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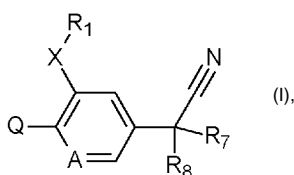
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(54) Title: PESTICIDALLY ACTIVE HETEROCYCLIC DERIVATIVES WITH SULFUR CONTAINING SUBSTITUENTS



(57) Abstract: Compounds of formula I (I), wherein the substituents are as defined in claim 1, and the agrochemically acceptable salts, stereoisomers, enantiomers, tautomers and N-oxides of those compounds, can be used as pesticides and can be prepared in a manner known per se.



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PESTICIDALLY ACTIVE HETEROCYCLIC DERIVATIVES WITH SULFUR CONTAINING
SUBSTITUENTS

The present invention relates to pesticidally active, in particular insecticidally active heterocyclic derivatives containing sulfur substituents, to intermediates for the preparation of those compounds, to compositions comprising those compounds, and to their use for controlling animal pests (including arthropods and in particular insects or representatives of the order *Acarina*).

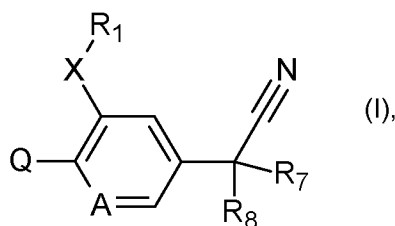
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Heterocyclic compounds with pesticidal action are known and described, for example, in WO 2012/086848, WO 2013/018928, WO2016/071214, EP2862853 and WO 2016/026848.

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There have now been found novel pesticidally active heterocyclic 6/5-bicyclic ring derivatives with sulfur containing phenyl and pyridyl substituents.

The present invention accordingly relates to compounds of formula I,



wherein

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A is CH or N;

X is S, SO or SO₂;

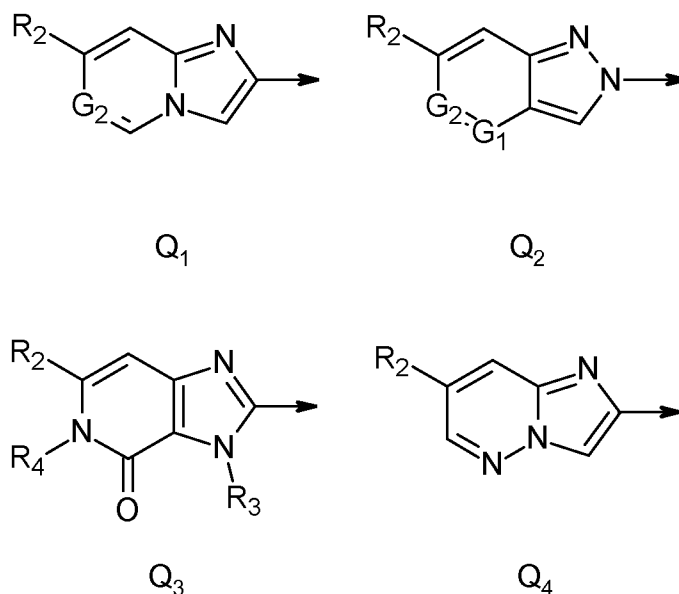
R₁ is C₁-C₄alkyl, C₁-C₄haloalkyl or C₃-C₆cycloalkyl-C₁-C₄alkyl;

R₇ and R₈ are, independently from each other, halogen, cyano, C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆cycloalkyl, C₁-C₄alkoxy, C₁-C₄alkoxy-C₁-C₄alkyl, C₁-C₄alkylsulfanyl, C₁-C₄alkylsulfanyl-C₁-C₄alkyl, C₁-C₄alkylsulfanyl-C₁-C₄alkyl, C₁-C₄alkylsulfonyl-C₁-C₄alkyl or C₁-C₄alkoxycarbonyl;

20

Q is a radical selected from the group consisting of formulae Q₁, Q₂, Q₃, and Q₄

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wherein the arrow denotes the point of attachment to the ring incorporating the radical A;
and wherein

R₂ is Ci-C₆haloalkyl, Ci-C₄haloalkylsulfanyl, Ci-C₄haloalkylsulfinyl, Ci-C₄haloalkylsulfonyl or Ci-
5 Cehaloalkoxy;

R₃ is Ci-C₄alkyl;

R₄ is Ci-C₄alkyl, Ci-C₄haloalkyl, or C₃-C₆cycloalkyl;

G₁ and G₂ are, independently from each other, N or CH;

and agrochemically acceptable salts, stereoisomers, enantiomers, tautomers and N-oxides of the
10 compounds of formula I.

Compounds of formula I which have at least one basic centre can form, for example, acid addition salts, for example with strong inorganic acids such as mineral acids, for example perchloric acid, sulfuric acid, nitric acid, nitrous acid, a phosphorus acid or a hydrohalic acid, with strong organic carboxylic acids,
15 such as Ci-C₄alkanecarboxylic acids which are unsubstituted or substituted, for example by halogen, for example acetic acid, such as saturated or unsaturated dicarboxylic acids, for example oxalic acid, malonic acid, succinic acid, maleic acid, fumaric acid or phthalic acid, such as hydroxycarboxylic acids, for example ascorbic acid, lactic acid, malic acid, tartaric acid or citric acid, or such as benzoic acid, or with organic sulfonic acids, such as Ci-C₄alkane- or arylsulfonic acids which are unsubstituted or
20 substituted, for example by halogen, for example methane- or p-toluenesulfonic acid. Compounds of formula I which have at least one acidic group can form, for example, salts with bases, for example mineral salts such as alkali metal or alkaline earth metal salts, for example sodium, potassium or magnesium salts, or salts with ammonia or an organic amine, such as morpholine, piperidine, pyrrolidine, a mono-, di- or tri-lower-alkylamine, for example ethyl-, diethyl-, triethyl- or
25 dimethylpropylamine, or a mono-, di- or trihydroxy-lower-alkylamine, for example mono-, di- or triethanolamine.

The alkyl groups occurring in the definitions of the substituents can be straight-chain or branched and are, for example, methyl, ethyl, n-propyl, isopropyl, n-butyl, sec-butyl, iso-butyl, tert-butyl, pentyl, hexyl, nonyl, decyl and their branched isomers. Alkylsulfanyl, alkylsulfinyl, alkylsulfonyl, alkoxy, alkenyl and alkynyl radicals are derived from the alkyl radicals mentioned. The alkenyl and alkynyl groups can be

5 mono- or polyunsaturated.

Halogen is generally fluorine, chlorine, bromine or iodine. This also applies, correspondingly, to halogen in combination with other meanings, such as haloalkyl or halophenyl.

10 Haloalkyl groups preferably have a chain length of from 1 to 6 carbon atoms. Haloalkyl is, for example, fluoromethyl, difluoromethyl, trifluoromethyl, chloromethyl, dichloromethyl, trichloromethyl, 2,2,2-trifluoroethyl, 2-fluoroethyl, 2-chloroethyl, pentafluoroethyl, 1,1-difluoro-2,2,2-trichloroethyl, 2,2,3,3-tetrafluoroethyl and 2,2,2-trichloroethyl.

15 Alkylsulfanyl is for example methylsulfanyl, ethylsulfanyl, propylsulfanyl, isopropylsulfanyl, butylsulfanyl, pentylsulfanyl, and hexylsulfanyl.

Alkylsulfinyl is for example methylsulfinyl, ethylsulfinyl, propylsulfinyl, isopropylsulfinyl, a butylsulfinyl, pentylsulfinyl, and hexylsulfinyl.

Alkylsulfonyl is for example methylsulfonyl, ethylsulfonyl, propylsulfonyl, isopropylsulfonyl, butylsulfonyl, pentylsulfonyl, and hexylsulfonyl.

20

Haloalkylsulfanyl groups preferably have a chain length of from 1 to 4 carbon atoms. Haloalkylsulfanyl is, for example, difluoromethylsulfanyl, trifluoromethylsulfanyl or 2,2,2-trifluoroethylsulfanyl. Similar considerations apply to the radicals C₁-C₄haloalkylsulfinyl and C₁-C₄haloalkylsulfonyl, which may be, for example, trifluoromethylsulfinyl, , trifluoromethylsulfonyl or 2,2,2-trifluoroethylsulfonyl.

25

Alkoxy groups preferably have a preferred chain length of from 1 to 6 carbon atoms. Alkoxy is, for example, methoxy, ethoxy, propoxy, i-propoxy, n-butoxy, isobutoxy, sec-butoxy and tert-butoxy and also the isomeric pentyloxy and hexyloxy radicals.

30 Alkoxy carbonyl groups preferably have a preferred chain length of from 1 to 5 carbon atoms. Alkoxy carbonyl is, for example, methoxycarbonyl, ethoxycarbonyl, propoxycarbonyl, i-propoxycarbonyl, n-butoxycarbonyl, isobutoxycarbonyl, sec-butoxycarbonyl and tert-butoxycarbonyl radicals.

35 Alkoxyalkyl groups preferably have a chain length of 1 to 6 carbon atoms. Alkoxyalkyl is, for example, methoxymethyl, methoxyethyl, ethoxymethyl, ethoxyethyl, n-propoxymethyl, n-propoxyethyl, isopropoxymethyl or isopropoxyethyl.

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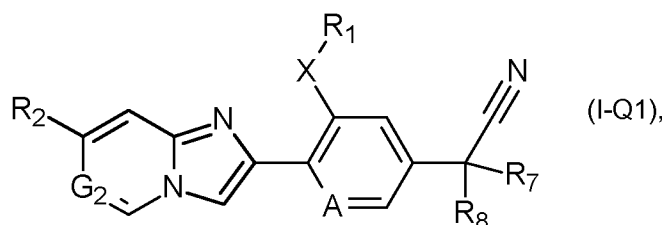
The cycloalkyl groups preferably have from 3 to 6 ring carbon atoms, for example cyclopropyl, cyclobutyl, cyclopentyl and cyclohexyl.

5 The cycloalkylalkyl groups preferably have 4-8 carbon atoms, for example, cyclopropylmethyl, cyclopropylethyl, cyclobutylmethyl, cyclopentylmethyl and cyclohexylmethyl.

The compounds of formula I according to the invention also include hydrates which may be formed during the salt formation.

10

A preferred group of compounds of formula I is represented by the compounds of formula I-Q1



wherein A, X, R₁, R₂, G₂, R₇, and R₈ are as defined under formula I above. In said preferred group of compounds of formula I-Q1,

15

A is preferably N;

R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;

R₂ is preferably Ci-C₄haloalkyl, Ci-C₄haloalkylsulfanyl, Ci-C₄haloalkylsulfanyl, Ci-C₄haloalkylsulfonyl; preferably Ci-C₄haloalkyl; and X is preferably SO₂.

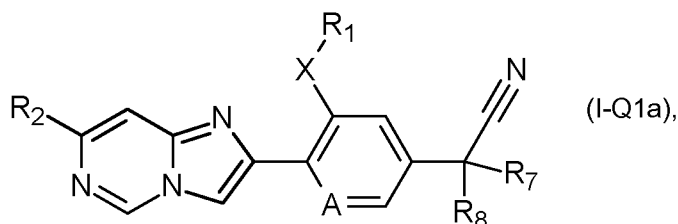
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An especially preferred group of compounds of formula I-Q1 are those wherein R₇ and R₈ are, independently from each other, halogen, cyano, Ci-C₆alkyl or Ci-C₄alkoxycarbonyl; preferably Ci-C₆alkyl.

25

Another especially preferred group of compounds of formula I-Q1 are those, wherein R₁ is ethyl and X is SO₂.

A more preferred group of compounds of formula I-Q1 is represented by the compounds of formula I-Q1a



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wherein A, X, R₁, R₂, R₇, and R_e are as defined under formula I above. In said preferred group of compounds of formula I-Q1 a,

R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropyl methyl;

R₂ is preferably Ci-C4haloalkyl, Ci-C4haloalkylsulfanyl, Ci-C4haloalkylsulfinyl, Ci-C4haloalkylsulfonyl;

5 preferably Ci-C4haloalkyl; and X is preferably SO₂.

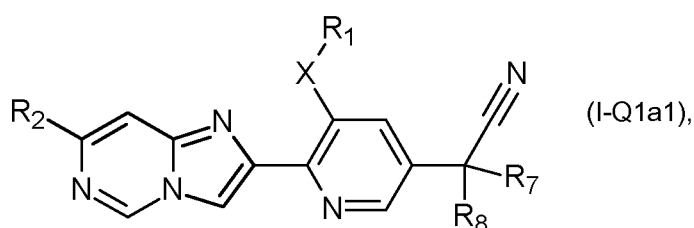
An especially preferred group of compounds of formula I-Q1 a are those wherein R₇ and R_e are, independently from each other, halogen, cyano, Ci-C6alkyl or Ci-C4alkoxycarbonyl; preferably Ci-Cealkyl.

10

Another especially preferred group of compounds of formula I-Q1 a are those, wherein R₁ is ethyl and X is SO₂.

An even more preferred group of compounds of formula I-Q1 a is represented by the compounds of formula I-Q1 a 1

15



wherein X, R₁, R₂, R₇, and R_e are as defined under formula I above. In said preferred group of compounds of formula I-Q1 a 1,

20

R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;

R₂ is preferably Ci-C4haloalkyl, Ci-C4haloalkylsulfanyl, Ci-C4haloalkylsulfinyl, Ci-C4haloalkylsulfonyl;

preferably Ci-C4haloalkyl; and X is preferably SO₂.

An especially preferred group of compounds of formula I-Q1 a 1 are those wherein R₇ and R_e are, independently from each other, halogen, cyano, Ci-C6alkyl or Ci-C4alkoxycarbonyl; preferably Ci-Cealkyl.

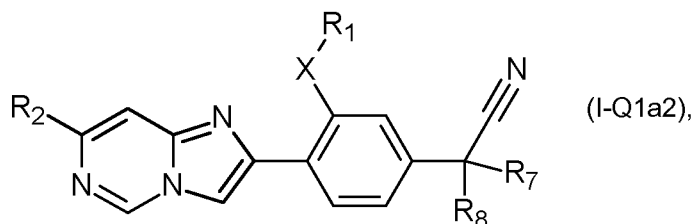
25

Another especially preferred group of compounds of formula I-Q1 a 1 are those, wherein R₁ is ethyl and X is SO₂.

30

Another even more preferred group of compounds of formula I-Q1 a is represented by the compounds of formula I-Q1 a 2

-6-



wherein X, R₁, R₂, R₇, and R_e are as defined under formula I above. In said preferred group of compounds of formula I-Q1 a2,

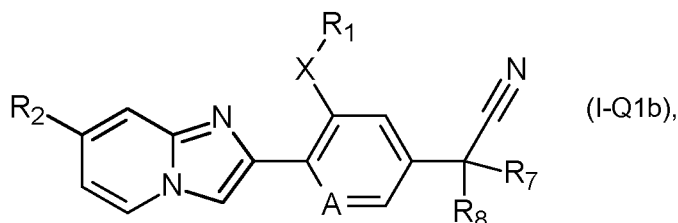
R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;

- 5 R₂ is preferably Ci-C4haloalkyl, Ci-C4haloalkylsulfanyl, Ci-C4haloalkylsulfinyl, Ci-C4haloalkylsulfonyl; preferably Ci-C4haloalkyl; and X is preferably SO₂.

An especially preferred group of compounds of formula I-Q1 a2 are those wherein R₇ and R_e are, independently from each other, halogen, cyano, Ci-C6alkyl or Ci-C4alkoxycarbonyl; preferably Ci-
10 Cealkyl.

Another especially preferred group of compounds of formula I-Q1 a2 are those, wherein R₁ is ethyl and X is SO₂.

- 15 Another more preferred group of compounds of formula I-Q1 is represented by the compounds of formula I-Q1 b



wherein A, X, R₁, R₂, R₇, and R_e are as defined under formula I above. In said preferred group of compounds of formula I-Q1 b,

- 20 R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;

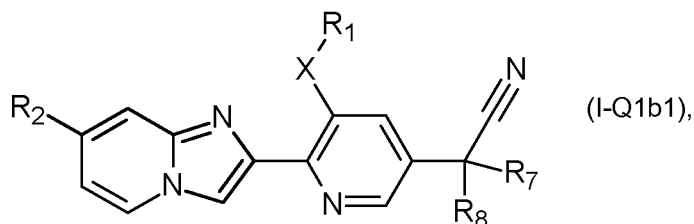
R₂ is preferably Ci-C4haloalkyl, Ci-C4haloalkylsulfanyl, Ci-C4haloalkylsulfinyl, Ci-C4haloalkylsulfonyl; preferably Ci-C4haloalkyl; and X is preferably SO₂.

- 25 An especially preferred group of compounds of formula I-Q1 b are those wherein R₇ and R_e are, independently from each other, halogen, cyano, Ci-C6alkyl or Ci-C4alkoxycarbonyl; preferably Ci-Cealkyl.

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Another especially preferred group of compounds of formula I-Q1 b are those, wherein R_1 is ethyl and X is SO_2 .

5 An even more preferred group of compounds of formula I-Q1 b is represented by the compounds of formula I-Q1b1



wherein X, R_1 , R_2 , R_7 , and R_8 are as defined under formula I above. In said preferred group of compounds of formula I-Q1 b1,

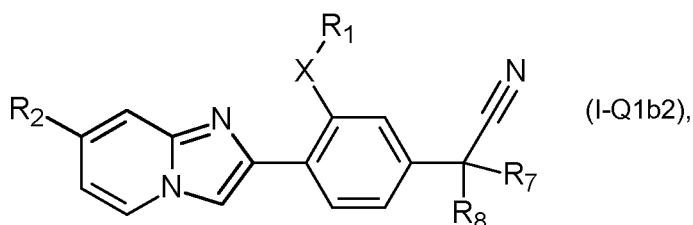
10 R_1 is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;
 R_2 is preferably Ci-C4haloalkyl, Ci-C4haloalkylsulfanyl, Ci-C4haloalkylsulfinyl, Ci-C4haloalkylsulfonyl;
 preferably Ci-C4haloalkyl; and X is preferably SO_2 .

15 An especially preferred group of compounds of formula I-Q1 b1 are those wherein R_7 and R_8 are, independently from each other, halogen, cyano, Ci-C6alkyl or Ci-C4alkoxycarbonyl; preferably Ci-Cealkyl.

Another especially preferred group of compounds of formula I-Q1 b1 are those, wherein R_1 is ethyl and X is SO_2 .

20

Another even more preferred group of compounds of formula I-Q1 b is represented by the compounds of formula I-Q1 b2



25 wherein X, R_1 , R_2 , R_7 , and R_8 are as defined under formula I above. In said preferred group of compounds of formula I-Q1 b2,

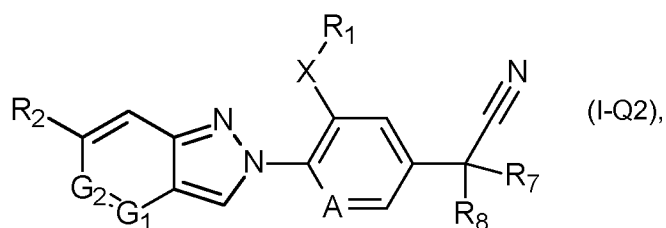
R_1 is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;
 R_2 is preferably Ci-C4haloalkyl, Ci-C4haloalkylsulfanyl, Ci-C4haloalkylsulfinyl, Ci-C4haloalkylsulfonyl;
 preferably Ci-C4haloalkyl; and X is preferably SO_2 .

An especially preferred group of compounds of formula I-Q1 b2 are those wherein R₇ and R_e are, independently from each other, halogen, cyano, Ci-C₆alkyl or Ci-C₄alkoxycarbonyl; preferably Ci-Cealkyl.

5

Another especially preferred group of compounds of formula I-Q1 b2 are those, wherein R₁ is ethyl and X is SO₂.

A second preferred group of compounds of formula I is represented by the compounds of formula I-Q2



10

wherein A, X, R_i, R₂, G_i, G₂, R₇, and R_e are as defined under formula I above. In said preferred group of compounds of formula I-Q2,

R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;

R₂ is preferably Ci-C₄haloalkyl; and X is preferably SO₂.

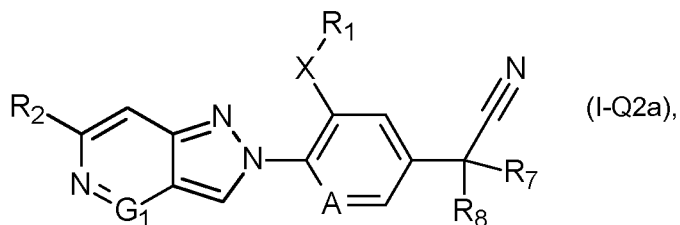
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An especially preferred group of compounds of formula I-Q2 are those wherein R₇ and R_e are, independently from each other, halogen, cyano, Ci-C₆alkyl or Ci-C₄alkoxycarbonyl; preferably Ci-Cealkyl.

20

Another especially preferred group of compounds of formula I-Q2 are those, wherein R₁ is ethyl and X is SO₂.

A more preferred group of compounds of formula I-Q2 is represented by the compounds of formula I-Q2a



25

wherein A, X, R_i, R₂, G_i, R₇, and R_e are as defined under formula I above. In said preferred group of compounds of formula I-Q2a,

A is preferably N;

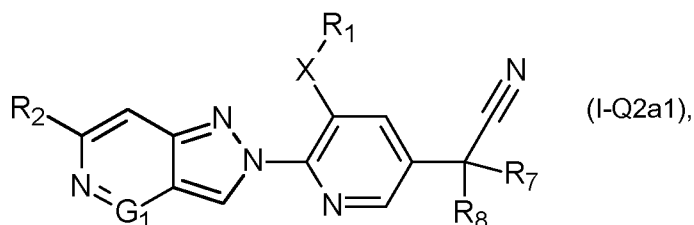
R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;

R₂ is preferably Ci-C4haloalkyl; G₁ is preferably CH; and X is preferably SO₂.

An especially preferred group of compounds of formula I-Q2a are those wherein R₇ and R_e are, independently from each other, halogen, cyano, Ci-C6alkyl or Ci-C4alkoxycarbonyl; preferably Ci-Cealkyl.

Another especially preferred group of compounds of formula I-Q2a are those, wherein R₁ is ethyl and X is SO₂.

An even more preferred group of compounds of formula I-Q2a is represented by the compounds of formula I-Q2a1



wherein X, R₁, R₂, G₁, R₇, and R_e are as defined under formula I above. In said preferred group of compounds of formula I-Q2a1 ,

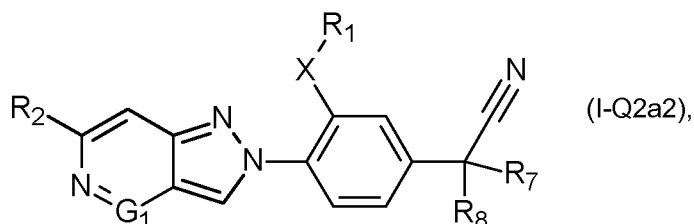
R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;

R₂ is preferably Ci-C4haloalkyl; G₁ is preferably CH; and X is preferably SO₂.

An especially preferred group of compounds of formula I-Q2a1 are those wherein R₇ and R_e are, independently from each other, halogen, cyano, Ci-C6alkyl or Ci-C4alkoxycarbonyl; preferably Ci-Cealkyl.

Another especially preferred group of compounds of formula I-Q2a1 are those, wherein R₁ is ethyl and X is SO₂.

Another even more preferred group of compounds of formula I-Q2a is represented by the compounds of formula I-Q2a2



-10-

wherein X, R₁, R₂, G₁, R₇, and R_e are as defined under formula I above. In said preferred group of compounds of formula I-Q2a2,

R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;

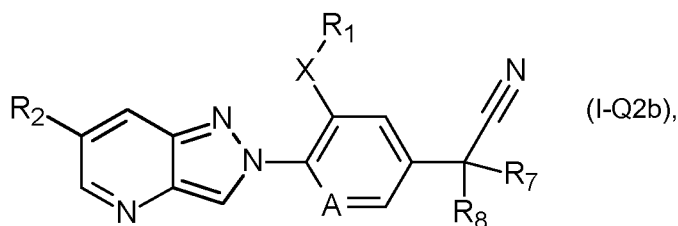
R₂ is preferably Ci-C4haloalkyl; G₁ is preferably CH; and X is preferably SO₂.

5

An especially preferred group of compounds of formula I-Q2a2 are those wherein R₇ and R_e are, independently from each other, halogen, cyano, Ci-C6alkyl or Ci-C4alkoxycarbonyl; preferably Ci-Cealkyl.

10 Another especially preferred group of compounds of formula I-Q2a1 are those, wherein R₁ is ethyl and X is SO₂.

Another more preferred group of compounds of formula I-Q2 is represented by the compounds of formula I-Q2b



15

wherein A, X, R₁, R₂, R₇, and R_e are as defined under formula I above. In said preferred group of compounds of formula I-Q2b,

R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;

R₂ is preferably Ci-C4haloalkyl; and X is preferably SO₂.

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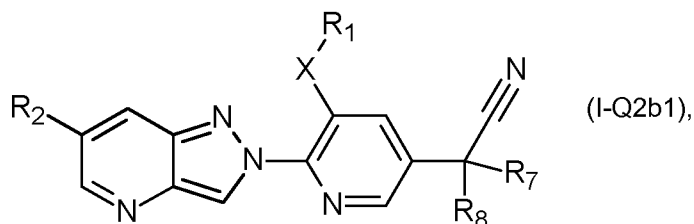
An especially preferred group of compounds of formula I-Q2b are those wherein R₇ and R_e are, independently from each other, halogen, cyano, Ci-C6alkyl or Ci-C4alkoxycarbonyl; preferably Ci-Cealkyl.

25 Another especially preferred group of compounds of formula I-Q2b are those, wherein R₁ is ethyl and X is SO₂.

An even more preferred group of compounds of formula I-Q2b is represented by the compounds of formula I-Q2b1

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wherein X, R₁, R₂, R₇, and R_e are as defined under formula I above. In said preferred group of compounds of formula I-Q2b1,

R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;

5 R₂ is preferably Ci-C4haloalkyl; and X is preferably SO₂.

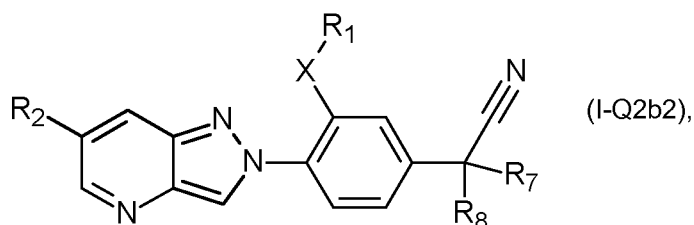
An especially preferred group of compounds of formula I-Q2b1 are those wherein R₇ and R_e are, independently from each other, halogen, cyano, Ci-C6alkyl or Ci-C4alkoxycarbonyl; preferably Ci-Cealkyl.

10

Another especially preferred compounds of formula I-Q2b1 are those, wherein R₁ is ethyl and X is SO₂.

Another even more preferred group of compounds of formula I-Q2b is represented by the compounds of formula I-Q2b2

15



wherein X, R₁, R₂, R₇, and R_e are as defined under formula I above. In said preferred group of compounds of formula I-Q2b2,

R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;

20 R₂ is preferably Ci-C4haloalkyl; and X is preferably SO₂.

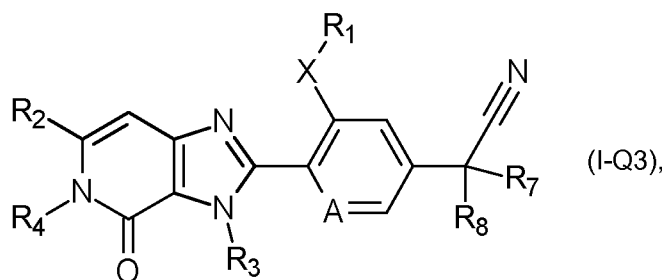
An especially preferred group of compounds of formula I-Q2b2 are those wherein R₇ and R_e are, independently from each other, halogen, cyano, Ci-C6alkyl or Ci-C4alkoxycarbonyl; preferably Ci-Cealkyl.

25

Another especially preferred group of compounds of formula I-Q1 b2 are those, wherein R₁ is ethyl and X is SO₂.

A third preferred group of compounds of formula I is represented by the compounds of formula I-Q3

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wherein A, X, R₁, R₂, R₄, R₇, and R_e are as defined under formula I above. In said preferred group of compounds of formula I-Q3,

R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;

5 R₂ is preferably Ci-C₄haloalkyl;

R₃ is preferably methyl;

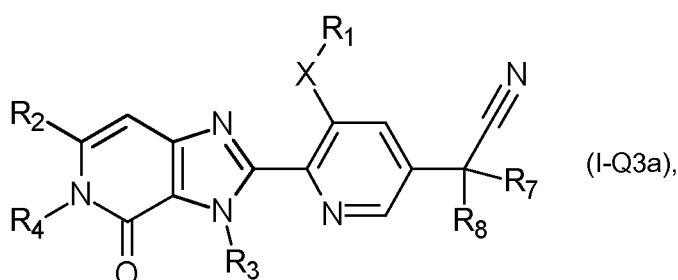
R₄ is preferably methyl, ethyl, 2,2,2-trifluoroethyl or cyclopropyl, and X is preferably SO₂.

10 An especially preferred group of compounds of formula I-Q3 are those wherein R₇ and R_e are, independently from each other, halogen, cyano, Ci-C₆alkyl or Ci-C₄alkoxycarbonyl; preferably Ci-Cealkyl.

Another especially preferred group of compounds of formula I-Q3 are those, wherein R₁ is ethyl and X is SO₂.

15

A more preferred group of compounds of formula I-Q3 is represented by the compounds of formula I-Q3a



20 wherein X, R₁, R₂, R₄, R₇, and R_e are as defined under formula I above. In said preferred group of compounds of formula I-Q3a,

R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;

R₂ is preferably Ci-C₄haloalkyl;

R₃ is preferably methyl;

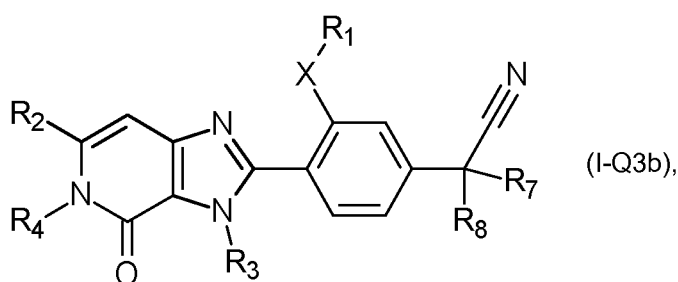
R₄ is preferably methyl, ethyl, 2,2,2-trifluoroethyl or cyclopropyl, and X is preferably SO₂.

25

An especially preferred group of compounds of formula I-Q3a are those wherein R₇ and R_e are, independently from each other, halogen, cyano, Ci-C₆alkyl or Ci-C₄alkoxycarbonyl; preferably Ci-Cealkyl.

- 5 Another especially preferred group of compounds of formula I-Q3a are those, wherein R₁ is ethyl and X is SO₂.

Another more preferred group of compounds of formula I-Q3 is represented by the compounds of formula I-Q3b



10

wherein X, R₁, R₂, R₄, R₇, and R_e are as defined under formula I above. In said preferred group of compounds of formula I-Q3b,

R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;

R₂ is preferably Ci-C₄haloalkyl;

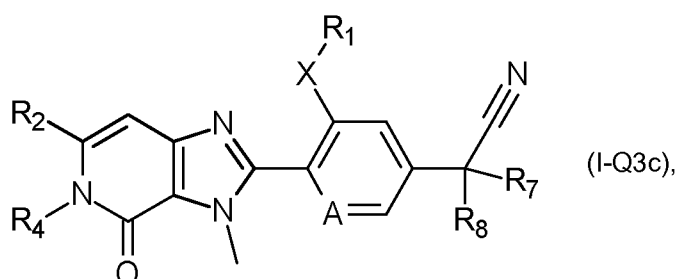
- 15 R₃ is preferably methyl;

R₄ is preferably methyl, ethyl, 2,2,2-trifluoroethyl or cyclopropyl, and X is preferably SO₂.

- 20 An especially preferred group of compounds of formula I-Q3b are those wherein R₇ and R_e are, independently from each other, halogen, cyano, Ci-C₆alkyl or Ci-C₄alkoxycarbonyl; preferably Ci-Cealkyl.

Another especially preferred group of compounds of formula I-Q3b are those, wherein R₁ is ethyl and X is SO₂.

- 25 An particularly preferred group of compounds of formula I-Q3 is represented by the compounds of formula I-Q3c



wherein A, X, R₁, R₂, R₄, R₇, and R_e are as defined under formula I above. In said preferred group of compounds of formula I-Q3c,

A is CH or N; preferably A is N;

R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;

5 R₂ is preferably C₁-C₄haloalkyl;

R₄ is preferably methyl, ethyl, 2,2,2-trifluoroethyl or cyclopropyl, and X is S or SO₂; preferably X is SO₂.

An especially preferred group of compounds of formula I-Q3c are those wherein R₇ and R_e are, independently from each other, halogen, cyano, C₁-C₆alkyl or C₁-C₄alkoxycarbonyl; preferably Ci-

10 Cealkyl.

Another especially preferred group of compounds of formula I-Q3c are those, wherein

A is CH or N; in particular A is N;

R₁ is ethyl;

15 X is S or SO₂; in particular X is SO₂;

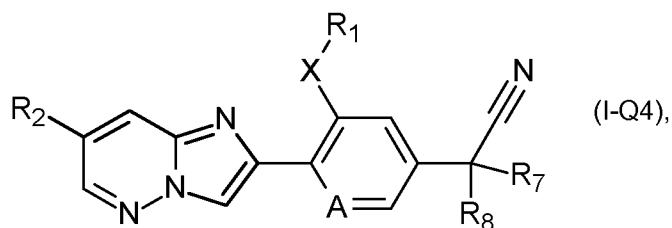
R₇ and R_e are, independently from each other, C₁-C₆alkyl, preferably methyl

R₂ is C₁-C₄haloalkyl, preferably trifluoromethyl; and

R₄ is ethyl, 2,2,2-trifluoroethyl or cyclopropyl.

20 Another especially preferred group of compounds of formula I-Q3c are those, wherein R₁ is ethyl and X is SO₂.

A fourth preferred group of compounds of formula I is represented by the compounds of formula I-Q4



25 wherein A, X, R₁, R₂, R₇, and R_e are as defined under formula I above. In said preferred group of compounds of formula I-Q4,

A is preferably N;

R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;

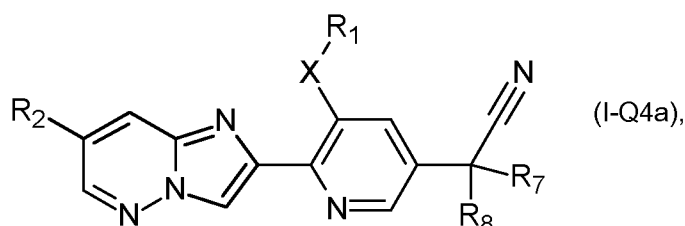
R₂ is preferably C₁-C₄haloalkyl; and X is preferably SO₂.

30

An especially preferred group of compounds of formula I-Q4 are those wherein R₇ and R_e are, independently from each other, halogen, cyano, C₁-C₆alkyl or C₁-C₄alkoxycarbonyl; preferably Ci-Cealkyl.

Another especially preferred group of compounds of formula I-Q4 are those, wherein R₁ is ethyl and X is SO₂.

5 A more preferred group of compounds of formula I-Q4 is represented by the compounds of formula I-Q4a



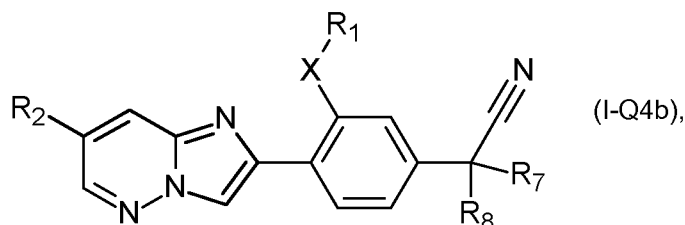
wherein X, R₁, R₂, R₇, and R₈ are as defined under formula I above. In said preferred group of compounds of formula I-Q4a,

10 R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;
R₂ is preferably Ci-C4haloalkyl; and X is preferably SO₂.

15 An especially preferred group of compounds of formula I-Q4a are those wherein R₇ and R₈ are, independently from each other, halogen, cyano, Ci-C6alkyl or Ci-C4alkoxycarbonyl; preferably Ci-Cealkyl.

Another especially preferred group of compounds of formula I-Q4a are those, wherein R₁ is ethyl and X is SO₂.

20 Another more preferred group of compounds of formula I-Q4 is represented by the compounds of formula I-Q4b



25 wherein X, R₁, R₂, R₇, and R₈ are as defined under formula I above. In said preferred group of compounds of formula I-Q4b,

R₁ is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropylmethyl;
R₂ is preferably Ci-C4haloalkyl; and X is preferably SO₂.

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An especially preferred group of compounds of formula I-Q4b are those wherein R_7 and Re are, independently from each other, halogen, cyano, C_1 - C_6 alkyl or C_1 - C_4 alkoxycarbonyl; preferably C_1 - C_6 alkyl.

- 5 Another especially preferred group of compounds of formula I-Q4b are those, wherein R_1 is ethyl and X is SO_2 .

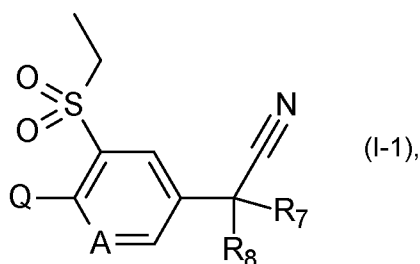
In all of the preferred embodiments mentioned above, independently

X is preferably S or SO_2 , most preferably SO_2 ,

- 10 R_1 is preferably methyl, ethyl, n-propyl, i-propyl or cyclopropyl methyl; most preferably ethyl;
 R_2 is preferably C_1 - C_4 haloalkyl; most preferably trifluoromethyl;
 R_7 is preferably C_1 - C_6 alkyl; most preferably methyl;
 Re is preferably C_1 - C_6 alkyl; most preferably methyl.

- 15 In all of the preferred embodiments mentioned above, preferably
X is S or SO_2 , most preferably SO_2 , and
 R_1 is methyl, ethyl, n-propyl, i-propyl or cyclopropyl methyl; most preferably ethyl; and
 R_2 is C_1 - C_4 haloalkyl; most preferably trifluoromethyl; and
 R_7 is C_1 - C_6 alkyl; most preferably methyl; and
20 Re is C_1 - C_6 alkyl; most preferably methyl.

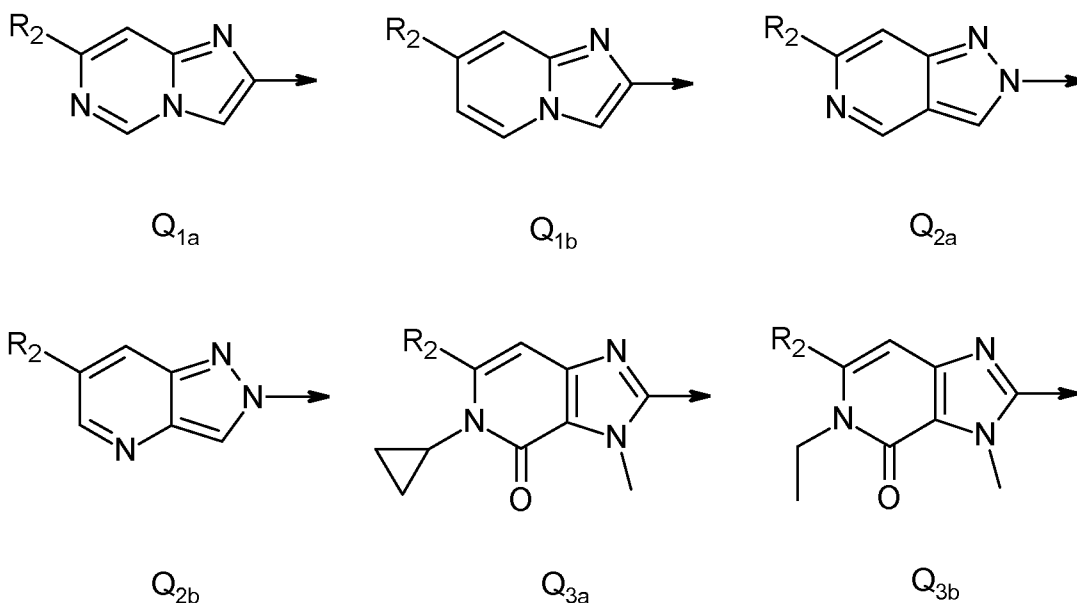
An outstanding group of compounds of formula I is represented by the compounds of formula 1-1



wherein

- 25 A is CH or N; in particular A is N;
 R_7 and Re are, independently from each other, C_1 - C_6 alkyl, preferably methyl; and
Q is a radical selected from the group consisting of formula Q_{1a} , Q_{1b} , Q_{2a} , Q_{2b} , Q_{3a} and Q_{3b}

-17-



in particular selected from Q_{1a} , Q_{2a} and Q_{3b} ;

wherein the arrow denotes the point of attachment to the ring incorporating the radical A;

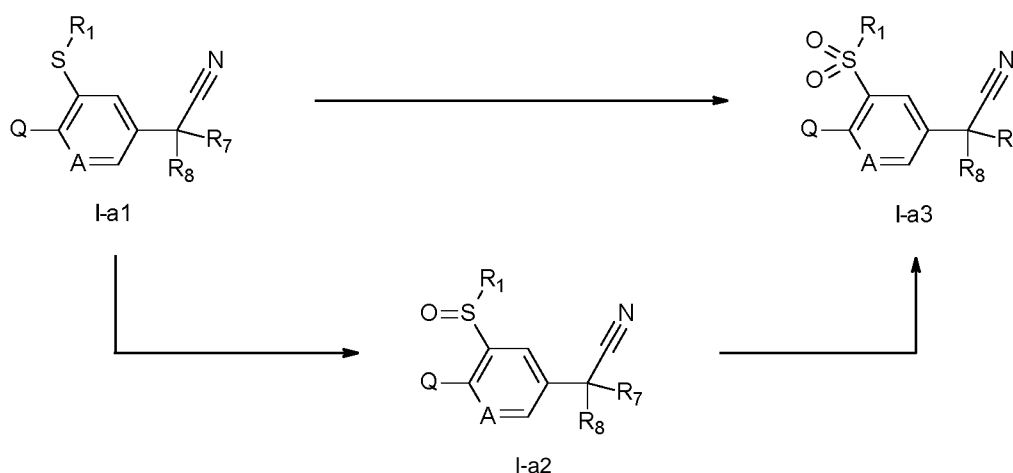
5 and in which

R_2 is C_1 - C_4 haloalkyl, preferably trifluoromethyl.

The process according to the invention for preparing compounds of formula I is carried out by methods known to those skilled in the art. Compounds of formula I-a3, wherein X is SO_2 and Q, A, R_1 , R_7 and R_e are defined as under formula I above, may be prepared by oxidation of compounds of formula I-a2, wherein X is SO and Q, A, R_1 , R_7 and R_e are defined as under formula I above. The reaction can be performed with reagents such as a peracid, for example peracetic acid or m-chloroperbenzoic acid, or a hydroperoxide, as for example, hydrogen peroxide or tert-butylhydroperoxide, or an inorganic oxidant, such as a monoperoxo-disulfate salt or potassium permanganate. In a similar way, compounds of formula I-a2, wherein X is SO and Q, A, R_1 , R_7 and R_e are defined as under formula I above, may be prepared by oxidation of compounds of formula I-a1, wherein X is S and Q, A, R_1 , R_7 and R_e are defined as under formula I above, under analogous conditions as described above. These reactions can be performed in various organic or aqueous solvents compatible to these conditions, by temperatures from below 0 °C up to the boiling point of the solvent system. The transformation of compounds of the formula I-a1 into compounds of the formula I-a2 and I-a3 is represented in Scheme 1.

Scheme 1

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Compounds of formula I, wherein X, Q, A, R₁, R₇ and R_e are defined as under formula I above, may be obtained by methods described in Scheme 2. Treatment of compounds of formula III, wherein Q, A and

5 R₁ are defined as under formula I above, X is S or SO₂, and X_{bi} is preferably halogen (even more preferably chlorine, bromine or iodine), with a compound of formula V in the presence of zinc(II)fluoride, and a palladium(0) catalyst such as tris(dibenzylideneacetone)dipalladium(0)-chloroform adduct (Pd₂(dba)₃), a ligand, for example Xantphos, in an inert solvent, such as DMF at temperatures between 100-160 °C, optionally under microwave heating, leads to compounds of formula II, wherein A, Q and

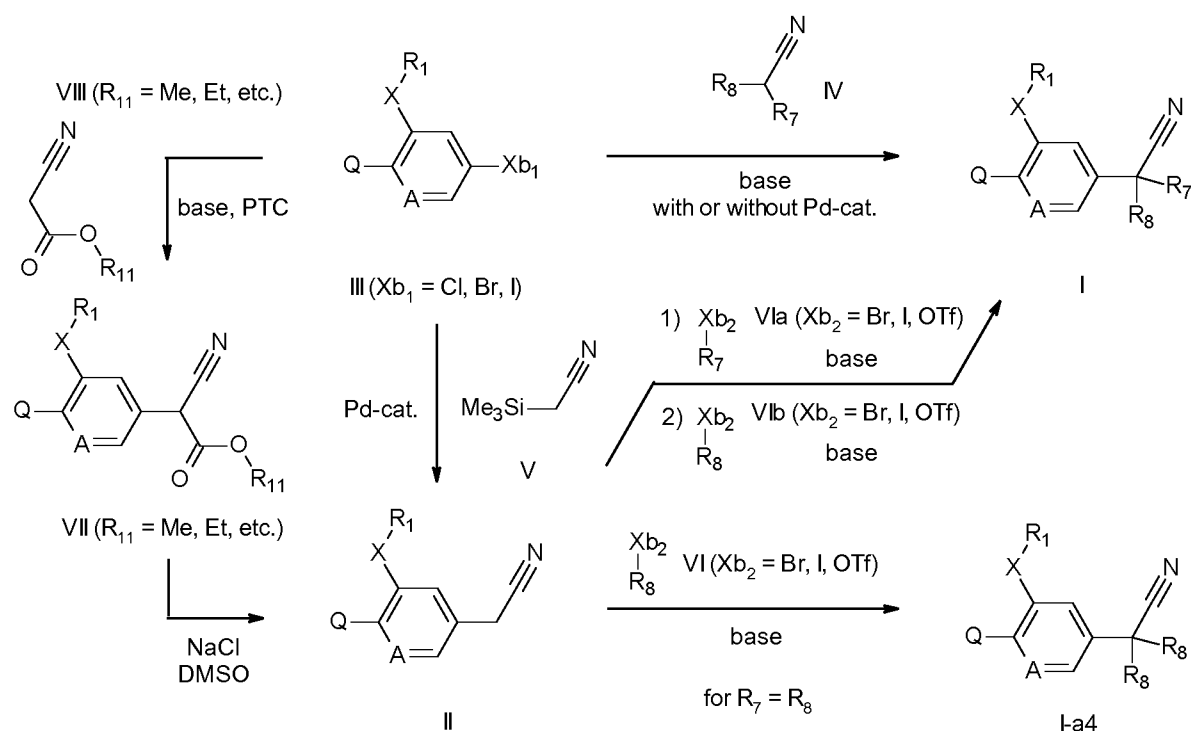
10 R₁ are defined as under general formula I above and X is S or SO₂. Such methods have been described in the literature, e.g. in *Org. Lett.*, 16(24), 6314-6317; **2014**. Compounds of formula II can be treated sequentially with alkylating reagents of general formula VI wherein X_{b2} is preferably Br, I, OSChMe or OTf, and R₇ and R_e is defined under formula I, in the presence of a base, such as sodium hydride, K₂CO₃, or Cs₂CO₃, in an inert solvent such as THF, DMF, or acetonitrile, to give compounds of formula I.

15 Alternatively, compounds of formula II can be subjected to an excess of the abovementioned base and reagent VI to obtain compounds of general type Ia-4, wherein R₇ = R_s. Alternatively, compound of formula II can be obtained from compounds of formula VII, wherein A, Q, X, and R₁ are defined as under formula I above, and R₁₁ stands for a C₁-C₆alkyl group, preferably methyl or ethyl, by Krapcho decarboxylation. Such methods have been described, for example in, *Tetrahedron Lett.* **1974**, 15, 1091-

20 1094. Compounds of formula VII may be obtained by reaction of compounds of formula III with cyanoacetates of general formula VIII, wherein R₁₁ stands for a C₁-C₆alkyl group, preferably methyl or ethyl. This reaction may proceed in polar aprotic solvents such as dimethylsulfoxide (DMSO), N,N-dimethylformamide (DMF), or N-methylpyrrolidone (NMP), in the presence of a base, such as K₂CO₃ or Na₂CO₃, in the presence or absence of a phase-transfer catalyst ("PTC") at temperatures between 20-

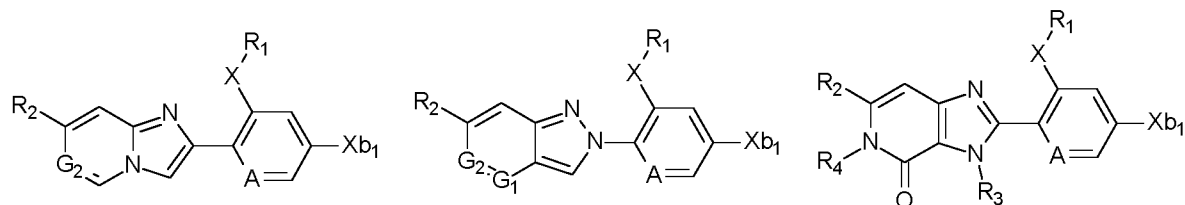
25 180 °C, preferably 80-140 °C. Similarly, transition metal-catalyzed processes are known, see for example, *Angew. Chem. Int. Ed.* **2011**, 50, 4470-4474. . Alternatively, compounds of formula I can be prepared directly from compounds of formula III by treatment with compounds of formula IV, wherein R₇ and R_e are defined as above for formula I, in the presence or absence of a catalyst such as Pd₂(dba)₃, and a ligand, such as BINAP, using a strong base such as LiHMDS, in an inert solvent such as THF at

temperatures between -20 and 120 °C. Such methods have been described in the literature, for example, *J. Am. Chem. Soc.* **2005**, *127*, 15824-15832; *J. Org. Chem.* **2005**, *70*, 10186-10189 or *Org. Lett.* **2011**, *13*, 1690-1693

5 Scheme 2

Compounds of general formula II, wherein A, X, and R₁ are defined as under formula I above and X_{b1} is preferably halogen (even more preferably chlorine, bromine or iodine), are known (Scheme 3). For example, compounds of formula II wherein Q = Q₁, are represented by compounds of formula IIa below, wherein A, G₂, X, R₁, and R₂ are defined as under formula I above and X_{b1} is preferably halogen (even more preferably chlorine, bromine or iodine). Synthesis of compounds of formula IIa, wherein G₂ is N have been described in WO2016/071214. Synthesis of compounds of formula IIa, wherein G₂ is CH have been described in WO2015/000715. Similarly, compounds of formula II wherein Q = Q₂, are represented by compounds of formula IIb below, wherein A, G₁, G₂, X, R₁, and R₂ are defined as under formula I above and X_{b1} is preferably halogen (even more preferably chlorine, bromine or iodine). Synthesis of compounds of formula IIb, wherein G₂ is CH and G₁ is N or CH have been described in WO2013/191113. Synthesis of compounds of formula IIa, wherein G₂ is N and G₁ is CH have been described in WO2017/134066. Synthesis of compounds of formula IIb, wherein G₂ is N and G₁ is N have been described in WO2016/020286. Furthermore, synthesis of compounds of formula IIc, wherein A, X, R₁, R₂, R₃ and R₄ are defined as under formula I above and X_{b1} is preferably halogen (even more preferably chlorine, bromine or iodine) have been described in WO2016/023954 and WO2017/089190. Synthesis of compounds of formula IIId, wherein Q = G₄ have been described in WO2015/000715.

Scheme 3



IIIa (Xb, = Cl, Br, I)

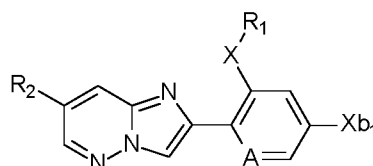
G2 = N: WO2016/071214
G2 = CH: WO2015/000715

IIIb (Xb, = Cl, Br, I)

G1, G2 = CH: WO2013/191113
G1 = N, G2 = CH: WO2013/191113
G1 = CH, G2 = N: WO2017/134066
G1 = N, G2 = N: WO2016/020286

IIIc (Xb, = Cl, Br, I)

WO2016/023954
WO2017/089190

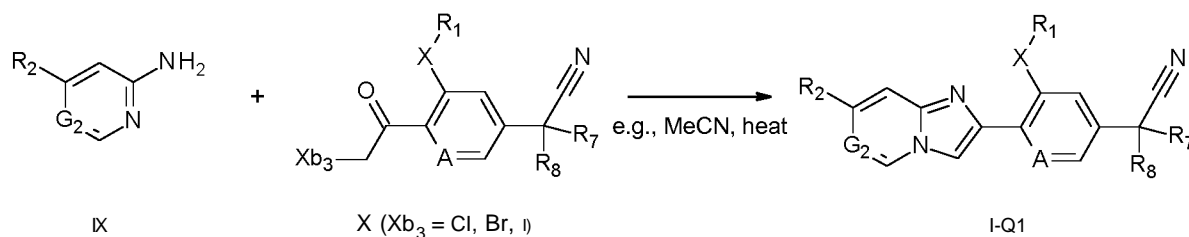


IIIid (Xb, = Cl, Br, I)

WO2015/000715

- 5 Alternatively, compounds of formula I-Q1, wherein A, X, R₁, R₂, G₂, R₇, and R_e are defined as under formula I above, may be prepared by methods as described in Scheme 4. Compounds of formula IX, wherein R₂ and G₂ are defined as under formula I, are reacted with compounds of formula X, wherein X, A, R₁, R₇ and R_e are as defined under formula I above, and Xb₃ is a halogen, preferably bromine, iodine or chlorine, in an inert solvent, for example ethanol or acetonitrile, optionally in the presence of a suitable base at temperatures between 80-150 °C, to give compounds of formula I-Q1. Such reactions may optionally be carried out in a microwave and have been described in the literature, for example WO2012/49280 or WO2003/031587. Compounds of formula IX are either commercially available or can be prepared using methods known to those skilled in the art.

15 Scheme 4



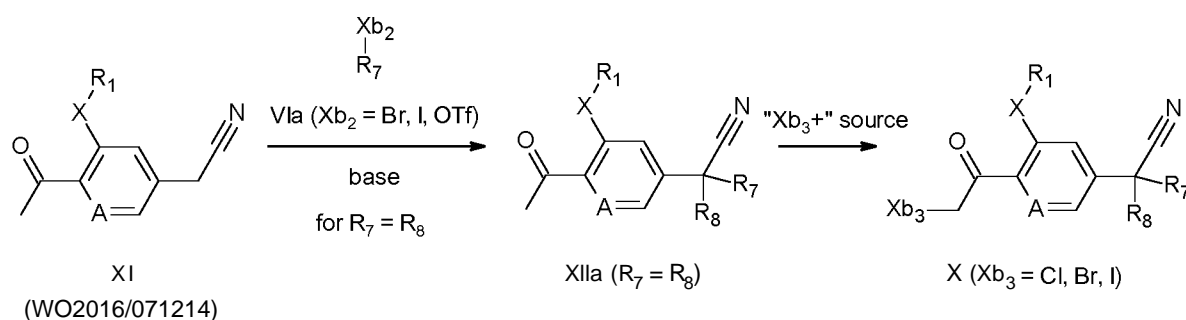
IX

X (Xb₃ = Cl, Br, I)

I-Q1

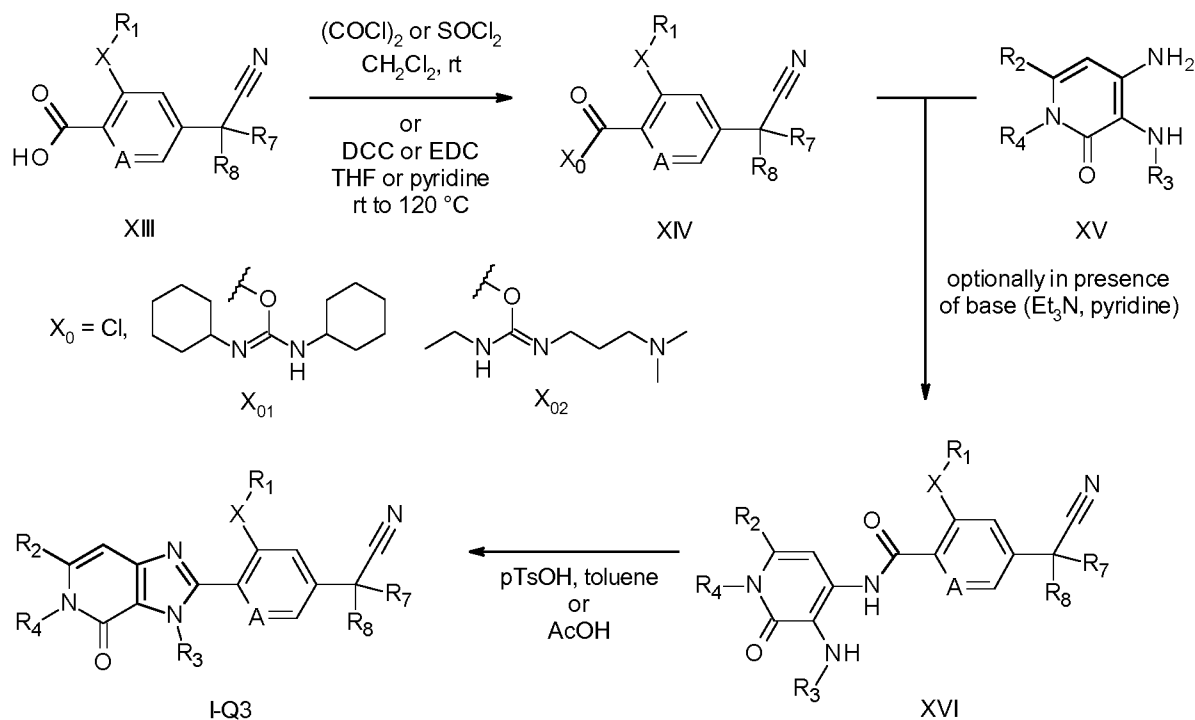
Compounds of formula X, wherein X, A, R₁, R₇ and R_e are as defined under formula I above, and X_{b3} is a halogen, preferably bromine, iodine or chlorine can be prepared in two steps from compounds of formula XI, wherein X and R₁ are defined as under formula I above (Scheme 5). Compounds of formula XI are known and their synthesis has been described, e.g. in WO2016/071214. Compounds of formula XI can be treated sequentially with alkylating reagents of general formula VIa wherein X_{b2} is preferably Br, I, OSChMe or OTf, and R₇ is defined under formula I, in the presence of a base, such as sodium hydride, K₂CO₃, or Cs₂CO₃, in an inert solvent such as THF, DMF, or acetonitrile, to give compounds of formula XIIa, wherein A, X, R₁, R₇ and R_e are defined as under formula I above. Subsequent treatment of compounds of formula XIIa with a halogenating reagent ("X_{b3}⁺ source), e.g. N-bromosuccinimide, N-iodosuccinimide, N-chlorosuccinimide, I₂, CuBr₂, Br₂ in acetic acid, PhNMe₃⁺Br₃⁻, typically in a solvent such as methanol, acetonitrile, THF, chloroform or dichloromethane at temperatures between 0 °C and 120 °C furnishes compounds of formula X. Additionally, compounds of formula X may be prepared analogously to methods described in WO2016/071214.

15 Scheme 5



Alternatively, compounds of formula I-Q3 may be prepared as described in Scheme 6. Treatment of compounds of formula XII, wherein R₁, A, X, R₇ and R_e are defined as above for formula I, can be activated to compounds of formula XIV by methods known to those skilled in the art and described in for example *Tetrahedron* **2005**, 61(46), 10827-10852. For example compounds of formula XIV wherein X₀ is chlorine are formed by treatment with, for example, oxalyl chloride or thionyl chloride in the presence of catalytic quantities of DMF in inert solvents such as methylene chloride or THF at temperatures between 20 °C to 100 °C, preferably 25 °C. Treatment of XIV with compounds of formula XV, wherein R₂, R₃ and R₄ are defined as described in formula I, optionally in the presence of a base, e.g. triethylamine or pyridine, leads to compounds of formula XVI. Alternatively, compounds of formula XVI can be prepared by treatment of compounds of formula XII with dicyclohexyl carbodiimide (DCC) or 1-ethyl-3-(3-dimethylaminopropyl)carbodiimide (EDC) to give the activated species XIV, wherein X₀ is X₀₁ and X₀₂, respectively, in an inert solvent, e.g. pyridine, or tetrahydrofuran (THF) optionally in the presence of a base, e.g., triethylamine, at temperatures between 50-180 °C. The obtained compounds of formula XVI can then be converted to compounds of formula I-Q3 by dehydration, e.g., by heating under microwave irradiation, in the presence of an acid catalyst, for example methanesulfonic acid, or

para-toluenesulfonic acid, in an inert solvent such as N-methyl pyrrolidone at temperatures between 25-180 °C, preferably 130-170 °C. Such processes and the synthesis of compounds of formula XV have been previously described in WO 2016/023951 and WO2017/089190.

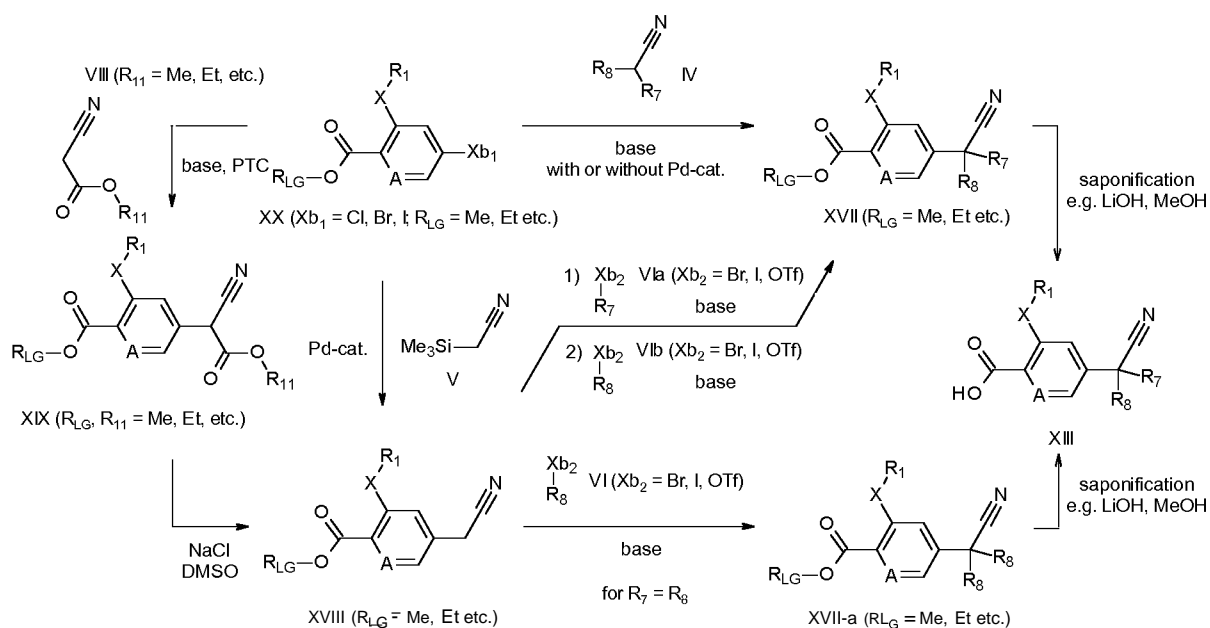
5 Scheme 6

Compounds of formula XII_I, wherein R₁, A, X, R₇ and R_e are defined as above for formula I, can be prepared by methods described in Scheme 7. Synthesis of the required starting materials of formula XX, wherein R₁, X, A are as defined as above for formula I, and wherein X_{bi} can be a halogen, preferentially chlorine, bromine or iodine, or a sulfonate, like for example a trifluoromethanesulfonate, most preferably bromine or iodine, and R_{LG} is C₁-C₄alkyl, have been previously described, for example in WO 2016/026848. Treatment of compounds of formula XX with trimethylsilyl acetonitrile (V), in the presence of zinc(II)fluoride, and a palladium(0)catalyst such as tris(dibenzylideneacetone)-dipalladium(0)-chloroform adduct (Pd₂(dba)₃), a ligand, for example Xantphos, in an inert solvent, such as DMF at temperatures between 100-160 °C, optionally under microwave heating, leads to compounds of formula XVII_{II}, wherein X is S or SO₂, R₁, A and R₇ are defined as in formula I above and R_{LG} is C₁-C₄alkyl. Such methods have been described in the literature, e.g. in *Org. Lett.*, 16(24), 6314-6317; 2014. Compounds of formula XVI_{II} can be sequentially treated with alkylating reagents of formula VI wherein X_{b2} is preferably Br, I, or OTf and R_e is defined under formula I, in the presence of a base, such as sodium hydride, K₂CO₃, or Cs₂CO₃, in an inert solvent such as THF, DMF, or acetonitrile, to give compounds of formula XVII, wherein X is S or SO₂, R₁, A, R₇ and R_e are defined as in formula I above and R_{LG} is C₁-C₄alkyl. Alternatively, compounds of formula XVII_I can be subjected to an excess of the abovementioned base and reagent VI to obtain compounds of general type XVII-a, wherein R₇ = R_s.

Alternatively, compounds of formula XVI I can be prepared directly from compounds of formula XX by treatment with compounds of formula IV, wherein R₇ and R_e are defined as above for formula I, in the presence or absence of a catalyst such as Pd₂(dba)₃, and a ligand, such as BINAP, using a strong base such as LiHMDS, in an inert solvent such as THF at temperatures between -20 and 120 °C. Such methods have been described in the literature, for example, *J. Am. Chem. Soc.* **2005**, *127*, 15824-15832; *J. Org. Chem.* **2005**, *70*, 10186-10189 or *Org. Lett.* **2011**, *13*, 1690-1693.

Alternatively, compound of formula XVI II can be obtained from compounds of formula XIX, wherein A, X, and R₁ are defined as under formula I above, R_{LG} and R₁₁ independently of each other stand for a C₁-C₆alkyl group, preferably methyl or ethyl, by Krapcho decarboxylation. Such methods have been described, for example in, *Tetrahedron Lett.* **1974**, *15*, 1091-1094. Compounds of formula XIX may be obtained by reaction of compounds of formula XX with cyanoacetates of formula VII I, wherein R₁₁ stands for a C_i-C₆alkyl group, preferably methyl or ethyl. This reaction may proceed in polar aprotic solvents such as dimethylsulfoxide (DMSO), N,N-dimethylformamide (DMF), or N-methylpyrrolidone (NMP), in the presence of a base, such as K₂CO₃ or Na₂CO₃, in the presence or absence of a phase-transfer catalyst ("PTC") at temperatures between 20-180 °C, preferably 80-140 °C. Similarly, transition metal-catalyzed processes are known, see for example, *Angew. Chem. Int. Ed.* **2011**, *50*, 4470-4474. Compounds of formula XVI I or XVI I-a can be converted to compounds of formula XIII by saponification under conditions known to a person skilled in the art. Compounds of formula VII I, V and VI are commercially available or methods to prepare those compounds are known to a person skilled in the art. Compounds of formula XX are known and their synthesis has been reported in the literature, see for example, WO2016/005263.

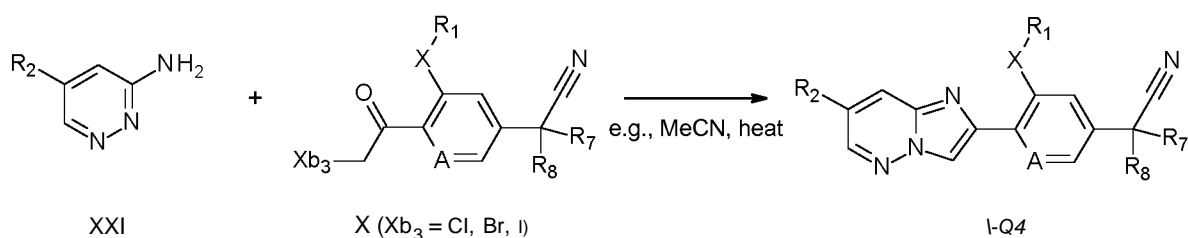
Scheme 7



Alternatively, compounds of formula I-Q4, wherein A, X, R₁, R₂, R₇, and R_e are defined as under formula I above, may be prepared by methods as described in Scheme 8. Compounds of formula I-Q4 can be

prepared analogous to compounds I-Q1 by reaction of compounds of formula XXI, wherein R₂ is defined as under formula I, with compounds of formula X, wherein X, A, R₁, R₇ and R₈ are as defined under formula I above, and Xb₃ is a halogen, preferably bromine, iodine or chlorine, in an inert solvent, for example ethanol or acetonitrile, optionally in the presence of a suitable base at temperatures between 80-150 °C, to give compounds of formula I-Q4. Such reactions may optionally be carried out in a microwave compounds of formula XXI are known, for example where R₂ is trifluoromethyl in WO 2016/051 193, or can be prepared by methods analogous to those described herein, or those skilled in the art.

10 Scheme 8



The reactants can be reacted in the presence of a base. Examples of suitable bases are alkali metal or alkaline earth metal hydroxides, alkali metal or alkaline earth metal hydrides, alkali metal or alkaline earth metal amides, alkali metal or alkaline earth metal alkoxides, alkali metal or alkaline earth metal acetates, alkali metal or alkaline earth metal carbonates, alkali metal or alkaline earth metal dialkylamides or alkali metal or alkaline earth metal alkylsilylamides, alkylamines, alkylenediamines, free or N-alkylated saturated or unsaturated cycloalkylamines, basic heterocycles, ammonium hydroxides and carbocyclic amines. Examples which may be mentioned are sodium hydroxide, sodium hydride, sodium amide, sodium methoxide, sodium acetate, sodium carbonate, potassium tert-butoxide, potassium hydroxide, potassium carbonate, potassium hydride, lithium diisopropylamide, potassium bis(trimethylsilyl)amide, calcium hydride, triethylamine, diisopropylethylamine, triethylenediamine, cyclohexylamine, N-cyclohexyl-N,N-dimethylamine, N,N-diethylaniline, pyridine, 4-(N,N-dimethylamino)pyridine, quinuclidine, N-methylmorpholine, benzyltrimethylammonium hydroxide and 1,8-diazabicyclo[5.4.0]undec-7-ene (DBU).

The reactants can be reacted with each other as such, i.e. without adding a solvent or diluent. In most cases, however, it is advantageous to add an inert solvent or diluent or a mixture of these. If the reaction is carried out in the presence of a base, bases which are employed in excess, such as triethylamine, pyridine, N-methylmorpholine or N,N-diethylaniline, may also act as solvents or diluents.

The reaction is advantageously carried out in a temperature range from approximately -80°C to approximately +140°C, preferably from approximately -30°C to approximately +100°C, in many cases in the range between ambient temperature and approximately +80°C.

A compound of formula I can be converted in a manner known per se into another compound of formula I by replacing one or more substituents of the starting compound of formula I in the customary manner by (an)other substituent(s) according to the invention.

5

Depending on the choice of the reaction conditions and starting materials which are suitable in each case, it is possible, for example, in one reaction step only to replace one substituent by another substituent according to the invention, or a plurality of substituents can be replaced by other substituents according to the invention in the same reaction step.

10

Salts of compounds of formula I can be prepared in a manner known per se. Thus, for example, acid addition salts of compounds of formula I are obtained by treatment with a suitable acid or a suitable ion exchanger reagent and salts with bases are obtained by treatment with a suitable base or with a suitable ion exchanger reagent.

15

Salts of compounds of formula I can be converted in the customary manner into the free compounds I, acid addition salts, for example, by treatment with a suitable basic compound or with a suitable ion exchanger reagent and salts with bases, for example, by treatment with a suitable acid or with a suitable ion exchanger reagent.

20

Salts of compounds of formula I can be converted in a manner known per se into other salts of compounds of formula I, acid addition salts, for example, into other acid addition salts, for example by treatment of a salt of inorganic acid such as hydrochloride with a suitable metal salt such as a sodium, barium or silver salt, of an acid, for example with silver acetate, in a suitable solvent in which an inorganic salt which forms, for example silver chloride, is insoluble and thus precipitates from the reaction mixture.

25

Depending on the procedure or the reaction conditions, the compounds of formula I, which have salt-forming properties can be obtained in free form or in the form of salts.

30

The compounds of formula I and, where appropriate, the tautomers thereof, in each case in free form or in salt form, can be present in the form of one of the isomers which are possible or as a mixture of these, for example in the form of pure isomers, such as antipodes and/or diastereomers, or as isomer mixtures, such as enantiomer mixtures, for example racemates, diastereomer mixtures or racemate mixtures, depending on the number, absolute and relative configuration of asymmetric carbon atoms which occur in the molecule and/or depending on the configuration of non-aromatic double bonds which occur in the molecule; the invention relates to the pure isomers and also to all isomer mixtures which are possible and is to be understood in each case in this sense hereinabove and hereinbelow, even when stereochemical details are not mentioned specifically in each case.

35

Diastereomer mixtures or racemate mixtures of compounds of formula I, in free form or in salt form, which can be obtained depending on which starting materials and procedures have been chosen can be separated in a known manner into the pure diastereomers or racemates on the basis of the physicochemical differences of the components, for example by fractional crystallization, distillation
5 and/or chromatography.

Enantiomer mixtures, such as racemates, which can be obtained in a similar manner can be resolved into the optical antipodes by known methods, for example by recrystallization from an optically active solvent, by chromatography on chiral adsorbents, for example high-performance liquid chromatography
10 (HPLC) on acetyl cellulose, with the aid of suitable microorganisms, by cleavage with specific, immobilized enzymes, via the formation of inclusion compounds, for example using chiral crown ethers, where only one enantiomer is complexed, or by conversion into diastereomeric salts, for example by reacting a basic end-product racemate with an optically active acid, such as a carboxylic acid, for example camphor, tartaric or malic acid, or sulfonic acid, for example camphorsulfonic acid, and
15 separating the diastereomer mixture which can be obtained in this manner, for example by fractional crystallization based on their differing solubilities, to give the diastereomers, from which the desired enantiomer can be set free by the action of suitable agents, for example basic agents.

Pure diastereomers or enantiomers can be obtained according to the invention not only by separating
20 suitable isomer mixtures, but also by generally known methods of diastereoselective or enantioselective synthesis, for example by carrying out the process according to the invention with starting materials of a suitable stereochemistry.

N-oxides can be prepared by reacting a compound of the formula I with a suitable oxidizing agent, for example the H_2O_2 /urea adduct in the presence of an acid anhydride, e.g. trifluoroacetic anhydride. Such
25 oxidations are known from the literature, for example from J. Med. Chem., 32 (12), 2561-73, 1989 or WO 00/1 561 5.

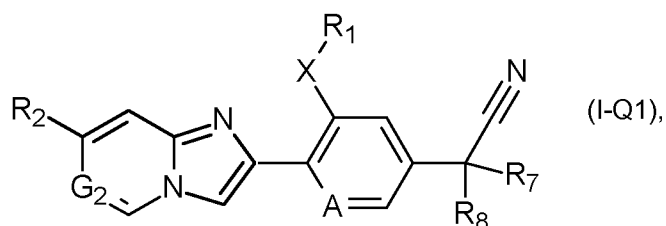
It is advantageous to isolate or synthesize in each case the biologically more effective isomer, for example enantiomer or diastereomer, or isomer mixture, for example enantiomer mixture or
30 diastereomer mixture, if the individual components have a different biological activity.

The compounds of formula I and, where appropriate, the tautomers thereof, in each case in free form or in salt form, can, if appropriate, also be obtained in the form of hydrates and/or include other solvents, for example those which may have been used for the crystallization of compounds which are present in
solid form.

35 The compounds of Tables X below can be prepared according to the methods described above. The examples which follow are intended to illustrate the invention and show preferred compounds of formula I.

Table X: This table discloses 15 substituent definitions X.001 to X.015 of the formula I-Q1 :

-27-



wherein R₂, G₂, A, R₁, R₇ and R₈ are as defined below:

Table X:

Comp.No	R ₂	G ₂	A	R ₁	R ₇	R ₈
X.001	CF ₃	N	N	Et	Me	Me
X.002	CF ₃	N	N	Et	Et	Et
X.003	CF ₃	N	N	Et	Me	C(O)OEt
X.004	CF ₃	N	N	Et	F	F
X.005	CF ₃	N	N	Et	Me	CN
X.006	CF ₃	CH	N	Et	Me	Me
X.007	CF ₃	CH	N	Et	Et	Et
X.008	CF ₃	CH	N	Et	Me	C(O)OEt
X.009	CF ₃	CH	N	Et	F	F
X.010	CF ₃	CH	N	Et	Me	CN
X.011	CF ₃	N	CH	Et	Me	Me
X.012	CF ₃	N	CH	Et	Et	Et
X.013	CF ₃	N	CH	Et	Me	C(O)OEt
X.014	CF ₃	N	CH	Et	F	F
X.015	CF ₃	N	CH	Et	Me	CN

5 and the N-oxides of the compounds of Table X. Me represents the methyl group, Et is the ethyl group, C(O)OEt is the ethoxycarbonyl group.

Table 1: This table discloses the 15 compounds 1.001 to 1.015 of the formula I-Q1, wherein X is S,

10 following structure:

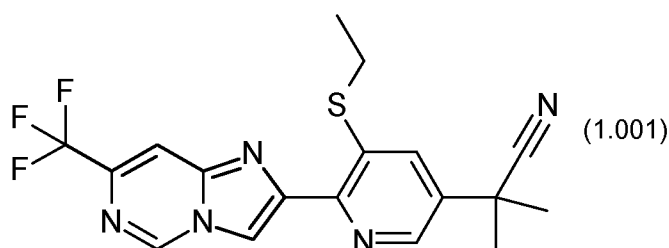
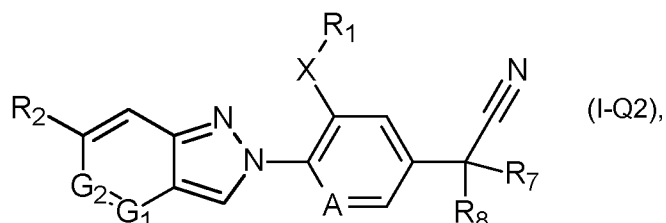


Table 2: This table discloses the 15 compounds 2.001 to 2.015 of the formula I-Q1, wherein X is SO,

Table 3: This table discloses the 15 compounds 3.001 to 3.015 of the formula I-Q1, wherein X is SO₂, and R₂, G₂, A, R₁, R₇ and R_e are as defined in Table X.

5 Table Y: This table discloses 20 substituent definitions Y.001 to Y.020 of the formula I-Q2:



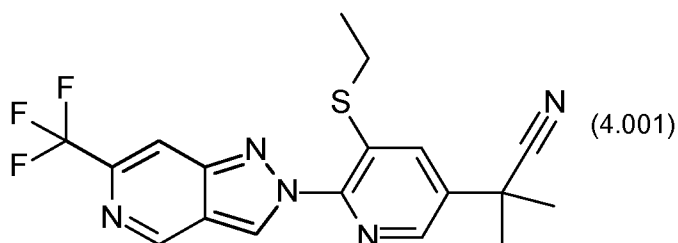
wherein R₂, G₂, G₁, A, R₁, R₇ and R_e are as defined below:

Table Y:

Comp.No	R ₂	G ₂	G ₁	A	R ₁	R ₇	R ₈
Y.001	CF ₃	N	CH	N	Et	Me	Me
Y.002	CF ₃	N	CH	N	Et	Et	Et
Y.003	CF ₃	N	CH	N	Et	Me	C(O)OEt
Y.004	CF ₃	N	CH	N	Et	F	F
Y.005	CF ₃	N	CH	N	Et	Me	CN
Y.006	CF ₃	CH	N	N	Et	Me	Me
Y.007	CF ₃	CH	N	N	Et	Et	Et
Y.008	CF ₃	CH	N	N	Et	Me	C(O)OEt
Y.009	CF ₃	CH	N	N	Et	F	F
Y.010	CF ₃	CH	N	N	Et	Me	CN
Y.011	CF ₃	N	CH	CH	Et	Me	Me
Y.012	CF ₃	N	CH	CH	Et	Et	Et
Y.013	CF ₃	N	CH	CH	Et	Me	C(O)OEt
Y.014	CF ₃	N	CH	CH	Et	F	F
Y.015	CF ₃	N	CH	CH	Et	Me	CN
Y.016	CF ₃	CH	N	CH	Et	Me	Me
Y.017	CF ₃	CH	N	CH	Et	Et	Et
Y.018	CF ₃	CH	N	CH	Et	Me	C(O)OEt
Y.019	CF ₃	CH	N	CH	Et	F	F
Y.020	CF ₃	CH	N	CH	Et	Me	CN

10 and the N-oxides of the compounds of Table Y. Me represents the methyl group, Et is the ethyl group, C(O)OEt is the ethoxycarbonyl group.

Table 4: This table discloses the 20 compounds 4.001 to 4.020 of the formula I-Q2, wherein X is S, and R₂, G₂, G₁, A, R₁, R₇ and R_e are as defined in Table Y. For example, compound 4.001 has the following structure:

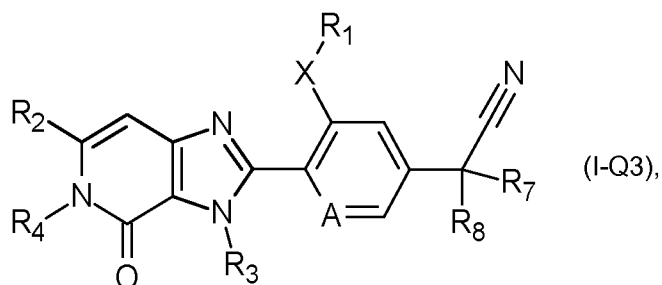


5 Table 5: This table discloses the 20 compounds 5.001 to 5.020 of the formula I-Q2, wherein X is SO, and R₂, G₂, G₁, A, R₁, R₇ and R_e are as defined in Table Y.

Table 6: This table discloses the 20 compounds 6.001 to 6.020 of the formula I-Q2, wherein X is SO₂, and R₂, G₂, G₁, A, R₁, R₇ and R_e are as defined in Table Y.

10

Table Z: This table discloses 20 substituent definitions Z.001 to Z.020 of the formula I-Q3:



wherein R₂, R₃, R₄, A, R₁, R₇ and R_e are as defined below:

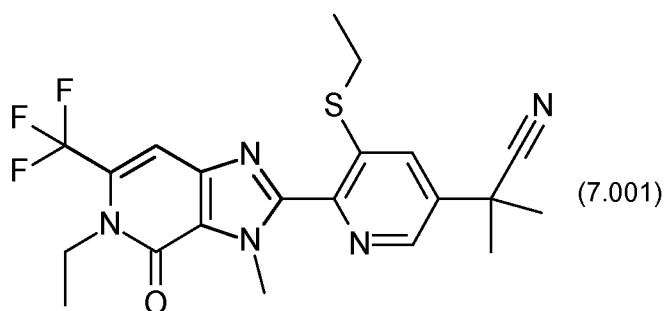
Table Z:

Comp.No	R ₂	R ₃	R ₄	A	R ₁	R ₇	R ₈
Z.001	CF ₃	Me	Et	N	Et	Me	Me
Z.002	CF ₃	Me	Et	N	Et	Et	Et
Z.003	CF ₃	Me	Et	N	Et	Me	C(O)OEt
Z.004	CF ₃	Me	Et	N	Et	F	F
Z.005	CF ₃	Me	Et	N	Et	Me	CN
Z.006	CF ₃	Me	c-Pr	N	Et	Me	Me
Z.007	CF ₃	Me	c-Pr	N	Et	Et	Et
Z.008	CF ₃	Me	c-Pr	N	Et	Me	C(O)OEt
Z.009	CF ₃	Me	c-Pr	N	Et	F	F
Z.010	CF ₃	Me	c-Pr	N	Et	Me	CN
Z.011	CF ₃	Me	Et	CH	Et	Me	Me
Z.012	CF ₃	Me	Et	CH	Et	Et	Et

Comp.No	R ₂	R ₃	R ₄	A	R ₁	R ₇	R ₈
Z.013	CF ₃	Me	Et	CH	Et	Me	C(O)OEt
Z.014	CF ₃	Me	Et	CH	Et	F	F
Z.015	CF ₃	Me	Et	CH	Et	Me	CN
Z.016	CF ₃	Me	c-Pr	CH	Et	Me	Me
Z.017	CF ₃	Me	c-Pr	CH	Et	Et	Et
Z.018	CF ₃	Me	c-Pr	CH	Et	Me	C(O)OEt
Z.019	CF ₃	Me	c-Pr	CH	Et	F	F
Z.020	CF ₃	Me	c-Pr	CH	Et	Me	CN

and the N-oxides of the compounds of Table Z. Me represents the methyl group, Et is the ethyl group, C(O)OEt is the ethoxycarbonyl group. c-Pr represents the cyclopropyl group.

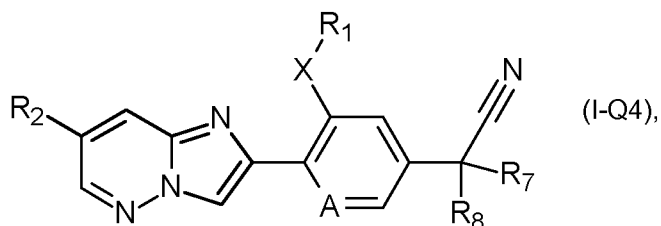
5 Table 7: This table discloses the 20 compounds 7.001 to 7.020 of the formula I-Q3, wherein X is S, and R₂, R₃, R₄, A, R₁, R₇ and R_e are as defined in Table Z. For example, compound 7.001 has the following structure:



10 Table 8: This table discloses the 20 compounds 8.001 to 8.020 of the formula I-Q3, wherein X is SO, and R₂, R₃, R₄, A, R₁, R₇ and R_e are as defined in Table Z.

Table 9: This table discloses the 20 compounds 9.001 to 9.020 of the formula I-Q3, wherein X is SO₂, and R₂, R₃, R₄, A, R₁, R₇ and R_e are as defined in Table Z.

Table XA: This table discloses 10 substituent definitions XA.001 to XA.010 of the formula I-Q4:



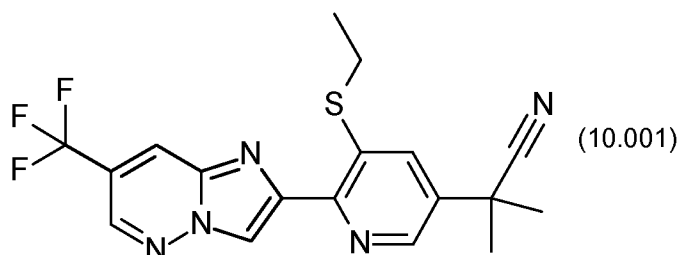
15 wherein R₂, A, R₁, R₇ and R_e are as defined below:

Table XA:

Comp.No	R ₂	A	R ₁	R ₇	R ₈
XA.001	CF ₃	N	Et	Me	Me
XA.002	CF ₃	N	Et	Et	Et
XA.003	CF ₃	N	Et	Me	C(O)OEt
XA.004	CF ₃	N	Et	F	F
XA.005	CF ₃	N	Et	Me	CN
XA.006	CF ₃	CH	Et	Me	Me
XA.007	CF ₃	CH	Et	Et	Et
XA.008	CF ₃	CH	Et	Me	C(O)OEt
XA.009	CF ₃	CH	Et	F	F
XA.010	CF ₃	CH	Et	Me	CN

and the N-oxides of the compounds of Table XA. Me represents the methyl group, Et is the ethyl group, C(O)OEt is the ethoxycarbonyl group.

- 5 Table 10: This table discloses the 10 compounds 10.001 to 10.010 of the formula I-Q4, wherein X is S, and R₂, A, R₁, R₇ and R₈ are as defined in Table XA. For example, compound 10.001 has the following structure:



- 10 Table 11: This table discloses the 10 compounds 11.001 to 11.010 of the formula I-Q4, wherein X is SO, and R₂, A, R₁, R₇ and R₈ are as defined in Table XA.

Table 12: This table discloses the 10 compounds 12.001 to 12.010 of the formula I-Q4, wherein X is SO₂, and R₂, A, R₁, R₇ and R₈ are as defined in Table XA.

- 15 The compounds of formula I according to the invention find use as pesticides in controlling, inhibiting growth or killing animal pests (including arthropods, nematodes and molluscs and in particular insects or representatives of the order *Acarina*, nematodes and molluscs). In particular the compounds of formula I according to the invention, are preventively and/or curatively valuable active ingredients in the field of pest control, even at low rates of application, which have a very favorable biocidal spectrum and are well tolerated by warm-blooded species, fish and plants. The active ingredients according to
- 20 the invention act against all or individual developmental stages of normally sensitive, but also resistant, animal pests, such as insects or representatives of the order *Acarina*. The insecticidal, nematicidal, molluscicidal or acaricidal activity of the active ingredients according to the invention can manifest itself directly, i. e. in destruction of the pests, which takes place either immediately or only

after some time has elapsed, for example during ecdysis, or indirectly, for example in a reduced growth, oviposition and/or hatching rate.

Examples of the abovementioned animal pests are:

- 5 from the order *Acarina*, for example,
 Acalitus spp, Aculus spp, Acaricalus spp, Aceria spp, Acarus siro, Amblyomma spp., Argas spp.,
 Boophilus spp., Brevipalpus spp., Bryobia spp, Calipitrimerus spp., Chorioptes spp., Dermanyssus
 gallinae, Dermatophagoides spp, Eotetranychus spp, Eriophyes spp., Hemitarsonemus spp,
 Hyalomma spp., Ixodes spp., Olygonychus spp, Ornithodoros spp., Polyphagotarsonne latus,
 10 Panonychus spp., Phyllocoptruta oleivora, Phytionemus spp, Polyphagotarsonemus spp, Psoroptes
 spp., Rhipicephalus spp., Rhizoglyphus spp., Sarcoptes spp., Steneotarsonemus spp, Tarsonemus
 spp. and Tetranychus spp.;
- from the order *Anoplura*, for example,
 Haematopinus spp., Linognathus spp., Pediculus spp., Pemphigus spp. and Phylloxera spp.;
- 15 from the order *Coleoptera*, for example,
 Agriotes spp., Amphimallon majale, Anomala orientalis, Anthonomus spp., Aphodius spp, Astylus
 atromaculatus, Ataenius spp, Atomaria linearis, Chaetocnema tibialis, Cerotoma spp, Conoderus spp,
 Cosmopolites spp., Cotinis nitida, Curculio spp., Cyclocephala spp, Dermestes spp., Diabrotica spp.,
 Diloboderus abderus, Epilachna spp., Eremnus spp., Heteronychus arator, Hypothenemus hampei,
 20 Lagria vilosa, Leptinotarsa decemlineata, Lissorhoptrus spp., Liogenys spp, Maecolaspis spp,
 Maladera castanea, Megascelis spp, Meligethes aeneus, Melolontha spp., Myochrous armatus,
 Orycaephilus spp., Otiorhynchus spp., Phyllophaga spp, Phlyctinus spp., Popillia spp., Psylliodes spp.,
 Rhyssomatus aubtilis, Rhizopertha spp., Scarabeidae, Sitophilus spp., Sitotroga spp., Somaticus spp,
 Sphenophorus spp, Sternechus subsignatus, Tenebrio spp., Tribolium spp. and Trogoderma spp.;
- 25 from the order *Diptera*, for example,
 Aedes spp., Anopheles spp, Antherigona soccata, Bactrocea oleae, Bibio hortulanus, Bradysia spp,
 Calliphora erythrocephala, Ceratitis spp., Chrysomyia spp., Culex spp., Cuterebra spp., Dacus spp.,
 Delia spp, Drosophila melanogaster, Fannia spp., Gastrophilus spp., Geomyza tripunctata, Glossina
 spp., Hypoderma spp., Hyppobosca spp., Liriomyza spp., Lucilia spp., Melanagromyza spp., Musca
 30 spp., Oestrus spp., Orseolia spp., Oscinella frit, Pegomyia hyoscyami, Phorbia spp., Rhagoletis spp,
 Rivelia quadrifasciata, Scatella spp, Sciara spp., Stomoxys spp., Tabanus spp., Tannia spp. and
 Tipula spp.;
- from the order *Hemiptera*, for example,
 Acanthocoris scabrator, Acrosternum spp, Adelphocoris lineolatus, Amblypelta nitida, Bathycoelia
 35 thalassina, Blissus spp, Cimex spp., Clavigralla tomentosicollis, Creontiades spp, Distantiella
 theobroma, Dichelops furcatus, Dysdercus spp., Edessa spp, Euchistus spp., Eurydema pulchrum,
 Eurygaster spp., Halyomorpha halys, Horcias nobilellus, Leptocoris spp., Lygus spp, Margarodes
 spp, Murgantia histrionic, Neomegalotomus spp, Nesidiocoris tenuis, Nezara spp., Nysius simulans,

- Oebalus insularis, Piesma spp., Piezodorus spp, Rhodnius spp., Sahlbergella singularis, Scaptocoris castanea, Scotinophara spp. ,Thyanta spp ,Triatoma spp., Vatiga illudens;
- Acyrtosium pisum, Adalges spp, Agalliana ensigera, Agonosцена targionii, Aleurodicus spp, Aleurocanthus spp, Aleurolobus barodensis, Aleurothrixus floccosus, Aleyrodes brassicae, Amarasca biguttula, Amritodus atkinsoni, Aonidiella spp., Aphididae, Aphis spp., Aspidiotus spp., Aulacorthum solani, Bactericera cockerelli, Bemisia spp, Brachycaudus spp, Brevicoryne brassicae, Cacopsylla spp, Cavariella aegopodii Scop., Ceroplaster spp., Chrysomphalus aonidium, Chrysomphalus dictyospermi, Cicadella spp, Cofana spectra, Cryptomyzus spp, Cicadulina spp, Coccus hesperidum, Dalbulus maidis, Dialeurodes spp, Diaphorina citri, Diuraphis noxia, Dysaphis spp, Empoasca spp., Eriosoma larigerum, Erythroneura spp., Gascardia spp., Glycaspis brimblecombei, Hyadaphis pseudobrassicae, Hyalopterus spp, Hyperomyzus pallidus, Idioscopus clypealis, Jacobiasca lybica, Laodelphax spp., Lecanium corni, Lepidosaphes spp., Lopaphis erysimi, Lyogenys maidis, Macrosiphum spp., Mahanarva spp, Metcalfa pruinosa, Metopolophium dirhodum, Myndus crudus, Myzus spp., Neotoxoptera sp, Nephrotettix spp., Nilaparvata spp., Nippolachnus piri Mats, Odonaspis ruthae, Oregma lanigera Zehnter, Parabemisia myricae, Paratrioza cockerelli, Parlatoria spp., Pemphigus spp., Peregrinus maidis, Perkinsiella spp, Phorodon humuli, Phylloxera spp, Planococcus spp., Pseudaulacaspis spp., Pseudococcus spp., Pseudatomoscelis seriatus, Psylla spp., Pulvinaria aethiopica, Quadraspidiotus spp., Quesada gigas, Recilia dorsalis, Rhopalosiphum spp., Saissetia spp., Scaphoideus spp., Schizaphis spp., Sitobion spp., Sogatella furcifera, Spissistilus festinus, Tarophagus Proserpina, Toxoptera spp, Trialeurodes spp, Tridiscus sporoboli, Trionymus spp, Trioza erytraeae , Unaspis citri, Zyginia flammigera, Zyginidia scutellaris, ;
- from the order *Hymenoptera*, for example,
- Acromyrmex, Arge spp, Atta spp., Cephus spp., Diprion spp., Diprionidae, Gilpinia polytoma, Hoplocampa spp., Lasius spp., Monomorium pharaonis, Neodiprion spp., Pogonomymex spp, Slenopsis invicta, Solenopsis spp. and Vespa spp.;
- from the order *Isoptera*, for example,
- Coptotermes spp, Cornitermes cumulans, Incisitermes spp, Macrotermes spp, Mastotermes spp, Microtermes spp, Reticulitermes spp.; Solenopsis geminate
- from the order *Lepidoptera*, for example,
- Acleris spp., Adoxophyes spp., Aegeria spp., Agrotis spp., Alabama argillaceae, Amylois spp., Anticarsia gemmatalis, Archips spp., Argyresthia spp, Argyrotaenia spp., Autographa spp., Bucculatrix thurberiella, Busseola fusca, Cadra cautella, Carposina nipponensis, Chilo spp., Choristoneura spp., Chrysoteuchia topiaria, Clysia ambiguella, Cnaphalocrocis spp., Cnephasia spp., Cochylis spp., Coleophora spp., Colias lesbia, Cosmophila flava, Crambus spp, Crocidolomia binotalis, Cryptophlebia leucotreta, Cydalima perspectalis, Cydia spp., Diaphania perspectalis, Diatraea spp., Diparopsis castanea, Earias spp., Eldana saccharina, Ephestia spp., Epinotia spp, Estigmene acrea, Etiella zinckinella, Eucosma spp., Eupoecilia ambiguella, Euproctis spp., Euxoa spp., Feltia jaculiferia, Grapholita spp., Hedyia nubiferana, Heliothis spp., Hellula undalis, Herpetogramma spp, Hyphantria cunea, Keiferia lycopersicella, Lasmopalpus lignosellus, Leucoptera scitella, Lithocollethis spp.,

- Lobesia botrana, Loxostege bifidalis, Lymantria spp., Lyonetia spp., Malacosoma spp., Mamestra brassicae, Manduca sexta, Mythimna spp, Noctua spp, Operophtera spp., Orniodes indica, Ostrinia nubilalis, Pammene spp., Pandemis spp., Panolis flammea, Papaipema nebris, Pectinophora gossypiella, Perileucoptera coffeella, Pseudaletia unipuncta, Phthorimaea operculella, Pieris rapae, Pieris spp., Plutella xylostella, Prays spp., Pseudoplusia spp, Rachiplusia nu, Richia albicosta, Scirpophaga spp., Sesamia spp., Sparganothis spp., Spodoptera spp., Sylepta derogate, Synanthedon spp., Thaumetopoea spp., Tortrix spp., Trichoplusia ni, Tuta absoluta, and Yponomeuta spp.;
- 5 from the order *Mallophaga*, for example, Damalinae spp. and Trichodectes spp.;
- 10 from the order *Orthoptera*, for example, Blatta spp., Blattella spp., Grylotalpa spp., Leucophaea maderae, Locusta spp., Neocurtilla hexadactyla, Periplaneta spp. , Scapteriscus spp, and Schistocerca spp.;
- from the order *Psocoptera*, for example, Liposcelis spp.;
- 15 from the order *Siphonaptera*, for example, Ceratophyllus spp., Ctenocephalides spp. and Xenopsylla cheopis;
- from the order *Thysanoptera*, for example, Calliothrips phaseoli, Frankliniella spp., Heliothrips spp, Hercinothrips spp., Parthenothrips spp,
- 20 Scirtothrips aurantii, Sericothrips variabilis, Taeniothrips spp., Thrips spp;
- from the order *Thysanura*, for example, Lepisma saccharina.
- The active ingredients according to the invention can be used for controlling, i. e. containing or destroying, pests of the abovementioned type which occur in particular on plants, especially on useful
- 25 plants and ornamentals in agriculture, in horticulture and in forests, or on organs, such as fruits, flowers, foliage, stalks, tubers or roots, of such plants, and in some cases even plant organs which are formed at a later point in time remain protected against these pests.
- Suitable target crops are, in particular, cereals, such as wheat, barley, rye, oats, rice, maize or
- 30 sorghum; beet, such as sugar or fodder beet; fruit, for example pomaceous fruit, stone fruit or soft fruit, such as apples, pears, plums, peaches, almonds, cherries or berries, for example strawberries, raspberries or blackberries; leguminous crops, such as beans, lentils, peas or soya; oil crops, such as oilseed rape, mustard, poppies, olives, sunflowers, coconut, castor, cocoa or ground nuts; cucurbits, such as pumpkins, cucumbers or melons; fibre plants, such as cotton, flax, hemp or jute; citrus fruit,
- 35 such as oranges, lemons, grapefruit or tangerines; vegetables, such as spinach, lettuce, asparagus, cabbages, carrots, onions, tomatoes, potatoes or bell peppers; Lauraceae, such as avocado, Cinnamomum or camphor; and also tobacco, nuts, coffee, eggplants, sugarcane, tea, pepper, grapevines, hops, the plantain family and latex plants.

The compositions and/or methods of the present invention may be also used on any ornamental and/or vegetable crops, including flowers, shrubs, broad-leaved trees and evergreens.

For example the invention may be used on any of the following ornamental species: *Ageratum* spp.,

- 5 *Alonsoa* spp., *Anemone* spp., *Anisodonteia capsensis*, *Anthemis* spp., *Antirrhinum* spp., *Aster* spp.,
Begonia spp. (e.g. *B. elatior*, *B. semperflorens*, *B. tubereux*), *Bougainvillea* spp., *Brachycome* spp.,
Brassica spp. (ornamental), *Calceolaria* spp., *Capsicum annuum*, *Catharanthus roseus*, *Canna* spp.,
Centaurea spp., *Chrysanthemum* spp., *Cineraria* spp. (*C. maritime*), *Coreopsis* spp., *Crassula*
coccinea, *Cuphea ignea*, *Dahlia* spp., *Delphinium* spp., *Dicentra spectabilis*, *Dorotheantus* spp.,
Eustoma grandiflorum, *Forsythia* spp., *Fuchsia* spp., *Geranium gnaphalium*, *Gerbera* spp.,
10 *Gomphrena globosa*, *Heliotropium* spp., *Helianthus* spp., *Hibiscus* spp., *Hortensia* spp., *Hydrangea*
spp., *Hypoestes phyllostachya*, *Impatiens* spp. (*I. Walleriana*), *Iresines* spp., *Kalanchoe* spp., *Lantana*
camara, *Lavatera trimestris*, *Leonotis leonurus*, *Lilium* spp., *Mesembryanthemum* spp., *Mimulus* spp.,
Monarda spp., *Nemesia* spp., *Tagetes* spp., *Dianthus* spp. (carnation), *Canna* spp., *Oxalis* spp., *Bell's*
spp., *Pelargonium* spp. (*P. peltatum*, *P. Zonale*), *Viola* spp. (pansy), *Petunia* spp., *PWox* spp.,
15 *Plectranthus* spp., *Poinsettia* spp., *Parthenocissus* spp. *cf. quinquefolia*, *P. tricuspidata*, *Primula*
spp., *Ranunculus* spp., *Rhododendron* spp., *Rosa* spp. (rose), *Rudbeckia* spp., *Saintpaulia* spp.,
Sa/wa spp., *Scaevola aemola*, *Schizanthus wisetonensis*, *Sedum* spp., *Solanum* spp., *Surfinia* spp.,
Tagetes spp., *Nicotinia* spp., *Verbena* spp., *Zinnia* spp. and other bedding plants.

For example the invention may be used on any of the following vegetable species: *Allium* spp. (*A*

- 20 *sativum*, *A. cepa*, *A. oschaninii*, *A. Porrum*, *A. ascalonicum*, *A. fistulosum*), *Anthriscus cerefolium*,
Apium graveolus, *Asparagus officinalis*, *Beta vulgaris*, *Brassica* spp. (*B. Oleracea*, *B. Pekinensis*, *B.*
rapa), *Capsicum annuum*, *Cicer arietinum*, *Cichorium endivia*, *Cichorium* spp. (*C. intybus*, *C. endivia*),
Citrillus lanatus, *Cucumis* spp. (*C. sativus*, *C. melo*), *Cucurbita* spp. (*C. pepo*, *C. maxima*), *Cyanara*
spp. (*C. scolymus*, *C. cardunculus*), *Daucus carota*, *Foeniculum vulgare*, *Hypericum* spp., *Lactuca*
25 *sativa*, *Lycopersicon* spp. (*L. esculentum*, *L. lycopersicum*), *Mentha* spp., *Ocimum basilicum*,
Petroselinum crispum, *Phaseolus* spp. (*P. vulgaris*, *P. coccineus*), *Pisum sativum*, *Raphanus sativus*,
Rheum rhaponticum, *Rosemarinus* spp., *Salvia* spp., *Scorzonera hispanica*, *Solanum melongena*,
Spinacea oleracea, *Valerianella* spp. (*V. locusta*, *V. eriocarpa*) and *Vicia faba*.

Preferred ornamental species include African violet, *Begonia*, *Dahlia*, *Gerbera*, *Hydrangea*, *Verbena*,

- 30 *Rosa*, *Kalanchoe*, *Poinsettia*, *Aster*, *Centaurea*, *Coreopsis*, *Delphinium*, *Monarda*, *Phlox*, *Rudbeckia*,
Sedum, *Petunia*, *Viola*, *Impatiens*, *Geranium*, *Chrysanthemum*, *Ranunculus*, *Fuchsia*, *Salvia*,
Hortensia, rosemary, sage, St. Johnswort, mint, sweet pepper, tomato and cucumber.

The active ingredients according to the invention are especially suitable for controlling Aphis craccivora, Diabrotica balteata, Heliothis virescens, Myzus persicae, Plutella xylostella and

- 35 Spodoptera littoralis in cotton, vegetable, maize, rice and soya crops. The active ingredients according to the invention are further especially suitable for controlling Mamestra (preferably in vegetables), Cydia pomonella (preferably in apples), Empoasca (preferably in vegetables, vineyards), Leptinotarsa (preferably in potatoes) and Chilo suppressalis (preferably in rice).

The active ingredients according to the invention are especially suitable for controlling *Aphis craccivora*, *Diabrotica balteata*, *Heliothis virescens*, *Myzus persicae*, *Plutella xylostella* and *Spodoptera littoralis* in cotton, vegetable, maize, rice and soya crops. The active ingredients according to the invention are further especially suitable for controlling *Mamestra* (preferably in vegetables),
 5 *Cydia pomonella* (preferably in apples), *Empoasca* (preferably in vegetables, vineyards), *Leptinotarsa* (preferably in potatoes) and *Chilo suppressalis* (preferably in rice).

In a further aspect, the invention may also relate to a method of controlling damage to plant and parts thereof by plant parasitic nematodes (Endoparasitic-, Semiendoparasitic- and Ectoparasitic
 10 nematodes), especially plant parasitic nematodes such as root knot nematodes, *Meloidogyne hapla*, *Meloidogyne incognita*, *Meloidogyne javanica*, *Meloidogyne arenaria* and other *Meloidogyne* species; cyst-forming nematodes, *Globodera rostochiensis* and other *Globodera* species; *Heterodera avenae*, *Heterodera glycines*, *Heterodera schachtii*, *Heterodera trifolii*, and other *Heterodera* species; Seed gall nematodes, *Anguina* species; Stem and foliar nematodes, *Aphelenchoides* species; Sting nematodes,
 15 *Belonolaimus longicaudatus* and other *Belonolaimus* species; Pine nematodes, *Bursaphelenchus xylophilus* and other *Bursaphelenchus* species; Ring nematodes, *Criconema* species, *Criconemella* species, *Criconemoides* species, *Mesocriconema* species; Stem and bulb nematodes, *Ditylenchus destructor*, *Ditylenchus dipsaci* and other *Ditylenchus* species; Awl nematodes, *Dolichodorus* species; Spiral nematodes, *Helicotylenchus multicinctus* and other *Helicotylenchus* species; Sheath and
 20 sheathoid nematodes, *Hemicyclophora* species and *Hemicriconemoides* species; *Hirshmanniella* species; Lance nematodes, *Hoploaimus* species; false rootknot nematodes, *Nacobbus* species; Needle nematodes, *Longidorus elongatus* and other *Longidorus* species; Pin nematodes, *Pratylenchus* species; Lesion nematodes, *Pratylenchus neglectus*, *Pratylenchus penetrans*, *Pratylenchus curvatus*, *Pratylenchus goodeyi* and other *Pratylenchus* species; Burrowing nematodes,
 25 *Radopholus similis* and other *Radopholus* species; Reniform nematodes, *Rotylenchus robustus*, *Rotylenchus reniformis* and other *Rotylenchus* species; *Scutellonema* species; Stubby root nematodes, *Trichodorus primitivus* and other *Trichodorus* species, *Paratrichodorus* species; Stunt nematodes, *Tylenchorhynchus claytoni*, *Tylenchorhynchus dubius* and other *Tylenchorhynchus* species; Citrus nematodes, *Tylenchulus* species; Dagger nematodes, *Xiphinema* species; and other
 30 plant parasitic nematode species, such as *Subanguina* spp., *Hypsoperine* spp., *Macroposthonia* spp., *Melinius* spp., *Punctodera* spp., and *Quinisulcius* spp..

The compounds of the invention may also have activity against the molluscs. Examples of which include, for example, Ampullariidae; *Arion* (*A. ater*, *A. circumscriptus*, *A. hortensis*, *A. rufus*);
 35 Bradybaenidae (*Bradybaena fruticum*); *Cepaea* (*C. hortensis*, *C. Nemoralis*); *ochlodina*; *Deroceras* (*D. agrestis*, *D. empiricorum*, *D. laeve*, *D. reticulatum*); *Discus* (*D. rotundatus*); *Euomphalia*; *Galba* (*G. trunculata*); *Helicelia* (*H. itala*, *H. obvia*); *Helicidae* *Helicigona arbustorum*); *Helicodiscus*; *Helix* (*H. aperta*); *Limax* (*L. cinereoniger*, *L. flavus*, *L. marginatus*, *L. maximus*, *L. tenellus*); *Lymnaea*; *Milax* (*M. gagates*, *M. marginatus*, *M. sowerbyi*); *Opeas*; *Pomacea* (*P. canaticulata*); *Vallonia* and *Zanitoides*.

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

Toxins that can be expressed by such transgenic plants include, for example, insecticidal proteins, for example insecticidal proteins from *Bacillus cereus* or *Bacillus popilliae*; or insecticidal proteins from *Bacillus thuringiensis*, such as δ -endotoxins, e.g. CryIAb, CryIAc, CryIF, Cry1Fa2, Cry2Ab, Cry3A, Cry3Bb1 or Cry9C, or vegetative insecticidal proteins (Vip), e.g. Vip1, Vip2, Vip3 or Vip3A; or
10 insecticidal proteins of bacteria colonising nematodes, for example *Photorhabdus* spp. or *Xenorhabdus* spp., such as *Photorhabdus luminescens*, *Xenorhabdus nematophilus*; toxins produced by animals, such as scorpion toxins, arachnid toxins, wasp toxins and other insect-specific neurotoxins; toxins produced by fungi, such as *Streptomyces* toxins, plant lectins, such as pea
15 lectins, barley lectins or snowdrop lectins; agglutinins; proteinase inhibitors, such as trypsin inhibitors, serine protease inhibitors, patatin, cystatin, papain inhibitors; ribosome-inactivating proteins (RIP), such as ricin, maize-RIP, abrin, luffin, saporin or bryodin; steroid metabolism enzymes, such as 3-hydroxysteroidoxidase, ecdysteroid-UDP-glycosyl-transferase, cholesterol oxidases, ecdysone
20 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 glucanases.

In the context of the present invention there are to be understood by δ -endotoxins, for example CryIAb, CryIAc, CryIF, Cry1Fa2, Cry2Ab, Cry3A, Cry3Bb1 or Cry9C, or vegetative insecticidal proteins (Vip), for example Vip1, Vip2, Vip3 or Vip3A, expressly also hybrid toxins, truncated toxins
25 and modified toxins. Hybrid toxins are produced recombinantly by a new combination of different domains of those proteins (see, for example, WO 02/15701). Truncated toxins, for example a truncated CryIAb, 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
30 Cry3A055, a cathepsin-G-recognition sequence is inserted into a Cry3A toxin (see WO 03/018810). Examples of such toxins or transgenic plants capable of synthesising such toxins are disclosed, for example, in EP-A-0 374 753, WO 93/07278, WO 95/34656, EP-A-0 427 529, EP-A-451 878 and WO 03/052073.

The processes for the preparation of such transgenic plants are generally known to the person skilled
35 in the art and are described, for example, in the publications mentioned 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 moths (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 CryIAb toxin); YieldGard Rootworm® (maize variety that expresses a Cry3Bb1 toxin); YieldGard Plus® (maize variety that expresses a CryIAb and a Cry3Bb1 toxin); Starlink® (maize variety that expresses a Cry9C toxin); Herculex I® (maize variety that expresses a Cry1 Fa2 toxin and the enzyme phosphinothricine N-acetyltransferase (PAT) to achieve tolerance to the herbicide glufosinate ammonium); NuCOTN 33B® (cotton variety that expresses a CryIAc toxin); Bollgard I® (cotton variety that expresses a CryIAc toxin); Bollgard II® (cotton variety that expresses a CryIAc and a Cry2Ab toxin); VipCot® (cotton variety that expresses a Vip3A and a CryIAb toxin); NewLeaf® (potato variety that expresses a Cry3A toxin); NatureGard®, Agrisure® GT Advantage (GA21 glyphosate-tolerant trait), Agrisure® CB Advantage (Bt1 1 corn borer (CB) trait) and Protecta®.

Further examples of such transgenic crops are:

1. **Bt1 1 Maize** from Syngenta Seeds SAS, Chemin de l'Hobit 27, F-31 790 St. Sauveur, France, registration number C/FR/96/05/1 0. 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 CryIAb toxin. Bt1 1 maize also transgenically expresses the enzyme PAT to achieve tolerance to the herbicide glufosinate ammonium.
2. **Bt1 76 Maize** from Syngenta Seeds SAS, Chemin de l'Hobit 27, F-31 790 St. Sauveur, France, registration number C/FR/96/05/1 0. 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 CryIAb toxin. Bt1 76 maize also transgenically expresses the enzyme PAT to achieve tolerance to the herbicide glufosinate ammonium.
3. **MIR604 Maize** from Syngenta Seeds SAS, Chemin de l'Hobit 27, F-31 790 St. Sauveur, France, registration number C/FR/96/05/1 0. 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 03/01 881 0.
4. **MON 863 Maize** from Monsanto Europe S.A. 270-272 Avenue de Tervuren, B-1 150 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-1 150 Brussels, Belgium, registration number C/ES/96/02.
6. **1507 Maize** from Pioneer Overseas Corporation, Avenue Tedesco, 7 B-1 160 Brussels, Belgium, registration number C/NL/00/1 0. Genetically modified maize for the expression of the protein Cry1 F 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 Tervuren, B-1 150 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 Cry1 Ab toxin obtained from *Bacillus thuringiensis subsp. kurstaki* which brings about tolerance to certain Lepidoptera, include the European corn borer.

10 Transgenic crops of insect-resistant plants are also described in BATS (Zentrum für Biosicherheit und Nachhaltigkeit, Zentrum BATS, Clarastrasse 13, 4058 Basel, Switzerland) Report 2003, (<http://bats.ch>).

The term "crops" is to be understood as including also crop 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-0 392 225). 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 95/3381 8 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.

Crops may also be modified for enhanced resistance to fungal (for example Fusarium, Anthracnose, or Phytophthora), bacterial (for example Pseudomonas) or viral (for example potato leafroll virus, tomato spotted wilt virus, cucumber mosaic virus) pathogens.

25 Crops also include those that have enhanced resistance to nematodes, such as the soybean cyst nematode.

Crops that are tolerance to abiotic stress include those that have enhanced tolerance to drought, high salt, high temperature, chill, frost, or light radiation, for example through expression of NF-YB or other proteins known in the art.

35 Antipathogenic substances which can be expressed by such transgenic plants include, for example, ion channel blockers, such as blockers for sodium and calcium channels, for example the viral KP1, KP4 or KP6 toxins; stilbene synthases; bibenzyl synthases; chitinases; glucanases; the so-called "pathogenesis-related proteins" (PRPs; see e.g. EP-A-0 392 225); antipathogenic substances produced by microorganisms, for example peptide antibiotics or heterocyclic antibiotics (see e.g. WO 95/3381 8) or protein or polypeptide factors involved in plant pathogen defence (so-called "plant disease resistance genes", as described in WO 03/000906).

Further areas of use of the compositions according to the invention are the protection of stored goods and store rooms and the protection of raw materials, such as wood, textiles, floor coverings or buildings, and also in the hygiene sector, especially the protection of humans, domestic animals and productive livestock against pests of the mentioned type.

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The present invention also provides a method for controlling pests (such as mosquitoes and other disease vectors; see also http://www.who.int/malaria/vector_control/irs/en/). In one embodiment, the method for controlling pests comprises applying the compositions of the invention to the target pests, to their locus or to a surface or substrate by brushing, rolling, spraying, spreading or dipping. By way of example, an IRS (indoor residual spraying) application of a surface such as a wall, ceiling or floor surface is contemplated by the method of the invention. In another embodiment, it is contemplated to apply such compositions to a substrate such as non-woven or a fabric material in the form of (or which can be used in the manufacture of) netting, clothing, bedding, curtains and tents.

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In one embodiment, the method for controlling such pests comprises applying a pesticidally effective amount of the compositions of the invention to the target pests, to their locus, or to a surface or substrate so as to provide effective residual pesticidal activity on the surface or substrate. Such application may be made by brushing, rolling, spraying, spreading or dipping the pesticidal composition of the invention. By way of example, an IRS application of a surface such as a wall, ceiling or floor surface is contemplated by the method of the invention so as to provide effective residual pesticidal activity on the surface. In another embodiment, it is contemplated to apply such compositions for residual control of pests on a substrate such as a fabric material in the form of (or which can be used in the manufacture of) netting, clothing, bedding, curtains and tents.

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Substrates including non-woven, fabrics or netting to be treated may be made of natural fibres such as cotton, raffia, jute, flax, sisal, hessian, or wool, or synthetic fibres such as polyamide, polyester, polypropylene, polyacrylonitrile or the like. The polyesters are particularly suitable. The methods of textile treatment are known, e.g. WO 2008/151984, WO 2003/034823, US 5631 072, WO 2005/64072, WO2006/128870, EP 1724392, WO 2005113886 or WO 2007/090739.

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Further areas of use of the compositions according to the invention are the field of tree injection/trunk treatment for all ornamental trees as well all sort of fruit and nut trees.

In the field of tree injection/trunk treatment, the compounds according to the present invention are especially suitable against wood-boring insects from the order *Lepidoptera* as mentioned above and from the order *Coleoptera*, especially against woodborers listed in the following tables A and B:

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Table A. Examples of exotic woodborers of economic importance.

Family	Species	Host or Crop Infested
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Buprestidae	<i>Agrilus planipennis</i>	Ash
Cerambycidae	<i>Anoplura glabripennis</i>	Hardwoods
Scolytidae	<i>Xylosandrus crassiusculus</i>	Hardwoods
	<i>X. mutilatus</i>	Hardwoods
	<i>Tomicus piniperda</i>	Conifers

Table B. Examples of native woodborers of economic importance.

Family	Species	Host or Crop Infested
Buprestidae	<i>Agrilus anxius</i>	Birch
	<i>Agrilus politus</i>	Willow, Maple
	<i>Agrilus sayi</i>	Bayberry, Sweetfern
	<i>Agrilus vittaticollis</i>	Apple, Pear, Cranberry, Serviceberry, Hawthorn
	<i>Chrysobothris femorata</i>	Apple, Apricot, Beech, Boxelder, Cherry, Chestnut, Currant, Elm, Hawthorn, Hackberry, Hickory, Horsechestnut, Linden, Maple, Mountain-ash, Oak, Pecan, Pear, Peach, Persimmon, Plum, Poplar, Quince, Redbud, Serviceberry, Sycamore, Walnut, Willow
	<i>Texania campestris</i>	Basswood, Beech, Maple, Oak, Sycamore, Willow, Yellow-poplar
Cerambycidae	<i>Goes pulverulentus</i>	Beech, Elm, Nuttall, Willow, Black oak, Cherrybark oak, Water oak, Sycamore
	<i>Goes tigrinus</i>	Oak
	<i>Neoclytus acuminatus</i>	Ash, Hickory, Oak, Walnut, Birch, Beech, Maple, Eastern

Family	Species	Host or Crop Infested
		hophornbeam, Dogwood , Persimmon, Redbud , Holly, Hackberry, Black locust, Honeylocust, Yellow-poplar, Chestnut, Osage-orange, Sassafras, Lilac, Mountain-mahogany, Pear, Cherry, Plum, Peach, Apple, Elm, Basswood , Sweetgum
	<i>Neoptychodes trilineatus</i>	Fig, Alder, Mulberry, Willow, Nettleaf hackberry
	<i>Oberea ocellata</i>	Sumac, Apple, Peach, Plum, Pear, Currant, Blackberry
	<i>Oberea tripunctata</i>	Dogwood , Viburnum, Elm, Sourwood, Blueberry, Rhododendron, Azalea, Laurel, Poplar, Willow, Mulberry
	<i>Oncideres cingulata</i>	Hickory, Pecan, Persimmon, Elm, Sourwood, Basswood, Honeylocust, Dogwood, Eucalyptus, Oak, Hackberry, Maple, Fruit trees
	<i>Saperda calcarata</i>	Poplar
	<i>Strophiona nitens</i>	Chestnut, Oak, Hickory, Walnut, Beech, Maple
Scolytidae	<i>Corthylus columbianus</i>	Maple, Oak, Yellow-poplar, Beech, Boxelder, Sycamore, Birch, Basswood, Chestnut, Elm
	<i>Dendroctonus frontalis</i>	Pine
	<i>Dryocoetes betulae</i>	Birch, Sweetgum, Wild cherry, Beech, Pear

Family	Species	Host or Crop Infested
	<i>Monarthrum fasciatum</i>	Oak, Maple, Birch, Chestnut, Sweetgum, Blackgum, Poplar, Hickory, Mimosa, Apple, Peach, Pine
	<i>Phloeotribus liminaris</i>	Peach, Cherry, Plum, Black cherry, Elm, Mulberry, Mountain-ash
	<i>Pseudopityophthorus pruinosis</i>	Oak, American beech, Black cherry, Chickasaw plum, Chestnut, Maple, Hickory, Hornbeam, Hophornbeam
Sesiidae	<i>Paranthrene simulans</i>	Oak, American chestnut
	<i>Sannina uroceriformis</i>	Persimmon
	<i>Synanthedon exitiosa</i>	Peach, Plum, Nectarine, Cherry, Apricot, Almond, Black cherry
	<i>Synanthedon pictipes</i>	Peach, Plum, Cherry, Beach, Black Cherry
	<i>Synanthedon rubrofascia</i>	Tupelo
	<i>Synanthedon scitula</i>	Dogwood, Pecan, Hickory, Oak, Chestnut, Beech, Birch, Black cherry, Elm, Mountain-ash, Viburnum, Willow, Apple, Loquat, Ninebark, Bayberry
	<i>Vitacea polistiformis</i>	Grape

The present invention may be also used to control any insect pests that may be present in turfgrass, including for example beetles, caterpillars, fire ants, ground pearls, millipedes, sow bugs, mites, mole crickets, scales, mealybugs ticks, spittlebugs, southern chinch bugs and white grubs. The present invention may be used to control insect pests at various stages of their life cycle, including eggs, larvae, nymphs and adults.

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In particular, the present invention may be used to control insect pests that feed on the roots of turfgrass including white grubs (such as *Cyclocephala spp.* (e.g. masked chafer, *C. lurida*),

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Rhizotrogus spp. (e.g. European chafer, *R. majalis*), *Cotinus spp.* (e.g. Green June beetle, *C. nitida*),

5 *Popillia* spp. (e.g. Japanese beetle, *P. japonica*), *Phyllophaga* spp. (e.g. May/June beetle), *Ataenius* spp. (e.g. Black turfgrass ataenius, *A. spretulus*), *Maladera* spp. (e.g. Asiatic garden beetle, *M. castanea*) and *Tomarus* spp.), ground pearls (*Margarodes* spp.), mole crickets (tawny, southern, and short-winged ; *Scapteriscus* spp., *Gryllotalpa africana*) and leatherjackets (European crane fly, *Tipula* spp.).

10 The present invention may also be used to control insect pests of turfgrass that are thatch dwelling, including armyworms (such as fall armyworm *Spodoptera frugiperda*, and common armyworm *Pseudaletia unipuncta*), cutworms, billbugs (*Sphenophorus* spp., such as *S. venatus verstitus* and *S. parvulus*), and sod webworms (such as *Crambus* spp. and the tropical sod webworm, *Herpetogramma phaeopteralis*).

15 The present invention may also be used to control insect pests of turfgrass that live above the ground and feed on the turfgrass leaves, including chinch bugs (such as southern chinch bugs, *Blissus insularis*), Bermudagrass mite (*Eriophyes cynodontiensis*), rhodesgrass mealybug (*Antonina graminis*), two-lined spittlebug (*Prospapia bicincta*), leafhoppers, cutworms (*Noctuidae* family), and greenbugs. The present invention may also be used to control other pests of turfgrass such as red imported fire ants (*Solenopsis invicta*) that create ant mounds in turf.

20 In the hygiene sector, the compositions according to the invention are active against ectoparasites such as hard ticks, soft ticks, mange mites, harvest mites, flies (biting and licking), parasitic fly larvae, lice, hair lice, bird lice and fleas.

Examples of such parasites are:

25 Of the order Anoplurida: *Haematopinus* spp., *Linognathus* spp., *Pediculus* spp. and *Phtirus* spp., *Solenopotes* spp..

Of the order Mallophagida: *Trimenopon* spp., *Menopon* spp., *Trinoton* spp., *Bovicola* spp., *Werneckiella* spp., *Lepikentron* spp., *Damalina* spp., *Trichodectes* spp. and *Felicola* spp..

30 Of the order Diptera and the suborders Nematocerina and Brachycerina, for example *Aedes* spp., *Anopheles* spp., *Culex* spp., *Simulium* spp., *Eusimulium* spp., *Phlebotomus* spp., *Lutzomyia* spp., *Culicoides* spp., *Chrysops* spp., *Hybomitra* spp., *Atylotus* spp., *Tabanus* spp., *Haematopota* spp., *Philipomyia* spp., *Braula* spp., *Musca* spp., *Hydrotaea* spp., *Stomoxys* spp., *Haematobia* spp., *Morellia* spp., *Fannia* spp., *Glossina* spp., *Calliphora* spp., *Lucilia* spp., *Chrysomyia* spp., *Wohlfahrtia* spp.,
35 *Sarcophaga* spp., *Oestrus* spp., *Hypoderma* spp., *Gasterophilus* spp., *Hippobosca* spp., *Lipoptena* spp. and *Melophagus* spp..

Of the order Siphonaptera, for example *Pulex* spp., *Ctenocephalides* spp., *Xenopsylla* spp., *Ceratophyllus* spp..

Of the order Heteroptera, for example Cimex spp., Triatoma spp., Rhodnius spp., Panstrongylus spp..

- 5 Of the order Blattellidae, for example Blatta orientalis, Periplaneta americana, Blattella germanica and Supella spp..

- Of the subclass Acaria (Acarida) and the orders Meta- and Meso-stigmata, for example Argas spp., Ornithodoros spp., Otobius spp., Ixodes spp., Amblyomma spp., Boophilus spp., Dermacentor spp.,
 10 Haemaphysalis spp., Hyalomma spp., Rhipicephalus spp., Dermanyssus spp., Raillietia spp., Pneumonyssus spp., Sternostoma spp. and Varroa spp..

- Of the orders Actinotrichida (Prostigmata) and Acaridida (Astigmata), for example Acarapis spp., Cheyletiella spp., Ornithocheyletia spp., Myobia spp., Psorergates spp., Demodex spp., Trombicula
 15 spp., Lirophorus spp., Acarus spp., Tyrophagus spp., Caloglyphus spp., Hypodectes spp., Pterolichus spp., Psoroptes spp., Chorioptes spp., Otodectes spp., Sarcoptes spp., Notoedres spp., Knemidocoptes spp., Cytodites spp. and Laminosioptes spp..

- The compositions according to the invention are also suitable for protecting against insect infestation
 20 in the case of materials such as wood, textiles, plastics, adhesives, glues, paints, paper and card, leather, floor coverings and buildings.

- The compositions according to the invention can be used, for example, against the following pests:
 25 beetles such as Hylotrupes bajulus, Chlorophorus pilosis, Anobium punctatum, Xestobium rufovillosum, Ptilinopsecticornis, Dendrobium pertinax, Ernobius mollis, Priobium carpini, Lyctus brunneus, Lyctus africanus, Lyctus planicollis, Lyctus linearis, Lyctus pubescens, Trogoxylon aequale, Minthesrugicollis, Xyleborus spec, Trypoderan spec, Apate monachus, Bostrychus capucinus, Heterobostrychus brunneus, Sinoxylon spec. and Dinoderus minutus, and also hymenoptera such as Sirex juvencus, Urocerus gigas, Urocerus gigas taignus and Urocerus augur, and termites such as
 30 Kaloterms flavicollis, Cryptotermes brevis, Heterotermes indicola, Reticulitermes flavipes, Reticulitermes santonensis, Reticulitermes lucifugus, Mastotermes darwiniensis, Zootermopsis nevadensis and Coptotermes formosanus, and bristletails such as Lepisma saccharina.

- The compounds according to the invention can be used as pesticidal agents in unmodified form, but
 35 they are generally formulated into compositions in various ways using formulation adjuvants, such as carriers, solvents and surface-active substances. The formulations can be in various physical forms, e.g. in the form of dusting powders, gels, wettable powders, water-dispersible granules, water-dispersible tablets, effervescent pellets, emulsifiable concentrates, microemulsifiable concentrates, oil-in-water emulsions, oil-flowables, aqueous dispersions, oily dispersions, suspo-emulsions, capsule

suspensions, emulsifiable granules, soluble liquids, water-soluble concentrates (with water or a water-miscible organic solvent as carrier), impregnated polymer films or in other forms known e.g. from the Manual on Development and Use of FAO and WHO Specifications for Pesticides, United Nations, First Edition, Second Revision (2010). Such formulations can either be used directly or diluted prior to use.

5 The dilutions can be made, for example, with water, liquid fertilisers, micronutrients, biological organisms, oil or solvents.

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

The active ingredients can also be contained in very fine microcapsules. Microcapsules contain the
15 active ingredients in a porous carrier. This enables the active ingredients to be released into the environment in controlled amounts (e.g. slow-release). Microcapsules usually have a diameter of from 0.1 to 500 microns. They contain active ingredients in an amount of about from 25 to 95 % by weight of the capsule weight. The active ingredients can be in the form of a monolithic solid, in the form of fine particles in solid or liquid dispersion or in the form of a suitable solution. The encapsulating
20 membranes can comprise, for example, natural or synthetic rubbers, cellulose, styrene/butadiene copolymers, polyacrylonitrile, polyacrylate, polyesters, polyamides, polyureas, polyurethane or chemically modified polymers and starch xanthates or other polymers that are known to the person skilled in the art. Alternatively, very fine microcapsules can be formed in which the active ingredient is contained in the form of finely divided particles in a solid matrix of base substance, but the
25 microcapsules are not themselves encapsulated.

The formulation adjuvants that are suitable for the preparation of the compositions according to the invention are known *per se*. As liquid carriers there may be used: water, toluene, xylene, petroleum ether, vegetable oils, acetone, methyl ethyl ketone, cyclohexanone, acid anhydrides, acetonitrile,
30 acetophenone, amyl acetate, 2-butanone, butylene carbonate, chlorobenzene, cyclohexane, cyclohexanol, alkyl esters of acetic acid, diacetone alcohol, 1,2-dichloropropane, diethanolamine, p-diethylbenzene, diethylene glycol, diethylene glycol abietate, diethylene glycol butyl ether, diethylene glycol ethyl ether, diethylene glycol methyl ether, N,N-dimethylformamide, dimethyl sulfoxide, 1,4-dioxane, dipropylene glycol, dipropylene glycol methyl ether, dipropylene glycol dibenzoate, diproxitol,
35 alkylpyrrolidone, ethyl acetate, 2-ethylhexanol, ethylene carbonate, 1,1,1-trichloroethane, 2-heptanone, alpha-pinene, d-limonene, ethyl lactate, ethylene glycol, ethylene glycol butyl ether, ethylene glycol methyl ether, gamma-butyrolactone, glycerol, glycerol acetate, glycerol diacetate, glycerol triacetate, hexadecane, hexylene glycol, isoamyl acetate, isobornyl acetate, isooctane,

isophorone, isopropylbenzene, isopropyl myristate, lactic acid, laurylamine, mesityl oxide, methoxypropanol, methyl isoamyl ketone, methyl isobutyl ketone, methyl laurate, methyl octanoate, methyl oleate, methylene chloride, m-xylene, n-hexane, n-octylamine, octadecanoic acid, octylamine acetate, oleic acid, oleylamine, o-xylene, phenol, polyethylene glycol, propionic acid, propyl lactate, propylene carbonate, propylene glycol, propylene glycol methyl ether, p-xylene, toluene, triethyl phosphate, triethylene glycol, xylenesulfonic acid, paraffin, mineral oil, trichloroethylene, perchloroethylene, ethyl acetate, amyl acetate, butyl acetate, propylene glycol methyl ether, diethylene glycol methyl ether, methanol, ethanol, isopropanol, and alcohols of higher molecular weight, such as amyl alcohol, tetrahydrofurfuryl alcohol, hexanol, octanol, ethylene glycol, propylene glycol, glycerol, A/-methyl-2-pyrrolidone and the like.

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

A large number of surface-active substances can advantageously be used in both solid and liquid formulations, especially in those formulations which can be diluted with a carrier prior to use. Surface-active substances may be anionic, cationic, non-ionic or polymeric and they can be used as emulsifiers, wetting agents or suspending agents or for other purposes. Typical surface-active substances include, for example, salts of alkyl sulfates, such as diethanolammonium lauryl sulfate; salts of alkylarylsulfonates, such as calcium dodecylbenzenesulfonate; alkylphenol/alkylene oxide addition products, such as nonylphenol ethoxylate; alcohol/alkylene oxide addition products, such as tridecylalcohol ethoxylate; soaps, such as sodium stearate; salts of alkylnaphthalenesulfonates, such as sodium dibutylnaphthalenesulfonate; dialkyl esters of sulfosuccinate salts, such as sodium di(2-ethylhexyl)sulfosuccinate; sorbitol esters, such as sorbitol oleate; quaternary amines, such as lauryltrimethylammonium chloride, polyethylene glycol esters of fatty acids, such as polyethylene glycol stearate; block copolymers of ethylene oxide and propylene oxide; and salts of mono- and dialkylphosphate esters; and also further substances described e.g. in McCutcheon's Detergents and Emulsifiers Annual, MC Publishing Corp., Ridgewood New Jersey (1981).

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

The compositions according to the invention can include an additive comprising an oil of vegetable or animal origin, a mineral oil, alkyl esters of such oils or mixtures of such oils and oil derivatives. The amount of oil additive in the composition according to the invention is generally from 0.01 to 10 %, based on the mixture to be applied. For example, the oil additive can be added to a spray tank in the desired concentration after a spray mixture has been prepared. Preferred oil additives comprise

mineral oils or an oil of vegetable origin, for example rapeseed oil, olive oil or sunflower oil, emulsified vegetable oil, alkyl esters of oils of vegetable origin, for example the methyl derivatives, or an oil of animal origin, such as fish oil or beef tallow. Preferred oil additives comprise alkyl esters of C8-C22 fatty acids, especially the methyl derivatives of C12-C18 fatty acids, for example the methyl esters of lauric acid, palmitic acid and oleic acid (methyl laurate, methyl palmitate and methyl oleate, respectively).
 5 Many oil derivatives are known from the Compendium of Herbicide Adjuvants, 10th Edition, Southern Illinois University, 2010.

10 The inventive compositions generally comprise from 0.1 to 99 % by weight, especially from 0.1 to 95 % by weight, of compounds of the present invention and from 1 to 99.9 % by weight of a formula-
 tion adjuvant which preferably includes from 0 to 25 % by weight of a surface-active substance. Whereas commercial products may preferably be formulated as concentrates, the end user will normally employ dilute formulations.

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

20 Preferred formulations can have the following compositions (weight %):

Emulsifiable concentrates:

active ingredient:	1 to 95 %, preferably 60 to 90 %
surface-active agent:	1 to 30 %, preferably 5 to 20 %
25 liquid carrier:	1 to 80 %, preferably 1 to 35 %

Dusts:

active ingredient:	0.1 to 10 %, preferably 0.1 to 5 %
solid carrier:	99.9 to 90 %, preferably 99.9 to 99 %

30 Suspension concentrates:

active ingredient:	5 to 75 %, preferably 10 to 50 %
water:	94 to 24 %, preferably 88 to 30 %
surface-active agent:	1 to 40 %, preferably 2 to 30 %

35 Wettable powders:

active ingredient:	0.5 to 90 %, preferably 1 to 80 %
surface-active agent:	0.5 to 20 %, preferably 1 to 15 %
solid carrier:	5 to 95 %, preferably 15 to 90 %

Granules :

active ingredient: 0.1 to 30 %, preferably 0.1 to 15 %

solid carrier: 99.5 to 70 %, preferably 97 to 85 %

5

The following Examples further illustrate, but do not limit, the invention.

<u>Wettable powders</u>	a)	b)	c)
active ingredients	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 combination 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.

10

<u>Powders for dry seed treatment</u>	a)	b)	c)
active ingredients	25 %	50 %	75 %
light mineral oil	5 %	5 %	5 %
highly dispersed silicic acid	5 %	5 %	-
Kaolin	65 %	40 %	-
Talcum	-	-	20%

The combination 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.

<u>Emulsifiable concentrate</u>	
active ingredients	10 %
octylphenol polyethylene glycol ether (4-5 mol of ethylene oxide)	3 %
calcium dodecylbenzenesulfonate	3 %
castor oil polyglycol ether (35 mol of ethylene oxide)	4 %
Cyclohexanone	30 %
xylene mixture	50 %

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

<u>Dusts</u>	a)	b)	c)
Active ingredients	5 %	6 %	4 %
Talcum	95 %	-	-
Kaolin	-	94 %	-
mineral filler	-	-	96 %

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

<u>Extruder granules</u>	
Active ingredients	15 %
sodium lignosulfonate	2 %
carboxymethylcellulose	1 %
Kaolin	82 %

The combination 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.

<u>Coated granules</u>	
Active ingredients	8 %
polyethylene glycol (mol. wt. 200)	3 %
Kaolin	89 %

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

Suspension concentrate

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

The finely ground combination 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.

10

Flowable concentrate for seed treatment

active ingredients	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-pig merit calcium salt	5 %
Silicone oil (in the form of a 75 % emulsion in water)	0.2 %
Water	45.3 %

The finely ground combination 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.

5

Slow Release Capsule Suspension

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

15

Formulation types include an emulsion concentrate (EC), a suspension concentrate (SC), a suspo-emulsion (SE), a capsule suspension (CS), a water dispersible granule (WG), an emulsifiable granule (EG), an emulsion, water in oil (EO), an emulsion, oil in water (EW), a micro-emulsion (ME), an oil dispersion (OD), an oil miscible flowable (OF), an oil miscible liquid (OL), a soluble concentrate (SL), an ultra-low volume suspension (SU), an ultra-low volume liquid (UL), a technical concentrate (TK), a dispersible concentrate (DC), a wettable powder (WP), a soluble granule (SG) or any technically feasible formulation in combination with agriculturally acceptable adjuvants.

20

Preparatory Examples:

"Mp" means melting point in °C. Free radicals represent methyl groups. ¹H NMR measurements were recorded on a Bruker 400MHz spectrometer, chemical shifts are given in ppm relevant to a TMS standard. Spectra measured in deuterated solvents as indicated. Either one of the LCMS methods below was used to characterize the compounds. The characteristic LCMS values obtained for each compound were the retention time ("Rt", recorded in minutes) and the measured molecular ion (M+H)⁺ or (M-H)⁻.

30

LCMS and GCMS Methods:

Method 1: Standard 1

Spectra were recorded on a Mass Spectrometer from Waters (ZQ Single quadrupole mass spectrometer) equipped with an electrospray source (Polarity: positive or negative ions, Capillary: 3.00

35

kV, Cone range: 30-60 V, Extractor: 2.00 V, Source Temperature: 150°C, Desolvation Temperature: 350°C, Cone Gas Flow: 0 L/Hr, Desolvation Gas Flow: 650 L/Hr, Mass range: 100 to 900 Da) and an Acquity UPLC from Waters: Binary pump, heated column compartment and diode-array detector.

Solvent degasser, binary pump, heated column compartment and diode-array detector. Column:

- 5 Waters UPLC HSS T3 , 1.8 μm , 30 x 2.1 mm, Temp: 60 °C, DAD Wavelength range (nm): 210 to 500, Solvent Gradient: A = water + 5% MeOH + 0.05 % HCOOH, B= Acetonitrile + 0.05 % HCOOH; gradient: 0 min 0% B, 100%A; 1.2-1.5min 100% B; Flow (ml/min) 0.85.

Method 2: Standard long

Spectra were recorded on a Mass Spectrometer from Waters (SQD or ZQ Single quadrupole mass

- 10 spectrometer) equipped with an electrospray source (Polarity: positive or negative ions, Capillary: 3.00 kV, Cone range: 30-60 V, Extractor: 2.00 V, Source Temperature: 150°C, Desolvation Temperature: 350°C, Cone Gas Flow: 0 L/Hr, Desolvation Gas Flow: 650 L/Hr, Mass range: 100 to 900 Da) and an Acquity UPLC from Waters: Binary pump, heated column compartment and diode-array detector.

Solvent degasser, binary pump, heated column compartment and diode-array detector. Column:

- 15 Waters UPLC HSS T3 , 1.8 μm , 30 x 2.1 mm, Temp: 60 °C, DAD Wavelength range (nm): 210 to 500, Solvent Gradient: A = water + 5% MeOH + 0.05 % HCOOH, B= Acetonitrile + 0.05 % HCOOH; gradient: 0 min 0% B, 100% A; 2.7-3.0 min 100% B; Flow (ml/min) 0.85.

Method 3: Standard 2 long

Spectra were recorded on a Mass Spectrometer from Agilent Technologies (6410 Triple Quadruple

- 20 Mass Spectrometer) equipped with an electrospray source (Polarity: Positive and Negative Polarity Switch, Capillary: 4.00 kV, Fragmentor: 100.00 V, Gas Temperature: 350 °C, Gas Flow: 11 L/min, Nebulizer Gas: 45 psi, Mass range: 110-1000 Da, DAD Wavelength range: 210-400 nm). Column: KINETEX EVO C 18, length 50 mm, diameter 4.6 mm, particle size 2.6 μm . Column oven temperature 40 °C. Solvent gradient: A= Water with 0.1% formic acid : Acetonitrile (95:5 v/v). B= Acetonitrile with

- 25 0.1% formic acid. Gradients 0 min 90% A, 10% B; 0.9-1.8 min 0% A, 100% B, 2.2-2.5 min 90% A, 10% B. Flow rate 1.8 mL/min.

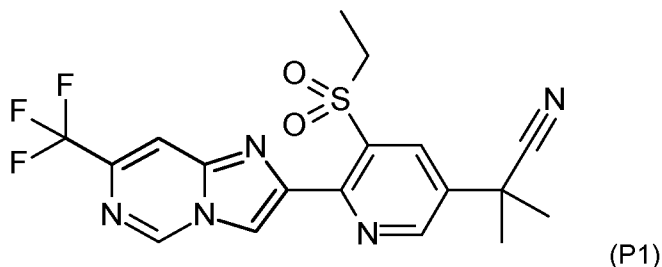
Method 4: Standard 2

Spectra were recorded on a Mass Spectrometer from Waters (Acquity SDS Mass Spectrometer)

equipped with an electrospray source (Polarity: Positive and Negative Polarity Switch, Capillary: 3.00

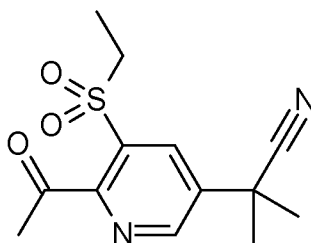
- 30 kV, Cone Voltage: 41.00 V, Source temperature: 150 °C, Desolvation Gas Flow: 1000 L/Hr, Desolvation temperature: 500 °C, Gas Flow @Cone: 50 L/hr, Mass range: 110-800 Da, PDA wavelength range: 210-400 nm. Column: Acquity UPLC HSS T3 C 18, length 30 mm, diameter 2.1 mm, particle size 1.8 μm . Column oven temperature 40 °C. Solvent gradient: A= Water with 0.1% formic acid : Acetonitrile (95:5 v/v). B= Acetonitrile with 0.05% formic acid. Gradients 0 min 90% A, 10% B;
- 35 0.2 min 50% A, 50% B; 0.7-1.3 min 0% A, 100% B; 1.4-1.6 min 90% A, 10% B. Flow rate 0.8 mL/min.

EXAMPLE P1: Preparation of 2-[5-ethylsulfonyl-6-[7-(trifluoromethyl)imidazo[1,2-c]pyrimidin-2-yl]-3-pyridyl]-2-methyl-propanenitrile (compound P1)



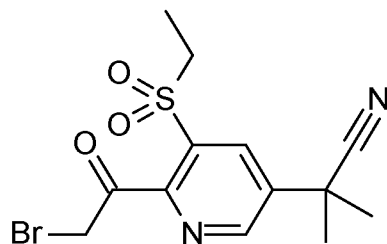
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Step 1: Preparation of 2-(6-acetyl-5-ethylsulfonyl-3-pyridyl)-2-methyl-propanenitrile



To a solution of 2-(6-acetyl-5-ethylsulfonyl-3-pyridyl)acetonitrile (1.50 g, 5.95 mmol, 1.00 equiv.) [prepared as described in WO2016/071214] in dimethylformamide (24 mL) was added sodium hydride (478 mg, 12.5 mmol, 2.10 equiv.) at 0 °C under argon atmosphere. The resulting mixture was stirred at 0 °C for 30 min and then was added dropwise to a solution of iodomethane (0.777 mL, 341 mg, 12.5 mmol, 2.10 equiv.) in dimethylformamide (24 mL) at 0 °C. The mixture was slowly warmed up to room temperature and stirred at this temperature for 4 h. The reaction mixture was diluted with ethyl acetate and sat. ammonium chloride solution. The aqueous layer was separated and extracted twice with ethyl acetate. The organic layers were combined, dried over anhydrous sodium sulfate, filtered, and concentrated under vacuum. The crude product was purified by flash chromatography (silica gel, ethyl acetate/cyclohexane) to afford 2-(6-acetyl-5-ethylsulfonyl-3-pyridyl)-2-methyl-propanenitrile. LCMS (method 1): 281 (M+H)⁺; retention time: 0.79 min

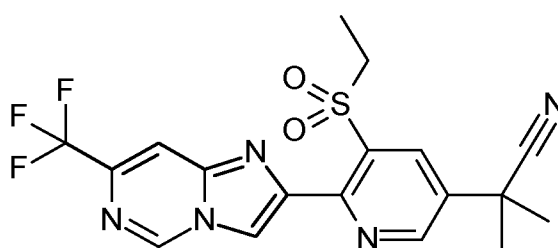
Step 2: Preparation of 2-[6-(2-bromoacetyl)-5-ethylsulfonyl-3-pyridyl]-2-methyl-propanenitrile



To a solution of 2-(6-acetyl-5-ethylsulfonyl-3-pyridyl)-2-methyl-propanenitrile (734 mg, 2.62 mmol, 1.00 equiv.) in ethyl acetate (6.5 mL) and chloroform (6.5 mL) was added copper(II)bromide (1.17 g, 5.24

mmol, 2.00 equiv.) at room temperature under argon atmosphere. The resulting mixture was heated to 140 °C for 2.5 h under microwave irradiation. The reaction mixture was filtered through a pad of celite and rinsed with ethyl acetate. The filtrate was concentrated under reduced pressure and the obtained crude product was purified by column chromatography (silica gel, ethyl acetate/cyclohexane) to afford
 5 2-[6-(2-bromoacetyl)-5-ethylsulfonyl-3-pyridyl]-2-methyl-propanenitrile. LCMS (method 1): 359 (M+H)⁺; retention time: 0.88 min

Step 3 : Preparation of 2-[5-ethylsulfonyl-6-[7-(trifluoromethyl)imidazo[1,2-c]pyrimidin-2-yl]-3-pyridyl]-2-methyl-propanenitrile (compound P1)



(P1)

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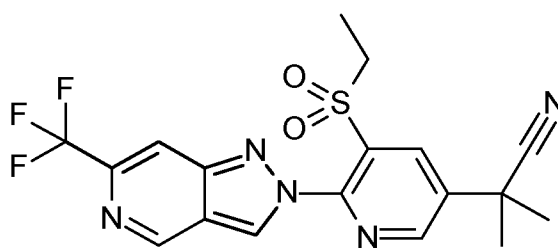
To a solution of 2-[6-(2-bromoacetyl)-5-ethylsulfonyl-3-pyridyl]-2-methyl-propanenitrile (275 mg, 0.766 mmol, 1.00 equiv.) in acetonitrile (8.0 mL) was added 6-(trifluoromethyl)pyrimidin-4-amine (142 mg, 0.842 mmol, 1.10 equiv.) [prepared as described in WO20 15/0007 15] at room temperature under argon atmosphere. The resulting mixture was heated to 90 °C for 2 days. The reaction mixture was
 15 cooled down at room temperature and diluted with ethyl acetate and saturated ammonium chloride solution. The aqueous layer was separated and extracted twice with ethyl acetate. The organic layers were combined, dried over anhydrous sodium sulfate, filtered, and concentrated under reduced pressure. The crude product was purified reverse phase HPLC to obtain the title compound. LCMS (method 2): 424 (M+H)⁺; retention time: 1.38 min.

20

Examples P14, P15, P16 and P20 as shown in table P below were prepared following an analogous sequence as described in example P1.

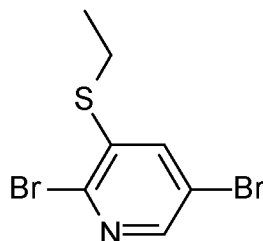
EXAMPLE P2: Preparation of 2-[5-ethylsulfonyl-6-[6-(trifluoromethyl)pyrazolo[4,3-c]pyridin-2-yl]-3-pyridyl]-2-methyl-propanenitrile (compound P2)

25



(P2)

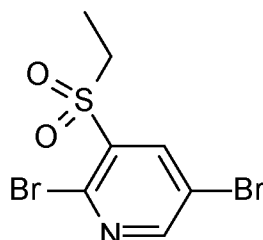
Step 1: Preparation of 2,5-dibromo-3-ethylsulfanyl-pyridine



5 A solution of diethyldisulfide (7.76 g, 63.5 mmol, 2.00 equiv.) and tert-butyl nitrite (4.91 g, 47.6 mmol, 1.50 equiv.) in DCE (60 mL) and DCM (40 mL) was heated to 40 °C. To this mixture was slowly added a solution of 2,5-dibromopyridin-3-amine (8.00 g, 31.7 mmol, 1.00 equiv.) in DCE (200 mL) slowly over 90 min and the reaction mixture was stirred for additional 1 h at 40 °C. After completion of the reaction, the reaction mass was cooled, diluted with water (100 mL), and extracted with DCM (2 x 100 mL). The organic layer was separated, combined organic layer was dried over sodium sulfate, filtered and concentrated under reduced pressure. The crude product was purified by column chromatography (silica gel, 5-15% ethyl acetate/cyclohexane) to afford 2,5-dibromo-3-ethylsulfanyl-pyridine. LCMS (Method 4): 296 (M+H)⁺, retention time 1.16 min.

10 ¹H NMR (400 MHz, CDCl₃) δ/ppm: 1.32 (t, 3 H), 2.98 (m, 2 H), 7.52 (s, 1 H) 8.19 (s, 1 H).

15 Step 2: Preparation of 2,5-dibromo-3-ethylsulfonyl-pyridine



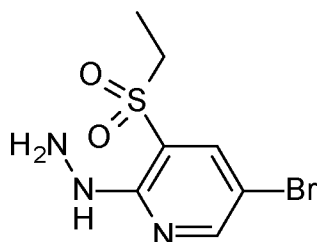
To a solution of 2,5-dibromo-3-ethylsulfanyl-pyridine (1.00 g, 3.36 mmol, 1.00 equiv.) in dichloromethane (40 mL) was added meta-chloroperbenzoic acid (1.83 g, 7.41 mmol, 2.20 equiv.) and the obtained solution was stirred at room temperature for 2 h. The reaction mixture was quenched with sodium hydroxide solution (1M, 100 mL) and extracted with dichloromethane (3x100 mL). The combined organic layers were dried (Na₂SO₄), filtered and concentrated under reduced pressure. The crude product was purified by column chromatography (silica gel, 30% ethyl acetate/cyclohexane) to afford 2,5-dibromo-3-ethylsulfonyl-pyridine. LCMS (method 4): 328 (M+H)⁺, retention time 0.88 min.

20 ¹H NMR (400 MHz, CDCl₃) δ/ppm: 1.34 (t, 3 H), 3.55 (q, 2 H), 8.54 (d, 1 H), 8.67 (d, 1 H).

25

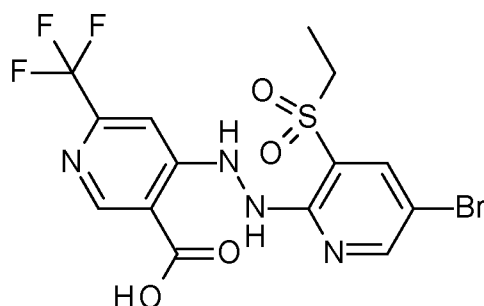
Step 3: Preparation of (5-bromo-3-ethylsulfonyl-2-pyridyl)hydrazine

-56-



Hydrazine monohydrate (6.20 g, 120 mmol, 6.00 equiv.) was added to a solution of 2,5-dibromo-3-ethylsulfonyl-pyridine (6.80 g, 21.0 mmol, 1.00 equiv.) in 1,4-dioxane (21 mL) and the reaction mixture was stirred at room temperature for 1 h. After completion of reaction, the reaction mixture was diluted with water (30 mL) and extracted with ethylacetate (2x30 mL). The combined organic layers were washed with water (20 mL), dried (Na₂S₀₄), filtered and concentrated under reduced pressure. The obtained crude (5-bromo-3-ethylsulfonyl-2-pyridyl)hydrazine was used for next step without any further purification. LCMS (method 3): 280 (M+H)⁺, retention time 0.60 min.

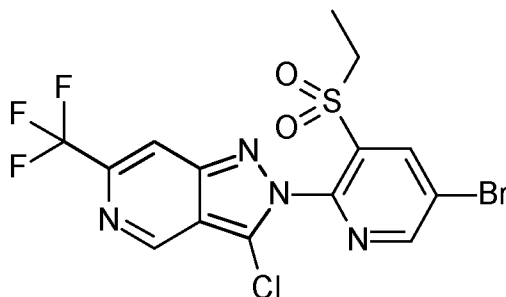
10 Step 4: Preparation of 4-[2-(5-bromo-3-ethylsulfonyl-2-pyridyl)hydrazino]-6-(trifluoromethyl)pyridine-3-carboxylic acid



To a round-bottom flask with reflux condenser charged with 4-chloro-6-(trifluoromethyl)pyridine-3-carboxylic acid (2.50 g, 11.0 mmol, 1.00 equiv) [CAS 1060810-66-3, commercially available; or prepared according to WO2013/064460, pp. 120] was added a solution of (5-bromo-3-ethylsulfonyl-2-pyridyl)hydrazine (4.70 g, 17.0 mmol, 1.50 equiv) in pentan-1-ol (120 mL) and the obtained reaction mixture was heated at 110 °C overnight. The obtained reaction mixture was concentrated under reduced pressure to remove pentanol. Remaining pentanol was removed by addition of toluene and co-evaporation. The obtained crude mixture was diluted with water (100 mL), brine (100 mL) and extracted with ethyl acetate (3x200 mL). The combined organic layers dried (Na₂S₀₄), filtered and concentrated under reduced pressure to obtain the crude product as a solid: Trituration with cyclohexane furnished 4-[2-(5-bromo-3-ethylsulfonyl-2-pyridyl)hydrazino]-6-(trifluoromethyl)pyridine-3-carboxylic acid as a solid. This compound was used for next step without any further purification.

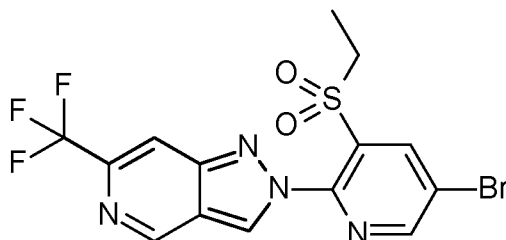
25 LCMS (method 3): 469 (M+H)⁺, retention time 1.39 min.

Step 5: Preparation of 2-(5-bromo-3-ethylsulfonyl-2-pyridyl)-3-chloro-6-(trifluoromethyl)pyrazolo[4,3-c]pyridine



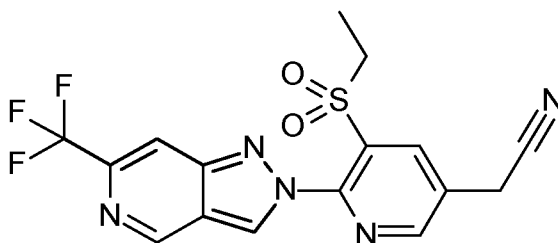
A solution of 4-[2-(5-bromo-3-ethylsulfonyl-2-pyridyl)hydrazino]-6-(trifluoromethyl)pyridine-3-carboxylic acid (3.00 g, 6.39 mmol, 1.00 equiv.) in POCl₃ (30 mL) was heated under reflux to 110 °C for 1.5 h. The obtained crude reaction mixture was then poured into ice (500 g) and quenched with solid sodium bicarbonate. The obtained mixture was extracted with dichloromethane (3x200 mL). The combined organic layers were dried over sodium sulfate, filtered and concentrated under reduced pressure. The crude solid product was purified by trituration with cyclohexane to furnish 2-(5-bromo-3-ethylsulfonyl-2-pyridyl)-3-chloro-6-(trifluoromethyl)pyrazolo[4,3-c]pyridine. LCMS (method 4): 469 (M+H)⁺, retention time 1.10 min. ¹H NMR (400 MHz, CDCl₃) δ/ppm: 1.33 (t, 3 H), 3.59 (q, 2 H), 7.97 (s, 1 H), 8.73 (s, 1 H), 8.99 (s, 1 H), 9.29 (s, 1 H).

Step 6: Preparation of 2-(5-bromo-3-ethylsulfonyl-2-pyridyl)-6-(trifluoromethyl)pyrazolo[4,3-c]pyridine



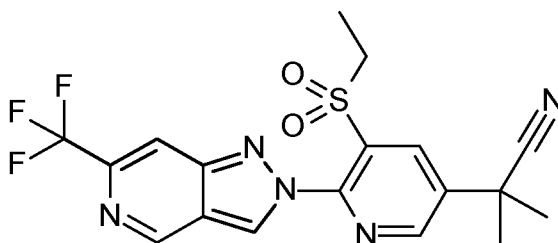
To a solution of 2-(5-bromo-3-ethylsulfonyl-2-pyridyl)-3-chloro-6-(trifluoromethyl)pyrazolo[4,3-c]pyridine (1.80 g, 3.80 mmol, 1.00 equiv.) in acetic acid (90 mL) was slowly added zinc (500 mg, 7.70 mmol, 2.00, equiv.) and the reaction mixture was heated to 60 °C for 2 h. The obtained reaction mixture was allowed to cool to room temperature, poured into water (30 mL), and resulting solution was extracted with ethyl acetate (3x20 mL). The combined organic layers were washed with brine (30 mL), dried over sodium sulfate, filtered and concentrated under reduced pressure. The residue was purified by column chromatography (40% ethyl acetate/cyclohexane) to obtain 2-(5-bromo-3-ethylsulfonyl-2-pyridyl)-6-(trifluoromethyl)pyrazolo[4,3-c]pyridine. LCMS (method 3): 435 (M+H)⁺, retention time 1.05 min. ¹H NMR (400 MHz, CDCl₃) δ/ppm: 1.44 (t, 3 H), 3.99 (q, 2 H), 8.04 (s, 1 H), 8.77 (s, 1 H), 8.88 (s, 1 H), 8.91 (s, 1 H), 9.39 (s, 1 H).

Step 7: Preparation of 2-[5-ethylsulfonyl-6-[6-(trifluoromethyl)pyrazolo[4,3-c]pyridin-2-yl]-3-pyridyl]acetonitrile



- 5 To a solution of 2-(5-bromo-3-ethylsulfonyl-2-pyridyl)-6-(trifluoromethyl)pyrazolo[4,3-c]pyridine (500 mg, 1.15 mmol, 1.00 equiv.) in N,N-dimethylformamide (7.0 mL) was added trimethylsilyl acetonitrile (265 mg, 2.30 mmol, 2.00 equiv.), zinc(II)fluoride (73 mg, 0.69 mmol, 0.60 equiv.) and Xanthphos (27 mg, 0.046 mmol, 0.040 equiv.) under nitrogen atmosphere. The reaction mass was purged with nitrogen for 15 min followed by addition of Pd2(dba)₃*CHCl₃ (22 mg, 0.020 mmol, 0.020 equiv.). The
- 10 obtained reaction mixture was then subjected to heating at 140 °C for 30 min under microwave irradiation. After cooling to room temperature, the reaction mixture was diluted with ethyl acetate (30 mL) and water (15 ml) was added. The organic phase was separated, washed with water, brine, dried (Na₂SO₄) and filtered. Concentration under reduced pressure finished the crude material which was purified by column chromatography (silica gel, ethyl acetate/cyclohexane) to yield the title compound.
- 15 LCMS (method 4): 396 (M+H)⁺, retention time 0.87 min. ¹H NMR (400 MHz, DMSO-d₆) δ/ppm: 1.21 - 1.29 (m, 3 H), 3.88 (q, 2 H), 4.40 (s, 2 H), 8.35 (s, 1 H), 8.63 (d, 1 H), 8.96 (d, 1 H), 9.44 (s, 1 H), 9.46-9.50 (m, 1 H).

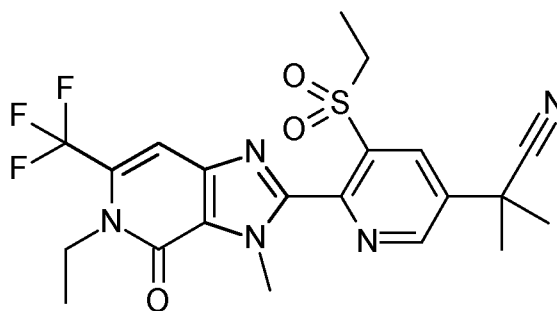
- Step 8: Preparation of 2-[5-ethylsulfonyl-6-[6-(trifluoromethyl)pyrazolo[4,3-c]pyridin-2-yl]-3-pyridyl]-2-methyl-propanenitrile (compound P2)
- 20



- To a solution of 2-[5-ethylsulfonyl-6-[6-(trifluoromethyl)pyrazolo[4,3-c]pyridin-2-yl]-3-pyridyl]acetonitrile (245 mg, 0.620 mmol, 1.00 equiv.) in acetonitrile (15 mL) was added cesium carbonate (717 mg, 1.86 mmol, 3.00 equiv.) followed by iodomethane (264 mg, 1.86 mmol, 3.00 equiv.). The resulting brown colored solution was stirred at room temperature for 5 h. The reaction mixture was then diluted with ethyl acetate (30 mL) and water (20 mL). The organic phase was separated, washed with water, brine and dried over sodium sulfate, filtered and evaporated. The crude material was purified by column
- 25

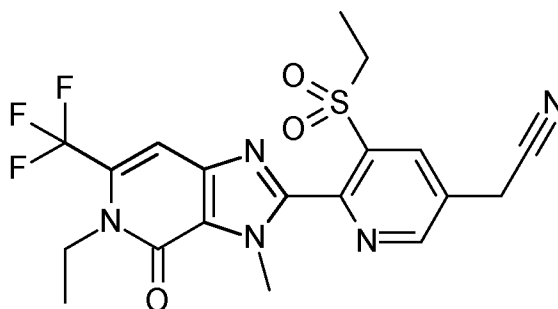
chromatography (silica gel, ethyl acetate/cyclohexane) to yield the title compound. LCMS (method 4): 424 (M+H)⁺, retention time 1.01 min. ¹H NMR (400 MHz, CDCl₃) δ/ppm: 1.45-1.50 (m, 3 H), 1.92 (s, 6 H), 4.01 (q, 2 H), 8.05 (s, 1 H), 8.66 (d, 1 H), 8.96 (d, 1 H), 9.02 (d, 1 H), 9.42 (s, 1 H).

5 EXAMPLE P3: Preparation of 2-[6-[5-ethyl-3-methyl-4-oxo-6-(trifluoromethyl)imidazo[4,5-c]pyridin-2-yl]-5-ethylsulfonyl-3-pyridyl]-2-methyl-propanenitrile (compound P3)



(P3)

Step 1: Preparation of 2-[6-[5-ethyl-3-methyl-4-oxo-6-(trifluoromethyl)imidazo[4,5-c]pyridin-2-yl]-5-ethylsulfonyl-3-pyridyl]acetonitrile



10

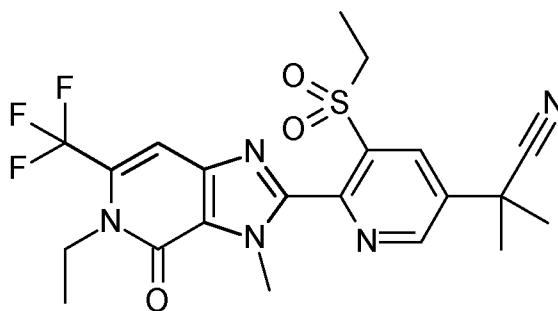
To a solution of 2-(5-bromo-3-ethylsulfonyl-2-pyridyl)-5-ethyl-3-methyl-6-(trifluoromethyl)imidazo[4,5-c]pyridin-4-one (800 mg, 1.62 mmol, 1.00 equiv.) [prepared as described in WO2017/084879 A 1] in dimethylformamide (3.5 mL) was added 2-trimethylsilylacetonitrile (0.336 mL, 278 mg, 2.43 mmol, 1.50 equiv.), Xantphos (38 mg, 0.065 mmol, 0.040 equiv.), zinc(II)fluoride (102 mg, 0.973 mmol, 0.600 equiv.) and (dba)₃Pd²⁺·CHCl₃ (30 mg, 0.032 mmol, 0.020 equiv.) under argon atmosphere. The reaction mixture was heated to 100 °C and stirred for 20 h. After cooling to room temperature, the reaction mixture was diluted in ethyl acetate (100 mL) and filtered through a plug of Celite. The filtrate was washed with water (3 x 25 mL) and brine (25 mL). The combined organic layers were dried (Na₂SO₄) and concentrated under reduced pressure. The crude material was purified by column chromatography (silica gel, methanol/dichloromethane) to afford the title compound. LCMS (method 1): 454 (M+H)⁺, retention time 0.93 min.

15

20

Step 2: Preparation of 2-[6-[5-ethyl-3-methyl-4-oxo-6-(trifluoromethyl)imidazo[4,5-c]pyridin-2-yl]-5-ethylsulfonyl-3-pyridyl]-2-methyl-propanenitrile (compound P3)

-60-



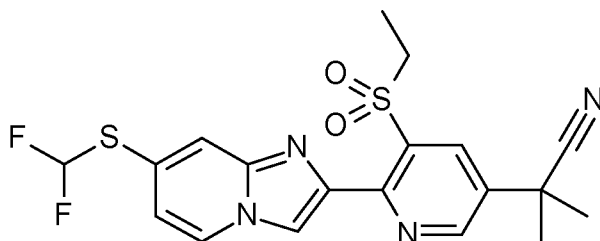
To a solution of 2-[6-[5-ethyl-3-methyl-4-oxo-6-(trifluoromethyl)imidazo[4,5-c]pyridin-2-yl]-5-ethylsulfonyl-3-pyridyl]acetonitrile (300 mg, 0.662 mmol, 1.00 equiv.) in dimethylformamide (6.0 mL) was added sodium hydride (60.8 mg, 1.59 mmol, 2.40 equiv.) at 0 °C under argon atmosphere. The resulting mixture was stirred for 30 min at 0 °C and then was added dropwise to a solution of iodomethane (0.098 mL, 225 mg, 1.59 mmol, 2.40 equiv.) in dimethylformamide (3 mL) at 0 °C. The mixture was slowly warmed up to room temperature and stirring was continued for 18 h. The obtained reaction mixture was diluted with ethyl acetate and saturated ammonium chloride saturated solution. The aqueous layer was separated and extracted with ethyl acetate (2x). The organic layers were combined, dried over anhydrous sodium sulfate, filtered, and concentrated under reduced pressure. The crude product was purified by column chromatography (silica gel, methanol/ dichloromethane) to afford the title compound as a white solid. LCMS (method 1): 482 (M+H)⁺; retention time: 1.02 min. ¹H NMR (400 MHz, CDCl₃) 5/ppm: 1.37 (t, 3 H), 1.39 (br t, 3 H), 1.90 (s, 6 H), 3.82 (d, 2 H), 4.10 (s, 3 H), 4.25 (d, 2 H), 7.21 (s, 1 H), 8.51 (d, 1 H), 9.15 (d, 1 H).

15

Examples P 10, P 11, P 12, P 13, P 17 and P 18 as shown in table P below were prepared following an analogous sequence as described in example P3.

EXAMPLE P5: Preparation of 2-[6-[7-(difluoromethylsulfanyl)imidazo[1,2-a]pyridin-2-yl]-5-ethylsulfonyl-3-pyridyl]-2-methyl-propanenitrile (compound P5)

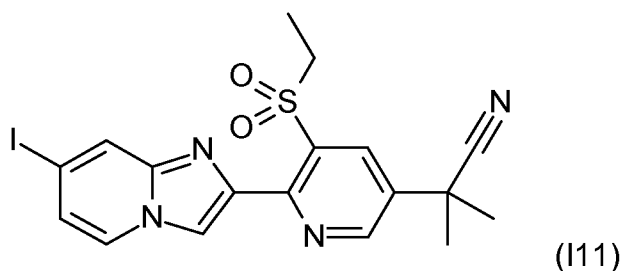
20



(P5)

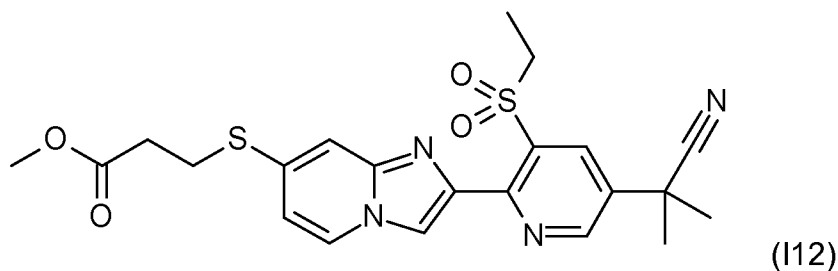
Step 1: Preparation of 2-[5-ethylsulfonyl-6-(7-iodoimidazo[1,2-a]pyridin-2-yl)-3-pyridyl]-2-methyl-propanenitrile (compound 111)

-61-



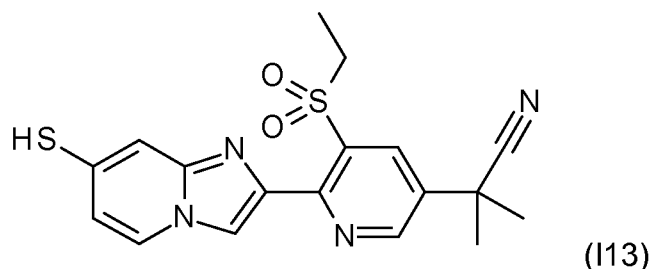
A mixture of 4-iodopyridin-2-amine (368 mg, 1.67 mmol, 1.00 equiv.) and 2-[6-(2-bromoacetyl)-5-ethylsulfonyl-3-pyridyl]-2-methyl-propanenitrile (600 mg, 1.67 mmol, 1.00 equiv.) [compound I2 prepared as described in step 2, example P 1] in acetonitrile (12 mL) was irradiated under microwave conditions at 150°C for 1 hour. After cooling down to room temperature, the reaction mass was diluted with water (10 mL) and brine (10 mL), and the aqueous phase was extracted with ethyl acetate (3*30 mL). The combined organic layers were dried over sodium sulfate, filtered and concentrated under reduced pressure. Purification by flash chromatography over silica gel (50% ethyl acetate in-cyclohexane) afforded 2-[5-ethylsulfonyl-6-(7-iodoimidazo[1,2-a]pyridin-2-yl)-3-pyridyl]-2-methyl-propanenitrile (450 mg, 0.94 mmol). LCMS (method 4): 481 (M+H)⁺; retention time: 0.94 min. ¹H NMR (400 MHz, DMSO-d₆) δ ppm 1.27 (t, 3 H) 1.82 - 1.85 (m, 6 H) 1.83 (s, 1 H) 4.22 (d, 2 H) 7.27 (dd, 1 H) 8.15 (s, 1 H) 8.44 - 8.49 (m, 3 H) 9.10 - 9.13 (m, 1 H).

Step 2: Preparation of methyl 3-[2-[5-(1-cyano-1-methyl-ethyl)-3-ethylsulfonyl-2-pyridyl]imidazo[1,2-a]pyridin-7-yl]sulfanylpropanoate (compound 112)



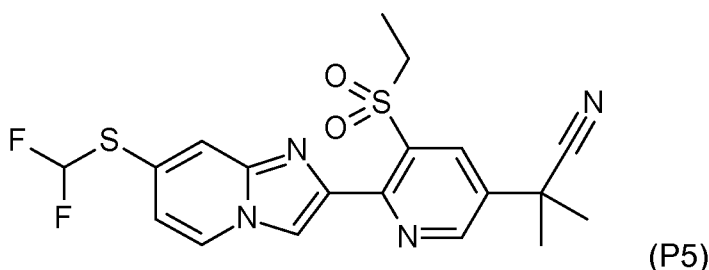
Palladium acetate (12 mg, 0.05 mmol, 0.05 equiv.) was added to a mixture of 2-[5-ethylsulfonyl-6-(7-iodoimidazo[1,2-a]pyridin-2-yl)-3-pyridyl]-2-methyl-propanenitrile (500 mg, 1.04 mmol) [compound 111 prepared as described above], N,N-diisopropylethylamine (370 μL, 2.08 mmol, 2.00 equiv.), methyl 3-mercaptopropionate (141 μL, 1.25 mmol, 1.20 equiv.), and 4,5-bis(diphenylphosphino)-9,9-dimethylxanthene (62 mg, 0.10 mmol, 0.10 equiv.) in 1,4-dioxane (10.4 mL) previously degassed with nitrogen for 10 min. The reaction mixture was stirred at 100 °C for 2 hours. After cooling down to room temperature, the reaction mass was diluted with water (20 mL) and the aqueous phase was extracted with ethyl acetate (3*30 mL). The combined organic layers were dried over sodium sulfate, filtered and concentrated under reduced pressure. The resulting solid was triturated with cyclohexane to afford methyl 3-[2-[5-(1-cyano-1-methyl-ethyl)-3-ethylsulfonyl-2-pyridyl]imidazo[1,2-a]pyridin-7-yl]sulfanylpropanoate (350 mg, 0.74 mmol). LCMS (method 4): 473 (M+H)⁺; retention time: 0.82 min.

Step 3: Preparation of 2-[5-ethylsulfonyl-6-(7-sulfanylimidazo[1,2-a]pyridin-2-yl)-3-pyridyl]-2-methyl-propanenitrile (compound 113)



5 Sodium hydroxide (69 mg, 1.68 mmol, 1.50 equiv.) was added to a solution of methyl 3-[2-[5-(1-cyano-1-methyl-ethyl)-3-ethylsulfonyl-2-pyridyl]imidazo[1,2-a]pyridin-7-yl]sulfanylpropanoate (530 mg, 1.12 mmol) [compound 112 prepared as described above] in methanol (1.0 mL). After stirring for 3 hours at room temperature, the reaction mixture was diluted with water (10 mL), acidified with 1N HCl (10 mL), and the aqueous phase was extracted with ethyl acetate (3*30 mL). The combined organic layers
10 were dried over sodium sulfate, filtered and concentrated under reduced pressure. The crude material was used quickly without any purification. LCMS (method 3): 387 (M+H)⁺; retention time: 1.11 min.

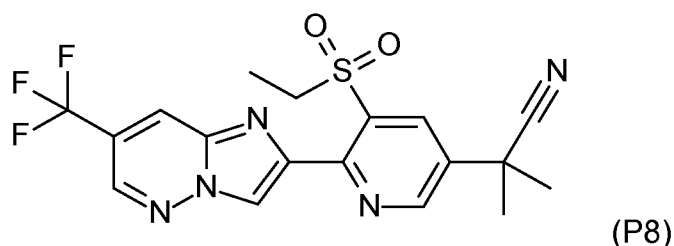
Step 4: Preparation of 2-[6-[7-(difluoromethylsulfanyl)imidazo[1,2-a]pyridin-2-yl]-5-ethylsulfonyl-3-pyridyl]-2-methyl-propanenitrile (compound P5)



15 Sodium 2-chloro-2,2-difluoro-acetate (357 mg, 2.33 mmol, 2.00 equiv.) and potassium carbonate (241 mg, 1.75 mmol, 1.50 equiv.) were added to a solution of 2-[5-ethylsulfonyl-6-(7-sulfanylimidazo[1,2-a]pyridin-2-yl)-3-pyridyl]-2-methyl-propanenitrile (450 mg, 1.16 mmol) in N,N-dimethylformamide (5.0 mL). After stirring at 90 °C for 4 hours, the reaction mixture was cooled down to room temperature and quenched with cold water (15 mL). The aqueous phase was extracted with ethyl acetate (3*30 mL). The combined organic layers were dried over sodium sulfate, filtered and concentrated under reduced pressure. Purification of the crude material by flash chromatography (silica gel, 30% ethyl acetate in-cyclohexane) afforded 2-[6-[7-(difluoromethylsulfanyl)imidazo[1,2-a]pyridin-2-yl]-5-ethylsulfonyl-3-pyridyl]-2-methyl-propanenitrile (95m g, 0.22 mmol). LCMS (method 4): 437 (M+H)⁺; retention time:
20 0.91 min. ¹H NMR (400 MHz, DMSO-d₆) δ ppm 1.25 - 1.31 (m, 3 H) 1.82 - 1.87 (m, 6 H) 4.24 (q, 2 H) 7.09 - 7.16 (m, 1 H) 7.51 - 7.84 (m, 1 H) 7.92 (s, 1 H) 8.48 (d, 1 H) 8.54 (s, 1 H) 8.71 (d, 1 H) 9.13 (d, 1 H).

Examples P6, P7, P9 and P19 as shown in table P below were prepared following an analogous sequence as described in example P5.

EXAMPLE P8: Preparation of 2-[5-ethylsulfonyl-6-[7-(trifluoromethyl)imidazo[1,2-b]pyridazin-2-yl]-3-pyridyl]-2-methyl-propanenitrile (compound P8)



To a solution of 2-[6-(2-bromoacetyl)-5-ethylsulfonyl-3-pyridyl]-2-methyl-propanenitrile (300 mg, 0.84 mmol, 1.00 equiv.) [compound 12 prepared as described in step 2, example P1] in acetonitrile (6.3 mL) were added 5-(trifluoromethyl)pyridazine-3-amine (150 mg, 0.88 mmol, 1.00 equiv.) [prepared as described in WO2016/051193] and magnesium oxide (67 mg, 1.70 mmol, 2.00 equiv.) at room temperature under argon atmosphere. The resulting mixture was heated to 90 °C overnight. The reaction mixture was cooled down at room temperature, filtered and concentrated. The crude material was diluted with ethyl acetate and saturated ammonium chloride solution. The aqueous layer was separated and extracted twice with ethyl acetate. The organic layers were combined, dried over anhydrous sodium sulfate, filtered, and concentrated under reduced pressure. The crude product was purified by flash chromatography over silica gel (ethyl acetate in cyclohexane) to obtain the title compound. LCMS (method 4): 424 (M+H)⁺; retention time: 0.97 min.

Table P: Examples of compounds of formula (I)

Compound No.	IUPAC name	Structure	Melting Point	MS/NMR
P1	2-[5-ethylsulfonyl-6-[7-(trifluoromethyl)imidazo[1,2-c]pyrimidin-2-yl]-3-pyridyl]-2-methyl-propanenitrile		172 - 174	LCMS (method 2): 424 (M+H) ⁺ ; retention time: 1.38 min
P2	2-[5-ethylsulfonyl-6-[6-(trifluoromethyl)pyrazolo[4,3-c]pyridin-2-yl]-3-pyridyl]-2-methyl-propanenitrile		192 - 194	LCMS (method 4): 424 (M+H) ⁺ ; retention time: 1.01 min

Compound No.	IUPAC name	Structure	Melting Point	MS/NMR
P3	2-[6-[5-ethyl-3-methyl-4-oxo-6-(trifluoromethyl)imidazo[4,5-c]pyridin-2-yl]-5-ethylsulfonyl-3-pyridyl]-2-methyl-propanenitrile		191 - 192	LCMS (method 1): 482 (M+H) ⁺ ; retention time: 1.04 min
P5	2-[6-[7-(difluoromethylsulfanyl)imidazo[1,2-a]pyridin-2-yl]-5-ethylsulfonyl-3-pyridyl]-2-methyl-propanenitrile		165 - 167	LCMS (method 4): 437 (M+H) ⁺ ; retention time: 0.91 min. ¹ H NMR (400 MHz, DMSO-d ₆) δ ppm 1.25 - 1.31 (m, 3 H) 1.82 - 1.87 (m, 6 H) 4.24 (q, 2 H) 7.09 - 7.16 (m, 1 H) 7.51 - 7.84 (m, 1 H) 7.92 (s, 1 H) 8.48 (d, 1 H) 8.54 (s, 1 H) 8.71 (d, 1 H) 9.13 (d, 1 H).
P6	2-[5-ethylsulfonyl-6-[7-(1,1,2,2,2-pentafluoroethyl)imidazo[1,2-a]pyridin-2-yl]-3-pyridyl]-2-methyl-propanenitrile			LC/MS (method 1) 473 (M+H) ⁺ ; retention time: 1.04 min. ¹ H NMR (400 MHz, CDCl ₃) δ ppm 1.40 (t, J=7.52 Hz, 3 H) 1.89 (s, 6 H) 4.04 (d, J=7.34 Hz, 2 H) 7.00 - 7.10 (m, 1 H) 7.98 (s, 1 H) 8.33 (d, J=6.97 Hz, 1 H) 8.37 (s, 1 H) 8.57 (d, J=2.20 Hz, 1 H) 9.06 - 9.12 (m, 1 H)
P7	2-[5-ethylsulfonyl-6-[7-(trifluoromethylsulfanyl)imidazo[1,2-a]pyridin-2-yl]-3-pyridyl]-2-methyl-propanenitrile		170 - 172	¹ H NMR (400 MHz, CDCl ₃) δ ppm 1.39 (t, J=7.52 Hz, 3 H) 1.89 (s, 6 H) 4.00 (q, J=7.58 Hz, 2 H) 7.10 (dd, J=6.97, 1.47 Hz, 1 H) 8.03 (s, 1 H) 8.24 (d, J=6.60 Hz, 1 H) 8.33 (s, 1 H) 8.57 (d, J=2.20 Hz, 1 H) 9.05 - 9.12 (m, 1 H)
P8	2-[5-ethylsulfonyl-6-[7-(trifluoromethyl)imidazo[1,2-b]pyridazin-2-yl]-3-pyridyl]-2-methyl-propanenitrile		171 - 172	LCMS (method 1): 424 (M+H) ⁺ ; retention time: 0.97 min

Compound No.	IUPAC name	Structure	Melting Point	MS/NMR
P9	2-[5-ethylsulfonyl-6-[7-(trifluoromethyl)imidazo[1,2-a]pyridin-2-yl]-3-pyridyl]-2-methylpropanenitrile		169 - 171	LCMS (method 1): 423 (M+H) ⁺ ; retention time: 0.96 min
P10	2-[5-ethylsulfonyl-6-[3-methyl-4-oxo-5-(2,2,2-trifluoroethyl)-6-(trifluoromethyl)imidazo[4,5-c]pyridin-2-yl]-3-pyridyl]-2-methylpropanenitrile		168 - 170	LCMS (method 4): 504 (M+H), retention time: 1.09 min. ¹ H NMR (400 MHz, CHLOROFORM-d) δ ppm 1.30 (t, J=7.27 Hz, 3 H) 1.77 (s, 6 H) 2.93 (q, J=7.34 Hz, 2 H) 4.15 (s, 3 H) 4.85 (br d, J=7.70 Hz, 2 H) 7.33 (s, 1 H) 7.79 (s, 1 H) 8.51 (br s, 1 H)
P11	2-[5-ethylsulfonyl-6-[3-methyl-4-oxo-5-(2,2,2-trifluoroethyl)-6-(trifluoromethyl)imidazo[4,5-c]pyridin-2-yl]-3-pyridyl]-2-methylpropanenitrile		200 - 202	LCMS (method 4): 536 (M+H), retention time: 1.02 min. ¹ H NMR (400 MHz, CHLOROFORM-d) δ ppm 1.30 (t, J=7.46 Hz, 3 H) 1.83 (s, 6 H) 3.74 (q, J=7.34 Hz, 2 H) 4.02 (s, 3 H) 4.84 (br d, J=7.58 Hz, 2 H) 7.20 - 7.24 (m, 1 H) 8.45 (d, J=2.20 Hz, 1 H) 9.09 (d, J=2.20 Hz, 1 H)
P12	2-[4-[5-cyclopropyl-3-methyl-4-oxo-6-(trifluoromethyl)imidazo[4,5-c]pyridin-2-yl]-3-ethylsulfonyl-phenyl]-2-methylpropanenitrile		178 - 179	LCMS (method 1): 493 (M+H) ⁺ ; retention time: 0.99 min
P13	2-[4-[5-ethyl-3-methyl-4-oxo-6-(trifluoromethyl)imidazo[4,5-c]pyridin-2-yl]-3-ethylsulfonyl-phenyl]-2-methylpropanenitrile		155 - 156	LCMS (method 1): 481 (M+H) ⁺ ; retention time: 1.01 min
P14	2-[6-[7-(difluoromethylsulfanyl)imidazo[1,2-c]pyrimidin-2-yl]-5-ethylsulfonyl-3-pyridyl]-2-methylpropanenitrile		150 - 152	LCMS (method 1): 438 (M+H) ⁺ ; retention time: 0.90 min

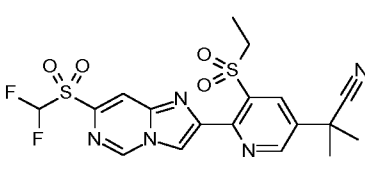
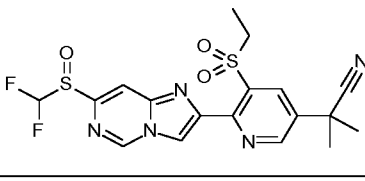
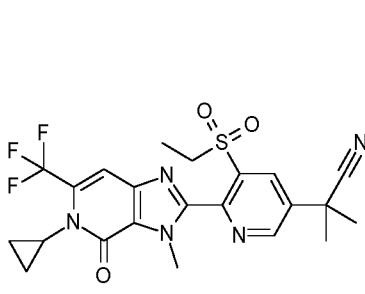
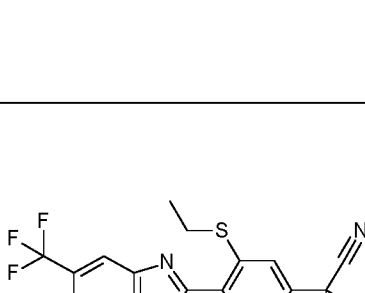
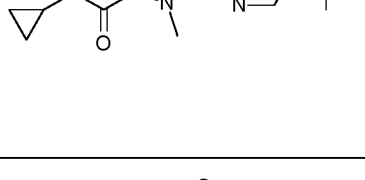
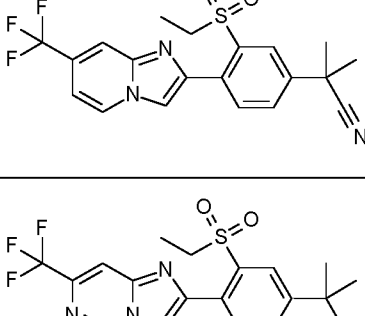
Compound No.	IUPAC name	Structure	Melting Point	MS/NMR
P15	2-[6-[7-(difluoromethylsulfonyl)imidazo[1,2-c]pyrimidin-2-yl]-5-ethylsulfonyl-3-pyridyl]-2-methylpropanenitrile		232 - 240	LCMS (method 1): 470 (M+H) ⁺ ; retention time: 0.85 min
P16	2-[6-[7-(difluoromethylsulfonyl)imidazo[1,2-c]pyrimidin-2-yl]-5-ethylsulfonyl-3-pyridyl]-2-methylpropanenitrile		130 - 150	LCMS (method 1): 454 (M+H) ⁺ ; retention time: 0.78 min
P17	2-[6-[5-cyclopropyl-3-methyl-4-oxo-6-(trifluoromethyl)imidazo[4,5-c]pyridin-2-yl]-5-ethylsulfonyl-3-pyridyl]-2-methylpropanenitrile		216 - 218	LCMS (method 3):-490 (M+H) ⁺ ; retention time: 1.46 min. ¹ H NMR (400 MHz, CDCl ₃) d ppm 9.15 (1 H, d) 8.51 (1 H, d) 7.19 (1 H, s) 4.07 - 4.07 (1 H, m) 4.04 - 4.08 (2H, m) 3.82 (2 H, q) 3.08 - 3.14 (1 H, m) 1.90 (6 H, s) 1.34 - 1.40 (3 H, m) 1.24 - 1.32 (4 H, m) 1.04 - 1.10 (2 H, m)
P18	2-[6-[5-cyclopropyl-3-methyl-4-oxo-6-(trifluoromethyl)imidazo[4,5-c]pyridin-2-yl]-5-ethylsulfonyl-3-pyridyl]-2-methylpropanenitrile		141 - 143	LCMS (method 3):-461 (M+H) ⁺ ; retention time: 1.52 min. ¹ H NMR (400 MHz, CDCl ₃) d ppm 8.56 (1 H, d) 7.84 (1 H, d) 7.29 - 7.32 (1 H, m) 4.18 (3 H, s) 3.07 - 3.14 (1H, m) 2.99 (2 H, q) 1.81 - 1.86 (6 H, m) 1.25 - 1.39 (6 H, m) 1.01 - 1.08 (2 H, m)
P19	2-[3-ethylsulfonyl-4-[7-(trifluoromethyl)imidazo[1,2-a]pyridin-2-yl]phenyl]-2-methylpropanenitrile		180 - 181	LCMS (method 1): 422 (M+H) ⁺ ; retention time: 0.99 min
P20	2-[3-ethylsulfonyl-4-[7-(trifluoromethyl)imidazo[1,2-c]pyrimidin-2-yl]phenyl]-2-methylpropanenitrile		157 - 158	LCMS (method 1): 423 (M+H) ⁺ ; retention time: 1.49 min

Table 11: Examples of novel intermediate compounds:

Compound No.	IUPAC Name	Structure	Melting Point	MS/NMR
I1	2-(6-acetyl-5-ethylsulfonyl-3-pyridyl)-2-methylpropanenitrile			LCMS (method 1): 281 (M+H) ⁺ ; retention time: 0.79 min
I2	2-[6-(2-bromoacetyl)-5-ethylsulfonyl-3-pyridyl]-2-methylpropanenitrile			LCMS (method 1): 359 (M+H) ⁺ ; retention time: 0.88 min
I3	2,5-dibromo-3-ethylsulfonylpyridine			LCMS (method 4): 296 (M+H) ⁺ ; retention time: 1.16 min
I4	2,5-dibromo-3-ethylsulfonylpyridine			LCMS (method 4): 328 (M+H) ⁺ ; retention time: 0.88 min
I5	(5-bromo-3-ethylsulfonyl-2-pyridyl)hydrazine			LCMS (method 3): 280 (M+H) ⁺ ; retention time: 0.60 min
I6	4-[2-(5-bromo-3-ethylsulfonyl-2-pyridyl)hydrazino]-6-(trifluoromethyl)pyridine-3-carboxylic acid			LCMS (method 3): 469 (M+H) ⁺ ; retention time: 1.39 min

Compound No.	IUPAC Name	Structure	Melting Point	MS/NMR
17	2-(5-bromo-3-ethylsulfonyl-2-pyridyl)-3-chloro-6-(trifluoromethyl)pyrazolo[4,3-c]pyridine			LCMS (method 4): 469 (M+H) ⁺ ; retention time: 1.10 min
18	2-(5-bromo-3-ethylsulfonyl-2-pyridyl)-6-(trifluoromethyl)pyrazolo[4,3-c]pyridine			LCMS (method 3): 435 (M+H) ⁺ ; retention time: 1.05 min
19	2-[5-ethylsulfonyl-6-[6-(trifluoromethyl)pyrazolo[4,3-c]pyridin-2-yl]-3-pyridyl]acetonitrile			LCMS (method 4): 396 (M+H) ⁺ ; retention time: 0.87 min
110	2-[6-[5-ethyl-3-methyl-4-oxo-6-(trifluoromethyl)imidazo[4,5-c]pyridin-2-yl]-5-ethylsulfonyl-3-pyridyl]acetonitrile			LCMS (method 1): 454 (M+H) ⁺ ; retention time: 0.93 min
111	2-[5-ethylsulfonyl-6-(7-iodoimidazo[1,2-a]pyridin-2-yl)-3-pyridyl]-2-methylpropanenitrile			LCMS (method 4): 481 (M+H) ⁺ ; retention time: 0.94 min 1H NMR (400 MHz, DMSO-d6) δ ppm 1.27 (t, 3 H) 1.82 - 1.85 (m, 6 H) 1.83 (s, 1 H) 4.22 (d, 2 H) 7.27 (dd, 1 H) 8.15 (s, 1 H) 8.44 - 8.49 (m, 3 H) 9.10 - 9.13 (m, 1 H)

Compound No.	IUPAC Name	Structure	Melting Point	MS/NMR
112	methyl 3-[2-[5-(1-cyano-1-methyl-ethyl)-3-ethylsulfonyl-2-pyridyl]imidazo[1,2-a]pyridin-7-yl]sulfanylpropanoate			LCMS (method 4): 473 (M+H) ⁺ ; retention time: 0.82 min
113	2-[5-ethylsulfonyl-6-(7-sulfanylimidazo[1,2-a]pyridin-2-yl)-3-pyridyl]-2-methylpropanenitrile			LCMS (method 3): 387 (M+H) ⁺ ; retention time: 1.11 min

The following mixtures of the compounds of formula I with active ingredients are preferred (the abbreviation "TX" means "one compound selected from the group consisting of the compounds described in Tables 1-12 and P of the present invention"):

- 5 an adjuvant selected from the group of substances consisting of petroleum oils (alternative name) (628) + TX,
- an acaricide selected from the group of substances consisting of 1,1-bis(4-chlorophenyl)-2-ethoxyethanol (IUPAC name) (910) + TX, 2,4-dichlorophenyl benzenesulfonate (IUPAC/Chemical Abstracts name) (1059) + TX, 2-fluoro-N-methyl-N-(1-naphthyl)acetamide (IUPAC name) (1295) + TX,
- 10 4-chlorophenyl phenyl sulfone (IUPAC name) (981) + TX, abamectin (1) + TX, acequinocyl (3) + TX, acetoprole [CCN] + TX, acrinathrin (9) + TX, aldicarb (16) + TX, aldoxycarb (863) + TX, alpha-cypermethrin (202) + TX, amidithion (870) + TX, amidoflumet [CCN] + TX, amidothioate (872) + TX, amiton (875) + TX, amiton hydrogen oxalate (875) + TX, amitraz (24) + TX, aramite (881) + TX, arsenous oxide (882) + TX, AVI 382 (compound code) + TX, AZ 60541 (compound code) + TX,
- 15 TX, azinphos-ethyl (44) + TX, azinphos-methyl (45) + TX, azobenzene (IUPAC name) (888) + TX, azocyclotin (46) + TX, azothoate (889) + TX, benomyl (62) + TX, benoxafos (alternative name) [CCN] + TX, benzoximate (71) + TX, benzyl benzoate (IUPAC name) [CCN] + TX, bifenazate (74) + TX, bifenthrin (76) + TX, binapacryl (907) + TX, brofenvalerate (alternative name) + TX, bromocyclen (918) + TX, bromophos (920) + TX, bromophos-ethyl (921) + TX, bromopropylate (94) + TX,
- 20 TX, buprofezin (99) + TX, butocarboxim (103) + TX, butoxycarboxim (104) + TX, butylpyridaben (alternative name) + TX, calcium polysulfide (IUPAC name) (111) + TX, camphechlor (941) + TX, carbanolate (943) + TX, carbaryl (115) + TX, carbofuran (118) + TX, carbophenothion (947) + TX, CGA 50'439 (development code) (125) + TX, chinomethionat (126) + TX, chlorbenside (959) + TX, chlordimeform (964) + TX, chlordimeform hydrochloride (964) + TX, chlorfenapyr (130) + TX,
- 25 chlorfenethol (968) + TX, chlorfenson (970) + TX, chlorfensulfide (971) + TX, chlorfenvinphos

(131) + TX, chlorobenzilate (975) + TX, chloromebuform (977) + TX, chloromethiuron (978) + TX, chloropropylate (983) + TX, chlorpyrifos (145) + TX, chlorpyrifos-methyl (146) + TX, chlorthiophos (994) + TX, cinerin I (696) + TX, cinerin II (696) + TX, cinerins (696) + TX, clofentezine (158) + TX, closantel (alternative name) [CCN] + TX, coumaphos (174) + TX, crotamiton (alternative name) [CCN] + TX, crotoxyphos (1010) + TX, cufraneb (1013) + TX, cyanthoate (1020) + TX, cyflumetofen (CAS Reg. No.: 400882-07-7) + TX, cyhalothrin (196) + TX, cyhexatin (199) + TX, cypermetrin (201) + TX, DCPM (1032) + TX, DDT (219) + TX, demephion (1037) + TX, demephion-0 (1037) + TX, demephion-S (1037) + TX, demeton (1038) + TX, demeton-methyl (224) + TX, demeton-O (1038) + TX, demeton-O-methyl (224) + TX, demeton-S (1038) + TX, demeton-S-methyl (224) + TX, demeton-S-methylsulfon (1039) + TX, diafenthion (226) + TX, dialifos (1042) + TX, diazinon (227) + TX, dichlofluanid (230) + TX, dichlorvos (236) + TX, dicliphos (alternative name) + TX, dicofol (242) + TX, dicrotophos (243) + TX, dienochlor (1071) + TX, dimefox (1081) + TX, dimethoate (262) + TX, dinactin (alternative name) (653) + TX, dinex (1089) + TX, dinex-diclexine (1089) + TX, dinobuton (269) + TX, dinocap (270) + TX, dinocap-4 [CCN] + TX, dinocap-6 [CCN] + TX, dinocton (1090) + TX, dinopenton (1092) + TX, dinosulfon (1097) + TX, dinoterbon (1098) + TX, dioxathion (1102) + TX, diphenyl sulfone (IUPAC name) (1103) + TX, disulfiram (alternative name) [CCN] + TX, disulfoton (278) + TX, DNOC (282) + TX, dofenapyn (1113) + TX, doramectin (alternative name) [CCN] + TX, endosulfan (294) + TX, endothion (1121) + TX, EPN (297) + TX, eprinomectin (alternative name) [CCN] + TX, ethion (309) + TX, ethoate-methyl (1134) + TX, etoxazole (320) + TX, etrimfos (1142) + TX, fenazaflor (1147) + TX, fenazaquin (328) + TX, fenbutatin oxide (330) + TX, fenothiocarb (337) + TX, fenpropathrin (342) + TX, fenpyrad (alternative name) + TX, fenpyroximate (345) + TX, fenson (1157) + TX, fentrifanil (1161) + TX, fenvalerate (349) + TX, fipronil (354) + TX, fluacrypyrim (360) + TX, fluazuron (1166) + TX, flubenzimine (1167) + TX, flucycloxuron (366) + TX, flucythrinate (367) + TX, fluenetil (1169) + TX, flufenoxuron (370) + TX, flumethrin (372) + TX, fluorbenside (1174) + TX, fluvalinate (1184) + TX, FMC 1137 (development code) (1185) + TX, formetanate (405) + TX, formetanate hydrochloride (405) + TX, formothion (1192) + TX, formparanate (1193) + TX, gamma-HCH (430) + TX, glyodin (1205) + TX, halfenprox (424) + TX, heptenophos (432) + TX, hexadecyl cyclopropanecarboxylate (IUPAC/Chemical Abstracts name) (1216) + TX, hexythiazox (441) + TX, iodomethane (IUPAC name) (542) + TX, isocarbophos (alternative name) (473) + TX, isopropyl 0-(methoxyaminothiophosphoryl)salicylate (IUPAC name) (473) + TX, ivermectin (alternative name) [CCN] + TX, jasmolin I (696) + TX, jasmolin II (696) + TX, jodfenphos (1248) + TX, lindane (430) + TX, lufenuron (490) + TX, malathion (492) + TX, malonoben (1254) + TX, mecarbam (502) + TX, mephosfolan (1261) + TX, mesulfen (alternative name) [CCN] + TX, methacrifos (1266) + TX, methamidophos (527) + TX, methidathion (529) + TX, methiocarb (530) + TX, methomyl (531) + TX, methyl bromide (537) + TX, metolcarb (550) + TX, mevinphos (556) + TX, mexacarbate (1290) + TX, milbemectin (557) + TX, milbemycin oxime (alternative name) [CCN] + TX, mipafox (1293) + TX, monocrotophos (561) + TX, morphothion (1300) + TX, moxidectin (alternative name) [CCN] + TX, naled (567) + TX, NC-184 (compound code) + TX, NC-

5 12 (compound code) + TX, nifluridide (1309) + TX, nikkomycins (alternative name) [CCN] + TX, nitrilacarb (1313) + TX, nitrilacarb 1:1 zinc chloride complex (1313) + TX, NNI-0101 (compound code) + TX, NNI-0250 (compound code) + TX, omethoate (594) + TX, oxamyl (602) + TX, oxydeprofos (1324) + TX, oxydisulfoton (1325) + TX, pp'-DDT (219) + TX, parathion (615) + TX,

5 permethrin (626) + TX, petroleum oils (alternative name) (628) + TX, phenkapton (1330) + TX, phenthoate (631) + TX, phorate (636) + TX, phosalone (637) + TX, phosfolan (1338) + TX, phosmet (638) + TX, phosphamidon (639) + TX, phoxim (642) + TX, pirimiphos-methyl (652) + TX, polychloroterpenes (traditional name) (1347) + TX, polynactins (alternative name) (653) + TX, proclonol (1350) + TX, profenofos (662) + TX, promacyl (1354) + TX, propargite (671) + TX,

10 propetamphos (673) + TX, propoxur (678) + TX, prothidathion (1360) + TX, prothoate (1362) + TX, pyrethrin I (696) + TX, pyrethrin II (696) + TX, pyrethrins (696) + TX, pyridaben (699) + TX, pyridaphenthion (701) + TX, pyrimidifen (706) + TX, pyrimitate (1370) + TX, quinalphos (711) + TX, quintofos (1381) + TX, R-1492 (development code) (1382) + TX, RA-17 (development code) (1383) + TX, rotenone (722) + TX, schradan (1389) + TX, sebufos (alternative name) + TX,

15 selamectin (alternative name) [CCN] + TX, SI-0009 (compound code) + TX, sophamide (1402) + TX, spirodiclofen (738) + TX, spiromesifen (739) + TX, SSI-121 (development code) (1404) + TX, sulfiram (alternative name) [CCN] + TX, sulfluramid (750) + TX, sulfotep (753) + TX, sulfur (754) + TX, SZI-121 (development code) (757) + TX, tau-fluvalinate (398) + TX, tebufenpyrad (763) + TX, TEPP (1417) + TX, terbam (alternative name) + TX, tetrachlorvinphos (777) + TX, tetradifon (786)

20 + TX, tetranactin (alternative name) (653) + TX, tetrasul (1425) + TX, thiafenox (alternative name) + TX, thiocarboxime (1431) + TX, thiofanox (800) + TX, thiometon (801) + TX, thioquinox (1436) + TX, thuringiensin (alternative name) [CCN] + TX, triamiphos (1441) + TX, triarathene (1443) + TX, triazophos (820) + TX, triazuron (alternative name) + TX, trichlorfon (824) + TX, trifenofos (1455) + TX, trinactin (alternative name) (653) + TX, vamidothion (847) + TX, vaniliprole [CCN]

25 and YI-5302 (compound code) + TX,

an algicide selected from the group of substances consisting of bethoxazin [CCN] + TX, copper dioctanoate (IUPAC name) (170) + TX, copper sulfate (172) + TX, cybutryne [CCN] + TX, dichlone (1052) + TX, dichlorophen (232) + TX, endothal (295) + TX, fentin (347) + TX, hydrated lime [CCN] + TX, nabam (566) + TX, quinoclamine (714) + TX, quinonamid (1379) + TX, simazine

30 (730) + TX, triphenyltin acetate (IUPAC name) (347) and triphenyltin hydroxide (IUPAC name) (347) + TX,

an anthelmintic selected from the group of substances consisting of abamectin (1) + TX, crufomate (1011) + TX, doramectin (alternative name) [CCN] + TX, emamectin (291) + TX, emamectin benzoate (291) + TX, eprinomectin (alternative name) [CCN] + TX, ivermectin (alternative name)

35 [CCN] + TX, milbemycin oxime (alternative name) [CCN] + TX, moxidectin (alternative name) [CCN] + TX, piperazine [CCN] + TX, selamectin (alternative name) [CCN] + TX, spinosad (737) and thiophanate (1435) + TX,

an avicide selected from the group of substances consisting of chloralose (127) + TX, endrin (1122) + TX, fenthion (346) + TX, pyridin-4-amine (IUPAC name) (23) and strychnine (745) + TX,

- a bactericide selected from the group of substances consisting of 1-hydroxy-1 /-pyridine-2-thione (IUPAC name) (1222) + TX, 4-(quinoxalin-2-ylamino)benzenesulfonamide (IUPAC name) (748) + TX, 8-hydroxyquinoline sulfate (446) + TX, bronopol (97) + TX, copper dioctanoate (IUPAC name) (170) + TX, copper hydroxide (IUPAC name) (169) + TX, cresol [CCN] + TX, dichlorophen (232) + TX, 5 dipyrithione (1105) + TX, dodicin (1112) + TX, fenaminosulf (1144) + TX, formaldehyde (404) + TX, hydrargaphen (alternative name) [CCN] + TX, kasugamycin (483) + TX, kasugamycin hydrochloride hydrate (483) + TX, nickel bis(dimethyldithiocarbamate) (IUPAC name) (1308) + TX, nitrapyrin (580) + TX, octhilonone (590) + TX, oxolinic acid (606) + TX, oxytetracycline (611) + TX, potassium hydroxyquinoline sulfate (446) + TX, probenazole (658) + TX, streptomycin (744) + TX, 10 streptomycin sesquisulfate (744) + TX, tecloftalam (766) + TX, and thiomersal (alternative name) [CCN] + TX,
- a biological agent selected from the group of substances consisting of *Adoxophyes orana* GV (alternative name) (12) + TX, *Agrobacterium radiobacter* (alternative name) (13) + TX, *Amblyseius* spp. (alternative name) (19) + TX, *Anagrapha falcifera* NPV (alternative name) (28) + TX, *Anagrus* 15 *atomus* (alternative name) (29) + TX, *Aphelinus abdominalis* (alternative name) (33) + TX, *Aphidius colemani* (alternative name) (34) + TX, *Aphidoletes aphidimyza* (alternative name) (35) + TX, *Autographa californica* NPV (alternative name) (38) + TX, *Bacillus firmus* (alternative name) (48) + TX, *Bacillus sphaericus* Neide (scientific name) (49) + TX, *Bacillus thuringiensis* Berliner (scientific name) (51) + TX, *Bacillus thuringiensis* subsp. *aizawai* (scientific name) (51) + TX, *Bacillus* 20 *thuringiensis* subsp. *israelensis* (scientific name) (51) + TX, *Bacillus thuringiensis* subsp. *japonensis* (scientific name) (51) + TX, *Bacillus thuringiensis* subsp. *kurstaki* (scientific name) (51) + TX, *Bacillus thuringiensis* subsp. *tenebrionis* (scientific name) (51) + TX, *Beauveria bassiana* (alternative name) (53) + TX, *Beauveria brongniartii* (alternative name) (54) + TX, *Chrysoperla carnea* (alternative name) (151) + TX, *Cryptolaemus montrouzieri* (alternative name) (178) + TX, *Cydia* 25 *pomonella* GV (alternative name) (191) + TX, *Dacnusa sibirica* (alternative name) (212) + TX, *Diglyphus isaea* (alternative name) (254) + TX, *Encarsia formosa* (scientific name) (293) + TX, *Eretmocerus eremicus* (alternative name) (300) + TX, *Helicoverpa zea* NPV (alternative name) (431) + TX, *Heterorhabditis bacteriophora* and *H. megidis* (alternative name) (433) + TX, *Hippodamia convergens* (alternative name) (442) + TX, *Leptomastix dactylopii* (alternative name) (488) + TX, 30 *Macrolophus caliginosus* (alternative name) (491) + TX, *Mamestra brassicae* NPV (alternative name) (494) + TX, *Metaphycus helvolus* (alternative name) (522) + TX, *Metarhizium anisopliae* var. *acidum* (scientific name) (523) + TX, *Metarhizium anisopliae* var. *anisopliae* (scientific name) (523) + TX, *Neodiprion sertifer* NPV and *N. lecontei* NPV (alternative name) (575) + TX, *Orius* spp. (alternative name) (596) + TX, *Paecilomyces fumosoroseus* (alternative name) (613) + TX, 35 *Phytoseiulus persimilis* (alternative name) (644) + TX, *Spodoptera exigua* multicapsid nuclear polyhedrosis virus (scientific name) (741) + TX, *Steinernema bibionis* (alternative name) (742) + TX, *Steinernema carpocapsae* (alternative name) (742) + TX, *Steinernema feltiae* (alternative name) (742) + TX, *Steinernema glaseri* (alternative name) (742) + TX, *Steinernema riobrave* (alternative name) (742) + TX, *Steinernema riobrave* (alternative name) (742) + TX, *Steinernema scapterisci*

(alternative name) (742) + TX, *Steinernema* spp. (alternative name) (742) + TX, *Trichogramma* spp. (alternative name) (826) + TX, *Typhlodromus occidentalis* (alternative name) (844) and *Verticillium lecanii* (alternative name) (848) + TX,

a soil sterilant selected from the group of substances consisting of iodomethane (IUPAC name) (542) and methyl bromide (537) + TX,

a chemosterilant selected from the group of substances consisting of apholate [CCN] + TX, bisazir (alternative name) [CCN] + TX, busulfan (alternative name) [CCN] + TX, diflubenzuron (250) + TX, dimatif (alternative name) [CCN] + TX, hemel [CCN] + TX, hempa [CCN] + TX, metepa [CCN] + TX, methiotepa [CCN] + TX, methyl apholate [CCN] + TX, morzid [CCN] + TX, penfluron (alternative name) [CCN] + TX, tepa [CCN] + TX, thiohempa (alternative name) [CCN] + TX, thiotepa (alternative name) [CCN] + TX, tretamine (alternative name) [CCN] and uredepa (alternative name) [CCN] + TX,

an insect pheromone selected from the group of substances consisting of (E)-dec-5-en-1 -yl acetate with (E)-dec-5-en-1 -ol (IUPAC name) (222) + TX, (E)-tridec-4-en-1 -yl acetate (IUPAC name) (829) + TX, (E)-6-methylhept-2-en-4-ol (IUPAC name) (541) + TX, (E,Z)-tetradeca-4, 10-dien-1 -yl acetate (IUPAC name) (779) + TX, (Z)-dodec-7-en-1 -yl acetate (IUPAC name) (285) + TX, (Z)-hexadec-1 -enal (IUPAC name) (436) + TX, (Z)-hexadec-1 1-en-1 -yl acetate (IUPAC name) (437) + TX, (Z)-hexadec-1 3-en-1 1-yn-1 -yl acetate (IUPAC name) (438) + TX, (Z)-icos-1 3-en-1 0-one (IUPAC name) (448) + TX, (Z)-tetradec-7-en-1 -al (IUPAC name) (782) + TX, (Z)-tetradec-9-en-1 -ol (IUPAC name) (783) + TX, (Z)-tetradec-9-en-1 -yl acetate (IUPAC name) (784) + TX, (7E,9Z)-dodeca-7,9-dien-1 -yl acetate (IUPAC name) (283) + TX, (9Z,11E)-tetradeca-9, 11-dien-1 -yl acetate (IUPAC name) (780) + TX, (9Z,12E)-tetradeca-9, 12-dien-1 -yl acetate (IUPAC name) (781) + TX, 14-methyloctadec-1 -ene (IUPAC name) (545) + TX, 4-methylnonan-5-ol with 4-methylnonan-5-one (IUPAC name) (544) + TX, alpha-multistriatin (alternative name) [CCN] + TX, brevicomin (alternative name) [CCN] + TX,

codlure (alternative name) [CCN] + TX, codlemone (alternative name) (167) + TX, cuelure (alternative name) (179) + TX, disparlure (277) + TX, dodec-8-en-1 -yl acetate (IUPAC name) (286) + TX, dodec-9-en-1 -yl acetate (IUPAC name) (287) + TX, dodeca-8 + TX, 10-dien-1 -yl acetate (IUPAC name) (284) + TX, dominicalure (alternative name) [CCN] + TX, ethyl 4-methyloctanoate (IUPAC name) (317) + TX, eugenol (alternative name) [CCN] + TX, frontalin (alternative name) [CCN] + TX, gossyplure (alternative name) (420) + TX, grandlure (421) + TX, grandlure I (alternative name) (421) + TX, grandlure II (alternative name) (421) + TX, grandlure III (alternative name) (421) + TX, grandlure IV (alternative name) (421) + TX, hexalure [CCN] + TX, ipsdienol (alternative name) [CCN] + TX, ipsenol (alternative name) [CCN] + TX, japonilure (alternative name) (481) + TX, lineatin (alternative name) [CCN] + TX, litlure (alternative name) [CCN] + TX, looplure (alternative name) [CCN] + TX, medlure [CCN] + TX, megatomoic acid (alternative name) [CCN] + TX, methyl eugenol (alternative name) (540) + TX, muscalure (563) + TX, octadeca-2, 13-dien-1 -yl acetate (IUPAC name) (588) + TX, octadeca-3, 13-dien-1 -yl acetate (IUPAC name) (589) + TX, orfralure (alternative name) [CCN] + TX, oryctalure (alternative name) (317) + TX, ostramone (alternative name) [CCN] + TX, siglure [CCN] + TX, sordidin (alternative name) (736) + TX, sulcatol

- (alternative name) [CCN] + TX, tetradec-1 1-en-1 -yl acetate (IUPAC name) (785) + TX, trimedlure (839) + TX, trimedlure A (alternative name) (839) + TX, trimedlure B₁ (alternative name) (839) + TX, trimedlure B₂ (alternative name) (839) + TX, trimedlure C (alternative name) (839) and trunc-call (alternative name) [CCN] + TX,
- 5 an insect repellent selected from the group of substances consisting of 2-(octylthio)ethanol (IUPAC name) (591) + TX, butopyronoxyl (933) + TX, butoxy(polypropylene glycol) (936) + TX, dibutyl adipate (IUPAC name) (1046) + TX, dibutyl phthalate (1047) + TX, dibutyl succinate (IUPAC name) (1048) + TX, diethyltoluamide [CCN] + TX, dimethyl carbate [CCN] + TX, dimethyl phthalate [CCN] + TX, ethyl hexanediol (1137) + TX, hexamide [CCN] + TX, methoquin-butyl (1276) + TX,
- 10 methylneodecanamide [CCN] + TX, oxamate [CCN] and picaridin [CCN] + TX, an insecticide selected from the group of substances consisting of 1-dichloro-1 -nitroethane (IUPAC/Chemical Abstracts name) (1058) + TX, 1,1-dichloro-2,2-bis(4-ethylphenyl)ethane (IUPAC name) (1056), + TX, 1,2-dichloropropane (IUPAC/Chemical Abstracts name) (1062) + TX, 1,2-dichloropropane with 1,3-dichloropropene (IUPAC name) (1063) + TX, 1-bromo-2-chloroethane
- 15 (IUPAC/Chemical Abstracts name) (916) + TX, 2,2,2-trichloro-1 -(3,4-dichlorophenyl)ethyl acetate (IUPAC name) (1451) + TX, 2,2-dichlorovinyl 2-ethylsulfinylethyl methyl phosphate (IUPAC name) (1066) + TX, 2-(1 ,3-dithiolan-2-yl)phenyl dimethylcarbamate (IUPAC/ Chemical Abstracts name) (1109) + TX, 2-(2-butoxyethoxy)ethyl thiocyanate (IUPAC/Chemical Abstracts name) (935) + TX, 2-(4,5-dimethyl-1 ,3-dioxolan-2-yl)phenyl methylcarbamate (IUPAC/ Chemical Abstracts name) (1084) +
- 20 TX, 2-(4-chloro-3,5-xylyloxy)ethanol (IUPAC name) (986) + TX, 2-chlorovinyl diethyl phosphate (IUPAC name) (984) + TX, 2-imidazolidone (IUPAC name) (1225) + TX, 2-isovalerylindan-1 ,3-dione (IUPAC name) (1246) + TX, 2-methyl(prop-2-ynyl)aminophenyl methylcarbamate (IUPAC name) (1284) + TX, 2-thiocyanatoethyl laurate (IUPAC name) (1433) + TX, 3-bromo-1 -chloroprop-1 -ene (IUPAC name) (917) + TX, 3-methyl-1 -phenylpyrazol-5-yl dimethylcarbamate (IUPAC name) (1283) +
- 25 TX, 4-methyl(prop-2-ynyl)amino-3,5-xylyl methylcarbamate (IUPAC name) (1285) + TX, 5,5-dimethyl-3-oxocyclohex-1 -enyl dimethylcarbamate (IUPAC name) (1085) + TX, abamectin (1) + TX, acephate (2) + TX, acetamiprid (4) + TX, acethion (alternative name) [CCN] + TX, acetoprole [CCN] + TX, acrinathrin (9) + TX, acrylonitrile (IUPAC name) (861) + TX, alanycarb (15) + TX, aldicarb (16) + TX, aldoxycarb (863) + TX, aldrin (864) + TX, allethrin (17) + TX, allosamidin
- 30 (alternative name) [CCN] + TX, allyxycarb (866) + TX, alpha-cypermethrin (202) + TX, alpha-ecdysone (alternative name) [CCN] + TX, aluminium phosphide (640) + TX, amidithion (870) + TX, amidothioate (872) + TX, aminocarb (873) + TX, amiton (875) + TX, amiton hydrogen oxalate (875) + TX, amitraz (24) + TX, anabasine (877) + TX, athidathion (883) + TX, AVI 382 (compound code) + TX, AZ 60541 (compound code) + TX, azadirachtin (alternative name) (41) + TX,
- 35 azamethiphos (42) + TX, azinphos-ethyl (44) + TX, azinphos-methyl (45) + TX, azothoate (889) + TX, *Bacillus thuringiensis* delta endotoxins (alternative name) (52) + TX, barium hexafluorosilicate (alternative name) [CCN] + TX, barium polysulfide (IUPAC/Chemical Abstracts name) (892) + TX, barthrin [CCN] + TX, Bayer 22/1 90 (development code) (893) + TX, Bayer 22408 (development code) (894) + TX, bendiocarb (58) + TX, benfuracarb (60) + TX, bensultap (66) + TX, beta-

cyfluthrin (194) + TX, beta-cypermethrin (203) + TX, bifenthrin (76) + TX, bioallethrin (78) + TX,
 bioallethrin S-cyclopentenyl isomer (alternative name) (79) + TX, bioethanomethrin [CCN] + TX,
 biopermethrin (908) + TX, bioresmethrin (80) + TX, bis(2-chloroethyl) ether (IUPAC name) (909) +
 TX, bistrifluron (83) + TX, borax (86) + TX, brofenvalerate (alternative name) + TX, bromfenvinfos
 5 (914) + TX, bromocyclen (918) + TX, bromo-DDT (alternative name) [CCN] + TX, bromophos
 (920) + TX, bromophos-ethyl (921) + TX, bufencarb (924) + TX, buprofezin (99) + TX, butacarb
 (926) + TX, butathiofos (927) + TX, butocarboxim (103) + TX, butonate (932) + TX,
 butoxycarboxim (104) + TX, butylpyridaben (alternative name) + TX, cadusafos (109) + TX,
 calcium arsenate [CCN] + TX, calcium cyanide (444) + TX, calcium polysulfide (IUPAC name) (111)
 10 + TX, camphechlor (941) + TX, carbanolate (943) + TX, carbaryl (115) + TX, carbofuran (118) +
 TX, carbon disulfide (IUPAC/Chemical Abstracts name) (945) + TX, carbon tetrachloride (IUPAC
 name) (946) + TX, carbophenothion (947) + TX, carbosulfan (119) + TX, cartap (123) + TX,
 cartap hydrochloride (123) + TX, cevadine (alternative name) (725) + TX, chlordane (128) + TX,
 chlordane (128) + TX, chlordecone (963) + TX, chlordimeform (964) + TX, chlordimeform
 15 hydrochloride (964) + TX, chlorethoxyfos (129) + TX, chlorfenapyr (130) + TX, chlorfenvinphos
 (131) + TX, chlorfluazuron (132) + TX, chlormephos (136) + TX, chloroform [CCN] + TX,
 chloropicrin (141) + TX, chlorphoxim (989) + TX, chlorprazophos (990) + TX, chlorpyrifos (145) +
 TX, chlorpyrifos-methyl (146) + TX, chlorthiophos (994) + TX, chromafenozide (150) + TX, cinerin
 I (696) + TX, cinerin II (696) + TX, cinerins (696) + TX, cis-resmethrin (alternative name) + TX,
 20 cismethrin (80) + TX, clocythrin (alternative name) + TX, cloethocarb (999) + TX, closantel
 (alternative name) [CCN] + TX, clothianidin (165) + TX, copper acetoarsenite [CCN] + TX, copper
 arsenate [CCN] + TX, copper oleate [CCN] + TX, coumaphos (174) + TX, coumithoate (1006) +
 TX, crotamiton (alternative name) [CCN] + TX, crotoxyphos (1010) + TX, crufomate (1011) + TX,
 cryolite (alternative name) (177) + TX, CS 708 (development code) (1012) + TX, cyanofenphos
 25 (1019) + TX, cyanophos (184) + TX, cyanthoate (1020) + TX, cyclethrin [CCN] + TX,
 cycloprothrin (188) + TX, cyfluthrin (193) + TX, cyhalothrin (196) + TX, cypermethrin (201) + TX,
 cyphenothrin (206) + TX, cyromazine (209) + TX, cythioate (alternative name) [CCN] + TX, *d*-
 limonene (alternative name) [CCN] + TX, cf-tetramethrin (alternative name) (788) + TX, DAEP
 (1031) + TX, dazomet (216) + TX, DDT (219) + TX, decarbofuran (1034) + TX, deltamethrin (223)
 30 + TX, demephion (1037) + TX, demephion-0 (1037) + TX, demephion-S (1037) + TX, demeton
 (1038) + TX, demeton-methyl (224) + TX, demeton-0 (1038) + TX, demeton-O-methyl (224) + TX,
 demeton-S (1038) + TX, demeton-S-methyl (224) + TX, demeton-S-methylsulphon (1039) + TX,
 diafenthiuron (226) + TX, dialifos (1042) + TX, diamidafos (1044) + TX, diazinon (227) + TX,
 dicapthion (1050) + TX, dichlofenthion (1051) + TX, dichlorvos (236) + TX, dicliphos (alternative
 35 name) + TX, dicresyl (alternative name) [CCN] + TX, dicrotophos (243) + TX, dicyclanil (244) + TX,
 dieldrin (1070) + TX, diethyl 5-methylpyrazol-3-yl phosphate (IUPAC name) (1076) + TX,
 diflubenzuron (250) + TX, dilor (alternative name) [CCN] + TX, dimefluthrin [CCN] + TX, dimefox
 (1081) + TX, dimetan (1085) + TX, dimethoate (262) + TX, dimethrin (1083) + TX,
 dimethylvinphos (265) + TX, dimetilan (1086) + TX, dinex (1089) + TX, dinex-diclexine (1089) +

TX, dinoprop (1093) + TX, dinosam (1094) + TX, dinoseb (1095) + TX, dinotefuran (271) + TX, diofenolan (1099) + TX, dioxabenzofos (1100) + TX, dioxacarb (1101) + TX, dioxathion (1102) + TX, disulfoton (278) + TX, dithicrofos (1108) + TX, DNOC (282) + TX, doramectin (alternative name) [CCN] + TX, DSP (1115) + TX, ecdysterone (alternative name) [CCN] + TX, EI 1642 (development code) (1118) + TX, emamectin (291) + TX, emamectin benzoate (291) + TX, EMPC (1120) + TX, empenothrin (292) + TX, endosulfan (294) + TX, endothion (1121) + TX, endrin (1122) + TX, EPBP (1123) + TX, EPN (297) + TX, epofenonane (1124) + TX, eprinomectin (alternative name) [CCN] + TX, esfenvalerate (302) + TX, etaphos (alternative name) [CCN] + TX, ethiofencarb (308) + TX, ethion (309) + TX, ethiprole (310) + TX, ethoate-m ethyl (1134) + TX, ethoprophos (312) + TX, ethyl formate (IUPAC name) [CCN] + TX, ethyl-DDD (alternative name) (1056) + TX, ethylene dibromide (316) + TX, ethylene dichloride (chemical name) (1136) + TX, ethylene oxide [CCN] + TX, etofenprox (319) + TX, etrimfos (1142) + TX, EXD (1143) + TX, famphur (323) + TX, fenamiphos (326) + TX, fenazaflor (1147) + TX, fenchlorphos (1148) + TX, fenethacarb (1149) + TX, fenfluthrin (1150) + TX, fenitrothion (335) + TX, fenobucarb (336) + TX, fenoxacrim (1153) + TX, fenoxycarb (340) + TX, fenpirithrin (1155) + TX, fenpropathrin (342) + TX, fenpyrad (alternative name) + TX, fensulfathion (1158) + TX, fenthion (346) + TX, fenthion-ethyl [CCN] + TX, fenvalerate (349) + TX, fipronil (354) + TX, flonicamid (358) + TX, flubendiamide (CAS. Reg. No.: 272451-65-7) + TX, flucofuron (1168) + TX, flucycloxuron (366) + TX, flucythrinate (367) + TX, fluenetil (1169) + TX, flufenerim [CCN] + TX, flufenoxuron (370) + TX, flufenprox (1171) + TX, flumethrin (372) + TX, fluvalinate (1184) + TX, FMC 1137 (development code) (1185) + TX, fonofos (1191) + TX, formetanate (405) + TX, formetanate hydrochloride (405) + TX, formothion (1192) + TX, formparanate (1193) + TX, fosmethilan (1194) + TX, fospirate (1195) + TX, fosthiazate (408) + TX, fosthietan (1196) + TX, furathiocarb (412) + TX, furethrin (1200) + TX, gamma-cyhalothrin (197) + TX, gamma-HCH (430) + TX, guazatine (422) + TX, guazatine acetates (422) + TX, GY-81 (development code) (423) + TX, halfenprox (424) + TX, halofenozide (425) + TX, HCH (430) + TX, HEOD (1070) + TX, heptachlor (1211) + TX, heptenophos (432) + TX, heterophos [CCN] + TX, hexaflumuron (439) + TX, HHDN (864) + TX, hydramethylnon (443) + TX, hydrogen cyanide (444) + TX, hydroprene (445) + TX, hyquincarb (1223) + TX, imidacloprid (458) + TX, imiprothrin (460) + TX, indoxacarb (465) + TX, iodomethane (IUPAC name) (542) + TX, IPSP (1229) + TX, isazofos (1231) + TX, isobenzan (1232) + TX, isocarbophos (alternative name) (473) + TX, isodrin (1235) + TX, isofenphos (1236) + TX, isolane (1237) + TX, isoprocarb (472) + TX, isopropyl 0-(methoxy-aminothiophosphoryl)salicylate (IUPAC name) (473) + TX, isoprothiolane (474) + TX, isothioate (1244) + TX, isoxathion (480) + TX, ivermectin (alternative name) [CCN] + TX, jasmolin I (696) + TX, jasmolin II (696) + TX, jodfenphos (1248) + TX, juvenile hormone I (alternative name) [CCN] + TX, juvenile hormone II (alternative name) [CCN] + TX, juvenile hormone III (alternative name) [CCN] + TX, kelevan (1249) + TX, kinoprene (484) + TX, lambda-cyhalothrin (198) + TX, lead arsenate [CCN] + TX, lepimectin (CCN) + TX, leptophos (1250) + TX, lindane (430) + TX, lirimfos (1251) + TX, lufenuron (490) + TX, lythidathion (1253) + TX, m-cumenyl methylcarbamate (IUPAC

name) (1014) + TX, magnesium phosphide (IUPAC name) (640) + TX, malathion (492) + TX,
 malonoben (1254) + TX, mazidox (1255) + TX, mecarbam (502) + TX, mecarphon (1258) + TX,
 menazon (1260) + TX, mephosfolan (1261) + TX, mercurous chloride (513) + TX, mesulfenfos
 (1263) + TX, metaflumizone (CCN) + TX, metam (519) + TX, metam-potassium (alternative name)
 5 (519) + TX, metam-sodium (519) + TX, methacrifos (1266) + TX, methamidophos (527) + TX,
 methanesulfonyl fluoride (IUPAC/Chemical Abstracts name) (1268) + TX, methidathion (529) + TX,
 methiocarb (530) + TX, methocrotophos (1273) + TX, methomyl (531) + TX, methoprene (532) +
 TX, methoquin-butyl (1276) + TX, methothrin (alternative name) (533) + TX, methoxychlor (534) +
 TX, methoxyfenozide (535) + TX, methyl bromide (537) + TX, methyl isothiocyanate (543) + TX,
 10 methylchloroform (alternative name) [CCN] + TX, methylene chloride [CCN] + TX, metofluthrin
 [CCN] + TX, metolcarb (550) + TX, metoxadiazone (1288) + TX, mevinphos (556) + TX,
 mexacarbate (1290) + TX, milbemectin (557) + TX, milbemycin oxime (alternative name) [CCN] +
 TX, mipafox (1293) + TX, mirex (1294) + TX, monocrotophos (561) + TX, morphothion (1300) +
 TX, moxidectin (alternative name) [CCN] + TX, naftalofos (alternative name) [CCN] + TX, naled
 15 (567) + TX, naphthalene (IUPAC/Chemical Abstracts name) (1303) + TX, NC-170 (development
 code) (1306) + TX, NC-184 (compound code) + TX, nicotine (578) + TX, nicotine sulfate (578) +
 TX, nifluridide (1309) + TX, nitenpyram (579) + TX, nithiazine (1311) + TX, nitrilacarb (1313) +
 TX, nitrilacarb 1:1 zinc chloride complex (1313) + TX, NNI-0101 (compound code) + TX, NNI-0250
 (compound code) + TX, normicotine (traditional name) (1319) + TX, novaluron (585) + TX,
 20 noviflumuron (586) + TX, 0-5-dichloro-4-iodophenyl O-ethyl ethylphosphonothioate (IUPAC name)
 (1057) + TX, 0,0-diethyl 0-4-methyl-2-oxo-2AY-chromen-7-yl phosphorothioate (IUPAC name) (1074)
 + TX, O,O-diethyl 0-6-methyl-2-propylpyrimidin-4-yl phosphorothioate (IUPAC name) (1075) + TX,
 O,O',O',O'-tetrapropyl dithiopyrophosphate (IUPAC name) (1424) + TX, oleic acid (IUPAC name)
 (593) + TX, omethoate (594) + TX, oxamyl (602) + TX, oxydemeton-methyl (609) + TX,
 25 oxydeprofos (1324) + TX, oxydisulfoton (1325) + TX, pp'-DDT (219) + TX, para-dichlorobenzene
 [CCN] + TX, parathion (615) + TX, parathion-methyl (616) + TX, penfluron (alternative name)
 [CCN] + TX, pentachlorophenol (623) + TX, pentachlorophenyl laurate (IUPAC name) (623) + TX,
 permethrin (626) + TX, petroleum oils (alternative name) (628) + TX, PH 60-38 (development code)
 (1328) + TX, phenkapton (1330) + TX, phenothrin (630) + TX, phenthoate (631) + TX, phorate
 30 (636) + TX, phosalone (637) + TX, phosfolan (1338) + TX, phosmet (638) + TX, phosnichlor
 (1339) + TX, phosphamidon (639) + TX, phosphine (IUPAC name) (640) + TX, phoxim (642) + TX,
 phoxim-methyl (1340) + TX, pirimetaphos (1344) + TX, pirimicarb (651) + TX, pirimiphos-ethyl
 (1345) + TX, pirimiphos-methyl (652) + TX, polychlorodicyclopentadiene isomers (IUPAC name)
 (1346) + TX, polychloroterpenes (traditional name) (1347) + TX, potassium arsenite [CCN] + TX,
 35 potassium thiocyanate [CCN] + TX, prallethrin (655) + TX, precocene I (alternative name) [CCN] +
 TX, precocene II (alternative name) [CCN] + TX, precocene III (alternative name) [CCN] + TX,
 primidophos (1349) + TX, profenofos (662) + TX, profluthrin [CCN] + TX, promacyl (1354) + TX,
 promecarb (1355) + TX, propaphos (1356) + TX, propetamphos (673) + TX, propoxur (678) + TX,
 prothidathion (1360) + TX, prothiofos (686) + TX, prothoate (1362) + TX, protrifenbute [CCN] + TX,

pymetrozine (688) + TX, pyraclofos (689) + TX, pyrazophos (693) + TX, pyresmethrin (1367) + TX, pyrethrin I (696) + TX, pyrethrin II (696) + TX, pyrethrins (696) + TX, pyridaben (699) + TX, pyridalyl (700) + TX, pyridaphenthion (701) + TX, pyrimidifen (706) + TX, pyrimitate (1370) + TX, pyriproxyfen (708) + TX, quassia (alternative name) [CCN] + TX, quinalphos (711) + TX,

5 quinalphos-methyl (1376) + TX, quinothion (1380) + TX, quintiofos (1381) + TX, R-1492 (development code) (1382) + TX, rafoxanide (alternative name) [CCN] + TX, resmethrin (719) + TX, rotenone (722) + TX, RU 15525 (development code) (723) + TX, RU 25475 (development code) (1386) + TX, ryania (alternative name) (1387) + TX, ryanodine (traditional name) (1387) + TX,

10 sabadilla (alternative name) (725) + TX, schradan (1389) + TX, sebufos (alternative name) + TX, selamectin (alternative name) [CCN] + TX, SI-0009 (compound code) + TX, SI-0205 (compound code) + TX, SI-0404 (compound code) + TX, SI-0405 (compound code) + TX, silafluofen (728) + TX, SN 72129 (development code) (1397) + TX, sodium arsenite [CCN] + TX, sodium cyanide (444) + TX, sodium fluoride (IUPAC/Chemical Abstracts name) (1399) + TX, sodium

15 hexafluorosilicate (1400) + TX, sodium pentachlorophenoxide (623) + TX, sodium selenate (IUPAC name) (1401) + TX, sodium thiocyanate [CCN] + TX, sophamide (1402) + TX, spinosad (737) + TX, spiromesifen (739) + TX, spirotetramat (CCN) + TX, sulcofuron (746) + TX, sulcofuron-sodium (746) + TX, sulfluramid (750) + TX, sulfotep (753) + TX, sulfuryl fluoride (756) + TX, sulprofos (1408) + TX, tar oils (alternative name) (758) + TX, tau-fluvalinate (398) + TX, tazimcarb (1412) + TX, TDE (1414) + TX,

20 tebufenozide (762) + TX, tebufenpyrad (763) + TX, tebupirimfos (764) + TX, teflubenzuron (768) + TX, tefluthrin (769) + TX, temephos (770) + TX, TEPP (1417) + TX, terallethrin (1418) + TX, terbam (alternative name) + TX, terbufos (773) + TX, tetrachloroethane [CCN] + TX, tetrachlorvinphos (777) + TX, tetramethrin (787) + TX, theta-cypermethrin (204) + TX,

25 thiacloprid (791) + TX, thiafenox (alternative name) + TX, thiamethoxam (792) + TX, thicofos (1428) + TX, thiocarboxime (1431) + TX, thiocyclam (798) + TX, thiocyclam hydrogen oxalate (798) + TX, thiodicarb (799) + TX, thiofanox (800) + TX, thiometon (801) + TX, thionazin (1434) + TX, thiosultap (803) + TX, thiosultap-sodium (803) + TX, thuringiensin (alternative name) [CCN] + TX,

30 tolfenpyrad (809) + TX, tralomethrin (812) + TX, transluthrin (813) + TX, transpermethrin (1440) + TX, triamiphos (1441) + TX, triazamate (818) + TX, triazophos (820) + TX, triazuron (alternative name) + TX, trichlorfon (824) + TX, trichlormetaphos-3 (alternative name) [CCN] + TX,

35 trichloronat (1452) + TX, trifenofos (1455) + TX, triflumuron (835) + TX, trimethacarb (840) + TX, triprene (1459) + TX, vamidothion (847) + TX, vanilprole [CCN] + TX, veratridine (alternative name) (725) + TX, veratrine (alternative name) (725) + TX, XMC (853) + TX, xylylcarb (854) + TX, YI-5302 (compound code) + TX, zeta-cypermethrin (205) + TX, zetamethrin (alternative name) + TX, zinc phosphide (640) + TX, zolaprofos (1469) and ZXI 8901 (development code) (858) + TX,

cyantraniliprole [736994-63-19] + TX, chlorantraniliprole [500008-45-7] + TX, cyenopyrafen [560121-52-0] + TX, cyflumetofen [400882-07-7] + TX, pyrifluquinazon [337458-27-2] + TX, spinetoram [187166-40-1 + 187166-15-0] + TX, spirotetramat [203313-25-1] + TX, sulfoxaflor [946578-00-3] + TX, flufiprole [704886-18-0] + TX, meperfluthrin [915288-13-0] + TX, tetramethylfluthrin [84937-88-2] + TX, triflumezopyrim (disclosed in WO 2012/092115) + TX, fluxametamide (WO 2007/026965) + TX,

epsilon-metofluthrin [240494-71 -7] + TX, epsilon-momfluorothrin [10651 24-65-3] + TX,
 fluazaindolizine [1254304-22-7] + TX, chlorprallethrin [399572-87-3] + TX, fluxametamide [928783-
 29-3] + TX, cyhalodiamide [1262605-53-7] + TX, tioxazafen [330459-31 -9] + TX, broflanilide [1207727-
 04-5] + TX, flufiprole [704886-1 8-0] + TX, cyclanilprole [1031 756-98-5] + TX, tetranilprole [1229654-
 5 66-3] + TX, guadipyr (described in WO201 0/060231) + TX, cycloxaprid (described in WO
 2005/077934) + TX, spiropidion + TX, Afidopyropen + TX, flupyrimin + TX, Momfluorothrin + TX,
 kappa-bifenthrin + TX, kappa-tefluthrin + TX, Dichloromezotiaz + TX, Tetrachloranilprole + TX,
 benzpyrimoxan + TX
 a molluscicide selected from the group of substances consisting of bis(tributyltin) oxide (IUPAC name)
 10 (91 3) + TX, bromoacetamide [CCN] + TX, calcium arsenate [CCN] + TX, cloethocarb (999) + TX,
 copper acetoarsenite [CCN] + TX, copper sulfate (172) + TX, fentin (347) + TX, ferric phosphate
 (IUPAC name) (352) + TX, metaldehyde (51 8) + TX, methiocarb (530) + TX, niclosamide (576) +
 TX, niclosamide-olamine (576) + TX, pentachlorophenol (623) + TX, sodium pentachlorophenoxide
 (623) + TX, tazimcarb (14 12) + TX, thiodicarb (799) + TX, tributyltin oxide (91 3) + TX, trifenmorph
 15 (1454) + TX, trimethacarb (840) + TX, triphenyltin acetate (IUPAC name) (347) and triphenyltin
 hydroxide (IUPAC name) (347) + TX, pyriprole [394730-71 -3] + TX,
 a nematicide selected from the group of substances consisting of AKD-3088 (compound code) + TX,
 1,2-dibromo-3-chloropropane (IUPAC/Chemical Abstracts name) (1045) + TX, 1,2-dichloropropane
 (IUPAC/ Chemical Abstracts name) (1062) + TX, 1,2-dichloropropane with 1,3-dichloropropene
 20 (IUPAC name) (1063) + TX, 1,3-dichloropropene (233) + TX, 3,4-dichlorotetrahydrothiophene 1,1-
 dioxide (IUPAC/Chemical Abstracts name) (1065) + TX, 3-(4-chlorophenyl)-5-methylrhodanine
 (IUPAC name) (980) + TX, 5-methyl-6-thioxo-1 ,3,5-thiadiazinan-3-ylacetic acid (IUPAC name) (1286)
 + TX, 6-isopentenylaminopurine (alternative name) (21 0) + TX, abamectin (1) + TX, acetoprole
 [CCN] + TX, alanycarb (15) + TX, aldicarb (16) + TX, aldoxycarb (863) + TX, AZ 60541
 25 (compound code) + TX, benclotiaz [CCN] + TX, benomyl (62) + TX, butylpyridaben (alternative
 name) + TX, cadusafos (109) + TX, carbofuran (118) + TX, carbon disulfide (945) + TX,
 carbosulfan (119) + TX, chloropicrin (14 1) + TX, chlorpyrifos (145) + TX, cloethocarb (999) + TX,
 cytokinins (alternative name) (21 0) + TX, dazomet (21 6) + TX, DBCP (1045) + TX, DCIP (2 18) +
 TX, diamidafos (1044) + TX, dichlofenthion (1051) + TX, dicliphos (alternative name) + TX,
 30 dimethoate (262) + TX, doramectin (alternative name) [CCN] + TX, emamectin (29 1) + TX,
 emamectin benzoate (291) + TX, eprinomectin (alternative name) [CCN] + TX, ethoprophos (31 2) +
 TX, ethylene dibromide (31 6) + TX, fenamiphos (326) + TX, fenpyrad (alternative name) + TX,
 fensulfthion (1158) + TX, fosthiazate (408) + TX, fosthietan (1196) + TX, furfural (alternative
 name) [CCN] + TX, GY-81 (development code) (423) + TX, heterophos [CCN] + TX, iodomethane
 35 (IUPAC name) (542) + TX, isamidofos (1230) + TX, isazofos (1231) + TX, ivermectin (alternative
 name) [CCN] + TX, kinetin (alternative name) (21 0) + TX, mecarphon (1258) + TX, metam (51 9) +
 TX, metam-potassium (alternative name) (51 9) + TX, metam-sodium (51 9) + TX, methyl bromide
 (537) + TX, methyl isothiocyanate (543) + TX, milbemycin oxime (alternative name) [CCN] + TX,
 moxidectin (alternative name) [CCN] + TX, *Myrothecium verrucaria* composition (alternative name)

- (565) + TX, NC-1 84 (compound code) + TX, oxamyl (602) + TX, phorate (636) + TX, phosphamidon (639) + TX, phosphocarb [CCN] + TX, sebufos (alternative name) + TX, selamectin (alternative name) [CCN] + TX, spinosad (737) + TX, terbam (alternative name) + TX, terbufos (773) + TX, tetrachlorothiophene (IUPAC/ Chemical Abstracts name) (1422) + TX, thiafenox (alternative name) + TX, thionazin (1434) + TX, triazophos (820) + TX, triazuron (alternative name) + TX, xylenols [CCN] + TX, YI-5302 (compound code) and zeatin (alternative name) (21 0) + TX, fluensulfone [31 8290-98-1] + TX, fluopyram + TX,
- a nitrification inhibitor selected from the group of substances consisting of potassium ethylxanthate [CCN] and nitrapyrin (580) + TX,
- 10 a plant activator selected from the group of substances consisting of acibenzolar (6) + TX, acibenzolar-S-methyl (6) + TX, probenazole (658) and *Reynoutria sachalinensis* extract (alternative name) (720) + TX,
- a rodenticide selected from the group of substances consisting of 2-isovalerylindan-1 ,3-dione (IUPAC name) (1246) + TX, 4-(quinoxalin-2-ylamino)benzenesulfonamide (IUPAC name) (748) + TX, alpha-chlorohydrin [CCN] + TX, aluminium phosphide (640) + TX, antu (880) + TX, arsenous oxide (882) + TX, barium carbonate (891) + TX, bithiosemi (91 2) + TX, brodifacoum (89) + TX, bromadiolone (91) + TX, bromethalin (92) + TX, calcium cyanide (444) + TX, chloralose (127) + TX, chlorophacinone (140) + TX, cholecalciferol (alternative name) (850) + TX, coumachlor (1004) + TX, coumafuryl (1005) + TX, coumatetralyl (175) + TX, crimidine (1009) + TX, difenacoum (246) + TX, difethialone (249) + TX, diphacinone (273) + TX, ergocalciferol (301) + TX,
- 15 flocoumafen (357) + TX, fluoroacetamide (379) + TX, flupropradine (1183) + TX, flupropradine hydrochloride (1183) + TX, gamma-HCH (430) + TX, HCH (430) + TX, hydrogen cyanide (444) + TX, iodomethane (IUPAC name) (542) + TX, lindane (430) + TX, magnesium phosphide (IUPAC name) (640) + TX, methyl bromide (537) + TX, norbormide (1318) + TX, phosacetim (1336) + TX,
- 20 phosphine (IUPAC name) (640) + TX, phosphorus [CCN] + TX, pindone (1341) + TX, potassium arsenite [CCN] + TX, pyrinuron (1371) + TX, scilliroside (1390) + TX, sodium arsenite [CCN] + TX, sodium cyanide (444) + TX, sodium fluoroacetate (735) + TX, strychnine (745) + TX, thallium sulfate [CCN] + TX, warfarin (851) and zinc phosphide (640) + TX,
- a synergist selected from the group of substances consisting of 2-(2-butoxyethoxy)ethyl piperonylate (IUPAC name) (934) + TX, 5-(1 ,3-benzodioxol-5-yl)-3-hexylcyclohex-2-enone (IUPAC name) (903) + TX, farnesol with nerolidol (alternative name) (324) + TX, MB-599 (development code) (498) + TX, MGK 264 (development code) (296) + TX, piperonyl butoxide (649) + TX, piprotal (1343) + TX, propyl isomer (1358) + TX, S421 (development code) (724) + TX, sesamex (1393) + TX, sesasmolin (1394) and sulfoxide (1406) + TX,
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- 35 an animal repellent selected from the group of substances consisting of anthraquinone (32) + TX, chloralose (127) + TX, copper naphthenate [CCN] + TX, copper oxychloride (171) + TX, diazinon (227) + TX, dicyclopentadiene (chemical name) (1069) + TX, guazatine (422) + TX, guazatine acetates (422) + TX, methiocarb (530) + TX, pyridin-4-amine (IUPAC name) (23) + TX, thiram (804) + TX, trimethacarb (840) + TX, zinc naphthenate [CCN] and ziram (856) + TX,

a virucide selected from the group of substances consisting of imanin (alternative name) [CCN] and ribavirin (alternative name) [CCN] + TX,

a wound protectant selected from the group of substances consisting of mercuric oxide (512) + TX, oothilinone (590) and thiophanate-methyl (802) + TX,

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and biologically active compounds selected from the group consisting of azaconazole (60207-31-0) + TX, bitertanol [70585-36-3] + TX, bromuconazole [116255-48-2] + TX, cyproconazole [94361-06-5] + TX, difenoconazole [119446-68-3] + TX, diniconazole [83657-24-3] + TX, epoxiconazole [106325-08-0] + TX, fenbuconazole [114369-43-6] + TX, fluquinconazole [136426-54-5] + TX,

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flusilazole [85509-19-9] + TX, flutriafol [76674-21-0] + TX, hexaconazole [79983-71-4] + TX, imazalil [35554-44-0] + TX, imibenconazole [86598-92-7] + TX, ipconazole [125225-28-7] + TX, metconazole [125116-23-6] + TX, myclobutanil [88671-89-0] + TX, pefurazoate [101903-30-4] + TX, penconazole [66246-88-6] + TX, prothioconazole [178928-70-6] + TX, pyrifenoxy [88283-41-4] + TX, prochloraz [67747-09-5] + TX, propiconazole [60207-90-1] + TX, simeconazole [149508-90-7] + TX,

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tebuconazole [107534-96-3] + TX, tetraconazole [112281-77-3] + TX, triadimefon [43121-43-3] + TX, triadimenol [55219-65-3] + TX, triflumizole [99387-89-0] + TX, triticonazole [131983-72-7] + TX, ancymidol [12771-68-5] + TX, fenarimol [60168-88-9] + TX, nuarimol [63284-71-9] + TX, bupirimate [41483-43-6] + TX, dimethirimol [5221-53-4] + TX, ethirimol [23947-60-6] + TX, dodemorph [1593-77-7] + TX, fenpropidine [67306-00-7] + TX, fenpropimorph [67564-91-4] + TX,

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spiroxamine [118134-30-8] + TX, tridemorph [81412-43-3] + TX, cyprodinil [121552-61-2] + TX, mepanipyrim [110235-47-7] + TX, pyrimethanil [53112-28-0] + TX, fenciclonil [74738-17-3] + TX, fludioxonil [131341-86-1] + TX, benalaxyl [71626-11-4] + TX, furalaxyl [57646-30-7] + TX, metalaxyl [57837-19-1] + TX, R-metalaxyl [70630-17-0] + TX, ofurace [58810-48-3] + TX, oxadixyl [77732-09-3] + TX, benomyl [17804-35-2] + TX, carbendazim [10605-21-7] + TX, debacarb

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[62732-91-6] + TX, fuberidazole [3878-19-1] + TX, thiabendazole [148-79-8] + TX, chlozolate [84332-86-5] + TX, dichlozoline [24201-58-9] + TX, iprodione [36734-19-7] + TX, myclozoline [54864-61-8] + TX, procymidone [32809-16-8] + TX, vinclozoline [50471-44-8] + TX, boscalid [188425-85-6] + TX, carboxin [5234-68-4] + TX, fenfuram [24691-80-3] + TX, flutolanil [66332-96-5] + TX, mepronil [55814-41-0] + TX, oxycarboxin [5259-88-1] + TX, penthiopyrad [183675-82-3] +

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TX, thifluzamide [130000-40-7] + TX, guazatine [108173-90-6] + TX, dodine [2439-10-3] [112-65-2] (free base) + TX, iminoctadine [13516-27-3] + TX, azoxystrobin [131860-33-8] + TX, dimoxystrobin [149961-52-4] + TX, enestroburin {Proc. BCPC, Int. Congr., Glasgow, 2003, 1, 93} + TX, fluoxastrobin [361377-29-9] + TX, kresoxim-methyl [143390-89-0] + TX, metominostrobin [133408-50-1] + TX, trifloxystrobin [141517-21-7] + TX, orysastrobin [248593-16-0] + TX,

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picoxystrobin [117428-22-5] + TX, pyraclostrobin [175013-18-0] + TX, ferbam [14484-64-1] + TX, mancozeb [8018-01-7] + TX, maneb [12427-38-2] + TX, metiram [9006-42-2] + TX, propineb [12071-83-9] + TX, thiram [137-26-8] + TX, zineb [12122-67-7] + TX, ziram [137-30-4] + TX, captafol [2425-06-1] + TX, captan [133-06-2] + TX, dichlofluanid [1085-98-9] + TX, fluoroimide [41205-21-4] + TX, folpet [133-07-3] + TX, tolylfluanid [731-27-1] + TX, bordeaux mixture [801-1-

63-0] + TX, copperhydroxid [20427-59-2] + TX, copperoxychlorid [1332-40-7] + TX, coppersulfat [7758-98-7] + TX, copperoxid [1317-39-1] + TX, mancopper [53988-93-5] + TX, oxine-copper [10380-28-6] + TX, dinocap [131-72-6] + TX, nitrothal-isopropyl [10552-74-6] + TX, edifenphos [17109-49-8] + TX, iprobenphos [26087-47-8] + TX, isoprothiolane [50512-35-1] + TX, phosdiphen
5 [36519-00-3] + TX, pyrazophos [13457-18-6] + TX, tolclofos-methyl [57018-04-9] + TX, acibenzo-
lar-S-methyl [135158-54-2] + TX, anilazine [101-05-3] + TX, benthiavalicarb [413615-35-7] + TX,
blasticidin-S [2079-00-7] + TX, chinomethionat [2439-01-2] + TX, chloroneb [2675-77-6] + TX,
chlorothalonil [1897-45-6] + TX, cyflufenamid [180409-60-3] + TX, cymoxanil [57966-95-7] + TX,
dichlone [117-80-6] + TX, diclocymet [139920-32-4] + TX, diclomezine [62865-36-5] + TX, dicloran
10 [99-30-9] + TX, diethofencarb [87130-20-9] + TX, dimethomorph [110488-70-5] + TX, SYP-LI90
(Flumorph) [211867-47-9] + TX, dithianon [3347-22-6] + TX, ethaboxam [162650-77-3] + TX,
etridiazole [2593-15-9] + TX, famoxadone [131807-57-3] + TX, fenamidone [161326-34-7] + TX,
fenoxanil [115852-48-7] + TX, fentin [668-34-8] + TX, ferimzone [89269-64-7] + TX, fluazinam
[79622-59-6] + TX, fluopicolide [239110-15-7] + TX, flusulfamide [106917-52-6] + TX, fenhexamid
15 [126833-17-8] + TX, fosetyl-aluminium [39148-24-8] + TX, hymexazol [10004-44-1] + TX,
iprovalicarb [140923-17-7] + TX, IKF-916 (Cyazofamid) [120116-88-3] + TX, kasugamycin [6980-18-
3] + TX, methasulfocarb [66952-49-6] + TX, metrafenone [220899-03-6] + TX, pencycuron [66063-
05-6] + TX, phthalide [27355-22-2] + TX, polyoxins [11113-80-7] + TX, probenazole [27605-76-1] +
TX, propamocarb [25606-41-1] + TX, proquinazid [189278-12-4] + TX, pyroquilon [57369-32-1] +
20 TX, quinoxifen [124495-18-7] + TX, quintozene [82-68-8] + TX, sulfur [7704-34-9] + TX, tiadinil
[223580-51-6] + TX, triazoxide [72459-58-6] + TX, tricyclazole [41814-78-2] + TX, triforine [26644-
46-2] + TX, validamycin [37248-47-8] + TX, zoxamide (RH7281) [156052-68-5] + TX,
mandipropamid [374726-62-2] + TX, isopyrazam [881685-58-1] + TX, sedaxane [874967-67-6] + TX,
3-difluoromethyl-1-methyl-1H-pyrazole-4-carboxylic acid (9-dichloromethylene-1,2,3,4-tetrahydro-1,4-
25 methano-naphthalen-5-yl)-amide (disclosed in WO 2007/048556) + TX, 3-difluoromethyl-1-methyl-1H-
pyrazole-4-carboxylic acid (3',4',5'-trifluoro-biphenyl-2-yl)-amide (disclosed in WO 2006/087343) + TX,
[(3S,4R,4aR,6S,6aS, 12R,12aS, 12bS)-3-[(cyclopropylcarbonyl)oxy]-1,3,4,4a,5,6,6a, 12,12a, 12b-
decahydro -e. 12-dihydroxy-4,6a,12b-trimethyl-11-oxo-9-(3-pyridinyl)-2H,11Hnaphtho[2,1-b]pyrano[3,4-
e]pyran-4-yl]methyl-cyclopropanecarboxylate [915972-17-7] + TX and 1,3,5-trimethyl-N-(2-methyl-1-
30 oxopropyl)-N-[3-(2-methylpropyl)-4-[2,2,2-trifluoro-1-methoxy-1-(trifluoromethyl)ethyl]phenyl]-1H-
pyrazole-4-carboxamide [926914-55-8] + TX; lancotrione [1486617-21-3] + TX, florpyrauxifen [943832-
81-3] + TX, ipfentrifluconazole [1417782-08-1] + TX, mefentrifluconazole [1417782-03-6] + TX,
quinofumelin [861647-84-9] + TX, chloroprallethrin [399572-87-3] + TX, cyhalodiamide [1262605-53-
7] + TX, fluazaindolizine [1254304-22-7] + TX, fluxametamide [928783-29-3] + TX, epsilon-
35 metofluthrin [240494-71-7] + TX, epsilon-momfluorothrin [1065124-65-3] + TX, pydiflumetofen
[1228284-64-7] + TX, kappa-bifenthrin [439680-76-9] + TX, broflanilide [1207727-04-5] + TX,
dicloromezotiaz [1263629-39-5] + TX, dipymetitron [16114-35-5] + TX, pyraziflumid [942515-63-1] +
TX, kappa-tefluthrin [391634-71-2] + TX, fencicoxamid [517875-34-2] + TX; fluindapyr [1383809-87-7]
+ TX; alpha-bromadiolone [28772-56-7] + TX; flupyrimin [1689566-03-7] + TX; benzpyrimoxan

[1449021-97-9] + TX; acynonapyr [1332838-1 7-1] + TX; inpyrfluxam [1352994-67-2] + TX, isoflucypram [1255734-28-1] + TX; rescalure [64309-03-1] + TX; aminopyrifin [1531 626-08-0] + TX; tyclopyrazoflor [147791 9-27-9] + TX; and spiropidion [1229023-00-0] + TX; and

5 microbials including: *Acinetobacter lwoffii* + TX, *Acremonium alternatum* + TX + TX, *Acremonium cephalosporium* + TX + TX, *Acremonium diospyri* + TX, *Acremonium obclavatum* + TX, *Adoxophyes orana granulovirus* (AdoxGV) (Capex®) + TX, *Agrobacterium radiobacter* strain K84 (Galltrol-A®) + TX, *Alternaria alternate* + TX, *Alternaria cassia* + TX, *Alternaria destruens* (Smolder®) + TX, *Ampelomyces quisqualis* (AQ1 0®) + TX, *Aspergillus flavus* AF36 (AF36®) + TX, *Aspergillus flavus* NRRL 2 1882 (Aflaguard®) + TX, *Aspergillus* spp. + TX, *Aureobasidium pullulans* + TX, *Azospirillum* + TX, (MicroAZ® + TX, TAZO B®) + TX, *Azotobacter* + TX, *Azotobacter chroococcum* (Azotomeal®) + TX, *Azotobacter* cysts (Bionatural Blooming Blossoms®) + TX, *Bacillus amyloliquefaciens* + TX, *Bacillus cereus* + TX, *Bacillus chitinosporus* strain CM-1 + TX, *Bacillus chitinosporus* strain AQ746 + TX, *Bacillus licheniformis* strain HB-2 (Biostart™ Rhizoboost®) + TX, *Bacillus licheniformis* strain 3086 (EcoGuard® + TX, Green Releaf®) + TX, *Bacillus circulans* + TX, *Bacillus firmus* (BioSafe® + TX, BioNem-WP® + TX, VOTiVO®) + TX, *Bacillus firmus* strain 1-1 582 + TX, *Bacillus macerans* + TX, *Bacillus marismortui* + TX, *Bacillus megaterium* + TX, *Bacillus mycoides* strain AQ726 + TX, *Bacillus papillae* (Milky Spore Powder®) + TX, *Bacillus pumilus* spp. + TX, *Bacillus pumilus* strain GB34 (Yield Shield®) + TX, *Bacillus pumilus* strain AQ7 17 + TX, *Bacillus pumilus* strain QST 2808 (Sonata® + TX, Ballad Plus®) + TX, *Bacillus spahericus* (VectoLex®) + TX, *Bacillus* spp. + TX, *Bacillus* spp. strain

10 AQ1 75 + TX, *Bacillus* spp. strain AQ1 77 + TX, *Bacillus* spp. strain AQ1 78 + TX, *Bacillus subtilis* strain QST 7 13 (CEASE® + TX, Serenade® + TX, Rhapsody®) + TX, *Bacillus subtilis* strain QST 7 14 (JAZZ®) + TX, *Bacillus subtilis* strain AQ1 53 + TX, *Bacillus subtilis* strain AQ743 + TX, *Bacillus subtilis* strain QST3002 + TX, *Bacillus subtilis* strain QST3004 + TX, *Bacillus subtilis* var. *amyloliquefaciens* strain FZB24 (Taegro® + TX, Rhizopro®) + TX, *Bacillus thuringiensis* Cry 2Ae + TX, *Bacillus*

25 *thuringiensis* Cry1 Ab + TX, *Bacillus thuringiensis aizawai* GC 9 1 (Agree®) + TX, *Bacillus thuringiensis israelensis* (BMP1 23® + TX, Aquabac® + TX, VectoBac®) + TX, *Bacillus thuringiensis kurstaki* (Javelin® + TX, Deliver® + TX, CryMax® + TX, Bonide® + TX, Scutella WP® + TX, Turilav WP® + TX, Astuto® + TX, Dipel WP® + TX, Biobit® + TX, Foray®) + TX, *Bacillus thuringiensis kurstaki* BMP 123 (Baritone®) + TX, *Bacillus thuringiensis kurstaki* HD-1 (Bioprotec-CAF / 3P®) + TX, *Bacillus*

30 *thuringiensis* strain BD#32 + TX, *Bacillus thuringiensis* strain AQ52 + TX, *Bacillus thuringiensis* var. *aizawai* (XenTari® + TX, DiPel®) + TX, bacteria spp. (GROWMEND® + TX, GROWSWEET® + TX, Shootup®) + TX, bacteriophage of *Clavipacter michiganensis* (AgriPhage®) + TX, Bakflor® + TX, *Beauveria bassiana* (Beaugenic® + TX, Brocaril WP®) + TX, *Beauveria bassiana* GHA (Mycotrol ES® + TX, Mycotrol O® + TX, BotaniGuard®) + TX, *Beauveria brongniartii* (Engerlingspizl® + TX,

35 Schweizer *Beauveria*® + TX, Melocont®) + TX, *Beauveria* spp. + TX, *Botrytis cineria* + TX, *Bradyrhizobium japonicum* (TerraMax®) + TX, *Brevibacillus brevis* + TX, *Bacillus thuringiensis tenebrionis* (Novodor®) + TX, BtBooster + TX, *Burkholderia cepacia* (Deny® + TX, Intercept® + TX, Blue Circle®) + TX, *Burkholderia gladii* + TX, *Burkholderia gladioli* + TX, *Burkholderia* spp. + TX, Canadian thistle fungus (CBH Canadian Bioherbicide®) + TX, *Candida butyri* + TX, *Candida famata* +

TX, *Candida fructus* + TX, *Candida glabrata* + TX, *Candida guilliermondii* + TX, *Candida melibiosica* + TX, *Candida oleophila* strain O + TX, *Candida parapsilosis* + TX, *Candida pelliculosa* + TX, *Candida pulcherrima* + TX, *Candida reukaufii* + TX, *Candida saitoana* (Bio-Coat® + TX, Biocure®) + TX, *Candida sake* + TX, *Candida* spp. + TX, *Candida tenuis* + TX, *Cedecea dravisae* + TX, *Cellulomonas flavigena* + TX, *Chaetomium cochliodes* (Nova-Cide®) + TX, *Chaetomium globosum* (Nova-Cide®) + TX, *Chromobacterium subtsugae* strain PRAA4-1 T (Grandevo®) + TX, *Cladosporium cladosporioides* + TX, *Cladosporium oxysporum* + TX, *Cladosporium chlorocephalum* + TX, *Cladosporium* spp. + TX, *Cladosporium tenuissimum* + TX, *Clonostachys rosea* (EndoFine®) + TX, *Colletotrichum acutatum* + TX, *Coniothyrium minitans* (Cotans WG®) + TX, *Coniothyrium* spp. + TX, *Cryptococcus albidus* (YIELDPLUS®) + TX, *Cryptococcus humicola* + TX, *Cryptococcus infirmo-miniatus* + TX, *Cryptococcus laurentii* + TX, *Cryptophlebia leucotreta granulovirus* (Cryptex®) + TX, *Cupriavidus campinensis* + TX, *Cydia pomonella granulovirus* (CYD-X®) + TX, *Cydia pomonella granulovirus* (Madex® + TX, Madex Plus® + TX, Madex Max/ Carpovirusine®) + TX, *Cylindrobasidium laeve* (Stumpout®) + TX, *Cylindrocladium* + TX, *Debaryomyces hansenii* + TX, *Drechslera hawaiiensis* + TX, *Enterobacter cloacae* + TX, *Enterobacteriaceae* + TX, *Entomophthora virulenta* (Vektor®) + TX, *Epicoccum nigrum* + TX, *Epicoccum purpurascens* + TX, *Epicoccum* spp. + TX, *Filobasidium floriforme* + TX, *Fusarium acuminatum* + TX, *Fusarium chlamydosporum* + TX, *Fusarium oxysporum* (Fusaclean® / Biofox C®) + TX, *Fusarium proliferatum* + TX, *Fusarium* spp. + TX, *Galactomyces geotrichum* + TX, *Gliocladium catenulatum* (Primastop® + TX, Prestop®) + TX, *Gliocladium roseum* + TX, *Gliocladium* spp. (SoilGard®) + TX, *Gliocladium virens* (Soilgard®) + TX, *Granulovirus* (Granupom®) + TX, *Halobacillus halophilus* + TX, *Halobacillus litoralis* + TX, *Halobacillus trueperi* + TX, *Halomonas* spp. + TX, *Halomonas subglaciescola* + TX, *Halovibrio variabilis* + TX, *Hanseniaspora uvarum* + TX, *Helicoverpa armigera nucleopolyhedrovirus* (Helicovex®) + TX, *Helicoverpa zea nuclear polyhedrosis virus* (Gemstar®) + TX, Isoflavone - formononetin (Myconate®) + TX, *Kloeckera apiculata* + TX, *Kloeckera* spp. + TX, *Lagenidium giganteum* (Laginex®) + TX, *Lecanicillium longisporum* (Vertiblast®) + TX, *Lecanicillium muscarium* (Vertikil®) + TX, *Lymantria Dispar nucleopolyhedrosis virus* (Disparvirus®) + TX, *Marinococcus halophilus* + TX, *Meira geulakonigii* + TX, *Metarhizium anisopliae* (Met52®) + TX, *Metarhizium anisopliae* (Destruxin WP®) + TX, *Metschnikowia fruticola* (Sheimer®) + TX, *Metschnikowia pulcherrima* + TX, *Microdochium dimerum* (Antibot®) + TX, *Micromonospora coerulea* + TX, *Microsphaeropsis ochracea* + TX, *Muscodor albus* 620 (Muscudor®) + TX, *Muscodor roseus* strain A3-5 + TX, *Mycorrhizae* spp. (AMykor® + TX, Root Maximizer®) + TX, *Myrothecium verrucaria* strain AARC-0255 (DiTera®) + TX, BROS PLUS® + TX, *Ophiostoma piliferum* strain D97 (Sylvanex®) + TX, *Paecilomyces farinosus* + TX, *Paecilomyces fumosoroseus* (PFR-97® + TX, PreFeRal®) + TX, *Paecilomyces linacinus* (Biostat WP®) + TX, *Paecilomyces lilacinus* strain 251 (MeloCon WG®) + TX, *Paenibacillus polymyxa* + TX, *Pantoea agglomerans* (BlightBan C9-1®) + TX, *Pantoea* spp. + TX, *Pasteuria* spp. (Econem®) + TX, *Pasteuria nishizawae* + TX, *Penicillium aurantiogriseum* + TX, *Penicillium billai* (Jumpstart® + TX, TagTeam®) + TX, *Penicillium brevicompactum* + TX, *Penicillium frequentans* + TX, *Penicillium griseofulvum* + TX, *Penicillium purpurogenum* + TX, *Penicillium* spp. + TX, *Penicillium viridicatum* + TX, *Phlebiopsis gigantean*

(Rotstop®) + TX, phosphate solubilizing bacteria (Phosphomeal®) + TX, *Phytophthora cryptogea* + TX, *Phytophthora palmivora* (Devine®) + TX, *Pichia anomala* + TX, *Pichia guillermondii* + TX, *Pichia membranaefaciens* + TX, *Pichia onychis* + TX, *Pichia stipites* + TX, *Pseudomonas aeruginosa* + TX, *Pseudomonas aureofasciens* (Spot-Less Biofungicide®) + TX, *Pseudomonas cepacia* + TX,

5 *Pseudomonas chlororaphis* (AtEze®) + TX, *Pseudomonas corrugate* + TX, *Pseudomonas fluorescens* strain A506 (BlightBan A506®) + TX, *Pseudomonas putida* + TX, *Pseudomonas reactans* + TX, *Pseudomonas* spp. + TX, *Pseudomonas syringae* (Bio-Save®) + TX, *Pseudomonas viridiflava* + TX, *Pseudomonas fluorescens* (Zequanox®) + TX, *Pseudozyma flocculosa* strain PF-A22 UL (Sporodex L®) + TX, *Puccinia canaliculata* + TX, *Puccinia thlaspeos* (Wood Warrior®) + TX, *Pythium*

10 *paroeacandrum* + TX, *Pythium oligandrum* (Polygandron® + TX, Polyversum®) + TX, *Pythium periplocum* + TX, *Rhanella aquatilis* + TX, *Rhanella* spp. + TX, *Rhizobia* (Dormal® + TX, Vault®) + TX, *Rhizoctonia* + TX, *Rhodococcus globerulus* strain AQ7 19 + TX, *Rhodosporidium diobovatum* + TX, *Rhodosporidium toruloides* + TX, *Rhodotorula* spp. + TX, *Rhodotorula glutinis* + TX, *Rhodotorula graminis* + TX, *Rhodotorula mucilagnosa* + TX, *Rhodotorula rubra* + TX, *Saccharomyces cerevisiae* +

15 TX, *Salinococcus roseus* + TX, *Sclerotinia minor* + TX, *Sclerotinia minor* (SARRITOR®) + TX, *Scytalidium* spp. + TX, *Scytalidium uredinicola* + TX, *Spodoptera exigua nuclear polyhedrosis virus* (Spod-X® + TX, Spexit®) + TX, *Serratia marcescens* + TX, *Serratia plymuthica* + TX, *Serratia* spp. + TX, *Sordaria fimicola* + TX, *Spodoptera littoralis nucleopolyhedrovirus* (Littovir®) + TX, *Sporobolomyces roseus* + TX, *Stenotrophomonas maltophilia* + TX, *Streptomyces ahygroscopicus* +

20 TX, *Streptomyces albaduncus* + TX, *Streptomyces exfoliates* + TX, *Streptomyces galbus* + TX, *Streptomyces griseoplanus* + TX, *Streptomyces griseoviridis* (Mycostop®) + TX, *Streptomyces lydicus* (Actinovate®) + TX, *Streptomyces lydicus* WYEC-1 08 (ActinoGrow®) + TX, *Streptomyces violaceus* + TX, *Tilletiopsis minor* + TX, *Tilletiopsis* spp. + TX, *Trichoderma asperellum* (T34 Biocontrol®) + TX, *Trichoderma gamsii* (Tenet®) + TX, *Trichoderma atroviride* (Plantmate®) + TX, *Trichoderma hamatum*

25 TH 382 + TX, *Trichoderma harzianum rifai* (Mycostar®) + TX, *Trichoderma harzianum* T-22 (Trianum-P® + TX, PlantShield HC® + TX, RootShield® + TX, Trianum-G®) + TX, *Trichoderma harzianum* T-39 (Trichodex®) + TX, *Trichoderma inhamatum* + TX, *Trichoderma koningii* + TX, *Trichoderma* spp. LC 52 (Sentinel®) + TX, *Trichoderma lignorum* + TX, *Trichoderma longibrachiatum* + TX, *Trichoderma polysporum* (Binab T®) + TX, *Trichoderma taxi* + TX, *Trichoderma virens* + TX, *Trichoderma virens*

30 (formerly *Gliocladium virens* GL-21) (SoilGuard®) + TX, *Trichoderma viride* + TX, *Trichoderma viride* strain ICC 080 (Remedier®) + TX, *Trichosporon pullulans* + TX, *Trichosporon* spp. + TX, *Trichothecium* spp. + TX, *Trichothecium roseum* + TX, *Typhula phacorrhiza* strain 94670 + TX, *Typhula phacorrhiza* strain 94671 + TX, *Ulocladium atrum* + TX, *Ulocladium oudemansii* (Botry-Zen®) + TX, *Ustilago maydis* + TX, various bacteria and supplementary micronutrients (Natural II®) + TX,

35 various fungi (Millennium Microbes®) + TX, *Verticillium chlamydosporium* + TX, *Verticillium lecanii* (Mycotal® + TX, Vertalec®) + TX, Vip3Aa20 (VIPtera®) + TX, *Virgibacillus marismortui* + TX, *Xanthomonas campestris* pv. *Poae* (Camperico®) + TX, *Xenorhabdus bovienii* + TX, *Xenorhabdus nematophilus*; and

Plant extracts including: pine oil (Retenol®) + TX, azadirachtin (Plasma Neem Oil® + TX, AzaGuard® + TX, MeemAzal® + TX, Molt-X® + TX, Botanical IGR (Neemazad® + TX, Neemix®) + TX, canola oil (Lilly Miller Vegol®) + TX, *Chenopodium ambrosioides near ambrosioides* (Requiem®) + TX, *Chrysanthemum* extract (Crisant®) + TX, extract of neem oil (Trilogy®) + TX, essentials oils of

5 *Labiatae* (Botania®) + TX, extracts of clove rosemary peppermint and thyme oil (Garden insect killer®) + TX, Glycinebetaine (Greenstim®) + TX, garlic + TX, lemongrass oil (GreenMatch®) + TX, neem oil + TX, *Nepeta cataria* (Catnip oil) + TX, *Nepeta catarina* + TX, nicotine + TX, oregano oil (MossBuster®) + TX, *Pedaliaceae* oil (Nematon®) + TX, pyrethrum + TX, *Quillaja saponaria* (NemaQ®) + TX, *Reynoutria sachalinensis* (Regalia® + TX, Sakalia®) + TX, rotenone (Eco Roten®) + TX, *Rutaceae*

10 plant extract (Soleo®) + TX, soybean oil (Ortho ecosense®) + TX, tea tree oil (Timorex Gold®) + TX, thymus oil + TX, AGNIQUE® MMF + TX, BugOil® + TX, mixture of rosemary sesame peppermint thyme and cinnamon extracts (EF 300®) + TX, mixture of clove rosemary and peppermint extract (EF 400®) + TX, mixture of clove peppermint garlic oil and mint (Soil Shot®) + TX, kaolin (Screen®) + TX, storage glucan of brown algae (Laminarin®); and

15 pheromones including: blackheaded fireworm pheromone (3M Sprayable Blackheaded Fireworm Pheromone®) + TX, Codling Moth Pheromone (Paramount dispenser-(CM)/ Isomate C-Plus®) + TX, Grape Berry Moth Pheromone (3M MEC-GBM Sprayable Pheromone®) + TX, Leafroller pheromone (3M MEC - LR Sprayable Pheromone®) + TX, Muscamone (Snip7 Fly Bait® + TX, Starbar Premium Fly Bait®) + TX, Oriental Fruit Moth Pheromone (3M oriental fruit moth sprayable pheromone®) + TX,

20 Peachtree Borer Pheromone (Isomate-P®) + TX, Tomato Pinworm Pheromone (3M Sprayable pheromone®) + TX, Entostat powder (extract from palm tree) (Exosex CM®) + TX, (E + TX,Z + TX,Z)-3 + TX,8 + TX, 11 Tetradecatrienyl acetate + TX, (Z + TX,Z + TX,E)-7 + TX, 11 + TX, 13-Hexadecatrienal + TX, (E + TX,Z)-7 + TX,9-Dodecadien-1-yl acetate + TX, 2-Methyl-1-butanol + TX, Calcium acetate + TX, Scenturion® + TX, Biolure® + TX, Check-Mate® + TX, Lavandulyl senecioate;

25 and

Macrobials including: *Aphelinus abdominalis* + TX, *Aphidius ervi* (Aphelinus-System®) + TX, *Acerophagus papaya* + TX, *Adalia bipunctata* (Adalia-System®) + TX, *Adalia bipunctata* (Adaline®) + TX, *Adalia bipunctata* (Aphidalia®) + TX, *Ageniaspis citricola* + TX, *Ageniaspis fuscicollis* + TX, *Amblyseius andersoni* (Anderline® + TX, Andersoni-System®) + TX, *Amblyseius californicus*

30 (Amblyline® + TX, Spical®) + TX, *Amblyseius cucumeris* (Thripex® + TX, Bugline cucumeris®) + TX, *Amblyseius fallacis* (Fallacis®) + TX, *Amblyseius swirskii* (Bugline swirskii® + TX, Swirskii-Mite®) + TX, *Amblyseius womersleyi* (WomerMite®) + TX, *Amitus hesperidum* + TX, *Anagrus atomus* + TX, *Anagrus fusciventris* + TX, *Anagrus kamali* + TX, *Anagrus loecki* + TX, *Anagrus pseudococci* (Citripar®) + TX, *Anicetus benefices* + TX, *Anisopteromalus calandrae* + TX, *Anthocoris nemoralis*

35 (Anthocoris-System®) + TX, *Aphelinus abdominalis* (Apheline® + TX, Aphiline®) + TX, *Aphelinus asychis* + TX, *Aphidius colemani* (Ahipar®) + TX, *Aphidius ervi* (Ervipar®) + TX, *Aphidius gifuensis* + TX, *Aphidius matricariae* (Ahipar-M®) + TX, *Aphidoletes aphidimyza* (Aphidend®) + TX, *Aphidoletes aphidimyza* (Aphidoline®) + TX, *Aphytis lingnanensis* + TX, *Aphytis melinus* + TX, *Aprostocetus hagenowii* + TX, *Atheta coriaria* (Staphyline®) + TX, *Bombus* spp. + TX, *Bombus terrestris* (Natupol

Beehive®) + TX, *Bombus terrestris* (Beeline® + TX, Tripol®) + TX, *Cephalonomia stephanoderis* + TX, *Chilocorus nigritus* + TX, *Chrysoperla carnea* (Chrysoline®) + TX, *Chrysoperla carnea* (Chrysopa®) + TX, *Chrysoperla rufilabris* + TX, *Cirrospilus ingenuus* + TX, *Cirrospilus quadristriatus* + TX, *Citrostichus phyllocnistoides* + TX, *Closterocerus chamaeleon* + TX, *Closterocerus* spp. + TX,

5 *Coccidoxenoides perminutus* (Planopar®) + TX, *Coccophagus cowperi* + TX, *Coccophagus lycimnia* + TX, *Cotesia flavipes* + TX, *Cotesia plutellae* + TX, *Cryptolaemus montrouzieri* (Cryptobug® + TX, Cryptoline®) + TX, *Cybocephalus nipponicus* + TX, *Dacnusa sibirica* + TX, *Dacnusa sibirica* (Minusa®) + TX, *Diglyphus isaea* (Diminex®) + TX, *Delphastus catalinae* (Delphastus®) + TX, *Delphastus pusillus* + TX, *Diachasmimorpha krausii* + TX, *Diachasmimorpha longicaudata* + TX,

10 *Diaparsis jucunda* + TX, *Diaphorencyrtus aligarhensis* + TX, *Diglyphus isaea* + TX, *Diglyphus isaea* (Miglyphus® + TX, Digline®) + TX, *Dacnusa sibirica* (DacDigline® + TX, Minex®) + TX, *Diversinervus* spp. + TX, *Encarsia citrina* + TX, *Encarsia formosa* (Encarsia max® + TX, Encarline® + TX, En-Strip®) + TX, *Eretmocerus eremicus* (Enermix®) + TX, *Encarsia guadeloupae* + TX, *Encarsia haitiensis* + TX, *Episyrphus balteatus* (Syrphidend®) + TX, *Eretmocerus siphonini* + TX, *Eretmocerus californicus* + TX, *Eretmocerus eremicus* (Ercal® + TX, Eretline e®) + TX, *Eretmocerus eremicus* (Bemimix®) + TX, *Eretmocerus hayati* + TX, *Eretmocerus mundus* (Bemipar® + TX, Eretline m®) + TX, *Eretmocerus siphonini* + TX, *Exochomus quadripustulatus* + TX, *Feltiella acarisuga* (Spidend®) + TX, *Feltiella acarisuga* (Feltiline®) + TX, *Fopius arisanus* + TX, *Fopius ceratitivorus* + TX, *Formononetin* (Wirless Beehome®) + TX, *Franklinothrips vespiformis* (Vespop®) + TX, *Galendromus occidentalis* + TX, *Goniozus legneri* + TX, *Habrobracon hebetor* + TX, *Harmonia axyridis* (HarmoBeetle®) + TX, *Heterorhabditis* spp. (Lawn Patrol®) + TX, *Heterorhabditis bacteriophora* (NemaShield HB® + TX, Nemaseek® + TX, Terranem-Nam® + TX, Terranem® + TX, Larvanem® + TX, B-Green® + TX, NemAttack® + TX, Nematop®) + TX, *Heterorhabditis megidis* (Nemasys H® + TX, BioNem H® + TX, Exhibitline hm® + TX, Larvanem-M®) + TX, *Hippodamia convergens* + TX,

25 *Hypoaspis aculeifer* (Aculeifer-System® + TX, Entomite-A®) + TX, *Hypoaspis miles* (Hypoline m® + TX, Entomite-M®) + TX, *Lbalia leucospoides* + TX, *Lecanoideus floccissimus* + TX, *Lemophagus errabundus* + TX, *Leptomastidea abnormis* + TX, *Leptomastix dactylopii* (Leptopar®) + TX, *Leptomastix epona* + TX, *Lindorus lophanthae* + TX, *Lipolexis oregmae* + TX, *Lucilia caesar* (Natufly®) + TX, *Lysiphlebus testaceipes* + TX, *Macrolophus caliginosus* (Mirical-N® + TX, Macroline c® + TX, Mirical®) + TX, *Mesoseiulus longipes* + TX, *Metaphycus flavus* + TX, *Metaphycus lounsburyi* + TX, *Micromus angulatus* (Milacewing®) + TX, *Microterys flavus* + TX, *Muscidifurax raptorellus* and *Spalangia cameroni* (Biopar®) + TX, *Neodryinus typhlocybae* + TX, *Neoseiulus californicus* + TX, *Neoseiulus cucumeris* (THRYPEX®) + TX, *Neoseiulus fallacis* + TX, *Nesideocoris tenuis* (NesidioBug® + TX, Nesibug®) + TX, *Ophyra aenescens* (Biofly®) + TX, *Orius insidiosus* (Thripor-l®) + TX, *Orius laevigatus* (Thripor-L® + TX, Oriline l®) + TX, *Orius majusculus* (Oriline m®) + TX, *Orius strigicollis* (Thripor-S®) + TX, *Pauesia juniperorum* + TX, *Pediobius foveolatus* + TX, *Phasmarhabditis hermaphrodita* (Nemaslug®) + TX, *Phymastichus coffea* + TX, *Phytoseiulus macropilus* + TX, *Phytoseiulus persimilis* (Spidex® + TX, Phytoline p®) + TX, *Podisus maculiventris* (Podisus®) + TX, *Pseudacteon curvatus* + TX, *Pseudacteon obtusus* + TX, *Pseudacteon tricuspis* +

TX, *Pseudaphycus maculipennis* + TX, *Pseudleptomastix mexicana* + TX, *Psyllaephagus pilosus* + TX, *Psytalia concolor* (complex) + TX, *Quadrastichus* spp. + TX, *Rhyzobius lophanthae* + TX, *Rodolia cardinalis* + TX, *Rumina decollate* + TX, *Semiolacher petiolatus* + TX, *Sitobion avenae* (Ervibank®) + TX, *Steinemema carpocapsae* (Nematac C® + TX, Millenium® + TX, BioNem C® + TX, NemAttack® + TX, Nemastar® + TX, Capsanem®) + TX, *Steinemema feltiae* (NemaShield® + TX, Nemasys F® + TX, BioNem F® + TX, Steinernema-System® + TX, NemAttack® + TX, Nemaplus® + TX, Exhibitline sf® + TX, Scia-rid® + TX, Entonem®) + TX, *Steinemema krausseii* (Nemasys L® + TX, BioNem L® + TX, Exhibitline srb®) + TX, *Steinemema riobrave* (BioVector® + TX, BioVektor®) + TX, *Steinemema scapterisci* (Nematac S®) + TX, *Steinemema* spp. + TX, *Steinernematid* spp. (Guardian Nematodes®) + TX, *Stethorus punctillum* (Stethorus®) + TX, *Tamarixia radiata* + TX, *Tetrastichus setifer* + TX, *Thripobius semiluteus* + TX, *Torymus sinensis* + TX, *Trichogramma brassicae* (Tricholine b®) + TX, *Trichogramma brassicae* (Tricho-Strip®) + TX, *Trichogramma evanescens* + TX, *Trichogramma minutum* + TX, *Trichogramma ostrinae* + TX, *Trichogramma platneri* + TX, *Trichogramma pretiosum* + TX, *Xanthopimpla stemmator*; and

15 other biologicals including: abscisic acid + TX, bioSea® + TX, *Chondrostereum purpureum* (Chontrol Paste®) + TX, *Colletotrichum gloeosporioides* (Collego®) + TX, Copper Octanoate (Cueva®) + TX, Delta traps (Trapline d®) + TX, *Erwinia amylovora* (Harpin) (ProAct® + TX, Ni-HIBIT Gold CST®) + TX, Ferri-phosphate (Ferramol®) + TX, Funnel traps (Trapline y®) + TX, Gallex® + TX, Grower's Secret® + TX, Homo-brassonolide + TX, Iron Phosphate (Lilly Miller Worry Free Ferramol Slug & Snail Bait®) + TX, MCP hail trap (Trapline f®) + TX, *Microctonus hyperodae* + TX, *Mycoleptodiscus terrestris* (Des-X®) + TX, BioGain® + TX, Aminomite® + TX, Zenox® + TX, Pheromone trap (Thripline ams®) + TX, potassium bicarbonate (MilStop®) + TX, potassium salts of fatty acids (Sanova®) + TX, potassium silicate solution (Sil-Matrix®) + TX, potassium iodide + potassiumthiocyanate (Enzicur®) + TX, SuffOil-X® + TX, Spider venom + TX, *Nosema locustae* (Semaspore Organic Grasshopper Control®) + TX, Sticky traps (Trapline YF® + TX, Rebell Amarillo®) + TX and Traps (Takitrapline y + b®) + TX,

25 or a biologically active compound or agent selected from: Brofluthrinat + TX, Diflovidazine + TX, Flometoquin + TX, Fluhexafon + TX, *Plutella xylostella* Granulosis virus + TX, *Cydia pomonella* Granulosis virus + TX, Imicyafos + TX, *Heliothis virescens* Nucleopolyhedrovirus + TX, *Heliothis punctigera* Nucleopolyhedrovirus + TX, *Helicoverpa zea* Nucleopolyhedrovirus + TX, *Spodoptera frugiperda* Nucleopolyhedrovirus + TX, *Plutella xylostella* Nucleopolyhedrovirus + TX, p-cymene + TX, Pyflubumide + TX, Pyrafluprole + TX, QRD 420 + TX, QRD 452 + TX, QRD 460 + TX, Terpenoid blends + TX, Terpenoids + TX, Tetraniiprole + TX, and oterpinene + TX;

30 or an active substance referenced by a code + TX, such as code AE 18871 96 (BSC-BX60309) + TX, code NNI-0745 GR + TX, code IKI-31 06 + TX, code JT-L00 1 + TX, code ZNQ-08056 + TX, code IPPA152201 + TX, code HNPC-A9908 (CAS: [66041 1-21 -2]) + TX, code HNPC-A2005 (CAS: [860028-1 2-2]) + TX, code JS1 18 + TX, code ZJ0967 + TX, code ZJ2242 + TX, code JS71 19 (CAS: [929545-74-4]) + TX, code SN-1 172 + TX, code HNPC-A9835 + TX, code HNPC-A9955 + TX, code HNPC-A3061 + TX, code Chuanhua 89-1 + TX, code IPP-1 0 + TX, code ZJ3265 + TX, code JS9 117 +

TX, code ZJ3757 + TX, code ZJ4042 + TX, code ZJ4014 + TX, code ITM-121 + TX, code DPX-RAB55 (DKI-2301) + TX, code NA-89 + TX, code MIE-1209 + TX, code MCI-8007 + TX, code BCS-CL73507 + TX, code S-1871 + TX, code DPX-RDS63 + TX, Quinofumelin + TX, mefentrifluconazol + TX, fenpicoxamid + TX, fluindapyr + TX, inpyrfluxam + TX or indiflumetpyr + TX, isoflucypram + TX, 5 pyrapropoyne + TX, florypicoxamid + TX, metyltetraprole + TX, ipflufenquin + TX, pyridachlometyl + TX or chloryridiflu + TX, tetrachlorantraniliprole + TX, tetrachloraniliprole + TX, Tyclopyrazoflor + TX, flupyrimin + TX or pyrifluramide + TX, benzpyrimoxan + TX, Benzosufyl + TX or oxazosufyl + TX, etpyrafen + TX, acynonapyr + TX or pyrinonafen + TX, oxotrione + TX, bixlozone + TX or 10 clofendizone + TX or dicloroxizone + TX, cyclopyranil + TX or pyrazocyclonil + TX or cyclopyrazonil + TX, alpha-bromadiolone + TX, code AKD-1193 + TX, Oxathiapiprolin + TX, Fluopyram + TX, Penflufen+ TX, Fluoxopyrosad+ TX, and Flupyradifurone + TX.

The references in brackets behind the active ingredients, e.g. [3878-19-1] refer to the Chemical Abstracts Registry number. The above described mixing partners are known. Where the active 15 ingredients are included in "The Pesticide Manual" [The Pesticide Manual - A World Compendium; Thirteenth Edition; Editor: C. D. S. Tomlin; The British Crop Protection Council], they are described therein under the entry number given in round brackets hereinabove for the particular compound; for example, the compound "abamectin" is described under entry number (1). Where "[CCN]" is added hereinabove to the particular compound, the compound in question is included in the "Compendium of 20 Pesticide Common Names", which is accessible on the internet [A. Wood; Compendium of Pesticide Common Names, Copyright © 1995-2004]; for example, the compound "acetoprole" is described under the internet address <http://www.alanwood.net/pesticides/acetoprole.html>.

Most of the active ingredients described above are referred to hereinabove by a so-called "common 25 name", the relevant "ISO common name" or another "common name" being used in individual cases. If the designation is not a "common name", the nature of the designation used instead is given in round brackets for the particular compound; in that case, the IUPAC name, the IUPAC/Chemical Abstracts name, a "chemical name", a "traditional name", a "compound name" or a "development code" is used or, if neither one of those designations nor a "common name" is used, an "alternative name" is 30 employed. "CAS Reg. No" means the Chemical Abstracts Registry Number.

The active ingredient mixture of the compounds of formula I selected from Tables 1-12 and P with active ingredients described above comprises a compound selected from Tables 1-12 and P and an active ingredient as described above preferably in a mixing ratio of from 100:1 to 1:6000, especially 35 from 50:1 to 1:50, more especially in a ratio of from 20:1 to 1:20, even more especially from 10:1 to 1:10, very especially from 5:1 and 1:5, special preference being given to a ratio of from 2:1 to 1:2, and a ratio of from 4:1 to 2:1 being likewise preferred, above all in a ratio of 1:1, or 5:1, or 5:2, or 5:3, or 5:4, or 4:1, or 4:2, or 4:3, or 3:1, or 3:2, or 2:1, or 1:5, or 2:5, or 3:5, or 4:5, or 1:4, or 2:4, or 3:4, or 1:3, or 2:3, or 1:2, or 1:600, or 1:300, or 1:150, or 1:35, or 2:35, or 4:35, or 1:75, or 2:75, or 4:75, or

1:6000, or 1:3000, or 1:1500, or 1:350, or 2:350, or 4:350, or 1:750, or 2:750, or 4:750. Those mixing ratios are by weight.

5 In one embodiment, the mixtures as described above can be used in a method for controlling pests, which comprises applying a composition comprising a mixture as described above to the pests or their environment, with the exception of a method for treatment of the human or warm-blooded animal body by surgery or therapy and diagnostic methods practised on the human or warm-blooded animal body.

10 The mixtures comprising a compound of formula I selected from Tables 1-12 and P and one or more active ingredients as described above can be applied, for example, in a single "ready-mix" form, in a combined spray mixture composed from separate formulations of the single active ingredient components, such as a "tank-mix", and in a combined use of the single active ingredients when applied in a sequential manner, i.e. one after the other with a reasonably short period, such as a few hours or days. The order of applying the compounds of formula I selected from Tables 1-12 and P and
15 the active ingredients as described above is not essential for working the present invention.

The compositions according to the invention can also comprise further solid or liquid auxiliaries, such as stabilizers, for example unepoxidized or epoxidized vegetable oils (for example epoxidized coconut oil, rapeseed oil or soya oil), antifoams, for example silicone oil, preservatives, viscosity regulators,
20 binders and/or tackifiers, fertilizers or other active ingredients for achieving specific effects, for example bactericides, fungicides, nematocides, plant activators, molluscicides or herbicides.

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

30 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 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
35 500 ppm, of active ingredient. The rate of application per hectare is generally 1 to 2000 g of active ingredient per hectare, in particular 10 to 1000 g/ha, preferably 10 to 600 g/ha.

A preferred method of application in the field of crop protection is application to the foliage of the plants (foliar application), it being possible to select frequency and rate of application to match the

danger of infestation with the pest in question. Alternatively, the active ingredient can reach the plants via the root system (systemic action), by drenching the locus of the plants with a liquid composition or by incorporating the active ingredient in solid form into the locus of the plants, for example into the soil, for example in the form of granules (soil application). In the case of paddy rice crops, such granules
5 can be metered into the flooded paddy-field .

The compounds of the invention and compositions thereof are also be suitable for the protection of plant propagation material, for example seeds, such as fruit, tubers or kernels, or nursery plants, against pests of the abovementioned type. The propagation material can be treated with the
10 compound prior to planting , for example seed can be treated prior to sowing. Alternatively, the compound can be applied to seed kernels (coating), either by soaking the kernels in a liquid composition or by applying a layer of a solid composition. It is also possible to apply the compositions when the propagation material is planted to the site of application, for example into the seed furrow during drilling . These treatment methods for plant propagation material and the plant propagation
15 material thus treated are further subjects of the invention. Typical treatment rates would depend on the plant and pest/fungi to be controlled and are generally between 1 to 200 grams per 100 kg of seeds, preferably between 5 to 150 grams per 100 kg of seeds, such as between 10 to 100 grams per 100 kg of seeds.

20 The term seed embraces seeds and plant propagules of all kinds including but not limited to true seeds, seed pieces, suckers, corns, bulbs, fruit, tubers, grains, rhizomes, cuttings, cut shoots and the like and means in a preferred embodiment true seeds.

The present invention also comprises seeds coated or treated with or containing a compound of
25 formula I. The term "coated or treated with and/or containing" generally signifies that the active ingredient is for the most part on the surface of the seed at the time of application, although a greater or lesser part of the ingredient may penetrate into the seed material, depending on the method of application. When the said seed product is (re)planted , it may absorb the active ingredient. In an embodiment, the present invention makes available a plant propagation material adhered thereto with
30 a compound of formula (I). Further, it is hereby made available, a composition comprising a plant propagation material treated with a compound of formula (I).

Seed treatment comprises all suitable seed treatment techniques known in the art, such as seed dressing , seed coating, seed dusting, seed soaking and seed pelleting. The seed treatment
35 application of the compound formula (I) can be carried out by any known methods, such as spraying or by dusting the seeds before sowing or during the sowing/planting of the seeds.

Biological Examples:

Example B1: *Spodoptera littoralis* (Egyptian cotton leaf worm)

Cotton leaf discs were placed onto agar in 24-well microtiter plates and sprayed with aqueous test solutions prepared from 10000 ppm DMSO stock solutions. After drying the leaf discs were infested with five L1 larvae. The samples were assessed for mortality, anti-feeding effect, and growth inhibition in comparison to untreated samples 3 days after infestation. Control of *Spodoptera littoralis* by a test sample is given when at least one of the categories mortality, anti-feedant effect, and growth inhibition is higher than the untreated sample.

The following compounds resulted in at least 80% control at an application rate of 200 ppm: P1, P2, P3, P5, P6, P7, P8, P9, P11, P12, P13, P14, P17, P18, and P19.

Example B2: *Spodoptera littoralis* (Egyptian cotton leaf worm)

Test compounds were applied by pipette from 10000 ppm DMSO stock solutions into 24-well plates and mixed with agar. Lettuce seeds were placed onto the agar and the multi well plate was closed by another plate which contained also agar. After 7 days the compound was absorbed by the roots and the lettuce grew into the lid plate. The lettuce leaves were then cut off into the lid plate. *Spodoptera* eggs were pipetted through a plastic stencil onto a humid gel blotting paper and the lid plate was closed with it. The samples were assessed for mortality, anti-feedant effect and growth inhibition in comparison to untreated samples 6 days after infestation.

The following compounds gave an effect of at least 80% in at least one of the three categories (mortality, anti-feeding, or growth inhibition) at a test rate of 12.5 ppm: P3.

Example B3: *Plutella xylostella* (Diamond back moth)

24-well microtiter plates with artificial diet were treated with aqueous test solutions prepared from 10000 ppm DMSO stock solutions by pipetting. After drying, the plates were infested with L2 larvae (10 to 15 per well). The samples were assessed for mortality and growth inhibition in comparison to untreated samples 5 days after infestation.

The following compounds gave an effect of at least 80% in at least one of the two categories (mortality or growth inhibition) at an application rate of 200 ppm: P1, P2, P3, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15, P16, P17, P18, P19, and P20.

Example B4: *Diabrotica balteata* (Corn root worm)

Maize sprouts placed onto an agar layer in 24-well microtiter plates were treated with aqueous test solutions prepared from 10000 ppm DMSO stock solutions by spraying. After drying, the plates were infested with L2 larvae (6 to 10 per well). The samples were assessed for mortality and growth inhibition in comparison to untreated samples 4 days after infestation.

The following compounds gave an effect of at least 80% in at least one of the two categories (mortality or growth inhibition) at an application rate of 200 ppm: P1, P2, P3, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P17, P18, P19, and P20.

Example B5: *Myzus persicae* (Green peach aphid)

Sunflower leaf discs were placed onto agar in a 24-well microtiter plate and sprayed with aqueous test solutions prepared from 10000 ppm DMSO stock solutions. After drying, the leaf discs were infested with an aphid population of mixed ages. The samples were assessed for mortality 6 days after infestation.

The following compounds resulted in at least 80% mortality at an application rate of 200 ppm: P 1, P2, P3, P5, P6, P7, P8, P9, P 10, P 11, P 12, P 14, P 15, P 16, P 17, P 18, and P20.

Example B6: *Myzus persicae* (Green peach aphid)

Roots of pea seedlings infested with an aphid population of mixed ages were placed directly into aqueous test solutions prepared from 10000 DMSO stock solutions. The samples were assessed for mortality 6 days after placing seedlings into test solutions.

The following compounds resulted in at least 80% mortality at a test rate of 24 ppm: P 1, P3, P8, P 15, P 16, and P 17.

Example B7: *Bemisia tabaci* (Cotton white fly)

Cotton leaf discs were placed on agar in 24-well microtiter plates and sprayed with aqueous test solutions prepared from 10000 ppm DMSO stock solutions. After drying the leaf discs were infested with adult white flies. The samples were checked for mortality 6 days after incubation.

The following compounds resulted in at least 80% mortality at an application rate of 200 ppm: P 1, P2, P3, P5, P6, P7, P8, P 10, P 11, P 12, P 13, P 14, P 17, P 19, and P20.

Example B8: *Euschistus heros* (Neotropical Brown Stink Bug)

Soybean leaves on agar in 24-well microtiter plates were sprayed with aqueous test solutions prepared from 10000 ppm DMSO stock solutions. After drying the leaves were infested with N2 nymphs. The samples were assessed for mortality and growth inhibition in comparison to untreated samples 5 days after infestation.

The following compounds gave an effect of at least 80% in at least one of the two categories (mortality or growth inhibition) at an application rate of 200 ppm: P 1, P2, P3, P8, and P 14.

Example B 10: *Tetranychus urticae* (Two-spotted spider mite)

Bean leaf discs on agar in 24-well microtiter plates were sprayed with aqueous test solutions prepared from 10000 ppm DMSO stock solutions. After drying the leaf discs were infested with a mite population of mixed ages. The samples were assessed for mortality on mixed population (mobile stages) 8 days after infestation.

The following compounds resulted in at least 80% mortality at an application rate of 200 ppm: P 1, P3, P6, P9, P 12, P 17, and P 18.

Example B 11: *Frankliniella occidentalis* (Western flower thrips)

Sunflower leaf discs were placed on agar in 24-well microtiter plates and sprayed with aqueous test solutions prepared from 10000 DMSO stock solutions. After drying the leaf discs were infested with a *Frankliniella* population of mixed ages. The samples were assessed for mortality 7 days after infestation.

5

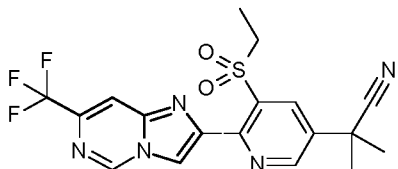
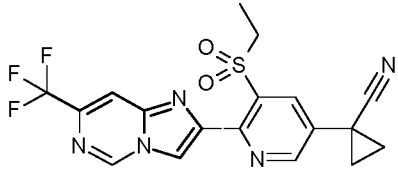
The following compounds resulted in at least 80% mortality at an application rate of 200 ppm: P3, P6, P7, P11, P12, and P17.

Example B 12: Comparison of the insecticidal activity of compound P 1 according to the invention with the structurally closest compound from the state of the art:

10

The activity of compound P 1 according to the preparatory examples and of compound P8 from WO 2016/0721414 against *Myzus persicae* feeding/contact (Example B5 above), *Myzus persicae* systemic (Example B6), and *Euschistus heros* (Example B8) is summarized in Table B 13:

Table B 12:

Compound	Concentration (ppm)	Insect (test method)	Mortality (%)
 (present invention)	12.5	<i>Myzus persicae</i> (B5)	100
	6	<i>Myzus persicae</i> (B6)	100
	0.8	<i>Euschistus heros</i> (B8)	100
 (state of the art)	12.5	<i>Myzus persicae</i> (B5)	0
	6	<i>Myzus persicae</i> (B6)	0
	0.8	<i>Euschistus heros</i> (B8)	0

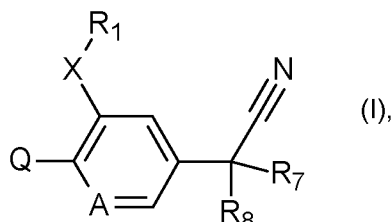
15

Table B 12 shows that compound P 1 according to the invention surprisingly exhibits a substantially better insecticidal action on *Myzus persicae* as feeding/contact (B5) and systemic (B6) application, and *Euschistus heros* (B8) at the tested application rates than the compound from the state of the art. This enhanced effect was not to be expected on the basis of the structural similarity of these compounds.

20

Claims:

1. A compound of formula I,



5

wherein

A is CH or N;

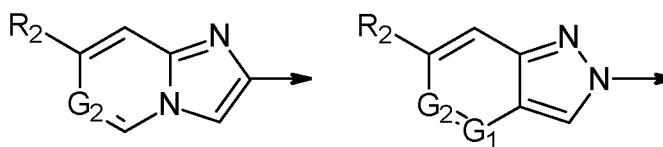
X is S, SO or SO₂;

R₁ is Ci-C4alkyl, Ci-C4haloalkyl or C₃-C6cycloalkylCi-C4alkyl;

10

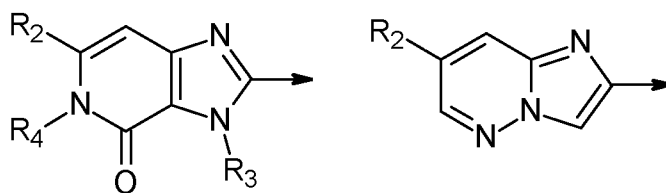
R₇ and R₈ are, independently from each other, halogen, cyano, Ci-C6alkyl, Ci-C6haloalkyl, C₃-C6cycloalkyl, Ci-C4alkoxy, Ci-C4alkoxyCi-C4alkyl, Ci-C4alkylsulfanyl, Ci-C4alkylsulfanyl-Ci-C4alkyl, Ci-C4alkylsulfinyl-Ci-C4alkyl, Ci-C4alkylsulfonyl-Ci-C4alkyl or Ci-C4alkoxycarbonyl;

Q is a radical selected from the group consisting of formulae Q₁, Q₂, Q₃, and Q₄



Q₁

Q₂



Q₃

Q₄

15

wherein the arrow denotes the point of attachment to the ring incorporating the radical A;
and wherein

R₂ is Ci-C6haloalkyl, Ci-C4haloalkylsulfanyl, Ci-C4haloalkylsulfinyl, Ci-C4haloalkylsulfonyl or Ci-C4haloalkoxy;

R₃ is C₁-C₄alkyl;

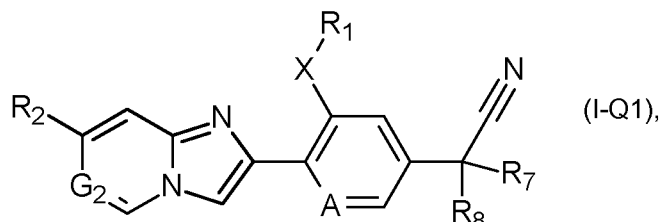
20

R₄ is Ci-C4alkyl, Ci-C4haloalkyl, or C₃-C6cycloalkyl;

G₁ and G₂ are, independently from each other, N or CH;

and agrochemically acceptable salts, stereoisomers, enantiomers, tautomers and N-oxides of the compounds of formula I.

2. A compound of formula I according to claim 1, represented by the compounds of formula I-Q1



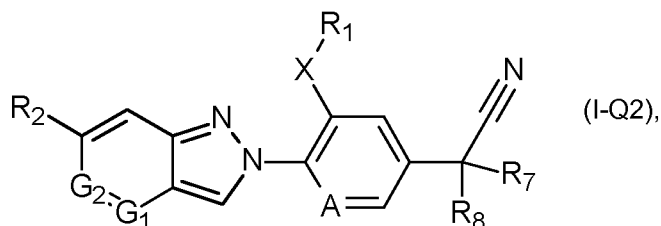
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wherein A, X, R₁, R₂, G₂, R₇ and R₈ are as defined under formula I in claim 1.

3. A compound of formula I-Q1 according to claim 2, wherein R₂ is C₁-Gihaloalkylsulfanyl, Ci-C₄haloalkylsulfinyl, C₁-C₄haloalkylsulfonyl; preferably C₁-C₄haloalkyl.

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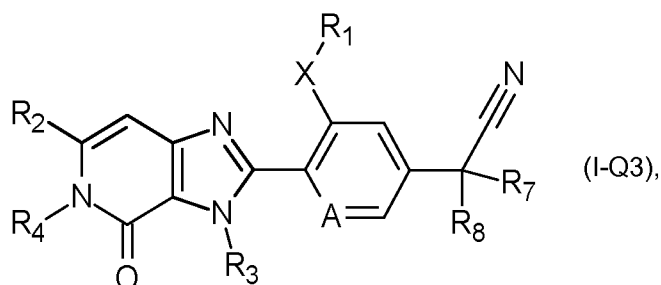
4. A compound of formula I according to claim 1, represented by the compounds of formula I-Q2



wherein A, X, R₁, R₂, G₁, G₂, R₇ and R₈ are as defined under formula I in claim 1.

15

5. A compound of formula I according to claim 1, represented by the compounds of formula I-Q3



wherein A, X, R₁, R₂, R₄, R₇ and R₈ are as defined under formula I in claim 1.

6. A compound of formula I-Q3 according to claim 5, wherein

20

A is CH or N; in particular A is N;

R₁ is ethyl;

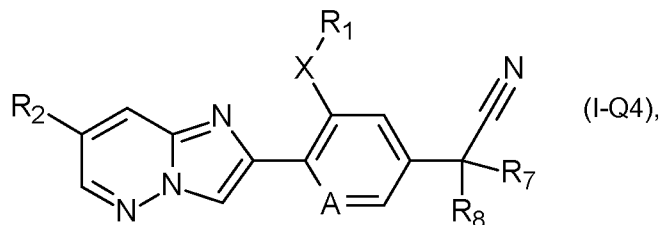
X is S or SO₂; in particular X is SO₂;

R₂ is C₁-C₄haloalkyl, preferably trifluoromethyl; and

-97-

R₄ is ethyl, 2,2,2-trifluoroethyl or cyclopropyl.

7. A compound of formula I according to claim 1, represented by the compounds of formula I-Q4

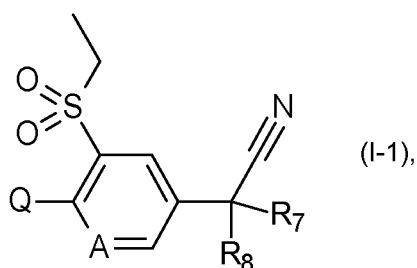


5 wherein A, X, R₁, R₂, R₇ and R_e are as defined under formula I in claim 1.

8. A compound of formula I according to any of claims 1 - 7, wherein R₇ and R_e are, independently from each other, halogen, cyano, C₁-C₆alkyl or C₁-C₄alkoxycarbonyl; preferably C₁-C₆alkyl.

10 9. A compound of formula I according to any of claims 1 - 7, wherein R₇ and R_e are methyl.

10. A compound of formula I according to claim 1, represented by the compounds of formula I-1



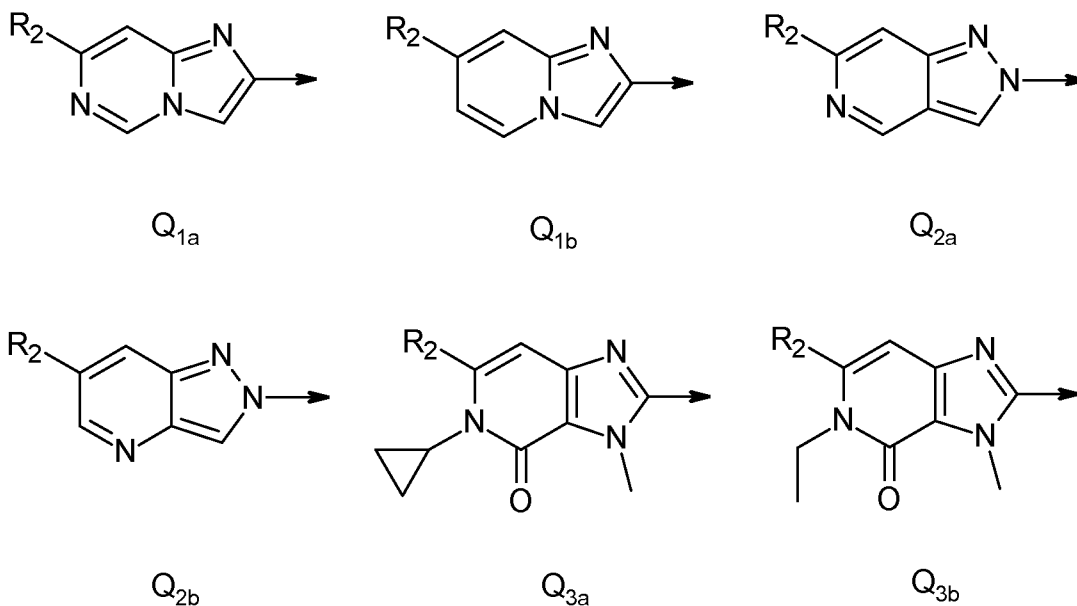
wherein

15 A is CH or N; in particular A is N;

R₇ and R_e are, independently from each other, C₁-C₆alkyl, preferably methyl; and

Q is a radical selected from the group consisting of formulae Q_{1a}, Q_{1b}, Q_{2a}, Q_{2b}, Q_{3a} and Q_{3b}

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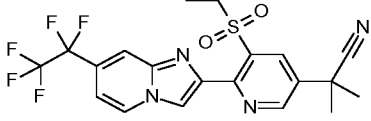
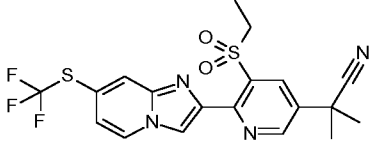
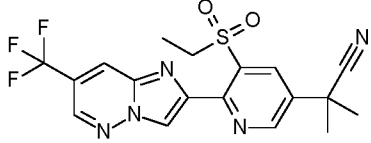
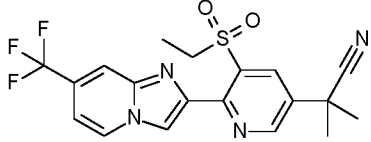
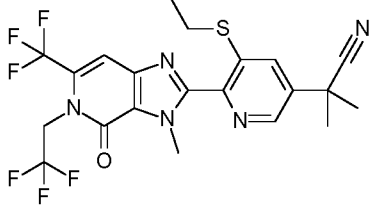
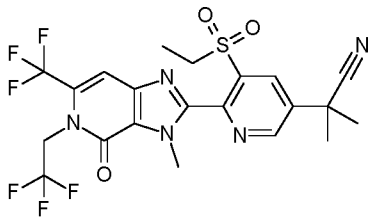
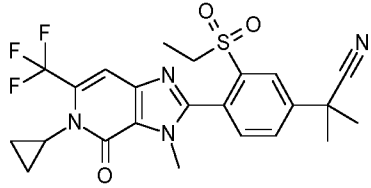
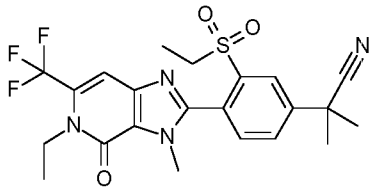


wherein the arrow denotes the point of attachment to the ring incorporating the radical A;
and in which R₂ is C₁-C₄haloalkyl, preferably trifluoromethyl.

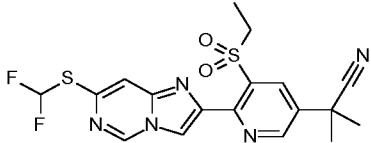
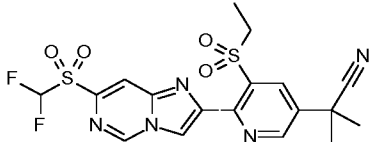
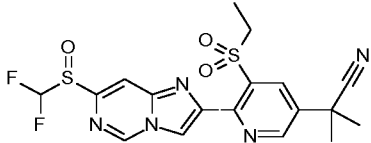
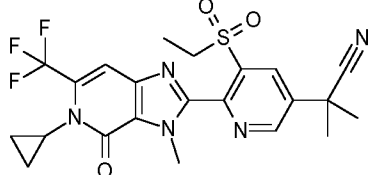
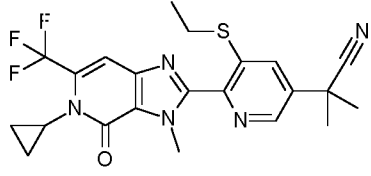
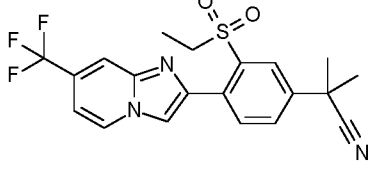
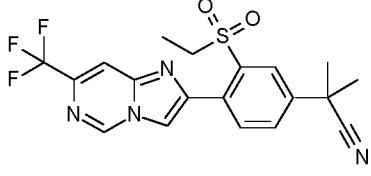
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11. A compound of formula I according to claim 1, which compound is selected from the group consisting of a compound represented by the formulae P 1 - P 3 and P 5 - P 20:

P1	
P2	
P3	
P5	

P6	
P7	
P8	
P9	
P10	
P11	
P12	
P13	

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P14	
P15	
P16	
P17	
P18	
P19	
P20	

12. A pesticidal composition, which comprises an insecticidally, acaricidally, nematocidally or molluscicidally effective amount of a compound of formula I as defined in any of claims 1 - 11 or, where appropriate, a tautomer thereof, in each case in free form or in agrochemically utilizable salt form, as active ingredient and, optionally, at least one auxiliary or diluent.

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13. A method for controlling insects, acarines, nematodes or molluscs, which comprises applying to a pest, to a locus of a pest, or to a plant susceptible to attack by a pest an insecticidally, acaricidally, nematocidally or molluscicidally effective amount of a compound of formula I as defined in any of claims 1 - 11 or a composition as defined claim 12.

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14. A method for the protection of plant propagation material from the attack by insects, acarines, nematodes or molluscs, which comprises treating the propagation material or the site, where the propagation material is planted, with a composition according to claim 12.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/074867

A. CLASSIFICATION OF SUBJECT MATTER
 INV. C07D473/04 A01N43/90 C07D471/04 A01P7/00 A01P5/00
 A01P9/00
 ADD.
 According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
 Minimum documentation searched (classification system followed by classification symbols)
 C07D A01N A01P
 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 , CHEM ABS Data, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	wo 2016/071214 AI (SYNGENTA PARTICIPATIONS AG [CH]) 12 May 2016 (2016-05-12) cited in the application page 1, lines 1-4 claims 1-14 page 48; compound Y.044 page 41; compound X.028 page 42; compound X.044 page 46; compound Y.028 ----- -/- .	1-14

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents :

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 "E" earlier application or patent but published on or after the international filing date
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 "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
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Date of the actual completion of the international search 13 December 2018	Date of mailing of the international search report 21/12/2018
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Marzi , El ena

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/074867

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	<p>wo 2017/089190 AI (SYNGENTA PARTICIPATIONS AG [CH]) 1 June 2017 (2017-06-01) cited in the application claims 1-13 page 1, lines 1-4 page 29; compounds 1.011, 1.1012, 1.003, 1.004 page 30; compounds 1.025-1.026 page 31; compounds 1.033, 1.034 -----</p>	1-14
Y	<p>wo 2016/121997 AI (NIHON NOHYAKU CO LTD [JP]) 4 August 2016 (2016-08-04) claims 1-9 & EP 3 252 046 AI (NIHON NOHYAKU CO LTD [JP]) 6 December 2017 (2017-12-06) -----</p>	1-14

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