Abstract:
The present invention relates to pyrethroid insecticides and the stereoisomers thereof and to compositions comprising the same. The invention also relates to the use of the insecticides or compositions comprising such insecticides for combating invertebrate pests. Furthermore, the invention relates to methods of applying such insecticides.
PYRETHROID INSECTICIDE FOR PROTECTING PLANTS AND SEED

[0001] The present invention relates to pyrethroid insecticides and the stereoisomers thereof and to compositions comprising the same. The invention also relates to the use of the said insecticides or of said compositions comprising such insecticides for combating invertebrate pests in plant agricultural uses. Furthermore, the invention relates to methods of applying such insecticides for plant agricultural use.

[0002] Invertebrate pests and in particular insects, arthropods and nematodes destroy growing and harvested crops, thereby causing large economic loss to the food supply. While a large number of pesticidal agents are known, due to the ability of target pests to develop resistance to said agents, there is an ongoing need for new agents for combating invertebrate pests such as insects, arachnids and nematodes. It is therefore an object of the present invention to provide compounds having a good pesticidal activity and showing a broad activity spectrum against a large number of different invertebrate pests, especially against difficult to control insects, arachnids and nematodes.

[0003] It has been found that these objectives can be achieved by the compounds of the general formula (I), as defined below.

[0004] DE 3005722 A1 discloses pyrethroids comprising a trifluormethylbenzylester group.

[0005] EP 0621 254 A2 discloses pyrethroids comprising halogen substituted benzylester groups, which are optionally further substituted.

[0006] JP 05-279213 discloses pyrethroids comprising a trifluormethylbenzylester group.

[0007] None of these documents discloses compounds of the formula (I) below.

[0008] Therefore, in a first aspect the present invention relates to compounds of formula (I),
or a stereoisomer thereof, wherein

[0010] \( R^1, R^2 \) are independently selected from the group consisting of halogen and C1-C4-haloalkyl;

[0011] \( R^{10} \) is selected from the group consisting of halogen;

[0012] \( R^{11} \) is selected from the group consisting of C1-C4-haloalkyl; and

[0013] \( R^{12} \) is selected from the group consisting of hydrogen and halogen.

[0014] Furthermore, the invention relates to processes for the synthesis of compounds of formula (I).

[0015] The compounds of the present invention, i.e. the compounds of formula (I), their stereoisomers, their salts, are particularly useful for controlling invertebrate pests, in particular for controlling arthropods and nematodes and especially insects. Therefore, the invention also relates to the use of a compound of the present invention, for combating or controlling invertebrate pests, in particular invertebrate pests of the group of insects, arachnids or nematodes.

[0016] The term "compound(s) according to the invention" comprises the compound(s) as defined herein as well as a stereoisomer, salt, thereof. The term "compound(s) of the present invention" is to be understood as equivalent to the term "compound(s) according to the invention", therefore also comprising a stereoisomer, salt, thereof. The term "composition(s) according to the invention" or "composition(s) of the present invention" comprises composition(s) comprising at least one compound according to the invention as defined above.

[0017] The invention also relates to agrochemical compositions comprising an auxiliary and at least one compound of the formula (I) according to the invention.

[0018] The present invention also relates to a method for protecting growing plants from attack or infestation by invertebrate pests of the group of insects, arachnids
or nematodes, which method comprises contacting a plant, or soil or water in which the plant is growing or may grow, with a pesticidally effective amount of at least one compound according to the invention or a composition according to the invention.

[0019] The present invention also relates to a method for the protection of plant propagation material, preferably seeds, from soil insects and of the seedlings' roots and shoots from soil and foliar insects comprising contacting the seeds before sowing and/or after pregermination with at least one compound according to the invention or a composition according to the invention.

[0020] The present invention also relates to plant propagation material, preferably seed, comprising a compound according to the invention in an amount of from 0.1 g to 10 kg per 100 kg of the plant propagation material.

[0021] The present invention also relates to the use of a compound according to the invention or a composition according to the invention for protecting growing plants from attack or infestation by invertebrate pests of the group of insects, arachnids or nematodes.

[0022] Depending on the substitution pattern, the compounds of the formula (I) may have one or more centers of chirality, in which case they are present as mixtures of enantiomers or diastereomers. The invention provides both the pure enantiomers or pure diastereomers of the compounds of formula (I), and their mixtures and the use according to the invention of the pure enantiomers or pure diastereomers of the compound of formula (I) or its mixtures. Suitable compounds of the formula (I) also include all possible geometrical stereoisomers (cis/trans isomers) and mixtures thereof. Cis/trans isomers may be present with respect to an alkene, carbon-nitrogen double-bond or amide group. The term "stereoisomer(s)" encompasses both optical isomers, such as enantiomers or diastereomers, the latter existing due to more than one center of chirality in the molecule, as well as geometrical isomers (cis/trans isomers).

[0023] The compounds of the present invention may be amorphous or may exist in one or more different crystalline states (polymorphs) which may have different macroscopic properties such as stability or show different biological properties such as activities. The present invention includes both amorphous and crystalline compounds of formula (I), their enantiomers or diastereomers, mixtures of different crystalline states of
the respective compound of formula (I), its enantiomers or diastereomers, as well as amorphous or crystalline salts thereof.

[0024] Salts of the compounds of the present invention are preferably agriculturally acceptable salts. They can be formed in a customary method, e.g. by reacting the compound with an acid if the compound of the present invention has a basic functionality or by reacting the compound with a suitable base if the compound of the present invention has an acidic functionality.

[0025] Suitable agriculturally acceptable salts are especially the salts of those cations or the acid addition salts of those acids whose cations and anions, respectively, do not have any adverse effect on the pesticidal action of the compounds according to the present invention. Suitable cations are in particular the ions of the alkali metals, preferably lithium, sodium and potassium, of the alkaline earth metals, preferably calcium, magnesium and barium, and of the transition metals, preferably manganese, copper, zinc and iron, and also ammonium (NH\(^+\)) and substituted ammonium in which one to four of the hydrogen atoms are replaced by Ci-C4-alkyl, Ci-C4-hydroxyalkyl, Ci-C4-alkoxy, Ci-C4-alkoxy-Ci-C4-alkyl, hydroxy-Ci-C4-alkoxy-Ci-C4-alkyl, phenyl or benzyl. Examples of substituted ammonium ions comprise methylammonium, isopropylammonium, dimethylammonium, diisopropylammonium, trimethylammonium, tetramethylammonium, tetraethylammonium, tetrabutylammonium, 2-hydroxyethylammonium, 2-(2-hydroxyethoxy)ethylammonium, bis(2-hydroxyethyl)ammonium, benzytrimethylammonium and benzil-triethylammonium, furthermore phosphonium ions, sulfonium ions, preferably tri(Ci-C4-alkyl) sulfonium, and sulfoxonium ions, preferably tri(Ci-C4-alkyl)sulfoxonium.

[0026] Anions of useful acid addition salts are primarily chloride, bromide, fluoride, hydrogensulfate, sulfate, dihydrogenphosphate, hydrogenphosphate, phosphate, nitrate, bicarbonate, carbonate, hexafluorosilicate, hexafluorophosphate, benzoate, and the anions of Ci-C4-alkanoic acids, preferably formate, acetate, propionate and butyrate. They can be formed by reacting compounds of the present invention with an acid of the corresponding anion, preferably of hydrochloric acid, hydrobromic acid, sulfuric acid, phosphoric acid or nitric acid.
[0027] The term “invertebrate pest” as used herein encompasses populations, such as arthropod pests, including insects and arachnids, as well as nematodes, which may attack plants thereby causing substantial damage to the plants attacked.

[0028] The term "plant propagation material" is to be understood to denote all the generative parts of the plant such as seeds and vegetative plant material such as cuttings and tubers (e.g. potatoes), which can be used for the multiplication of the plant. This includes seeds, roots, fruits, tubers, bulbs, rhizomes, shoots, sprouts and other parts of plants. Seedlings and young plants, which are to be transplanted after germination or after emergence from soil, may also be included. These plant propagation materials may be treated prophylactically with a plant protection compound either at or before planting or transplanting.

[0029] The term "plants" comprises any types of plants including "non-cultivated plants" and in particular "cultivated plants". The term "non-cultivated plants" refers to any wild type species or related species or related genera of a cultivated plant.

[0030] The term "cultivated plants" is to be understood as including plants which have been modified by breeding, mutagenesis or genetic engineering. Genetically modified plants are plants, which genetic material has been so modified by the use of recombinant DNA techniques that under natural circumstances cannot readily be obtained by cross breeding, mutations or natural recombination. Typically, one or more genes have been integrated into the genetic material of a genetically modified plant in order to improve certain properties of the plant. Such genetic modifications also include but are not limited to targeted post-translational modification of protein(s) (oligo- or polypeptides), e.g. by glycosylation or polymer additions such as prenylated, acetylated or farnesylated moieties or PEG moieties (e.g. as disclosed in Biotechnol Prog. 2001 Jul-Aug;17(4):720-8., Protein Eng Des Sel. 2004 Jan;17(l):57-66, Nat Protoc. 2007;2(5): 1225-35., Curr Opin Chem Biol. 2006 Oct;10(5):487-91. Epub 2006 Aug 28., Biomaterials. 2001 Mar;22(5):405-17, Bioconjug Chem. 2005 Jan-Feb;16(l):1 13-21).

[0031] The term "cultivated plants" is to be understood also including plants that have been rendered tolerant to applications of specific classes of herbicides, such as hydroxy-phenylpyruvate dioxygenase (HPPD) inhibitors; acetolactate synthase (ALS) inhibitors, such as sulfonyl ureas (see e.g. US 6,222,100, WO 01/82685, WO 00/26390,
03/14357, WO 03/13225, WO 03/14356, WO 04/16073) or imidazolinones (see e.g. US
6222100, WO 01/82685, WO 00/26390, WO 97/41218, WO 98/02526, WO 98/02527,
WO 04/106529, WO 05/20673, WO 03/14357, WO 03/13225, WO 03/14356, WO
04/16073); enolpyruvylshikimate-3-phosphate synthase (EPSPS) inhibitors, such as
glyphosate (see e.g. WO 92/00377); glutamine synthetase (GS) inhibitors, such as
glufosinate (see e.g. EP-A-0242236, EP-A-242246) or oxynil herbicides (see e.g. US
5,559,024) as a result of conventional methods of breeding or genetic engineering. Sev-
eral cultivated plants have been rendered tolerant to herbicides by conventional methods
of breeding (mutagenesis), for example Clearfield® summer rape (Canola) being tolerant
to imidazolinones, e.g. imazamox. Genetic engineering methods have been used to re-
der cultivated plants, such as soybean, cotton, corn, beets and rape, tolerant to herbi-
cides, such as glyphosate and glufosinate, some of which are commercially available un-
der the trade names RoundupReady® (glyphosate) and LibertyLink® (glufosinate).

[0032] The term "cultivated plants" is to be understood also including plants that
are by the use of recombinant DNA techniques capable to synthesize one or more insec-
tical proteins, especially those known from the bacterial genus Bacillus, particularly
from Bacillus thuringiensis, such as a-endotoxins, e.g. CryIA(b), Cry1A(c), CryIF, Cry-
IF(a2), CryIIA(b), CryIII(a), CryIIIB(bl) or Cry9c; vegetative insecticidal proteins (VIP),
e.g. VIP1, VIP2, VIP3 or VIP3A; insecticidal proteins of bacteria colonizing nema-
todes, for example Photorhabdus spp. or Xenorhabdus spp.; toxins produced by animals,
such as scorpion toxins, arachnid toxins, wasp toxins, or other insect-specific neurotox-
ins; toxins produced by fungi, such Streptomyces toxins, plant lectins, such as pea or
barley lectins; agglutinins; protease inhibitors, such as trypsin inhibitors, serine prote-
ase inhibitors, patatin, cystatin or papain inhibitors; ribosome-inactivating proteins
(RIP), such as ricin, maize-RIP, abrin, luffin, saporin or bryodin; steroid metabolism en-
zymes, such as 3-hydroxysteroid oxidase, ecdysteroid-IDP-glycosyl-transferase, choles-
terol oxidases, edysone inhibitors or HMG-CoA-reductase; ion channel blockers, such
as blockers of sodium or calcium channels; juvenile hormone esterase; diuretic hormone
receptors (helicokinin receptors); stilben synthase, bibenzyl synthase, chitinases or glu-
canases. In the context of the present invention these insecticidal proteins or toxins are to
be understood expressly also as pre-toxins, hybrid proteins, truncated or otherwise modi-
fled proteins. Hybrid proteins are characterized by a new combination of protein domains. (see, for example WO 02/015701). Further examples of such toxins or genetically-modified plants capable of synthesizing such toxins are disclosed, for example, in EP-A 374 753, WO 93/007278, WO 95/34656, EP-A 427 529, EP-A 451 878, WO 03/018810 und WO 03/052073. The methods for producing such genetically modified plants are generally known to the person skilled in the art and are described, for example, in the publications mentioned above. These insecticidal proteins contained in the genetically modified plants impart to the plants producing these proteins protection from harmful pests from certain taxonomic groups of arthropods, particularly to beetles (Coleoptera), flies (Diptera), and butterflies and moths (Lepidoptera) and to plant parasitic nematodes (Nematoda).

[0033] The term "cultivated plants" is to be understood also including plants that are by the use of recombinant DNA techniques capable to synthesize one or more proteins to increase the resistance or tolerance of those plants to bacterial, viral or fungal pathogens. Examples of such proteins are the so-called "pathogenesis-related proteins" (PR proteins, see, for example EP-A 0 392 225), plant disease resistance genes (for example potato cultivars, which express resistance genes acting against Phytophthora infestans derived from the mexican wild potato Solanum bulbocastanum) or T4-lysozyme (e.g. potato cultivars capable of synthesizing these proteins with increased resistance against bacteria such as Erwinia amylovora). The methods for producing such genetically modified plants are generally known to the person skilled in the art and are described, for example, in the publications mentioned above.

[0034] The term "cultivated plants" is to be understood also including plants that are by the use of recombinant DNA techniques capable to synthesize one or more proteins to increase the productivity (e.g. bio mass production, grain yield, starch content, oil content or protein content), tolerance to drought, salinity or other growth-limiting environmental factors or tolerance to pests and fungal, bacterial or viral pathogens of those plants.
The term "cultivated plants" is to be understood also including plants that contain by the use of recombinant DNA techniques a modified amount of substances of content or new substances of content, specifically to improve human or animal nutrition, for example oil crops that produce health-promoting long-chain omega-3 fatty acids or unsaturated omega-9 fatty acids (e.g. Nexera® rape).

The term "cultivated plants" is to be understood also including plants that contain by the use of recombinant DNA techniques a modified amount of substances of content or new substances of content, specifically to improve raw material production, for example potatoes that produce increased amounts of amylopectin (e.g. Amflora® potato).

The organic moieties mentioned in the above definitions of the variables are - like the term halogen - collective terms for individual listings of the individual group members. The prefix C\textsubscript{n}-C\textsubscript{m} indicates in each case the possible number of carbon atoms in the group.

The term halogen denotes in each case fluorine, bromine, chlorine or iodine, preferably fluorine, chlorine or bromine, more preferably fluorine or chlorine, and in particular fluorine.

The term "C\textsubscript{n}-C\textsubscript{m}-haloalkyl" as used herein refers to a straight-chain or branched alkyl group having n to m carbon atoms, e.g. 1 to 4, in particular 1 to 2 carbon atoms (as mentioned above), where some or all of the hydrogen atoms in these groups may be replaced by halogen atoms as mentioned above, for example Ci-C4-haloalkyl, such as chloromethyl, bromomethyl, dichloromethyl, trichloromethyl, fluoromethyl, difluoromethyl, trifluoromethyl, chlorofluoromethyl, dichlorofluoromethyl, chlorodifluoromethyl, 1-chloroethyl, 1-bromoethyl, 1-fluoroethyl, 2-fluoroethyl, 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 and the like. The term Ci-C4-haloalkyl in particular comprises Ci-C2-fluoroalkyl, which is synonym with methyl or ethyl, wherein 1, 2, 3, 4 or 5 hydrogen atoms are substituted by fluorine atoms, such as fluoro-methyl, difluoromethyl, trifluoromethyl, 1-fluoroethyl, 2-fluoroethyl, 2,2-difluoroethyl, 2,2,2-trifluoroethyl and pentafluoromethyl.
The remarks made below as to preferred embodiments of the variables (substituents) of the compounds of formula (I) are valid on their own as well as preferably in combination with each other. The remarks made below concerning preferred embodiments of the variables further are valid on their own as well as preferably in combination with each other concerning the compounds of formula (I) as well as concerning the uses and methods according to the invention and the composition according to the invention.

In a first aspect the present invention relates to compounds of formula (I),

![Chemical Structure](image)

or a stereoisomer thereof, wherein

R¹, R² are independently selected from the group consisting of halogen and Ci-C4-haloalkyl;

R¹⁰ is selected from the group consisting of halogen;

R¹¹ is selected from the group consisting of Ci-C4-haloalkyl; and

R¹² is selected from the group consisting of hydrogen and halogen.

In a preferred embodiment, R¹, R² are independently selected from the group consisting of fluorine, chlorine, chloromethyl, bromomethyl, dichloromethyl, trichloromethyl, fluoromethyl, difluoromethyl, trifluoromethyl, chlorofluoromethyl, dichlorofluoromethyl, chlorodifluoromethyl, 1-chloroethyl, 1-bromoethyl, 1-fluoroethyl, 2-fluoroethyl, 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, and pentafluoroethyl. In a more preferred embodiment, R¹ and R² are independently selected from the group consisting of chlorine, Ci-C₂-chloroalkyl, and Ci-C₂-fluoroalkyl, wherein chlorine, Ci-chloroalkyl, and Ci-fluoroalkyl are even more preferred.

In another preferred embodiment, at least one of R¹ and R² are selected from halogen, such as chlorine or fluorine. More preferred, at least one of R¹ and R² are selected from chlorine.
In another more preferred embodiment, one of R<sup>1</sup> and R<sup>2</sup> are selected from halogen (such as chlorine) and one of R<sup>1</sup> and R<sup>2</sup> are selected from Ci-C4-haloalkyl.

In another preferred embodiment, at least one of R<sup>1</sup> or R<sup>2</sup> are selected from the group consisting of Ci-C4-haloalkyl, preferably Ci-C2-haloalkyl, such as chloromethyl, bromomethyl, dichloromethyl, fluoromethyl, difluoromethyl, trifluoromethyl, chlorofluoromethyl, dichlorofluoromethyl, chlorodifluoromethyl, 1-chloroethyl, 1-bromoethyl, 1-fluoroethyl, 2-fluoroethyl, 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, and pentafluoroethyl.

In another preferred embodiment, R<sup>10</sup> is selected from the group consisting of chlorine and fluorine, wherein fluorine is more preferred.

In another preferred embodiment, R<sup>12</sup> is selected from the group consisting of chlorine and fluorine, wherein fluorine is more preferred.

In another preferred embodiment, R<sup>11</sup> is selected from the group consisting of Ci-C2-chloroalkyl and Ci-C2-fluoroalkyl, such as chloromethyl, bromomethyl, dichloromethyl, trichloromethyl, fluoromethyl, difluoromethyl, trifluoromethyl, chlorofluoromethyl, dichlorofluoromethyl, chlorodifluoromethyl, 1-chloroethyl, 1-bromoethyl, 1-fluoroethyl, 2-fluoroethyl, 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, and pentafluoroethyl. In a more preferred embodiment, R<sup>11</sup> is trifluoromethyl.

In another preferred embodiment, R<sup>10</sup> and R<sup>12</sup> are independently selected from the group consisting of chlorine and fluorine. In a more preferred embodiment, R<sup>10</sup> and R<sup>12</sup> are fluorine.

In a most preferred embodiment, R<sup>1</sup> is chlorine, R<sup>2</sup> is trifluoromethyl, R<sup>10</sup> and R<sup>12</sup> are fluorine, and R<sup>11</sup> is trifluoromethyl.

In another most preferred embodiment, R<sup>1</sup> and R<sup>2</sup> are chlorine, R<sup>10</sup> and R<sup>12</sup> are fluorine, and R<sup>11</sup> is trifluoromethyl.
[0057] The compounds of the formula (I) can be prepared by the standard methods of organic chemistry. The compounds of the formula (I) belong to the class of pyrethroids, and may be synthesized similar to other pyrethroids, such as described in DE 3005722, EP 0621254, EP 0128351, JP 05-279213 or EP 0006978.

[0058] As a rule, the compounds of formula (I), and their precursors in the synthesis process, can be prepared by the methods described above. If individual compounds cannot be prepared via the above-described routes, they can be prepared by derivatization of other compounds (I) or the respective precursor or by customary modifications of the synthesis routes described. For example, in individual cases, certain compounds of formula (I) can advantageously be prepared from other compounds of formula (I) by derivatization, e.g. by ester hydrolysis, amidation, esterification, ether cleavage, olefination, reduction, oxidation and the like, or by customary modifications of the synthesis routes described.

[0059] The reaction mixtures are worked up in the customary manner, for example by mixing with water, separating the phases, and, if appropriate, purifying the crude products by chromatography, for example on alumina or on silica gel. Some of the intermediates and end products may be obtained in the form of colorless or pale brown viscous oils which are freed or purified from volatile components under reduced pressure and at moderately elevated temperature. If the intermediates and end products are obtained as solids, they may be purified by recrystallization or trituration.

[0060] Due to their excellent activity, the compounds of the present invention may be used for controlling invertebrate pests.

[0061] Preferably, the method of the invention serves for protecting plant propagation material (such as seed) and the plant which grows therefrom from invertebrate pest attack or infestation and comprises treating the plant propagation material (such as seed) with a pesticidally effective amount of a compound of the present invention as defined above or with a pesticidally effective amount of an agricultural composition as defined above and below. The method of the invention is not limited to the protection of the "substrate" (plant, plant propagation materials, soil material etc.) which has been treated according to the invention, but also has a preventive effect, thus, for example, ac-
cording protection to a plant which grows from a treated plant propagation materials
(such as seed), the plant itself not having been treated.

[0062] In the sense of the present invention, "invertebrate pests" are preferably
selected from arthropods and nematodes, more preferably from harmful insects, arach-
nids and nematodes, and even more preferably from insects, acarids and nematodes. In
the sense of the present invention, "invertebrate pests" are most preferably insects.

[0063] The invention further provides an agricultural composition for combating
invertebrate pests, which comprises such an amount of at least one compound according
to the invention and at least one inert liquid and/or solid agronomically acceptable carri-
er that has a pesticidal action and, if desired, at least one surfactant.

[0064] Such a composition may comprise a single active compound of the pre-
sent invention or a mixture of several active compounds of the present invention. The
composition according to the present invention may comprise an individual isomer or
mixtures of isomers or a salt as well as individual tautomers or mixtures of tautomers.

[0065] The compounds of the present invention are in particular suitable for effi-
ciently controlling arthropod pests such as arachnids, myriapodes and insects as well as
nematodes. They are especially suitable for efficiently combating or controlling the fol-
lowing pests:

[0066] Insects from the order of the lepidopterans (Lepidoptera), for example
Agrotis ypsilon, Agrotis segetum, Alabama argillacea, Anticarsia gemmatalis, Ar-
gyresthia conjugella, Autographa gamma, Bupalus piniarius, Cacoecia murinana, Capua
reticulana, Cheimatobia brumata, Choristoneura fumiferana, Choristoneura occidentalis,
Cirphis unipuncta, Cydia pomonella, Dendrolimus pini, Diaphania nitidalis, Diatraea
grandiosella, Earias insulana, Elasmopalpus lignosellus, Eupoecilia ambiguelia, Evetria
bouliana, Feltia subterranea, Galleria mellonella, Grapholitha funebrana, Grapholitha
molesta, Heliothis armigera, Heliothis virescens, Heliothis zea, Hellula undalis, Hibernia
defoliaria, Hyphantria cunea, Hyponomeuta malinellus, Keiferia lycopersicella, Lambdi-
na fiscellaria, Laphygemia exigua, Leucocatha coffeella, Leucocatha scitella, Lithocolletis
blancardella, Lobesia botrana, Loxostege sticticalis, Lymantria dispar, Lymantria mon-
acha, Lyonetia clerkella, Malacosoma neustria, Mamestra brassicae, Orgyia pseudotsuga-
ta, Ostrinia nubilalis, Panolis flammea, Pectinophora gossypiella, Peridroma saucia,
Phalera bucephala, Phthorimaea operculella, Phyllocnistis citrella, Pieris brassicae, Plathypena scabra, Plutella xylostella, Pseudoplusia includens, Pyhyacionia frustrana, Scrobipalpula absoluta, Sitotroga cerealella, Sparganothis pilleriana, Spodoptera frugiperda, Spodoptera littoralis, Spodoptera litura, Thaumatopoea pityocampa, Tortrix viridana, Trichoplusia ni and Zeiraphera canadensis;


[0068] flies, mosquitoes (Diptera), e.g. Aedes aegypti, Aedes albopictus, Aedes vexans, Anastrepha ludens, Anopheles maculipennis, Anopheles crucians, Anopheles albimanus, Anopheles gambiae, Anopheles freeborni, Anopheles leucophyshrus, Anopheles minimus, Anopheles quadrimaculatus, Calliphora vicina, Ceratitis capitata, Chrysomya bezziana, Chrysomya hominivorax, Chrysomya macellaria, Chrysops discalis, Chrysops silacea, Chrysops atlanticus, Cochliomyia hominivorax, Contarinia sorgicola Cordylobia anthropophaga, Culicoides furens, Culex pipiens, Culex nigripalpus, Culex quinquefasciatus, Culex tarsalis, Culiseta inornata, Culiseta melanura, Dacus cucurbitae, Dacus oleae, Dasineura brassicae, Delia antique, Delia coarctata, Delia platura, Delia radicum, Dermatobia hominis, Fannia canicularis, Geomyza Tripunctata, Gasterophilus intestinalis, Glossina morsitans, Glossina palpalis, Glossina fuscipes, Glossina tachinoides, Haematobia irritans, Haplodiplosis equestris, Hippelates spp., Hylemyia platura,
Hypoderma lineata, Leptoconops torrens, Liriomyza sativae, Liriomyza trifolii, Lucilia caprina, Lucilia cuprina, Lucilia sericata, Lycoria pectoralis, Mansonia titillanus, Mayetiola destructor, Musca autumnalis, Musca domestica, Muscina stabulans, Oestrus ovis, Opomyza florum, Oscinella frit, Pegomya hyoscyami, Phorbia antiqua, Phorbia brassicae, Phorbia coarctata, Phlebotomus argentipes, Psorophora columbiae, Psila rosae, Psorophora discolor, Prosimulium mixtum, Rhagoletis cerasi, Rhagoletis pomonella, Sarcophaga haemorrhoidalis, Sarcophaga spp., Simulium vittatum, Stomoxys calcitrans, Tabanus bovinus, Tabanus atratus, Tabanus lineola, and Tabanus similis, Tipula oleracea, and Tipula paludosa;

[0069] thrips (Thysanoptera), e.g. Dichromothrips corbetti, Dichromothrips ssp., Frankliniella fusca, Frankliniella occidentalis, Frankliniella tritici, Scirtothrips cirri, Thrips oryzae, Thrips palmi and Thrips tabaci, termites (Isoptera), e.g. Calotermes flavicollis, Leucotermes flavipes, Heterotermes aureus, Reticulitermes flavipes, Reticulitermes virginicus, Reticulitermes lucifugus, Reticulitermes santonensis, Reticulitermes grassei, Termes natalensis, and Coptotermes formosanus;

[0070] cockroaches (Blattaria - Blattodea), e.g. Blattella germanica, Blattella asahinae, Periplaneta americana, Periplaneta japonica, Periplaneta brunnea, Periplaneta fuligginosa, Periplaneta australasiae, and Blatta orientalis;

[0071] bugs, aphids, leafhoppers, whiteflies, scale insects, cicadas (Hemiptera), e.g. Acrosternum hilare, Blissus leucopterus, Cyrtopeltis notatus, Dysdercus cingulatus, Dysdercus intermedius, Eurygaster integriceps, Euschistus impictiventris, Leptoglossus phyllopus, Lygus lineolaris, Lygus pratensis, Nezara viridula, Piesma quadrata, Solubea insularis, Thyanta perditor, Acrithosiphon onobrychis, Adelges laricis, Aphidula nasturtii, Aphis fabae, Aphis forbesi, Aphis pomi, Aphis gossypii, Aphis grossulariae, Aphis schneideri, Aphis spiraecola, Aphis sambuci, Acrithosiphon pisum, Aulacorthum solani, Bemisia argentifolii, Brachycaudus cardui, Brachycaudus helichrysi, Brachycaudus persicae, Brachycaudus prunicola, Brevicoryne brassicae, Capitophorus horni, Ceropis gossypii, Chaetosiphon fragaefolii, Cryptomyzus ribis, Dreyfusia nordmanniana, Dreyfusia piceae, Dysaphis radicola, Dysaulacorthum pseudosolani, Dysaphis plantaginea, Dysaphis pyri, Empoasca fabae, Hyperomyzus pruni, Hyperomyzus lactucae, Macrosiphum avenae, Macrosiphum euphorbiae, Macrosiphon rosae, Megoura viciae,
Melanaphis pyrarius, Metopolophium dirhodum, Myzus persicae, Myzus ascalonicus, Myzus cerasi, Myzus varians, Nasonovia ribis-nigri, Nilaparvata lugens, Pemphigus bursarius, Perkinsiella saccharicida, Phorodon humuli, Psylla mali, Psylla piri, Rhopalomyzus ascalonicus, Rhopalosiphum maidis, Rhopalosiphum padi, Rhopalosiphum insertum, Sappaphis mala, Sappaphis mali, Schizaphis graminum, Schizoneura lanuginosa, Sitobion avenae, Trialeurodes vaporariorum, Toxoptera aurantii, and Arilus critatus;


[0073] crickets, grasshoppers, locusts (Orthoptera), e.g. Acheta domestica, Gryllotalpa gryllotalpa, Locusta migratoria, Melanoplus bivittatus, Melanoplus femurrubrum, Melanoplus mexicanus, Melanoplus sanguinipes, Melanoplus spretus, Nomadacris septemfasciata, Schistocerca americana, Schistocerca gregaria, Docioctamus maroccanus, Tachycines asynamorus, Oedaleus senegalensis, Zonoberus variegatus, Hieroglyphus daganensis, Kraussaria angulifera, Calliptamus italicus, Chortoicetes terminifera, and Locustana pardalina;

[0074] arachnoidea, such as arachnids (Acarina), e.g. of the families Argasidae, Ixodidae and Sarcoptidae, such as Amblyomma americanum, Amblyomma variegatum, Amblyomma maculatum, Argas persicus, Boophilus annulatus, Boophilus decoloratus, Boophilus microplus, Dermacentor silvarum, Dermacentor andersoni, Dermacentor variabilis, Hyalomma truncatum, Ixodes ricinus, Ixodes ricinus, Ixodes scapularis, Ixodes holocyclus, Ixodes pacificus, Ornithodorus moubata, Ornithodorus hermsi, Ornithodorus turicata, Ornithonyssus bacoti, Otobius megnini, Dermanyssus gallinae, Psoroptes ovis, Rhipicephalus sanguineus, Rhipicephalus appendiculatus, Rhipicephalus evertsi, Sarcoptes scabiei, and Eriophyidae spp. such as Aculus schlechtendali, Phyllo-
coptrata oleivora and Eriophyes sheldoni; Tarsonemidae spp. such as Phytonemus pallidus and Polyphagotarsonemus latus; Tenuipalpidae spp. such as Brevipalpus phoenicis; Tetranychidae spp. such as Tetranychus cinnabarinus, Tetranychus kanzawai, Tetranychus pacificus, Tetranychus telarius and Tetranychus urticae, Panonychus ulmi, Panonychus citri, and Oligonychus pratensis; Araneida, e.g. Latrodectus mactans, and Loxosceles reclusa; fleas (Siphonaptera), e.g. Ctenocephalides felis, Ctenocephalides canis, Xenopsylla cheopis, Pulex irritans, Tunga penetrans, and Nosopsyllus fasciatus, silver-fish, firebrat (Thysanura), e.g. Lepisma saccharina and Thermobia domestica, centipedes (Chilopoda), e.g. Scutigera coleoptrata, millipedes (Diplopoda), e.g. Narceus spp., Earwigs (Dermaptera), e.g. forficula auricularia, lice (Phthiraptera), e.g. Pediculus humanus capitis, Pediculus humanus corporis, Pthirus pubis, Haematopinus eurysternus, Haematopinus suis, Linognathus vituli, Bovicola bovis, Menopon gallinae, Menacanthus stramineus and Solenopotes capillatus. Collembola (springtails), e.g. Onychiurus ssp.

The compounds of the present invention, including their salts, stereoisomers and tautomers, are also suitable for controlling Nematodes: plant parasitic nematodes such as root knot nematodes, Meloidogyne hapla, Meloidogyne incognita, Meloidogyne javanica, 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 Heliocotylenchus species; Sheath and sheathoid nematodes, Hemiciclophora species and Hemicriconemoides species; Hirshmanniella species; Lance nematodes, Hoploaimus species; false rootknot nematodes, Nacobbus species; Needle nematodes, Longidorus elongatus and other Longidorus 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 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.

[0078] The compounds of the present invention, including their salts, stereoisomers and tautomers, are also suitable for controlling arachnids (Arachnoidea), such as acarians (Acarina), e.g. of the families Argasidae, Ixodidae and Sarcoptidae, such as Amblyomma americanum, Amblyomma variegatum, Argas persicus, Boophilus annulatus, Boophilus decoloratus, Boophilus microplus, Dermacentor silvarum, Hyalomma truncatum, Ixodes ricinus, Ixodes ricinus, Ornithodorus moubata, Otobius megnini, Dermanyssus gallinae, Psoroptes ovis, Rhipicephalus appendiculatus, Rhipicephalus evertsi, Sarcoptes scabiei, and Eriophyidae spp. such as Aculus schlechtendali, Phyllocoptera oleivora and Eriophyes sheldoni; Tarsonomidae spp. such as Phytomenus pallidus and Polyphagotarsonemus latus; Tenuipalpidae spp. such as Brevipalpus phoenicis; Tetranychidae spp. such as Tetranychus cinnabarinus, Tetranychus kanzawai, Tetranychus pacificus, Tetranychus telarius and Tetranychus urticae, Panonychus ulmi, Panonychus citri, and oligonychus pratensis.

[0079] The compounds of the present invention, including their salts, stereoisomers and tautomers, are particularly useful for controlling insects, preferably sucking or piercing insects such as insects from the genera Thysanoptera, Diptera and Hemiptera, in particular the following species:

[0080] Thysanoptera : Frankliniella fusca, Frankliniella occidentalis, Frankliniella tritici, Scirtothrips citri, Thrips oryzae, Thrips palmi and Thrips tabaci,

hominivorax, Chrysomya macellaria, Chrysops discalis, Chrysops atlanticus, Cochliomyia hominivorax, Contarinia sorgicola Cordylobia anthropophaga, Culicoides furens, Culex pipiens, Culex nigripalpus, Culex quinquefasciatus, Culex tarsalis, Culiseta inornata, Culiseta melanura, Dacus cucurbitae, Dacus oleae, Dasineura brassicae, Delia antique, Delia coarctata, Delia platura, Delia radicum, Dermatobia hominis, Fannia canicularis, Geomyza Tripunctata, Gasterophilus intestinalis, Glossina mortitans, Glossina palpalis, Glossina fusciptes, Glossina tachinoides, Haematobia irritans, Haplodiplosis equesris, Hippelates spp., Hylemyia platura, Hypoderma lineata, Leptocoris torrens, Liriomyza sativae, Liriomyza trifolii, Lucilia caprina, Lucilia cuprina, Mansonia titillanus, Mayetiola destructor, Musca autumnalis, Musca domestica, Muscina stabulans, Oestrus ovis, Ophomyza florum, Oscinella frit, Pegomya hysocyami, Phorbia antiqua, Phorbia brassicae, Phorbia coarctata, Phlebotomus argentipes, Psorophora columbiae, Psila rosae, Psorophora discolor, Psorophora mixtum, Rhagoletis cerasi, Rhagoletis pomonella, Sarcophaga haemorrhoidalis, Sarcophaga spp., Simulium vittatum, Stomoxys calcitrans, Tabanus bovinus, Tabanus atratus, Tabanus lineola, and Tabanus similis, Tipula oleracea, and Tipula paludosa;

[0082] Hemiptera, in particular aphids: Acyrthosiphon onobrychis, Adelges laricis, Aphidula nasturtii, Aphis fabae, Aphis forbesi, Aphis pomi, Aphis gossypii, Aphis grossulariae, Aphis schneideri, Aphis spiraecola, Aphis sambuci, Acrystosiphon pisum, Aulacorthum solani, Brachycaudus cardui, Brachycaudus helichrysi, Brachycaudus persicae, Brachycaudus prunicola, Brevicoryne brassicae, Capitophorus horni, Ceroshipa gossypii, Chaetosiphon fragaefolii, Cryptomyzus ribis, Dreyfusia nordmanniana, Dreyfusia piceae, Dysaphis radicola, Dysaulacorthum pseudosolani, Dysaphis plantaginea, Dysaphis pyri, Empoasca fabae, Hyalopterus pruni, Hyperomyzus lactucae, Macrosiphum avenae, Macrosiphum euphorbiae, Macrosiphum rosae, Megoura viciae, Melanaphis pyrarius, Metopolophium dirhodum, Myzodes persicae, Myzus ascalonicus, Myzus cerasi, Myzus varians, Nasonovia ribis-nigri, Nilaparvata lugens, Pemphigus bursarius, Perkinsiella saccharicida, Phorodon humuli, Psylla mali, Psylla piri, Rhopalomyzus ascalonicus, Rhopalsosiphum maidis, Rhopalsosiphum padi, Rhopalsosiphum insertum, Sappaphis mala, Sappaphis mali, Schizaphis graminum, Schizoneura lanuginosa, Sitobion avenae, Trialeurodes vaporariorum, Toxoptera aurantiand, and Viteus vitifolii.
The compounds of the present invention, including their salts, stereoisomers and tautomers, are particularly useful for controlling insects of the orders Hemiptera and Thysanoptera.

The compounds I can be converted into customary types of agrochemical compositions, e.g. solutions, emulsions, suspensions, dusts, powders, pastes, granules, pressings, capsules, and mixtures thereof. Examples for composition types are suspensions (e.g. SC, OD, FS), emulsifiable concentrates (e.g. EC), emulsions (e.g. EW, EO, ES, ME), capsules (e.g. CS, ZC), pastes, pastilles, wettable powders or dusts (e.g. WP, SP, WS, DP, DS), pressings (e.g. BR, TB, DT), granules (e.g. WG, SG, GR, FG, GG, MG), insecticidal articles (e.g. LN), as well as gel formulations for the treatment of plant propagation materials such as seeds (e.g. GF). These and further compositions types are defined in the “Catalogue of pesticide formulation types and international coding system”, Technical Monograph No. 2, 6th Ed. May 2008, CropLife International.

The compositions are prepared in a known manner, such as described by Mollet and Grubemann, Formulation technology, Wiley VCH, Weinheim, 2001; or Knowles, New developments in crop protection product formulation, Agrow Reports DS243, T&F Informa, London, 2005.

Examples for suitable auxiliaries are solvents, liquid carriers, solid carriers or fillers, surfactants, dispersants, emulsifiers, wetters, adjuvants, solubilizers, penetration enhancers, protective colloids, adhesion agents, thickeners, humectants, repellents, attractants, feeding stimulants, compatibilizers, bactericides, anti-freezing agents, anti-foaming agents, colorants, tackifiers and binders.

Suitable solvents and liquid carriers are water and organic solvents, such as mineral oil fractions of medium to high boiling point, e.g. kerosene, diesel oil; oils of vegetable or animal origin; aliphatic, cyclic and aromatic hydrocarbons, e.g. toluene, paraffin, tetrahydronaphthalene, alkylated naphthalenes; alcohols, e.g. ethanol, propanol, butanol, benzylalcohol, cyclohexanol; glycols; DMSO; ketones, e.g. cyclohexanone; esters, e.g. lactates, carbonates, fatty acid esters, gamma-butyrolactone; fatty acids; phosphonates; amines; amides, e.g. N-methylpyrrolidone, fatty acid dimethylamides; and mixtures thereof.
[0088] Suitable solid carriers or fillers are mineral earths, e.g. silicates, silica gels, talc, kaolins, limestone, lime, chalk, clays, dolomite, diatomaceous earth, bentonite, calcium sulfate, magnesium sulfate, magnesium oxide; polysaccharide powders, e.g. cellulose, starch; fertilizers, e.g. ammonium sulfate, ammonium phosphate, ammonium nitrate, ureas; products of vegetable origin, e.g. cereal meal, tree bark meal, wood meal, nutshell meal, and mixtures thereof.

[0089] Suitable surfactants are surface-active compounds, such as anionic, cationic, nonionic and amphoteric surfactants, block polymers, polyelectrolytes, and mixtures thereof. Such surfactants can be used as emulsifier, dispersant, solubilizer, wetter, penetration enhancer, protective colloid, or adjuvant. Examples of surfactants are listed in McCutcheon's, Vol.1: Emulsifiers & Detergents, McCutcheon's Directories, Glen Rock, USA, 2008 (International Ed. or North American Ed.).

[0090] Suitable anionic surfactants are alkali, alkaline earth or ammonium salts of sulfonates, sulfates, phosphates, carboxylates, and mixtures thereof. Examples of sulfonates are alkylaryl sulfonates, diphenyl sulfonates, alpha-olefin sulfonates, lignine sulfonates, sulfonates of fatty acids and oils, sulfonates of ethoxylated alkylphenols, sulfonates of alkoxylated aryphenols, sulfonates of condensed naphthalenes, sulfonates of dodecyl- and tridecylbenzenes, sulfonates of naphthalenes and alkynaphthalenes, sulfosuccinates or sulfosuccinimimates. Examples of sulfates are sulfates of fatty acids and oils, of ethoxylated alkylphenols, of alcohols, of ethoxylated alcohols, or of fatty acid esters. Examples of phosphates are phosphate esters. Examples of carboxylates are alkyl carboxylates, and carboxyethyl alcohol or alkylphenol ethoxylates.

[0091] Suitable nonionic surfactants are alkoxylates, N-substituted fatty acid amides, amine oxides, esters, sugar-based surfactants, polymeric surfactants, and mixtures thereof. Examples of alkoxylates are compounds such as alcohols, alkylphenols, amines, amides, arylenphenols, fatty acids or fatty acid esters which have been alkoxylated with 1 to 50 equivalents. Ethylene oxide and/or propylene oxide may be employed for the alkoxylation, preferably ethylene oxide. Examples of N-substituted fatty acid amides are fatty acid glucamides or fatty acid alkanolamides. Examples of esters are fatty acid esters, glycerol esters or monoglycerides. Examples of sugar-based surfactants are sorbitans, ethoxylated sorbitans, sucrose and glucose esters or alkylpolyglucosides. Examples
of polymeric surfactants are homo- or copolymers of vinylpyrrolidone, vinylalcohols, or vinylacetate.

[0092] Suitable cationic surfactants are quaternary surfactants, for example quaternary ammonium compounds with one or two hydrophobic groups, or salts of long-chain primary amines. Suitable amphoteric surfactants are alkylbetains and imidazolines. Suitable block polymers are block polymers of the A-B or A-B-A type comprising blocks of polyethylene oxide and polypropylene oxide, or of the A-B-C type comprising alkanol, polyethylene oxide and polypropylene oxide. Suitable polyelectrolytes are polyelectrolytes. Examples of polyelectrolytes are alkali salts of polyacrylic acid or polyaacid comb polymers. Examples of polybases are polyvinylamines or polyethyleneamines.

[0093] Suitable adjuvants are compounds, which have a neglectable or even no pesticidal activity themselves, and which improve the biological performance of the compound I on the target. Examples are surfactants, mineral or vegetable oils, and other auxilaries. Further examples are listed by Knowles, Adjuvants and additives, Agrow Reports DS256, T&F Informa UK, 2006, chapter 5.

[0094] Suitable thickeners are polysaccharides (e.g. xanthan gum, carboxymethylcellulose), anorganic clays (organically modified or unmodified), polycarboxylates, and silicates.

[0095] Suitable bactericides are bronopol and isothiazolinone derivatives such as alkylisothiazolinones and benzisothiazolinones.

[0096] Suitable anti-freezing agents are ethylene glycol, propylene glycol, urea and glycerin.

[0097] Suitable anti-foaming agents are silicones, long chain alcohols, and salts of fatty acids.

[0098] Suitable colorants (e.g. in red, blue, or green) are pigments of low water solubility and water-soluble dyes. Examples are inorganic colorants (e.g. iron oxide, titian oxide, iron hexacyanoferrate) and organic colorants (e.g. alizarin-, azo- and phthalo-cyanine colorants).

[0099] Suitable tackifiers or binders are polyvinylpyrrolidons, polyvinylacetates, polyvinyl alcohols, polyacrylates, biological or synthetic waxes, and cellulose ethers.
Examples for composition types and their preparation are:

(i) **Water-soluble concentrates (SL, LS)**

10-60 wt% of a compound I according to the invention and 5-15 wt% wetting agent (e.g. alcohol alkoxylates) are dissolved in water and/or in a water-soluble solvent (e.g. alcohols) up to 100 wt%. The active substance dissolves upon dilution with water.

(ii) **Dispersible concentrates (DC)**

5-25 wt% of a compound I according to the invention and 1-10 wt% dispersant (e.g. polyvinylpyrrolidone) are dissolved in up to 100 wt% organic solvent (e.g. cyclohexanone). Dilution with water gives a dispersion.

(iii) **Emulsifiable concentrates (EC)**

15-70 wt% of a compound I according to the invention and 5-10 wt% emulsifiers (e.g. calcium dodecylbenzenesulfonate and castor oil ethoxylate) are dissolved in up to 100 wt% water-insoluble organic solvent (e.g. aromatic hydrocarbon). Dilution with water gives an emulsion.

(iv) **Emulsions (EW, EO, ES)**

5-40 wt% of a compound I according to the invention and 1-10 wt% emulsifiers (e.g. calcium dodecylbenzenesulfonate and castor oil ethoxylate) are dissolved in 20-40 wt% water-insoluble organic solvent (e.g. aromatic hydrocarbon). This mixture is introduced into up to 100 wt% water by means of an emulsifying machine and made into a homogeneous emulsion. Dilution with water gives an emulsion.

(v) **Suspensions (SC, OD, FS)**

In an agitated ball mill, 20-60 wt% of a compound I according to the invention are comminuted with addition of 2-10 wt% dispersants and wetting agents (e.g. sodium lignosulfonate and alcohol ethoxylate), 0.1-2 wt% thickener (e.g. xanthan gum) and up to 100 wt% water to give a fine active substance suspension. Dilution with water gives a stable suspension of the active substance. For FS type composition up to 40 wt% binder (e.g. polyvinylalcohol) is added.
(vi) Water-dispersible granules and water-soluble granules (WG, SG)

[00106] 50-80 wt% of a compound I according to the invention are ground finely with addition of up to 100 wt% dispersants and wetting agents (e.g. sodium lignosulfonate and alcohol ethoxylate) and prepared as water-dispersible or water-soluble granules by means of technical appliances (e.g. extrusion, spray tower, fluidized bed). Dilution with water gives a stable dispersion or solution of the active substance.

(vii) Water-dispersible powders and water-soluble powders (WP, SP, WS)

[00107] 50-80 wt% of a compound I according to the invention are ground in a rotor-stator mill with addition of 1-5 wt% dispersants (e.g. sodium lignosulfonate), 1-3 wt% wetting agents (e.g. alcohol ethoxylate) and up to 100 wt% solid carrier, e.g. silica gel. Dilution with water gives a stable dispersion or solution of the active substance.

(viii) Gel (GW, GF)

[00108] In an agitated ball mill, 5-25 wt% of a compound I according to the invention are comminuted with addition of 3-10 wt% dispersants (e.g. sodium lignosulfonate), 1-5 wt% thickener (e.g. carboxymethylcellulose) and up to 100 wt% water to give a fine suspension of the active substance. Dilution with water gives a stable suspension of the active substance.

(ix) Microemulsion (ME)

[00109] 5-20 wt% of a compound I according to the invention are added to 5-30 wt% organic solvent blend (e.g. fatty acid dimethylamide and cyclohexanone), 10-25 wt% surfactant blend (e.g. alkohol ethoxylate and aryphenol ethoxylate), and water up to 100%. This mixture is stirred for 1 h to produce spontaneously a thermodynamically stable microemulsion.

(x) Microcapsules (CS)

[00110] An oil phase comprising 5-50 wt% of a compound I according to the invention, 0-40 wt% water insoluble organic solvent (e.g. aromatic hydrocarbon), 2-15 wt% acrylic monomers (e.g. methylmethacrylate, methacrylic acid and a di- or triacrylate) are dispersed into an aqueous solution of a protective colloid (e.g. polyvinyl alcohol). Radical polymerization initiated by a radical initiator results in the formation of
poly(meth)acrylate microcapsules. Alternatively, an oil phase comprising 5-50 wt% of a compound I according to the invention, 0-40 wt% water insoluble organic solvent (e.g. aromatic hydrocarbon), and an isocyanate monomer (e.g. diphenylmethene-4,4’-diisocyanatae) are dispersed into an aqueous solution of a protective colloid (e.g. polyvinyl alcohol). The addition of a polyamine (e.g. hexamethylenediamine) results in the formation of a polyurea microcapsules. The monomers amount to 1-10 wt%. The wt% relate to the total CS composition.

(xi) **Dustable powders (DP, DS)**

[00111] 1-10 wt% of a compound I according to the invention are ground finely and mixed intimately with up to 100 wt% solid carrier, e.g. finely divided kaolin.

(xii) **Granules (GR, FG)**

[00112] 0.5-30 wt% of a compound I according to the invention is ground finely and associated with up to 100 wt% solid carrier (e.g. silicate). Granulation is achieved by extrusion, spray-drying or the fluidized bed.

(xiii) **Ultra-low volume liquids (UL)**

[00113] 1-50 wt% of a compound I according to the invention are dissolved in up to 100 wt% organic solvent, e.g. aromatic hydrocarbon.

[00114] The compositions types i) to xi) may optionally comprise further auxiliaries, such as 0-1 wt% bactericides, 5-15 wt% anti-freezing agents, 0-1 wt% anti-foaming agents, and 0-1 wt% colorants.
[00115] The agrochemical compositions generally comprise between 0.1 and 95%, preferably between 0.1 and 90%, and most preferably between 0.5 and 75%, by weight of active substance. The active substances are employed in a purity of from 90% to 100%, preferably from 95% to 100% (according to NMR spectrum).

[00116] Water-soluble concentrates (LS), Suspoemulsions (SE), flowable concentrates (FS), powders for dry treatment (DS), water-dispersible powders for slurry treatment (WS), water-soluble powders (SS), emulsions (ES), emulsifiable concentrates (EC) and gels (GF) are usually employed for the purposes of treatment of plant propagation materials, particularly seeds. The compositions in question give, after two-to-tenfold dilution, active substance concentrations of from 0.01 to 60% by weight, preferably from 0.1 to 40% by weight, in the ready-to-use preparations. Application can be carried out before or during sowing. Methods for applying or treating compound I and compositions thereof, respectively, on to plant propagation material, especially seeds include dressing, coating, pelleting, dusting, soaking and in-furrow application methods of the propagation material. Preferably, compound I or the compositions thereof, respectively, are applied on to the plant propagation material by a method such that germination is not induced, e.g., by seed dressing, pelleting, coating and dusting.

[00117] When employed in plant protection, the amounts of active substances applied are, depending on the kind of effect desired, from 0.001 to 2 kg per ha, preferably from 0.005 to 2 kg per ha, more preferably from 0.05 to 0.9 kg per ha, in particular from 0.1 to 0.75 kg per ha.

[00118] In treatment of plant propagation materials such as seeds, e.g., by dusting, coating or drenching seed, amounts of active substance of from 0.1 to 1000 g, preferably from 1 to 1000 g, more preferably from 1 to 100 g and most preferably from 5 to 100 g, per 100 kilogram of plant propagation material (preferably seed) are generally required.

[00119] When used in the protection of materials or stored products, the amount of active substance applied depends on the kind of application area and on the desired effect. Amounts customarily applied in the protection of materials are 0.001 g to 2 kg, preferably 0.005 g to 1 kg, of active substance per cubic meter of treated material.
Various types of oils, wetters, adjuvants, fertilizer, or micronutrients, and other pesticides (e.g. herbicides, insecticides, fungicides, growth regulators, safeners) may be added to the active substances or the compositions comprising them as premix or, if appropriate not until immediately prior to use (tank mix). These agents can be admixed with the compositions according to the invention in a weight ratio of 1:100 to 100:1, preferably 1:10 to 10:1.

The user applies the composition according to the invention usually from a predosage device, a knapsack sprayer, a spray tank, a spray plane, or an irrigation system. Usually, the agrochemical composition is made up with water, buffer, and/or further auxiliaries to the desired application concentration and the ready-to-use spray liquor or the agrochemical composition according to the invention is thus obtained. Usually, 20 to 2000 liters, preferably 50 to 400 liters, of the ready-to-use spray liquor are applied per hectare of agricultural useful area.

According to one embodiment, individual components of the composition according to the invention such as parts of a kit or parts of a binary or ternary mixture may be mixed by the user himself in a spray tank and further auxiliaries may be added, if appropriate.

In a further embodiment, either individual components of the composition according to the invention or partially premixed components, e.g. components comprising compounds 1 and/or active substances from the groups A) to O), may be mixed by the user in a spray tank and further auxiliaries and additives may be added, if appropriate.

In a further embodiment, either individual components of the composition according to the invention or partially premixed components, e.g. components comprising compounds 1 and/or active substances from the groups A) to O), can be applied jointly (e.g. after tank mix) or consecutively.

In the methods and uses of this invention, the compounds according to the invention may be applied with other active ingredients, for example with other pesticides, insecticides, herbicides, fertilizers such as ammonium nitrate, urea, potash, and superphosphate, phytotoxicants and plant growth regulators, safeners and nematicides. These additional ingredients may be used sequentially or in combination
with the above-described compositions, if appropriate also added only immediately prior to use (tank mix). For example, the plant(s) may be sprayed with a composition of this invention either before or after being treated with other active ingredients.

[00126] The following list M of pesticides together with which the compounds according to the invention can be used and with which potential synergistic effects might be produced, is intended to illustrate the possible combinations, but not to impose any limitation:

[00127] M.1. Organo(thio)phosphate compounds: acephate, azamethiphos, azinphos-ethyl, azinphos-methyl, chloroethoxyfos, chlorfenvinphos, chlormephos, chlorpyrifos, chlorpyrifos-methyl, coumaphos, cyanophos, demeton-S-methyl, diazinon, dichlorvos/ DDVP, dicrotophos, dimethoate, dimethyvinphos, disulfoton, EPN, ethion, ethoprophos, famphur, fenamiphos, fenitrothion, fenthion, flupyrazophos, fosfiazate, heptenophos, isoxathion, malathion, mecarbam, methamidophos, methidathion, mevinphos, monocrotophos, naled, omethoate, oxydemeton-methyl, parathion, parathion-methyl, phenthoate, phorate, phosalone, phosmet, phosphamidon, phoxim, pirimiphos-methyl, profenofos, propramochlor, prorhalofos, pyraclofos, pyridaphenthion, quinalphos, sulfotep, tebufenpyram, temephos, terbufos, tetrachlorvinphos, thiometon, triazophos, tri-chlorfon, vanidothion;

[00128] M.2. Carbamate compounds: aldicarb, alanycarb, bendiocarb, benfuracarb, butocarboxim, butoxycarboxim, carbaryl, carbofuran, carbosulfan, ethiofencarb, fenobucarb, formetanate, furathiocarb, isoprocarb, methiocarb, methomyl, metolcarb, oxamyl, pirimicarb, propoxur, thiocarb, thiofanox, trimethacarb, XMC, xylylcarb, triazamate;


[00132] M.6. GABA gated chloride channel antagonists: chlordane, endosulfan, gamma-HCH (lindane); ethiprole, fipronil, pyrafluprole, pyriproxyfen

[00133] M.7. Chloride channel activators: abamectin, emamectin benzoate, milbemectin, lepimectin;

[00134] M.8. METI I compounds: fenazaquin, fenpyroximate, pyrimidifen, pyridaben, tebufenpyrad, tolfenpyrad, flufenoxuron, rotenone;

[00135] M.9. METI II and III compounds: acequinocyl, fluacyprim, hydramethylthon;

[00136] M.10. Uncouplers of oxidative phosphorylation: chlorfenapyr, DNOC;

[00137] M.11. Inhibitors of oxidative phosphorylation: azocyclotin, cyhexatin, diavethionuron, fenbutatin oxide, propargite, tetrydion;


[00141] M.15. Fumigants: methyl bromide, chloropicrin sulfuryl fluoride;


[00143] M.17. Mite growth inhibitors: clofentezine, hexythiazox, etoxazole;

M.19. Lipid biosynthesis inhibitors: spirodiclofen, spiromesifen, spirotetramat;

M.20. Octapaminergic agonists: amitraz;

M.21. Ryanodine receptor modulators: flubendiamide and the phtalamid compound (R), (S)-3-Chlor-Nl-(2-methyl-4-[1,2,2,2-tetrafluoro-1-(trifluormethyl)ethyl]phenyl)-N2-(1-methyl-2-methysulfonylethyl)phthalamid (M21.1)

M.22. Isoxazoline compounds: 4-[5-(3,5-Dichloro-phenyl)-5-trifluoromethyl-4,5-dihydro-isoxazol-3-yl]-2-methyl-N-pyridin-2-ylmethyl-benzamide (M22.1), 4-[5-(3,5-Dichloro-phenyl)-5-trifluoromethyl-4,5-dihydro-isoxazol-3-yl]-2-methyl-N-(2,2,2-trifluoro-ethyl)-benzamide (M22.2), 4-[5-(3,5-Dichloro-phenyl)-5-trifluoromethyl-4,5-dihydro-isoxazol-3-yl]-2-methyl-N-[2,2,2-trifluoro-ethylcarbamoyl]-methyl]-benzamide (M22.3), 4-[5-(3,5-Dichloro-phenyl)-5-trifluoromethyl-4,5-dihydro-isoxazol-3-yl]-naphthalene-1-carboxylic acid [(2,2,2-trifluoro-ethylcarbamoyl)-methyl]-amide (M22.4), 5-(3,5-Dichlorophenyl)-5-trifluoromethyl-4,5-dihydro-isoxazol-3-yl]-N-[(methoxyimino)methyl]-2-methylbenzamide (M22.5) 4-[5-(3-Chloro-5-trifluoromethyl-phenyl)-5-trifluoromethyl-4,5-dihydro-isoxazol-3-yl]-2-methyl-N-[(2,2,2-trifluoro-ethylcarbamoyl)-methyl]-benzamide (M22.6), 4-[5-(3-Chloro-5-trifluoromethyl-phenyl)-5-trifluoromethyl-4,5-dihydro-isoxazol-3-yl]-naphthalene-1-carboxylic acid [(2,2,2-trifluoro-ethylcarbamoyl)-methyl]-amide (M22.7) and 5-[5-(3,5-Dichloro-4-fluoro-phenyl)-5-trifluoromethyl-4,5-dihydro-isoxazol-3-yl]-2-[1,2,4]triazol-1-yl-benzonitrile (M22.8); M.23. Anthranilamide compounds: chloranthraniliprole, cyantraniliprole, 5-Bromo-2-(3-chloro-pyridin-2-yl)-2H-pyrazole-3-carboxylic acid [4-cyano-2-(1-cyclopropyl-ethylcarbamoyl)-6-methyl-phenyl]-amide (M23.1), 5-Bromo-2-(3-chloro-pyridin-2-yl)-2H-pyrazole-3-carboxylic acid [2-chloro-4-cyano-6-(1-cyclopropyl-ethylcarbamoyl)-phenyl]-amide (M23.2), 5-Bromo-2-(3-chloro-pyridin-2-yl)-2H-pyrazole-3-carboxylic acid [2-bromo-4-cyano-6-(1-cyclopropyl-ethylcarbamoyl)-phenyl]-amide(M23.3), 5-Bromo-2-(3-chloro-pyridin-2-yl)-2H-pyrazole-3-carboxylic acid [2-bromo-4-chloro-6-(1-cyclopropyl-ethylcarbamoyl)-phenyl]-amide(M23.4), 5-Bromo-2-(3-chloro-pyridin-2-yl)-2H-pyrazole-3-carboxylic acid [2,4-dichloro-6-(1-cyclopropyl-ethylcarbamoyl)-phenyl]-amide (M23.5), 5-Bromo-2-(3-chloro-pyridin-2-yl)-2H-pyrazole-3-carboxylic acid [4-
chloro-2-(1-cyclopropyl-ethylcarbamoyl)-6-methyl-phenylamide (M23.6), N’-(2-[(5-Bromo-2-(3-chloro-pyridin-2-yl)-2H-pyrazole-3-carbonyl]-amino)-5-chloro-3-methyl-benzoyl)hydrzonecarboxylic acid methyl ester (M23.7), N’-(2-[(5-Bromo-2-(3-chloro-pyridin-2-yl)-2H-pyrazole-3-carbonyl]-amino)-5-chloro-3-methyl-benzoyl)-N’-methyl-hydrazinecarboxylic acid methyl ester (M23.8), N’-(2-[(5-Bromo-2-(3-chloro-pyridin-2-yl)-2H-pyrazole-3-carbonyl]-amino)-5-chloro-3-methyl-benzoyl)-N,N’-dimethyl-hydrazinecarboxylic acid methyl ester (M23.9), N’-(3,5-Dibromo-2-[(5-bromo-2-(3-chloro-pyridin-2-yl)-2H-pyrazole-3-carbonyl]-amino]-benzoyl)-N,N’-dimethyl-hydrazinecarboxylic acid methyl ester (M23.10), N’-(3,5-Dibromo-2-{[5-bromo-2-(3-chloro-pyridin-2-yl)-2H-pyrazole-3-carbonyl]-amino}-benzoyl)-N,N’-dimethyl-hydrazinecarboxylic acid methyl ester (M23.11) and N’-(3,5-Dibromo-2-{[5-bromo-2-(3-chloro-pyridin-2-yl)-2H-pyrazole-3-carbonyl]-amino}-benzoyl)-N,N’-dimethyl-hydrazinecarboxylic acid methyl ester (M23.12);

[00149] M.24. Malononitrile compounds: 2-(2,2,3,3,4,4,5,5-octafluoropentyl)-2-(3,3,3-trifluoro-propyl)malononitrile (CF$_2$HCF$_2$CF$_2$CF$_2$C(CH$_2$)$_2$CF$_3$) (M24.1) and 2-(2,2,3,3,4,4,5-octafluoropentyl)-2-(3,3,4,4,4-pentafluorobutyl)malonodinitrile (CF$_2$HCF$_2$CF$_2$CF$_2$C(CH$_2$)$_2$CH$_2$CF$_3$) (M24.2);

[00150] M.25. Microbial disruptors: Bacillus thuringiensis subsp. Israeliensi, Bacillus sphaericus, Bacillus thuringiensis subsp. Aizawai, Bacillus thuringiensis subsp. Kurstaki, Bacillus thuringiensis subsp. Tenebrionis;

[00151] M.26. Aminofuranone compounds:

[00152] 4-[(6-Bromopyrid-3-yl)methyl](2-fluoroethyl)amino)furan-2(5H)-on (M26.1), 4-[(6-Fluoropyrid-3-yl)methyl](2,2-difluoroethyl)amino)furan-2(5H)-on (M26.2), 4-[(2-Chlorol,3-thiazolo-5-yl)methyl](2-fluoroethyl)amino)furan-2(5H)-on (M26.3), 4-[(6-Chloropyrid-3-yl)methyl](2-fluoroethyl)amino)furan-2(5H)-on (M26.4), 4-[(6-Chloropyrid-3-yl)methyl] (2,2-difluoroethyl)amino)furan-2(5H)-on (M26.5), 4-[(6-Chloro-5-fluoropyrid-3-yl)methyl](methyl)amino)furan-2(5H)-on (M26.6), 4-[(5,6-Dichloropyrid-3-yl)methyl](2-fluoroethyl)amino)furan-2(5H)-on (M26.7), 4-[(6-Chloro-5-fluoropyrid-3-yl)methyl](cyclopropyl)amino)furan-2(5H)-on (M26.8), 4-[(6-Chloropyrid-3-yl)methyl](cyclopropyl)amino)furan-2(5H)-on (M26.9) and 4-[(6-Chloropyrid-3-yl)methyl](methyl)amino)furan-2(5H)-on (M26.10);
Various compounds: aluminium phosphide, amidoflumet, benclo-thiaz, benzoaximate, bifenazate, borax, bromopropylate, cyanide, cyenopyrafen, cyfluometofen, chinomethionate, dicofol, fluoroacetate, phosphine, pyridalyl, pyrifu-
quinazon, sulfur, organic sulfur compounds, tartar emetic, sulfoxaflor, N-R-2,2-dihalo-
1-R"cyclo-propanecarboxamide-2-(2,6-dichloro-a,a,a-trifluoro-p-tolyl)hydrazone or N-
R'-2,2-di (R")propionamide-2-(2,6-dichloro-a,a,a-trifluoro-p-tolyl)-hydrazone, wherein
R is methyl or ethyl, halo is chloro or bromo, R" is hydrogen or methyl and R " is methyl
or ethyl, 4-But-2-ynyloxy-6-(3,5-dimethyl-piperidin-l-yl)-2-fluoro-pyrimidine (M27.1),
Cyclopropaneacetic acid, 1,1'-[((3S,4R,4aR,6S,6aS,12R,12aS,12bS)-4-[[2-cyclopropyl-
acetyl]oxy]methyl] -1,3,4,4a,5,6,6a, 12, 12a, 12b-decahydro-12-hydroxy-4,6a, 12b-tri-
methyl-1-oxo-9-(3-pyridinyl)-2H,1 IH-naphtho[2,1-b]pyrano[3,4-e]pyran-3,6-diyl ester(M27.2) and 8-(2-Cyclopropylmethoxy-4-trifluoromethyl-phenoxo)-3-(6-trifluoro-
methyl-pyridazin-3-yl)-3-aza-bicyclo[3.2.1]octane(M27.3).

[00154] The commercially available compounds of the group M may be found in

[00155] Paraoxon and their preparation have been described in Farm Chemicals
Handbook, Volume 88, Meister Publishing Company, 2001. Flupyradifluoros has been de-
preparation have been described in US 6300348.-M21.1 is known from WO 2007/101540.-Isoxazolines M22.1 to M22.8 have been described in e.g. WO2005/085216, WO 2007/079162, WO 2007/026965, WO 2009/126668 and WO2009/051956. An-
thranilamides M23.1 to M23.6 have been described in WO 2008/72743 and WO
200872783, those M23.7 to M23.12 in WO 2007/043677. Malononitriles M24.1 and M24.2 have been described in WO 02/089579, WO 02/090320, WO 02/090321, WO
04/006677, WO 05/068423, WO 05/068432 and WO 05/063694. Aminofuranones M26.1 to M6.10 have been described eg. in WO 2007/1 15644. Alkynylether M27.1 is
described e.g. in JP 2006131529. Organic sulfur compounds have been described in WO
2007060839. Pyripyropene derivative M27.2 has been described in WO 2008/ 66153 and
WO 2008/108491. Pyridazin M27.3 has been described in JP 2008/1 15155.
[00156] The invertebrate pest (also referred to as "plant pest"), i.e. the insects, arachnids and nematodes, the plant, soil or water in which the plant is growing or may grow can be contacted with the compounds of the present invention or composition(s) comprising them by any application method known in the art. As such, "contacting" includes both direct contact (applying the compounds/compositions directly on the invertebrate pest or plant - typically to the foliage, stem or roots of the plant) and indirect contact (applying the compounds/compositions to the locus of the invertebrate pest or plant) as it pertains to protecting growing plants and crops.

[00157] The compounds of the present invention or the pesticidal compositions comprising them may be used to protect growing plants and crops from attack or infestation by animal pests, especially insects, acaridae or arachnids by contacting the plant/crop with a pesticidally effective amount of compounds of the present invention. The term "crop" refers both to growing and harvested crops.

[00158] The compounds of the present invention and the compositions comprising them are particularly important in the control of a multitude of insects on various cultivated plants, such as cereal, root crops, oil crops, vegetables, spices, ornamentals, for example seed of durum and other wheat, barley, oats, rye, maize (fodder maize and sugar maize / sweet and field corn), soybeans, oil crops, crucifers, cotton, sunflowers, bananas, rice, oilseed rape, turnip rape, sugarbeet, fodder beet, eggplants, potatoes, grass, lawn, turf, fodder grass, tomatoes, leeks, pumpkin/squash, cabbage, iceberg lettuce, pepper, cucumbers, melons, Brassica species, melons, beans, peas, garlic, onions, carrots, tuberous plants such as potatoes, sugar cane, tobacco, grapes, petunias, geranium/pelargoniums, pansies and impatiens.

[00159] The compounds of the present invention are employed as such or in form of compositions by treating the insects or the plants, plant propagation materials, such as seeds, soil, surfaces, materials or rooms to be protected from insecticidal attack with an insecticidally effective amount of the active compounds. The application can be carried out both before and after the infection of the plants, plant propagation materials, such as seeds, soil, surfaces, materials or rooms by the insects.
Moreover, invertebrate pests may be controlled by contacting the target pest, its food supply, habitat, breeding ground or its locus with a pesticidally effective amount of compounds of the present invention. As such, the application may be carried out before or after the infection of the locus, growing crops, or harvested crops by the pest.

The compounds of the present invention can also be applied preventively to places at which occurrence of the pests is expected.

The compounds of the present invention may be also used to protect growing plants from attack or infestation by pests by contacting the plant with a pesticidally effective amount of compounds of the present invention. As such, "contacting" includes both direct contact (applying the compounds/compositions directly on the pest and/or plant - typically to the foliage, stem or roots of the plant) and indirect contact (applying the compounds/compositions to the locus of the pest and/or plant).

"Locus" means a habitat, breeding ground, plant, seed, soil, area, material or environment in which a pest or parasite is growing or may grow.

In general, "pesticidally effective amount" means the amount of active ingredient needed to achieve an observable effect on growth, including the effects of ne-crosis, death, retardation, prevention, and removal, destruction, or otherwise diminishing the occurrence and activity of the target organism. The pesticidally effective amount can vary for the various compounds/compositions used in the invention. A pesticidally effective amount of the compositions will also vary according to the prevailing conditions such as desired pesticidal effect and duration, weather, target species, locus, mode of application, and the like.

In the case of soil treatment or of application to the pests dwelling place or nest, the quantity of active ingredient ranges from 0.0001 to 500 g per 100 m², preferably from 0.001 to 20 g per 100 m².

Customary application rates in the protection of materials are, for example, from 0.01 g to 1000 g of active compound per m² treated material, desirably from 0.1 g to 50 g per m².
[00167] Insecticidal compositions for use in the impregnation of materials typically contain from 0.001 to 95 weight %, preferably from 0.1 to 45 weight %, and more preferably from 1 to 25 weight % of at least one repellent and/or insecticide.

[00168] For use in treating crop plants, the rate of application of the active ingredients of this invention may be in the range of 0.1 g to 4000 g per hectare, desirably from 25 g to 600 g per hectare, more desirably from 50 g to 500 g per hectare.

EXAMPLES

[00169] The present invention is now illustrated in further details by the following examples, without imposing any limitation thereto.

EXAMPLE 1

2.16 g of compound (A), 1.9 g of compound (B), 0.93 g picolin and 20 ml toluene were mixed and kept at room temperature overnight. The volatiles were removed at 60 °C under vacuum to receive 3.5 g or the product (C). Analysis by H-NMR (CDCl₃) confirmed the structure (C).

EXAMPLE 2
2.48 g of compound (D), 1.9 g of compound (B), 0.93 g picolin and 20 ml toluene were mixed and kept at room temperature overnight. The volatiles were removed at 60 °C under vacuum to receive 3.8 g of the product (E). Analysis by H-NMR (CDCl3) confirmed the structure (E).
We claim:

1. Compound of formula (I)

\[
\begin{array}{c}
\text{R}^{1} \\
\text{R}^{2} \\
\text{R}^{3} \\
\text{R}^{10} \\
\text{R}^{11} \\
\text{R}^{12}
\end{array}
\]

or a stereoisomer thereof, wherein

5 \( R^{1} \) and \( R^{2} \) are independently selected from the group consisting of halogen and \( C_{1-4} \)-haloalkyl;

\( R^{10} \) is halogen;

10 \( R^{11} \) is selected from the group consisting of \( C_{1-4} \)-haloalkyl; and

\( R^{12} \) is selected from the group consisting of hydrogen and halogen.

2. The compound of formula (I) according to claim 1, wherein \( R^{10} \) and \( R^{12} \) are independently selected from the group consisting of chlorine and flourine.

3. The compound of formula (I) according to claim 1, wherein \( R^{11} \) is selected from the group consisting of \( C_{1-2} \)-chloroalkyl and \( C_{1-2} \)-fluoroalkyl.

4. The compound of formula (I) according to claim 1, wherein \( R^{11} \) is trifluoromethyl.

5. The compound of formula (I) according to claim 1, wherein \( R^{1} \) and \( R^{2} \) are independently selected from the group consisting of chlorine, \( C_{1-2} \)-chloroalkyl, and \( d \)-\( d \)-fluoroalkyl.

6. The compound of formula (I) according to claim 1, wherein at least one of \( R^{1} \) and \( R^{2} \) are chlorine.
7. The compound of formula (I) according to claim 1, wherein R₁ is chlorine, R₂ is trifluoromethyl, R₁₀ and R₁₂ are fluorine, and R₁₁ is trifluoromethyl.

8. The compound of formula (I) according to claim 1, wherein R₁ and R₂ are chlorine, R₁₀ and R₁₂ are fluorine, and R₁₁ is trifluoromethyl.

9. An agricultural composition comprising at least one compound as defined in claim 1 or a stereoisomer thereof and at least one auxiliary.

10. A method for protecting growing plants from attack or infestation by invertebrate pests comprising contacting the plant or soil or water in which the plant is growing with a pesticidally effective amount of a compound as defined in claim 1.

11. A method for the protection of plant propagation material from pests comprising contacting the plant propagation material with a pesticidally effective amount of a compound as defined in claim 1.

12. Plant propagation material comprising a compound as defined in claim 1 in an amount of from 0.1 g to 10 kg per 100 kg of the plant propagation material.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
INV. C07C69/743 A01N53/00
ADD.

According to International Patent Classification (IPC) and both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C07C A01N

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

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

EPO-Internal, WPI Data, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>JP H05 279213 A (DAINI PPON JOCHUGI KO LTD) 26 October 1993 (1993-10-26) cited in the application on page 4; compound 7</td>
<td>1,3-6, 9-12</td>
</tr>
<tr>
<td>X</td>
<td>EP 0 016 513 A2 (ICI LTD [GB]) 1 October 1980 (1980-10-01) claim 1 entry 2; page 4; table 1</td>
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**Further documents are listed in the continuation of Box C.**

See patent family annex.

* Special categories of cited documents :

**A** document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search

18 November 2013

Date of mailing of the international search report

26/11/2013

Name and mailing address of the ISA:
European Patent Office, P.B. 5818 Patentlaan 2
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van Bergen, Marc
<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
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<th>Patent family member(s)</th>
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<tr>
<td></td>
<td></td>
<td>AU 561939 B2</td>
<td>21-05-1987</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AU 3134984 A</td>
<td>15-11-1984</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AU 5492380 A</td>
<td>21-08-1980</td>
</tr>
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<td></td>
<td></td>
<td>BR 8000844 A</td>
<td>21-10-1980</td>
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<tr>
<td></td>
<td></td>
<td>DE 3060562 DI</td>
<td>12-08-1982</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EP 0016513 A2</td>
<td>01-10-1980</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ES 8107149 AI</td>
<td>16-12-1981</td>
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<tr>
<td></td>
<td></td>
<td>GB 2046732 A</td>
<td>19-11-1980</td>
</tr>
<tr>
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<td></td>
<td>JP H0140017 B2</td>
<td>24-08-1989</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP S55111445 A</td>
<td>28-08-1980</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP S63233935 A</td>
<td>29-09-1988</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NZ 192733 A</td>
<td>30-03-1982</td>
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<td></td>
<td></td>
<td>US 4385070 A</td>
<td>24-05-1983</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 4486355 A</td>
<td>04-12-1984</td>
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<tr>
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<td>ZA 8000406 A</td>
<td>28-01-1981</td>
</tr>
</tbody>
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