	6 %	10 %
phenol polyethylene glycol ether (7-8 mol of ethylene oxide)	-	2 %	-
highly dispersed silicic acid	5 %	10 %	10 %
Kaolin	62 %	27 %	-

The active ingredient is thoroughly mixed with the adjuvants and the mixture is thoroughly ground in a suitable mill, affording wettable powders that can be diluted with water to give suspensions of the desired concentration.

Powders for dry seed treatment	a)	b)	c)
active ingredients [components (A) and (B)]	25 %	50 %	75 %
light mineral oil	5 %	5 %	5 %
highly dispersed silicic acid	5 %	5 %	-
Kaolin	65 %	40 %	-
Talcum	-		20 %

The active ingredient is thoroughly mixed with the adjuvants and the mixture is thoroughly ground in a suitable mill, affording powders that can be used directly for seed treatment.

Emulsifiable concentrate	
active ingredients [components (A) and (B)]	10 %
octylphenol polyethylene glycol ether (4-5 mol of ethylene oxide)	3 %
calcium dodecylbenzenesulfonate	3 %
castor oil polyglycol ether (35 mol of ethylene oxide)	4 %
Cyclohexanone	30 %
xylene mixture	50 %

Emulsions of any required dilution, which can be used in plant protection, can be obtained from this concentrate by dilution with water.

Dusts	a)	b)	c)
active ingredients [components (A) and (B)]	5 %	6 %	4 %
talcum	95 %	-	-
Kaolin	-	94 %	-
mineral filler	-	-	96 %

Ready-for-use dusts are obtained by mixing the active ingredient with the carrier and grinding the mixture in a suitable mill. Such powders can also be used for dry dressings for seed.

Extruder granules	
active ingredients [components (A) and (B)]	15 %
sodium lignosulfonate	2 %
carboxymethylcellulose	1 %
Kaolin	82 %

The active ingredient is mixed and ground with the adjuvants, and the mixture is moistened with water. The mixture is extruded and then dried in a stream of air.

Coated granules	
active ingredients [components (A) and (B)]	8 %
polyethylene glycol (mol. wt. 200)	3 %
Kaolin	89 %

The finely ground active ingredient is uniformly applied, in a mixer, to the kaolin moistened with polyethylene glycol. Non-dusty coated granules are obtained in this manner.

Suspension concentrate	
active ingredients [components (A) and (B)]	40 %
propylene glycol	10 %
nonylphenol polyethylene glycol ether (15 mol of ethylene oxide)	6 %
Sodium lignosulfonate	10 %
carboxymethylcellulose	1 %
silicone oil (in the form of a 75 % emulsion in water)	1 %
Water	32 %

The finely ground active ingredient is intimately mixed with the adjuvants, giving a suspension concentrate from which suspensions of any desired dilution can be obtained by dilution with water. Using such dilutions, living plants as well as plant propagation material can be treated and protected against infestation by microorganisms, by spraying, pouring or immersion.

Flowable concentrate for seed treatment

active ingredients [components (A) and (B)]	40 %
propylene glycol	5 %
copolymer butanol PO/EO	2 %
tristyrenephenole with 10-20 moles EO	2 %
1,2-benzisothiazolin-3-one (in the form of a 20% solution in water)	0.5 %
monoazo-pigment calcium salt	5 %
Silicone oil (in the form of a 75 % emulsion in water)	0.2 %
Water	45.3 %

The finely ground active ingredient is intimately mixed with the adjuvants, giving a suspension concentrate from which suspensions of any desired dilution can be obtained by dilution with water. Using such dilutions, living plants as well as plant propagation material can be treated and protected against infestation by microorganisms, by spraying, pouring or immersion.

Slow Release Capsule Suspension

28 parts of a combination of the active ingredients [components (A) and (B)] is mixed with 2 parts of an aromatic solvent and 7 parts of toluene diisocyanate/polymethylene-polyphenylisocyanate-mixture (8:1). This mixture is emulsified in a mixture of 1.2 parts of polyvinylalcohol, 0.05 parts of a defoamer and 51.6 parts of water until the desired particle size is achieved. To this emulsion a mixture of 2.8 parts 1,6-diaminohexane in 5.3 parts of water is added. The mixture is agitated until the polymerization reaction is completed. The obtained capsule suspension is stabilized by adding 0.25 parts of a thickener and 3 parts of a dispersing agent. The capsule suspension formulation contains 28% of the active ingredients. The medium capsule diameter is 8-15 microns. The resulting formulation is applied to seeds as an aqueous suspension in an apparatus suitable for that purpose.

The compounds N'-[5-bromo-2-methyl-6-[(1S)-1-methyl-2-propoxy-ethoxy]-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-bromo-2-methyl-6-[(1R)-1-methyl-2-propoxy-ethoxy]-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-cyano-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-(difluoromethyl)-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[2,5-dimethyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-bromo-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[6-(2-allyloxy-1-methyl-ethoxy)-5-chloro-2-methyl-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-chloro-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-bromo-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-isopropyl-N-methyl-formamidine and N-isopropyl-N'-[5-methoxy-2-methyl-4-(2,2,2-trifluoro-1-hydroxy-1-phenyl-ethyl)phenyl]-N-methyl-formamidine may be prepared according to the methods described in WO 2015/155075, WO 2017/063973 and WO 2017/102635.

The compounds N-methoxy-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]cyclopropanecarboxamide, N,2-dimethoxy-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propenamide, N-ethyl-2-methyl-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-

yl]phenyl]methyl]propenamide, 1-methoxy-3-methyl-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea, 1,3-dimethoxy-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea, 3-ethyl-1-methoxy-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea, N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propanamide, 4,4-dimethyl-2-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]isoxazolidin-3-one, 5,5-dimethyl-2-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]isoxazolidin-3-one, ethyl 1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]pyrazole-4-carboxylate, N,N-dimethyl-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]-1,2,4-triazol-3-amine, (3-methylisoxazol-5-yl)-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methanone, (5-methyl-2-pyridyl)-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methanone, 2-oxo-N-propyl-2-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]acetamide and ethyl 1-[[5-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]-2-thienyl]methyl]pyrazole-4-carboxylate may be prepared according to the methods described in WO 2017/055469, WO 2017/055473, WO 2017/093348, WO 2017/118689, WO 2017/220485, WO 2018/065414, WO 2018/158365, WO 2018/177894, WO 2018/177880, WO 2018/219773 and WO 2019/002151.

The compounds methyl (Z)-3-methoxy-2-[2-methyl-5-[3-(trifluoromethyl)pyrazol-1-yl]phenoxy]prop-2-enoate, methyl (Z)-3-methoxy-2-[2-methyl-5-(3-propylpyrazol-1-yl)phenoxy]prop-2-enoate, methyl (*Z*)-2-(5-cyclohexyl-2-methyl-phenoxy)-3-methoxy-prop-2-enoate, methyl (*Z*)-2-(5-cyclopentyl-2-methyl-phenoxy)-3-methoxy-prop-2-enoate, methyl (Z)-2-[5-(3-isopropylpyrazol-1-yl)-2-methyl-phenoxy]-3-methoxy-prop-2-enoate, methyl (Z)-3-methoxy-2-[2-methyl-5-(4-propyltriazol-2-yl)phenoxy]prop-2-enoate, methyl (Z)-3-methoxy-2-[2-methyl-5-[4-(trifluoromethyl)triazol-2-yl]phenoxy]prop-2-enoate, methyl (Z)-2-[5-(4-cyclohexylthiazol-2-yl)-2-methyl-phenoxy]-3-methoxy-prop-2-enoate, methyl (Z)-2-[5-[4-(ethoxymethyl)thiazol-2-yl]-2-methyl-phenoxy]-3-methoxy-prop-2-enoate, methyl (Z)-2-[5-(4-bromothiazol-2-yl)-2-methyl-phenoxy]-3-methoxy-prop-2-enoate, methyl (Z)-3-methoxy-2-[2-methyl-5-[5-(trifluoromethyl)thiazol-2-yl]phenoxy]prop-2-enoate may be prepared according to the methods described in WO 2020/079111, WO 2020/193387 and WO 2020/165403.

2-[cyano-(2,6-difluoro-4-pyridyl)amino]-5-methyl-N-spiro[3.4]octan-3-yl-thiazole-4-carboxamide, 2-[cyano-(2,6-difluoro-4-pyridyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[cyano-(2,6-difluoro-4-pyridyl)amino]-N-hexyl-5-methyl-thiazole-4-carboxamide, (these compounds may be prepared from the methods described in WO2017207362, WO2019105933, WO2020109509), 2-[(2,6-difluoro-4-pyridyl)-(2-methoxyacetyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[(2,6-difluoro-4-pyridyl)-(tetrahydropyran-4-carbonyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[(2,6-difluoro-4-pyridyl)-(oxetane-3-carbonyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[(2,6-difluoro-4-pyridyl)-(tetrahydrofuran-3-carbonyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[acetyl-(2,6-difluoro-4-pyridyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[(2,6-difluoro-4-pyridyl)-(2-methylpropanoyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, (these compounds may be prepared from the methods described in WO2017207362, WO2019105933, WO2020109511, WO2021244952).

The compound methyl 3-[(4-chlorophenyl)methyl]-2-hydroxy-1-methyl-2-(1,2,4-triazol-1-ylmethyl)cyclopentanecarboxylate may be prepared according to the methods described in WO

2012/169516. The compound 4-[[6-[2-(2,4-difluorophenyl)-1,1-difluoro-2-hydroxy-3-(tetrazol-1-yl)propyl]-3-pyridyl]oxy]benzonitrile may be prepared according to the methods described in WO 2012/177638. The compound methyl 2-[4-(4-chlorophenoxy)-2-(trifluoromethyl)phenyl]-2-hydroxy-3-(1,2,4-triazol-1-yl)propanoate may be prepared according to the methods described in WO 2019/093522.

List of Abbreviations:

Aq	= aqueous
br s	= broad singlet
DCM	= dichloromethane
dd	= doublet of doublets
DMF	= dimethylformamide
d	= doublet
EtOAc	= ethyl acetate
equiv.	= equivalent
h	= hour(s)
M	= molar
m	= multiplet
MeOD	= methanol-d
MeOH	= methanol
min	= minutes
MHz	= mega hertz
mp	= melting point
Pd-Xphos G2	= chloro(2-dicyclohexylphosphino-2′,4′,6′-triisopropyl-1,1′-biphenyl)[2-(2′-amino-1,1′-biphenyl)]palladium(II)
ppm	= parts per million
rh	= relative humidity
RT	= room temperature
R_t	= retention time
s	= singlet
t	= triplet
THF	= tetrahydrofuran
LC/MS	= Liquid Chromatography Mass Spectrometry (description of the apparatus and the methods used for LC/MS analysis are given above).

Preparation examples

Example A1: 7,8-difluoro-3-[rac-(3S,4S)-5-chloro-3,4-dimethyl-3,4-dihydroisoquinolin-1-yl]quinoline (compound E.01)

Step 1:

To a solution of 2-chloroacetophenone (5.00 g, 31.37 mmol) in THF (50 mL) and MeOH (15 mL) was added sodium borohydride (1.21 g, 31.37 mmol) at 0 °C, the resulting solution was warmed to RT and stirred for 3 h. Saturated NH_4Cl solution was added to the reaction mixture, and the mixture was partitioned between water and EtOAc. The organic phase was dried over $MgSO_4$, filtered and concentrated to give 1-(2-chlorophenyl)ethanol which was used without further purification.

LC-MS (Method G1), R_t = 1.21 min, (M+H) = 139.

^1H NMR (400MHz, $CDCl_3$) δ ppm: 7.62 (dd, 1H), 7.27-7.39 (m, 2H), 7.18-7.26 (m, 1H), 5.31 (q, 1H), 2.13 (s, 1H), 1.51 (d, 3H).

Step 2:

To a solution of 1-(2-chlorophenyl)ethanol (5.7 g, 36 mmol) in diethyl ether (60 mL), cooled at 0°C, was added phosphorus tribromide (2.1 mL, 22 mmol). The reaction mixture was stirred at 0°C for 10 min, gradually warmed to RT and stirred at this temperature for 90 min. Ice cold water was then added and the resulting mixture was rapidly stirred for 10 min. The reaction mixture was extracted with EtOAc, the organic phase was washed with H_2O, dried over $MgSO_4$, filtered and concentrated under reduced pressure. The residue was purified by flash chromatography (silica, cyclohexane: EtOAc) to give 1-(1-bromoethyl)-2-chloro-benzene as a colorless liquid.

^1H NMR (400MHz, $CDCl_3$) δ ppm: 7.65 (dd, 1H), 7.21-7.39 (m, 3H), 5.66 (q, 1H), 2.04-2.08 (m, 3H).

Step 3:

A suspension of 2-methylpropane-2-sulfinamide (2.00 g, 16.5 mmol), $MgSO_4$ (9.93 g, 82.5 mmol) and acetaldehyde (1.72 mL, 33 mmol) in DCM (33 mL) was stirred for 18 h at RT. The solids were removed by filtration and the filtrate was concentrated under reduced pressure to give N-ethylidene-2-methyl-propane-2-sulfinamide as orange liquid which was used without further purification.

LC-MS (method G): R_t = 0.65 min, (M+H) = 148.

^1H NMR (400MHz, $CDCl_3$) δ ppm: 8.08-8.14 (m, 1H), 2.26 (d, 3H), 1.22 (s, 9H).

Step 4:

To a suspension of magnesium turnings (0.22 g, 9.11 mmol) in diethyl ether (3 mL) were added 2 drops of di-*iso*-butylaluminium hydride (1M in toluene). Then a solution of 1-(1-bromoethyl)-2-chloro-benzene (0.80 g, 3.65 mmol) in diethyl ether (3 mL) was added dropwise. The reaction mixture was stirred for 15 min at RT then cooled to 0°C. N-ethylidene-2-methyl-propane-2-sulfinamide (0.48 g, 3.28 mmol) in diethyl ether (2 mL) was added, the reaction mixture was gradually warmed to RT and was stirred for an additional 2 h at RT. Ice cold water was added and the mixture was extracted with EtOAc.

The organic phase was washed with H_2O, dried over $MgSO_4$, filtered and concentrated under reduced pressure. The residue was purified by flash chromatography (silica, cyclohexane: EtOAc) to give N-[2-(2-chlorophenyl)-1-methyl-propyl]-2-methyl-propane-2-sulfinamide as a mixture of isomers.

LC-MS (Method G1), R_t = 1.15 min (isomer 1) and 1.19 min (isomer 2), (M+H) = 288.

Step 5:

To a solution of N-[2-(2-chlorophenyl)-1-methyl-propyl]-2-methyl-propane-2-sulfinamide (2.29 g, 7.16 mmol) in MeOH (14 mL) at 0°C was added HCl (4 M in dioxane, 3.6 mL). The resulting mixture was warmed to RT and stirred for 1 h. The reaction mixture was then basified with aq. NaOH (2M) solution and extracted with EtOAc. The organic phase was dried over $MgSO_4$, filtrated and concentrated under reduced pressure. The residue was dissolved in acetonitrile (70 mL) and treated with 7,8-difluoroquinoline-3-carboxylic acid (1.58 g, 7.55 mmol), triethylamine (2.65 mL, 18.9 mmol) and propylphosphonic anhydride (50% in EtOAc, 7.64 mL, 12.84 mmol). The resulting solution was stirred at RT for 6 h, water was then added and the mixture was extracted with EtOAc. The organic phase was washed with H_2O, dried over $MgSO_4$, filtered and concentrated *in vacuo*. The residue was purified by flash chromatography (silica, cyclohexane: EtOAc) to give N-[2-(2-chlorophenyl)-1-methyl-propyl]-7,8-difluoro-quinoline-3-carboxamide.

LC-MS (Method G1), R_t = 1.13 min, (M+H) = 374.

^{1}H NMR (400MHz, $CDCl_3$) δ ppm: 9.28 (d, 1H), 8.62 (t, 1H), 7.72 (d, 1H), 7.51-7.56 (m, 1H), 7.28-7.43 (m, 4H), 7.20-7.23 (m, 1H), 6.06-6.18 (br d, 1h), 4.58-4.71 (m, 1H), 3.67 (quint, 1H), 1.38 (d, 3H), 1.19 (d, 3H).

^{19}F NMR (377 MHz, $CDCl_3$) δ ppm : 132.15 (s, 1F), 150.2 (s.1F).

Step 6:

To a suspension of N-[2-(2-chlorophenyl)-1-methyl-propyl]-7,8-difluoro-quinoline-3-carboxamide (0.36 g, 0.96 mmol) in DCM (5 mL) at -5 °C was added trifluoromethanesulfonic anhydride (0.19 mL, 1.15 mmol). The reaction mixture was aged at -5 °C for 90 min and then 2,6-di-*tert*-butylpyridine (0.33 mL, 1.44 mmol) was added. The reaction mixture was gradually warmed to RT and stirred for 16 h at this temperature. Water was then added and the mixture was extracted with EtOAc. The organic phase was washed with aq. $NaHCO_3$ solution, dried over MgSO4, filtered and concentrated *in vacuo*. The residue was purified by flash chromatography (silica, cyclohexane:EtOAc) to give 3-(5-chloro-3,4-dimethyl-3,4-dihydroisoquinolin-1-yl)-7,8-difluoro-quinoline.

LC-MS (Method G1), R_t = 1.11 min, (M+H) = 357.

^{1}H NMR (400 MHz, CD_3OD) δ ppm: 9.13 (d, 1H), 8.6 (s, 1H), 7.94 (ddd, 1H), 7.63-7-75 (m, 2H), 7.37 (t, 1H), 7.23-7.29 (m, 1H), 3.8 (dd, 1H), 3.35-3.39 (m, 1H), 1.68 (d, 3H), 1.11 (d, 3H).

^{19}F NMR (377 MHz, CD_3OD) δ ppm : 136.16 (s, 1F), 154.36 (s.1F).

Example A2: rac-5-chloro-1-(8-fluoro-3-quinolyl)-3,4-dimethyl-3,4-dihydroisoquinoline (E.15)

Compound E.15 can be prepared in analogy to synthesis example A.1, using 8-fluoroquinoline-3-carboxylic acid instead of 7,8-difluoroquinoline-3-carboxylic acid in step 5.

LC-MS (Method G1), R_t = 1.40 min, (M+H) = 339.

^{1}H NMR (400 MHz, $CDCl_3$) δ ppm: 9.14 (d, 1 H), 8.43 (t, 1 H), 7.69 (d, 1 H), 7.45 - 7.58 (m, 3 H), 7.27 (s, 1 H), 7.23 (t, 1 H), 7.15 (d, 1H), 3.73 (dd, 1 H),) 3.28 (dd, 1 H), 1.67 - 1.71 (d, 3 H), 1.10 (d, 3 H).

Example A3: (3S,4S or 3R,4R)-5-chloro-1-(8-fluoro-3-quinolyl)-3,4-dimethyl-3,4-dihydroisoquinoline (compounds E.10 and E.11)

The enantiomers of *rac*-5-chloro-1-(8-fluoro-3-quinolyl)-3,4-dimethyl-3,4-dihydroisoquinoline were separated by preparative SFC (Sepiatec Prep SFC 100) over a chiral stationary phase (Daicel CHIRALPAK® IC, 5 mm, 2.0 cm x 25 cm). Mobile phase: A: CO_2 B: 2-propanol, isocratic: 35% B, backpressure: 150 bar, flow rate: 60 mL/min, detection: UV 245 nm, sample concentration: 20 mg/mL in MeOH/acetonitrile, Injection: 1000 µL. Compound E.10 (enantiomer 1 of 2) was obtained as first eluting isomer, compound E.11 (enantiomer 2 of 2) was obtained as second eluting isomer.

Example A4: rac-(3S,4S)-5-bromo-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline (compound E.16) and rac-(3S,4R)-5-bromo-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydro-isoquinoline (E.18)

Step 1:

1-(2-Bromo-3-methylphenyl)-2-propanone (8.0 g, 35 mmol) was added to aq. NaOH (1 M, 30 mL) at 0°C and the resulting emulsion was treated with benzyl(triethyl)ammonium chloride (0.40 g, 1.8 mmol) and iodomethane (7.5 g, 53 mmol). The reaction mixture was gradually warmed to RT and stirred for 24 h at this temperature. Water was then added, and the emulsion was extracted with EtOAc. The organic layer was washed with brine, dried over $MgSO_4$, filtrated, and concentrated *in vacuo*. The oily residue was purified by medium pressure chromatography (silica, cyclohexane:EtOAc eluent) to afford 3-(2-bromo-3-methyl-phenyl)butan-2-one as oil.

LC-MS (Method G), R_t = 1.06 min, (M+H) = 241.

^{1}H NMR (400MHz, $CDCl_3$) δ ppm 7.16-7.23 (m, 2H), 6.98 (dd, 1H), 4.40 (q, 1H), 2.48 (s, 3H), 2.10 (s, 3H), 1.39 (d, 3H).

Step 2:

To a solution of 3-(2-bromo-3-methyl-phenyl)butan-2-one (1.0 g, 3.1 mmol) in ethanol (8 mL) was added sodium borohydride (0.07 g, 1.87 mmol) at 0°C. The reaction mixture was gradually warmed to RT and stirred for 45 min at RT. Water was then added, and the emulsion was extracted with EtOAc. The organic layer was washed with brine, dried over $MgSO_4$, filtrated, and concentrated *in vacuo*. The oily residue was purified by medium pressure chromatography (silica, cyclohexane:EtOAc eluent) to afford 3-(2-bromo-3-methyl-phenyl)butan-2-ol as an inseparable mixture of diastereomers with rac-(2S,3R)-3-(2-bromo-3-methyl-phenyl)butan-2-ol as major component.

LC-MS (Method G), R_t = 1.01 min, (M-OH) = 225.

Step 3:

8-fluoroquinoline-3-carbonitrile (0.03g, 0.17 mmol) and 3-(2-bromo-3-methyl-phenyl)butan-2-ol (0.05 g, 0.2 mmol, as solution in cyclohexane [0.5 mL]) was added simultaneously to sulfuric acid (0.5 mL) at 0°C. The resulting solution was warmed to RT and stirred for 30 min at this temperature. Ice water was then added, and the mixture was basified with aq. NaOH (4M) and extracted with EtOAc. The organic layer was washed with brine, dried over MgSO4, filtrated, and concentrated *in vacuo*. The residue was purified by medium pressure chromatography (silica, cyclohexane:EtOAc eluent) to afford rac-(3S,4S)-5-bromo-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline and rac-(3S,4R)-5-bromo-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline .

E.16

LC-MS (Method G1), R_t = 0.98 min, (M+H) = 397.

^{1}H NMR (400 MHz, $CDCl_3$) δ ppm 9.16 (d, 1H), 8.44 (t, 1H), 7.70 (d, 1H), 7.53-7.60 (m, 1H), 7.46-7.52 (m, 1H), 7.18 (d, 1H), 7.11-7.14 (d, 1H), 4.47(q, 1H), 3.34 (q, 1H), 2.53 (s, 3H), 1.28 (d, 3H), 1.11 (d, 3H).

E.18

LC-MS (Method G1), R_t = 1.01 min, (M+H) = 397.

^{1}H NMR (400 MHz, $CDCl_3$) δ ppm 9.15 (d, 1H), 8.44 (t, 1H), 7.69 (d, 1H), 7.44-7.58 (m, 2H), 7.18 (d, 1H), 7.06-7.15 (m, 1H), 3.71 (dd, 1H), 3.30 (dd, 1H), 2.52 (s, 3H), 1.70 (d, 3H), 1.09 (d, 3H).

Example A5: rac-(3S,4S)-5-chloro-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline (compound E.014)

Step 1:

To a solution of 2-chloro-3-methyl-benzaldehyde (4.0 g, 25.9 mmol) in THF (60 mL) was added methyl magnesium bromide (3.2 M in 2-MeTHF, 12 mL, 38.8 mmol) at 0°C. The resulting solution was stirred for 1 h at 0°C, warmed to RT and stirred for additional 3 h. Ice water was then added to the reaction mixture, and the mixture was partitioned between water and EtOAc. The organic phase was dried over $MgSO_4$, filtered and concentrated to give 1-(2-chlorophenyl)ethanol which was used without

further purification.

^{1}H NMR (400MHz, $CDCl_3$) δ ppm: 7.45 (dd, 1H), 7.14 – 7.23 (m, 2H), 5.33 (q, 1H), 2.39 (s, 3H), 1.49 (d, 3H).

Step 2:

To a solution of 1-(2-chloro-3-methyl-phenyl)ethanol (8.7 g, 46 mmol) in diethyl ether (90 mL), cooled at 0°C, was added phosphorus tribromide (2.6 mL, 28 mmol). The reaction mixture was stirred at 0°C for 10 min, gradually warmed to RT and stirred at this temperature for 90 min. Ice cold water was then added and the resulting mixture was rapidly stirred for 10 min. The reaction mixture was extracted with EtOAc, the organic phase was washed with H_2O, dried over $MgSO_4$, filtered, and concentrated under reduced pressure. The residue was purified by medium pressure chromatography (silica, cyclohexane:EtOAc eluent) to give 1-(1-bromoethyl)-2-chloro-3-methyl-benzene as clear liquid.

^{1}H NMR (400 MHz, $CDCl_3$) δ ppm 7.51 (dd, 1 H), 7.15 - 7.24 (m, 2 H), 5.73 (q, 1 H), 2.41 (s, 3 H), 2.06 (d, 3 H).

Step 3:

To a suspension of magnesium turnings (1.0 g, 41.2 mmol) in diethyl ether (15 mL) was added di-*iso*-butylaluminium hydride (1M in toluene, 2 drops). Then a solution of 1-(1-bromoethyl)-2-chloro-3-methyl-benzene (3.85 g, 16.5 mmol) in diethyl ether (15 mL) was added dropwise. The reaction mixture was stirred for 15 min at RT then cooled to 0°C. N-ethylidene-2-methyl-propane-2-sulfinamide (1.94 g, 13.2 mmol) in diethyl ether (4 mL) was added, the reaction mixture was gradually warmed to RT and was stirred for additional 2 h at RT. Ice cold water was added and the mixture was extracted with EtOAc. The organic phase was washed with H_2O, dried over $MgSO_4$, filtered and concentrated under reduced pressure. The residue was purified by medium pressure chromatography (silica, cyclohexane:EtOAc eluent) to give N-[2-(2-chloro-3-methyl-phenyl)-1-methyl-propyl]-2-methyl-propane-2-sulfinamide.

LC-MS (Method G1), R_t = 1.18 min, (M+H) = 302.

Step 4:

To a solution of N-[2-(2-chloro-3-methyl-phenyl)-1-methyl-propyl]-2-methyl-propane-2-sulfinamide (2.8 g, 9.3 mmol) in methanol (20 mL) was added HCl (4M in 1,4-dioxane, 4.6 mL, 19 mmol) at 0°C. The reaction mixture was gradually warmed to RT and stirred for 1 h. The reaction mixture was then concentrated under reduced pressure, the residue was taken up in water and basified with aq. NaOH (2N). The resulting emulsion was extracted with EtOAc and the organic layer was concentrated *in vacuo* to afford a mixture of 3-(2-chloro-3-methyl-phenyl)butan-2-amine and methyl 2-methylpropane-2-sulfinate which was used as such for the next step.

Step 5:

To a solution of 8-fluoroquinoline-3-carboxylic acid (1.1 g, 5.5 mmol), 3-(2-chloro-3-methyl-phenyl)butan-2-amine (1.0 g, 5.0 mmol) and triethylamine (1.8 mL, 13 mmol) in acetonitrile (18 mL) was added T3P (50% in EtOAc, 5.4 mL, 9 mmol) at RT. The reaction mixture was stirred for 5 h at RT and then quenched with water. The resulting mixture was extracted with EtOAc, the organic layer was washed with brine, dried over $MgSO_4$, filtrated, and concentrated *in vacuo*. The residue was purified by medium pressure chromatography (silica, cyclohexane:EtOAc eluent) to afford 8-fluoro-N-[rac-(1S,2R)-2-(2-chloro-3-methyl-phenyl)-1-methyl-propyl]quinoline-3-carboxamide as solid.

LC-MS (Method G1), R_t = 1.47 min, (M+H) = 371.

^{1}H NMR (400 MHz, $CDCl_3$) δ ppm 9.27 (d, 1 H), 8.62 (s, 1 H), 7.70 (s, 1 H), 7.47 - 7.62 (m, 2 H), 7.12 - 7.25 (m, 3 H), 6.32 (br d, 1 H), 4.54 - 4.63 (m, 1H), 3.67 - 3.74 (m, 1 H), 2.41 (s, 3 H), 1.36 (d, 3 H), 1.18 (d, 3 H).

Step 6:

To a solution of 8-fluoro-N-[rac-(1S,2R)-2-(2-chloro-3-methyl-phenyl)-1-methyl-propyl]quinoline-3-carboxamide (0.40 g, 1.1 mmol) in DCM (6 mL) at -5°C was added triflic anhydride (0.37 g, 1.29 mmol) and the reaction mixture was aged for 90 min at -5°C. 2,6-di-*tert*-butylpyridine (0.32 g, 1.62 mmol) was then added, the reaction mixture was gradually warmed to RT and stirred for 16 h. Water and aq. $NaHCO_3$ was added and the mixture was extracted with EtOAc. The organic layer was washed with brine, dried over $MgSO_4$, filtrated, and concentrated *in vacuo*. The residue was purified by medium pressure chromatography (silica, cyclohexane:EtOAc eluent) to afford rac-(3S,4S)-5-chloro-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline as beige solid.

LC-MS (Method G1), R_t = 1.23 min, (M+H) = 353.

^{1}H NMR (400 MHz, $CDCl_3$) δ ppm 9.13 (d, 1 H), 8.43 (t, 1 H), 7.68 (d, 1 H), 7.44 - 7.57 (m, 2 H), 7.16 (d, 1 H), 7.05 (d, 1 H), 3.66 - 3.73 (m, 1 H) 3.27 - 3.33 (m, 1 H), 2.48 (s, 3 H), 1.69 (d, 3 H), 1.08 (d, 3 H).

Example A6: rac-(3S,4S)-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline-5-carbonitrile (compound E.08)

A microwave vial was charged with rac-(3S,4S)-5-chloro-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline (0.50 g, 1.42 mmol), potassium acetate (0.02 g, 0.18 mmol), potassium ferrocyanide (0.28 g, 0.71 mmol) and Pd-Xphos G2 (0.13 g, 0.14 mmol). 1,4-dioxane (3.5 mL) / water (3.5 mL) was then added and the reaction mixture was degassed with Ar. The vial was capped and heated to 120°C for 2h in a microwave reactor. The reaction mixture was diluted with water and extracted with EtOAc. The organic layer was washed with brine, dried over $MgSO_4$, filtrated, and concentrated *in vacuo*. The residue was purified by medium pressure chromatography (silica, cyclohexane:EtOAc

eluent) to afford rac-(3S,4S)-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline-5-carbonitrile as off-white solid.

LC-MS (Method G1), R_t = 1.07 min, (M+H) = 344.

^{1}H NMR (400 MHz, $CDCl_3$) δ ppm 9.12 (d, 1 H), 8.42 (s, 1 H), 7.69 (d, 1 H), 7.44 - 7.59 (m, 2 H), 7.36 (d, 1H), 7.20 - 7.31 (m, 1 H), 3.75 (dd, 1 H), 3.26 (dd, 1 H), 2.64 (s, 3 H), 1.70 (d, 3 H), 1.17 (d, 3 H).

^{19}F NMR (376 MHz, $CDCl_3$) δ ppm -125.08 (s, 1 F).

Example A7: (3S,4S or 3R,4R)-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline-5-carbonitrile (compounds E.04 and E.05)

The enantiomers of rac-(3S,4S)-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline-5-carbonitrile (compound E.08) were separated by preparative SFC (Sepiatec Prep SFC 100) over a chiral stationary phase (Daicel CHIRALPAK® IC, 5mm, 2.0 cm x 25cm). Mobile phase: A: CO_2 B: 2-propanol, isocratic: 30% B, backpressure: 150 bar, flow rate: 60 ml/min, detection: UV 245 nm, sample concentration: 30 mg/mL in DCM/2-propanol, Injection: 1000 µL. Compound E.05 (enantiomer 1 of 2) was obtained as first eluting isomer, compound E.04 (enantiomer 2 of 2) was obtained as second eluting isomer.

Example A8: (3S,4S and 3R,4R)-5-chloro-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline (compounds E.02 and E.03)

The enantiomers of rac-(3S,4S)-5-chloro-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline (compound E.14) were separated by preparative SFC (Sepiatec Prep SFC 100) over a chiral stationary phase (Daicel CHIRALPAK® IC, 5mm, 2.0 cm x 25cm). Mobile phase: A: CO_2 B: 2-propanol, isocratic: 30% B, backpressure: 150 bar, flow rate: 60 ml/min, detection: UV 245 nm, sample concentration: 30 mg/mL in DCM/2-propanol, Injection: 1000 µL. Compound E.03 (enantiomer 1 of 2) was obtained as first eluting isomer, compound E.02 (enantiomer 2 of 2) was obtained as second eluting isomer.

Example A9: rac-(3S,4S)-1-(7,8-difluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline-5-carbonitrile (compound E.06)

Compound E.06 can be prepared in analogy to synthesis example A.6, using rac-(3S,4S)-5-chloro-1-(7,8-difluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline instead of rac-(3S,4S)-5-chloro-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline as substrate for the cyanation.

LC-MS (Method G1), R_t = 1.25 min, (M+H) = 362.

^{1}H NMR (400 MHz, $CDCl_3$) δ ppm 9.14 (d, 1 H), 8.42 (s, 1 H), 7.68 (ddd, 1 H), 7.47 - 7.55 (m, 1 H), 7.35 (d, 1 H), 7.24 - 7.29 (m, 2 H), 3.70 - 3.79 (m, 1 H), 3.22 - 3.30 (m, 1 H), 2.64 (s, 3 H), 1.69 (d, 3 H), 1.17 (d, 3 H).

^{19}F NMR (377 MHz, $CDCl_3$) δ ppm -133.45 (s, 1 F), -133.49 (s, 1 F), -150.73 (s, 1 F), -150.77 (s,

1 F).

Example A10: rac-(3S,4S)-5-chloro-1-(7,8-difluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline (compound E.07)

Compound E.07 can be prepared in analogy to synthesis example A.5, using using 7,8-difluoroquinoline-3-carboxylic acid instead of 8-fluoroquinoline-3-carboxylic acid in step 5.

Example A11: rac-(3S,4R)-5-chloro-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline (E.09)

Compound E.09 can be prepared in analogy to synthesis example A4, using 1-(2-chloro-3-methylphenyl)-2-propanone instead of 1-(2-bromo-3-methylphenyl)-2-propanone as starting material in step 1.

LC-MS (Method G1), R_t = 1.14 min, (M+H) = 353.

^{1}H NMR (400 MHz, $CDCl_3$) δ ppm 9.15 (d, 1 H), 8.42 (t, 1 H), 7.69 (d, 1 H), 7.45 - 7.58 (m, 2 H), 7.16 (d, 1 H), 7.07 (d, 1 H), 4.42 - 4.48 (m, 1 H), 3.33 (q, 1 H), 2.48 (s, 3 H), 1.27 (d, 3 H), 1.09 (d, 3 H).

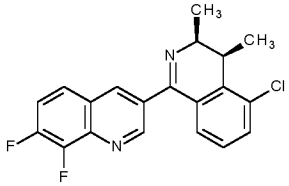
Example A12: rac-(3S,4R)-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline-5-carbonitrile (E.17)

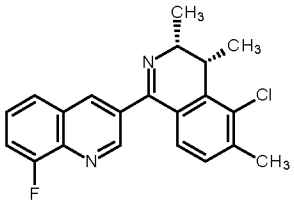
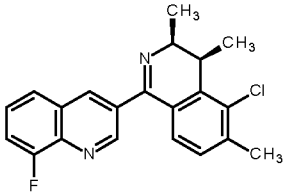
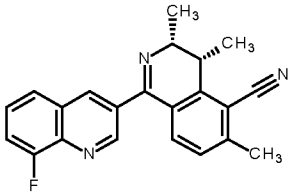
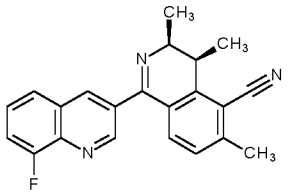
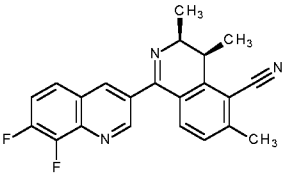
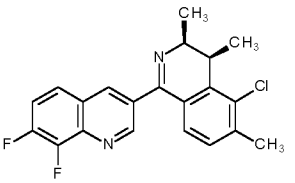
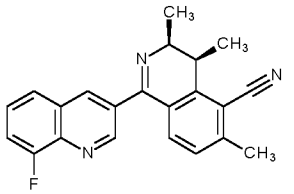
Compound E.017 can be prepared in analogy to synthesis example A.6, using rac-(3S,4R)-5-bromo-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline instead of rac-(3S,4S)-5-chloro-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline as substrate for the cyanation.

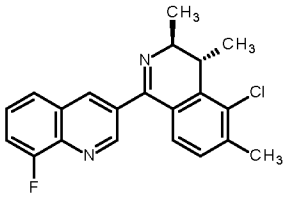
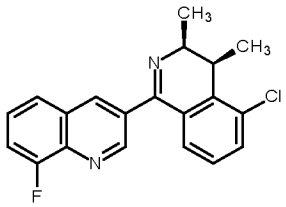
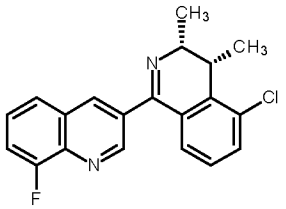
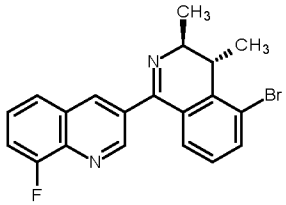
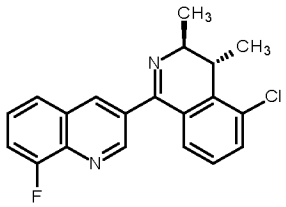
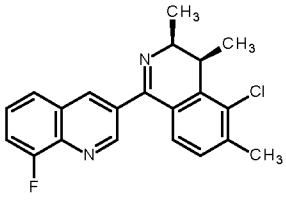
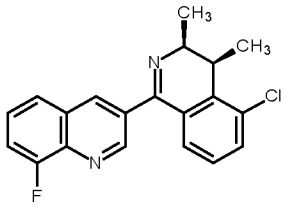
LC-MS (Method G), R_t = 0.92 min, (M+H) = 344.

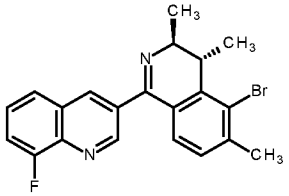
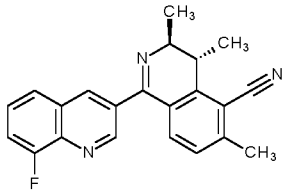
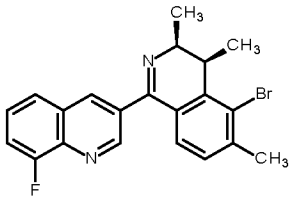
^{1}H NMR (400 MHz, $CDCl_3$) δ ppm 9.15 (d, 1H), 8.43 (t, 1H), 7.70 (d, 1H), 7.55-7.61 (m, 1H), 7.47-7.53 (m, 1H), 7.39 (d, 1H), 7.25 (d, 1H), 4.52 (q, 1H), 3.29 (q, 1H), 2.65 (s, 3H), 1.37 (d, 3H), 1.12 (d, 3H).

Table T1: Melting point (mp) data and/or retention times (R_t) for compounds E.01 to E.18 according to Formula (I):

Entry	IUPAC name	**STRUCTURE**	Rt (min)	[M+H] (measured)	Method	mp (°C)
E.01	7,8-difluoro-3-[rac-(3S,4S)-5-chloro-3,4-dimethyl-3,4-dihydroisoquinolin-1-yl]quinoline		1.13	357	G1	

Entry	IUPAC name	STRUCTURE	Rt (min)	[M+H] (measured)	Method	mp (°C)
E.02	(3R,4R)-5-chloro-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline		3.55		H1	
E.03	(3S,4S)-5-chloro-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline		2.04		H1	
E.04	(3R,4R)-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline-5-carbonitrile		3.12		H1	
E.05	(3S,4S)-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline-5-carbonitrile		1.91		H1	
E.06	rac-(3S,4S)-1-(7,8-difluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline-5-carbonitrile		1.25	362	G1	140 - 142
E.07	rac-(3S,4S)-5-chloro-1-(7,8-difluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline		1.19	371	G1	
E.08	rac-(3S,4S)-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline-5-carbonitrile		1.07	344	G1	164 - 166

Entry	IUPAC name	STRUCTURE	Rt (min)	[M+H] (measured)	Method	mp (°C)
E.09	rac-(3S,4R)-5-chloro-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline		1.14	353	G1	82 - 84
E.10	(3S,4S)-5-chloro-1-(8-fluoro-3-quinolyl)-3,4-dimethyl-3,4-dihydroisoquinoline		2.52		H1	
E.11	(3R,4R)-5-chloro-1-(8-fluoro-3-quinolyl)-3,4-dimethyl-3,4-dihydroisoquinoline		4.18		H1	
E.12	rac-(3S,4R)-5-bromo-1-(8-fluoro-3-quinolyl)-3,4-dimethyl-3,4-dihydroisoquinoline		1.44	383	G1	132 - 134
E.13	rac-(3S,4R)-5-chloro-1-(8-fluoro-3-quinolyl)-3,4-dimethyl-3,4-dihydroisoquinoline		1.43	339	G1	112 - 114
E.14	rac-(3S,4S)-5-chloro-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline		1.31	353	G1	84 - 86
E.15	rac-(3S,4S)-5-chloro-1-(8-fluoro-3-quinolyl)-3,4-dimethyl-3,4-dihydroisoquinoline		1.40	339	G1	100 – 102

Entry	IUPAC name	STRUCTURE	Rt (min)	[M+H] (measured)	Method	mp (°C)
E.16	rac-(3S,4R)-5-bromo-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline		0.98	440	G	
E.17	rac-(3S,4R)-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline-5-carbonitrile		0.92	344	G	
E.18	rac-(3S,4S)-5-bromo-1-(8-fluoro-3-quinolyl)-3,4,6-trimethyl-3,4-dihydroisoquinoline		1.02	397	G	

BIOLOGICAL EXAMPLES:

Fusarium culmorum / liquid culture (Head blight)

Conidia of the fungus from cryogenic storage are directly mixed into nutrient broth (PDB potato dextrose broth). After placing a (DMSO) solution of test compound into a microtiter plate (96-well format), the nutrient broth containing the fungal spores is added. The test plates are incubated at 24 °C and the inhibition of growth is determined photometrically 3 - 4 days after application.

The following compounds in Table E gave at least 80% control of *Fusarium culmorum* at 20 ppm when compared to untreated control under the same conditions, which showed extensive disease development:

E.01, E.02, E.03, E.04, E.05, E.06, E.07, E.09, E.10, E.12, E.13, E.14, E.15, E.17, E.18.

Fusarium culmorum / wheat / spikelet preventative (Head blight)

Wheat spikelets cv. Monsun are placed on agar in multiwell plates (24-well format) and sprayed with the formulated test compound diluted in water. The spikelets are inoculated with a spore suspension of the fungus 1 day after application. The inoculated spikelets are incubated at 20 °C and 60% rh under a light regime of 72 h semi darkness followed by 12 h light / 12 h darkness in a climate chamber and the activity of a compound is assessed as percent disease control compared to untreated when an appropriate level of disease damage appears on untreated check spikelets (6 – 8 days after application).

The following compounds in Table E gave at least 80% control of *Fusarium culmorum* at 200 ppm when compared to untreated control under the same conditions, which showed extensive disease development:

E.03, E.05, E.06, E.08, E.09, E.10, E.12, E.14, E.15, E.16, E.17, E.18.

Gibberella zeae (*Fusarium graminearum*) / wheat / spikelet preventative (Head blight)

Wheat spikelets cv. Monsun are placed on agar in multiwell plates (24-well format) and sprayed with the formulated test compound diluted in water. One day after application, the spikelets are inoculated with a spore suspension of the fungus. The inoculated test leaf disks are incubated at 20 °C and 60% rh under a light regime of 72 h semi darkness followed by 12 h light / 12 h darkness in a climate chamber, the activity of a compound is assessed as percent disease control compared to untreated when an appropriate level of disease damage appears on untreated check spikelets (6 - 8 days after application).

The following compounds in Table E gave at least 80% control of *Gibberella zeae* at 200 ppm when compared to untreated control under the same conditions, which showed extensive disease development:

E.03, E.05, E.06, E.08, E.09, E.10, E.12, E.14, E.18

Monographella nivalis (*Microdochium nivale*) / liquid culture (foot rot cereals)

Conidia of the fungus from cryogenic storage are directly mixed into nutrient broth (PDB potato dextrose broth). After placing a (DMSO) solution of test compound into a microtiter plate (96-well format), the nutrient broth containing the fungal spores is added. The test plates are incubated at 24 °C and the inhibition of growth is determined photometrically 4-5 days after application.

The following compounds in Table E gave at least 80% control of *Monographella nivalis* at 20 ppm when compared to untreated control under the same conditions, which showed extensive disease development:

E.01, E.03, E.05, E.06, E.07, E.09, E.10, E.11, E.12, E.13, E.14, E.15, E.17, E.18.

Glomerella lagenarium (Colletotrichum lagenarium) / liquid culture (Anthracnose)

Conidia of the fungus from cryogenic storage are directly mixed into nutrient broth (PDB potato dextrose broth). After placing a (DMSO) solution of test compound into a microtiter plate (96-well format), the nutrient broth containing the fungal spores is added. The test plates are incubated at 24 °C and the inhibition of growth is measured photometrically 3-4 days after application.

The following compounds gave at least 80% control of *Glomerella lagenarium* at 20 ppm when compared to untreated control under the same conditions, which showed extensive disease development:

E.01, E.03, E.05, E.07, E.09, E.10, E.12, E.13, E.14, E.15, E.18

Botryotinia fuckeliana (Botrytis cinerea) / liquid culture (Gray mould)

Conidia of the fungus from cryogenic storage are directly mixed into nutrient broth (Vogels broth). After placing a (DMSO) solution of test compound into a microtiter plate (96-well format), the nutrient broth containing the fungal spores is added. The test plates are incubated at 24 °C and the inhibition of growth is determined photometrically 3-4 days after application.

The following compounds gave at least 80% control of *Botryotinia fuckeliana* at 20 ppm when compared to untreated control under the same conditions, which showed extensive disease development:

E.01, E.02, E.03, E.04, E.05, E.06, E.07, E.09, E.10, E.11, E.12, E.13, E.14, E.15, E.17, E.18

Mycosphaerella graminicola (*Septoria tritici*) / liquid culture (*Septoria blotch*)

Conidia of the fungus from cryogenic storage are directly mixed into nutrient broth (PDB potato dextrose broth). After placing a (DMSO) solution of test compound into a microtiter plate (96-well format), the nutrient broth containing the fungal spores is added. The test plates are incubated at 24 °C and the inhibition of growth is determined photometrically 4-5 days after application.

The following compounds in Table E gave at least 80% control of *Mycosphaerella graminicola* at 20 ppm when compared to untreated control under the same conditions, which showed extensive disease development:

E.02, E.03, E.05, E.06, E.07, E.10, E.11, E.14, E.15, E.18.

Mycosphaerella graminicola (Septoria tritici) on wheat / preventative

2-week old wheat plants cv. Riband are sprayed in a spray chamber with the formulated (emulsifiable concentrate) test compound diluted in water. The test plants are inoculated by spraying a spore suspension on them one day after application and then kept at 22°C/21°C (day/night) in a greenhouse. Disease damage is assessed directly when an appropriate level of disease appears on untreated check plants and efficacy was calculated compared to untreated controls (16 - 19 days after application).

The following compounds in Table E gave at least 80% control of *Mycosphaerella graminicola* at 60 ppm when compared to untreated control under the same conditions, which showed extensive disease development.

E.03, E.05, E.10, E.13, E.14, E.15.

Botrytis cinerea on tomato / preventative (Botrytis on tomato)

4-week old tomato plants are treated in a spray chamber with the test compound formulated as emulsifible concentrate diluted in water. The test plants are inoculated by spraying them with a spore suspension two days after application. The inoculated test plants are incubated at 20° C and 95% rh in a greenhouse and the percentage leaf area covered by disease is assessed when an appropriate level of disease appears on untreated check plants (5 – 6 days after application).

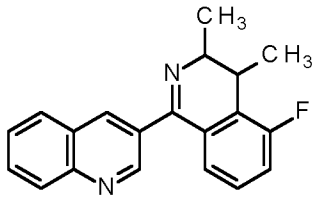
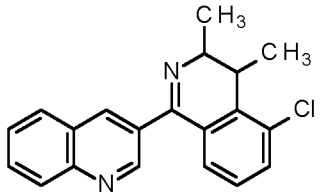
The following compounds gave at least 80% control of botrytis cinera at 200 ppm when compared to untreated control under the same conditions, which showed extensive disease development.

E.03, E.05, E.08, E.10, E.14

Comparative Examples

Mycosphaerella graminicola (*Septoria tritici*) on wheat / preventative

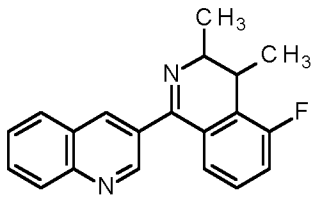
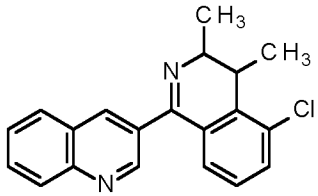
2-week old wheat plants cv. Riband are sprayed in a spray chamber with the test compound formulated as emulsifiable concentrate diluted in water. The test plants are inoculated by spraying a spore suspension on them one day after application and then kept at 22°C/21°C (day/night) in a greenhouse. Disease damage is assessed directly when an appropriate level of disease appears on untreated check plants and efficacy was calculated compared to untreated controls (16 to 19 days after application).

Compound	Rate of application (ppm)	Efficacy (% control)
 Comparative compound A (compound 1-130 according to WO 2007/011022)	20	30
 Comparative compound B (compound 1-133 according to WO 2007/011022)	20	51
Compound E.03	20	93
Compound E.05	20	98
Compound E.06	20	82
Compound E.07	20	93

Botrytis cinerea on tomato / preventative (Botrytis on tomato)

4-week old tomato plants are treated in a spray chamber with the test compound formulated as emulsifible concentrate diluted in water. The test plants are inoculated by spraying them with a spore suspension two days after application. The inoculated test plants are incubated at 20° C and 95% rh in

a greenhouse and the percentage leaf area covered by disease is assessed when an appropriate level of disease appears on untreated check plants (5 - 6 days after application).

Compound	Rate of application (ppm)	Efficacy (% control)
 Comparative compound A (compound 1-130 according to WO 2007/011022)	60	34
 Comparative compound B (compound 1-133 according to WO 2007/011022)	60	49
Compound E.03	60	71
Compound E.05	60	63
Compound E.06	60	41
Compound E.07	60	78

In the comparative experimental examples above, it is shown for selected compounds according to the invention that control on *Mycosphaerella graminicola* (*Septoria tritici*) is significantly superior to that for compounds of the prior art (WO 2007/011022). Additionally, it is demonstrated in the comparative examples above that the compounds according to this invention display excellent control of *Mycosphaerella graminicola* (*Septoria tritici*) without compromising the spectrum of other diseases controlled by the compounds of the prior art (eg, *Botrytis cinerea*).

COMPOSITION EXAMPLES

Further biolgical test examples relating to fungicidal compositions according to the invention comprising a mixture of components (A) and (B) as active ingredients:

Methods

In vitro activity against *Zymoseptoria tritici* (Septoria leaf blotch of wheat):

Other names: *Septoria tritici, Mycosphaerella graminicola* (EPPO code: SEPTTR).

Conidia of the fungus from cryogenic storage were directly mixed into nutrient broth (Vogel's medium). A DMSO solution of the test compounds was placed into a microtiter plate (96-well format) and the nutrient broth containing the fungal spores added to it. The test plates were incubated at 24° C and the inhibition of growth was determined visually after 96 h.

In vitro activity against *Fusarium culmorum* (culm rot of cereals):

EPPO code: FUSACU

Conidia of the fungus from cryogenic storage were directly mixed into nutrient broth (PDB potato dextrose broth). A DMSO solution of the test compounds was placed into a microtiter plate (96-well format) and the nutrient broth containing the fungal spores was added to it. The test plates were incubated at 24° C and the inhibition of growth was determined visually after 72 h.

In-vitro activity against ***Microdochium nivale*** (foot rot of cereals)

Other names: Fusarium nivale, *Monographella nivalis* (EPPO code: MONGNI)

Conidia of the fungus from cryogenic storage were directly mixed into nutrient broth (PDB potato dextrose broth). A DMSO solution of the test compounds was placed into a microtiter plate (96-well format) and the nutrient broth containing the fungal spores was added to it. The test plates were incubated at 24° C and the inhibition of growth was determined visually after 96 h.

Table X1 (below) shows the *in vitro* efficacy of mixture compositions comprised of compound E.03 as component (A) and preferred mixing partners as component (B). "Yes" marks a ratio of components (A) and (B) which provided at least 80% control of the indicated disease-causing fungus at the indicated concentration. "-" marks a ratio component (A) and component (B), which provided less than 80% control of the indicated disease-causing fungus at the indicated concentration.

EPPO = European and Mediterranean Plant Protection Organization

Table X1

Component		Application rates		Control of fungal pathogen equal or greater than 80%		
(A)	(B)	Ratio (A):(B)	Conc. (A):(B) (ppm)	FUSACU	MONGNI	SEPTTR
E.03	isoflucypram	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes

		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	benzovindiflupyr	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	fluxapyroxad	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	pydiflumetofen	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	difenoconazole	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	mefentrifluconazole	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	prothioconazole	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes

		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	metconazole	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	metyltetraprole	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	azoxystrobin	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	pyraclostrobin	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	florylpicoxamid	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	cyprodinil	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes

		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	fenpropidin	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	folpet	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	cyflufenamid	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	sulphur	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	disodium phosphonate	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.03	Aureobasidin A	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes

		1 : 100	0.2 : 20	yes	yes	yes
E.03	Jawsamycin	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes

Table X2 shows the *in vitro* efficacy of mixture compositions comprised of compound E.05 (A) and preferred mixing partners (B). “Yes” marks a ratio of components (A) and (B) which provided at least 80% control of the indicated disease-causing fungus at the indicated concentration. “-“ marks a ratio of component (A) and component (B), which provided less than 80% control of the indicated disease causing fungus at the indicated concentration.

Table X2

Component		**Application rates**		**Control of fungal pathogen equal or greater than 80%**		
(A)	**(B)**	**Ratio (A):(B)**	**Conc. (A):(B) (ppm)**	**FUSACU**	**MONGNI**	**SEPTTR**
E.05	isoflucypram	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.05	benzovindiflupyr	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.05	fluxapyroxad	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	-	yes
		1 : 10	0.2 : 2	yes	yes	yes

		1 : 100	0.2 : 20	yes	yes	yes
E.05	pydiflumetofen	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.05	difenoconazole	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	-	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.05	mefentrifluconazole	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	-	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.05	prothioconazole	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1		yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.05	metconazole	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	-	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.05	metyltetraprole	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes

E.05	azoxystrobin	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.05	pyraclostrobin	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.05	florylpicoxamid	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.05	cyprodinil	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.05	fenpropidin	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	-	yes
		1 : 10	0.2 : 2	yes	-	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.05	folpet	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.05	cyflufenamid	100 : 1	2 : 0.02	yes	yes	yes

		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	-	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.05	sulphur	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	-	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.05	disodium phosphonate	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	-	yes
		1 : 10	0.2 : 2	yes	-	yes
		1 : 100	0.2 : 20	yes	-	yes
E.05	Aureobasidin A	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	-	yes
		1 : 10	0.2 : 2	yes	-	yes
		1 : 100	0.2 : 20	yes	-	yes
E.05	Jawsamycin	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes

Table X3 shows the *in vitro* efficacy of mixture compositions comprised of compound E.10 (A) and preferred mixing partners (B). “Yes” marks a ratio of components (A) and (B) which provided at least 80% control of the indicated disease-causing fungus at the indicated concentration. “-“ marks a ratio of components (A) and (B) which provided less than 80% control of the indicated disease-causing fungus at the indicated concentration.

Table X3

Component		Application rates		Control of fungal pathogen equal or greater than 80%		
(A)	(B)	Ratio (A):(B)	Conc. (A):(B) (ppm)	FUSACU	MONGNI	SEPTTR
E.10	isoflucypram	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	benzovindiflupyr	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	fluxapyroxad	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	pydiflumetofen	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	difenoconazole	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	mefentrifluconazole	100 : 1	2 : 0.02	yes	yes	yes

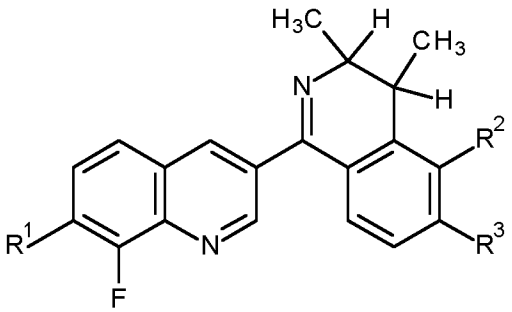
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	prothioconazole	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	metconazole	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	metyltetraprole	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	azoxystrobin	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	pyraclostrobin	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	florylpicoxamid	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes

		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	cyprodinil	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	fenpropidin	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	folpet	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	cyflufenamid	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	sulphur	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	disodium phosphonate	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes

		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	Aureobasidin A	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes
E.10	Jawsamycin	100 : 1	2 : 0.02	yes	yes	yes
		10 : 1	2 : 0.2	yes	yes	yes
		1 : 1	2 : 2	yes	yes	yes
		1 : 1	0.2 : 0.2	yes	yes	yes
		1 : 10	0.2 : 2	yes	yes	yes
		1 : 100	0.2 : 20	yes	yes	yes

CLAIMS:

1. A fungicidal composition comprising a mixture of components (A) and (B) as active ingredients, wherein component (A) is a compound of formula (I):



(I)

wherein

R^1 is fluoro or hydrogen;

R^2 is chloro, bromo, cyano, difluoromethyl or methoxy

R^3 is methyl or hydrogen.

or a salt, tautomer and/or an N-oxide thereof,

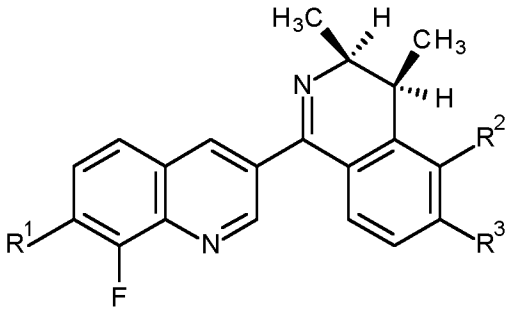
and

component (B) is a compound selected from the group consisting of:

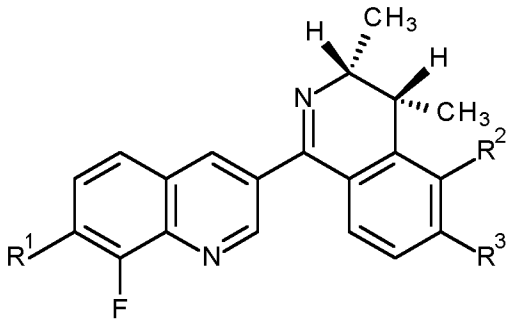
difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, isopyrazam, fluopyram, penthiopyrad, sedaxane, bixafen, boscalid, cyproconazole, tebuconazole, hexaconazole, propiconazole, epoxiconazole, flutriafol, fluindapyr, ipconazole, inpyrfluxam, paclobutrazol, trifloxystrobin, thiabendazole, picoxystrobin, pyraclostrobin, kresoxim methyl, metalaxyl-M, fenpropimorph, spiroxamine, mancozeb, chlorothalonil, oxathiapiprolin, mandipropamid, metrafenone, fenpicoxamid, fluazinam, fludioxinil, fluoxastrobin, fosetyl-aluminium, acibenzolar-S-methyl, procymidone, penconazole, carbendazim, fenhexamid, prochloraz, penthiopyrad, propineb, maneb, prohexadione-calcium, sulfur, calcium phosphonate, Timorex Gold™ (plant extract comprising tea tree oil), N'-[5-bromo-2-methyl-6-[(1S)-1-methyl-2-propoxy-ethoxy]-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-bromo-2-methyl-6-[(1R)-1-methyl-2-propoxy-ethoxy]-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-cyano-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-(difluoromethyl)-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[2,5-dimethyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-bromo-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[6-(2-allyloxy-1-methyl-ethoxy)-5-chloro-2-methyl-3-pyridyl]-N-ethyl-N-methyl-

formamidine, N'-[5-chloro-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-bromo-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-isopropyl-N-methyl-formamidine and N-isopropyl-N'-[5-methoxy-2-methyl-4-(2,2,2-trifluoro-1-hydroxy-1-phenyl-ethyl)phenyl]-N-methyl-formamidine, N-methoxy-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]cyclopropanecarboxamide, N,2-dimethoxy-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propenamide, N-ethyl-2-methyl-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propenamide, 1-methoxy-3-methyl-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea, 1,3-dimethoxy-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea, 3-ethyl-1-methoxy-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea, N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propanamide, 4,4-dimethyl-2-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]isoxazolidin-3-one, 5,5-dimethyl-2-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]isoxazolidin-3-one, ethyl 1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]pyrazole-4-carboxylate, N,N-dimethyl-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]-1,2,4-triazol-3-amine, (3-methylisoxazol-5-yl)-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methanone, (5-methyl-2-pyridyl)-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methanone, 2-oxo-N-propyl-2-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]acetamide and ethyl 1-[[5-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]-2-thienyl]methyl]pyrazole-4-carboxylate, methyl (*Z*)-3-methoxy-2-[2-methyl-5-[3-(trifluoromethyl)pyrazol-1-yl]phenoxy]prop-2-enoate, methyl (Z)-3-methoxy-2-[2-methyl-5-(3-propylpyrazol-1-yl)phenoxy]prop-2-enoate, methyl (*Z*)-2-(5-cyclohexyl-2-methyl-phenoxy)-3-methoxy-prop-2-enoate, methyl (*Z*)-2-(5-cyclopentyl-2-methyl-phenoxy)-3-methoxy-prop-2-enoate, methyl (Z)-2-[5-(3-isopropylpyrazol-1-yl)-2-methyl-phenoxy]-3-methoxy-prop-2-enoate, methyl (Z)-3-methoxy-2-[2-methyl-5-(4-propyltriazol-2-yl)phenoxy]prop-2-enoate, methyl (Z)-3-methoxy-2-[2-methyl-5-[4-(trifluoromethyl)triazol-2-yl]phenoxy]prop-2-enoate, methyl (Z)-2-[5-(4-cyclohexylthiazol-2-yl)-2-methyl-phenoxy]-3-methoxy-prop-2-enoate, methyl (Z)-2-[5-[4-(ethoxymethyl)thiazol-2-yl]-2-methyl-phenoxy]-3-methoxy-prop-2-enoate, methyl (Z)-2-[5-(4-bromothiazol-2-yl)-2-methyl-phenoxy]-3-methoxy-prop-2-enoate, methyl (Z)-3-methoxy-2-[2-methyl-5-[5-(trifluoromethyl)thiazol-2-yl]phenoxy]prop-2-enoate, 2-[(2,6-difluoro-4-pyridyl)-(2-methoxyacetyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[cyano-(2,6-difluoro-4-pyridyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[cyano-(2,6-difluoro-4-pyridyl)amino]-5-methyl-N-spiro[3.4]octan-3-yl-thiazole-4-carboxamide, 2-[cyano-(2,6-difluoro-4-pyridyl)amino]-N-hexyl-5-methyl-thiazole-4-carboxamide, 2-[acetyl-(2,6-difluoro-4-pyridyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[acetyl-(2,6-difluoro-4-pyridyl)amino]-5-methyl-N-spiro[3.4]octan-3-yl-thiazole-4-carboxamide, methyl 3-[(4-chlorophenyl)methyl]-2-hydroxy-1-methyl-2-(1,2,4-triazol-1-ylmethyl)cyclopentanecarboxylate, 4-[[6-[2-(2,4-difluorophenyl)-1,1-difluoro-2-hydroxy-3-(tetrazol-1-yl)propyl]-3-pyridyl]oxy]benzonitrile, methyl 2-[4-(4-chlorophenoxy)-2-(trifluoromethyl)phenyl]-2-hydroxy-3-(1,2,4-triazol-1-yl)propanoate.

2. A fungicidal composition according to claim 1, wherein component (A) is a compound of formula (I) represented by formula (IA) or formula (IB):

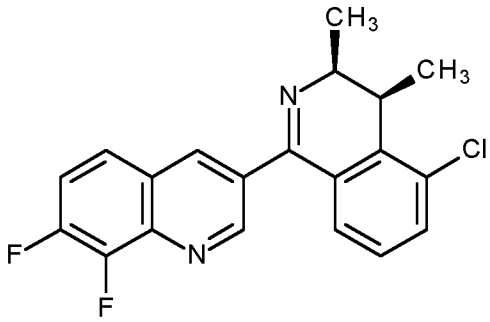


(IA)



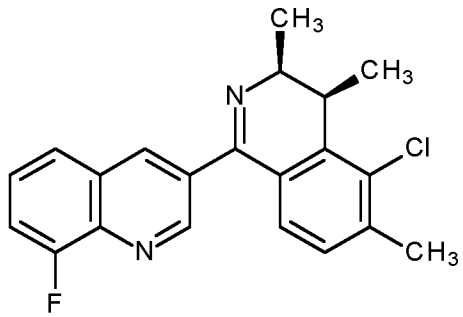
(IB).

3. A fungicidal composition according to claim 1, wherein component (A) is a compound selected from:



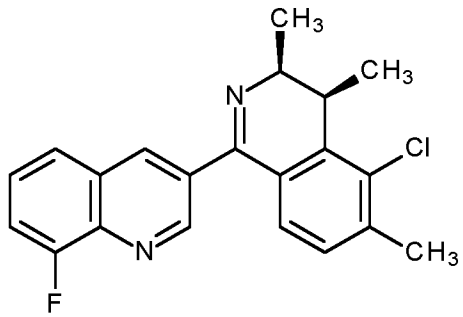
(racemic)

(compound E.01),



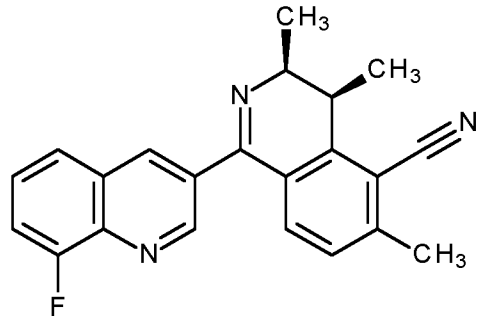
(enantiomer 1 of 2)

(compound E.02),



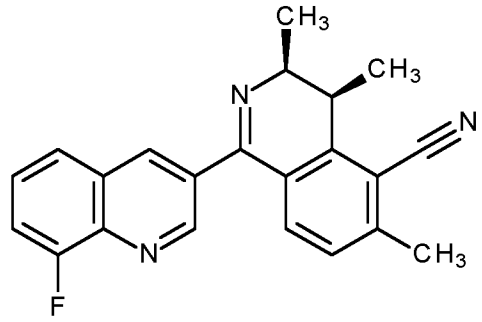
(enantiomer 2 of 2)

(compound E.03),



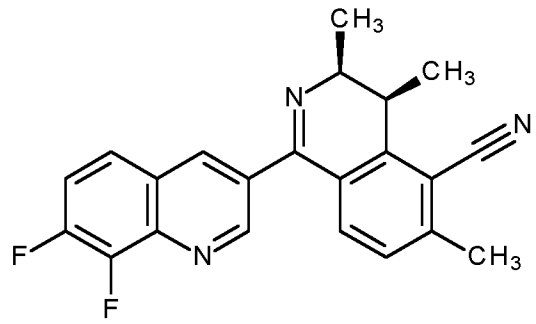
(enantiomer 1 of 2)

(compound E.04),



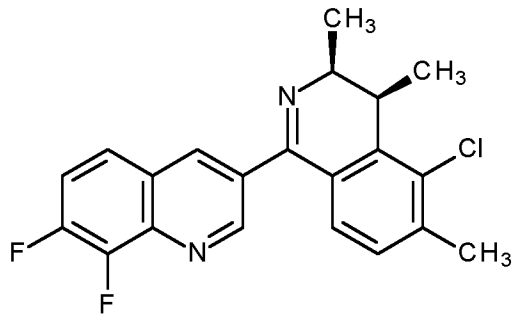
(enantiomer 2 of 2)

(compound E.05),



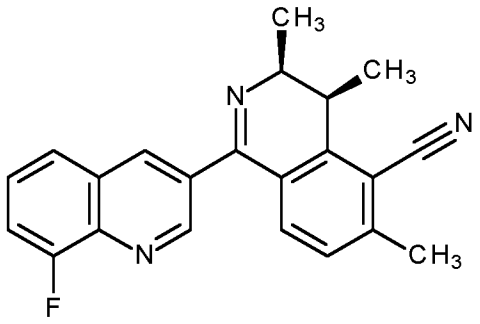
(racemic)

(compound E.06),



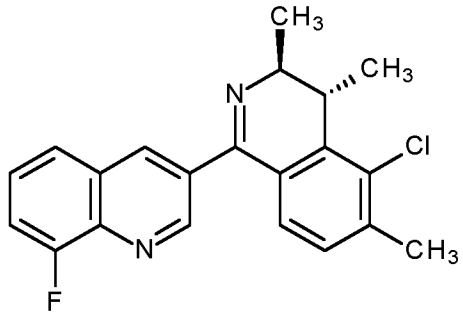
(racemic)

(compound E.07),



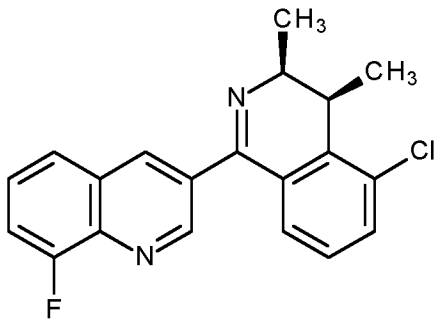
(racemic)

(compound E.08),



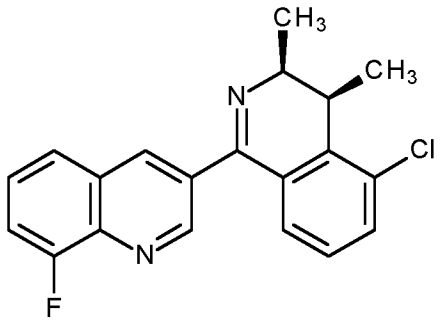
(racemic)

(compound E.09),



(enantiomer 1 of 2)

(compound E.10),



(enantiomer 2 of 2)

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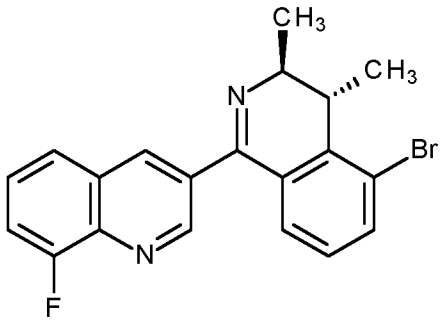
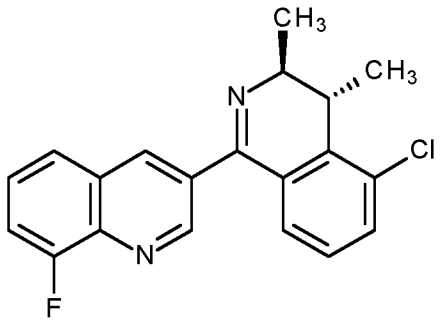


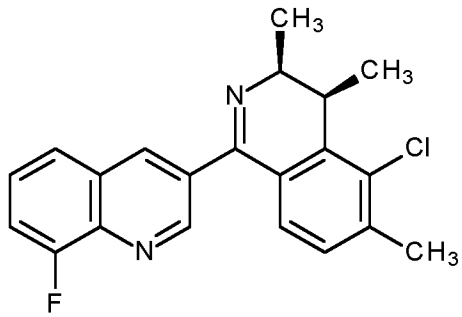
(racemic)

(compound E.12),



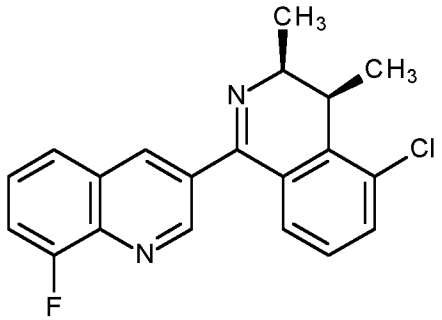
(racemic)

(compound E.13),



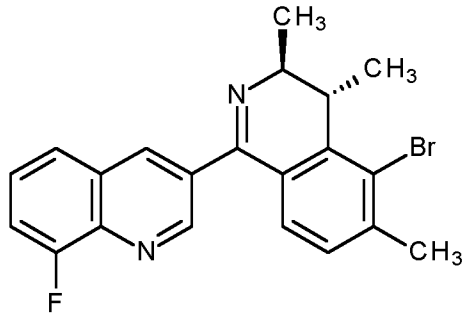
(racemic)

(compound E.14),



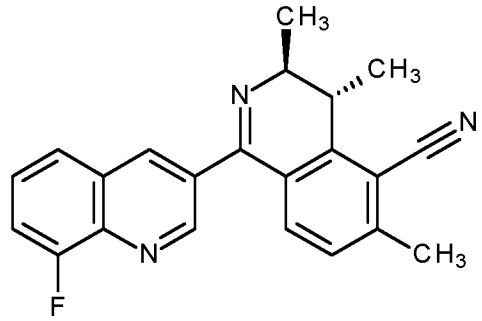
(racemic)

(compound E.15),



(racemic)

(compound E.16), or

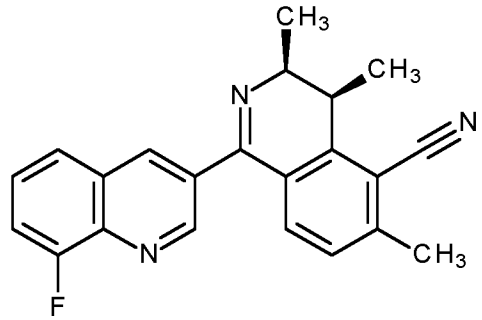


(racemic)

(compound E.17),

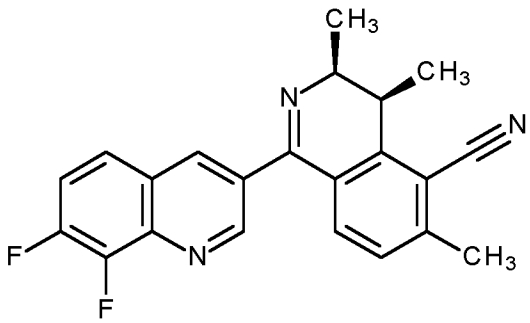
or a salt, tautomer or N-oxide thereof.

4. A fungicidal composition according to claim 1 to 3, wherein component (A) is:



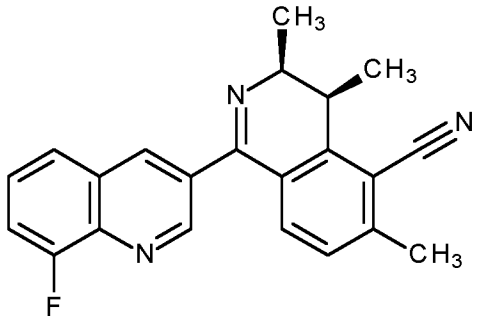
(enantiomer 2 of 2)

(compound E.05),



(racemic)

(compound E.06), or



(racemic)

(compound E.08),

or a salt, tautomer or N-oxide thereof.

5. A fungicidal composition according to any one of claims 1 to 4, wherein component (B) is a compound selected from the group consisting of difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin.

6. A fungicidal composition according to any one of claims 1 to 5, wherein component (B) is a compound selected from florylpicoxamid, prothioconazole, fenpropidin, azoxystrobin, cyprodinil, folpet, pydiflumetofen.

7. A fungicidal composition according to to any one of claims 1 to 6, wherein the weight ratio of component (A) to component (B) is from 100:1 to 1:100.

8. A fungicidal composition according to to any one of claims 1 to 7, wherein the weight ratio of component (A) to component (B) is from 20:1 to 1:20.

9. A fungicidal composition according to to any one of claims 1 to 8, wherein the weight ratio of component (A) to component (B) is from 12:1 to 1:12.

10. A fungicidal composition according to to any one of claims 1 to 9, wherein the weight ratio of component (A) to component (B) is from 5:1 and 1:5.

11. A fungicidal composition according to to any one of claims 1 to 10, wherein the weight ratio of component (A) to component (B) is from 3:1 to 1:3.

12. A fungicidal composition according to any of claims 1 to 11, wherein the composition comprises as a further active ingredient a component (C), which is different to the compound of component (B), selected from the group consisting of:

difenoconazole, mefentrifluconazole, prothioconazole, metconazole, folpet, pydiflumetofen, isoflucypram, benzovindiflupyr, fluxapyroxad, metyltetraprole, azoxystrobin, cyprodinil, florylpicoxamid, fenpropidin, isopyrazam, fluopyram, penthiopyrad, sedaxane, bixafen, boscalid, cyproconazole, tebuconazole, hexaconazole, propiconazole, epoxiconazole, flutriafol, fluindapyr, ipconazole, inpyrfluxam, paclobutrazol, trifloxystrobin, thiabendazole, picoxystrobin, pyraclostrobin, kresoxim methyl, metalaxyl-M, fenpropimorph, spiroxamine, mancozeb, chlorothalonil, oxathiapiprolin, mandipropamid, metrafenone, fenpicoxamid, fluazinam, fludioxinil, fluoxastrobin, fosetyl-aluminium, acibenzolar-S-methyl, procymidone, penconazole, carbendazim, fenhexamid, prochloraz, penthiopyrad, propineb, maneb, prohexadione-calcium, sulfur, calcium phosphonate, Timorex Gold™ (plant extract comprising tea tree oil), N'-[5-bromo-2-methyl-6-[(1S)-1-methyl-2-propoxy-ethoxy]-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-bromo-2-methyl-6-[(1R)-1-methyl-2-propoxy-ethoxy]-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-cyano-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-(difluoromethyl)-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[2,5-dimethyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-bromo-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[6-(2-allyloxy-1-methyl-ethoxy)-5-chloro-2-methyl-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-chloro-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine, N'-[5-bromo-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-isopropyl-N-methyl-formamidine and N-isopropyl-N'-[5-methoxy-2-methyl-4-(2,2,2-trifluoro-1-hydroxy-1-phenyl-ethyl)phenyl]-N-methyl-formamidine, N-methoxy-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]cyclopropanecarboxamide, N,2-dimethoxy-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propenamide, N-ethyl-2-methyl-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propenamide, 1-methoxy-3-methyl-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea, 1,3-dimethoxy-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea, 3-ethyl-1-methoxy-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea, N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propanamide, 4,4-dimethyl-2-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]isoxazolidin-3-one, 5,5-dimethyl-2-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]isoxazolidin-3-one, ethyl 1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]pyrazole-4-carboxylate, N,N-dimethyl-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]-1,2,4-triazol-3-amine, (3-methylisoxazol-5-yl)-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methanone, (5-methyl-2-pyridyl)-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methanone, 2-oxo-N-propyl-2-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]acetamide and ethyl 1-[[5-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]-2-thienyl]methyl]pyrazole-4-carboxylate, methyl (*Z*)-3-methoxy-2-[2-methyl-5-[3-(trifluoromethyl)pyrazol-1-yl]phenoxy]prop-2-enoate, methyl (*Z*)-3-methoxy-2-[2-methyl-5-(3-propylpyrazol-1-yl)phenoxy]prop-2-enoate, methyl (*Z*)-2-(5-cyclohexyl-2-methyl-phenoxy)-3-methoxy-prop-2-enoate, methyl (*Z*)-2-(5-cyclopentyl-2-methyl-phenoxy)-3-methoxy-prop-2-

enoate, methyl (Z)-2-[5-(3-isopropylpyrazol-1-yl)-2-methyl-phenoxy]-3-methoxy-prop-2-enoate, methyl (Z)-3-methoxy-2-[2-methyl-5-(4-propyltriazol-2-yl)phenoxy]prop-2-enoate, methyl (Z)-3-methoxy-2-[2-methyl-5-[4-(trifluoromethyl)triazol-2-yl]phenoxy]prop-2-enoate, methyl (Z)-2-[5-(4-cyclohexylthiazol-2-yl)-2-methyl-phenoxy]-3-methoxy-prop-2-enoate, methyl (Z)-2-[5-[4-(ethoxymethyl)thiazol-2-yl]-2-methyl-phenoxy]-3-methoxy-prop-2-enoate, methyl (Z)-2-[5-(4-bromothiazol-2-yl)-2-methyl-phenoxy]-3-methoxy-prop-2-enoate, methyl (Z)-3-methoxy-2-[2-methyl-5-[5-(trifluoromethyl)thiazol-2-yl]phenoxy]prop-2-enoate, 2-[cyano-(2,6-difluoro-4-pyridyl)amino]-5-methyl-N-spiro[3.4]octan-3-yl-thiazole-4-carboxamide, 2-[cyano-(2,6-difluoro-4-pyridyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[cyano-(2,6-difluoro-4-pyridyl)amino]-N-hexyl-5-methyl-thiazole-4-carboxamide, 2-[(2,6-difluoro-4-pyridyl)-(2-methoxyacetyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[(2,6-difluoro-4-pyridyl)-(tetrahydropyran-4-carbonyl)amino]-N-(2,2-dimethylcyclo-butyl)-5-methyl-thiazole-4-carboxamide, 2-[(2,6-difluoro-4-pyridyl)-(oxetane-3-carbonyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[(2,6-difluoro-4-pyridyl)-(tetrahydrofuran-3-carbonyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[acetyl-(2,6-difluoro-4-pyridyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-carboxamide, 2-[(2,6-difluoro-4-pyridyl)-(2-methylpropanoyl)amino]-N-(2,2-dimethylcyclobutyl)-5-methyl-thiazole-4-; methyl 3-[(4-chlorophenyl)methyl]-2-hydroxy-1-methyl-2-(1,2,4-triazol-1-ylmethyl)cyclopentanecarboxylate, 4-[[6-[2-(2,4-difluorophenyl)-1,1-difluoro-2-hydroxy-3-(tetrazol-1-yl)propyl]-3-pyridyl]oxy]benzonitrile, methyl 2-[4-(4-chlorophenoxy)-2-(trifluoromethyl)phenyl]-2-hydroxy-3-(1,2,4-triazol-1-yl)propanoate.

13. A fungicidal composition according to any one of claims 1 to 12, wherein the composition further comprises an agriculturally acceptable carrier and, optionally, a surfactant and/or formulation adjuvants.

14. A method of controlling or preventing phytopathogenic diseases, especially phytopathogenic fungi, on useful plants or on propagation material thereof, which comprises applying to the useful plants, the locus thereof or propagation material thereof a fungicidal composition as defined in any one of claims 1 to 13.

15. The method according to claim 14, wherein the phytopathogenic fungi is:
(i) *Mycosphaerella graminicola,*
(ii) *Monographella nivalis* (*Microdochium nivale*),
(iii) *Gibberella zeae* (anamorph: *Fusarium graminearum*), or
(iv) *Fusarium culmorum*

16. The method according to claim 14 or 15, wherein the composition components (A) and (B) are applied in a sequential manner.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2023/076583

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01N43/42 C07D401/04 A01P3/00
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 C07D

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	WO 2022/223376 A1 (SYNGENTA CROP PROTECTION AG [CH]) 27 October 2022 (2022-10-27) cited in the application the claims; compounds with registry number 2855085-47-9, 2855085-42-4, 2855085-43-5, 2855085-33-3, 2855085-34-4, 2855085-35-3, 2855085-36-6, 2855085-37-7, 2855085-38-8, 2855085-39-9, 2855085-40-2, 2855085-41-3, 2855085-44-6, 2855085-45-7, 2855085-46-8, 2855085-50-4; pages 6-9; page 25, last paragraph; pages 26-45	1-16
Y	WO 2021/074309 A1 (SYNGENTA CROP PROTECTION AG [CH]) 22 April 2021 (2021-04-22) the claims; the tables and pages 26-45	1-16

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

[x] See patent family annex.

* Special categories of cited documents :

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"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
1 December 2023	14/12/2023

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	Lorenzo Varela, M

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2023/076583

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2021/074311 A1 (SYNGENTA CROP PROTECTION AG [CH]) 22 April 2021 (2021-04-22) the claims; the tables; page 20, last paragraph; pages 21-41 -----	1-16
A	WO 2009/119089 A1 (NIPPON SODA CO [JP]; MITANI AKIRA [JP] ET AL.) 1 October 2009 (2009-10-01) the whole document -----	1-16

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2023/076583

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		CA 3214731 A1	27-10-2022
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		TW 202309005 A	01-03-2023
		UY 39731 A	30-11-2022
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