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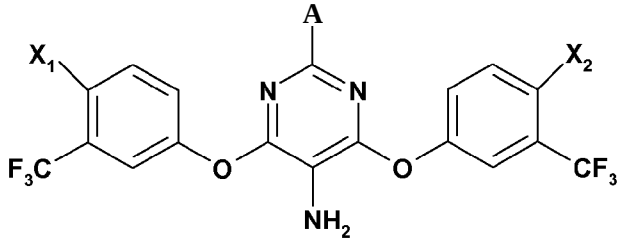



(1)

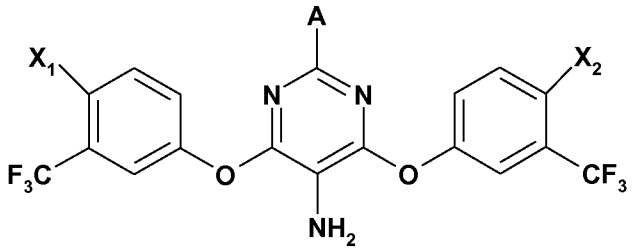
(57) **Abstract:** The invention relates to the use of specific pyrimidine compounds of Formula (I), wherein the variables have the meaning as indicated in the claims; in free form and in salt form; and optionally the enantiomers and geometrical isomers thereof, in the control of agricultural invertebrate pests.

New Use

The present invention relates to the use of certain 2,4,6-trisubstituted 5-aminopyrimidine compounds, especially insects and acari, in agriculture, processes in the control of agricultural or botanical pests, and furthermore agricultural compositions containing one or more of these compounds.

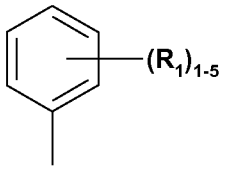
WO 2005/8521 1 discloses a large group of 4,6-bis-phenoxy-5-amino-pyrimidines with various substituents in the 2 position, among them 4,6-bis-(4-fluoro-3-[trifluoromethyl]-phenoxy)-5-aminopyrimidine which is substituted in the 2-position by phenyl. The biological properties, in particular the effectiveness against animal parasites, of this compound are, however, dissatisfactory in the field of pest control. WO 2008/0009691 discloses the use of specific 4,6-bis-phenoxy-5-amino-pyrimidines in the control of animal parasites. It has now been found that the compounds of said PCT publication have superior properties in the control of agricultural pests.

The present invention therefore in one aspect relates to a the use of a compound of formula




(1)

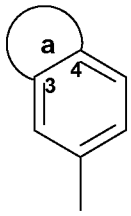
wherein $X_1$ and $X_2$ are each independently halogen; and
A is a radical of formula




(2)

wherein $(Ri)_{1-5}$ is 1 to 5 same or different substituents selected from the group consisting of $CrC_4$-alkyl, halogen-$CrC_4$-alkyl, hydroxy-$CrC_4$-alkyl, $Ci\text{-}C_4$-alkoxy-$Ci\text{-}C_4$-alkyl, **$R2R_3N$-C1-C4-**alkyl, halogen, cyano, hydroxy, $CrC_4$-alkoxy, halogen-$CrC_4$-alkoxy, thiol, $CrC_4$-alkylthio, halogen-$CrC_4$-alkylthio, $CrC_4$-alkanoyl, halogen-$CrC_4$-alkanoyl, $Ci\text{-}C_4$-alkanoylamino,

halogen-Ci-C $_4$-alkanoylamino, $COOR_2$, $CONH_2$, $CONR_2R_3$, $S0_3H$, $S0_2NR_2R_3$, $C_1$-$C_4$-alkyl-sulfonylamino, $CrC_4$-alkylsulfonyloxy, halogen-$CrC_4$-alkylsulfonyloxy, $CrC_4$-alkylsulfonyl, halogen-$CrC_4$-alkylsulfonyl, $CrC_4$-alkylsulfinyl, halo-$CrC_4$-alkylsulfinyl, $NR_2R_3$ and a $C_3$-$C_5$-heterocyclic radical having 1 or 2 same or different hetero-atoms selected from O, S and N ; or A is a radical of formula




(3)

wherein ring (a) denotes a 5- or 6-membered carbocyclic or heterocyclic ring which is annulated in the 3- and 4-position;

or A is a heterocyclic radical having from 3 to 9 C-atoms and from 1 to 3 same or different heteroatoms selected from the group consisting of N, O and S, which heterocyclic radical is unsubstituted or further substituted by $CrC_4$-alkyl, hydroxy, $CrC_4$-alkoxy, halogen or $NR2R_3$; and

$R_2$ and $R_3$ are each independently hydrogen or $CrC_4$-alkyl which is unsubstituted or substituted by halogen, hydroxy, $CrC_4$-alkoxy, thiol or $CrC_4$-alkylthio, in free form or in salt form,

In the control of agricultural invertebrate pests.

Alkyl - as a group *per se* and as structural element of other groups and compounds such as halogen-alkyl, hydroxyl-alkyl, alkoxy-alkyl, $R_2R_3$N-alkyl, alkoxy, alkylthio, alkylsulfinyl, alkylsulfonyl or alkylsulfonyloxy alkylsulfonylamino - is, in each case with due consideration of the specific number of carbon atoms in the group or compound in question, either straight-chained, i.e. methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl or octyl, or branched, e.g. isopropyl, isobutyl, sec.-butyl, tert.-butyl, isopentyl, neopentyl or isohexyl. Preferred meanings of alkyl are methyl, ethyl or n- or isopropyl, in particular Ci-$C_2$-alkyl and especially methyl or ethyl.

Alkoxy - as a group *per se* and as structural element of other groups - is for example methoxy, ethoxy, propoxy, isopropoxy, n-butoxy, isobutoxy, sec.-butoxy or tert.-butoxy; preferably $CrC_2$-alkoxy, and especially methoxy or ethoxy.

Halogen - as a group *per se* and as structural element of other groups - preferably means, for example, iodine, bromine, chlorine or fluorine, preferably chlorine or fluorine.

Halogen-substituted carbon-containing groups and compounds, such as halogen-alkyl, halogen-CrC $_4$-alkoxy, halogen-Ci-C $_4$-alkylthio, halogen -Ci-$C_4$-alkanoyl, halogen-Ci-C $_4$-alkanoylamino, halogen-Ci-C $_4$-alkylsulfonyloxy or halogen-CrC $_4$-alkylsulfonyl, may be partially halogenated or perhalogenated, whereby in the case of multiple halogenation, the halogen substituents may be identical or different. Examples of preferred halogen-alkyl - as a group *per se* and as structural element of other groups and compounds such as halogen-alkoxy or halogen-alkylthio, - are methyl which is mono- to trisubstituted by fluorine, chlorine and/or bromine, such as $CHF_2$ or $CF_3$; ethyl which is mono- to pentasubstituted by fluorine, chlorine and/or bromine, such as $CH_2CF_3$, $CF_2CF_3$, $CF_2CCl_3$, $CF_2CHCl_2$, $CF_2CHF_2$, $CF_2CFCl_2$, $CF_2CHBr_2$, $CF_2CHClF$, $CF_2CHBrF$ or CClFCHClF; propyl or isopropyl, mono- to heptasubstituted by fluorine, chlorine and/or bromine, such as $CH_2CHBrCH_2Br$, $CF_2CHFCF_3$, $CH_2CF_2CF_3$ or $CH(CF_3)_2$; butyl or one of its isomers, mono- to nonasubstituted by fluorine, chlorine and/or bromine, such as $CF(CF_3)CHFCF_3$ or $CH_2(CF_2)_2CF_3$; pentyl or one of its isomers substituted once to eleven times by fluorine, chlorine and/or bromine, such as $CF(CF_3)(CHF)_2CF_3$ or $CH_2(CF_2)_3CF_3$; and hexyl or one of its isomers substituted once to thirteen times by fluorine, chlorine and/or bromine, such as $(CH_2)_4CHBrCH_2Br$, $CF_2(CHF)_4CF_3$, $CH_2(CF_2)_4CF_3$ or $C(CF_3)_2(CHF)_2CF_3$.

Examples of alkanoyl - as a group *per se* and as structural element of other groups and compounds such as halogen-alkanoyl, alkanoylamino or halogen-alkanoylamino - are propionyl or in particular acetyl.

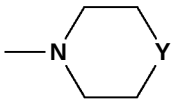
Examples of heterocyclic radicals or heterocyclic rings are thienyl, furanyl, pyrryl, pyrrolidinyl, dioxolanyl, oxazolyl, thiadiazolyl, oxadiazolyl, pyrazolyl, pirazinyl, piperazinyl, piperidinyl, morpholinyl, pyridyl, pyrimidyl, s-triazinyl, 1,2,4-triazinyl, imidazolyl, thiazolyl, triazolyl, tetrazolyl, benzothienyl, benzofuranyl, benzothiazolyl, benzoxazolyl, benzimidazolyl, benztriazolyl, indolyl or indazolyl, which may each be further substituted, for example, by Ci-$C_2$-alkyl or halogen.

$X_1$ and $X_2$ are different or preferably identical and are each most preferably chlorine or fluorine, in particular fluorine.

Preferred meanings of $R_2$ and $R_3$ are hydrogen or Ci-C $_2$-alkyl, which is unsubstituted or substituted by chlorine hydroxyl, methoxy, ethoxy, thiol, methylthio or ethylthio. Most preferred meanings of $R_2$ and $R_3$ are hydrogen, methyl, ethyl or hydroxyethyl. Preferred radicals $NR2R_3$ are amino, methylamino, ethylamino, N.N-dimethylamino, N,N-diethylamino and N-2-hydroxyethylamino, in particular amino or N,N-dimethyl- or diethylamino.

Examples of $R_2R_3$N-Ci-C $_4$-alkyl are $R_2R_3$N-ethyl or, in particular $R_2R_3$N-methyl, wherein the above-given meaning and preferences apply for $R_2$ and $R_3$. Preferred $R_2R_3$N-CrC $_4$-alkyl radicals are aminomethyl, N-methylaminomethyl, N,N-dimethylaminomethyl and N,N-diethylaminomethyl.

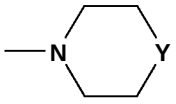
$R_1$ as a $C_3$-$C_5$-heterocyclic radical may be, for example, any one of the above mentioned heterocyclic radicals having 3 to 5 C-atoms in its basic structure. Examples of preferred heterocyclic radicals $R_1$ are 1,3-dioxolan-2-yl, 2-methyl-1 ,3-dioxolan-2-yl, N-pyrrolidinyl or a radical of the formula




(4)

wherein Y is NH, NCi-C $_2$-alkyl, O or S, preferably NH, NCH $_3$ or O, and in particular O.

Preferred radicals $R_1$ are unsubstituted or halogeno-, thiol-, Ci-C $_2$-alkoxy- or hydroxyl-substituted CrC $_4$-alkyl, hydroxyl, unsubstituted or halogeno-substituted CrC $_4$-alkoxy, thiol, CrC $_4$-alkylthio, halogen, Ci-C $_2$-alkylsulfinyl, CrC $_2$-alkylsulfonyl, Ci-C $_2$-alkylsulfonylamino, acetyl, acetylamino, a radical $NR_2R_3$ or $R_2R_3$N-Ci-C $_2$-alkyl wherein each the above-given meanings and preferences for $R_2$ and $R_3$ apply, and a radical of formula




(4)

wherein Y is NH, NCi-C $_2$-alkyl, O or S, preferably NH, NCH $_3$ or O, and in particular O.

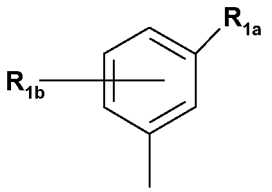
Even more preferred radicals $R_1$ include unsubstituted or Ci-C $_2$-alkoxy- or hydroxyl-substituted CrC $_4$-alkyl, hydroxyl, unsubstituted or halogen-substituted Ci-C $_2$-alkoxy, Ci-C $_2$-

alkylthio, halogen, a radical $NR_2R_3$ or $R_2R_3N$-methyl, wherein each the above-given meanings and preferences for $R_2$ and $R_3$ apply, and a radical of the above-given formula (4), wherein Y is O.

Particular preferred radicals $R_1$ include methyl, ethyl, isopropyl, 1- or 2-hydroxyethyl, hydroxyl, methoxy, ethoxy, trifluoromethoxy, methylthio, chlorine, fluorine, amino, N-mono- or N,N-dimethylamino, N-mono- or N,N-diethylamino, N-2-hydroxyethylamino, N,N-dimethylaminomethyl, N,N-diethylaminomethyl and morpholinyl.

The number of radicals $R_1$ at the phenyl ring A is from 1 to 5, preferably from 1 to 4, more preferably 1 to 3, and in particular 1 or 2. The radicals $R_1$ may be present in 0-, m- and/or p-position, preferably in the m-position, relative to the C-atom which is bonded to the pyrimidine ring.

A preferred phenyl radical A is a radical of formula



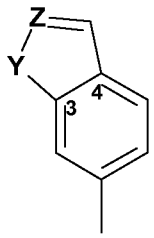

(2a)

wherein for $R_{1a}$ the meanings and preferences given above for $R_1$ apply, and $R_{1b}$ is H or has independently one the meanings given above for $R_1$. A particularly preferred embodiment of the present invention concerns a radical of the above-given formula (2a) wherein $R_{1b}$ is H, halogen, $C_1$-$C_2$-alkoxy, $C_1$-$C_2$-alkyl, halo-$C_1$-$C_2$-alkyl or halo-$C_1$-$C_2$-alkoxy, in particular H, and for $R_{1a}$ the meanings and preferences given above for $R_1$ apply. An even more preferred embodiment concerns a radical of formula (2a), wherein $R_{1b}$ is H, chlorine, fluorine, methyl, trifluoromethyl, methoxy or trifluoromethoxy, in particular H, and for $R_{1a}$ the meanings and preferences given above for $R_1$ apply.

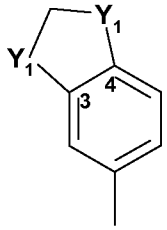
In case A denotes a radical of formula (3), the ring (a) denotes, for example, an annulated phenyl, cyclopentyl or cyclohexyl ring which may be further substituted, for example by a substituent as given before for $R_1$. Preferably, the annulated ring (a) is a 6-membered or, in particular, a 5-membered heterocyclic ring having one or two heteroatoms selected from the group consisting of N, O and S and being unsubstituted or further substituted by $C_1$-$C_2$-alkyl.

Particularly preferred annulated rings (a) are a 5-membered heterocyclic ring having 1 or 2 N-or O-atoms.

A preferred radical A is of formula




(3a) or




(3b)

wherein Y is -NH-, -N(Ci-$C_2$-alkyl)-, -O- or -S- and Z is CH or N, or most preferably, Y is -NH- or -N(Cr$C_2$-alkyl)- and Z is CH; and $Y_1$ is -0-.

In case A denotes a heterocyclic radical, said radical A is preferably a 5- or 6-membered ring having 1 or 2 same or different heteroatoms selected from the group consisting of N, O and S, which radical may be further substituted, for example, by Cr$C_2$-alkyl, Cr$C_2$-alkoxy or halogen, and/or may carry an annulated benzo ring. Examples of suitable heterocyclic radicals are mentioned before. Preferred heterocyclic radicals A are heteroaromatic radicals.

Examples of preferred heterocyclic radicals A are thienyl; furanyl; pyrrolyl; benzothienyl; benzofuranyl; pyrazolyl, pyridinyl; or pyrimidinyl; each of which unsubstituted or substituted, for example, by halogen or Ci-$C_2$-alkyl. The heterocyclic radical may be bonded via the C-atom in o- or m-position, in case of a 6-membered ring also in p-position, relative to the heteroatom. Particularly preferred heterocyclic radicals A are thien-2- or -3-yl, which is unsubstituted or substituted by methyl or chlorine; benzothien-3-yl; furan-2- or -3-yl; pyrazol-3- or -4-yl; N-methyl-pyrazol-3- or -4-yl or pyridine-3- or -4-yl.

One preferred embodiment of the compounds as used in the present invention concerns a compound of the above-given formula (1), wherein $x_1$ and $X_2$ are each fluorine or chlorine; and A is

(i) a radical of the above-given formula (2), wherein $(R_1)_{1\text{-}5}$ is 1 to 4, preferably 1 or 2, same or different substituents selected from the group consisting of unsubstituted or halogeno-, thiol-, Ci-$C_2$-alkoxy- or hydroxyl-substituted Cr$C_4$-alkyl; hydroxyl; unsubstituted or halogeno-substituted Ci-$C_4$-alkoxy; thiol; Ci-$C_4$-alkylthio; halogen; Ci-$C_2$-alkylsulfinyl; Ci-$C_2$-

alkylsulfonyl; Ci-C$_2$-alkylsulfonylamino; acetyl; acetylamino; a radical $NR_2R_3$ or $R_2R_3$N-Ci-C$_2$-alkyl, wherein $R_2$ and $R_3$ are each independently hydrogen or CrC$_4$-alkyl which is unsubstituted or substituted by halogen, hydroxy, CrC$_4$-alkoxy, thiol or Ci-C$_4$-alkylthio; and a radical of the above-given formula (4), wherein Y is NH, NCrC$_2$-alkyl, O or S; or is

(ii) a radical of the above-given formula (3), wherein the annulated ring (a) is a 6-membered or, in particular, a 5-membered heterocyclic ring having one or two heteroatoms selected from the group consisting of N, O and S; or is

(iii) is a 5- or 6-membered heterocyclic radical having 1 or 2 same or different heteroatoms selected from the group consisting of N, O and S, which radical may be further substituted, for example, by CrC$_2$-alkyl, CrC$_2$-alkoxy or halogen, and/or may carry an annulated benzo ring.

A further preferred embodiment of the compounds as used in the present invention concerns a compound of the above-given formula (1), wherein $X_1$ and $X_2$ are each fluorine; and A is

(i) a radical of the above-given formula (2a), wherein $R_{1a}$ is unsubstituted or Ci-C$_2$-alkoxy- or hydroxyl-substituted CrC$_4$-alkyl hydroxyl; unsubstituted or halogen-substituted Ci-C$_2$-alkoxy; Ci-C$_2$-alkylthio; halogen; a radical $NR_2R_3$ or $R_2R_3$N-methyl, wherein $R_2$ and $R_3$ are each independently hydrogen or Ci-C$_2$-alkyl, which is unsubstituted or substituted by chlorine hydroxyl, methoxy, ethoxy, thiol, methylthio or ethylthio; or morpholinyl; and $R_{1b}$ is H, halogen, Ci-C$_2$-alkoxy, Ci-C$_2$-alkyl, halo-Ci-C$_2$-alkyl or halo-Ci-C$_2$-alkoxy; or is

(ii) is a radical of the above-given formula (3a) or (3b),wherein Y is -NH-, -N(Ci-C$_2$-alkyl)-, -O- or -S- and Z is CH or N; and $Y_1$ is -0-; or is

(iii) a thienyl; furanyl; pyrrolyl; benzothienyl; benzofuranyl; pyrazolyl, pyridinyl; or pyrimidinyl radical, each of which being unsubstituted or substituted, for example, by halogen or Ci-C$_2$-alkyl.

A particularly preferred embodiment of the compounds as used in the present invention concerns a compound of the above-given formula (1), wherein $X_1$ and $X_2$ are each fluorine; and A is a radical of the above-given formula (2a), wherein $R_{1a}$ is methyl, ethyl, isopropyl, 1- or 2-hydroxyethyl, hydroxy, methoxy, ethoxy, trifluoromethoxy, methylthio, chlorine, fluorine, amino, N-mono- or N,N-dimethylamino, N-mono- or N,N-diethylamino, N-2-hydroxyethylamino, N,N-dimethylaminomethyl, N,N-diethylaminomethyl or morpholinyl; and R-ib is H, chlorine, fluorine, methyl, trifluoromethyl, methoxy or trifluoromethoxy, in particular

H.

Still a further preferred embodiment of the compounds as used in the present invention concerns a compound of the above-given formula (1), wherein $X_1$ and $X_2$ are each fluorine; and A is thien-2- or -3-yl, being unsubstituted or substituted by methyl or chlorine; benzothien-3-yl; furan-2- or -3-yl; pyrazol-3- or -4-yl; N-methyl-pyrazol-3- or -4-yl or pyridine-3- or -4-yl.

The compounds of formula (1) of the present invention, in free form or in salt form respectively, may be prepared by a process, for example, as disclosed in WO 2008/0009691 .

The compounds according to the present invention have potent insecticidal and acaricidal activity in the agricultural field. Therefore, the compounds represented by formula (I) or formula (Ia) of the present invention can be used as insecticides and acaricides. The compounds according to the present invention also exert an appropriate controlling effect against harmful insects without phytotoxicity against cultured plants. In addition, the compounds of the present invention can be used for controlling a wide variety of pests including, for example, harmful sucking insects, biting insects and other plant-parasitic pests and stored grain pests and can be applied for their control, in particular eradication and extermination. Therefore, the present invention also encompasses a method for combating harmful pests.

The compounds according to the invention, in combination with good plant tolerance and being tolerated well by the environment, are suitable for protecting plants and plant organs, for increasing the harvest yields, for improving the quality of the harvested material and for controlling pests, in particular insects, arachnids, helminths, nematodes and molluscs, which are encountered in agriculture, in horticulture, in animal husbandry, in forests, in gardens and leisure facilities, in the protection of stored products and of materials. They may be preferably employed as plant protection agents. They are active against normally sensitive and resistant species and against all or some stages of development. The agricultural invertebrate pests which can be combated by using the compounds and compositions according to the invention include inter alia:

From the order of the Anoplura (Phthiraptera), for example, Damalinia spp., Haematopinus spp., Linognathus spp., Pediculus spp., Trichodectes spp.

From the class of the Arachnida, for example, Acarus siro, Aceria sheldoni, Aculops spp., Aculus spp., Amblyomma spp., Argas spp., Boophilus spp., Brevipalpus spp., Bryobia praetiosa, Chorioptes spp., Dermanyssus gallinae, Eotetranychus spp., Epitrimerus pyri, Eutetranychus spp., Eriophyes spp., Hemitarsonemus spp., Hyalomma spp., Ixodes spp., Latrodectus mactans, Metatetranychus spp., Oligonychus spp., Ornithodoros spp., Panonychus spp., Phyllocoptruta oleivora, Polyphagotarsonemus latus, Psoroptes spp., Rhipicephalus spp., Rhizoglyphus spp., Sarcoptes spp., Scorpio maurus, Stenotarsonemus spp., Tarsonemus spp., Tetranychus spp., Vasates lycopersici.

From the class of the Bivalva, for example, Dreissena spp.

From the order Blattodea including cockroaches from the families Blattellidae and Blattidae (e.g., oriental cockroach {Blatta orientalis Linnaeus), Asian cockroach {Blatella asahinai Mizukubo), German cockroach {Blattella germanica Linnaeus), brownbanded cockroach {Supella longipalpa Fabricius), American cockroach {Periplaneta americana Linnaeus), brown cockroach {Periplaneta brunnea Burmeister), Madeira cockroach {Leucophaea maderae Fabricius)), smoky brown cockroach {Periplaneta fiiliginosa Service), Australian Cockroach {Periplaneta australasiae Fabr.), lobster cockroach {Nauphoeta cinerea Olivier) and smooth cockroach {Symploce pollens Stephens)).

From the order of the Chilopoda, for example, Geophilus spp., Scutigera spp.

From the order of the Coleoptera, for example, Acanthoscelides obtectus, Adoretus spp., Agelastica alni, Agriotes spp., Amphimallon solstitialis, Anobium punctatum, Anoplophora spp., Anthonomus spp., Anthrenus spp., Apogonia spp., Atomaria spp., Attagenus spp., Bruchidius obtectus, Bruchus spp., Ceuthorhynchus spp., Cleonus mendicus, Conoderus spp., Cosmopolites spp., Costelytra zealandica, Curculio spp., Cryptorhynchus lapathi, Dermestes spp., Diabrotica spp., Epilachna spp., Faustinus cubae, Gibbium psylloides, Heteronychus arator, Hylamorpha elegans, Hylotrupes bajulus, Hypera postica, Hypothenemus spp., Lachnosterna consanguinea, Leptinotarsa decemlineata, Lissorhoptrus oryzophilus, Lixus spp., Lyctus spp., Meligethes aeneus, Melolontha

melolontha, Migdolus spp., Monochamus spp., Naupactus xanthographus, Niptus hololeucus, Oryctes rhinoceros, Oryzaephilus surinamensis, Otiorrhynchus sulcatus, Oxycetonia jucunda, Phaedon cochleariae, Phyllophaga spp., Popillia japonica, Premnotrypes spp., Psylliodes chrysocephala, Ptinus spp., Rhizobius ventralis, Rhizopertha dominica, Sitophilus spp., Sphenophorus spp., Stemechus spp., Symphyletes spp., Tenebrio molitor, Tribolium spp., Trogo- derma spp., Tychius spp., Xylotrechus spp., Zabrus spp.; as well as Callosobruchus Chinensis, Sitophilus zeamais, Tribolium Castaneum, Epilachna vigintioctomaculata, Agriotes fuscicollis, Anomala rufocuprea, Leptinotarsa decemlineata, Diabrotica spp., Monochamus alternatus, Lissorhoptrus oryzophilus, Lyctus bruneus, and Aulacophora femoralis.

From the order of the Collembola, for example, Onychiurus armatus.

From the order of the Dermaptera, for example, Forf[iota]cula auricularia.

From the order of the Diplopoda, for example, Blaniulus guttulatus.

From the order of the Diptera, for example, Aedes spp., Anopheles spp., Bibio hortulanus, Calliphora erythrocephala, Ceratitis capitata, Chrysomyia spp., Cochliomyia spp., Cordylobia anthropophaga, Culex spp., Cuterebra spp., Dacus oleae, Dermatobia hominis, Drosophila spp., Fannia spp., Gastrophilus spp., Hylemyia spp., Hyppobosca spp., Hypoderma spp., Liriomyza spp., Lucilia spp., Musca spp., Nezara spp., Oestrus spp., Oscinella frit, Pegomyia hyoscyami, Phorbia spp., Stomoxys spp., Tabanus spp., Tannia spp., Tipula paludosa, Wohlfahrtia spp.; as well as Musca domestica, Aedes aegypti, Hylemia platura, Culex pipiens, Anopheles sinensis, Culex tritaeniorhychus and Liriomyza trifolii.

From the order Homoptera including: Acyrthisiphon pisum Harris (pea aphid), Aphis craccivora Koch (cowpea aphid), Aphis fabae Scopoli (black bean aphid),' Aphis gossypii Glover (cotton aphid, melon aphid), Aphis pomi De Geer (apple aphid), Aphis spiraecola Patch (spirea aphid), Aulacorthum solani Kaltenbach (foxglove aphid), Chaetosiphon fragaefolii Cockerell (strawberry aphid), Diuraphis noxia Kurdjumov/Mordvilko (Russian wheat aphid), Dysaphis plantaginea Paaserini (rosy apple aphid), Eriosoma lanigerum Hausmann (woolly apple aphid), Hyalopterus pruni Geoffroy (mealy plum aphid), Lipaphis

erysimi Kaltenbach (turnip aphid), Metopolophiurn dirrhodum Walker (cereal aphid), Macrosipum euphorbiae Thomas (potato aphid), Myzus persicae Sulzer (peach-potato aphid, green peach aphid), Nasonovia r[iota]bisnigri Mosley (lettuce aphid), Pemphigus spp. (root aphids and gall aphids), Rhopalosiphum maidis Fitch (corn leaf aphid), Rhopalosiphum padi Linnaeus (bird cherry-oat aphid), Schizaphis graminum Rondani (greenbug), Sitobion avenae Fabricius (English grain aphid), Therioaphis maculata Buckton (spotted alfalfa aphid), Toxoptera aurantu Boyer de Fonscolombe (black citrus aphid), and Toxoptera cit[eta]cida Kirkaldy (brown citrus aphid); Adelges spp. (adelgids); Phylloxera devastatrix Pergande (pecan phylloxera); Bemisia tabaci Gennadius (tobacco whitefly, sweetpotato whitefly), Bemisia argentifolii Bellows & Perring (silverleaf whitefly), Dialeurodes citri Ashmead (citrus whitefly) and Trialeurodes vaporariorum Westwood (greenhouse whitefly); Empoasca f[alpha]bae Harris (potato leafhopper), Laodelphax str[iota]atellus Fallen (smaller brown planthopper), Macrolestes quadrilineatus Forbes (aster leafhopper), Nephotettix cinticeps Uhler (green leafhopper), Nephotettix nigropictus Stal (rice leafhopper), Nilaparvata lugens Stal (brown planthopper), Peregrinus maidis Ashmead (corn planthopper), Sogatella fiircifera Horvath (white-backed planthopper), Sogatodes orizicola Muir (rice delphacid), Typhlocyba pomaria McAtee white apple leafhopper, Erythroneoura spp. (grape leafhoppers); Magicidada septendecim Linnaeus (periodical cicada); lcerya purchasi Maskell (cottony cushion scale), Quadraspidiotus perniciosus Comstock (San Jose scale); Planococcus citri Risso (citrus mealybug); Pseudococcus spp. (other mealybug complex); Cacopsylla pyricola Foerster (pear psylla), Trioza diospyri Ashmead (persimmon psylla).

From the class of the Gastropoda, for example, Arion spp., Biomphalaria spp., Bulinus spp., Deroceras spp., Galba spp., Lymnaea spp., Oncomelania spp., Succinea spp.

From the order Isoptera including termites in the Termitidae (e.g., Macrotermes sp., Odontotermes obesus Rambur), Kalotermitidae (e.g., Cryptotermes sp.), and Rhinotermitidae (e.g., Reticulitermes sp., Coptotermes sp., Heteroterm.es tenuis Hagen) families, the eastern subterranean termite {Reticulitermes flavipes Kollar), western subterranean termite {Reticulitermes hesperus Banks), Formosan subterranean termite {Coptotermes formosanus Shiraki), West Indian drywood termite {Incisitermes immigrans Snyder), powder post termite {Cryptotermes brevis Walker), drywood termite {Incisitermes snyderi Light), southeastern subterranean termite {Reticulitermes virginicus Banks), western

drywood termite {Incisitermes minor Hagen), arboreal termites such as Nasutitermes sp. and other termites of economic importance.

From the order Orthoptera including grasshoppers, locusts and crickets (e.g., migratory grasshoppers (e.g., Melanoplus sanguinipes Fabricjus, M. differentialis Thomas), American grasshoppers (e.g., Schistocerca americana Drury), desert locust (Schistocerca gregaria Forskal), migratory locust (Locusta migratoria Linnaeus), bush locust (Zonocerus spp.), house cricket (Acheta domesticus Linnaeus), mole crickets (e.g., tawny mole cricket (Scapteriscus vicinus Scudder) and southern mole cricket (Scapteriscus borellii Giglio-Tos)).

From the class of the helminths, for example, Ancylostoma duodenale, Ancylostoma ceylanicum, Acylostoma braziliensis, Ancylostoma spp., Ascaris lubricoides, Ascaris spp., Brugia malayi, Brugia timori, Bunostomum spp., Chabertia spp., Clonorchis spp., Cooperia spp., Dicrocoelium spp, Dictyocaulus filaria, Diphyllobothrium latum, Dracunculus medinensis, Echinococcus granulosus, Echinococcus multilocularis, Enterobius vermicularis, Faciola spp., Haemonchus spp., Heterakis spp., Hymenolepis nana, Hyostrongulus spp., Loa Loa, Nematodirus spp., Oesophagostomum spp., Opisthorchis spp., Onchocerca volvulus, Ostertagia spp., Paragonimus spp., Schistosomen spp., Strongyloides fuelleborni, Strongyloides stercoralis, Stronyloides spp., Taenia saginata, Taenia solium, Trichinella spiralis, Trichinella nativa, Trichinella britovi, Trichinella nelsoni, Trichinella pseudopsiralis, Trichostrongulus spp., Trichuris trichuria, Wuchereria bancrofti.

It is furthermore possible to control protozoa, such as Eimeria.

From the order of the Heteroptera, for example, Anasa tristis, Antestiopsis spp., BHssus spp., Calocoris spp., Campylomma livida, Cavelerius spp., Cimex spp., Creontiades dilutus, Dasynus piperis, Dichelops furcatus, Diconocoris hewetti, Dysdercus spp., Euschistus spp., Eurygaster spp., Heliopeltis spp., Horcias nobilellus, Leptocorisa spp., Leptoglossus phyllopus, Lygus spp., Macropes excavatus, Miridae, Nezara spp., Oebalus spp., Pentomidae, Piesma quadrata, Piezodorus spp., Psallus seriatus, Pseudacysta persea, Rhodnius spp., Sahlbergella singularis, Scotinophora spp., Stephanitis nashi, Tibraca spp., Triatoma spp.

From the order of the Homoptera, for example, Acyrthosipon spp., Aeneolamia spp.,

Agonoscena spp., Aleurodes spp., Aleurolobus barodensis, Aleurothrixus spp., Amrasca spp., Anuraphis cardui, Aonidiella spp., Aphanostigma pin, Aphis spp., Arboridia apicalis, Aspidiella spp., Aspidiotus spp., Atanus spp., Aulacorthum solani, Bemisia spp., Brachycaudus helichrysii, Brachycolus spp., Brevicoryne brassicae, Calligypona marginata, Carneocephala fulgida, Ceratovacuna lanigera, Cercopidae, Ceroplastes spp., Chaetosiphon fragaefolii, Chionaspis tegalensis, Chlorita onukii, Chromaphis juglandicola, Chrysomphalus f[iota]cus, Cicadulina mbila, Coccomytilus halli, Coccus spp., Cryptomyzus ribis, Dalbulus spp., Dialeurodes spp., Diaphorina spp., Diaspis spp., Doralis spp., Drosicha spp., Dysaphis spp., Dysmicoccus spp., Empoasca spp., Eriosoma spp., Erythroneura spp., Euscelis bilobatus, Geococcus coffeae, Homalodisca coagulata, Hyalopterus arundinis, Icerya spp., Idiocerus spp., Idioscopus spp., Laodelphax striatellus, Lecanium spp., Lepidosaphes spp., Lipaphis erysimi, Macrosiphum spp., Mahanarva fimbriolata, Melanaphis sacchari, Metcalfiella spp., Metopolophium dirhodum, Monellia costalis, Monelliopsis pecanis, Myzus spp., Nasonovia ribisnigri, Nephotettix spp., Nilaparvata lugens, Oncometopia spp., Orthezia praelonga, Parabemisia myricae, Paratrioza spp., Parlatoria spp., Pemphigus spp., Pere- grinus maidis, Phenacoccus spp., Phloeomyzus passerinii, Phorodon humuli, Phylloxera spp., Pinnaspis aspidistrae, Planococcus spp., Protopulvinaria pyriformis, Pseudaulacaspis pentagona, Pseudococcus spp., Psylla spp., Pteromalus spp., Pyrilla spp., Quadraspidiotus spp., Quesada gigas, Rastrococcus spp., Rhopalosiphum spp., Saissetia spp., Scaphoides titanus, Schizaphis graminum, Selenaspidus articulatus, Sogata spp., Sogatella furcifera, Sogatodes spp., Stictocephala festina, Tenalaphara malayensis, Tinocallis caryaefoliae, Tomaspis spp., Toxoptera spp., Tri- aleurodes vaporariorum, Trioza spp., Typhlocyba spp., Unaspis spp., Viteus vitifolii. From the order of the Hymenoptera, for example, Diprion spp., Hoplocampa spp., Lasius spp., Monomorium pharaonis, Vespa spp.

From the order of the Isopoda, for example, Armadillidium vulgare, Oniscus asellus, Porcellio scaber.

From the order of the Isoptera, for example, Reticulitermes spp., Odontotermes spp.; as well as Reticulitermes speratus and Coptotermes formosanus.

From the order of the Lepidoptera, for example, Acronicta major, Aedia leucomelas, Agrotis spp., Alabama argillacea, Anticarsia spp., Barathra brassicae, Bucculatrix thurberiella,

Bupalus piniarius, Cacoecia podana, Capua reticulana, Carpocapsa pomonella, Cheimatobia brumata, Chilo spp., Choristoneura fumiferana, Clysia ambiguella, Cnaphalocerus spp., Earias insulana, Ephestia kuehniella, Euproctis chrysorrhoea, Euxoa spp., Feltia spp., Galleria mellonella, Helicoverpa spp., Heliothis spp., Hofmannophila pseudospretella, Homona magnanima, Hyponomeuta padella, Laphygma spp., Lithocolletis blancardella, Lithophane antennata, Loxagrotis albicosta, Lymantria spp., Malacosoma neustria, Mamestra brassicae, Mocis repanda, Mythimna separata, Oria spp., Oulema oryzae, Panolis flammea, Pectinophora gossypiella, Phyllocnistis citrella, Pieris spp., Plutella xylostella, Prodenia spp., Pseudaletia spp., Pseudoplusia includens, Pyrausta nubilalis, Spodoptera spp., Thermesia gemmatalis, Tinea pellionella, Tineola bisselliella, Tortrix viridana, Trichoplusia spp.; as well as Lymantria dispar, Malacosoma neustria, Pieris rapae, Spodoptera litura, Mamestra brassicae, Chilo suppressalis, Pyrausta nubilalis, Ephestia cautella, Adoxophyes orana, Carpocapsa pomonella, Agrotis fticosa, Galleria mellonella, Plutella maculipennis, Heliothis virescens and Phyllocnistis citrella.

From the order of the Orthoptera, for example, Acheta domesticus, Blatta orientalis, Gryllotalpa spp., Leucophaea maderae, Locusta spp., Melanoplus spp., Schistocerca gregaria; as well as Blattella germanica, Periplaneta americana, Gryllotalpa africana and Locusta migratoria migratoriaodes.

From the order of the Siphonaptera, for example, Ceratophyllus spp., Xenopsylla cheopis.

From the order of the Symphyla, for example, Scutigerella immaculata.

From the order of the Thysanoptera, for example, Baliothrips biformis, Enneothrips flavens, Frankliniella spp., Heliothrips spp., Hercinothrips femoralis, Kakothrips spp., Rhipiphorothrips cruentatus, Scirtothrips spp., Taeniothrips cardamoni, Thrips spp.; as well as Thrips palmi and Frankliniella occidentalis. From the order of Hemiptera, for example, Nephotettix cincticeps, Nilaparvata lugens, Pseudococcus comstocki, Unaspis yanonensis, Myzus persicas, Aphis pomi, Aphis gossypii, Rhopalosiphum pseudobrassicas, Stephanitis nashi, Nazara spp., Trialeurodes vaporariorm and Pshylla spp..

From the order of the Thysanura, for example, Lepisma saccharina.

The phytoparasitic nematodes include, for example, Anguina spp., Aphelenchoides spp., Belonoaimus spp., Bursaphelenchus spp., Ditylenchus dipsaci, Globodera spp., Heliocotylenchus spp., Heterodera spp., Longidorus spp., Meloidogyne spp., Radopholus similis, Rotylenchus spp., Trichodorus spp., Tylenchorhynchus spp., Tylenchulus spp., Tylenchulus semipenetrans, Xiphinema spp.; as well as Meloidogyne incognita, Bursaphelenchus lignicolus Mamiya et Kiyohara, Aphelenchoides besseyi, and Heterodera glycines and Pratylenchus spp.

Mites include, for example, Tetranychus cinnabarinus, Tetranychus urticae, Panonychus citri, Aculops pelekassi and Tarsonemus spp.

If appropriate, the compounds according to the invention can, at certain concentrations or application rates, also be used as herbicides, safeners, growth regulators or agents to improve plant properties, or as microbicides, for example as fungicides, antimycotics, bactericides, viricides (including agents against viroids) or as agents against MLO (mycoplasma-like organisms) and RLO (rickettsia-like organisms). If appropriate, they can also be employed as intermediates or precursors for the synthesis of other active compounds.

The term "controlling" as used herein means that the active compounds are effective in reducing the incidence of the respective parasite to innocuous levels. More specifically, "controlling", as used herein, means that the active compound is effective in killing the respective parasite, inhibiting its growth, or inhibiting its proliferation. The active compounds of the present invention, when used as insecticides, may be formed into conventional formulation forms. Such formulation forms include, for example, solutions, emulsions, wettable powders, water dispersible granules, suspensions, powders, foams, pastes, tablets, granules, aerosols, active compound-impregnated natural and synthetic substances, microcapsules, seed coating agents, formulations used with burning device (burning devices include, for example, fumigation and smoking cartridges, cans and coils) and UVL [cold mist, warm mist].

These formulations may be prepared according to known methods. For example, they can be prepared by mixing the active compounds with extenders, i.e. liquid diluents or carriers; liquefied gas diluents or carriers; solid diluents or carriers, and, optionally by using

surfactants i.e. emulsif[iota]ers and/or dispersants and/or foam-forming agents. The formulations are prepared in advance in suitable facilities or directly before or during the application.

Suitable for use as auxiliaries are substances which are suitable for imparting to the compounds and compositions itself and/or to preparations derived therefrom (for example spray liquors, seed dressings) particular properties such as certain technical properties and/or also particular biological properties. Typical suitable auxiliaries are: extenders, solvents or diluents and carriers.

Suitable extenders are, for example, water, polar and nonpolar organic chemical liquids, for example from the classes of the aromatic and non-aromatic hydrocarbons (such as paraffins, alkylbenzenes, alkylnaphthalenes, chlorobenzenes), the alcohols and polyols (which, if appropriate, may also be substituted, etherified and/or esterified), the ketones (such as acetone, cyclohexanone), esters (including fats and oils) and (poly)ethers, the unsubstituted and substituted amines, amides, lactams (such as N-alkylpyrrolidones) and lactones, the sulphones and sulphoxides (such as dimethyl sulphoxide).

If the extender used is water, it is also possible to employ, for example, organic solvents as auxiliary solvents.

Suitable solid carriers are for example, ammonium salts and ground natural minerals such as kaolins, clays, talc, chalk, quartz, attapulgite, montmorillonite or diatomaceous earth, and ground synthetic minerals, such as finely divided silica, alumina and silicates; suitable solid carriers for granules are: for example, crushed and fractionated natural rocks such as calcite, marble, pumice, sepiolite and dolomite, and also synthetic granules of inorganic and organic meals, and granules of organic material such as paper, sawdust, coconut shells, maize cobs and tobacco stalks; suitable emulsif[iota]ers and/or foam-formers are: for example, nonionic and anionic emulsif[iota]ers, such as polyoxyethylene fatty acid esters, polyoxyethylene fatty alcohol ethers, for example alkylaryl polyglycol ethers, alkylsulphonates, alkyl sulphates, arylsulphonates and also protein hydrolysates; suitable dispersants are nonionic and/or ionic substances, for example from the classes of the alcohol-POE- and/or -POP-ethers, acid and/or POP-POE esters, alkyl aryl and/or POP-POE ethers, fat- and/or POP-POE adducts, POE- and/or POP-polyol derivatives, POE-

and/or POP-sorbitan- or -sugar adducts, alkyl or aryl sulphates, alkyl- or arylsulphonates and alkyl or aryl phosphates or the corresponding PO-ether adducts. Furthermore, suitable oligo- or polymers, for example those derived from vinylic monomers, from acrylic acid, from EO and/or PO alone or in combination with, for example, (poly)alcohols or (poly)amines. It is also possible to employ lignin and its sulphonic acid derivatives, unmodified and modified celluloses, aromatic and/or aliphatic sulphonic acids and their adducts with formaldehyde.

Liquid diluents, solvents or carriers include, for example, aromatic hydrocarbons (for example, xylene, toluene, alkylnaphthalene), chlorinated aromatic or chlorinated aliphatic hydrocarbons (for example, chlorobenzens, ethylene chlorides, methylene chlorides), aliphatic hydrocarbons [for example, cyclohexanes or paraffins (for example, mineral oil fractions or vegetable oils)], alcohols (for example, butanol, glycol and their ethers or esters), ketones (for example, acetone, methylethylketone, methylisobutylketone, cyclohexanone), strongly polar solvents (for example, dimethylformamide, dimethyl sulfoxide) and water.

Liquefied gas diluents or carriers include substances which are present as gases at normal temperature and pressure, and include, for example, aerosol propellants such as furan, propane, nitrogen gas, carbon dioxide and halogenated hydrocarbons.

Solid diluents include, for example, ground natural minerals (for example, kaolin, clay, talc, chalk, quartz, attapulgite, montmorillonite or diatomaceous earth) and ground synthetic minerals (for example, highly-dispersive silicic acid, alumina, silicate).

Solid carriers for granules include, for example, crushed and fractionated rocks (for example, calcite, marble, pumice stone, sepiolite, dolomite), synthetic granules of inorganic or organic powders, and fine particles of organic materials (for example, sawdust, coconut shells, maize cob, tobacco stalks).

Emulsifiers and/or foam-forming agents include, for example, nonionic or anionic emulsifiers [for example, polyoxyethylene fatty acid esters, polyoxyethylene fatty alcohol ethers (for example, alkylaryl polyglycol ether), alkyl sulfonates, alkyl sulfates, aryl sulfonates ], and albumin hydrolysis products.

Dispersants include, for example, lignin sulfite waste liquor and methylcellulose. Binding agents may also be used in the formulations (powders, granules, emulsions) and include, for example, carboxymethylcellulose and natural or synthetic polymers (for example, gum Arabic, polyvinyl alcohol, polyvinyl acetate).

Colorants may be used and include, for example, inorganic pigments (e.g. iron oxide, titanium oxide, Prussian Blue), organic dyes (e.g. alizarin dyes, azo dyes or metal phthalocyanine dyes) and trace elements (e.g. salts of iron, manganese, boron, copper, cobalt, molybdenum and zinc).

Other possible auxiliaries are perfumes, mineral or vegetable, optionally modified oils, waxes and nutrients (including trace nutrients), such as salts of iron, manganese, boron, copper, cobalt, molybdenum and zinc.

Stabilizers, such as low-temperature stabilizers, preservatives, antioxidants, light stabilizers or other agents which improve chemical and/or physical stability may also be present.

In general, formulations according to the invention may contain the above-enumerated active components at an amount ranging from 0.1 to 95 % by weight, preferably from 0.5 to 90% by weight.

The active compounds according to the present invention may exist in combination with other active compounds, for example, insecticides, toxic baits, bactericides, acaricides, nematicides, fungicides, growth regulating agents, herbicides in the form of commercially useful formulations or in the application forms prepared from such formulations. The aforementioned insecticides include, for example, organophosphorus agents, carbamate agents, carboxylate agents, chlorinated hydrocarbon type agents, insecticidal substances produced by microorganisms.

In addition, the active compounds according to the present invention may exist as mixed agents with synergists, and such formulations and application forms include commercially useful ones. The synergists are not necessarily active per se, but can enhance the action of the active compounds.

The content of the active compound according to the present invention in a commercially useful application form may vary in a wide range.

The concentration of the active compound according to the present invention for application may be in the range of from 0.0000001 to 100% by weight, preferably in the range of from 0.00001 to 1% by weight. The compounds according to the present invention may be used in ordinary manners suitable for their application forms. It is understood that the compounds according to the invention can also be present in compositions containing further ingredients, such as auxiliaries or active ingredients. The skilled person will choose a suitable ingredient among those named herein and known in the art and which are supposed to enhance a property which is considered being favorable in view of the intended application and use.

All plants and plant parts can be treated in accordance with the invention. Plants are to be understood as meaning in the present context all plants and plant populations such as desired and undesired wild plants or crop plants (including naturally occurring crop plants). Crop plants can be plants which can be obtained by conventional plant breeding and optimization methods or by biotechnological and genetic engineering methods or by combinations of these methods, including the transgenic plants and including the plant cultivars protectable or not protectable by plant breeders' rights. Plant parts are to be understood as meaning all parts and organs of plants above and below the ground, such as shoot, leaf, flower and root, examples which may be mentioned being leaves, needles, stalks, stems, flowers, fruit bodies, fruits, seeds, roots, tubers and rhizomes. The plant parts also include harvested material, and vegetative and generative propagation material, for example cuttings, tubers, rhizomes, offshoots and seeds.

Treatment according to the invention of the plants and plant parts with the active compounds is carried out directly or by allowing the compounds to act on their surroundings, habitat or storage space by the customary treatment methods, for example by immersion, spraying, evaporation, fogging, scattering, painting on, injecting and, in the case of propagation material, in particular in the case of seed, also by applying one or more coats.

As already mentioned above, it is possible to treat all plants and their parts according to the

invention. In a preferred embodiment, wild plant species and plant cultivars, or those obtained by conventional biological breeding methods, such as crossing or protoplast fusion, and parts thereof, are treated. In a further preferred embodiment, transgenic plants and plant cultivars obtained by genetic engineering methods, if appropriate in combination with conventional methods (Genetically Modified Organisms), and parts thereof, are treated. The terms "parts", "parts of plants" and "plant parts" have been explained above.

Particularly preferably, plants of the plant cultivars which are in each case commercially available or in use are treated according to the invention. Plant cultivars are understood as meaning plants having novel properties ("traits") which have been obtained by conventional breeding, by mutagenesis or by recombinant DNA techniques. These can be cultivars, bio- or genotypes. Depending on the plant species or plant cultivars, their location and growth conditions (soils, climate, vegetation period, diet), the treatment according to the invention may also result in superadditive "synergistic") effects. Thus, for example, reduced application rates and/or a widening of the activity spectrum and/or an increase in the activity of the substances and compositions which can be used according to the invention, better plant growth, increased tolerance to high or low temperatures, increased tolerance to drought or to water or soil salt content, increased flowering performance, easier harvesting, accelerated maturation, higher harvest yields, higher quality and/or a higher nutritional value of the harvested products, better storage stability and/or processability of the harvested products are possible, which exceed the effects which were actually to be expected.

The preferred transgenic plants or plant cultivars (obtained by genetic engineering) which are to be treated according to the invention include all plants which, by virtue of the genetic modification, received genetic material which imparts particularly advantageous, useful traits to these plants. Examples of such traits are better plant growth, increased tolerance to high or low temperatures, increased tolerance to drought or to water or soil salt content, increased flowering performance, easier harvesting, accelerated maturation, higher harvest yields, higher quality and/or a higher nutritional value of the harvested products, better storage stability and/or processability of the harvested products. Further and particularly emphasized examples of such traits are a better defence of the plants against animal and microbial pests, such as against insects, mites, phytopathogenic fungi, bacteria and/or viruses, and also increased tolerance of the plants to certain herbicidally active compounds. Examples of transgenic plants which may be mentioned are the important crop plants, such

as cereals (wheat, rice), maize, soya beans, potatoes, sugar beet, tomatoes, peas and other vegetable varieties, cotton, tobacco, oilseed rape and also fruit plants (with the fruits apples, pears, citrus fruits and grapes), and particular emphasis is given to maize, soya beans, potatoes, cotton, tobacco and oilseed rape. Traits that are emphasized in particular are the increased defence of the plants against insects, arachnids, nematodes and slugs and snails by virtue of toxins formed in the plants, in particular those formed in the plants by the genetic material from Bacillus thuringiensis (for example by the genes Cry[lota]A(a), Cry[lota]A(b), Cry[lota]A(c), CryEA, CryIHA, CryIIIB2, Cry9c, Cry2Ab, Cry3Bb and CrylF and also combinations thereof) (referred to hereinbelow as "Bt plants"). Traits that are also particularly emphasized are the increased defence of the plants against fungi, bacteria and viruses by systemic acquired resistance (SAR), systemin, phytoalexins, elicitors and resistance genes and correspondingly expressed proteins and toxins. Traits that are furthermore particularly emphasized are the increased tolerance of the plants to certain herbicidally active compounds, for example imidazolinones, sulphonylureas, glyphosate or phosphinotricin (for example the "PAT" gene). The genes which impart the desired traits in question can also be present in combination with one another in the transgenic plants. Examples of "Bt plants" which may be mentioned are maize varieties, cotton varieties, soya bean varieties and potato varieties which are sold under the trade names YIELD GARD(R) (for example maize, cotton, soya beans), KnockOut(R) (for example maize), StarLink(R) (for example maize), Bollgard(R) (cotton), Nucotn(R) (cotton) and NewLeaf(R) (potato). Examples of herbicide-tolerant plants which may be mentioned are maize varieties, cotton varieties and soya bean varieties which are sold under the trade names Roundup Ready(R) (tolerance to glyphosate, for example maize, cotton, soya beans), Liberty Link(R) (tolerance to phosphinotricin, for example oilseed rape), IMI(R) (tolerance to imidazolinones) and STS(R) (tolerance to sulphonylureas, for example maize). Herbicide-resistant plants (plants bred in a conventional manner for herbicide tolerance) which may be mentioned include the varieties sold under the name Clearf[iota]eld(R) (for example maize). Of course, these statements also apply to plant cultivars having these genetic traits or genetic traits still to be developed, which plant cultivars will be developed and/or marketed in the future.

The plants listed can be treated according to the invention in a particularly advantageous manner with the compounds or compositions according to the invention. The preferred ranges stated above for the active compounds or compositions also apply to the treatment

of these plants. Particular emphasis is given to the treatment of plants with the compounds or compositions specifically mentioned in the present text.

It has furthermore been found that the compounds according to the invention also have a strong insecticidal action against insects which destroy industrial materials.

The following insects may be mentioned as examples and as preferred - but without any limitation:

Beetles, such as Hylotrupes bajulus, Chlorophorus pilosis, Anobium punctatum, Xestobium rufovillosum, Ptilinus pecticornis, Dendrobium pertinex, Ernobius mollis, Priobium carpini, Lyctus brunneus, Lyctus africanus, Lyctus planicollis, Lyctus linearis, Lyctus pubescens, Trogoxylon aequale, Minthes rugicollis, Xyleborus spec. Tryptodendron spec. Apate monachus, Bostrychus capucins, Heterobostrychus brunneus, Sinoxylon spec. Dinoderus minutus;

Hymenopterons, such as Sirex juvencus, Urocerus gigas, Urocerus gigas taignus, Urocerus augur;

Termites, such as Kalotermes flavicollis, Cryptotermes brevis, Heterotermes indicola, Reticulitermes flavipes, Reticulitermes santonensis, Reticulitermes lucifugus, Mastotermes darwiniensis, Zootermopsis nevadensis, Coptotermes formosanus;

Bristletails, such as Lepisma saccharina. Industrial materials in the present connection are to be understood as meaning non-living materials, such as, preferably, plastics, adhesives, sizes, papers and cardboards, leather, wood and processed wood products and coating compositions.

The ready-to-use compositions may, if appropriate, comprise further insecticides and, if appropriate, one or more fungicides.

With respect to possible additional additives, reference may be made to the insecticides and fungicides mentioned above.

The compounds according to the invention can likewise be employed for protecting objects which come into contact with saltwater or brackish water, in particular hulls, screens, nets, buildings, moorings and signalling systems, against fouling.

Furthermore, the compounds according to the invention, alone or in combinations with other active compounds, may be employed as antifouling agents.

In domestic, hygiene and stored-product protection, the active compounds are also suitable for controlling insects, arachnids and mites, which are found in enclosed spaces such as, for example, dwellings, factory halls, offices, vehicle cabins and the like. They can be employed alone or in combination with other active compounds and auxiliaries in domestic insecticide products for controlling these pests. They are active against sensitive and resistant species and against all developmental stages. These pests include:

From the order of the Scorpionidea, for example, Buthus occitanus.

From the order of the Acarina, for example, Argas persicus, Argas reflexus, Bryobia ssp., Dermanyssus gallinae, Glyciphagus domesticus, Ornithodorus moubat, Rhipicephalus sanguineus, Trombicula alfreddugesi, Neutrombicula autumnalis, Dermatophagoides pteronissimus, Dermatophagoides forinae.

From the order of the Araneae, for example, Aviculariidae, Araneidae.

From the order of the Opiliones, for example, Pseudoscorpiones chelifer, Pseudoscorpiones cheiridium, Opiliones phalangium.

From the order of the Isopoda, for example, Oniscus asellus, Porcellio scaber.

From the order of the Diplopoda, for example, Blaniulus guttulatus, Polydesmus spp. From the order of the Chilopoda, for example, Geophilus spp.

From the order of the Zygentoma, for example, Ctenolepisma spp., Lepisma saccharina, Lepismodes inquilinus.

From the order of the Blattaria, for example, Blatta orientalies, Blattella germanica, Blattella asahinai, Leucophaea maderae, Panchlora spp., Parcoblatta spp., Periplaneta australasiae, Periplaneta americana, Periplaneta brunnea, Periplaneta fuliginosa, Supella longipalpa.

From the order of the Saltatoria, for example, Acheta domesticus.

From the order of the Dermaptera, for example, Forficula auricularia.

From the order of the Isoptera, for example, Kalotermes spp., Reticulitermes spp.

From the order of the Psocoptera, for example, Lepinatus spp., Liposcelis spp.

From the order of the Coleoptera, for example, Anthrenus spp., Attagenus spp., Dermestes spp., Latheticus oryzae, Necrobia spp., Ptinus spp., Rhizopertha dominica, Sitophilus granarius, Sitophilus oryzae, Sitophilus zeamais, Stegobium paniceum.

From the order of the Diptera, for example, Aedes aegypti, Aedes albopictus, Aedes taeniorhynchus, Anopheles spp., Calliphora erythrocephala, Chrysozona pluvialis, Culex quinquefasciatus, Culex pipiens, Culex tarsalis, Drosophila spp., Fannia canicularis, Musca domestica, Phlebotomus spp., Sarcophaga carnaria, Simulium spp., Stomoxys calcitrans, Tipula paludosa.

From the order of the Lepidoptera, for example, Achroia grisella, Galleria mellonella, Plodia interpunctella, Tinea cloacella, Tinea pellionella, Tineola bisselliella.

From the order of the Siphonaptera, for example, Ctenocephalides canis, Ctenocephalides felis, Pulex irritans, Tunga penetrans, Xenopsylla cheopis.

From the order of the Hymenoptera, for example, Camponotus herculeanus, Lasius fuliginosus, Lasius niger, Lasius umbratus, Monomorium pharaonis, Paravespula spp., Tetramorium caespitum.

From the order of the Anoplura, for example, Pediculus humanus capitis, Pediculus humanus corporis, Pemphigus spp., Phylloera vastatrix, Phthirus pubis.

From the order of the Heteroptera, for example, Cimex hemipterus, Cimex lectularius, Rhodinus prolixus, Triatoma infestans. In the field of domestic insecticides, a combination with other suitable active compounds, such as phosphoric esters, carbamates, pyrethroids, neonicotinoids, growth regulators or active compounds from other known classes of insecticides can be used and is especially preferable.

The compounds or compositions according to the invention, preferable in their suitable application form, can be used in aerosols, pressure-free spray products, for example pump and atomizer sprays, automatic fogging systems, foggers, foams, gels, evaporator products with evaporator tablets made of cellulose or polymer, liquid evaporators, gel and membrane evaporators, propeller- driven evaporators, energy-free, or passive, evaporation systems, moth papers, moth bags and moth gels, as granules or dusts, in baits for scattering or in bait stations.

The compounds or compositions according to the invention are particularly suitable for treating seed. A large part of the damage to crop plants which is caused by pests occurs as early as when the seed is attacked during storage and after the seed is introduced into the soil, during and immediately after germination of the plants. This phase is particularly critical since the roots and shoots of the growing plant are particularly sensitive and even minor damage can lead to the death of the whole plant. Protecting the seed and the germinating plant by the use of suitable compositions is therefore of particularly great interest.

The control of pests by treating the seed of plants has been known for a long time and is subject- matter of continuous improvements. However, the treatment of seed entails a series of problems which cannot always be solved in a satisfactory manner. Thus, it is desirable to develop methods for protecting the seed and the germinating plant which dispense with the additional application of crop protection agents after sowing or after the emergence of the plants. It is furthermore desirable to optimize the amount of active compound employed in such a way as to provide maximum protection for the seed and the germinating plant from attack by pests, but without damaging the plant itself by the active compound employed. In particular, methods for the treatment of seed should also take into consideration the intrinsic insecticidal properties of transgenic plants in order to achieve optimum protection of the seed and also the germinating plant with a minimum of crop

protection agents being employed.

The present invention therefore in particular also relates to a method for the protection of seed and germinating plants from attack by pests, by treating the seed with a composition according to the invention. The invention likewise relates to the use of the compositions according to the invention for the treatment of seed for protecting the seed and the resulting plant from pests. Furthermore, the invention relates to seed which has been treated with a composition according to the invention so as to afford protection from pests. One of the advantages of the present invention is that the particular systemic properties of the compositions according to the invention mean that treatment of the seed with these compositions not only protects the seed itself, but also the resulting plants after emergence, from pests. In this manner, the immediate treatment of the crop at the time of sowing or shortly thereafter can be dispensed with.

Furthermore, it must be considered as advantageous that the compounds or compositions according to the invention can also be employed in particular in transgenic seed, the plants arising from this seed being capable of expressing a protein directed against pests. By treating such seed with the compositions according to the invention, certain pests can be controlled merely by the expression of the, for example, insecticidal protein, and additionally be protected by the compositions according to the invention against damage.

The compounds or compositions according to the invention are suitable for protecting seed of any plant variety as already mentioned above which is employed in agriculture, in the greenhouse, in forests or in horticulture. In particular, this takes the form of seed of maize, peanut, canola, oilseed rape, poppy, soya beans, cotton, beet (for example sugar beet and fodder beet), rice, sorghum and millet, wheat, barley, oats, rye, sunflower, tobacco, potatoes or vegetables (for example tomatoes, cabbage plants). The compositions according to the invention are likewise suitable for treating the seed of fruit plants and vegetables as already mentioned above. The treatment of the seed of maize, soya beans, cotton, wheat and canola or oilseed rape is of particular importance.

As already mentioned above, the treatment of transgenic seed with a composition according to the invention is also of particular importance. This takes the form of seed of plants which, as a rule, comprise at least one heterologous gene which governs the

expression of a polypeptide with in particular insecticidal properties. Li this context, the heterologous genes in transgenic seed may be derived from microorganisms such as Bacillus, Rhizobium, Pseudomonas, Serratia, Trichoderma, Clavibacter, Glomus or Gliocladium. The present invention is particularly suitable for the treatment of transgenic seed which comprises at least one heterologous gene originating from Bacillus sp. and whose gene product shows activity against the European corn borer and/or the corn root worm. It is particularly preferably a heterologous gene derived from Bacillus thuringiensis.

In the context of the present invention, the composition according to the invention is applied to the seed either alone or in a suitable formulation. Preferably, the seed is treated in a state which is stable enough to avoid damage during treatment. In general, the seed may be treated at any point in time between harvest and sowing. The seed usually used has been separated from the plant and freed from cobs, shells, stalks, coats, hairs or the flesh of the fruits.

When treating the seed, care must generally be taken that the amount of the composition according to the invention applied to the seed and/or the amount of further additives is chosen in such a way that the germination of the seed is not adversely affected, or that the resulting plant is not damaged. This must be borne in mind in particular in the case of active compounds which may have phytotoxic effects at certain application rates.

The formulation, i.e. preparations containing the active ingredient of formula (1), or combinations of these active ingredients with other active ingredients, and optionally a solid, semi-solid or liquid adjuvant, are produced in a manner known *per se,* for example by intimately mixing, kneading or dispersing the active ingredients with compositions of excipients, whereby the physiological compatibility of the formulation excipients must be taken into consideration.
The solvents in question may be: alcohols (aliphatic and aromatic), such as benzylalcohol, ethanol, propanol, isopropanol or butanol, fatty alcohols, such as oleyl alcohol and glycols and their ethers and esters, such as glycerin, propylene glycol, dipropylene glycol ether, ethylene glycol, ethylene glycol monomethyl or -ethyl ether and butyl dioxytol, carbonates, such as propylene carbonate, ketones, such as cyclohexanone, isophorone or diacetanol alcohol and polyethylene glycols, such as PEG 300. In addition, the compositions may comprise strong polar solvents, such as N-methyl-2-pyrrolidone, dimethyl sulfoxide or

dimethylformamide, or water, fatty acid esters, such as ethyl oleate or isopropylpalmitate, vegetable oils, such as rape, castor, coconut, or soybean oil, synthetic mono-, di-, triglycerides like e.g. glyceryl monostearate and medium chain triglycerides and also, if appropriate, silicone oils. The mentioned ingredients may also serve as carrier for particulate application froms.

As ointment base resp. structure building ingredients the following excipients may be used: Petroleum based substances, such as Vaseline or paraffines, bases made from wool fat, like e.g. lanolin or lanolin alcohols, polyethylene glycols like e.g. macrogols and lipid bases like e.g. phospholipids or triglycerids, such as hydrogenated vegetable oils.

The use of emulsifiers, wetting agents and spreading agents may also be required, in general, lecithins like soy lecithin, salts of fatty acids with alkaline earth and alkali metals, alkyl sulfates like sodium cetylstearyl sulphate, cholates, fatty alcohols like cetyl alcohol, sterols like cholestesterol, polyoxyethylene sorbitan fatty acid esters like polysorbate 20, sorbitan fatty acid esters like sorbitan mono laureate, fatty acid esters and fatty alcohol ethers of polyoxyethylene like poloxyl oleyl ether, polyoxypropylene polyoxyethylene block copolymers as e.g. Pluronic™ , saccharose esters like saccharose distearate, polyglyceryl fatty acid esters like polyglycerol oleate and fatty acid esters like e.g. ethyl oleate or isopropylmyristate.

The formulations may also include gelifying and stiffening agents, like e.g. polyacrylic acid derivatives, cellulose ethers, polyvinyl alcohols, polyvinylpyrrolidone and fine disperse silicium dioxide.

As polymeric agents with controlled release properties, may be applied derivatives made by e.g. polylactic acid, polylactic coglycolic acid, poly orthoester, polyethylene carbonate, poly anhydrids and starch and PVC based matrices.

The addition of penetration enhancers like ketones, sulfoxides, amides, fatty acid esters and fatty alcohols may be necessary.

Also preservatives like sorbic acid, benzyl alcohol and parabenes, and antioxidants as e.g. alpha tocopherol may be added.

The active ingredient or combinations of the active ingredient may also applied in capsules, like hard gelatine capsules or soft capsules.

The binders for tablets and boli may be chemically modified polymeric natural substances

that are soluble in water or in alcohol, such as starch, cellulose or protein derivatives (e.g. methyl cellulose, carboxymethyl cellulose, ethylhydroxyethyl cellulose, proteins such as zein, gelatin and the like), as well as synthetic polymers, such as polyvinyl alcohol, polyvinyl pyrrolidone etc. The tablets also contain fillers (e.g. starch, microcrystalline cellulose, sugar, lactose etc.), lubricants (e.g. magnesium stearate), glidants (e.g. colloidal silicon dioxide) and disintegrants (e.g. cellulose derivatives) and acid resistant coatings, like e.g. acrylic acid esters.

The compounds of formula (1) according to the invention may be used alone or in combination with other biocides. They may be combined with pesticides having the same sphere of activity e.g. to increase activity, or with substances having another sphere of activity e.g. to broaden the range of activity. It can also be sensible to add so-called repellents. Since the compounds of formula (1) are adulticides, i.e. since they are effective in particular against the adult stage of the target parasites, the addition of pesticides which instead attack the juvenile stages of the parasites may be very advantageous. In this way, the greatest part of those parasites that produce great economic damage will be covered. Moreover, this action will contribute substantially to avoiding the formation of resistance. Many combinations may also lead to synergistic effects, i.e. the total amount of active ingredient can be reduced, which is desirable from an ecological point of view. Preferred groups of combination partners and especially preferred combination partners are known to the art-skilled worker.

As a consequence, a further aspect of the present invention relates to a combination preparation for the control of agricultural invertebrate pests, characterised in that it contains, in addition to a compound of formula (1), at least one further active ingredient having the same or different sphere of activity and at least one physiologically acceptable carrier. The present invention is not restricted to two-fold combinations.

As a rule, the agricultural compositions according to the invention contain 0.1 to 99 % by weight, especially 0.1 to 95 % by weight of one or more active ingredients of formula (1), 99.9 to 1 % by weight, especially 99.8 to 5 % by weight of a solid or liquid admixture, including 0 to 25 % by weight, especially 0.1 to 25 % by weight of a surfactant.

In each of the processes according to the invention for pest control or in each of the pest control compositions according to the invention, the active ingredients of formula (1) can be

used in all of their steric configurations or in mixtures thereof.

The following examples serve to illustrate the invention. They do not limit the invention. The letter 'h' stands for hour. The starting materials are known and partially commercially available or may be produced in analogy to methods known per se.

Preparation examples:

Example 1: 4,6-bis-(4-fluoro-3-(trifluoromethyl)phenoxy)-pyrimidin-5-ylamine

Dissolved in 70 ml DMF, 40.8 g 4-fluoro-3-(trifluoromethyl)-phenol are stirred under an inert gas atmosphere and cooled to 10°C. To this, 5.8 g sodium hydride are added slowly under vigorous stirring. The mixture is then allowed to warm up to room temperature and stirred for 1 h. Then, a solution of 19.9 g 4,6-Dichloro-5-aminopyrimidine in 50 ml DMF is added dropwise and the reaction mixture is heated for 24 h at 80°C. After quenching with water and concentration under reduced pressure the crude mixture is extracted twice with ethyl acetate. The combined organic phases are washed with water and saturated sodium chloride and finally dried over magnesium sulfate and charcoal. The dark brown oily residue is dissolved in 100 ml diethylether and treated with 100 ml hexane. The resulting title compound crystallizes as a colorless solid with a melting point of 104-105°C.

Example 2: 2-Bromo-4,6-bis-(4-fluoro-3-trifluoromethyl-phenoxy)-pyrimidin-5-ylamine

3.9ml bromine in 50ml acetic acid are added dropwise to a solution of 34g of 4,6-bis-(4-fluoro-3-(trifluoromethyl)phenoxy)-pyrimidin-5-ylamine in 150ml acetic acid under nitrogen. The mixture is stirred overnight at room temperature. 2ml of bromine in 25ml acetic acid are added dropwise. The mixture is stirred overnight at room temperature and is then poured over 2.5l ice/water. The precipitate is collected by filtration, dissolved in 400ml dichloromethane, and washed with water. The organic layer is dried over $MgSO_4$, filtered and then concentrated under vacuum to give 29g of a brown solid. The solid is further purified by filtration over silica gel and recrystallization from diisopropylether to give 23g of 2-Bromo-4,6-bis-(4-fluoro-3-trifluoromethyl-phenoxy)-pyrimidin-5-ylamine (mp. 184-186°C).

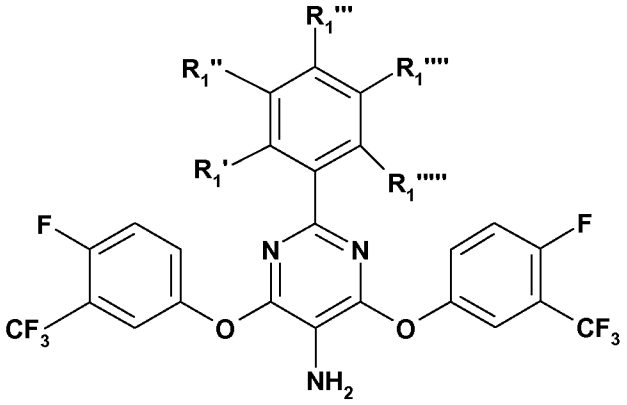
Example 3: 2-(3-Dimethylamino-phenyl)-4,6-bis-(4-fluoro-3-trifluoromethyl-phenoxy)-pyrimidin-5-ylamine

23g of 2-Bromo-4,6-bis-(4-fluoro-3-trifluoromethyl-phenoxy)-pyrimidin-5-ylamine are dissolved under nitrogen together with 10.7g of 3-(N,N-dimethylamino) phenylboronic acid, 0.4g of tris(dibenzylideneacetone)dipalladium, 27.5g of $K_3PO_4$ and 0.7g of 2-dicyclohexyl-

phosphino-2',6'-dimethoxybiphenyl in 450ml of toluene. The mixture is heated at 75°C for 24h, diluted with diethylether, washed with water and then dried over $MgSO_4$. The solvents are removed under vacuum. 14.8g of the title compound are isolated as white powder (mp. 110-111°C) after purification by filtration and recrystallization from cyclohexane.

The substances named in the following Tables 1, 1a, 1b, 2, 2a and 2b are prepared analogously to the above-described method.

Table 1 provides 34 compounds of formula




(1'),

wherein the meanings of $R_1'$, $R_1''$, $R_1'''$, $R_1''''$ and $R_1'''''$ are given in Table 1.

Table 1:

| No | $R_1'$ | $R_1''$ | $R_1'''$ | $R_1''''$ | $R_1'''''$ | mp (°C) |
|---|---|---|---|---|---|---|
| 1.1 | H | H | $CF_3$ | H | H | 128-129 |
| 1.2 | H | H | $OCH_3$ | H | H | 158-160 |
| 1.3 | H | H | Cl | H | H | 156-158 |
| 1.4 | H | Cl | H | H | H | 142-144 |
| 1.5 | Cl | H | H | H | H | 106-109 |
| 1.6 | $OCH_3$ | H | H | H | H | 128-130 |
| 1.7 | H | $OCH_3$ | H | H | H | 110-112 |
| 1.8 | H | Cl | H | Cl | H | 157-160 |
| 1.9 | H | $CH_3$ | H | H | H | 128-130 |
| 1.10 | H | $CH(CH_3)_2$ | H | H | H | 79-81 |
| 1.11 | H | S-$CH_3$ | H | H | H | 89-91 |

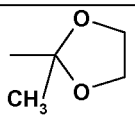
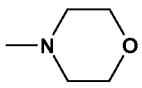
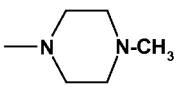
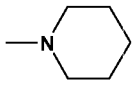
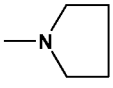
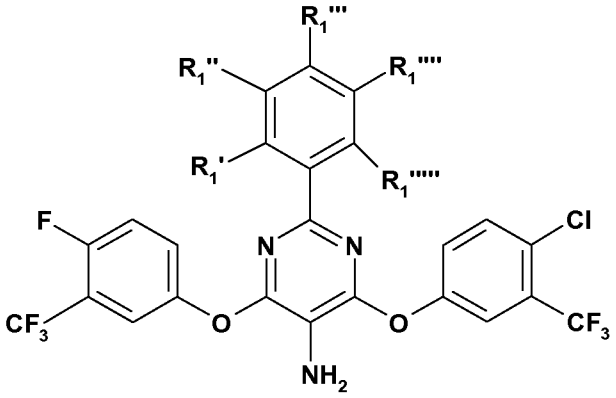
| No | $R_1$' | $R_1$'' | $R_1$''' | $R_1$'''' | $R_1$''''' | mp (°C) |
|---|---|---|---|---|---|---|
| 1.12 | H | $OCH_3$ | H | $OCH_3$ | H | 143-144 |
| 1.13 | H | F | H | H | H | 113-115 |
| 1.14 | H | $C(O)CH_3$ | H | H | H | 140-141 |
| 1.15 | H | $OCF_3$ | H | H | H | 142-143 |
| 1.16 | H | $S(O)CH_3$ | H | H | H | 155-156 |
| 1.17 | H | $S(O)_2CH_3$ | H | H | H | 140-142 |
| 1.18 | H | $CH(OH)CH_3$ | H | H | H | |
| 1.19 | H | $NHC(O)CH_3$ | H | H | H | 205-206 |
| 1.20 | H | OH | H | H | H | 173-175 |
| 1.21 | H | $NHS(O)_2CH_3$ | H | H | H | 151-153 |
| 1.22 | F | H | H | H | F | 79-81 |
| 1.23 | H | $CH_3$ | F | H | H | 130-132 |
| 1.24 | H |  | H | H | H | 142-144 |
| 1.25 | H | $OCH_3$ | H | H | F | 85-87 |
| 1.26 | H | $NH_2$ | H | H | H | 128-129 |
| 1.27 | H | $CH_2OCH_3$ | H | H | H | 116-118 |
| 1.28 | H | $CH_2N(CH_3)_2$ | H | H | H | |
| 1.29 | H | $N(CH_3)_2$ | F | H | H | |
| 1.30 | H |  | H | H | H | 149-150 |
| 1.31 | H |  | H | H | H | |
| 1.32 | H |  | H | H | H | 118-119 |
| 1.33 | H |  | H | H | H | 104-105 |
| 1.34 | H | $N(CH_3)_2$ | H | H | H | 110-111 |

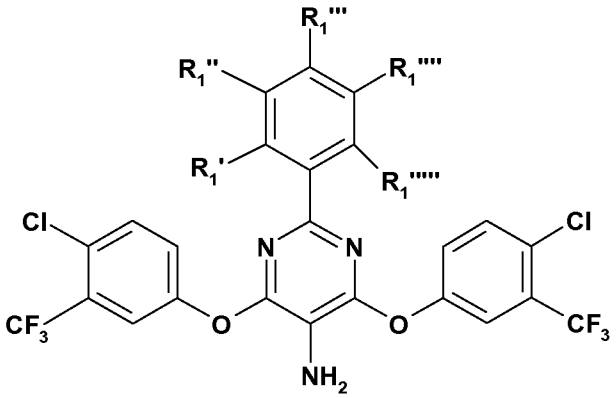
Table 1a provides 34 compounds of formula



(1''),

wherein the meanings of $R_1'$, $R_1''$, $R_1'''$, $R_1''''$ and $R_1'''''$ are given in Table 1.

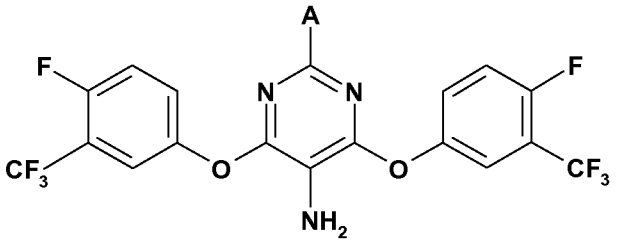
Table 1b provides 34 compounds of formula



(1'''),

wherein the meanings of $R_1'$, $R_1''$, $R_1'''$, $R_1''''$ and $R_1'''''$ are given in Table 1.

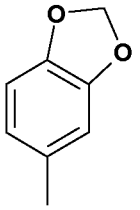
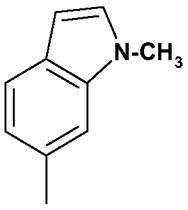
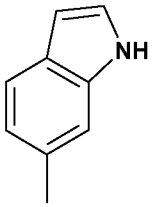
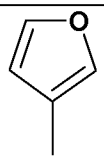
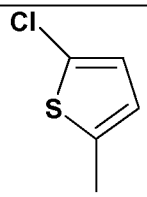
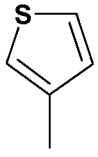
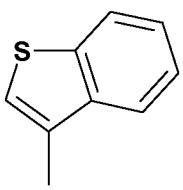
Table 2 provides 12 compounds of formula



(1*),

wherein the meaning of A is given in Table 2.

Table 2:

| No | A | mp (°C) |
|---|---|---|
| 2.1 |  | 128-129 |
| 2.2 |  | 122-124 |
| 2.3 |  | |
| 2.4 |  | 99-102 |
| 2.5 |  | 106-108 |
| 2.6 |  | 108-111 |
| 2.7 |  | 127-129 |

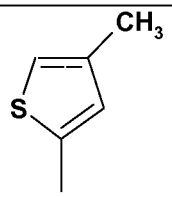
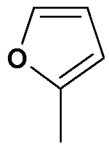
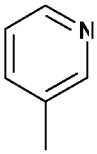
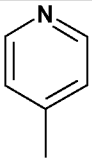
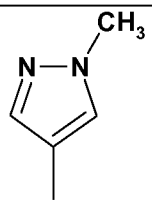
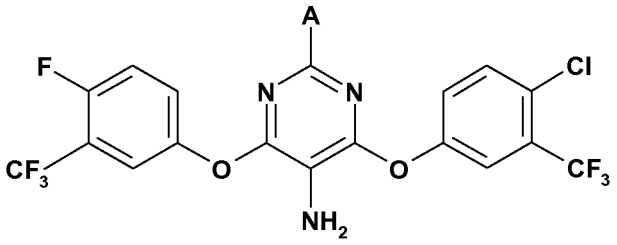
| No | A | mp (°C) |
|---|---|---|
| 2.8 |  | 100-102 |
| 2.9 |  | 128-130 |
| 2.10 |  | 124-125 |
| 2.11 |  | 170-171 |
| 2.12 |  | 138-140 |

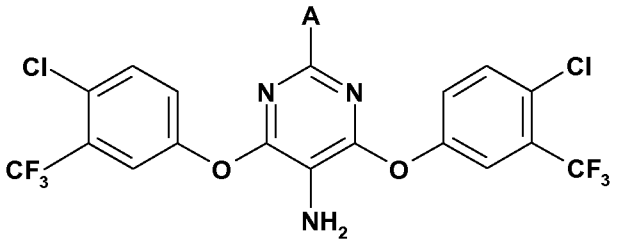
Table 2a provides 12 compounds of formula



(1**),

wherein the meaning of A is given in Table 2.

Table 2b provides 12 compounds of formula




(1***),

wherein the meaning of A is given in Table 2.

Biological Examples:

A. Insecticidal efficacy testing against peach-potato aphids

Leaf discs (3 cm diameter) were cut fresh from uninfested Chinese cabbage *(Brassica napus L var chinensis cv Tip-Top).* Leaf discs were placed onto a bed of agar (1 % w/w) contained in 5 cm Petri dishes. Each leaf disc was infested with 20 adult aphids, and then sprayed with the test solution in a Burkhard Potter Tower calibrated to apply a volume of 300 l/ha. The Burkhard Potter Tower was calibrated following the methodology set out in i2LResearch Ltd SOP/231/02, 'Use, Calibration and Maintenance of the Potter Tower'. The Petri dishes were sealed with a ventilated lid, and incubated in a controlled environment room at 20 ± 2 °C, 60-70% relative humidity and a L16:D8 photoperiod.

Aphid mortality was assessed at 24h and 72 h after treatment. Aphids were scored as dead if they were unable to walk after stimulation with a seeking needle.

Three replicates of 20 aphids were tested at a concentration of 0.05% and 0.01% of the active compound. The Table below shows the results obtained with the compound of Example 3 (compound 1.34).

Table 2. Mortality and Abbott corrected % mortality of adult peach-potato aphids 72 hours after treatment with the compound No. 1.34 (Example 3) at an application rate of 300 l/ha.

| Replicate | Concentration Compound 1.34 (%) | Mortality at 72 h | Total tested | % Mortality |
|---|---|---|---|---|
| 1 | 0.05 | 20 | 20 | 100.00 |
| 2 | 0.05 | 20 | 20 | 100.00 |

| | | | | |
|---|---|---|---|---|
| 3 | 0.05 | 20 | 20 | 100.00 |
| 1 | 0.01 | 19 | 20 | 95.00 |
| 2 | 0.01 | 19 | 20 | 95.00 |
| 3 | 0.01 | 19 | 20 | 95.00 |

The above test clearly demonstrates the efficacy of compound 1.34 against adult peach-potato aphids at a concentration as low as of 0.01 % or higher.

B. Acaricidal efficacy testing against two-spotted spider mites

Leaf discs (3 cm diameter) were cut fresh from uninfested dwarf French bean plants. Leaf discs were placed onto a bed of agar contained in 5 cm Petri dishes. Each leaf disc was infested with 20-25 adult mites within the circle of insect glue using a fine brush. Leaf discs were then sprayed with the test solution in a Burkhard Potter Tower. The Petri dishes were sealed with a ventilated lid, and incubated at 26 ± 2 °C, 60-70% relative humidity on L16:D8 photoperiod.

Mites were scored as dead or alive under a binocular microscope 24 h and 72 h after treatment with the two compounds.

The bioassay for each active compound was then set up for the susceptibility of the standard laboratory susceptible strain with a concentration of 0.05% or 0.01% of the active compound. The efficacy of compound 1.34 against adult spider mites is shown in Table 4:

Table 4. Mortality and Abbott corrected % mortality of adult spider mites 72 hours after treatment with compound 1.34 an application rate of 300 l/ha.

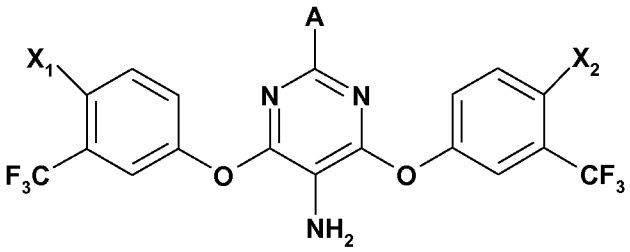
| **Replicate** | **Concentration Compound 1.34 (%)** | **Mortality at 72 h** | **Total tested** | **% Mortality** |
|---|---|---|---|---|
| 1 | 0.05 | 20 | 20 | 100 |
| 2 | 0.05 | 20 | 20 | 100 |
| 3 | 0.05 | 20 | 20 | 100 |
| 1 | 0.01 | 19 | 20 | 95 |

| | | | | |
|---|---|---|---|---|
| 2 | 0.01 | 19 | 20 | 95 |
| 3 | 0.01 | 19 | 20 | 95 |

The above test clearly demonstrates the efficacy of compound 1.34 against two-spotted spider mites at a concentration as low as of 0.01 % or higher.

**Claims:**

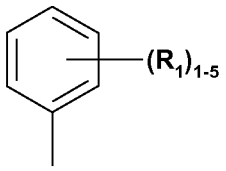
1. Use of a compound of formula




(1)

wherein $X_1$ and $X_2$ are each independently halogen; and

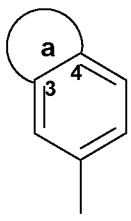
A is a radical of formula




(2)

wherein $(Ri)_{1-5}$ is 1 to 5 same or different substituents selected from the group consisting of $CrC_4$-alkyl, halogen-$CrC_4$-alkyl, hydroxy-$CrC_4$-alkyl, $Ci\text{-}C_4$-alkoxy-$Ci\text{-}C_4$-alkyl, **$R2R_3N$-C1-C4-**alkyl, halogen, nitro, cyano, hydroxy, $CrC_4$-alkoxy, halogen-$CrC_4$-alkoxy, thiol, **C1-C4-**alkylthio, halogen-$CrC_4$-alkylthio, $CrC_4$-alkanoyl, halogen -$CrC_4$-alkanoyl, **C1-C4-**alkanoylamino, halogen-$Ci\text{-}C_4$-alkanoylamino, $COOR_2$, $CONH_2$, $CONR2R_3$, $S0_3H$, **$SO2NR2R_3$,** $Ci\text{-}C_4$-alkylsulfonylamino, $CrC_4$-alkylsulfonyloxy, halogen-$CrC_4$-alkylsulfonyloxy, $CrC_4$-alkylsulfonyl, halogen-$CrC_4$-alkylsulfonyl, $CrC_4$-alkylsulfinyl, halo-$CrC_4$-alkylsulfinyl, $NR_2R_3$ and a $C_3$-$C_5$-heterocyclic radical having 1 or 2 same or different hetero-atoms selected from O, S and N ;

or A is a radical of formula




(3)

wherein ring (a) denotes a 5- or 6-membered carbocyclic or heterocyclic ring which is annulated in the 3- and 4-position;

or A is a heterocyclic radical having from 3 to 9 C-atoms and from 1 to 3 same or different heteroatoms selected from the group consisting of N, O and S, which heterocyclic radical is unsubstituted or further substituted by **Ci-C**$_4$-alkyl, hydroxy, **CrC** $_4$-alkoxy, halogen or NR2R$_3$; and

**R$_2$** and **R$_3$** are each independently hydrogen or **Ci-C**$_4$-alkyl which is unsubstituted or substituted by halogen, hydroxy, **CrC** $_4$-alkoxy, thiol or **Ci-C**$_4$-alkylthio,

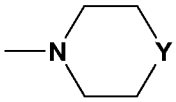
in free form or in salt form,

in the control of agricultural invertebrate pests.

2. Use according to claim 1, wherein $X_1$ and $X_2$ are each fluorine.

3. Use according to claim 1 or 2, wherein A is a radical of formula (2).

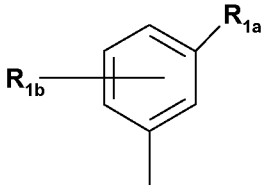
4. Use according to claim 3, wherein **(R$_1$)$_{1-5}$** is 1 or 2 same or different substituents selected from the group consisting of unsubstituted or halogeno-, thiol-, **CrC** $_2$-alkoxy- or hydroxyl-substituted **CrC** $_4$-alkyl; hydroxyl; unsubstituted or halogeno-substituted **CrC** $_4$-alkoxy; thiol; **CrC** $_4$-alkylthio; halogen; **CrC** $_2$-alkylsulfinyl; **Ci-C**$_2$-alkylsulfonyl; **Ci-C**$_2$-alkylsulfonylamino; acetyl; acetylamino; a radical **NR$_2$R$_3$** or **R$_2$R$_3$N-CrC** $_2$**-alkyl**, wherein **R$_2$** and **R$_3$** are each independently hydrogen or **Ci-C**$_4$-alkyl which is unsubstituted or substituted by halogen, hydroxy, **CrC** $_4$-alkoxy, thiol or **Ci-C**$_4$-alkylthio; and a radical of formula




**(4)**

wherein Y is NH, NC$_1$-C$_2$-alkyl, O or S.

5. Use according to claim 3, wherein A is a radical of formula

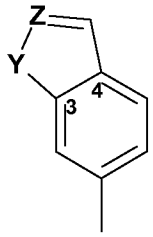



**(2a)**

wherein **R$_{1a}$** is unsubstituted or **Ci-C**$_2$-alkoxy- or hydroxyl-substituted **CrC** $_4$-alkyl; hydroxyl; unsubstituted or halogen-substituted **CrC** $_2$-alkoxy; **Ci-C**$_2$-alkylthio; halogen; a radical **NR$_2$R$_3$** or **R$_2$R$_3$N-Ci-C$_2$-alkyl**, wherein **R$_2$** and **R$_3$** are each independently hydrogen or **Ci-C**$_2$-alkyl, which is unsubstituted or substituted by chlorine hydroxyl, methoxy, ethoxy, thiol, methylthio or ethylthio; or morpholinyl; and **R$_{1b}$** is **H,** halogen, **Ci-C**$_2$-alkoxy, **CrC** $_2$-alkyl, halo**-CrC** $_2$-alkyl or halo**-CrC** $_2$-alkoxy, in particular **H.**

6. Use according to claim 5, wherein $R_{1a}$ is methyl, ethyl, isopropyl, 1- or 2-hydroxyethyl, hydroxy, methoxy, ethoxy, trifluoromethoxy, methylthio, chlorine, fluorine, amino, N-mono- or N,N-dimethylamino, N-mono- or N,N-diethylamino, N-2-hydroxyethylamino N,N-dimethylaminomethyl, N,N-diethylaminomethyl and morpholinyl, and $R_{1b}$ is H.

7. Use according to claim 1 or 2, wherein A is a radical of formula




(3a)

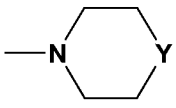
wherein Y is -NH-, -N($C_1$-$C_2$-alkyl)-, -O- or -S-, in particular -NH- or -N($C_1$-$C_2$-alkyl)-; and Z is CH or N, in particular.

8. Use according to claim 1 or 2, wherein A is a 5- or 6-membered heterocyclic radical having 1 or 2 same or different heteroatoms selected from the group consisting of N, O and S, which radical is further unsubstituted or substituted by $CrC_2$-alkyl, $CrC_2$-alkoxy or halogen, and/or may carry an annulated benzo ring.

9. Use according to claim 8, wherein A is thienyl; furanyl; pyrrolyl; benzothienyl; benzofuranyl; pyrazolyl, pyridinyl; or pyrimidinyl; each of which being unsubstituted or substituted by halogen or Ci-$C_2$-alkyl.

10. Use according to claim 1 or 2, wherein A is

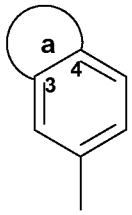
(i) a radical of the above-given formula (2), wherein $(R_1)_{1-5}$ is 1 to 5, preferably 1 or 2, same or different substituents selected from the group consisting of unsubstituted or halogeno-, thiol-, Ci-$C_2$-alkoxy- or hydroxyl-substituted $CrC_4$-alkyl; hydroxyl; unsubstituted or halogeno-substituted $CrC_4$-alkoxy; thiol; $CrC_4$-alkylthio; halogen; Ci-$C_2$-alkylsulfinyl; Ci-$C_2$-alkylsulfonyl; Ci-$C_2$-alkylsulfonylamino; acetyl; acetylamino; a radical $NR_2R_3$ or $R_2R_3$N-Ci-$C_2$-alkyl, wherein $R_2$ and $R_3$ are each independently hydrogen or $CrC_4$-alkyl which is unsubstituted or substituted by halogen, hydroxy, $CrC_4$-alkoxy, thiol or $CrC_4$-alkylthio; and a radical of the formula




(4)

wherein Y is NH, NCi-$C_2$-alkyl, O or S; or is

(ii) a radical of the above-given formula



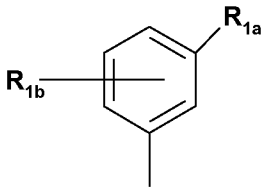

(3)

wherein the annulated ring (a) is a 6-membered or a 5-membered heterocyclic ring having one or two heteroatoms selected from the group consisting of N, O and S; or is

(iii) a 5- or 6-membered heterocyclic radical having 1 or 2 same or different heteroatoms selected from the group consisting of N, O and S, which radical is further unsubstituted or substituted by Ci-$C_2$-alkyl, Cr$C_2$-alkoxy or halogen, and/or may carry an annulated benzo ring.

11. Use according to claim 1 or 2, wherein A is

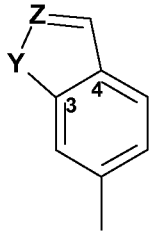
(i) a radical of the above-given formula



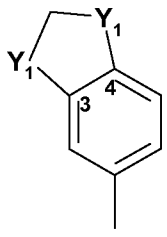

(2a)

wherein $R_{1a}$ is unsubstituted or Cr$C_2$-alkoxy- or hydroxyl-substituted Ci-$C_4$-alkyl, hydroxyl; unsubstituted or halogen-substituted Cr$C_2$-alkoxy; Ci-$C_2$-alkylthio; halogen; a radical $NR_2R_3$ or $R_2R_3$N-methyl, wherein $R_2$ and $R_3$ are each independently hydrogen or Cr$C_2$-alkyl, which is unsubstituted or substituted by chlorine hydroxyl, methoxy, ethoxy, thiol, methylthio or ethylthio; or morpholinyl; and $R_{1b}$ is H, halogen, Ci-$C_2$-alkoxy, Cr$C_2$-alkyl, halo-Cr$C_2$-alkyl or halo-Ci-$C_2$-alkoxy; or is

(ii) a radical of the formula




(3a) or




(3b)

wherein Y is -NH-, -N(C$_1$-$C_2$-alkyl)-, -O- or -S-, Z is CH or N; and $Y_1$ is -0-; or is

(iii) a thienyl; furanyl; pyrrolyl; benzothienyl; benzofuranyl; pyrazolyl, pyridinyl; or pyrimidinyl radical, each of which being unsubstituted or substituted by halogen or Ci-$C_2$-alkyl.

12. Use according to claim 1, wherein the compound of formula (1) is 2-(3-Dimethylamino-

phenyl)-4,6-bis-(4-fluoro-3-trifluorom ethyl-phenoxy)-pyrimidin-5-ylamine.

13. Composition for the use in the control of agricultural invertebrate pests, comprising as active ingredient at least one compound of the formula (1) according to any one of claims 1 to 12, in addition to a carrier and/or a dispersant.

14. Method of controlling agricultural invertebrate pests, which comprises applying an agriculturally effective amount of at least one compound of formula (1) according to any one of claims 1 to 12.