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(71) Applicant: SYNGENTA CROP PROTECTION AG
[CH/CH]; Rosentalstrasse 67, 4058 Basel (CH).

(72) Inventors: WENDEBORN, Sebastian, Volker; Syngenta Crop Protection AG Schaffhauserstrasse, 4332 Stein (CH). RENDINE, Stefano; Syngenta Crop Protection AG Schaffhauserstrasse, 4332 Stein (CH). SCARBOROUGH, Christopher, Charles; Syngenta Crop Protection AG Schaffhauserstrasse, 4332 Stein (CH). LAMBERTH, Clemens; Syngenta Crop Protection AG Schaffhauserstrasse, 4332 Stein (CH).

(74) Agent: SYNGENTA IP; Rosentalstrasse 67, 4058 Basel (CH).

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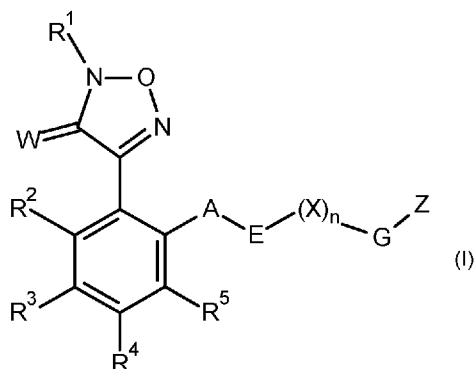
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(54) Title: MICROBIOCIDAL 1,2,5-OXADIAZOL-3(2H)-ONE DERIVATIVES



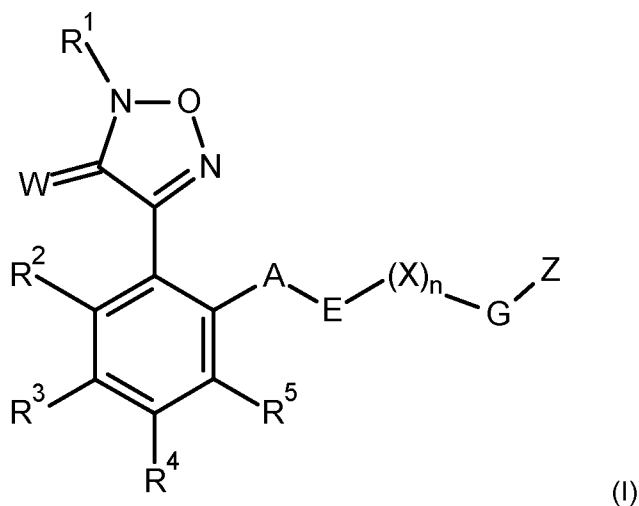
(57) Abstract: Compounds of the formula (I) wherein the substituents are as defined in claim 1, useful as a pesticides, especially as fungicides.

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MICROBIOCIDAL 1,2,5-OXADIAZOL-3(2H)-ONE DERIVATIVES

The present invention relates to microbiocidal furazanone derivatives, e.g., as active ingredients, which have microbiocidal activity, in particular, fungicidal activity. The invention also relates to 5 agrochemical compositions which comprise at least one of the furazanone derivatives, to processes of preparation of these compounds and to uses of the furazanone derivatives or compositions in agriculture or horticulture for controlling or preventing infestation of plants, harvested food crops, seeds or non-living materials by phytopathogenic microorganisms, preferably fungi.

10 According to the present invention, there is provided a compound of formula (I):



wherein

15 R^1 is C_1 - C_6 alkyl or C_3 - C_6 cycloalkyl;

R^2 is selected from the group consisting of hydrogen, halogen, cyano, C_1 - C_6 alkyl, C_1 - C_6 haloalkyl and C_3 - C_6 cycloalkyl;

20 R^3 and R^4 are each independently selected from the group consisting of hydrogen, halogen, cyano, C_1 - C_6 alkyl, C_1 - C_6 haloalkyl and C_3 - C_6 cycloalkyl;

R^5 is selected from the group consisting of hydrogen, halogen, cyano, C_1 - C_6 alkyl, C_1 - C_6 haloalkyl and C_3 - C_6 cycloalkyl;

25

W is O or S;

A is a direct bond or CR^6R^7 ;

30

E is CR^6R^7 , O, S or SO_2 ;

X is CR⁶R⁷;

n is 0, 1 or 2;

5 G is carbocyclyl, wherein the carbocyclyl is a 6- to 10-membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated or saturated, or heterocyclyl, wherein the heterocyclyl is a 5- to 10- membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated or saturated, comprising 1, 2, 3 or 4 heteroatoms individually selected from nitrogen, oxygen and sulphur, and wherein said carbocyclyl or heterocyclyl are
10 optionally substituted by 1, 2 or 3 R⁸ substituents, which may be the same or different;

Z is hydrogen, carbocyclyl, carbocyclyloxy, wherein the carbocyclyl is a 6- to 10-membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated or saturated, heterocyclyl or heterocyclyloxy, wherein the heterocyclyl is a 5- to 10- membered
15 mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated or saturated, comprising 1, 2, 3 or 4 heteroatoms individually selected from nitrogen, oxygen and sulphur,
and wherein any of said carbocyclyl, carbocyclyloxy, heterocyclyl or heterocyclyloxy are
20 optionally substituted by 1, 2 or 3 R⁹ substituents, which may be the same or different;

R⁶ and R⁷ are each independently selected from the group consisting of hydrogen, halogen and C₁-C₆alkyl;

each R⁸ is independently selected from the group consisting of hydroxy, halogen, cyano, C₁-
25 C₆alkyl, C₂-C₆alkenyl, C₂-C₆alkynyl, C₁-C₆alkoxy, C₃-C₆cycloalkyl, C₃-C₆cycloalkoxy, C₁-
C₆alkylsulfonyl, C₁-C₆haloalkyl, C₁-C₆haloalkoxy, C₃-C₆halocycloalkyl, C₁-C₆alkoxyC₁-C₆alkyl,
C₁-C₆haloalkoxyC₁-C₆alkyl, C₁-C₆haloalkylsulfonyl and C₁-C₆alkylcarbonyl; and

each R⁹ is independently selected from the group consisting of hydroxy, halogen, cyano, C₁-
30 C₆alkyl, C₂-C₆alkenyl, C₂-C₆alkynyl, C₁-C₆alkoxy, C₃-C₆cycloalkyl, C₃-C₆cycloalkoxy, C₁-
C₆alkylsulfonyl, C₁-C₆haloalkyl, C₁-C₆haloalkoxy, C₃-C₆halocycloalkyl, C₁-C₆alkoxyC₁-C₆alkyl,
C₁-C₆haloalkoxyC₁-C₆alkyl, C₁-C₆haloalkylsulfonyl and C₁-C₆alkylcarbonyl;

or an agronomically acceptable salt;

35

or N-oxide thereof.

It has been found that the novel compounds of formula (I) have, a very advantageous level of biological activity for protecting plants against diseases that are caused by fungi.

40

According to a second aspect of the invention, there is provided an agrochemical composition comprising a fungicidally effective amount of a compound of formula (I) and an agrochemically-acceptable diluent or carrier. Such an agricultural composition may further comprise at least one additional active ingredient.

5

According to a third aspect of the invention, there is provided a method of controlling or preventing infestation of useful plants by phytopathogenic microorganisms, wherein a fungicidally effective amount of a compound of formula (I), or a composition comprising this compound as active ingredient, is applied to the plants, to parts thereof or the locus thereof.

10

According to a fourth aspect of the invention, there is provided the use of a compound of formula (I) as a fungicide. According to this particular aspect of the invention, the use may exclude methods for the treatment of the human or animal body by surgery or therapy.

15 As used herein, the term "halogen" or "halo" refers to fluorine (fluoro), chlorine (chloro), bromine (bromo) or iodine (iodo), preferably fluorine, chlorine or bromine.

As used herein, cyano means a -CN group.

As used herein, hydroxy means a -OH group.

As used herein, the term "C₁-C₆alkyl" refers to a straight or branched hydrocarbon chain radical
20 consisting solely of carbon and hydrogen atoms, containing no unsaturation, having from one to six carbon atoms, and which is attached to the rest of the molecule by a single bond. C₁-C₄alkyl and C₁-C₂alkyl are to be construed accordingly. Examples of C₁-C₆alkyl include, but are not limited to, methyl, ethyl, *n*-propyl, 1-methylethyl (iso-propyl), *n*-butyl, and 1-dimethylethyl (*t*-butyl).

As used herein, the term "C₁-C₆alkoxy" refers to a radical of the formula -OR_a where R_a is a C₁-
25 C₆alkyl radical as generally defined above. Examples of C₁-C₄alkoxy include, but are not limited to, methoxy, ethoxy, propoxy, iso-propoxy and *t*-butoxy.

As used herein, the term "C₁-C₆haloalkyl" refers to a C₁-C₆alkyl radical, as generally defined above, substituted by one or more of the same or different halogen atoms. C₁-C₄haloalkyl is to be construed accordingly. Examples of C₁-C₆haloalkyl include, but are not limited to chloromethyl,
30 fluoromethyl, fluoroethyl, difluoromethyl, trifluoromethyl and 2,2,2-trifluoroethyl.

As used herein, the term "C₁-C₆haloalkoxy" refers to a C₁-C₆alkoxy group, as defined above, substituted by one or more of the same or different halogen atoms. C₁-C₄haloalkoxy is to be construed accordingly. Examples of C₁-C₆haloalkoxy include, but are not limited to, fluoromethoxy, difluoromethoxy, fluoroethoxy, trifluoromethoxy and trifluoroethoxy.

35 As used herein, the term "C₁-C₆haloalkoxyC₁-C₆alkyl-" refers to a C₁-C₆haloalkoxy group, as defined above attached to the rest of the molecule by a C₁-C₆alkylene radical as defined above.

As used herein, the term "C₂-C₆alkenyl" refers to a straight or branched hydrocarbon chain radical consisting solely of carbon and hydrogen atoms, containing at least one double bond that can be of either the (*E*)- or (*Z*)-configuration, having from two to six carbon atoms, which is attached to the rest of
40 the molecule by a single bond. C₂-C₄alkenyl is to be construed accordingly. Examples of C₂-C₆alkenyl include, but are not limited to, prop-1-enyl, allyl (prop-2-enyl) and but-1-enyl.

As used herein, the term "C₂-C₆alkynyl" refers to a straight or branched hydrocarbon chain radical group consisting solely of carbon and hydrogen atoms, containing at least one triple bond, having from two to six carbon atoms, and which is attached to the rest of the molecule by a single bond. C₂-C₄alkynyl is to be construed accordingly. Examples of C₂-C₆alkynyl include, but are not limited to, prop-1-ynyl, propargyl (prop-2-ynyl) and but-1-ynyl.

As used herein, the term "C₁-C₆alkoxyC₁-C₆alkyl-" refers to radical of the formula R_a-O-R_b- where R_a is a C₁-C₆alkyl radical as generally defined above, and R_b is a C₁-C₆alkylene radical as generally defined above. C₁-C₂alkoxyC₁-C₂alkyl is to be construed accordingly.

As used herein, the term "C₃-C₆cycloalkyl" refers to a stable, monocyclic ring radical which is saturated or partially unsaturated and contains 3 to 6 carbon atoms. C₃-C₄cycloalkyl is to be construed accordingly. Examples of C₃-C₆cycloalkyl include, but are not limited to, cyclopropyl, cyclobutyl, cyclopentyl and cyclohexyl.

As used herein, the term "C₃-C₆halocycloalkyl" refers to a C₃-C₆cycloalkyl radical, as generally defined above, substituted by one or more of the same or different halogen atoms. C₃-C₄halocycloalkyl is to be construed accordingly.

As used herein, the term "C₃-C₆cycloalkoxy" refers to a radical of the formula -OR_a where R_a is a C₃-C₆cycloalkyl radical as generally defined above.

As used herein, the term "C₃-C₆cycloalkylC₁-C₃alkyl-" refers to a C₃-C₆cycloalkyl ring as defined above attached to the rest of the molecule by a C₁-C₃alkylene radical as defined above. The term "C₃-C₄cycloalkylC₁-C₂alkyl-" is to be construed accordingly. Examples of C₃-C₆cycloalkylC₁-C₃alkyl- include, but are not limited to cyclopropylmethyl- and cyclobutylethyl-.

As used herein, the term "C₁-C₆alkylsulfonyl" refers to a radical of the formula -S(O)₂R_a where R_a is a C₁-C₆alkyl radical as generally defined above.

As used herein, the term "C₁-C₆haloalkylsulfonyl" refers to a C₁-C₆alkylsulfonyl radical, as generally defined above, substituted by one or more of the same or different halogen atoms.

As used herein, the term "C₁-C₆alkylcarbonyl" refers to a radical of the formula -C(O)R_a where R_a is a C₁-C₆alkyl radical as generally defined above.

As used herein, except where explicitly stated otherwise, the term "carbocyclyl" refers to a 6- to 10-membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated or saturated, which contains 6 to 10 carbon atoms. Examples of carbocyclyl include, but are not limited to phenyl, naphthyl and indanyl.

As used herein, the term "carbocycloxy" refers to a carbocyclyl ring as defined above attached to the rest of the molecule *via* an oxygen atom.

As used herein, the term "phenoxy" refers to a phenyl ring attached to the rest of the molecule *via* an oxygen atom.

As used herein, except where explicitly stated otherwise, the term "heterocyclyl" or "heterocyclic" refers to a 5- to 10- membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated or saturated, comprising 1, 2, 3 or 4 heteroatoms individually selected from nitrogen, oxygen and sulphur. The term "heterocyclyl" includes, but is not limited to stable 4- to 6-membered saturated monocyclic radicals such as pyrrolinyl, pyrrolidyl, tetrahydrofuryl, tetrahydrothienyl, tetrahydrothiopyranyl, piperidyl, piperazinyl, tetrahydropyranyl, dihydroisoxazolyl, dioxolanyl,

morpholinyl or δ -lactamyl. The term "heterocyclyl" further includes, but is not limited to "heteroaryl" radicals that are a 5- to 10- membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated, such as furyl, pyrrolyl, imidazolyl, thienyl, pyrazolyl, thiazolyl, isothiazolyl, oxazolyl, isoxazolyl, triazolyl, tetrazolyl, pyrazinyl, pyridazinyl, pyrimidyl, pyridyl, indolyl, indazolyl, 5 benzimidazolyl, pyrrolopyridinyl, triazolopyridinyl or tetrahydroindazolyl. The heterocyclyl radical may be bonded to the rest of the molecule *via* a carbon atom or heteroatom.

As used herein, the term "heterocycloxy" refers to a heterocyclyl ring as defined above attached to the rest of the molecule *via* an oxygen atom.

10 The presence of one or more possible asymmetric carbon atoms in a compound of formula (I) means that the compounds may occur in chiral isomeric forms, i.e., enantiomeric or diastereomeric forms. Also atropisomers may occur as a result of restricted rotation about a single bond. Formula (I) is intended to include all those possible isomeric forms and mixtures thereof. The present invention includes all those possible isomeric forms and mixtures thereof for a compound of formula (I). Likewise, 15 formula (I) is intended to include all possible tautomers (including lactam-lactim tautomerism and keto-enol tautomerism) where present. The present invention includes all possible tautomeric forms for a compound of formula (I).

In each case, the compounds of formula (I) according to the invention are in free form, in 20 covalently hydrated form, or in salt form, e.g., an agronomically usable or agrochemically acceptable salt form.

The following list provides definitions, including preferred definitions, for substituents A, E, G, W, X, Z, R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, R⁹ and n with reference to the compounds of formula (I) according to 25 the invention. For any one of these substituents, any of the definitions given below may be combined with any definition of any other substituent given below or elsewhere in this document.

R¹ is C₁-C₆alkyl or C₃-C₆cycloalkyl. Preferably R¹ is selected from the group consisting of methyl, ethyl and cyclopropyl. More preferably, R¹ is methyl or ethyl, most preferably R¹ is methyl. 30

R² is selected from the group consisting of hydrogen, halogen, cyano, C₁-C₆alkyl, C₁-C₆haloalkyl and C₃-C₆cycloalkyl. Preferably, R² is selected from the group consisting of hydrogen, halogen and C₁-C₆alkyl. More preferably, R² is selected from the group consisting of hydrogen, chloro, methyl and ethyl. Even more preferably, R² is hydrogen or methyl. Most preferably, R² is hydrogen. 35

R³ and R⁴ are each independently selected from the group consisting of hydrogen, halogen, cyano, C₁-C₆alkyl, C₁-C₆haloalkyl and C₃-C₆cycloalkyl. Preferably, R³ and R⁴ are each independently selected from the group consisting of hydrogen, halogen and C₁-C₆alkyl. More preferably, R³ and R⁴ are each independently selected from the group consisting of hydrogen, chloro, methyl and ethyl. Even more 40 preferably, R³ and R⁴ are each independently hydrogen or methyl. Most preferably, R³ and R⁴ are hydrogen.

R⁵ is selected from the group consisting of hydrogen, halogen, cyano, C₁-C₆alkyl, C₁-C₆haloalkyl and C₃-C₆cycloalkyl. Preferably, R⁵ is selected from the group consisting of hydrogen, halogen and C₁-C₆alkyl. More preferably, R⁵ is halogen or C₁-C₆alkyl. Even more preferably, R⁵ is selected from the
5 group consisting of chloro, methyl and ethyl. Most preferably R⁵ is methyl.

W is O or S. Preferably W is O.

A is a direct bond or CR⁶R⁷. Preferably, A is a direct bond or CH₂. More preferably, A is CH₂.
10

E is CR⁶R⁷, O, S or SO₂. Preferably, E is CR⁶R⁷ or O. More preferably, E is CH₂ or O. Most preferably E is O.

X is CR⁶R⁷, preferably X is CH₂.
15

n is 0, 1 or 2. Preferably, n is 0 or 1. More preferably, n is 0.

G is carbocyclyl, wherein the carbocyclyl is a 6- to 10-membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated or saturated, or heterocyclyl, wherein the
20 heterocyclyl is a 5- to 10- membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated or saturated, comprising 1, 2, 3 or 4 heteroatoms individually selected from nitrogen, oxygen and sulphur, and wherein said carbocyclyl or heterocyclyl are optionally substituted by 1, 2 or 3 R⁸ substituents, which may be the same or different.

25 Preferably, G is carbocyclyl, wherein the carbocyclyl is a 6- to 10-membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated, or heterocyclyl, wherein the heterocyclyl is a 5- to 10- membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated, comprising 1, 2, 3 or 4 heteroatoms individually selected from nitrogen, oxygen and sulphur, and wherein said carbocyclyl or heterocyclyl are optionally substituted by 1, 2 or 3
30 R⁸ substituents, which may be the same or different.

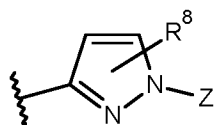
More preferably, G is phenyl or heterocyclyl, wherein the heterocyclyl is a 5- to 10- membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated, comprising 1, 2, 3 or 4 heteroatoms individually selected from nitrogen, oxygen and sulphur, and wherein said phenyl or
35 heterocyclyl are optionally substituted by 1, 2 or 3 R⁸ substituents, which may be the same or different.

Even more preferably, G is phenyl or heteroaryl, wherein the heteroaryl is a 5- or 6-membered aromatic ring which comprises 1, 2 or 3 heteroatoms individually selected from nitrogen, oxygen and sulphur, wherein said phenyl or heteroaryl are optionally substituted by 1 or 2 R⁸ substituents, which may be the
40 same or different.

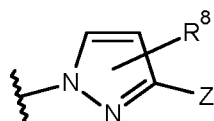
Even more preferably still, G is phenyl, pyridyl or pyrazolyl, wherein said phenyl, pyridyl or pyrazolyl are optionally substituted by 1 or 2 R^8 substituents, which may be the same or different. Yet even more preferably still, G is phenyl or pyrazolyl, wherein said phenyl or pyrazolyl are optionally substituted by 1 R^8 substituent.

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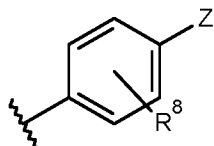
In a preferred embodiment G is selected from the group consisting of formula G-I to G-III below



G-I



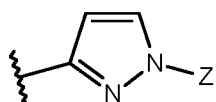
G-II



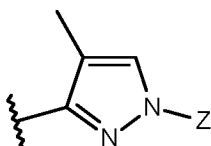
G-III

10 wherein Z and R^8 are as defined herein and the jagged line defines the point of attachment to the remaining part of a compound of formula (I).

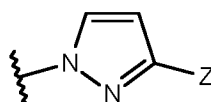
In a more preferred embodiment G is selected from the group consisting of formula G-Ia to G-Va below



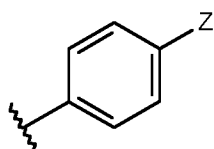
G-Ia



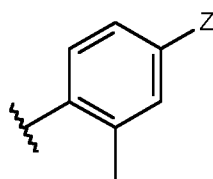
G-IIa



G-IIIa



G-IVa

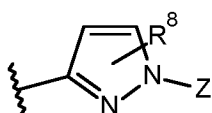


G-Va

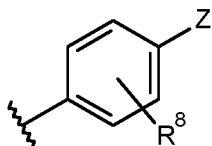
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wherein Z is as defined herein and the jagged line defines the point of attachment to the remaining part of a compound of formula (I).

In one embodiment G is a group of formula G-I or G-III below



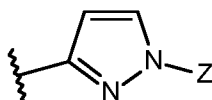
G-I



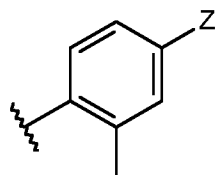
G-III

wherein Z and R⁸ are as defined herein and the jagged line defines the point of attachment to the remaining part of a compound of formula (I).

5 In an even more preferred embodiment G is a group of formula G-Ia or G-Va below



G-Ia



G-Va

wherein Z is as defined herein and the jagged line defines the point of attachment to the remaining part of a compound of formula (I).

- 10 Z is hydrogen, carbocyclyl, carbocycloxy, wherein the carbocyclyl is a 6- to 10-membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated or saturated, heterocyclyl or heterocycloxy, wherein the heterocyclyl is a 5- to 10- membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated or saturated, comprising 1, 2, 3 or 4 heteroatoms individually selected from nitrogen, oxygen and sulphur,
- 15 and wherein any of said carbocyclyl, carbocycloxy, heterocyclyl or heterocycloxy are optionally substituted by 1, 2 or 3 R⁹ substituents, which may be the same or different.

Preferably, Z is hydrogen, carbocyclyl, carbocycloxy, wherein the carbocyclyl is a 6- to 10-membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated, heterocyclyl or heterocycloxy, wherein the heterocyclyl is a 5- to 10- membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated, comprising 1, 2, 3 or 4 heteroatoms individually selected from nitrogen, oxygen and sulphur,

20 and wherein any of said carbocyclyl, carbocycloxy, heterocyclyl or heterocycloxy are optionally substituted by 1, 2 or 3 R⁹ substituents, which may be the same or different.

25

More preferably, Z is hydrogen, phenyl, phenoxy, heterocyclyl or heterocycloxy, wherein the heterocyclyl is a 5- to 10- membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated, comprising 1, 2, 3 or 4 heteroatoms individually selected from nitrogen, oxygen and sulphur,

- 30 and wherein any of said phenyl, phenoxy, heterocyclyl or heterocycloxy are optionally substituted by 1, 2 or 3 R⁹ substituents, which may be the same or different.

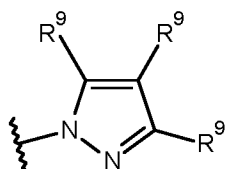
Even more preferably, Z is phenyl or heterocyclyl, wherein the heterocyclyl is a 5- to 10- membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated, comprising 1, 2, 3 or 4 heteroatoms individually selected from nitrogen, oxygen and sulphur, and wherein any of said phenyl or heterocyclyl are optionally substituted by 1, 2 or 3 R⁹ substituents, which may be the same or different.

Even more preferably still, Z is phenyl or heterocyclyl, wherein the heterocyclyl is a 5- to 10- membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated, comprising 1, 2 or 3 heteroatoms individually selected from nitrogen and oxygen, and wherein any of said phenyl or heterocyclyl are optionally substituted by 1, 2 or 3 R⁹ substituents, which may be the same or different.

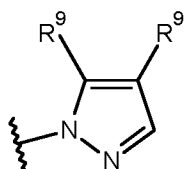
15 Yet even more preferably still, Z is phenyl or heteroaryl, wherein the heteroaryl is a 5- or 6-membered aromatic ring which comprises 1, 2 or 3 nitrogen atoms, and wherein any of said phenyl or heteroaryl are optionally substituted by 1, 2 or 3 R⁹ substituents, which may be the same or different.

20 Futhermore preferably still, Z is phenyl or pyrazolyl, wherein said phenyl or pyrazolyl are optionally substituted by 1, 2 or 3 R⁹ substituents, which may be the same or different.

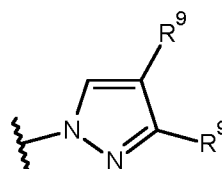
In a preferred embodiment Z is selected from the group consisting of formula Z-I to Z-VII below



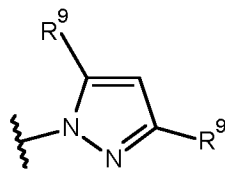
Z-I



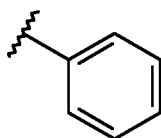
Z-II



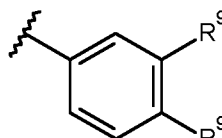
Z-III



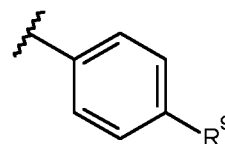
Z-IV



Z-V



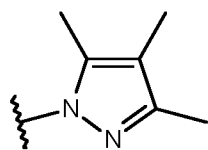
Z-VI



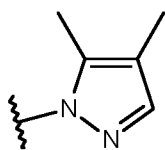
Z-VII

wherein each R^9 is as defined herein and the jagged line defines the point of attachment to the remaining part of a compound of formula (I).

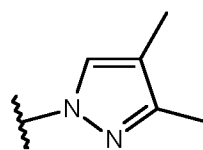
In a furthermore preferred embodiment Z is selected from the group consisting of formula Z-Ia to Z-Va
5 below



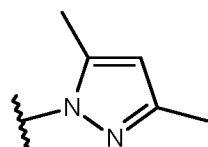
Z-Ia



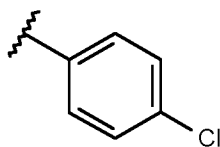
Z-IIa



Z-IIIa



Z-IVa



Z-Va

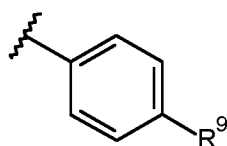
wherein the jagged line defines the point of attachment to the remaining part of a compound of formula
(I).

10

In one embodiment Z is a group of formula Z-I or Z-VII below



Z-I

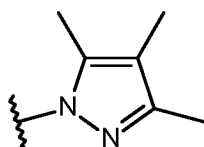


Z-VII

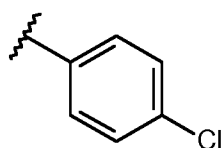
wherein the jagged line defines the point of attachment to the remaining part of a compound of formula
(I).

15

In an even furthermore preferred embodiment Z is a group of formula Z-Ia or Z-Va below



Z-Ia



Z-Va

wherein the jagged line defines the point of attachment to the remaining part of a compound of formula
(I).

20

R^6 and R^7 are each independently selected from the group consisting of hydrogen, halogen and C_1 - C_6 alkyl. Preferably, R^6 and R^7 are each independently selected from the group consisting of hydrogen,

halogen, methyl and ethyl. More preferably, R⁶ and R⁷ are each independently hydrogen or halogen. Most preferably, R⁶ and R⁷ are each hydrogen.

each R⁸ is independently selected from the group consisting of hydroxy, halogen, cyano, C₁-C₆alkyl, C₂-C₆alkenyl, C₂-C₆alkynyl, C₁-C₆alkoxy, C₃-C₆cycloalkyl, C₃-C₆cycloalkoxy, C₁-C₆alkylsulfonyl, C₁-C₆haloalkyl, C₁-C₆haloalkoxy, C₃-C₆halocycloalkyl, C₁-C₆alkoxyC₁-C₆alkyl, C₁-C₆haloalkoxyC₁-C₆alkyl, C₁-C₆haloalkylsulfonyl and C₁-C₆alkylcarbonyl. Preferably, each R⁸ is independently selected from the group consisting of halogen, cyano, C₁-C₆alkyl, C₂-C₆alkenyl, C₁-C₆alkoxy, C₃-C₆cycloalkyl, C₃-C₆cycloalkoxy, C₁-C₆alkylsulfonyl, C₁-C₆haloalkyl, C₁-C₆haloalkoxy and C₁-C₆haloalkylsulfonyl. More preferably, each R⁸ is independently selected from the group consisting of halogen, cyano, C₁-C₆alkyl, C₁-C₆alkoxy, C₃-C₆cycloalkyl, C₁-C₆haloalkyl and C₁-C₆haloalkoxy. Even more preferably, each R⁸ is independently selected from the group consisting of halogen, C₁-C₆alkyl, C₁-C₆alkoxy, C₃-C₆cycloalkyl and C₁-C₆haloalkyl. Even more preferably still, each R⁸ is independently selected from the group consisting of halogen, C₁-C₆alkyl and C₁-C₆haloalkyl. Yet even more preferably still, each R⁸ is independently selected from the group consisting of chloro, fluoro, bromo, methyl and trifluoromethyl. Most preferably, each R⁸ is independently chloro or methyl.

each R⁹ is independently selected from the group consisting of hydroxy, halogen, cyano, C₁-C₆alkyl, C₂-C₆alkenyl, C₂-C₆alkynyl, C₁-C₆alkoxy, C₃-C₆cycloalkyl, C₃-C₆cycloalkoxy, C₁-C₆alkylsulfonyl, C₁-C₆haloalkyl, C₁-C₆haloalkoxy, C₃-C₆halocycloalkyl, C₁-C₆alkoxyC₁-C₆alkyl, C₁-C₆haloalkoxyC₁-C₆alkyl, C₁-C₆haloalkylsulfonyl and C₁-C₆alkylcarbonyl. Preferably, each R⁹ is independently selected from the group consisting of halogen, cyano, C₁-C₆alkyl, C₂-C₆alkenyl, C₁-C₆alkoxy, C₃-C₆cycloalkyl, C₃-C₆cycloalkoxy, C₁-C₆alkylsulfonyl, C₁-C₆haloalkyl, C₁-C₆haloalkoxy and C₁-C₆haloalkylsulfonyl. More preferably, each R⁹ is independently selected from the group consisting of halogen, cyano, C₁-C₆alkyl, C₁-C₆alkoxy, C₃-C₆cycloalkyl, C₁-C₆haloalkyl and C₁-C₆haloalkoxy. Even more preferably, each R⁹ is independently selected from the group consisting of halogen, C₁-C₆alkyl, C₁-C₆alkoxy, C₃-C₆cycloalkyl and C₁-C₆haloalkyl. Even more preferably still, each R⁹ is independently selected from the group consisting of halogen, C₁-C₆alkyl and C₁-C₆haloalkyl. Yet even more preferably still, each R⁹ is independently selected from the group consisting of chloro, fluoro, bromo, methyl and trifluoromethyl. Most preferably, each R⁹ is independently chloro or methyl.

Preferably, in a compound according to formula (I) of the invention;

R¹ is methyl;

R² is hydrogen;

R³ and R⁴ are hydrogen;

R⁵ is selected from the group consisting of chloro, methyl and ethyl;

W is O;

A is CH₂;

E is O;

n is 0;

G is phenyl or heteroaryl, wherein the heteroaryl is a 5- or 6-membered aromatic ring which comprises 1, 2 or 3 heteroatoms individually selected from nitrogen, oxygen and sulphur, wherein said phenyl or heteroaryl are optionally substituted by 1 or 2 R⁸ substituents, which may be the same or different;

Z is phenyl or heterocyclyl, wherein the heterocyclyl is a 5- to 10- membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated, comprising 1, 2 or 3 heteroatoms individually selected from nitrogen and oxygen,

and wherein any of said phenyl or heterocyclyl are optionally substituted by 1, 2 or 3 R⁹ substituents, which may be the same or different;

each R⁸ is independently selected from the group consisting of halogen, C₁-C₆alkyl and C₁-C₆haloalkyl;

10 and

each R⁹ is independently selected from the group consisting of halogen, C₁-C₆alkyl and C₁-C₆haloalkyl.

More preferably, in a compound according to formula (I) of the invention;

R¹ is methyl;

15 R² is hydrogen;

R³ and R⁴ are hydrogen;

R⁵ is methyl;

W is O;

A is CH₂;

20 E is O;

n is 0;

G is phenyl or pyrazolyl, wherein said phenyl or pyrazolyl are optionally substituted by 1 R⁸ substituent;

Z is phenyl or pyrazolyl, wherein said phenyl or pyrazolyl are optionally substituted by 1, 2 or 3 R⁹ substituents, which may be the same or different;

25 each R⁸ is independently selected from the group consisting of chloro, fluoro, bromo, methyl and trifluoromethyl; and

each R⁹ is independently selected from the group consisting of chloro, fluoro, bromo, methyl and trifluoromethyl.

30 Even more preferably, in a compound according to formula (I) of the invention;

R¹ is methyl;

R² is hydrogen;

R³ and R⁴ are hydrogen;

R⁵ is methyl;

35 W is O;

A is CH₂;

E is O;

n is 0;

G is phenyl or pyrazolyl, wherein said phenyl or pyrazolyl are optionally substituted by 1 R⁸ substituent;

40 Z is phenyl or pyrazolyl, wherein said phenyl or pyrazolyl are optionally substituted by 1, 2 or 3 R⁹ substituents, which may be the same or different;

each R⁸ is independently chloro or methyl; and
each R⁹ is independently chloro or methyl.

In an alternative preferred embodiment of the invention;

- 5 R¹ is methyl;
R² is hydrogen;
R³ and R⁴ are hydrogen;
R⁵ is selected from the group consisting of chloro, methyl and ethyl;
W is O;
- 10 A is CH₂;
E is CH₂;
n is 0;
G is phenyl or heteroaryl, wherein the heteroaryl is a 5- or 6-membered aromatic ring which comprises
1, 2 or 3 heteroatoms individually selected from nitrogen, oxygen and sulphur, wherein said phenyl or
15 heteroaryl are optionally substituted by 1 or 2 R⁸ substituents, which may be the same or different;
Z is phenyl or heterocyclyl, wherein the heterocyclyl is a 5- to 10- membered mono- or fused bicyclic
ring system, which may be aromatic and/or partially saturated, comprising 1, 2 or 3 heteroatoms
individually selected from nitrogen and oxygen,
and wherein any of said phenyl or heterocyclyl are optionally substituted by 1, 2 or 3 R⁹ substituents,
20 which may be the same or different;
each R⁸ is independently selected from the group consisting of halogen, C₁-C₆alkyl and C₁-C₆haloalkyl;
and
each R⁹ is independently selected from the group consisting of halogen, C₁-C₆alkyl and C₁-C₆haloalkyl.
- 25 In an alternative preferred embodiment of the invention;
R¹ is methyl;
R² is hydrogen;
R³ and R⁴ are hydrogen;
R⁵ is selected from the group consisting of chloro, methyl and ethyl;
- 30 W is O;
A is a direct bond;
E is O;
X is CH₂;
n is 1;
- 35 G is phenyl or heteroaryl, wherein the heteroaryl is a 5- or 6-membered aromatic ring which comprises
1, 2 or 3 heteroatoms individually selected from nitrogen, oxygen and sulphur, wherein said phenyl or
heteroaryl are optionally substituted by 1 or 2 R⁸ substituents, which may be the same or different;
Z is phenyl or heterocyclyl, wherein the heterocyclyl is a 5- to 10- membered mono- or fused bicyclic
ring system, which may be aromatic and/or partially saturated, comprising 1, 2 or 3 heteroatoms
40 individually selected from nitrogen and oxygen,

and wherein any of said phenyl or heterocyclyl are optionally substituted by 1, 2 or 3 R⁹ substituents, which may be the same or different;

each R⁹ is independently selected from the group consisting of halogen, C₁-C₆alkyl and C₁-C₆haloalkyl; and

- 5 each R⁹ is independently selected from the group consisting of halogen, C₁-C₆alkyl and C₁-C₆haloalkyl.

In one embodiment, the compounds of formula (I) according to the invention may be useful for combating phytopathogenic fungi (e.g. *Alternaria alternata*, *Plasmopara viticola*, *Sclerotinia sclerotiorum*
10 or *Septoria tritici* also known as *Mycosphaerella graminicola*) containing a mutation in the mitochondrial cytochrome b conferring resistance to Qo inhibitors (e.g. strobilurins such as azoxystrobin, pyraclostrobin and trifloxystrobin or fenamidone or famoxadone).

In a further embodiment, the compounds of formula (I) according to the invention may be useful
15 for combating phytopathogenic fungi (e.g. *Alternaria alternata*, *Plasmopara viticola*, *Sclerotinia sclerotiorum* or *Septoria tritici* also known as *Mycosphaerella graminicola*) containing a mutation in the mitochondrial cytochrome b conferring resistance to Qo inhibitors (e.g. strobilurins such as azoxystrobin, pyraclostrobin and trifloxystrobin or fenamidone or famoxadone), wherein the mutation is G143A.

20 In a further embodiment, the compounds of formula (I) according to the invention may be useful for combating phytopathogenic fungi (e.g. *Phakopsora pachyrhizi*) containing a mutation in the mitochondrial cytochrome b conferring resistance to Qo inhibitors (e.g. strobilurins such as azoxystrobin, pyraclostrobin, picoxystrobin and trifloxystrobin or fenamidone or famoxadone), wherein the mutation is F129L.

25

In another embodiment, the invention also relates to a method of controlling or preventing infestation by phytopathogenic fungi in a plant (e.g. *Alternaria alternate*, *Plasmopara viticola*, *Sclerotinia sclerotiorum* or *Septoria tritici* also known as *Mycosphaerella graminicola*), wherein said phytopathogenic fungi contains a mutation in the mitochondrial cytochrome b conferring resistance to
30 Qo inhibitors (e.g. strobilurins such as azoxystrobin, pyraclostrobin and trifloxystrobin or fenamidone or famoxadone), said method comprising applying to the plant, to parts thereof or the locus thereof, a fungicidally effective amount of a compound of formula (I).

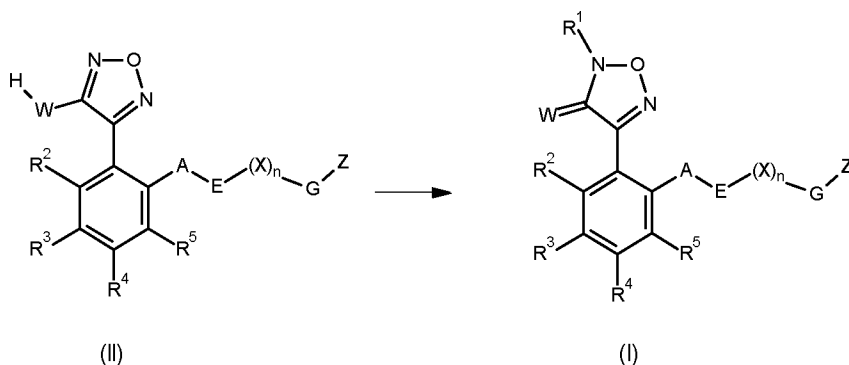
The level of resistance and therefore the impact on the performance of the fungicide can be measured by the use of a 'Resistance Factor' (RF). The resistance factor can be calculated by dividing
35 the concentration of a fungicide that provides a set level of disease control (i.e. 50 percent) for the 'resistant' fungal strain with the concentration of the same fungicide that provides the same level of disease control for the 'susceptible' strain of the same fungal species (RF = EC₅₀ value of the resistant strain/EC₅₀ value of the sensitive strain). Although there are no set rules, three categories can be defined: 1) RF ≥ 50 = resistant strain, 2) 5 ≤ RF < 50 = less sensitive strain (shift in sensitivity), and 3)
40 RF < 5 = sensitive strain.

In order to obtain resistant fungal strains, a researcher is to locate a host crop and geographical region where the relevant resistance had been reported in literature. Leaf samples infected by the target disease are then collected from the locations/host crops and sent to a laboratory, where pure cultures would be isolated. The resistant phenotype of the fungal cultures is determined either by conducting a full dose response bioassay and comparing the bioassay results to similar bioassay results for a known susceptible strain of the same species. Alternatively the resistance genotype of the fungal strain can be determined by molecular techniques (e.g. qPCR) if the resistance mechanism for the relevant species is known.

The compounds of formula (I) according to the invention, wherein A, E, G, W, X, Z, R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, R⁹ and n are as defined for formula (I), can be made as shown in the following schemes.

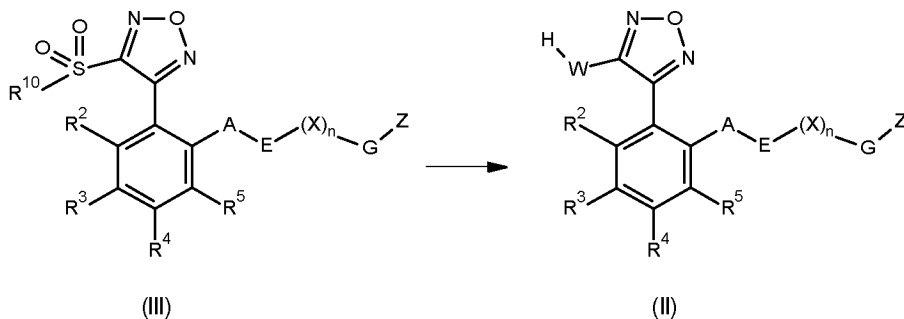
The compounds of formula (I) according to the invention, wherein A, E, G, W, X, Z, R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, R⁹ and n are as defined for formula (I), can be obtained by transformation of a compound of formula (II), wherein A, E, G, W, X, Z, R², R³, R⁴, R⁵ and n are as defined for formula (I), with an alkylation reagent, such as diazomethane or iodomethane. This is shown in Scheme 1 below.

Scheme 1



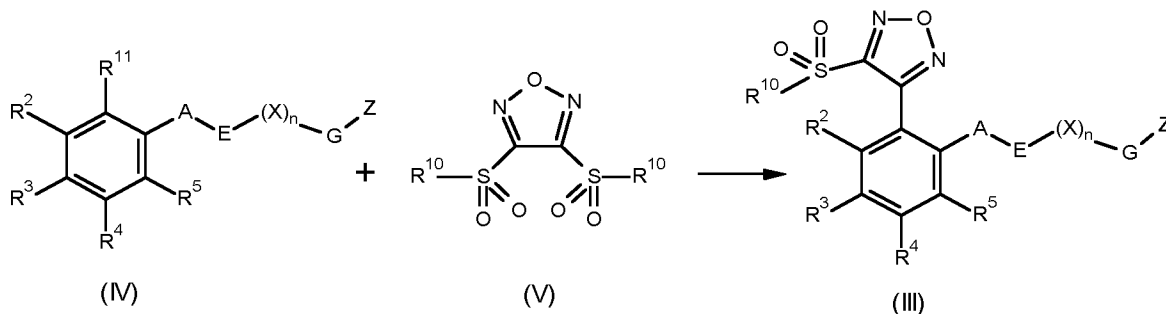
The compounds of formula (II), wherein A, E, G, W, X, Z, R², R³, R⁴, R⁵ and n are as defined for formula (I), can be obtained by transformation of a compound of formula (III), wherein A, E, G, X, Z, R², R³, R⁴, R⁵ and n are as defined for formula (I) and R¹⁰ is optionally substituted phenyl, and a base, such as sodium hydroxide or potassium hydroxide. This is shown in Scheme 2 below.

Scheme 2



The compounds of formula (III), wherein A, E, G, X, Z, R², R³, R⁴, R⁵ and n are as defined for formula (I) and R¹⁰ is optionally substituted phenyl, can be obtained by transformation of a compound of formula (IV), wherein A, E, G, X, Z, R², R³, R⁴, R⁵ and n are as defined for formula (I) and R¹¹ is halogen, with a compound of formula (V), wherein R¹⁰ is optionally substituted phenyl, and with a reagent suitable for halogen-metal exchange, such as n-butyl lithium, tert-butyl lithium, isopropylmagnesium chloride or magnesium turnings and a suitable activator. This is shown in Scheme 3 below.

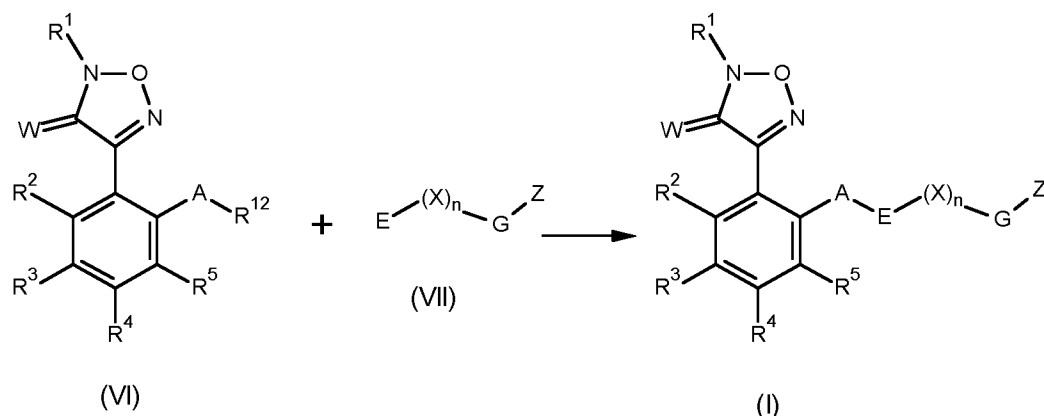
Scheme 3



10

Alternatively, the compounds of formula (I), A, E, G, W, X, Z, R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, R⁹ and n are as defined for formula (I), can be obtained by transformation of a compound of formula (VI), wherein A, W, R¹, R², R³, R⁴ and R⁵ are as defined for formula (I) and R¹² is a protecting group, such as an ether or a ketal, with a compound of formula (VII), wherein E, G, X, Z and n are as defined for formula (I). This is shown in Scheme 4 below.

Scheme 4

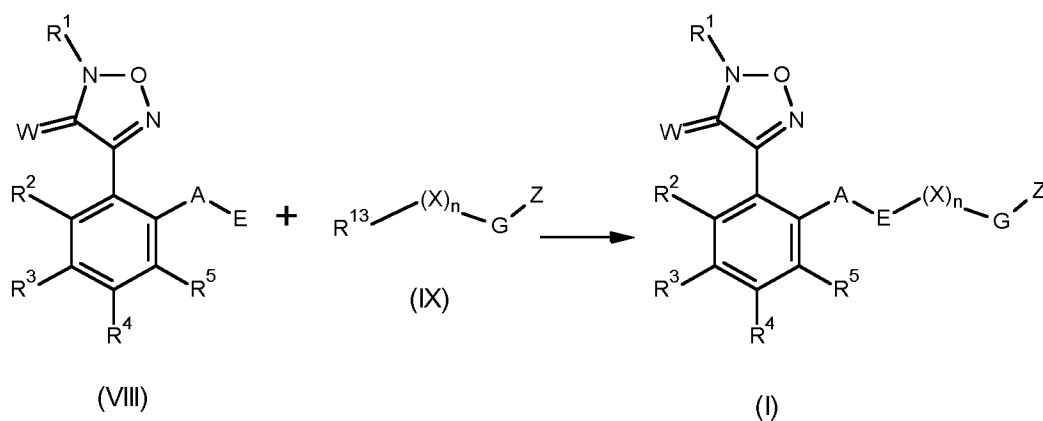


20

Alternatively, the compounds of formula (I), A, E, G, W, X, Z, R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, R⁹ and n are as defined for formula (I), can be obtained by transformation of a compound of formula (VIII), wherein A, E, W, R¹, R², R³, R⁴ and R⁵ are as defined for formula (I) with a compound of formula (IX), wherein G, X, Z and n are as defined for formula (I) and R¹³ is a leaving group, such as a halogen. This is shown in Scheme 5 below.

25

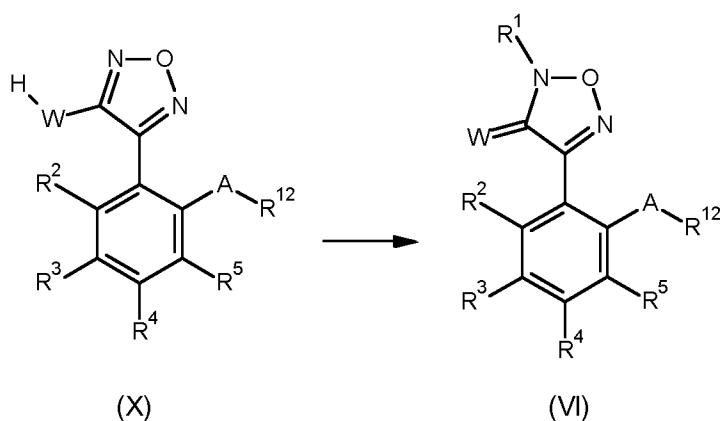
Scheme 5



- 5 The compounds of formula (VI), wherein A, W, R¹, R², R³, R⁴ and R⁵ are as defined for formula (I) and R¹² is a protecting group, such as an ether or a ketal, can be obtained by transformation of a compound of formula (X), wherein A, W, R², R³, R⁴ and R⁵ are as defined for formula (I) and R¹² is a protecting group, such as an ether or a ketal, with an alkylation reagent, such as diazomethane or iodomethane. This is shown in Scheme 6 below.

10

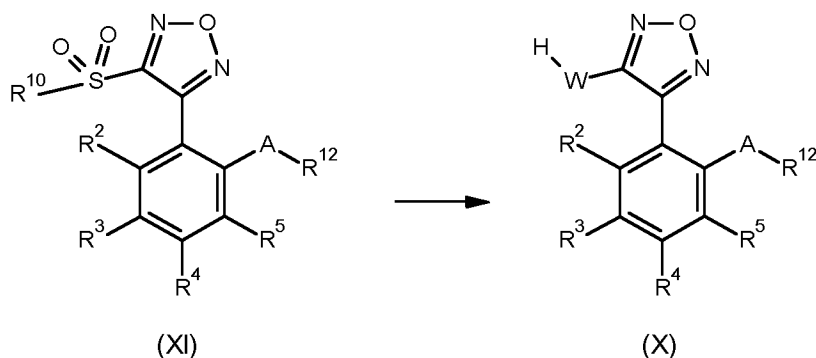
Scheme 6



- 15 The compounds of formula (X), wherein A, W, R², R³, R⁴ and R⁵ are as defined for formula (I) and R¹² is a protecting group, such as an ether or a ketal, can be obtained by transformation of a compound of formula (XI), wherein A, R², R³, R⁴ and R⁵ are as defined for formula (I), R¹⁰ is optionally substituted phenyl and R¹² is a protecting group, such as an ether or a ketal, and a base, such as sodium hydroxide or potassium hydroxide. This is shown in Scheme 7 below.

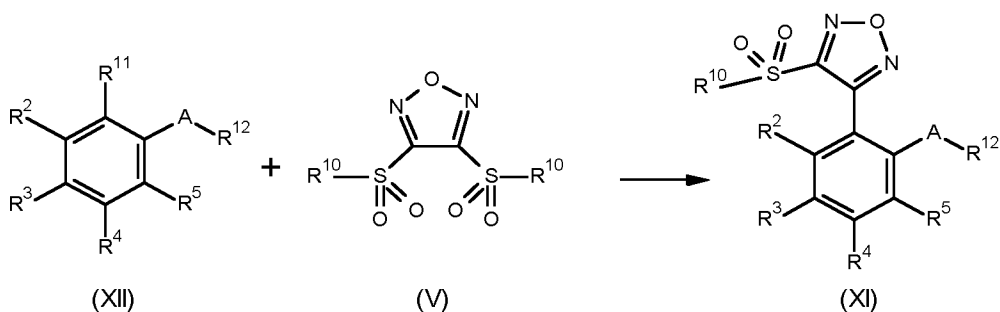
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Scheme 7



The compounds of formula (XI), wherein A, R², R³, R⁴ and R⁵ are as defined for formula (I), R¹⁰ is optionally substituted phenyl and R¹² is a protecting group, such as an ether or a ketal, can be obtained by transformation of a compound of formula (XII), wherein A, R², R³, R⁴ and R⁵ are as defined for formula (I), R¹¹ is halogen and R¹² is a protecting group, such as an ether or a ketal, with a compound of formula (V), wherein R¹⁰ is optionally substituted phenyl, and with a reagent suitable for halogen-metal exchange, such as n-butyl lithium, tert-butyl lithium, isopropylmagnesium chloride or magnesium turnings and a suitable activator. This is shown in Scheme 8 below.

Scheme 8

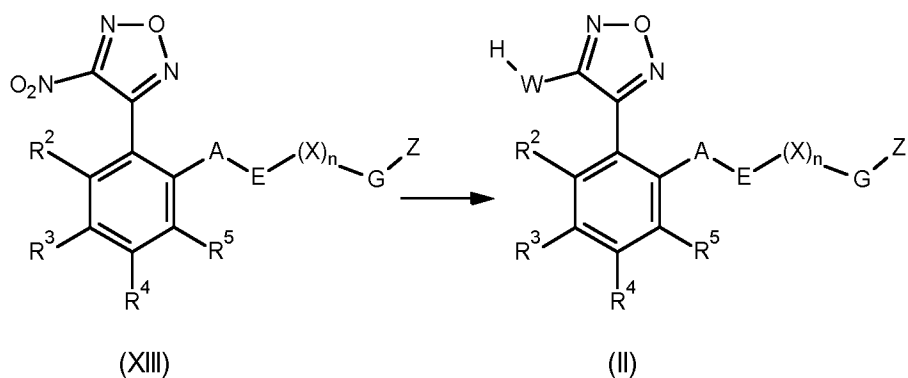


Alternatively, the compounds of formula (II), wherein A, E, G, W, X, Z, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, R⁹ and n are as defined for formula (I), can be obtained by transformation of a compound of formula (XIII), wherein A, E, G, X, Z, R², R³, R⁴, R⁵ and n are as defined for formula (I), and with a base, such as sodium hydroxide or potassium hydroxide. This is shown in Scheme 9 below.

20

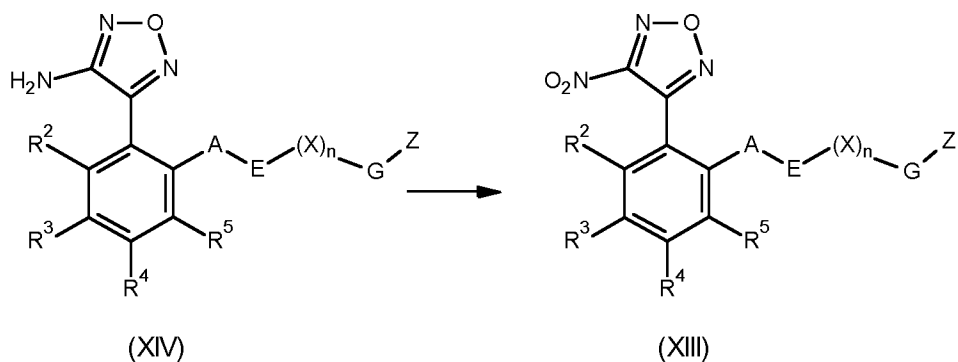
25

Scheme 9



The compounds of formula (XIII), wherein A, E, G, X, Z, R², R³, R⁴, R⁵ and n are as defined for formula (I), can be obtained by transformation of a compound of formula (XIV), wherein A, E, G, X, Z, R², R³, R⁴, R⁵ and n are as defined for formula (I), and with an oxidation reagent, such as hydrogen peroxide and sulfuric acid or sodium nitrite. This is shown in Scheme 10 below.

Scheme 10



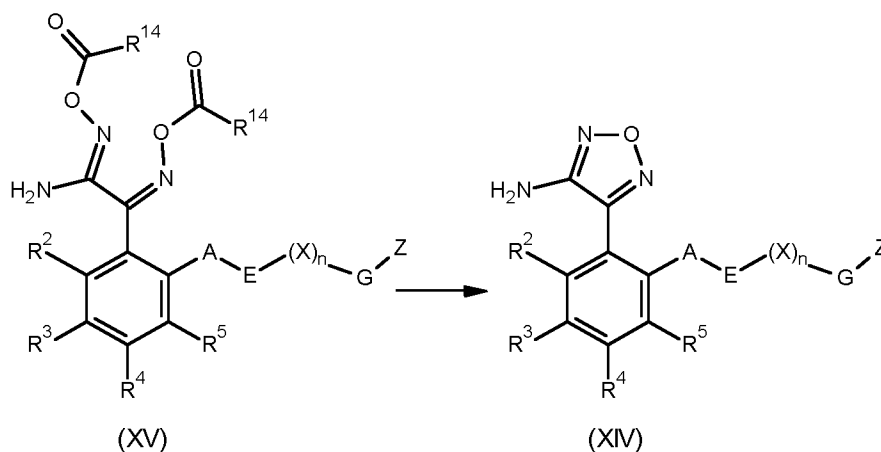
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The compounds of formula (XIV), wherein A, E, G, X, Z, R², R³, R⁴, R⁵ and n are as defined for formula (I), can be obtained by transformation of a compound of formula (XV), wherein A, E, G, X, Z, R², R³, R⁴, R⁵ and n are as defined for formula (I) and R¹⁴ is C₁-C₆alkyl, and base, such as sodium acetate. This is shown in Scheme 11 below.

20

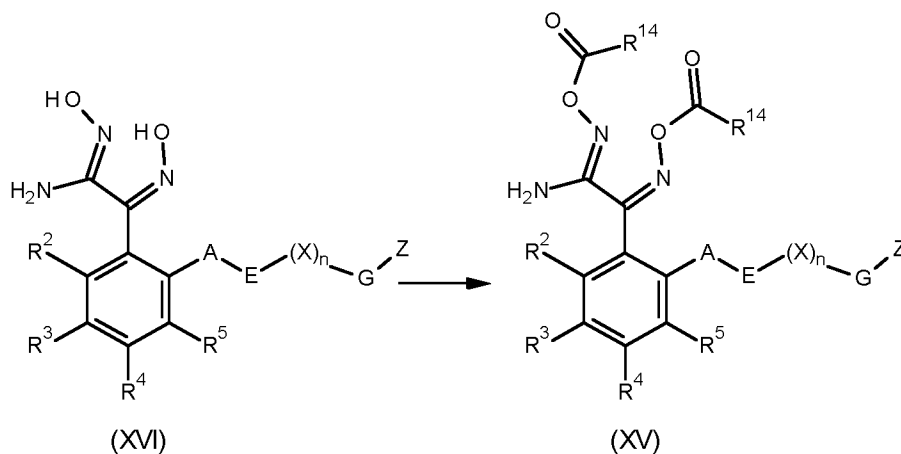
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Scheme 11



The compounds of formula (XV), wherein wherein A, E, G, X, Z, R², R³, R⁴, R⁵ and n are as defined for formula (I) and R¹⁴ is C₁-C₆alkyl, can be obtained by transformation of a compound of formula (XVI), wherein A, E, G, X, Z, R², R³, R⁴, R⁵ and n are as defined for formula (I), and with an alkanolic acid halide or alkanolic acid anhydride. This is shown in Scheme 12 below.

Scheme 12

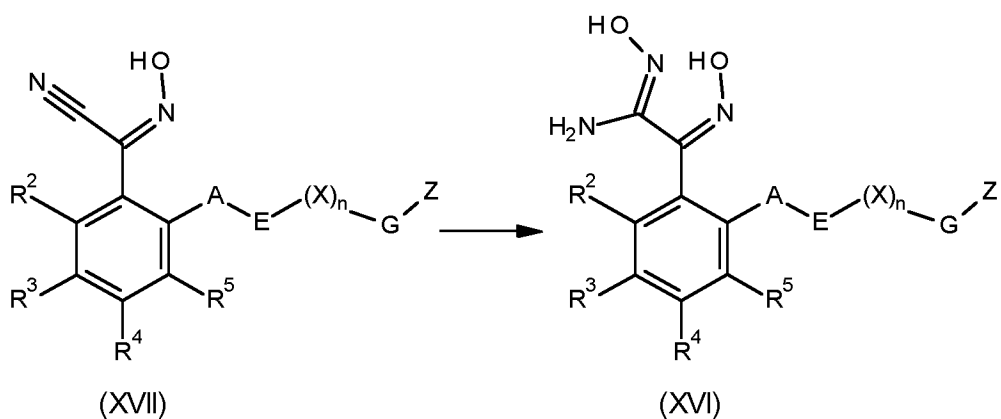


10

The compounds of formula (XVI), wherein A, E, G, X, Z, R², R³, R⁴, R⁵ and n are as defined for formula (I), can be obtained by transformation of a compound of formula (XVII), wherein A, E, G, X, Z, R², R³, R⁴, R⁵ and n are as defined for formula (I), and with hydroxylamine hydrochloride and a base, such as sodium hydroxide or potassium hydroxide. This is shown in Scheme 13 below.

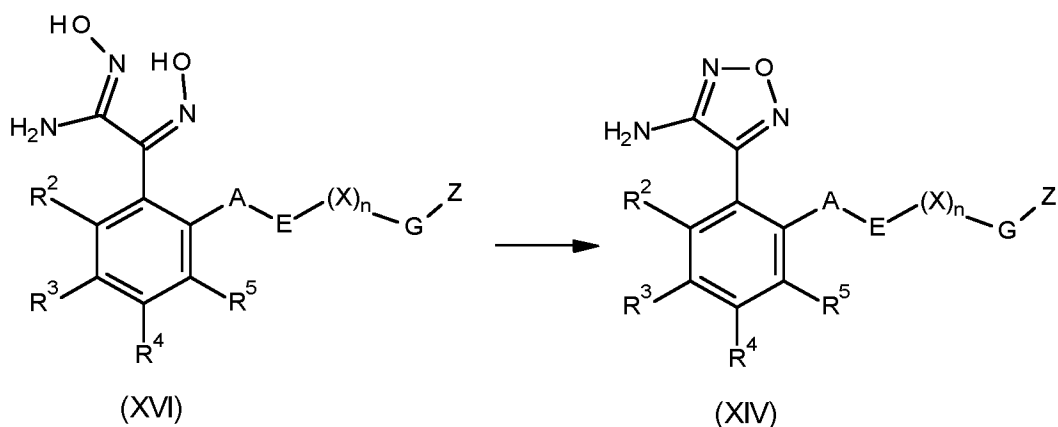
20

Scheme 13



- 5 The compounds of formula (XIV), wherein A, E, G, X, Z, R², R³, R⁴, R⁵ and n are as defined for formula (I), can be obtained by transformation of a compound of formula (XVI), wherein A, E, G, X, Z, R², R³, R⁴, R⁵ and n are as defined for formula (I), and with carbonyldiimidazole. This is shown in Scheme 14 below.

10 Scheme 14



- 15 Functional group interconversions as described in the previous schemes are known to the persons skilled in the art. Extensive lists of reaction conditions can be found in: *Comprehensive Organic Functional Group Transformations*, Edited by A. R. Katritzky, O. Meth-Cohn and C. W. Rees. Pergamon Press (Elsevier Science Ltd.), Tarrytown, NY. 1995; or in: *Comprehensive Organic Transformations: A Guide to Functional Group Preparations*, Edited by Richard C. Larock, Wiley-VCH, New York 1999.

- 20 If the synthesis yields mixtures of isomers, a separation is generally not necessarily required because in some cases the individual isomers can be interconverted during work-up for use or during application (e. g. under the action of light, acids or bases). Such conversions may also take place after use, e. g. in the treatment of plants in the treated plant, or in the harmful fungus to be controlled.

As already indicated, it has now been found that the novel compounds of Formula (I) of the present invention have a very advantageous level of biological activity for protecting plants against diseases that are caused by fungi.

The compounds of formula (I) can be used in the agricultural sector and related fields of use, e.g., as active ingredients for controlling plant pests or on non-living materials for the control of spoilage microorganisms or organisms potentially harmful to man. The novel compounds are distinguished by excellent activity at low rates of application, by being well tolerated by plants and by being environmentally safe. They have very useful curative, preventive and systemic properties and can be used for protecting numerous cultivated plants. The compounds of formula (I) can be used to inhibit or destroy the pests that occur on plants or parts of plants (fruit, blossoms, leaves, stems, tubers, roots) of different crops of useful plants, while at the same time protecting also those parts of the plants that grow later, e.g., from phytopathogenic microorganisms.

The present invention further relates to a method for controlling or preventing infestation of plants or plant propagation material and/or harvested food crops susceptible to microbial attack by treating plants or plant propagation material and/or harvested food crops wherein an effective amount a compound of formula (I) is applied to the plants, to parts thereof or the locus thereof.

It is also possible to use compounds of formula (I) as fungicide. The term "fungicide" as used herein means a compound that controls, modifies, or prevents the growth of fungi. The term "fungicidally effective amount" where used 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.

It may also be possible to use compounds of formula (I) as dressing agents for the treatment of plant propagation material, e.g., seed, such as fruits, tubers or grains, or plant cuttings, for the protection against fungal infections as well as against phytopathogenic fungi occurring in the soil. The propagation material can be treated with a composition comprising a compound of formula (I) before planting: seed, for example, can be dressed before being sown. The active compounds of formula (I) can also be applied to grains (coating), either by impregnating the seeds in a liquid formulation or by coating them with a solid formulation. The composition can also be applied to the planting site when the propagation material is being planted, for example, to the seed furrow during sowing. The invention relates also to such methods of treating plant propagation material and to the plant propagation material so treated.

Furthermore, the compounds of formula (I) can be used for controlling fungi in related areas, for example in the protection of technical materials, including wood and wood related technical products, in food storage, in hygiene management.

In addition, the invention could be used to protect non-living materials from fungal attack, e.g. lumber, wall boards and paint.

The compounds of formula (I) are for example, effective against fungi and fungal vectors of disease as well as phytopathogenic bacteria and viruses. These fungi and fungal vectors of disease as well as phytopathogenic bacteria and viruses are for example:

Absidia corymbifera, Alternaria spp, Aphanomyces spp, Ascochyta spp, Aspergillus spp. including A. flavus, A. fumigatus, A. nidulans, A. niger, A. terreus, Aureobasidium spp. including A. pullulans, Blastomyces dermatitidis, Blumeria graminis, Bremia lactucae, Botryosphaeria spp. including B. dothidea, B. obtusa, Botrytis spp. including B. cinerea, Candida spp. including C. albicans, C. glabrata, C. krusei, C. lusitanae, C. parapsilosis, C. tropicalis, Cephalosporium fragrans, Ceratocystis spp, Cercospora spp. including C. arachidicola, Cercosporidium personatum, Cladosporium spp, Claviceps purpurea, Coccidioides immitis, Cochliobolus spp, Colletotrichum spp. including C. musae, Cryptococcus neoformans, Diaporthe spp, Didymella spp, Drechslera spp, Elsinoe spp, Epidermophyton spp, Erwinia amylovora, Erysiphe spp. including E. cichoracearum, Eutypa lata, Fusarium spp. including F. culmorum, F. graminearum, F. langsethiae, F. moniliforme, F. oxysporum, F. proliferatum, F. subglutinans, F. solani, Gaeumannomyces graminis, Gibberella fujikuroi, Gloeodes pomigena, Gloeosporium musarum, Glomerella cingulate, Guignardia bidwellii, Gymnosporangium juniperi-virginianae, Helminthosporium spp, Hemileia spp, Histoplasma spp. including H. capsulatum, Laetisaria fuciformis, Leptographium lindbergi, Leveillula taurica, Lophodermium seeditiosum, Microdochium nivale, Microsporium spp, Monilinia spp, Mucor spp, Mycosphaerella spp. including M. graminicola, M. pomi, Oncobasidium theobromaeon, Ophiostoma piceae, Paracoccidioides spp, Penicillium spp. including P. digitatum, P. italicum, Petriellidium spp, Peronosclerospora spp. Including P. maydis, P. philippinensis and P. sorghi, Peronospora spp, Phaeosphaeria nodorum, Phakopsora pachyrhizi, Phellinus igniarius, Phialophora spp, Phoma spp, Phomopsis viticola, Phytophthora spp. including P. infestans, Plasmopara spp. including P. halstedii, P. viticola, Pleospora spp., Podosphaera spp. including P. leucotricha, Polymyxa graminis, Polymyxa betae, Pseudocercospora herpotrichoides, Pseudomonas spp, Pseudoperonospora spp. including P. cubensis, P. humuli, Pseudopeziza tracheiphila, Puccinia Spp. including P. hordei, P. recondita, P. striiformis, P. triticea, Pyrenopeziza spp, Pyrenophora spp, Pyricularia spp. including P. oryzae, Pythium spp. including P. ultimum, Ramularia spp, Rhizoctonia spp, Rhizomucor pusillus, Rhizopus arrhizus, Rhynchosporium spp, Scedosporium spp. including S. apiospermum and S. prolificans, Schizothyrium pomi, Sclerotinia spp, Sclerotium spp, Septoria spp, including S. nodorum, S. tritici, Sphaerotheca macularis, Sphaerotheca fusca (Sphaerotheca fuliginea), Sporothrix spp, Stagonospora nodorum, Stemphylium spp, Stereum hirsutum, Thanatephorus cucumeris, Thielaviopsis basicola, Tilletia spp, Trichoderma spp. including T. harzianum, T. pseudokoningii, T. viride, Trichophyton spp, Typhula spp, Uncinula necator, Urocystis spp, Ustilago spp, Venturia spp. including V. inaequalis, Verticillium spp, and Xanthomonas spp.

The compounds of formula (I) may be used for example on turf, ornamentals, such as flowers, shrubs, broad-leaved trees or evergreens, for example conifers, as well as for tree injection, pest management and the like.

Within the scope of present invention, target crops and/or useful plants to be protected typically comprise 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 tritiale 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 and soya beans; nuts for example almond, cashew, ground nut, hazelnut, peanut, 5 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.

The term "useful plants" is to be understood as also including useful plants that have been 10 rendered tolerant to herbicides like bromoxynil or classes of herbicides (such as, for example, HPPD inhibitors, ALS inhibitors, for example primisulfuron, prosulfuron and trifloxysulfuron, EPSPS (5-enolpyrovyl-shikimate-3-phosphate-synthase) inhibitors, GS (glutamine synthetase) inhibitors or PPO (protoporphyrinogen-oxidase) inhibitors) as a result of conventional methods of breeding or genetic engineering. An example of a crop that has been rendered tolerant to imidazolinones, e.g. imazamox, 15 by conventional methods of breeding (mutagenesis) is Clearfield® summer rape (Canola). Examples of crops that have been rendered tolerant to herbicides or classes of herbicides by genetic engineering methods include glyphosate- and glufosinate-resistant maize varieties commercially available under the trade names RoundupReady®, Herculex I® and LibertyLink®.

The term "useful plants" is to be understood as also including useful plants which have been so 20 transformed by the use of recombinant DNA techniques that they are capable of synthesising one or more selectively acting toxins, such as are known, for example, from toxin-producing bacteria, especially those of the genus *Bacillus*.

Examples of such plants are: YieldGard® (maize variety that expresses a CryIA(b) toxin); YieldGard Rootworm® (maize variety that expresses a CryIIIB(b1) toxin); YieldGard Plus® (maize 25 variety that expresses a CryIA(b) and a CryIIIB(b1) toxin); Starlink® (maize variety that expresses a Cry9(c) toxin); Herculex I® (maize variety that expresses a CryIF(a2) toxin and the enzyme phosphinothricine N-acetyltransferase (PAT) to achieve tolerance to the herbicide glufosinate ammonium); NuCOTN 33B® (cotton variety that expresses a CryIA(c) toxin); Bollgard I® (cotton variety that expresses a CryIA(c) toxin); Bollgard II® (cotton variety that expresses a CryIA(c) and a CryIIA(b) 30 toxin); VIPCOT® (cotton variety that expresses a VIP toxin); NewLeaf® (potato variety that expresses a CryIIIA toxin); NatureGard® Agrisure® GT Advantage (GA21 glyphosate-tolerant trait), Agrisure® CB Advantage (Bt11 corn borer (CB) trait), Agrisure® RW (corn rootworm trait) and Protecta®.

The term "crops" is to be understood as including also crop plants which have been so 35 transformed by the use of recombinant DNA techniques that they are capable of synthesising one or more selectively acting toxins, such as are known, for example, from toxin-producing bacteria, especially those of the genus *Bacillus*.

Toxins that can be expressed by such transgenic plants include, for example, insecticidal proteins from *Bacillus cereus* or *Bacillus popilliae*; or insecticidal proteins from *Bacillus thuringiensis*, such as δ -endotoxins, e.g. Cry1Ab, Cry1Ac, Cry1F, Cry1Fa2, Cry2Ab, Cry3A, Cry3Bb1 or Cry9C, or 40 vegetative insecticidal proteins (Vip), e.g. Vip1, Vip2, Vip3 or Vip3A; or insecticidal proteins of bacteria

colonising nematodes, for example *Photorhabdus* spp. or *Xenorhabdus* spp., such as *Photorhabdus luminescens*, *Xenorhabdus nematophilus*; toxins produced by animals, such as scorpion toxins, arachnid toxins, wasp toxins and other insect-specific neurotoxins; toxins produced by fungi, such as *Streptomyces* toxins, plant lectins, such as pea lectins, barley lectins or snowdrop lectins; agglutinins; 5 proteinase inhibitors, such as trypsin inhibitors, serine protease inhibitors, patatin, cystatin, papain inhibitors; ribosome-inactivating proteins (RIP), such as ricin, maize-RIP, abrin, luffin, saporin or bryodin; steroid metabolism enzymes, such as 3-hydroxysteroidoxidase, ecdysteroid-UDP-glycosyl-transferase, cholesterol oxidases, ecdysone inhibitors, HMG-COA-reductase, ion channel blockers, such as blockers of sodium or calcium channels, juvenile hormone esterase, diuretic hormone receptors, stilbene 10 synthase, bibenzyl synthase, chitinases and glucanases.

Further, in the context of the present invention there are to be understood by δ -endotoxins, for example Cry1Ab, Cry1Ac, Cry1F, Cry1Fa2, Cry2Ab, Cry3A, Cry3Bb1 or Cry9C, or vegetative insecticidal proteins (Vip), for example Vip1, Vip2, Vip3 or Vip3A, expressly also hybrid toxins, truncated toxins and modified toxins. Hybrid toxins are produced recombinantly by a new combination of different 15 domains of those proteins (see, for example, WO 02/15701). Truncated toxins, for example a truncated Cry1Ab, are known. In the case of modified toxins, one or more amino acids of the naturally occurring toxin are replaced. In such amino acid replacements, preferably non-naturally present protease recognition sequences are inserted into the toxin, such as, for example, in the case of Cry3A055, a cathepsin-G-recognition sequence is inserted into a Cry3A toxin (see WO 03/018810).

20 Examples of such toxins or transgenic plants capable of synthesising such toxins are disclosed, for example, in EP-A-0 374 753, WO93/07278, WO95/34656, EP-A-0 427 529, EP-A-451 878 and WO 03/052073.

The processes for the preparation of such transgenic plants are generally known to the person skilled in the art and are described, for example, in the publications mentioned above. CryI-type 25 deoxyribonucleic acids and their preparation are known, for example, from WO 95/34656, EP-A-0 367 474, EP-A-0 401 979 and WO 90/13651.

The toxin contained in the transgenic plants imparts to the plants tolerance to harmful insects. Such insects can occur in any taxonomic group of insects, but are especially commonly found in the beetles (Coleoptera), two-winged insects (Diptera) and butterflies (Lepidoptera).

30 Transgenic plants containing one or more genes that code for an insecticidal resistance and express one or more toxins are known and some of them are commercially available. Examples of such plants are: YieldGard® (maize variety that expresses a Cry1Ab toxin); YieldGard Rootworm® (maize variety that expresses a Cry3Bb1 toxin); YieldGard Plus® (maize variety that expresses a Cry1Ab and 35 a Cry3Bb1 toxin); Starlink® (maize variety that expresses a Cry9C toxin); Herculex I® (maize variety that expresses a Cry1Fa2 toxin and the enzyme phosphinothricine N-acetyltransferase (PAT) to achieve tolerance to the herbicide glufosinate ammonium); NuCOTN 33B® (cotton variety that expresses a Cry1Ac toxin); Bollgard I® (cotton variety that expresses a Cry1Ac toxin); Bollgard II® (cotton variety that expresses a Cry1Ac and a Cry2Ab toxin); VipCot® (cotton variety that expresses a Vip3A and a 40 Cry1Ab toxin); NewLeaf® (potato variety that expresses a Cry3A toxin); NatureGard®, Agrisure® GT

Advantage (GA21 glyphosate-tolerant trait), Agrisure® CB Advantage (Bt11 corn borer (CB) trait) and Protecta®.

Further examples of such transgenic crops are:

5

1. **Bt11 Maize** from Syngenta Seeds SAS, Chemin de l'Hobit 27, F-31 790 St. Sauveur, France, registration number C/FR/96/05/10. Genetically modified *Zea mays* which has been rendered resistant to attack by the European corn borer (*Ostrinia nubilalis* and *Sesamia nonagrioides*) by transgenic expression of a truncated Cry1Ab toxin. Bt11 maize also transgenically expresses the enzyme PAT to
10 achieve tolerance to the herbicide glufosinate ammonium.

2. **Bt176 Maize** from Syngenta Seeds SAS, Chemin de l'Hobit 27, F-31 790 St. Sauveur, France, registration number C/FR/96/05/10. Genetically modified *Zea mays* which has been rendered resistant to attack by the European corn borer (*Ostrinia nubilalis* and *Sesamia nonagrioides*) by transgenic
15 expression of a Cry1Ab toxin. Bt176 maize also transgenically expresses the enzyme PAT to achieve tolerance to the herbicide glufosinate ammonium.

3. **MIR604 Maize** from Syngenta Seeds SAS, Chemin de l'Hobit 27, F-31 790 St. Sauveur, France, registration number C/FR/96/05/10. Maize which has been rendered insect-resistant by transgenic
20 expression of a modified Cry3A toxin. This toxin is Cry3A055 modified by insertion of a cathepsin-G-protease recognition sequence. The preparation of such transgenic maize plants is described in WO 03/018810.

4. **MON 863 Maize** from Monsanto Europe S.A. 270-272 Avenue de Tervuren, B-1150 Brussels, Belgium, registration number C/DE/02/9. MON 863 expresses a Cry3Bb1 toxin and has resistance to
25 certain Coleoptera insects.

5. **IPC 531 Cotton** from Monsanto Europe S.A. 270-272 Avenue de Tervuren, B-1150 Brussels, Belgium, registration number C/ES/96/02.
30

6. **1507 Maize** from Pioneer Overseas Corporation, Avenue Tedesco, 7 B-1160 Brussels, Belgium, registration number C/NL/00/10. Genetically modified maize for the expression of the protein Cry1F for achieving resistance to certain Lepidoptera insects and of the PAT protein for achieving tolerance to the herbicide glufosinate ammonium.
35

7. **NK603 × MON 810 Maize** from Monsanto Europe S.A. 270-272 Avenue de Tervuren, B-1150 Brussels, Belgium, registration number C/GB/02/M3/03. Consists of conventionally bred hybrid maize varieties by crossing the genetically modified varieties NK603 and MON 810. NK603 × MON 810 Maize transgenically expresses the protein CP4 EPSPS, obtained from *Agrobacterium sp.* strain CP4, which
40 imparts tolerance to the herbicide Roundup® (contains glyphosate), and also a Cry1Ab toxin obtained

from *Bacillus thuringiensis subsp. kurstaki* which brings about tolerance to certain Lepidoptera, include the European corn borer.

The term "locus" as used herein means fields in or on which plants are growing, or where seeds
5 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.

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" is understood to denote generative parts of the plant, such
10 as seeds, which can be used for the multiplication of the latter, and vegetative material, such as cuttings or tubers, for example potatoes. There can be mentioned for example seeds (in the strict sense), roots, fruits, tubers, bulbs, rhizomes and parts of plants. Germinated plants and young plants which are to be transplanted after germination or after emergence from the soil, may also be mentioned. These young plants can be protected before transplantation by a total or partial treatment by immersion. Preferably
15 "plant propagation material" is understood to denote seeds.

The compounds of formula I may be used in unmodified form or, preferably, together with the adjuvants conventionally employed in the art of formulation. To this end they may be conveniently formulated in known manner to emulsifiable concentrates, coatable pastes, directly sprayable or dilutable solutions or suspensions, dilute emulsions, wettable powders, soluble powders, dusts,
20 granulates, and also encapsulations e.g. in polymeric substances. As with the type of the compositions, the methods of application, such as spraying, atomising, dusting, scattering, coating or pouring, are chosen in accordance with the intended objectives and the prevailing circumstances. The compositions may also contain further adjuvants such as stabilizers, antifoams, viscosity regulators, binders or tackifiers as well as fertilizers, micronutrient donors or other formulations for obtaining special effects.

25 Suitable carriers and adjuvants, e.g. for agricultural use, can be solid or liquid and are substances useful in formulation technology, e.g. natural or regenerated mineral substances, solvents, dispersants, wetting agents, tackifiers, thickeners, binders or fertilizers. Such carriers are for example described in WO 97/33890.

Suspension concentrates are aqueous formulations in which finely divided solid particles of the
30 active compound are suspended. Such formulations include anti-settling agents and dispersing agents and may further include a wetting agent to enhance activity as well an anti-foam and a crystal growth inhibitor. In use, these concentrates are diluted in water and normally applied as a spray to the area to be treated. The amount of active ingredient may range from 0.5% to 95% of the concentrate.

Wettable powders are in the form of finely divided particles which disperse readily in water or
35 other liquid carriers. The particles contain the active ingredient retained in a solid matrix. Typical solid matrices include fuller's earth, kaolin clays, silicas and other readily wet organic or inorganic solids. Wettable powders normally contain from 5% to 95% of the active ingredient plus a small amount of wetting, dispersing or emulsifying agent.

Emulsifiable concentrates are homogeneous liquid compositions dispersible in water or other
40 liquid and may consist entirely of the active compound with a liquid or solid emulsifying agent, or may also contain a liquid carrier, such as xylene, heavy aromatic naphthas, isophorone and other non-volatile

organic solvents. In use, these concentrates are dispersed in water or other liquid and normally applied as a spray to the area to be treated. The amount of active ingredient may range from 0.5% to 95% of the concentrate.

Granular formulations include both extrudates and relatively coarse particles and are usually applied without dilution to the area in which treatment is required. Typical carriers for granular formulations include sand, fuller's earth, attapulgite clay, bentonite clays, montmorillonite clay, vermiculite, perlite, calcium carbonate, brick, pumice, pyrophyllite, kaolin, dolomite, plaster, wood flour, ground corn cobs, ground peanut hulls, sugars, sodium chloride, sodium sulphate, sodium silicate, sodium borate, magnesia, mica, iron oxide, zinc oxide, titanium oxide, antimony oxide, cryolite, gypsum, diatomaceous earth, calcium sulphate and other organic or inorganic materials which absorb or which can be coated with the active compound. Granular formulations normally contain 5% to 25% of active ingredients which may include surface-active agents such as heavy aromatic naphthas, kerosene and other petroleum fractions, or vegetable oils; and/or stickers such as dextrans, glue or synthetic resins.

Dusts are free-flowing admixtures of the active ingredient with finely divided solids such as talc, clays, flours and other organic and inorganic solids which act as dispersants and carriers.

Microcapsules are typically droplets or granules of the active ingredient enclosed in an inert porous shell which allows escape of the enclosed material to the surroundings at controlled rates. Encapsulated droplets are typically 1 to 50 microns in diameter. The enclosed liquid typically constitutes 50 to 95% of the weight of the capsule and may include solvent in addition to the active compound. Encapsulated granules are generally porous granules with porous membranes sealing the granule pore openings, retaining the active species in liquid form inside the granule pores. Granules typically range from 1 millimetre to 1 centimetre and preferably 1 to 2 millimetres in diameter. Granules are formed by extrusion, agglomeration or prilling, or are naturally occurring. Examples of such materials are vermiculite, sintered clay, kaolin, attapulgite clay, sawdust and granular carbon. Shell or membrane materials include natural and synthetic rubbers, cellulosic materials, styrene-butadiene copolymers, polyacrylonitriles, polyacrylates, polyesters, polyamides, polyureas, polyurethanes and starch xanthates.

Other useful formulations for agrochemical applications include simple solutions of the active ingredient in a solvent in which it is completely soluble at the desired concentration, such as acetone, alkylated naphthalenes, xylene and other organic solvents. Pressurised sprayers, wherein the active ingredient is dispersed in finely-divided form as a result of vaporisation of a low boiling dispersant solvent carrier, may also be used.

Suitable agricultural adjuvants and carriers that are useful in formulating the compositions of the invention in the formulation types described above are well known to those skilled in the art.

Liquid carriers that can be employed include, for example, water, toluene, xylene, petroleum naphtha, crop oil, acetone, methyl ethyl ketone, cyclohexanone, acetic anhydride, acetonitrile, acetophenone, amyl acetate, 2-butanone, chlorobenzene, cyclohexane, cyclohexanol, alkyl acetates, diacetonol, 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-dimethyl formamide, dimethyl sulfoxide, 1,4-dioxane, dipropylene glycol, dipropylene glycol methyl ether, dipropylene glycol dibenzoate, diproxitol, alkyl pyrrolidinone, ethyl acetate, 2-ethyl hexanol,

ethylene carbonate, 1,1,1-trichloroethane, 2-heptanone, alpha pinene, d-limonene, ethylene glycol, ethylene glycol butyl ether, ethylene glycol methyl ether, gamma-butyrolactone, glycerol, glycerol diacetate, glycerol monoacetate, glycerol triacetate, hexadecane, hexylene glycol, isoamyl acetate, isobornyl acetate, isooctane, isophorone, isopropyl benzene, isopropyl myristate, lactic acid, 5 laurylamine, mesityl oxide, methoxy-propanol, methyl isoamyl ketone, methyl isobutyl ketone, methyl laurate, methyl octanoate, methyl oleate, methylene chloride, m-xylene, n-hexane, n-octylamine, octadecanoic acid, octyl amine acetate, oleic acid, oleylamine, o-xylene, phenol, polyethylene glycol (PEG400), propionic acid, propylene glycol, propylene glycol monomethyl ether, p-xylene, toluene, triethyl phosphate, triethylene glycol, xylene sulfonic acid, paraffin, mineral oil, trichloroethylene, 10 perchloroethylene, ethyl acetate, amyl acetate, butyl acetate, methanol, ethanol, isopropanol, and higher molecular weight alcohols such as amyl alcohol, tetrahydrofurfuryl alcohol, hexanol, octanol, etc., ethylene glycol, propylene glycol, glycerine and N-methyl-2-pyrrolidinone. Water is generally the carrier of choice for the dilution of concentrates.

Suitable solid carriers include, for example, talc, titanium dioxide, pyrophyllite clay, silica, 15 attapulgite clay, kieselguhr, chalk, diatomaceous earth, lime, calcium carbonate, bentonite clay, fuller's earth, cotton seed hulls, wheat flour, soybean flour, pumice, wood flour, walnut shell flour and lignin.

A broad range of surface-active agents are advantageously employed in both said liquid and solid compositions, especially those designed to be diluted with carrier before application. These agents, when used, normally comprise from 0.1% to 15% by weight of the formulation. They can be 20 anionic, cationic, non-ionic or polymeric in character and can be employed as emulsifying agents, wetting agents, suspending agents or for other purposes. Typical surface active agents include salts of alkyl sulfates, such as diethanolammonium lauryl sulphate; alkylarylsulfonate salts, such as calcium dodecylbenzenesulfonate; alkylphenol-alkylene oxide addition products, such as nonylphenol-C.sub. 18 ethoxylate; alcohol-alkylene oxide addition products, such as tridecyl alcohol-C.sub. 16 ethoxylate; 25 soaps, such as sodium stearate; alkylnaphthalenesulfonate salts, 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 lauryl trimethylammonium 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 dialkyl 30 phosphate esters.

Other adjuvants commonly utilized in agricultural compositions include crystallisation inhibitors, viscosity modifiers, suspending agents, spray droplet modifiers, pigments, antioxidants, foaming agents, anti-foaming agents, light-blocking agents, compatibilizing agents, antifoam agents, sequestering agents, neutralising agents and buffers, corrosion inhibitors, dyes, odorants, spreading agents, 35 penetration aids, micronutrients, emollients, lubricants and sticking agents.

In addition, further, other biocidally active ingredients or compositions may be combined with the compositions of the invention and used in the methods of the invention and applied simultaneously or sequentially with the compositions of the invention. When applied simultaneously, these further active ingredients may be formulated together with the compositions of the invention or mixed in, for example, 40 the spray tank. These further biocidally active ingredients may be fungicides, herbicides, insecticides, bactericides, acaricides, nematocides and/or plant growth regulators.

Pesticidal agents are referred to herein using their common name are known, for example, from "The Pesticide Manual", 15th Ed., British Crop Protection Council 2009.

In addition, the compositions of the invention may also be applied with one or more systemically acquired resistance inducers ("SAR" inducer). SAR inducers are known and described in, for example, 5 United States Patent No. US 6,919,298 and include, for example, salicylates and the commercial SAR inducer acibenzolar-S-methyl.

The compounds of formula (I) are normally used in the form of agrochemical compositions and can be applied to the crop area or plant to be treated, simultaneously or in succession with further 10 compounds. These further compounds can be e.g. fertilizers or micronutrient donors or other preparations, which influence the growth of plants. They can also be selective herbicides or non-selective herbicides as well as insecticides, fungicides, bactericides, nematocides, molluscicides or mixtures of several of these preparations, if desired together with further carriers, surfactants or application promoting adjuvants customarily employed in the art of formulation.

15 The compounds of formula (I) may be used in the form of (fungicidal) compositions for controlling or protecting against phytopathogenic microorganisms, comprising as active ingredient at least one compound of formula (I) or of at least one preferred individual compound as defined herein, in free form or in agrochemically usable salt form, and at least one of the above-mentioned adjuvants.

The invention therefore provides a composition, preferably a fungicidal composition, comprising 20 at least one compound formula (I) an agriculturally acceptable carrier and optionally an adjuvant. An agricultural acceptable carrier is for example a carrier that is suitable for agricultural use. Agricultural carriers are well known in the art. Preferably said composition may comprise at least one or more pesticidally-active compounds, for example an additional fungicidal active ingredient in addition to the compound of formula (I).

25 The compound of formula (I) may be the sole active ingredient of a composition or it may be admixed with one or more additional active ingredients such as a pesticide, fungicide, synergist, herbicide or plant growth regulator where appropriate.

Examples of suitable additional active ingredients include the following: acycloamino acid fungicides, aliphatic nitrogen fungicides, amide fungicides, anilide fungicides, antibiotic fungicides, 30 aromatic fungicides, arsenical fungicides, aryl phenyl ketone fungicides, benzamide fungicides, benzanilide fungicides, benzimidazole fungicides, benzothiazole fungicides, botanical fungicides, bridged diphenyl fungicides, carbamate fungicides, carbanilate fungicides, conazole fungicides, copper fungicides, dicarboximide fungicides, dinitrophenol fungicides, dithiocarbamate fungicides, dithiolane fungicides, furamide fungicides, furanilide fungicides, hydrazide fungicides, imidazole fungicides, 35 mercury fungicides, morpholine fungicides, organophosphorous fungicides, organotin fungicides, oxathiin fungicides, oxazole fungicides, phenylsulfamide fungicides, polysulfide fungicides, pyrazole fungicides, pyridine fungicides, pyrimidine fungicides, pyrrole fungicides, quaternary ammonium fungicides, quinoline fungicides, quinone fungicides, quinoxaline fungicides, strobilurin fungicides, sulfonanilide fungicides, thiadiazole fungicides, thiazole fungicides, thiazolidine fungicides, 40 thiocarbamate fungicides, thiophene fungicides, triazine fungicides, triazole fungicides, triazolopyrimidine fungicides, urea fungicides, valinamide fungicides, and zinc fungicides.

Examples of suitable additional active ingredients also include the following: 3-difluoromethyl-1-methyl-1H-pyrazole-4-carboxylic acid (9-dichloromethylene-1,2,3,4-tetrahydro-1,4-methanonaphthalen-5-yl)-amide, 3-difluoromethyl-1-methyl-1H-pyrazole-4-carboxylic acid methoxy-[1-methyl-2-(2,4,6-trichlorophenyl)-ethyl]-amide, 1-methyl-3-difluoromethyl-1H-pyrazole-4-carboxylic acid (2-dichloromethylene-3-ethyl-1-methyl-indan-4-yl)-amide (1072957-71-1), 1-methyl-3-difluoromethyl-1H-pyrazole-4-carboxylic acid (4'-methylsulfanyl-biphenyl-2-yl)-amide, 1-methyl-3-difluoromethyl-4H-pyrazole-4-carboxylic acid [2-(2,4-dichlorophenyl)-2-methoxy-1-methyl-ethyl]-amide, (5-Chloro-2,4-dimethyl-pyridin-3-yl)-(2,3,4-trimethoxy-6-methyl-phenyl)-methanone, (5-Bromo-4-chloro-2-methoxypyridin-3-yl)-(2,3,4-trimethoxy-6-methyl-phenyl)-methanone, 2-{2-[(E)-3-(2,6-Dichlorophenyl)-1-methyl-prop-2-en-(E)-ylideneaminooxymethyl]-phenyl}-2-[(Z)-methoxyimino]-N-methyl-acetamide, 3-[5-(4-Chlorophenyl)-2,3-dimethyl-isoxazolidin-3-yl]-pyridine, (E)-N-methyl-2-[2-(2,5-dimethylphenoxy)methyl]phenyl]-2-methoxy-iminoacetamide, 4-bromo-2-cyano-N,N-dimethyl-6-trifluoromethylbenzimidazole-1-sulphonamide, a-[N-(3-chloro-2,6-xylyl)-2-methoxyacetamido]-γ-butyrolactone, 4-chloro-2-cyano-N,N-dimethyl-5-p-tolylimidazole-1-sulfonamide, N-allyl-4,5-dimethyl-2-trimethylsilylthiophene-3-carboxamide, N-(1-cyano-1,2-dimethylpropyl)-2-(2,4-dichlorophenoxy)propionamide, N-(2-methoxy-5-pyridyl)-cyclopropane carboxamide, (+-)-cis-1-(4-chlorophenyl)-2-(1H-1,2,4-triazol-1-yl)-cycloheptanol, 2-(1-tert-butyl)-1-(2-chlorophenyl)-3-(1,2,4-triazol-1-yl)-propan-2-ol, 2',6'-dibromo-2-methyl-4-trifluoromethoxy-4'-trifluoromethyl-1,3-thiazole-5-carboxanilide, 1-imidazolyl-1-(4'-chlorophenoxy)-3,3-dimethylbutan-2-one, methyl (E)-2-[2-[6-(2-cyanophenoxy)pyrimidin-4-yloxy]phenyl]3-methoxyacrylate, methyl (E)-2-[2-[6-(2-thioamidophenoxy)pyrimidin-4-yloxy]phenyl]3-methoxyacrylate, methyl (E)-2-[2-[6-(2-fluorophenoxy)pyrimidin-4-yloxy]phenyl]3-methoxyacrylate, methyl (E)-2-[2-[6-(2,6-difluorophenoxy)pyrimidin-4-yloxy]phenyl]3-methoxyacrylate, methyl (E)-2-[2-[3-(pyrimidin-2-yloxy)phenoxy]phenyl]3-methoxyacrylate, methyl (E)-2-[2-[3-(5-methylpyrimidin-2-yloxy)-phenoxy]phenyl]3-methoxyacrylate, methyl (E)-2-[2-[3-(phenyl-sulphonyloxy)phenoxy]phenyl]3-methoxyacrylate, methyl (E)-2-[2-[3-(4-nitrophenoxy)phenoxy]phenyl]3-methoxyacrylate, methyl (E)-2-[2-phenoxyphenyl]3-methoxyacrylate, methyl (E)-2-[2-(3,5-dimethyl-benzoyl)pyrrol-1-yl]3-methoxyacrylate, methyl (E)-2-[2-(3-methoxyphenoxy)phenyl]3-methoxyacrylate, methyl (E)-2-[2-(2-phenylethen-1-yl)-phenyl]3-methoxyacrylate, methyl (E)-2-[2-(3,5-dichlorophenoxy)pyridin-3-yl]3-methoxyacrylate, methyl (E)-2-(2-(3-(1,1,2,2-tetrafluoroethoxy)phenoxy)phenyl)-3-methoxyacrylate, methyl (E)-2-(2-[3-(alpha-hydroxybenzyl)phenoxy]phenyl)-3-methoxyacrylate, methyl (E)-2-(2-(4-phenoxy-pyridin-2-yloxy)phenyl)-3-methoxyacrylate, methyl (E)-2-[2-(3-n-propyloxy-phenoxy)phenyl]3-methoxyacrylate, methyl (E)-2-[2-(3-isopropyloxyphenoxy)phenyl]3-methoxyacrylate, methyl (E)-2-[2-[3-(2-fluorophenoxy)phenoxy]phenyl]3-methoxyacrylate, methyl (E)-2-[2-(3-ethoxyphenoxy)phenyl]3-methoxyacrylate, methyl (E)-2-[2-(4-tert-butyl-pyridin-2-yloxy)phenyl]3-methoxyacrylate, methyl (E)-2-[2-[3-(3-cyanophenoxy)phenoxy]phenyl]3-methoxyacrylate, methyl (E)-2-[2-[(3-methyl-pyridin-2-yloxymethyl)phenyl]3-methoxyacrylate, methyl (E)-2-[2-[6-(2-methyl-phenoxy)pyrimidin-4-yloxy]phenyl]3-methoxyacrylate, methyl (E)-2-[2-(5-bromo-pyridin-2-yloxymethyl)phenyl]3-methoxyacrylate, methyl (E)-2-[2-(3-(3-iodopyridin-2-yloxy)phenoxy)phenyl]3-methoxyacrylate, methyl (E)-2-[2-[6-(2-chloropyridin-3-yloxy)pyrimidin-4-yloxy]phenyl]3-methoxyacrylate, methyl (E)-2-[2-(5,6-dimethylpyrazin-2-yl)methylloximinomethyl]phenyl]3-methoxyacrylate, methyl (E)-2-[2-[6-(6-methylpyridin-2-yloxy)pyrimidin-4-yloxy]phenyl]3-methoxyacrylate, methyl (E)-2-[2-(3-

methoxyphenyl)methyloximinomethyl]-phenyl)-3-methoxyacrylate, methyl (E)-2-{2-(6-(2-azidophenoxy)-pyrimidin-4-yloxy]phenyl)-3-methoxyacrylate, methyl (E),(E)-2-{2-[6-phenylpyrimidin-4-yl)-methyloximinomethyl]phenyl)-3-methoxyacrylate, methyl (E),(E)-2-{2-[(4-chlorophenyl)-methyloximinomethyl]-phenyl)-3-methoxyacrylate, methyl (E)-2-{2-[6-(2-n-propylphenoxy)-1,3,5-triazin-4-yloxy]phenyl)-3-methoxyacrylate, methyl (E),(E)-2-{2-[(3-nitrophenyl)methyloximinomethyl]phenyl)-3-methoxyacrylate, 3-chloro-7-(2-aza-2,7,7-trimethyl-oct-3-en-5-ine), 2,6-dichloro-N-(4-trifluoromethylbenzyl)-benzamide, 3-iodo-2-propinyl alcohol, 4-chlorophenyl-3-iodopropargyl formal, 3-bromo-2,3-diiodo-2-propenyl ethylcarbamate, 2,3,3-triiodoallyl alcohol, 3-bromo-2,3-diiodo-2-propenyl alcohol, 3-iodo-2-propinyl n-butylcarbamate, 3-iodo-2-propinyl n-hexylcarbamate, 3-iodo-2-propinyl cyclohexyl-carbamate, 3-iodo-2-propinyl phenylcarbamate; phenol derivatives, such as tribromophenol, tetrachlorophenol, 3-methyl-4-chlorophenol, 3,5-dimethyl-4-chlorophenol, phenoxyethanol, dichlorophene, o-phenylphenol, m-phenylphenol, p-phenylphenol, 2-benzyl-4-chlorophenol, 5-hydroxy-2(5H)-furanone; 4,5-dichlorodithiazolinone, 4,5-benzodithiazolinone, 4,5-trimethylenedithiazolinone, 4,5-dichloro-(3H)-1,2-dithiol-3-one, 3,5-dimethyl-tetrahydro-1,3,5-thiadiazine-2-thione, N-(2-p-chlorobenzoyl ethyl)-hexaminium chloride, acibenzolar, acypetacs, alanycarb, albendazole, aldimorph, allicin, allyl alcohol, ametocradin, amisulbrom, amobam, ampropylfos, anilazine, asomate, aureofungin, azaconazole, azafendin, azithiram, azoxystrobin, barium polysulfide, benalaxyl, benalaxyl-M, benodanil, benomyl, benquinox, bentaluron, benthiavalicarb, benthiazole, benzalkonium chloride, benzamacril, benzamorf, benzohydroxamic acid, benzovindiflupyr, berberine, bethoxazin, biloxazol, binapacryl, biphenyl, bitertanol, bithionol, bixafen, blasticidin-S, boscalid, bromothalonil, bromuconazole, bupirimate, buthiobate, butylamine calcium polysulfide, captafol, captan, carbamorph, carbendazim, carbendazim chlorhydrate, carboxin, carpropamid, carvone, CGA41396, CGA41397, chinomethionate, chitosan, chlobenthiazone, chloraniformethan, chloranil, chlorfenazole, chloroneb, chloropicrin, chlorothalonil, chlorozolate, chlozolate, climbazole, clotrimazole, clozylacon, copper containing compounds such as copper acetate, copper carbonate, copper hydroxide, copper naphthenate, copper oleate, copper oxychloride, copper oxyquinolate, copper silicate, copper sulphate, copper tallate, copper zinc chromate and Bordeaux mixture, cresol, cufraneb, cuprobam, cuprous oxide, cyazofamid, cyclafuramid, cycloheximide, cyflufenamid, cymoxanil, cypendazole, cyproconazole, cyprodinil, dazomet, debacarb, decafentin, dehydroacetic acid, di-2-pyridyl disulphide 1, 1'-dioxide, dichlofluanid, diclomezine, dichlone, dicloran, dichlorophen, dichlozoline, diclobutrazol, diclocymet, diethofencarb, difenoconazole, difenzoquat, diflumetorim, O, O-di-iso-propyl-S-benzyl thiophosphate, dimefluazole, dimetachlone, dimetconazole, dimethomorph, dimethirimol, diniconazole, diniconazole-M, dinobuton, dinocap, dinocton, dinopenton, dinosulfon, dinoterbon, diphenylamine, dipyrithione, disulfiram, ditalimfos, dithianon, dithioether, dodecyl dimethyl ammonium chloride, dodemorph, dodicin, dodine, doguadine, drazoxolon, edifenphos, enestroburin, epoxiconazole, etaconazole, etem, ethaboxam, ethirimol, ethoxyquin, ethilicin, ethyl (Z)-N-benzyl-N ([methyl (methylthioethylideneamino-oxycarbonyl) amino] thio)-β-alaninate, etridiazole, famoxadone, fenamidone, fenaminosulf, fenapanil, fenarimol, fenbuconazole, fenfuram, fenhexamid, fenitropan, fenoxanil, fenciclonil, fencicoxamid, fenpropidin, fenpropimorph, fenpyrazamine, fentin acetate, fentin hydroxide, ferbam, ferimzone, fluazinam, fludioxonil, flumetover, flumorph, flupicolide, fluopyram, fluoroimide, fluotrimazole, fluoxastrobin, fluquinconazole, flusilazole, flusulfamide, flutanil, flutolanil, flutriafol,

fluxapyroxad, folpet, formaldehyde, fosetyl, fuberidazole, furalaxyl, furametpyr, furcarbanil, furconazole, furfural, furmecyclox, furophanate, glyodin, griseofulvin, guazatine, halacrinat, hexa chlorobenzene, hexachlorobutadiene, hexachlorophene, hexaconazole, hexylthiofos, hydrargaphen, hydroxyisoxazole, hymexazole, imazalil, imazalil sulphate, imibenconazole, iminoctadine, iminoctadine triacetate, inezin, 5 iodocarb, ipconazole, ipfentrifluconazole, iprobenfos, iprodione, iprovalicarb, isopropanyl butyl carbamate, isoprothiolane, isopyrazam, isotianil, isovalledione, izopamfos, kasugamycin, kresoxim-methyl, LY186054, LY211795, LY248908, mancozeb, mandipropamid, maneb, mebenil, mecarbinzid, mefenoxam, mefentrifluconazole, mepanipyrim, mepronil, mercuric chloride, mercurous chloride, meptyldinocap, metalaxyl, metalaxyl-M, metam, metazoxolon, metconazole, methasulfocarb, 10 methfuroxam, methyl bromide, methyl iodide, methyl isothiocyanate, metiram, metiram-zinc, metominostrobin, metrafenone, metsulfovax, milneb, moroxydine, myclobutanil, myclozolin, nabam, natamycin, neoasozin, nickel dimethyldithiocarbamate, nitrostyrene, nitrothal-iso- propyl, nuarimol, octhiline, ofurace, organomercury compounds, orysastrobin, osthol, oxadixyl, oxasulfuron, oxathiapiprolin, oxine-copper, oxolinic acid, oxpoconazole, oxycarboxin, paclobutrazol, parinol, 15 pefurazoate, penconazole, pencycuron, penflufen, pentachlorophenol, penthiopyrad, phenamacril, phenazin oxide, phosdiphen, phosetyl-Al, phosphorus acids, phthalide, picoxystrobin, piperalin, polycarbamate, polyoxin D, polyoxrim, polyram, probenazole, prochloraz, procymidone, propamidine, propamocarb, propiconazole, propineb, propionic acid, proquinazid, prothiocarb, prothioconazole, pydiflumetofen, pyracarbolid, pyraclostrobin, pyrametrostrobin, pyraoxystrobin, pyrazophos, 20 pyribencarb, pyridinitril, pyrifenoxy, pyrimethanil, pyriofenone, pyroquilon, pyroxychlor, pyroxyfur, pyrrolnitrin, quaternary ammonium compounds, quinacetol, quinazamid, quinconazole, quinomethionate, quinoxifen, quintozene, rabenzazole, santonin, sedaxane, silthiofam, simeconazole, sipconazole, sodium pentachlorophenate, spiroxamine, streptomycin, sulphur, sultropen, tebuconazole, tebflouin, tecloftalam, tecnazene, tecoram, tetraconazole, thiabendazole, thiadifluor, thicyofen, 25 thifluzamide, 2- (thiocyanomethylthio) benzothiazole, thiophanate-methyl, thioquinox, thiram, tiadinil, timibenconazole, tioxyimid, tolclofos-methyl, tolylfluanid, triadimefon, triadimenol, triamiphos, triarimol, triazbutil, triazoxide, tricyclazole, tridemorph, trifloxystrobin, triflumazole, triforine, triflumizole, triticonazole, uniconazole, urbacide, validamycin, valifenalate, vapam, vinclozolin, zarilamid, zineb, ziram, and zoxamide.

30

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- 35 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 40 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
5 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.

10 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,
15 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,
20 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,
25 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,
30 carbofuran, carbosulfan, cloethocarb, ethiofencarb, fenoxycarb, fenthio carb, 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-
35 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,
40 tefluthrin, tralomethrin, Zeta-cypermethrin.

Arthropod growth regulators: a) chitin synthesis inhibitors: benzoylureas: chlorfluazuron, diflubenzuron, fluazuron, flucyclozuron, flufenoxuron, hexaflumuron, lufenuron, novaluron, teflubenzuron, triflumuron, buprofezin, diofenolan, hexythiazox, etoxazole, chlorfentazine; b) ecdysone antagonists: halofenozide, methoxyfenozide, tebufenozide; c) juvenoids: pyriproxyfen, methoprene 5 (including S-methoprene), fenoxycarb; d) lipid biosynthesis inhibitors: spiroadiclofen.

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, diaclofen, diafenthiuron, DBI-3204, dinactin, dihydroxymethyl-dihydroxypyrrolidine, dinobuton, dinocap, 10 endosulfan, ethiprole, ethofenprox, fenazaquin, flumite, MTI- 800, fenpyroximate, fluacrypyrim, flubenzimine, flubrocyclopropanol, flufenazine, flufenprox, fluproxyfen, halofenprox, hydramethylnon, IKI-220, kanemite, NC-196, neem guard, nidinorterfuran, nitenpyram, SD-35651, WL-108477, pirydaryl, propargite, prothifonbutyl, pymethrozine, pyridaben, pyrimidifen, NC-1111, R-195, RH-0345, RH-2485, RYI-210, S-1283, S-1833, SI-8601, silafluofen, silomazine, spinosad, tebufenpyrad, tetradifon, 15 tetranactin, thiachlorid, 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.

20 Other biological agents: enrofloxacin, febantel, penethamate, moloxicam, cefalexin, kanamycin, pimobendan, clenbuterol, omeprazole, tiamulin, benazepril, pyriprole, cefquinome, florfenicol, busserelin, cefovecin, tulathromycin, ceftiofur, carprofen, metaflumizone, praziquarantel, triclabendazole.

The following mixtures of the compounds of formula (I) with active ingredients are preferred.
25 The abbreviation "TX" means one compound selected from the group consisting of the compounds described in Table 1 (below) or Table 2 (compound I.aa.005 or I.c.005) (below).

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- 30 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 35 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 40 + 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, mecarbarn + 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-methylpropyl)-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.

5 + 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 +

10 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-yl acetate + 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, codlure

15 + 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, frontaline + 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, litture + TX, looplure + TX, medlure + TX, megatomoic acid + TX, methyl eugenol + TX, muscalure + TX,

20 octadeca-2,13-dien-1-yl acetate + TX, octadeca-3,13-dien-1-yl acetate + TX, orfuralure + TX, oryctalure + TX, ostramone + TX, siglure + TX, sordidin + TX, sulcatol + TX, tetradec-11-en-1-yl acetate + TX, trimedlure + TX, trimedlure A + TX, trimedlure B₁ + TX, trimedlure B₂ + 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 carbamate + TX,

25 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-ethylsulfinyethyl 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,

30 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-

35 oxocyclohex-1-enyl dimethylcarbamate + TX, acethion + TX, acrylonitrile + TX, aldrin + TX, allosamidin + TX, allylcarb + 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

40 + 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
5 + 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,
10 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,
15 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,
20 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, nor nicotine + TX, O-5-dichloro-4-iodophenyl O-ethyl
25 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
30 + 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, quinotion + 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
35 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,
40 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, benclotiaz + TX, cytokinins + TX, DCIP + TX, furfural + TX, isamidofos + TX, kinetin + TX, Myrothecium verrucaria composition + TX, tetrachlorothiophene + TX, xilenols + TX, zeatin + TX, potassium ethylxanthate + TX, acibenzolar + TX, acibenzolar-S-methyl + TX, Reynoutria sachalinensis extract + TX, alpha-chlorohydrin + TX, antu + TX, barium carbonate + TX, bithiosemi + 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, flupropradine + TX, flupropradine 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, fenpropidine + TX, fenpropimorph + TX, spiroxamine + TX, tridemorph + TX, cyprodinil + TX, mepanipyrim + TX, pyrimethanil + TX, fencpiclonil + TX, fludioxonil + TX, benalaxyl + TX, furalaxyl + TX, metalaxyl + TX, R-metalaxyl + TX, ofurace + TX, oxadixyl + TX, carbendazim + TX, debacarb + TX, fuberidazole + TX, thiabendazole + TX, chlozoline + 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, fenaminostrobin + 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, 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, quinoxifen + TX, quintozone + TX, tiadinil + TX, triazoxide + TX, tricyclazole + TX, triforine + TX, validamycin + TX, valifenalate + TX, zoxamide + TX, mandipropamid + 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, lvbenmixianan + 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, aminopyrifin + TX, ametocradin + 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, fempicoxamid + TX, tebufloquin + TX, ipflufenquin + 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, benzothioestrobin + 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]benzotrile + 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, 5 coumoxystrobin + TX.

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, 10 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.

20 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).

25 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.

35 (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).

40 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).

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
5 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
10 <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
15 Abstracts name, a "chemical name", a "traditional name", a "compound name" or a "development 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.

The active ingredient mixture of the compounds of formula (I) selected from a compound described in Table 1 (below) or Table 2 (compound I.aa.005 or I.c.005) (below) and an active ingredient
20 as described above are preferably in a mixing ratio of from 100:1 to 1:6000, 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
25 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 mixtures as described above 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, with the exception of a method for treatment of the human or animal body by surgery or
30 therapy and diagnostic methods practised on the human or animal body.

The mixtures comprising a compound of formula (I) selected from a compound described in Table 1 (below) or Table 2 (compound I.aa.005 or I.c.005) (below), 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
35 "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 a compound described in Table 1 (below) or Table 2 (compound I.aa.005 or I.c.005) (below), and the active ingredient(s) as described above, is not essential for working the present invention.

40 The compositions according to the invention can also comprise further solid or liquid auxiliaries, such as stabilizers, for example unepoxidized or epoxidized vegetable oils (for example epoxidized

coconut oil, rapeseed oil or soya oil), antifoams, for example silicone oil, preservatives, viscosity regulators, binders and/or tackifiers, fertilizers or other active ingredients for achieving specific effects, for example bactericides, fungicides, nematocides, plant activators, molluscicides or herbicides.

The compositions according to the invention are prepared in a manner known per se, in the absence of auxiliaries for example by grinding, screening and/or compressing a solid active ingredient and in the presence of at least one auxiliary for example by intimately mixing and/or grinding the active ingredient with the auxiliary (auxiliaries). These processes for the preparation of the compositions and the use of the compounds of formula (I) for the preparation of these compositions are also a subject of the invention.

10

Another aspect of the invention is related to the use of a compound of formula (I) or of a preferred individual compound as defined herein, of a composition comprising at least one compound of formula (I) or at least one preferred individual compound as above-defined, or of a fungicidal or insecticidal mixture comprising at least one compound of formula (I) or at least one preferred individual compound as above-defined, in admixture with other fungicides or insecticides as described above, for controlling or preventing infestation of plants, e.g. useful plants such as crop plants, propagation material thereof, e.g. seeds, harvested crops, e.g. harvested food crops, or non-living materials by insects or by phytopathogenic microorganisms, preferably fungal organisms.

A further aspect of the invention is related to a method of controlling or preventing an infestation of plants, e.g., useful plants such as crop plants, propagation material thereof, e.g. seeds, harvested crops, e.g., harvested food crops, or of non-living materials by insects or by phytopathogenic or spoilage microorganisms or organisms potentially harmful to man, especially fungal organisms, which comprises the application of a compound of formula (I) or of a preferred individual compound as above-defined as active ingredient to the plants, to parts of the plants or to the locus thereof, to the propagation material thereof, or to any part of the non-living materials.

Controlling or preventing means reducing infestation by phytopathogenic or spoilage microorganisms or organisms potentially harmful to man, especially fungal organisms, to such a level that an improvement is demonstrated.

A preferred method of controlling or preventing an infestation of crop plants by phytopathogenic microorganisms, especially fungal organisms, or insects which comprises the application of a compound of formula (I), or an agrochemical composition which contains at least one of said compounds, is foliar application. The frequency of application and the rate of application will depend on the risk of infestation by the corresponding pathogen or insect. However, the compounds of formula (I) can also penetrate the plant through the roots via the soil (systemic action) by drenching the locus of the plant with a liquid formulation, or by applying the compounds in solid form to the soil, e.g. in granular form (soil application). In crops of water rice such granulates can be applied to the flooded rice field. The compounds of formula I may also be applied to seeds (coating) by impregnating the seeds or tubers either with a liquid formulation of the fungicide or coating them with a solid formulation.

A formulation, e.g. a composition containing the compound of formula (I), and, if desired, a solid or liquid adjuvant or monomers for encapsulating the compound of formula (I), may be prepared in a

known manner, typically by intimately mixing and/or grinding the compound with extenders, for example solvents, solid carriers and, optionally, surface active compounds (surfactants).

Advantageous rates of application are normally from 5g to 2kg of active ingredient (a.i.) per hectare (ha), preferably from 10g to 1kg a.i./ha, most preferably from 20g to 600g a.i./ha. When used
5 as seed drenching agent, convenient dosages are from 10mg to 1g of active substance per kg of seeds.

When the combinations of the present invention are used for treating seed, rates of 0.001 to 50 g of a compound of formula I per kg of seed, preferably from 0.01 to 10g per kg of seed are generally sufficient.

Suitably, a composition comprising a compound of formula (I) according to the present invention
10 is applied either preventative, meaning prior to disease development or curative, meaning after disease development.

The compositions of the invention may be employed in any conventional form, for example in the form of a twin pack, a powder for dry seed treatment (DS), an emulsion for seed treatment (ES), a flowable concentrate for seed treatment (FS), a solution for seed treatment (LS), a water dispersible
15 powder for seed treatment (WS), a capsule suspension for seed treatment (CF), a gel for seed treatment (GF), an emulsion concentrate (EC), a suspension concentrate (SC), a suspo-emulsion (SE), a capsule suspension (CS), a water dispersible granule (WG), an emulsifiable granule (EG), an emulsion, water in oil (EO), an emulsion, oil in water (EW), a micro-emulsion (ME), an oil dispersion (OD), an oil miscible flowable (OF), an oil miscible liquid (OL), a soluble concentrate (SL), an ultra-low volume suspension
20 (SU), an ultra-low volume liquid (UL), a technical concentrate (TK), a dispersible concentrate (DC), a wettable powder (WP) or any technically feasible formulation in combination with agriculturally acceptable adjuvants.

Such compositions may be produced in conventional manner, e.g. by mixing the active ingredients with appropriate formulation inerts (diluents, solvents, fillers and optionally other formulating
25 ingredients such as surfactants, biocides, anti-freeze, stickers, thickeners and compounds that provide adjuvancy effects). Also conventional slow release formulations may be employed where long lasting efficacy is intended. Particularly formulations to be applied in spraying forms, such as water dispersible concentrates (e.g. EC, SC, DC, OD, SE, EW, EO and the like), wettable powders and granules, may contain surfactants such as wetting and dispersing agents and other compounds that provide adjuvancy
30 effects, e.g. the condensation product of formaldehyde with naphthalene sulphonate, an alkylarylsulphonate, a lignin sulphonate, a fatty alkyl sulphate, and ethoxylated alkylphenol and an ethoxylated fatty alcohol.

A seed dressing formulation is applied in a manner known per se to the seeds employing the combination of the invention and a diluent in suitable seed dressing formulation form, e.g. as an aqueous
35 suspension or in a dry powder form having good adherence to the seeds. Such seed dressing formulations are known in the art. Seed dressing formulations may contain the single active ingredients or the combination of active ingredients in encapsulated form, e.g. as slow release capsules or microcapsules.

In general, the formulations include from 0.01 to 90% by weight of active agent, from 0 to 20%
40 agriculturally acceptable surfactant and 10 to 99.99% solid or liquid formulation inerts and adjuvant(s), the active agent consisting of at least the compound of formula (I) optionally together with other active

agents, particularly microbiocides or conservatives or the like. Concentrated forms of compositions generally contain in between about 2 and 80%, preferably between about 5 and 70% by weight of active agent. Application forms of formulation may for example contain from 0.01 to 20% by weight, preferably from 0.01 to 5% by weight of active agent. Whereas commercial products will preferably be formulated as concentrates, the end user will normally employ diluted formulations.

Whereas it is preferred to formulate commercial products as concentrates, the end user will normally use dilute formulations.

Table 1 below illustrates examples of individual compounds of formula (I) according to the invention.

Table 1: Individual compounds of formula (I) according to the invention

Compound No.	R ¹	W	R ²	R ³	R ⁴	R ⁵
001	CH ₃	O	H	H	H	H
002	CH ₃	O	H	H	H	F
003	CH ₃	O	H	H	H	Cl
004	CH ₃	O	H	H	H	CN
005	CH ₃	O	H	H	H	CH ₃
006	CH ₃	O	H	H	H	CH ₂ CH ₃
007	CH ₃	O	H	H	H	CF ₃
008	CH ₃	O	H	H	H	cyclopropyl
009	CH ₃	O	H	H	F	H
010	CH ₃	O	H	H	Cl	H
011	CH ₃	O	H	H	CN	H
012	CH ₃	O	H	H	CH ₃	H
013	CH ₃	O	H	H	CH ₂ CH ₃	H
014	CH ₃	O	H	H	CF ₃	H
015	CH ₃	O	H	H	cyclopropyl	H
016	CH ₃	O	H	F	H	H
017	CH ₃	O	H	Cl	H	H
018	CH ₃	O	H	CN	H	H
019	CH ₃	O	H	CH ₃	H	H
020	CH ₃	O	H	CH ₂ CH ₃	H	H
021	CH ₃	O	H	CF ₃	H	H
022	CH ₃	O	H	cyclopropyl	H	H
023	CH ₃	O	F	H	H	H
024	CH ₃	O	Cl	H	H	H
025	CH ₃	O	CN	H	H	H

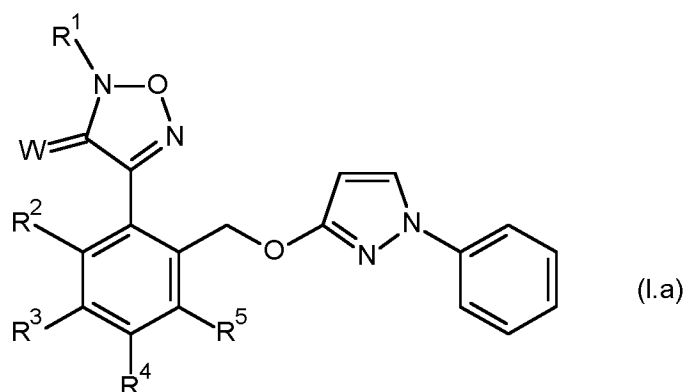
026	CH ₃	O	CH ₃	H	H	H
027	CH ₃	O	CH ₂ CH ₃	H	H	H
028	CH ₃	O	CF ₃	H	H	H
029	CH ₃	O	cyclopropyl	H	H	H
030	CH ₃	S	H	H	H	H
031	CH ₃	S	H	H	H	F
032	CH ₃	S	H	H	H	Cl
033	CH ₃	S	H	H	H	CN
034	CH ₃	S	H	H	H	CH ₃
035	CH ₃	S	H	H	H	CH ₂ CH ₃
036	CH ₃	S	H	H	H	CF ₃
037	CH ₃	S	H	H	H	cyclopropyl
038	CH ₃	S	H	H	F	H
039	CH ₃	S	H	H	Cl	H
040	CH ₃	S	H	H	CN	H
041	CH ₃	S	H	H	CH ₃	H
042	CH ₃	S	H	H	CH ₂ CH ₃	H
043	CH ₃	S	H	H	CF ₃	H
044	CH ₃	S	H	H	cyclopropyl	H
045	CH ₃	S	H	F	H	H
046	CH ₃	S	H	Cl	H	H
047	CH ₃	S	H	CN	H	H
048	CH ₃	S	H	CH ₃	H	H
049	CH ₃	S	H	CH ₂ CH ₃	H	H
050	CH ₃	S	H	CF ₃	H	H
051	CH ₃	S	H	cyclopropyl	H	H
052	CH ₃	S	F	H	H	H
053	CH ₃	S	Cl	H	H	H
054	CH ₃	S	CN	H	H	H
055	CH ₃	S	CH ₃	H	H	H
056	CH ₃	S	CH ₂ CH ₃	H	H	H
057	CH ₃	S	CF ₃	H	H	H
058	CH ₃	S	cyclopropyl	H	H	H
059	CH ₂ CH ₃	O	H	H	H	H
060	CH ₂ CH ₃	O	H	H	H	F
061	CH ₂ CH ₃	O	H	H	H	Cl
062	CH ₂ CH ₃	O	H	H	H	CN
063	CH ₂ CH ₃	O	H	H	H	CH ₃
064	CH ₂ CH ₃	O	H	H	H	CH ₂ CH ₃
065	CH ₂ CH ₃	O	H	H	H	CF ₃

066	CH ₂ CH ₃	O	H	H	H	cyclopropyl
067	CH ₂ CH ₃	O	H	H	F	H
068	CH ₂ CH ₃	O	H	H	Cl	H
069	CH ₂ CH ₃	O	H	H	CN	H
070	CH ₂ CH ₃	O	H	H	CH ₃	H
071	CH ₂ CH ₃	O	H	H	CH ₂ CH ₃	H
072	CH ₂ CH ₃	O	H	H	CF ₃	H
073	CH ₂ CH ₃	O	H	H	cyclopropyl	H
074	CH ₂ CH ₃	O	H	F	H	H
075	CH ₂ CH ₃	O	H	Cl	H	H
076	CH ₂ CH ₃	O	H	CN	H	H
077	CH ₂ CH ₃	O	H	CH ₃	H	H
078	CH ₂ CH ₃	O	H	CH ₂ CH ₃	H	H
079	CH ₂ CH ₃	O	H	CF ₃	H	H
080	CH ₂ CH ₃	O	H	cyclopropyl	H	H
081	CH ₂ CH ₃	O	F	H	H	H
082	CH ₂ CH ₃	O	Cl	H	H	H
083	CH ₂ CH ₃	O	CN	H	H	H
084	CH ₂ CH ₃	O	CH ₃	H	H	H
085	CH ₂ CH ₃	O	CH ₂ CH ₃	H	H	H
086	CH ₂ CH ₃	O	CF ₃	H	H	H
087	CH ₂ CH ₃	O	cyclopropyl	H	H	H
088	cyclopropyl	O	H	H	H	H
089	cyclopropyl	O	H	H	H	F
090	cyclopropyl	O	H	H	H	Cl
091	cyclopropyl	O	H	H	H	CN
092	cyclopropyl	O	H	H	H	CH ₃
093	cyclopropyl	O	H	H	H	CH ₂ CH ₃
094	cyclopropyl	O	H	H	H	CF ₃
095	cyclopropyl	O	H	H	H	cyclopropyl
096	cyclopropyl	O	H	H	F	H
097	cyclopropyl	O	H	H	Cl	H
098	cyclopropyl	O	H	H	CN	H
099	cyclopropyl	O	H	H	CH ₃	H
100	cyclopropyl	O	H	H	CH ₂ CH ₃	H
101	cyclopropyl	O	H	H	CF ₃	H
102	cyclopropyl	O	H	H	cyclopropyl	H
103	cyclopropyl	O	H	F	H	H
104	cyclopropyl	O	H	Cl	H	H
105	cyclopropyl	O	H	CN	H	H

106	cyclopropyl	O	H	CH ₃	H	H
107	cyclopropyl	O	H	CH ₂ CH ₃	H	H
108	cyclopropyl	O	H	CF ₃	H	H
109	cyclopropyl	O	H	cyclopropyl	H	H
110	cyclopropyl	O	F	H	H	H
111	cyclopropyl	O	Cl	H	H	H
112	cyclopropyl	O	CN	H	H	H
113	cyclopropyl	O	CH ₃	H	H	H
114	cyclopropyl	O	CH ₂ CH ₃	H	H	H
115	cyclopropyl	O	CF ₃	H	H	H
116	cyclopropyl	O	cyclopropyl	H	H	H

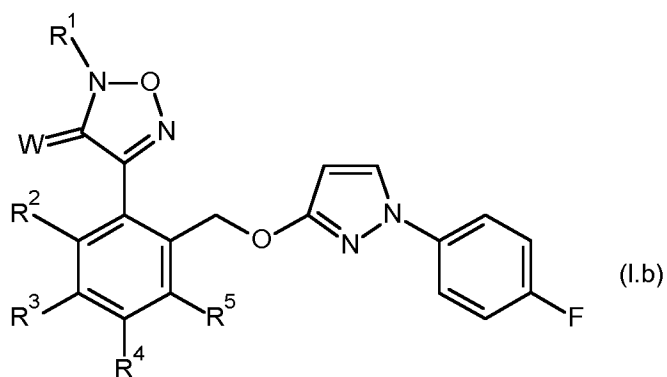
where

a) 116 compounds of formula (I.a):



5 wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

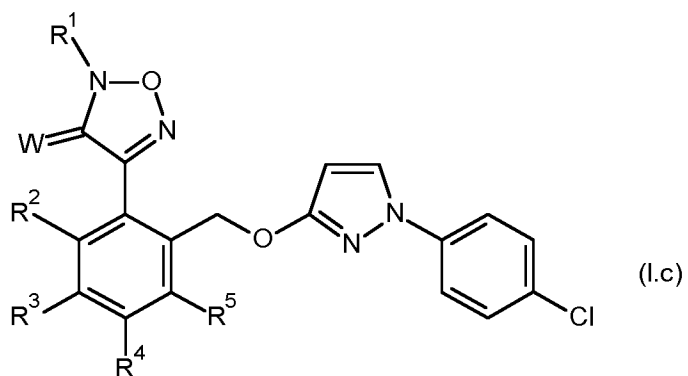
b) 116 compounds of formula (I.b):



wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

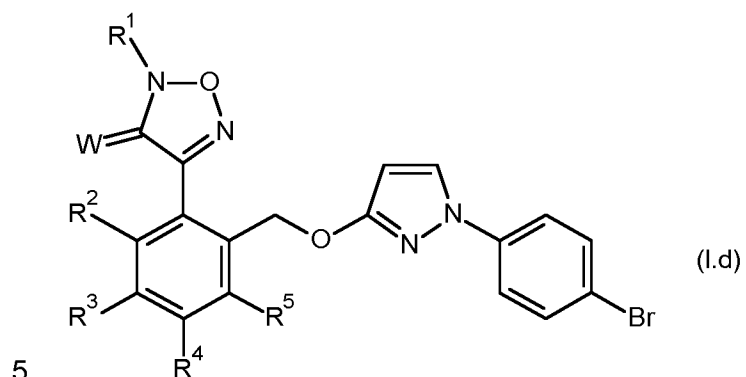
10

c) 116 compounds of formula (I.c):



wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

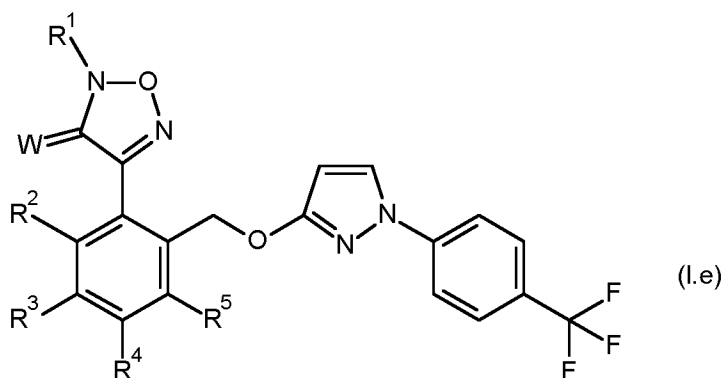
d) 116 compounds of formula (I.d):



5

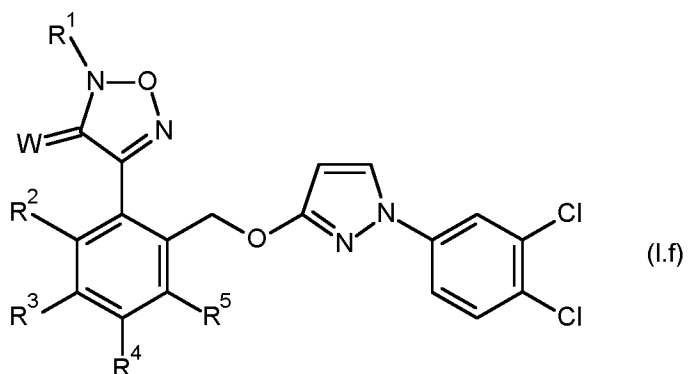
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

e) 116 compounds of formula (I.e):



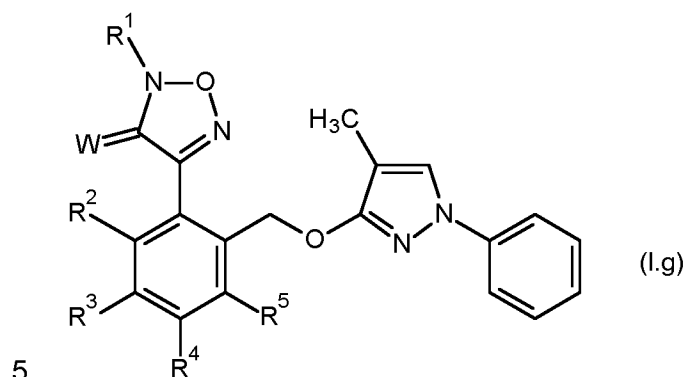
10 wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

f) 116 compounds of formula (I.f):



wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

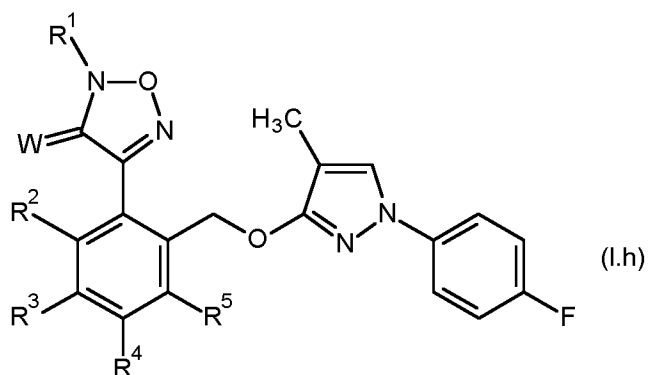
g) 116 compounds of formula (I.g):



5

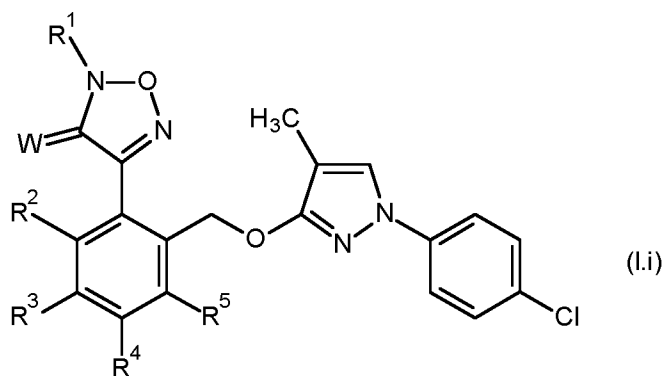
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

h) 116 compounds of formula (I.h):



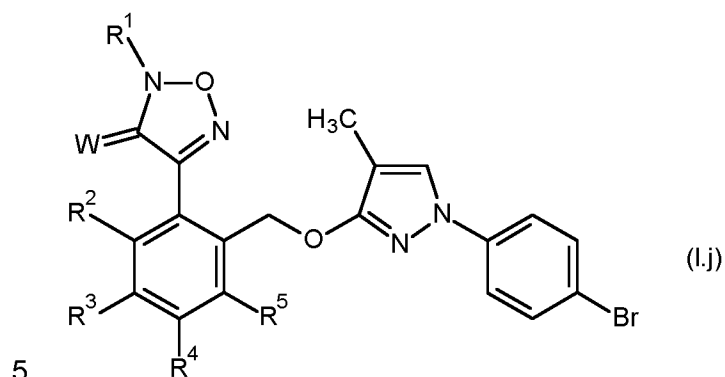
10 wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

i) 116 compounds of formula (I.i):



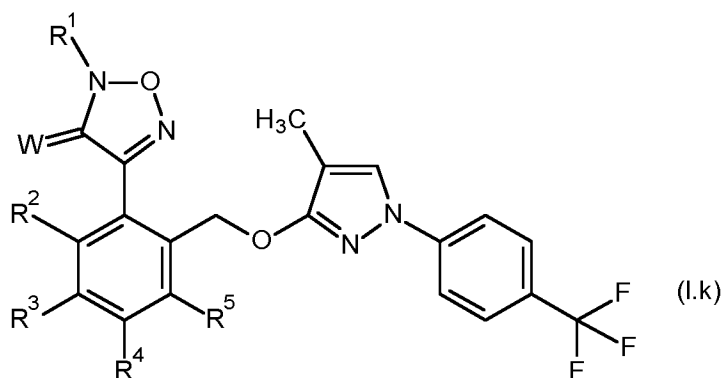
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

j) 116 compounds of formula (I.j):



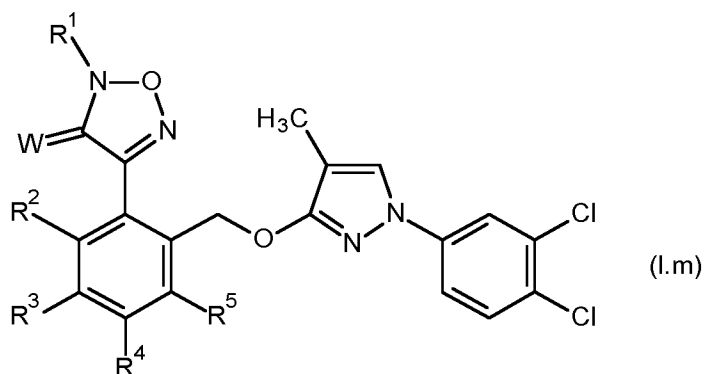
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

k) 116 compounds of formula (I.k):



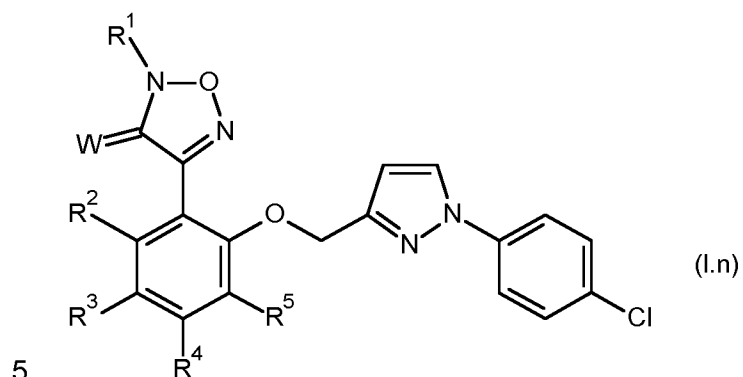
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

m) 116 compounds of formula (I.m):



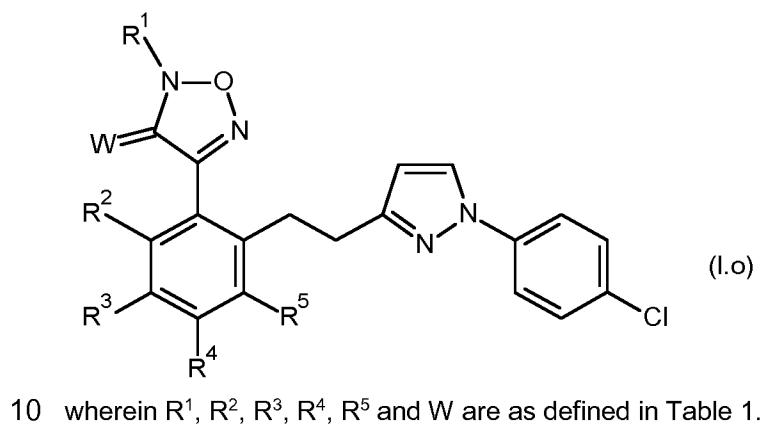
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

n) 116 compounds of formula (l.n):



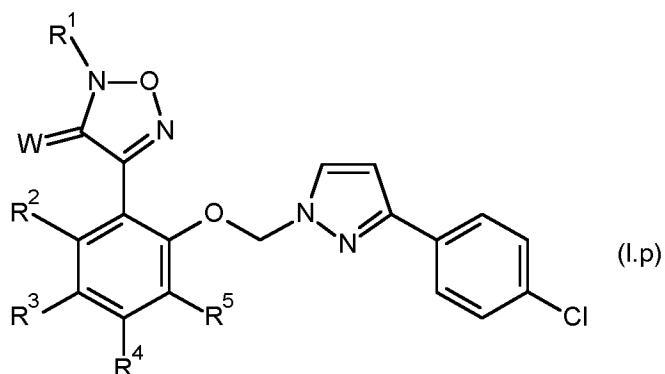
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

o) 116 compounds of formula (l.o):



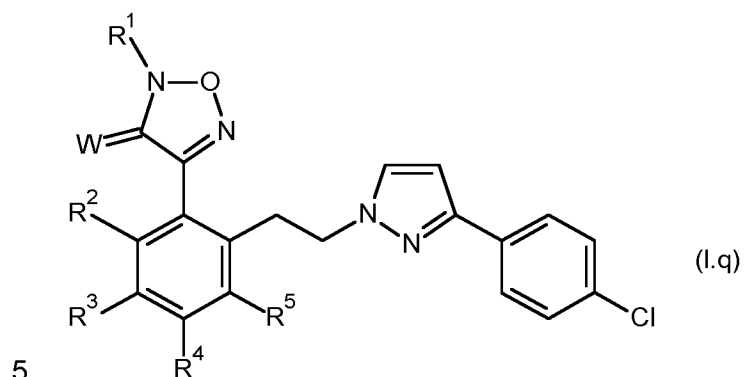
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

p) 116 compounds of formula (l.p):



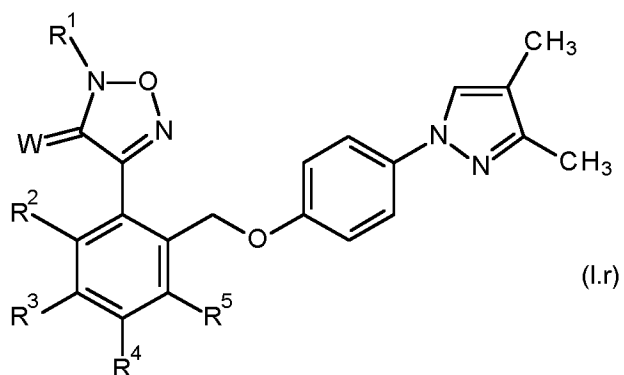
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

q) 116 compounds of formula (I.q):



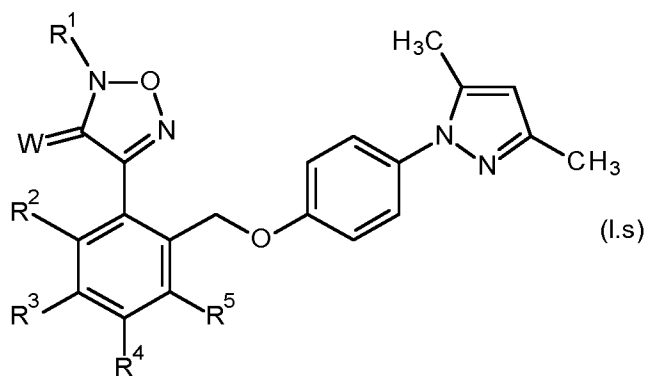
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

r) 116 compounds of formula (I.r):



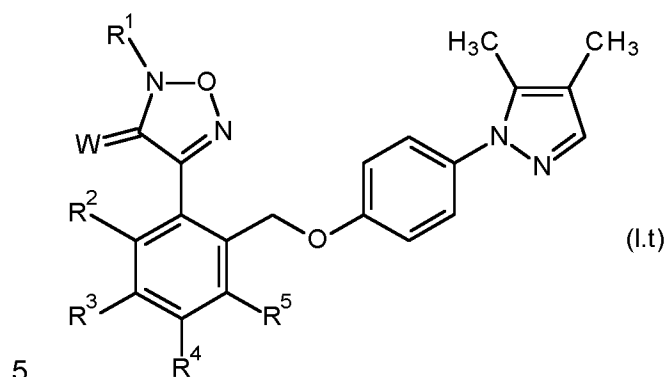
10 wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

s) 116 compounds of formula (I.s):



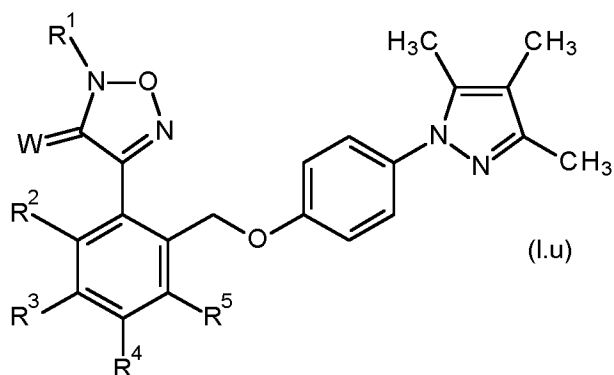
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

t) 116 compounds of formula (I.t):



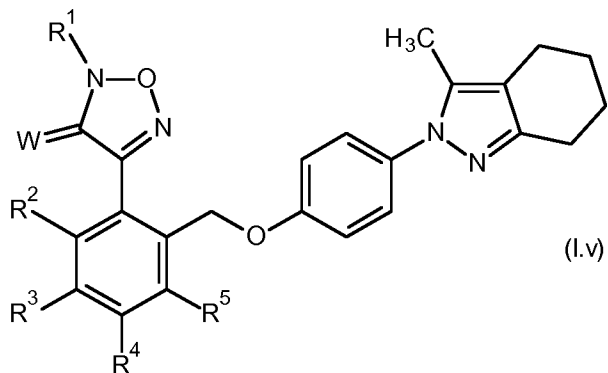
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

u) 116 compounds of formula (I.u):



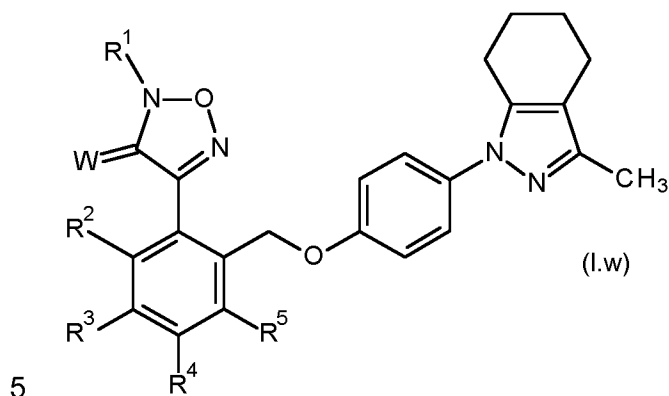
10 wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

v) 116 compounds of formula (I.v):



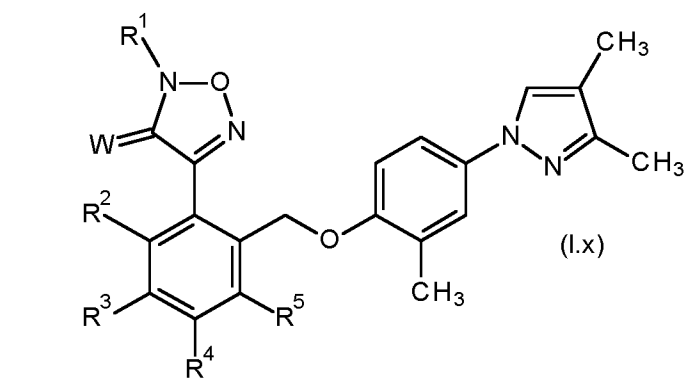
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

w) 116 compounds of formula (I.w):



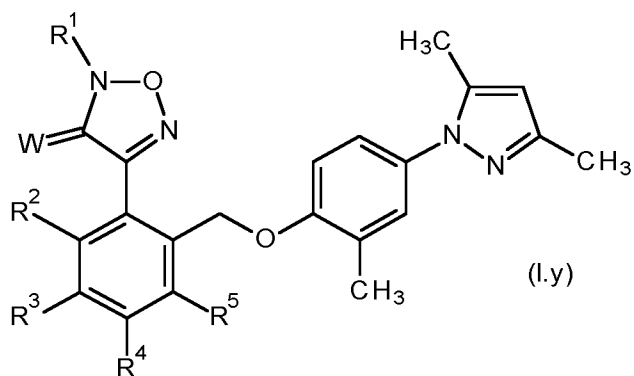
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

x) 116 compounds of formula (I.x):



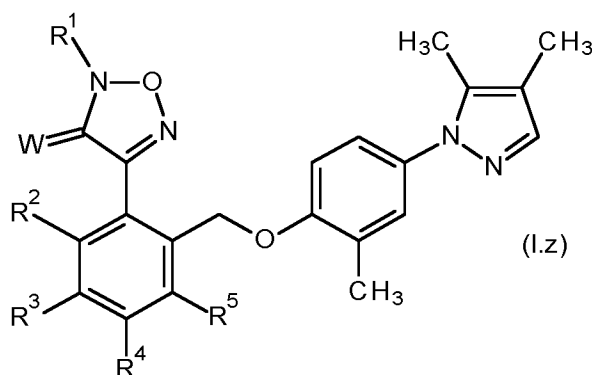
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

y) 116 compounds of formula (I.y):



wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table

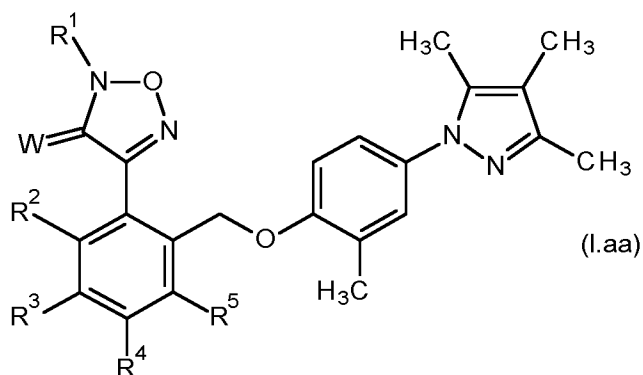
z) 116 compounds of formula (I.z):



5

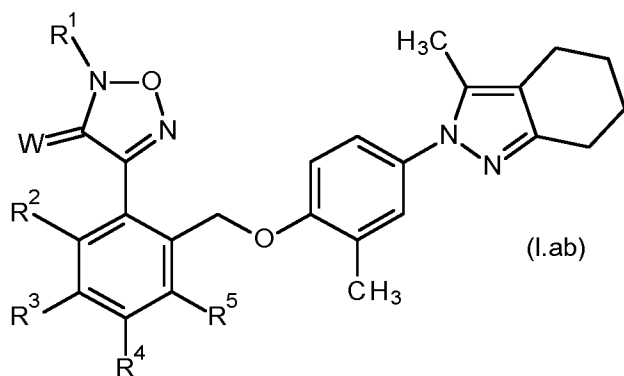
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

aa) 116 compounds of formula (I.aa):



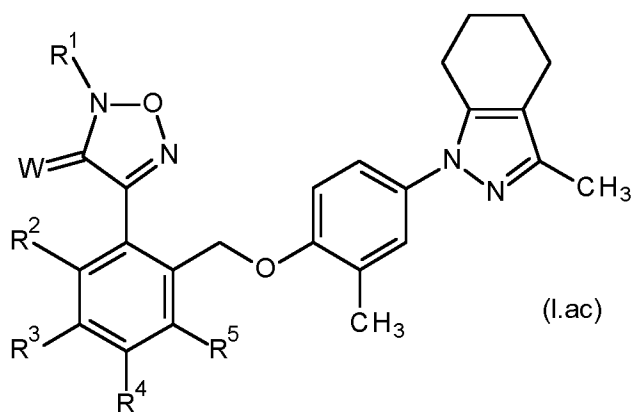
10 wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

ab) 116 compounds of formula (I.ab):



wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

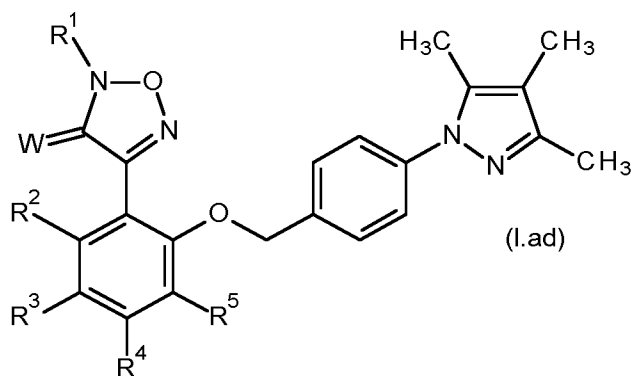
ac) 116 compounds of formula (I.ac):



5

wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

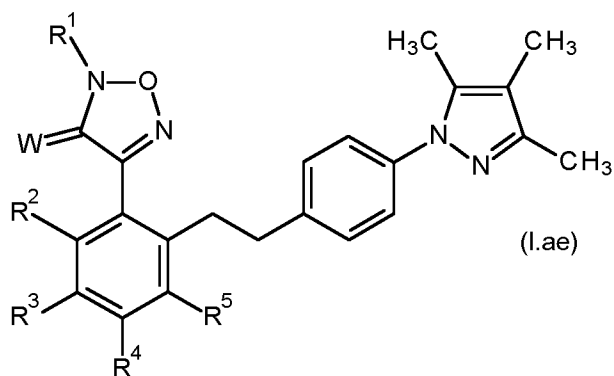
ad) 116 compounds of formula (I.ad):



10

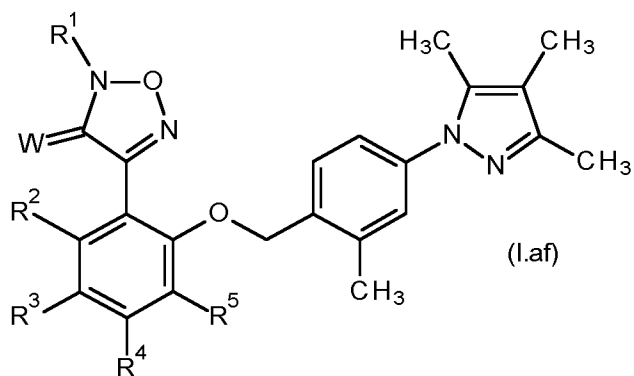
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

ae) 116 compounds of formula (I.ae):



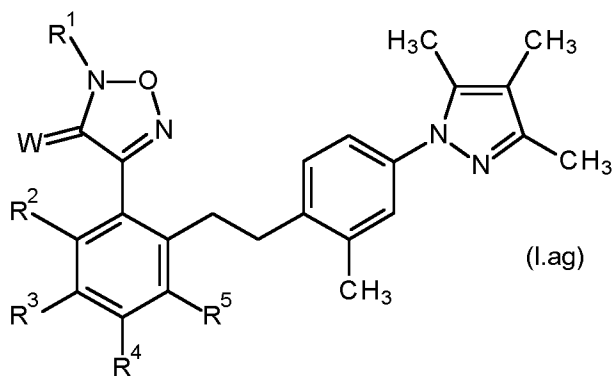
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

5 af) 116 compounds of formula (I.af):



wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

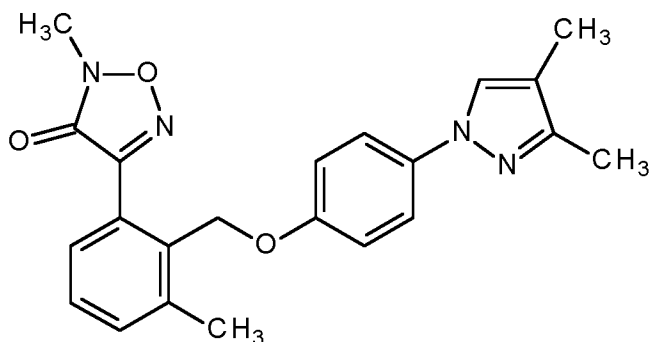
ag) 116 compounds of formula (I.ag):



10

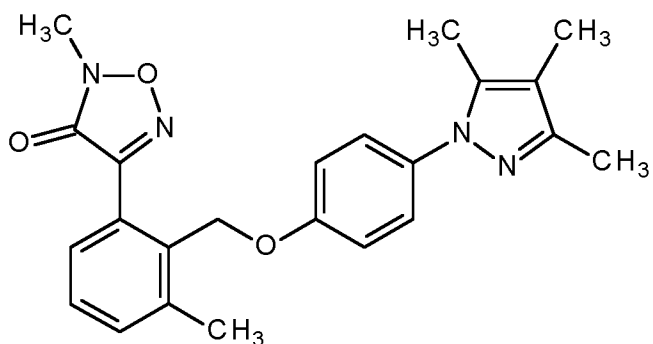
wherein R¹, R², R³, R⁴, R⁵ and W are as defined in Table 1.

Especially preferred compounds are:

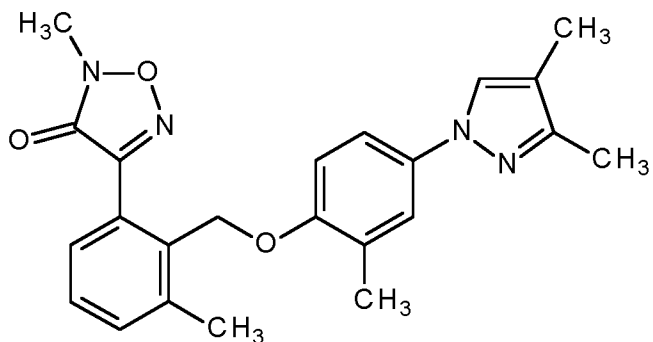


4-[2-[[4-(3,4-dimethylpyrazol-1-yl)phenoxy]methyl]-3-methyl-phenyl]-2-methyl-1,2,5-oxadiazol-3-one;

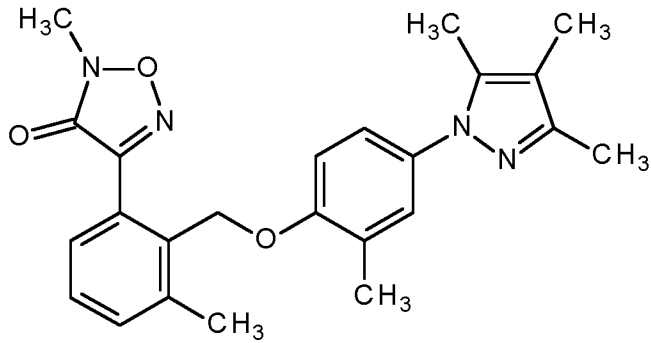
5



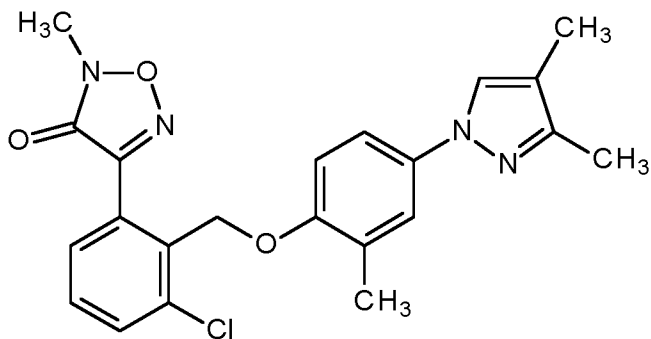
2-methyl-4-[3-methyl-2-[[4-(3,4,5-trimethylpyrazol-1-yl)phenoxy]methyl]phenyl]-1,2,5-oxadiazol-3-one;



10 4-[2-[[4-(3,4-dimethylpyrazol-1-yl)-2-methyl-phenoxy]methyl]-3-methyl-phenyl]-2-methyl-1,2,5-oxadiazol-3-one;

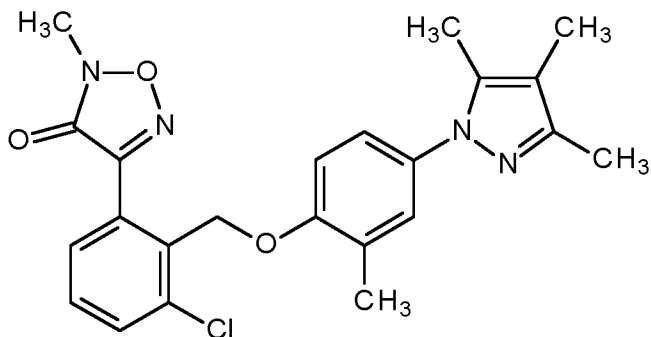


2-methyl-4-[3-methyl-2-[[2-methyl-4-(3,4,5-trimethylpyrazol-1-yl)phenoxy]methyl]phenyl]-1,2,5-oxadiazol-3-one;



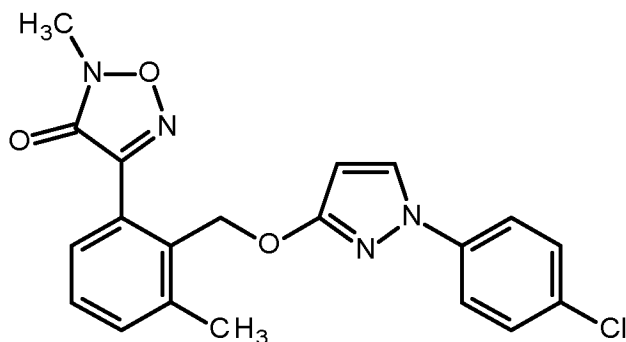
5

4-[3-chloro-2-[[4-(3,4-dimethylpyrazol-1-yl)-2-methyl-phenoxy]methyl]phenyl]-2-methyl-1,2,5-oxadiazol-3-one;

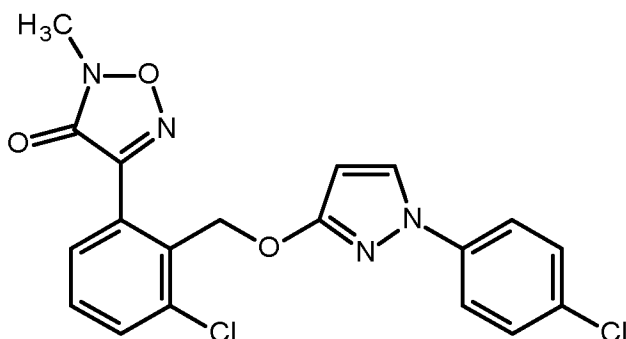


10

4-[3-chloro-2-[[2-methyl-4-(3,4,5-trimethylpyrazol-1-yl)phenoxy]methyl]phenyl]-2-methyl-1,2,5-oxadiazol-3-one;



4-[2-[[1-(4-chlorophenyl)pyrazol-3-yl]oxymethyl]-3-methyl-phenyl]-2-methyl-1,2,5-oxadiazol-3-one; and



5

4-[3-chloro-2-[[1-(4-chlorophenyl)pyrazol-3-yl]oxymethyl]phenyl]-2-methyl-1,2,5-oxadiazol-3-one.

EXAMPLES

10 The Examples which follow serve to illustrate the invention. The compounds of the invention can be distinguished from known compounds 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 60 ppm, 20 ppm or 2 ppm.

15 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).

20 Throughout this description, temperatures are given in degrees Celsius and "m.p." means melting point. LC/MS means Liquid Chromatography Mass Spectroscopy and the description of the apparatus and the methods is as follows:

LC/MS Method :

25 *Method A:* ACQUITY UPLC from Waters, Waters UPLC HSS T3, 1.8 μ m particle size, 30 x 2.1 mm column, 0.85 mL/min., 60 °C, H₂O/MeOH 95:5 + 0.05% HCOOH (90%) / CH₃CN + 0.05% HCOOH (10%) – 1.2 min. – CH₃CN + 0.05% HCOOH (100%) – 0.30 min., ACQUITY SQD Mass Spectrometer from

Waters, ionization method: electrospray (ESI), Polarity: positive ions, Capillary (kV) 3.00, Cone (V) 30.00, Extractor (V) 2.00, Source Temperature (°C) 150, Desolvation Temperature (°C) 350, Cone Gas Flow (L/Hr) 0, Desolvation Gas Flow (L/Hr) 650).

5 *Method B:* ACQUITY UPLC from Waters, Waters UPLC HSS T3, 1.8 µm particle size, 30 x 2.1 mm column, 0.85 mL/min., 60 °C, H₂O/MeOH 95:5 + 0.05% HCOOH (90%) / CH₃CN + 0.05% HCOOH (10%) – 2.7 min. – CH₃CN + 0.05% HCOOH (100%) – 0.30 min., ACQUITY SQD Mass Spectrometer from Waters, ionization method: electrospray (ESI), Polarity: positive ions, Capillary (kV) 3.00, Cone (V) 30.00, Extractor (V) 2.00, Source Temperature (°C) 150, Desolvation Temperature (°C) 350, Cone Gas Flow (L/Hr) 0, Desolvation Gas Flow (L/Hr) 650)).

10

Where necessary, enantiomerically pure final compounds may be obtained from racemic materials as appropriate via standard physical separation techniques, such as reverse phase chiral chromatography, or through stereoselective synthetic techniques, eg, by using chiral starting materials.

15 Formulation Examples

<u>Wettable powders</u>	a)	b)	c)
active ingredient [compound of formula (I)]	25 %	50 %	75 %
sodium lignosulfonate	5 %	5 %	-
sodium lauryl sulfate	3 %	-	5 %
sodium diisobutylphthalenesulfonate	-	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
20 of the desired concentration.

<u>Powders for dry seed treatment</u>	a)	b)	c)
active ingredient [compound of formula (I)]	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.

25

Emulsifiable concentrate

active ingredient [compound of formula (I)]	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.

<u>Dusts</u>	a)	b)	c)
Active ingredient [compound of formula (I)]	5 %	6 %	4 %
Talcum	95 %	-	-
Kaolin	-	94 %	-
mineral filler	-	-	96 %

5

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 ingredient [compound of formula (I)]	15 %
sodium lignosulfonate	2 %
Carboxymethylcellulose	1 %
Kaolin	82 %

10 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 ingredient [compound of formula (I)]	8 %
polyethylene glycol (mol. wt. 200)	3 %
Kaolin	89 %

15 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 ingredient [compound of formula (I)]	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 ingredient [compound of formula (I)]	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 compound of formula (I) are 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.

List of Abbreviations:

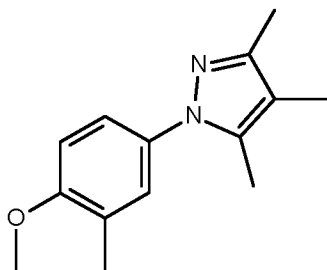
	ACN	= acetonitrile
	CDCl ₃	= chloroform-d
5	°C	= degrees Celsius
	DCM	= dichloromethane
	DIAD	= diisopropyl azodicarboxylate
	DMF	= dimethylformamide
	DMSO	= dimethyl sulfoxide
10	d	= doublet
	EA	= ethyl acetate
	h	= hour(s)
	HATU	= 1-[Bis(dimethylamino)methylene]-1H-1,2,3-triazolo[4,5-b]pyridinium-3-oxide hexafluorophosphate
15	HCl	= hydrochloric acid
	M	= molar
	min	= minutes
	MHz	= mega hertz
	mp	= melting point
20	MTBE	= methyl tert-butyl ether
	ppm	= parts per million
	RT	= room temperature
	s	= singlet
	t	= triplet
25	THF	= tetrahydrofuran
	TPP	= triphenylphosphine
	LC/MS	= Liquid Chromatography Mass Spectrometry (description of the apparatus and the methods used for LC/MS analysis are given above)

30 Preparation examples:

Example 1: This example illustrates the preparation of 2-methyl-4-[3-methyl-2-[[2-methyl-4-(3,4,5-trimethylpyrazol-1-yl)phenoxy]methyl]phenyl]-1,2,5-oxadiazol-3-one (compound I.a.a.005)

35

a) Preparation of 1-(4-methoxy-3-methylphenyl)-3,4,5-trimethyl-1H-pyrazole

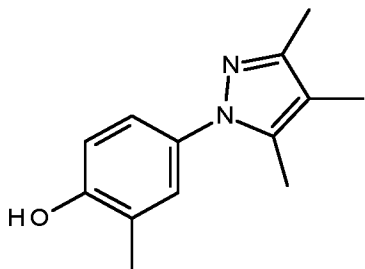


To a solution of (4-methoxy-3-methyl-phenyl)boronic acid (3.01 g, 18.2 mmol) and 3,4,5-trimethyl-1H-pyrazole (2.00 g, 18.2 mmol) in acetonitrile (25.0 mL) were added pyridine (2.87 g, 36.3 mmol) and Cu(II)acetate monohydrate (725 mg, 3.63 mmol) at room temperature. The resulting reaction mixture
5 was stirred at room temperature under O₂ gas atmosphere for 24 h. Reaction mixture was analyzed by TLC (30% EtOAc /hexanes), and it showed no starting material. The reaction mixture was diluted with ethyl acetate (200 mL) and water (100 mL). Organic layer was separated and aqueous layer was extracted with ethyl acetate (2 × 100 mL). The combined organic layer was dried over anhydrous Na₂SO₄ and concentrated under reduced pressure to afford crude reaction mixture.
10 The crude compound was purified by combi-flash (20 to 40% EtOAc/hexanes). Pure fractions were combined and evaporated under reduced pressure to obtain 1-(4-methoxy-3-methyl-phenyl)-3,4,5-trimethyl-pyrazole (2.87 g, 11.8 mmol, 65%) as brownish liquid.

¹H NMR (400 MHz, chloroform-*d*): δ 7.26 – 7.12 (m, 2H), 6.83 (d, *J* = 8.0 Hz, 1H), 3.85 (s, 3H), 2.23 (s, 6H), 2.16 (s, 3H), 1.96 (s, 3H).

15

b) Preparation of 1-(2-methyl-4-(3,4,5-trimethyl-1H-pyrazol-1-yl)phenol)

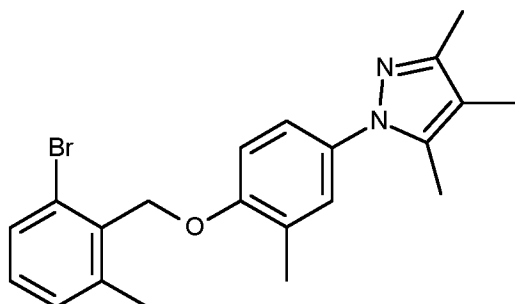


To a stirred solution of 1-(4-methoxy-3-methyl-phenyl)-3,4,5-trimethyl-pyrazole (2.80 g, 12.2 mmol) in CH₂Cl₂ (28 mL) was added BBr₃ (1.0 M in CH₂Cl₂) (9.14 g, 36.5 mmol) at –10 °C. The resulting reaction
20 mixture was stirred at 10 °C for 4 h. Progress of reaction was monitored by TLC (50% EtOAc /hexanes) and it showed no starting material. The reaction mixture was diluted with CH₂Cl₂ (200 mL) and water (50 mL). Organic layer was separated and aqueous layer was further extracted with CH₂Cl₂ (2 × 100 mL). The combined organic layer was dried over anhydrous Na₂SO₄ and concentrated under reduced pressure to afford 1-(2-methyl-4-(3,4,5-trimethyl-1H-pyrazol-1-yl)phenol (1.50 g, 6.24 mmol, 51%) as a
25 light brown solid.

MS (MM) *m/z* 217.1 [M + H]⁺

^1H NMR (400 MHz, $\text{DMSO-}d_6$): δ 7.15 (d, $J = 2.4$ Hz, 1H), 7.06 (dd, $J = 4.0, 8.0$ Hz, 1H), 6.85 (d, $J = 8.0$ Hz, 1H), 2.15 (s, 3H), 2.14 (s, 3H), 1.93 (s, 3H), 1.91 (s, 3H).

- 5 c) Preparation of 1-(4-((2-bromo-6-methylbenzyl)oxy)-3-methylphenyl)-3,4,5-trimethyl-1H-pyrazole



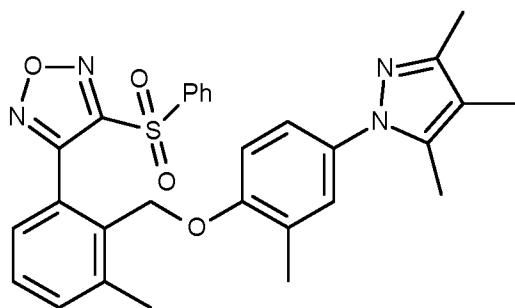
A 100 mL two neck flask equipped with nitrogen balloon was charged with (2-bromo-6-methylphenyl)methanol (1.00 g, 4.97 mmol), 1-(2-methyl-4-(3,4,5-trimethylpyrazol-1-yl)phenol) (1.18 g, 5.47 mmol) in THF (20.0 mL). TPP (1.96 g, 7.46 mmol) was added to the reaction mixture at 0 °C and stirred for 10 min. To this reaction mixture, was added DIAD (1.51 g, 7.46 mmol) drop wise and stirred at room temperature for 8 h. Reaction mixture was analyzed by TLC (20% EtOAc /hexanes), and it showed no starting material. The reaction mixture was diluted with ethyl acetate (100 mL) and water (50 mL). The organic layer was separated, aqueous layer was extracted with ethyl acetate (2 × 50 mL). The combined organic layer was dried over anhydrous Na_2SO_4 and concentrated under reduced pressure to afford crude reaction mixture. The crude compound was purified by combi-flash (10 to 15% EtOAc/hexanes) to obtain an impure material which was again purified by reverse phase chromatography (combi-flash, C18 column) (80 to 100% ACN/water). Pure fractions were combined and evaporated under reduced pressure to obtain 1-[4-[(2-bromo-6-methyl-phenyl) methoxy]-3-methyl-phenyl]-3,4,5-trimethyl-pyrazole (500 mg, 1.19 mmol, 24%) as a brownish solid.

20

MS (MM) m/z 399.0 $[\text{M} + \text{H}]^+$

^1H NMR (400 MHz, chloroform- d): δ 7.47 (d, $J = 8.0$ Hz, 1H), 7.19 – 7.15 (m, 3H), 7.11 (t, $J = 8.0$ Hz, 1H), 7.04 (d, $J = 8.0$ Hz, 1H), 5.22 (s, 2H), 2.46 (s, 3H), 2.23 (s, 3H), 2.20 (s, 3H), 2.18 (s, 3H), 1.97 (s, 25 3H).

- d) Preparation of 3-(3-methyl-2-((2-methyl-4-(3,4,5-trimethyl-1H-pyrazol-1-yl)phenoxy)methyl)phenyl)-4-(phenylsulfonyl)-1,2,5-oxadiazole



A 25 mL two neck flask equipped with nitrogen balloon was charged with 1-[4-[(2-bromo-6-methyl-phenyl) methoxy]-3-methyl-phenyl]-3,4,5-trimethyl-pyrazole (500 mg, 1.25 mmol) in dry THF (6.00 mL). Isopropyl magnesium bromide (0.75 M in THF) (155 mg, 0.626 mmol) was added to the reaction mixture drop-wise at 0 °C and stirred for 10 min. To this reaction mixture, was added *n*-BuLi (2.5 M in hexanes) (78.9 mg, 1.25 mmol) drop wise. After stirring at 0 °C for 10 min, resulting reaction mixture was warmed to at room temperature continued stirring for 1 h. Then reaction mixture was again cooled to –10 °C and a solution of 3,4-bis(benzenesulfonyl)isoxazole (437 mg, 1.25 mmol) in THF was added drop wise for 10 min. The resulting reaction mixture was slowly warmed to room temperature and stirred for 1 h.

10 Reaction mixture was analyzed by TLC (30% EtOAc /hexanes), and it showed no starting material. The reaction mixture was quenched with aq.NH₄Cl (6.0 mL), diluted with ethyl acetate (50 mL) and water (20 mL). Organic layer was separated and aqueous layer was extracted with ethyl acetate (2 × 50 mL). The combined organic layers were dried over anhydrous Na₂SO₄ and concentrated under reduced pressure to afford crude reaction mixture. The crude compound was purified by combi-flash (20 to 30%

15 EtOAc/hexanes). Pure fractions were combined and evaporated under reduced pressure to obtain 3-(benzenesulfonyl)-4-[3-methyl-2-[(2-methyl-4-(3,4,5-trimethylpyrazol-1-yl)phenoxy)methyl]phenyl]-1,2,5-oxadiazole (120 mg, 0.204 mmol, 16%) as a yellow solid.

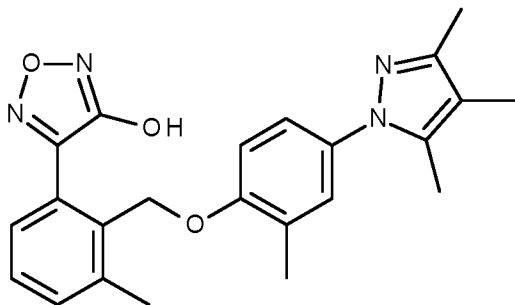
MS (MM) *m/z* 529.1 [M + H]⁺

20

¹H NMR (400 MHz, chloroform-*d*): δ 7.81 – 7.79 (m, *J* = 8.0 Hz, 2H), 7.68 (t, *J* = 8.0 Hz, 1H), 7.52 – 7.47 (m, 3H), 7.40 (t, *J* = 8.0 Hz, 1H), 7.22 (d, *J* = 8.0 Hz, 1H), 7.14 (d, *J* = 2.0 Hz, 1H), 7.07 (dd, *J* = 2.4, 8.4 Hz, 1H), 6.71 (d, *J* = 8.0 Hz, 1H), 4.86 (s, 2H), 2.50 (s, 3H), 2.22 (s, 3H), 2.16 (s, 3H), 2.06 (s, 3H), 1.96 (s, 3H).

25

e) Preparation of 4-(3-methyl-2-((2-methyl-4-(3,4,5-trimethyl-1H-pyrazol-1-yl)phenoxy)methyl)phenyl)-1,2,5-oxadiazol-3-ol



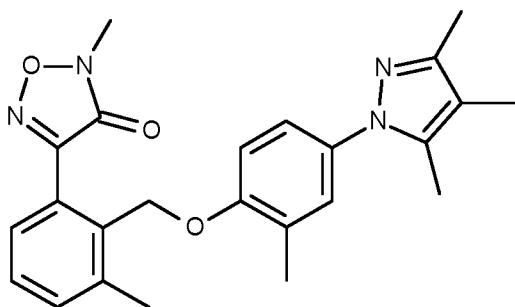
A 4 mL vial was charged with 3-(benzenesulfonyl)-4-[3-methyl-2-[[2-methyl-4-(3,4,5-trimethylpyrazol-1-yl)phenoxy]methyl]phenyl]-1,2,5-oxadiazole (100 mg, 0.189 mmol) and DMSO (2.0 mL). To this
 5 reaction mixture, was added sodium hydroxide (30.3 mg, 0.757 mmol) at 10 °C. The resulting reaction mixture was stirred at room temperature for 16 h. Reaction mixture was analyzed by TLC (60% EtOAc /hexanes) and it showed no starting material. The reaction mixture was slowly neutralized with 2N HCl (0.3 mL), diluted with ethyl acetate (50 mL) and water (20 mL). Organic layer was separated and aqueous layer was extracted with ethyl acetate (2 × 50 mL). The combined organic layer was dried over
 10 anhydrous Na₂SO₄ and concentrated under reduced pressure to obtain 4-(3-methyl-2-((2-methyl-4-(3,4,5-trimethyl-1H-pyrazol-1-yl)phenoxy)methyl)phenyl)-1,2,5-oxadiazol-3-ol (80 mg, crude) as green color liquid. The obtained crude compound was used in next step without further purification.

MS (MM) *m/z* 405.0 [M + H]⁺

15

¹H NMR (400 MHz, DMSO-*d*₆): δ 7.54 – 7.52 (m, 1H), 7.51 – 7.50 (m, 2H), 7.43 – 7.36 (m, 1H), 7.10 (t, *J* = 8.0 Hz, 2H), 6.97 (dd, *J* = 2.0, 4.0 Hz, 1H), 5.08 (s, 2H), 2.48 (s, 3H), 2.10 (s, 3H), 2.04 (s, 3H), 1.92 (s, 3H), 1.85 (s, 3H).

20 f) Preparation of 2-methyl-4-[3-methyl-2-[[2-methyl-4-(3,4,5-trimethylpyrazol-1-yl)phenoxy]methyl]phenyl]-1,2,5-oxadiazol-3-one (Compound I.a.a.005)



25 A 25 mL flask equipped with nitrogen balloon was charged with 4-[3-methyl-2-[[2-methyl-4-(3,4,5-trimethylpyrazol-1-yl)phenoxy]methyl]phenyl]-1,2,5-oxadiazol-3-ol (80.0 mg, 0.198 mmol) and CH₂Cl₂ (1.0 mL). CH₂N₂ (0.5M in MTBE) (83.2 mg, 1.98 mmol) was added to the reaction mixture by drop-wise at 0 °C, stirred for 30 min. The resulting reaction mixture was slowly warmed to room temperature and

stirred for 5 h. Reaction mixture was analyzed by TLC (30% EtOAc /hexanes) and it showed no starting material. The reaction mixture was diluted with CH₂Cl₂ (50 mL) and water (20 mL). Organic layer was separated and aqueous layer was extracted with CH₂Cl₂ (2 × 50 mL). The combined organic layer was dried over anhydrous Na₂SO₄ and concentrated under reduced pressure to afford crude reaction mixture 5 which was purified by combi-flash (10 to 50% EtOAc/hexanes). Pure fractions were combined and evaporated under reduced pressure to obtain 2-methyl-4-[3-methyl-2-[[2-methyl-4-(3,4,5-trimethylpyrazol-1-yl)phenoxy]methyl]phenyl]-1,2,5-oxadiazol-3-one (Compound I.aa.005, 8.0 mg, 0.0172 mmol, 8.7%) as an off white solid.

10 MS (MM) *m/z* 419.0 [M + H]⁺

¹H NMR (400 MHz, chloroform-*d*): δ 7.54 – 7.51 (m, 1H), 7.35 – 7.32 (m, 2H), 7.08 (d, *J* = 4.0 Hz, 1H), 7.04 (dd, *J* = 4.0, 8.0 Hz, 1H), 6.83 (d, *J* = 8.0 Hz, 1H), 5.20 (s, 2H), 3.62 (s, 3H), 2.43 (s, 3H), 2.16 (s, 3H), 2.09 (s, 3H), 2.00 (s, 3H), 1.89 (s, 3H).

15

Table 2 provides selected compounds of the present invention.

Preferably, the compound according to formula (I) is compound I.aa.005 or I.c.005 listed in Table 2 (below).

20

Table 2: ¹H-NMR data and LC/MS data (Rt = Retention time) for selected compounds of Table 1.

No.	Structure	¹ H-NMR (400 MHz, CDCl ₃)	LC/MS
I.aa.005		7.54 – 7.51 (m, 1H), 7.35 – 7.32 (m, 2H), 7.08 (d, <i>J</i> = 4.0 Hz, 1H), 7.04 (dd, <i>J</i> = 4.0, 8.0 Hz, 1H), 6.83 (d, <i>J</i> = 8.0 Hz, 1H), 5.20 (s, 2H), 3.62 (s, 3H), 2.43 (s, 3H), 2.16 (s, 3H), 2.09 (s, 3H), 2.00 (s, 3H), 1.89 (s, 3H)	
I.c.005			Rt = 1.12 min; MS: <i>m/z</i> = 397 (M+1)

25

Biological examplesAlternaria solani / tomato / leaf disc (early blight)

- 5 Tomato leaf disks cv. Baby are placed on agar in multiwell plates (24-well format) and sprayed with the formulated test compound diluted in water. The leaf disks are inoculated with a spore suspension of the fungus 2 days after application. The inoculated leaf disks are incubated at 23 °C / 21°C (day/night) and 80% rh under a light regime of 12/12 h (light/dark) in a climate cabinet and the activity of a compound is assessed as percent disease control compared to untreated when an appropriate
- 10 level of disease damage appears on untreated check disk leaf disks (5 – 7 days after application).

Compounds I.c.005 and I.aa.005 at 200 ppm in the formulation give at least 80% disease control in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development.

- 15 Blumeria graminis f. sp. tritici (Erysiphe graminis f. sp. tritici) / wheat / leaf disc preventative (Powdery mildew on wheat)

- Wheat leaf segments cv. Kanzler are placed on agar in a multiwell plate (24-well format) and sprayed with the test compound formulated with DMSO and Tween20 and diluted in water. The leaf
- 20 disks are inoculated by shaking powdery mildew infected plants above the test plates 1 day after application. The inoculated leaf disks are incubated at 20°C and 60% rh under a light regime of 24 h 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 leaf segments (6 - 8 days after application).

- 25 Compounds I.c.005 and I.aa.005 at 200 ppm in the formulation give at least 80% disease control in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development.

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

- 30 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.

- 35 Compounds I.c.005 and I.aa.005 at 200 ppm in the formulation give at least 80% disease control in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development.

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),
5 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 to 4 days after application.

Compounds I.c.005 and I.aa.005 at 200 ppm in the formulation give at least 80% disease control in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development.

10

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
15 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.

Compounds I.c.005 and I.aa.005 at 200 ppm in the formulation give at least 80% disease control in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development.

20

Mycosphaerella arachidis (Cercospora arachidicola) / liquid culture (early leaf spot)

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),
25 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.

Compounds I.c.005 and I.aa.005 at 200 ppm in the formulation give at least 80% disease control in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development.

30

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),
35 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 to 5 days after application.

Compounds I.c.005 and I.aa.005 at 200 ppm in the formulation give at least 80% disease control in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development.

40

Puccinia recondita f. sp. *tritici* / wheat / leaf disc preventative (Brown rust)

Wheat leaf segments cv. Kanzler are placed on agar in multiwell plates (24-well format) and sprayed with the formulated test compound diluted in water. The leaf disks are inoculated with a spore suspension of the fungus 1 day after application. The inoculated leaf segments are incubated at 19°C and 75% rh under a light regime of 12 h light / 12 h darkness in a climate cabinet and the activity of a compound is assessed as percent disease control compared to untreated when an appropriate level of disease damage appears in untreated check leaf segments (7 – 9 days after application).

Compounds I.c.005 and I.aa.005 at 200 ppm in the formulation give at least 80% disease control in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development.

Pyrenophora teres / barley / leaf disc preventative (Net blotch)

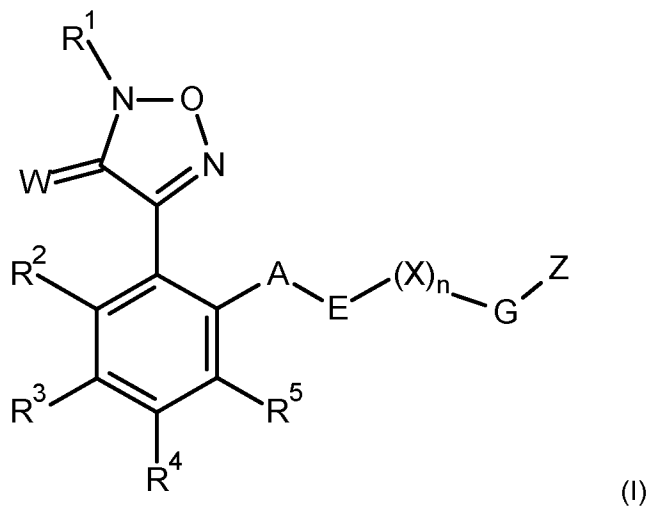
Barley leaf segments cv. Hasso are placed on agar in a multiwell plate (24-well format) and sprayed with the formulated test compound diluted in water. The leaf segments are inoculated with a spore suspension of the fungus 2 days after application. The inoculated leaf segments are incubated at 20°C and 65% rh under a light regime of 12 h light / 12 h darkness in a climate cabinet and the activity of a compound is assessed as disease control compared to untreated when an appropriate level of disease damage appears in untreated check leaf segments (5 – 7 days after application).

Compounds I.c.005 and I.aa.005 at 200 ppm in the formulation give at least 80% disease control in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development.

CLAIMS:

1. A compound of formula (I)

5



wherein

10 R¹ is C₁-C₆alkyl or C₃-C₆cycloalkyl;

R² is selected from the group consisting of hydrogen, halogen, cyano, C₁-C₆alkyl, C₁-C₆haloalkyl and C₃-C₆cycloalkyl;

15 R³ and R⁴ are each independently selected from the group consisting of hydrogen, halogen, cyano, C₁-C₆alkyl, C₁-C₆haloalkyl and C₃-C₆cycloalkyl;

R⁵ is selected from the group consisting of hydrogen, halogen, cyano, C₁-C₆alkyl, C₁-C₆haloalkyl and C₃-C₆cycloalkyl;

20

W is O or S;

A is a direct bond or CR⁶R⁷;

25

E is CR⁶R⁷, O, S or SO₂;

X is CR⁶R⁷;

n is 0, 1 or 2;

30

5 G is carbocyclyl, wherein the carbocyclyl is a 6- to 10-membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated or saturated, or heterocyclyl, wherein the heterocyclyl is a 5- to 10- membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated or saturated, comprising 1, 2, 3 or 4 heteroatoms individually selected from nitrogen, oxygen and sulphur, and wherein said carbocyclyl or heterocyclyl are optionally substituted by 1, 2 or 3 R⁸ substituents, which may be the same or different;

10 Z is hydrogen, carbocyclyl, carbocyclyloxy, wherein the carbocyclyl is a 6- to 10-membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated or saturated, heterocyclyl or heterocyclyloxy, wherein the heterocyclyl is a 5- to 10- membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated or saturated, comprising 1, 2, 3 or 4 heteroatoms individually selected from nitrogen, oxygen and sulphur,

15 and wherein any of said carbocyclyl, carbocyclyloxy, heterocyclyl or heterocyclyloxy are optionally substituted by 1, 2 or 3 R⁹ substituents, which may be the same or different;

R⁶ and R⁷ are each independently selected from the group consisting of hydrogen, halogen and C₁-C₆alkyl;

20 each R⁸ is independently selected from the group consisting of hydroxy, halogen, cyano, C₁-C₆alkyl, C₂-C₆alkenyl, C₂-C₆alkynyl, C₁-C₆alkoxy, C₃-C₆cycloalkyl, C₃-C₆cycloalkoxy, C₁-C₆alkylsulfonyl, C₁-C₆haloalkyl, C₁-C₆haloalkoxy, C₃-C₆halocycloalkyl, C₁-C₆alkoxyC₁-C₆alkyl, C₁-C₆haloalkoxyC₁-C₆alkyl, C₁-C₆haloalkylsulfonyl and C₁-C₆alkylcarbonyl; and

25 each R⁹ is independently selected from the group consisting of hydroxy, halogen, cyano, C₁-C₆alkyl, C₂-C₆alkenyl, C₂-C₆alkynyl, C₁-C₆alkoxy, C₃-C₆cycloalkyl, C₃-C₆cycloalkoxy, C₁-C₆alkylsulfonyl, C₁-C₆haloalkyl, C₁-C₆haloalkoxy, C₃-C₆halocycloalkyl, C₁-C₆alkoxyC₁-C₆alkyl, C₁-C₆haloalkoxyC₁-C₆alkyl, C₁-C₆haloalkylsulfonyl and C₁-C₆alkylcarbonyl;

30 or an agronomically acceptable salt;

or N-oxide thereof.

2. The compound according to claim 1, wherein R¹ is methyl.
- 35 3. The compound according to claim 1 or claim 2, wherein R² is hydrogen.
4. The compound according to any one of claims 1 to 3, wherein R³ and R⁴ are hydrogen.
- 40 5. The compound according to any one of claims 1 to 4, wherein R⁵ is methyl.

6. The compound according to any one of claims 1 to 5, wherein W is O.
7. The compound according to any one of claims 1 to 6, wherein A is CH₂.
- 5 8. The compound according to any one of claims 1 to 7, wherein E is O.
9. The compound according to any one of claims 1 to 8, wherein n is 0.
10. The compound according to any one of claims 1 to 9, wherein G is phenyl or heteroaryl, wherein
10 the heteroaryl is a 5- or 6-membered aromatic ring which comprises 1, 2 or 3 heteroatoms individually selected from nitrogen, oxygen and sulphur, wherein said phenyl or heteroaryl are optionally substituted by 1 or 2 R⁸ substituents, which may be the same or different.
11. The compound according to any one of claims 1 to 10, wherein G is phenyl or pyrazolyl, wherein
15 said phenyl or pyrazolyl are optionally substituted by 1 R⁸ substituent.
12. The compound according to any one of claims 1 to 11, wherein Z is phenyl or heterocyclyl, wherein the heterocyclyl is a 5- to 10- membered mono- or fused bicyclic ring system, which may be aromatic and/or partially saturated, comprising 1, 2 or 3 heteroatoms individually
20 selected from nitrogen and oxygen, and wherein any of said phenyl or heterocyclyl are optionally substituted by 1, 2 or 3 R⁹ substituents, which may be the same or different.
13. The compound according to any one of claims 1 to 12, wherein Z is phenyl or pyrazolyl, wherein
25 said phenyl or pyrazolyl are optionally substituted by 1, 2 or 3 R⁹ substituents, which may be the same or different.
14. The compound according to any one of claims 1 to 13, wherein each R⁸ and R⁹ is independently selected from the group consisting of halogen, C₁-C₆alkyl and C₁-C₆haloalkyl.
30
15. An agrochemical composition comprising a fungicidally effective amount of a compound of formula (I) according to any one of claims 1 to 14 and an agrochemically-acceptable diluent or carrier.
- 35 16. The composition according to claim 15, further comprising at least one additional active ingredient.
17. A method of controlling or preventing infestation of useful plants by phytopathogenic microorganisms, wherein a fungicidally effective amount of a compound of formula (I) according
40 to any of claims 1 to 14, or a composition comprising this compound as active ingredient, is applied to the plants, to parts thereof or the locus thereof.

18. Use of a compound of formula (I) according to any one of claims 1 to 14 as a fungicide.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/070924

A. CLASSIFICATION OF SUBJECT MATTER
INV. C07D413/12 A01N43/82
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)
C07D A01N

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, EMBASE, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	LEONID L. FERSHTAT ET AL: "Side-chain prototropic tautomerism of 4-hydroxyfuroxans in methylation reactions", TETRAHEDRON LETTERS, vol. 57, no. 50, 7 November 2016 (2016-11-07), pages 5685-5689, XP055620884, AMSTERDAM, NL ISSN: 0040-4039, DOI: 10.1016/j.tetlet.2016.11.023 table 3; compound 5f	1-18
A	JP H06 306064 A (TOSOH CORP) 1 November 1994 (1994-11-01) page 5; claims 1, 2; compounds 2-7	1-18
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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search 11 September 2019	Date of mailing of the international search report 14/10/2019
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Moriggi, J
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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/070924

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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A	EP 3 246 316 A1 (SUMITOMO CHEMICAL CO [JP]) 22 November 2017 (2017-11-22) claims 1, 4-6 -----	1-18
A	WO 2013/162072 A1 (SUMITOMO CHEMICAL CO [JP]) 31 October 2013 (2013-10-31) paragraph [0005]; claims 1, 18-20 -----	1-18
A	WO 97/05120 A1 (SUMITOMO CHEMICAL CO [JP]; OHSUMI TADASHI [JP]; MATSUNAGA REI [JP]) 13 February 1997 (1997-02-13) page 19 - page 26; claims 1, 5; compounds 1-70 -----	1-18

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2019/070924

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