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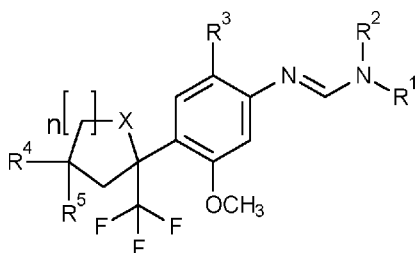
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(54) Title: MICROBIOCIDAL PHENYLAMIDINE DERIVATIVES



(I)

(57) Abstract: Compounds of the formula (I) wherein the substituents are as defined in claim 1. Furthermore, the present invention relates to agrochemical compositions which comprise compounds of formula (I), to preparation of these compositions, and to the use of the compounds or compositions in agriculture or horticulture for combating, preventing or controlling infestation of plants, harvested food crops, seeds or non-living materials by phytopathogenic microorganisms, in particular fungi.



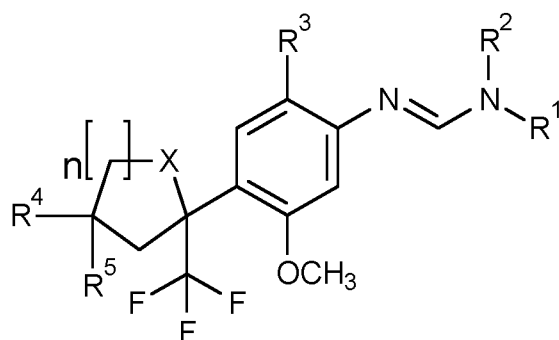
MICROBIOCIDAL PHENYLAMIDINE DERIVATIVES

The present invention relates to microbiocidal phenylamidine derivatives, e.g. as active ingredients, which have microbiocidal activity, in particular fungicidal activity. The invention also relates to preparation of these phenylamidine derivatives, to intermediates useful in the preparation of these phenylamidine derivatives, to the preparation of these intermediates, to agrochemical compositions which comprise at least one of the phenylamidine derivatives, to preparation of these compositions and to the use of the phenylamidine 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, in particular fungi.

Certain fungicidal phenylamidine compounds are described in WO 2000/046184.

It has now surprisingly been found that certain novel phenylamidine derivatives have favourable fungicidal properties.

The present invention therefore provides compounds of formula (I)



(I)

wherein

R¹ and R² are each independently selected from C₁-C₄alkyl and C₃-C₈cycloalkyl; or

R¹ and R² together with the nitrogen atom to which they are attached form a three- to six- membered saturated cyclic group;

R³ is hydrogen, halogen or C₁-C₄ alkyl;

R⁴ and R⁵ are each independently selected from hydrogen and C₁-C₄ alkyl; or

R⁴ and R⁵ together with the carbon atom to which they are attached form a carbonyl group (C=O);

X is O, S or NCH₃;

n is 0 or 1;

and salts, metal complexes, stereoisomers and N-oxides thereof.

In a second aspect the present invention provides an agrochemical composition comprising a compound of formula (I).

Compounds of formula (I) may be used to control phytopathogenic microorganisms. Thus, in order to control a phytopathogen a compound of formula (I), or a composition
5 comprising a compound of formula (I), according to the invention may be applied directly to the phytopathogen, or to the locus of a phytopathogen, in particular to a plant susceptible to attack by phytopathogens.

Thus, in a third aspect the present invention provides the use of a compound of formula (I), or a composition comprising a compound of formula (I), as described herein to
10 control a phytopathogen.

In a further aspect the present invention provides a method of controlling phytopathogens, comprising applying a compound of formula (I), or a composition comprising a compound of formula (I), as described herein to said phytopathogen, or to the locus of said phytopathogen, in particular to a plant susceptible to attack by a
15 phytopathogen.

Compounds of formula (I) are particularly effective in the control of phytopathogenic fungi.

Thus, in a yet further aspect the present invention provides the use of a compound of formula (I), or a composition comprising a compound of formula (I), as described herein to
20 control phytopathogenic fungi.

In a further aspect the present invention provides a method of controlling phytopathogenic fungi, comprising applying a compound of formula (I), or a composition comprising a compound of formula (I), as described herein to said phytopathogenic fungi, or to the locus of said phytopathogenic fungi, in particular to a plant susceptible to attack by
25 phytopathogenic fungi.

Where substituents are indicated as being optionally substituted, this means that they may or may not carry one or more identical or different substituents, e.g. one to four substituents. Normally not more than three such optional substituents are present at the
30 same time. Preferably not more than two such optional substituents are present at the same time (i.e. the group may be optionally substituted by one or two of the substituents indicated as "optional"). Where the "optional substituent" group is a larger group, such as cycloalkyl or phenyl, it is most preferred that only one such optional substituent is present. Where a group is indicated as being substituted, e.g. alkyl, this includes those groups that are part of other
35 groups, e.g. the alkyl in alkylthio.

The term "halogen" refers to fluorine, chlorine, bromine or iodine, preferably fluorine, chlorine or bromine.

Alkyl substituents (either alone or as part of a larger group, such as alkoxy-, alkylthio-) may be straight-chained or branched. Alkyl on its own or as part of another substituent is, depending upon the number of carbon atoms mentioned, for example, methyl, ethyl, n-propyl, n-butyl, n-pentyl, n-hexyl and the isomers thereof, for example, iso-propyl, iso-butyl, 5 sec-butyl, *tert*-butyl or iso-amyl.

Cycloalkyl substituents may be saturated or partially unsaturated, preferably fully saturated, and are, for example, cyclopropyl, cyclobutyl, cyclopentyl or cyclohexyl.

Haloalkyl groups (either alone or as part of a larger group, eg. haloalkyloxy) may contain one or more identical or different halogen atoms and, for example, may stand for 10 CH_2Cl , CHCl_2 , CCl_3 , CH_2F , CHF_2 , CF_3 , CF_3CH_2 , CH_3CF_2 , CF_3CF_2 or CCl_3CCl_2 .

Alkoxy means a radical -OR, where R is alkyl, e.g. as defined above. Alkoxy groups include, but are not limited to, methoxy, ethoxy, 1-methylethoxy, propoxy, butoxy, 1-methylpropoxy and 2-methylpropoxy.

15 The presence of one or more possible asymmetric carbon atoms in a compound of formula (I) means that the compounds may occur in optically 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 20 and mixtures thereof for a compound of formula (I). Likewise, formula (I) is intended to include all possible tautomers. 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 oxidized form as a N-oxide or in salt form, e.g. an agronomically usable salt form.

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

Preferred values of R^1 , R^2 , R^3 , R^4 , R^5 , X and n are, in any combination thereof, as set 30 out below:

Preferably R^1 and R^2 are each independently C_1 - C_4 alkyl.

More preferably R^1 and R^2 are each independently selected from methyl, ethyl and isopropyl.

Even more preferably R^1 is methyl, ethyl or isopropyl and R^2 is methyl or ethyl.

35 Most preferably R^1 is ethyl or isopropyl and R^2 is methyl.

Preferably R^3 is halogen or C_1 - C_3 alkyl.

More preferably R^3 is fluoro, chloro or methyl.

Even more preferably R^3 is chloro or methyl.

Most preferably R^3 is methyl.

Preferably R^4 and R^5 are each independently selected from hydrogen and methyl, or R^4 and R^5 together with the carbon atom to which they are attached form a carbonyl group.

5 More preferably R^4 and R^5 are both hydrogen, or R^4 and R^5 together with the carbon atom to which they are attached form a carbonyl group.

Most preferably R^4 and R^5 are both hydrogen.

Preferably X is O or S.

Most preferably X is O.

10 Most preferably n is 1.

Embodiments according to the invention are provided as set out below.

Embodiment 1 provides compounds of formula (I), or a salt, stereoisomer or N-oxide thereof, as defined above.

15 Embodiment 2 provides compounds according to embodiment 1, or a salt, stereoisomer or N-oxide thereof, wherein R^1 and R^2 are each independently C_1 - C_4 alkyl.

Embodiment 3 provides compounds according to embodiment 1 or 2, or a salt, stereoisomer or N-oxide thereof, wherein R^3 is halogen or C_1 - C_3 alkyl.

20 Embodiment 4 provides compounds according to any one of embodiments 1, 2 or 3, or a salt, stereoisomer or N-oxide thereof, wherein R^4 and R^5 are each independently selected from hydrogen and methyl, or R^4 and R^5 together with the carbon atom to which they are attached form a carbonyl group.

Embodiment 5 provides compounds according to any one of embodiments 1, 2, 3 or 4, or a salt, stereoisomer or N-oxide thereof, wherein X is O or S.

25 Embodiment 6 provides compounds according to any one of embodiments 1, 2, 3, 4, or 5, or a salt, stereoisomer or N-oxide thereof, wherein R^1 and R^2 are each independently selected from methyl, ethyl and isopropyl.

Embodiment 7 provides compounds according to any one of embodiments 1, 2, 3, 4, 5, or 6, or a salt, stereoisomer or N-oxide thereof, wherein R^3 is fluoro, chloro or methyl.

30 Embodiment 8 provides compounds according to any one of embodiments 1, 2, 3, 4, 5, 6, or 7, or a salt, stereoisomer or N-oxide thereof, wherein R^4 and R^5 are both hydrogen, or R^4 and R^5 together with the carbon atom to which they are attached form a carbonyl group.

Embodiment 9 provides compounds according to any one of embodiments 1, 2, 3, 4, 5, 6, 7, or 8, or a salt, stereoisomer or N-oxide thereof, wherein R^1 is methyl, ethyl or
35 isopropyl and R^2 is methyl or ethyl.

Embodiment 10 provides compounds according to any one of embodiments 1, 2, 3, 4, 5, 6, 7, 8, or 9, or a salt, stereoisomer or N-oxide thereof, wherein R^3 is chloro or methyl.

Embodiment 11 provides compounds according to any one of embodiments 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, or a salt, stereoisomer or N-oxide thereof, wherein R¹ is ethyl or isopropyl and R² is methyl.

Embodiment 12 provides compounds according to any one of embodiments 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11, or a salt, stereoisomer or N-oxide thereof, wherein R³ is methyl.

Embodiment 13 provides compounds according to any one of embodiments 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 or 12, or a salt, stereoisomer or N-oxide thereof, wherein R⁴ and R⁵ are both hydrogen.

Embodiment 14 provides compounds according to any one of embodiments 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 or 13, or a salt, stereoisomer or N-oxide thereof, wherein n is 1.

Embodiment 15 provides compounds according to any one of embodiments 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 or 14, or a salt, stereoisomer or N-oxide thereof, wherein X is O.

A preferred group of compounds according to the invention are those of formula (I-1) which are compounds of formula (I) wherein

R¹ and R² are each independently C₁-C₄ alkyl;

R³ is halogen or C₁-C₃ alkyl;

R⁴ and R⁵ are each independently selected from hydrogen and methyl, or R⁴ and R⁵ together with the carbon atom to which they are attached form a carbonyl group;

X is O, S or NCH₃;

n is 0 or 1;

or a salt, stereoisomer or N-oxide thereof.

One group of compounds according to this embodiment are compounds of formula (I-1a) which are compounds of formula (I-1) wherein X is O.

Another group of compounds according to this embodiment are compounds of formula (I-1b) which are compounds of formula (I-1) wherein X is S.

Another group of compounds according to this embodiment are compounds of formula (I-1c) which are compounds of formula (I-1) wherein X is NCH₃.

A further preferred group of compounds according to the invention are those of formula (I-2) which are compounds of formula (I) wherein

R¹ and R² are each independently selected from methyl, ethyl and isopropyl;

R³ is fluoro, chloro or methyl;

R⁴ and R⁵ are both hydrogen, or R⁴ and R⁵ together with the carbon atom to which they are attached form a carbonyl group;

X is O, S or NCH₃;

n is 0 or 1;

or a salt, stereoisomer or N-oxide thereof.

One group of compounds according to this embodiment are compounds of formula (I-2a) which are compounds of formula (I-2) wherein X is O.

Another group of compounds according to this embodiment are compounds of formula (I-2b) which are compounds of formula (I-2) wherein X is S.

Another group of compounds according to this embodiment are compounds of formula (I-2c) which are compounds of formula (I-2) wherein X is NCH₃.

A further preferred group of compounds according to the invention are those of formula (I-3) which are compounds of formula (I) wherein

R¹ is methyl, ethyl or isopropyl and R² is methyl or ethyl;

R³ is chloro or methyl;

R⁴ and R⁵ are both hydrogen, or R⁴ and R⁵ together with the carbon atom to which they are attached form a carbonyl group;

X is O, S or NCH₃;

n is 0 or 1;

or a salt, stereoisomer or N-oxide thereof.

One group of compounds according to this embodiment are compounds of formula (I-3a) which are compounds of formula (I-3) wherein X is O.

Another group of compounds according to this embodiment are compounds of formula (I-3b) which are compounds of formula (I-3) wherein X is S.

Another group of compounds according to this embodiment are compounds of formula (I-3c) which are compounds of formula (I-3) wherein X is NCH₃.

A further preferred group of compounds according to the invention are those of formula (I-4) which are compounds of formula (I) wherein

R¹ is ethyl or isopropyl and R² is methyl;

R³ is methyl;

R⁴ and R⁵ are both hydrogen;

X is O or S;

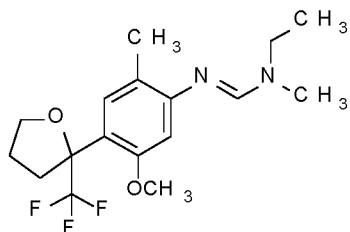
n is 0 or 1 (preferably n is 1);

or a salt, stereoisomer or N-oxide thereof.

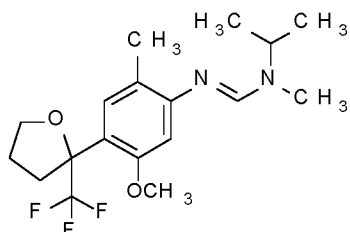
One group of compounds according to this embodiment are compounds of formula (I-4a) which are compounds of formula (I-4) wherein X is O.

Another group of compounds according to this embodiment are compounds of formula (I-4b) which are compounds of formula (I-4) wherein X is S.

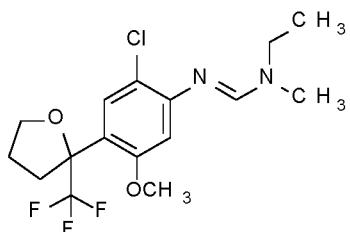
Certain preferred compounds of formula (I) are:



N-ethyl-N'-[5-hydroxy-2-methyl-4-[2-(trifluoromethyl)tetrahydrofuran-2-yl]phenyl]-N-methyl-formamidine;

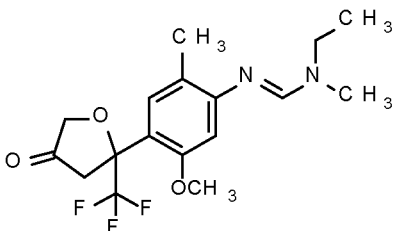


N'-[5-hydroxy-2-methyl-4-[2-(trifluoromethyl)tetrahydrofuran-2-yl]phenyl]-N-isopropyl-N-methyl-formamidine;

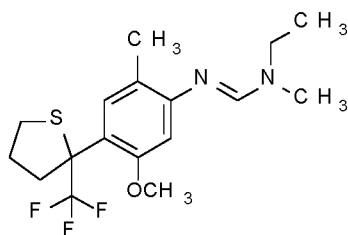


N'-[2-chloro-5-hydroxy-4-[2-(trifluoromethyl)tetrahydrofuran-2-yl]phenyl]-N-ethyl-N-methyl-formamidine;

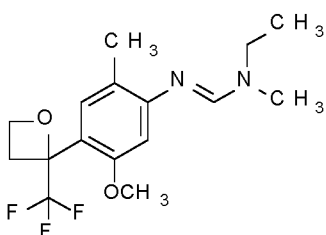
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N-ethyl-N'-[5-hydroxy-2-methyl-4-[4-oxo-2-(trifluoromethyl)tetrahydrofuran-2-yl]phenyl]-N-methyl-formamidine;



N-ethyl-N'-[5-hydroxy-2-methyl-4-[2-(trifluoromethyl)tetrahydrothiophen-2-yl]phenyl]-N-methyl-formamidine;



5

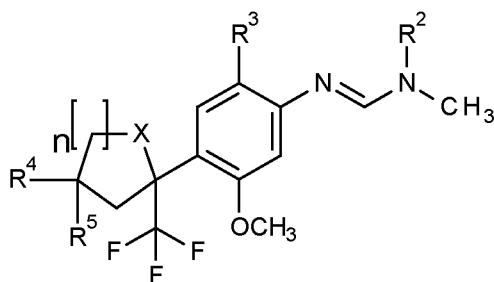
N-ethyl-N'-[5-hydroxy-2-methyl-4-[2-(trifluoromethyl)oxetan-2-yl]phenyl]-N-methyl-formamidine.

Compounds according to the invention 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, improved physico-chemical properties, or increased biodegradability).

15

Specific examples of compounds of formula (I) are illustrated in the Tables 1 to 4 below.

Each of Tables 1 to 4, which follow Table P below, make available 48 compounds of the formula (I-A)



(I-A)

20

wherein R², R³, X and n are as defined in Table P (below) and R⁴ and R⁵ are as defined in Tables 1 to 4, respectively.

Thus, Table 1 individualizes 48 compounds of formula (I-A) wherein for each row of Table P, R⁴ and R⁵ are as defined in Table 1; similarly, Table 2 individualizes 48 compounds of formula (I-A) wherein for each row of Table P, R⁴ and R⁵ are as defined in Table 2; and so on for Tables 3 and 4.

Table P

Entry	R ²	R ³	X	n
P.01	Me	H	O	0
P.02	Me	H	O	1
P.03	Me	H	S	0
P.04	Me	H	S	1
P.05	Me	Cl	O	0
P.06	Me	Cl	O	1
P.07	Me	Cl	S	0
P.08	Me	Cl	S	1
P.09	Me	Me	O	0
P.10	Me	Me	O	1
P.11	Me	Me	S	0
P.12	Me	Me	S	1
P.13	Et	H	O	0
P.14	Et	H	O	1
P.15	Et	H	S	0
P.16	Et	H	S	1
P.17	Et	Cl	O	0
P.18	Et	Cl	O	1
P.19	Et	Cl	S	0
P.20	Et	Cl	S	1
P.21	Et	Me	O	0
P.22	Et	Me	O	1
P.23	Et	Me	S	0
P.24	Et	Me	S	1
P.25	<i>i</i> -Pr	H	O	0
P.26	<i>i</i> -Pr	H	O	1
P.27	<i>i</i> -Pr	H	S	0
P.28	<i>i</i> -Pr	H	S	1
P.29	<i>i</i> -Pr	Cl	O	0
P.30	<i>i</i> -Pr	Cl	O	1
P.31	<i>i</i> -Pr	Cl	S	0
P.32	<i>i</i> -Pr	Cl	S	1
P.33	<i>i</i> -Pr	Me	O	0

Entry	R ²	R ³	X	n
P.34	<i>i</i> -Pr	Me	O	1
P.35	<i>i</i> -Pr	Me	S	0
P.36	<i>i</i> -Pr	Me	S	1
P.37	cyclopropyl	H	O	0
P.38	cyclopropyl	H	O	1
P.39	cyclopropyl	H	S	0
P.40	cyclopropyl	H	S	1
P.41	cyclopropyl	Cl	O	0
P.42	cyclopropyl	Cl	O	1
P.43	cyclopropyl	Cl	S	0
P.44	cyclopropyl	Cl	S	1
P.45	cyclopropyl	Me	O	0
P.46	cyclopropyl	Me	O	1
P.47	cyclopropyl	Me	S	0
P.48	cyclopropyl	Me	S	1

Table 1: This table discloses 48 compounds 1.01 to 1.48 of the formula I-A wherein R⁴ and R⁵ are both hydrogen, and wherein the variables R², R³, X and n have the specific meaning given in the corresponding line of Table P. For example, compound 1.01 has the following structure:

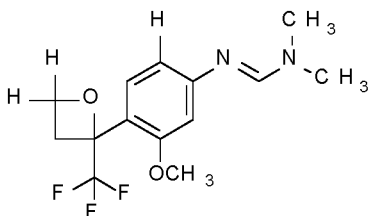


Table 2: This table discloses 48 compounds 2.01 to 2.48 of the formula I-A wherein R⁴ and R⁵ are both methyl, and wherein the variables R², R³, X and n have the specific meaning given in the corresponding line of Table P.

Table 3: This table discloses 48 compounds 3.01 to 3.48 of the formula I-A wherein R⁴ and R⁵ are both ethyl, and wherein the variables R², R³, X and n have the specific meaning given in the corresponding line of Table P.

15

Table 4: This table discloses 48 compounds 4.01 to 4.48 of the formula I-A wherein R⁴ and R⁵ together form a carbonyl group, and wherein the variables R², R³, X and n have the specific meaning given in the corresponding line of Table P.

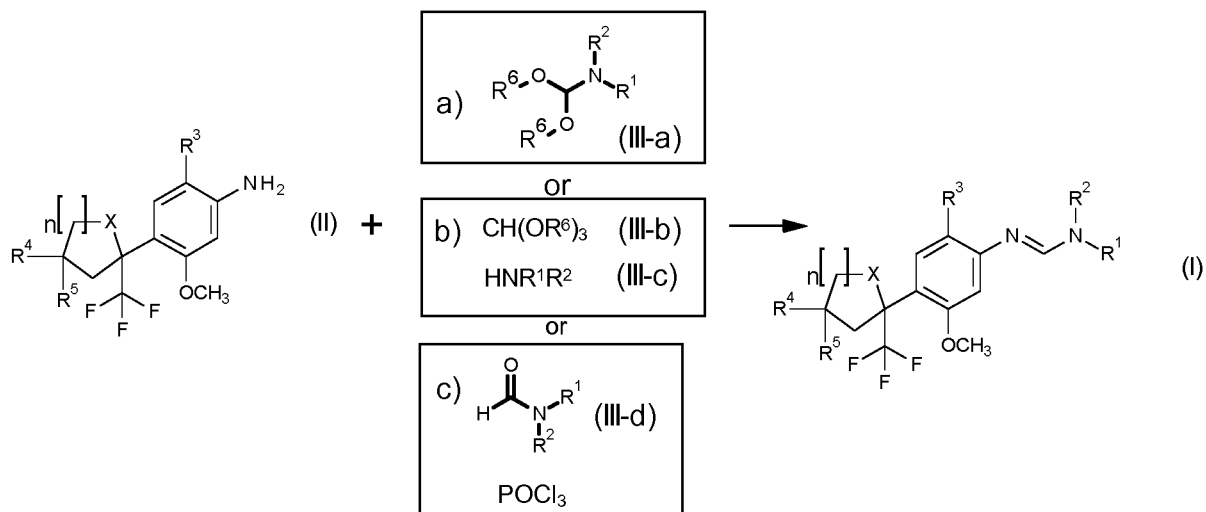
Compounds of the present invention can be made as shown in the following schemes, in which, unless otherwise stated, the definition of each variable is as defined above for a compound of formula (I).

The compounds of formula (I), wherein R^1 , R^2 , R^3 , R^4 , R^5 , X and n are as defined for formula (I), can be obtained by transformation of a compound of formula (II), wherein R^3 , R^4 , R^5 , X and n are as defined for formula (I), by several known methods among which the most widely uses are the following:

- a) Treatment with a compound of formula (III-a), wherein R^1 and R^2 are as defined for formula (I) and R^6 is C_1 - C_4 alkyl, in an organic solvent such as toluene or methanol at temperatures between 0 °C and 100 °C.
- b) Treatment with an orthoester of formula (III-b), wherein R^6 is C_1 - C_4 alkyl, followed by treatment with an amine of formula (III-c), wherein R^1 and R^2 are as defined for formula (I), in an organic solvent such as methanol at temperatures between 20 °C and 100 °C.
- c) Treatment with a formamide of formula (III-d), wherein R^1 and R^2 are as defined for formula (I), and an activating agent such as $POCl_3$ in an inert solvent such as dichloromethane at temperatures between -20 °C and 40 °C

This is shown in Scheme 1 below.

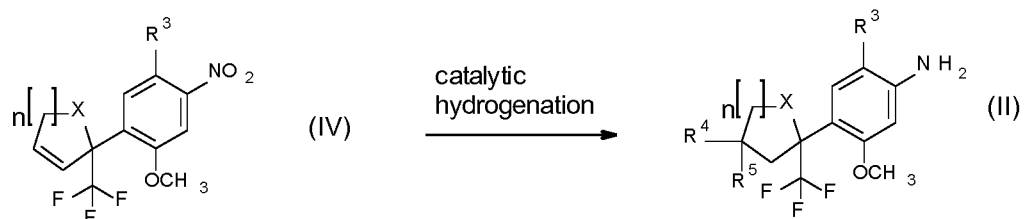
Scheme 1



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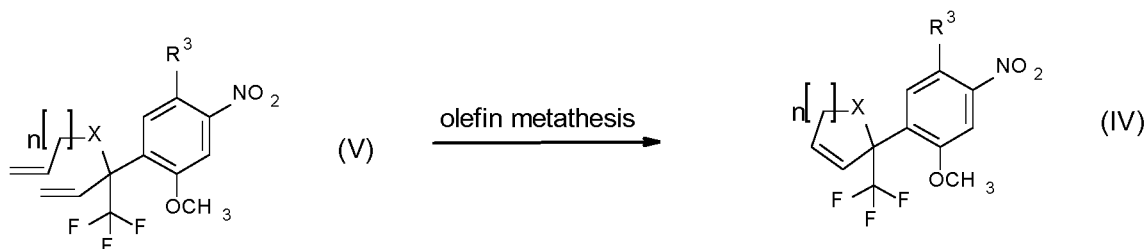
Compounds of formula (II), wherein R^3 , X and n are as defined for formula (I) and R^4 and R^5 are hydrogen, can be obtained by transformation of a compound of formula (IV), wherein R^3 , X and n are as defined for formula (I), under reductive conditions, e.g. by catalytic hydrogenation. This is shown in Scheme 2 below.

Scheme 2



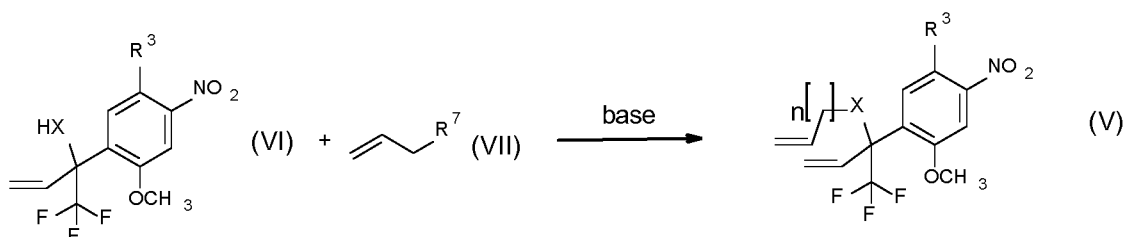
Compounds of formula (IV), wherein R^3 , X and n are as defined for formula (I), can be obtained by transformation of a compound of formula (V), wherein R^3 , X and n are as defined for formula (I), with a transition metal catalyst system under the conditions of the olefin metathesis. This is shown in Scheme 3 below.

Scheme 3



Compounds of formula (V), wherein R^3 and X are as defined for formula (I) and n is 1, can be obtained by transformation of a compound of formula (VI), wherein R^3 and X are as defined for formula (I), with a compound of formula (VII), wherein R^7 is halogen, preferably chloro or bromo and with a base. This is shown in Scheme 4 below.

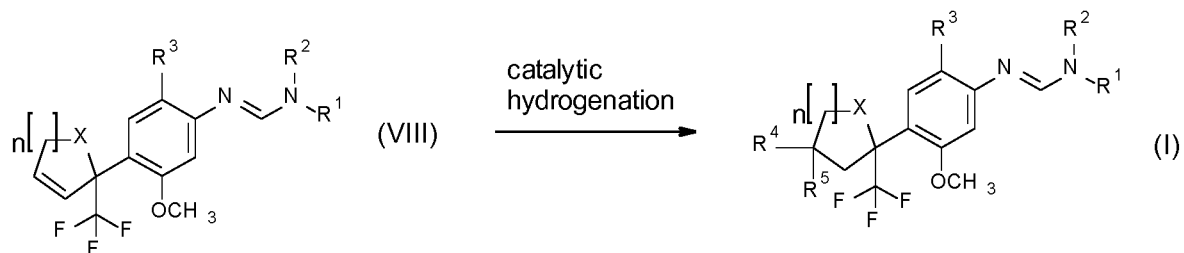
Scheme 4



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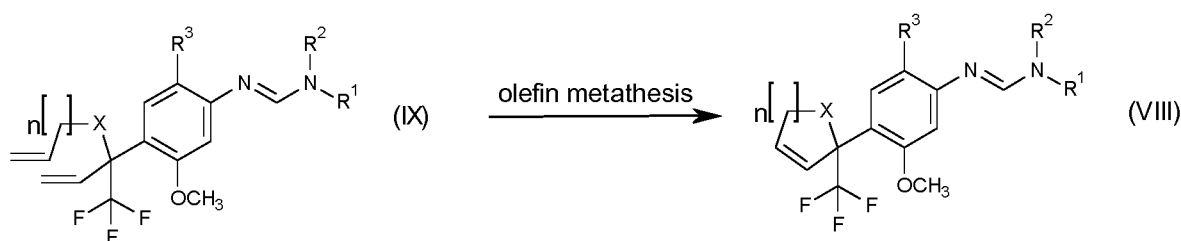
Alternatively, the compounds of formula (I), wherein R^1 , R^2 , R^3 , X and n are as defined for formula (I) and R^4 and R^5 are hydrogen, can be obtained by transformation of a compound of formula (VIII), wherein R^1 , R^2 , R^3 , X and n are as defined for formula (I), under reductive conditions, e.g. by catalytic hydrogenation.. This is shown in Scheme 5 below.

Scheme 5



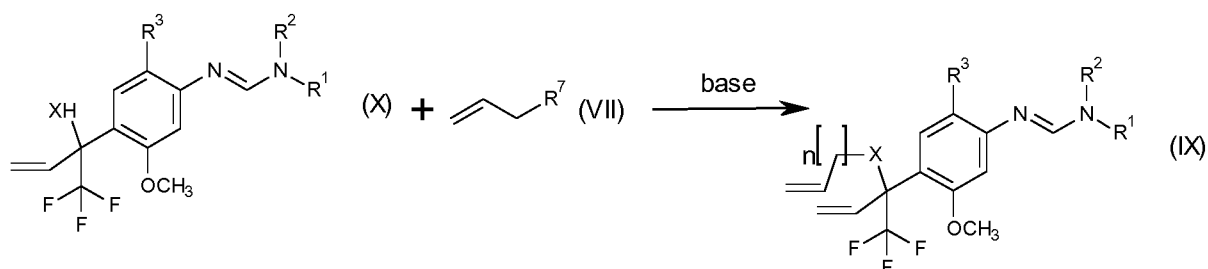
The compounds of formula (VIII), wherein R^1 , R^2 , R^3 , X and n are as defined for formula (I) can be obtained by transformation of a compound of formula (IX), wherein R^1 , R^2 , R^3 , X and n are as defined for formula (I), with a transition metal catalyst system under the conditions of the olefin metathesis. This is shown in Scheme 6 below.

Scheme 6



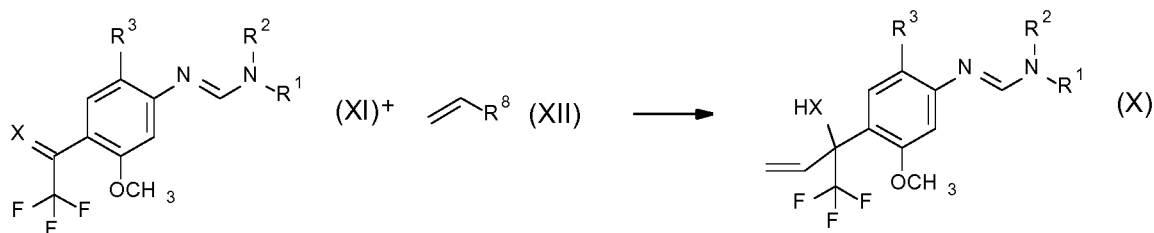
Compounds of formula (IX), wherein R^1 , R^2 , R^3 and X are as defined for formula (I) and n is 1, can be obtained by transformation of a compound of formula (X), wherein R^1 , R^2 , R^3 and X are as defined for formula (I), with a compound of formula (VII), wherein R^7 is halogen, preferably chloro or bromo and with a base. This is shown in Scheme 7 below.

Scheme 7



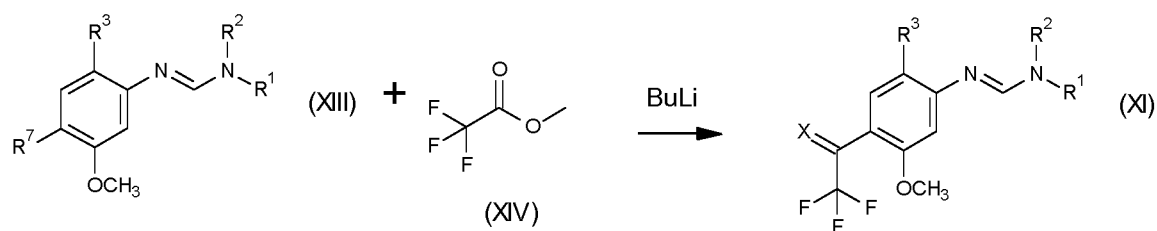
Compounds of formula (X), wherein R^1 , R^2 , R^3 and X are as defined for formula (I), can be obtained by transformation of a compound of formula (XI), wherein R^1 , R^2 , R^3 and X are as defined for formula (I), with a compound of formula (XII), wherein R^8 is MgBr or Li . This is shown in Scheme 8 below.

Scheme 8



5 Compounds of formula (XI), wherein R¹, R² and R³ are as defined for formula (I) and X is O, can be obtained by transformation of a compound of formula (XIII), wherein R¹, R² and R³ are as defined for formula (I) and R⁷ is halogen, preferably bromo or iodo, with a compound of formula (XIV) and with a strong base, such as butyl lithium. This is shown in Scheme 9 below.

10 Scheme 9

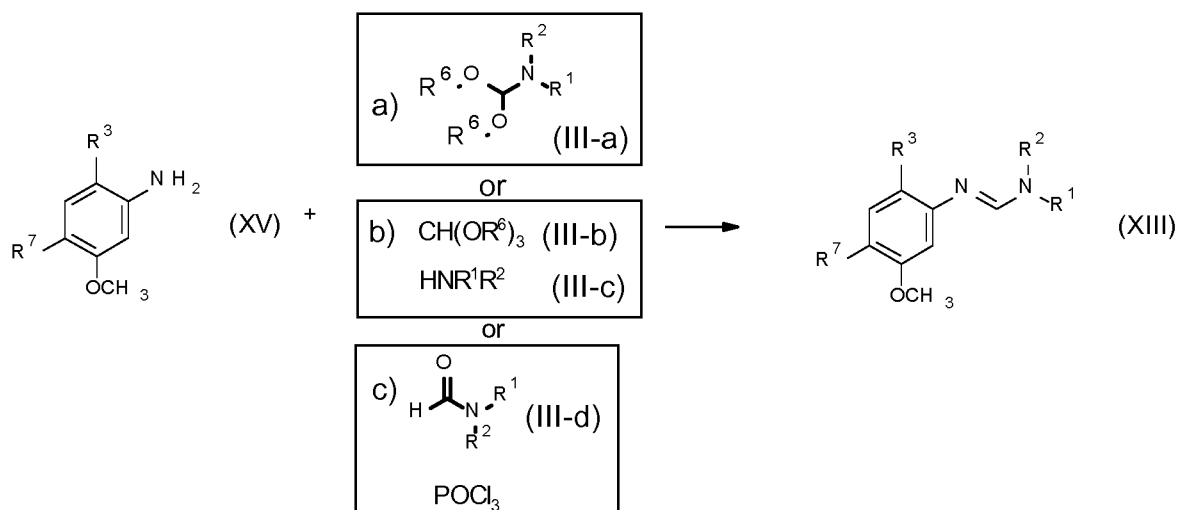


The compounds of formula (XIII), wherein R¹, R² and R³ are as defined for formula (I) and R⁷ is halogen, preferably bromo or iodo, can be obtained by transformation of a compound of formula (XV), wherein R³ is as defined for formula (I) and R⁷ is halogen, preferably bromo or iodo, by several known methods among which the most widely uses are the following:

- 20 a) Treatment with a compound of formula (III-a), wherein R¹ and R² are as defined for formula (I) and R⁶ is C₁-C₄alkyl, in an organic solvent such as toluene or methanol at temperatures between 0 °C and 100 °C.
- b) Treatment with an orthoester of formula (III-b), wherein R⁶ is C₁-C₄alkyl, followed by treatment with an amine of formula (III-c), wherein R¹ and R² are as defined for formula (I), in an organic solvent such as methanol at temperatures between 20 °C and 100 °C.
- 25 c) Treatment with a formamide of formula (III-d), wherein R¹ and R² are as defined for formula (I), and an activating agent such as POCl₃ in an inert solvent such as dichloromethane at temperatures between -20 °C and 40 °C

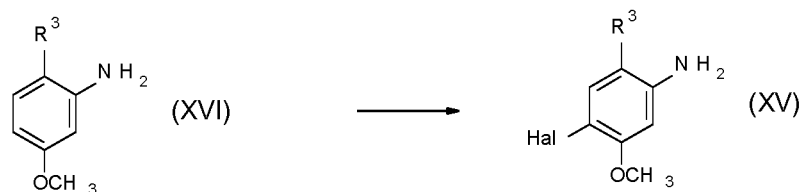
This is shown in Scheme 10 below.

Scheme 10



- 5 The compounds of formula (XV), wherein R^3 is as defined for formula (I) and R^7 is halogen, preferably bromo or iodo, can be obtained by transformation of a compound of formula (XVI), wherein R^3 is as defined for formula (I) with a halogenation agent, such as bromine, N-bromosuccinimide or N-iodosuccinimide. This is shown in Scheme 11 below.

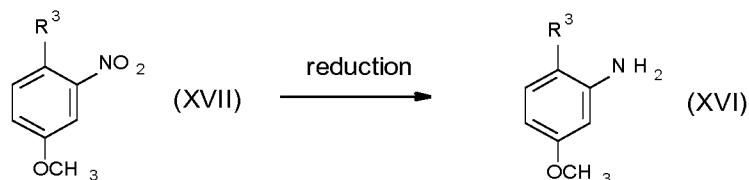
Scheme 11



10

The compounds of formula (XVI), wherein R^3 is as defined for formula (I), can be obtained by transformation of a compound of formula (XVII), wherein R^3 is as defined for formula (I), under reductive conditions, e.g. by catalytic hydrogenation or under conditions of the Bechamp reaction. This is shown in Scheme 12 below.

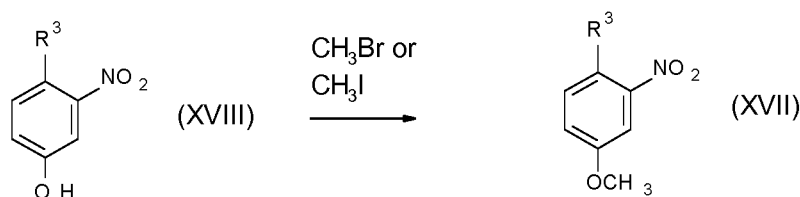
15 Scheme 12



The compounds of formula (XVII), wherein R^3 is as defined for formula (I), can be obtained by transformation of a compound of formula (XVIII), wherein R^3 is as defined for formula (I), with methyl bromide or methyl iodide and with a base such as sodium hydride or potassium carbonate. This is shown in Scheme 13 below.

20

Scheme 13



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

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
control of spoilage microorganisms or organisms potentially harmful to man. The novel
10 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 may 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
15 useful plants, while at the same time protecting also those parts of the plants that grow later
e.g. from phytopathogenic microorganisms.

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" means the quantity of such a compound or
20 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 is also possible to use compounds of formula (I) as dressing agents for the
25 treatment of plant propagation material, e.g., seed, such as fruits, tubers or grains, or plant
cuttings (for example rice), 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 compounds of formula (I) can also be applied to grains
30 (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 according to present invention 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.

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

Compounds of formula (I) and fungicidal compositions containing them may be used to control plant diseases caused by a broad spectrum of fungal plant pathogens. They are effective in controlling a broad spectrum of plant diseases, such as foliar pathogens of
10 ornamental, turf, vegetable, field, cereal, and fruit crops.

These fungi and fungal vectors of disease, as well as phytopathogenic bacteria and viruses, which may be controlled 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.
15 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,
20 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.
25 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 lindbergii, Leveillula taurica, Lophodermium segetis, Microdochium nivale,
30 Microsporium spp, Monilinia spp, Mucor spp, Mycosphaerella spp. including M. graminicola, M. pomi, Oncobasidium theobromae, 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,
35 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. tritici*, *Pyrenopeziza* spp,
Pyrenophora spp, *Pyricularia* spp. including *P. oryzae*, *Pythium* spp. including *P. ultimum*,
Ramularia spp, *Rhizoctonia* spp, *Rhizomucor pusillus*, *Rhizopus arrhizus*, *Rhynchosporium*
 5 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.*
 10 *pseudokoningii*, *T. viride*,
Trichophyton spp, *Typhula* spp, *Uncinula necator*, *Urocystis* spp, *Ustilago* spp,
Venturia spp. including *V. inaequalis*, *Verticillium* spp, and *Xanthomonas* spp.

In particular, compounds of formula (I) and fungicidal compositions containing them
 may be used to control plant diseases caused by a broad spectrum of fungal plant pathogens
 15 in the Basidiomycete, Ascomycete, Oomycete and/or Deuteromycete, Blasocladiomycete,
 Chytridiomycete, Glomeromycete and/or Mucoromycete classes.

These pathogens may include:

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

Ascomycetes, including blotch, spot, blast or blight diseases and/or rots for example
 those caused by *Pleosporales* such as *Stemphylium solani*, *Stagonospora tainanensis*,
 30 *Spilocaea oleaginea*, *Setosphaeria turcica*, *Pyrenochaeta lycopersici*, *Pleospora herbarum*,
Phoma destructiva, *Phaeosphaeria herpotrichoides*, *Phaeocryptococcus gaeumannii*,
Ophiosphaerella graminicola, *Ophiobolus graminis*, *Leptosphaeria maculans*, *Hendersonia*
creberrima, *Helminthosporium tritici-repentis*, *Setosphaeria turcica*, *Drechslera glycines*,
Didymella bryoniae, *Cycloconium oleagineum*, *Corynespora cassicola*, *Cochliobolus sativus*,
 35 *Bipolaris cactivora*, *Venturia inaequalis*, *Pyrenophora teres*, *Pyrenophora tritici-repentis*,
Alternaria alternata, *Alternaria brassicicola*, *Alternaria solani* and *Alternaria tomatophila*,
Capnodiales such as *Septoria tritici*, *Septoria nodorum*, *Septoria glycines*, *Cercospora*

- arachidicola*, *Cercospora sojina*, *Cercospora zeae-maydis*, *Cercospora capsellae* and *Cercospora herpotrichoides*, *Cladosporium carpophilum*, *Cladosporium effusum*, *Passalora fulva*, *Cladosporium oxysporum*, *Dothistroma septosporum*, *Isariopsis clavispora*, *Mycosphaerella fijiensis*, *Mycosphaerella graminicola*, *Mycovellosiella koepkei*,
- 5 *Phaeoisariopsis bataticola*, *Pseudocercospora vitis*, *Pseudocercospora herpotrichoides*, *Ramularia beticola*, *Ramularia collo-cygni*, Magnaportheales such as *Gaeumannomyces graminis*, *Magnaporthe grisea*, *Pyricularia oryzae*, Diaporthales such as *Anisogramma anomala*, *Apiognomonia errabunda*, *Cytospora platani*, *Diaporthe phaseolorum*, *Discula destructiva*, *Gnomonia fructicola*, *Greeneria uvicola*, *Melanconium juglandinum*, *Phomopsis*
- 10 *viticola*, *Sirococcus clavigignenti-juglandacearum*, *Tubakia dryina*, *Dicarpella* spp., *Valsa ceratosperma*, and others such as *Actinothyrium graminis*, *Ascochyta pisi*, *Aspergillus flavus*, *Aspergillus fumigatus*, *Aspergillus nidulans*, *Asperisporium caricae*, *Blumeriella jaapii*, *Candida* spp., *Capnodium ramosum*, *Cephalosporium gramineum*, *Ceratocystis paradoxa*, *Chaetomium* spp., *Hymenoscyphus pseudoalbidus*, *Coccidioides*
- 15 spp., *Cylindrosporium padi*, *Diplocarpon malae*, *Drepanopeziza campestris*, *Elsinoe ampelina*, *Epicoccum nigrum*, *Epidermophyton* spp., *Eutypa lata*, *Geotrichum candidum*, *Gibellina cerealis*, *Gloeocercospora sorghi*, *Gloeodes pomigena*, *Gloeosporium perennans*; *Gloeotinia temulenta*, *Griphosphaeria corticola*, *Kabatiella lini*, *Leptographium microsporum*, *Leptosphaerulina crassiasca*, *Lophodermium seditiosum*, *Marssonina graminicola*,
- 20 *Microdochium nivale*, *Monilinia fructicola*, *Monographella albescens*, *Monosporascus cannonballus*, *Naemacyclus* spp., *Ophiostoma novo-ulmi*, *Paracoccidioides brasiliensis*, *Penicillium expansum*, *Pestalotia rhododendri*, *Petriellidium* spp., *Pezicula* spp., *Phialophora gregata*, *Phyllachora pomigena*, *Phymatotrichum omnivora*, *Physalospora abdita*, *Plectosporium tabacinum*, *Polyscytalum pustulans*, *Pseudopeziza medicaginis*,
- 25 *Pyrenopeziza brassicae*, *Ramulispora sorghi*, *Rhabdocline pseudotsugae*, *Rhynchosporium secalis*, *Sacrocladium oryzae*, *Scedosporium* spp., *Schizothyrium pomi*, *Sclerotinia sclerotiorum*, *Sclerotinia minor*, *Sclerotium* spp., *Typhula ishikariensis*, *Seimatosporium mariae*, *Lepteutypa cupressi*, *Septocytia ruborum*, *Sphaceloma perseae*, *Sporonema phacidioides*, *Stigmia palmivora*, *Tapesia yallundae*, *Taphrina bullata*, *Thielviopsis basicola*,
- 30 *Trichoseptoria fructigena*, *Zygophiala jamaicensis*; powdery mildew diseases for example those caused by Erysiphales such as *Blumeria graminis*, *Erysiphe polygoni*, *Uncinula necator*, *Sphaerotheca fuliginea*, *Podosphaera leucotricha*, *Podosphaera macularis*, *Golovinomyces cichoracearum*, *Leveillula taurica*, *Microsphaera diffusa*, *Oidiopsis gossypii*, *Phyllactinia guttata* and *Oidium arachidis*; molds for example those caused by
- 35 Botryosphaerales such as *Dothiorella aromatica*, *Diplodia seriata*, *Guignardia bidwellii*, *Botrytis cinerea*, *Botryotinia allii*, *Botryotinia fabae*, *Fusicoccum amygdali*, *Lasiodiplodia theobromae*, *Macrophoma theicola*, *Macrophomina phaseolina*, *Phyllosticta*

cucurbitacearum; anthracnoses for example those caused by Glomerellales such as *Colletotrichum gloeosporioides*, *Colletotrichum lagenarium*, *Colletotrichum gossypii*, *Glomerella cingulata*, and *Colletotrichum graminicola*; and wilts or blights for example those caused by Hypocreales such as *Acremonium strictum*, *Claviceps purpurea*, *Fusarium* 5 *culmorum*, *Fusarium graminearum*, *Fusarium virguliforme*, *Fusarium oxysporum*, *Fusarium subglutinans*, *Fusarium oxysporum* f.sp. *cubense*, *Gerlachia nivale*, *Gibberella fujikuroi*, *Gibberella zeae*, *Gliocladium* spp., *Myrothecium verrucaria*, *Nectria ramulariae*, *Trichoderma viride*, *Trichothecium roseum*, and *Verticillium theobromae*.

Basidiomycetes, including smuts for example those caused by Ustilaginales such as 10 *Ustilaginoidea virens*, *Ustilago nuda*, *Ustilago tritici*, *Ustilago zeae*, rusts for example those caused by Pucciniales such as *Cerotelium fici*, *Chrysomyxa arctostaphyli*, *Coleosporium ipomoeae*, *Hemileia vastatrix*, *Puccinia arachidis*, *Puccinia cacabata*, *Puccinia graminis*, *Puccinia recondita*, *Puccinia sorghi*, *Puccinia hordei*, *Puccinia striiformis* f.sp. *Hordei*, *Puccinia striiformis* f.sp. *Secalis*, *Pucciniastrum coryli*, or Uredinales such as *Cronartium* 15 *ribicola*, *Gymnosporangium juniperi-viginianae*, *Melampsora medusae*, *Phakopsora pachyrhizi*, *Phragmidium mucronatum*, *Physopella ampelosidis*, *Tranzschelia discolor* and *Uromyces viciae-fabae*; and other rots and diseases such as those caused by *Cryptococcus* spp., *Exobasidium vexans*, *Marasmiellus inoderma*, *Mycena* spp., *Sphacelotheca reiliana*, *Typhula ishikariensis*, *Urocystis agropyri*, *Itersonilia perplexans*, *Corticium invisum*, *Laetisaria* 20 *fuciformis*, *Waitea circinata*, *Rhizoctonia solani*, *Thanetophorus cucurmeris*, *Entyloma dahliae*, *Entylomella microspora*, *Neovossia molinae* and *Tilletia caries*.

Blastocladiomycetes, such as *Physoderma maydis*.

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

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

In addition to their fungicidal activity, the compounds and compositions comprising them may also have activity against bacteria such as *Erwinia amylovora*, *Erwinia caratovora*, *Xanthomonas campestris*, *Pseudomonas syringae*, *Strptomyces scabies* and other related 30 species as well as certain protozoa.

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 tritcale and wheat; fibre plants for 35 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, 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.

10 The useful plants and / or target crops in accordance with the invention include conventional as well as genetically enhanced or engineered varieties such as, for example, insect resistant (e.g. Bt. and VIP varieties) as well as disease resistant, herbicide tolerant (e.g. glyphosate- and glufosinate-resistant maize varieties commercially available under the trade names RoundupReady® and LibertyLink®) and nematode tolerant varieties. By way of
15 example, suitable genetically enhanced or engineered crop varieties include the Stoneville 5599BR cotton and Stoneville 4892BR cotton varieties.

The term "useful plants" and/or "target crops" is to be understood as including also useful plants that have been 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-enol-pyrovyl-shikimate-3-phosphate-synthase)
20 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, by conventional methods of breeding (mutagenesis) is Clearfield® summer rape (Canola).
25 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" and/or "target crops" is to be understood as including those
30 which naturally are or have been rendered resistant to harmful insects. This includes plants transformed by the use of recombinant DNA techniques, for example, to be capable of synthesising one or more selectively acting toxins, such as are known, for example, from toxin-producing bacteria. Examples of toxins which can be expressed include δ -endotoxins, vegetative insecticidal proteins (Vip), insecticidal proteins of bacteria colonising nematodes,
35 and toxins produced by scorpions, arachnids, wasps and fungi. An example of a crop that has been modified to express the *Bacillus thuringiensis* toxin is the Bt maize KnockOut® (Syngenta Seeds). An example of a crop comprising more than one gene that codes for

insecticidal resistance and thus expresses more than one toxin is VipCot® (Syngenta Seeds). Crops or seed material thereof can also be resistant to multiple types of pests (so-called stacked transgenic events when created by genetic modification). For example, a plant can have the ability to express an insecticidal protein while at the same time being herbicide
5 tolerant, for example Herculex I® (Dow AgroSciences, Pioneer Hi-Bred International).

The term "useful plants" and/or "target crops" is to be understood as including also useful plants which have been so transformed by the use of recombinant DNA techniques that they are capable of synthesising antipathogenic substances having a selective action, such as, for example, the so-called "pathogenesis-related proteins" (PRPs, see e.g. EP-A-0
10 392 225). Examples of such antipathogenic substances and transgenic plants capable of synthesising such antipathogenic substances are known, for example, from EP-A-0 392 225, WO 95/33818, and EP-A-0 353 191. The methods of producing such transgenic plants are generally known to the person skilled in the art and are described, for example, in the publications mentioned above.

15 Toxins that can be expressed by 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 vegetative insecticidal proteins (Vip), e.g. Vip1, Vip2, Vip3 or Vip3A; or insecticidal proteins of bacteria colonising nematodes, for example *Photorhabdus* spp. or
20 *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; proteinase inhibitors, such as trypsin inhibitors, serine protease inhibitors, patatin, cystatin, papain inhibitors;
25 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 synthase, bibenzyl synthase, chitinases and
30 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
35 produced recombinantly by a new combination of different 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 WO03/018810).

5 More 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 WO03/052073.

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
10 above. CryI-type 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
15 (Lepidoptera).

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
20 Plus® (maize variety that expresses a Cry1Ab and 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
25 variety that expresses a Cry1Ac and a Cry2Ab toxin); VipCot® (cotton variety that expresses a Vip3A and a 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:

30 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 achieve tolerance to the herbicide
35 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 expression of a Cry1Ab toxin. Bt176 maize also transgenically expresses the enzyme PAT to achieve tolerance to the herbicide glufosinate ammonium.

5 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 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.

10 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 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.

15 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.

 7. **NK603 × MON 810 Maize** from Monsanto Europe S.A. 270-272 Avenue de
20 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 imparts tolerance to the herbicide Roundup® (contains glyphosate), and also a Cry1Ab toxin obtained from *Bacillus*
25 *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 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.

30 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 as seeds, which can be used for the multiplication of the latter, and vegetative material, such as cuttings or tubers, for example potatoes. There may be mentioned for
35 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 may be protected

before transplantation by a total or partial treatment by immersion. Preferably "plant propagation material" is understood to denote seeds.

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

5 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, granulates, and also encapsulations e.g. in polymeric
10 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
15 effects.

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.

20 Suspension concentrates are aqueous formulations in which finely divided solid particles of the 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 as 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
25 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 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
30 active ingredient plus a small amount of wetting, dispersing or emulsifying agent.

Emulsifiable concentrates are homogeneous liquid compositions dispersible in water or other 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
35 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, diacetonolalcohol, 1,2-dichloropropane, diethanolamine, 5 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 10 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, laurylamine, mesityl oxide, methoxy-propanol, methyl isoamyl ketone, methyl isobutyl ketone, methyl laurate, methyl octanoate, methyl oleate, methylene 15 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, perchloroethylene, ethyl acetate, amyl acetate, butyl acetate, methanol, ethanol, isopropanol, and higher molecular 20 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, attapulgite clay, kieselguhr, chalk, diatomaceous earth, lime, calcium carbonate, 25 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 30 the formulation. They can be 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 35 nonylphenol-C.sub. 18 ethoxylate; alcohol-alkylene oxide addition products, such as tridecyl alcohol-C.sub. 16 ethoxylate; soaps, such as sodium stearate; alkyl naphthalenesulfonate salts, such as sodium dibutyl naphthalenesulfonate; 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 phosphate esters.

5 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, penetration aids, micronutrients, emollients,
10 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
15 compositions of the invention or mixed in, for example, the spray tank. These further biocidally active ingredients may be fungicides, herbicides, insecticides, bactericides, acaricides, nematocides and/or plant growth regulators.

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
20 described in, for example, 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 compositions and can be applied to the crop area or plant to be treated, simultaneously or in succession with further compounds. These further compounds can be e.g. fertilizers or micronutrient donors
25 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.

30 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 above-defined, in free form or in agrochemically usable salt form, and at least one of the above-mentioned adjuvants.

35 The invention therefore provides a composition, preferably a fungicidal composition, comprising 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).

The compound of formula (I) may be the sole active ingredient of a composition or it
5 may be admixed with one or more additional active ingredients such as a pesticide, fungicide, synergist, herbicide or plant growth regulator where appropriate. An additional active ingredient may, in some cases, result in unexpected synergistic activities.

Examples of suitable additional active ingredients include the following: 1,2,4-thiadiazoles, 2,6-dinitroanilines, acylalanines, aliphatic nitrogenous compounds, amidines,
10 aminopyrimidinols, anilides, anilino-pyrimidines, anthraquinones, antibiotics, aryl-phenylketones, benzamides, benzene-sulfonamides, benzimidazoles, benzothiazoles, benzothiadiazoles, benzothiophenes, benzoylpyridines, benzthiadiazoles, benzylcarbamates, butylamines, carbamates, carboxamides, carpropamids, chloronitriles, cinnamic acid amides, copper containing compounds, cyanoacetamideoximes, cyanoacrylates, cyanoimidazoles,
15 cyanomethylene-thiazolidines, dicarbonitriles, dicarboxamides, dicarboximides, dimethylsulphamates, dinitrophenol carbonates, dinitrophenyl, dinitrophenyl crotonates, diphenyl phosphates, dithiino compounds, dithiocarbamates, dithioethers, dithiolanes, ethyl-amino-thiazole carboxamides, ethyl-phosphonates, furan carboxamides, glucopyranosyls, glucopyranoxyls, glutaronitriles, guanidines, herbicides/plant growth regulators,
20 hexopyranosyl antibiotics, hydroxy(2-amino)pyrimidines, hydroxyanilides, hydroxyisoxazoles, imidazoles, imidazolinones, insecticides/plant growth regulators, isobenzofuranones, isoxazolidinyl-pyridines, isoxazolines, maleimides, mandelic acid amides, mectin derivatives, morpholines, norpholines, n-phenyl carbamates, organotin compounds, oxathiin carboxamides, oxazoles, oxazolidine-diones, phenols, phenoxy quinolines, phenyl-
25 acetamides, phenylamides, phenylbenzamides, phenyl-oxo-ethyl-thiophenes amides, phenylpyrroles, phenylureas, phosphorothiolates, phosphorus acids, phthalamic acids, phthalimides, picolinamides, piperazines, piperidines, plant extracts, polyoxins, propionamides, pthalimides, pyrazole-4-carboxamides, pyrazolinones, pyridazinones, pyridines, pyridine carboxamides, pyridinyl-ethyl benzamides, pyrimdinamines, pyrimidines,
30 pyrimidine-amines, pyrimidione-hydrazone, pyrrolidines, pyrrolquinoliones, quinazolinones, quinolines, quinoline derivatives, quinoline-7-carboxylic acids, quinoxalines, spiroketalamines, strobilurins, sulfamoyl triazoles, sulphamides, tetrazolyloximes, thiadiazines, thiadiazole carboxamides, thiazole carboxanides, thiocyanates, thiophene carboxamides, toluamides, triazines, triazobenthiazoles, triazoles, triazole-thiones, triazolo-
35 pyrimidylamine, valinamide carbamates, ammonium methyl phosphonates, arsenic-containing compounds, benyimidazolylcarbamates, carbonitriles, carboxanilides, carboximidamides, carboxylic phenylamides, diphenyl pyridines, furanilides, hydrazine

carboxamides, imidazoline acetates, isophthalates, isoxazolones, mercury salts, organomercury compounds, organophosphates, oxazolidinediones, pentylsulfonyl benzenes, phenyl benzamides, phosphonothionates, phosphorothioates, pyridyl carboxamides, pyridyl furfuryl ethers, pyridyl methyl ethers, SDHIs, thiadiazinanethiones, thiazolidines..

5 A further aspect of 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 phytopathogenic or spoilage microorganisms or organisms potentially harmful to man, especially fungal organisms, which comprises the application of a compound of formula (I) or
10 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 insects or by phytopathogenic or spoilage microorganisms or organisms potentially harmful to man, especially fungal
15 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
20 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
25 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
30 compound with extenders, for example solvents, solid carriers and, optionally, surface active compounds (surfactants).

The application methods for the compositions, that is the methods of controlling pests of the abovementioned type, such as spraying, atomizing, dusting, brushing on, dressing, scattering or pouring - which are to be selected to suit the intended aims of the prevailing
35 circumstances - and the use of the compositions for controlling pests of the abovementioned type are other subjects of the invention. Typical rates of concentration are between 0.1 and 1000 ppm, preferably between 0.1 and 500 ppm, of active ingredient. The rate of application

per hectare is preferably 1g to 2000 g of active ingredient per hectare, more preferably 10 to 1000 g/ha, most preferably 10 to 600 g/ha. When used 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
5 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 is applied either preventative, meaning prior to disease development or curative, meaning after disease development.

10 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 powder for seed treatment (WS), a capsule suspension for seed treatment (CF), a gel for seed treatment (GF), an emulsion concentrate (EC), a
15 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 (SU), an ultra-low volume liquid (UL), a technical concentrate (TK), a dispersible
20 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 (diluent, solvents, fillers and optionally other formulating ingredients such as surfactants, biocides, anti-freeze, stickers, thickeners
25 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 effects, e.g. the
30 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
35 formulation form, e.g. as an aqueous 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 5 0 to 20% 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) together with component (B) and (C), and optionally 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 10 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 15 user will normally use dilute formulations.

EXAMPLES

The Examples which follow serve to illustrate the invention. Certain compounds of the invention can be distinguished from known compounds by virtue of greater efficacy at low 20 application rates, which can be verified by the person skilled in the art using the experimental procedures outlined in the Examples, using lower application rates if necessary, for example 50 ppm, 12.5 ppm, 6 ppm, 3 ppm, 1.5 ppm, 0.8 ppm or 0.2 ppm.

Throughout this description, temperatures are given in degrees Celsius and "m.p." 25 means melting point. LC/MS means Liquid Chromatography Mass Spectroscopy.

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 diisobutyl naphthalenesulfonate	-	6 %	10 %
phenol polyethylene glycol ether (7-8 mol of ethylene oxide)	-	2 %	-
highly dispersed silicic acid	5 %	10 %	10 %
Kaolin	62 %	27 %	-

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

<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

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

Emulsifiable concentrate

active 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.

10

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

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

Extruder granules

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

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

Coated granules

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

5

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 %

10

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.

15

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
5 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-
10 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
15 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.

20 Preparation examples

Example 1: this example illustrates the preparation of N-ethyl-N'-[5-methoxy-2-methyl-4-[2-(trifluoromethyl)tetrahydrofuran-2-yl]phenyl]-N-methyl-formamidine (Compound 1.22)

25 Preparation of N-ethyl-N'-[5-methoxy-2-methyl-4-(2,2,2-trifluoroacetyl)phenyl]-N-methyl-formamidine

N'-(4-bromo-5-methoxy-2-methyl-phenyl)-N-ethyl-N-methyl-formamidine (6.0 g, 21.04 mmol) was dissolved in tetrahydrofuran (84 mL) and cooled to -78 °C. A 2N n-butyl lithium
30 solution in cyclohexane (18.9 mL, 37.87 mmol) was added dropwise. The resulting yellow solution was stirred for 1 h at -78 °C. Ethyl 2,2,2-trifluoroacetate (8.97 g, 63.128 mmol) neat was added dropwise. At the end of the addition the cooling bath was removed and the reaction was warmed to 0-5 °C and then quenched with a saturated ammonium chloride solution. The mixture was extracted with ethyl acetate. The organic layer was washed with
35 brine, dried over sodium sulfate, filtered and concentrated under reduce pressure.

The residue was purified by chromatography on silica gel, using ethyl acetate / dichloromethane as eluent system, to deliver N-ethyl-N'-[5-methoxy-2-methyl-4-(2,2,2-trifluoroacetyl)phenyl]-N-methyl-formamidine (5.1 g, 16.89 mmol).

Major isomer: ¹H-NMR (400 MHz, CDCl₃): δ = 1.27 (t, 3H), 2.22 (s, 3H), 3.08 (s, 3H),
5 3.41 (d, 2H), 3.90 (s, 3H), 6.36 (br. s, 1H), 7.56 (br. s, 2H)

Minor isomer: ¹H-NMR (400 MHz, CDCl₃): δ = 1.27 (t, 3H), 2.22 (s, 3H), 3.08 (s, 3H),
3.62 (d, 2H), 3.90 (s, 3H), 6.36 (br. s, 1H), 7.50 (s, 1H), 7.56 (br. s, 1H)

Ratio E/Z : 3 : 5

10 Preparation of N-ethyl-N'-[4-[1-hydroxy-1-(trifluoromethyl)allyl]-5-methoxy-2-methyl-phenyl]-N-methyl-formamidine

To a solution of N-ethyl-N'-[5-methoxy-2-methyl-4-(2,2,2-trifluoroacetyl)phenyl]-N-methyl-formamidine (2.00 g, 6.29mmol) in tetrahydrofuran (7 mL) was added
15 bromo(vinyl)magnesium (7.23 mL, 7.23 mmol) was added dropwise at -5°C and the reaction mixture was stirred at 0°C for 45min. The reaction mixture was filtrated and poured on cooled water (15mL), then aqueous ammonium chloride solution was added until disappearance of the precipitate and the mixture was extracted with ethyl acetate (3 X 20mL). The combined organic layers were washed with brine, dried over sodium sulfate, filtered and concentrated
20 under vacuum to afford N-ethyl-N'-[4-[1-hydroxy-1-(trifluoromethyl)allyl]-5-methoxy-2-methyl-phenyl]-N-methyl-formamidine (2.20 g, 5.99 mmol). The material was used as crude for the next step.

¹H-NMR (400 MHz, CDCl₃): δ = 7.46 (1H, m), 7.07 (1H, s), 6.42 (2H, m), 6.31 (1H, s),
5.77 (1H, d), 5.52 (1H, d), 3.93 (3H, br s), 3.36 (2H, m), 3.03 (3H, s), 2.21 (3H, s), 1.24 (3H, t)
25

Preparation of N'-[4-[1-allyloxy-1-(trifluoromethyl)allyl]-5-methoxy-2-methyl-phenyl]-N-ethyl-N-methyl-formamidine

To a solution of N-ethyl-N'-[4-[1-hydroxy-1-(trifluoromethyl)allyl]-5-methoxy-2-methyl-phenyl]-N-methyl-formamidine (2.25 g, 6.13 mmol) in N,N-dimethylformamide (24.5mL) was added sodium hydride (0.258 g, 6.74mmol) portionwise. The reaction mixture was stirred at room temperature for 30min. Then, allyl bromide (0.536 mL, 6.13 mmol) was added dropwise and the reaction mixture was stirred at room temperature for overnight. The reaction mixture was quenched with slow addition of saturated ammonium chloride solution (20mL) and then
35 extracted with ethyl acetate (3 X 15mL). The combined organic layers were washed with water (2X100mL), brine, dried over sodium sulfate, filtered and concentrated under vacuum. The crude material was purified by chromatography on silica gel using (ethyl acetate / cyclohexane

as eluent system, to deliver N'-[4-[1-allyloxy-1-(trifluoromethyl)allyl]-5-methoxy-2-methyl-phenyl]-N-ethyl-N-methyl-formamidine (1.99 g, 5.3 mmol).

¹H-NMR(400MHz,DMSO): δ = 1.14 (t, 3H), 2.12 (s, 3H), 2.86-3.08 (m, 3H), 3.44 (m, 2H), 3.70 (s, 3H), 3.85 (d, 2H), 5.17 (dd, 1H), 5.33 (m, 2H), 5.49 (d, 1H), 5.93 (1H, m), 6.32 (dd, 1H), 6.52 (s, 1H), 7.17 (s, 1H), 7.59-7.86 (m, 1H)

Preparation of N-ethyl-N'-[5-methoxy-2-methyl-4-[5-(trifluoromethyl)-2H-furan-5-yl]phenyl]-N-methyl-formamidine

10

A solution of N'-[4-[1-allyloxy-1-(trifluoromethyl)allyl]-5-methoxy-2-methyl-phenyl]-N-ethyl-N-methyl-formamidine (1.00 g, 2.7 mmol) in dichloromethane (54.0 mL) was degassed with argon before benzyldiene- bis(tricyclohexylphosphine)dichlororuthenium (0.113 g, 0.135 mmol) was added. The reaction mixture was stirred at room temperature overnight. The reaction mixture was concentrated under vacuum then the residue was taken-up in water (60mL) and acidified with HCl 2M. The mixture was extracted with diethyl ether (2 X 20mL) then the aqueous layer was basified with aqueous sodium bicarbonate solution (until pH 10). The solution was extracted with dichloromethane (3X20mL) and the combined organic layers were washed with brine, dried over sodium sulfate, filtered and concentrated under vacuum. The crude material was purified by chromatography on silica gel using (ethyl acetate / cyclohexane as eluent system to deliver N-ethyl-N'-[5-methoxy-2-methyl-4-[5-(trifluoromethyl)-2H-furan-5-yl]phenyl]-N-methyl-formamidine (0.90 g, 2.6 mmol).

¹H-NMR(400MHz,DMSO): δ = 8.22-8.62 (1H, m), 7.49 (1H, s), 7.14 (2H, m), 6.26-6.69 (2H, m), 4.59-4.92 (2H, m), 3.86 (3H, s), 3.57-3.78 (2H, m), 3.28-3.36 (3H, m), 2.30 (3H, m), 1.28 (3H, t).

Preparation of N-ethyl-N'-[5-methoxy-2-methyl-4-[2-(trifluoromethyl)tetrahydrofuran-2-yl]phenyl]-N-methyl-formamidine (Compound 1.22)

30 A solution of N-ethyl-N'-[5-methoxy-2-methyl-4-[5-(trifluoromethyl)-2H-furan-5-yl]phenyl]-N-methyl-formamidine (200 mg, 0.58 mmol) in ethanol (6 mL) was degassed with argon and palladium on charcoal (0.01869 g, cat.) was added. The reaction mixture was stirred under hydrogen atmosphere at room temperature for 4h. The reaction mixture was filtrated through celite and the filtrate was concentrated under vacuum. The solid was taken-up in water (20 mL) and acidified with HCl until reaching pH 1. The mixture was extracted with diethyl ether (10 mL) and the aqueous layer was basified with NaHCO₃. The mixture was extracted with dichloromethane (3 X 10mL) and the combined organic layers were washed

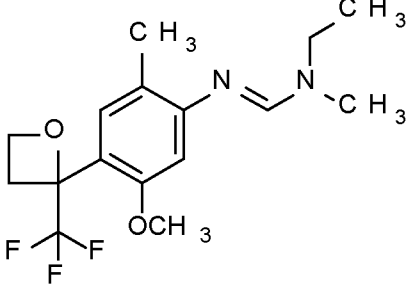
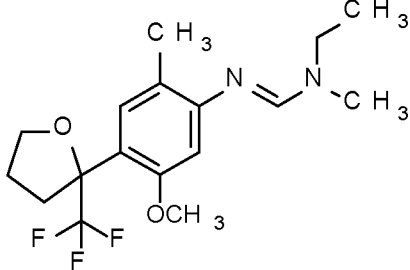
with brine, dried over sodium sulfate, filtered and concentrated under vacuum to afford N-ethyl-N'-[5-methoxy-2-methyl-4-[2-(trifluoromethyl)tetrahydrofuran-2-yl]phenyl]-N-methyl-formamidinium (Compound 1.22, 98 mg, 0.29 mmol).

¹H-NMR(400MHz,DMSO): δ = 7.72 (1H, s), 7.27 (1H, s), 6.48 (1H, s), 3.77 (4H, s), 3.33 (2H, m), 2.99 (3H, br s), 2.64 (1H, ddd), 2.38 (1H, dt), 2.10 (3H, s), 2.00 (2H, m), 1.14 (3H, m).

Table E: Physical (LC/MS) data of certain compounds of formula (I)

LC/MS (Liquid Chromatography Mass Spectrometry) method used:

(ACQUITY UPLC from Waters, Phenomenex Gemini C18, 3 μ m particle size, 110 Angström, 30 x 3 mm column, 1.7mL/min., 60 °C, H₂O + 0.05% HCOOH (95%) / CH₃CN/MeOH 4:1 + 0.04% HCOOH (5%) – 2 min. – CH₃CN/MeOH 4:1 + 0.04% HCOOH (5%) - 0.8 min., ACQUITY SQD Mass Spectrometer from Waters, ionization method: electrospray (ESI), Polarity: positive ions, Capillary (kV) 3.00, Cone (V) 20.00, Extractor (V) 3.00, Source Temperature (°C) 150, Desolvation Temperature (°C) 400, Cone Gas Flow (L/Hr) 60, Desolvation Gas Flow (L/Hr) 700).

No.	Compound Name	Structure	LC/MS
1.21	N-ethyl-N'-[5-methoxy-2-methyl-4-[2-(trifluoromethyl)oxetan-2-yl]phenyl]-N-methyl-formamidinium		Rt = 0.64 min; MS: m/z = 331 (M+1)
1.22	N-ethyl-N'-[5-methoxy-2-methyl-4-[2-(trifluoromethyl)tetrahydrofuran-2-yl]phenyl]-N-methyl-formamidinium		Rt = 0.65 min; MS: m/z = 345 (M+1)

Biological Examples

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

Wheat leaf segments cv. Kanzler were placed on agar in a multiwell plate (24-well format) and sprayed with the formulated test compound diluted in water. The leaf disks were inoculated by shaking powdery mildew infected plants above the test plates 1 day after application. The inoculated leaf disks were 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 was 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).

The following compounds gave at least 80% disease control at 200 ppm in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development:

1.21 and 1.22

Phakopsora pachyrhizi / soybean / leaf disk preventative (soybean rust)

Four-week old soybean plants are sprayed in a spray chamber with the formulated test compound diluted in water. Leaf disks are cut from treated plants and placed on agar into 24-well plates one day after application. Leaf disks are inoculated by spraying them with a spore suspension on their lower leaf surface. After an incubation period in a climate cabinet of 24-36 hours in darkness at 20 °C and 75% rh, the leaf disks are then kept at 20 °C with 12 h light/day and 75% rh. The percentage leaf disk area covered by disease is assessed when an appropriate level of disease appears on untreated check plants (12 – 14 days after application).

The following compounds gave at least 80% disease control at 200 ppm in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development:

1.21 and 1.22

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

Wheat leaf segments cv. Kanzler were placed on agar in multiwell plates (24-well format) and sprayed with the formulated test compound diluted in water. The leaf disks were inoculated with a spore suspension of the fungus 1 day after application. The inoculated leaf segments were 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 was 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).

The following compounds gave at least 80% disease control at 200 ppm in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development:

1.21 and 1.22

5

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

Wheat leaf segments cv. Kanzler are placed on agar in multiwell plates (24-well format). The leaf segments are inoculated with a spore suspension of the fungus. Plates were stored in darkness at 19°C and 75% rh. The formulated test compound diluted in water was applied 1 day after inoculation. The leaf segments were 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 was assessed as percent disease control compared to untreated when an appropriate level of disease damage appears in untreated check leaf segments (6 – 8 days after application).

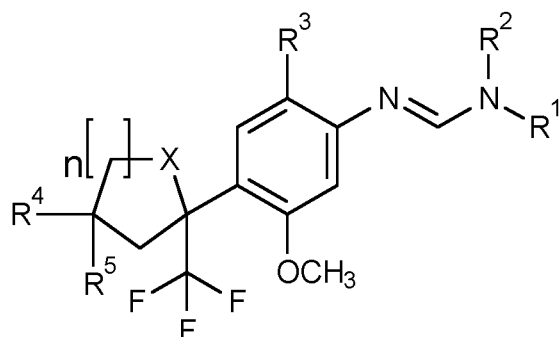
15 The following compounds gave at least 80% disease control at 200 ppm in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development:

1.21 and 1.22

20

CLAIMS

1. A compound of formula (I)



(I)

5

wherein

R¹ and R² are each independently selected from C₁-C₄alkyl and C₃-C₈cycloalkyl; or
R¹ and R² together with the nitrogen atom to which they are attached form a three- to six- membered saturated cyclic group;

10 R³ is hydrogen, halogen or C₁-C₄ alkyl;

R⁴ and R⁵ are each independently selected from hydrogen and C₁-C₄ alkyl; or

R⁴ and R⁵ together with the carbon atom to which they are attached form a carbonyl group (C=O);

X is O, S or NCH₃;

15 n is 0 or 1;

or a salt, metal complex, stereoisomer or N-oxide thereof.

2. A compound according to claim 1 wherein R¹ and R² are each independently C₁-C₄ alkyl.

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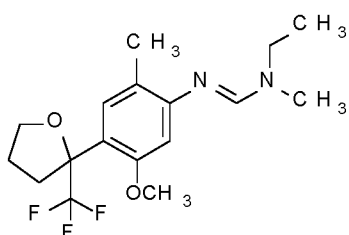
3. A compound according to claim 1 or 2 wherein R³ is halogen or C₁-C₃ alkyl.

4. A compound according to any one of claims 1, 2 or 3 wherein R⁴ and R⁵ are each independently selected from hydrogen and methyl, or R⁴ and R⁵ together with the carbon atom to which they are attached form a carbonyl group.

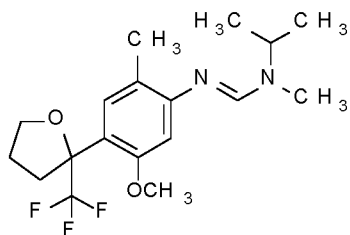
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5. A compound according to any one of claims 1, 2, 3 or 4 wherein R¹ and R² are each independently selected from methyl, ethyl and isopropyl.

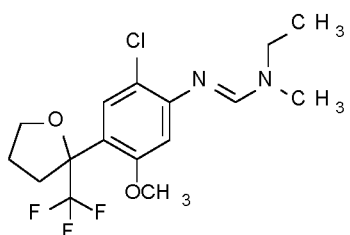
6. A compound according to any one of claims 1, 2, 3, 4, or 5 wherein R^3 is fluoro, chloro or methyl.
7. A compound according to any one of claims 1, 2, 3, 4, 5 or 6 wherein R^4 and R^5 are both hydrogen, or R^4 and R^5 together with the carbon atom to which they are attached form a carbonyl group.
8. A compound according to any one of claims 1, 2, 3, 4, 5, 6 or 7 wherein R^1 is methyl, ethyl or isopropyl and R^2 is methyl or ethyl.
9. A compound according to any one of claims 1, 2, 3, 4, 5, 6, 7 or 8 wherein R^3 is chloro or methyl and R^4 and R^5 are both hydrogen.
10. A compound according to claim 1 wherein R^1 and R^2 are each independently selected from methyl, ethyl and isopropyl; R^3 is fluoro, chloro or methyl; R^4 and R^5 are both hydrogen, or R^4 and R^5 together with the carbon atom to which they are attached form a carbonyl group; X is O, S or NCH_3 ; n is 0 or 1; or a salt, metal complex, stereoisomer or N-oxide thereof.
11. A compound according to claim 1 wherein the compound is selected from:



N-ethyl-N'-[5-hydroxy-2-methyl-4-[2-(trifluoromethyl)tetrahydrofuran-2-yl]phenyl]-N-methyl-formamidine;

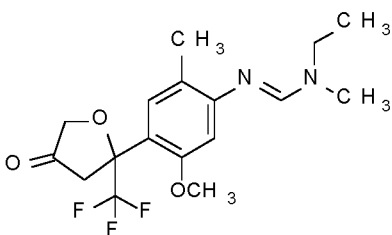


N'-[5-hydroxy-2-methyl-4-[2-(trifluoromethyl)tetrahydrofuran-2-yl]phenyl]-N-isopropyl-N-methyl-formamidine;



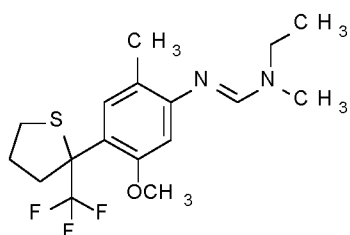
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N'-[2-chloro-5-hydroxy-4-[2-(trifluoromethyl)tetrahydrofuran-2-yl]phenyl]-N-ethyl-N-methyl-formamidine;



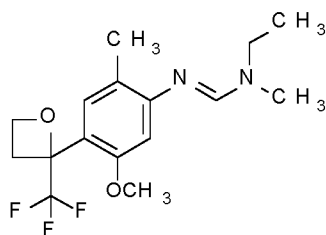
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N-ethyl-N'-[5-hydroxy-2-methyl-4-[4-oxo-2-(trifluoromethyl)tetrahydrofuran-2-yl]phenyl]-N-methyl-formamidine;



15

N-ethyl-N'-[5-hydroxy-2-methyl-4-[2-(trifluoromethyl)tetrahydrothiophen-2-yl]phenyl]-N-methyl-formamidine; or



N-ethyl-N'-[5-hydroxy-2-methyl-4-[2-(trifluoromethyl)oxetan-2-yl]phenyl]-N-methyl-formamidine;

or a salt, metal complex, stereoisomer or N-oxide thereof.

5

12. A compound according to any one of claims 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10 wherein X is O or S.
13. A composition comprising a fungicidally effective amount of a compound of formula (I) as defined in any of claims 1 – 12.
14. A composition according to claim 13, wherein the composition further comprises at least one additional active ingredient and/or a diluent.
15. A method of combating, preventing or controlling phytopathogenic fungi which comprises applying to phytopathogenic fungi, to the locus of phytopathogenic fungi, or to a plant susceptible to attack by phytopathogenic fungi, or to propagation material thereof, a fungicidally effective amount of a compound of formula (I) as defined in any of claims 1 – 12 or a composition comprising a fungicidally effective amount of a compound of formula (I) as defined in any of claims 1 – 12.

20

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/083052

A. CLASSIFICATION OF SUBJECT MATTER
INV. C07D305/06 C07D307/06 C07D307/20 C07D333/12 A01N37/52
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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2017/102635 A1 (SYNGENTA PARTICIPATIONS AG [CH]) 22 June 2017 (2017-06-22) see structure and activity of the phenylamide derivatives according to claim 1 -----	1-15



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

12 December 2018

Date of mailing of the international search report

03/01/2019

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2018/083052

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2017102635 A1	22-06-2017	CN 108366562 A	03-08-2018
		CO 2018005946 A2	10-07-2018
		EP 3389379 A1	24-10-2018
		UY 37020 A	31-07-2017
		WO 2017102635 A1	22-06-2017
