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(54) Title: PHENOXYETHANAMINE DERIVATIVES FOR CONTROLLING PESTS

(57) Abstract: The invention is in the technical field of insect control and relates to novel phenoxyethanamine derivatives, their production and use for controlling pests and in particular insecticide-resistant pests such as mosquitoes and cockroaches.

PHENOXYETHANAMINE DERIVATIVES FOR CONTROLLING PESTS

The invention is in the technical field of insect control and relates to novel phenoxyethanamine derivatives, their production and use for controlling pests and in particular insecticide-resistant pests such as mosquitoes and cockroaches.

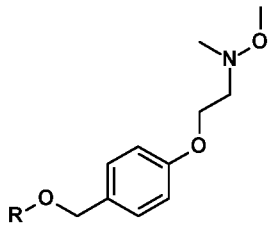
Today's main insecticides used for vector control (including mosquitoes) relate to four chemical classes: pyrethroids, organochlorines (including DDT), organophosphates and carbamates. The use of pyrethroids far exceeds that of the other three classes due to its rapid and durable effect and its low toxicity and costs. However, recently resistance against pyrethroids have been reported which causes major concerns for the World Health Organization (WHO) and solutions how to tackle the emerging resistance are seen as to be of critical importance for the future vector control management (see e.g. http://www.who.int/malaria/world_malaria_report_2011/WMR2011_chapter4.pdf).

Two main mechanisms of insecticide resistance were identified: target site resistance and metabolic resistance. Target site resistance occurs when the site of action of an insecticide is modified in mosquito populations so that the insecticide no longer binds effectively and the insect is therefore unaffected, or less affected, by the insecticide. Target site resistant mutations can affect acetylcholinesterase, which is the molecular target of organophosphates and carbamates, voltage-gated sodium channels (for pyrethroids and DDT), which is known as knock-down resistance (*kdr*), or the GABA receptor (for Dieldrin), which is known as resistance to Dieldrin (*Rdl*). Metabolic resistance occurs when increased levels or modified activities of a detoxifying enzyme system (such as esterases, monooxygenases or glutathione S-transferases (GST)) prevent the insecticide from reaching its intended site of action. Both mechanisms of resistances can be found in the same vector populations and sometimes within the same vector.

Pyrethroids are the only insecticides that have obtained WHO recommendation against Malaria vectors or both Indoor Residual Sprays (IRS) and Long-Lasting Insecticidal Mosquito Nets (LLINs), in the form of Alpha-Cypermethrin, Bifenthrin, Cyfluthrin, Permethrin, Deltamethrin, Lambda-Cyhalothrin and Etofenprox. It has been the chemical class of choice in agriculture and public health applications over the last several decades because of its relatively low toxicity to humans, rapid knock-down effect, relative longevity (duration of 3-6 months when used as IRS), and low cost. However, massive use of pyrethroids in agricultural applications and for vector control led to the development of resistance in major malaria and dengue vectors. Strong resistance has e.g. been reported for the pyrethroid Deltamethrin (and Permethrin) for the Anopheles gambiae Tiassalé (from southern Côte d´Ivoire) strain (Constant V.A. Edi et al., Emerging Infectious Diseases, Vol. 18, No. 9, September 2012). Pyrethroid resistance was also reported for Permethrin, Deltamethrin and Lambda-Cyhalothrin for the Aedes aegypti Cayman Island strain (Angela F. Harris et al., Am. J. Trop. Med. Hyg., 83(2), 2010) and Alpha-

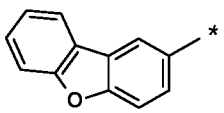
Cypermethrin, Permethrin and Lambda-Cyhalothrin for certain Anopheles strains (Win Van Bortel, Malaria Journal, 2008, 7:102). Pyrethroid resistance has also been detected in cockroaches.

Due to the emerging resistance in pests such as mosquitoes and/or cockoaches against certain insecticides and in particular against pyrethroids there is an ongoing need for alternative solutions and strategies for pest control management and in particular vector control management. With the present invention it has now been surprisingly found that the phenoxyethanamine compounds of the formula (I)



(I)

in which R is



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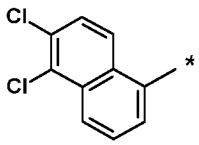


where the asterisk* indicates the point of attachment to the compound of formula (I), are useful for pest control management and in particular vector control management noticeable also the control of insecticide-resistant pests such as mosquitoes and cockroaches.

The compound(s) of the formula (I) according to the invention also encompass their agrochemically active salts, metal complexes and N-oxides.

A preferred embodiment of compound(s) of formula (I) relate to 2-{4-[(Dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine and/or 2-(4-{[(5,6-Dichlor-1-naphthyl)-oxy]methyl}phenoxy)-N-methoxy-N-methylethanamine.

Phenoxyethanamine compounds have been described in WO 2002017712 A2 and WO 2006078619 A1 in connection with their use to control insects in agricultural crops such as *Heliothis virescens*, the American budworm which is a moth of the Noctuidae family. The larvae feed on various important crops such as tobacco, soy, cotton etc.

WO 2002017712 A2 and WO 2006078619 A1 do not disclose the compounds of the present invention explicitly and these prior art documents also do not describe the use of phenoxyethanamine compounds to control mosquitos or cockroaches, not to mention insecticide-resistant mosquitos or cockroaches.

The term "insecticide-resistant pest" respectively "insecticide-resistant mosquito" resp. "insecticide-resistant cockroach" means a pest respectively a mosquito resp. a cockroach that is resistant to at least one insecticide selected from the group of pyrethroids, organophosphates and carbamates. A preferred embodiment of the invention is the control of "insecticide-resistant mosquitos" and/or "insecticide-resistant cockroaches". In a preferred definition the term "insecticide-resistant mosquito" resp. "insecticide-resistant cockroach" refers to a mosquito resp. a cockroach that is resistant to a least one insecticide selected from the group of pyrethroids, organophosphates and carbamates (preferably pyrethroids).

Pyrethroids in this connection refer more preferably to at least one compound selected from the group of Acrinathrin, Allethrin (d-cis-trans, d-trans), Beta-Cyfluthrin, Bifenthrin, Bioallethrin, Bioallethrin-S-cyclopentyl-isomer, Bioethanomethrin, Biopermethrin, Bioresmethrin, Chlovaporthrin, cis-Cypermethrin, cis-Resmethrin, cis-Permethrin, Clocythrin, Cycloprothrin, Cyfluthrin, Cyhalothrin, Cypermethrin (alpha-, beta-, theta-, zeta-), Cyphenothrin, Deltamethrin, Empenthrin (1R-isomer), Esfenvalerate, Etofenprox, Fenpropathrin, Fenpyrithrin, Fenvalerate, Flubrocythrinate, Flucythrinate, Flufenprox, Flumethrin, Fluvalinate, Fubfenprox, gamma-Cyhalothrin, Imiprothrin, Kadethrin, Lambda-Cyhalothrin, Permethrin (cis-, trans-), Phenothrin (1R-trans isomer), Prallethrin, Protrifenbute, Pyresmethrin, Resmethrin, RU 15525, Silafluofen, tau-Fluvalinate, Terallethrin, Tetramethrin (1R isomer), Tralomethrin, ZXI 8901 and Pyrethrin (pyrethrum).

Organophosphate refers preferably to a compound selected from the group of Acephate, Azamethiphos, Azinphos (-methyl, -ethyl), Bromophos-ethyl, Bromfenvinfos (-methyl), Butathiofos, Cadusafos, Carbophenothion, Chlorethoxyfos, Chlorfenvinphos, Chlormephos, Chlorpyrifos(-methyl/-ethyl), Coumaphos, Cyanofenphos, Cyanophos, Chlorfenvinphos, Demeton-S-methyl, Demeton-S-methylsulphon, Dialifos, Diazinon, Dichlofenthion, Dichlorvos/DDVP, Dicrotophos, Dimethoate, Dimethylvinphos, Dioxabenzofos, Disulfoton, EPN, Ethion, Ethoprophos, Etrimfos, Famphur, Fenamiphos, Fenitrothion, Fensulfothion, Fenthion, Flupyrazofos, Fonofos, Formothion, Fosmethilan, Fosthiazate, Heptenophos, Iodofenphos, Iprobenfos, Isazofos, Isofenphos, Isopropyl O-Salicylate, Isoxathion, Malathion, Mecarbam, Methacrifos, Methamidophos, Methidathion, Mevinphos, Monocrotophos, Naled, Omethoate, Oxydemeton-methyl, Parathion (-methyl/-ethyl), Phenthoate, Phorate, Phosalone, Phosmet, Phosphamidon, Phosphocarb, Phoxim, Pirimiphos (-methyl/-ethyl), Profenofos, Propaphos, Propetamphos, Prothiofos, Prothoate, Pyraclofos, Pyridaphenthion, Pyridathion, Quinalphos, Sebufos, Sulfotep, Sulprofos, Tebupirimfos, Temephos, Terbufos, Tetrachlorvinphos, Thiometon, Triazophos, Triclorfon and Vamidothion. In a more preferred embodiment, the term

organophosphate refers to a compound selected from the group of Acephate, Chlorpyrifos, Dimethoate, Diazinon, Malathion, Methamidophos, Monocrotophos, Parathion-methyl, Profenofos and Terbufos.

Carbamate refers to a compound selected from the group of Alanycarb, Aldicarb, Aldoxycarb, Allyxycarb, Aminocarb, Bendiocarb, Benfuracarb, Bufencarb, Butacarb, Butocarboxim, Butoxycarboxim, Carbaryl, Carbofuran, Carbosulfan, Cloethocarb, Dimetilan, Ethiofencarb, Fenobucarb, Fenothiocarb, Formetanate, Furathiocarb, Isoprocarb, Metam-sodium, Methiocarb, Methomyl, Metolcarb, Oxamyl, Pirimicarb, Promecarb, Propoxur, Thiodicarb, Thiofanox, Trimethacarb, XMC, Xylylcarb and Triazamate. In a more preferred embodiment, the term "carbamate" refers to a compound selected from the group of Aldicarb, Benfuracarb, Carbaryl, Carbofuran, Carbosulfan, Fenobucarb, Methiocarb, Methomyl, Oxamyl, Thiodicarb and Triazamate.

In a more preferred embodiment of the invention, a compound of the invention is used to control insecticide-resistant mosquitoes that are resistant against at least one pyrethroid insecticide. In this connection the pyrethroid resistance is against one pyrethroid as defined above. In a more preferred embodiment the term "pyrethroid" refers to a compound selected from the group of Alpha-Cypermethrin, Bifenthrin, Cyfluthrin, Cypermethrin, Deltamethrin, D-D Trans-Cyphenothrin Esfenvalerate, Etofenprox, Lambda-Cyhalothrin, Permethrin, Pyrethrins (Pyrethrum), Phenothrin and Zeta-Cypermethrin. In a preferred embodiment pyrethroid resistance exists in regard to at least one pyrethroid selected from the group of Cyfluthrin, Cypermethrin, Deltamethrin, Lambda-Cyhalothrin and Permethrin. In a more preferred embodiment pyrethroid resistance exists in regard to at least one pyrethroid selected from the group of Cyfluthrin, Cypermethrin and Permethrin; more preferably against at least Cypermethrin.

In another more preferred embodiment of the invention, a compound of the invention is used to control insecticide-resistant cockroaches that are resistant against at least one pyrethroid insecticide selected from the group of Alpha-Cypermethrin, Bifenthrin, Cyfluthrin, Cypermethrin, Deltamethrin, D-D Trans-Cyphenothrin Esfenvalerate, Etofenprox, Lambda-Cyhalothrin, Permethrin, Pyrethrins (Pyrethrum), Phenothrin and Zeta-Cypermethri; or a carbamate selected from the group of Propoxur; or an organophosphate selected from the group of Fenthion. In a preferred embodiment pyrethroid resistance exists in regard to at least one pyrethroid selected from the group of Cyfluthrin, Cypermethrin, Deltamethrin, Lambda-Cyhalothrin and Permethrin; more preferably against at least Deltamethrin.

In another preferred embodiment of the invention a compound is used to control multi-resistant pests, preferably mosquitoes resp. cockroaches. Multi-resistant mosquitoes refer to mosquitoes resp. cockroaches where several different resistance mechanisms are present simultaneously such as target-site resistance and metabolic resistance. The different resistance mechanisms may combine to provide

resistance to multiple classes of products (IRAC publication: "Prevention and Management of Insecticide Resistance in Vectors of Public Health Importance"; second edition; 2011).

The term "insecticide-resistance" is the term used to describe the situation in which the pests are no longer killed by the standard dose of insecticide (they are no longer susceptible to the insecticide) or manage to avoid coming into contact with the insecticide). See 1.2.; p.27; "Global Plan for Insecticide Resistance Management", WHO 2012).

As an example, WHO recommended standard dose of insecticide for indoor residual treatment against mosquito vectors are: Alpha-Cypermethrin 20-30 mg/m^2, Bifenthrin 25-50 mg/m^2, Cyfluthrin 20-50 mg/m^2, Deltamethrin 20-25 mg/m^2, Etofenprox 100-300 mg/m^2, Lambda-Cyhalothrin 20-30 mg/m^2 (http://www.who.int/whopes/Insecticides_IRS_Malaria_09.pdf). WHO recommended standard dose of insecticide products treatment of nets for malaria vector control are: Alpha-Cypermethrin 20-40 mg/m^2, Cyfluthrin 50 mg/m^2, Deltamethrin 15-25 mg/m^2, Etofenprox 200 mg/m^2, Lambda-Cyhalothrin 10-15 mg/m^2, Permethrin 200-500 mg/m^2 (http://www.who.int/whopes/Insecticides_ITN_Malaria_ok3.pdf). WHO recommended standard dose for space spraying against mosquitoes are described in the publication: http://www.who.int/whopes/Insecticides_for_space_spraying_Jul_2012.pdf. WHO recommended insecticide doses for bed bug control are e.g. for Deltamethrin 0.3 – 0.5 g/l or g/kg; Cyfluthrin 0.4 g/l or g/kg; Cypermethrin 0.5-2.0 g/l or g/kg; Permethrin 1.25 g/l or g/kg etc. (see Pesticides and their Application, WHO 2006; WHO/CDS/NTD/WHOPES/GCDPP/2006.1).

The term "control" mosquitoes resp. cockroaches refers to the possibility to be able to kill and/or repel mosquitoes resp. cockroaches and in particular mosquitoes resp. cockroaches that are insecticide-resistant (e.g. in the case of mosquitoes in order to avoid the biting of humans and transmission of the vectors to humans).

In a preferred embodiment of the invention the mosquitoes and preferably the insecticide-resistant mosquitoes are selected from the genus Anopheles, Culex and Aedes. Examples include Aedes aegypti, Aedes albopictus, Aedes japonicas, Aedes sticticus, Aedes vexans, Coquillettidia perturbans, Culex molestus, Culex pallens, Culex pipiens, Culex quinquefasciatus, Culex restuans, Culex tarsalis, Anopheles albimanus, Anopheles albitarsis, Anopheles annularis, Anopheles aquasalis, Anopheles arabiensis, Anopheles aconitus, Anopheles atroparvus, Anopheles balabacensis, Anopheles coluzzii, Anopheles culicifacies, Anopheles darlingi, Anopheles dirus, Anopheles farauti, Anopheles flavirostris, Anopheles fluviatilis, Anopheles freeborni, Anopheles funestus, Anopheles gambiae s.l. , Anopheles koliensis, Anopheles labranchiae, Anopheles lesteri, Anopheles leucosphyrus, Anopheles maculatus, Anopheles marajoara, Anopheles melas, Anopheles merus, Anopheles messeae, Anopheles minimus, Anopheles moucheti, Anopheles nili, Anopheles nuneztovari, Anopheles plumbeus, Anopheles pseudopunctipennis, Anopheles punctipennis, Anopheles punctulatus, Anopheles quadrimaculatus,

Anopheles sacharovi, Anopheles sergentii, Anopheles sinensis, Anopheles stephensi, Anopheles subpictus, Anopheles sundaicus, Anopheles superpictus, and Mansonia titillans, Ochlerotatus stimulans, Ochlerotatus japonicas.

In a more preferred embodiment of the invention the insecticide-resistant mosquitoes are selected from the group of Anopheles gambiae, Anopheles funestus, Aedes aegypti and Culex spp. In another more preferred embodiment of the invention an active ingredient is used against insecticide-resistant mosquitoes that are selected from the group of Anopheles gambiae RSPH, Anopheles gambiae, strain Tiassalé, Anopheles gambiae VK7, Anopheles funestus FUMOZ-R and Culex quinquefasciatus strain P00.

Anopheles gambiae, strain RSPH is a multi-resistant mosquito (target-site and metabolic-resistance) that is described in the reagent catalog of the Malaria Research and Reference Reagent Resource Center (www.MR4.org; MR4-number: MRA-334).

Anopheles gambiae, strain Tiassalé is a multi-resistant mosquito (target and metabolic-resistant strain) which shows cross-resistance between carbamates, organophosphates and pyrethroids and is described in Constant V.A. Edi et al., Emerging Infectious Diseases; Vol. 18, No. 9, September 2012 & Ludovic P Ahoua Alou et al., Malaria Journal 9: 167, 2010).

Anopheles gambiae, strain VK7 is a target-resistant mosquito and is described in Dabiré Roch Kounbobr et al., Malaria Journal, 7:188, 2008.

Anopheles funestus, strain FUMOZ-R is a metabolic-resistant strain and is described in Hunt et al., Med Vet Entomol. 2005 Sep; 19(3): 271-5. In this article it has been reported that Anopheles funestus – as one of the major malaria vector mosquitoes in Africa – showed resistance to pyrethroids and carbamate insecticides in South Africa.Culex quinquefasciatus (metabolic-resistant to DDT strain P00); received from Texchem, Penang, Malaysia.

In a preferred embodiment of the invention the insecticide-resistant cockroaches are selected from the genus Blattodea e.g. Blatta orientalis, Blattella asahinai, Blattella germanica, Leucophaea maderae, Loboptera decipiens, Neostylopyga rhombifolia, Panchlora spp., Parcoblatta spp., Periplaneta spp., z. B. Periplaneta americana, Periplaneta australasiae, Pycnoscelus surinamensis, Supella longipalpa. In a more preferred embodiment of the invention the insecticide-resistant cockroaches are selected from Blattella germanica, more preferably the strain Ukraine.

In another preferred embodiment of the invention, a compound of the formula (I) is used in vector control. For the purpose of the present invention, a vector is a pest – such as an arthropod, in particular an insect or arachnid, capable of transmitting pathogens such as, for example, viruses, worms, single-

cell organisms and bacteria from a reservoir (animal, human, etc.) to a host. The pathogens can be transmitted either mechanically (for example trachoma by non-stinging flies) to a host, or by injection (for example malaria parasites by mosquitoes) into a host.

Examples of vectors and the diseases or pathogens they transmit are:

1) Mosquitoes

- Anopheles: malaria, filariasis;

- Culex: Japanese encephalitis, other viral diseases, filariasis, transmission of other worms;

- Aedes: yellow fever, dengue fever, chikungunya, other viral diseases (e.g. Zika virus), and filariasis;

- Simuliidae: transmission of worms, in particular Onchocerca volvulus;

- Psychodidae: transmission of leishmaniasis.

2) Lice: skin infections, epidemic typhus;

3) Fleas: plague, endemic typhus, cestodes;

4) Flies: sleeping sickness (trypanosomiasis); cholera, other bacterial diseases;

5) Mites: acariosis, epidemic typhus, rickettsialpox, tularaemia, Saint Louis encephalitis, tick-borne encephalitis (TBE), Crimean–Congo haemorrhagic fever, borreliosis;

6) Ticks: borellioses such as Borrelia burgdorferi sensu lato., Borrelia duttoni, tick-borne encephalitis, Q fever (Coxiella burnetii), babesioses (Babesia canis canis), ehrlichiosis.

Examples of vectors in the sense of the present invention are insects and arachnids such as mosquitoes, in particular of the genera Aedes, Anopheles, for example A. gambiae, A. arabiensis, A. funestus, A. dirus (malaria) and Culex, psychodids such as Phlebotomus, Lutzomyia, lice, fleas, flies, mites and ticks capable of transmitting pathogens to animals and/or humans.

In a preferred embodiment of the invention, vector control refers to Malaria and Dengue vector control and vectors in connection with the present invention are preferably mosquitoes and more preferably insecticide-resistant mosquitoes.

A skilled person in the art is fully aware that application rates for a compound of the invention to control pests such as mosquitoes resp. cockroaches and in particular insecticide-resistant pests such as

mosquitoes resp. cockroaches depend on various factors such as the formulation type, application form, the object/surface to be treated etc.

However, as a general guidance the application rate for an active ingredient of the invention to control insecticide-resistant mosquitoes is preferably at least 0.8 - 20 mg/m^2, more preferably at least 4 - 20 mg/m^2. As general guidance for the application rate for an active ingredient of the invention to control insecticide-resistant cockroaches is preferably at least 100-200 mg/m^2, more preferably 200 mg/m^2.

In another preferred embodiment of the invention, it has been found that a compound of the invention can also be used for vector control solutions. Vector control solutions are means to control a vector, such as a mosquito and in particular relate to an indoor residual spray, an insecticide treated net, a longer lasting insecticide net, space spray, spatial repellent and/or a household insecticidal producs to control mosquitoes and in particular to control insecticide-resistant mosquitoes.

Indoor residual sprays (IRS) according to the invention refer to formulations that are applied on walls and roofs of houses and domestic animal shelters in order to kill adult vector mosquitoes that land and rest on these surfaces. The primary effect of such sprays is towards curtailing malaria (and dengue) transmission by reducing the life span of vector mosquitoes so that they can no longer transmit the disease from one person to another and reducing the density of the vector mosquitoes.

Insecticide treated net (ITN) are mosquito nets or bednets impregnated with insecticides that are useful for vector control. However, only pyrethroid insecticides are approved for use on ITNs. There are several types of nets available. Nets may vary by size, material and/or treatment. Most nets are made of polyester but nets are also available in cotton, polyethylene, or polypropylene. Previously, nets had to be retreated every 6-12 months, more frequently if the nets were washed. Nets were retreated by simply dipping them in a mixture of water and insecticide and allowing them to dry in a shady place. WHO recommends various formulations for retreatment (see http://www.who.int/whopes/Insecticides_ITN_Malaria_ok3.pdf). The need for frequent retreatment was a major barrier to widespread use of ITNs in endemic countries. The additional cost of the insecticide and the lack of understanding of its importance resulted in very low retreatment rates in most African countries. More recently, several companies have developed long-lasting insecticide-treated nets (LLINs) that maintain effective levels of insecticide for at least 3 years.

Longer lasting insecticide net (LLINs) are nets that are treated at factory level by a process that binds or incorporates insecticides into the fibers. WHO recommended LLINs are made from polyester, polyethylene, polypropylene and compounds such as deltamethrin, alpha-cypermethrin, permethrin and PBO to increase efficacy (http://www.who.int/whopes/Long_lasting_insecticidal_nets_Jul_2012.pdf). In another embodiment of the invention ITN and LLINs made from polypropylene wherein an active

ingredient is embedded are preferred. In particular such LLINs are described in WO2009/121580A2, WO2011/128380A1 and WO2011/141260A1.

Space sprays are liquid insecticidal formulations that can be dispersed into the air in the form of hundreds of millions of tiny droplets less than 50µm in diameter. They are only effective while the droplets remain airborne. Space sprays are applied mainly as thermal fogs or cold fogs.

Spatial repellents, or area repellents (also known as deterrents) are defined as chemicals that work in the vapor phase to prevent human-vector contact by disrupting normal behavioral patterns within a designated area or "safe zone" (e.g. a space occupied by potential human hosts) thus making the space unsuitable for the insect.

The compound(s) of the present invention may also be comprised in household insecticidal products such as e.g. "heated" air fresheners in which insecticidal compositions are released upon heating (electrically or by burning), smoke coils, vaporizers, 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 plastic, 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 spreading or in bait stations.

According to another preferred embodiment of the invention, a compound of the invention is used together with a base material. In a preferred embodiment of the invention it has been found that a compound of the invention can be used with a suitable base material selected from the group of a polymers such thermoplastics or thermosets; plant-based materials; coating/impregnation solutions and/or mixtures thereof to control insecticide-resistant pests.

According to the present invention polymers include synthetic polymers such as thermoplastics or thermosets. Thermosets, also known as thermosoftening plastics, are polymers that turn to liquid when heated and freeze to a rigid state when cooled sufficiently. Most thermoplastics are high-molecular-weight polymers whose chains associate through weak Van der Waals forces (e.g. polyethylene); stronger dipole-dipole interactions and hydrogen bonding (e.g. nylon) or even stacking of aromatic rings (e.g. polystyrene). Thermoplastic polymers differ from thermosetting polymers (e.g. phenolics, epoxies) in that they can be remelted and remoulded. Many thermoplastic materials are addition polymers; e.g. vinyl chain-growth polymers such as polyethylene and polypropylene; others are productions of condensation or other forms of polyaddition polymerisation, such as the polyamides or polyester. Polymers such as thermoplastics and rubber polymers can be selected from the group of Acrylonitrile Butadiene Styrene (ABS), Acrylic (PMMA), Celluloid, Cellulose acetate, Cyclic Olefin Copolymer (COC), Ethylene-Vinyl Acetate (EVA), Ethylene Vinyl Alcohol (EVOH), Fluoroplastics (PTFE, alongside with FEP, PFA, CTFE, ECTFE, ETFE), Ionomers, Liquid Crystal Polymer (LCP),

Polyoxymethylene (POM or Acetal), Polyacrylates (Acrylic), Polyacrylonitrile (PAN or Acrylonitrile), Polyamide (PA or Nylon), Polyamide-imide (PAI), Polyaryletherketone (PAEK or Ketone), Polybutadiene (PBD), Polybutylene (PB), Polybutylene Terephthalate (PBT), Polycaprolactone (PCL), Polychlorotrifluoroethylene (PCTFE), Polyethylene Terephthalate (PET), Polycyclohexylene dimethylene Terephthalate (PCT), Polycarbonate (PC), Polyhydroxyalkanoates (PHAs), Polyketone (PK), Polyester, Polyethylene (PE), Linear low-density polyethylene (LDPE, LLDPE), medium-density polyethlylene (MDPE), high-density polyethylene (HDPE), Polyetheretherketone (PEEK), Polyetherketoneketone (PEKK), Polyetherimide (PEI), Polyethersulfone (PES), Chlorinated Polyethylene (CPE), Olyimide (PI), Polylactic Acid (PLA), Polymethylpentene (PMP) , Polyphenylene Oxide (PPO), Polyphenylene Sulfide (PPS), Polyphthalamide (PPA), Polypropylene (PP), Polystyrene (PS), Polysulfone (PSU), Polytrimethylene terephthalate (PTT), Polyurethane (PU), Polyvinyl Acetate (PVA), Polyvinyl Chloride (PVC), Polyvinylidene Chloride (PVDC), Styrene-acrylonitrile (SAN).

In another embodiment of the invention, an active ingredient is used together with polymers selected from the group of polyester, polyamide and polyolefins (such as polyethylene, polypropylene). The compound(s) of the present invention can be added during processing of the polymeric material. As the processing temperatures of common polymers such as thermoplastics are in a range of 130-320°C (e.g. extrusion, compounding, film blowing, spinning, calendaring, foaming etc.), the compounds of the present invention might melt during processing as well and are solidifying together with the matrix polymer during cool-down giving a homogenous material compound containing the desired amount of insecticide. The addition of an active ingredient can also be done in a two-step process, with a concentrate (masterbatch) produced via mixing of the polymer with an active ingredient and a second processing step where the active ingredient is further diluted by adding additional polymers during processing.

The concentration of the active ingredient in (respectively on) polymers can be varied within a relatively wide concentration range (for example from 1% to 15% by weight). The concentration should be chosen according to the field of application such that the requirements concerning efficacy, durability and toxicity are met.

According to the present invention the term “thermoset” refers to a thermosetting plastic which is a polymer material that irreversibly cures. The cure may be done through heat (generally above 200 °C (392 °F)), through a chemical reaction (two-part epoxy, for example), or irradiation such as electron beam processing. Thermoset materials are usually liquid or malleable prior to curing and designed to be molded into their final form, or used as adhesives. Others are solids like that of the molding compound used in semiconductors and integrated circuits (IC). Once hardened a thermoset resin cannot be reheated and melted back to a liquid form. According to IUPAC recommendation: A thermosetting polymer is a prepolymer in a soft solid or viscous state that changes irreversibly into an infusible, insoluble polymer

network by curing. Curing can be induced by the action of heat or suitable radiation, or both. A cured thermosetting polymer is called a thermoset. Some examples of thermosets are: Polyester fiberglass systems (sheet molding compounds and bulk molding compounds); vulcanized rubber; bakelite, a phenol-formaldehyde resin; duroplast; urea-formaldehyde foam; melamine resin; epoxy resin; polyimides; cyanate esters or polycyanurates.

The term “plant-based natural materials” refers to natural derived substrates/fibers such cellulose-based materials (paper/cardboard), cotton, sisal, jute, wood, flax, cotton, bamboo, hemp, wool etc.

For the production of polymers such as thermoplastics, thermosets or composite materials and mixtures thereof (e.g. thermoplastics mixed with other thermoplastics e.g. thermoplastics with plant-based natural materials) additional additives can be used such a e.g. metal deactivators, peroxide scavengers, basic co-stabilizers, nucleating agents, plasticizers, lubricants, UV-protecting agents, emulsifiers, pigments, viscosity modifiers, catalysts, flow control agents, optical brighteners, antistatic agents and blowing agents, benzofuranones and indolinones, fluorescent plasticizers, mould release agents, flame-retardant additives, synergists, antistatic agents such as sulphonate salts, pigments and also organic and inorganic dyes and also compounds containing epoxy groups or anhydride groups.

The term "coating/impregnation solution", as used herein, shall refer to a solution that is later sprayed to form a coating, a part of a coating, or is used for impregnation and include the herein discussed active ingredients as well as other coating/impregnation solution components such as but not limited to solvents, polymers, oils, fats, natural resins, tensides, surfactants, emulgators, stabilizers, salts thickeners, fragrants, pigments and/or other additives. Coating/impregnation solutions are preferably liquid at room temperature (25°C).

According to the present invention the term “coatings/impregnation” refers to a (preferably liquid) solution that is applied to the surface of an object, usually referred to as the substrate (which can also be a base material) or the object is dipped into the solution. In the context of the present invention, coatings or impregnation (e.g. in the form of a spray or solution) are preferably applied to walls floor mats, sleeping mats, sacking or mattresses, made of sisal, cotton, wool, jute or other vegetable fibers) in order to control/kill/repel mosquitoes inside and outside of houses.

In another preferred embodiment the active ingredient(s) of the invention is/are preferably used with the base material in a concentration of below 50 weight per cent (wt%), preferred below 30 wt%, more preferably below 20, and especially preferred below 15 wt% (the combination of the active ingredient and the base material equals 100 wt%).

The polymers of the present invention can be processed into miscellaneous products such as for example, filaments, fabrics, chips, pellets, pearls, foams, foils, pellets, plates, air-cushioning materials,

films, nets, profiles, sheets, textiles, wires, threads, tapes, cable and pipe linings, casings for electrical instruments (for example in switch boxes, aircraft, refrigerators, etc.). Further examples are given herein below.

The polymers with an active ingredient as well as the threads, fibers, filaments, multifilaments, fabrics, wovens, nets etc. produced therefrom are very useful for controlling/killing insecticide-resistant mosquitoes. The manufacturing of such products is described in detail in e.g. WO 2009/121580 A2, WO 2011/128380 A1, WO 2011/141260 A1.

Polymers as well as plant-based materials together with the active ingredients of the invention can also be used to produce textiles. According to the present invention the term “textiles” is referring to a textile or cloth that is a flexible woven material consisting of a network of natural or artificial fibers often referred to as thread or yarn. Yarn is produced by spinning raw fibers of a plant-based material such as wool, flax, cotton, hemp, or other materials such as polymers to produce long strands. Textiles are formed by weaving, knitting, crocheting, knotting, or pressing fibers together. Such products can also be used to produce ITNs resp. LLINs.

Further products which can be made with the discussed base materials or onto which the coating/impregnation solutions of the invention can be applied include e.g. outdoor carpetings, outdoor furniture, window shades, curtains, outdoor coverings for tables, and other flat surfaces, patio decks, hulls, filtering, flags, backpacks, tents, nets, mosquito nets, transportation devices such as balloons, kites, sails, and parachutes; technical textiles such as geotextiles (reinforcement of embankments), agrotextiles (textiles for crop protection such as horticulture films), protective clothing, electrical insulation, insulation for buildings etc.

Another embodiment of the invention are an ITN and/or LLIN (preferably a LLIN) produced from polymers selected from the group of polyolefins (polyethylene, polypropylene and the like), polyesters (polyethylenterephthalates and the like) and polyamides.

According to the present invention, the term “knock-down” describes the state of an animal on its back or side, which is still capable of uncoordinated movement including short periods of flying.

The compound(s) of the formula (I) can also be used against other pests not mentioned above. They are active against normally sensitive and resistant species and against all or some stages of development. These pests include:

pests from the phylum of the Arthropoda, in particular from the class of the Arachnida, for example Acarus spp., for example Acarus siro, Aceria kuko, Aceria sheldoni, Aculops spp., Aculus spp., for example Aculus fockeui, Aculus schlechtendali, Amblyomma spp., Amphitetranychus viennensis, Argas

spp., Boophilus spp., Brevipalpus spp., for example Brevipalpus phoenicis, Bryobia graminum, Bryobia praetiosa, Centruroides spp., Chorioptes spp., Dermanyssus gallinae, Dermatophagoides pteronyssinus, Dermatophagoides farinae, Dermacentor spp., Eotetranychus spp., for example Eotetranychus hicoriae, Epitrimerus pyri, Eutetranychus spp., for example Eutetranychus banksi, Eriophyes spp., for example Eriophyes pyri, Glycyphagus domesticus, Halotydeus destructor, Hemitarsonemus spp., for example Hemitarsonemus latus (=Polyphagotarsonemus latus), Hyalomma spp., Ixodes spp., Latrodectus spp., Loxosceles spp., Neutrombicula autumnalis, Nuphersa spp., Oligonychus spp., for example Oligonychus coffeae, Oligonychus coniferarum, Oligonychus ilicis, Oligonychus indicus, Oligonychus mangiferus, Oligonychus pratensis, Oligonychus punicae, Oligonychus yothersi, Ornithodorus spp., Ornithonyssus spp., Panonychus spp., for example Panonychus citri (=Metatetranychus citri), Panonychus ulmi (=Metatetranychus ulmi), Phyllocoptruta oleivora, Platytetranychus multidigituli, Polyphagotarsonemus latus, Psoroptes spp., Rhipicephalus spp., Rhizoglyphus spp., Sarcoptes spp., Scorpio maurus, Steneotarsonemus spp., Steneotarsonemus spinki, Tarsonemus spp., for example Tarsonemus confusus, Tarsonemus pallidus, Tetranychus spp., for example Tetranychus canadensis, Tetranychus cinnabarinus, Tetranychus turkestani, Tetranychus urticae, Trombicula alfreddugesi, Vaejovis spp., Vasates lycopersici;

from the class of the Chilopoda, for example Geophilus spp., Scutigera spp.;

from the order or the class of the Collembola, for example Onychiurus armatus; Sminthurus viridis;

from the class of the Diplopoda, for example Blaniulus guttulatus;

from the order of the Coleoptera, for example Acalymma vittatum, Acanthoscelides obtectus, Adoretus spp., Aethina tumida, Agelastica alni, Agrilus spp., for example Agrilus planipennis, Agrilus coxalis, Agrilus bilineatus, Agrilus anxius, Agriotes spp., for example Agriotes linneatus, Agriotes mancus, Alphitobius diaperinus, Amphimallon solstitialis, Anobium punctatum, Anoplophora spp., for example Anoplophora glabripennis, Anthonomus spp., for example Anthonomus grandis, Anthrenus spp., Apion spp., Apogonia spp., Atomaria spp., for example Atomaria linearis, Attagenus spp., Baris caerulescens, Bruchidius obtectus, Bruchus spp., for example Bruchus pisorum, Bruchus rufimanus, Cassida spp., Cerotoma trifurcata, Ceutorrhynchus spp., for example Ceutorrhynchus assimilis, Ceutorrhynchus quadridens, Ceutorrhynchus rapae, Chaetocnema spp., for example Chaetocnema confinis, Chaetocnema denticulata, Chaetocnema ectypa, Cleonus mendicus, Conoderus spp., Cosmopolites spp., for example Cosmopolites sordidus, Costelytra zealandica, Ctenicera spp., Curculio spp., for example Curculio caryae, Curculio caryatrypes,Curculio obtusus, Curculio sayi, Cryptolestes ferrugineus, Cryptolestes pusillus, Cryptorhynchus lapathi, Cryptorhynchus mangiferae, Cylindrocopturus spp., Cylindrocopturus adspersus, Cylindrocopturus furnissi, Dendroctonus spp., for example Dendroctonus ponderosae, Dermestes spp., Diabrotica spp., for example Diabrotica balteata, Diabrotica barberi, Diabrotica

undecimpunctata howardi, Diabrotica undecimpunctata undecimpunctata, Diabrotica virgifera virgifera, Diabrotica virgifera zeae, Dichocrocis spp., Dicladispa armigera, Diloboderus spp., Epicaerus spp., Epilachna spp., for example Epilachna borealis, Epilachna varivestis, Epitrix spp., for example Epitrix cucumeris, Epitrix fuscula, Epitrix hirtipennis, Epitrix subcrinita, Epitrix tuberis, Faustinus spp., Gibbium psylloides, Gnathocerus cornutus, Hellula undalis, Heteronychus arator, Heteronyx spp., Hylamorpha elegans, Hylotrupes bajulus, Hypera postica, Hypomeces squamosus, Hypothenemus spp., for example Hypothenemus hampei, Hypothenemus obscurus, Hypothenemus pubescens, Lachnosterna consanguinea, Lasioderma serricorne, Latheticus oryzae, Lathridius spp., Lema spp., Leptinotarsa decemlineata, Leucoptera spp., for example Leucoptera coffeella, Limonius ectypus, Lissorhoptrus oryzophilus, Listronotus (= Hyperodes) spp., Lixus spp., Luperodes spp., Luperomorpha xanthodera, Lyctus spp., Megacyllene spp., for example Megacyllene robiniae, Megascelis spp., Melanotus spp., for example Melanotus longulus oregonensis, Meligethes aeneus, Melolontha spp., for example Melolontha melolontha, Migdolus spp., Monochamus spp., Naupactus xanthographus, Necrobia spp., Neogalerucella spp., Niptus hololeucus, Oryctes rhinoceros, Oryzaephilus surinamensis, Oryzaphagus oryzae, Otiorhynchus spp., for example Otiorhynchus cribricollis, Otiorhynchus ligustici, Otiorhynchus ovatus, Otiorhynchus rugosostriarus, Otiorhynchus sulcatus, Oulema spp., for example Oulema melanopus, Oulema oryzae, Oxycetonia jucunda, Phaedon cochleariae, Phyllophaga spp., Phyllophaga helleri, Phyllotreta spp., for example Phyllotreta armoraciae, Phyllotreta pusilla, Phyllotreta ramosa, Phyllotreta striolata, Popillia japonica, Premnotrypes spp., Prostephanus truncatus, Psylliodes spp., for example Psylliodes affinis, Psylliodes chrysocephala, Psylliodes punctulata, Ptinus spp., Rhizobius ventralis, Rhizopertha dominica, Rhynchophorus spp., Rhynchophorus ferrugineus, Rhynchophorus palmarum, Scolytus spp., for example Scolytus multistriatus, Sinoxylon perforans, Sitophilus spp., for example Sitophilus granarius, Sitophilus linearis, Sitophilus oryzae, Sitophilus zeamais, Sphenophorus spp., Stegobium paniceum, Sternechus spp., for example Sternechus paludatus, Symphyletes spp., Tanymecus spp., for example Tanymecus dilaticollis, Tanymecus indicus, Tanymecus palliatus, Tenebrio molitor, Tenebrioides mauretanicus, Tribolium spp., for example Tribolium audax, Tribolium castaneum, Tribolium confusum, Trogoderma spp., Tychius spp., Xylotrechus spp., Zabrus spp., for example Zabrus tenebrioides;

from the order of the Dermaptera, for example Anisolabis maritime, Forficula auricularia, Labidura riparia;

from the order of the Diptera (other then Anopheles, Cules and Aedes mentioned above) such as for example Agromyza spp., for example Agromyza frontella, Agromyza parvicornis, Anastrepha spp., Asphondylia spp., Bactrocera spp., for example Bactrocera cucurbitae, Bactrocera dorsalis, Bactrocera oleae, Bibio hortulanus, Calliphora erythrocephala, Calliphora vicina, Ceratitis capitata, Chironomus spp., Chrysomya spp., Chrysops spp., Chrysozona pluvialis, Cochliomya spp., Contarinia spp., for

example Contarinia johnsoni, Contarinia nasturtii, Contarinia pyrivora, Contarinia schulzi, Contarinia sorghicola, Contarinia tritici, Cordylobia anthropophaga, Cricotopus sylvestris, Culicoides spp., Culiseta spp., Cuterebra spp., Dacus oleae, Dasineura spp., for example Dasineura brassicae, Delia spp., for example Delia antiqua, Delia coarctata, Delia florilega, Delia platura, Delia radicum, Dermatobia hominis, Drosophila spp., for example Drosphila melanogaster, Drosophila suzukii, Echinocnemus spp., Euleia heraclei, Fannia spp., Gasterophilus spp., Glossina spp., Haematopota spp., Hydrellia spp., Hydrellia griseola, Hylemya spp., Hippobosca spp., Hypoderma spp., Liriomyza spp., for example Liriomyza brassicae, Liriomyza huidobrensis, Liriomyza sativae, Lucilia spp., for example Lucilia cuprina, Lutzomyia spp., Mansonia spp., Musca spp., for example Musca domestica, Musca domestica vicina, Oestrus spp., Oscinella frit, Paratanytarsus spp., Paralauterborniella subcincta, Pegomya or Pegomyia spp., for example Pegomya betae, Pegomya hyoscyami, Pegomya rubivora, Phlebotomus spp., Phorbia spp., Phormia spp., Piophila casei, Platyparea poeciloptera, Prodiplosis spp., Psila rosae, Rhagoletis spp., for example Rhagoletis cingulata, Rhagoletis completa, Rhagoletis fausta, Rhagoletis indifferens, Rhagoletis mendax, Rhagoletis pomonella, Sarcophaga spp., Simulium spp., for example Simulium meridionale, Stomoxys spp., Tabanus spp., Tetanops spp., Tipula spp., for example Tipula paludosa, Tipula simplex, Toxotrypana curvicauda;

from the order of the Hemiptera, for example Acizzia acaciaebaileyanae, Acizzia dodonaeae, Acizzia uncatoides, Acrida turrita, Acyrthosipon spp., for example Acyrthosiphon pisum, Acrogonia spp., Aeneolamia spp., Agonoscena spp., Aleurocanthus spp., Aleyrodes proletella, Aleurolobus barodensis, Aleurothrixus floccosus, Allocaridara malayensis, Amrasca spp., for example Amrasca bigutulla, Amrasca devastans, Anuraphis cardui, Aonidiella spp., for example Aonidiella aurantii, Aonidiella citrina, Aonidiella inornata, Aphanostigma piri, Aphis spp., for example Aphis citricola, Aphis craccivora, Aphis fabae, Aphis forbesi, Aphis glycines, Aphis gossypii, Aphis hederae, Aphis illinoisensis, Aphis middletoni, Aphis nasturtii, Aphis nerii, Aphis pomi, Aphis spiraecola, Aphis viburniphila, Arboridia apicalis, Arytainilla spp., Aspidiella spp., Aspidiotus spp., for example Aspidiotus nerii, Atanus spp., Aulacorthum solani, Bemisia tabaci, Blastopsylla occidentalis, Boreioglycaspis melaleucae, Brachycaudus helichrysi, Brachycolus spp., Brevicoryne brassicae, Cacopsylla spp., for example Cacopsylla pyricola, Calligypona marginata, Capulinia spp., Carneocephala fulgida, Ceratovacuna lanigera, Cercopidae, Ceroplastes spp., Chaetosiphon fragaefolii, Chionaspis tegalensis, Chlorita onukii, Chondracris rosea, Chromaphis juglandicola, Chrysomphalus aonidum, Chrysomphalus ficus, Cicadulina mbila, Coccomytilus halli, Coccus spp., for example Coccus hesperidum, Coccus longulus, Coccus pseudomagnoliarum, Coccus viridis, Cryptomyzus ribis, Cryptoneossa spp., Ctenarytaina spp., Dalbulus spp., Dialeurodes chittendeni, Dialeurodes citri, Diaphorina citri, Diaspis spp., Diuraphis spp., Doralis spp., Drosicha spp., Dysaphis spp., for example Dysaphis apiifolia, Dysaphis plantaginea, Dysaphis tulipae, Dysmicoccus spp., Empoasca spp., for example Empoasca abrupta, Empoasca fabae, Empoasca maligna, Empoasca solana, Empoasca stevensi,

Eriosoma spp., for example Eriosoma americanum, Eriosoma lanigerum, Eriosoma pyricola, Erythroneura spp., Eucalyptolyma spp., Euphyllura spp., Euscelis bilobatus, Ferrisia spp., Fiorinia spp., Furcaspis oceanica, Geococcus coffeae, Glycaspis spp., Heteropsylla cubana, Heteropsylla spinulosa, Homalodisca coagulata, Hyalopterus arundinis, Hyalopterus pruni, Icerya spp., for example Icerya purchasi, Idiocerus spp., Idioscopus spp., Laodelphax striatellus, Lecanium spp., for example Lecanium corni (=Parthenolecanium corni), Lepidosaphes spp., for example Lepidosaphes ulmi, Lipaphis erysimi, Lopholeucaspis japonica, Lycorma delicatula, Macrosiphum spp., for example Macrosiphum euphorbiae, Macrosiphum lilii, Macrosiphum rosae, Macrosteles facifrons, Mahanarva spp., Melanaphis sacchari, Metcalfiella spp., Metcalfa pruinosa, Metopolophium dirhodum, Monellia costalis, Monelliopsis pecanis, Myzus spp., for example Myzus ascalonicus, Myzus cerasi, Myzus ligustri, Myzus ornatus, Myzus persicae,. Myzus nicotianae, Nasonovia ribisnigri, Neomaskellia spp., Nephotettix spp., for example Nephotettix cincticeps,, Nephotettix nigropictus, Nettigoniclla spectra, Nilaparvata lugens, Oncometopia spp., Orthezia praelonga, Oxya chinensis, Pachypsylla spp., Parabemisia myricae, Paratrioza spp., for example Paratrioza cockerelli, Parlatoria spp., Pemphigus spp., for example Pemphigus bursarius, Pemphigus populivenae, Peregrinus maidis, Perkinsiella spp., Phenacoccus spp., for example Phenacoccus madeirensis, Phloeomyzus passerinii, Phorodon humuli, Phylloxera spp., for example Phylloxera devastatrix, Phylloxera notabilis, Pinnaspis aspidistrae, Planococcus spp., for example Planococcus citri, Prosopidopsylla flava, Protopulvinaria pyriformis, Pseudaulacaspis pentagona, Pseudococcus spp., for example Pseudococcus calceolariae, Pseudococcus comstocki, Pseudococcus longispinus, Pseudococcus maritimus, Pseudococcus viburni, Psyllopsis spp., Psylla spp., for example Psylla buxi, Psylla mali, Psylla pyri, Pteromalus spp., Pulvinaria spp., Pyrilla spp., Quadraspidiotus spp., for example Quadraspidiotus juglansregiae, Quadraspidiotus ostreaeformis, Quadraspidiotus perniciosus, Quesada gigas, Rastrococcus spp., Rhopalosiphum spp., for example Rhopalosiphum maidis, Rhopalosiphum oxyacanthae, Rhopalosiphum padi, Rhopalosiphum rufiabdominale, Saissetia spp., for example Saissetia coffeae, Saissetia miranda, Saissetia neglecta, Saissetia oleae, Scaphoideus titanus, Schizaphis graminum, Selenaspidus articulatus, Sipha flava, Sitobion avenae, Sogata spp., Sogatella furcifera, Sogatodes spp., Stictocephala festina, Siphoninus phillyreae, Tenalaphara malayensis,Tetragonocephela spp., Tinocallis caryaefoliae, Tomaspis spp., Toxoptera spp., for example Toxoptera aurantii, Toxoptera citricidus, Trialeurodes vaporariorum, Trioza spp., for example Trioza diospyri, Typhlocyba spp., Unaspis spp., Viteus vitifolii, Zygina spp.;

from the suborder of the Heteroptera, for example Aelia spp., Anasa tristis, Antestiopsis spp., Boisea spp., Blissus spp., Calocoris spp., Campylomma livida, Cavelerius spp., Cimex spp., for example Cimex adjunctus, Cimex hemipterus, Cimex lectularius, Cimex pilosellus, Collaria spp., Creontiades dilutus, Dasynus piperis, Dichelops furcatus, Diconocoris hewetti, Dysdercus spp., Euschistus spp., for example Euschistus heros, Euschistus servus, Euschistus tristigmus, Euschistus variolarius, Eurydema spp., Eurygaster spp., Halyomorpha halys, Heliopeltis spp., Horcias nobilellus, Leptocorisa spp., Leptocorisa

varicornis, Leptoglossus occidentalis, Leptoglossus phyllopus, Lygocoris spp., for example Lygocoris pabulinus, Lygus spp., for example Lygus elisus, Lygus hesperus, Lygus lineolaris, Macropes excavatus, Megacopta cribraria, Miridae, Monalonion atratum, Nezara spp., for example Nezara viridula, Nysius spp., Oebalus spp., Pentomidae, Piesma quadrata, Piezodorus spp., for example Piezodorus guildinii, Psallus spp., Pseudacysta persea, Rhodnius spp., Sahlbergella singularis, Scaptocoris castanea, Scotinophora spp., Stephanitis nashi, Tibraca spp., Triatoma spp.;

from the order of the Hymenoptera, for example Acromyrmex spp., Athalia spp., for example Athalia rosae, Atta spp., Camponotus spp., Dolichovespula spp., Diprion spp., for example Diprion similis, Hoplocampa spp., for example Hoplocampa cookei, Hoplocampa testudinea, Lasius spp., Linepithema (Iridiomyrmex) humile, Monomorium pharaonis, Paratrechina spp., Paravespula spp., Plagiolepis spp., Sirex spp., for example Sirex noctilio, Solenopsis invicta, Tapinoma spp., Technomyrmex albipes, Urocerus spp., Vespa spp., for example Vespa crabro, Wasmannia auropunctata, Xeris spp.;

from the order of the Isopoda, for example Armadillidium vulgare, Oniscus asellus, Porcellio scaber;

from the order of the Isoptera, for example Coptotermes spp., for example Coptotermes formosanus, Cornitermes cumulans, Cryptotermes spp., Incisitermes spp., Kalotermes spp., Microtermes obesi, Nasutitermes spp., Odontotermes spp., Porotermes spp., Reticulitermes spp., for example Reticulitermes flavipes, Reticulitermes hesperus;

from the order of the Lepidoptera, for example Achroia grisella, Acronicta major, Adoxophyes spp., for example Adoxophyes orana, Aedia leucomelas, Agrotis spp., for example Agrotis segetum, Agrotis ipsilon, Alabama spp., for example Alabama argillacea, Amyelois transitella, Anarsia spp., Anticarsia spp., for example Anticarsia gemmatalis, Argyroploce spp., Autographa spp., Barathra brassicae, Blastodacna atra, Borbo cinnara, Bucculatrix thurberiella, Bupalus piniarius, Busseola spp., Cacoecia spp., Caloptilia theivora, Capua reticulana, Carpocapsa pomonella, Carposina niponensis, Cheimatobia brumata, Chilo spp., for example Chilo plejadellus, Chilo suppressalis, Choreutis pariana, Choristoneura spp., Chrysodeixis chalcites, Clysia ambiguella, Cnaphalocerus spp., Cnaphalocrocis medinalis, Cnephasia spp., Conopomorpha spp., Conotrachelus spp., Copitarsia spp., Cydia spp., for example Cydia nigricana, Cydia pomonella, Dalaca noctuides, Diaphania spp., Diparopsis spp., Diatraea saccharalis, Dioryctria spp., for example Dioryctria zimmermani, Earias spp., Ecdytolopha aurantium, Elasmopalpus lignosellus, Eldana saccharina, Ephestia spp., for example Ephestia elutella, Ephestia kuehniella, Epinotia spp., Epiphyas postvittana, Erannis spp., Erschoviella musculana, Etiella spp., Eudocima spp., Eulia spp., Eupoecilia ambiguella, Euproctis spp., for example Euproctis chrysorrhoea, Euxoa spp., Feltia spp., Galleria mellonella, Gracillaria spp., Grapholitha spp., for example Grapholita molesta, Grapholita prunivora, Hedylepta spp., Helicoverpa spp., for example Helicoverpa armigera, Helicoverpa zea, Heliothis spp., for example Heliothis virescens, Hofmannophila pseudospretella,

Homoeosoma spp., Homona spp., Hyponomeuta padella, Kakivoria flavofasciata, Lampides spp., Laphygma spp., Laspeyresia molesta, Leucinodes orbonalis, Leucoptera spp., for example Leucoptera coffeella, Lithocolletis spp., for example Lithocolletis blancardella, Lithophane antennata, Lobesia spp., for example Lobesia botrana, Loxagrotis albicosta, Lymantria spp., for example Lymantria dispar, Lyonetia spp., for example Lyonetia clerkella, Malacosoma neustria, Maruca testulalis, Mamestra brassicae, Melanitis leda, Mocis spp., Monopis obviella, Mythimna separata, Nemapogon cloacellus, Nymphula spp., Oiketicus spp., Omphisa spp., Operophtera spp., Oria spp., Orthaga spp., Ostrinia spp., for example Ostrinia nubilalis, Panolis flammea, Parnara spp., Pectinophora spp., for example Pectinophora gossypiella, Perileucoptera spp., Phthorimaea spp., for example Phthorimaea operculella, Phyllocnistis citrella, Phyllonorycter spp., for example Phyllonorycter blancardella, Phyllonorycter crataegella, Pieris spp., for example Pieris rapae, Platynota stultana, Plodia interpunctella, Plusia spp., Plutella xylostella (=Plutella maculipennis), Podesia spp., for example Podesia syringae, Prays spp., Prodenia spp., Protoparce spp., Pseudaletia spp., for example Pseudaletia unipuncta, Pseudoplusia includens, Pyrausta nubilalis, Rachiplusia nu, Schoenobius spp., for example Schoenobius bipunctifer, Scirpophaga spp., for example Scirpophaga innotata, Scotia segetum, Sesamia spp., for example Sesamia inferens, Sparganothis spp., Spodoptera spp., for example Spodoptera eradiana, Spodoptera exigua, Spodoptera frugiperda, Spodoptera praefica, Stathmopoda spp., Stenoma spp., Stomopteryx subsecivella, Synanthedon spp., Tecia solanivora, Thaumetopoea spp., Thermesia gemmatalis, Tinea cloacella, Tinea pellionella, Tineola bisselliella, Tortrix spp., Trichophaga tapetzella, Trichoplusia spp., for example Trichoplusia ni, Tryporyza incertulas, Tuta absoluta, Virachola spp.;

from the order of the Orthoptera or Saltatoria, for example Acheta domesticus, Dichroplus spp., Gryllotalpa spp., for example Gryllotalpa gryllotalpa, Hieroglyphus spp., Locusta spp., for example Locusta migratoria, Melanoplus spp., for example Melanoplus devastator, Paratlanticus ussuriensis, Schistocerca gregaria;

from the order of the Phthiraptera, for example Damalinia spp., Haematopinus spp., Linognathus spp., Pediculus spp., Phylloxera vastatrix, Phthirus pubis, Trichodectes spp.;

from the order of the Psocoptera, for example Lepinotus spp., Liposcelis spp.;

from the order of the Siphonaptera, for example, Ceratophyllus spp., Ctenocephalides spp., for example Ctenocephalides canis, Ctenocephalides felis, Pulex irritans, Tunga penetrans, Xenopsylla cheopis;

from the order of the Thysanoptera, for example Anaphothrips obscurus, Baliothrips biformis, Chaetanaphothrips leeuweni, Drepanothrips reuteri, Enneothrips flavens, Frankliniella spp., for example Frankliniella fusca, Frankliniella occidentalis, Frankliniella schultzei, Frankliniella tritici, Frankliniella vaccinii, Frankliniella williamsi, Haplothrips spp., Heliothrips spp., Hercinothrips femoralis, Kakothrips

spp., Rhipiphorothrips cruentatus, Scirtothrips spp., Taeniothrips cardamomi, Thrips spp., for example Thrips palmi, Thrips tabaci;

from the order of the Zygentoma (= Thysanura), for example Ctenolepisma spp., Lepisma saccharina, Lepismodes inquilinus, Thermobia domestica;

from the class of the Symphyla, for example Scutigerella spp., for example Scutigerella immaculata;

pests from the phylum of the Mollusca, for example from the class of the Bivalvia, for example Dreissena spp.,

and also from the class of the Gastropoda, for example Arion spp., for example Arion ater rufus, Biomphalaria spp., Bulinus spp., Deroceras spp., for example Deroceras laeve, Galba spp., Lymnaea spp., Oncomelania spp., Pomacea spp., Succinea spp.;

plant pests from the phylum of the Nematoda, i.e. phytoparasitic nematodes, in particular Aglenchus spp., for example Aglenchus agricola, Anguina spp., for example Anguina tritici, Aphelenchoides spp., for example Aphelenchoides arachidis, Aphelenchoides fragariae, Belonolaimus spp., for example Belonolaimus gracilis, Belonolaimus longicaudatus, Belonolaimus nortoni, Bursaphelenchus spp., for example Bursaphelenchus cocophilus, Bursaphelenchus eremus, Bursaphelenchus xylophilus, Cacopaurus spp., for example Cacopaurus pestis, Criconemella spp., for example Criconemella curvata, Criconemella onoensis, Criconemella ornata, Criconemella rusium, Criconemella xenoplax (= Mesocriconema xenoplax), Criconemoides spp., for example Criconemoides ferniae, Criconemoides onoense, Criconemoides ornatum, Ditylenchus spp., for example Ditylenchus dipsaci, Dolichodorus spp., Globodera spp., for example Globodera pallida, Globodera rostochiensis, Helicotylenchus spp., for example Helicotylenchus dihystera, Hemicriconemoides spp., Hemicycliophora spp., Heterodera spp., for example Heterodera avenae, Heterodera glycines, Heterodera schachtii, Hirschmaniella spp., Hoplolaimus spp., Longidorus spp., for example Longidorus africanus, Meloidogyne spp., for example Meloidogyne chitwoodi, Meloidogyne fallax, Meloidogyne hapla, Meloidogyne incognita, Meloinema spp., Nacobbus spp., Neotylenchus spp., ., Paralongidorus spp., Paraphelenchus spp., Paratrichodorus spp., for example Paratrichodorus minor, Paratylenchus spp., Pratylenchus spp., for example Pratylenchus penetrans, Pseudohalenchus spp., Psilenchus spp., Punctodera spp., Quinisulcius spp., Radopholus spp., for example Radopholus citrophilus, Radopholus similis, Rotylenchulus spp., Rotylenchus spp., Scutellonema spp., Subanguina spp., Trichodorus spp., for example Trichodorus obtusus, Trichodorus primitivus, Tylenchorhynchus spp., for example Tylenchorhynchus annulatus, Tylenchulus spp., for example Tylenchulus semipenetrans, Xiphinema spp., for example Xiphinema index.

Another embodiment of the invention relates to a method for controlling mosquitoes and/or cockroaches, preferably insecticide-resistant mosquitoes and/or cockroaches.

Another embodiment of the invention relates to a cockroach bait comprising a compound according to formula (I) or a composition according to the invention.

The present invention further relates to compositions (hereinafter also referred to as formulations) and use forms prepared therefrom as pesticides, for example drench, drip and spray liquors, comprising at least one compound of the formula (I). In some cases, the use forms comprise further pesticides and/or adjuvants which improve action (synergists), such as penetrants, e.g. vegetable oils, for example rapeseed oil, sunflower oil, mineral oils, for example paraffin oils, alkyl esters of vegetable fatty acids, for example rapeseed oil methyl ester or soya oil methyl ester, or alkanol alkoxylates and/or spreaders, for example alkylsiloxanes and/or salts, for example organic or inorganic ammonium or phosphonium salts, for example ammonium sulphate or diammonium hydrogenphosphate, or sebacic esters or piperonylbutoxide (PBO) and/or retention promoters, for example dioctyl sulphosuccinate or hydroxypropyl guar polymers and/or humectants, for example glycerol.

Customary formulations are, for example, water-soluble liquids (SL), emulsion concentrates (EC), emulsions in water (EW), suspension concentrates (SC, SE, FS, OD), water-dispersible granules (WG), granules (GR) and capsule concentrates (CS); these and further possible formulation types are described, for example, by Crop Life International and in Pesticide Specifications, Manual on development and use of FAO and WHO specifications for pesticides, FAO Plant Production and Protection Papers – 173, prepared by the FAO/WHO Joint Meeting on Pesticide Specifications, 2004, ISBN: 9251048576. The formulations, in addition to one or more compound(s) of the formula (I), optionally comprise further agrochemically active compounds.

These are preferably compositions or use forms which comprise auxiliaries, for example extenders, solvents, spontaneity promoters, carriers, emulsifiers, dispersants, frost protectants, biocides, thickeners and/or further auxiliaries, for example adjuvants. An adjuvant in this context is a component which enhances the biological effect of the formulation, without the component itself having any biological effect. Examples of adjuvants are agents which promote retention, spreading, attachment to a surface or penetration into a vector animal.

These formulations are prepared in a known way, for example by mixing the compound(s) of the formula (I) with auxiliaries such as, for example, extenders, solvents and/or solid carriers and/or other auxiliaries such as, for example, surfactants. The formulations are prepared either in suitable facilities or else before or during application.

The auxiliaries used may be substances suitable for imparting special properties, such as certain physical, technical and/or biological properties, to the formulation of the compound(s) of the formula (I), or to the use forms prepared from these formulations (for example ready-to-use pesticides such as spray liquors or seed dressing products).

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. Essentially, suitable liquid solvents are: aromatics such as xylene, toluene or alkylnaphthalenes, chlorinated aromatics or chlorinated aliphatic hydrocarbons such as chlorobenzenes, chloroethylenes or methylene chloride, aliphatic hydrocarbons such as cyclohexane or paraffins, for example mineral oil fractions, mineral and vegetable oils, alcohols such as butanol or glycol and their ethers and esters, ketones such as acetone, methyl ethyl ketone, methyl isobutyl ketone or cyclohexanone, strongly polar solvents such as dimethylformamide and dimethyl sulphoxide, and also water.

In principle, it is possible to use all suitable solvents. Examples of suitable solvents are aromatic hydrocarbons, such as xylene, toluene or alkylnaphthalenes, chlorinated aromatic or chlorinated aliphatic hydrocarbons, such as chlorobenzene, chloroethylene or methylene chloride, aliphatic hydrocarbons, such as cyclohexane, paraffins, petroleum fractions, mineral and vegetable oils, alcohols, such as methanol, ethanol, isopropanol, butanol or glycol and their ethers and esters, ketones such as acetone, methyl ethyl ketone, methyl isobutyl ketone or cyclohexanone, strongly polar solvents, such as dimethyl sulphoxide, and also water.

In principle, it is possible to use all suitable carriers. Useful carriers include especially: for example ammonium salts and ground natural minerals such as kaolins, clays, talc, chalk, quartz, attapulgite, montmorillonite or diatomaceous earth, and ground synthetic materials such as finely divided silica, alumina and natural or synthetic silicates, resins, waxes and/or solid fertilizers. Mixtures of such carriers can likewise be used. Useful carriers for granules include: for example crushed and fractionated natural rocks such as calcite, marble, pumice, sepiolite, dolomite, and synthetic granules of inorganic and organic meals, and also granules of organic material such as sawdust, paper, coconut shells, corn cobs and tobacco stalks.

Liquefied gaseous extenders or solvents can also be used. Particularly suitable extenders or carriers are those which are gaseous at ambient temperature and under atmospheric pressure, for example aerosol propellant gases, such as halohydrocarbons, and also butane, propane, nitrogen and carbon dioxide.

Examples of emulsifiers and/or foam-formers, dispersants or wetting agents with ionic or nonionic properties, or mixtures of these surfactants, are salts of polyacrylic acid, salts of lignosulphonic acid, salts of phenolsulphonic acid or naphthalenesulphonic acid, polycondensates of ethylene oxide with fatty alcohols or with fatty acids or with fatty amines, with substituted phenols (preferably alkylphenols or arylphenols), salts of sulphosuccinic esters, taurine derivatives (preferably alkyl taurates), phosphoric esters of polyethoxylated alcohols or phenols, fatty esters of polyols, and derivatives of the compounds containing sulphates, sulphonates and phosphates, for example alkylaryl polyglycol ethers, alkylsulphonates, alkyl sulphates, arylsulphonates, protein hydrolysates, lignosulphite waste liquors and methylcellulose. The presence of a surfactant is advantageous if one of the compound(s) of the formula (I) and/or one of the inert carriers is insoluble in water and when the application takes place in water.

It is possible to use colorants such as inorganic pigments, for example iron oxide, titanium oxide and Prussian Blue, and organic dyes such as alizarin dyes, azo dyes and metal phthalocyanine dyes, and nutrients and trace nutrients such as salts of iron, manganese, boron, copper, cobalt, molybdenum and zinc as further auxiliaries in the formulations and the use forms derived therefrom.

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

Tackifiers such as carboxymethylcellulose and natural and synthetic polymers in the form of powders, granules or latices, such as gum arabic, polyvinyl alcohol and polyvinyl acetate, or else natural phospholipids such as cephalins and lecithins and synthetic phospholipids may also be present as additional auxiliaries in the formulations and the use forms derived therefrom. Further possible auxiliaries are mineral and vegetable oils.

Optionally, further auxiliaries may be present in the formulations and the use forms derived therefrom. Examples of such additives include fragrances, protective colloids, binders, adhesives, thickeners, thixotropic agents, penetrants, retention promoters, stabilizers, sequestrants, complexing agents, humectants, spreaders. In general, the compound(s) of the formula (I) can be combined with any solid or liquid additive commonly used for formulation purposes.

Useful retention promoters include all those substances which reduce the dynamic surface tension, for example dioctyl sulphosuccinate, or increase the viscoelasticity, for example hydroxypropyl guar polymers.

The formulations preferably comprise between 0.00000001 and 98% by weight of the compound of the formula (I) or, with particular preference, between 0.01% and 95% by weight of the compound of the formula (I), more preferably between 0.5% and 90% by weight of the compound of the formula (I), based on the weight of the formulation.

The content of the compound(s) of the formula (I) in the use forms prepared from the formulations (in particular pesticides) may vary within wide ranges. The concentration of the compound of the formula (I) in the use forms is usually between 0.00000001 and 95% by weight of the compound of the formula (I), preferably between 0.00001 and 1% by weight, based on the weight of the use form. The compound(s) are employed in a customary manner appropriate for the use forms.

The compound(s) of the formula (I) may also be employed as a mixture with one or more suitable insecticides, bird repellents, sterilants, safeners and/or semiochemicals in order thus, for example, to broaden the spectrum of action, to prolong the duration of action, to increase the rate of action, to prevent repulsion or prevent evolution of resistance.

If one of the compounds mentioned below can occur in different tautomeric forms, these forms are also included even if not explicitly mentioned in each case. Further, all named mixing partners can, if their functional groups enable this, optionally form salts with suitable bases or acids.

Insecticides/acaricides/nematicides

The active compounds identified here by their common names are known and are described, for example, in the pesticide handbook ("The Pesticide Manual" 16th Ed., British Crop Protection Council 2012) or can be found on the Internet (e.g. http://www.alanwood.net/pesticides). The classification is based on the current IRAC Mode of Action Classification Scheme at the time of filing of this patent application.

(1) Acetylcholinesterase (AChE) inhibitors, such as, for example, carbamates, for example alanycarb, aldicarb, bendiocarb, benfuracarb, butocarboxim, butoxycarboxim, carbaryl, carbofuran, carbosulfan, ethiofencarb, fenobucarb, formetanate, furathiocarb, isoprocarb, methiocarb, methomyl, metolcarb, oxamyl, pirimicarb, propoxur, thiodicarb, thiofanox, triazamate, trimethacarb, XMC and xylylcarb; or organophosphates, for example acephate, azamethiphos, azinphos-ethyl, azinphos-methyl, cadusafos, chlorethoxyfos, chlorfenvinphos, chlormephos, chlorpyrifos-methyl, coumaphos, cyanophos, demeton-S-methyl, diazinon, dichlorvos/DDVP, dicrotophos, dimethoate, dimethylvinphos, disulfoton, EPN, ethion, ethoprophos, famphur, fenamiphos, fenitrothion, fenthion, fosthiazate, heptenophos, imicyafos, isofenphos, isopropyl O-(methoxyaminothiophosphoryl) salicylate, isoxathion, malathion, mecarbam, methamidophos, methidathion, mevinphos, monocrotophos, naled, omethoate, oxydemeton-methyl, parathion-methyl, phenthoate, phorate, phosalone, phosmet, phosphamidon, phoxim, pirimiphos-methyl,

profenofos, propetamphos, prothiofos, pyraclofos, pyridaphenthion, quinalphos, sulfotep, tebupirimfos, temephos, terbufos, tetrachlorvinphos, thiometon, triazophos, triclorfon and vamidothion.

(2) GABA-gated chloride channel blockers, such as, for example, cyclodiene-organochlorines, for example chlordane and endosulfan or phenylpyrazoles (fiproles), for example ethiprole and fipronil.

(3) Sodium channel modulators, such as, for example, pyrethroids, e.g. acrinathrin, allethrin, d-cis-trans allethrin, d-trans allethrin, bifenthrin, bioallethrin, bioallethrin s-cyclopentenyl isomer, bioresmethrin, cycloprothrin, cyfluthrin, beta-cyfluthrin, cyhalothrin, lambda-cyhalothrin, gamma-cyhalothrin, cypermethrin, alpha-cypermethrin, beta-cypermethrin, theta-cypermethrin, zeta-cypermethrin, cyphenothrin [(1R)-trans-isomer], deltamethrin, empenthrin [(EZ)-(1R)-isomer], esfenvalerate, etofenprox, fenpropathrin, fenvalerate, flucythrinate, flumethrin, tau-fluvalinate, halfenprox, imiprothrin, kadethrin, momfluorothrin, permethrin, phenothrin [(1R)-trans-isomer], prallethrin, pyrethrins (pyrethrum), resmethrin, silafluofen, tefluthrin, tetramethrin, tetramethrin [(1R)- isomer)], tralomethrin and transfluthrin or DDT or methoxychlor.

(4) Nicotinic acetylcholine receptor (nAChR) competitive modulators, such as, for example, neonicotinoids, e.g. acetamiprid, clothianidin, dinotefuran, imidacloprid, nitenpyram, thiacloprid and thiamethoxam or nicotine or sulfoxaflor or flupyradifurone.

(5) Nicotinic acetylcholine receptor (nAChR) allosteric modulators, such as, for example, spinosyns, e.g. spinetoram and spinosad.

(6) Glutamate-gated chloride channel (GluCl) allosteric modulators, such as, for example, avermectins/milbemycins, for example abamectin, emamectin benzoate, lepimectin and milbemectin.

(7) Juvenile hormone mimics, such as, for example, juvenile hormone analogues, e.g. hydroprene, kinoprene and methoprene or fenoxycarb or pyriproxyfen.

(8) Miscellaneous non-specific (multi-site) inhibitors, such as, for example, alkyl halides, e.g. methyl bromide and other alkyl halides; or chloropicrine or sulphuryl fluoride or borax or tartar emetic or methyl isocyanate generators, e.g. diazomet and metam.

(9) Modulators of Chordotonal Organs, such as, for example pymetrozine or flonicamid.

(10) Mite growth inhibitors, such as, for example clofentezine, hexythiazox and diflovidazin or etoxazole.

(11) Microbial disruptors of the insect gut membrane, such as, for example *Bacillus thuringiensis* subspecies *israelensis*, *Bacillus sphaericus*, *Bacillus thuringiensis* subspecies *aizawai*, *Bacillus*

thuringiensis subspecies *kurstaki*, *Bacillus thuringiensis* subspecies *tenebrionis*, and *B.t.* plant proteins: Cry1Ab, Cry1Ac, Cry1Fa, Cry1A.105, Cry2Ab, Vip3A, mCry3A, Cry3Ab, Cry3Bb, Cry34Ab1/35Ab1.

(12) Inhibitors of mitochondrial ATP synthase, such as, ATP disruptors such as, for example, diafenthiuron or organotin compounds, for example azocyclotin, cyhexatin and fenbutatin oxide or propargite or tetradifon.

(13) Uncouplers of oxidative phosphorylation via disruption of the proton gradient, such as, for example, chlorfenapyr, DNOC and sulfluramid.

(14) Nicotinic acetylcholine receptor channel blockers, such as, for example, bensultap, cartap hydrochloride, thiocylam, and thiosultap-sodium.

(15) Inhibitors of chitin biosynthesis, type 0, such as, for example, bistrifluron, chlorfluazuron, diflubenzuron, flucycloxuron, flufenoxuron, hexaflumuron, lufenuron, novaluron, noviflumuron, teflubenzuron and triflumuron.

(16) Inhibitors of chitin biosynthesis, type 1, for example buprofezin.

(17) Moulting disruptor (in particular for Diptera, i.e. dipterans), such as, for example, cyromazine.

(18) Ecdysone receptor agonists, such as, for example, chromafenozide, halofenozide, methoxyfenozide and tebufenozide.

(19) Octopamine receptor agonists, such as, for example, amitraz.

(20) Mitochondrial complex III electron transport inhibitors, such as, for example, hydramethylnone or acequinocyl or fluacrypyrim.

(21) Mitochondrial complex I electron transport inhibitors, such as, for example from the group of the METI acaricides, e.g. fenazaquin, fenpyroximate, pyrimidifen, pyridaben, tebufenpyrad and tolfenpyrad or rotenone (Derris).

(22) Voltage-dependent sodium channel blockers, such as, for example indoxacarb or metaflumizone.

(23) Inhibitors of acetyl CoA carboxylase, such as, for example, tetronic and tetramic acid derivatives, e.g. spirodiclofen, spiromesifen and spirotetramat.

(24) Mitochondrial complex IV electron transport inhibitors, such as, for example, phosphines, e.g. aluminium phosphide, calcium phosphide, phosphine and zinc phosphide or cyanides, e.g. calcium cyanide, potassium cyanide and sodium cyanide.

(25) Mitochondrial complex II electron transport inhibitors, such as, for example, *beta*-ketonitrile derivatives, e.g. cyenopyrafen and cyflumetofen and carboxanilides, such as, for example, pyflubumide.

(28) Ryanodine receptor modulators, such as, for example, diamides, e.g. chlorantraniliprole, cyantraniliprole and flubendiamide,

further active compounds such as, for example, Afidopyropen, Afoxolaner, Azadirachtin, Benclothiaz, Benzoximate, Bifenazate, Broflanilide, Bromopropylate, Chinomethionat, Chloroprallethrin, Cryolite, Cyclaniliprole, Cycloxaprid, Cyhalodiamide, Dicloromezotiaz, Dicofol, epsilon-Metofluthrin, epsilon-Momfluthrin, Flometoquin, Fluazaindolizine, Fluensulfone, Flufenerim, Flufenoxystrobin, Flufiprole, Fluhexafon, Fluopyram, Fluralaner, Fluxametamide, Fufenozide, Guadipyr, Heptafluthrin, Imidaclothiz, Iprodione, kappa-Bifenthrin, kappa-Tefluthrin, Lotilaner, Meperfluthrin, Paichongding, Pyridalyl, Pyrifluquinazon, Pyriminostrobin, Spirobudiclofen, Tetramethylfluthrin, Tetraniliprole, Tetrachlorantraniliprole, Tioxazafen, Thiofluoximate, Triflumezopyrim and iodomethane; furthermore preparations based on Bacillus firmus (I-1582, BioNeem, Votivo), and also the following compounds: 1-{2-fluoro-4-methyl-5-[(2,2,2-trifluoroethyl)sulphinyl]phenyl}-3-(trifluoromethyl)-1H-1,2,4-triazole-5-amine (known from WO2006/043635) (CAS 885026-50-6), {1'-[(2E)-3-(4-chlorophenyl)prop-2-en-1-yl]-5-fluorospiro[indol-3,4'-piperidin]-1(2H)-yl}(2-chloropyridin-4-yl)methanone (known from WO2003/106457) (CAS 637360-23-7), 2-chloro-N-[2-{1-[(2E)-3-(4-chlorophenyl)prop-2-en-1-yl]piperidin-4-yl}-4-(trifluoromethyl)phenyl]isonicotinamide (known from WO2006/003494) (CAS 872999-66-1), 3-(4-chloro-2,6-dimethylphenyl)-4-hydroxy-8-methoxy-1,8-diazaspiro[4.5]dec-3-en-2-one (known from WO 2010052161) (CAS 1225292-17-0), 3-(4-chloro-2,6-dimethylphenyl)-8-methoxy-2-oxo-1,8-diazaspiro[4.5]dec-3-en-4-yl ethyl carbonate (known from EP2647626) (CAS 1440516-42-6), 4-(but-2-yn-1-yloxy)-6-(3,5-dimethylpiperidin-1-yl)-5-fluoropyrimidine (known from WO2004/099160) (CAS 792914-58-0), PF1364 (known from JP2010/018586) (CAS 1204776-60-2), N-[(2E)-1-[(6-chloropyridin-3-yl)methyl]pyridin-2(1H)-ylidene]-2,2,2-trifluoroacetamide (known from WO2012/029672) (CAS 1363400-41-2), (3E)-3-[1-[(6-chloro-3-pyridyl)methyl]-2-pyridylidene]-1,1,1-trifluoro-propan-2-one (known from WO2013/144213) (CAS 1461743-15-6), , N-[3-(benzylcarbamoyl)-4-chlorophenyl]-1-methyl-3-(pentafluoroethyl)-4-(trifluoromethyl)-1H-pyrazole-5-carboxamide (known from WO2010/051926) (CAS 1226889-14-0), 5-bromo-4-chloro-N-[4-chloro-2-methyl-6-(methylcarbamoyl)phenyl]-2-(3-chloro-2-pyridyl)pyrazole-3-carboxamide (known from CN103232431) (CAS 1449220-44-3), 4-[5-(3,5-dichlorophenyl)-4,5-dihydro-5-(trifluoromethyl)-3-isoxazolyl]-2-methyl-N-(cis-1-oxido-3-thietanyl)-benzamide, 4-[5-(3,5-dichlorophenyl)-4,5-dihydro-5-(trifluoromethyl)-3-isoxazolyl]-2-methyl-N-(trans-1-oxido-3-thietanyl)-benzamide and 4-[(5S)-5-(3,5-dichlorophenyl)-4,5-dihydro-5-(trifluoromethyl)-3-isoxazolyl]-2-methyl-N-(cis-1-oxido-3-thietanyl)benzamide (known from WO 2013/050317 A1) (CAS 1332628-83-7), N-[3-chloro-1-(3-pyridinyl)-1H-pyrazol-4-yl]-N-ethyl-3-[(3,3,3-trifluoropropyl)sulfinyl]-propanamide, (+)-N-[3-chloro-1-

(3-pyridinyl)-1H-pyrazol-4-yl]-N-ethyl-3-[(3,3,3-trifluoropropyl)sulfinyl]-propanamide and (-)-N-[3-chloro-1-(3-pyridinyl)-1H-pyrazol-4-yl]-N-ethyl-3-[(3,3,3-trifluoropropyl)sulfinyl]-propanamide (known from WO 2013/162715 A2, WO 2013/162716 A2, US 2014/0213448 A1) (CAS 1477923-37-7), 5-[[(2E)-3-chloro-2-propen-1-yl]amino]-1-[2,6-dichloro-4-(trifluoromethyl)phenyl]-4-[(trifluoromethyl)sulfinyl]-1H-pyrazole-3-carbonitrile (known from CN 101337937 A) (CAS 1105672-77-2), 3-bromo-N-[4-chloro-2-methyl-6-[(methylamino)thioxomethyl]phenyl]-1-(3-chloro-2-pyridinyl)-1H-pyrazole-5-carboxamide, (Liudaibenjiaxuanan, known from CN 103109816 A) (CAS 1232543-85-9); N-[4-chloro-2-[[(1,1-dimethylethyl)amino]carbonyl]-6-methylphenyl]-1-(3-chloro-2-pyridinyl)-3-(fluoromethoxy)-1H-Pyrazole-5-carboxamide (known from WO 2012/034403 A1) (CAS 1268277-22-0), N-[2-(5-amino-1,3,4-thiadiazol-2-yl)-4-chloro-6-methylphenyl]-3-bromo-1-(3-chloro-2-pyridinyl)-1H-pyrazole-5-carboxamide (known from WO 2011/085575 A1) (CAS 1233882-22-8), 4-[3-[2,6-dichloro-4-[(3,3-dichloro-2-propen-1-yl)oxy]phenoxy]propoxy]-2-methoxy-6-(trifluoromethyl)-pyrimidine (known from CN 101337940 A) (CAS 1108184-52-6); (2E)- and 2(Z)-2-[2-(4-cyanophenyl)-1-[3-(trifluoromethyl)phenyl]ethylidene]-N-[4-(difluoromethoxy)phenyl]-hydrazinecarboxamide (known from CN 101715774 A) (CAS 1232543-85-9); 3-(2,2-dichloroethenyl)-2,2-dimethyl-4-(1H-benzimidazol-2-yl)phenyl-cyclopropanecarboxylic acid ester (known from CN 103524422 A) (CAS 1542271-46-4); (4aS)-7-chloro-2,5-dihydro-2-[[(methoxycarbonyl)[4-[(trifluoromethyl)thio]phenyl]amino]carbonyl]-indeno[1,2-e][1,3,4]oxadiazine-4a(3H)-carboxylic acid methyl ester (known from CN 102391261 A) (CAS 1370358-69-2); 6-deoxy-3-O-ethyl-2,4-di-O-methyl-, 1-[N-[4-[1-[4-(1,1,2,2,2-pentafluoroethoxy)phenyl]-1H-1,2,4-triazol-3-yl]phenyl]carbamate]-α-L-mannopyranose (known from US 2014/0275503 A1) (CAS 1181213-14-8); 8-(2-cyclopropylmethoxy-4-trifluoromethyl-phenoxy)-3-(6-trifluoromethyl-pyridazin-3-yl)-3-aza-bicyclo[3.2.1]octane (CAS 1253850-56-4), (8-anti)-8-(2-cyclopropylmethoxy-4-trifluoromethyl-phenoxy)-3-(6-trifluoromethyl-pyridazin-3-yl)-3-aza-bicyclo[3.2.1]octane (CAS 933798-27-7), (8-syn)-8-(2-cyclopropylmethoxy-4-trifluoromethyl-phenoxy)-3-(6-trifluoromethyl-pyridazin-3-yl)-3-aza-bicyclo[3.2.1]octane (known from WO 2007040280 A1, WO 2007040282 A1) (CAS 934001-66-8), N-[3-chloro-1-(3-pyridinyl)-1H-pyrazol-4-yl]-N-ethyl-3-[(3,3,3-trifluoropropyl)thio]-propanamide (known from WO 2015/058021 A1, WO 2015/058028 A1) (CAS 1477919-27-9) and N-[4-(aminothioxomethyl)-2-methyl-6-[(methylamino)carbonyl]phenyl]-3-bromo-1-(3-chloro-2-pyridinyl)-1H-pyrazole-5-carboxamide (known from CN 103265527 A) (CAS 1452877-50-7).

Fungicides

The active ingredients specified herein by their Common Name are known and described, for example, in The Pesticide Manual (16th Ed.British Crop Protection Council) or can be searched in the internet (e.g. www.alanwood.net/pesticides).

All named fungicidal mixing partners of the classes (1) to (15) can, if their functional groups enable this, optionally form salts with suitable bases or acids. All named mixing partners of the classes (1) to (15) can include tautomeric forms, where applicable.

1) Inhibitors of the ergosterol biosynthesis, for example (1.001) cyproconazole, (1.002) difenoconazole, (1.003) epoxiconazole, (1.004) fenhexamid, (1.005) fenpropidin, (1.006) fenpropimorph, (1.007) fenpyrazamine, (1.008) fluquinconazole, (1.009) flutriafol, (1.010) imazalil, (1.011) imazalil sulfate, (1.012) ipconazole, (1.013) metconazole, (1.014) myclobutanil, (1.015) paclobutrazol, (1.016) prochloraz, (1.017) propiconazole, (1.018) prothioconazole, (1.019) Pyrisoxazole, (1.020) spiroxamine, (1.021) tebuconazole, (1.022) tetraconazole, (1.023) triadimenol, (1.024) tridemorph, (1.025) triticonazole, (1.026) (1R,2S,5S)-5-(4-chlorobenzyl)-2-(chloromethyl)-2-methyl-1-(1H-1,2,4-triazol-1-ylmethyl)cyclopentanol, (1.027) (1S,2R,5R)-5-(4-chlorobenzyl)-2-(chloromethyl)-2-methyl-1-(1H-1,2,4-triazol-1-ylmethyl)cyclopentanol, (1.028) (2R)-2-(1-chlorocyclopropyl)-4-[(1R)-2,2-dichlorocyclopropyl]-1-(1H-1,2,4-triazol-1-yl)butan-2-ol, (1.029) (2R)-2-(1-chlorocyclopropyl)-4-[(1S)-2,2-dichlorocyclopropyl]-1-(1H-1,2,4-triazol-1-yl)butan-2-ol, (1.030) (2R)-2-[4-(4-chlorophenoxy)-2-(trifluoromethyl)phenyl]-1-(1H-1,2,4-triazol-1-yl)propan-2-ol, (1.031) (2S)-2-(1-chlorocyclopropyl)-4-[(1R)-2,2-dichlorocyclopropyl]-1-(1H-1,2,4-triazol-1-yl)butan-2-ol, (1.032) (2S)-2-(1-chlorocyclopropyl)-4-[(1S)-2,2-dichlorocyclopropyl]-1-(1H-1,2,4-triazol-1-yl)butan-2-ol, (1.033) (2S)-2-[4-(4-chlorophenoxy)-2-(trifluoromethyl)phenyl]-1-(1H-1,2,4-triazol-1-yl)propan-2-ol, (1.034) (R)-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-1,2-oxazol-4-yl](pyridin-3-yl)methanol, (1.035) (S)-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-1,2-oxazol-4-yl](pyridin-3-yl)methanol, (1.036) [3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-1,2-oxazol-4-yl](pyridin-3-yl)methanol, (1.037) 1-({(2R,4S)-2-[2-chloro-4-(4-chlorophenoxy)phenyl]-4-methyl-1,3-dioxolan-2-yl}methyl)-1H-1,2,4-triazole, (1.038) 1-({(2S,4S)-2-[2-chloro-4-(4-chlorophenoxy)phenyl]-4-methyl-1,3-dioxolan-2-yl}methyl)-1H-1,2,4-triazole, (1.039) 1-{[3-(2-chlorophenyl)-2-(2,4-difluorophenyl)oxiran-2-yl]methyl}-1H-1,2,4-triazol-5-yl thiocyanate, (1.040) 1-{[rel(2R,3R)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)oxiran-2-yl]methyl}-1H-1,2,4-triazol-5-yl thiocyanate, (1.041) 1-{[rel(2R,3S)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)oxiran-2-yl]methyl}-1H-1,2,4-triazol-5-yl thiocyanate, (1.042) 2-[(2R,4R,5R)-1-(2,4-dichlorophenyl)-5-hydroxy-2,6,6-trimethylheptan-4-yl]-2,4-dihydro-3H-1,2,4-triazole-3-thione, (1.043) 2-[(2R,4R,5S)-1-(2,4-dichlorophenyl)-5-hydroxy-2,6,6-trimethylheptan-4-yl]-2,4-dihydro-3H-1,2,4-triazole-3-thione, (1.044) 2-[(2R,4S,5R)-1-(2,4-dichlorophenyl)-5-hydroxy-2,6,6-trimethylheptan-4-yl]-2,4-dihydro-3H-1,2,4-triazole-3-thione, (1.045) 2-[(2R,4S,5S)-1-(2,4-dichlorophenyl)-5-hydroxy-2,6,6-trimethylheptan-4-yl]-2,4-dihydro-3H-1,2,4-triazole-3-thione, (1.046) 2-[(2S,4R,5R)-1-(2,4-dichlorophenyl)-5-hydroxy-2,6,6-trimethylheptan-4-yl]-2,4-dihydro-3H-1,2,4-triazole-3-thione, (1.047) 2-[(2S,4R,5S)-1-(2,4-dichlorophenyl)-5-hydroxy-2,6,6-trimethylheptan-4-yl]-2,4-dihydro-3H-1,2,4-triazole-3-thione, (1.048) 2-[(2S,4S,5R)-1-(2,4-dichlorophenyl)-5-hydroxy-2,6,6-trimethylheptan-4-yl]-2,4-dihydro-3H-1,2,4-triazole-3-thione, (1.049) 2-[(2S,4S,5S)-1-(2,4-

dichlorophenyl)-5-hydroxy-2,6,6-trimethylheptan-4-yl]-2,4-dihydro-3H-1,2,4-triazole-3-thione, (1.050) 2-[1-(2,4-dichlorophenyl)-5-hydroxy-2,6,6-trimethylheptan-4-yl]-2,4-dihydro-3H-1,2,4-triazole-3-thione, (1.051) 2-[2-chloro-4-(2,4-dichlorophenoxy)phenyl]-1-(1H-1,2,4-triazol-1-yl)propan-2-ol, (1.052) 2-[2-chloro-4-(4-chlorophenoxy)phenyl]-1-(1H-1,2,4-triazol-1-yl)butan-2-ol, (1.053) 2-[4-(4-chlorophenoxy)-2-(trifluoromethyl)phenyl]-1-(1H-1,2,4-triazol-1-yl)butan-2-ol, (1.054) 2-[4-(4-chlorophenoxy)-2-(trifluoromethyl)phenyl]-1-(1H-1,2,4-triazol-1-yl)pentan-2-ol, (1.055) 2-[4-(4-chlorophenoxy)-2-(trifluoromethyl)phenyl]-1-(1H-1,2,4-triazol-1-yl)propan-2-ol, (1.056) 2-{[3-(2-chlorophenyl)-2-(2,4-difluorophenyl)oxiran-2-yl]methyl}-2,4-dihydro-3H-1,2,4-triazole-3-thione, (1.057) 2-{[rel(2R,3R)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)oxiran-2-yl]methyl}-2,4-dihydro-3H-1,2,4-triazole-3-thione, (1.058) 2-{[rel(2R,3S)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)oxiran-2-yl]methyl}-2,4-dihydro-3H-1,2,4-triazole-3-thione, (1.059) 5-(4-chlorobenzyl)-2-(chloromethyl)-2-methyl-1-(1H-1,2,4-triazol-1-ylmethyl)cyclopentanol, (1.060) 5-(allylsulfanyl)-1-{[3-(2-chlorophenyl)-2-(2,4-difluorophenyl)oxiran-2-yl]methyl}-1H-1,2,4-triazole, (1.061) 5-(allylsulfanyl)-1-{[rel(2R,3R)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)oxiran-2-yl]methyl}-1H-1,2,4-triazole, (1.062) 5-(allylsulfanyl)-1-{[rel(2R,3S)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)oxiran-2-yl]methyl}-1H-1,2,4-triazole, (1.063) N'-(2,5-dimethyl-4-{[3-(1,1,2,2-tetrafluoroethoxy)phenyl]sulfanyl}phenyl)-N-ethyl-N-methylimidoformamide, (1.064) N'-(2,5-dimethyl-4-{[3-(2,2,2-trifluoroethoxy)phenyl]sulfanyl}phenyl)-N-ethyl-N-methylimidoformamide, (1.065) N'-(2,5-dimethyl-4-{[3-(2,2,3,3-tetrafluoropropoxy)phenyl]sulfanyl}phenyl)-N-ethyl-N-methylimidoformamide, (1.066) N'-(2,5-dimethyl-4-{[3-(pentafluoroethoxy)phenyl]sulfanyl}phenyl)-N-ethyl-N-methylimidoformamide, (1.067) N'-(2,5-dimethyl-4-{3-[(1,1,2,2-tetrafluoroethyl)sulfanyl]phenoxy}phenyl)-N-ethyl-N-methylimidoformamide, (1.068) N'-(2,5-dimethyl-4-{3-[(2,2,2-trifluoroethyl)sulfanyl]phenoxy}phenyl)-N-ethyl-N-methylimidoformamide, (1.069) N'-(2,5-dimethyl-4-{3-[(2,2,3,3-tetrafluoropropyl)sulfanyl]phenoxy}phenyl)-N-ethyl-N-methylimidoformamide, (1.070) N'-(2,5-dimethyl-4-{3-[(pentafluoroethyl)sulfanyl]phenoxy}phenyl)-N-ethyl-N-methylimidoformamide, (1.071) N'-(2,5-dimethyl-4-phenoxyphenyl)-N-ethyl-N-methylimidoformamide, (1.072) N'-(4-{[3-(difluoromethoxy)phenyl]sulfanyl}-2,5-dimethylphenyl)-N-ethyl-N-methylimidoformamide, (1.073) N'-(4-{3-[(difluoromethyl)sulfanyl]phenoxy}-2,5-dimethylphenyl)-N-ethyl-N-methylimidoformamide, (1.074) N'-[5-bromo-6-(2,3-dihydro-1H-inden-2-yloxy)-2-methylpyridin-3-yl]-N-ethyl-N-methylimidoformamide, (1.075) N'-{4-[(4,5-dichloro-1,3-thiazol-2-yl)oxy]-2,5-dimethylphenyl}-N-ethyl-N-methylimidoformamide, (1.076) N'-{5-bromo-6-[(1R)-1-(3,5-difluorophenyl)ethoxy]-2-methylpyridin-3-yl}-N-ethyl-N-methylimidoformamide, (1.077) N'-{5-bromo-6-[(1S)-1-(3,5-difluorophenyl)ethoxy]-2-methylpyridin-3-yl}-N-ethyl-N-methylimidoformamide, (1.078) N'-{5-bromo-6-[(cis-4-isopropylcyclohexyl)oxy]-2-methylpyridin-3-yl}-N-ethyl-N-methylimidoformamide, (1.079) N'-{5-bromo-6-[(trans-4-isopropylcyclohexyl)oxy]-2-methylpyridin-3-yl}-N-ethyl-N-methylimidoformamide, (1.080) N'-{5-bromo-6-[1-(3,5-difluorophenyl)ethoxy]-2-methylpyridin-3-yl}-N-ethyl-N-methylimidoformamide, (1.081) Mefentrifluconazole, (1.082) Ipfentrifluconazole.

2) Inhibitors of the respiratory chain at complex I or II, for example (2.001) benzovindiflupyr, (2.002) bixafen, (2.003) boscalid, (2.004) carboxin, (2.005) fluopyram, (2.006) flutolanil, (2.007) fluxapyroxad, (2.008) furametpyr, (2.009) Isofetamid, (2.010) isopyrazam (anti-epimeric enantiomer 1R,4S,9S), (2.011) isopyrazam (anti-epimeric enantiomer 1S,4R,9R), (2.012) isopyrazam (anti-epimeric racemate 1RS,4SR,9SR), (2.013) isopyrazam (mixture of syn-epimeric racemate 1RS,4SR,9RS and anti-epimeric racemate 1RS,4SR,9SR), (2.014) isopyrazam (syn-epimeric enantiomer 1R,4S,9R), (2.015) isopyrazam (syn-epimeric enantiomer 1S,4R,9S), (2.016) isopyrazam (syn-epimeric racemate 1RS,4SR,9RS), (2.017) penflufen, (2.018) penthiopyrad, (2.019) pydiflumetofen, (2.020) Pyraziflumid, (2.021) sedaxane, (2.022) 1,3-dimethyl-N-(1,1,3-trimethyl-2,3-dihydro-1H-inden-4-yl)-1H-pyrazole-4-carboxamide, (2.023) 1,3-dimethyl-N-[(3R)-1,1,3-trimethyl-2,3-dihydro-1H-inden-4-yl]-1H-pyrazole-4-carboxamide, (2.024) 1,3-dimethyl-N-[(3S)-1,1,3-trimethyl-2,3-dihydro-1H-inden-4-yl]-1H-pyrazole-4-carboxamide, (2.025) 1-methyl-3-(trifluoromethyl)-N-[2'-(trifluoromethyl)biphenyl-2-yl]-1H-pyrazole-4-carboxamide, (2.026) 2-fluoro-6-(trifluoromethyl)-N-(1,1,3-trimethyl-2,3-dihydro-1H-inden-4-yl)benzamide, (2.027) 3-(difluoromethyl)-1-methyl-N-(1,1,3-trimethyl-2,3-dihydro-1H-inden-4-yl)-1H-pyrazole-4-carboxamide, (2.028) 3-(difluoromethyl)-1-methyl-N-[(3R)-1,1,3-trimethyl-2,3-dihydro-1H-inden-4-yl]-1H-pyrazole-4-carboxamide, (2.029) 3-(difluoromethyl)-1-methyl-N-[(3S)-1,1,3-trimethyl-2,3-dihydro-1H-inden-4-yl]-1H-pyrazole-4-carboxamide, (2.030) 3-(difluoromethyl)-N-(7-fluoro-1,1,3-trimethyl-2,3-dihydro-1H-inden-4-yl)-1-methyl-1H-pyrazole-4-carboxamide, (2.031) 3-(difluoromethyl)-N-[(3R)-7-fluoro-1,1,3-trimethyl-2,3-dihydro-1H-inden-4-yl]-1-methyl-1H-pyrazole-4-carboxamide, (2.032) 3-(difluoromethyl)-N-[(3S)-7-fluoro-1,1,3-trimethyl-2,3-dihydro-1H-inden-4-yl]-1-methyl-1H-pyrazole-4-carboxamide, (2.033) 5,8-difluoro-N-[2-(2-fluoro-4-{[4-(trifluoromethyl)pyridin-2-yl]oxy}phenyl)ethyl]quinazolin-4-amine, (2.034) N-(2-cyclopentyl-5-fluorobenzyl)-N-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1H-pyrazole-4-carboxamide, (2.035) N-(2-tert-butyl-5-methylbenzyl)-N-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1H-pyrazole-4-carboxamide, (2.036) N-(2-tert-butylbenzyl)-N-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1H-pyrazole-4-carboxamide, (2.037) N-(5-chloro-2-ethylbenzyl)-N-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1H-pyrazole-4-carboxamide, (2.038) N-(5-chloro-2-isopropylbenzyl)-N-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1H-pyrazole-4-carboxamide, (2.039) N-[(1R,4S)-9-(dichloromethylene)-1,2,3,4-tetrahydro-1,4-methanonaphthalen-5-yl]-3-(difluoromethyl)-1-methyl-1H-pyrazole-4-carboxamide, (2.040) N-[(1S,4R)-9-(dichloromethylene)-1,2,3,4-tetrahydro-1,4-methanonaphthalen-5-yl]-3-(difluoromethyl)-1-methyl-1H-pyrazole-4-carboxamide, (2.041) N-[1-(2,4-dichlorophenyl)-1-methoxypropan-2-yl]-3-(difluoromethyl)-1-methyl-1H-pyrazole-4-carboxamide, (2.042) N-[2-chloro-6-(trifluoromethyl)benzyl]-N-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1H-pyrazole-4-carboxamide, (2.043) N-[3-chloro-2-fluoro-6-(trifluoromethyl)benzyl]-N-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1H-pyrazole-4-carboxamide, (2.044) N-[5-chloro-2-(trifluoromethyl)benzyl]-N-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1H-pyrazole-4-carboxamide, (2.045) N-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-

methyl-N-[5-methyl-2-(trifluoromethyl)benzyl]-1H-pyrazole-4-carboxamide, (2.046) N-cyclopropyl-3-(difluoromethyl)-5-fluoro-N-(2-fluoro-6-isopropylbenzyl)-1-methyl-1H-pyrazole-4-carboxamide, (2.047) N-cyclopropyl-3-(difluoromethyl)-5-fluoro-N-(2-isopropyl-5-methylbenzyl)-1-methyl-1H-pyrazole-4-carboxamide, (2.048) N-cyclopropyl-3-(difluoromethyl)-5-fluoro-N-(2-isopropylbenzyl)-1-methyl-1H-pyrazole-4-carbothioamide, (2.049) N-cyclopropyl-3-(difluoromethyl)-5-fluoro-N-(2-isopropylbenzyl)-1-methyl-1H-pyrazole-4-carboxamide, (2.050) N-cyclopropyl-3-(difluoromethyl)-5-fluoro-N-(5-fluoro-2-isopropylbenzyl)-1-methyl-1H-pyrazole-4-carboxamide, (2.051) N-cyclopropyl-3-(difluoromethyl)-N-(2-ethyl-4,5-dimethylbenzyl)-5-fluoro-1-methyl-1H-pyrazole-4-carboxamide, (2.052) N-cyclopropyl-3-(difluoromethyl)-N-(2-ethyl-5-fluorobenzyl)-5-fluoro-1-methyl-1H-pyrazole-4-carboxamide, (2.053) N-cyclopropyl-3-(difluoromethyl)-N-(2-ethyl-5-methylbenzyl)-5-fluoro-1-methyl-1H-pyrazole-4-carboxamide, (2.054) N-cyclopropyl-N-(2-cyclopropyl-5-fluorobenzyl)-3-(difluoromethyl)-5-fluoro-1-methyl-1H-pyrazole-4-carboxamide, (2.055) N-cyclopropyl-N-(2-cyclopropyl-5-methylbenzyl)-3-(difluoromethyl)-5-fluoro-1-methyl-1H-pyrazole-4-carboxamide, (2.056) N-cyclopropyl-N-(2-cyclopropylbenzyl)-3-(difluoromethyl)-5-fluoro-1-methyl-1H-pyrazole-4-carboxamide.

3) Inhibitors of the respiratory chain at complex III, for example (3.001) ametoctradin, (3.002) amisulbrom, (3.003) azoxystrobin, (3.004) coumethoxystrobin, (3.005) coumoxystrobin, (3.006) cyazofamid, (3.007) dimoxystrobin, (3.008) enoxastrobin, (3.009) famoxadone, (3.010) fenamidone, (3.011) flufenoxystrobin, (3.012) fluoxastrobin, (3.013) kresoxim-methyl, (3.014) metominostrobin, (3.015) orysastrobin, (3.016) picoxystrobin, (3.017) pyraclostrobin, (3.018) pyrametostrobin, (3.019) pyraoxystrobin, (3.020) trifloxystrobin, (3.021) (2E)-2-{2-[({[(1E)-1-(3-{[(E)-1-fluoro-2-phenylvinyl]oxy}phenyl)ethylidene]amino}oxy)methyl]phenyl}-2-(methoxyimino)-N-methylacetamide, (3.022) (2E,3Z)-5-{[1-(4-chlorophenyl)-1H-pyrazol-3-yl]oxy}-2-(methoxyimino)-N,3-dimethylpent-3-enamide, (3.023) (2R)-2-{2-[(2,5-dimethylphenoxy)methyl]phenyl}-2-methoxy-N-methylacetamide, (3.024) (2S)-2-{2-[(2,5-dimethylphenoxy)methyl]phenyl}-2-methoxy-N-methylacetamide, (3.025) (3S,6S,7R,8R)-8-benzyl-3-[({3-[(isobutyryloxy)methoxy]-4-methoxypyridin-2-yl}carbonyl)amino]-6-methyl-4,9-dioxo-1,5-dioxonan-7-yl 2-methylpropanoate, (3.026) 2-{2-[(2,5-dimethylphenoxy)methyl]phenyl}-2-methoxy-N-methylacetamide, (3.027) N-(3-ethyl-3,5,5-trimethylcyclohexyl)-3-formamido-2-hydroxybenzamide, (3.028) (2E,3Z)-5-{[1-(4-chloro-2-fluorophenyl)-1H-pyrazol-3-yl]oxy}-2-(methoxyimino)-N,3-dimethylpent-3-enamide, (3.029) methyl {5-[3-(2,4-dimethylphenyl)-1H-pyrazol-1-yl]-2-methylbenzyl}carbamate.

4) Inhibitors of the mitosis and cell division, for example (4.001) carbendazim, (4.002) diethofencarb, (4.003) ethaboxam, (4.004) fluopicolide, (4.005) pencycuron, (4.006) thiabendazole, (4.007) thiophanate-methyl, (4.008) zoxamide, (4.009) 3-chloro-4-(2,6-difluorophenyl)-6-methyl-5-phenylpyridazine, (4.010) 3-chloro-5-(4-chlorophenyl)-4-(2,6-difluorophenyl)-6-methylpyridazine,

(4.011) 3-chloro-5-(6-chloropyridin-3-yl)-6-methyl-4-(2,4,6-trifluorophenyl)pyridazine, (4.012) 4-(2-bromo-4-fluorophenyl)-N-(2,6-difluorophenyl)-1,3-dimethyl-1H-pyrazol-5-amine, (4.013) 4-(2-bromo-4-fluorophenyl)-N-(2-bromo-6-fluorophenyl)-1,3-dimethyl-1H-pyrazol-5-amine, (4.014) 4-(2-bromo-4-fluorophenyl)-N-(2-bromophenyl)-1,3-dimethyl-1H-pyrazol-5-amine, (4.015) 4-(2-bromo-4-fluorophenyl)-N-(2-chloro-6-fluorophenyl)-1,3-dimethyl-1H-pyrazol-5-amine, (4.016) 4-(2-bromo-4-fluorophenyl)-N-(2-chlorophenyl)-1,3-dimethyl-1H-pyrazol-5-amine, (4.017) 4-(2-bromo-4-fluorophenyl)-N-(2-fluorophenyl)-1,3-dimethyl-1H-pyrazol-5-amine, (4.018) 4-(2-chloro-4-fluorophenyl)-N-(2,6-difluorophenyl)-1,3-dimethyl-1H-pyrazol-5-amine, (4.019) 4-(2-chloro-4-fluorophenyl)-N-(2-chloro-6-fluorophenyl)-1,3-dimethyl-1H-pyrazol-5-amine, (4.020) 4-(2-chloro-4-fluorophenyl)-N-(2-chlorophenyl)-1,3-dimethyl-1H-pyrazol-5-amine, (4.021) 4-(2-chloro-4-fluorophenyl)-N-(2-fluorophenyl)-1,3-dimethyl-1H-pyrazol-5-amine, (4.022) 4-(4-chlorophenyl)-5-(2,6-difluorophenyl)-3,6-dimethylpyridazine, (4.023) N-(2-bromo-6-fluorophenyl)-4-(2-chloro-4-fluorophenyl)-1,3-dimethyl-1H-pyrazol-5-amine, (4.024) N-(2-bromophenyl)-4-(2-chloro-4-fluorophenyl)-1,3-dimethyl-1H-pyrazol-5-amine, (4.025) N-(4-chloro-2,6-difluorophenyl)-4-(2-chloro-4-fluorophenyl)-1,3-dimethyl-1H-pyrazol-5-amine.

5) Compounds capable to have a multisite action, for example (5.001) bordeaux mixture, (5.002) captafol, (5.003) captan, (5.004) chlorothalonil, (5.005) copper hydroxide, (5.006) copper naphthenate, (5.007) copper oxide, (5.008) copper oxychloride, (5.009) copper(2+) sulfate, (5.010) dithianon, (5.011) dodine, (5.012) folpet, (5.013) mancozeb, (5.014) maneb, (5.015) metiram, (5.016) metiram zinc, (5.017) oxine-copper, (5.018) propineb, (5.019) sulfur and sulfur preparations including calcium polysulfide, (5.020) thiram, (5.021) zineb, (5.022) ziram, (5.023) 6-ethyl-5,7-dioxo-6,7-dihydro-5H-pyrrolo[3',4':5,6][1,4]dithiino[2,3-c][1,2]thiazole-3-carbonitrile.

6) Compounds capable to induce a host defence, for example (6.001) acibenzolar-S-methyl, (6.002) isotianil, (6.003) probenazole, (6.004) tiadinil.

7) Inhibitors of the amino acid and/or protein biosynthesis, for example (7.001) cyprodinil, (7.002) kasugamycin, (7.003) kasugamycin hydrochloride hydrate, (7.004) oxytetracycline, (7.005) pyrimethanil, (7.006) 3-(5-fluoro-3,3,4,4-tetramethyl-3,4-dihydroisoquinolin-1-yl)quinoline.

8) Inhibitors of the ATP production, for example (8.001) silthiofam.

9) Inhibitors of the cell wall synthesis, for example (9.001) benthiavalicarb, (9.002) dimethomorph, (9.003) flumorph, (9.004) iprovalicarb, (9.005) mandipropamid, (9.006) pyrimorph, (9.007) valifenalate, (9.008) (2E)-3-(4-tert-butylphenyl)-3-(2-chloropyridin-4-yl)-1-(morpholin-4-yl)prop-2-en-1-one, (9.009) (2Z)-3-(4-tert-butylphenyl)-3-(2-chloropyridin-4-yl)-1-(morpholin-4-yl)prop-2-en-1-one.

10) Inhibitors of the lipid and membrane synthesis, for example (10.001) propamocarb, (10.002) propamocarb hydrochloride, (10.003) tolclofos-methyl.

11) Inhibitors of the melanin biosynthesis, for example (11.001) tricyclazole, (11.002) 2,2,2-trifluoroethyl {3-methyl-1-[(4-methylbenzoyl)amino]butan-2-yl}carbamate.

12) Inhibitors of the nucleic acid synthesis, for example (12.001) benalaxyl, (12.002) benalaxyl-M (kiralaxyl), (12.003) metalaxyl, (12.004) metalaxyl-M (mefenoxam).

13) Inhibitors of the signal transduction, for example (13.001) fludioxonil, (13.002) iprodione, (13.003) procymidone, (13.004) proquinazid, (13.005) quinoxyfen, (13.006) vinclozolin.

14) Compounds capable to act as an uncoupler, for example (14.001) fluazinam, (14.002) meptyldinocap.

15) Further compounds, for example (15.001) Abscisic acid, (15.002) benthiazole, (15.003) bethoxazin, (15.004) capsimycin, (15.005) carvone, (15.006) chinomethionat, (15.007) cufraneb, (15.008) cyflufenamid, (15.009) cymoxanil, (15.010) cyprosulfamide, (15.011) flutianil, (15.012) fosetyl-aluminium, (15.013) fosetyl-calcium, (15.014) fosetyl-sodium, (15.015) methyl isothiocyanate, (15.016) metrafenone, (15.017) mildiomycin, (15.018) natamycin, (15.019) nickel dimethyldithiocarbamate, (15.020) nitrothal-isopropyl, (15.021) oxamocarb, (15.022) Oxathiapiprolin, (15.023) oxyfenthiin, (15.024) pentachlorophenol and salts, (15.025) phosphorous acid and its salts, (15.026) propamocarb-fosetylate, (15.027) pyriofenone (chlazafenone), (15.028) tebufloquin, (15.029) tecloftalam, (15.030) tolnifanide, (15.031) 1-(4-{4-[(5R)-5-(2,6-difluorophenyl)-4,5-dihydro-1,2-oxazol-3-yl]-1,3-thiazol-2-yl}piperidin-1-yl)-2-[5-methyl-3-(trifluoromethyl)-1H-pyrazol-1-yl]ethanone, (15.032) 1-(4-{4-[(5S)-5-(2,6-difluorophenyl)-4,5-dihydro-1,2-oxazol-3-yl]-1,3-thiazol-2-yl}piperidin-1-yl)-2-[5-methyl-3-(trifluoromethyl)-1H-pyrazol-1-yl]ethanone, (15.033) 2-(6-benzylpyridin-2-yl)quinazoline, (15.034) 2,6-dimethyl-1H,5H-[1,4]dithiino[2,3-c:5,6-c']dipyrrole-1,3,5,7(2H,6H)-tetrone, (15.035) 2-[3,5-bis(difluoromethyl)-1H-pyrazol-1-yl]-1-[4-(4-{5-[2-(prop-2-yn-1-yloxy)phenyl]-4,5-dihydro-1,2-oxazol-3-yl}-1,3-thiazol-2-yl)piperidin-1-yl]ethanone, (15.036) 2-[3,5-bis(difluoromethyl)-1H-pyrazol-1-yl]-1-[4-(4-{5-[2-chloro-6-(prop-2-yn-1-yloxy)phenyl]-4,5-dihydro-1,2-oxazol-3-yl}-1,3-thiazol-2-yl)piperidin-1-yl]ethanone, (15.037) 2-[3,5-bis(difluoromethyl)-1H-pyrazol-1-yl]-1-[4-(4-{5-[2-fluoro-6-(prop-2-yn-1-yloxy)phenyl]-4,5-dihydro-1,2-oxazol-3-yl}-1,3-thiazol-2-yl)piperidin-1-yl]ethanone, (15.038) 2-[6-(3-fluoro-4-methoxyphenyl)-5-methylpyridin-2-yl]quinazoline, (15.039) 2-{(5R)-3-[2-(1-{[3,5-bis(difluoromethyl)-1H-pyrazol-1-yl]acetyl}piperidin-4-yl)-1,3-thiazol-4-yl]-4,5-dihydro-1,2-oxazol-5-yl}-3-chlorophenyl methanesulfonate, (15.040) 2-{(5S)-3-[2-(1-{[3,5-bis(difluoromethyl)-1H-pyrazol-1-yl]acetyl}piperidin-4-yl)-1,3-thiazol-4-yl]-4,5-dihydro-1,2-oxazol-5-yl}-3-chlorophenyl methanesulfonate, (15.041) 2-{2-[(7,8-difluoro-2-methylquinolin-3-yl)oxy]-6-fluorophenyl}propan-2-ol, (15.042) 2-{2-fluoro-6-[(8-fluoro-2-methylquinolin-3-yl)oxy]phenyl}propan-2-ol, (15.043) 2-{3-[2-(1-

{[3,5-bis(difluoromethyl)-1H-pyrazol-1-yl]acetyl}piperidin-4-yl)-1,3-thiazol-4-yl]-4,5-dihydro-1,2-oxazol-5-yl}-3-chlorophenyl methanesulfonate, (15.044) 2-{3-[2-(1-{[3,5-bis(difluoromethyl)-1H-pyrazol-1-yl]acetyl}piperidin-4-yl)-1,3-thiazol-4-yl]-4,5-dihydro-1,2-oxazol-5-yl}phenyl methanesulfonate, (15.045) 2-phenylphenol and salts, (15.046) 3-(4,4,5-trifluoro-3,3-dimethyl-3,4-dihydroisoquinolin-1-yl)quinoline, (15.047) 3-(4,4-difluoro-3,3-dimethyl-3,4-dihydroisoquinolin-1-yl)quinoline, (15.048) 4-amino-5-fluoropyrimidin-2-ol (tautomeric form: 4-amino-5-fluoropyrimidin-2(1H)-one), (15.049) 4-oxo-4-[(2-phenylethyl)amino]butanoic acid, (15.050) 5-amino-1,3,4-thiadiazole-2-thiol, (15.051) 5-chloro-N'-phenyl-N'-(prop-2-yn-1-yl)thiophene-2-sulfonohydrazide, (15.052) 5-fluoro-2-[(4-fluorobenzyl)oxy]pyrimidin-4-amine, (15.053) 5-fluoro-2-[(4-methylbenzyl)oxy]pyrimidin-4-amine, (15.054) 9-fluoro-2,2-dimethyl-5-(quinolin-3-yl)-2,3-dihydro-1,4-benzoxazepine, (15.055) but-3-yn-1-yl {6-[({[(Z)-(1-methyl-1H-tetrazol-5-yl)(phenyl)methylene]amino}oxy)methyl]pyridin-2-yl}carbamate, (15.056) ethyl (2Z)-3-amino-2-cyano-3-phenylacrylate, (15.057) phenazine-1-carboxylic acid, (15.058) propyl 3,4,5-trihydroxybenzoate, (15.059) quinolin-8-ol, (15.060) quinolin-8-ol sulfate (2:1), (15.061) tert-butyl {6-[({[(1-methyl-1H-tetrazol-5-yl)(phenyl)methylene]amino}oxy)methyl]pyridin-2-yl}carbamate, (15.062) 5-fluoro-4-imino-3-methyl-1-[(4-methylphenyl)sulfonyl]-3,4-dihydropyrimidin-2(1H)-one.

Biological pesticides as mixing components

The compounds of the formula (I) can be combined with biological pesticides.

Biological pesticides comprise in particular bacteria, fungi, yeasts, plant extracts and products formed by microorganisms, including proteins and secondary metabolites.

Biological pesticides comprise bacteria such as spore-forming bacteria, root-colonising bacteria and bacteria which act as biological insecticides, fungicides or nematicides.

Examples of such bacteria which are employed or can be used as biological pesticides are:

Bacillus amyloliquefaciens, strain FZB42 (DSM 231179), or *Bacillus cereus,* in particular *B. cereus* strain CNCM I-1562 or *Bacillus firmus*, strain I-1582 (Accession number CNCM I-1582) or *Bacillus pumilus*, in particular strain GB34 (Accession No. ATCC 700814) and strain QST2808 (Accession No. NRRL B-30087), or *Bacillus subtilis*, in particular strain GB03 (Accession No. ATCC SD-1397), or *Bacillus subtilis* strain QST713 (Accession No. NRRL B-21661) or *Bacillus subtilis strain* OST 30002 (Accession No. NRRL B-50421) *Bacillus thuringiensis*, in particular *B. thuringiensis* subspecies *israelensis* (serotype H-14), strain AM65-52 (Accession No. ATCC 1276), or *B. thuringiensis subsp. aizawai*, in particular strain ABTS-1857 (SD-1372), or *B. thuringiensis subsp. kurstaki* strain HD-1, or *B. thuringiensis subsp. tenebrionis* strain NB 176 (SD-5428), *Pasteuria penetrans*, *Pasteuria spp.* (Rotylenchulus reniformis nematode)-PR3 (Accession Number ATCC SD-5834), *Streptomyces*

microflavus strain AQ6121 (= QRD 31.013, NRRL B-50550), *Streptomyces galbus* strain AQ 6047 (Acession Number NRRL 30232).

Examples of fungi and yeasts which are employed or can be used as biological pesticides are:

Beauveria bassiana, in particular strain ATCC 74040, *Coniothyrium minitans*, in particular strain CON/M/91-8 (Accession No. DSM-9660), *Lecanicillium spp.*, in particular strain HRO LEC 12, *Lecanicillium lecanii*, (formerly known as *Verticillium lecanii*), in particular strain KV01, *Metarhizium anisopliae*, in particular strain F52 (DSM3884/ ATCC 90448), *Metschnikowia fructicola*, in particular strain NRRL Y-30752, *Paecilomyces fumosoroseus (*now: *Isaria fumosorosea)*, in particular strain IFPC 200613, or strain Apopka 97 (Accesion No. ATCC 20874), *Paecilomyces lilacinus*, in particular *P. lilacinus* strain 251 (AGAL 89/030550), *Talaromyces flavus*, in particular strain V117b, *Trichoderma atroviride*, in particular strain SC1 (Accession Number CBS 122089), *Trichoderma harzianum*, in particular *T. harzianum rifai T39*. (Accession Number CNCM I-952).

Examples of viruses which are employed or can be used as biological pesticides are:

Adoxophyes orana (summer fruit tortrix) granulosis virus (GV), *Cydia pomonella* (codling moth) granulosis virus (GV), *Helicoverpa armigera* (cotton bollworm) nuclear polyhedrosis virus (NPV), *Spodoptera exigua* (beet armyworm) mNPV, *Spodoptera frugiperda* (fall armyworm) mNPV, *Spodoptera littoralis* (African cotton leafworm) NPV.

Also included are bacteria and fungi which are added as 'inoculant' to plants or plant parts or plant organs and which, by virtue of their particular properties, promote plant growth and plant health. Examples which may be mentioned are:

Agrobacterium spp., *Azorhizobium caulinodans*, *Azospirillum spp.*, *Azotobacter spp.*, *Bradyrhizobium spp.*, *Burkholderia spp.*, in particular *Burkholderia cepacia* (formerly known as *Pseudomonas cepacia*), *Gigaspora spp.*, or *Gigaspora monosporum*, *Glomus spp.*, *Laccaria spp.*, *Lactobacillus buchneri*, *Paraglomus spp.*, *Pisolithus tinctorus*, *Pseudomonas spp.*, *Rhizobium spp.*, in particular *Rhizobium trifolii*, *Rhizopogon spp.*, *Scleroderma spp.*, *Suillus spp.*, *Streptomyces spp.*

Examples of plant extracts and products formed by microorganisms including proteins and secondary metabolites which are employed or can be used as biological pesticides are:

Allium sativum, Artemisia absinthium, azadirachtin, Biokeeper WP, Cassia nigricans, Celastrus angulatus, Chenopodium anthelminticum, chitin, Armour-Zen, Dryopteris filix-mas, Equisetum arvense, Fortune Aza, Fungastop, Heads Up (Chenopodium quinoa saponin extract), Pyrethrum/Pyrethrins, Quassia amara, Quercus, Quillaja, Regalia, "Requiem ™ Insecticide", rotenone, ryania/ryanodine,

Symphytum officinale, Tanacetum vulgare, thymol, Triact 70, TriCon, Tropaeulum majus, Urtica dioica, Veratrin, Viscum album, Brassicaceae extract, in particular oilseed rape powder or mustard powder.

Safener as mixing components

The compound(s) of the formula (I) can be combined with safeners such as, for example, benoxacor, cloquintocet (-mexyl), cyometrinil, cyprosulfamide, dichlormid, fenchlorazole (-ethyl), fenclorim, flurazole, fluxofenim, furilazole, isoxadifen (-ethyl), mefenpyr (-diethyl), naphthalic anhydride, oxabetrinil, 2-methoxy-N-({4-[(methylcarbamoyl)amino]phenyl}sulphonyl)benzamide (CAS 129531-12-0), 4-(dichloroacetyl)-1-oxa-4-azaspiro[4.5]decane (CAS 71526-07-3), 2,2,5-trimethyl-3-(dichloroacetyl)-1,3-oxazolidine (CAS 52836-31-4).Beyond the uses describe above the compound(s) of the present invention can also be used for plant protection, seed treatment, anmimal health, protection of industrial materials, control of animal pests in the hygiene sector.

Plants and plant parts

All plants and plant parts can be treated in accordance with the invention. Here, plants are to be understood to mean all plants and plant parts such as wanted and unwanted wild plants or crop plants (including naturally occurring crop plants), for example cereals (wheat, rice, triticale, barley, rye, oats), maize, soya bean, potato, sugar beet, sugar cane, tomatoes, pepper, cucumber, melon, carrot, watermelon, onion, lettuce, spinach, leek, beans, *Brassica oleracea* (e.g. cabbage) and other vegetable species, cotton, tobacco, oilseed rape, and also fruit plants (with the fruits apples, pears, citrus fruits and grapevines). Crop plants can be plants which can be obtained by conventional breeding and optimization methods or by biotechnological and genetic engineering methods or combinations of these methods, including the transgenic plants and including the plant varieties which can or cannot be protected by varietal property rights. Plants should be understood to mean all developmental stages, such as seeds, seedlings, young (immature) plants up to mature plants. Plant parts should be understood to mean all parts and organs of the plants above and below ground, such as shoot, leaf, flower and root, examples given being leaves, needles, stalks, stems, flowers, fruit bodies, fruits and seeds, and also tubers, roots and rhizomes. Parts of plants also include harvested plants or harvested plant parts and vegetative and generative propagation material, for example seedlings, tubers, rhizomes, cuttings and seeds.

Treatment according to the invention of the plants and plant parts with the compound(s) of the formula (I) is carried out directly or by allowing the compounds to act on the surroundings, environment or storage space by the customary treatment methods, for example by immersion, spraying, evaporation, fogging, scattering, painting on, injection and, in the case of propagation material, in particular in the case of seeds, 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 also 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 term “parts” or “parts of plants” or “plant parts” has been explained above. The invention is used with particular preference to treat plants of the respective commercially customary cultivars or those that are in use. Plant cultivars are to be understood as meaning plants having new properties ("traits") and which have been obtained by conventional breeding, by mutagenesis or by recombinant DNA techniques. They can be cultivars, varieties, bio- or genotypes.

Transgenic plant, seed treatment and integration events

The transgenic plants or plant cultivars (those obtained by genetic engineering) which can be treated with preference in accordance with the invention include all plants which, through the genetic modification, received genetic material which imparts particular advantageous useful properties ("traits") to these plants. Examples of such properties are better plant growth, increased tolerance to high or low temperatures, increased tolerance to drought or to levels of water or soil salinity, enhanced flowering performance, easier harvesting, accelerated ripening, higher yields, higher quality and/or a higher nutritional value of the harvested products, better storage life and/or processability of the harvested products. Further and particularly emphasized examples of such properties are increased resistance of the plants against animal and microbial pests, such as against insects, arachnids, nematodes, mites, slugs and snails owing, for example, to toxins formed in the plants, in particular those formed in the plants by the genetic material from Bacillus thuringiensis (for example by the genes CryIA(a), CryIA(b), CryIA(c), CryIIA, CryIIIA, CryIIIB2, Cry9c Cry2Ab, Cry3Bb and CryIF and also combinations thereof), furthermore increased resistance of the plants against phytopathogenic fungi, bacteria and/or viruses owing, for example, to systemic acquired resistance (SAR), systemin, phytoalexins, elicitors and also resistance genes and correspondingly expressed proteins and toxins, and also increased tolerance of the plants to certain herbicidally active compounds, for example imidazolinones, sulphonylureas, glyphosate or phosphinothricin (for example the "PAT" gene). The genes which impart the desired traits in question may also be present in combinations with one another in the transgenic plants. Examples of transgenic plants which may be mentioned are the important crop plants, such as cereals (wheat, rice, triticale, barley, rye, oats), maize, soya beans, potatoes, sugar beet, sugar cane, tomatoes, peas and other types of vegetable, cotton, tobacco, oilseed rape and also fruit plants (with the fruits apples, pears, citrus fruits and grapes), with particular emphasis being given to maize, soya beans, wheat, rice, potatoes, cotton, sugar cane, tobacco and oilseed rape. Traits which are

particularly emphasized are the increased resistance of the plants to insects, arachnids, nematodes and slugs and snails.

Crop protection – types of treatment

The treatment of the plants and plant parts with the compound(s) of the formula (I) is carried out directly or by action on their surroundings, habitat or storage space using customary treatment methods, for example by dipping, spraying, atomizing, irrigating, evaporating, dusting, fogging, broadcasting, foaming, painting, spreading-on, injecting, watering (drenching), drip irrigating and, in the case of propagation material, in particular in the case of seed, furthermore as a powder for dry seed treatment, a solution for liquid seed treatment, a water-soluble powder for slurry treatment, by incrusting, by coating with one or more coats, etc. It is furthermore possible to apply the compound(s) of the formula (I) by the ultra-low volume method or to inject the application form or the compound of the formula (I) itself into the soil.

A preferred direct treatment of the plants is foliar application, i.e. the compound(s) of the formula (I) are applied to the foliage, where treatment frequency and the application rate should be adjusted according to the level of infestation with the pest in question.

In the case of systemically active compounds, the compound(s) of the formula (I) also access the plants via the root system. The plants are then treated by the action of the compound(s) of the formula (I) on the habitat of the plant. This may be done, for example, by drenching, or by mixing into the soil or the nutrient solution, i.e. the locus of the plant (e.g. soil or hydroponic systems) is impregnated with a liquid form of the compound(s) of the formula (I), or by soil application, i.e. the compound(s) of the formula (I) according to the invention are introduced in solid form (e.g. in the form of granules) into the locus of the plants. In the case of paddy rice crops, this can also be done by metering the compound of the formula (I) in a solid application form (for example as granules) into a flooded paddy field.

Treatment of seed

The control of animal pests by treating the seed of plants has been known for a long time and is the subject 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, or at least reduce considerably, the additional application of pesticides during storage, after sowing or after emergence of the plants. It is furthermore desirable to optimize the amount of active compound employed in such a way as to provide optimum protection for the seed and the germinating plant from attack by animal 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 or nematicidal properties of pest-resistant or -

tolerant transgenic plants in order to achieve optimum protection of the seed and also the germinating plant with a minimum of pesticides 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 one of the compounds of the formula (I). The method according to the invention for protecting seed and germinating plants against attack by pests furthermore comprises a method where the seed is treated simultaneously in one operation or sequentially with a compound of the formula (I) and a mixing component. It also comprises a method where the seed is treated at different times with a compound of the formula (I) and a mixing component.

The invention likewise relates to the use of the compounds of the formula (I) for the treatment of seed for protecting the seed and the resulting plant from animal pests.

Furthermore, the invention relates to seed which has been treated with a compound of the formula (I) according to the invention so as to afford protection from animal pests. The invention also relates to seed which has been treated simultaneously with a compound of the formula (I) and a mixing component. The invention furthermore relates to seed which has been treated at different times with a compound of the formula (I) and a mixing component. In the case of seed which has been treated at different points in time with a compound of the formula (I) and a mixing component, the individual substances may be present on the seed in different layers. Here, the layers comprising a compound of the formula (I) and mixing components may optionally be separated by an intermediate layer. The invention also relates to seed where a compound of the formula (I) and a mixing component have been applied as component of a coating or as a further layer or further layers in addition to a coating.

Furthermore, the invention relates to seed which, after the treatment with a compound of the formula (I), is subjected to a film-coating process to prevent dust abrasion on the seed.

One of the advantages encountered with a systemically acting compound of the formula (I) is the fact that, by treating the seed, not only the seed itself but also the plants resulting therefrom are, after emergence, protected against animal pests. In this manner, the immediate treatment of the crop at the time of sowing or shortly thereafter can be dispensed with.

It has to be considered a further advantage that by treatment of the seed with a compound of the formula (I), germination and emergence of the treated seed may be enhanced.

It is likewise to be considered advantageous that compound(s) of the formula (I) can be used in particular also for transgenic seed.

Furthermore, compound(s) of the formula (I) can be employed in combination with compositions or compounds of signalling technology, leading to better colonization by symbionts such as, for example, rhizobia, mycorrhizae and/or endophytic bacteria or fungi, and/or to optimized nitrogen fixation.

The compound(s) of the formula (I) are suitable for protection of seed of any plant variety which is used in agriculture, in the greenhouse, in forests or in horticulture. In particular, this takes the form of seed of cereals (for example wheat, barley, rye, millet and oats), corn, cotton, soya beans, rice, potatoes, sunflowers, coffee, tobacco, canola, oilseed rape, beets (for example sugarbeets and fodder beets), peanuts, vegetables (for example tomatoes, cucumbers, bean, cruciferous vegetables, onions and lettuce), fruit plants, lawns and ornamental plants. The treatment of the seed of cereals (such as wheat, barley, rye and oats), maize, soya beans, cotton, canola, oilseed rape, vegetables and rice is of particular importance.

As already mentioned above, the treatment of transgenic seed with a compound of the formula (I) 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 and/or nematicidal properties. The heterologous genes in transgenic seed can originate 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. It is particularly preferably a heterologous gene derived from Bacillus thuringiensis.

In the context of the present invention, the compound of the formula (I) can be applied to the seed. Preferably, the seed is treated in a state in which it 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. For example, it is possible to use seed which has been harvested, cleaned and dried down to a moisture content which allows storage. Alternatively, it is also possible to use seed which, after drying, has been treated with, for example, water and then dried again, for example priming. In the case of rice seed, it is also possible to use seed which has been soaked, for example in water to a certain stage of the rice embryo (‘pigeon breast stage’), stimulating the germination and a more uniform emergence.

When treating the seed, care must generally be taken that the amount of the compound of the formula (I) 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 ensured particularly in the case of active compounds which can exhibit phytotoxic effects at certain application rates.

In general, the compound(s) of the formula (I) are applied to the seed in a suitable formulation. Suitable formulations and processes for seed treatment are known to the person skilled in the art.

The compound(s) of the formula (I) can be converted to the customary seed dressing formulations, such as solutions, emulsions, suspensions, powders, foams, slurries or other coating compositions for seed, and also ULV formulations.

These formulations are prepared in a known manner, by mixing the compound(s) of the formula (I) with customary additives such as, for example, customary extenders and also solvents or diluents, colorants, wetting agents, dispersants, emulsifiers, antifoams, preservatives, secondary thickeners, adhesives, gibberellins and also water.

Colorants which may be present in the seed-dressing formulations which can be used in accordance with the invention are all colorants which are customary for such purposes. It is possible to use either pigments, which are sparingly soluble in water, or dyes, which are soluble in water. Examples include the dyes known by the names Rhodamine B, C.I. Pigment Red 112 and C.I. Solvent Red 1.

Useful wetting agents which may be present in the seed dressing formulations usable in accordance with the invention are all substances which promote wetting and which are conventionally used for the formulation of agrochemically active compounds. Preference is given to using alkylnaphthalenesulphonates, such as diisopropyl- or diisobutylnaphthalenesulphonates.

Useful dispersants and/or emulsifiers which may be present in the seed dressing formulations usable in accordance with the invention are all nonionic, anionic and cationic dispersants conventionally used for the formulation of active agrochemical ingredients. Preference is given to using nonionic or anionic dispersants or mixtures of nonionic or anionic dispersants. Suitable nonionic dispersants include in particular ethylene oxide/propylene oxide block polymers, alkylphenol polyglycol ethers and tristryrylphenol polyglycol ethers, and the phosphated or sulphated derivatives thereof. Suitable anionic dispersants are in particular lignosulphonates, polyacrylic acid salts and arylsulphonate/formaldehyde condensates.

Antifoams which may be present in the seed dressing formulations usable in accordance with the invention are all foam-inhibiting substances conventionally used for the formulation of active agrochemical ingredients. Preference is given to using silicone antifoams and magnesium stearate.

Preservatives which may be present in the seed dressing formulations usable in accordance with the invention are all substances usable for such purposes in agrochemical compositions. Examples include dichlorophene and benzyl alcohol hemiformal.

Secondary thickeners which may be present in the seed dressing formulations usable in accordance with the invention are all substances which can be used for such purposes in agrochemical compositions. Cellulose derivatives, acrylic acid derivatives, xanthan, modified clays and finely divided silica are preferred.

Adhesives which may be present in the seed dressing formulations usable in accordance with the invention are all customary binders usable in seed dressing products. Polyvinylpyrrolidone, polyvinyl acetate, polyvinyl alcohol and tylose may be mentioned as being preferred.

Gibberellins which can be present in the seed-dressing formulations which can be used in accordance with the invention are preferably the gibberellins A1, A3 (= gibberellic acid), A4 and A7; gibberellic acid is especially preferably used. The gibberellins are known (cf. R. Wegler "Chemie der Pflanzenschutz- and Schädlingsbekämpfungsmittel", vol. 2, Springer Verlag, 1970, pp. 401-412).

The seed dressing formulations usable in accordance with the invention can be used to treat a wide variety of different kinds of seed either directly or after prior dilution with water. For instance, the concentrates or the preparations obtainable therefrom by dilution with water can be used to dress the seed of cereals, such as wheat, barley, rye, oats, and triticale, and also the seed of maize, rice, oilseed rape, peas, beans, cotton, sunflowers, soya beans and beets, or else a wide variety of different vegetable seed. The seed dressing formulations usable in accordance with the invention, or the dilute use forms thereof, can also be used to dress seed of transgenic plants.

For treatment of seed with the seed dressing formulations usable in accordance with the invention, or the use forms prepared therefrom by adding water, all mixing units usable customarily for the seed dressing are useful. Specifically, the procedure in the seed dressing is to place the seed into a mixer, operated batch-wise or continously, to add the particular desired amount of seed dressing formulations, either as such or after prior dilution with water, and to mix everything until the formulation is distributed homogeneously on the seed. If appropriate, this is followed by a drying operation.

The application rate of the seed dressing formulations usable in accordance with the invention can be varied within a relatively wide range. It is guided by the particular content of the compound(s) of the formula (I) in the formulations and by the seed. The application rates of the compound of the formula (I) are generally between 0.001 and 50 g per kilogram of seed, preferably between 0.01 and 15 g per kilogram of seed.

Animal health

In the animal health field, i.e. in the field of veterinary medicine, the compound(s) of the formula (I) are active against animal parasites, in particular ectoparasites or endoparasites. The term endoparasite

includes in particular helminths and protozoae, such as coccidia. Ectoparasites are typically and preferably arthropods, in particular insects or acarids.

In the field of veterinary medicine the compound(s) of the formula (I) are suitable, with favourable toxicity in warm blooded animals, for controlling parasites which occur in animal breeding and animal husbandry in livestock, breeding, zoo, laboratory, experimental and domestic animals. They are active against all or specific stages of development of the parasites.

Agricultural livestock include, for example, mammals, such as, sheep, goats, horses, donkeys, camels, buffaloes, rabbits, reindeers, fallow deers, and in particular cattle and pigs; or poultry, such as turkeys, ducks, geese, and in particular chickens; or fish or crustaceans, e.g. in aquaculture; or, as the case may be, insects such as bees.

Domestic animals include, for example, mammals, such as hamsters, guinea pigs, rats, mice, chinchillas, ferrets or in particular dogs, cats; cage birds; reptiles; amphibians or aquarium fish.

According to a particular embodiment, the compound(s) of the formula (I) are administered to mammals.

According to another particular embodiment, the compound(s) of the formula (I) are administered to birds, namely cage birds or in particular poultry.

By using the compound(s) of the formula (I) to control animal parasites, it is intended to reduce or prevent illness, cases of deaths and performance reductions (in the case of meat, milk, wool, hides, eggs, honey and the like), so that more economical and simpler animal keeping is made possible and better animal well-being is achievable.

The term “control” or "controlling", as used herein with regard to the animal health field, means that the compound(s) of the formula (I) are effective in reducing the incidence of the respective parasite in an animal infected with such parasites to innocuous levels. More specifically, "controlling", as used herein, means that the compound(s) of the formula (I) are effective in killing the respective parasite, inhibiting its growth, or inhibiting its proliferation.

Exemplary arthropods include, without any limitation

from the order of the Anoplurida, for example, Haematopinus spp., Linognathus spp., Pediculus spp., Phtirus spp., Solenopotes spp.;

from the order of the Mallophagida and the suborders Amblycerina and Ischnocerina, for example Bovicola spp., Damalina spp., Felicola spp., Lepikentron spp., Menopon spp., Trichodectes spp., Trimenopon spp., Trinoton spp., Werneckiella spp.;

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

from the order of the Siphonapterida, for example Ceratophyllus spp.; Ctenocephalides spp., Pulex spp., Tunga spp., Xenopsylla spp.;

from the order of the Heteropterida, for example Cimex spp., Panstrongylus spp., Rhodnius spp., Triatoma spp.; as well as nuisance and hygiene pests from the order of the Blattarida.

Further, among the arthropods, the following acari may be mentioned by way of example, without any limitation:

from the subclass of the Acari (Acarina) and the order of the Metastigmata, for example, from the family of argasidae like Argas spp., Ornithodorus spp., Otobius spp., from the family of Ixodidae like Amblyomma spp., Dermacentor spp., Haemaphysalis spp., Hyalomma spp., Ixodes spp., Rhipicephalus (Boophilus) spp , Rhipicephalus spp. (the original genus of multi host ticks); from the order of mesostigmata like Dermanyssus spp., Ornithonyssus spp., Pneumonyssus spp., Raillietia spp., Sternostoma spp., Tropilaelaps spp., Varroa spp.; from the order of the Actinedida (Prostigmata), for example Acarapis spp., Cheyletiella spp., Demodex spp., Listrophorus spp., Myobia spp., Neotrombicula spp., Ornithocheyletia spp., Psorergates spp., Trombicula spp.; and from the order of the Acaridida (Astigmata), for example Acarus spp., Caloglyphus spp., Chorioptes spp., Cytodites spp., Hypodectes spp., Knemidocoptes spp., Laminosioptes spp., Notoedres spp., Otodectes spp., Psoroptes spp., Pterolichus spp., Sarcoptes spp., Trixacarus spp., Tyrophagus spp.

Exemplary parasitic protozoa include, without any limitation:

Mastigophora (Flagellata) such as:

Metamonada: from the order Diplomonadida, for example, Giardia spp., Spironucleus spp.

Parabasala: from the order Trichomonadida, for example, Histomonas spp., Pentatrichomonas spp.,Tetratrichomonas spp., Trichomonas spp., Tritrichomonas spp.

Euglenozoa: from the order Trypanosomatida, for example, Leishmania spp., Trypanosoma spp

Sarcomastigophora (Rhizopoda), such as Entamoebidae, for example, Entamoeba spp., Centramoebidae, for example, Acanthamoeba sp., Euamoebidae, e.g. Hartmanella sp.

Alveolata such as Apicomplexa (Sporozoa): e.g. Cryptosporidium spp.; from the order Eimeriida, for example, Besnoitia spp., Cystoisospora spp., Eimeria spp., Hammondia spp., Isospora spp., Neospora spp., Sarcocystis spp., Toxoplasma spp.; from the order Adeleida e.g. Hepatozoon spp., Klossiella spp.; from the order Haemosporida e.g. Leucocytozoon spp., Plasmodium spp.; from the order Piroplasmida e.g. Babesia spp., Ciliophora spp., Echinozoon spp., Theileria spp.; from the order Vesibuliferida e.g. Balantidium spp., Buxtonella spp.

Microspora such as Encephalitozoon spp., Enterocytozoon spp., Globidium spp., Nosema spp., and furthermore, e.g. Myxozoa spp.

Helminths pathogenic for humans or animals include, for example, acanthocephala, nematodes, pentastoma and platyhelmintha (e.g. monogenea, cestodes and trematodes).

Exemplary helminths include, without any limitation:

Monogenea: e.g.: Dactylogyrus spp., Gyrodactylus spp., Microbothrium spp., Polystoma spp., Troglocephalus spp.

Cestodes: from the order of the Pseudophyllidea, for example: Bothridium spp., Diphyllobothrium spp., Diplogonoporus spp., Ichthyobothrium spp., Ligula spp., Schistocephalus spp., Spirometra spp.

from the order of the Cyclophyllida, for example: Andyra spp., Anoplocephala spp., Avitellina spp., Bertiella spp., Cittotaenia spp., Davainea spp., Diorchis spp., Diplopylidium spp., Dipylidium spp., Echinococcus spp., Echinocotyle spp., Echinolepis spp., Hydatigera spp., Hymenolepis spp., Joyeuxiella spp., Mesocestoides spp., Moniezia spp., Paranoplocephala spp., Raillietina spp., Stilesia spp., Taenia spp., Thysaniezia spp., Thysanosoma spp.

Trematodes: from the class of the Digenea, for example: Austrobilharzia spp., Brachylaima spp., Calicophoron spp., Catatropis spp., Clonorchis spp. Collyriclum spp., Cotylophoron spp., Cyclocoelum spp., Dicrocoelium spp., Diplostomum spp., Echinochasmus spp., Echinoparyphium spp., Echinostoma spp., Eurytrema spp., Fasciola spp., Fasciolides spp., Fasciolopsis spp., Fischoederius spp., Gastrothylacus spp., Gigantobilharzia spp., Gigantocotyle spp., Heterophyes spp., Hypoderaeum spp.,

Leucochloridium spp., Metagonimus spp., Metorchis spp., Nanophyetus spp., Notocotylus spp., Opisthorchis spp., Ornithobilharzia spp., Paragonimus spp., Paramphistomum spp., Plagiorchis spp., Posthodiplostomum spp., Prosthogonimus spp., Schistosoma spp., Trichobilharzia spp., Troglotrema spp., Typhlocoelum spp.

Nematodes: from the order of the Trichinellida, for example: Capillaria spp., Eucoleus spp., Paracapillaria spp., Trichinella spp., Trichomosoides spp., Trichuris spp.

from the order of the Tylenchida, for example: Micronema spp., Parastrongyloides spp., Strongyloides spp.

from the order of the Rhabditina, for example: Aelurostrongylus spp., Amidostomum spp., Ancylostoma spp., Angiostrongylus spp., Bronchonema spp., Bunostomum spp., Chabertia spp., Cooperia spp., Cooperioides spp., Crenosoma spp., Cyathostomum spp., Cyclococercus spp., Cyclodontostomum spp., Cylicocyclus spp., Cylicostephanus spp., Cylindropharynx spp., Cystocaulus spp., Dictyocaulus spp., Elaphostrongylus spp., Filaroides spp., Globocephalus spp., Graphidium spp., Gyalocephalus spp., Haemonchus spp., Heligmosomoides spp., Hyostrongylus spp., Marshallagia spp., Metastrongylus spp., Muellerius spp., Necator spp., Nematodirus spp., Neostrongylus spp., Nippostrongylus spp., Obeliscoides spp., Oesophagodontus spp., Oesophagostomum spp., Ollulanus spp.; Ornithostrongylus spp., Oslerus spp., Ostertagia spp., Paracooperia spp., Paracrenosoma spp., Parafilaroides spp., Parelaphostrongylus spp., Pneumocaulus spp., Pneumostrongylus spp., Poteriostomum spp., Protostrongylus spp., Spicocaulus spp., Stephanurus spp., Strongylus spp., Syngamus spp., Teladorsagia spp., Trichonema spp., Trichostrongylus spp., Triodontophorus spp., Troglostrongylus spp., Uncinaria spp.

from the order of the Spirurida, for example: Acanthocheilonema spp., Anisakis spp., Ascaridia spp.; Ascaris spp., Ascarops spp., Aspiculuris spp., Baylisascaris spp., Brugia spp., Cercopithifilaria spp., Crassicauda spp., Dipetalonema spp., Dirofilaria spp., Dracunculus spp.; Draschia spp., Enterobius spp., Filaria spp., Gnathostoma spp., Gongylonema spp., Habronema spp., Heterakis spp.; Litomosoides spp., Loa spp., Onchocerca spp., Oxyuris spp., Parabronema spp., Parafilaria spp., Parascaris spp., Passalurus spp., Physaloptera spp., Probstmayria spp., Pseudofilaria spp., Setaria spp., Skjrabinema spp., Spirocerca spp., Stephanofilaria spp., Strongyluris spp., Syphacia spp., Thelazia spp., Toxascaris spp., Toxocara spp., Wuchereria spp.

Acantocephala: from the order of the Oligacanthorhynchida, for example: Macracanthorhynchus spp., Prosthenorchis spp.; from the order of the Moniliformida, for example: Moniliformis spp.

from the order of the Polymorphida, for example: Filicollis spp.; from the order of the Echinorhynchida, for example: Acanthocephalus spp., Echinorhynchus spp., Leptorhynchoides spp.

Pentastoma: from the order of the Porocephalida, for example: Linguatula spp.

In the veterinary field and in animal keeping, the administration of the compound(s) of the formula (I) is carried out by methods generally known in the art, such as enterally, parenterally, dermally or nasally, in the form of suitable preparations. Administration can be carried out prophylactically, methaphylactically or therapeutically.

Thus, one embodiment of the present invention refers to the compound(s) of the formula (I) for use as a medicament.

Another aspect refers to the compound(s) of the formula (I) for use as an antiendoparasitical agent.

Another particular aspect refers to the compound(s) of the formula (I) for use as a anthelmintic agent, more particular for use as a nematicidal agent, a platyhelminthicidal agent, an acanthocephalicidal agent, or a pentastomicidal agent.

Another particular aspect refers to the compound(s) of the formula (I) for use as an antiprotozoal agent.

Another aspect refers to the compound(s) of the formula (I) for use as an antiectoparasitical agent, in particular an arthropodicidal agent, more particular an insecticidal agent or acaricidal agent.

Further aspects of the invention are veterinary formulations, comprising an effective amount of at least one compound of the formula (I) and at least one of the following: pharmaceutically acceptable excipient (e.g. solid or liquid diluents), pharmaceutically acceptable auxiliary (e.g. surfactants), in particular a pharmaceutically acceptable excipient and/or pharmaceutically acceptable auxiliary which is normally used in veterinary formulations.

A related aspect of the invention is a method for preparing a veterinary formulation as described herein, comprising the step of mixing at least one compound of the formula (I) with pharmaceutically acceptable excipients and/or auxiliaries, in particular with pharmaceutically acceptable excipients and/or auxiliaries which are normally used in veterinary formulations.

Another particular aspect of the invention are veterinary formulations, selected from the group of ectoparasiticidal and endoparasiticidal formulations, more particular selected from the group of anthelmintic, antiprotozoal, and arthropodicidal formulations, even more particular selected from the group of nematicidal, platyhelminthicidal, acanthocephalicidal, pentastomicidal, insecticidal, and acaricidal formulations, in accordance with the mentioned aspects, as well as their methods for preparation.

Another aspect refers to a method for treatment of a parasitic infection, in particular an infection by a parasite selected from the group of ectoparasites and endoparasites mentioned herein, by applying an effective amount of a compound of the formula (I) to an animal, in particular a non-human animal, in need thereof.

Another aspect refers to a method for treatment of a parasitic infection, in particular an infection by a parasite selected from the group of ectoparasites and endoparasites mentioned herein, by applying a veterinary formulation as defined herein to an animal, in particular a non-human animal, in need thereof.

Another aspect refers to the use of the compound(s) of the formula (I) in the treatment of a parasitic infection, in particular an infection by a parasite selected from the group of ectoparasites and endoparasites mentioned herein, in an animal, in particular a non-human animal.

In the present context of the animal health or veterinary field, the term "treatment" includes prophylactic, metaphylactic or therapeutical treatment.

In a particular embodiment, mixtures of at least one compound of the formula (I) with other active ingredients, particularly with endo- and ectoparasiticides, for the veterinary field are provided herewith.

In the field of animal health “mixture” not only means that two (or more) different active ingredients are formulated in a joint formulation and are accordingly applied together but also refers to products which comprise separate formulations for each active compound. Accordingly, if more than two active compounds are to be applied, all active compounds may be formulated in a joint formulation or all active compounds may be formulated in separate formulations; also feasible are mixed forms where some of the active compounds are formulated jointly and some of the active compounds are formulated separately. Separate formulations allow the separate or successive application of the active compounds in question.

The active compounds specified herein by their common names are known and described, for example, in the Pesticide Manual (see above) or can be searched in the internet (e.g. http://www.alanwood.net/pesticides).

Exemplary active ingredients from the group of ectoparasiticides, as mixing partners, include, without limitation insecticides and acaricides listed in detail above. Further active ingredients which may be used are listed below following the aforementioned classification which is based on the current IRAC Mode of Action Classification Scheme: (1) Acetylcholinesterase (AChE) inhibitors; (2) GABA-gated chloride channel blockers; (3) Sodium channel modulators; (4) Nicotinic acetylcholine receptor (nAChR) competitive modulators; (5) Nicotinic acetylcholine receptor (nAChR) allosteric modulators; (6) Glutamate-gated chloride channel (GluCl) allosteric modulators; (7) Juvenile hormone mimics; (8)

Miscellaneous non-specific (multi-site) inhibitors; (9) Modulators of Chordotonal Organs; (10) Mite growth inhibitors; (12) Inhibitors of mitochondrial ATP synthase, such as, ATP disruptors; (13) Uncouplers of oxidative phosphorylation via disruption of the proton gradient; (14) Nicotinic acetylcholine receptor channel blockers; (15) Inhibitors of chitin biosynthesis, type 0; (16) Inhibitors of chitin biosynthesis, type 1; (17) Moulting disruptor (in particular for Diptera, i.e. dipterans); (18) Ecdysone receptor agonists; (19) Octopamine receptor agonists; (21) Mitochondrial complex I electron transport inhibitors; (25) Mitochondrial complex II electron transport inhibitors; (20) Mitochondrial complex III electron transport inhibitors; (22) Voltage-dependent sodium channel blockers; (23) Inhibitors of acetyl CoA carboxylase; (28) Ryanodine receptor modulators;

Active compounds with unknown or non-specific mode of action, e.g., fentrifanil, fenoxacrim, cycloprene, chlorobenzilate, chlordimeform, flubenzimine, dicyclanil, amidoflumet, quinomethionate, triarathene, clothiazoben, tetrasul, potassium oleate, petroleum, metoxadiazone, gossyplure, flutenzin, bromopropylate, cryolite;

Compounds from other classes, e.g. butacarb, dimetilan, cloethocarb, phosphocarb, pirimiphos (-ethyl), parathion (-ethyl), methacrifos, isopropyl o-salicylate, trichlorfon, sulprofos, propaphos, sebufos, pyridathion, prothoate, dichlofenthion, demeton-S-methylsulphone, isazofos, cyanofenphos, dialifos, carbophenothion, autathiofos, aromfenvinfos (-methyl), azinphos (-ethyl), chlorpyrifos (-ethyl), fosmethilan, iodofenphos, dioxabenzofos, formothion, fonofos, flupyrazofos, fensulfothion, etrimfos;

organochlorines, e.g. camphechlor, lindane, heptachlor; or phenylpyrazoles, e.g. acetoprole, pyrafluprole, pyriprole, vaniliprole, sisapronil; or isoxazolines, e.g. sarolaner, afoxolaner, lotilaner, fluralaner;

pyrethroids, e.g. (cis-, trans-), metofluthrin, profluthrin, flufenprox, flubrocythrinate, fubfenprox, fenfluthrin, protrifenbute, pyresmethrin, RU15525, terallethrin, cis-resmethrin, heptafluthrin, , bioethanomethrin, biopermethrin, fenpyrithrin, cis-cypermethrin, cis-permethrin, clocythrin, cyhalothrin (lambda-), chlovaporthrin, or halogenated carbonhydrogen compounds (HCHs),

neonicotinoids, e.g. nithiazine

dicloromezotiaz, triflumezopyrim

macrocyclic lactones, e.g. nemadectin, ivermectin, latidectin, moxidectin, selamectin, eprinomectin, doramectin, emamectin benzoate; milbemycin oxime

triprene, epofenonane, diofenolan;

Biologicals, hormones or pheromones, for example natural products, e.g. thuringiensin, codlemone or neem components

dinitrophenols, e.g. dinocap, dinobuton, binapacryl;

benzoylureas, e.g. fluazuron, penfluron,

amidine derivatives, e.g. chlormebuform, cymiazole, demiditraz

Bee hive varroa acaricides, for example organic acids, e.g. formic acid, oxalic acid.

Exemplary active ingredients from the group of endoparasiticides, as mixing partners, include, without limitation, anthelmintically active compounds and antiprotozoal active compounds.

Anthelmintically active compounds, including, without limitation, the following nematicidally, trematicidally and/or cestocidally active compounds:

from the class of macrocyclic lactones, for example: eprinomectin, abamectin, nemadectin, moxidectin, doramectin, selamectin, lepimectin, latidectin, milbemectin, ivermectin, emamectin, milbemycin;

from the class of benzimidazoles and probenzimidazoles, for example: oxibendazole, mebendazole, triclabendazole, thiophanate, parbendazole, oxfendazole, netobimin, fenbendazole, febantel, thiabendazole, cyclobendazole, cambendazole, albendazole-sulphoxide, albendazole, flubendazole;

from the class of depsipeptides, preferably cyclic depsipetides, in particular 24-membered cyclic depsipeptides, for example: emodepside, PF1022A;

from the class of tetrahydropyrimidines, for example: morantel, pyrantel, oxantel;

from the class of imidazothiazoles, for example: butamisole, levamisole, tetramisole;

from the class of aminophenylamidines, for example: amidantel, deacylated amidantel (dAMD), tribendimidine;

from the class of aminoacetonitriles, for example: monepantel;

from the class of paraherquamides, for example: paraherquamide, derquantel;

from the class of salicylanilides, for example: tribromsalan, bromoxanide, brotianide, clioxanide, closantel, niclosamide, oxyclozanide, rafoxanide;

from the class of substituted phenols, for example: nitroxynil, bithionol, disophenol, hexachlorophene, niclofolan, meniclopholan;

from the class of organophosphates, for example: trichlorfon, naphthalofos, dichlorvos/DDVP, crufomate, coumaphos, haloxon;

from the class of piperazinones / quinolines, for example: praziquantel, epsiprantel;

from the class of piperazines, for example: piperazine, hydroxyzine;

from the class of tetracyclines, for example: tetracyclin, chlorotetracycline, doxycyclin, oxytetracyclin, rolitetracyclin;

from diverse other classes, for example: bunamidine, niridazole, resorantel, omphalotin, oltipraz, nitroscanate, nitroxynile, oxamniquine, mirasan, miracil, lucanthone, hycanthone, hetolin, emetine, diethylcarbamazine, dichlorophen, diamfenetide, clonazepam, bephenium, amoscanate, clorsulon.

Antiprotozoal active compounds, including, without limitation, the following active compounds:

from the class of triazines, for example: diclazuril, ponazuril, letrazuril, toltrazuril;

from the class of polylether ionophore, for example: monensin, salinomycin, maduramicin, narasin;

from the class of macrocyclic lactones, for example: milbemycin, erythromycin;

from the class of quinolones, for example: enrofloxacin, pradofloxacin;

from the class of quinines, for example: chloroquine;

from the class of pyrimidines, for example: pyrimethamine;

from the class of sulfonamides, for example: sulfaquinoxaline, trimethoprim, sulfaclozin;

from the class of thiamines, for example: amprolium;

from the class of lincosamides, for example: clindamycin;

from the class of carbanilides, for example: imidocarb;

from the class of nitrofuranes, for example: nifurtimox;

from the class of quinazolinone alkaloids, for example: halofuginon;

from diverse other classes, for example: oxamniquin, paromomycin;

from the class of vaccines or antigenes from microorganisms, for example: Babesia canis rossi, Eimeria tenella, Eimeria praecox, Eimeria necatrix, Eimeria mitis, Eimeria maxima, Eimeria brunetti, Eimeria acervulina, Babesia canis vogeli, Leishmania infantum, Babesia canis canis, Dictyocaulus viviparus.

All named mixing partners can, if their functional groups enable this, optionally form salts with suitable bases or acids.

Protection of industrial materials

The compound(s) of the formula (I) are suitable for protecting industrial materials against attack or destruction by insects, for example from the orders Coleoptera, Hymenoptera, Isoptera, Lepidoptera, Psocoptera and Zygentoma.

Industrial materials in the present context are understood to mean inanimate materials, such as preferably plastics, adhesives, sizes, papers and cards, leather, wood, processed wood products and coating compositions. The use of the invention for protecting wood is particularly preferred.

In a further embodiment, the compound(s) of the formula (I) are used together with at least one further insecticide and/or at least one fungicide.

In a further embodiment, the compound(s) of the formula (I) are present as a ready-to-use pesticide, i.e. they can be applied to the material in question without further modifications. Suitable further insecticides or fungicides are in particular those mentioned above.

Surprisingly, it has also been found that the compound(s) of the formula (I) can 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. Likewise, the compound(s) of the formula (I), alone or in combinations with other active compounds, can be used as antifouling agents.

Control of animal pests in the hygiene sector

The compound(s) of the formula (I) are suitable for controlling animal pests in the hygiene sector. In particular, the invention can be applied in the domestic sector, in the hygiene sector and in the protection of stored products, especially for controlling insects, arachnids, ticks and mites encountered in enclosed spaces such as dwellings, factory halls, offices, vehicle cabins, animal husbandries. For controlling animal pests, the compound(s) of the formula (I) are used alone or in combination with other active compounds and/or auxiliaries. They are preferably used in domestic insecticide products. The compound(s) of the formula (I) are effective against sensitive and resistant species, and against all developmental stages.

These pests include, for example, pests from the class Arachnida, from the orders Scorpiones, Araneae and Opiliones, from the classes Chilopoda and Diplopoda, from the class Insecta the order Blattodea, from the orders Coleoptera, Dermaptera, Diptera, Heteroptera, Hymenoptera, Isoptera, Lepidoptera, Phthiraptera, Psocoptera, Saltatoria or Orthoptera, Siphonaptera and Zygentoma and from the class Malacostraca the order Isopoda.

They are used, for example, 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 plastic, 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 spreading or in bait stations.

A further aspect of the invention relates to methods to produce the compound(s) of formula (I) according to Scheme 1 comprising at least one of the following steps (1) to (3):

Step 1:

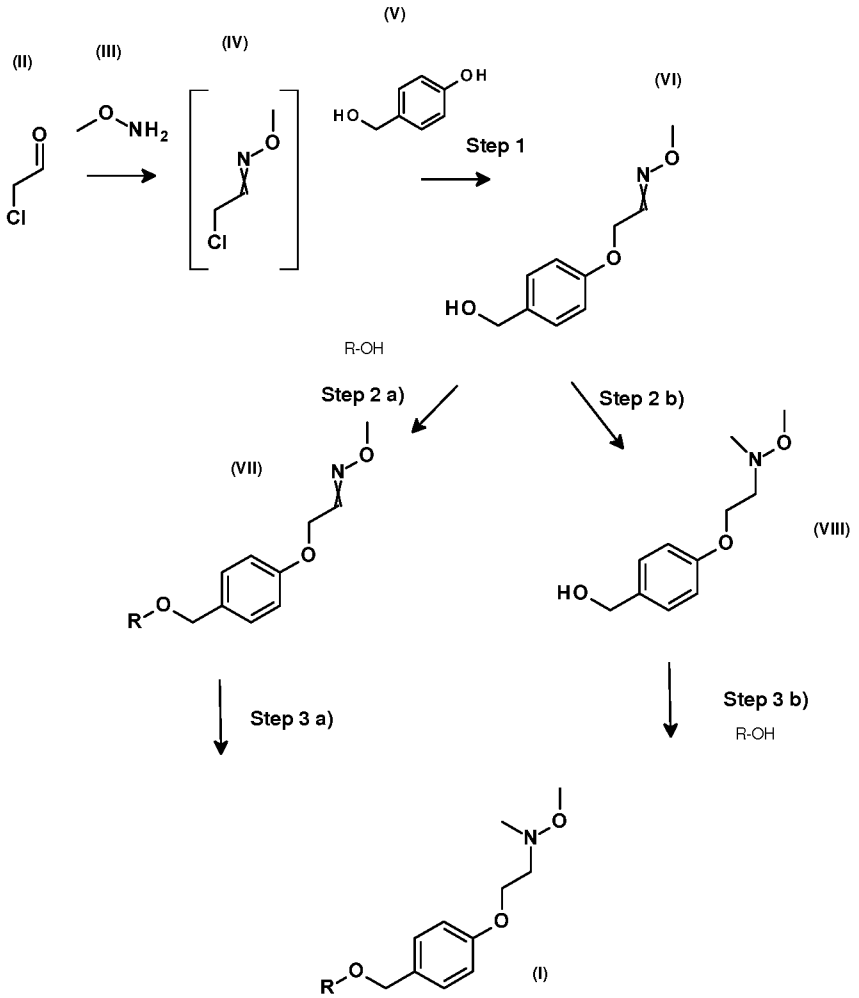
Chloroacetaldehyde (II) was reacted with O-methylhydroxylamine hydrochloride (III) in the presence of a solvent, for example water, to give 2-chloro-N-methoxyethanimine (IV). Synthesis of 2-chloro-N-methoxyethanimine (IV) has already been described by H. Walter et al. in WO 2010106071 A1. 4-Hydroxybenzylalcohol (V) was then regioselectively alkylated with 2-chloro-N-methoxyethanimine (IV) in the presence of a base, for example potassium carbonate, and an organic solvent, for example acetonitrile or dimethylformamide, and optionally in the presence of a catalyst, for example potassium iodide, to yield {4-[2-(methoxyimino)ethoxy]phenyl}methanol (VI). Analogous regioselective alkylations of 4-hydroxybenzylalcohol (V) have often been described in literature (for example by G, Gellermann et al., Tetrahedron **2010**, *66*, 878 – 886).

Step 2 & 3:

{4-[2-(Methoxyimino)ethoxy]phenyl}methanol (VI) was coupled, for example via the corresponding benzyl chloride which was prepared using thionylchloride, with R-OH (wherein R is defined as above) in the presence of a base, for example potassium carbonate, and an organic solvent, for example acetonitrile or dimethylformamide, and optionally in the presence of a catalyst, for example potassium iodide, to form compounds corresponding to formula (VII) (step 2a). Compound(s) of formula (I) were prepared from compounds of formula (VII) using a reduction / reductive alkylation reaction sequence with formaldehyde in the presence of a reducing agent, for example sodium cyanoborohydride, and an acid, for example acetic acid (step 3a).

Alternatively, compound(s) of formula (I) can be prepared from {4-[2-(methoxyimino)ethoxy]phenyl}-methanol (VI) via (4-{2-[methoxy(methyl)amino]ethoxy}phenyl)methanol (VIII): First, (4-{2-[methoxy(methyl)amino]ethoxy}phenyl)methanol (VIII) was prepared from {4-[2-(methoxyimino)-ethoxy]phenyl}methanol (VI) using the reduction / reductive alkylation reaction sequence with formaldehyde in the presence of a reducing agent, for example sodium cyanoborohydride, and an acid, for example acetic acid (step 2b). Then, (4-{2-[methoxy(methyl)amino]ethoxy}phenyl)methanol (VIII) was coupled, for example via the corresponding benzyl chloride which was prepared using thionylchloride, with R-OH (wherein R is as defined above) in the presence of a base, for example potassium carbonate, and an organic solvent, for example acetonitrile or dimethylformamide, and optionally in the presence of a catalyst, for example potassium iodide, to form compound(s) of formula (I) (step 3b).

Scheme 1: Overview of synthesis of compound(s) according to formula (I):



NMR-Peak lists

1H-NMR data of selected examples and intermediates are written in form of 1H-NMR-peak lists. To each signal peak are listed the δ-value in ppm and the signal intensity in round brackets. Between the δ-value – signal intensity pairs are semicolons as delimiters.

The peak list of an example has therefore the form:

δ_1 (intensity$_1$); δ_2 (intensity$_2$);……..; δ_i (intensity$_i$);……; δ_n (intensity$_n$)

Intensity of sharp signals correlates with the height of the signals in a printed example of a NMR spectrum in cm and shows the real relations of signal intensities. From broad signals several peaks or the middle of the signal and their relative intensity in comparison to the most intensive signal in the spectrum can be shown.

For calibrating chemical shift for 1H spectra, we use tetramethylsilane and/or the chemical shift of the solvent used, especially in the case of spectra measured in DMSO. Therefore in NMR peak lists, tetramethylsilane peak can occur but not necessarily.

The 1H-NMR peak lists are similar to classical 1H-NMR prints and contains therefore usually all peaks, which are listed at classical NMR-interpretation.

Additionally they can show like classical 1H-NMR prints signals of solvents, stereoisomers of the target compounds, which are also object of the invention, and/or peaks of impurities.

To show compound signals in the delta-range of solvents and/or water the usual peaks of solvents, for example peaks of DMSO in DMSO-D_6 and the peak of water are shown in our 1H-NMR peak lists and have usually on average a high intensity .

The peaks of stereoisomers of the target compounds and/or peaks of impurities have usually on average a lower intensity than the peaks of target compounds (for example with a purity >90%).

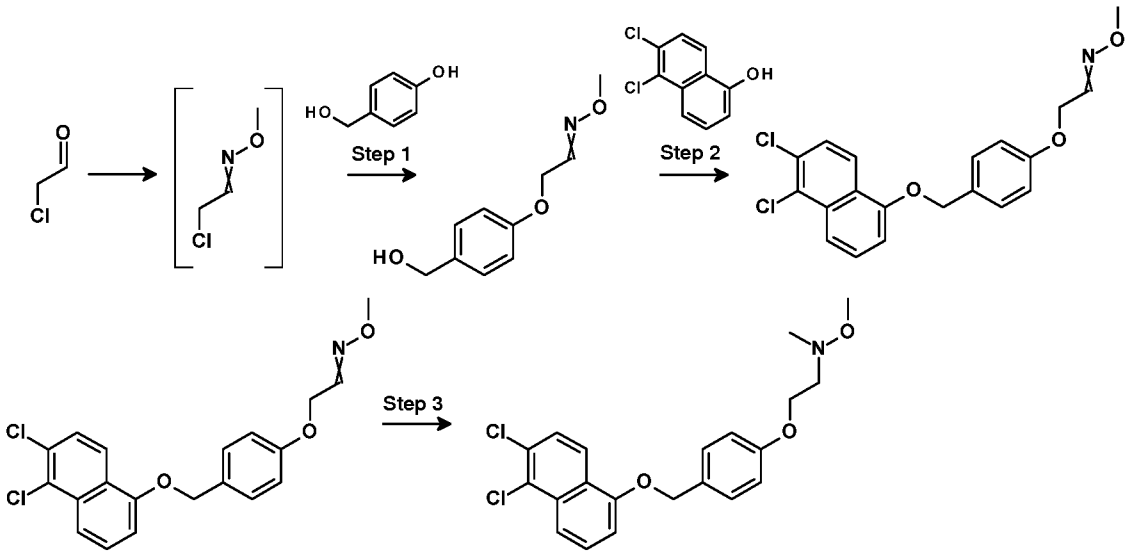
Such stereoisomers and/or impurities can be typical for the specific preparation process. Therefore their peaks can help to recognize the reproduction of our preparation process via “side-products-fingerprints”.

An expert, who calculates the peaks of the target compounds with known methods (MestreC, ACD-simulation, but also with empirically evaluated expectation values) can isolate the peaks of the target compounds as needed optionally using additional intensity filters. This isolation would be similar to relevant peak picking at classical 1H-NMR interpretation.

Further details of NMR-data description with peak lists you find in the publication "Citation of NMR Peaklist Data within Patent Applications" of the Research Disclosure Database Number 564025.

EXAMPLES:

Example 1: Synthesis of 2-(4-{[(5,6-dichloro-1-naphthyl)oxy]methyl}phenoxy)-N-methoxy-N-methylethanamine



Scheme 2: Overview of the synthesis of 2-(4-{[(5,6-dichloro-1-naphthyl)oxy]methyl}phenoxy)-N-methoxy-N-methylethanamine

Step 1: Synthesis of {4-[2-(methoxyimino)ethoxy]phenyl}methanol

48 mL (372 mmol) of a 50 % aqueous solution of chloroacetaldehyde was added to 124 mL (409 mmol) of a 25 % aqueous solution of O-methylhydroxylamine hydrochloride. The reaction mixture was stirred overnight at room temperature and extracted several times with diethyl ether. The combined organic phases were washed with a saturated aqueous sodium chloride solution, dried over sodium sulfate and filtrated. After addition of 100 mL acetonitrile the diethyl ether was removed under reduced pressure (30 °C, 300 mbar). The obtained solution of 2-chloro-N-methoxyethanimine in acetonitrile was added to a suspension of 33.0 g (270 mmol) 4-hydroxybenzylalcohol, 73.5 g (532 mmol) potassium carbonate and 44 mg (0.27 mmol) potassium iodide in 100 mL acetonitrile. The mixture was heated overnight under reflux. After cooling to room temperature the reaction mixture was filtrated and the filtrate was concentrated under reduced pressure. Water was added to the residue and repeatedly extracted with ethyl acetate. The combined organic phases were washed with saturated aqueous sodium chloride solution, dried over sodium sulfate and filtrated. The solvent was removed under reduced pressure to give 52.2 g {4-[2-(methoxyimino)ethoxy]phenyl}methanol.

^{1}H-NMR (400.0 MHz, d_6-DMSO): δ = 8.315 (2.6); 7.627 (1.2); 7.613 (2.5); 7.598 (1.2); 7.250 (1.4); 7.243 (2.8); 7.221 (3.2); 7.042 (0.5); 7.032 (1.0); 7.023 (0.5); 6.937 (3.5); 6.915 (3.0); 6.894 (1.3); 6.872 (1.2); 5.054 (1.0); 4.991 (0.5); 4.806 (1.8); 4.797 (1.8); 4.637 (0.4); 4.625 (4.5); 4.611 (4.4); 4.418 (2.8); 4.406 (3.8); 3.862 (5.7); 3.794 (16.0); 3.776 (0.5); 3.759 (0.4); 3.733 (0.6); 3.321 (3.7); 3.298 (0.5); 2.505 (22.7); 2.501 (29.2); 2.496 (22.1); 2.045 (0.4); 2.030 (0.9); 0.000 (14.8).

Step 2: Synthesis of 2-(4-{[(5,6-dichloro-1-naphthyl)oxy]methyl}phenoxy)-N-methoxyethanimine

0.95 mL (13.1 mmol) thionylchloride and a catalytic amount of N,N-dimethylformamide were added to a solution of 850 mg (4.35 mmol) {4-[2-(methoxyimino)ethoxy]phenyl}methanol in 30 mL toluene. The reaction mixture was stirred for 4 hours at room temperature and then concentrated under reduced pressure. The residue was dissolved in 30 mL N,N-dimethylformamide and 1.21 g (5.66 mmol) 5,6-dichloro-1-naphthol and 1.81 g (13.1 mmol) potassium carbonate were added. The reaction mixture was stirred for 2 hours at 70 °C, adsorbed on silica gel and purified by MPLC (gradient: cyclohexane/ethyl acetate), to give 799 mg of an E/Z mixture of 2-(4-{[(5,6-dichloro-1-naphthyl)oxy]methyl}phenoxy)-N-methoxyethanimine.

^{1}H-NMR (400.0 MHz, d_6-DMSO): δ = 8.175 (2.3); 8.152 (2.5); 7.784 (2.2); 7.763 (3.3); 7.689 (2.0); 7.677 (4.0); 7.669 (3.0); 7.654 (4.2); 7.648 (1.8); 7.641 (1.2); 7.627 (0.6); 7.514 (3.4); 7.508 (2.5); 7.492 (4.0); 7.486 (2.1); 7.270 (2.8); 7.251 (2.5); 7.079 (1.2); 7.070 (2.6); 7.060 (1.3); 7.049 (1.7); 7.027 (1.5); 7.004 (3.8); 6.982 (3.5); 5.260 (9.1); 4.857(5.1); 4.848 (5.0); 4.678 (2.1); 4.664 (2.1); 3.872 (16.0); 3.805 (7.5); 3.327 (36.5); 2.672 (0.4); 2.507 (56.5); 2.503 (71.8); 2.498 (54.1); 2.329 (0.5); 1.397 (0.4); 0.000 (4.6).

Step 3: Synthesis of 2-(4-{[(5,6-dichloro-1-naphthyl)oxy]methyl}phenoxy)-N-methoxy-N-methyl-ethanamine

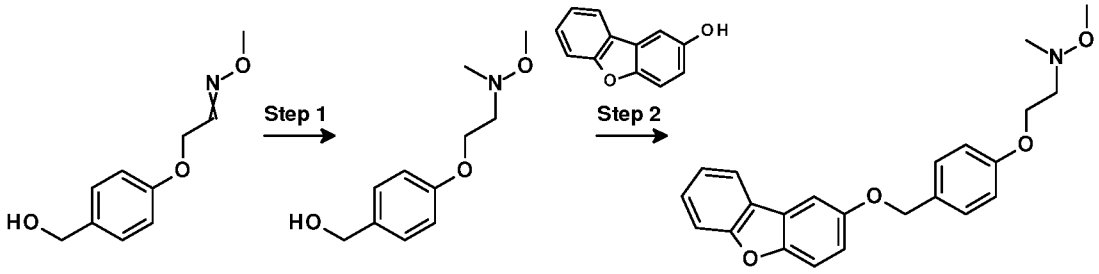
193 mg (3.07 mmol) sodium cyanoborohydride was added to a solution of 799 mg (2.04 mmol) of an E/Z mixture of 2-(4-{[(5,6-dichloro-1-naphthyl)oxy]methyl}phenoxy)-N-methoxyethanimine in 18 mL acetic acid. After stirring at room temperature for 3 hours 6.2 mL (82.9 mmol) of a 37 % aqueous formaldehyde solution was added. After additional 5 min 386 mg (6.14 mmol) sodium cyanoborohydride were added. The reaction mixture was stirred for 1 hour at room temperature, adsorbed on silica geland purified by MPLC (gradient: cyclohexane/ethyl acetate), to give 665 mg of 2-(4-{[(5,6-dichloro-1-naphthyl)oxy]methyl}phenoxy)-N-methoxy-N-methylethanamine.

^{1}H-NMR (400.0 MHz, d_6-DMSO): δ = 8.177 (2.1); 8.154 (2.4); 7.784 (1.6); 7.763 (2.4); 7.690 (1.6); 7.676 (3.4); 7.671 (2.3); 7.654 (3.1); 7.650 (1.5); 7.488 (3.4); 7.467 (3.8); 7.275 (2.0); 7.256 (1.8); 7.017 (4.0); 6.996 (3.7); 5.253 (6.7); 4.786 (0.6); 4.657 (0.6); 4.128 (2.0); 4.114 (4.4); 4.099 (2.2); 3.412 (19.1); 3.326 (68.0); 3.281 (1.0); 2.969 (1.9); 2.955 (4.0); 2.940 (1.9); 2.676 (0.4); 2.671 (0.6); 2.667

(0.4); 2.571 (16.0); 2.524 (1.6); 2.507 (68.5); 2.502 (90.2); 2.498 (66.8); 2.334 (0.4); 2.329 (0.6); 2.325 (0.4); 1.397 (1.3); 0.008 (0.4); 0.000 (14.2); – 0.008 (0.5).

2-{4-[(Dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine can be synthesized analogously by using dibenzo[b,d]furan-2-ol in step 2 of the synthesis process.

Example 2: Synthesis of 2-{4-[(dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine



Scheme 3: Overview of the synthesis of 2-{4-[(dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine

Step 1: Synthesis of (4-{2-[methoxy(methyl)amino]ethoxy}phenyl)methanol

14.3 g (227 mmol) sodium cyanoborohydride was cautiously added to a solution of 37.0 g (152 mmol) {4-[2-(methoxyimino)ethoxy]phenyl}methanol in 0.50 L acetic acid at 10 °C. The reaction mixture was stirred for 2 hours at room temperature. After cooling down to 10 °C, 34.3 mL (455 mmol) of a 36.5 % aqueous formaldehyde solution was added. The reaction mixture was stirred for 2.5 hours at room temperature and then concentrated under reduced pressure. 0.50 L water was added to the residue. The mixture was adjusted to a pH of 10 with 50 % aqueous sodium hydroxide solution and then repeatedly extracted with ethyl acetate. The combined organic phases were dried over sodium sulfate, filtrated and concentrated under reduced pressure. The residue was dissolved in 150 mL ethanol and 2.5 g (66 mmol) sodium borohydride was added under ice cooling. The reaction mixture was stirred overnight at room temperature. Water was cautiously added to the reaction mixture which was then repeatedly extracted with ethyl acetate. The combined organic phases were washed with saturated aqueous sodium chloride solution, dried over sodium sulfate, filtrated and evaporated to give 31.2 g (4-{2-[methoxy(methyl)amino]ethoxy}phenyl)methanol.

^{1}H-NMR (400.0 MHz, d_6-DMSO): δ = 7.248 (0.4); 7.227 (4.0);7.206 (4.1); 6.952 (0.4); 6.931 (0.4); 6.903 (4.4); 6.882 (3.8); 5.040 (1.4); 5.026 (2.9); 5.012 (1.5); 4.502 (0.6); 4.412 (5.1); 4.398 (4.7); 4.082 (2.4); 4.068 (4.8); 4.054 (2.4); 4.021 (0.3); 3.402 (17.9); 3.322 (10.9); 2.947 (2.3); 2.932 (4.5); 2.918 (2.2); 2.560 (16.0); 2.501 (25.1); 1.239 (0.6); 0.000 (18.1).

Step 2: Synthesis of 2-{4-[(dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine

A catalytic amount of N,N-dimethylformamide and 0.37 mL (5.1 mmol) thionylchloride were added to a solution of 1.00 g (90 % purity, 4.26 mmol) (4-{2-[methoxy(methyl)amino]ethoxy}phenyl)methanol in 8 mL toluene. The reaction mixture was stirred for 2 hours at room temperature and then concentrated under reduced pressure. The residue was dissolved in 30 mL dichloromethane and washed with 15 mL saturated aqueous sodium hydrogen carbonate solution. The aqueous phase was once again extracted with 20 mL dichloromethane. The combined organic phases were dried over sodium sulfate, filtrated and evaporated. The residue was dissolved in 10 mL acetonitrile and 6.94 g (21.3 mmol) cesium carbonate and 667 mg (3.62 mmol) dibenzo[b,d]furan-2-ol were added. The mixture was stirred for 30 min at 80 °C and evaporated to give the crude product. This was purified by MPLC (gradient: cyclohexane/ethyl acetate) to give 1.08 g 2-{4-[(dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine.

^{1}H-NMR (400.0 MHz, d_6-DMSO): δ = 8.132 (1.8); 8.112 (1.9); 7.824 (2.6); 7.817 (2.8); 7.670 (2.0); 7.649 (2.6); 7.613 (2.6); 7.591 (2.9); 7.526 (0.9); 7.523 (1.1); 7.505 (1.9); 7.488 (0.9); 7.484 (1.1); 7.444 (3.5); 7.423 (4.0); 7.401 (1.5); 7.382 (2.2); 7.364 (1.2); 7.169 (1.6); 7.162 (1.6); 7.147 (1.4); 7.140 (1.5); 6.995 (4.0); 6.974 (3.9); 5.119 (7.6); 4.119 (2.1); 4.104 (4.5); 4.090 (2.3); 3.408 (19.2); 3.325 (11.7); 2.963 (2.1); 2.949 (4.3); 2.935 (2.1); 2.567 (16.0); 2.507 (23.2); 2.503 (31.5); 2.498 (25.0); 1.397 (0.5); 0.008 (1.0); 0.000(25.4); – 0.008 (1.4).

2-(4-{[(5,6-Dichloro-1-naphthyl)oxy]methyl}phenoxy)-N-methoxy-N-methylethanamine can be synthesized analogously by using 5,6-dichlor-1-naphthol in step 2 of the synthesis process.

Example 3: Biological Efficacy

Solvent: Acetone + 2000ppm Rapeseedoil-methylester (RME)

To produce suitable preparation compounds 21, 178 and 223 of WO 2002017712 A2 and the compound(s) according to the formula (I) of the invention were independently dissolved in acetone containing 2000ppm RME. The active compound solution was pipetted onto a glazed tile and, after drying, adult mosquitoes of the species:

- Anopheles gambiae (target-site-resistant and metabolic-resistant strain: RSPH),

-Anopheles gambiae, (target-site-resistant strain Tiassalé)

- Anopheles gambiae (target-site-resistant strain: VK7),

- Anopheles funestus (metabolic-resistant strain FUMOZ-R)

and

- Culex quinquefasciatus (metabolic-resistant to DDT; strain P00)

and adult cockroaches of the species:

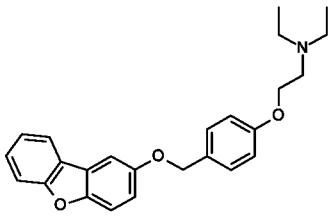
- Blattella germanica (susceptible strain)

- Blattella germanica (metabolic resistant strain: Ukraine; resistant to Deltamethrin, Propoxur, Bendiocarb, Fenthion and DTT; the Ukraine strain is based on the place where specimens of these cockroaches were collected in 2012. The detailed collection area was Odessa at the Black Sea in the Ukraine. The strain was introduced into the insect rearing of the applicant. Extensive susceptibility assays of specimens of the Ukraine strain revealed different results in comparison to fully susceptible strains.)

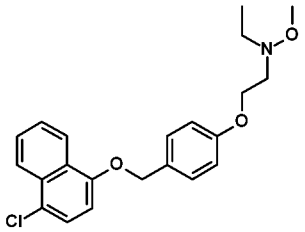
were placed onto the treated tile (each strain was tested on separate tiles). The exposition time for mosquitoes was 30 minutes and for cockroaches 60 minutes.

24 hours after contact to the treated surface, the knock-down proportion of the test animals in % was determined. Here, 100% (effect) means that all mosquitoes resp. cockroaches have been knocked-down; 0% (effect) means that none of the mosquitoes resp. cockroaches have been knocked-down.

Example 21 (of WO 2002017712 A2)



Example 178 (WO 2002017712 A2)



Example 223 (WO 2002017712 A2)

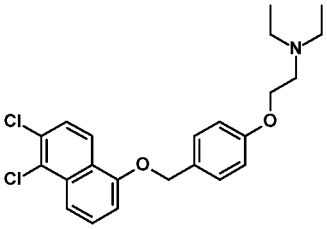


Table 1: Efficiency of compounds 21, 178 and 223 of WO 2002017712 A2 and compounds of formula (I) of the invention against Anopheles gambiae RSPH

Anopheles gambiae RSPH		
Example	**Compound concentration [mg/m²]**	**Knock-Down after 24 hours [%]**
compound no. 21 of WO 2002017712 A2	4	43
compound no. 21 of WO 2002017712 A2	2	71
compound no. 178 of WO 2002017712 A2	4	71
compound no. 178 of WO 2002017712 A2	2	64
compound no. 223 of WO 2002017712 A2	4	64
compound no. 223 of WO 2002017712 A2	2	29
2-{4-[(Dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine	4	100
2-{4-[(Dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine	2	100
2-(4-{[(5,6-Dichlor-1-naphthyl)oxy]¬methyl}phenoxy)-N-methoxy-N-methylethanamine	4	100
2-(4-{[(5,6-Dichlor-1-naphthyl)oxy]¬methyl}phenoxy)-N-methoxy-N-methylethanamine	2	79

Table 2: Efficiency of compounds 21, 178 and 223 of WO 2002017712 A2 and compounds of formula (I) of the invention against Anopheles gambiae strain Tiassalé

Anopheles gambiae Tiassalé		
Example	**Compound concentration [mg/m²]**	**Knock-Down after 24 hours [%]**
compound no. 21 of WO 2002017712 A2	20	13
compound no. 21 of WO 2002017712 A2	2	0
compound no. 178 of WO 2002017712 A2	20	100
compound no. 178 of WO 2002017712 A2	2	0

compound no. 223 of WO 2002017712 A2	20	25
compound no. 223 of WO 2002017712 A2	2	0
2-{4-[(Dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine	20	100
2-{4-[(Dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine	2	88
2-(4-{[(5,6-Dichlor-1-naphthyl)oxy]¬methyl}phenoxy)-N-methoxy-N-methylethanamine	20	100
2-(4-{[(5,6-Dichlor-1-naphthyl)oxy]¬methyl}phenoxy)-N-methoxy-N-methylethanamine	2	75

Table 3: Efficiency of compounds 21, 178 and 223 of WO 2002017712 A2 and compounds of formula (I) of the invention against Anopheles gambiae VK7

Anopheles gambiae VK7		
Example	**Compound concentration [mg/m²]**	**Knock-Down after 24 hours [%]**
compound no. 21 of WO 2002017712 A2	20	20
compound no. 21 of WO 2002017712 A2	4	20
compound no. 178 of WO 2002017712 A2	20	100
compound no. 178 of WO 2002017712 A2	4	60
compound no. 223 of WO 2002017712 A2	20	0
compound no. 223 of WO 2002017712 A2	4	10
2-{4-[(Dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine	20	90
2-{4-[(Dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine	4	100
2-(4-{[(5,6-Dichlor-1-naphthyl)oxy]¬methyl}phenoxy)-N-methoxy-N-methylethanamine	20	100
2-(4-{[(5,6-Dichlor-1-naphthyl)oxy]¬methyl}phenoxy)-N-methoxy-N-methylethanamine	4	80

Table 4: Efficiency of compounds 21, 178 and 223 of WO 2002017712 A2 and compounds of formula (I) of the invention against *Anopheles* FUMOZ-R

Anopheles FUMOZ-R		
Example	**Compound concentration [mg/m²]**	**Knock-Down after 24 hours [%]**
compound no. 21 of WO 2002017712 A2	20	0
compound no. 21 of WO 2002017712 A2	4	0
compound no. 178 of WO 2002017712 A2	20	100
compound no. 178 of WO 2002017712 A2	4	25
compound no. 223 of WO 2002017712 A2	20	0
compound no. 223 of WO 2002017712 A2	4	0
2-{4-[(Dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine	20	100
2-{4-[(Dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine	4	88
2-(4-{[(5,6-Dichlor-1-naphthyl)oxy]¬methyl}phenoxy)-N-methoxy-N-methylethanamine	20	100
2-(4-{[(5,6-Dichlor-1-naphthyl)oxy]¬methyl}phenoxy)-N-methoxy-N-methylethanamine	4	100

Table 5: Efficiency of compounds 21, 178 and 223 of WO 2002017712 A2 and compounds of formula (I) of the invention against Culex quinquefasciatus P00

Culex quinquefasciatus P00		
Example	**Compound concentration [mg/m²]**	**Knock-Down after 24 hours [%]**
compound no. 21 of WO 2002017712 A2	20	11
compound no. 21 of WO 2002017712 A2	4	22
compound no. 178 of WO 2002017712 A2	20	89
compound no. 178 of WO 2002017712 A2	4	78
compound no. 223 of WO 2002017712 A2	20	44

compound no. 223 of WO 2002017712 A2	4	33
2-{4-[(Dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine	20	100
2-{4-[(Dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine	4	67
2-(4-{[(5,6-Dichlor-1-naphthyl)oxy]¬methyl}phenoxy)-N-methoxy-N-methylethanamine	20	100
2-(4-{[(5,6-Dichlor-1-naphthyl)oxy]¬methyl}phenoxy)-N-methoxy-N-methylethanamine	4	89

Table 6: Efficiency of compounds 21, 178 and 223 of WO 2002017712 A2 and compounds of formula (I) of the invention against Blattella germanica (susceptible strain)

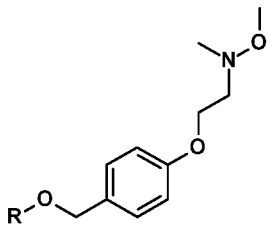
Blattella germanica (susceptible strain)		
Example	**Compound concentration [mg/m²]**	**Knock-Down after 24 hours [%]**
compound no. 21 of WO 2002017712 A2	200	10
compound no. 178 of WO 2002017712 A2	200	90
compound no. 223 of WO 2002017712 A2	200	100
2-{4-[(Dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine	200	100

Table 7: Efficiency of compounds 21, 178 and 223 of WO 2002017712 A2 and compounds of formula (I) of the invention against Blattella germanica strain Ukraine

Blattella germanica Ukraine		
Example	**Compound concentration [mg/m²]**	**Knock-Down after 24 hours [%]**
compound no. 21 of WO 2002017712 A2	200	10
compound no. 178 of WO 2002017712 A2	200	80
compound no. 223 of WO 2002017712 A2	200	100
2-{4-[(Dibenzo[b,d]furan-2-yloxy)methyl]phenoxy}-N-methoxy-N-methylethanamine	200	80

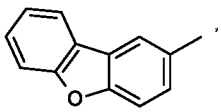
CLAIMS:

1. A compound of the formula (I):

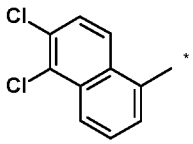


(I)

in which R is



or



where the asterisk* indicates the point of attachment to the compound of formula (I) including their agrochemically active salts, metal complexes and N-oxides.

2. A composition characterized by a content of at least one compound of the formula (I) according to claim 1, in addition to auxiliaries.

3. Use of a compound according to claim 1 or a composition according to claim 2 to control insecticide-resistant pests.

4. Use according to claim 3, wherein the insecticide-resistant pests are mosquitoes and/or cockroaches.

5. Use according to claim 4, wherein the insecticide-resistant pests are mosquitoes.

6. Use according to claim 5, wherein the insecticide-resistant mosquitoes are resistant against at least one pyrethroid insecticide preferably selected from the group consisting of Alpha-Cypermethrin, Bifenthrin, Cyfluthrin, Cypermethrin, Deltamethrin, D-D Trans-Cyphenothrin Esfenvalerate, Etofenprox, Lambda-Cyhalothrin, Permethrin, Pyrethrins (Pyrethrum), Phenothrin, and Zeta-Cypermethrin.

7. Use according to claim 6 wherein the pyrethroid resistance exists against a pyrethroid selected from the group of Cyfluthrin, Cypermethrin, Deltamethrin, Lambda-Cyhalothrin and Permethrin.

8. Use according to one of the claims 3 to 7 wherein the insecticide-resistant mosquitoes are selected from the group of Anopheles gambiae, Anopheles funestus and Culex spp.

9. Use according to claim 8 wherein the insecticide-resistant mosquitoes are selected from the group of Anopheles gambiae RSPH, Anopheles gambiae strain Tiassalé, Anopheles funestus FUMOZ-R, Anopheles gambiae VK7 and Culex quinquefasciatus strain P00.

10. Use of a compound according to claim 1 or a composition according to claim 2 for vector control.

11. A vector control solution comprising a compound according to claim 1 or a composition according to claim 2.

12. A vector control solution according to claim 11 which is selected from the group of an indoor residual spray, an insecticide treated net, a longer lasting insecticide net, a space spray, a spatial repellent and/or a household insecticidal product.

13. Use of a compound according to claim 1 or a composition according to claim 2 or a vector control solution according to claim 11 to control mosquitoes and/or cockroaches.

14. A method for controlling mosquitoes and/or cockroaches, preferably insecticide-resistant mosquitoes and/or cockroaches with a compound according to claim 1 or a composition according to claim 2 or a vector control solution according to claim 11.

15. A cockroach bait comprising a compound according to claim 1 or a composition according to claim 2.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/060680

A. CLASSIFICATION OF SUBJECT MATTER
INV. C07C239/20 C07D307/91 A01N33/16 A01N43/12 A01P7/04
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C07C C07D

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 02/17712 A2 (FMC CORP [US]) 7 March 2002 (2002-03-07) cited in the application compounds 21, 178, 223 -----	1-15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 May 2018	13/06/2018

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2018/060680

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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