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PESTICIDALLY ACTIVE HETEROCYCLIC DERIVATIVES WITH SULFUR CONTAINING SUBSTITUENTS

Abstract

Compounds of the formula (I), wherein the substituents are as defined in claim **1**. Furthermore, the present invention relates to agrochemical compositions which comprise compounds of formula (I), to preparation of these compositions, and to the use of the compounds or compositions in agriculture or horticulture for combating, preventing or controlling animal pests, including arthropods and in particular insects, molluscs, *nematodes* or representatives of the order Acarina. ##STR00001##

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Background/Summary

[0001] The present invention relates to pesticidally active, in particular insecticidally active heterocyclic derivatives containing sulfur substituents, to processes for their preparation, 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.
[0002] Heterocyclic derivatives containing sulfur substituents are known and described, for example, in WO 2019/131575, WO 2019/131587, WO 2020/158889, WO 2020/171077, WO 2020/203763, WO 2021/141106, WO 2020/178789 and WO 2021/033141.
[0003] It has now surprisingly been found that certain novel sulfur-containing phenyl and pyridyl derivatives linked to an (aza)chromenone moiety have favorable properties as pesticides.
[0004] The present invention therefore provides compounds of formula I,
##STR00002## [0005] wherein [0006] R.sub.2 is C.sub.1-C.sub.6haloalkyl, C.sub.1-C.sub.4haloalkylsulfanyl, C.sub.1-C.sub.4haloalkylsulfinyl, C.sub.1-C.sub.4haloalkylsulfonyl or C.sub.1-C.sub.6haloalkoxy; [0007] G is CH or N; [0008] X.sub.1 is O, S or NR.sub.6, in which R.sub.6 is C.sub.1-C.sub.4alkyl; [0009] R.sub.7 is hydrogen, C.sub.1-C.sub.4alkyl or halogen; [0010] Q is a radical selected from the group consisting of formula Qa and Qb
##STR00003## [0011] wherein the arrow denotes the point of attachment to the bicyclic ring; [0012] and wherein A represents CH or N; [0013] X is S, SO, SO.sub.2; [0014] R.sub.1 is C.sub.1-C.sub.4alkyl or C.sub.3-C.sub.6cycloalkyl-C.sub.1-C.sub.4alkyl; [0015] Q.sub.1 is hydrogen, halogen, C.sub.1-C.sub.6haloalkyl, C.sub.3-C.sub.6cycloalkyl, C.sub.3-C.sub.6cycloalkyl monosubstituted by cyano, C.sub.1-C.sub.6cyanoalkyl, C.sub.1-C.sub.6cyanoalkoxy, C.sub.1-C.sub.6haloalkoxy, —N(R.sub.4).sub.2, —N(R.sub.4)COR.sub.5 or 2-pyridyloxy; or [0016] Q.sub.1 is a five- to six-membered aromatic or heteroaromatic ring system linked via a ring carbon atom to the ring which contains the substituent A, said ring system is unsubstituted or is mono- or polysubstituted by substituents selected from the group consisting of halogen, cyano, C.sub.1-C.sub.4alkyl, C.sub.1-C.sub.4haloalkyl, C.sub.1-C.sub.4alkoxy, C.sub.1-C.sub.4haloalkoxy, C.sub.1-C.sub.4alkylsulfanyl, C.sub.1-C.sub.4alkylsulfinyl and C.sub.1-C.sub.4alkylsulfonyl; and said ring system can contain 1, 2 or 3 ring heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, where said ring system may not contain more than one ring oxygen atom and not more than one ring sulfur atom; or [0017] Q.sub.1 is a five-membered heteroaromatic ring system linked via a ring nitrogen atom to the ring which contains the substituent A, said ring system is unsubstituted or is mono- or polysubstituted by substituents selected from the group consisting of halogen, cyano, C.sub.1-C.sub.4alkyl, C.sub.1-C.sub.4haloalkyl, C.sub.1-

C.sub.4alkoxy, C.sub.1-C.sub.4haloalkoxy, C.sub.1-C.sub.4alkylsulfanyl, C.sub.1-C.sub.4alkylsulfinyl and C.sub.1-C.sub.4alkylsulfonyl; and said ring system contains 1, 2 or 3 ring heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, where said ring system contains at least one ring nitrogen atom and may not contain more than one ring oxygen atom and not more than one ring sulfur atom; [0018] R.sub.3 is hydrogen or C.sub.1-C.sub.4alkyl; [0019] each R.sub.4 independently is hydrogen, C.sub.1-C.sub.4alkyl or C.sub.3-C.sub.6cycloalkyl; and [0020] R.sub.5 is C.sub.1-C.sub.6alkyl, C.sub.1-C.sub.6haloalkyl or C.sub.3-C.sub.6cycloalkyl.

[0021] The present invention also provides agrochemically acceptable salts, stereoisomers, enantiomers, tautomers and N-oxides of the compounds of formula 1.

[0022] 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, such as C.sub.1-C.sub.4alkanecarboxylic 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 C.sub.1-C.sub.4alkane- or arylsulfonic acids which are unsubstituted or 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 dimethylpropylamine, or a mono-, di- or trihydroxy-lower-alkylamine, for example mono-, di- or triethanolamine.

[0023] In each case, the compounds of formula (1) according to the invention are in free form, in oxidized form as a N-oxide or in salt form, e.g. an agronomically usable salt form.

[0024] N-oxides are oxidized forms of tertiary amines or oxidized forms of nitrogen containing heteroaromatic compounds. They are described for instance in the book “Heterocyclic N-oxides” by A. Albini and S. Pietra, CRC Press, Boca Raton 1991.

[0025] The compounds of formula I according to the invention also include hydrates which may be formed during the salt formation.

[0026] Where substituents are indicated as being itself further substituted, this means that they carry one or more identical or different substituents, e.g. one to four substituents. Normally not more than three such optional substituents are present at the same time. Preferably not more than two such substituents are present at the same time (i.e. the group is substituted by one or two of the substituents indicated). Where the additional substituent group is a larger group, such as cycloalkyl or phenyl, it is most preferred that only one such optional substituent is present. Where a group is indicated as being substituted, e.g. alkyl, this includes those groups that are part of other groups, e.g. the alkyl in alkylthio.

[0027] The term “C.sub.1-C.sub.nalkyl” as used herein refers to a saturated straight-chain or branched hydrocarbon radical attached via any of the carbon atoms having 1 to n carbon atoms, for example, any one of the radicals methyl, ethyl, n-propyl, 1-methylbutyl, 2-methylbutyl, 3-methylbutyl, 2, 2-dimethylpropyl, 1-ethylpropyl, n-hexyl, n-pentyl, 1, 1-dimethylpropyl, 1, 2-dimethylpropyl, 1-methylpentyl, 2-methylpentyl, 3-methylpentyl, 4-methylpentyl, 1, 1-dimethylbutyl, 1,2-dimethylbutyl, 1, 3-dimethylbutyl, 2, 2-dimethylbutyl, 2, 3-dimethylbutyl, 3, 3-dimethylbutyl, 1-ethylbutyl, 2-ethylbutyl, 1,1, 2-trimethylpropyl, 1,2, 2-trimethylpropyl, 1-ethyl-1-methylpropyl, or 1-ethyl-2-methylpropyl.

[0028] The term “C.sub.1-C.sub.nhaloalkyl” as used herein refers to a straight-chain or branched

saturated alkyl radical attached via any of the carbon atoms having 1 to n carbon atoms (as mentioned above), where some or all of the hydrogen atoms in these radicals may be replaced by fluorine, chlorine, bromine and/or iodine, i.e., for example, any one of chloromethyl, dichloromethyl, trichloromethyl, fluoromethyl, difluoromethyl, trifluoromethyl, chlorofluoromethyl, dichlorofluoromethyl, chlorodifluoromethyl, 2-fluoroethyl, 2-chloroethyl, 2-bromoethyl, 2-iodoethyl, 2, 2-difluoroethyl, 2,2, 2-trifluoroethyl, 2-chloro-2-fluoroethyl, 2-chloro-2, 2-difluoroethyl, 2, 2-dichloro-2-fluoroethyl, 2,2, 2-trichloroethyl, pentafluoroethyl, 2-fluoropropyl, 3-fluoropropyl, 2,2-difluoropropyl, 2, 3-difluoropropyl, 2-chloropropyl, 3-chloropropyl, 2, 3-dichloropropyl, 2-bromopropyl, 3-bromopropyl, 3,3, 3-trifluoropropyl, 3,3, 3-trichloropropyl, 2,2, 3,3, 3-pentafluoropropyl, heptafluoropropyl, 1-(fluoromethyl)-2-fluoroethyl, 1-(chloromethyl)-2-chloroethyl, 1-(bromomethyl)-2-bromoethyl, 4-fluorobutyl, 4-chlorobutyl, 4-bromobutyl or nonafluorobutyl. Accordingly, a term “C.sub.1-C.sub.2-fluoroalkyl” would refer to a C.sub.1-C.sub.2-alkyl radical which carries 1,2, 3,4, or 5 fluorine atoms, for example, any one of difluoromethyl, trifluoromethyl, 1-fluoroethyl, 2-fluoroethyl, 2, 2-difluoroethyl, 2,2, 2-trifluoroethyl, 1,1, 2, 2-tetrafluoroethyl or pentafluoroethyl.

[0029] The term “C.sub.1-C.sub.nalkoxy” as used herein refers to a straight-chain or branched saturated alkyl radical having 1 to n carbon atoms (as mentioned above) which is attached via an oxygen atom, i.e., for example, any one of methoxy, ethoxy, n-propoxy, 1-methylethoxy, n-butoxy, 1-methylpropoxy, 2-methylpropoxy or 1, 1-dimethylethoxy.

[0030] The term “C.sub.1-C.sub.nhaloalkoxy” as used herein refers to a C.sub.1-C.sub.nalkoxy radical as mentioned above which is partially or fully substituted by fluorine, chlorine, bromine and/or iodine, i.e., for example, any one of chloromethoxy, dichloromethoxy, trichloromethoxy, fluoromethoxy, difluoromethoxy, trifluoromethoxy, chlorofluoromethoxy, dichlorofluoromethoxy, chlorodifluoromethoxy, 2-fluoroethoxy, 2-chloroethoxy, 2-bromoethoxy, 2-iodoethoxy, 2, 2-difluoroethoxy, 2,2, 2-trifluoroethoxy, 2-chloro-2-fluoroethoxy, 2-chloro-2, 2-difluoroethoxy, 2, 2-dichloro-2-fluoroethoxy, 2,2, 2-trichloroethoxy, pentafluoroeth- oxy, 2-fluoropropoxy, 3-fluoropropoxy, 2, 2-difluoropropoxy, 2, 3-difluoropropoxy, 2-chloropropoxy, 3-chloropropoxy, 2, 3-dichloropropoxy, 2-bromopropoxy, 3-bromopropoxy, 3,3, 3-trifluoropropoxy, 3,3, 3-trichloropropoxy, 2,2, 3,3, 3-pentafluoropropoxy, heptafluoropropoxy, 1-(fluoromethyl)-2-fluoroethoxy, 1-(chloromethyl)-2-chloroethoxy, 1-(bromomethyl)-2-bromoethoxy, 4-fluorobutoxy, 4-chlorobutoxy, or 4-bromobutoxy.

[0031] The term “C.sub.1-C.sub.n-alkylsulfanyl” as used herein refers to a straight chain or branched saturated alkyl radical having 1 to n carbon atoms (as mentioned above) which is attached via a sulfur atom, i.e., for example, any one of methylthio, ethylthio, n-propylthio, 1-methylethylthio, butylthio, 1-methylpropylthio, 2-methylpropylthio or 1, 1-dimethylethylthio.

[0032] The term “C.sub.1-C.sub.nalkylsulfinyl” as used herein refers to a straight chain or branched saturated alkyl radical having 1 to n carbon atoms (as mentioned above) which is attached via the sulfur atom of the sulfinyl group, i.e., for example, any one of methylsulfinyl, ethylsulfinyl, n-propylsulfinyl, 1-methylethyl-sulfinyl, n-butylsulfinyl, 1-methylpropylsulfinyl, 2-methylpropylsulfinyl, 1, 1-dimethyl-ethylsulfinyl, n-pentylsulfinyl, 1-methylbutylsulfinyl, 2-methylbutylsulfinyl, 3-methyl- butylsulfinyl, 1, 1-dimethylpropylsulfinyl, 1, 2-dimethylpropylsulfinyl, 2,2-dimethylpropylsulfinyl or 1-ethylpropylsulfinyl.

[0033] The term “C.sub.1-C.sub.nalkylsulfonyl” as used herein refers to a straight chain or branched saturated alkyl radical having 1 to n carbon atoms (as mentioned above) which is attached via the sulfur atom of the sulfonyl group, i.e., for example, any one of methylsulfonyl, ethylsulfonyl, n-propylsulfonyl, isopropylsulfonyl, n-butylsulfonyl, 1-methylpropylsulfonyl, 2-methylpropylsulfonyl or t-butylsulphonyl.

[0034] The term “C.sub.1-C.sub.nhaloalkylsulfanyl” as used herein refers to a C.sub.1-C.sub.nalkylthio radical as mentioned above which is partially or fully substituted by fluorine, chlorine, bromine and/or iodine, i.e., for example, any one of fluoromethylthio, difluoromethylthio,

trifluoromethylthio, chlorodifluoromethylthio, bromodifluoromethylthio, 2-fluoroethylthio, 2-chloroethylthio, 2-bromoethylthio, 2-iodoethylthio, 2, 2-difluoroethylthio, 2,2,2-trifluoroethylthio, 2,2, 2-trichloroethylthio, 2-chloro-2-fluoroethylthio, 2-chloro-2,2-difluoroethylthio, 2, 2-dichloro-2-fluoroethylthio, pentafluoroethylthio, 2-fluoropropylthio, 3-fluoropropylthio, 2-chloropropylthio, 3-chloropropylthio, 2-bromopropylthio, 3-bromopropylthio, 2,2-difluoropropylthio, 2,3-difluoropropylthio, 2, 3-dichloropropylthio, 3,3, 3-trifluoropropylthio, 3,3, 3-trichloropropylthio, 2,2, 3,3, 3-pentafluoropropylthio, heptafluoropropylthio, 1-(fluoromethyl)-2-fluoroethylthio, 1-(chloromethyl)-2-chloroethylthio, 1-(bromomethyl)-2-bromoethylthio, 4-fluorobutylthio, 4-chlorobutylthio, or 4-bromobutylthio.

[0035] The term “C.sub.1-C.sub.nhaloalkylsulfinyl” and “C.sub.1-C.sub.nhaloalkylsulfonyl” refers to the groups above but with the sulfur in oxidations state 1 or 2 respectively.

[0036] The term “C.sub.1-C.sub.ncyanoalkyl” as used herein refers to a straight chain or branched saturated alkyl radicals having 1 to n carbon atoms (as mentioned above) which is substituted by a cyano group, for example cyanomethylene, cyanoethylene, 1,1-dimethylcyanomethyl, cyanomethyl, cyanoethyl, and 1-dimethylcyanomethyl.

[0037] The term “C.sub.1-C.sub.ncyanoalkoxy” refers to the groups above but which is attached via an oxygen atom.

[0038] The suffix “—C.sub.1-C.sub.nalkyl” after terms such as “C.sub.3-C.sub.ncycloalkyl”, wherein n is an integer from 1-6, as used herein refers to a straight chain or branched saturated alkyl radicals which is substituted by C.sub.3-C.sub.ncycloalkyl. An example of C.sub.3-C.sub.ncycloalkyl-C.sub.1-C.sub.nalkyl is for example, cyclopropylmethyl.

[0039] The term “C.sub.3-C.sub.6cycloalkyl” as used herein refers to 3-6 membered cycloalkyl groups such as cyclopropane, cyclobutane, cyclopropane, cyclopentane and cyclohexane.

[0040] The term “C.sub.3-C.sub.ncycloalkyl” monosubstituted by cyano as used herein refers to saturated or partially unsaturated mono-, bi- or tricyclic hydrocarbons having 3 to n carbon atoms (as mentioned above) which is substituted by a cyano group.

[0041] Halogen is generally fluorine, chlorine, bromine or iodine. This also applies, correspondingly, to halogen in combination with other meanings, such as haloalkyl.

[0042] In the context of this invention “mono- or polysubstituted” in the definition of the Q.sub.1 substituents, means typically, depending on the chemical structure of the substituents, monosubstituted to five-times substituted, more preferably mono-, double- or triple-substituted.

[0043] In the context of the this invention, the phrase “Q.sub.1 is a five- to six-membered aromatic or heteroaromatic ring system, linked via a ring carbon atom . . . ” and the phrase “Q.sub.1 is a five-membered heteroaromatic ring system linked via a ring nitrogen atom . . . ”, as the case may be, refer to the manner of attachment of particular embodiments of the substituent Q.sub.1 to the radical Q (wherein Q also is substituted by X—R.sub.1 and R.sub.3 as described above) as represented by either formula Qa or formula Qb, which can be pyridyl or phenyl when A represents N or CH, respectively, as the case may be.

[0044] In the context of this invention, examples of “Q.sub.1 is a five- to six-membered aromatic or heteroaromatic ring system, linked via a ring carbon atom . . . ; and said ring system can contain 1, 2 or 3 heteroatoms . . . ” are, but not limited to, phenyl, pyrazolyl, triazolyl, pyridinyl and pyrimidinyl; preferably phenyl, 2-pyridyl, 3-pyridyl, 4-pyridyl, pyrimidin-2-yl, pyrimidin-4-yl, and pyrimidin-5-yl.

[0045] In the context of this invention, examples of “Q.sub.1 is a five-membered heteroaromatic ring system linked via a ring nitrogen atom . . . ; and said ring system contains 1, 2 or 3 heteroatoms . . . ” are, but not limited to, pyrazolyl, pyrrolyl, imidazolyl and triazolyl; preferably pyrrol-1-yl, pyrazol-1-yl, triazol-2-yl, 1,2,4-triazol-1-yl, triazol-1-yl, and imidazol-1-yl.

[0046] Certain embodiments according to the invention are provided as set out below.

[0047] Embodiment 1 provides compounds of formula I, or an agrochemically acceptable salt, stereoisomer, enantiomer, tautomer or N-oxide thereof, as defined above.

[0048] Embodiment 2 provides compounds, or an agrochemically acceptable salt, stereoisomer, enantiomer, tautomer or N-oxide thereof, according to embodiment 1 wherein Q is Qa and having preferred values of R.sub.2, G, X.sub.1, R.sub.6, R.sub.7, A, X, R.sub.1, Q.sub.1, R.sub.3, R.sub.4 and R.sub.5 as set out below.
[0049] Embodiment 3 provides compounds, or an agrochemically acceptable salt, stereoisomer, enantiomer, tautomer or N-oxide thereof, according to embodiment 1 wherein Q is Qb and having preferred values of R.sub.2, G, X.sub.1, R.sub.6, R.sub.7, A, X, R.sub.1, Q.sub.1, R.sub.3, R.sub.4 and R.sub.5 as set out below.
[0050] With respect to embodiments 1-3, preferred values of R.sub.2, G, X.sub.1, R.sub.6, R.sub.7, A, X, R.sub.1, Q.sub.1, R.sub.3, R.sub.4 and R.sub.5 are, in any combination thereof, as set out below:
[0051] Preferably R.sub.2 is C.sub.1-C.sub.2fluoroalkyl, trifluoromethylsulfanyl, trifluoromethylsulfinyl, trifluoromethylsulfonyl or C.sub.1-C.sub.2fluoroalkoxy.
[0052] Also preferred is when R.sub.2 is C.sub.1-C.sub.2fluoroalkyl or C.sub.1-C.sub.2fluoroalkoxy.
[0053] More preferably R.sub.2 is —CF.sub.3, —CF.sub.2CF.sub.3, —CHF.sub.2, —SCF.sub.3, —SO.sub.2CF.sub.3, —OCF.sub.3 or —OCHF.sub.2.
[0054] Even more preferably R.sub.2 is —CF.sub.3, —SO.sub.2CF.sub.3, —OCF.sub.3 or —OCHF.sub.2.
[0055] Most preferably R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2.
[0056] Preferably G is CH or N.
[0057] Most preferably G is CH.
[0058] Preferably X.sub.1 is O, S or N(C.sub.1-C.sub.2alkyl).
[0059] More preferably X.sub.1 is O, S or NCH.sub.3.
[0060] Most preferably X.sub.1 is O.
[0061] Preferably R.sub.6 is C.sub.1-C.sub.2alkyl.
[0062] More preferably R.sub.6 is methyl or ethyl.
[0063] Most preferably R.sub.6 is methyl.
[0064] Preferably R.sub.7 is hydrogen, C.sub.1-C.sub.2alkyl or chloro.
[0065] More preferably R.sub.7 is hydrogen or methyl.
[0066] Most preferably R.sub.7 is hydrogen.
[0067] Preferably A is N or CH.
[0068] Most preferably A is N.
[0069] Preferably X is S or SO.sub.2.
[0070] Most preferably X is SO.sub.2.
[0071] Preferably R.sub.1 is C.sub.1-C.sub.4alkyl or cyclopropyl-C.sub.1-C.sub.4alkyl.
[0072] More preferably R.sub.1 is ethyl or cyclopropylmethyl.
[0073] Most preferably R.sub.1 is ethyl.
[0074] When Q is Qa, preferably Q.sub.1 is hydrogen, C.sub.1-C.sub.6haloalkyl, C.sub.3-C.sub.6cycloalkyl, C.sub.3-C.sub.6cycloalkyl monosubstituted by cyano, C.sub.1-C.sub.6cyanoalkyl, C.sub.1-C.sub.6cyanoalkoxy, C.sub.1-C.sub.6haloalkoxy, —N(R.sub.4)COR.sub.5 or 2-pyridyloxy.
[0075] Also preferred is when Q.sub.1 is a five- to six-membered aromatic or heteroaromatic ring system linked via a ring carbon atom to the ring which contains the substituent A, said ring system is unsubstituted or is mono-substituted by substituents selected from the group consisting of halogen, cyano and C.sub.1-C.sub.4haloalkyl; and said ring system can contain 1 or 2 ring nitrogen atoms.
[0076] Also preferred is when Q.sub.1 is a five-membered heteroaromatic ring system linked via a ring nitrogen atom to the ring which contains the substituent A, said ring system is unsubstituted or is mono-substituted by substituents selected from the group consisting of halogen, cyano and

C.sub.1-C.sub.4haloalkyl; and said ring system contains 2 or 3 ring nitrogen atoms.
[0077] More preferably Q.sub.1 is hydrogen, trifluoromethyl, difluoroethyl, cyclopropyl, cyanocyclopropyl, cyanoisopropyl, cyanoisopropoxy, trifluoroethoxy, difluoropropoxy, —N(R.sub.4)COR.sub.5 in which R.sub.4 is hydrogen or methyl and R.sub.5 is either methyl, ethyl or cyclopropyl; or Q.sub.1 is 2-pyridyloxy, N-linked pyrazolyl which can be mono-substituted by chloro, cyano or trifluoromethyl; or Q.sub.1 is N-linked triazolyl or C-linked pyrimidinyl.
[0078] Most preferably Q.sub.1 is hydrogen, trifluoromethyl, 1,1-difluoroethyl, cyclopropyl, 1-cyanocyclopropyl, 1-cyano-1-methyl-ethyl, 1-cyano-1-methyl-ethoxy, 2,2,2-trifluoroethoxy, 2,2-difluoropropoxy, —N(CH.sub.3)COCH.sub.3, —N(CH.sub.3)COCH.sub.2CH.sub.3, —N(CH.sub.3)CO(cyclopropyl), 2-pyridyloxy, pyrazol-1-yl, 3-chloro-pyrazol-1-yl, 3-cyano-pyrazol-1-yl, 3-trifluoromethyl-pyrazol-1-yl, 1,2,4-triazol-1-yl or pyrimidin-2-yl.
[0079] When Q is Qb, preferably Q.sub.1 is hydrogen, C.sub.3-C.sub.6cycloalkyl, —N(R.sub.4).sub.2 or —N(R.sub.4)COR.sub.5.
[0080] Also preferred is when Q.sub.1 is a five- to six-membered aromatic or heteroaromatic ring system linked via a ring carbon atom to the ring which contains the substituent A, said ring system is unsubstituted or is mono-substituted by substituents selected from the group consisting of halogen, cyano and C.sub.1-C.sub.4haloalkyl; and said ring system can contain 1 or 2 ring nitrogen atoms.
[0081] Also preferred is when Q.sub.1 is a five-membered heteroaromatic ring system linked via a ring nitrogen atom to the ring which contains the substituent A, said ring system is unsubstituted or is mono-substituted by substituents selected from the group consisting of halogen, cyano and C.sub.1-C.sub.4haloalkyl; and said ring system contains 2 or 3 ring nitrogen atoms.
[0082] More preferably Q.sub.1 is hydrogen, cyclopropyl, —N(R.sub.4).sub.2 or —N(R.sub.4)COR.sub.5, in each of which R.sub.4 independently is either hydrogen or methyl and R.sub.5 is either methyl, ethyl or cyclopropyl; or Q.sub.1 is N-linked triazolyl or C-linked pyrimidinyl.
[0083] Most preferably Q.sub.1 is hydrogen, cyclopropyl, —NH(CH.sub.3), —N(CH.sub.3)COCH.sub.3, —N(CH.sub.3)COCH.sub.2CH.sub.3, —N(CH.sub.3)CO(cyclopropyl), 1,2,4-triazol-1-yl or pyrimidin-2-yl.
[0084] Preferably R.sub.3 is hydrogen or C.sub.1-C.sub.4alkyl.
[0085] More preferably R.sub.3 is hydrogen or methyl.
[0086] Most preferably R.sub.3 is hydrogen.
[0087] Preferably each R.sub.4 independently is hydrogen or C.sub.1-C.sub.4alkyl.
[0088] Most preferably each R.sub.4 independently is hydrogen or methyl.
[0089] Preferably R.sub.5 is C.sub.1-C.sub.6alkyl or C.sub.3-C.sub.6cycloalkyl.
[0090] More preferably R.sub.5 is methyl, ethyl or cyclopropyl.
[0091] Most preferably R.sub.5 is methyl.
[0092] Further embodiments according to the invention are provided as set forth below.
[0093] A preferred group of compounds of formula I is represented by the compounds of formula I-1
##STR00004## [0094] wherein R.sub.2, G, X.sub.1, R.sub.6, R.sub.7, A, X, R.sub.1, Q.sub.1, R.sub.3, R.sub.4 and R.sub.5 are as defined under formula I above; or an agrochemically acceptable salt, stereoisomer, enantiomer, tautomer or N-oxide of a compound of formula I-1.
[0095] In one preferred group of compounds of formula I-1, [0096] R.sub.2 is C.sub.1-C.sub.2fluoroalkyl or C.sub.1-C.sub.2fluoroalkoxy; [0097] G is CH or N; [0098] X.sub.1 is O, S or NCH.sub.3; [0099] R.sub.7 is hydrogen or methyl; [0100] A is N or CH; [0101] X is S or SO.sub.2; [0102] R.sub.1 is ethyl or cyclopropylmethyl; [0103] Q.sub.1 is hydrogen, C.sub.1-C.sub.6haloalkyl, C.sub.3-C.sub.6cycloalkyl, C.sub.3-C.sub.6cycloalkyl monosubstituted by cyano, C.sub.1-C.sub.6cyanoalkyl, C.sub.1-C.sub.6cyanoalkoxy, C.sub.1-C.sub.6haloalkoxy, 2-pyridyloxy, or —N(R.sub.4)COR.sub.5 in which R.sub.4 is hydrogen or methyl and R.sub.5 is

either methyl, ethyl or cyclopropyl; and [0104] R.sub.3 is hydrogen or methyl.
[0105] In another preferred group of compounds of formula I-1, [0106] R.sub.2 is C.sub.1-C.sub.2fluoroalkyl or C.sub.1-C.sub.2fluoroalkoxy; [0107] G is CH or N; [0108] X.sub.1 is O, S or NCH.sub.3; [0109] R.sub.7 is hydrogen or methyl; [0110] A is N or CH; [0111] X is S or SO.sub.2; [0112] R.sub.1 is ethyl or cyclopropylmethyl; [0113] Q.sub.1 is hydrogen, trifluoromethyl, difluoroethyl, cyclopropyl, cyanocyclopropyl, cyanoisopropyl, cyanoisopropoxy, trifluoroethoxy, difluoropropoxy, 2-pyridyloxy, or —N(R.sub.4)COR.sub.5 in which R.sub.4 is hydrogen or methyl and R.sub.5 is either methyl, ethyl or cyclopropyl; and [0114] R.sub.3 is hydrogen or methyl.
[0115] In another preferred group of compounds of formula I-1, [0116] R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; [0117] G is CH or N; [0118] X.sub.1 is O, S or NCH.sub.3; [0119] R.sub.7 is hydrogen or methyl; [0120] A is N or CH; [0121] X is S or SO.sub.2; [0122] R.sub.1 is ethyl or cyclopropylmethyl; [0123] Q.sub.1 is hydrogen, trifluoromethyl, 1,1-difluoroethyl, cyclopropyl, 1-cyanocyclopropyl, 1-cyano-1-methyl-ethyl, 1-cyano-1-methyl-ethoxy, 2,2,2-trifluoroethoxy, 2,2-difluoropropoxy, —N(CH.sub.3)COCH.sub.3, —N(CH.sub.3)COCH.sub.2CH.sub.3, —N(CH.sub.3)CO(cyclopropyl), or 2-pyridyloxy; and [0124] R.sub.3 is hydrogen or methyl.
[0125] In another preferred group of compounds of formula I-1, [0126] R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; [0127] G is CH; [0128] X.sub.1 is O; [0129] R.sub.7 is hydrogen; [0130] A is N; [0131] X is SO.sub.2; [0132] R.sub.1 is ethyl; [0133] Q.sub.1 is hydrogen, trifluoromethyl, 1,1-difluoroethyl, cyclopropyl, 1-cyanocyclopropyl, 1-cyano-1-methyl-ethyl, 1-cyano-1-methyl-ethoxy, 2,2,2-trifluoroethoxy, 2,2-difluoropropoxy, —N(CH.sub.3)COCH.sub.3, —N(CH.sub.3)COCH.sub.2CH.sub.3, —N(CH.sub.3)CO(cyclopropyl), or 2-pyridyloxy; and [0134] R.sub.3 is hydrogen.
[0135] In another further preferred group of compounds of formula I-1, Q.sub.1 is a five- to six-membered aromatic or heteroaromatic ring system linked via a ring carbon atom to the ring which contains the substituent A, said ring system is unsubstituted or is mono-substituted by substituents selected from the group consisting of halogen, cyano and C.sub.1-C.sub.4haloalkyl; and said ring system can contain 1 or 2 ring nitrogen atoms. In this embodiment, more preferably Q.sub.1 is C-linked pyrimidinyl.
[0136] Also preferred compounds of formula I-1 are those wherein Q.sub.1 is a five-membered heteroaromatic ring system linked via a ring nitrogen atom to the ring which contains the substituent A, said ring system is unsubstituted or is mono-substituted by substituents selected from the group consisting of halogen, cyano and C.sub.1-C.sub.4haloalkyl; and said ring system contains 2 or 3 ring nitrogen atoms. In this embodiment, more preferably Q.sub.1 is N-linked pyrazolyl which can be mono-substituted by chloro, cyano or trifluoromethyl; or Q.sub.1 is N-linked triazolyl.
[0137] In another preferred group of compounds of formula I-1, [0138] R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; [0139] G is CH or N; [0140] X.sub.1 is O, S or NCH.sub.3; [0141] R.sub.7 is hydrogen or methyl; [0142] A is N or CH; [0143] X is S or SO.sub.2; [0144] R.sub.1 is ethyl or cyclopropylmethyl; [0145] Q.sub.1 is N-linked triazolyl, C-linked pyrimidinyl, or N-linked pyrazolyl which can be mono-substituted by chloro, cyano or trifluoromethyl; and [0146] R.sub.3 is hydrogen or methyl.
[0147] In another preferred group of compounds of formula I-1, [0148] R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; [0149] G is CH; [0150] X.sub.1 is O; [0151] R.sub.7 is hydrogen; [0152] A is N; [0153] X is SO.sub.2; [0154] R.sub.1 is ethyl; [0155] Q.sub.1 is pyrazol-1-yl, 3-chloro-pyrazol-1-yl, 3-cyano-pyrazol-1-yl, 3-trifluoromethyl-pyrazol-1-yl, 1,2,4-triazol-1-yl or pyrimidin-2-yl; and [0156] R.sub.3 is hydrogen.
[0157] In compounds of formula I-1 and all of the preferred embodiments of compounds of formula I-1 mentioned above, unless otherwise specified, R.sub.2, G, X.sub.1, R.sub.6, R.sub.7, A, X, R.sub.1, Q.sub.1, R.sub.3, R.sub.4 and R.sub.5 are as defined under formula I above; [0158]

preferably R.sub.2 is C.sub.1-C.sub.2fluoroalkyl or C.sub.1-C.sub.2fluoroalkoxy; most preferably R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; [0159] preferably G is CH or N; most preferably G is CH; [0160] preferably X.sub.1 is O, S or NCH.sub.3; most preferably X.sub.1 is O; [0161] preferably R.sub.7 is hydrogen or methyl; most preferably R.sub.7 is hydrogen; [0162] preferably A is N or CH; most preferably A is N; [0163] preferably X is S or SO.sub.2; most preferably X is SO.sub.2; [0164] preferably R.sub.1 is ethyl or cyclopropylmethyl; most preferably R.sub.1 is ethyl; [0165] preferably Q.sub.1 is hydrogen, trifluoromethyl, difluoroethyl, cyclopropyl, cyanocyclopropyl, cyanoisopropyl, cyanoisopropoxy, trifluoroethoxy, difluoropropoxy, 2-pyridyloxy, N-linked triazolyl, C-linked pyrimidinyl, N-linked pyrazolyl which can be mono-substituted by chloro, cyano or trifluoromethyl; or Q.sub.1 is —N(R.sub.4)COR.sub.5 in which R.sub.4 is hydrogen or methyl and R.sub.5 is either methyl, ethyl or cyclopropyl; most preferably Q.sub.1 is hydrogen, trifluoromethyl, 1,1-difluoroethyl, cyclopropyl, 1-cyanocyclopropyl, 1-cyano-1-methyl-ethyl, 1-cyano-1-methyl-ethoxy, 2,2,2-trifluoroethoxy, 2,2-difluoropropoxy, —N(CH.sub.3)COCH.sub.3, —N(CH.sub.3)COCH.sub.2CH.sub.3, —N(CH.sub.3)CO(cyclopropyl), 2-pyridyloxy, pyrazol-1-yl, 3-chloro-pyrazol-1-yl, 3-cyano-pyrazol-1-yl, 3-trifluoromethyl-pyrazol-1-yl, 1,2,4-triazol-1-yl or pyrimidin-2-yl; [0166] preferably R.sub.3 is hydrogen or methyl; most preferably R.sub.3 is hydrogen.

[0167] One further preferred group of compounds according to this embodiment are compounds of formula (I-1-1) which are compounds of formula (I-1) wherein [0168] R.sub.2 is C.sub.1-C.sub.2fluoroalkyl or C.sub.1-C.sub.2fluoroalkoxy; [0169] G is CH or N; [0170] X.sub.1 is O, S or NCH.sub.3; [0171] R.sub.7 is hydrogen or methyl; [0172] A is N or CH; [0173] X is S or SO.sub.2; [0174] R.sub.1 is ethyl or cyclopropylmethyl; [0175] Q.sub.1 is hydrogen, trifluoromethyl, difluoroethyl, cyclopropyl, cyanocyclopropyl, cyanoisopropyl, cyanoisopropoxy, trifluoroethoxy, difluoropropoxy, 2-pyridyloxy, N-linked pyrazolyl which can be mono-substituted by chloro, cyano or trifluoromethyl; or Q.sub.1 is N-linked triazolyl, C-linked pyrimidinyl, or —N(R.sub.4)COR.sub.5 in which R.sub.4 is hydrogen or methyl and R.sub.5 is either methyl, ethyl or cyclopropyl; and [0176] R.sub.3 is hydrogen or methyl.

[0177] One further preferred group of compounds according to this embodiment are compounds of formula (I-1-2) which are compounds of formula (I-1-1) wherein [0178] Q.sub.1 is hydrogen, trifluoromethyl, 1,1-difluoroethyl, cyclopropyl, 1-cyanocyclopropyl, 1-cyano-1-methyl-ethyl, 1-cyano-1-methyl-ethoxy, 2,2,2-trifluoroethoxy, 2,2-difluoropropoxy, —N(CH.sub.3)COCH.sub.3, —N(CH.sub.3)COCH.sub.2CH.sub.3, —N(CH.sub.3)CO(cyclopropyl), 2-pyridyloxy, pyrazol-1-yl, 3-chloro-pyrazol-1-yl, 3-cyano-pyrazol-1-yl, 3-trifluoromethyl-pyrazol-1-yl, 1,2,4-triazol-1-yl or pyrimidin-2-yl.

[0179] One further preferred group of compounds according to this embodiment are compounds of formula (I-1-3) which are compounds of formula (I-1-1) wherein [0180] Q.sub.1 is hydrogen, cyclopropyl, cyanocyclopropyl, cyanoisopropyl or cyanoisopropoxy.

[0181] One further preferred group of compounds according to this embodiment are compounds of formula (I-1-4) which are compounds of formula (I-1-1) wherein [0182] Q.sub.1 is hydrogen, cyclopropyl, 1-cyanocyclopropyl, 1-cyano-1-methyl-ethyl or 1-cyano-1-methyl-ethoxy.

[0183] One further preferred group of compounds according to this embodiment are compounds of formula (I-1-5) which are compounds of formula (I-1) wherein [0184] R.sub.2 is C.sub.1-C.sub.2fluoroalkyl or C.sub.1-C.sub.2fluoroalkoxy, preferably R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; [0185] G is CH or N; [0186] X.sub.1 is O, S or NCH.sub.3; [0187] R.sub.7 is hydrogen or methyl; [0188] A is N; [0189] X is SO.sub.2; [0190] R.sub.1 is ethyl; [0191] Q.sub.1 is hydrogen, cyclopropyl, 1-cyanocyclopropyl, 1-cyano-1-methyl-ethyl or 1-cyano-1-methyl-ethoxy; and [0192] R.sub.3 is hydrogen.

[0193] One further preferred group of compounds according to this embodiment are compounds of formula (I-1-6) which are compounds of formula (I-1-5) wherein [0194] G is CH; [0195] X.sub.1 is

O; and [0196] R.sub.7 is hydrogen or methyl, preferably hydrogen.
[0197] One further preferred group of compounds according to this embodiment are compounds of formula (I-1-7) which are compounds of formula (I-1-5) wherein [0198] G is N; [0199] X.sub.1 is O; and [0200] R.sub.7 is hydrogen or methyl, preferably hydrogen.
[0201] Another preferred group of compounds of formula I is represented by the compounds of formula I-2
##STR00005## [0202] wherein R.sub.2, G, X.sub.1, R.sub.6, R.sub.7, A, X, R.sub.1, Q.sub.1, R.sub.3, R.sub.4 and R.sub.5 are as defined under formula I above; or an agrochemically acceptable salt, stereoisomer, enantiomer, tautomer or N-oxide of a compound of formula I-2.
[0203] In one preferred group of compounds of formula I-2, [0204] R.sub.2 is C.sub.1-C.sub.2fluoroalkyl or C.sub.1-C.sub.2fluoroalkoxy; [0205] G is CH or N; [0206] X.sub.1 is O, S or NCH.sub.3; [0207] R.sub.7 is hydrogen or methyl; [0208] A is N or CH; [0209] X is S or SO.sub.2; [0210] R.sub.1 is ethyl or cyclopropylmethyl; [0211] Q.sub.1 is hydrogen, C.sub.3-C.sub.6cycloalkyl, —N(R.sub.4).sub.2 or —N(R.sub.4)COR.sub.5, in each of which R.sub.4 independently is either hydrogen or methyl and R.sub.5 is either methyl, ethyl or cyclopropyl; and [0212] R.sub.3 is hydrogen or methyl.
[0213] In another preferred group of compounds of formula I-2, [0214] R.sub.2 is C.sub.1-C.sub.2fluoroalkyl or C.sub.1-C.sub.2fluoroalkoxy; [0215] G is CH or N; [0216] X.sub.1 is O, S or NCH.sub.3; [0217] R.sub.7 is hydrogen or methyl; [0218] A is N or CH; [0219] X is S or SO.sub.2; [0220] R.sub.1 is ethyl or cyclopropylmethyl; [0221] Q.sub.1 is hydrogen, cyclopropyl, —N(R.sub.4).sub.2 or —N(R.sub.4)COR.sub.5, in each of which R.sub.4 independently is either hydrogen or methyl and R.sub.5 is either methyl, ethyl or cyclopropyl; and [0222] R.sub.3 is hydrogen or methyl.
[0223] In another preferred group of compounds of formula I-2, [0224] R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; [0225] G is CH or N; [0226] X.sub.1 is O, S or NCH.sub.3; [0227] R.sub.7 is hydrogen or methyl; [0228] A is N or CH; [0229] X is S or SO.sub.2; [0230] R.sub.1 is ethyl or cyclopropylmethyl; [0231] Q.sub.1 is hydrogen, cyclopropyl, —NH(CH.sub.3), —N(CH.sub.3)COCH.sub.3, —N(CH.sub.3)COCH.sub.2CH.sub.3, or —N(CH.sub.3)CO(cyclopropyl); and [0232] R.sub.3 is hydrogen or methyl.
[0233] In another preferred group of compounds of formula I-2, [0234] R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; [0235] G is CH; [0236] X.sub.1 is O; [0237] R.sub.7 is hydrogen; [0238] A is N; [0239] X is SO.sub.2; [0240] R.sub.1 is ethyl; [0241] Q.sub.1 is hydrogen, cyclopropyl, —NH(CH.sub.3), —N(CH.sub.3)COCH.sub.3, —N(CH.sub.3)COCH.sub.2CH.sub.3, or —N(CH.sub.3)CO(cyclopropyl); and [0242] R.sub.3 is hydrogen.
[0243] In another further preferred group of compounds of formula I-2, Q.sub.1 is a five- to six-membered aromatic or heteroaromatic ring system linked via a ring carbon atom to the ring which contains the substituent A, said ring system is unsubstituted or is mono-substituted by substituents selected from the group consisting of halogen, cyano and C.sub.1-C.sub.4haloalkyl; and said ring system can contain 1 or 2 ring nitrogen atoms. In this embodiment, more preferably Q.sub.1 is C-linked pyrimidinyl.
[0244] Also preferred compounds of formula I-2 are those wherein Q.sub.1 is a five-membered heteroaromatic ring system linked via a ring nitrogen atom to the ring which contains the substituent A, said ring system is unsubstituted or is mono-substituted by substituents selected from the group consisting of halogen, cyano and C.sub.1-C.sub.4haloalkyl; and said ring system contains 2 or 3 ring nitrogen atoms. In this embodiment, more preferably Q.sub.1 is N-linked triazolyl.
[0245] In another preferred group of compounds of formula I-2, [0246] R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; [0247] G is CH or N; [0248] X.sub.1 is O, S or NCH.sub.3; [0249] R.sub.7 is hydrogen or methyl; [0250] A is N or CH; [0251] X is S or SO.sub.2; [0252] R.sub.1 is ethyl or cyclopropylmethyl; [0253] Q.sub.1 is N-linked triazolyl or C-linked pyrimidinyl; and [0254] R.sub.3 is hydrogen or methyl.

[0255] In another preferred group of compounds of formula I-2, [0256] R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; [0257] G is CH; [0258] X.sub.1 is O; [0259] R.sub.7 is hydrogen; [0260] A is N; [0261] X is SO.sub.2; [0262] R.sub.1 is ethyl; [0263] Q.sub.1 is 1,2,4-triazol-1-yl or pyrimidin-2-yl; and [0264] R.sub.3 is hydrogen.
[0265] In compounds of formula I-2 and all of the preferred embodiments of compounds of formula I-2 mentioned above, unless otherwise specified, R.sub.2, G, X.sub.1, R.sub.6, R.sub.7, A, X, R.sub.1, Q.sub.1, R.sub.3, R.sub.4 and R.sub.5 are as defined under formula I above; [0266] preferably R.sub.2 is C.sub.1-C.sub.2fluoroalkyl or C.sub.1-C.sub.2fluoroalkoxy; most preferably R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; [0267] preferably G is CH or N; most preferably G is CH; [0268] preferably X.sub.1 is O, S or NCH.sub.3; most preferably X.sub.1 is O; [0269] preferably R.sub.7 is hydrogen or methyl; most preferably R.sub.7 is hydrogen; [0270] preferably A is N or CH; most preferably A is N; [0271] preferably X is S or SO.sub.2; most preferably X is SO.sub.2; [0272] preferably R.sub.1 is ethyl or cyclopropylmethyl; most preferably R.sub.1 is ethyl; [0273] preferably Q.sub.1 is hydrogen, cyclopropyl, N-linked triazolyl, C-linked pyrimidinyl, —N(R.sub.4).sub.2 or —N(R.sub.4)COR.sub.5, in each of which R.sub.4 independently is either hydrogen or methyl and R.sub.5 is either methyl, ethyl or cyclopropyl; most preferably Q.sub.1 is hydrogen, cyclopropyl, —NH(CH.sub.3), —N(CH.sub.3)COCH.sub.3, —N(CH.sub.3)COCH.sub.2CH.sub.3, —N(CH.sub.3)CO(cyclopropyl), 1,2,4-triazol-1-yl or pyrimidin-2-yl; [0274] preferably R.sub.3 is hydrogen or methyl; most preferably R.sub.3 is hydrogen.
[0275] One further preferred group of compounds according to this embodiment are compounds of formula (I-2-1) which are compounds of formula (I-2) wherein [0276] R.sub.2 is C.sub.1-C.sub.2fluoroalkyl or C.sub.1-C.sub.2fluoroalkoxy; [0277] G is CH or N; [0278] X.sub.1 is O, S or NCH.sub.3; [0279] R.sub.7 is hydrogen or methyl; [0280] A is N or CH; [0281] X is S or SO.sub.2; [0282] R.sub.1 is ethyl or cyclopropylmethyl; [0283] Q.sub.1 is hydrogen, cyclopropyl, N-linked triazolyl, C-linked pyrimidinyl, —N(R.sub.4).sub.2 or —N(R.sub.4)COR.sub.5, in each of which R.sub.4 independently is either hydrogen or methyl and R.sub.5 is either methyl, ethyl or cyclopropyl; and [0284] R.sub.3 is hydrogen or methyl.
[0285] One further preferred group of compounds according to this embodiment are compounds of formula (I-2-2) which are compounds of formula (I-2-1) wherein [0286] Q.sub.1 is hydrogen, cyclopropyl, —NH(CH.sub.3), —N(CH.sub.3)COCH.sub.3, —N(CH.sub.3)COCH.sub.2CH.sub.3, —N(CH.sub.3)CO(cyclopropyl), 1,2,4-triazol-1-yl or pyrimidin-2-yl.
[0287] One further preferred group of compounds according to this embodiment are compounds of formula (I-2-3) which are compounds of formula (I-2-1) wherein [0288] Q.sub.1 is hydrogen, cyclopropyl, N-linked triazolyl or C-linked pyrimidinyl.
[0289] One further preferred group of compounds according to this embodiment are compounds of formula (I-2-4) which are compounds of formula (I-2-1) wherein [0290] Q.sub.1 is hydrogen, cyclopropyl, 1,2,4-triazol-1-yl or pyrimidin-2-yl.
[0291] One further preferred group of compounds according to this embodiment are compounds of formula (I-2-5) which are compounds of formula (I-2) wherein [0292] R.sub.2 is C.sub.1-C.sub.2fluoroalkyl or C.sub.1-C.sub.2fluoroalkoxy, preferably R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; [0293] G is CH or N; [0294] X.sub.1 is O, S or NCH.sub.3; [0295] R.sub.7 is hydrogen or methyl; [0296] A is N; [0297] X is SO.sub.2; [0298] R.sub.1 is ethyl; [0299] Q.sub.1 is hydrogen, cyclopropyl, 1,2,4-triazol-1-yl or pyrimidin-2-yl; and [0300] R.sub.3 is hydrogen.
[0301] One further preferred group of compounds according to this embodiment are compounds of formula (I-2-6) which are compounds of formula (I-2-5) wherein [0302] G is CH; [0303] X.sub.1 is O; and [0304] R.sub.7 is hydrogen or methyl, preferably hydrogen.
[0305] One further preferred group of compounds according to this embodiment are compounds of formula (I-2-7) which are compounds of formula (I-2-5) wherein [0306] G is N; [0307] X.sub.1 is O; and [0308] R.sub.7 is hydrogen or methyl, preferably hydrogen.

[0309] An outstanding group of compounds according to the invention are those of formula I-3 ##STR00006## [0310] wherein [0311] R.sub.2 is C.sub.1-C.sub.2fluoroalkyl or C.sub.1-C.sub.2fluoroalkoxy, preferably R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; [0312] G is CH or N; [0313] X.sub.1 is O, S or NCH.sub.3; [0314] R.sub.7 is hydrogen or methyl; [0315] Q′ is a radical selected from the group consisting of formula Qa1 and Qb1 ##STR00007## [0316] wherein the arrow denotes the point of attachment to the bicyclic ring; [0317] and wherein [0318] Q.sub.1 is hydrogen, trifluoromethyl, difluoroethyl, cyclopropyl, cyanocyclopropyl, cyanoisopropyl, cyanoisopropoxy, trifluoroethoxy, difluoropropoxy, 2-pyridyloxy, N-linked pyrazolyl which can be mono-substituted by chloro, cyano or trifluoromethyl; or Q.sub.1 is N-linked triazolyl, C-linked pyrimidinyl or —N(R.sub.4)COR.sub.5, in which R.sub.4 is hydrogen or methyl and R.sub.5 is either methyl, ethyl or cyclopropyl; or an agrochemically acceptable salt, stereoisomer, enantiomer, tautomer or N-oxide of a compound of formula I-3.

[0319] One further outstanding group of compounds according to this embodiment are compounds of formula (I-3-1) which are compounds of formula (I-3) wherein [0320] Q.sub.1 is hydrogen, trifluoromethyl, 1,1-difluoroethyl, cyclopropyl, 1-cyanocyclopropyl, 1-cyano-1-methyl-ethyl, 1-cyano-1-methyl-ethoxy, 2,2,2-trifluoroethoxy, 2,2-difluoropropoxy, —N(CH.sub.3)COCH.sub.3, —N(CH.sub.3)COCH.sub.2CH.sub.3, —N(CH.sub.3)CO(cyclopropyl), 2-pyridyloxy, pyrazol-1-yl, 3-chloro-pyrazol-1-yl, 3-cyano-pyrazol-1-yl, 3-trifluoromethyl-pyrazol-1-yl, 1,2,4-triazol-1-yl or pyrimidin-2-yl.

[0321] One further outstanding group of compounds according to this embodiment are compounds of formula (I-3-2) which are compounds of formula (I-3) wherein [0322] Q.sub.1 is hydrogen, cyclopropyl, cyanocyclopropyl, cyanoisopropyl, cyanoisopropoxy, N-linked triazolyl or C-linked pyrimidinyl.

[0323] One further outstanding group of compounds according to this embodiment are compounds of formula (I-3-3) which are compounds of formula (I-3) wherein [0324] Q.sub.1 is hydrogen, cyclopropyl, 1-cyanocyclopropyl, 1-cyano-1-methyl-ethyl, 1-cyano-1-methyl-ethoxy, 1,2,4-triazol-1-yl or pyrimidin-2-yl.

[0325] One further outstanding group of compounds according to this embodiment are compounds of formula (I-3-4) which are compounds of formula (I-3-3) wherein [0326] G is CH; [0327] X.sub.1 is O; and [0328] R.sub.7 is hydrogen or methyl, preferably hydrogen.

[0329] One further outstanding group of compounds according to this embodiment are compounds of formula (I-3-5) which are compounds of formula (I-3-3) wherein [0330] G is N; [0331] X.sub.1 is O; and [0332] R.sub.7 is hydrogen or methyl, preferably hydrogen.

[0333] Compounds according to the invention may possess any number of benefits including, inter alia, advantageous levels of biological activity for protecting plants against insects or superior properties for use as agrochemical active ingredients (for example, greater biological activity, an advantageous spectrum of activity, an increased safety profile, improved physico-chemical properties, or increased biodegradability or environmental profile). In particular, it has been surprisingly found that certain compounds of formula (I) may show an advantageous safety profile with respect to non-target arthropods, in particular pollinators such as honey bees, solitary bees, and bumble bees. Most particularly, *Apis mellifera*.

[0334] In another aspect the present invention provides a composition comprising an insecticidally, acaricidally, nematicidally or molluscicidally effective amount of a compound of formula (I), or an agrochemically acceptable salt, stereoisomer, enantiomer, tautomer or N-oxide thereof, as defined in any of the embodiments under compounds of formula (I-1), (I-2) and (I-3) (above), and, optionally, an auxiliary or diluent.

[0335] In a further aspect the present invention provides a method of combating and 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, nematicidally or

molluscicidally effective amount of a compound of formula (I), or an agrochemically acceptable salt, stereoisomer, enantiomer, tautomer or N-oxide thereof, as defined in any of the embodiments under compounds of formula (I-1), (I-2) and (I-3) (above) or a composition as defined above.
[0336] In a yet further aspect, the present invention provides 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 as defined above.
[0337] The process according to the invention for preparing compounds of formula I is carried out in principle by methods known to those skilled in the art. More specifically, and as described in scheme 1 and 2, the subgroup of compounds of formula I, wherein X is SO (sulfoxide) and/or SO.sub.2 (sulfone), may be obtained by means of an oxidation reaction of the corresponding sulfide compounds of formula I, wherein X is S, involving reagents such as, for example, m-chloroperoxybenzoic acid (mCPBA), hydrogen peroxide, oxone, sodium periodate, sodium hypochlorite or tert-butyl hypochlorite amongst other oxidants. The oxidation reaction is generally conducted in the presence of a solvent. Examples of the solvent to be used in the reaction include aliphatic halogenated hydrocarbons such as dichloromethane and chloroform; esters, such as ethyl acetate; alcohols such as methanol and ethanol; acetic acid; water; and mixtures thereof. The amount of the oxidant to be used in the reaction is generally 1 to 3 moles, preferably 1 to 1.2 moles, relative to 1 mole of the sulfide compounds I to produce the sulfoxide compounds I, and preferably 2 to 2.2 moles of oxidant, relative to 1 mole of of the sulfide compounds I to produce the sulfone compounds 1. Such oxidation reactions are disclosed, for example, in WO 2013/018928.
##STR00008##
[0338] The chemistry described above in scheme 1 to access compounds of formula I-a2 and I-a3 from compounds of formula I-a1 can be applied analogously (scheme 2) for the preparation of compounds of formula I-a5 and I-a6 from compounds of formula I-a4, wherein all substituent definitions mentioned previously remain valid.
##STR00009##
[0339] The subgroup of compounds of formula I, wherein R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I and wherein Q is defined as Qa, in which Q.sub.1, R.sub.3, X, A and R.sub.1 are as defined in formula I, may be defined as compounds of formula I-Qa.
##STR00010##
[0340] Such compounds of formula I-Qa can be prepared (scheme 3) by a Suzuki cross-coupling reaction, which involves for example, reacting compounds of formula II-Qa, wherein Q.sub.1, R.sub.3, X, A and R.sub.1 are as defined in formula I, and wherein Xa is a leaving group like, for example, chlorine, bromine or iodine, or an aryl- or alkylsulfonate such as trifluoromethanesulfonate, with compounds of formula III, wherein R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I and wherein Ya is a boron-derived functional group, such as for example B(OH).sub.2 or B(OR.sub.b1).sub.2, wherein R.sub.bi can be a C.sub.1-C.sub.4alkyl group or the two groups OR.sub.b1 can form together with the boron atom a five membered ring, such as for example a pinacol boronic ester. The reaction can be catalyzed by a palladium based catalyst, for example tetrakis(triphenyl-phosphine)palladium or (1,1′bis(diphenylphosphino)ferrocene)dichloropalladium-dichloromethane (1:1 complex), in presence of a base, such as sodium carbonate, potassium carbonate or cesium fluoride, in a solvent or a solvent mixture, like, for example a mixture of 1,2-dimethoxyethane and water or of dioxane and water or of acetonitrile and water, preferably under inert atmosphere. The reaction temperature can preferentially range from ambient temperature to the boiling point of the reaction mixture. Such Suzuki reactions are well known to those skilled in the art and have been reviewed, for example *J. Orgmet. Chem.* 576, 1999, 147-168.
[0341] Alternatively compounds of formula I-Qa may be prepared by a Stille cross-coupling reaction of compounds of formula III, wherein Ya is a trialkyl tin derivative, preferably tri-n-butyl

tin, with compounds of formula II-Qa, wherein Xa is a leaving group like, for example, chlorine, bromine or iodine, or an aryl- or alkylsulfonate such as trifluoromethanesulfonate. Such Stille reactions are usually carried out in the presence of a palladium catalyst, for example tetrakis(triphenylphosphine)-palladium(0), or (1,1′bis(diphenylphosphino)-ferrocene)dichloropalladium-dichloromethane (1:1 complex), in an inert solvent such as DMF, acetonitrile, or dioxane, optionally in the presence of an additive, such as cesium fluoride, or lithium chloride, and optionally in the presence of a further catalyst, for example copper(I)iodide. Such Stille couplings are also well known to those skilled in the art and have been described in for example *J. Org. Chem.*, 2005, 70, 8601-8604, *J. Org. Chem.*, 2009, 74, 5599-5602, and *Angew. Chem. Int. Ed.*, 2004, 43, 1132-1136.

[0342] Compounds of formula III, wherein R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I and wherein Ya is a boron-derived functional group, such as for example B(OH).sub.2 or B(OR.sub.b1).sub.2, wherein R.sub.b, can be a C.sub.1-C.sub.4alkyl group or the two groups OR.sub.b1 can form together with the boron atom a five membered ring, such as for example a pinacol boronic ester,

##STR00011## [0343] can be prepared (scheme 4) by reacting compounds of formula IV, wherein R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I and wherein Xb is a leaving group such as, for example, chlorine, bromine or iodine, under borylation conditions detailed in scheme 5.

[0344] Alternatively, compounds of formula III, wherein R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I and wherein Ya is a trialkyl tin derivative, preferably tri-n-butyl tin, may be prepared via a stannylation step, involving for example reacting compounds of formula IV with an organometallic species like, for example, an organomagnesium compound (for example isopropylmagnesium chloride), to generate an intermediate species via metal-halogen exchange, preferably performed in an anhydrous aprotic solvent, such as tetrahydrofuran, at low temperature, preferably between −78° C. and 0° C., and quenching said intermediate species with a tin reagent of formula (alkyl).sub.3SnCl, for example tri-n-butyl tin chloride (n-butyl).sub.3SnCl.

[0345] Similarly, compounds of formula IIIa (a subgroup of compounds of formula III), wherein R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I and wherein Ya is B(OR.sub.b1).sub.2, wherein R.sub.b, is a C.sub.1-C.sub.4alkyl group,

##STR00012## [0346] can be prepared (scheme 5) by reacting compounds of formula IV, wherein R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I and wherein Xb is a leaving group such as, for example, chlorine, bromine or iodine, with an organometallic species like, for example, an organomagnesium compound (for example isopropylmagnesium chloride or isopropylmagnesium chloride lithium chloride complex), to generate an intermediate species via metal-halogen exchange, preferably performed in an anhydrous aprotic solvent, such as tetrahydrofuran, at low temperature, preferably between −78° C. and 0° C., and reacting said intermediate species with a trialkyl borate reagent of formula B(OR.sub.b1).sub.3, wherein R.sub.b, is a C.sub.1-C.sub.4alkyl group. Depending on nature of the trialkyl borate, the reaction treatment conditions and the workup conditions, the dialkylboronate IIIa can be formed and isolated, or the boronic acid compound of formula IIIc (another subgroup of compounds of formula III), wherein R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I, can be obtained directly. Such conditions have been described in the literature, for example, in WO 2017/122722.

[0347] Compounds of formula IIIb (yet another subgroup of compounds of formula III), wherein R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I and wherein Ya is a pinacol boronic ester (also known as the Bpin group, a case where the two groups OR.sub.b1 form together with the boron atom a five membered ring), may be prepared by reacting compounds of formula IV, wherein R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I and wherein Xb is a leaving group such as, for example, chlorine, bromine or iodine, with bis(pinacolato)diborane of formula V under palladium-catalyzed reaction conditions. Typically such conditions involve 1,1′bis(diphenylphosphino)ferrocene)dichloropalladium(II) (optionally as the dichloromethane

adduct), in the presence of a base, such as potassium acetate or potassium carbonate, in an inert solvent such as dioxane, N,N-dimethylformamide or acetonitrile, preferably under inert atmosphere, at temperatures preferentially ranging from ambient temperature to the boiling point of the reaction mixture. Such conditions have been described in the literature, for example, in Bioorg. Med. Chem. 15, 7138-7143 (2007). Depending on the reaction treatment conditions and the workup conditions, the pinacol boronic ester IIIb will be formed in situ, and the boronic acid compound of formula IIIc can be obtained directly. Such conditions have been described in the literature, for example, in Chem. Pharm. Bull. 68(8): 797-801 (2020).

[0348] Hydrolysis of either compounds of formula IIIa or IIIb into compounds of formula IIIc (all substituents as defined above) can be performed by methods known to those skilled in the art, for example with water, optionally in the presence of a co-solvent such as pentane, tetrahydrofuran or methanol, optionally either in the presence of aqueous acid (such as hydrochloric acid) or aqueous base (such as lithium, sodium or potassium hydroxide), preferably at temperatures between 0 and 40° C., even more preferably around 10 to 30° C.

[0349] Compounds of formula II-Qa, wherein Q.sub.1, R.sub.3, X, A and R.sub.1 are as defined in formula I, and wherein Xa is a leaving group like, for example, chlorine, bromine or iodine, ##STR00013## [0350] can be prepared (scheme 6) by reacting compounds of formula VI-Qa, wherein Q.sub.1, R.sub.3, X, A and R.sub.1 are as defined in formula I, with a nitrite, such as tert-butyl nitrite t-BuONO or isoamyl nitrite (examples of non aqueous conditions), or sodium nitrite in the presence of a hydrohalic acid HXa in water (aqueous conditions), and a copper salt Cu(I)Xa, wherein Xa is a leaving group like, for example, chlorine, bromine or iodine, under Sandmeyer-type reaction conditions. This transformation is preferably performed in an inert solvent, such as acetonitrile or a halogenated solvent like 1,2-dichloroethane or 1,2-dibromoethane (non aqueous conditions), or water at temperatures between 0-150° C., preferably at temperatures ranging from room temperature to the boiling point of the reaction mixture.

[0351] Alternatively, compounds of formula II-Qa, wherein X is S, and in which Q.sub.1, R.sub.3, A and R.sub.1 are as defined in formula I, and wherein Xa is a leaving group like, for example, chlorine, bromine or iodine, or an aryl- or alkylsulfonate such as trifluoromethanesulfonate, can be prepared by reacting compounds of formula VII-Qa, wherein Q.sub.1, R.sub.3 and A are as defined in formula I, and wherein Xa is a leaving group like, for example, chlorine, bromine or iodine, or an aryl- or alkylsulfonate such as trifluoromethanesulfonate, and wherein Xc is a leaving group such as, for example, fluoro or nitro, with a reagent of formula VIII

R.sub.1—SH (VIII), [0352] or a salt thereof, wherein R.sub.1 is as defined in formula I, optionally in the presence of a suitable base, such as alkali metal carbonates, for example sodium carbonate and potassium carbonate, or alkali metal hydrides such as sodium hydride, or alkali metal hydroxides such as sodium hydroxide and potassium hydroxide, or sodium or potassium tert-butoxide, in an inert solvent at temperatures preferably between 25-120° C. Examples of solvent to be used include ethers such as tetrahydrofuran THF, ethylene glycol dimethyl ether, tert-butylmethyl ether, and 1,4-dioxane, aromatic hydrocarbons such as toluene and xylene, nitriles such as acetonitrile or polar aprotic solvents such as N,N-dimethylformamide, N,N-dimethylacetamide, N-methyl-2-pyrrolidone NMP or dimethyl sulfoxide. Examples of salts of the compound of formula VIII include compounds of formula VIIIa

R.sub.1—S-M (VIIIa), [0353] wherein R.sub.1 is as defined above and wherein M is, for example, sodium or potassium. Such a process to prepare compounds of formula VIII can be found, for example, in WO16/091731.

[0354] Alternatively, this reaction to form II-Qa can be carried out in the presence of a palladium catalyst, such as tris(dibenzylideneacetone)dipalladium(0), in the presence of a phosphine ligand, such as xanthphos, in an inert solvent, for example, xylene at temperatures between 100-160° C.,

preferably 140° C., as described in Tetrahedron 2005, 61, 5253-5259.
[0355] Oxidation of compounds of formula II-Qa, wherein X is S, and in which Q.sub.1, R.sub.3, A and R.sub.1 are as defined in formula I, and wherein Xa is a leaving group like, for example, chlorine, bromine or iodine, or an aryl- or alkylsulfonate such as trifluoromethanesulfonate, with a suitable oxidizing agent, into compounds of formula II-Qa, wherein X is SO or SO.sub.2 may be achieved under conditions already described above.
[0356] Certain compounds of formula II-Qa, wherein Q.sub.1, R.sub.3, X, A and R.sub.1 are as defined in formula I, and wherein Xa is a leaving group, such as for example chlorine, are known and described in WO 2019/131587. Other compounds of formula II-Qa may be prepared in analogy to preparative descriptions found in said document.
[0357] Certain compounds of formula VI-Qa, wherein Q.sub.1, R.sub.3, X, A and R.sub.1 are as defined in formula I, are known and described in WO 2020/174094. Other compounds of formula VI-Qa may be prepared in analogy to preparative descriptions found in said document, or may be prepared by methods known to a person skilled in the art.
[0358] Compounds of formula VII-Qa, wherein Q.sub.1, R.sub.3 and A are as defined in formula I, and wherein Xa is a leaving group like, for example, chlorine, bromine or iodine, or an aryl- or alkylsulfonate such as trifluoromethanesulfonate, and wherein Xc is a leaving group such as, for example, fluoro or nitro; and reagents of formula VIII and VIIIa, or salts thereof, wherein R.sub.1 is as defined in formula I; are either known, commercially available or may be prepared by methods known to a person skilled in the art.
[0359] Compounds of formula IV, wherein R.sub.2, G and X.sub.1 are as defined in formula I and R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl, and wherein Xb is a leaving group such as, for example, chlorine, bromine or iodine,
##STR00014## [0360] can be prepared (scheme 7) by reacting compounds of formula IX, wherein R.sub.2, G and X.sub.1 are as defined in formula I and R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl, with an electrophilic halogen source Xb.sup.+ reagent (such as bromine Br.sub.2, N-bromosuccinimide NBS, iodine I.sub.2, or t-butyl hypochlorite tBuOCl amongst others), wherein Xb is chlorine, bromine or iodine, in an inert solvent, such as dichloromethane, chloroform, acetonitrile, dimethylacetamide, methanol, ethanol or pyridine, at temperatures between 0 and 50° C.
[0361] Compounds of formula IX, wherein R.sub.2, G and X.sub.1 are as defined in formula I and R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl, can be prepared by reacting compounds of formula X, wherein R.sub.2, G and X.sub.1 are as defined in formula I, with a reagent of formula XI, wherein R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl, under heating conditions, optionally in the presence of a diluent, such as N,N-dimethylformamide, dimethylacetamide, toluene or xylene, at temperatures between 5° and 180° C., preferably at temperatures ranging from 80° C. to the boiling point of the reaction mixture. Typically, a reagent of formula XI is for example N,N-dimethyl-formamide dimethyl acetal DMF-DMA (R.sub.7 is H) or 1,1-dimethoxy-N,N-dimethyl-ethanamine (R.sub.7 is methyl), which are commercial or may be prepared according to known procedures. Such conditions (for both steps in scheme 7) have been described in the literature, for example, in Synthesis 901-903 (1979), Bioorg. Med. Chem. Lett. 25, 2510-2513 (2015) or Eur. J. Org. Chem. 6440-6446 (2020).
[0362] Alternatively, compounds of formula IV, wherein R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I and wherein Xb is a leaving group such as, for example, chlorine, bromine or iodine,
##STR00015## [0363] can be prepared (scheme 8) by performing a halogenation reaction on compounds of formula XII, wherein R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I. Suitable conditions, preferably when R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl, may involve reacting compounds of formula XII with pyrrolidine or piperidine in an alcohol (such as methanol or ethanol) at temperatures between 3° and 100° C., preferably at temperatures ranging from 60° C.

to the boiling point of the reaction mixture, to form an enamino ketone intermediate. Subsequent treatment of said enamino ketone intermediate with a halogenating reagent of formula (Xb).sub.2, wherein Xb is chlorine, bromine or iodine, in an inert solvent (such as, for example, chloroform), at temperatures between 0 and 40° C., can deliver the compounds of formula IV, as described in Synthesis 719-7821 (1981) or Synthesis 901-903 (1979). Alternatively, oxidative halogenation conditions may be also be suitable to form the compounds of formula IV, for example by reacting compounds of formula XII with a hydrohalic acid HXb, wherein Xb is chlorine, bromine or iodine, in the presence of oxone (Synthesis (2004), 2641-2644; preferably Xb is chlorine or bromine) or m-chloroperbenzoic acid (Synthesis (1993), 283-4; preferably Xb is chlorine) as oxidants, in an inert solvent (such as, for example, dichloromethane or N,N-dimethylformamide), at temperatures between 0 and 40° C. Other oxidative halogenation conditions may involve ceric ammonium nitrate (CAN) and iodine (Xb is iodine), in an inert solvent (such as, for example, acetonitrile), at temperatures between 5° and 90° C., as described in Tetrahedron Letters 72 (2021) article 153070 (https://doi.org/10.1016/j.tetlet.2021.153070).

[0364] Compounds of formula XII, wherein R.sub.2, G and X.sub.1 are as defined in formula I and R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl, may be prepared by cyclizing compounds of formula XIII, wherein R.sub.2, G and X.sub.1 are as defined in formula I and R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl, and in which Ra is hydrogen or C.sub.1-C.sub.4alkyl, in the presence of acids, such as hydrochloric acid, hydrobromic acid, sulfuric acid, p-toluenesulfonic acid or polyphosphoric acid, in inert solvents such as acetic acid, methanol, ethanol, dimethylsulfoxide or water (or mixtures thereof), at temperatures between 0 and 100° C., preferably between room temperature and 80° C. Such conditions have been described in the literature, for example, in J. Med. Chem. 33, 1859-1865 (1990). In the particular situation where Ra is C.sub.1-C.sub.4alkyl, cyclization may be achieved by using potassium carbonate, optionally in catalytic amounts, in inerts solvents such as N,N-dimethylformamide or dimethylacetamide, at temperatures between 8° and 180° C., as described in Organic Letters 14, 2710-2713 (2012).

[0365] Compounds of formula XIII, wherein R.sub.2, G and X.sub.1 are as defined in formula I and R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl, and in which Ra is hydrogen or C.sub.1-C.sub.4alkyl,

##STR00016## [0366] may be prepared (scheme 9) typically by Claisen condensation-type chemistry from either starting materials of formula X-1 or XIV under conditions known to a person skilled in the art. For example, compounds of formula XIII may be obtained by condensation of compounds of formula X-1, wherein R.sub.2, G and X.sub.1 are as defined in formula I, and in which Ra is hydrogen or C.sub.1-C.sub.4alkyl, with a reagent of formula R.sub.7C(O)OR.sub.b, wherein R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl and R.sub.b is C.sub.1-C.sub.4alkyl (preferably methyl or ethyl), in the presence of a base, such as sodium hydride, sodium methoxide, sodium ethoxide or potassium t-butoxide, in inert solvents such as tetrahydrofuran, diethyl ether or t-butyl ethyl ether. Compounds of formula X described above (scheme 7) form a particular subgroup of compounds of formula X-1 wherein Ra is hydrogen.

[0367] Alternatively, compounds of formula XIII may be obtained by condensation of compounds of formula XIV, wherein R.sub.2, G and X.sub.1 are as defined in formula I, and in which Ra is hydrogen or C.sub.1-C.sub.4alkyl and R.sub.c is chloro or C.sub.1-C.sub.4alkoxy (preferably methoxy or ethoxy), with a reagent of formula R.sub.7C(O)CH.sub.3 or a reagent of formula R.sub.7C(O)CH.sub.2C(O)R.sub.d, wherein R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl and R.sub.d is methyl or C.sub.1-C.sub.4alkoxy (preferably methoxy or ethoxy), under analogous conditions as described above or adequately selected by a person skilled in the art. Such conditions have been described in the literature, for example, in J. Med. Chem. 33, 1859-1865 (1990).

[0368] Compounds of formula X-1, wherein R.sub.2, G and X.sub.1 are as defined in formula I, and in which Ra is hydrogen or C.sub.1-C.sub.4alkyl (encompassing compounds of formula X, wherein R.sub.2, G and X.sub.1 are as defined in formula I); and [0369] compounds of formula

XIV, wherein R.sub.2, G and X.sub.1 are as defined in formula I, and in which Ra is hydrogen or C.sub.1-C.sub.4alkyl and R.sub.c is chloro or C.sub.1-C.sub.4alkoxy (preferably methoxy or ethoxy); [0370] are either known, commercially available or may be prepared by methods known to a person skilled in the art.

[0371] The subgroup of compounds of formula I, wherein R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I and wherein Q is defined as Qb, in which Q.sub.1, R.sub.3, X, A and R.sub.1 are as defined in formula I, may be defined as compounds of formula I-Qb.

##STR00017##

[0372] The chemistry described previously in scheme 3 to access compounds of formula I-Qa from compounds of formula III and compounds of formula II-Qa, can be applied analogously (scheme 10) for the preparation of compounds of formula I-Qb from compounds of formula III and compounds of formula II-Qb, wherein all substituent definitions mentioned previously remain valid.

[0373] The chemistry described previously in scheme 6 to access compounds of formula II-Qa from either compounds of formula VI-Qa or compounds of formula VII-Qa, can be applied analogously (scheme 11) for the preparation of compounds of formula II-Qb from either compounds of formula VI-Qb or compounds of formula VII-Qb, wherein all substituent definitions mentioned previously remain valid.

##STR00018##

[0374] Alternatively, compounds of formula I-Qb, wherein Q.sub.1, R.sub.3, X, A, R.sub.1, R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I, may be prepared as illustrated in scheme 12.

##STR00019##

[0375] In the particular situation within scheme 12 when Q.sub.1 is an optionally substituted triazole linked via a ring nitrogen atom to the ring which contains the group A, then compounds of formula I-Qb, wherein X is SO or SO.sub.2, may be prepared from compounds of formula XVb, wherein R.sub.3, X, A, R.sub.1, R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I above, and in which X is SO or SO.sub.2, and wherein Xd is a leaving group like, for example, chlorine, bromine or iodine (preferably chlorine or bromine), or an aryl- or alkylsulfonate such as trifluoromethanesulfonate, by reaction (C—N bond formation) with an optionally substituted triazole Q.sub.1-H (which contains an appropriate NH functionality) (XVIaa), wherein Q.sub.1 is N-linked triazolyl, in solvents such as alcohols (eg. methanol, ethanol, isopropanol, or higher boiling linear or branched alcohols), pyridine or acetic acid, optionally in the presence of an additional base, such as potassium carbonate K.sub.2CO.sub.3 or cesium carbonate Cs.sub.2CO.sub.3, optionally in the presence of a copper catalyst, for example copper(I) iodide, at temperatures between 30-180° C., optionally under microwave irradiation.

[0376] In the particular situation within scheme 12 when Q.sub.1 is —N(R.sub.4)COR.sub.5, wherein R.sub.4 and R.sub.5 are as defined in formula I, then compounds of formula I-Qb, wherein X is SO or SO.sub.2, may be prepared from compounds of formula XVb, wherein R.sub.3, X, A, R.sub.1, R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I above, and in which X is SO or SO.sub.2, and wherein Xd is a leaving group like, for example, chlorine, bromine or iodine (preferably chlorine or bromine), or an aryl- or alkylsulfonate such as trifluoromethanesulfonate, by reaction (C—N bond formation) with a reagent Q.sub.1-H (XVIaa) equivalent to HN(R.sub.4)COR.sub.5, wherein R.sub.4 and R.sub.5 are as defined in formula 1. Such a reaction is performed in the presence of a base, such as potassium carbonate, cesium carbonate, sodium hydroxide, in an inert solvent, such as toluene, dimethylformamide DMF, N-methyl pyrrolidine NMP, dimethyl sulfoxide DMSO, dioxane, tetrahydrofuran THF, and the like, optionally in the presence of a catalyst, for example palladium(II)acetate, bis(dibenzylideneacetone)palladium(0) (Pd(dba).sub.2) or tris(dibenzylideneacetone)-dipalladium(0) (Pd.sub.2(dba).sub.3, optionally in form of a chloroform adduct), or a palladium pre-catalyst such as for example tert-BuBrettPhos Pd

G3 [(2-Di-tert-butylphosphino-3,6-dimethoxy-2′,4′,6′-triisopropyl-1,1′-biphenyl)-2-(2′-amino-1,1′-biphenyl)]palladium(II) methanesulfonate or BrettPhos Pd G3 [(2-di-cyclohexylphosphino-3,6-dimethoxy-2′, 4′,6′-triisopropyl-1,1′-biphenyl)-2-(2′-amino-1,1′-biphenyl)]palladium(II) methanesulfonate, and optionally in the presence of a ligand, for example SPhos, t-BuBrettPhos or Xantphos, at temperatures between 60-120° C., optionally under microwave irradiation.

[0377] In the particular situation within scheme 12 when Q.sub.1 is —N(R.sub.4).sub.2, wherein R.sub.4 is as defined in formula I, then compounds of formula I-Qb, wherein X is SO or SO.sub.2, may be prepared from compounds of formula XVb, wherein R.sub.3, X, A, R.sub.1, R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I above, and in which X is SO or SO.sub.2, and wherein Xd is a leaving group like, for example, chlorine, bromine or iodine (preferably chlorine or bromine), or an aryl- or alkylsulfonate such as trifluoromethanesulfonate, by reaction (C—N bond formation) with a reagent Q.sub.1-H (XVIaa) equivalent to HN(R.sub.4).sub.2, or a salt thereof (such as a hydrohalide salt, preferably a hydrochloride or a hydrobromide salt, or a trifluoroacetic acid salt, or any other equivalent salt), wherein R.sub.4 is as defined in formula 1. Such a reaction is commonly performed in an inert solvent such as alcohols, amides, esters, ethers, nitriles and water, particularly preferred are methanol, ethanol, 2,2,2-trifluoroethanol, propanol, isopropanol, N,N-dimethylformamide, N,N-dimethylacetamide, dioxane, tetrahydrofuran, dimethoxyethane, acetonitrile, ethyl acetate, toluene, water or mixtures thereof, at temperatures between 0-150° C., optionally under microwave irradiation or pressurized conditions using an autoclave, optionally in the presence of a copper catalyst, such as copper powder, copper(I) iodide or copper sulfate (optionally in form of a hydrate), or mixtures thereof, optionaly in presence a ligand, for example diamine ligands (e.g. N,N′-dimethylethylenediamine or trans-cyclohexyldiamine) or dibenzylideneacetone (dba), or 1,10-phenanthroline, and optionally in presence of a base such as potassium phosphate. Reagents HN(R.sub.4).sub.2, or HN(R.sub.4)COR.sub.5, wherein R.sub.4 and R.sub.5 are as defined in formula I, are either known, commercially available or may be prepared by methods known to a person skilled in the art.

[0378] Alternatively, compounds of formula I-Qb, wherein X is SO or SO.sub.2, may be prepared by a Suzuki reaction, which involves for example, reacting compounds of formula XVb, wherein R.sub.3, X, A, R.sub.1, R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I above, and in which X is SO or SO.sub.2, and wherein Xd is a leaving group like, for example, chlorine, bromine or iodine (preferably chlorine or bromine), or an aryl- or alkylsulfonate such as trifluoromethanesulfonate, with compounds of formula (XVI), wherein Q.sub.1 is as defined in formula I, and wherein Y.sub.b1 can be a boron-derived functional group, such as for example B(OH).sub.2 or B(OR.sub.b1).sub.2 wherein R.sub.b, can be a C.sub.1-C.sub.4alkyl group or the two groups OR.sub.b1 can form together with the boron atom a five membered ring, as for example a pinacol boronic ester. The reaction may be catalyzed by a palladium based catalyst, for example tetrakis(triphenylphosphine)palladium(0), (1,1′bis(diphenylphosphino)ferrocene)dichloro-palladium-dichloromethane (1:1 complex) or chloro(2-dicyclohexylphosphino-2′,4′,6′-triisopropyl-1,1′-biphenyl)[2-(2′-amino-1,1′-biphenyl)]palladium(II) (XPhos palladacycle), in presence of a base, like sodium carbonate, tripotassium phosphate or cesium fluoride, in a solvent or a solvent mixture, like, for example dioxane, acetonitrile, N,N-dimethyl-formamide, a mixture of 1,2-dimethoxyethane and water or of dioxane/water, or of toluene/water, preferably under inert atmosphere. The reaction temperature can preferentially range from room temperature to the boiling point of the reaction mixture, or the reaction may be performed under microwave irradiation. Such Suzuki reactions are well known to those skilled in the art and have been reviewed, for example, in J. Organomet. Chem. 576, 1999, 147-168.

[0379] Alternatively compounds of formula I-Qb, wherein X is SO or SO.sub.2, may be prepared by a Stille reaction between compounds of formula (XVIa), wherein Q.sub.1 is as defined above, and wherein Y.sub.b2 is a trialkyltin derivative, preferably tri-n-butyl tin or tri-methyl-tin, and compounds of formula XVb, wherein R.sub.3, X, A, R.sub.1, R.sub.2, G, X.sub.1 and R.sub.7 are

as defined in formula I above, and in which X is SO or SO.sub.2, and wherein Xd is a leaving group like, for example, chlorine, bromine or iodine (preferably chlorine or bromine), or an aryl- or alkylsulfonate such as trifluoromethanesulfonate. Such Stille reactions are usually carried out in the presence of a palladium catalyst, for example tetrakis(triphenylphosphine)palladium(0), or bis(triphenylphosphine)palladium(II) dichloride, in an inert solvent such as N,N-dimethylformamide, acetonitrile, toluene or dioxane, optionally in the presence of an additive, such as cesium fluoride, or lithium chloride, and optionally in the presence of a further catalyst, for example copper(I)iodide. Such Stille couplings are also well known to those skilled in the art, and have been described in for example J. Org. Chem., 2005, 70, 8601-8604, J. Org. Chem., 2009, 74, 5599-5602, and Angew. Chem. Int. Ed., 2004, 43, 1132-1136.

[0380] When Q.sub.1 is a five-membered aromatic ring system linked via a ring nitrogen atom to the ring which contains the substituent A, then compounds of formula I-Qb, wherein X is SO or SO.sub.2, may be prepared from compounds of formula XVb, wherein R.sub.3, X, A, R.sub.1, R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I above, and in which X is SO or SO.sub.2, and wherein Xd is a leaving group like, for example, chlorine, bromine or iodine (preferably chlorine or bromine), or an aryl- or alkylsulfonate such as trifluoromethanesulfonate, by reaction with a heterocycle Q.sub.1-H (which contains an appropriate NH functionality) (XVIaa), wherein Q.sub.1 is as defined above, in the presence of a base, such as potassium carbonate K.sub.2CO.sub.3 or cesium carbonate Cs.sub.2CO.sub.3, optionally in the presence of a copper catalyst, for example copper(I) iodide, with or without an additive such as L-proline, N,N′-dimethylcyclohexane-1,2-diamine or N,N′-dimethyl-ethylene-diamine, in an inert solvent such as N-methylpyrrolidone NMP or N,N-dimethylformamide DMF at temperatures between 30-150° C., optionally under microwave irradiation.

[0381] Oxidation of compounds of formula XVb, wherein R.sub.3, X, A, R.sub.1, R.sub.2, G, X.sub.1 and R.sub.7 are as defined in formula I above, and in which X is S, and wherein Xd is a leaving group like, for example, chlorine, bromine or iodine (preferably chlorine or bromine), or an aryl- or alkylsulfonate such as trifluoromethanesulfonate, with a suitable oxidizing agent, into compounds of formula XVb, wherein X is SO or SO.sub.2 may be achieved under conditions already described above.

[0382] A large number of compounds of formula (XVI), (XVIa) and (XVIaa) are commercially available or can be prepared by those skilled in the art.

[0383] Alternatively, compounds of formula I-Qb, wherein X is SO or SO.sub.2, may be prepared from compounds of formula XVb, wherein X is S (sulfide) by involving the same chemistry as described above, but by changing the order of the steps (i.e. by running the sequence XVb (X is S) to I-Qb (X is S) via Suzuki, Stille or C—N bond formation, followed by an oxidation step to form I-Qb (X is SO or SO.sub.2).

[0384] The chemistry described previously in scheme 12 to access compounds of formula I-Qb from compounds of formula XVb, can be applied analogously (scheme 13) for the preparation of compounds of formula I-Qa from compounds of formula XVa, wherein all substituent definitions mentioned previously remain valid.

##STR00020##

[0385] Alternatively, compounds of formula I, wherein Q, R.sub.2, G and X.sub.1 are as defined in formula I and R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl,

##STR00021## [0386] may be prepared (scheme 14) by reacting compounds of formula XVIII, wherein Q (in present scheme 14, the arrow in Qa, respectively Qb, denotes the point of attachment to the carbon atom ortho to the carbonyl group), R.sub.2, G and X.sub.1 are as defined in formula I, with a reagent of formula XI, wherein R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl, under analogous conditions already described in scheme 7 for the transformation of compounds of formula X into compounds of formula IX. Typically, a reagent of formula XI is for example N,N-dimethylformamide dimethyl acetal DMF-DMA (R.sub.7 is H) or 1,1-dimethoxy-N,N-dimethyl-

ethanamine (R.sub.7 is methyl). The process XVIII+XI under such conditions allows direct formation of compounds of formula I without isolation of possible intermediate compounds of formula XVII, wherein Q, R.sub.2, G and X.sub.1 are as defined in formula I and R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl. Such cyclization conditions have been described in the literature, for example, in WO 2015/047113.

[0387] Similarly, compounds of formula I, wherein Q, R.sub.2, G and X.sub.1 are as defined in formula I and R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl, may be prepared (scheme 14) by reacting compounds of formula XVIII, wherein Q, R.sub.2, G and X.sub.1 are as defined in formula I, with a reagent of formula XIX, wherein R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl and in which R.sub.f is C.sub.1-C.sub.4alkyl, preferably in the presence of an additive (optionally in catalytic amounts) such as pyridine, piperidine, morpholine or 4-dimethylaminopyridine (DMAP), optionally in the presence of a diluent, such as N,N-dimethylformamide, dimethylacetamide, toluene or xylene, at temperatures between 5° and 180° C., preferably at temperatures ranging from 80° C. to the boiling point of the reaction mixture. Typically, a reagent of formula XIX is for example triethyl orthoformate (R.sub.7 is H and R.sub.f is ethyl). The process XVIII+XIX under such conditions allows direct formation of compounds of formula I without isolation of possible intermediate compounds of formula XX, wherein Q, R.sub.2, G and X.sub.1 are as defined in formula I, R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl and in which R.sub.f is C.sub.1-C.sub.4alkyl. Such cyclization conditions have been described in the literature, for example, in J. Chem Research (12), 683-685 (2008).

[0388] Alternatively, compounds of formula I, wherein Q, R.sub.2, G and X.sub.1 are as defined in formula I and R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl,

##STR00022##

may be prepared (scheme 15) by cyclizing compounds of formula XXI, wherein Q (in present scheme 15, the arrow in Qa, respectively Qb, denotes the point of attachment to the carbon atom ortho to the carbonyl group), R.sub.2, G and X.sub.1 are as defined in formula I and R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl, and in which Ra is hydrogen or C.sub.1-C.sub.4alkyl, under analogous conditions already detailed in scheme 8 for the transformation of compounds of formula XIII into compounds of formula XII. Other such cyclization conditions have also been described in the literature, for example, in WO 2007/065888 or Eur. J. Org. Chem. 2971-2983 (2019).

[0389] Compounds of formula XVIII, wherein Q (in present scheme 18, the arrow in Qa, respectively Qb, denotes the point of attachment to the carbon atom ortho to the carbonyl group), R.sub.2, G and X.sub.1 are as defined in formula I,

##STR00023## [0390] may be prepared (scheme 16) by dealkylation of compounds of formula XVIII-1, wherein Q, R.sub.2, G and X.sub.1 are as defined in formula I, and in which Ra is C.sub.1-C.sub.4alkyl, in the presence of reagents such as boron tribromide or aluminium chloride, in solvents such as dichloromethane or 1,2-dichloroethane, and at temperatures ranging from −78° C. to room temperature, under conditions known to a person skilled in the art, and described for example in J Med Chem 61, 7917-7928 (2018).

[0391] Compounds of formula XVIII-1, wherein Q, R.sub.2, G and X.sub.1 are as defined in formula I, and in which Ra is hydrogen or C.sub.1-C.sub.4alkyl (encompassing compounds of formula XVIII, wherein Q, R.sub.2, G and X.sub.1 are as defined in formula I), may be prepared by reacting compounds of formula X-1, wherein R.sub.2, G and X.sub.1 are as defined in formula I, and in which Ra is hydrogen or C.sub.1-C.sub.4alkyl (encompassing compounds of formula X, wherein R.sub.2, G and X.sub.1 are as defined in formula I), with either compounds of formula II-Qa or II-Qb, wherein Q.sub.1, R.sub.3, X, A and R.sub.1 are as defined in formula I, and wherein Xa is a leaving group like, for example, chlorine, bromine or iodine, or an aryl- or alkylsulfonate such as trifluoromethane-sulfonate, in the presence of a base such as potassium or cesium carbonate, sodium hydride, sodium methoxide, sodium ethoxide or potassium t-butoxide, in inert solvents such as tetrahydrofuran, t-butyl ethyl ether, acetonitrile, dimethylsulfoxide or N,N-

dimethylformamide, and at temperatures ranging between 0 to 80° C., preferably between 20° C. and the boiling point of the reaction mixture. Such conditions have been described in the literature, for example, in Tetrahedron Letters 54, 402-405 (2013). Reacting X-1 with II-Qa provides XVIII-1 wherein Q is Qa; similarly, reacting X-1 with II-Qb provides XVIII-1 wherein Q is Qb.
[0392] Alternatively, compounds of formula XVIII-1, wherein Q, R.sub.2, G and X.sub.1 are as defined in formula I, and in which Ra is hydrogen or C.sub.1-C.sub.4alkyl, may be prepared by reacting compounds of formula X-1, wherein R.sub.2, G and X.sub.1 are as defined in formula I, and in which Ra is hydrogen or C.sub.1-C.sub.4alkyl, with either compounds of formula II-Qa or II-Qb, wherein Q.sub.1, R.sub.3, X, A and R.sub.1 are as defined in formula I, and wherein Xa is a leaving group like, for example, chlorine, bromine or iodine, or an aryl- or alkylsulfonate such as trifluoromethane-sulfonate, in the presence of a catalyst, for example palladium(II)acetate, palladium(II)chloride, bis(dibenzylideneacetone)palladium(0) (Pd(dba).sub.2) or tris(dibenzylideneacetone)-dipalladium(0) (Pd.sub.2(dba).sub.3, optionally in form of a chloroform adduct), in the presence of a ligand, for example triphenylphosphine, BINAP or Xantphos, in the presence of a base such as sodium or potassium t-butoxide, cesium carbonate or potassium carbonate, in inert solvents such as tetrahydrofuran, toluene or dioxane, and at temperatures between 60-120° C., optionally under microwave irradiation. Such conditions have been described in the literature, for example, in WO2016/097073, CN109956928 or Angew Chem Int Ed 53, 1529-1533 (2014).
[0393] Compounds of formula XXI, wherein Q (in present scheme 17, the arrow in Qa, respectively Qb, denotes the point of attachment to the carbon atom ortho to the carbonyl group), R.sub.2, G and X.sub.1 are as defined in formula I and R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl, and in which Ra is hydrogen or C.sub.1-C.sub.4alkyl,
##STR00024## [0394] may be prepared (scheme 17) by reacting compounds of formula XIII, wherein R.sub.2, G and X.sub.1 are as defined in formula I and R.sub.7 is hydrogen or C.sub.1-C.sub.4alkyl, and in which Ra is hydrogen or C.sub.1-C.sub.4alkyl, with either compounds of formula II-Qa or II-Qb, wherein Q.sub.1, R.sub.3, X, A and R.sub.1 are as defined in formula I, and wherein Xa is a leaving group like, for example, chlorine, bromine or iodine, or an aryl- or alkylsulfonate such as trifluoromethanesulfonate, in the presence of a base such as lithium diisopropylamide, potassium bis(trimethylsilyl)amide, sodium methoxide, sodium ethoxide, potassium t-butoxide or sodium hydride, optionally under copper or palladium catalysis, in inert solvents such as tetrahydrofuran, t-butyl ethyl ether or N,N-dimethylformamide, and at temperatures between 0 to 80° C. Reacting XIII with II-Qa provides XXI wherein Q is Qa; similarly, reacting XIII with II-Qb provides XXI wherein Q is Qb.
[0395] 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).
[0396] 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.
[0397] The reactions are 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.
[0398] 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, and by post modification of compounds of with reactions such as oxidation, alkylation, reduction, acylation and other methods known by those skilled in the art.
[0399] 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.
[0400] 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.
[0401] 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.
[0402] 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.
[0403] 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.
[0404] 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.
[0405] 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 diasteromers or racemates on the basis of the physicochemical differences of the components, for example by fractional crystallization, distillation and/or chromatography.
[0406] 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 (HPLC) on acetyl celulose, 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 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.

[0407] Pure diastereomers or enantiomers can be obtained according to the invention not only by separating 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.

[0408] N-oxides can be prepared by reacting a compound of formula I with a suitable oxidizing agent, for example the H.sub.2O.sub.2/urea adduct in the presence of an acid anhydride, e.g. trifluoroacetic anhydride. Such oxidations are known from the literature, for example from *J. Med. Chem.*, 32 (12), 2561-73, 1989 or WO 2000/15615.

[0409] 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 diastereomer mixture, if the individual components have a different biological activity.

[0410] 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.

[0411] The compounds according to the following Tables A-1 to A-36, Tables B-1 to B-36, Tables C-1 to C-36 and Tables D-1 to D-36 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 1.

[0412] The tables A-1 to A-36 below illustrate specific compounds of the invention.

##STR00025##

[0413] Table A-1 provides 20 compounds A-1.001 to A-1.020 of formula Ia-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.

TABLE-US-00001 TABLE Y Substituent definitions of Q.sub.1 Index Q.sub.1 1 H 2 —N(CH.sub.3)COCH.sub.3 3 —N(CH.sub.3)COCH.sub.2CH.sub.3 4 —N(CH.sub.3)COcycloC3 5 CF.sub.3 6 [00026]  embedded image 7 OCH.sub.2CF.sub.3 8 [00027]embedded image 9 [00028]embedded image 10 [00029]embedded image 11 [00030]embedded image 12 [00031]embedded image 13 [00032]embedded image 14 [00033]embedded image 15 [00034]embedded image 16 [00035]embedded image 17 [00036]embedded image 18 [00037]embedded image 19 [00038]embedded image 20 [00039]embedded image

[0414] In the table Y and in tables A, “cycloC3” represents cyclopropyl.

[0415] For example, compound A-10.018 is

##STR00040##

[0416] Table A-2 provides 20 compounds A-2.001 to A-2.020 of formula Ia-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.

[0417] Table A-3 provides 20 compounds A-3.001 to A-3.020 of formula Ia-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.

[0418] Table A-4 provides 20 compounds A-4.001 to A-4.020 of formula Ia-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.

[0419] Table A-5 provides 20 compounds A-5.001 to A-5.020 of formula Ia-Qa wherein R.sub.2 is

CF.sub.3, R.sub.7 is H, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0420] Table A-6 provides 20 compounds A-6.001 to A-6.020 of formula Ia-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0421] Table A-7 provides 20 compounds A-7.001 to A-7.020 of formula Ia-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0422] Table A-8 provides 20 compounds A-8.001 to A-8.020 of formula Ia-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0423] Table A-9 provides 20 compounds A-9.001 to A-9.020 of formula Ia-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0424] Table A-10 provides 20 compounds A-10.001 to A-10.020 of formula Ia-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0425] Table A-11 provides 20 compounds A-11.001 to A-11.020 of formula Ia-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0426] Table A-12 provides 20 compounds A-12.001 to A-12.020 of formula Ia-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0427] Table A-13 provides 20 compounds A-13.001 to A-13.020 of formula Ia-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0428] Table A-14 provides 20 compounds A-14.001 to A-14.019 of formula Ia-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0429] Table A-15 provides 20 compounds A-15.001 to A-15.020 of formula Ia-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0430] Table A-16 provides 20 compounds A-16.001 to A-16.020 of formula Ia-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0431] Table A-17 provides 20 compounds A-17.001 to A-17.020 of formula Ia-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0432] Table A-18 provides 20 compounds A-18.001 to A-18.020 of formula Ia-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0433] Table A-19 provides 20 compounds A-19.001 to A-19.020 of formula Ia-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0434] Table A-20 provides 20 compounds A-20.001 to A-20.020 of formula Ia-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0435] Table A-21 provides 20 compounds A-21.001 to A-21.020 of formula Ia-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.

[0436] Table A-22 provides 20 compounds A-22.001 to A-22.020 of formula Ia-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0437] Table A-23 provides 20 compounds A-23.001 to A-23.020 of formula Ia-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0438] Table A-24 provides 20 compounds A-24.001 to A-24.020 of formula Ia-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0439] Table A-25 provides 20 compounds A-25.001 to A-25.020 of formula Ia-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0440] Table A-26 provides 20 compounds A-26.001 to A-26.020 of formula Ia-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0441] Table A-27 provides 20 compounds A-27.001 to A-27.020 of formula Ia-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0442] Table A-28 provides 20 compounds A-28.001 to A-28.020 of formula Ia-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0443] Table A-29 provides 20 compounds A-29.001 to A-29.020 of formula Ia-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0444] Table A-30 provides 20 compounds A-30.001 to A-30.020 of formula Ia-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0445] Table A-31 provides 20 compounds A-31.001 to A-31.020 of formula Ia-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0446] Table A-32 provides 20 compounds A-32.001 to A-32.020 of formula Ia-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0447] Table A-33 provides 20 compounds A-33.001 to A-33.020 of formula Ia-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0448] Table A-34 provides 20 compounds A-34.001 to A-34.020 of formula Ia-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0449] Table A-35 provides 20 compounds A-35.001 to A-35.020 of formula Ia-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0450] Table A-36 provides 20 compounds A-36.001 to A-36.020 of formula Ia-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0451] The tables B-1 to B-36 below further illustrate specific compounds of the invention.
##STR00041##
[0452] Table B-1 provides 12 compounds B-1.001 to B-1.012 of formula Ia-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

TABLE-US-00002 TABLE Z Substituent definitions of Q.sub.1 Index Q.sub.1 1 H 2 —N(CH.sub.3)COCH.sub.3 3 —N(CH.sub.3)COCH.sub.2CH.sub.3 4 —N(CH.sub.3)COcycloC3 5 [00042]  embedded image 6 [00043]  embedded image 7 —NH.sub.2 8 —NH(CH.sub.3) 9 —NHCOCH.sub.3 10 —NHCOCH.sub.2CH.sub.3 11 —NHCOcycloC3 12 [00044]
 embedded image

[0453] In the table Z and in tables B, “cycloC3” represents cyclopropyl.

[0454] Table B-2 provides 12 compounds B-2.001 to B-2.012 of formula Ia-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0455] Table B-3 provides 12 compounds B-3.001 to B-3.012 of formula Ia-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0456] Table B-4 provides 12 compounds B-4.001 to B-4.012 of formula Ia-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0457] Table B-5 provides 12 compounds B-5.001 to B-5.012 of formula Ia-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0458] Table B-6 provides 12 compounds B-6.001 to B-6.012 of formula Ia-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0459] Table B-7 provides 12 compounds B-7.001 to B-7.012 of formula Ia-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0460] Table B-8 provides 12 compounds B-8.001 to B-8.012 of formula Ia-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0461] Table B-9 provides 12 compounds B-9.001 to B-9.012 of formula Ia-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0462] Table B-10 provides 12 compounds B-10.001 to B-10.012 of formula Ia-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0463] Table B-11 provides 12 compounds B-11.001 to B-11.012 of formula Ia-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0464] Table B-12 provides 12 compounds B-12.001 to B-12.012 of formula Ia-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0465] Table B-13 provides 12 compounds B-13.001 to B-13.012 of formula Ia-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0466] Table B-14 provides 12 compounds B-14.001 to B-14.012 of formula Ia-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0467] Table B-15 provides 12 compounds B-15.001 to B-15.012 of formula Ia-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0468] Table B-16 provides 12 compounds B-16.001 to B-16.012 of formula Ia-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is

as defined in table Z.
[0469] Table B-17 provides 12 compounds B-17.001 to B-17.012 of formula Ia-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0470] Table B-18 provides 12 compounds B-18.001 to B-18.012 of formula Ia-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0471] Table B-19 provides 12 compounds B-19.001 to B-19.012 of formula Ia-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0472] Table B-20 provides 12 compounds B-20.001 to B-20.012 of formula Ia-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0473] Table B-21 provides 12 compounds B-21.001 to B-21.012 of formula Ia-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0474] Table B-22 provides 12 compounds B-22.001 to B-22.012 of formula Ia-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0475] Table B-23 provides 12 compounds B-23.001 to B-23.012 of formula Ia-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0476] Table B-24 provides 12 compounds B-24.001 to B-24.012 of formula Ia-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0477] Table B-25 provides 12 compounds B-25.001 to B-25.012 of formula Ia-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0478] Table B-26 provides 12 compounds B-26.001 to B-26.012 of formula Ia-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0479] Table B-27 provides 12 compounds B-27.001 to B-27.012 of formula Ia-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0480] Table B-28 provides 12 compounds B-28.001 to B-28.012 of formula Ia-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0481] Table B-29 provides 12 compounds B-29.001 to B-29.012 of formula Ia-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0482] Table B-30 provides 12 compounds B-30.001 to B-30.012 of formula Ia-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0483] Table B-31 provides 12 compounds B-31.001 to B-31.012 of formula Ia-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0484] Table B-32 provides 12 compounds B-32.001 to B-32.012 of formula Ia-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0485] Table B-33 provides 12 compounds B-33.001 to B-33.012 of formula Ia-Qb wherein

R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0486] Table B-34 provides 12 compounds B-34.001 to B-34.012 of formula Ia-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0487] Table B-35 provides 12 compounds B-35.001 to B-35.012 of formula Ia-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0488] Table B-36 provides 12 compounds B-36.001 to B-36.012 of formula Ia-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0489] The tables C-1 to C-36 below further illustrate specific compounds of the invention.
##STR00045##
[0490] In the table Y and in tables C, “cycloC3” represents cyclopropyl.
[0491] Table C-1 provides 20 compounds C-1.001 to C-1.020 of formula Ib-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0492] Table C-2 provides 20 compounds C-2.001 to C-2.020 of formula Ib-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0493] Table C-3 provides 20 compounds C-3.001 to C-3.020 of formula Ib-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0494] Table C-4 provides 20 compounds C-4.001 to C-4.020 of formula Ib-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0495] Table C-5 provides 20 compounds C-5.001 to C-5.020 of formula Ib-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0496] Table C-6 provides 20 compounds C-6.001 to C-6.020 of formula Ib-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0497] Table C-7 provides 20 compounds C-7.001 to C-7.020 of formula Ib-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0498] Table C-8 provides 20 compounds C-8.001 to C-8.020 of formula Ib-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0499] Table C-9 provides 20 compounds C-9.001 to C-9.020 of formula Ib-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0500] Table C-10 provides 20 compounds C-10.001 to C-10.020 of formula Ib-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0501] Table C-11 provides 20 compounds C-11.001 to C-11.020 of formula Ib-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0502] Table C-12 provides 20 compounds C-12.001 to C-12.020 of formula Ib-Qa wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.

[0503] Table C-13 provides 20 compounds C-13.001 to C-13.020 of formula Ib-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0504] Table C-14 provides 20 compounds C-14.001 to C-14.020 of formula Ib-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0505] Table C-15 provides 20 compounds C-15.001 to C-15.020 of formula Ib-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0506] Table C-16 provides 20 compounds C-16.001 to C-16.020 of formula Ib-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0507] Table C-17 provides 20 compounds C-17.001 to C-17.020 of formula Ib-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0508] Table C-18 provides 20 compounds C-18.001 to C-18.020 of formula Ib-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0509] Table C-19 provides 20 compounds C-19.001 to C-19.20 of formula Ib-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0510] Table C-20 provides 20 compounds C-20.001 to C-20.020 of formula Ib-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0511] Table C-21 provides 20 compounds C-21.001 to C-21.020 of formula Ib-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0512] Table C-22 provides 20 compounds C-22.001 to C-22.020 of formula Ib-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0513] Table C-23 provides 20 compounds C-23.001 to C-23.020 of formula Ib-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0514] Table C-24 provides 20 compounds C-24.001 to C-24.020 of formula Ib-Qa wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0515] Table C-25 provides 20 compounds C-25.001 to C-25.020 of formula Ib-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0516] Table C-26 provides 20 compounds C-26.001 to C-26.020 of formula Ib-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0517] Table C-27 provides 20 compounds C-27.001 to C-27.020 of formula Ib-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0518] Table C-28 provides 20 compounds C-28.001 to C-28.020 of formula Ib-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0519] Table C-29 provides 20 compounds C-29.001 to C-29.020 of formula Ib-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is

as defined in table Y.
[0520] Table C-30 provides 20 compounds C-30.001 to C-30.020 of formula Ib-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0521] Table C-31 provides 20 compounds C-31.001 to C-31.020 of formula Ib-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0522] Table C-32 provides 20 compounds C-32.001 to C-32.020 of formula Ib-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0523] Table C-33 provides 20 compounds C-33.001 to C-33.020 of formula Ib-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0524] Table C-34 provides 20 compounds C-34.001 to C-34.020 of formula Ib-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0525] Table C-35 provides 20 compounds C-35.001 to C-35.020 of formula Ib-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0526] Table C-36 provides 20 compounds C-36.001 to C-36.020 of formula Ib-Qa wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Y.
[0527] The tables D-1 to D-36 below further illustrate specific compounds of the invention.
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[0528] In the table Z and in tables D, “cycloC3” represents cyclopropyl.
[0529] Table D-1 provides 12 compounds D-1.001 to D-1.012 of formula Ib-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0530] Table D-2 provides 12 compounds D-2.001 to D-2.012 of formula Ib-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0531] Table D-3 provides 12 compounds D-3.001 to D-3.012 of formula Ib-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0532] Table D-4 provides 12 compounds D-4.001 to D-4.012 of formula Ib-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0533] Table D-5 provides 12 compounds D-5.001 to D-5.012 of formula Ib-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0534] Table D-6 provides 12 compounds D-6.001 to D-6.012 of formula Ib-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is H, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0535] Table D-7 provides 12 compounds D-7.001 to D-7.012 of formula Ib-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0536] Table D-8 provides 12 compounds D-8.001 to D-8.012 of formula Ib-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0537] Table D-9 provides 12 compounds D-9.001 to D-9.012 of formula Ib-Qb wherein R.sub.2 is

CF.sub.3, R.sub.7 is CH.sub.3, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0538] Table D-10 provides 12 compounds D-10.001 to D-10.012 of formula Ib-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0539] Table D-11 provides 12 compounds D-11.001 to D-11.012 of formula Ib-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0540] Table D-12 provides 12 compounds D-12.001 to D-12.012 of formula Ib-Qb wherein R.sub.2 is CF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0541] Table D-13 provides 12 compounds D-13.001 to D-13.012 of formula Ib-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0542] Table D-14 provides 12 compounds D-14.001 to D-14.012 of formula Ib-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0543] Table D-15 provides 12 compounds D-15.001 to D-15.012 of formula Ib-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0544] Table D-16 provides 12 compounds D-16.001 to D-16.012 of formula Ib-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0545] Table D-17 provides 12 compounds D-17.001 to D-17.012 of formula Ib-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0546] Table D-18 provides 12 compounds D-18.001 to D-18.012 of formula Ib-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is H, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0547] Table D-19 provides 12 compounds D-19.001 to D-19.012 of formula Ib-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0548] Table D-20 provides 12 compounds D-20.001 to D-20.012 of formula Ib-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0549] Table D-21 provides 12 compounds D-21.001 to D-21.012 of formula Ib-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0550] Table D-22 provides 12 compounds D-22.001 to D-22.012 of formula Ib-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0551] Table D-23 provides 12 compounds D-23.001 to D-23.012 of formula Ib-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0552] Table D-24 provides 12 compounds D-24.001 to D-24.012 of formula Ib-Qb wherein R.sub.2 is OCHF.sub.2, R.sub.7 is CH.sub.3, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0553] Table D-25 provides 12 compounds D-25.001 to D-25.012 of formula Ib-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.

[0554] Table D-26 provides 12 compounds D-26.001 to D-26.012 of formula Ib-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0555] Table D-27 provides 12 compounds D-27.001 to D-27.012 of formula Ib-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0556] Table D-28 provides 12 compounds D-28.001 to D-28.012 of formula Ib-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0557] Table D-29 provides 12 compounds D-29.001 to D-29.012 of formula Ib-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0558] Table D-30 provides 12 compounds D-30.001 to D-30.012 of formula Ib-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is H, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0559] Table D-31 provides 12 compounds D-31.001 to D-31.012 of formula Ib-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is N, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0560] Table D-32 provides 12 compounds D-32.001 to D-32.012 of formula Ib-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is N, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0561] Table D-33 provides 12 compounds D-33.001 to D-33.012 of formula Ib-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is N, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0562] Table D-34 provides 12 compounds D-34.001 to D-34.012 of formula Ib-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is S, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0563] Table D-35 provides 12 compounds D-35.001 to D-35.012 of formula Ib-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is SO, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0564] Table D-36 provides 12 compounds D-36.001 to D-36.012 of formula Ib-Qb wherein R.sub.2 is OCF.sub.3, R.sub.7 is CH.sub.3, A is CH, X is SO.sub.2, R.sub.1 is CH.sub.2CH.sub.3 and Q.sub.1 is as defined in table Z.
[0565] The compounds of formula I according to the invention are preventively and/or curatively valuable ac-tive 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 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 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 oviposition and/or hatching rate, a good activity corresponding to a destruction rate (mortality) of at least 50 to 60%.
[0566] Examples of the above mentioned animal pests are: [0567] from the order Acarina, for example, [0568] *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., *Polyphagotarsone latus, Panonychus* spp., *Phyllocoptruta oleivora, Phytonemus* spp, *Polyphagotarsonemus* spp, *Psoroptes* spp., *Rhipicephalus* spp., *Rhizoglyphus* spp., *Sarcoptes* spp.,

Steneotarsonemus spp, *Tarsonemus* spp. and *Tetranychus* spp.; [0569] from the order Anoplura, for example, [0570] *Haematopinus* spp., *Linognathus* spp., *Pediculus* spp., *Pemphigus* spp. and *Phylloxera* spp.; [0571] from the order Coleoptera, for example, [0572] *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, Lagria vilosa, Leptinotarsa decemLineata, Lissorhoptrus* spp., *Liogenys* spp, *Maecolaspis* spp, *Maladera castanea, Megascelis* spp, *Melighetes 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.; [0573] from the order Diptera, for example, [0574] *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* 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.; [0575] from the order Hemiptera, for example, [0576] *Acanthocoris scabrator, Acrosternum* spp, *Adelphocoris lineolatus, Amblypelta nitida, Bathycoelia thalassina, Blissus* spp, *Cimex* spp., *Clavigralla tomentosicollis, Creontiades* spp, *Distantiella theobroma, Dichelops furcatus, Dysdercus* spp., *Edessa* spp, *Euschistus* spp., *Eurydema pulchrum, Eurygaster* spp., *Halyomorpha halys, Horcias nobilellus, Leptocorisa* 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; Acyrthosium pisum, Adalges* spp, *Agalliana ensigera, Agonoscena 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, *Nephotettix* 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 erytreae, Unaspis citri, Zygina flammigera, Zyginidia scutellaris;* [0577] from the order Hymenoptera, for example, [0578] *Acromyrmex, Arge* spp, *Atta* spp., *Cephus* spp., *Diprion* spp., *Diprionidae, Gilpinia polytoma, Hoplo-campa* spp., *Lasius* spp., *Monomorium pharaonis, Neodiprion* spp., *Pogonomyrmex* spp, *Slenopsis invicta, Solenopsis* spp. and *Vespa* spp.; [0579] from the order Isoptera, for example, [0580] *Coptotermes* spp, *Corniternes*

cumulans, Incisitermes spp, *Macrotermes* spp, *Mastotermes* spp, *Microtermes* spp, *Reticulitermes* spp.; *Solenopsis geminate* [0581] from the order Lepidoptera, for example, [0582] *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, Gra-pholita* spp., *Hedya 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 gossypi-ela, 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.; [0583] from the order Mallophaga, for example, [0584] *Damalinea* spp. and *Trichodectes* spp.; [0585] from the order Orthoptera, for example, [0586] *Blatta* spp., *Blattella* spp., *Gryllotalpa* spp., *Leucophaea maderae, Locusta* spp., *Neocurtilla hexadactyla, Periplaneta* spp., *Scapteriscus* spp, and *Schistocerca* spp.; [0587] from the order Psocoptera, for example, [0588] *Liposcelis* spp.; [0589] from the order Siphonaptera, for example, [0590] *Ceratophyllus* spp., *Ctenocephalides* spp. and *Xenopsylla cheopis;* [0591] from the order Thysanoptera, for example, [0592] *Calliothrips phaseoli, Frankliniella* spp., *Heliothrips* spp, *Hercinothrips* spp., *Parthenothrips* spp, *Scirtothrips aurantii, Sericothrips variabilis, Taeniothrips* spp., *Thrips* spp; [0593] from the order Thysanura, for example, *Lepisma saccharina.*

[0594] 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 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.

[0595] Suitable target crops are, in particular, cereals, such as wheat, barley, rye, oats, rice, maize or 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, 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, Cinnamonium or camphor; and also tobacco, nuts, coffee, eggplants, sugarcane, tea, pepper, grapevines, hops, the plantain family and latex plants.

[0596] 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., *Alonsoa* spp., *Anemone* spp., *Anisodontea capsenisis, Anthemis* spp., *Antirrhinum* spp., *Aster* spp., *Begonia* spp. (*e.g. B. elatior, B. semperflorens, B. tubéreux*), *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., *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., *Bellis* spp., *Pelargonium* spp. (*P. peltatum, P. Zonale*), *Viola* spp. (pansy), *Petunia* spp., *Phlox* spp., *Plecthranthus* spp., *Poinsettia* spp., *Parthenocissus* spp. (*P. quinquefolia, P. tricuspidata*), *Primula* spp., *Ranunculus* spp., *Rhododendron* spp., *Rosa* spp. (rose), *Rudbeckia* spp., *Saintpaulia* spp., *Salvia* spp., *Scaevola aemola, Schizanthus wisetonensis, Sedum* spp., *Solanum* spp., *Surfinia* spp., *Tagetes* spp., *Nicotinia* spp., *Verbena* spp., *Zinnia* spp. and other bedding plants.

[0597] For example the invention may be used on any of the following vegetable species: *Allium* spp. (*A. sativum, A. cepa, A. oschaninii, A. Porrum, A. ascalonicum, A. fistulosum*), *Anthriscus cerefolium, Apium graveolus, Asparagus officinalis, Beta vulgarus, Brassica* spp. (*B. Oleracea, B. Pekinensis, B. rapa*), *Capsicum annuum, Cicer arietinum, Cichorium endivia, Cichorum* 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 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.*

[0598] Preferred ornamental species include African violet, *Begonia, Dahlia, Gerbera, Hydrangea, Verbena, 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.

[0599] 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), *Cydia pomonella* (preferably in apples), *Empoasca*(preferably in vegetables, vineyards), *Leptinotarsa* (preferably in potatos) and *Chilo supressalis* (preferably in rice).

[0600] 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), *Cydia pomonella* (preferably in apples), *Empoasca*(preferably in vegetables, vineyards), *Leptinotarsa* (preferably in potatos) and *Chilo supressalis* (preferably in rice).

[0601] 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 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, *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, *Heliocotylenchus multicinctus* and other *Helicotylenchus* species; Sheath and sheathoid nematodes, *Hemicycliophora* 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 curvitatus, Pratylenchus goodeyi* and other *Pratylenchus* species; Burrowing *nematodes, 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 plant parasitic nematode species, such as *Subanguina* spp., *Hypsoperine* spp., *Macroposthonia* spp., *Melinius* spp., *Punctodera* spp., and *Quinisulcius* spp.

[0602] 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*); *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.*

[0603] 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 genus *Bacillus.*

[0604] 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 S-endotoxins, e.g. Cry1Ab, Cry1Ac, Cry1F, Cry1Fa2, Cry2Ab, Cry3A, Cry3Bb1 or Cry9C, or vegetative insecticidal proteins (Vip), e.g. Vip1, Vip2, Vip3 or Vip3A; or insecticidal proteins of bacteria colonising *nematodes*, for example *Photorhabdus* spp. or *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 Streptomycetes toxins, plant lectins, such as pea lectins, barley lectins or snowdrop lectins; agglutinins; proteinase inhibitors, such as trypsin inhibitors, serine protease inhibitors, patatin, cystatin, papain inhibitors; ribosome-inactivating proteins (RIP), such as ricin, maize-RIP, abrin, luffin, saporin or bryodin; steroid metabolism enzymes, such as 3-hydroxysteroidoxidase, ecdysteroid-UDP-glycosyl-transferase, cholesterol oxidases, ecdysone inhibitors, HMG-COA-reductase, ion channel blockers, such as blockers of sodium or calcium channels, juvenile hormone esterase, diuretic hormone receptors, stilbene synthase, bibenzyl synthase, chitinases and glucanases.

[0605] In the context of the present invention there are to be understood by S-endotoxins, for example Cry1Ab, Cry1Ac, Cry1F, Cry1Fa2, Cry2Ab, Cry3A, Cry3Bb1 orCry9C, or vegetative insecticidal proteins (Vip), for example Vip1, Vip2, Vip3 or Vip3A, expressly also hybrid toxins, truncated toxins and modified toxins. Hybrid toxins are produced recombinantly by a new combination of different domains of those proteins (see, for example, WO 02/15701). Truncated toxins, for example a truncated Cry1Ab, are known. In the case of modified toxins, one or more amino acids of the naturally occurring toxin are replaced. In such amino acid replacements, preferably non-naturally present protease recognition sequences are inserted into the toxin, such as, for example, in the case of Cry3A055, a cathepsin-G-recognition sequence is inserted into a Cry3A

toxin (see WO 03/018810). 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.

[0606] The processes for the preparation of such transgenic plants are generally known to the person skilled in the art and are described, for example, in the publications mentioned above. Cryl-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.

[0607] 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).

[0608] Transgenic plants containing one or more genes that code for an insecticidal resistance and express one or more toxins are known and some of them are commercially available. Examples of such plants are: YieldGard® (maize variety that expresses a Cry1Ab toxin); YieldGard Rootworm® (maize variety that expresses a Cry3Bb1 toxin); YieldGard Plus® (maize variety that expresses a Cry1Ab and 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 Cry1Ac toxin); Bollgard I® (cotton variety that expresses a Cry1Ac toxin); Bollgard I| (cotton variety that expresses a Cry1Ac and a Cry2Ab toxin); VipCot® (cotton variety that expresses a Vip3A and a Cry1Ab toxin); NewLeaf® (potato variety that expresses a Cry3A toxin); NatureGard®, Agrisure® GT Advantage (GA21 glyphosate-tolerant trait), Agrisure® CB Advantage (Bt11 corn borer (CB) trait) and Protecta®.

[0609] Further examples of such transgenic crops are: [0610] 1. Bt11 Maize from Syngenta Seeds SAS, Chemin de I'Hobit 27, F-31 790 St. Sauveur, France, registration number C/FR/96/05/10. Genetically modified *Zea mays* which has been rendered resistant to attack by the European corn borer (*Ostrinia nubilalis* and *Sesamia* nonagrioides) by transgenic expression of a truncated Cry1Ab toxin. Bt11 maize also transgenically expresses the enzyme PAT to achieve tolerance to the herbicide glufosinate ammonium. [0611] 2. Bt176 Maize from Syngenta Seeds SAS, Chemin de I'Hobit 27, F-31 790 St. Sauveur, France, registration number C/FR/96/05/10. Genetically modified *Zea mays* which has been rendered resistant to attack by the European corn borer (*Ostrinia nubilalis* and *Sesamia* nonagrioides) by transgenic expression of a Cry1Ab toxin. Bt176 maize also transgenically expresses the enzyme PAT to achieve tolerance to the herbicide glufosinate ammonium. [0612] 3. MIR604 Maize from Syngenta Seeds SAS, Chemin de I'Hobit 27, F-31 790 St. Sauveur, France, registration number C/FR/96/05/10. Maize which has been rendered insect-resistant by transgenic expression of a modified Cry3A toxin. This toxin is Cry3A055 modified by insertion of a cathepsin-G-protease recognition sequence. The preparation of such transgenic maize plants is described in WO 03/018810. [0613] 4. MON 863 Maize from Monsanto Europe S.A. 270-272 Avenue de Tervuren, B-1150 Brussels, Belgium, registration number C/DE/02/9. MON 863 expresses a Cry3Bb1 toxin and has resistance to certain Coleoptera insects. [0614] 5. IPC 531 Cotton from Monsanto Europe S.A. 270-272 Avenue de Tervuren, B-1150 Brussels, Belgium, registration number C/ES/96/02. [0615] 6. 1507 Maize from Pioneer Overseas Corporation, Avenue Tedesco, 7 B-1160 Brussels, Belgium, registration number C/NL/00/10. Genetically modified maize for the expression of the protein Cry1F for achieving resistance to certain Lepidoptera insects and of the PAT protein for achieving tolerance to the herbicide glufosinate ammonium. [0616] 7. NK603×MON 810 Maize from Monsanto Europe S.A. 270-272 Avenue de Tervuren, B-1150 Brussels, Belgium, registration number C/GB/02/M3/03. Consists of conventionally bred hybrid maize varieties by crossing the genetically modified varieties NK603 and MON 810. NK603×MON 810 Maize transgenically expresses the protein CP4 EPSPS, obtained from *Agrobacterium* sp. strain CP4, which imparts tolerance to the herbicide Roundup® (contains glyphosate), and also a Cry1Ab toxin obtained from *Bacillus thuringiensis* subsp. *kurstaki* which

brings about tolerance to certain Lepidoptera, include the European corn borer.
[0617] 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).
[0618] 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 95/33818 and EP-A-0 353 191. The methods of producing such transgenic plants are generally known to the person skilled in the art and are described, for example, in the publications mentioned above.
[0619] 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.
[0620] Crops also include those that have enhanced resistance to *nematodes*, such as the soybean cyst nematode.
[0621] 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.
[0622] 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 95/33818) or protein or polypeptide factors involved in plant pathogen defence (so-called “plant disease resistance genes”, as described in WO 03/000906).
[0623] 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.
[0624] 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.
[0625] 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.
[0626] 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, U.S. Pat. No. 5,631,072, WO 2005/64072, WO2006/128870, EP 1724392, WO 2005113886 or WO 2007/090739.

[0627] Further areas of use of the compositions according to the invention are the field of tree injectiontrunk treatment for all ornamental trees as well all sort of fruit and nut trees.

[0628] In the field of tree injectionltrunk 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:

TABLE-US-00003 TABLE A Examples of exotic woodborers of economic importance. Family Species Host or Crop Infested Buprestidae *Agrilus planipennis* Ash Cerambycidae *Anoplura glabripennis* Hardwoods Scolytidae *Xylosandrus crassiusculus* Hardwoods *X. mutilatus* Hardwoods *Tomicus piniperda* Conifers

TABLE-US-00004 TABLE B Examples of native woodborers of economic importance. Family Species Host or Crop Infested Buprestidae *Agrilus anxius* Birch *Agrilus politus* Willow, Maple *Agrilus sayi* Bayberry, Sweetfern *Agrilus vittaticolllis* Apple, Pear, Cranberry, Serviceberry, Hawthorn *Chrysobothris femorata* 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 *Texania campestris* Basswood, Beech, Maple, Oak, Sycamore, Willow, Yellow-poplar Cerambycidae *Goes pulverulentus* Beech, Elm, Nuttall, Willow, Black oak, Cherrybark oak, Water oak, Sycamore *Goes tigrinus* Oak *Neoclytus acuminatus* Ash, Hickory, Oak, Walnut, Birch, Beech, Maple, Eastern 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 *Neoptychodes trilineatus* Fig, Alder, Mulberry, Willow, Netleaf hackberry *Oberea ocellata* Sumac, Apple, Peach, Plum, Pear, Currant, Blackberry *Oberea tripunctata* Dogwood, Viburnum, Elm, Sourwood, Blueberry, Rhododendron, Azalea, Laurel, Poplar, Willow, Mulberry *Oncideres cingulata* Hickory, Pecan, Persimmon, Elm, Sourwood, Basswood, Honeylocust, Dogwood, Eucalyptus, Oak, Hackberry, Maple, Fruit trees *Saperda calcarata* Poplar *Strophiona nitens* Chestnut, Oak, Hickory, Walnut, Beech, Maple Scolytidae *Corthylus columbianus* Maple, Oak, Yellow-poplar, Beech, Boxelder, Sycamore, Birch, Basswood, Chestnut, Elm *Dendroctonus frontalis* Pine *Dryocoetes betulae* Birch, Sweetgum, Wild cherry, Beech, Pear *Monarthrum fasciatum* Oak, Maple, Birch, Chestnut, Sweetgum, Blackgum, Poplar, Hickory, Mimosa, Apple, Peach, Pine *Phloeotribus liminaris* Peach, Cherry, Plum, Black cherry, Elm, Mulberry, Mountain-ash *Pseudopityophthorus pruinosus* Oak, American beech, Black cherry, Chickasaw plum, Chestnut, Maple, Hickory, Hornbeam, Hophornbeam Sesiidae *Paranthrene simulans* Oak, American chestnut *Sannina uroceriformis* Persimmon *Synanthedon exitiosa* Peach, Plum, Nectarine, Cherry, Apricot, Almond, Black cherry *Synanthedon pictipes* Peach, Plum, Cherry, Beach, Black Cherry *Synanthedon rubrofascia* Tupelo *Synanthedon scitula* Dogwood, Pecan, Hickory, Oak, Chestnut, Beech, Birch, Black cherry, Elm, Mountain-ash, Viburnum, Willow, Apple, Loquat, Ninebark, Bayberry *Vitacea polistiformis* Grape

[0629] 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.

[0630] 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*),

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

[0631] 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*).

[0632] 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 cynodoniensis*), rhodesgrass mealybug (*Antonina graminis*), two-lined spittlebug (*Propsapia 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.

[0633] 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.

[0634] Examples of such parasites are:

[0635] Of the order Anoplurida: *Haematopinus* spp., *Linognathus* spp., *Pediculus* spp. and *Phtirus* spp., *Solenopotes* spp.

[0636] Of the order Mallophagida: *Trimenopon* spp., *Menopon* spp., *Trinoton* spp., *Bovicola* spp., *Werneckiella* spp., *Lepikentron* spp., *Damalina* spp., *Trichodectes* spp. and *Felicola* spp.

[0637] 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., *Sarcophaga* spp., *Oestrus* spp., *Hypoderma* spp., *Gasterophilus* spp., *Hippobosca* spp., *Lipoptena* spp. and *Melophagus* spp.

[0638] Of the order Siphonapterida, for example *Pulex* spp., *Ctenocephalides* spp., *Xenopsylla* spp., *Ceratophyllus* spp.

[0639] Of the order Heteropterida, for example *Cimex* spp., *Triatoma* spp., *Rhodnius* spp., *Panstrongylus* spp.

[0640] Of the order Blattarida, for example *Blatta orientalis, Periplaneta americana*, Blattelagermanica and *Supella* spp.

[0641] Of the subclass Acaria (Acarida) and the orders Meta- and Meso-*stigmata*, for example *Argas* spp., *Ornithodorus* spp., *Otobius* spp., *Ixodes* spp., *Amblyomma* spp., *Boophilus* spp., *Dermacentor* spp., *Haemophysalis* spp., *Hyalomma* spp., *Rhipicephalus* spp., *Dermanyssus* spp., *Raillietia* spp., *Pneumonyssus* spp., *Sternostoma* spp. and *Varroa* spp.

[0642] Of the orders Actinedida (Prostigmata) and Acaridida (Astigmata), for example *Acarapis* spp., *Cheyletiella* spp., *Ornithocheyletia* spp., *Myobia* spp., *Psorergatesspp., Demodex* spp., *Trombicula* spp., *Listrophorus* 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.

[0643] The compositions according to the invention are also suitable for protecting against insect infestation in the case of materials such as wood, textiles, plastics, adhesives, glues, paints, paper and card, leather, floor coverings and buildings.

[0644] The compositions according to the invention can be used, for example, against the following pests: beetles such as *Hylotrupes bajulus, Chlorophorus pilosis, Anobium punctatum, Xestobium rufovillosum, Ptilinuspecticornis, Dendrobium pertinex, Ernobius mollis, Priobium carpini, Lyctus brunneus, Lyctus africanus, Lyctus planicollis, Lyctus linearis, Lyctus pubescens, Trogoxylon aequale, Minthesrugicollis, Xyleborus spec., Tryptodendron spec., Apate monachus, Bostrychus capucins, Heterobostrychus brunneus, Sinoxylon spec. and Dinoderus minutus*, and also hymenopterans such as *Sirex juvencus, Urocerus gigas, Urocerus gigas taignus and Urocerus augur*, and termites such as *Kalotermes flavicollis, Cryptotermes brevis, Heterotermes indicola, Reticulitermes flavipes, Reticulitermes santonensis, Reticulitermes lucifugus, Mastotermes darwiniensis, Zootermopsis nevadensis* and *Coptotermes formosanus*, and bristletails such as *Lepisma saccharina.*

[0645] The compounds according to the invention can be used as pesticidal agents in unmodified form, but 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. The dilutions can be made, for example, with water, liquid fertilisers, micronutrients, biological organisms, oil or solvents.

[0646] The formulations can be prepared e.g. by mixing the active ingredient with the formulation adjuvants in order to obtain compositions in the form of finely divided solids, granules, solutions, dispersions or emulsions. The active ingredients can also be formulated with other adjuvants, such as finely divided solids, mineral oils, oils of vegetable or animal origin, modified oils of vegetable or animal origin, organic solvents, water, surface-active substances or combinations thereof.

[0647] The active ingredients can also be contained in very fine microcapsules. Microcapsules contain the active ingredients in a porous carrier. This enables the active ingredients to be released into the environment in controlled amounts (e.g. slow-release). Microcapsules usually have a diameter of from 0.1 to 500 microns. They contain active ingredients in an amount of about from 25 to 95% by weight of the capsule weight. The active ingredients can be in the form of a monolithic solid, in the form of fine particles in solid or liquid dispersion or in the form of a suitable solution. The encapsulating membranes can comprise, for example, natural or synthetic rubbers, cellulose, styrene/butadiene copolymers, polyacrylonitrile, polyacrylate, polyesters, polyamides, polyureas, polyurethane or chemically modified polymers and starch xanthates or other polymers that are known to the person skilled in the art. Alternatively, very fine microcapsules can be formed in which the active ingredient is contained in the form of finely divided particles in a solid matrix of base substance, but the microcapsules are not themselves encapsulated.

[0648] 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, acetophenone, amyl acetate, 2-butanone, butylene carbonate, chlorobenzene, cyclohexane, cyclohexanol, alkyl esters of acetic acid, diacetone alcohol, 1,2-dichloropropane, diethanolamine, p-diethylbenzene, diethylene glycol, diethylene glycol abietate, diethylene glycol butyl ether, diethylene glycol ethyl ether, diethylene glycol methyl ether, N,N-dimethylformamide, dimethyl sulfoxide, 1,4-dioxane, dipropylene glycol, dipropylene glycol methyl ether, dipropylene glycol dibenzoate, diproxitol, alkylpyrrolidone, ethyl acetate, 2-

ethylhexanol, ethylene carbonate, 1,1,1-trichloroethane, 2-heptanone, alpha-pinene, d-limonene, ethyl lactate, ethylene glycol, ethylene glycol butyl ether, ethylene glycol methyl ether, gamma-butyrolactone, glycerol, glycerol acetate, glycerol diacetate, glycerol triacetate, hexadecane, hexylene glycol, isoamyl acetate, isobornyl acetate, isooctane, isophorone, isopropylbenzene, isopropyl myristate, lactic acid, laurylamine, mesityl oxide, methoxy-propanol, methyl isoamyl ketone, methyl isobutyl ketone, methyl laurate, methyl octanoate, methyl oleate, methylene chloride, m-xylene, n-hexane, n-octylamine, octadecanoic acid, octylamine acetate, oleic acid, oleylamine, o-xylene, phenol, polyethylene glycol, propionic acid, propyl lactate, propylene carbonate, propylene glycol, propylene glycol methyl ether, p-xylene, toluene, triethyl phosphate, triethylene glycol, xylenesulfonic acid, paraffin, mineral oil, trichloroethylene, perchloroethylene, ethyl acetate, amyl acetate, butyl acetate, propylene glycol methyl ether, diethylene glycol methyl ether, methanol, ethanol, isopropanol, and alcohols of higher molecular weight, such as amyl alcohol, tetrahydrofurfuryl alcohol, hexanol, octanol, ethylene glycol, propylene glycol, glycerol, N-methyl-2-pyrrolidone and the like.

[0649] Suitable solid carriers are, for example, talc, titanium dioxide, pyrophyllite clay, silica, attapulgite clay, kieselguhr, limestone, calcium carbonate, bentonite, calcium montmorillonite, cottonseed husks, wheat flour, soybean flour, pumice, wood flour, ground walnut shells, lignin and similar substances. A large number of surface-active substances can advantageously be used in both solid and liquid formulations, especially in those formulations which can be diluted with a carrier prior to use. Surface-active substances may be anionic, cationic, non-ionic or polymeric and they can be used as emulsifiers, wetting agents or suspending agents or for other purposes. Typical surface-active substances include, for example, salts of alkyl sulfates, such as diethanolammonium lauryl sulfate; salts of alkylarylsulfonates, such as calcium dodecylbenzenesulfonate; alkylphenol/alkylene oxide addition products, such as nonylphenol ethoxylate; alcohol/alkylene oxide addition products, such as tridecylalcohol ethoxylate; soaps, such as sodium stearate; salts of alkylnaphthalenesulfonates, such as sodium dibutylnaphthalenesulfonate; dialkyl esters of sulfosuccinate salts, such as sodium di(2-ethylhexyl)sulfosuccinate; sorbitol esters, such as sorbitol oleate; quaternary amines, such as lauryltrimethylammonium chloride, polyethylene glycol esters of fatty acids, such as polyethylene glycol stearate; block copolymers of ethylene oxide and propylene oxide; and salts of mono- and di-alkylphosphate esters; and also further substances described e.g. in McCutcheon's Detergents and Emulsifiers Annual, MC Publishing Corp., Ridgewood New Jersey (1981).

[0650] 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.

[0651] 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 C.sub.8-C.sub.22 fatty acids, especially the methyl derivatives of C.sub.12-C.sub.18 fatty acids, for example the methyl esters of lauric acid, palmitic acid and oleic acid (methyl laurate, methyl palmitate and methyl oleate, respectively). Many oil derivatives are known from the Compendium of Herbicide Adjuvants, 10.sup.th Edition, Southern Illinois

University, 2010.

[0652] 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.

[0653] 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.

[0654] Preferred formulations can have the following compositions (weight %):

TABLE-US-00005 Emulsifiable concentrates: active ingredient: 1 to 95%, preferably 60 to 90% surface-active agent: 1 to 30%, preferably 5 to 20% liquid carrier: 1 to 80%, preferably 1 to 35%

TABLE-US-00006 Dusts: active ingredient: 0.1 to 10%, preferably 0.1 to 5% solid carrier: 99.9 to 90%, preferably 99.9 to 99%

TABLE-US-00007 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%

TABLE-US-00008 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%

TABLE-US-00009 Granules: active ingredient: 0.1 to 30%, preferably 0.1 to 15% solid carrier: 99.5 to 70%, preferably 97 to 85%

[0655] The following Examples further illustrate, but do not limit, the invention.

TABLE-US-00010 Wettable powders a) b) c) active ingredients 25% 50% 75% sodium lignosulfonate 5% 5% — sodium lauryl sulfate 3% — 5% sodium diisobutylnaphthalenesulfonate — 6% 10% phenol polyethylene glycol ether — 2% — (7-8 mol of ethylene oxide) highly dispersed silicic acid 5% 10% 10% Kaolin 62% 27% —

[0656] 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.

TABLE-US-00011 Powders for dry seed treatment 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%

[0657] 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.

TABLE-US-00012 Emulsifiable concentrate active ingredients 10% octylphenol polyethylene glycol ether (4-5 mol of ethylene 3% oxide) calcium dodecylbenzenesulfonate 3% castor oil polyglycol ether (35 mol of ethylene oxide) 4% Cyclohexanone 30% xylene mixture 50%

[0658] Emulsions of any required dilution, which can be used in plant protection, can be obtained from this concentrate by dilution with water.

TABLE-US-00013 Dusts a) b) c) Active ingredients 5% 6% 4% Talcum 95% — — Kaolin — 94% — mineral filler — — 96%

[0659] 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.

TABLE-US-00014 Extruder granules Active ingredients 15% sodium lignosulfonate 2% carboxymethylcellulose 1% Kaolin 82%

[0660] 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.

TABLE-US-00015 Coated granules Active ingredients 8% polyethylene glycol (mol. wt. 200) 3% Kaolin 89%

[0661] 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.
TABLE-US-00016 Suspension concentrate active ingredients 40% propylene glycol 10% nonylphenol polyethylene glycol ether 6% (15 mol of ethylene oxide) Sodium lignosulfonate 10% carboxymethylcellulose 1% silicone oil (in the form of a 75% emulsion in water) 1% Water 32%
[0662] 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.
TABLE-US-00017 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 0.5% form of a 20% solution in water) monoazo-pigment calcium salt 5% Silicone oil (in the form of a 75% emulsion in water) 0.2% Water 45.3%
[0663] 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.
Slow Release Capsule Suspension
[0664] 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.
[0665] 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.

Description

PREPARATORY EXAMPLES
[0666] “Mp” means melting point in ° C. Free radicals represent methyl groups. .sup.1H NMR measurements were recorded on a Brucker 400 MHz 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).sup.+ or (M−H).sup.−.
LCMS and GCMS Methods:
Method 1:
[0667] Spectra were recorded on a Mass Spectrometer from Waters Corporation (SQD, SQDII or QDA Single quadrupole mass spectrometer) equipped with an electrospray source (Polarity:

positive and negative ions), Capillary: 0.8-3.00 kV, Cone: 5-30 V, Source Temperature: 120-150° C., Desolvation Temperature: 350-600° C., Cone Gas Flow: 50-150 l/h, Desolvation Gas Flow: 650-1000 l/h, Mass range: 110 to 950 Da and an Acquity UPLC from Waters Corporation: Binary pump, heated column compartment, diode-array detector and ELSD. Column: Waters UPLC HSS T3, 1.8 µm, 30×2.1 mm, Temp: 60° C., DAD Wavelength range (nm): 210 to 400, Runtime: 1.5 min; Solvents: A=water+5% MeOH+0.05% HCOOH, B=Acetonitrile+0.05% HCOOH; Flow (ml/min) 0.85, Gradient: 10% B isocratic for 0.2 min, then 10-100% B in 1.0 min, 100% B isocratic for 0.2 min, 100-10% B in 0.05 min, 10% B isocratic for 0.05 min.

Method 2:

[0668] Spectra were recorded on a Mass Spectrometer from Waters Corporation (SQD, SQDII or QDA Single quadrupole mass spectrometer) equipped with an electrospray source (Polarity: positive and negative ions), Capillary: 0.8-3.00 kV, Cone: 5-30 V, Source Temperature: 120-150° C., Desolvation Temperature: 350-600° C., Cone Gas Flow: 50-150 l/h, Desolvation Gas Flow: 650-1000 l/h, Mass range: 110 to 950 Da and an Acquity UPLC from Waters Corporation: Binary pump, heated column compartment, diode-array detector and ELSD. Column: Waters UPLC HSS T3, 1.8 µm, 30×2.1 mm, Temp: 60° C., DAD Wavelength range (nm): 210 to 400, Runtime: 3.0 min; Solvents: A=water+5% MeOH+0.05% HCOOH, B=Acetonitrile+0.05% HCOOH; Flow (ml/min) 0.85, Gradient: 10% B isocratic for 0.2 min, then 10-100% B in 2.5 min, 100% B isocratic for 0.3 min.

Method 3:

[0669] Spectra were recorded on a Mass Spectrometer from Waters (SQD2 or QDA Single quadrupole mass spectrometer) equipped with an electrospray source (Polarity: Positive and Negative Polarity Switch), Capillary: 0.8-3.00 kV, Cone range: 25 Source Temperature: 120-150° C., Desolvation Temperature: 500-600° C., Cone Gas Flow: 50 L/h, Desolvation Gas Flow: 1000 L/h, Mass range: 110 to 850 Da) and an Acquity UPLC from Waters: Quaternary solvent manager, heated column compartment, diode-array detector. Column: Acquity UPLC HSS T3 C18, 1.8 µm, 30×2.1 mm, Temp: 40° C., DAD Wavelength range (nm): 200 to 400, Solvent Gradient: A=water+5% Acetonitrile+0.1% HCOOH, B=Acetonitrile+0.05% HCOOH: gradient: 0 min 10% B; 0. -0.2 min 10-50% B; 0.2-0.6 min 50-100% B; 0.6-1.3 min 100% B; 1.3-1.4 min 100-10% B; 1.4-1.6 min 10% B; Flow (mL/min) 0.6.

Method 4:

[0670] Spectra were recorded on a Mass Spectrometer from Agilent Technologies (MSD-IQ mass spectrometer) equipped with an electrospray source (Polarity: positive or negative ions, MS2 Scan, Capillary: 3.5 kV, Fragmentor: 110 V, Desolvation Temperature: 325° C., Gas Flow: 13 L/min, Nebulizer Gas: 55 psi, Mass range: 110 to 850 Da) and a 1290 Series HPLC from Agilent: quaternary pump, heated column compartment and diode-array detector. Column: AGILENT POROSHELL 120 EC-C18, 1.9 µm, 50×2.1 mm, Temp: 40° C., DAD Wavelength range (nm): 190 to 400, Solvent Gradient: A=water+5% Acetonitrile+0.1% HCOOH, B=Acetonitrile+0.1% HCOOH: gradient: 0-0.5 min 10% B, 90% A; 1.2-1.5 min 95% B, 05% A; 1.8-2.5 min 10% B, 90% A; Flow (mL/min) 0.8.

Method 5:

[0671] Spectra were recorded on a ACQUITY Mass Spectrometer from Waters Corporations (SQD or SQDII Single quadrupole mass spectrometer) equipped with an electrospray source (Polarity: positive or negative ions, Capillary: 3.0 kV, Cone: 30V, Extractor: 3.00 V, Source Temperature: 150° C., Desolvation Temperature: 400° C., Cone Gas Flow: 60 L/hr, Desolvation Gas Flow: 700 L/hr, Mass range: 140 to 800 Da) and an ACQUITY UPLC from Waters Corporations with solvent degasser, binary pump, heated column compartment and diode-array detector. Column: Waters UPLC HSS T3, 1.8 µm, 30×2.1 mm, Temp: 60° C., DAD Wavelength range (nm): 210 to 400, Solvent Gradient: A=Water/Methanol 9:1+0.1% formic acid, B=Acetonitrile+0.1% formic acid, gradient: 0-100% B in 2.5 min; Flow (ml/min) 0.75.

Example P1: Preparation of 3-(3-ethylsulfanyl-2-pyridyl)-7-(trifluoromethyl)chromen-4-one (compound P1)

##STR00047##

Step 1: Preparation of (E)-3-(dimethylamino)-1-[2-hydroxy-4-(trifluoromethyl)phenyl]prop-2-en-1-one (intermediate I1)

##STR00048##

[0672] A mixture of 1-(2-hydroxy-4-trifluoromethyl)phenyl)ethenone (4.77 g, 22.2 mmol) and N,N-dimethyl-formamide dimethyl acetal (3.84 mL, 28.9 mmol, 1.3 equiv.) was stirred at 100° C. for 2 hours. After cooling to room temperature, the reaction mixture was diluted with water, and the aqueous phase was extracted twice with ethyl acetate. The combined organic phases were washed with water, then brine, dried over magnesium sulfate, filtered, and concentrated in vacuo. The crude material was used directly without any purification. LCMS (method 1): Rt=0.98 min, m/z 260 [M+H].sup.+.

Step 2: Preparation of 3-iodo-7-(trifluoromethyl)chromen-4-one (intermediate I2)

##STR00049##

[0673] To a solution of (E)-3-(dimethylamino)-1-[2-hydroxy-4-(trifluoromethyl)phenyl]prop-2-en-1-one (5.96 g, 23 mmol) in methanol (57 mL) cooled at 5° C. was added iodine (7.00 g, 27.6 mmol, 1.2 equiv.). The reaction mixture was stirred for 17 hours at room temperature. The mixture was diluted with a sodium thiosulfate aqueous solution and stirred for 15 minutes. The precipitate formed was filtered, then dissolved in ethyl acetate. The organic phase was washed with brine twice, dried over magnesium sulfate, and concentrated in vacuo with isolute. The crude material was purified by flash chromatography over silica gel (ethyl acetate in cyclohexane) to afford the desired product as an orange solid. LCMS (method 1): Rt=1.02 min, m/z 341 [M+H].sup.+.

Step 3: Preparation of [4-oxo-7-(trifluoromethyl)chromen-3-yl]boronic acid (intermediate I3)

##STR00050##

[0674] To a solution of 3-iodo-7-(trifluoromethyl)chromen-4-one (0.3 g, 0.88 mmol) in THF (1.5 mL) cooled at −78° C. was added isopropylmagnesium chloride lithium chloride complex (1.3M in THF) (0.95 mL, 1.23 mmol, 1.4 equiv.) dropwise. The reaction mixture was stirred at −78° C. for 15 minutes before trimethyl borate (0.25 mL, 2.21 mmol, 2.5 equiv.) was added. The reaction mixture was then allowed to warm to room temperature and stirred for 2 hours. The mixture was diluted with an aqueous ammonium chloride solution, the product extracted with ethyl acetate twice, the combined organic phases dried over magnesium sulfate, and concentrated in vacuo. The crude material was used directly without any purification. LCMS (method 1): Rt=0.89 min, m/z 259 [M+H].sup.+.

Step 4: Preparation of 2-bromo-3-ethylsulfanyl-pyridine (intermediate I4)

##STR00051##

[0675] To a solution of 2-bromo-3-fluoro-pyridine (CAS: 40273-45-8) (24.9 g, 141 mmol) in N,N-dimethyl-formamide (80 mL) cooled at −50° C. was added sodium ethanethiolate (13.2 g, 141 mmol, 1 equiv.). The reaction mixture was cooled to −60° C. and stirred for 20 min at this temperature, and was then allowed to warm to room temperature. The reaction mixture was diluted with water and ethyl acetate. The aqueous phase was extracted with ethyl acetate (3 times). The combined organic phases were washed with water twice, then brine, dried over magnesium sulfate, and concentrated in vacuo with isolute. The crude material was purified by flash chromatography over silica gel (ethyl acetate in cyclohexane) to afford the desired product as a colorless oil. LCMS (method 1): Rt=0.94 min, m/z 218/220 [M+H].sup.+.

Step 5: Preparation of 3-(3-ethylsulfanyl-2-pyridyl)-7-(trifluoromethyl)chromen-4-one (compound P1)

##STR00052##

[0676] To a solution of 2-bromo-3-ethylsulfanyl-pyridine (0.025 g, 0.116 mmol) and [4-oxo-7-(trifluoro-methyl)chromen-3-yl]boronic acid (0.03 g, 0.116 mmol, 1 equiv.) in dioxane (0.46 mL)

degassed with argon were added 1,1′-bis(diphenylphosphino)ferrocene]dichloropalladium(II) complex with dichloromethane (0.010 g, 0.0116 mmol, 0.1 equiv.), water (0.17 mL) and potassium carbonate (0.048 g, 0.348 mmol, 3 equiv.). The reaction mixture was stirred under argon at 60° C. for 70 minutes. The mixture was allowed to cool to room temperature, diluted with an aqueous sodium hydrogeno-carbonate solution, and the product extracted with ethyl acetate. The organic phase was washed with brine, dried over magnesium sulfate, filtered and concentrated in vacuo. The crude material was purified by flash chromatography over silica gel (ethyl acetate in cyclohexane) to afford the desired product. LCMS (method 1): Rt=1.03 min, m/z 352 [M+H].sup.+.

Example P2: Preparation of 3-(3-ethylsulfonyl-2-pyridyl)-7-(trifluoromethyl)chromen-4-one (compound P2)

##STR00053##

[0677] To a solution at 0° C. of 3-(3-ethylsulfanyl-2-pyridyl)-7-(trifluoromethyl)chromen-4-one (0.048 g, 0.137 mmol) in ethyl acetate (0.72 mL) was added 3-chloroperbenzoic acid (0.064 g, 0.288 mmol, 2.1 equiv.) and the mixture stirred at room temperature for 2 hours. The reaction mixture was quenched with an aqueous sodium bisulfite solution and the product extracted with ethyl acetate. The organic phase was washed with water, then with a sodium hydrogenocarbonate aqueous solution, dried over magnesium sulfate, filtered and concentrated in vacuo. The crude material was purified by preparative HPLC (acetonitrile in water with formic acid) to afford the desired product as a solid. LCMS (method 1): Rt=0.91 min, m/z 384 [M+H].sup.+. .sup.1H NMR (400 MHz, CDCl.sub.3) δ ppm 1.34 (t, 3H), 3.40 (q, 2H), 7.62 (dd, 1H), 7.71 (dd, 1H), 7.85 (s, 1H), 8.16 (s, 1H), 8.42 (m, 2H), 8.94 (dd, 1H).

Example P3: Preparation 1-[5-ethylsulfanyl-6-[4-oxo-7-(trifluoromethyl)chromen-3-yl]-3-pyridyl]cyclopropane-carbonitrile (compound P3)

##STR00054##

Step 1: Preparation of 1-(6-bromo-5-ethylsulfanyl-3-pyridyl)cyclopropanecarbonitrile (intermediate I5)

##STR00055##

[0678] To a solution of 1-(6-amino-5-ethylsulfanyl-3-pyridyl)cyclopropanecarbonitrile (prepared as described in WO2020/174094) (6.95 g, 31.7 mmol) in ethylene dibromide (69.5 mL) was added copper(II) bromide (10.7 g, 47.5 mmol, 1.5 equiv.). The reaction mixture was stirred at room temperature for 10 minutes before isoamyl nitrite (6.52 mL, 47.5 mmol, 1.5 equiv.) was added dropwise. The mixture was further stirred at room temperature for 4.5 hours. The reaction mixture was diluted with an aqueous sodium hydrogenocarbonate solution and ethyl acetate, then filtered over celite. The aqueous phase was extracted twice with ethyl acetate. The combined organic phases were washed with water and with an aqueous sodium hydrogenocarbonate solution, dried over magnesium sulfate, and concentrated in vacuo with isolute. The crude material was purified by flash chromatography over silica gel (ethyl acetate in cyclohexane) to afford the desired product as a yellow solid. LCMS (method 1): Rt=0.99 min, m/z 283/285 [M+H].sup.+. .sup.1H NMR (400 MHz, CDCl.sub.3) δ ppm 1.44 (t, 3H), 1.47 (m, 2H), 1.83 (m, 2H), 3.01 (q, 2H), 7.45 (d, 1H), 7.94 (d, 1H).

Step 2: Preparation of 1-[5-ethylsulfanyl-6-[4-oxo-7-(trifluoromethyl)chromen-3-yl]-3-pyridyl]cyclopropane-carbonitrile (compound P3)

##STR00056##

[0679] To a solution of 1-(6-bromo-5-ethylsulfanyl-3-pyridyl)cyclopropanecarbonitrile (0.030 g, 0.106 mmol) and [4-oxo-7-(trifluoromethyl)chromen-3-yl]boronic acid (0.027 g, 0.106 mmol, 1 equiv.) in acetonitrile (0.82 mL) degassed with argon were added 1,1′-bis(diphenylphosphino)ferrocene]dichloropalladium(II) complex with dichloromethane (0.009 g, 0.011 mmol, 0.1 equiv.), water (0.32 mL) and potassium carbonate (0.037 g, 0.265 mmol, 2.5 equiv.). The reaction mixture was stirred under argon at 60° C. for 45 minutes. The mixture was

allowed to cool to room temperature, diluted with an aqueous sodium hydrogenocarbonate solution, and the product extracted with ethyl acetate. The organic phase was washed with brine, dried over magnesium sulfate, filtered and concentrated in vacuo. The crude material was purified by flash chromatography over silica gel (ethyl acetate in cyclohexane) to afford the desired product as a solid. LCMS (method 1): Rt=1.07 min, m/z 417 [M+H].sup.+. .sup.1H NMR (400 MHz, CDCl.sub.3) δ ppm 1.29 (t, 3H), 1.54 (m, 2H), 1.87 (m, 2H), 2.95 (q, 2H), 7.69 (d, 1H), 7.72 (d, 1H), 7.83 (s, 1H), 8.13 (s, 1H), 8.34 (d, 1H), 8.44 (d, 1H).

Example P4: Preparation of 1-[5-ethylsulfonyl-6-[4-oxo-7-(trifluoromethyl)chromen-3-yl]-3-pyridyl]cyclopropane-carbonitrile (compound P4)

##STR00057##

Step 1: Preparation of 1-(6-bromo-5-ethylsulfonyl-3-pyridyl)cyclopropanecarbonitrile (intermediate I6)

##STR00058##

[0680] To a solution of 1-(6-bromo-5-ethylsulfanyl-3-pyridyl)cyclopropanecarbonitrile (4.19 g, 14.8 mmol) in ethyl acetate (59 mL) at 0° C. was added 3-chloroperbenzoic acid (7.83 g, 34 mmol, 2.3 equiv.) portionwise and the mixture was stirred at room temperature for 16 hours. The reaction mixture was quenched by dropwise addition of an aqueous sodium bisulfite solution, stirred for 10 minutes, then diluted with aqueous sodium hydrogenocarbonate solution, and the product extracted with ethyl acetate. The organic phase was washed with a sodium hydroxide aqueous solution, then a sodium hydrogenocarbonate aqueous solution, dried over magnesium sulfate, filtered and concentrated in vacuo. The crude material was used directly without any purification. LCMS (method 1): Rt=0.77 min, m/z 315/317 [M+H].sup.+. .sup.1H NMR (400 MHz, CDCl.sub.3) δ ppm 1.34 (t, 3H), 1.55 (m, 2H), 1.94 (m, 2H), 3.56 (q, 2H), 8.17 (d, 1H), 8.67 (d, 1H).

Step 2: Preparation of 1-[5-ethylsulfonyl-6-[4-oxo-7-(trifluoromethyl)chromen-3-yl]-3-pyridyl]cyclopropane-carbonitrile (compound P4)

##STR00059##

[0681] To a solution of 1-(6-bromo-5-ethylsulfonyl-3-pyridyl)cyclopropanecarbonitrile (0.696 g, 2.7 mmol) and [4-oxo-7-(trifluoromethyl)chromen-3-yl]boronic acid (0.858 g, 2.7 mmol, 1 equiv.) in acetonitrile (14 mL) degassed with argon were added 1,1′-bis(diphenylphosphino)ferrocene]dichloropalladium(II) complex with dichloromethane (0.231 g, 0.27 mmol, 0.1 equiv.), water (5.4 mL), and potassium carbonate (0.858 g, 6.21 mmol, 2.3 equiv.) at 0° C. The mixture was stirred at 60° C. for 20 minutes. The reaction mixture was allowed to cool to room temperature, diluted with water, and the product extracted twice with ethyl acetate. The combined organic phases were washed with a sodium hydroxide aqueous solution and brine, dried over magnesium sulfate, filtered and concentrated in vacuo with isolute. The crude material was purified by flash chromatography over silica gel (ethyl acetate in cyclohexane) to afford the desired product as a solid. LCMS (method 1): Rt=0.98 min, m/z 449 [M+H].sup.+.

Example P5: Preparation of 3-(5-bromo-3-ethylsulfonyl-2-pyridyl)-7-(trifluoromethyl)-chromen-4-one (compound P9)

##STR00060##

Step 1: 2-(5-Bromo-3-ethylsulfonyl-2-pyridyl)-1-[2-hydroxy-4-(trifluoromethyl)phenyl]ethenone (intermediate I7)

##STR00061##

[0682] To a solution of 2-hydroxy-4-(trifluoromethyl)phenyl-ethaneone (3.00 g, 14.70 mmol) and 2,5-dibromo-3-ethylsulfonyl-pyridine (4.835 g, 14.70 mmol) in DMSO (21 mL) potassium carbonate (2.641 g, 19.104 mmol, 1.30 equiv.) was added. The mixture was stirred at room temperature for 1 day. Then additional potassium carbonate (2.0 g) was added, and the mixture was stirred at room temperature for another day. Then water was added, and the mixture was extracted twice with ethyl acetate. The combined organic phases were washed with water and brine, dried with magnesium sulfate, filtered, and concentrated. The residue was purified by chromatography

(cyclohexane-ethyl acetate-1% AcOH) to afford 3.18 g of 2-(5-Bromo-3-ethylsulfonyl-2-pyridyl)-1-[2-hydroxy-4-(trifluoromethyl)phenyl]-ethenone. LCMS (method 1): Rt=1.10 min, m/z 452/454 [M+H].sup.+. .sup.1H NMR (400 MHz, CDCl.sub.3) δ ppm 1.34 (t, 3H), 3.24 (q, 2H), 5.12 (s, 2H), 7.24 (d, 1H), 7.31 (s, 1H), 8.02 (d, 1H), 8.48 (d, 1H), 8.87 (d, 1H), 11.78 (s, 1H).
Step 2: 3-(5-bromo-3-ethylsulfonyl-2-pyridyl)-7-(trifluoromethyl)-chromen-4-one (compound P9)
##STR00062##
[0683] A mixture of 2-(5-bromo-3-ethylsulfonyl-2-pyridyl)-1-[2-hydroxy-4-(trifluoromethyl)phenyl]-ethenone (2.48 g, 5.48 mmol) and N,N-dimethylformamid-dimethylacetal (0.949 mL, 7.13 mmol, 1.30 equiv.) in methanol (19.8 mL) was stirred under reflux for 2.5 hours. Then water was added, and the mixture was extracted twice with ethyl acetate. The combined organic phases were washed with water and brine, dried with magnesium sulfate, filtered, and concentrated. Chromatography (cyclohexane-ethyl acetate) gave a mixture of desired product and starting material. The mixture was dissolved in methanol (20 mL) and N,N-dimethylformamid-dimethylacetal (0.5 mL) was added. The mixture was stirred under reflux for 16 hours. LC/MS showed full conversion and no more traces of starting material. Water was added and the mixture was extracted twice with ethyl acetate. The combined organic phases were washed with water and brine, dried with magnesium sulfate, filtered, and concentrated. to afford 1.66 g of 3-(5-bromo-3-ethylsulfonyl-2-pyridyl)-7-(trifluoromethyl)-chromen-4-one. LCMS (method 1): Rt=1.04 min, m/z 462/464 [M+H].sup.+. .sup.1H NMR (400 MHz, CDCl.sub.3) δ ppm 1.38 (t, 3H), 3.43 (q, 2H), 7.72 (d, 1H), 7.88 (s, 1H), 8.18 (s, 1H), 8.41 (d, 1H), 8.54 (d, 1H), 8.98 (d, 1H).
Example P6: Preparation of 3-[3-ethylsulfonyl-5-(4-fluorophenyl)-2-pyridyl]-7-(trifluoromethyl)chromen-4-one (compound P16)
##STR00063##
[0684] To a solution of 3-(5-bromo-3-ethylsulfonyl-2-pyridyl)-7-(trifluoromethyl)chromen-4-one (105 mg, 0.227 mmol) in toluene (20 mL) and water (4 mL) was added sodium carbonate (61 mg, 0.568 mmol, 2.5 equiv.) and (4-fluorophenyl)boronic acid (111 mg, 0.7951 mmol, 3.5 equiv.). The reaction mixture was stirred at room temperature under nitrogen atmosphere, then tetrakis-(triphenylphosphin)-palladium (0) (27 mg, 0.0227 mmol, 0.1 equiv.) was added the reaction mixture was stirred at 90° C. for 12 hours. After completion of reaction mass cooled to room temperature and water (20 mL) was added. The mixture was was extracted with ethyl acetate (three times). The combined organic layers were washed with brine, dried over sodium sulfate and concentrated under vacuum. The residue was purified by flash chromatography using 30% ethyl acetate in cyclohexane to afford 65 mg of 3-[3-ethylsulfonyl-5-(4-fluorophenyl)-2-pyridyl]-7-(trifluoromethyl)chromen-4-one. LCMS (method 3): Rt=1.07 min, m/z 478 [M+H].sup.+. .sup.1H NMR (400 MHz, CDCl.sub.3) δ ppm 1.37 (t, 3H), 3.43 (d, 2H), 7.15-7.28 (m, 2H), 7.60-7.69 (m, 2H), 7.73 (d, 1H), 7.87 (s, 1H), 8.21 (s, 1H), 8.42 (d, 1H), 8.54 (d, 1H), 9.10 (broad s, 1H).
TABLE-US-00018 TABLE P Examples of compounds of formula (I) LCMS Rt [M + H].sup.+ Mp No. IUPAC name Structures (min) (measured) Method (° C.) P1 3-(3-ethylsulfanyl- 2-pyridyl)-7-(trifluoromethyl) chromen-4-one [00064]  embedded image 1.03 352 1 — P2 3-(3-ethylsulfonyl-2-pyridyl)-7- (trifluoromethyl) chromen-4-one [00065]  embedded image 0.91 384 1 — P3 1-[5-ethylsulfanyl- 6-[4-oxo-7- (trifluoromethyl) chromen-3-yl]-3- pyridyl] cyclopropane- carbonitrile [00066]  embedded image 1.07 417 1 — P4 1-[5-ethylsulfonyl- 6-[4-oxo-7- (trifluoromethyl) chromen-3-yl]-3- pyridyl] cyclopropane- carbonitrile [00067]  embedded image 0.98 449 1 182-185 P5 2-[5-ethylsulfonyl- 6-[4-oxo-7- (trifluoromethyl) chromen-3-yl]- 3-pyridyl]-2- methyl-propane- nitrile [00068]  embedded image 0.98 451 1 P6 2-[[5-ethylsulfonyl- 6-[4-oxo-7-(trifluoromethyl) chromen-3-yl]- 3-pyridyl]oxy]- 2-methyl- propanenitrile [00069]embedded image 1.65 467 4 144-146 P7 1-[5-ethylsulfonyl- 6-[2-methyl- 4-oxo-7-(trifluoromethyl) chromen-3-yl]-3- pyridyl] cyclopropane- carbonitrile [00070]  embedded image 0.97 463 1 P8 3-(5-bromo-3- ethylsulfonyl-2- pyridyl)-2-methyl-7- (trifluoromethyl) chromen-4-one [00071]  embedded image 1.06 476/478 1 P9 3-(5-bromo-3- ethylsulfonyl-2- pyridyl)-7-

(trifluoromethyl)- chromen-4-one [00072]  embedded image 1.04 462/464 1 P10 3-(6-cyclopropyl-3- ethylsulfonyl-2- pyridyl)-7- (trifluoromethyl) chromen-4-one [00073]  embedded image 1.07 424 1 P11 3-(5-cyclopropyl-3- ethylsulfonyl- 2-pyridyl)-7-(trifluoromethyl) chromen-4-one [00074]embedded image 0.98 424 1 P12 1-[5-ethylsulfonyl- 6-[4-oxo-7- (trifluoromethyl) pyrano[2,3- b]pyridin-3-yl]- 3-pyridyl]-cyclo- propanecarbonitrile [00075]  embedded image 0.85 450 1 179-181 P13 1-[6-[7- (difluoromethoxy)- 4-oxo-chromen-3-yl]-5- ethylsulfonyl- 3-pyridyl]-cyclo- propanecarbonitrile [00076]  embedded image 0.87 447 1 P14 1-[5-ethylsulfonyl- 6-[1-methyl- 4-oxo-7- (trifluoromethyl)-3- quinolyl]-3- pyridyl]-cyclo-propanecarbonitrile [00077]embedded image 1.04 462 3 208-209 P15 1-[5-ethylsulfonyl- 6-[4-oxo-7- (trifluoromethoxy) chromen-3-yl]- 3-pyridyl]- cyclopropane- carbonitrile [00078]  embedded image 0.98 465 1 P16 3-[3-ethylsulfonyl- 5-(4- fluorophenyl)- 2-pyridyl]-7-(trifluoromethyl) chromen-4-one [00079]  embedded image 1.07 478 3 158-160 P17 3-[5-(difluoromethoxy)- 3-ethylsulfonyl-2- pyridyl]-7- (trifluoromethyl) chromen-4-one [00080]  embedded image 1.64 450 4 P18 3-(3-ethylsulfonyl- 5-pyrimidin- 2-yl-2-pyridyl)- 7-(trifluoro-methyl)chromen- 4-one [00081]  embedded image 1.51 462 4 232-234 P19 3-[3-ethylsulfonyl- 5-(2,4,5- trifluorophenyl)- 2-pyridyl]-7- (trifluoromethyl) chromen-4-one [00082]embedded image 1.76 514.41 5 P20 3-[3- ethylsulfonyl-5-[4- (trifluoromethyl) phenyl]-2- pyridyl]-7-(trifluoromethyl)- chromen-4-one [00083]  embedded image 1.84 528.43 5 P21 3-[5-(4-chloro-2,6-dimethyl- phenyl)-3- ethylsulfonyl-2- pyridyl]-7- (trifluoromethyl)- chromen-4-one [00084]  embedded image 1.95 522.43 5 P22 3-[5-(4- chlorophenyl)-3- ethylsulfonyl- 2-pyridyl]-7-(trifluoromethyl) chromen-4-one [00085]  embedded image 1.8 494.38 5 P23 3-[5-(6-chloro- 3-pyridyl)-3- ethylsulfonyl- 2-pyridyl]-7- (trifluoromethyl) chromen-4-one [00086]embedded image 1.57 495.38 5 P24 3-[3-ethylsulfonyl- 5-(5-fluoro-2- thienyl)-2-pyridyl]- 7-(trifluoro- methyl)chromen- 4-one [00087]  embedded image 1.74 484.36 5 P25 3-[5-(3-chloro-4-fluoro-phenyl)- 3-ethylsulfonyl- 2-pyridyl]-7- (trifluoromethyl) chromen-4-one [00088]  embedded image 1.81 512.4 5 P26 3-[5-(1-ethyl- 3,5-dimethyl- pyrazol-4-yl)-3- ethylsulfonyl-2-pyridyl]-7- (trifluoromethyl)- chromen-4-one [00089]  embedded image 1.52 506.51 5 P27 3-[3-ethylsulfonyl- 5-(3-pyridyl)- 2-pyridyl]-7- (trifluoromethyl)- chromen-4-one [00090]  embedded image 1.29 461.42 5 P28 3-(3-ethylsulfonyl- 5-pyrimidin- 5-yl-2-pyridyl)- 7-(trifluoro- methyl)chromen- 4-one [00091]  embedded image 1.55 462.29 5 P29 3-[5-(1,3-dimethylpyrazol- 4-yl)- 3-ethylsulfonyl- 2-pyridyl]-7- (trifluoromethyl) chromen-4-one [00092]  embedded image 1.4 478.45 5 P30 3-[3-ethylsulfonyl- 5-(6-fluoro-3- pyridyl)-2-pyridyl]- 7-(trifluoro- methyl)chromen- 4-one [00093]  embedded image 1.5 479.4 5 P31 3-[5-(1,4-dimethylpyrazol-3- yl)-3-ethylsulfonyl- 2-pyridyl]-7- (trifluoromethyl) chromen-4-one [00094]embedded image 1.51 478.46 5 P32 3-[5-(5-chloro- 2-thienyl)-3- ethylsulfonyl- 2-pyridyl]-7-(trifluoromethyl) chromen-4-one [00095]embedded image 1.84 500.35 5 P33 3-[3- ethylsulfonyl-5-(1- isopropylpyrazol- 4-yl)-2- pyridyl]-7- (trifluoromethyl)- chromen-4-one [00096]  embedded image 1.53 492.46 5 P34 3-[3- ethylsulfonyl-5-(2- methylpyrimidin- 5-yl)-2-pyridyl]-7- (trifluoromethyl)- chromen-4-one [00097]  embedded image 1.33 476.43 5 P35 3-[3-ethylsulfonyl-5-(3- fluorophenyl)-2- pyridyl]-7- (trifluoromethyl) chromen-4-one [00098]  embedded image 1.71 478.43 5 P36 3-[5-(1,5- dimethylpyrazol- 4-yl)- 3-ethylsulfonyl- 2-pyridyl]-7- (trifluoromethyl) chromen-4-one [00099]  embedded image 1.4 478.44 5 P37 3-[3-ethylsulfonyl- 5-(3,4,5- trifluorophenyl)- 2-pyridyl]-7- (trifluoromethyl) chromen-4-one [00100]  embedded image 1.78 514.41 5 P38 3-[3- ethylsulfonyl-5-[4- (trifluoromethyl)- 2-thienyl]-2-pyridyl]-7- (trifluoromethyl)- chromen-4-one [00101]embedded image 1.82 534.4 5 P39 3-[3-ethylsulfonyl- 5-[5- (trifluoromethyl)- 3-thienyl]-2- pyridyl]-7- (trifluoromethyl)- chromen-4-one [00102]  embedded image 1.83 534.4 5 P40 3-(3-ethylsulfonyl- 5-isoxazol-4- yl-2-pyridyl)-7-(trifluoromethyl)- chromen-4-one [00103]  embedded image 1.39 451.38 5 P41 3-[3-ethylsulfonyl-5-(1- methylpyrrol-3- yl)-2-pyridyl]-7- (trifluoromethyl) chromen-4-one [00104]  embedded image 1.55 463.44 5 P42 3-[3- ethylsulfonyl-5-[6- (trifluoromethoxy)- 3-pyridyl]-2-

pyridyl]-7- (trifluoromethyl)- chromen-4-one [00105]  embedded image 1.75 545.44 5 P43 3-[5-(3,5- dichloro-4-fluoro- phenyl)-3- ethylsulfonyl-2- pyridyl]-7- (trifluoromethyl)- chromen-4-one [00106]  embedded image 1.94 546.38 5 P44 3-[5-(3-chloro-5- fluoro-phenyl)- 3-ethylsulfonyl- 2-pyridyl]-7- (trifluoromethyl) chromen-4-one [00107]  embedded image 1.84 512.4 5 P45 3-[5-(3,5- dichlorophenyl)-3- ethylsulfonyl- 2-pyridyl]-7- (trifluoromethyl) chromen-4-one [00108]  embedded image 1.94 528.37 5 P46 3-[5-(1- ethylpyrazol-3-yl)- 3-ethylsulfonyl- 2-pyridyl]-7-(trifluoromethyl) chromen-4-one [00109]  embedded image 1.53 478.46 5 P47 3-(3-ethylsulfonyl-5-pyrazin-2- yl-2-pyridyl)- 7-(trifluoro- methyl)chromen- 4-one [00110]  embedded image 1.55 462.28 5 P48 3-[5-(4-chloro- 2-fluoro-phenyl)- 3-ethylsulfonyl- 2-pyridyl]-7- (trifluoromethyl) chromen-4-one [00111]  embedded image 1.84 512.39 5

[0685] The activity of the compositions according to the invention can be broadened considerably, and adapted to prevailing circumstances, by adding other insecticidally, acaricidally and/or fungicidally active ingredients. The mixtures of the compounds of formula I with other insecticidally, acaricidally and/or fungicidally active ingredients may also have further surprising advantages which can also be described, in a wider sense, as synergistic activity. For example, better tolerance by plants, reduced phytotoxicity, insects can be controlled in their different development stages or better behaviour during their production, for example during grinding or mixing, during their storage or during their use. Suitable additions to active ingredients here are, for example, representatives of the following classes of active ingredients: organophosphorus compounds, nitrophenol derivatives, thioureas, juvenile hormones, formamidines, benzophenone derivatives, ureas, pyrrole derivatives, carbamates, pyrethroids, chlorinated hydrocarbons, acylureas, pyridylmethyleneamino derivatives, macrolides, neonicotinoids and *Bacillus thuringiensis* preparations.

[0686] 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 A-1 to A-36, Tables B-1 to B-36, Tables C-1 to C-36 and Tables D-1 to D-36 and Table P of the present invention”): [0687] an adjuvant selected from the group of substances consisting of petroleum oils (alternative name) (628)+TX; [0688] abamectin+TX, acequinocyl+TX, acetamiprid+TX, acetoprole+TX, acrinathrin+TX, acynonapyr+TX, afidopyropen+TX, afoxolaner+TX, alanycarb+TX, allethrin+TX, alpha-cypermethrin+TX, alphamethrin+TX, amidoflumet+TX, aminocarb+TX, azocyclotin+TX, bensultap+TX, benzoximate+TX, benzpyrimoxan+TX, betacyfluthrin+TX, beta-cypermethrin+TX, bifenazate+TX, bifenthrin+TX, binapacryl+TX, bioallethrin+TX, S-bioallethrin+TX, bioresmethrin+TX, bistrifluron+TX, broflanilide+TX, brofluthrinate+TX, bromophos-ethyl+TX, buprofezine+TX, butocarboxim+TX, cadusafos+TX, carbaryl+TX, carbosulfan+TX, cartap+TX, CAS number: 1632218-00-8+TX, CAS number: 1808115-49-2+TX, CAS number: 2032403-97-5+TX, CAS number: 2044701-44-0+TX, CAS number: 2128706-05-6+TX, CAS number: 2095470-94-1+TX, CAS number: 2377084-09-6+TX, CAS number: 1445683-71-5+TX, CAS number: 2408220-94-8+TX, CAS number: 2408220-91-5+TX, CAS number: 1365070-72-9+TX, CAS number: 2171099-09-3+TX, CAS number: 2396747-83-2+TX, CAS number: 2133042-31-4+TX, CAS number: 2133042-44-9+TX, CAS number: 1445684-82-1+TX, CAS number: 1445684-82-1+TX. CAS number: 1922957-45-6+TX, CAS number: 1922957-46-7+TX, CAS number: 1922957-47-8+TX, CAS number: 1922957-48-9+TX, CAS number: 2415706-16-8+TX, CAS number: 1594624-87-9+TX, CAS number: 1594637-65-6+TX, CAS number: 1594626-19-3+TX, CAS number: 1990457-52-7+TX, CAS number: 1990457-55-0+TX, CAS number: 1990457-57-2+TX, CAS number: 1990457-77-6+TX, CAS number: 1990457-66-3+TX, CAS number: 1990457-85-6+TX, CAS number: 2220132-55-6+TX, CAS number: 1255091-74-7+TX, CAS number: RNA (*Leptinotarsa decemlineata*-specific recombinant double-stranded interfering GS2)+TX, CAS number: 2719848-60-7+TX, CAS number: 1956329-03-5+TX, chlorantraniliprole+TX, chlordane+TX, chlorfenapyr+TX, chloroprallethrin+TX,

chromafenozide+TX, clenpirin+TX, cloethocarb+TX, clothianidin+TX, 2-chlorophenyl N-methylcarbamate (CPMC)+TX, cyanofenphos+TX, cyantraniliprole+TX, cyclaniliprole+TX, cyclobutrifluram+TX, cycloprothrin+TX, cycloxaprid+TX, cyenopyrafen+TX, cyetpyrafen (or etpyrafen)+TX, cyflumetofen+TX, cyfluthrin+TX, cyhalodiamide+TX, cyhalothrin+TX, cypermethrin+TX, cyphenothrin+TX, cyproflanilide+TX, cyromazine+TX, deltamethrin+TX, diafenthiuron+TX, dialifos+TX, dibrom+TX, dicloromezotiaz+TX, diflovidazine+TX, diflubenzuron+TX, dimpropyridaz+TX, dinactin+TX, dinocap+TX, dinotefuran+TX, dioxabenzofos+TX, emamectin (or emamectin benzoate)+TX, empenthrin+TX, epsilon-momfluorothrin+TX, epsilon-metofluthrin+TX, esfenvalerate+TX, ethion+TX, ethiprole+TX, etofenprox+TX, etoxazole+TX, famphur+TX, fenazaquin+TX, fenfluthrin+TX, fenmezoditiaz+TX, fenitrothion+TX, fenobucarb+TX, fenothiocarb+TX, fenoxycarb+TX, fenpropathrin+TX, fenpyroximate+TX, fensulfothion+TX, fenthion+TX, fentinacetate+TX, fenvalerate+TX, fipronil+TX, flometoquin+TX, flonicamid+TX, fluacrypyrim+TX, fluazaindolizine+TX, fluazuron+TX, flubendiamide+TX, flubenzimine+TX, fluchlordiniliprole+TX, flucitrinate+TX, flucycloxuron+TX, flucythrinate+TX, fluensulfone+TX, flufenerim+TX, flufenprox+TX, flufiprole+TX, fluhexafon+TX, flumethrin+TX, fluopyram+TX, flupentiofenox+TX, flupyradifurone+TX, flupyrimin+TX, fluralaner+TX, fluvalinate+TX, fluxametamide+TX, fosthiazate+TX, gamma-cyhalothrin+TX, guadipyr+TX, halofenozide+TX, halfenprox+TX, heptafluthrin+TX, hexythiazox+TX, hydramethylnon+TX, imicyafos+TX, imidacloprid+TX, imiprothrin+TX, indazapyroxamet+TX, indoxacarb+TX, iodomethane+TX, iprodione+TX, isocycloseram+TX, isothioate+TX, ivermectin+TX, kappa-bifenthrin+TX, kappa-tefluthrin+TX, lambda-Cyhalothrin+TX, lepimectin+TX, lotilaner+TX, lufenuron+TX, metaflumizone+TX, metaldehyde+TX, metam+TX, methomyl+TX, methoxyfenozide+TX, metofluthrin+TX, metolcarb+TX, mexacarbate+TX, milbemectin+TX, momfluorothrin+TX, niclosamide+TX, nicofluprole+TX; nitenpyram+TX, nithiazine+TX, omethoate+TX, oxamyl+TX, oxazosulfyl+TX, parathion-ethyl+TX, permethrin+TX, phenothrin+TX, phosphocarb+TX, piperonylbutoxide+TX, pirimicarb+TX, pirimiphos-ethyl+TX, pirimiphos-methyl+TX, Polyhedrosis virus+TX, prallethrin+TX, profenofos+TX, profluthrin+TX, propargite+TX, propetamphos+TX, propoxur+TX, prothiophos+TX, protrifenbute+TX, pyflubumide+TX, pymetrozine+TX, pyraclofos+TX, pyrafluprole+TX, pyridaben+TX, pyridalyl+TX, pyrifluquinazon+TX, pyrimidifen+TX, pyriminostrobin+TX, pyriprole+TX, pyriproxyfen+TX, resmethrin+TX, sarolaner+TX, selamectin+TX, silafluofen+TX, spinetoram+TX, spinosad+TX, spirobudifen+TX; spirodiclofen+TX, spiromesifen+TX, spiropidion+TX, spirotetramat+TX, spidoxamat+TX, sulfoxaflor+TX, tebufenozide+TX, tebufenpyrad+TX, tebupirimiphos+TX, tefluthrin+TX, temephos+TX, tetrachlorantraniliprole+TX, tetradiphon+TX, tetramethrin+TX, tetramethylfluthrin+TX, tetranactin+TX, tetraniliprole+TX, theta-cypermethrin+TX, thiacloprid+TX, thiamethoxam+TX, thiocyclam+TX, thiodicarb+TX, thiofanox+TX, thiometon+TX, thiosultap+TX, tigolaner+TX, tiorantraniliprole+TX; tioxazafen+TX, tolfenpyrad+TX, toxaphene+TX, tralomethrin+TX, transfluthrin+TX, triazamate+TX, triazophos+TX, trichlorfon+TX, trichloronate+TX, trichlorphon+TX, trifluenfuronate+TX, triflumezopyrim+TX, tyclopyrazoflor+TX, zeta-cypermethrin+TX, Extract of seaweed and fermentation product derived from melasse+TX, Extract of seaweed and fermentation product derived from melasse comprising urea+TX, amino acids+TX, potassium and molybdenum and EDTA-chelated manganese+TX, Extract of seaweed and fermented plant products+TX, Extract of seaweed and fermented plant products comprising phytohormones+TX, vitamins+TX, EDTA-chelated copper+TX, zinc+TX, and iron+TX, azadirachtin+TX, *Bacillus aizawai*+TX, *Bacillus* chitinosporus AQ746 (NRRL Accession No B-21 618)+TX, *Bacillus firmus*+TX, *Bacillus kurstaki*+TX, *Bacillus mycoides* AQ726 (NRRL Accession No. B-21664)+TX, *Bacillus pumilus* (NRRL Accession No B-30087)+TX, *Bacillus pumilus* AQ717 (NRRL Accession No. B-21662)+TX, *Bacillus* sp. AQ178 (ATCC Accession No. 53522)+TX, *Bacillus* sp. AQ175 (ATCC

Accession No. 55608)+TX, *Bacillus* sp. AQ177 (ATCC Accession No. 55609)+TX, *Bacillus subtilis* unspecified+TX, *Bacillus subtilis* AQ153 (ATCC Accession No. 55614)+TX, *Bacillus subtilis* AQ30002 (NRRL Accession No. B-50421)+TX, *Bacillus subtilis* AQ30004 (NRRL Accession No. B—50455)+TX, *Bacillus subtilis* AQ713 (NRRL Accession No. B-21661)+TX, *Bacillus subtilis* AQ743 (NRRL Accession No. B-21665)+TX, *Bacillus thuringiensis* AQ52 (NRRL Accession No. B-21619)+TX, *Bacillus thuringiensis* BD #32 (NRRL Accession No B-21530)+TX, *Bacillus thuringiensis* subspec. *kurstaki* BMP 123+TX, *Beauveria bassiana*+TX, D-limonene+TX, *Granulovirus*+TX, Harpin+TX, *Helicoverpa armigera* Nucleopolyhedrovirus+TX, *Helicoverpa zea* Nucleopolyhedrovirus+TX, *Heliothis virescens* Nucleopolyhedrovirus+TX, *Heliothis punctigera* Nucleopolyhedrovirus+TX, *Metarhizium* spp.+TX, *Muscodor albus* 620 (NRRL Accession No. 30547)+TX, *Muscodor roseus* A3-5 (NRRL Accession No. 30548)+TX, Neem tree based products+TX, *Paecilomyces* fumosoroseus+TX, *Paecilomyces lilacinus*+TX, *Pasteuria nishizawae*+TX, *Pasteuria penetrans*+TX, *Pasteuria ramosa*+TX, *Pasteuria* thornei+TX, *Pasteuria* usgae+TX, P-cymene+TX, *Plutella xylostella* Granulosis virus+TX, *Plutella xylostella* Nucleopolyhedrovirus+TX, Polyhedrosis virus+TX, pyrethrum+TX, QRD 420 (a terpenoid blend)+TX, QRD 452 (a terpenoid blend)+TX, QRD 460 (a terpenoid blend)+TX, *Quillaja saponaria*+TX, *Rhodococcus globerulus* AQ719 (NRRL Accession No B-21663)+TX, *Spodoptera frugiperda* Nucleopolyhedrovirus+TX, *Streptomyces galbus* (NRRL Accession No. 30232)+TX, *Streptomyces* sp. (NRRL Accession No. B-30145)+TX, Terpenoid blend+TX, and *Verticillium* spp.+TX; [0689] 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 (730)+TX, triphenyltin acetate (IUPAC name) (347) and triphenyltin hydroxide (IUPAC name) (347)+TX; [0690] an anthelmintic selected from the group of substances consisting of abamectin (1)+TX, crufomate (1011)+TX, cyclobutrifluram+TX, doramectin (alternative name) [CCN]+TX, emamectin (291)+TX, emamectin benzoate (291)+TX, eprinomectin (alternative name) [CCN]+TX, ivermectin (alternative name) [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; [0691] 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-1H-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, 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, octhilinone (590)+TX, oxolinic acid (606)+TX, oxytetracycline (611)+TX, potassium hydroxyquinoline sulfate (446)+TX, probenazole (658)+TX, streptomycin (744)+TX, streptomycin sesquisulfate (744)+TX, tecloftalam (766)+TX, and thiomersal (alternative name) [CCN]+TX; [0692] 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 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 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 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, *Macrolophus caliginosus* (alternative name) (491)+TX, *Mamestra brassicae* NPV (alternative name) (494)+TX, *Metaphycus helvolus* (alternative name) (522)+TX, *Metarhizium anisopliae* var. *acridum* (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, *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 riobravis* (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; [0693] a soil sterilant selected from the group of substances consisting of iodomethane (IUPAC name) (542) and methyl bromide (537)+TX; [0694] 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; [0695] 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-11-enal (IUPAC name) (436)+TX, (Z)-hexadec-11-en-1-yl acetate (IUPAC name) (437)+TX, (Z)-hexadec-13-en-11-yn-1-yl acetate (IUPAC name) (438)+TX, (Z)-icos-13-en-10-one (IUPAC name) (448)+TX, (Z)-tetradec-7-en-1-a1 (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, codlelure (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; 1:1 mixture of the (Z,E) and (Z,Z) isomers of hexadeca-7,11-dien-1-yl-acetate) (420)+TX, grandlure (421)+TX,

grandlure I (alternative name) (421)+TX, grandlure II (alternative name) (421)+TX, grandlure Ill (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 Bi (alternative name) (839)+TX, trimedlure B.sub.2 (alternative name) (839)+TX, trimedlure C (alternative name) (839) and trunc-call (alternative name) [CCN]+TX; [0696] 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, methylneodecanamide [CCN]+TX, oxamate [CCN] and picaridin [CCN]+TX; [0697] a molluscicide selected from the group of substances consisting of bis(tributyltin) oxide (IUPAC name) (913)+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 (518)+TX, methiocarb (530)+TX, niclosamide (576)+TX, niclosamide-olamine (576)+TX, pentachlorophenol (623)+TX, sodium pentachlorophenoxide (623)+TX, tazimcarb (1412)+TX, thiodicarb (799)+TX, tributyltin oxide (913)+TX, trifenmorph (1454)+TX, trimethacarb (840)+TX, triphenyltin acetate (IUPAC name) (347) and triphenyltin hydroxide (IUPAC name) (347)+TX, pyriprole [394730-71-3]+TX; [0698] 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 (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) (210)+TX, abamectin (1)+TX, acetoprole [CCN]+TX, alanycarb (15)+TX, aldicarb (16)+TX, aldoxycarb (863)+TX, AZ 60541 (compound code)+TX, benclothiaz [CCN]+TX, benomyl (62)+TX, butylpyridaben (alternative name)+TX, cadusafos (109)+TX, carbofuran (118)+TX, carbon disulfide (945)+TX, carbosulfan (119)+TX, chloropicrin (141)+TX, chlorpyrifos (145)+TX, cloethocarb (999)+TX, cyclobutrifluram+TX, cytokinins (alternative name) (210)+TX, dazomet (216)+TX, DBCP (1045)+TX, DCIP (218)+TX, diamidafos (1044)+TX, dichlofenthion (1051)+TX, dicliphos (alternative name)+TX, dimethoate (262)+TX, doramectin (alternative name) [CCN]+TX, emamectin (291)+TX, emamectin benzoate (291)+TX, eprinomectin (alternative name) [CCN]+TX, ethoprophos (312)+TX, ethylene dibromide (316)+TX, fenamiphos (326)+TX, fenpyrad (alternative name)+TX, fensulfothion (1158)+TX, fosthiazate (408)+TX, fosthietan (1196)+TX, furfural (alternative name) [CCN]+TX, GY-81 (development code) (423)+TX, heterophos [CCN]+TX, iodomethane (IUPAC name) (542)+TX, isamidofos (1230)+TX, isazofos (1231)+TX, ivermectin (alternative name) [CCN]+TX, kinetin (alternative name) (210)+TX, mecarphon (1258)+TX, metam (519)+TX, metam-potassium (alternative name) (519)+TX, metam-sodium (519)+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-184 (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) (210)+TX, fluensulfone [318290-98-1]+TX, fluopyram+TX; [0699] a nitrification inhibitor selected from the group of substances consisting of potassium ethylxanthate [CCN] and nitrapyrin (580)+TX; [0700] 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; [0701] 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, bisthiosemi (912)+TX, brodifacoum (89)+TX, bromadiolone (including alpha-bromadiolone)+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, flocoumafen (357)+TX, fluoroacetamide (379)+TX, flupropadine (1183)+TX, flupropadine 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, 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; [0702] 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; [0703] a virucide selected from the group of substances consisting of imanin (alternative name) [CCN] and ribavirin (alternative name) [CCN]+TX; [0704] a wound protectant selected from the group of substances consisting of mercuric oxide (512)+TX, octhilinone (590) and thiophanate-methyl (802)+TX; [0705] a biologically active substance selected from 1,1-bis(4-chloro-phenyl)-2-ethoxyethanol+TX, 2,4-dichlorophenyl benzenesulfonate+TX, 2-fluoro-N-methyl-N-1-naphthylacetamide+TX, 4-chlorophenyl phenyl sulfone+TX, acetoprole+TX, aldoxycarb+TX, amidithion+TX, amidothioate+TX, amiton+TX, amiton hydrogen oxalate+TX, amitraz+TX, aramite+TX, arsenous oxide+TX, azobenzene+TX, azothoate+TX, benomyl+TX, benoxa-fos+TX, benzyl benzoate+TX, bixafen+TX, brofenvalerate+TX, bromo-cyclen+TX, bromophos+TX, bromopropylate+TX, buprofezin+TX, butocarboxim+TX, butoxycarboxim+TX, butylpyridaben+TX, calcium polysulfide+TX, camphechlor+TX, carbanolate+TX, carbophenothion+TX, cymiazole+TX, chino-methionat+TX, chlorbenside+TX, chlordimeform+TX, chlordimeform hydrochloride+TX, chlorfenethol+TX, chlorfenson+TX,

chlorfensulfide+TX, chlorobenzilate+TX, chloromebuform+TX, chloromethiuron+TX, chloropropylate+TX, chlorthiophos+TX, cinerin I+TX, cinerin II+TX, cinerins+TX, closantel+TX, coumaphos+TX, crotamiton+TX, crotoxyphos+TX, cufraneb+TX, cyanthoate+TX, DCPM+TX, DDT+TX, demephion+TX, demephion-O+TX, demephion-S+TX, demeton-methyl+TX, demeton-O+TX, demeton-O-methyl+TX, demeton-S+TX, demeton-S-methyl+TX, demeton-S-methylsulfon+TX, dichlofluanid+TX, dichlorvos+TX, dicliphos+TX, dienochlor+TX, dimefox+TX, dinex+TX, dinex-diclexine+TX, dinocap-4+TX, dinocap-6+TX, dinocton+TX, dinopenton+TX, dinosulfon+TX, dinoterbon+TX, dioxathion+TX, diphenyl sulfone+TX, disulfiram+TX, DNOC+TX, dofenapyn+TX, doramectin+TX, endothion+TX, eprinomectin+TX, ethoate-methyl+TX, etrimfos+TX, fenazaflor+TX, fenbutatin oxide+TX, fenothiocarb+TX, fenpyrad+TX, fen-pyroximate+TX, fenpyrazamine+TX, fenson+TX, fentrifanil+TX, flubenzimine+TX, flucycloxuron+TX, fluenetil+TX, fluorbenside+TX, FMC 1137+TX, formetanate+TX, formetanate hydrochloride+TX, formparanate+TX, gamma-HCH+TX, glyodin+TX, halfenprox+TX, hexadecyl cyclopropanecarboxylate+TX, isocarbophos+TX, jasmolin I+TX, jasmolin II+TX, jodfenphos+TX, lindane+TX, malonoben+TX, mecarbam+TX, mephosfolan+TX, mesulfen+TX, methacrifos+TX, methyl bromide+TX, metolcarb+TX, mexacarbate+TX, milbemycin oxime+TX, mipafox+TX, monocrotophos+TX, morphothion+TX, moxidectin+TX, naled+TX, 4-chloro-2-(2-chloro-2-methyl-propyl)-5-[(6-iodo-3-pyridyl)methoxy]pyridazin-3-one+TX, nifluridide+TX, nikkomycins+TX, nitrilacarb+TX, nitrilacarb 1:1 zinc chloride complex+TX, omethoate+TX, oxydeprofos+TX, oxydisulfoton+TX, pp′-DDT+TX, parathion+TX, permethrin+TX, phenkapton+TX, phosalone+TX, phosfolan+TX, phosphamidon+TX, polychloroterpenes+TX, polynactins+TX, proclonol+TX, promacyl+TX, propoxur+TX, prothidathion+TX, prothoate+TX, pyrethrin I+TX, pyrethrin II+TX, pyrethrins+TX, pyridaphenthion+TX, pyrimitate+TX, quinalphos+TX, quintiofos+TX, R-1492+TX, phosglycin+TX, rotenone+TX, schradan+TX, sebufos+TX, selamectin+TX, sophamide+TX, SSI-121+TX, sulfiram+TX, sulfluramid+TX, sulfotep+TX, sulfur+TX, diflovidazin+TX, tau-fluvalinate+TX, TEPP+TX, terbam+TX, tetradifon+TX, tetrasul+TX, thiafenox+TX, thiocarboxime+TX, thiofanox+TX, thiometon+TX, thioquinox+TX, thuringiensin+TX, triamiphos+TX, triarathene+TX, triazophos+TX, triazuron+TX, trifenofos+TX, trinactin+TX, vamidothion+TX, vaniliprole+TX, bethoxazin+TX, copper dioctanoate+TX, copper sulfate+TX, cybutryne+TX, dichlone+TX, dichlorophen+TX, endothal+TX, fentin+TX, hydrated lime+TX, nabam+TX, quinoclamine+TX, quinonamid+TX, simazine+TX, triphenyltin acetate+TX, triphenyltin hydroxide+TX, crufomate+TX, piperazine+TX, thiophanate+TX, chloralose+TX, fenthion+TX, pyridin-4-amine+TX, strychnine+TX, 1-hydroxy-1H-pyridine-2-thione+TX, 4-(quinoxalin-2-ylamino)benzenesulfonamide+TX, 8-hydroxyquinoline sulfate+TX, bronopol+TX, copper hydroxide+TX, cresol+TX, dipyrithione+TX, dodicin+TX, fenaminosulf+TX, formaldehyde+TX, hydrargaphen+TX, kasugamycin+TX, kasugamycin hydrochloride hydrate+TX, nickel bis(dimethyldithiocarbamate)+TX, nitrapyrin+TX, octhilinone+TX, oxolinic acid+TX, oxytetracycline+TX, potassium hydroxyquinoline sulfate+TX, probenazole+TX, streptomycin+TX, streptomycin sesquisulfate+TX, tecloftalam+TX, thiomersal+TX, *Adoxophyes orana* GV+TX, *Agrobacterium radiobacter*+TX, *Amblyseius* spp.+TX, *Anagrapha falcifera* NPV+TX, *Anagrus atomus*+TX, *Aphelinus abdominalis*+TX, *Aphidius colemani*+TX, *Aphidoletes aphidimyza*+TX, *Autographa californica* NPV+TX, *Bacillus sphaericus* Neide+TX, *Beauveria brongniartii*+TX, *Chrysoperla carnea*+TX, *Cryptolaemus montrouzieri*+TX, *Cydia pomonella* GV+TX, *Dacnusa sibirica*+TX, *Diglyphus isaea*+TX, *Encarsia formosa*+TX, *Eretmocerus eremicus*+TX, *Heterorhabditis bacteriophora* and *H. megidis*+TX, *Hippodamia convergens*+TX, *Leptomastix dactylopii*+TX, *Macrolophus caliginosus*+TX, *Mamestra brassicae* NPV+TX, *Metaphycus helvolus*+TX, *Metarhizium anisopliae* var. *acridum*+TX, *Metarhizium anisopliae* var. *anisopliae*+TX, *Neodiprion sertifer* NPV and *N. lecontei* NPV+TX, *Orius* spp.+TX, *Paecilomyces fumosoroseus*+TX, *Phytoseiulus persimilis*+TX, *Steinernema bibionis*+TX, *Steinernema*

carpocapsae+TX, *Steinernema feltiae*+TX, *Steinernema glaseri*+TX, *Steinernema riobrave*+TX, *Steinernema riobravis*+TX, *Steinernema scapterisci*+TX, *Steinernema* spp.+TX, *Trichogramma* spp.+TX, *Typhlodromus occidentalis*+TX, *Verticillium lecanii*+TX, apholate+TX, bisazir+TX, busulfan+TX, dimatif+TX, hemel+TX, hempa+TX, metepa+TX, methiotepa+TX, methyl apholate+TX, morzid+TX, penfluron+TX, tepa+TX, thiohempa+TX, thiotepa+TX, tretamine+TX, uredepa+TX, (E)-dec-5-en-1-yl acetate with (E)-dec-5-en-1-ol+TX, (E)-tridec-4-en-1-yl acetate+TX, (E)-6-methylhept-2-en-4-ol+TX, (E,Z)-tetradeca-4,10-dien-1-yl acetate+TX, (Z)-dodec-7-en-1-yl acetate+TX, (Z)-hexadec-11-enal+TX, (Z)-hexadec-11-en-1-yl acetate+TX, (Z)-hexadec-13-en-11-yn-1-yl acetate+TX, (Z)-icos-13-en-10-one+TX, (Z)-tetradec-7-en-1-a1+TX, (Z)-tetradec-9-en-1-ol+TX, (Z)-tetradec-9-en-1-yl acetate+TX, (7E,9Z)-dodeca-7,9-dien-1-yl acetate+TX, (9Z,11E)-tetradeca-9,11-dien-1-yl acetate+TX, (9Z,12E)-tetradeca-9,12-dien-1-yl acetate+TX, 14-methyloctadec-1-ene+TX, 4-methylnonan-5-ol with 4-methylnonan-5-one+TX, alpha-multistriatin+TX, brevicomin+TX, codlelure+TX, codlemone+TX, cuelure+TX, disparlure+TX, dodec-8-en-1-yl acetate+TX, dodec-9-en-1-yl acetate+TX, dodeca-8+TX, 10-dien-1-yl acetate+TX, dominicalure+TX, ethyl 4-methyloctanoate+TX, eugenol+TX, frontalin+TX, grandlure+TX, grandlure I+TX, grandlure II+TX, grandlure III+TX, grandlure IV+TX, hexalure+TX, ipsdienol+TX, ipsenol+TX, japonilure+TX, lineatin+TX, litlure+TX, looplure+TX, medlure+TX, megatomoic acid+TX, methyl eugenol+TX, muscalure+TX, octadeca-2,13-dien-1-yl acetate+TX, octadeca-3,13-dien-1-yl acetate+TX, orfralure+TX, oryctalure+TX, ostramone+TX, siglure+TX, sordidin+TX, sulcatol+TX, tetradec-11-en-1-yl acetate+TX, trimedlure+TX, trimedlure A+TX, trimedlure Bi+TX, trimedlure B.sub.2+TX, trimedlure C+TX, trunc-call+TX, 2-(octylthio)-ethanol+TX, butopyronoxyl+TX, butoxy(polypropylene glycol)+TX, dibutyl adipate+TX, dibutyl phthalate+TX, dibutyl succinate+TX, diethyltoluamide+TX, dimethyl carbate+TX, dimethyl phthalate+TX, ethyl hexanediol+TX, hexamide+TX, methoquin-butyl+TX, methylneodecanamide+TX, oxamate+TX, picaridin+TX, 1-dichloro-1-nitroethane+TX, 1,1-dichloro-2,2-bis(4-ethylphenyl)-ethane+TX, 1,2-dichloropropane with 1,3-dichloropropene+TX, 1-bromo-2-chloroethane+TX, 2,2,2-trichloro-1-(3,4-dichloro-phenyl)ethyl acetate+TX, 2,2-dichlorovinyl 2-ethylsulfinylethyl methyl phosphate+TX, 2-(1,3-dithiolan-2-yl)phenyl dimethylcarbamate+TX, 2-(2-butoxyethoxy)ethyl thiocyanate+TX, 2-(4,5-dimethyl-1,3-dioxolan-2-yl)phenyl methylcarbamate+TX, 2-(4-chloro-3,5-xylyloxy)ethanol+TX, 2-chlorovinyl diethyl phosphate+TX, 2-imidazolidone+TX, 2-isovalerylindan-1,3-dione+TX, 2-methyl(prop-2-ynyl)aminophenyl methylcarbamate+TX, 2-thiocyanatoethyl laurate+TX, 3-bromo-1-chloroprop-1-ene+TX, 3-methyl-1-phenylpyrazol-5-yl dimethyl-carbamate+TX, 4-methyl(prop-2-ynyl)amino-3,5-xylyl methylcarbamate+TX, 5,5-dimethyl-3-oxocyclohex-1-enyl dimethylcarbamate+TX, acethion+TX, acrylonitrile+TX, aldrin+TX, allosamidin+TX, allyxycarb+TX, alpha-ecdysone+TX, aluminium phosphide+TX, aminocarb+TX, anabasine+TX, athidathion+TX, azamethiphos+TX, *Bacillus thuringiensis* delta endotoxins+TX, barium hexafluorosilicate+TX, barium polysulfide+TX, barthrin+TX, Bayer 22/190+TX, Bayer 22408+TX, beta-cyfluthrin+TX, beta-cypermethrin+TX, bioethanomethrin+TX, biopermethrin+TX, bis(2-chloroethyl) ether+TX, borax+TX, bromfenvinfos+TX, bromo-DDT+TX, bufencarb+TX, butacarb+TX, butathiofos+TX, butonate+TX, calcium arsenate+TX, calcium cyanide+TX, carbon disulfide+TX, carbon tetrachloride+TX, cartap hydrochloride+TX, cevadine+TX, chlorbicyclen+TX, chlordane+TX, chlordecone+TX, chloroform+TX, chloropicrin+TX, chlorphoxim+TX, chlorprazophos+TX, cis-resmethrin+TX, cismethrin+TX, clocythrin+TX, copper acetoarsenite+TX, copper arsenate+TX, copper oleate+TX, coumithoate+TX, cryolite+TX, CS 708+TX, cyanofenphos+TX, cyanophos+TX, cyclethrin+TX, cythioate+TX, d-tetramethrin+TX, DAEP+TX, dazomet+TX, decarbofuran+TX, diamidafos+TX, dicapthon+TX, dichlofenthion+TX, dicresyl+TX, dicyclanil+TX, dieldrin+TX, diethyl 5-methylpyrazol-3-yl phosphate+TX, dilor+TX, dimefluthrin+TX, dimetan+TX, dimethrin+TX, dimethylvinphos+TX, dimetilan+TX, dinoprop+TX, dinosam+TX, dinoseb+TX, diofenolan+TX, dioxabenzofos+TX, dithicrofos+TX,

DSP+TX, ecdysterone+TX, El 1642+TX, EMPC+TX, EPBP+TX, etaphos+TX, ethiofencarb+TX, ethyl formate+TX, ethylene dibromide+TX, ethylene dichloride+TX, ethylene oxide+TX, EXD+TX, fenchlorphos+TX, fenethacarb+TX, fenitrothion+TX, fenoxacrim+TX, fenpirithrin+TX, fensulfothion+TX, fenthion-ethyl+TX, flucofuron+TX, fosmethilan+TX, fospirate+TX, fosthietan+TX, furathiocarb+TX, furethrin+TX, guazatine+TX, guazatine acetates+TX, sodium tetrathiocarbonate+TX, halfenprox+TX, HCH+TX, HEOD+TX, heptachlor+TX, heterophos+TX, HHDN+TX, hydrogen cyanide+TX, hyquincarb+TX, IPSP+TX, isazofos+TX, isobenzan+TX, isodrin+TX, isofenphos+TX, isolane+TX, isoprothiolane+TX, isoxathion+TX, juvenile hormone I+TX, juvenile hormone II+TX, juvenile hormone Ill+TX, kelevan+TX, kinoprene+TX, lead arsenate+TX, leptophos+TX, lirimfos+TX, lythidathion+TX, m-cumenyl methylcarbamate+TX, magnesium phosphide+TX, mazidox+TX, mecarphon+TX, menazon+TX, mercurous chloride+TX, mesulfenfos+TX, metam+TX, metam-potassium+TX, metam-sodium+TX, methanesulfonyl fluoride+TX, methocrotophos+TX, methoprene+TX, methothrin+TX, methoxychlor+TX, methyl isothiocyanate+TX, methylchloroform+TX, methylene chloride+TX, metoxadiazone+TX, mirex+TX, naftalofos+TX, naphthalene+TX, NC-170+TX, nicotine+TX, nicotine sulfate+TX, nithiazine+TX, nornicotine+TX, O-5-dichloro-4-iodophenyl O-ethyl ethylphosphonothioate+TX, O,O-diethyl O-4-methyl-2-oxo-2H-chromen-7-yl phosphorothioate+TX, O,O-diethyl O-6-methyl-2-propylpyrimidin-4-yl phosphorothioate+TX, O,O,O′,O′-tetrapropyl dithiopyrophosphate+TX, oleic acid+TX, para-dichlorobenzene+TX, parathion-methyl+TX, pentachlorophenol+TX, pentachlorophenyl laurate+TX, PH 60-38+TX, phenkapton+TX, phosnichlor+TX, phosphine+TX, phoxim-methyl+TX, pirimetaphos+TX, polychlorodicyclopentadiene isomers+TX, potassium arsenite+TX, potassium thiocyanate+TX, precocene I+TX, precocene II+TX, precocene Ill+TX, primidophos+TX, profluthrin+TX, promecarb+TX, prothiofos+TX, pyrazophos+TX, pyresmethrin+TX, quassia+TX, quinalphos-methyl+TX, quinothion+TX, rafoxanide+TX, resmethrin+TX, rotenone+TX, kadethrin+TX, ryania+TX, ryanodine+TX, sabadilla+TX, schradan+TX, sebufos+TX, SI-0009+TX, thiapronil+TX, sodium arsenite+TX, sodium cyanide+TX, sodium fluoride+TX, sodium hexafluorosilicate+TX, sodium pentachlorophenoxide+TX, sodium selenate+TX, sodium thiocyanate+TX, sulcofuron+TX, sulcofuron-sodium+TX, sulfuryl fluoride+TX, sulprofos+TX, tar oils+TX, tazimcarb+TX, TDE+TX, tebupirimfos+TX, temephos+TX, terallethrin+TX, tetrachloroethane+TX, thicrofos+TX, thiocyclam+TX, thiocyclam hydrogen oxalate+TX, thionazin+TX, thiosultap+TX, thiosultap-sodium+TX, tralomethrin+TX, transpermethrin+TX, triazamate+TX, trichlormetaphos-3+TX, trichloronat+TX, trimethacarb+TX, tolprocarb+TX, triclopyricarb+TX, triprene+TX, veratridine+TX, veratrine+TX, XMC+TX, zetamethrin+TX, zinc phosphide+TX, zolaprofos+TX, meperfluthrin+TX, tetramethylfluthrin+TX, bis(tributyltin) oxide+TX, bromoacetamide+TX, ferric phosphate+TX, niclosamide-olamine+TX, tributyltin oxide+TX, pyrimorph+TX, trifenmorph+TX, 1,2-dibromo-3-chloropropane+TX, 1,3-dichloropropene+TX, 3,4-dichlorotetrahydrothio-phene 1,1-dioxide+TX, 3-(4-chlorophenyl)-5-methylrhodanine+TX, 5-methyl-6-thioxo-1,3,5-thiadiazinan-3-ylacetic acid+TX, 6-isopentenylaminopurine+TX, anisiflupurin+TX, benclothiaz+TX, cytokinins+TX, DCIP+TX, furfural+TX, isamidofos+TX, kinetin+TX, *Myrothecium* verrucaria composition+TX, tetrachlorothiophene+TX, xylenols+TX, zeatin+TX, potassium ethylxanthate+TX, acibenzolar+TX, acibenzolar-S-methyl+TX, *Reynoutria sachalinensis* extract+TX, alpha-chlorohydrin+TX, antu+TX, barium carbonate+TX, bisthiosemi+TX, brodifacoum+TX, bromadiolone+TX, bromethalin+TX, chlorophacinone+TX, cholecalciferol+TX, coumachlor+TX, coumafuryl+TX, coumatetralyl+TX, crimidine+TX, difenacoum+TX, difethialone+TX, diphacinone+TX, ergocalciferol+TX, flocoumafen+TX, fluoroacetamide+TX, flupropadine+TX, flupropadine hydrochloride+TX, norbormide+TX, phosacetim+TX, phosphorus+TX, pindone+TX, pyrinuron+TX, scilliroside+TX, -sodium fluoroacetate+TX, thallium sulfate+TX, warfarin+TX, -2-(2-butoxyethoxy)ethyl piperonylate+TX, 5-(1,3-benzodioxol-5-yl)-3-hexylcyclohex-2-enone+TX,

farnesol with nerolidol+TX, verbutin+TX, MGK 264+TX, piperonyl butoxide+TX, piprotal+TX, propyl isomer+TX, S421+TX, sesamex+TX, sesasmolin+TX, sulfoxide+TX, anthraquinone+TX, copper naphthenate+TX, copper oxychloride+TX, dicyclopentadiene+TX, thiram+TX, zinc naphthenate+TX, ziram+TX, imanin+TX, ribavirin+TX, chloroinconazide+TX, mercuric oxide+TX, thiophanate-methyl+TX, azaconazole+TX, bitertanol+TX, bromuconazole+TX, cyproconazole+TX, difenoconazole+TX, diniconazole-+TX, epoxiconazole+TX, fenbuconazole+TX, fluquinconazole+TX, flusilazole+TX, flutriafol+TX, furametpyr+TX, hexaconazole+TX, imazalil-+TX, imiben-conazole+TX, ipconazole+TX, metconazole+TX, myclobutanil+TX, paclobutrazole+TX, pefurazoate+TX, penconazole+TX, prothioconazole+TX, pyrifenox+TX, prochloraz+TX, propiconazole+TX, pyrisoxazole+TX, -simeconazole+TX, tebucon-azole+TX, tetraconazole+TX, triadimefon+TX, triadimenol+TX, triflumizole+TX, triticonazole+TX, ancymidol+TX, fenarimol+TX, nuarimol+TX, bupirimate+TX, dimethirimol+TX, ethirimol+TX, dodemorph+TX, fenpropidin+TX, fenpropimorph+TX, spiroxamine+TX, tridemorph+TX, cyprodinil+TX, mepanipyrim+TX, pyrimethanil+TX, fenpiclonil+TX, fludioxonil+TX, benalaxyl+TX, furalaxyl+TX, metalaxyl+TX, R-metalaxyl+TX, ofurace+TX, oxadixyl+TX, carbendazim+TX, debacarb+TX, fuberidazole-+TX, thiabendazole+TX, chlozolinate+TX, dichlozoline+TX, myclozoline-+TX, procymidone+TX, vinclozoline+TX, boscalid+TX, carboxin+TX, fenfuram+TX, flutolanil+TX, mepronil+TX, oxycarboxin+TX, penthiopyrad+TX, thifluzamide+TX, dodine+TX, iminoctadine+TX, azoxystrobin+TX, dimoxystrobin+TX, enestroburin+TX, fenaminstrobin+TX, flufenoxystrobin+TX, fluoxastrobin+TX, kresoxim--methyl+TX, metominostrobin+TX, trifloxystrobin+TX, orysastrobin+TX, picoxystrobin+TX, pyraclostrobin+TX, pyrametostrobin+TX, pyraoxystrobin+TX, ferbam+TX, mancozeb+TX, maneb+TX, metiram+TX, propineb+TX, zineb+TX, captafol+TX, captan+TX, fluoroimide+TX, folpet+TX, tolylfluanid+TX, bordeaux mixture+TX, copper oxide+TX, mancopper+TX, oxine-copper+TX, nitrothal-isopropyl+TX, edifenphos+TX, iprobenphos+TX, phosdiphen+TX, tolclofos-methyl+TX, anilazine+TX, benthiavalicarb+TX, blasticidin-S+TX, chloroneb-+TX, chloro-tha-lonil+TX, cyflufenamid+TX, cymoxanil+TX, cyclobutrifluram+TX, diclocymet+TX, diclomezine-+TX, dicloran+TX, diethofencarb+TX, dimethomorph-+TX, flumorph+TX, dithianon+TX, ethaboxam+TX, etridiazole+TX, famoxadone+TX, fenamidone+TX, fenoxanil+TX, ferimzone+TX, fluazinam+TX, flumetylsulforim+TX, fluopicolide+TX, fluoxytioconazole+TX, flusulfamide+TX, fluxapyroxad+TX,-fenhexamid+TX, fosetyl-aluminium-+TX, hymexazol+TX, iprovalicarb+TX, cyazofamid+TX, methasulfocarb+TX, metrafenone+TX, pencycuron+TX, phthalide+TX, polyoxins+TX, propamocarb+TX, pyribencarb+TX, proquinazid+TX, pyroquilon+TX, pyriofenone+TX, quinoxyfen+TX, quintozene+TX, tiadinil+TX, triazoxide+TX, tricyclazole+TX, triforine+TX, validamycin+TX, valifenalate+TX, zoxamide+TX, mandipropamid+TX, flubeneteram+TX, isopyrazam+TX, sedaxane+TX, benzovindiflupyr+TX, pydiflumetofen+TX, 3-difluoromethyl-1-methyl-1H-pyrazole-4-carboxylic acid (3′,4′,5′-trifluoro-biphenyl-2-yl)-amide+TX, isoflucypram+TX, isotianil+TX, dipymetitrone+TX, 6-ethyl-5,7-dioxo-pyrrolo[4,5][1,4]dithiino[1,2-c]isothiazole-3-carbonitrile+TX, 2-(difluoromethyl)-N-[3-ethyl-1,1-dimethyl-indan-4-yl]pyridine-3-carboxamide+TX, 4-(2,6-difluorophenyl)-6-methyl-5-phenyl-pyridazine-3-carbonitrile+TX, (R)-3-(difluoromethyl)-1-methyl-N-[1,1,3-trimethylindan-4-yl]pyrazole-4-carboxamide+TX, 4-(2-bromo-4-fluoro-phenyl)-N-(2-chloro-6-fluoro-phenyl)-2,5-dimethyl-pyrazol-3-amine+TX, 4-(2-bromo- 4-fluorophenyl)-N-(2-chloro- 6-fluorophenyl)-1, 3-dimethyl-1H-pyrazol- 5-amine+TX, fluindapyr+TX, coumethoxystrobin (jiaxiangjunzhi)+TX, Ivbenmixianan+TX, dichlobentiazox+TX, mandestrobin+TX, 3-(4,4-difluoro-3,4-dihydro-3,3-dimethylisoquinolin-1-yl)quinolone+TX, 2-[2-fluoro-6-[(8-fluoro-2-methyl-3-quinolyl)oxy]phenyl]propan-2-ol+TX, oxathiapiprolin+TX, tert-butyl N-[6-[[[(1-methyltetrazol-5-yl)-phenyl-methylene]amino]oxymethyl]-2-pyridyl]carbamate+TX, pyraziflumid+TX, inpyrfluxam+TX, trolprocarb+TX, mefentrifluconazole+TX, ipfentrifluconazole+TX, 2-

(difluoromethyl)-N-[(3R)-3-ethyl-1,1-dimethyl-indan-4-yl]pyridine-3-carboxamide+TX, N′-(2,5-dimethyl-4-phenoxy-phenyl)-N-ethyl-N-methyl-formamidine+TX, N′-[4-(4,5-dichlorothiazol-2-yl)oxy-2,5-dimethyl-phenyl]-N-ethyl-N-methyl-formamidine+TX, [2-[3-[2-[1-[2-[3,5-bis(difluoromethyl)pyrazol-1-yl]acetyl]-4-piperidyl]thiazol-4-yl]-4,5-dihydroisoxazol-5-yl]-3-chloro-phenyl]methanesulfonate+TX, but-3-ynyl N-[6-[[(Z)-[(1-methyltetrazol-5-yl)-phenyl-methylene]amino]oxymethyl]-2-pyridyl]carbamate+TX, methyl N-[[5-[4-(2,4-dimethylphenyl)triazol-2-yl]-2-methyl-phenyl]methyl]carbamate+TX, 3-chloro-6-methyl-5-phenyl-4-(2,4,6-trifluorophenyl)pyridazine+TX, pyridachlometyl+TX, 3-(difluoromethyl)-1-methyl-N-[1,1,3-trimethylindan-4-yl]pyrazole-4-carboxamide+TX, 1-[2-[[1-(4-chlorophenyl)pyrazol-3-yl]oxymethyl]-3-methyl-phenyl]-4-methyl-tetrazol-5-one+TX, 1-methyl-4-[3-methyl-2-[[2-methyl-4-(3,4,5-trimethylpyrazol-1-yl)phenoxy]methyl]phenyl]tetrazol-5-one+TX, aminopyrifen+TX, ametoctradin+TX, amisulbrom+TX, penflufen+TX, (Z,2E)-5-[1-(4-chlorophenyl)pyrazol-3-yl]oxy-2-methoxyimino-N,3-dimethyl-pent-3-enamide+TX, florylpicoxamid+TX, fenpicoxamid+TX, metarylpicoxamid+TX, tebufloquin+TX, ipflufenoquin+TX, quinofumelin+TX, isofetamid+TX, ethyl 1-[[4-[[2-(trifluoromethyl)-1,3-dioxolan-2-yl]methoxy]phenyl]methyl]pyrazole-3-carboxylate+TX (may be prepared from the methods described in WO 2020/056090), ethyl 1-[[4-[(Z)-2-ethoxy-3,3,3-trifluoro-prop-1-enoxy]phenyl]methyl]pyrazole-3-carboxylate+TX (may be prepared from the methods described in WO 2020/056090), methyl N-[[4-[1-(4-cyclopropyl-2,6-difluoro-phenyl)pyrazol-4-yl]-2-methyl-phenyl]methyl]carbamate+TX (may be prepared from the methods described in WO 2020/097012), methyl N-[[4-[1-(2,6-difluoro-4-isopropyl-phenyl)pyrazol-4-yl]-2-methyl-phenyl]methyl]carbamate+TX (may be prepared from the methods described in WO 2020/097012), 6-chloro-3-(3-cyclopropyl-2-fluoro-phenoxy)-N-[2-(2,4-dimethylphenyl)-2,2-difluoro-ethyl]-5-methyl-pyridazine-4-carboxamide+TX (may be prepared from the methods described in WO 2020/109391), 6-chloro-N-[2-(2-chloro-4-methyl-phenyl)-2,2-difluoro-ethyl]-3-(3-cyclopropyl-2-fluoro-phenoxy)-5-methyl-pyridazine-4-carboxamide+TX (may be prepared from the methods described in WO 2020/109391), 6-chloro-3-(3-cyclopropyl-2-fluoro-phenoxy)-N-[2-(3,4-dimethylphenyl)-2,2-difluoro-ethyl]-5-methyl-pyridazine-4-carboxamide+TX (may be prepared from the methods described in WO 2020/109391), N-[2-[2,4-dichloro-phenoxy]phenyl]-3-(difluoromethyl)-1-methyl-pyrazole-4-carboxamide+TX, N-[2-[2-chloro-4-(trifluoromethyl)phenoxy]phenyl]-3-(difluoromethyl)-1-methyl-pyrazole-4-carboxamide+TX, benzothiostrobin+TX, phenamacril+TX, 5-amino-1,3,4-thiadiazole-2-thiol zinc salt (2:1)+TX, fluopyram+TX, flufenoxadiazam+TX, flutianil+TX, fluopimomide+TX, pyrapropoyne+TX, picarbutrazox+TX, 2-(difluoromethyl)-N-(3-ethyl-1,1-dimethyl-indan-4-yl)pyridine-3-carboxamide+TX, 2-(difluoromethyl)-N-((3R)-1, 1, 3-trimethylindan- 4-yl) pyridine- 3-carboxamide+TX, 4-[[6-[2-(2,4-difluorophenyl)-1,1-difluoro-2-hydroxy-3-(1,2,4-triazol-1-yl)propyl]-3-pyridyl]oxy]benzonitrile+TX, metyltetraprole+TX, 2-(difluoromethyl)-N((3R)-1, 1, 3-trimethylindan-4- yl)pyridine- 3-carboxamide+TX, α-(1, 1-dimethylethyl)-α- [4′-(trifluoromethoxy) [1, 1′-biphenyl]-4-yl]-5-pyrimidinemethanol+TX, fluoxapiprolin+TX, enoxastrobin+TX, methyl (Z)-3-methoxy-2-[2-methyl-5-[4-(trifluoromethyl)triazol-2-yl]phenoxy]prop-2-enoate+TX, methyl (Z)-3-methoxy-2-[2-methyl-5-(4-propyltriazol-2-yl)phenoxy]prop-2-enoate+TX, methyl (Z)-2-[5-(3-isopropylpyrazol-1-yl)-2-methyl-phenoxy]-3-methoxy-prop-2-enoate+TX, methyl (Z)-3-methoxy-2-[2-methyl-5-(3-propylpyrazol-1-yl)phenoxy]prop-2-enoate+TX, methyl (Z)-3-methoxy-2-[2-methyl-5-[3-(trifluoromethyl)pyrazol-1-yl]phenoxy]prop-2-enoate+TX (these compounds may be prepared from the methods described in WO2020/079111), methyl (Z)-2-(5-cyclohexyl-2-methyl-phenoxy)-3-methoxy-prop-2-enoate+TX, methyl (Z)-2-(5-cyclopentyl-2-methyl-phenoxy)-3-methoxy-prop-2-enoate+TX (these compounds may be prepared from the methods described in WO2020/193387), 4-[[6-[2-(2,4-difluorophenyl)-1,1-difluoro-2-hydroxy-3-(1,2,4-triazol-1-yl)propyl]-3-pyridyl]oxy]benzonitrile+TX, 4-[[6-[2-(2,4-difluorophenyl)-1,1-difluoro-2-hydroxy-3-(5-sulfanyl-

1,2,4-triazol-1-yl)propyl]-3-pyridyl]oxy]benzonitrile+TX, 4-[[6-[2-(2,4-difluorophenyl)-1,1-difluoro-2-hydroxy-3-(5-thioxo-4H-1,2,4-triazol-1-yl)propyl]-3-pyridyl]oxy]benzonitrile+TX, trinexapac+TX, coumoxystrobin+TX, zhongshengmycin+TX, thiodiazole copper+TX, zinc thiazole+TX, amectotractin+TX, iprodione+TX, seboctylamine+TX; N′-[5-bromo-2-methyl-6-[(1S)-1-methyl-2-propoxy-ethoxy]-3-pyridyl]-N-ethyl-N-methyl-formamidine+TX, N′-[5-bromo-2-methyl-6-[(1R)-1-methyl-2-propoxy-ethoxy]-3-pyridyl]-N-ethyl-N-methyl-formamidine+TX, N′-[5-bromo-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine+TX, N′-[5-chloro-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine+TX, N′-[5-bromo-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-isopropyl-N-methyl-formamidine+TX (these compounds may be prepared from the methods described in WO2015/155075); N′-[5-bromo-2-methyl-6-(2-propoxypropoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine+TX (this compound may be prepared from the methods described in IPCOM000249876D); N-isopropyl-N′-[5-methoxy-2-methyl-4-(2,2,2-trifluoro-1-hydroxy-1-phenyl-ethyl)phenyl]-N-methyl-formamidine+TX, N′-[4-(1-cyclopropyl-2,2,2-trifluoro-1-hydroxy-ethyl)-5-methoxy-2-methyl-phenyl]-N-isopropyl-N-methyl-formamidine+TX (these compounds may be prepared from the methods described in WO2018/228896); N-ethyl-N′-[5-methoxy-2-methyl-4-[(2-trifluoromethyl)oxetan-2-yl]phenyl]-N-methyl-formamidine+TX, N-ethyl-N′-[5-methoxy-2-methyl-4-[(2-trifuoromethyl)tetrahydrofuran-2-yl]phenyl]-N-methyl-formamidine+TX (these compounds may be prepared from the methods described in WO2019/110427); N-[(1R)-1-benzyl-3-chloro-1-methyl-but-3-enyl]-8-fluoro-quinoline-3-carboxamide+TX, N-[(1S)-1-benzyl-3-chloro-1-methyl-but-3-enyl]-8-fluoro-quinoline-3-carboxamide+TX, N-[(1R)-1-benzyl-3,3,3-trifluoro-1-methyl-propyl]-8-fluoro-quinoline-3-carboxamide+TX, N-[(1S)-1-benzyl-3,3,3-trifluoro-1-methyl-propyl]-8-fluoro-quinoline-3-carboxamide+TX, N-[(1R)-1-benzyl-1,3-dimethyl-butyl]-7,8-difluoro-quinoline-3-carboxamide+TX, N-[(1S)-1-benzyl-1,3-dimethyl-butyl]-7,8-difluoro-quinoline-3-carboxamide+TX, 8-fluoro-N-[(1R)-1-[(3-fluorophenyl)methyl]-1,3-dimethyl-butyl]quinoline-3-carboxamide+TX, 8-fluoro-N-[(1S)-1-[(3-fluorophenyl)methyl]-1,3-dimethyl-butyl]quinoline-3-carboxamide+TX, N-[(1R)-1-benzyl-1,3-dimethyl-butyl]-8-fluoro-quinoline-3-carboxamide+TX, N-[(1S)-1-benzyl-1,3-dimethyl-butyl]-8-fluoro-quinoline-3-carboxamide+TX, N-((1R)-1-benzyl-3-chloro-1-methyl-but-3-enyl)-8-fluoro-quinoline-3-carboxamide+TX, N-((1S)-1-benzyl-3-chloro-1-methyl-but-3-enyl)-8-fluoro-quinoline-3-carboxamide+TX (these compounds may be prepared from the methods described in WO2017/153380); 1-(6,7-dimethylpyrazolo[1,5-a]pyridin-3-yl)-4,4,5-trifluoro-3,3-dimethyl-isoquinoline+TX, 1-(6,7-dimethylpyrazolo[1,5-a]pyridin-3-yl)-4,4,6-trifluoro-3,3-dimethyl-isoquinoline+TX, 4,4-difluoro-3,3-dimethyl-1-(6-methylpyrazolo[1,5-a]pyridin-3-yl)isoquinoline+TX, 4,4-difluoro-3,3-dimethyl-1-(7-methylpyrazolo[1,5-a]pyridin-3-yl)isoquinoline+TX, 1-(6-chloro-7-methyl-pyrazolo[1,5-a]pyridin-3-yl)-4,4-difluoro-3,3-dimethyl-isoquinoline+TX (these compounds may be prepared from the methods described in WO2017/025510); 1-(4,5-dimethylbenzimidazol-1-yl)-4,4,5-trifluoro-3,3-dimethyl-isoquinoline+TX, 1-(4,5-dimethylbenzimidazol-1-yl)-4,4-difluoro-3,3-dimethyl-isoquinoline+TX, 6-chloro-4,4-difluoro-3,3-dimethyl-1-(4-methylbenzimidazol-1-yl)isoquinoline+TX, 4,4-difluoro-1-(5-fluoro-4-methyl-benzimidazol-1-yl)-3,3-dimethyl-isoquinoline+TX, 3-(4,4-difluoro-3,3-dimethyl-1-isoquinolyl)-7,8-dihydro-6H-cyclopenta[e]benzimidazole+TX (these compounds may be prepared from the methods described in WO2016/156085); N-methoxy-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]cyclopropanecarboxamide+TX, N,2-dimethoxy-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propanamide+TX, N-ethyl-2-methyl-N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propanamide+TX, 1-methoxy-3-methyl-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea+TX, 1,3-dimethoxy-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea+TX, 3-ethyl-1-methoxy-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]urea+TX, N-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]propanamide+TX, 4,4-dimethyl-2-[[4-[5-

(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]isoxazolidin-3-one+TX, 5,5-dimethyl-2-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]isoxazolidin-3-one+TX, ethyl 1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]pyrazole-4-carboxylate+TX, N,N-dimethyl-1-[[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methyl]-1,2,4-triazol-3-amine+TX. The compounds in this paragraph may be prepared from the methods described in WO 2017/055473, WO 2017/055469, WO 2017/093348 and WO 2017/118689; 2-[6-(4-chlorophenoxy)-2-(trifluoromethyl)-3-pyridyl]-1-(1,2,4-triazol-1-yl)propan-2-ol+TX (this compound may be prepared from the methods described in WO 2017/029179); 2-[6-(4-bromophenoxy)-2-(trifluoromethyl)-3-pyridyl]-1-(1,2,4-triazol-1-yl)propan-2-ol+TX (this compound may be prepared from the methods described in WO 2017/029179); 3-[2-(1-chlorocyclopropyl)-3-(2-fluorophenyl)-2-hydroxy-propyl]imidazole-4-carbonitrile+TX (this compound may be prepared from the methods described in WO 2016/156290); 3-[2-(1-chlorocyclopropyl)-3-(3-chloro-2-fluoro-phenyl)-2-hydroxy-propyl]imidazole-4-carbonitrile+TX (this compound may be prepared from the methods described in WO 2016/156290); (4-phenoxyphenyl)methyl 2-amino-6-methyl-pyridine-3-carboxylate+TX (this compound may be prepared from the methods described in WO 2014/006945); 2,6-Dimethyl-1H,5H-[1,4]dithiino[2,3-c:5,6-c′]dipyrrole-1,3,5,7(2H,6H)-tetrone+TX (this compound may be prepared from the methods described in WO 2011/138281); N-methyl-4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]benzenecarbothioamide+TX; N-methyl-4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]benzamide+TX; (Z,2E)-5-[1-(2,4-dichlorophenyl)pyrazol-3-yl]oxy-2-methoxyimino-N,3-dimethyl-pent-3-enamide+TX (this compound may be prepared from the methods described in WO 2018/153707); N′-(2-chloro-5-methyl-4-phenoxy-phenyl)-N-ethyl-N-methyl-formamidine+TX; N′-[2-chloro-4-(2-fluorophenoxy)-5-methyl-phenyl]-N-ethyl-N-methyl-formamidine+TX (this compound may be prepared from the methods described in WO 2016/202742); 2-(difluoromethyl)-N-[(3S)-3-ethyl-1,1-dimethyl-indan-4-yl]pyridine-3-carboxamide+TX (this compound may be prepared from the methods described in WO 2014/095675); (5-methyl-2-pyridyl)-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methanone+TX, (3-methylisoxazol-5-yl)-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]methanone+TX (these compounds may be prepared from the methods described in WO 2017/220485); 2-oxo-N-propyl-2-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]acetamide+TX (this compound may be prepared from the methods described in WO 2018/065414); ethyl 1-[[5-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]-2-thienyl]methyl]pyrazole-4-carboxylate+TX (this compound may be prepared from the methods described in WO 2018/158365); 2,2-difluoro-N-methyl-2-[4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]phenyl]acetamide+TX, N—[(E)-methoxyiminomethyl]-4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]benzamide+TX, N—[(Z)-methoxyiminomethyl]-4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]benzamide+TX, N—[N-methoxy-C-methyl-carbonimidoyl]-4-[5-(trifluoromethyl)-1,2,4-oxadiazol-3-yl]benzamide+TX (these compounds may be prepared from the methods described in WO 2018/202428); [0706] 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* (AQ10®)+TX, *Aspergillus flavus* AF36 (AF36®)+TX, *Aspergillus flavus* NRRL 21882 (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 1-1582+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 AQ717+TX, *Bacillus pumilus* strain QST 2808 (Sonata®+TX, Ballad Plus®)+TX, *Bacillus spahericus* (VectoLex®)+TX, *Bacillus* spp.+TX, *Bacillus* spp. strain AQ175+TX, *Bacillus* spp. strain AQ177+TX, *Bacillus* spp. strain AQ178+TX, *Bacillus subtilis* strain QST 713 (CEASE®+TX, Serenade®+TX, Rhapsody®)+TX, *Bacillus subtilis* strain QST 714 (JAZZ®)+TX, *Bacillus subtilis* strain AQ153+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 thuringiensis* Cry1Ab+TX, *Bacillus thuringiensis aizawai* GC 91 (Agree®)+TX, *Bacillus thuringiensis israelensis* (BMP123®+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 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* (Engerlingspilz®+TX, 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 tenius*+TX, *Cedecea dravisae*+TX, *Cellulomonas flavigena*+TX, *Chaetomium cochliodes* (Nova-Cide®)+TX, *Chaetomium globosum* (Nova-Cide®)+TX, *Chromobacterium subtsugae* strain PRAA4-1T (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 infirmominiatus*+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 hawaiinensis*+TX, *Enterobacter cloacae*+TX, Enterobacteriaceae+TX, *Entomophtora 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* (Shemer®)+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 guilermondii*+TX, *Pichia membranaefaciens*+TX, *Pichia onychis*+TX, *Pichia stipites*+TX, *Pseudomonas aeruginosa*+TX, *Pseudomonas aureofasciens* (Spot-Less Biofungicide®)+TX, *Pseudomonas cepacia*+TX, *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, *Pseudomons fluorescens* (Zequanox®)+TX, *Pseudozyma flocculosa* strain PF-A22 UL (Sporodex L®)+TX, *Puccinia canaliculata*+TX, *Puccinia thlaspeos* (Wood Warrior®)+TX, *Pythium paroecandrum*+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 AQ719+TX, *Rhodosporidium diobovatum*+TX, *Rhodosporidium toruloides*+TX, *Rhodotorula* spp.+TX, *Rhodotorula glutinis*+TX, *Rhodotorula graminis*+TX, *Rhodotorula mucilagnosa*+TX, *Rhodotorula rubra*+TX, *Saccharomyces cerevisiae*+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*+TX, *Streptomyces albaduncus*+TX, *Streptomyces exfoliates*+TX, *Streptomyces galbus*+TX, *Streptomyces griseoplanus*+TX, *Streptomyces griseoviridis* (Mycostop®)+TX, *Streptomyces lydicus* (Actinovate®)+TX, *Streptomyces lydicus* WYEC-108 (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* 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* (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 Ill)+TX, various fungi (Millennium Microbes®)+TX, *Verticillium chlamydosporium*+TX, *Verticillium lecanii* (Mycotal®+TX, Vertalec®)+TX, Vip3Aa20 (VIPtera®)+TX, *Virgibaclillus marismortui*+TX, *Xanthomonas campestris* pv. *Poae* (Camperico®)+TX, *Xenorhabdus bovienii*+TX, *Xenorhabdus nematophilus;* [0707] 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 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 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 pepermint thyme and cinnamon extracts (EF 300®)+TX, mixture of clove rosemary and peppermint extract (EF 400®)+TX, mixture of clove pepermint garlic oil and mint (Soil Shot®)+TX, kaolin (Screen®)+TX, storage glucam of brown algae (Laminarin®); [0708] 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, Peachtree Borer Pheromone (Isomate-P®)+TX, Tomato Pinworm Pheromone (3M Sprayable Pheromone®)+TX, Entostat powder (extract from palm tree) (Exosex CM®)+TX, (3E,8Z,11Z)-3,8,11-Tetradecatrienyl acetate+TX, (7Z,11Z,13E)-7,11,13-Hexadecatrienal+TX, (E,Z)-7,9-Dodecadien-1-yl acetate+TX, 2-Methyl-1-butanol+TX, Calcium acetate+TX, Scenturion®+TX, Biolure®+TX, Check-Mate®+TX, Lavandulyl senecioate+TX; [0709] 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* (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, *Anagyrus fusciventris*+TX, *Anagyrus kamali*+TX, *Anagyrus loecki*+TX, *Anagyrus pseudococci* (Citripar®)+TX, *Anicetus benefices*+TX, *Anisopteromalus calandrae*+TX, *Anthocoris nemoralis* (*Anthocoris*-System®)+TX, *Aphelinus abdominalis* (Apheline®+TX, Aphiline®)+TX, *Aphelinus asychis*+TX, *Aphidius colemani* (Aphipar®)+TX, *Aphidius ervi* (Ervipar®)+TX, *Aphidius gifuensis*+TX, *Aphidius matricariae* (Aphipar-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, *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, *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, *Eretmoceris 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, *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, Oriline I®)+TX, *Orius laevigatus* (Thripor-L®+TX, Oriline I®)+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, *Psyttalia concolor* (complex)+TX, *Quadrastichus* spp.+TX, *Rhyzobius lophanthae*+TX, *Rodolia cardinalis*+TX, *Rumina decollate*+TX, *Semielacher petiolatus*+TX, *Sitobion avenae* (Ervibank®)+TX, *Steinernema carpocapsae* (Nematac C®+TX, Millenium®+TX, BioNem C®+TX, NemAttack®+TX, Nemastar®+TX, Capsanem®)+TX, *Steinernema feltiae* (NemaShield®+TX, Nemasys F®+TX, BioNem F®+TX, *Steinernema*-System®+TX, NemAttack®+TX, Nemaplus®+TX, Exhibitline Sf®+TX, Scia-Rid®+TX, Entonem®)+TX, *Steinernema* kraussei (Nemasys L®+TX, BioNem L®+TX, Exhibitline Srb®)+TX, *Steinernema riobrave* (BioVector®+TX, BioVektor®)+TX, *Steinernema scapterisci* (Nematac S®)+TX, *Steinernema* spp.+TX, *Steinernematid* spp. (Guardian Nematodes®)+TX, *Stethorus punctillum* (*Stethorus*®)+TX, Tamarixia radiate+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 ostriniae*+TX, *Trichogramma platneri*+TX, *Trichogramma pretiosum*+TX, *Xanthopimpla stemmator*+TX; [0710] 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, fatty acids derived from a natural by-product of extra virgin olive oil (FLIPPER®)+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; [0711] (1) antibacterial agents selected from the group of: [0712] (1.1) bacteria, examples of which are *Bacillus mojavensis* strain R3B (Accession No. NCAIM (P) B001389) (WO 2013/034938) from Certis USA LLC, a subsidiary of Mitsui & Co.+TX; *Bacillus pumilus*, in particular strain BU F-33, having NRRL Accession No. 50185 (available as part of the CARTISSA® product from BASF, EPA Reg. No. 71840-19)+TX; *Bacillus subtilis*, in particular strain QST713/AQ713 (available as SERENADE OPTI or SERENADE ASO from Bayer CropScience LP, US, having NRRL Accession No. B21661, U.S. Pat. No. 6,060,051)+TX; *Bacillus subtilis* strain BU1814, (available as VELONDIS® PLUS, VELONDIS® FLEX and VELONDIS® EXTRA from BASF SE)+TX; *Bacillus subtilis* var. *amyloliquefaciens* strain FZB24 having Accession No. DSM 10271 (available from Novozymes as TAEGRO® or TAEGRO® ECO (EPA Registration No. 70127-5))+TX; *Bacillus subtilis* CX-9060 from Certis USA LLC, a subsidiary of Mitsui & Co.+TX; *Bacillus* sp., in particular strain D747 (available as DOUBLE NICKEL® from Kumiai Chemical Industry Co., Ltd.), having Accession No. FERM BP-8234, U.S. Pat. No. 7,094,592+TX; *Paenibacillus* sp. strain having Accession No. NRRL B-50972 or Accession No. NRRL B-67129, WO 2016/154297+TX; *Paenibacillus polymyxa*, in particular strain AC-1 (e.g. TOPSEED® from Green Biotech Company Ltd.)+TX; *Pantoea agglomerans*, in particular strain E325 (Accession No. NRRL B-21856) (available as BLOOMTIME BIOLOGICAL™ FD BIOPESTICIDE from Northwest Agri Products)+TX; *Pseudomonas* proradix (e.g. PRORADIX® from Sourcon Padena)+TX; and [0713] (1.2) fungi, examples of which are *Aureobasidium pullulans*, in particular blastospores of strain DSM14940, blastospores of strain DSM 14941 or mixtures of blastospores of strains DSM14940 and DSM14941 (e.g., BOTECTOR® and BLOSSOM PROTECT® from bio-ferm, CH)+TX; *Pseudozyma aphidis* (as disclosed in WO2011/151819 by Yissum Research Development Company of the Hebrew University of Jerusalem)+TX; *Saccharomyces cerevisiae*, in particular strains CNCM No. 1-3936, CNCM No. 1-3937, CNCM No. 1-3938 or CNCM No. 1-3939 (as disclosed in WO 2010/086790 from Lesaffre et Compagnie, FR)+TX; [0714] (2) biological fungicides selected from the group of: [0715] (2.1) bacteria, examples of which are *Agrobacterium radiobacter* strain K.sub.84 (e.g. GALLTROL-A® from AgBioChem, CA)+TX; *Agrobacterium radiobacter* strain K.sub.1026 (e.g. NOGALL™ from BASF SE)+TX; *Bacillus subtilis* var. *amyloliquefaciens* strain FZB24 having Accession No. DSM 10271 (available from Novozymes as TAEGRO® or TAEGRO® ECO (EPA Registration No. 70127-5))+TX; *Bacillus amyloliquefaciens*, in particular strain D747 (available as Double Nickel™ from Kumiai Chemical Industry Co., Ltd., having accession number FERM BP-8234, U.S. Pat. No. 7,094,592)+TX; *Bacillus amyloliquefaciens* strain F727 (also known as strain MB1110) (NRRL Accession No. B-50768, WO 2014/028521) (STARGUS® from Marrone Bio Innovations)+TX; *Bacillus amyloliquefaciens* strain FZB42, Accession No. DSM 23117 (available as RHIZOVITAL® from ABiTEP, DE)+TX; *Bacillus amyloliquefaciens* isolate B246 (e.g. AVOGREEN™ from University of Pretoria)+TX; *Bacillus licheniformis*, in particular strain SB3086, having Accession No. ATCC 55406, WO 2003/000051 (available as ECOGUARD® Biofungicide and GREEN RELEAF™ from Novozymes)+TX+TX;

Bacillus licheniformis FMCH001 and *Bacillus subtilis* FMCHOO2 (QUARTZO® (WG) and PRESENCE® (WP) from FMC Corporation)+TX; *Bacillus* methylotrophicus strain BAC-9912 (from Chinese Academy of Sciences' Institute of Applied Ecology)+TX; *Bacillus mojavensis* strain R3B (Accession No. NCAIM (P) B001389) (WO 2013/034938) from Certis USA LLC, a subsidiary of Mitsui & Co.+TX; *Bacillus mycoides*, isolate, having Accession No. B-30890 (available as BMJ TGAI® or WG and LifeGard™ from Certis USA LLC, a subsidiary of Mitsui & Co.)+TX; *Bacillus pumilus*, in particular strain QST2808 (available as SONATA® from Bayer CropScience LP, US, having Accession No. NRRL B-30087 and described in U.S. Pat. No. 6,245,551)+TX; *Bacillus pumilus*, in particular strain GB34 (available as Yield Shield® from Bayer AG, DE)+TX; *Bacillus pumilus*, in particular strain BU F-33, having NRRL Accession No. 50185 (available as part of the CARTISSA product from BASF, EPA Reg. No. 71840-19)+TX; *Bacillus subtilis*, in particular strain QST713/AQ713 (available as SERENADE OPTI or SERENADE ASO from Bayer CropScience LP, US, having NRRL Accession No. B21661 and described in U.S. Pat. No. 6,060,051)+TX; *Bacillus subtilis* Y1336 (available as BIOBAC® WP from Bion-Tech, Taiwan, registered as a biological fungicide in Taiwan under Registration Nos. 4764, 5454, 5096 and 5277)+TX; *Bacillus subtilis* strain MBI 600 (available as SUBTILEX from BASF SE), having Accession Number NRRL B-50595, U.S. Pat. No. 5,061,495+TX; *Bacillus subtilis* strain GB03 (available as Kodiak® from Bayer AG, DE)+TX; *Bacillus subtilis* strain BU1814, (available as VELONDIS® PLUS, VELONDIS® FLEX and VELONDIS® EXTRA from BASF SE)+TX; *Bacillus subtilis* CX-9060 from Certis USA LLC, a subsidiary of Mitsui & Co.+TX; *Bacillus subtilis* KTSB strain (FOLIACTIVE® from Donaghys)+TX; *Bacillus subtilis* IAB/BSO3 (AVIV™ from STK Bio-Ag Technologies, PORTENTO® from Idai Nature)+TX; *Bacillus subtilis* strain Y1336 (available as BIOBAC® WP from Bion-Tech, Taiwan, registered as a biological fungicide in Taiwan under Registration Nos. 4764, 5454, 5096 and 5277)+TX; *Paenibacillus* epiphyticus (WO 2016/020371) from BASF SE+TX; *Paenibacillus polymyxa* ssp. *plantarum* (WO 2016/020371) from BASF SE+TX; *Paenibacillus* sp. strain having Accession No. NRRL B-50972 or Accession No. NRRL B-67129, WO 2016/154297+TX; *Pseudomonas chlororaphis* strain AFS009, having Accession No. NRRL B-50897, WO 2017/019448 (e.g., HOWLER™ and ZIO® from AgBiome Innovations, US)+TX; *Pseudomonas chlororaphis*, in particular strain MA342 (e.g. CEDOMON®, CERALL®, and CEDRESS® by Bioagri and Koppert)+TX; *Pseudomonas fluorescens* strain A506 (e.g. BLIGHTBAN® A506 by NuFarm)+TX; *Pseudomonas* proradix (e.g. PRORADIX® from Sourcon Padena)+TX; *Streptomyces griseoviridis* strain K61 (also known as *Streptomyces galbus* strain K61) (Accession No. DSM 7206) (MYCOSTOP® from Verdera, PREFENCE® from BioWorks, cf. Crop Protection 2006, 25, 468-475)+TX; *Streptomyces lydicus* strain WYEC108 (also known as *Streptomyces lydicus* strain WYCD108US) (ACTINO-IRON® and ACTINOVATE® from Novozymes)+TX; and [0716] (2.2) fungi, examples of which are *Ampelomyces quisqualis*, in particular strain AQ 10 (e.g. AQ 10® by IntrachemBio Italia)+TX; *Ampelomyces quisqualis* strain AQ10, having Accession No. CNCM 1-807 (e.g., AQ 10® by IntrachemBio Italia)+TX; *Aspergillus flavus* strain NRRL 21882 (products known as AFLA-GUARD® from Syngenta/ChemChina)+TX; *Aureobasidium pullulans*, in particular blastospores of strain DSM14940+TX; *Aureobasidium pullulans*, in particular blastospores of strain DSM 14941+TX; *Aureobasidium pullulans*, in particular mixtures of blastospores of strains DSM14940 and DSM 14941 (e.g. Botector® by bio-ferm, CH)+TX; *Chaetomium* cupreum (Accession No. CABI 353812) (e.g. BIOKUPRUM™ by AgriLife)+TX; *Chaetomium globosum* (available as RIVADIOM® by *Rivale*)+TX; *Cladosporium* cladosporioides, strain H39, having Accession No. CBS122244, US 2010/0291039 (by Stichting Dienst Landbouwkundig Onderzoek)+TX; *Coniothyrium minitans*, in particular strain CON/M/91-8 (Accession No. DSM9660, e.g. Contans® from Bayer CropScience Biologics GmbH)+TX; *Cryptococcus flavescens*, strain 3C (NRRL Y-50378), (B2.2.99)+TX; *Dactylaria candida*+TX; *Dilophosphora alopecuri* (available as TWIST FUNGUS®)+TX; *Fusarium oxysporum*, strain

Fo47 (available as FUSACLEAN® by Natural Plant Protection)+TX; *Gliocladium catenulatum* (Synonym: *Clonostachys rosea* f. *catenulate*) strain J1446 (e.g. Prestop® by Lallemand)+TX; *Gliocladium roseum* (also known as *Clonostachys rosea* f *rosea*), in particular strain 321U from Adjuvants Plus, strain ACM941 as disclosed in Xue (Efficacy of *Clonostachys rosea* strain ACM941 and fungicide seed treatments for controlling the root tot complex of field pea, Can Jour Plant Sci 83(3): 519-524), or strain IK726 (Jensen D F, et al. Development of a biocontrol agent for plant disease control with special emphasis on the near commercial fungal antagonist *Clonostachys rosea* strain 'IK726', Australas Plant Pathol. 2007, 36:95-101)+TX; *Lecanicillium lecanii* (formerly known as *Verticillium lecanii*) conidia of strain KV01 (e.g. Vertalec® by Koppert/Arysta)+TX; *Metschnikowia fructicola*, in particular strain NRRL Y-30752, (B2.2.3)+TX; *Microsphaeropsis ochracea*+TX; *Muscodor roseus*, in particular strain A3-5 (Accession No. NRRL 30548)+TX; *Penicillium steckii* (DSM 27859, WO 2015/067800) from BASF SE+TX; *Penicillium vermiculatum*+TX; *Phlebiopsis gigantea* strain VRA 1992 (ROTSTOP® C from Danstar Ferment)+TX; *Pichia anomala*, strain WRL-076 (NRRL Y-30842), U.S. Pat. No. 7,579,183+TX; *Pseudozyma flocculosa*, strain PF-A22 UL (available as SPORODEX® L by Plant Products Co., CA)+TX; *Saccharomyces cerevisiae*, in particular strain LASO2 (from Agro-Levures et Dérivés), strain LAS117 cell walls (CEREVISANE® from Lesaffre, ROMEO® from BASF SE), strains CNCM No. 1-3936, CNCM No. 1-3937, CNCM No. 1-3938, CNCM No. 1-3939 (WO 2010/086790) from Lesaffre et Compagnie, FR+TX; Simplicillium lanosoniveum+TX; *Talaromyces flavus*, strain V117b+TX; *Trichoderma* asperelloides JM41R (Accession No. NRRL B-50759) (TRICHO PLUS® from BASF SE)+TX; *Trichoderma* asperellum, in particular, strain kd (e.g. T-Gro from Andermatt Biocontrol)+TX; *Trichoderma* asperellum, in particular strain SKT-1, having Accession No. FERM P-16510 (e.g. ECO-HOPE® from Kumiai Chemical Industry), strain T34 (e.g. T34 Biocontrol by Biocontrol Technologies S.L., ES) or strain ICC 012 from Isagro+TX; *Trichoderma* atroviride, in particular strain SC1 (having Accession No. CBS 122089, WO 2009/116106 and U.S. Pat. No. 8,431,120 (from Bi-PA)), strain 77B (T77 from Andermatt Biocontrol) or strain LU132 (e.g. Sentinel from Agrimm Technologies Limited)+TX; *Trichoderma atroviride*, strain CNCM 1-1237 (e.g. Esquive® WP from Agrauxine, FR)+TX; *Trichoderma atroviride*, strain no. V08/002387+TX; *Trichoderma atroviride*, strain NMI no. V08/002388+TX; *Trichoderma atroviride*, strain NMI no. V08/002389+TX; *Trichoderma atroviride*, strain NMI no. V08/002390+TX; *Trichoderma atroviride*, strain LC52 (e.g. Tenet by Agrimm Technologies Limited)+TX; *Trichoderma atroviride*, strain ATCC 20476 (IMI 206040)+TX; *Trichoderma atroviride*, strain T11 (IM1352941/CECT20498)+TX; *Trichoderma* atroviride, strain SKT-1 (FERM P-16510), JP Patent Publication (Kokai) 11-253151 A+TX; *Trichoderma atroviride*, strain SKT-2 (FERM P-16511), JP Patent Publication (Kokai) 11-253151 A+TX; *Trichoderma atroviride*, strain SKT-3 (FERM P-17021), JP Patent Publication (Kokai) 11-253151 A+TX; *Trichoderma fertile* (e.g. product TrichoPlus from BASF)+TX; *Trichoderma gamsii* (formerly *T. viride*), strain ICCO80 (IMI CC 392151 CABI, e.g. BioDerma by AGROBIOSOL DE MEXICO, S.A. DE C.V.)+TX; *Trichoderma* gamsii (formerly *T. viride*), strain ICC 080 (IMI CC 392151 CABI) (available as BIODERMA® by AGROBIOSOL DE MEXICO, S.A. DE C.V.)+TX; *Trichoderma harmatum*+TX; *Trichoderma harmatum*, having Accession No. ATCC 28012+TX; *Trichoderma harzianum* strain T-22 (e.g. Trianum-P from Andermatt Biocontrol or Koppert) or strain *Cepa* SimbT5 (from Simbiose Agro)+TX; *Trichoderma harzianum*+TX; *Trichoderma harzianum* rifai T39 (e.g. Trichodex® from Makhteshim, US)+TX; *Trichoderma harzianum*, strain ITEM 908 (e.g. Trianum-P from Koppert)+TX; *Trichoderma harzianum*, strain TH35 (e.g. Root-Pro by Mycontrol)+TX; *Trichoderma harzianum*, strain DB 103 (available as T-GRO®7456 by Dagutat Biolab)+TX; *Trichoderma polysporum*, strain IMI 206039 (e.g. Binab TF WP by BINAB Bio-Innovation AB, Sweden)+TX; *Trichoderma stromaticum*, having Accession No. Ts3550 (e.g. Tricovab by CEPLAC, Brazil)+TX; *Trichoderma virens* (also known as *Gliocladium virens*), in particular strain GL-21 (e.g. SoilGard by Certis, US)+TX; *Trichoderma virens* strain G-41,

formerly known as *Gliocladium virens* (Accession No. ATCC 20906) (e.g., ROOTSHIELD® PLUS WP and TURFSHIELD® PLUS WP from BioWorks, US)+TX; *Trichoderma viride*, strain TV1(e.g. Trianum-P by Koppert)+TX; *Trichoderma viride*, in particular strain B35 (Pietr et al., 1993, Zesz. Nauk. A R w Szczecinie 161: 125-137)+TX; mixtures of *Trichoderma asperellum* strain ICC 012 (also known as *Trichoderma harzianum* ICC012), having Accession No. CABI CC IMI 392716 and *Trichoderma* gamsii (formerly *T. viride*) strain ICC 080, having Accession No. IMI 392151 (e.g., BIO-TAM™ from Isagro USA, Inc. and BIODERMA® by Agrobiosol de Mexico, S.A. de C.V.)+TX; *Ulocladium oudemansii* strain U3, having Accession No. NM 99/06216 (e.g., BOTRY-ZEN® by Botry-Zen Ltd, New Zealand and BOTRYSTOP® from BioWorks, Inc.)+TX; *Verticillium albo-atrum* (formerly *V. dahliae*), strain WCS850 having Accession No. WCS850, deposited at the Central Bureau for Fungi Cultures (e.g., DUTCH TRIG® by Tree Care Innovations)+TX; *Verticillium chlamydosporium*+TX; [0717] (3) biological control agents having an effect for improving plant growth and/or plant health selected from the group of: [0718] (3.1) bacteria, examples of which are *Azospirillum brasilense* (e.g., VIGOR® from KALO, Inc.)+TX; *Azospirillum lipoferum* (e.g., VERTEX-IF™ from TerraMax, Inc.)+TX; *Azorhizobium caulinodans*, in particular strain ZB—SK-5+TX; *Azotobacter chroococcum*, in particular strain H23+TX; *Azotobacter vinelandii*, in particular strain ATCC 12837+TX; a mixture of *Azotobacter vinelandii* and *Clostridium pasteurianum* (available as INVIGORATE® from Agrinos)+TX; *Bacillus amyloliquefaciens* µm414 (LOLI-PEPTA® from Biofilm Crop Protection)+TX; *Bacillus amyloliquefaciens* SB3281 (ATCC #PTA-7542, WO 2017/205258)+TX; *Bacillus amyloliquefaciens* TJ1000 (available as QUIKROOTS® from Novozymes)+TX; *Bacillus amyloliquefaciens*, in particular strain IN937a+TX; *Bacillus amyloliquefaciens*, in particular strain FZB42 (e.g. RHIZOVITAL® from ABiTEP, DE)+TX; *Bacillus amyloliquefaciens* BS27 (Accession No. NRRL B-5015)+TX; *Bacillus cereus* family member EE128 (NRRL No. B-50917)+TX; *Bacillus cereus* family member EE349 (NRRL No. B-50928)+TX; *Bacillus cereus*, in particular strain BPO1 (ATCC 55675, e.g. MEPICHLOR® from Arysta Lifescience, US)+TX; *Bacillus firmus*, in particular strain CNMC 1-1582 (e.g. VOTIVO® from BASF SE)+TX; *Bacillus mycoides* BT155 (NRRL No. B-50921)+TX; *Bacillus mycoides* EE118 (NRRL No. B-50918)+TX; *Bacillus mycoides* EE141 (NRRL No. B-50916)+TX; *Bacillus mycoides* BT46-3 (NRRL No. B-50922)+TX; *Bacillus pumilus*, in particular strain QST2808 (having Accession No. NRRL No. B-30087)+TX; *Bacillus pumilus*, in particular strain GB34 (e.g. YIELD SHIELD® from Bayer Crop Science, DE)+TX; *Bacillus siamensis*, in particular strain KCTC 13613T+TX; *Bacillus subtilis*, in particular strain QST713/AQ713 (having NRRL Accession No. B-21661 and described in U.S. Pat. No. 6,060,051, available as SERENADE® OPTI or SERENADE® ASO from Bayer CropScience LP, US)+TX; *Bacillus subtilis*, in particular strain AQ30002 (having Accession Nos. NRRL B-50421 and described in U.S. patent application Ser. No. 13/330,576)+TX; *Bacillus subtilis*, in particular strain AQ30004 (and NRRL B-50455 and described in U.S. patent application Ser. No. 13/330,576)+TX; *Bacillus subtilis* strain BU1814, (available as TEQUALIS® from BASF SE), *Bacillus subtilis* rm303 (RHIZOMAX® from Biofilm Crop Protection)+TX; *Bacillus thuringiensis* BT013A (NRRL No. B-50924) also known as *Bacillus thuringiensis* 4Q7+TX; a mixture of *Bacillus licheniformis* FMCH001 and *Bacillus subtilis* FMCH002 (available as QUARTZO® (WG), PRESENCE® (WP) from FMC Corporation)+TX; *Bacillus subtilis*, in particular strain MBI 600 (e.g. SUBTILEX® from BASF SE)+TX; *Bacillus* tequilensis, in particular strain NII-0943+TX; Bradyrhizobiumjaponicum (e.g. OPTIMIZE® from Novozymes)+TX; Delftia *acidovorans*, in particular strain RAY209 (e.g. BIOBOOST® from Brett Young Seeds)+TX; *Mesorhizobium cicer* (e.g., NODULATOR from BASF SE)+TX; *Lactobacillus* sp. (e.g. LACTOPLANT® from LactoPAFI)+TX; *Rhizobium leguminosarium biovar viciae* (e.g., NODULATOR from BASF SE)+TX; *Pseudomonas proradix* (e.g. PRORADIX® from Sourcon Padena)+TX; *Pseudomonas aeruginosa*, in particular strain PN1+TX; *Rhizobium leguminosarum*, in particular bv. viceae strain Z25 (Accession No. CECT 4585)+TX; *Paenibacillus polymyxa*, in

particular strain AC-1 (e.g. TOPSEED® from Green Biotech Company Ltd.)+TX; *Serratia marcescens*, in particular strain SRM (Accession No. MTCC 8708)+TX; *Sinorhizobium meliloti* strain NRG-185-1 (NITRAGIN® GOLD from Bayer CropScience)+TX; *Thiobacillus* sp. (e.g. CROPAID® from Cropaid Ltd UK)+TX; and [0719] (3.2) fungi, examples of which are Purpureocillium lilacinum (previously known as *Paecilomyces lilacinus*) strain 251 (AGAL 89/030550, e.g. BioAct from Bayer CropScience Biologics GmbH)+TX; *Penicillium bilaii*, strain ATCC 22348 (e.g. JumpStart® from Acceleron BioAg), *Talaromyces flavus*, strain V117b+TX; *Trichoderma* atroviride strain CNCM 1-1237 (e.g. Esquive® WP from Agrauxine, FR), *Trichoderma viride*, e.g. strain B35 (Pietr et al., 1993, Zesz. Nauk. A R w Szczecinie 161: 125-137)+TX; *Trichoderma atroviride* strain LC52 (also known as *Trichoderma atroviride* strain LU132, e.g. Sentinel from Agrimm Technologies Limited)+TX; *Trichoderma* atroviride strain SC1 described in International Application No. PCT/IT2008/000196)+TX; *Trichoderma* asperellum strain kd (e.g. T-Gro from Andermatt Biocontrol)+TX; *Trichoderma* asperellum strain Eco-T (Plant Health Products, ZA), *Trichoderma harzianum* strain T-22 (e.g. Trianum-P from Andermatt Biocontrol or Koppert)+TX; *Myrothecium verrucaria* strain AARC-0255 (e.g. DiTera™ from Valent Biosciences)+TX; *Penicillium bilaii* strain ATCC ATCC20851+TX; *Pythium oligandrum* strain M1 (ATCC 38472, e.g. Polyversum from Biopreprаty, CZ)+TX; *Trichoderma virens* strain GL-21 (e.g. SoilGard® from Certis, USA)+TX; *Verticillium albo-atrum* (formerly *V. dahliae*) strain WCS850 (CBS 276.92, e.g. Dutch Trig from Tree Care Innovations)+TX; *Trichoderma* atroviride, in particular strain no. V08/002387, strain no. NMI No. V08/002388, strain no. NMI No. V08/002389, strain no. NMI No. V08/002390+TX; *Trichoderma harzianum* strain ITEM 908, *Trichoderma harzianum*, strain TSTh20+TX; *Trichoderma harzianum* strain 1295-22+TX; *Pythium oligandrum* strain DV74+TX; *Rhizopogon* amylopogon (e.g. comprised in Myco-Sol from Helena Chemical Company)+TX; *Rhizopogon* fulvigleba (e.g. comprised in Myco-Sol from Helena Chemical Company)+TX; *Trichoderma virens* strain GI-3+TX; [0720] (4) insecticidally active biological control agents selected from [0721] (4.1) bacteria, examples of which are *Agrobacterium radiobacter* strain K84 (Galltrol from AgBiochem Inc.)+TX; *Bacillus amyloliquefaciens*, in particular strain PTS-4838 (e.g. AVEO from Valent Biosciences, US)+TX; *Bacillus firmus*, in particular strain CNMC 1-1582 (e.g. VOTIVO® from BASF SE)+TX; *Bacillus mycoides*, isolate J. (e.g. BmJ from Certis USA LLC, a subsidiary of Mitsui & Co.)+TX; *Bacillus sphaericus*, in particular Serotype H5a5b strain 2362 (strain ABTS-1743) (e.g. VECTOLEX® from Valent BioSciences, US)+TX; *Bacillus thuringiensis* subsp. *aizawai*, in particular strain ABTS-1857 (SD-1372, e.g. XENTARI® from Valent BioSciences)+TX; *Bacillus thuringiensis* subsp. *aizawai*, in particular serotype H-7 (e.g. FLORBAC® WG from Valent BioSciences, US)+TX; *Bacillus thuringiensis israelensis* strain BMP 144 (e.g. AQUABAC® by Becker Microbial Products IL)+TX; *Bacillus thuringiensis* subsp. *israelensis* (serotype H-14) strain AM65-52 (Accession No. ATCC 1276) (e.g. VECTOBAC® by Valent BioSciences, US)+TX; *Bacillus thuringiensis* subsp. *aizawai* strain GC-91+TX; *Bacillus thuringiensis* var. Colmeri (e.g. TIANBAOBTC by Changzhou Jianghai Chemical Factory)+TX; *Bacillus thuringiensis* var. *japonensis* strain Buibui+TX; *Bacillus thuringiensis* subsp. *kurstaki* strain BMP 123 from Becker Microbial Products, IL+TX; *Bacillus thuringiensis* subsp. *kurstaki* strain BMP 123 by Becker Microbial Products, IL, e.g. BARITONE from Bayer CropScience+TX; *Bacillus thuringiensis* subsp. *kurstaki* strain HD-1 (e.g. DIPEL® ES from Valent BioSciences, US)+TX; *Bacillus thuringiensis* var. *kurstaki* strain EVB-113-19 (e.g., BIOPROTEC® from AEF Global)+TX; *Bacillus thuringiensis* subsp. *kurstaki* strain ABTS 351+TX; *Bacillus thuringiensis* subsp. *kurstaki* strain PB 54+TX; *Bacillus thuringiensis* subsp. *kurstaki* strain SA 11, (JAVELIN from Certis, US)+TX; *Bacillus thuringiensis* subsp. *kurstaki* strain SA 12 (THURICIDE from Certis, US)+TX; *Bacillus thuringiensis* subsp. *kurstaki* strain EG 2348 (LEPINOX from Certis, US)+TX; *Bacillus thuringiensis* subsp. *kurstaki* strain EG 7841 (CRYMAX from Certis, US)+TX; *Bacillus thuringiensis* subsp. *tenebrionis* strain NB 176 (SD-5428, e.g. NOVODOR® FC from BioFa DE)+TX; *Brevibacillus laterosporus* (LATERAL from

Ecolibrium Biologicals)+TX; *Burkholderia* spp., in particular *Burkholderia* rinojensis strain A396 (also known as *Burkholderia* rinojensis strain MBI 305) (Accession No. NRRL B-50319+TX; WO 2011/106491 and WO 2013/032693+TX; e.g. MB1206 TGAI and ZELTO® from Marrone Bio Innovations)+TX; *Chromobacterium subtsugae*, in particular strain PRAA4-1T (MBI-203+TX; e.g. GRANDEVO® from Marrone Bio Innovations)+TX; *Lecanicillium muscarium* Ve6 (MYCOTAL from Koppert)+TX; *Paenibacillus popilliae* (formerly *Bacillus popilliae*+TX; e.g. MILKY SPORE POWDER™ and MILKY SPORE GRANULAR™ from St. Gabriel Laboratories)+TX; *Pasteuria* nishizawae strain Pn1 (CLARIVA from Syngenta/ChemChina)+TX; *Serratia entomophila* (e.g. INVADE® by Wrightson Seeds)+TX; *Serratia marcescens*, in particular strain SRM (Accession No. MTCC 8708)+TX; *Trichoderma* asperellum (TRICHODERMAX from Novozymes)+TX; *Wolbachia pipientis* ZAP strain (e.g., ZAP MALES® from MosquitoMate)+TX; and [0722] (4.2) fungi, examples of which are *Beauveria bassiana* strain ATCC 74040 (e.g. NATURALIS® from Intrachem Bio Italia)+TX; *Beauveria bassiana* strain GHA (Accession No. ATCC74250, e.g. BOTANIGUARD® ES and MYCONTROL-O® from Laverlam International Corporation)+TX; *Beauveria bassiana* strain ATP02 (Accession No. DSM 24665)+TX; Isaria fumosorosea (previously known as *Paecilomyces fumosoroseus*) strain Apopka 97) PREFERAL from SePRO+TX; *Metarhizium anisopliae* 3213-1 (deposited under NRRL accession number 67074) (WO 2017/066094+TX; Pioneer Hi-Bred International)+TX; *Metarhizium robertsii* 15013-1 (deposited under NRRL accession number 67073)+TX; *Metarhizium robertsii* 23013-3 (deposited under NRRL accession number 67075)+TX; *Paecilomyces lilacinus* strain 251 (MELOCON from Certis, US)+TX; *Zoophtora radicans*+TX; [0723] (5) Viruses selected from the group consisting of *Adoxophyes orana* (summer fruit *tortrix*) granulosis virus (GV)+TX; *Cydia pomonella* (codling moth) granulosis virus (GV)+TX; *Helicoverpa armigera* (cotton bollworm) nuclear polyhedrosis virus (NPV)+TX; *Spodoptera exigua* (beet armyworm) mNPV+TX; *Spodoptera frugiperda* (fall armyworm) mNPV+TX; *Spodoptera littoralis* (African cotton leafworm) NPV+TX; [0724] (6) Bacteria and fungi which can be added as ‘inoculant’ to plants or plant parts or plant organs and which, by virtue of their particular properties, promote plant growth and plant health selected from *Agrobacterium* spp.+TX; *Azorhizobium caulinodans*+TX; *Azospirillum* spp.+TX; *Azotobacter* spp.+TX; *Bradyrhizobium* spp.+TX; *Burkholderia* spp., in particular *Burkholderia cepacia* (formerly known as *Pseudomonas cepacia*)+TX; *Gigaspora* spp., or *Gigaspora monosporum*+TX; *Glomus* spp.+TX; *Laccaria* spp.+TX; *LactoBacillus buchneri*+TX; *Paraglomus* spp.+TX; *Pisolithus tinctorus*+TX; *Pseudomonas* spp.+TX; *Rhizobium* spp., in particular *Rhizobium trifolii*+TX; *Rhizopogon* spp.+TX; *Scleroderma* spp.+TX; *Suillus* spp.+TX; *Streptomyces* spp.+TX; [0725] (7) Plant extracts and products formed by microorganisms including proteins and secondary metabolites which can be used as biological control agents, selected from *Allium sativum* (NEMGUARD from Eco-Spray+TX; BRALIC from ADAMA)+TX; Armour-Zen+TX; *Artemisia absinthium*+TX; Azadirachtin (e.g. AZATIN XL from Certis, US)+TX; Biokeeper WP+TX; Brassicaceae extract, in particular oilseed rape powder or mustard powder+TX; *Cassia nigricans*+TX; *Celastrus angulatus*+TX; *Chenopodium anthelminticum*+TX; Chitin+TX; Dryopteris filix-mas+TX; *Equisetum arvense*+TX; Fortune Aza+TX; Fungastop+TX; Heads Up (*Chenopodium quinoa* saponin extract)+TX; PROBLAD (naturally occurring Blad polypeptide from Lupin seeds), Certis EU+TX; FRACTURE (naturally occurring Blad polypeptide from Lupin seeds), FMC+TX; Pyrethrum/Pyrethrins+TX; Quassia *amara*+TX; *Quercus*+TX; *Quillaja* extract (QL AGRI 35 from BASF)+TX; *Reynoutria sachalinensis* extract (REGALLIA/REGALIA MAXX from Marrone Bio)+TX; “Requiem™ Insecticide”+TX; Rotenone+TX; ryania/ryanodine+TX; Symphytum *officinale*+TX; *Tanacetum vulgare*+TX; Thymol+TX; Thymol mixed with Geraniol (CEDROZ from Eden Research)+TX; Thymol mixed with Geraniol and Eugenol (MEVALONE from Eden Research)+TX; Triact 70+TX; TriCon+TX; *Tropaeulum majus*+TX; *Melaleuca alternifolia* extract (TIMOREX GOLD from STK)+TX; *Urtica dioica*+TX; Veratrin+TX; and *Viscum album*+TX; and a safener, such as benoxacor+TX, cloquintocet (including cloquintocet-

mexyl)+TX, cyprosulfamide+TX, dichlormid+TX, fenchlorazole (including fenchlorazole-ethyl)+TX, fenclorim+TX, fluxofenim+TX, furilazole+TX, isoxadifen (including isoxadifen-ethyl)+TX, mefenpyr (including mefenpyr-diethyl)+TX, metcamifen+TX and oxabetrinil+TX.

[0726] 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 ingredients are included in "The Pesticide Manual" [The Pesticide Manual—A World Compendium; Thirteenth Edition; Editor: C. D. S. TomLin; The British Crop Protection Council], they are described therein under the entry number given in round brackets hereinabove for the particular compound; for example, the compound "abamectin" is described under entry number (1). Where "[CCN]" is added hereinabove to the particular compound, the compound in question is included in the "Compendium of Pesticide Common Names", which is accessible on the internet [A. Wood; *Compendium of Pesticide Common Names*, Copyright © 1995-2004]; for example, the compound "acetoprole" is described under the internet address http://www.alanwood.net/pesticides/acetoprole.html.

[0727] Most of the active ingredients described above are referred to hereinabove by a so-called "common name", the relevant "ISO common name" or another "common name" being used in individual cases. If the designation is not a "common name", the nature of the designation used instead is given in round brackets for the particular compound; in that case, the IUPAC name, the IUPAC/Chemical Abstracts name, a "chemical name", a "traditional name", a "compound name" or a "develoment code" is used or, if neither one of those designations nor a "common name" is used, an "alternative name" is employed. "CAS Reg. No" means the Chemical Abstracts Registry Number.

[0728] The active ingredient mixture of the compounds of formula I selected from Tables A-1 to A-36, Tables B-1 to B-36, Tables C-1 to C-36 and Tables D-1 to D-36 and Table P with active ingredients described above comprises a compound selected from Tables A-1 to A-36, Tables B-1 to B-36, Tables C-1 to C-36 and Tables D-1 to D-36 and Table P and an active ingredient as described above preferably in a mixing ratio of from 100:1 to 1:6000, especially from 50:1 to 1:50, more especially in a ratio of from 20:1 to 1:20, even more especially from 10:1 to 1:10, very especially from 5:1 and 1:5, special preference being given to a ratio of from 2:1 to 1:2, and a ratio of from 4:1 to 2:1 being likewise preferred, above all in a ratio of 1:1, or 5:1, or 5:2, or 5:3, or 5:4, or 4:1, or 4:2, or 4:3, or 3:1, or 3:2, or 2:1, or 1:5, or 2:5, or 3:5, or 4:5, or 1:4, or 2:4, or 3:4, or 1:3, or 2:3, or 1:2, or 1:600, or 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.

[0729] The mixtures as described above can be used in a method for controlling pests, which comprises applying a composition comprising a mixture as described above to the pests or their environment, with the exception of a method for treatment of the human or animal body by surgery or therapy and diagnostic methods practised on the human or animal body.

[0730] The mixtures comprising a compound of formula I selected from Tables A-1 to A-36, Tables B-1 to B-36, Tables C-1 to C-36 and Tables D-1 to D-36 and Table 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 A-1 to A-36, Tables B-1 to B-36, Tables C-1 to C-36 and Tables D-1 to D-36 and Table P and the active ingredients as described above is not essential for working the present invention.

[0731] The compositions according to the invention can also comprise further solid or liquid auxiliaries, such as stabilizers, for example unepoxidized or epoxidized vegetable oils (for example epoxidized coconut oil, rapeseed oil or soya oil), antifoams, for example silicone oil, preservatives,

viscosity regulators, binders and/or tackifiers, fertilizers or other active ingredients for achieving specific effects, for example bactericides, fungicides, nematocides, plant activators, molluscicides or herbicides.

[0732] The compositions according to the invention are prepared in a manner known per se, in the absence of auxiliaries for example by grinding, screening and/or compressing a solid active ingredient and in the presence of at least one auxiliary for example by intimately mixing and/or grinding the active ingredient with the auxiliary (auxiliaries). These processes for the preparation of the compositions and the use of the compounds I for the preparation of these compositions are also a subject of the invention.

[0733] 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 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.

[0734] 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 can be metered into the flooded paddy-field.

[0735] 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 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 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.

[0736] 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.

[0737] The present invention also comprises seeds coated or treated with or containing a compound of 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 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).

[0738] 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 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

[0739] The Examples which follow serve to illustrate the invention. Certain compounds of the invention can be distinguished from known compounds by virtue of greater efficacy at low application rates, which can be verified by the person skilled in the art using the experimental procedures outlined in the Examples, using lower application rates if necessary, for example 50 ppm, 12.5 ppm, 6 ppm, 3 ppm, 1.5 ppm, 0.8 ppm or 0.2 ppm.

Example B1: Activity Against *Chilo suppressalis* (Striped Rice Stemborer)

[0740] 24-well microtiter plates with artificial diet were treated with aqueous test solutions prepared from 10′000 ppm DMSO stock solutions by pipetting. After drying, the plates were infested with L2 larvae (6-8 per well). The samples were assessed for mortality, anti-feeding effect, and growth inhibition in comparison to untreated samples 6 days after infestation. Control of *Chilo suppressalis* 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.

[0741] The following compounds resulted in at least 80% control at an application rate of 200 ppm: P2, P4, P5, P7, P8, P9, P10, P11, P13, P14, P15.

Example B2: Activity Against *Diabrotica* Balteata (Corn Root Worm)

[0742] Maize sprouts placed onto an agar layer in 24-well microtiter plates were treated with aqueous test solutions prepared from 10′000 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.

[0743] 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: P2, P3, P4, P5, P7, P9, P10, P11, P13, P14, P15.

Example B3: Activity Against *Euschistus heros* (Neotropical Brown Stink Bug)

[0744] Soybean leaves on agar in 24-well microtiter plates were sprayed with aqueous test solutions prepared from 10′000 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.

[0745] 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: P2, P3, P4, P5, P7, P11, P13, P14, P15.

Example B4: Activity Against *Myzus persicae* (Green Peach Aphid) Feeding/Contact Activity

[0746] Sunflower leaf discs were placed onto agar in a 24-well microtiter plate and sprayed with aqueous test solutions prepared from 10′000 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.

[0747] The following compounds resulted in at least 80% mortality at an application rate of 200 ppm: P2, P3, P4, P5, P7, P10, P11, P13, P14, P15.

Example B5: Activity Against *Myzus persicae* (Green Peach Aphid) Systemic Activity

[0748] Roots of pea seedlings infested with an aphid population of mixed ages were placed directly into aqueous test solutions prepared from 10′000 DMSO stock solutions. The samples were assessed for mortality 6 days after placing seedlings into test solutions.

[0749] The following compounds resulted in at least 80% mortality at a test rate of 24 ppm: P2, P4, P5, P7, P11, P13, P14.

Example B6: Activity Against *Plutella xylostella* (Diamond Back Moth)

[0750] 24-well microtiter plates with artificial diet were treated with aqueous test solutions prepared from 10′000 ppm DMSO stock solutions by pipetting. After drying, *Plutella* eggs were pipetted through a plastic stencil onto a gel blotting paper and the plate was closed with it. The samples were assessed for mortality and growth inhibition in comparison to untreated samples 8 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: P2, P3, P4, P5, P7, P9, P10, P11, P13, P14, P15.

Example B7: Activity Against *Spodoptera littoralis* (Egyptian Cotton Leaf Worm)

[0751] Cotton leaf discs were placed onto agar in 24-well microtiter plates and sprayed with aqueous test solutions prepared from 10′000 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.

[0752] The following compounds resulted in at least 80% control at an application rate of 200 ppm: P2, P3, P4, P5, P7, P8, P9, P10, P11, P13, P14, P15, P16.

Claims

1. A compound of formula (I) ##STR00112## wherein R.sub.2 is C.sub.1-C.sub.6haloalkyl, C.sub.1-C.sub.4haloalkylsulfanyl, C.sub.1-C.sub.4haloalkylsulfinyl, C.sub.1-C.sub.4haloalkylsulfonyl or C.sub.1-C.sub.6haloalkoxy; G is CH or N; X.sub.1 is O, S or NR.sub.6, in which R.sub.6 is C.sub.1-C.sub.4alkyl; R.sub.7 is hydrogen, C.sub.1-C.sub.4alkyl or halogen; Q is a radical selected from the group consisting of formula Qa and Qb ##STR00113## wherein the arrow denotes the point of attachment to the bicyclic ring; and wherein A represents CH or N; X is S, SO, SO.sub.2; R.sub.1 is C.sub.1-C.sub.4alkyl or C.sub.3-C.sub.6cycloalkyl-C.sub.1-C.sub.4alkyl; Q.sub.1 is hydrogen, halogen, C.sub.1-C.sub.6haloalkyl, C.sub.3-C.sub.6cycloalkyl, C.sub.3-C.sub.6cycloalkyl monosubstituted by cyano, C.sub.1-C.sub.6cyanoalkyl, C.sub.1-C.sub.6cyanoalkoxy, C.sub.1-C.sub.6haloalkoxy, —N(R.sub.4).sub.2, —N(R.sub.4)COR.sub.5 or 2-pyridyloxy; or Q.sub.1 is a five- to six-membered aromatic or heteroaromatic ring system linked via a ring carbon atom to the ring which contains the substituent A, said ring system is unsubstituted or is mono- or polysubstituted by substituents selected from the group consisting of halogen, cyano, C.sub.1-C.sub.4alkyl, C.sub.1-C.sub.4haloalkyl, C.sub.1-C.sub.4alkoxy, C.sub.1-C.sub.4haloalkoxy, C.sub.1-C.sub.4alkylsulfanyl, C.sub.1-C.sub.4alkylsulfinyl and C.sub.1-C.sub.4alkylsulfonyl; and said ring system can contain 1, 2 or 3 ring heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, where said ring system may not contain more than one ring oxygen atom and not more than one ring sulfur atom; or Q.sub.1 is a five-membered heteroaromatic ring system linked via a ring nitrogen atom to the ring which contains the substituent A, said ring system is unsubstituted or is mono- or polysubstituted by substituents selected from the group consisting of halogen, cyano, C.sub.1-C.sub.4alkyl, C.sub.1-C.sub.4haloalkyl, C.sub.1-C.sub.4alkoxy, C.sub.1-C.sub.4haloalkoxy, C.sub.1-C.sub.4alkylsulfanyl, C.sub.1-C.sub.4alkylsulfinyl and C.sub.1-C.sub.4alkylsulfonyl; and said ring system contains 1, 2 or 3 ring heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, where said ring system contains at least one ring nitrogen atom and may not contain more than one ring oxygen atom and not more than one ring sulfur atom; R.sub.3 is hydrogen or C.sub.1-C.sub.4alkyl; each R.sub.4 independently is hydrogen, C.sub.1-C.sub.4alkyl or C.sub.3-C.sub.6cycloalkyl; and R.sub.5 is C.sub.1-C.sub.6alkyl, C.sub.1-C.sub.6haloalkyl or C.sub.3-C.sub.6cycloalkyl; or an agrochemically acceptable salt, stereoisomer, enantiomer, tautomer or N-oxide of a compound of formula I.

2. A compound of formula I according to claim 1, represented by the compounds of formula I-1 ##STR00114## wherein R.sub.2, G, X.sub.1, R.sub.6, R.sub.7, A, X, R.sub.1, Q.sub.1, R.sub.3, R.sub.4 and R.sub.5 are as defined under formula I in claim 1; or an agrochemically acceptable salt, stereoisomer, enantiomer, tautomer or N-oxide of a compound of formula I-1.

3. A compound of formula I-1 according to claim 2, wherein R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; G is CH or N; X.sub.1 is O, S or NCH.sub.3; R.sub.7 is hydrogen or methyl; A

is N or CH; X is S or SO.sub.2; R.sub.1 is ethyl or cyclopropylmethyl; Q.sub.1 is hydrogen, trifluoromethyl, 1,1-difluoroethyl, cyclopropyl, 1-cyanocyclopropyl, 1-cyano-1-methyl-ethyl, 1-cyano-1-methyl-ethoxy, 2,2,2-trifluoroethoxy, 2,2-difluoropropoxy, —N(CH.sub.3)COCH.sub.3, —N(CH.sub.3)COCH.sub.2CH.sub.3, —N(CH.sub.3)CO(cyclopropyl), or 2-pyridyloxy; and P3 is hydrogen or or methyl.

4. A compound of formula I-1 according to claim 2, wherein R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; G is CH; X.sub.1 is O; R.sub.7 is hydrogen; A is N; X is SO.sub.2; R.sub.1 is ethyl; Q.sub.1 is hydrogen, trifluoromethyl, 1,1-difluoroethyl, cyclopropyl, 1-cyanocyclopropyl, 1-cyano-1-methyl-ethyl, 1-cyano-1-methyl-ethoxy, 2,2,2-trifluoroethoxy, 2,2-difluoropropoxy, —N(CH.sub.3)COCH.sub.3, —N(CH.sub.3)COCH.sub.2CH.sub.3, —N(CH.sub.3)CO(cyclopropyl), or 2-pyridyloxy; and R.sub.3 is hydrogen.

5. A compound of formula I-1 according to claim 2, wherein R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; G is CH or N; X.sub.1 is O, S or NCH.sub.3; R.sub.7 is hydrogen or methyl; A is N or CH; X is S or SO.sub.2; R.sub.1 is ethyl or cyclopropylmethyl; Q.sub.1 is N-linked triazolyl, C-linked pyrimidinyl, or N-linked pyrazolyl which can be mono-substituted by chloro, cyano or trifluoromethyl; and R.sub.3 is hydrogen or or methyl.

6. A compound of formula I-1 according to claim 2, wherein R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; G is CH; X.sub.1 is O; R.sub.7 is hydrogen; A is N; X is SO.sub.2; R.sub.1 is ethyl; Q.sub.1 is pyrazol-1-yl, 3-chloro-pyrazol-1-yl, 3-cyano-pyrazol-1-yl, 3-trifluoromethyl-pyrazol-1-yl, 1,2,4-triazol-1-yl or pyrimidin-2-yl; and R.sub.3 is hydrogen.

7. A compound of formula I according to claim 1, represented by the compounds of formula I-2 ##STR00115## wherein R.sub.2, G, X.sub.1, R.sub.6, R.sub.7, A, X, R.sub.1, Q.sub.1, R.sub.3, R.sub.4 and R.sub.5 are as defined under formula I in claim 1; or an agrochemically acceptable salt, stereoisomer, enantiomer, tautomer or N-oxide of a compound of formula I-2.

8. A compound of formula I-2 according to claim 7, wherein R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; G is CH or N; X.sub.1 is O, S or NCH.sub.3; R.sub.7 is hydrogen or methyl; A is N or CH; X is S or SO.sub.2; R.sub.1 is ethyl or cyclopropylmethyl; Q.sub.1 is hydrogen, cyclopropyl, —NH(CH.sub.3), —N(CH.sub.3)COCH.sub.3, —N(CH.sub.3)COCH.sub.2CH.sub.3, or —N(CH.sub.3)CO(cyclopropyl); and R.sub.3 is hydrogen or or methyl.

9. A compound of formula I-2 according to claim 7, wherein R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; G is CH; X.sub.1 is O; R.sub.7 is hydrogen; A is N; X is SO.sub.2; R.sub.1 is ethyl; Q.sub.1 is hydrogen, cyclopropyl, —NH(CH.sub.3), —N(CH.sub.3)COCH.sub.3, —N(CH.sub.3)COCH.sub.2CH.sub.3, or —N(CH.sub.3)CO(cyclopropyl); and R.sub.3 is hydrogen.

10. A compound of formula I-2 according to claim 7, wherein R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; G is CH or N; X.sub.1 is O, S or NCH.sub.3; R.sub.7 is hydrogen or methyl; A is N or CH; X is S or SO.sub.2; R.sub.1 is ethyl or cyclopropylmethyl; Q.sub.1 is N-linked triazolyl or C-linked pyrimidinyl; and R.sub.3 is hydrogen or or methyl.

11. A compound of formula I-2 according to claim 7, wherein R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; G is CH; X.sub.1 is O; R.sub.7 is hydrogen; A is N; X is SO.sub.2; R.sub.1 is ethyl; Q.sub.1 is 1,2,4-triazol-1-yl or pyrimidin-2-yl; and R.sub.3 is hydrogen.

12. A compound of formula I according to claim 1, represented by the compounds of formula I-3 ##STR00116## wherein R.sub.2 is C.sub.1-C.sub.2fluoroalkyl or C.sub.1-C.sub.2fluoroalkoxy, preferably R.sub.2 is —CF.sub.3, —OCF.sub.3 or —OCHF.sub.2; G is CH or N; X.sub.1 is O, S or NCH.sub.3; R.sub.7 is hydrogen or methyl; Q′ is a radical selected from the group consisting of formula Qa1 and Qb1 ##STR00117## wherein the arrow denotes the point of attachment to the bicyclic ring; and wherein Q.sub.1 is hydrogen, trifluoromethyl, difluoroethyl, cyclopropyl, cyanocyclopropyl, cyanoisopropyl, cyanoisopropoxy, trifluoroethoxy, difluoropropoxy, 2-pyridyloxy, N-linked pyrazolyl which can be mono-substituted by chloro, cyano or trifluoromethyl; or Q.sub.1 is N-linked triazolyl, C-linked pyrimidinyl or —N(R.sub.4)COR.sub.5, in which R.sub.4 is hydrogen or methyl and R.sub.5 is either methyl, ethyl or cyclopropyl; or an

agrochemically acceptable salt, stereoisomer, enantiomer, tautomer or N-oxide of a compound of formula I-3.

13. A compound of formula I-3 according to claim 12, wherein Q.sub.1 is hydrogen, trifluoromethyl, 1,1-difluoroethyl, cyclopropyl, 1-cyanocyclopropyl, 1-cyano-1-methyl-ethyl, 1-cyano-1-methyl-ethoxy, 2,2,2-trifluoroethoxy, 2,2-difluoropropoxy, —N(CH.sub.3)COCH.sub.3, —N(CH.sub.3)COCH.sub.2CH.sub.3, —N(CH.sub.3)CO(cyclopropyl), 2-pyridyloxy, pyrazol-1-yl, 3-chloro-pyrazol-1-yl, 3-cyano-pyrazol-1-yl, 3-trifluoromethyl-pyrazol-1-yl, 1,2,4-triazol-1-yl or pyrimidin-2-yl.

14. A compound of formula I-3 according to claim 12, wherein Q.sub.1 is hydrogen, cyclopropyl, cyanocyclopropyl, cyanoisopropyl, cyanoisopropoxy, N-linked triazolyl or C-linked pyrimidinyl.

15. A compound of formula I-3 according to claim 12, wherein Q.sub.1 is hydrogen, cyclopropyl, 1-cyanocyclopropyl, 1-cyano-1-methyl-ethyl, 1-cyano-1-methyl-ethoxy, 1,2,4-triazol-1-yl or pyrimidin-2-yl.

16. A compound of formula I-3 according to claim 12 wherein G is CH; X.sub.1 is O; and R.sub.7 is hydrogen or methyl, preferably hydrogen.

17. A compound of formula I-3 according to claim 12 wherein G is N; X.sub.1 is O; and R.sub.7 is hydrogen or methyl, preferably hydrogen.

18. A compound of formula I according to claim 1 selected from the group consisting of: 3-(3-ethylsulfanyl-2-pyridyl)-7-(trifluoromethyl)chromen-4-one (compound P1); 3-(3-ethylsulfonyl-2-pyridyl)-7-(trifluoromethyl)chromen-4-one (compound P2); 1-[5-ethylsulfanyl-6-[4-oxo-7-(trifluoromethyl)chromen-3-yl]-3-pyridyl]cyclopropane-carbonitrile (compound P3); and 1-[5-ethylsulfonyl-6-[4-oxo-7-(trifluoromethyl)chromen-3-yl]-3-pyridyl]cyclopropane-carbonitrile (compound P4)

19. A composition comprising an insecticidally, acaricidally, nematicidally or molluscicidally effective amount of a compound of formula (I), or an agrochemically acceptable salt, stereoisomer, enantiomer, tautomer or N-oxide thereof, as defined in claim 1 and, optionally, an auxiliary or diluent.

20. A method of combating and 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, nematicidally or molluscicidally effective amount of a compound of formula (I), or an agrochemically acceptable salt, stereoisomer, enantiomer, tautomer or N-oxide thereof, as defined in claim 1.

21. 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 19.