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(54) Title: MIXTURES COMPRISING BENZPYRIMOXAN AND OXAZOSULFYL AND USES AND METHODS OF APPLYING THEM

(57) Abstract: The present invention relates to mixtures comprising benzpyrimoxan and the pesticide oxazosulfyl, and to methods for controlling pest invertebrates, especially rice pest invertebrates, which methods comprise applying such mixtures.

Mixtures comprising benzpyrimoxan and oxazosulfyl and uses and methods of applying them

The present invention relates to pesticidal mixtures of benzpyrimoxan and oxazosulfyl, and to methods of applying said mixtures.

There is a need for effective and safe pesticides and pesticide mixtures, especially in agriculture, and especially against rice pest invertebrates. It has been found that these objectives can be achieved by agrochemical mixtures comprising the pesticides benzpyrimoxan and oxazosulfyl.

In a first aspect, the invention relates to agrochemical mixtures comprising benzpyrimoxan and the pesticide oxazosulfyl (mixtures according to the invention).

Benzpyrimoxan and oxazosulfyl are also called compound I and/or compound II of the mixtures according to the invention, or compounds of the present invention. As the order of the mixture partner in the name of the mixture is irrelevant, it is irrelevant if a compound is called compound I or compound II.
Benzpyrimoxan and some of its mixtures are described in WO2016104516.
Oxazosulfyl is described e.g. in WO2017104592, and some of its mixtures in WO2016002595.

One typical problem arising in the field of pest control lies in the need to reduce the dosage rates of the active ingredient in order to reduce or avoid unfavorable environmental or toxicological effects whilst still allowing effective pest control. Another problem encountered concerns the need to have available pest control agents which are effective against a broad spectrum of pests.
There also exists the need for pest control agents that combine knock-down activity with prolonged control, that is, fast action with long lasting action.
Another difficulty in relation to the use of pesticides is that the repeated and exclusive application of an individual pesticidal compound leads in many cases to a rapid selection of pests which have developed natural or adapted resistance against the active compound in question.
Therefore there is a need for pest control agents that help prevent or overcome resistance.
Furthermore, there is a desire for pesticide compounds or combination of compounds,
which when applied improve plants, which may result in “plant health”, “vitality of plant propagation material” or “increased plant yield”.
It is therefore an object of the present invention to provide agricultural combinations, which solve one or more than one of the discussed problems as

- reducing the dosage rate,
- enhancing the spectrum of activity,
- combining knock-down activity with prolonged control,
- improving resistance management,
- Improved plant health;
- Improved vitality of plant propagation material, also termed seed vitality;
- Increased plant yield.

It was therefore an object of the present invention to provide pesticidal mixtures which solve at least one of the discussed problems.
It has been found that this object is in part or in whole achieved by the combination of active compounds as defined herein.

Moreover, the invention relates to

- a composition comprising the pesticidal mixture as defined herein and at least one inert liquid and/or solid acceptable carrier;
- an agricultural composition comprising the pesticidal mixture as defined herein and at least one inert liquid and/or solid acceptable carrier;
- a method for controlling or combating invertebrate pests, comprising contacting said pest or its food supply, habitat, breeding grounds with a pesticidally effective amount of the pesticidal mixture as defined herein;
- a method of protecting plants from attack or infestation by invertebrate pests, contacting a plant, a plant propagation material or soil or water in which the plant is growing, with a pesticidally effective amount of the pesticidal mixture as defined herein;
- a plant propagation material comprising the pesticidal mixture as defined herein in an amount of from 0.1 g to 10 kg per 100 kg of seed;
- a method for protection of plant propagation material comprising contacting the plant propagation material with the pesticidal mixture as defined herein in an amount of from 0.1 g to 10 kg per 100 kg of plant propagation material;
- the use of the pesticidal mixture as defined herein for protecting growing plants or plant propagation material from attack or infestation by invertebrate pests;
- a method for controlling phytopathogenic harmful fungi, wherein the fungi, their habitat or the plants to be protected against fungal attack, the soil or seed are treated with an effective amount of the pesticidal mixture comprising compound I and at least one specific compound B;
- a method for protecting plants from phytopathogenic harmful fungi, wherein the fungi, their habitat or the plants to be protected against fungal attack, the soil or seed are treated with an effective amount of the pesticidal mixture comprising compound I and at least one specific compound B;
- a method for protecting animals against infestation or infection by parasites which comprises administering to the animals a parasitically effective amount of the pesticidal mixture as defined herein;
- a method for treating animals infested or infected by parasites which comprises administering to the animals a parasitically effective amount of the pesticidal mixture as defined herein to the animal in need thereof; and
- the use of the pesticidal mixture as defined herein for combating parasites in and on animals.

In a special embodiment, the invention relates to the use of the mixtures according to the invention to combat or control rice pest invertebrates, respectively to methods of combating or controlling rice pest invertebrates by applying such mixtures.

Rice (Oryza species, especially Oryza sativa) is an important basic food in the world. It is a staple food in Asia and is an important part of many cultures. Rice is therefore an important crop and is cultivated in large areas, especially in Asia.

Invertebrate pests and, in particular, insects, arthropods and nematodes cause significant damage to growing and harvested rice crop, thereby causing large economic loss to the food supply and to property. While a large number of pesticidal agents are known, due to the ability of target pests to develop resistance to said agents, there is an ongoing need for new agents for combating invertebrate pests such as insects, arachnids and nematodes. Further, rice cultivation requires special pesticides suitable for the farming methods used in rice, e.g. use of nursery boxes, paddy fields, aquatic environment and so on. Pesticides suitable for the use in rice must also be tolerated well by the rice plants. They must also be tolerated well by the environment of the rice plants, e.g. from an ecotoxicological point of view, i.e. they must not harm beneficial organisms. Further, they must survive the conditions in which they are applied, to ensure efficacy. This is especially a challenge in the aquatic environment and the high temperature climate conditions, in which rice is usually grown. On the other hand, they must degrade within a reasonable period of time so that they do not have any negative impact on the environment. They must not impact the health of the farmer and the consumer. They should not be present in the rice product later on (low or no residues), to ensure safety of the human beings consuming the rice. Furthermore, many pests have developed resistance against pesticides commonly used in rice. Therefore, pesticides suitable for the use in rice should be effective against those pests have developed resistance to other pesticides. Not all pesticides are able fulfil the requirements to be used in these conditions.

It is therefore an object of the present invention to provide compounds having a good pesticidal activity and showing a good activity spectrum against a large number of different invertebrate pests occurring in rice, especially against insects, arachnids and nematodes that are difficult to control, while still showing a good regulatory profile.

In a further embodiment of the invention, the invention relates to a mixture according to the invention, wherein benzpyrimoxan and oxazosulfyl are the only active ingredients (binary mixtures). They may however, comprise further ingredients like carriers, adjuvants, auxiliaries and other formulation ingredients.

As mentioned above, the mixtures according to the invention are especially suitable in rice.

In oneembodiment of the invention, the invention relates to certain methods and uses of the mixtures according to the invention, in rice:

- mixture according to the invention for use in controlling rice pests, especially rice pest invertebrates, in rice
- compositions comprising a mixture according to the invention, for use in controlling rice pests, especially rice pest invertebrates, in rice;
- a method for combating rice pest invertebrates, infestation, or infection by rice pest invertebrates, which method comprises contacting said pest or its food supply, habitat or breeding grounds with a pesticidally effective amount of a mixture according to the invention as defined above or a composition thereof;

- a method for controlling rice pest invertebrates, infestation, or infection by invertebrate pests, which method comprises contacting said pest or its food supply, habitat or breeding grounds with a pesticidally effective amount of a mixture according to the invention as defined above or a composition comprising the mixture according to the invention;
- a method for preventing or protecting against rice pest invertebrates comprising contacting the rice pest invertebrates, or their food supply, habitat or breeding grounds with a mixture according to the invention as defined above or a composition comprising a mixture according to the invention as defined above or a composition comprising a mixture according to the invention;
- a method for protecting rice, rice plants, rice plant propagation material and/or growing rice plants from attack or infestation by rice pest invertebrates comprising contacting or treating the rice, rice plants, rice plant propagation material and growing rice plants, or soil, material, surface, space, area or water in which the rice, rice plants, rice plant propagation material is stored or the rice plant is growing, with a pesticidally effective amount of a mixture according to the invention as defined above or a composition comprising a mixture according to the invention;
- a method for increasing the health of rice plants, especially in paddy rice fields, comprising the treatment with a mixture according to the invention;
- a method for increasing the yield of rice plants, comprising the treatment with a mixture according to the invention;
- rice seed comprising a mixture according to the invention as defined above, in an amount of from 0.1 g to 10 kg per 100 kg of seed;
- the use of a mixture according to the invention as defined above for protecting growing rice plants or rice plant propagation material from attack or infestation by rice pest invertebrates;

All the compounds of the mixtures of the present invention including if applicable their stereoisomers, their tautomers, their salts or their N-oxides as well as compositions thereof are particularly useful for controlling invertebrate pests, in particular for controlling arthropods and nematodes and especially insects. Therefore, the invention relates to the use of a compound as disclosed in the present invention, for combating or controlling invertebrate pests, in particular invertebrate pests of the group of insects, arachnids or nematodes.
The term "composition(s) according to the invention" or "composition(s) of the present invention" encompasses composition(s) comprising a mixture according to the invention according to the invention as defined above, therefore also including a stereoisomer, an agriculturally or veterinary acceptable salt, tautomer or an N-oxide of the respective compounds.

Moreover, it has also been found that simultaneous, that is joint or separate, application of benzpyrimoxan and oxazosulfyl or successive application of benzpyrimoxan and oxazosulfyl allows enhanced control of pests, compared to the control rates that are possible with the individual compounds.

The mixtures of the invention may be a physical mixture of benzpyrimoxan and oxazosulfyl. Accordingly, the invention also provides a mixture benzpyrimoxan and oxazosulfyl. However, the composition may also be any combination of benzpyrimoxan and oxazosulfyl, it not being required benzpyrimoxan and oxazosulfyl to be present together in the same formulation.

An example of a composition according to the invention or to be used according to the invention in which benzpyrimoxan and oxazosulfyl are not present together in the same formulation is a combipack. In a combipack, two or more components of a combipack are packaged separately, i.e., not jointly pre-formulated. As such, combipacks include one or more separate containers such as vials, cans, bottles, pouches, bags or canisters, each container containing a separate component for an agrochemical composition. One example is a two-component combipack. Accordingly, the invention also relates to a two-component combipack, comprising a first component which in turn comprises compound I, a liquid or solid carrier and, if appropriate, at least one surfactant and/or at least one customary auxiliary, and a second component which in turn comprises at least one compound II, a liquid or solid carrier and, if appropriate, at least one surfactant and/or at least one customary auxiliary. More details, e.g. as to suitable liquid and solid carriers, surfactants and customary auxiliaries are described below.

The "combined" use of benzpyrimoxan "in combination with" and oxazosulfyl on the one hand can be understood as using a physical mixture of benzpyrimoxan and oxazosulfyl. On the other hand, the combined use may also consist in using benzpyrimoxan and oxazosulfyl separately, but within a sufficiently short time of one another so that the desired effect can take place. More detailed illustrations of the combined use can be found in the specifications below.

The term "invertebrate pest" (also referred to as animal pests) as used herein encompasses animal populations, such as insects, arachnids and nematodes, which may attack plants, thereby causing substantial damage to the plants attacked, as well as ectoparasites which may infest animals, in particular warm blooded animals such as e.g. mammals or birds, or other higher animals such as reptiles, amphibians or fish, thereby causing substantial damage to the animals infested.

Pests

The mixtures of the present invention are especially suitable for efficiently combating animal pests such as arthropods, gastropods and nematodes including but not limited to:

insects from the order of **Lepidoptera**, for example *Achroia grisella*, *Acleris* spp. such as *A. fimbriana, A. gloverana, A. variana; Acrolepiopsis assectella, Acronicta major, Adoxophyes* spp. such as *A. cyrtosema, A. orana; Aedia leucomelas, Agrotis* spp. such as *A. exclamationis, A. fucosa, A. ipsilon, A. orthogoma, A. segetum, A. subterranea; Alabama argillacea, Aleurodicus dispersus, Alsophila pometaria, Ampelophaga rubiginosa, Amyelois transitella, Anacampsis sarcitella, Anagasta kuehniella, Anarsia lineatella, Anisota senatoria, Antheraea pernyi, Anticarsia (=Thermesia)* spp. such as *A. gemmatalis; Apamea* spp., *Aproaerema modicella, Archips* spp. such as *A. argyrospila, A. fuscocupreanus, A. rosana, A. xyloseanus; Argyresthia conjugella, Argyroploce* spp., *Argyrotaenia* spp. such as *A. velutinana; Athetis mindara, Austroasca viridigrisea, Autographa gamma, Autographa nigrisigna, Barathra brassicae, Bedellia* spp., *Bonagota salubricola, Borbo cinnara, Bucculatrix thurberiella, Bupalus piniarius, Busseola* spp., *Cacoecia*

spp. such as *C. murinana, C. podana; Cactoblastis cactorum, Cadra cautella, Calingo braziliensis, Caloptilis theivora, Capua reticulana, Carposina* spp. such as *C. niponensis, C. sasakii; Cephus* spp., *Chaetocnema aridula, Cheimatobia brumata, Chilo* spp. such as *C. Indicus, C. suppressalis, C. partellus; Choreutis pariana, Choristoneura* spp. such as *C. conflictana, C. fumiferana, C. longicellana, C. murinana, C. occidentalis, C. rosaceana; Chrysodeixis (=Pseudoplusia)* spp. *such as C. eriosoma, C. includens; Cirphis unipuncta, Clysia ambiguella, Cnaphalocerus* spp., *Cnaphalocrocis medinalis, Cnephasia* spp., *Cochylis hospes, Coleophora* spp., *Colias eurytheme, Conopomorpha* spp., *Conotrachelus* spp., *Copitarsia* spp., *Corcyra cephalonica, Crambus caliginosellus, Crambus teterrellus, Crocidosema (=Epinotia) aporema, Cydalima (=Diaphania) perspectalis, Cydia (=Carpocapsa)* spp. such as *C. pomonella, C. latiferreana; Dalaca noctuides, Datana integerrima, Dasychira pinicola, Dendrolimus* spp. such as *D. pini, D. spectabilis, D. sibiricus; Desmia funeralis, Diaphania* spp. such as *D. nitidalis, D. hyalinata; Diatraea grandiosella, Diatraea saccharalis, Diphthera festiva, Earias* spp. such as *E. insulana, E. vittella; Ecdytolopha aurantianu, Egira (=Xylomyges) curialis, Elasmopalpus lignosellus, Eldana saccharina, Endopiza viteana, Ennomos subsignaria, Eoreuma loftini, Ephestia* spp. such as *E. cautella, E. elutella, E. kuehniella; Epinotia aporema, Epiphyas postvittana, Erannis tiliaria, Erionota thrax, Etiella* spp., *Eulia* spp., *Eupoecilia ambiguella, Euproctis chrysorrhoea, Euxoa* spp., *Evetria bouliana, Faronta albilinea, Feltia* spp. such as *F. subterranean; Galleria mellonella, Gracillaria* spp., *Grapholita* spp. such as *G. funebrana, G. molesta, G. inopinata; Halysidota* spp., *Harrisina americana, Hedylepta* spp., *Helicoverpa* spp. such as *H. armigera (=Heliothis armigera), H. zea (=Heliothis zea); Heliothis* spp. such as *H. assulta, H. subflexa, H. virescens; Hellula* spp. such as *H. undalis, H. rogatalis; Helocoverpa gelotopoeon, Hemileuca oliviae, Herpetogramma licarsisalis, Hibernia defoliaria, Hofmannophila pseudospretella, Homoeosoma electellum, Homona magnanima, Hypena scabra, Hyphantria cunea, Hyponomeuta padella, Hyponomeuta malinellus, Kakivoria flavofasciata, Keiferia lycopersicella, Lambdina fiscellaria fiscellaria, Lambdina fiscellaria lugubrosa, Lamprosema indicata, Laspeyresia molesta, Leguminivora glycinivorella, Lerodea eufala, Leucinodes orbonalis, Leucoma salicis, Leucoptera* spp. such as *L. coffeella, L. scitella; Leuminivora lycinivorella, Lithocolletis blancardella, Lithophane antennata, Llattia octo (=Amyna axis), Lobesia botrana, Lophocampa* spp., *Loxagrotis albicosta, Loxostege* spp. such as *L. sticticalis, L. cereralis; Lymantria* spp. such as *L. dispar, L. monacha; Lyonetia clerkella, Lyonetia prunifoliella, Malacosoma* spp. such as *M. americanum, M. californicum, M. constrictum, M. neustria; Mamestra* spp. such as *M. brassicae, M. configurata; Mamstra brassicae, Manduca* spp. such as *M. quinquemaculata, M. sexta; Marasmia spp, Marmara* spp., *Maruca testulalis, Megalopyge lanata, Melanchra picta, Melanitis leda, Mocis* spp. such as *M. lapites, M. repanda; Mocis latipes, Monochroa fragariae, Mythimna separata, Nemapogon cloacella, Neoleucinodes elegantalis, Nepytia* spp., *Nymphula* spp., *Oiketicus* spp., *Omiodes indicata, Omphisa anastomosalis, Operophtera brumata, Orgyia pseudotsugata, Oria* spp., *Orthaga thyrisalis, Ostrinia* spp. such as *O. nubilalis; Oulema oryzae, Paleacrita vernata, Panolis flammea, Parnara* spp., *Papaipema nebris, Papilio cresphontes, Paramyelois transitella, Paranthrene regalis, Paysandisia archon, Pectinophora* spp. such as *P. gossypiella; Peridroma saucia, Perileucoptera* spp., such as *P. coffeella; Phalera bucephala, Phryganidia californica, Phthorimaea* spp. such as *P. operculella; Phyllocnistis citrella, Phyllonorycter* spp. such as *P. blancardella, P. crataegella, P. issikii, P. ringoniella; Pieris* spp. such as *P. brassicae, P. rapae,*

P. napi; Pilocrocis tripunctata, Plathypena scabra, Platynota spp. such as *P. flavedana, P. idaeusalis, P. stultana; Platyptilia carduidactyla, Plebejus argus, Plodia interpunctella, Plusia spp, Plutella maculipennis, Plutella xylostella, Pontia protodica, Prays* spp., *Prodenia* spp., *Proxenus lepigone, Pseudaletia* spp. such as *P. sequax, P. unipuncta; Pyrausta nubilalis, Rachiplusia nu, Richia albicosta, Rhizobius ventralis, Rhyacionia frustrana, Sabulodes aegrotata, Schizura concinna, Schoenobius* spp., *Schreckensteinia festaliella, Scirpophaga* spp. such as *S. incertulas, S. innotata; Scotia segetum, Sesamia* spp. such as *S. inferens, Seudyra subflava, Sitotroga cerealella, Sparganothis pilleriana, Spilonota lechriaspis, S. ocellana, Spodoptera (=Lamphygma)* spp. such as *S. cosmoides, S. eridania, S. exigua, S. frugiperda, S. latisfascia, S. littoralis, S. litura, S. omithogalli; Stigmella* spp., *Stomopteryx subsecivella, Strymon bazochii, Sylepta derogata, Synanthedon* spp. such as S. exitiosa, *Tecia solanivora, Telehin licus, Thaumatopoea pityocampa, Thaumatotibia (=Cryptophlebia) leucotreta, Thaumetopoea pityocampa, Thecla* spp., *Theresimima ampelophaga, Thyrinteina* spp, *Tildenia inconspicuella, Tinea* spp. such as *T. cloacella, T. pellionella; Tineola bisselliella, Tortrix* spp. such as *T. viridana; Trichophaga tapetzella, Trichoplusia* spp. such as *T. ni; Tuta (=Scrobipalpula) absoluta, Udea* spp. such as *U. rubigalis, U. rubigalis; Virachola* spp., *Yponomeuta padella, and Zeiraphera canadensis;*

insects from the order of **Coleoptera**, for example *Acalymma vittatum, Acanthoscehdes obtectus, Adoretus* spp., *Agelastica alni, Agrilus* spp. such as *A. anxius, A. planipennis, A. sinuatus; Agriotes* spp. such as *A. fuscicollis, A. lineatus, A. obscurus; Alphitobius diaperinus, Amphimallus solstitialis, Anisandrus dispar, Anisoplia austriaca, Anobium punctatum, Anomala corpulenta, Anomala rufocuprea, Anoplophora* spp. such as *A. glabripennis; Anthonomus* spp. such as *A. eugenii, A. grandis, A. pomorum; Anthrenus* spp., *Aphthona euphoridae, Apion* spp., *Apogonia* spp., *Athous haemorrhoidalis, Atomaria* spp. such as *A. linearis; Attagenus* spp., *Aulacophora femoralis, Blastophagus piniperda, Blitophaga undata, Bruchidius obtectus, Bruchus* spp. such as *B. lentis, B. pisorum, B. rufimanus; Byctiscus betulae, Callidiellum rufipenne, Callopistria floridensis, Callosobruchus chinensis, Cameraria ohridella, Cassida nebulosa, Cerotoma trifurcata, Cetonia aurata, Ceuthorhynchus* spp. such as *C. assimilis, C. napi; Chaetocnema tibialis, Cleonus mendicus, Conoderus* spp. such as *C. vespertinus; Conotrachelus nenuphar, Cosmopolites* spp., *Costelytra zealandica, Crioceris asparagi, Cryptolestes ferrugineus, Cryptorhynchus lapathi, Ctenicera* spp. such as *C. destructor; Curculio* spp., *Cylindrocopturus* spp., *Cyclocephala* spp., *Dactylispa balyi, Dectes texanus, Dermestes* spp., *Diabrotica* spp. such as *D. undecimpunctata, D. speciosa, D. longicornis, D. semipunctata, D. virgifera; Diaprepes abbreviates, Dichocrocis* spp., *Dicladispa armigera, Diloboderus abderus, Diocalandra frumenti (Diocalandra stigmaticollis), Enaphalodes rufulus, Epilachna* spp. such as *E. varivestis, E. vigintioctomaculata; Epitrix* spp. such as *E. hirtipennis, E. similaris; Eutheola humilis, Eutinobothrus brasiliensis, Faustinus cubae, Gibbium psylloides, Gnathocerus cornutus, Hellula undalis, Heteronychus arator, Hylamorpha elegans, Hylobius abietis, Hylotrupes bajulus, Hypera* spp. such as *H. brunneipennis, H. postica; Hypomeces squamosus, Hypothenemus* spp., *Ips typographus, Lachnosterna consanguinea, Lasioderma serricorne, Latheticus oryzae, Lathridius* spp., *Lema* spp. such as *L. bilineata, L. melanopus; Leptinotarsa* spp. such as *L. decemlineata; Leptispa pygmaea, Limonius californicus, Lissorhoptrus oryzophilus, Lixus* spp., *Luperodes* spp., *Lyctus* spp. such as *L. bruneus; Liogenys fuscus, Macrodactylus* spp. such as *M. subspinosus; Maladera matrida, Megaplatypus mutates, Megascelis* spp., *Melanotus communis, Meligethes* spp.

such as *M. aeneus; Melolontha* spp. such as *M. hippocastani, M. melolontha; Metamasius hemipterus, Microtheca* spp., *Migdolus* spp. such as *M. fryanus, Monochamus* spp. such as *M. alternatus; Naupactus xanthographus, Niptus hololeucus, Oberia brevis, Oemona hirta, Oryctes rhinoceros, Oryzaephilus surinamensis, Oryzaphagus oryzae, Otiorrhynchus sulcatus, Otiorrhynchus ovatus, Otiorrhynchus sulcatus, Oulema melanopus, Oulema oryzae, Oxycetonia jucunda, Phaedon* spp. such as *P. brassicae, P. cochleariae; Phoracantha recurva, Phyllobius pyri, Phyllopertha horticola, Phyllophaga* spp. such as *P. helleri; Phyllotreta* spp. such as *P. chrysocephala, P. nemorum, P. striolata, P. vittula; Phyllopertha horticola, Popillia japonica, Premnotrypes* spp., *Psacothea hilaris, Psylliodes chrysocephala, Prostephanus truncates, Psylliodes* spp., *Ptinus* spp., *Pulga saltona, Rhizopertha dominica, Rhynchophorus* spp. such as *R. billineatus, R. ferrugineus, R. palmarum, R. phoenicis, R. vulneratus; Saperda candida, Scolytus schevyrewi, Scyphophorus acupunctatus, Sitona lineatus, Sitophilus* spp. such as *S. granaria, S. oryzae, S. zeamais; Sphenophorus* spp. such as *S. levis; Stegobium paniceum, Sternechus* spp. such as *S. subsignatus; Strophomorphus ctenotus, Symphyletes* spp., *Tanymecus* spp., *Tenebrio molitor, Tenebrioides mauretanicus, Tribolium* spp. such as *T. castaneum; Trogoderma* spp., *Tychius* spp., *Xylotrechus* spp. such as *X. pyrrhoderus; and, Zabrus* spp. *such as Z. tenebrioides;*

insects from the order of **Diptera** e.g. *Aedes* spp. such as *A. aegypti, A. albopictus, A. vexans; Anastrepha ludens, Anopheles* spp. such as *A. albimanus, A. crucians, A. freeborni, A. gambiae, A. leucosphyrus, A. maculipennis, A. minimus, A. quadrimaculatus, A. sinensis; Bactrocera invadens, Bibio hortulanus, Calliphora erythrocephala, Calliphora vicina, Ceratitis capitata, Chrysomyia* spp. such as *C. bezziana, C. hominivorax, C. macellaria; Chrysops atlanticus, Chrysops discalis, Chrysops silacea, Cochliomyia* spp. such as *C. hominivorax; Contarinia* spp. such as *C. sorghicola; Cordylobia anthropophaga, Culex* spp. such as *C. nigripalpus, C. pipiens, C. quinquefasciatus, C. tarsalis, C. tritaeniorhynchus; Culicoides furens, Culiseta inornata, Culiseta melanura, Cuterebra* spp., *Dacus cucurbitae, Dacus oleae, Dasineura brassicae, Dasineura oxycoccana, Delia* spp. such as *D. antique, D. coarctata, D. platura, D. radicum; Dermatobia hominis, Drosophila* spp. such as *D. suzukii, Fannia* spp. such as *F. canicularis; Gastraphilus* spp. such as *G. intestinalis; Geomyza tipunctata, Glossina* spp. such as *G. fuscipes, G. morsitans, G. palpalis, G. tachinoides; Haematobia irritans, Haplodiplosis equestris, Hippelates* spp., Hylemyia spp. such as *H. platura; Hypoderma* spp. such as *H. lineata; Hyppobosca* spp., *Hydrellia philippina, Leptoconops torrens, Liriomyza* spp. such as *L. sativae, L. trifolii; Lucilia* spp. such as *L. caprina, L. cuprina, L. sericata; Lycoria pectoralis, Mansonia titillanus, Mayetiola* spp. such as *M. destructor; Musca* spp. such as *M. autumnalis, M. domestica; Muscina stabulans, Oestrus* spp. such as *O. ovis; Opomyza florum, Oscinella* spp. such as *O. frit; Orseolia oryzae, Pegomya hysocyami, Phlebotomus argentipes, Phorbia* spp. such as *P. antiqua, P. brassicae, P. coarctata; Phytomyza gymnostoma, Prosimulium mixtum, Psila rosae, Psorophora columbiae, Psorophora discolor, Rhagoletis* spp. such as *R. cerasi, R. cingulate, R. indifferens, R. mendax, R. pomonella; Rivellia quadrifasciata, Sarcophaga* spp. such as *S. haemorrhoidalis; Simulium vittatum, Sitodiplosis mosellana, Stomoxys* spp. such as *S. calcitrans; Tabanus* spp. such as *T. atratus, T. bovinus, T. lineola, T. similis; Tannia spp., Thecodiplosis japonensis, Tipula oleracea, Tipula paludosa,* and *Wohlfahrtia* spp;

insects from the order of **Thysanoptera** for example, *Baliothrips biformis, Dichromothrips corbetti, Dichromothrips* ssp., *Echinothrips americanus, Enneothrips flavens, Frankliniella* spp. such as *F. fusca, F. occidentalis, F. tritici; Heliothrips* spp., *Hercinothrips femoralis, Kakothrips* spp., *Microcephalothrips abdominalis, Neohydatothrips samayunkur, Pezothrips kellyanus, Rhipiphorothrips cruentatus, Scirtothrips* spp. such as *S. citri, S. dorsalis, S. perseae; Stenchaetothrips spp, Taeniothrips cardamoni, Taeniothrips inconsequens, Thrips* spp. such as *T. imagines, T. hawaiiensis, T. oryzae, T. palmi, T. parvispinus, T. tabaci;*

insects from the order of **Hemiptera** for example, *Acizzia jamatonica*, *Acrosternum* spp. such as *A. hilare;* Acyrthosipon spp. such as *A. onobrychis, A. pisum; Adelges laricis, Adelges tsugae, Adelphocoris* spp., such as *A. rapidus, A. superbus; Aeneolamia* spp., *Agonoscena* spp., *Aulacorthum solani, Aleurocanthus woglumi, Aleurodes* spp., *Aleurodicus disperses, Aleurolobus barodensis, Aleurothrixus* spp., *Amrasca* spp., *Anasa tristis, Antestiopsis* spp., *Anuraphis cardui, Aonidiella* spp., *Aphanostigma piri, Aphidula nasturtii, Aphis* spp. such as *A. craccivora, A. fabae, A. forbesi, A. gossypii, A. grossulariae, A. maidiradicis, A. pomi, A. sambuci, A. schneideri, A. spiraecola; Arboridia apicalis, Arilus critatus, Aspidiella* spp., *Aspidiotus* spp., *Atanus* spp., *Aulacaspis yasumatsui, Aulacorthum solani, Bactericera cockerelli (Paratrioza cockerelli), Bemisia* spp. such as *B. argentifolii, B. tabaci (Aleurodes tabaci); Blissus* spp. such as *B. leucopterus; Brachycaudus* spp. such as *B. cardui, B. helichrysi, B. persicae, B. prunicola; Brachycolus* spp., *Brachycorynella asparagi, Brevicoryne brassicae, Cacopsylla* spp. such as *C. fulguralis, C. pyricola (Psylla piri); Calligypona marginata, Calocoris* spp., *Campylomma livida, Capitophorus horni, Carneocephala fulgida, Cavelerius* spp., *Ceraplastes* spp., *Ceratovacuna lanigera, Ceroplastes ceriferus, Cerosipha gossypii, Chaetosiphon fragaefolii, Chionaspis tegalensis, Chlorita onukii, Chromaphis juglandicola, Chrysomphalus ficus, Cicadulina mbila, Cimex* spp. such as *C. hemipterus, C. lectularius; Coccomytilus halli, Coccus* spp. such as *C. hesperidum, C. pseudomagnoliarum*; *Corythucha arcuata, Creontiades dilutus, Cryptomyzus ribis, Chrysomphalus aonidum, Cryptomyzus ribis, Ctenarytaina spatulata, Cyrtopeltis notatus, Dalbulus* spp., *Dasynus piperis, Dialeurodes* spp. such as *D. citrifolii; Dalbulus maidis, Diaphorina* spp. such as *D. citri; Diaspis* spp. such as *D. bromeliae; Dichelops furcatus, Diconocoris hewetti, Doralis* spp., *Dreyfusia nordmannianae, Dreyfusia piceae, Drosicha* spp., *Dysaphis* spp. such as *D. plantaginea, D. pyri, D. radicola; Dysaulacorthum pseudosolani, Dysdercus* spp. such as *D. cingulatus, D. intermedius; Dysmicoccus* spp., *Edessa* spp., *Geocoris* spp., *Empoasca* spp. such as *E. fabae, E. solana; Epidiaspis leperii, Eriosoma* spp. such as *E. lanigerum, E. pyricola; Erythroneura* spp., *Eurygaster* spp. such as *E. integriceps; Euscelis bilobatus, Euschistus* spp. such as *E. heros, E. impictiventris, E. servus; Fiorinia theae, Geococcus coffeae, Glycaspis brimblecombei, Halyomorpha* spp. such as *H. halys; Heliopeltis* spp., *Homalodisca vitripennis (=H. coagulata), Horcias nobilellus, Hyalopterus pruni, Hyperomyzus lactucae, Icerya* spp. such as *I. purchase; Idiocerus* spp., *Idioscopus* spp., *Laodelphax striatellus, Lecanium* spp., *Lecanoideus floccissimus, Lepidosaphes* spp. such as *L. ulmi; Leptocorisa* spp., *Leptoglossus phyllopus, Lipaphis erysimi, Lygus* spp. such as *L. hesperus, L. lineolaris, L. pratensis; Maconellicoccus hirsutus, Marchalina hellenica, Macropes excavatus, Macrosiphum* spp. such as *M. rosae, M. avenae, M. euphorbiae; Macrosteles quadrilineatus, Mahanarva fimbriolata, Megacopta cribraria, Megoura viciae, Melanaphis pyrarius, Melanaphis sacchari, Melanocallis*

(=Tinocallis) caryaefoliae, Metcafiella spp., *Metopolophium dirhodum, Monellia costalis, Monelliopsis pecanis, Myzocallis coryli, Murgantia* spp., *Myzus* spp. such as *M. ascalonicus, M. cerasi, M. nicotianae, M. persicae, M. varians; Nasonovia ribis-nigri, Neotoxoptera formosana, Neomegalotomus spp, Nephotettix* spp. such as *N. malayanus, N. nigropictus, N. parvus, N. virescens; Nezara* spp. such as *N. viridula; Nilaparvata lugens, Nysius huttoni, Oebalus* spp. such as *O. pugnax; Oncometopia* spp., *Orthezia praelonga, Oxycaraenus hyalinipennis, Parabemisia myricae, Parlatoria* spp., *Parthenolecanium* spp. such as *P. corni, P. persicae; Pemphigus* spp. such as *P. bursarius, P. populivenae; Peregrinus maidis, Perkinsiella saccharicida, Phenacoccus* spp. such as *P. aceris, P. gossypii; Phloeomyzus passerinii, Phorodon humuli, Phylloxera* spp. such as *P. devastatrix, Piesma quadrata, Piezodorus* spp. such as *P. guildinii; Pinnaspis aspidistrae, Planococcus* spp. such as *P. citri, P. ficus; Prosapia bicincta, Protopulvinaria pyriformis, Psallus seriatus, Pseudacysta persea, Pseudaulacaspis pentagona, Pseudococcus* spp. such as *P. comstocki; Psylla* spp. such as *P. mali; Pteromalus* spp., *Pulvinaria amygdali, Pyrilla* spp., *Quadraspidiotus* spp., such as *Q. perniciosus; Quesada gigas, Rastrococcus* spp., *Reduvius senilis, Rhizoecus americanus, Rhodnius* spp., *Rhopalomyzus ascalonicus, Rhopalosiphum* spp. such as *R. pseudobrassicas, R. insertum, R. maidis, R. padi; Sagatodes* spp., *Sahlbergella singularis, Saissetia* spp., *Sappaphis mala, Sappaphis mali, Scaptocoris* spp., *Scaphoides titanus, Schizaphis graminum, Schizoneura lanuginosa, Scotinophora* spp., *Selenaspidus articulatus, Sitobion avenae, Sogata* spp., *Sogatella furcifera, Solubea insularis, Spissistilus festinus (=Stictocephala festina), Stephanitis nashi, Stephanitis pyrioides, Stephanitis takeyai, Tenalaphara malayensis, Tetraleurodes perseae, Therioaphis maculate, Thyanta* spp. such as *T. accerra, T. perditor; Tibraca* spp., *Tomaspis* spp., *Toxoptera* spp. such as *T. aurantii; Trialeurodes* spp. such as *T. abutilonea, T. ricini, T. vaporariorum; Triatoma* spp., *Trioza* spp., *Typhlocyba* spp., *Unaspis* spp. such as *U. citri, U. yanonensis; and Viteus vitifolii,*

Insects from the order **Hymenoptera** for example *Acanthomyops interjectus*, *Athalia rosae, Atta* spp. *such as A. capiguara, A. cephalotes, A. cephalotes, A. laevigata, A. robusta, A. sexdens, A. texana, Bombus* spp., *Brachymyrmex* spp., *Camponotus* spp. such as *C. floridanus, C. pennsylvanicus, C. modoc; Cardiocondyla nuda, Chalibion sp, Crematogaster* spp., *Dasymutilla occidentalis, Diprion* spp., *Dolichovespula maculata, Dorymyrmex* spp., *Dryocosmus kuriphilus, Formica* spp., *Hoplocampa* spp. such as *H. minuta, H. testudinea; Iridomyrmex humilis,* Lasius spp. such as *L. niger, Linepithema humile, Liometopum* spp., *Leptocybe invasa, Monomorium* spp. such as *M. pharaonis, Monomorium, Nylandria fulva, Pachycondyla chinensis, Paratrechina longicornis, Paravespula* spp., such as *P. germanica, P. pennsylvanica, P. vulgaris; Pheidole* spp. such as *P. megacephala; Pogonomyrmex* spp. such as *P. barbatus, P. californicus, Polistes rubiginosa, Prenolepis impairs, Pseudomyrmex gracilis, Schelipron* spp., *Sirex cyaneus, Solenopsis* spp. such as *S. geminata, S.invicta, S. molesta, S. richteri, S. xyloni, Sphecius speciosus, Sphex* spp., *Tapinoma* spp. such as *T. melanocephalum, T. sessile; Tetramorium* spp. such as *T. caespitum, T. bicarinatum, Vespa* spp. such as *V. crabro; Vespula* spp. such as *V. squamosal; Wasmannia auropunctata*, *Xylocopa* sp;

Insects from the order **Orthoptera** for example *Acheta domesticus, Calliptamus italicus, Chortoicetes terminifera, Ceuthophilus* spp., *Diastrammena asynamora, Dociostaurus maroccanus, Gryllotalpa* spp. such as *G. africana, G. gryllotalpa; Gryllus* spp., *Hieroglyphus daganensis, Kraussaria angulifera, Locusta* spp. such as *L. migratoria, L. pardalina; Melanoplus* spp. such

as *M. bivittatus, M. femurrubrum, M. mexicanus, M. sanguinipes, M. spretus; Nomadacris septemfasciata, Oedaleus senegalensis, Scapteriscus* spp., *Schistocerca* spp. such as *S. americana, S. gregaria, Stemopelmatus* spp., *Tachycines asynamorus,* and *Zonozerus variegatus;*

Pests from the Class **Arachnida** for example **Acari**,e.g. of the families Argasidae, Ixodidae and Sarcoptidae, such as *Amblyomma* spp. (e.g. *A. americanum, A. variegatum, A. maculatum*), Argas spp. such as *A. persicu*), *Boophilus* spp. such as *B. annulatus, B. decoloratus, B. microplus, Dermacentor* spp. such as *D.silvarum, D. andersoni, D. variabilis, Hyalomma* spp. such as *H. truncatum, Ixodes* spp. such as *I. ricinus, I. rubicundus, I. scapularis, I. holocyclus, I. pacificus, Rhipicephalus sanguineus, Ornithodorus* spp. such as *O. moubata, O. hermsi, O. turicata, Ornithonyssus bacoti, Otobius megnini, Dermanyssus gallinae, Psoroptes* spp. such as *P. ovis, Rhipicephalus* spp. such as *R. sanguineus, R. appendiculatus, Rhipicephalus evertsi, Rhizoglyphus* spp., *Sarcoptes* spp. such as*S. Scabiei*; and Family **Eriophyidae** including *Aceria* spp. such as *A. sheldoni*, *A. anthocoptes*, *Acallitus* spp., *Aculops* spp. such as *A. lycopersici*, *A. pelekassi*; *Aculus* spp. such as *A. schlechtendali; Colomerus vitis, Epitrimerus pyri, Phyllocoptruta oleivora; Eriophytes ribis* and *Eriophyes* spp. such as *Eriophyes sheldoni*; Family **Tarsonemidae** including *Hemitarsonemus* spp., *Phytonemus pallidus and Polyphagotarsonemus latus, Stenotarsonemus* spp. *Steneotarsonemus spinki*; Family **Tenuipalpidae** including Brevipalpus spp. such as *B. phoenicis*; Family **Tetranychidae** including *Eotetranychus* spp., *Eutetranychus* spp., *Oligonychus* spp., *Petrobia latens*, *Tetranychus* spp. such as *T. cinnabarinus, T. evansi, T. kanzawai, T, pacificus, T. phaseulus, T. telarius* and *T. urticae*; *Bryobia praetiosa*; *Panonychus* spp. such as *P. ulmi*, *P. citri*; *Metatetranychus* spp. and *Oligonychus* spp. such as *O. pratensis, O. perseae*, *Vasates lycopersici*; *Raoiella indica, Family* **Carpoglyphidae** including *Carpoglyphus* spp.*; Penthaleidae* spp. such as *Halotydeus destructor*; Family **Demodicidae** with species such as *Demodex* spp.; Family **Trombicidea** including *Trombicula* spp.; Family **Macronyssidae** including *Ornothonyssus* spp.; Family **Pyemotidae** including *Pyemotes tritici*; *Tyrophagus putrescentiae*; Family **Acaridae** including *Acarus siro*; Family **Araneida** including *Latrodectus mactans*, *Tegenaria agrestis, Chiracanthium sp, Lycosa sp Achaearanea tepidariorum* and *Loxosceles reclusa*;

Pests from the Phylum **Nematoda**, for example, plant parasitic nematodes such as root-knot nematodes, *Meloidogyne* spp. such as *M. hapla, M. incognita, M. javanica;* cyst-forming nematodes, *Globodera* spp. such as *G. rostochiensis; Heterodera* spp. such as *H. avenae, H. glycines, H. schachtii, H. trifolii;* Seed gall nematodes, *Anguina* spp.; Stem and foliar nematodes, *Aphelenchoides* spp. such as *A. besseyi;* Sting nematodes, *Belonolaimus* spp. such as *B. longicaudatus;* Pine nematodes, *Bursaphelenchus* spp. such as *B. lignicolus, B. xylophilus;* Ring nematodes, *Criconema* spp., *Criconemella* spp. such as *C. xenoplax* and *C. ornata;* and, *Criconemoides* spp. such as *Criconemoides informis; Mesocriconema* spp.*;* Stem and bulb nematodes, *Ditylenchus* spp. such as *D. destructor, D. dipsaci;* Awl nematodes, *Dolichodorus* spp.*;* Spiral nematodes, *Heliocotylenchus multicinctus;* Sheath and sheathoid nematodes, *Hemicycliophora* spp. and *Hemicriconemoides* spp.*; Hirshmanniella* spp.*;* Lance nematodes, *Hoploaimus* spp.*;* False rootknot nematodes, *Nacobbus* spp.*;* Needle nematodes, *Longidorus* spp. such as *L. elongatus;* Lesion nematodes, *Pratylenchus* spp. such as *P. brachyurus, P. neglectus, P. penetrans, P. curvitatus, P. goodeyi;* Burrowing nematodes, *Radopholus* spp. such as *R. similis; Rhadopholus* spp.*; Rhodopholus* spp.*;* Reniform nematodes, *Rotylenchus* spp. such as

R. robustus, R. reniformis; Scutellonema spp.*;* Stubby-root nematode, *Trichodorus* spp. such as *T. obtusus*, *T. primitivus; Paratrichodorus* spp. such as *P. minor;* Stunt nematodes, *Tylenchorhynchus* spp. such as *T. claytoni*, *T. dubius;* Citrus nematodes, *Tylenchulus* spp. such as *T. semipenetrans;* Dagger nematodes, *Xiphinema* spp.*;* and other plant parasitic nematode species;

Insects from the order **Blattodea** for example *Macrotermes* spp. such as *M. natalensis; Cornitermes cumulans, Procornitermes* spp.*, Globitermes sulfureus, Neocapritermes* spp. such as *N. opacus, N. parvus; Odontotermes spp., Nasutitermes* spp. such as *N. corniger*, *Coptotermes* spp. such as *C. formosanus, C. gestroi, C. acinaciformis; Reticulitermes* spp. such as *R. hesperus, R. tibialis, R. speratus, R. flavipes, R. grassei, R. lucifugus, R. virginicus; Heterotermes* spp. such as *H. aureus, H. longiceps, H. tenuis; Cryptotermes* spp. such as *C. brevis, C. cavifrons; Incisitermes* spp. such as *I. minor, I. snyderi*; *Marginitermes hubbardi*, *Kalotermes flavicollis, Neotermes* spp. such as *N. castaneus, Zootermopsis* spp. *such as Z. angusticollis*, *Z. nevadensis*, *Mastotermes* spp. such as *M. darwiniensis; Blatta* spp. such as *B. orientalis, B. lateralis; Blattella* spp. such as *B. asahinae, B. germanica; Rhyparobia maderae, Panchlora nivea, Periplaneta* spp. such as *P. americana, P. australasiae, P. brunnea, P. fuliginosa, P. japonica; Supella longipalpa, Parcoblatta pennsylvanica, Eurycotis floridana, Pycnoscelus surinamensis,*

Insects from the order **Siphonoptera** for example *Cediopsylla simples*, *Ceratophyllus* spp.*, Ctenocephalides* spp. such as *C. felis*, *C. canis, Xenopsylla cheopis*, *Pulex irritans*, *Trichodectes canis*, *Tunga penetrans*, and *Nosopsyllus fasciatus,*

Insects from the order **Thysanura** for example *Lepisma saccharina* , *Ctenolepisma urbana*, and *Thermobia domestica,*

Pests from the class **Chilopoda** for example *Geophilus* spp.*,* Scutigera spp. such as *Scutigera coleoptrata*;

Pests from the class **Diplopoda** for example *Blaniulus guttulatus*, *Julus* spp.*, Narceus* spp.,

Pests from the class **Symphyla** for example *Scutigerella immaculata,*

Insects from the order **Dermaptera***,* for example *Forficula auricularia*,

Insects from the order **Collembola**, for example *Onychiurus* spp., such as *Onychiurus armatus,*

Pests from the order **Isopoda** for example, *Armadillidium vulgare, Oniscus asellus, Porcellio scaber,*

Insects from the order **Phthiraptera**, for example *Damalinia* spp., Pediculus spp. such as *Pediculus humanus capitis, Pediculus humanus corporis, Pediculus humanus humanus; Pthirus pubis*, Haematopinus spp. such as *Haematopinus eurysternus*, *Haematopinus suis*; Linognathus spp. such as *Linognathus vituli; Bovicola bovis, Menopon gallinae, Menacanthus stramineus* and *Solenopotes capillatus, Trichodectes* spp.*,*

Examples of further pest species which may be controlled by compounds of fomula (I) include: from the Phylum **Mollusca**, class **Bivalvia,** for example, *Dreissena* spp.; class **Gastropoda**, for example, *Arion* spp.*, Biomphalaria* spp.*, Bulinus* spp.*, Deroceras* spp.*, Galba* spp.*, Lymnaea* spp.*, Oncomelania* spp.*, Pomacea canaliclata, Succinea* spp.*;* from the class of the **helminths**, for example, *Ancylostoma duodenale, Ancylostoma ceylanicum, Acylostoma braziliensis, Ancylostoma* spp.*, Ascaris lubricoides, Ascaris spp., Brugia malayi, Brugia timori, Bunostomum* spp.*, Chabertia* spp.*, Clonorchis* spp.*, Cooperia* spp.*, Dicrocoelium* spp.*, Dictyocaulus filaria, Diphyl-*

lobothrium latum, Dracunculus medinensis, Echinococcus granulosus, Echinococcus multilocularis, Enterobius vermicularis, Faciola spp., Haemonchus spp. such as *Haemonchus contortus; Heterakis* spp., *Hymenolepis nana, Hyostrongulus* spp., *Loa Loa, Nematodirus* spp., *Oesophagostomum* spp., *Opisthorchis* spp., *Onchocerca volvulus, Ostertagia* spp., *Paragonimus* spp., *Schistosomen* spp., *Strongyloides fuelleborni, Strongyloides stercora lis, Stronyloides* spp., *Taenia saginata, Taenia solium, Trichinella spiralis, Trichinella nativa, Trichinella britovi, Trichinella nelsoni, Trichinella pseudopsiralis, Trichostrongulus spp., Trichuris trichuria, Wuchereria bancrofti.*

Rice pests

In the context of this invention, rice pest invertebrates are animal pests, which occur in rice. The rice pest invertebrates include insects, acarids and nematodes, preferably insects. Rice pest invertebrates, which are well-known in rice, include but are not limited to the following species:

Hemiptera:

brown planthopper – *Nilaparvata lugens*
small brown planthopper – *Laodelphax striatellus*
white-backed planthopper – *Sogatella furcifera*
white leafhopper – *Cofana spectra*
green leafhopper – *Nephotettix virescens, N. nigriceps, N. cincticeps, N. malayanus*
zig zag leafhopper – *Recilia dorsalis*
maize orange leafhopper – *Cicadulina bipunctata*
aster leafhopper - *Macrosteles fascifrons*
rice earhead bug, *Leptocorisa oratorius, L. acuta*
rice stink bugs – *Nezara viridula, Pygomenida varipennis, Eysarcoris, Tibraca limbatriventris, Eysarcoris ventralis*
small stink bug - *Oebalus poecilus, O. pugnax*
coreid bug – *Eysarcoris* sp
chinch bug - *Blissus leucopterus leucopterus*
rice mealybug, *Brevennia rehi, Pseudococcus saccharicola*
rice aphids, *Rhopalosiphum rufiabdominalis, Macrosiphum avenae, Hysteroneura setariae, Tetraneuro nigriabdominalis*
bean root aphid - *Smynthurodes betae*

Lepidoptera:

rice skipper – *Parnara guttata, Melanitis leda ismene*
rice stem borer / striped stem borer – *Chilo suppressalis, Chilo polychrusus, Chilo partellus, Chilo plejadellus*
rice stalk borer – *Chilotraea polychrysa*
pink rice borer – *Sesamia inferens*
yellow rice borer – *Tryporyza (=Scirpophaga) incertulas*
white rice borer – *Tryporyza innotata*
rice leafroller / leaf folder – *Cnaphalocrocis medinalis, Marasmia patnalis, M. exigua*
rice ear-cutting caterpillar / armyworm– *Pseudaletia separata*

green caterpillar – *Xanthodes transversa*
green rice caterpillar – *Narnaga aenescens*
green horned caterpillars - *Melanitis leda ismene, Mycalesis sp*
fall army worm – *Spodoptera frugiperda*
cutworm – *Mythimna separata*
rice case worm- *Nymphula depunctalis*
black hairy caterpillar, *Amata sp.*
hairy caterpillar- *Mocis frugalis*
yellow caterpillar, *Psalis pennatula*
rice semi-brown looper, *Mocis frugalis*
rice semi-looper, *Chrysodeixis chalcites*
grass webworm - *Herpetogramma licarsisalis*
sugarcane borer - *Diatraea saccharalis*
corn stalk borer – *Elasmopalpus lignosellus*
striped grass looper – *Mocis latipes*
european corn borer – *Ostrinia nubilalis*
Mexican rice borer – *Eoreuma loftini*

Coleoptera:
water weevil – *Lissorhopterus oryzophilus*
rice plant weevil – *Echinocnemus squamous*
rice weevil - *Oryzophagus oryzae*
rice hispa – *Diclodispa armigera*
rice leaf beetle – *Oulema oryzae*
rice blackbug – *Scotinophora vermidulate, S. vermidulate, S. lurida, S. latiuscula*
rice flea beetle – *Chaetocnima basalis*
grubs - *Leucopholis irrorata, Leucopholis irrorata, Phyllophaga sp, Heteronychus sp*
scarab beetle (bicho torito) - *Diloboderus abderus*
billbugs - *Sphenophorus spp*
grape colaspis - *Colaspis brunnea, C. louisianae*
rice pollen beetle, *Chilolaba acuta*

Diptera:
stem maggot – *Chlorops oryzae*
leafminer – *Agromyza oryzae*
rice whorl maggot / rice stem maggot – *Hydrellia sasakii*
rice whorl maggot / small rice leafminer – *Hydrellia griseola*
rice gall midge – Orseolia (=*Pachydiplosis) oryzae*
rice shoot fly- *Atherigona oryzae*
rice seed midge – *Chironomus cavazzai, Chironomus spp, Cricotopus spp*

Thysanoptera:
rice thrips- *Chloethrips oryzae*, *Stenochaetothrips biformis, Perrisothrips sp., Hoplothrips sp.,*

Orthoptera:
rice grasshoppers, *Hieroglyphus banian, Hieroglyphus nigrorepletus, Catantops pinguis, Attractomorpha burri, A. crenulate, A. psittacina psittacina, A. Bedeli, Oxya adenttata, Oxya ebneri, Oxya hyla intricata, Acrida turricata*
locusts – *Locusta migratoria manilensis*
mole cricket, *Grylotalpa africana*
field cricket: *Gryllus bimaculatus, Teleogryllus occipitalis, Euscyrtus concinus*
katydid – *Conocephalus longipennis*

Isoptera:
termites – *Macrotermes gilvus, Syntermes molestans*

Hymenoptera:
ants – *Solenopsis geminata*
rice white tip nematode – *Aphelenchoides besseyi*

Acari:
rice panicle mite - *Steotarsonemus pinki*

Crustacea:
tadpole shrimp - *Triops longicaudatus. T. cancriformis*
rice crayfish - *Procambarus clarkii, Orconectes virilis*.

In addition, rice is affected by a range of bugs including *Leptocorisa chinensis*, *Lagynotomus elongates*, *Nerzara viridula*, *Eysacoris parvus*, *Leptocorisa oratorius*, *Oebalus pugnax*, *Cletus trigonus*, as well as a variety of mites, caterpillars, beetles, rootworms and maggots.

In one embodiment, the rice pest invertebrate is a biting/chewing insect.
In one embodiment, the rice pest invertebrate is a piercing/sucking insect.
In one embodiment, the rice pest invertebrate is a rasping insect.
In one embodiment, the rice pest invertebrate is a siphoning insect.
In one embodiment, the rice pest invertebrate is a sponging insect.

In one embodiment, the rice pest invertebrate is selected from brown planthopper (*Nilaparvata lugens),* small brown planthopper (*Laodelphax striatellus),* white-backed planthopper (*Sogatella furcifera),* rice stem borer / striped stem borer (*Chilo suppressalis),* yellow rice borer (*Tryporyza (=Scirpophaga) incertulas),* rice leafroller / leaf folder (*Cnaphalocrocis medinalis),* water weevil (*Lissorhopterus oryzophilus).*

In one embodiment, the rice pest invertebreate is from the order Hemiptera or Lepidoptera.
In one embodiment, the rice pest invertebrate is from the order Hemiptera. In a further embodiment, the rice pest invertebrate is a hopper, preferably selected from brown planthopper

(*Nilaparvata lugens*), small brown planthopper (*Laodelphax striatellus*), white-backed planthopper (*Sogatella furcifera*), green leafhopper (*Nephotettix virescens*). In a further embodiment, the rice pest invertebrate is selected from brown planthopper (*Nilaparvata lugens*) and green leafhopper (*Nephotettix virescens*), preferably brown planthopper (*Nilaparvata lugens*).

In one embodiment, the rice pest invertebrate is the brown planthopper (*Nilaparvata lugens*).

In one embodiment, the rice pest invertebrate is the green leafhopper (*Nephotettix virescens*).

In a further embodiment, the rice pest invertebrate is a stink bug, preferably selected from rice stink bugs (*Nezara viridula, Pygomenida varipennis, Eysarcoris, Tibraca limbatriventris, Eysarcoris ventralis*) or small stink bug (*Oebalus poecilus, O. pugnax).*

In one embodiment, the rice pest invertebrate is from the order Lepidoptera. In a further embodiment, the rice pest invertebrate is a borer, preferably stem borer, preferably rice stem borer (*Chilo suppressalis*) or yellow rice borer (*Tryporyza (=Scirpophaga) incertulas*).

In a further embodiment, the rice pest invertebrate is the rice leafroller / leaf folder (*Cnaphalocrocis medinalis, Marasmia patnalis, M. exigua*).

In one embodiment, the rice pest invertebrate is from the order Coleoptera. In a further embodiment, the rice pest invertebrate is water weevil (*Lissorhopterus oryzophilus*). In a further embodiment, the rice pest invertebrate is rice weevil (*Oryzophagus oryzae*).

In one embodiment, the rice pest invertebrate is from the family of termites (order Isoptera).

Binary and higher mixtures

The mixtures of the present invention may be combined and applied in agriculture in mixture with further active ingredients, for example with other pesticides, in particular insecticides, nematicides, fungicides, herbicides, safeners, fertilizers such as ammonium nitrate, urea, potash, and superphosphate, phytotoxicants and plant growth regulators. Preferred mixing partners are insecticides, nematicides and fungicides.

These mixtures are also embraced by the term “mixture(s) of the present invention” or “mixture(s) according to the invention”.

These additional ingredients may be used sequentially or in combination with the mixtures of the invention, if appropriate also added only immediately prior to use (tank mix). For example, the plant(s) may be sprayed with a mixture of this invention either before or after being treated with other active ingredients.

In one embodiment, the invention relates to the mixtures of the present invention, which are binary mixtures of compounds I and II, i.e. wherein these active ingredients are the only actives. Preferred weight ratios for such binary mixtures are from 5000:1 to 1:5000, preferably from 1000:1 to 1:1000, more preferably from 100:1 to 1:100, particularly preferably from 10:1 to 1:10. In such binary mixtures, compounds I and II may be used in equal amounts, or an excess of component I, or an excess of component II may be used.

In one embodiment, the preferred weight ratio of benzpyrimoxan and oxazosulfyl is 100:1 to 1:1, 50:1 to 1:1, 40:1 to 1:1, 20:1 to to 1:1, 16:1 to 1:1 or 10:1 to 1:1. In another embodiment, the preferred weight ratio is 100:1 to 1:3, 50:1 to 1:3, 40:1 to 1:3, 20:1 to to 1:3, 16:1 to 1:3 or 10:1 to

1:3. In another embodiment, the preferred weight ratio is 100:1 to 3:1, 50:1 to 3:1, 40:1 to 3:1, 20:1 to to 3:1, 16:1 to 3:1 or 10:1 to 3:1.

The same mixture ratio preferences do also apply for compounds I and II, if the mixture is not a binary mixture, i.e. if it comprises more active compounds.

The present invention also relates to methods according to the invention, applying a mixture of a mixture according to the present invention, with at least one further mixing partner as defined herein after, provided that the additional mixture partner is not yet contained in the mixture of compound I and II. These mixtures are also considered mixtures of the present invention.

The following list M of pesticides, grouped and numbered according the Mode of Action Classification of the Insecticide Resistance Action Committee (IRAC), together with which the mixtures of the present invention can be used and with which potential synergistic effects might be produced, is intended to illustrate the possible combinations, but not to impose any limitation:

M.1 Acetylcholine esterase (AChE) inhibitors: M.1A carbamates, e.g. aldicarb, alanycarb, bendiocarb, benfuracarb, butocarboxim, butoxycarboxim, carbaryl, carbofuran, carbosulfan, ethiofencarb, fenobucarb, formetanate, furathiocarb, isoprocarb, methiocarb, methomyl, metolcarb, oxamyl, pirimicarb, propoxur, thiodicarb, thiofanox, trimethacarb, XMC, xylylcarb and triazamate; or M.1B organophosphates, e.g. acephate, azamethiphos, azinphos-ethyl, azinphosmethyl, cadusafos, chlorethoxyfos, chlorfenvinphos, chlormephos, chlorpyrifos, 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, parathion-methyl, phenthoate, phorate, phosalone, phosmet, phosphamidon, phoxim, pirimiphos- methyl, profenofos, propetamphos, prothiofos, pyraclofos, pyridaphenthion, quinalphos, sulfotep, tebupirimfos, temephos, terbufos, tetrachlorvinphos, thiometon, triazophos, trichlorfon, and vamidothion;

M.2. GABA-gated chloride channel antagonists: M.2A cyclodiene organochlorine compounds, e.g. endosulfan or chlordane; or M.2B fiproles (phenylpyrazoles), e.g. ethiprole, fipronil, flufiprole, pyrafluprole, and pyriprole;

M.3 Sodium channel modulators from the class of M.3A pyrethroids, e.g. acrinathrin, allethrin, d-cis-trans allethrin, d-trans allethrin, bifenthrin, kappa-bifenthrin, bioallethrin, bioallethrin S-cylclopentenyl, bioresmethrin, cycloprothrin, cyfluthrin, beta-cyfluthrin, cyhalothrin, lambda-cyhalothrin, gamma-cyhalothrin, cypermethrin, alpha-cypermethrin, beta-cypermethrin, theta-cypermethrin, zeta-cypermethrin, cyphenothrin, deltamethrin, empenthrin, esfenvalerate, etofenprox, fenpropathrin, fenvalerate, flucythrinate, flumethrin, tau-fluvalinate, halfenprox, heptafluthrin, imiprothrin, meperfluthrin,metofluthrin, momfluorothrin, epsilon-momfluorothrin, permethrin, phenothrin, prallethrin, profluthrin, pyrethrin (pyrethrum), resmethrin, silafluofen, tefluthrin, kappa-tefluthrin, tetramethylfluthrin, tetramethrin, tralomethrin, and transfluthrin; or M.3B sodium channel modulators such as DDT or methoxychlor;

M.4 Nicotinic acetylcholine receptor agonists (nAChR): M.4A neonicotinoids, e.g. acetamiprid, clothianidin, cycloxaprid, dinotefuran, imidacloprid, nitenpyram, thiacloprid and thiamethoxam; or the compounds M.4A.1 4,5-Dihydro-N-nitro-1-(2-oxiranylmethyl)-1H-imidazol-2-amine,

M.4A.2: (2E-)-1-[(6-Chloropyridin-3-yl)methyl]-N'-nitro-2-pentylidenehydrazinecarboximidamide; or M4.A.3: 1-[(6-Chloropyridin-3-yl)methyl]-7-methyl-8-nitro-5-propoxy-1,2,3,5,6,7-hexahydroimidazo[1,2-a]pyridine; or M.4B nicotine; M.4C sulfoxaflor; M.4D flupyradifurone; M.4E triflumezopyrim, M.4E.1a) (3R)-3-(2-chlorothiazol-5-yl)-8-methyl-5-oxo-6-phenyl-2,3-dihydrothiazolo[3,2-a]pyrimidin-8-ium-7-olate, M.4E.1b) (3S)-3-(6-chloro-3-pyridyl)-8-methyl-5-oxo-6-phenyl-2,3-dihydrothiazolo[3,2-a]pyrimidin-8-ium-7-olate, M.4E.1c) (3S)-8-methyl-5-oxo-6-phenyl-3-pyrimidin-5-yl-2,3-dihydrothiazolo[3,2-a]pyrimidin-8-ium-7-olate, M.4E.1d) (3R)-3-(2-chlorothiazol-5-yl)-8-methyl-5-oxo-6-[3-(trifluoromethyl)phenyl]-2,3-dihydrothiazolo[3,2-a]pyrimidin-8-ium-7-olate; M.4E.1e) (3R)-3-(2-chlorothiazol-5-yl)-6-(3,5-dichlorophenyl)-8-methyl-5-oxo-2,3-dihydrothiazolo[3,2-a]pyrimidin-8-ium-7-olate, M.4E.1f) (3R)-3-(2-chlorothiazol-5-yl)-8-ethyl-5-oxo-6-phenyl-2,3-dihydrothiazolo[3,2-a]pyrimidin-8-ium-7-olate;

M.5 Nicotinic acetylcholine receptor allosteric activators:spinosyns, e.g. spinosad or spinetoram;

M.6 Chloride channel activators from the class of avermectins and milbemycins, e.g. abamectin, emamectin benzoate, ivermectin, lepimectin, or milbemectin;

M.7 Juvenile hormone mimics, such as M.7A juvenile hormone analogues hydroprene, kinoprene, and methoprene; or M.7B fenoxycarb, or M.7C pyriproxyfen;

M.8 miscellaneous non-specific (multi-site) inhibitors, e.g. M.8A alkyl halides as methyl bromide and other alkyl halides, M.8B chloropicrin, M.8C sulfuryl fluoride, M.8D borax, or M.8E tartar emetic;

M.9 Chordotonal organ TRPV channel modulators, e.g. M.9B pymetrozine; pyrifluquinazon;

M.10 Mite growth inhibitors, e.g. M.10A clofentezine, hexythiazox, and diflovidazin, or M.10B etoxazole;

M.11 Microbial disruptors of insect midgut membranes, e.g. *bacillus thuringiensis* or *bacillus sphaericus* and the insecticdal proteins they produce such as *bacillus thuringiensis subsp. israelensis*, *bacillus sphaericus*, *bacillus thuringiensis subsp. aizawai*, *bacillus thuringiensis subsp. kurstaki* and *bacillus thuringiensis subsp. tenebrionis*, or the Bt crop proteins: Cry1Ab, Cry1Ac, Cry1Fa, Cry2Ab, mCry3A, Cry3Ab, Cry3Bb, and Cry34/35Ab1;

M.12 Inhibitors of mitochondrial ATP synthase, e.g. M.12A diafenthiuron, or M.12B organotin miticides such as azocyclotin, cyhexatin, or fenbutatin oxide, M.12C propargite, or M.12D tetradifon;

M.13 Uncouplers of oxidative phosphorylation via disruption of the proton gradient, e.g. chlorfenapyr, DNOC, or sulfluramid;

M.14 Nicotinic acetylcholine receptor (nAChR) channel blockers, e.g. nereistoxin analogues bensultap, cartap hydrochloride, thiocyclam, or thiosultap sodium;

M.15 Inhibitors of the chitin biosynthesis type 0, such as benzoylureas e.g. bistrifluron, chlorfluazuron, diflubenzuron, flucycloxuron, flufenoxuron, hexaflumuron, lufenuron, novaluron, noviflumuron, teflubenzuron, or triflumuron;

M.16 Inhibitors of the chitin biosynthesis type 1, e.g. buprofezin;

M.17 Moulting disruptors, Dipteran, e.g. cyromazine;

M.18 Ecdyson receptor agonists such as diacylhydrazines, e.g. methoxyfenozide, tebufenozide, halofenozide, fufenozide, or chromafenozide;

M.19 Octopamin receptor agonists, e.g. amitraz;

M.20 Mitochondrial complex III electron transport inhibitors, e.g. M.20A hydramethylnon, M.20B acequinocyl, M.20C fluacrypyrim; or M.20D bifenazate;

M.21 Mitochondrial complex I electron transport inhibitors, e.g. M.21A METI acaricides and insecticides such as fenazaquin, fenpyroximate, pyrimidifen, pyridaben, tebufenpyrad or tolfenpyrad, or M.21B rotenone;

M.22 Voltage-dependent sodium channel blockers, e.g. M.22A indoxacarb, M.22B metaflumizone, or M.22B.1: 2-[2-(4-Cyanophenyl)-1-[3-(trifluoromethyl)phenyl]ethylidene]-N-[4-(difluoromethoxy)phenyl]-hydrazinecarboxamide or M.22B.2: N-(3-Chloro-2-methylphenyl)-2-[(4-chlorophenyl)[4-[methyl(methylsulfonyl)amino]phenyl]methylene]-hydrazinecarboxamide;

M.23 Inhibitors of the of acetyl CoA carboxylase, such as Tetronic and Tetramic acid derivatives, e.g. spirodiclofen, spiromesifen, or spirotetramat; M.23.1 spiropidion;

M.24 Mitochondrial complex IV electron transport inhibitors, e.g. M.24A phosphine such as aluminium phosphide, calcium phosphide, phosphine or zinc phosphide, or M.24B cyanide;

M.25 Mitochondrial complex II electron transport inhibitors, such as beta-ketonitrile derivatives, e.g. cyenopyrafen or cyflumetofen;

M.28 Ryanodine receptor-modulators from the class of diamides, e.g. flubendiamide, chlorantraniliprole, cyantraniliprole, tetraniliprole, M.28.1: (R)-3-Chlor-N1-{2-methyl-4-[1,2,2,2 –tetrafluoro-1-(trifluoromethyl)ethyl]phenyl}-N2-(1-methyl-2-methylsulfonylethyl)phthalamid, M.28.2: (S)-3-Chloro-N1-{2-methyl-4-[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]phenyl}-N2-(1-methyl-2-methylsulfonylethyl)phthalamid, M.28.3: cyclaniliprole, or M.28.4: methyl-2-[3,5-dibromo-2-({[3-bromo-1-(3-chlorpyridin-2-yl)-1H-pyrazol-5-yl]carbonyl}amino)benzoyl]-1,2-dimethylhydrazinecarboxylate; M.28.5i) 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; M.28.5j) 3-Chloro-1-(3-chloro-2-pyridinyl)-N-[2,4-dichloro-6-[[(1-cyano-1-methylethyl)amino]carbonyl]phenyl]-1H-pyrazole-5-carboxamide; M.28.5k) tetrachlorantraniliprole; M.28.5l) N-[4-Chloro-2-[[(1,1-dimethylethyl)amino]carbonyl]-6-methylphenyl]-1-(3-chloro-2-pyridinyl)-3-(fluoromethoxy)-1H-pyrazole-5-carboxamide; or M.28.6: cyhalodiamide; or

M.29: Chordotonal organ Modulators – undefined target site, e.g. flonicamid;

M.UN. insecticidal active compounds of unknown or uncertain mode of action, e.g. afidopyropen, afoxolaner, azadirachtin, amidoflumet, benzoximate, broflanilide, bromopropylate, chinomethionat, cryolite, dicloromezotiaz, dicofol, flufenerim, flometoquin, fluensulfone, fluhexafon, fluopyram, fluralaner, metaldehyde, metoxadiazone, piperonyl butoxide, pyflubumide, pyridalyl, tioxazafen, M.UN.3: 11-(4-chloro-2,6-dimethylphenyl)-12-hydroxy-1,4-dioxa-9-aza-dispiro[4.2.4.2]-tetradec-11-en-10-one,

M.UN.4: 3-(4'-fluoro-2,4-dimethylbiphenyl-3-yl)-4-hydroxy-8-oxa-1-azaspiro[4.5]dec-3-en-2-one, M.UN.5: 1-[2-fluoro-4-methyl-5-[(2,2,2-trifluoroethyl)sulfinyl]phenyl]-3-(trifluoromethyl)-1H-1,2,4-triazole-5-amine, or actives on basis of *bacillus firmus* (Votivo, I-1582);

M.UN.6: flupyrimin;

M.UN.8: fluazaindolizine; M.UN.9.a): 4-[5-(3,5-dichlorophenyl)-5-(trifluoromethyl)-4H-isoxazol-3-yl]-2-methyl-N-(1-oxothietan-3-yl)benzamide; M.UN.9.b): fluxametamide; M.UN.10: 5-[3-[2,6-dichloro-4-(3,3-dichloroallyloxy)phenoxy]propoxy]-1H-pyrazole;

M.UN.11.i) 4-cyano-N-[2-cyano-5-[[2,6-dibromo-4-[1,2,2,3,3,3-hexafluoro-1-(trifluoromethyl)propyl]phenyl]carbamoyl]phenyl]-2-methyl-benzamide; M.UN.11.j) 4-cyano-3-[(4-cyano-2-methyl-

benzoyl)amino]-N-[2,6-dichloro-4-[1,2,2,3,3,3-hexafluoro-1-(trifluoromethyl)propyl]phenyl]-2-fluoro-benzamide; M.UN.11.k) N-[5-[[2-chloro-6-cyano-4-[1,2,2,3,3,3-hexafluoro-1-(trifluoromethyl)propyl]phenyl]carbamoyl]-2-cyano-phenyl]-4-cyano-2-methyl-benzamide; M.UN.11.l) N-[5-[[2-bromo-6-chloro-4-[2,2,2-trifluoro-1-hydroxy-1-(trifluoromethyl)ethyl]phenyl]carbamoyl]-2-cyano-phenyl]-4-cyano-2-methyl-benzamide; M.UN.11.m) N-[5-[[2-bromo-6-chloro-4-[1,2,2,3,3,3-hexafluoro-1-(trifluoromethyl)propyl]phenyl]carbamoyl]-2-cyano-phenyl]-4-cyano-2-methyl-benzamide; M.UN.11.n) 4-cyano-N-[2-cyano-5-[[2,6-dichloro-4-[1,2,2,3,3,3-hexafluoro-1-(trifluoromethyl)propyl]phenyl]carbamoyl]phenyl]-2-methyl-benzamide; M.UN.11.o) 4-cyano-N-[2-cyano-5-[[2,6-dichloro-4-[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]phenyl]carbamoyl]phenyl]-2-methyl-benzamide; M.UN.11.p) N-[5-[[2-bromo-6-chloro-4-[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]phenyl]carbamoyl]-2-cyano-phenyl]-4-cyano-2-methyl-benzamide; or

M.UN.12.a) 2-(1,3-Dioxan-2-yl)-6-[2-(3-pyridinyl)-5-thiazolyl]-pyridine; M.UN.12.b) 2-[6-[2-(5-Fluoro-3-pyridinyl)-5-thiazolyl]-2-pyridinyl]-pyrimidine; M.UN.12.c) 2-[6-[2-(3-Pyridinyl)-5-thiazolyl]-2-pyridinyl]-pyrimidine; M.UN.12.d) N-Methylsulfonyl-6-[2-(3-pyridyl)thiazol-5-yl]pyridine-2-carboxamide; M.UN.12.e) N-Methylsulfonyl-6-[2-(3-pyridyl)thiazol-5-yl]pyridine-2-carboxamide;

M.UN.14a) 1-[(6-Chloro-3-pyridinyl)methyl]-1,2,3,5,6,7-hexahydro-5-methoxy-7-methyl-8-nitro-imidazo[1,2-a]pyridine; or M.UN.14b) 1-[(6-Chloropyridin-3-yl)methyl]-7-methyl-8-nitro-1,2,3,5,6,7-hexahydroimidazo[1,2-a]pyridin-5-ol;

M.UN.16a) 1-isopropyl-N,5-dimethyl-N-pyridazin-4-yl-pyrazole-4-carboxamide; or M.UN.16b) 1-(1,2-dimethylpropyl)-N-ethyl-5-methyl-N-pyridazin-4-yl-pyrazole-4-carboxamide; M.UN.16c) N,5-dimethyl-N-pyridazin-4-yl-1-(2,2,2-trifluoro-1-methyl-ethyl)pyrazole-4-carboxamide; M.UN.16d) 1-[1-(1-cyanocyclopropyl)ethyl]-N-ethyl-5-methyl-N-pyridazin-4-yl-pyrazole-4-carboxamide; M.UN.16e) N-ethyl-1-(2-fluoro-1-methyl-propyl)-5-methyl-N-pyridazin-4-yl-pyrazole-4-carboxamide; M.UN.16f) 1-(1,2-dimethylpropyl)-N,5-dimethyl-N-pyridazin-4-yl-pyrazole-4-carboxamide; M.UN.16g) 1-[1-(1-cyanocyclopropyl)ethyl]-N,5-dimethyl-N-pyridazin-4-yl-pyrazole-4-carboxamide; M.UN.16h) N-methyl-1-(2-fluoro-1-methyl-propyl]-5-methyl-N-pyridazin-4-yl-pyrazole-4-carboxamide; M.UN.16i) 1-(4,4-difluorocyclohexyl)-N-ethyl-5-methyl-N-pyridazin-4-yl-pyrazole-4-carboxamide; or M.UN.16j) 1-(4,4-difluorocyclohexyl)-N,5-dimethyl-N-pyridazin-4-yl-pyrazole-4-carboxamide,

M.UN.17a) N-(1-methylethyl)-2-(3-pyridinyl)-2H-indazole-4-carboxamide; M.UN.17b) N-cyclopropyl-2-(3-pyridinyl)-2H-indazole-4-carboxamide; M.UN.17c) N-cyclohexyl-2-(3-pyridinyl)-2H-indazole-4-carboxamide; M.UN.17d) 2-(3-pyridinyl)-N-(2,2,2-trifluoroethyl)-2H-indazole-4-carboxamide; M.UN.17e) 2-(3-pyridinyl)-N-[(tetrahydro-2-furanyl)methyl]-2H-indazole-5-carboxamide; M.UN.17f) methyl 2-[[2-(3-pyridinyl)-2H-indazol-5-yl]carbonyl]hydrazinecarboxylate; M.UN.17g) N-[(2,2-difluorocyclopropyl)methyl]-2-(3-pyridinyl)-2H-indazole-5-carboxamide; M.UN.17h) N-(2,2-difluoropropyl)-2-(3-pyridinyl)-2H-indazole-5-carboxamide; M.UN.17i) 2-(3-pyridinyl)-N-(2-pyrimidinylmethyl)-2H-indazole-5-carboxamide; M.UN.17j) N-[(5-methyl-2-pyrazinyl)methyl]-2-(3-pyridinyl)-2H-indazole-5-carboxamide,

M.UN.18. tyclopyrazoflor;

M.UN.19 sarolaner, M.UN.20 lotilaner;

M.UN.21 N-[4-Chloro-3-[[(phenylmethyl)amino]carbonyl]phenyl]-1-methyl-3-(1,1,2,2,2-pentafluoroethyl)-4-(trifluoromethyl)-1H-pyrazole-5-carboxamide; M.UN.22a 2-(3-ethylsulfonyl-2-pyridyl)-

3-methyl-6-(trifluoromethyl)imidazo[4,5-b]pyridine, or M.UN.22b 2-[3-ethylsulfonyl-5-(trifluoromethyl)-2-pyridyl]-3-methyl-6-(trifluoromethyl)imidazo[4,5-b]pyridine;
M.UN.23 Isocycloseram;
M.UN.24a) N-[4-chloro-3-(cyclopropylcarbamoyl)phenyl]-2-methyl-5-(1,1,2,2,2-pentafluoroethyl)-4-(trifluoromethyl)pyrazole-3-carboxamide or M.UN.24b) N-[4-chloro-3-[(1-cyanocyclopropyl)carbamoyl]phenyl]-2-methyl-5-(1,1,2,2,2-pentafluoroethyl)-4-(trifluoromethyl)pyrazole-3-carboxamide; M.UN.25 acynonapyr; M.UN.26 benzpyrimoxan; M.UN.27 tigolaner; M.UN.28 Oxazosulfyl;
M.UN.29a) [(2S,3R,4R,5S,6S)-3,5-dimethoxy-6-methyl-4-propoxy-tetrahydropyran-2-yl] N-[4-[1-[4-(trifluoromethoxy)phenyl]-1,2,4-triazol-3-yl]phenyl]carbamate; M.UN.29b) [(2S,3R,4R,5S,6S)-3,4,5-trimethoxy-6-methyl-tetrahydropyran-2-yl] N-[4-[1-[4-(trifluoromethoxy)phenyl]-1,2,4-triazol-3-yl]phenyl]carbamate; M.UN.29c) [(2S,3R,4R,5S,6S)-3,5-dimethoxy-6-methyl-4-propoxy-tetrahydropyran-2-yl] N-[4-[1-[4-(1,1,2,2,2-pentafluoroethoxy)phenyl]-1,2,4-triazol-3-yl]phenyl]carbamate; M.UN.29d) [(2S,3R,4R,5S,6S)-3,4,5-trimethoxy-6-methyl-tetrahydropyran-2-yl] N-[4-[1-[4-(1,1,2,2,2-pentafluoroethoxy)phenyl]-1,2,4-triazol-3-yl]phenyl]carbamate; M.UN.29.e) (2Z)-3-(2-isopropylphenyl)-2-[(E)-[4-[1-[4-(trifluoromethoxy)phenyl]-1,2,4-triazol-3-yl]phenyl]methylenehydrazono]thiazolidin-4-one or M.UN.29f) (2Z)-3-(2-isopropylphenyl)-2-[(E)-[4-[1-[4-(1,1,2,2,2-pentafluoroethoxy)phenyl]-1,2,4-triazol-3-yl]phenyl]methylenehydrazono]thiazolidin-4-one;
M.UN.30a) 2-(6-chloro-3-ethylsulfonyl-imidazo[1,2-a]pyridin-2-yl)-3-methyl-6-(trifluoromethyl)imidazo[4,5-b]pyridine, M.UN.30b) 2-(6-bromo-3-ethylsulfonyl-imidazo[1,2-a]pyridin-2-yl)-3-methyl-6-(trifluoromethyl)imidazo[4,5-b]pyridine, M.UN.30c) 2-(3-ethylsulfonyl-6-iodo-imidazo[1,2-a]pyridin-2-yl)-3-methyl-6-(trifluoromethyl)imidazo[4,5-b]pyridine, M.UN.30d) 2-[3-ethylsulfonyl-6-(trifluoromethyl)imidazo[1,2-a]pyridin-2-yl]-3-methyl-6-(trifluoromethyl)imidazo[4,5-b]pyridine, M.UN.30e) 2-(7-chloro-3-ethylsulfonyl-imidazo[1,2-a]pyridin-2-yl)-3-methyl-6-(trifluoromethyl)imidazo[4,5-b]pyridine, M.UN.30f) 2-(3-ethylsulfonyl-7-iodo-imidazo[1,2-a]pyridin-2-yl)-3-methyl-6-(trifluoromethyl)imidazo[4,5-b]pyridine, M.UN.30g) 3-ethylsulfonyl-6-iodo-2-[3-methyl-6-(trifluoromethyl)imidazo[4,5-b]pyridin-2-yl]imidazo[1,2-a]pyridine-8-carbonitrile, M.UN.30h) 2-[3-ethylsulfonyl-8-fluoro-6-(trifluoromethyl)imidazo[1,2-a]pyridin-2-yl]-3-methyl-6-(trifluoromethyl)imidazo[4,5-b]pyridine, M.UN.30i) 2-[3-ethylsulfonyl-7-(trifluoromethyl)imidazo[1,2-a]pyridin-2-yl]-3-methyl-6-(trifluoromethylsulfinyl)imidazo[4,5-b]pyridine, M.UN.30j) 2-[3-ethylsulfonyl-7-(trifluoromethyl)imidazo[1,2-a]pyridin-2-yl]-3-methyl-6-(trifluoromethyl)imidazo[4,5-c]pyridine, M.UN.30k) 2-(6-bromo-3-ethylsulfonyl-imidazo[1,2-a]pyridin-2-yl)-6-(trifluoromethyl)pyrazolo[4,3-c]pyridine.

The commercially available compounds of the group M listed above may be found in The Pesticide Manual, 17th Edition, C. MacBean, British Crop Protection Council (2015) among other publications. The online Pesticide Manual is updated regularly and is accessible through http://bcpcdata.com/pesticide-manual.html.
Another online data base for pesticides providing the ISO common names is http://www.alanwood.net/pesticides.
The M.4 cycloxaprid is known from WO2010/069266 and WO2011/069456. M.4A.1 is known from CN 103814937; CN105367557, CN 105481839. M.4A.2, guadipyr, is known from WO 2013/003977, and M.4A.3 (approved as paichongding in China) is known from WO

2007/101369. M.4E.1a) to M.4E.1f) are known from WO2018177970. M.22B.1 is described in CN10171577 and M.22B.2 in CN102126994. Spiropidion M.23.1 is known from WO 2014/191271. M.28.1 and M.28.2 are known from WO2007/101540. M.28.3 is described in WO2005/077934. M.28.4 is described in WO2007/043677. M.28.5a) to M.28.5d) and M.28.5h) are described in WO 2007/006670, WO2013/024009 and WO 2013/024010, M.28.5i) is described in WO2011/085575, M.28.5j) in WO2008/134969, M.28.5k) in US2011/046186 and M.28.5l) in WO2012/034403. M.28.6 can be found in WO2012/034472. M.UN.3 is known from WO2006/089633 and M.UN.4 from WO2008/067911. M.UN.5 is described in WO2006/043635, and biological control agents on the basis of *bacillus firmus* are described in WO2009/124707. Flupyrimin is described in WO2012/029672. M.UN.8 is known from WO2013/055584. M.UN.9.a) is described in WO2013/050317. M.UN.9.b) is described in WO2014/126208. M.UN.10 is known from WO2010/060379. Broflanilide and M.UN.11.b) to M.UN.11.h) are described in WO2010/018714, and M.UN.11i) to M.UN.11.p) in WO 2010/127926. M.UN.12.a) to M.UN.12.c) are known from WO2010/006713, M.UN.12.d) and M.UN.12.e) are known from WO2012/000896. M.UN.14a) and M.UN.14b) are known from WO2007/101369. M.UN.16.a) to M.UN.16h) are described in WO2010/034737, WO2012/084670, and WO2012/143317, resp., and M.UN.16i) and M.UN.16j) are described in WO2015/055497. M.UN.17a) to M.UN.17.j) are described in WO2015/038503. M.UN.18 Tycloprazoflor is described in US2014/0213448. M.UN.19 is described in WO2014/036056. M.UN.20 is known from WO2014/090918. M.UN.21 is known from EP2910126. M.UN.22a and M.UN.22b are known from WO2015/059039 and WO2015/190316. M.UN.23a and M.UN.23b are known from WO2013/050302. M.UN.24a) and M.UN.24b) are known from WO2012/126766. Acynonapyr M.UN.25 is known from WO 2011/105506. Benzpyrimoxan M.UN.26 is known from WO2016/104516. M.UN.27 is known from WO2016/174049. M.UN.28 Oxazosulfyl is known from WO2017/104592. M.UN.29a) to M.UN.29f) are known from WO2009/102736 or WO2013116053. M.UN.30 is known from WO2013/050302. M.UN.30a) to M.UN.30k) are known from WO2018/052136.

The following list of fungicides, in conjunction with which the mixtures of the present invention can be used, is intended to illustrate the possible combinations in the methods according to the invention but does not limit them:

A) Respiration inhibitors

- Inhibitors of complex III at Q_o site: azoxystrobin (A.1.1), coumethoxystrobin (A.1.2), coumoxystrobin (A.1.3), dimoxystrobin (A.1.4), enestroburin (A.1.5), fenaminstrobin (A.1.6), fenoxystrobin/flufenoxystrobin (A.1.7), fluoxastrobin (A.1.8), kresoxim-methyl (A.1.9), mandestrobin (A.1.10), metominostrobin (A.1.11), orysastrobin (A.1.12), picoxystrobin (A.1.13), pyraclostrobin (A.1.14), pyrametostrobin (A.1.15), pyraoxystrobin (A.1.16), trifloxystrobin (A.1.17), 2-(2-(3-(2,6-dichlorophenyl)-1-methyl-allylideneaminooxymethyl)-phenyl)-2-methoxyimino-*N*-methyl-acetamide (A.1.18), pyribencarb (A.1.19), triclopyricarb/chlorodincarb (A.1.20), famoxadone (A.1.21), fenamidone (A.1.21), methyl-*N*-[2-[(1,4-dimethyl-5-phenyl-pyrazol-3-yl)oxylmethyl]phenyl]-*N*-methoxy-carbamate (A.1.22), metyltetrapole (A.1.25), (*Z*,2*E*)-5-[1-(2,4-dichlorophenyl)pyrazol-3-yl]-oxy-2-methoxyimino-*N*,3-dimethyl-pent-3-enamide (A.1.34), (*Z*,2*E*)-5-[1-(4-chlorophenyl)pyrazol-3-yl]oxy-2-methoxyimino-*N*,3-dimethyl-

pent-3-enamide (A.1.35), pyriminostrobin (A.1.36), bifujunzhi (A.1.37), 2-(ortho-((2,5-dimethylphenyl-oxymethylen)phenyl)-3-methoxy-acrylic acid methylester (A.1.38);

- inhibitors of complex III at Q_i site: cyazofamid (A.2.1), amisulbrom (A.2.2), [(6*S*,7*R*,8*R*)-8-benzyl-3-[(3-hydroxy-4-methoxy-pyridine-2-carbonyl)amino]-6-methyl-4,9-dioxo-1,5-dioxonan-7-yl] 2-methylpropanoate (A.2.3), fenpicoxamid (A.2.4), florylpicoxamid (A.2.5);
- inhibitors of complex II: benodanil (A.3.1), benzovindiflupyr (A.3.2), bixafen (A.3.3), boscalid (A.3.4), carboxin (A.3.5), fenfuram (A.3.6), fluopyram (A.3.7), flutolanil (A.3.8), fluxapyroxad (A.3.9), furametpyr (A.3.10), isofetamid (A.3.11), isopyrazam (A.3.12), mepronil (A.3.13), oxycarboxin (A.3.14), penflufen (A.3.15), penthiopyrad (A.3.16), pydiflumetofen (A.3.17), pyraziflumid (A.3.18), sedaxane (A.3.19), tecloftalam (A.3.20), thifluzamide (A.3.21), inpyrfluxam (A.3.22), pyrapropoyne (A.3.23), fluindapyr (A.3.28), N-[2-[2-chloro-4-(trifluoromethyl)phenoxy]phenyl]-3-(difluoromethyl)-5-fluoro-1-methyl-pyrazole-4-carboxamide (A.3.29), methyl (*E*)-2-[2-[(5-cyano-2-methyl-phenoxy)methyl]phenyl]-3-methoxy-prop-2-enoate (A.3.30), isoflucypram (A.3.31), 2-(difluoromethyl)-*N*-(1,1,3-trimethyl-indan-4-yl)pyridine-3-carboxamide (A.3.32), 2-(difluoromethyl)-*N*-[(3*R*)-1,1,3-trimethylindan-4-yl]pyridine-3-carboxamide (A.3.33), 2-(difluoromethyl)-*N*-(3-ethyl-1,1-dimethyl-indan-4-yl)pyridine-3-carboxamide (A.3.34), 2-(difluoromethyl)-*N*-[(3*R*)-3-ethyl-1,1-dimethyl-indan-4-yl]pyridine-3-carboxamide (A.3.35), 2-(difluoromethyl)-*N*-(1,1-dimethyl-3-propyl-indan-4-yl)pyridine-3-carboxamide (A.3.36), 2-(difluoromethyl)-*N*-[(3*R*)-1,1-dimethyl-3-propyl-indan-4-yl]pyridine-3-carboxamide (A.3.37), 2-(difluoromethyl)-*N*-(3-isobutyl-1,1-dimethyl-indan-4-yl)pyridine-3-carboxamide (A.3.38), 2-(difluoromethyl)-*N*-[(3*R*)-3-isobutyl-1,1-dimethyl-indan-4-yl]pyridine-3-carboxamide (A.3.39);
- other respiration inhibitors: diflumetorim (A.4.1); nitrophenyl derivates: binapacryl (A.4.2), dinobuton (A.4.3), dinocap (A.4.4), fluazinam (A.4.5), meptyldinocap (A.4.6), ferimzone (A.4.7); organometal compounds: fentin salts, e. g. fentin-acetate (A.4.8), fentin chloride (A.4.9) or fentin hydroxide (A.4.10); ametoctradin (A.4.11); silthiofam (A.4.12);

B) Sterol biosynthesis inhibitors (SBI fungicides)

- C14 demethylase inhibitors: triazoles: azaconazole (B.1.1), bitertanol (B.1.2), bromuconazole (B.1.3), cyproconazole (B.1.4), difenoconazole (B.1.5), diniconazole (B.1.6), diniconazole-M (B.1.7), epoxiconazole (B.1.8), fenbuconazole (B.1.9), fluquinconazole (B.1.10), flusilazole (B.1.11), flutriafol (B.1.12), hexaconazole (B.1.13), imibenconazole (B.1.14), ipconazole (B.1.15), metconazole (B.1.17), myclobutanil (B.1.18), oxpoconazole (B.1.19), paclobutrazole (B.1.20), penconazole (B.1.21), propiconazole (B.1.22), prothioconazole (B.1.23), simeconazole (B.1.24), tebuconazole (B.1.25), tetraconazole (B.1.26), triadimefon (B.1.27), triadimenol (B.1.28), triticonazole (B.1.29), uniconazole (B.1.30), 2-(2,4-difluorophenyl)-1,1-difluoro-3-(tetrazol-1-yl)-1-[5-[4-(2,2,2-trifluoroethoxy)phenyl]-2-pyridyl]propan-2-ol (B.1.31), 2-(2,4-difluorophenyl)-1,1-difluoro-3-(tetrazol-1-yl)-1-[5-[4-(trifluoromethoxy)phenyl]-2-pyridyl]propan-2-ol (B.1.32), 4-[[6-[2-(2,4-difluorophenyl)-1,1-difluoro-2-hydroxy-3-(5-sulfanyl-1,2,4-triazol-1-yl)propyl]-3-pyridyl]oxy]benzonitrile (B.1.33), ipfentrifluconazole (B.1.37), mefentrifluconazole (B.1.38), 2-(chloromethyl)-2-methyl-5-(p-tolylmethyl)-1-(1,2,4-triazol-1-ylmethyl)cyclopentanol (B.1.43); imidazoles: imazalil (B.1.44), pefurazoate (B.1.45), prochloraz (B.1.46), triflumizol (B.1.47); pyrimidines, pyridines, piperazines: fenarimol (B.1.49),

pyrifenox (B.1.50), triforine (B.1.51), [3-(4-chloro-2-fluoro-phenyl)-5-(2,4-difluorophenyl)isoxazol-4-yl]-(3-pyridyl)methanol (B.1.52);

- Delta14-reductase inhibitors: aldimorph (B.2.1), dodemorph (B.2.2), dodemorph-acetate (B.2.3), fenpropimorph (B.2.4), tridemorph (B.2.5), fenpropidin (B.2.6), piperalin (B.2.7), spiroxamine (B.2.8);
- Inhibitors of 3-keto reductase: fenhexamid (B.3.1);
- Other Sterol biosynthesis inhibitors: chlorphenomizole (B.4.1);

C) Nucleic acid synthesis inhibitors

- phenylamides or acyl amino acid fungicides: benalaxyl (C.1.1), benalaxyl-M (C.1.2), kiralaxyl (C.1.3), metalaxyl (C.1.4), metalaxyl-M (C.1.5), ofurace (C.1.6), oxadixyl (C.1.7);
- other nucleic acid synthesis inhibitors: hymexazole (C.2.1), octhilinone (C.2.2), oxolinic acid (C.2.3), bupirimate (C.2.4), 5-fluorocytosine (C.2.5), 5-fluoro-2-(p-tolylmethoxy)pyrimidin-4-amine (C.2.6), 5-fluoro-2-(4-fluorophenylmethoxy)pyrimidin-4-amine (C.2.7), 5-fluoro-2-(4-chlorophenylmethoxy)pyrimidin-4 amine (C.2.8);

D) Inhibitors of cell division and cytoskeleton

- tubulin inhibitors: benomyl (D.1.1), carbendazim (D.1.2), fuberidazole (D1.3), thiabendazole (D.1.4), thiophanate-methyl (D.1.5), pyridachlometyl (D.1.6), *N*-ethyl-2-[(3-ethynyl-8-methyl-6-quinolyl)oxy]butanamide (D.1.8), *N*-ethyl-2-[(3-ethynyl-8-methyl-6-quinolyl)oxy]-2-methylsulfanyl-acetamide (D.1.9), 2-[(3-ethynyl-8-methyl-6-quinolyl)oxy]-*N*-(2-fluoroethyl)butanamide (D.1.10), 2-[(3-ethynyl-8-methyl-6-quinolyl)oxy]-*N*-(2-fluoroethyl)-2-methoxy-acetamide (D.1.11), 2-[(3-ethynyl-8-methyl-6-quinolyl)oxy]-*N*-propyl-butanamide (D.1.12), 2-[(3-ethynyl-8-methyl-6-quinolyl)oxy]-2-methoxy-*N*-propyl-acetamide (D.1.13), 2-[(3-ethynyl-8-methyl-6-quinolyl)oxy]-2-methylsulfanyl-*N*-propyl-acetamide (D.1.14), 2-[(3-ethynyl-8-methyl-6-quinolyl)oxy]-*N*-(2-fluoroethyl)-2-methylsulfanyl-acetamide (D.1.15), 4-(2-bromo-4-fluoro-phenyl)-*N*-(2-chloro-6-fluoro-phenyl)-2,5-dimethyl-pyrazol-3-amine (D.1.16);
- other cell division inhibitors: diethofencarb (D.2.1), ethaboxam (D.2.2), pencycuron (D.2.3), fluopicolide (D.2.4), zoxamide (D.2.5), metrafenone (D.2.6), pyriofenone (D.2.7), phenamacril (D.2.8);

E) Inhibitors of amino acid and protein synthesis

- methionine synthesis inhibitors: cyprodinil (E.1.1), mepanipyrim (E.1.2), pyrimethanil (E.1.3);
- protein synthesis inhibitors: blasticidin-S (E.2.1), kasugamycin (E.2.2), kasugamycin hydrochloride-hydrate (E.2.3), mildiomycin (E.2.4), streptomycin (E.2.5), oxytetracyclin (E.2.6);

F) Signal transduction inhibitors

- MAP / histidine kinase inhibitors: fluoroimid (F.1.1), iprodione (F.1.2), procymidone (F.1.3), vinclozolin (F.1.4), fludioxonil (F.1.5);
- G protein inhibitors: quinoxyfen (F.2.1);

G) Lipid and membrane synthesis inhibitors

- Phospholipid biosynthesis inhibitors: edifenphos (G.1.1), iprobenfos (G.1.2), pyrazophos (G.1.3), isoprothiolane (G.1.4);
- lipid peroxidation: dicloran (G.2.1), quintozene (G.2.2), tecnazene (G.2.3), tolclofos-methyl (G.2.4), biphenyl (G.2.5), chloroneb (G.2.6), etridiazole (G.2.7), zinc thiazole (G.2.8);
- phospholipid biosynthesis and cell wall deposition: dimethomorph (G.3.1), flumorph (G.3.2), mandipropamid (G.3.3), pyrimorph (G.3.4), benthiavalicarb (G.3.5), iprovalicarb (G.3.6),

valifenalate (G.3.7);

- compounds affecting cell membrane permeability and fatty acides: propamocarb (G.4.1);
- inhibitors of oxysterol binding protein: oxathiapiprolin (G.5.1), fluoxapiprolin (G.5.3), 4-[1-[2-[3-(difluoromethyl)-5-methyl-pyrazol-1-yl]acetyl]-4-piperidyl]-*N*-tetralin-1-yl-pyridine-2-carboxamide (G.5.4), 4-[1-[2-[3,5-bis(difluoromethyl)pyrazol-1-yl]acetyl]-4-piperidyl]-*N*-tetralin-1-yl-pyridine-2-carboxamide (G.5.5), 4-[1-[2-[3-(difluoromethyl)-5-(trifluoromethyl)pyrazol-1-yl]acetyl]-4-piperidyl]-*N*-tetralin-1-yl-pyridine-2-carboxamide (G.5.6), 4-[1-[2-[5-cyclopropyl-3-(difluoromethyl)pyrazol-1-yl]acetyl]-4-piperidyl]-*N*-tetralin-1-yl-pyridine-2-carboxamide (G.5.7), 4-[1-[2-[5-methyl-3-(trifluoromethyl)pyrazol-1-yl]acetyl]-4-piperidyl]-*N*-tetralin-1-yl-pyridine-2-carboxamide (G.5.8), 4-[1-[2-[5-(difluoromethyl)-3-(trifluoromethyl)pyrazol-1-yl]acetyl]-4-piperidyl]-*N*-tetralin-1-yl-pyridine-2-carboxamide (G.5.9), 4-[1-[2-[3,5-bis(trifluoromethyl)pyrazol-1-yl]acetyl]-4-piperidyl]-*N*-tetralin-1-yl-pyridine-2-carboxamide (G.5.10), (4-[1-[2-[5-cyclopropyl-3-(trifluoromethyl)pyrazol-1-yl]acetyl]-4-piperidyl]-*N*-tetralin-1-yl-pyridine-2-carboxamide (G.5.11);

H) Inhibitors with Multi Site Action

- inorganic active substances: Bordeaux mixture (H.1.1), copper (H.1.2), copper acetate (H.1.3), copper hydroxide (H.1.4), copper oxychloride (H.1.5), basic copper sulfate (H.1.6), sulfur (H.1.7);
- thio- and dithiocarbamates: ferbam (H.2.1), mancozeb (H.2.2), maneb (H.2.3), metam (H.2.4), metiram (H.2.5), propineb (H.2.6), thiram (H.2.7), zineb (H.2.8), ziram (H.2.9);
- organochlorine compounds: anilazine (H.3.1), chlorothalonil (H.3.2), captafol (H.3.3), captan (H.3.4), folpet (H.3.5), dichlofluanid (H.3.6), dichlorophen (H.3.7), hexachlorobenzene (H.3.8), pentachlorphenole (H.3.9) and its salts, phthalide (H.3.10), tolylfluanid (H.3.11);
- guanidines and others: guanidine (H.4.1), dodine (H.4.2), dodine free base (H.4.3), guazatine (H.4.4), guazatine-acetate (H.4.5), iminoctadine (H.4.6), iminoctadine-triacetate (H.4.7), iminoctadine-tris(albesilate) (H.4.8), dithianon (H.4.9), 2,6-dimethyl-1*H*,5*H*-[1,4]dithiino[2,3-c:5,6-c']dipyrrole-1,3,5,7(2*H*,6*H*)-tetraone (H.4.10);

I) Cell wall synthesis inhibitors

- inhibitors of glucan synthesis: validamycin (I.1.1), polyoxin B (I.1.2);
- melanin synthesis inhibitors: pyroquilon (I.2.1), tricyclazole (I.2.2), carpropamid (I.2.3), dicyclomet (I.2.4), fenoxanil (I.2.5);

J) Plant defence inducers

- acibenzolar-S-methyl (J.1.1), probenazole (J.1.2), isotianil (J.1.3), tiadinil (J.1.4), prohexadione-calcium (J.1.5); phosphonates: fosetyl (J.1.6), fosetyl-aluminum (J.1.7), phosphorous acid and its salts (J.1.8), calcium phosphonate (J.1.11), potassium phosphonate (J.1.12), potassium or sodium bicarbonate (J.1.9), 4-cyclopropyl-*N*-(2,4-dimethoxyphenyl)thiadiazole-5-carboxamide (J.1.10);

K) Unknown mode of action

- bronopol (K.1.1), chinomethionat (K.1.2), cyflufenamid (K.1.3), cymoxanil (K.1.4), dazomet (K.1.5), debacarb (K.1.6), diclocymet (K.1.7), diclomezine (K.1.8), difenzoquat (K.1.9), difenzoquat-methylsulfate (K.1.10), diphenylamin (K.1.11), fenitropan (K.1.12), fenpyrazamine (K.1.13), flumetover (K.1.14), flusulfamide (K.1.15), flutianil (K.1.16), harpin (K.1.17), methasulfocarb (K.1.18), nitrapyrin (K.1.19), nitrothal-isopropyl (K.1.20), tolprocarb (K.1.21), oxin-

copper (K.1.22), proquinazid (K.1.23), tebufloquin (K.1.24), tecloftalam (K.1.25), triazoxide (K.1.26), *N*'-(4-(4-chloro-3-trifluoromethyl-phenoxy)-2,5-dimethyl-phenyl)-*N*-ethyl-*N*-methyl formamidine (K.1.27), *N*'-(4-(4-fluoro-3-trifluoromethyl-phenoxy)-2,5-dimethyl-phenyl)-*N*-ethyl-*N*-methyl formamidine (K.1.28), *N*'-[4-[[3-[(4-chlorophenyl)methyl]-1,2,4-thiadiazol-5-yl]-oxy]-2,5-dimethyl-phenyl]-*N*-ethyl-*N*-methyl-formamidine (K.1.29), *N*'-(5-bromo-6-indan-2-yloxy-2-methyl-3-pyridyl)-*N*-ethyl-*N*-methyl-formamidine (K.1.30), *N*'-[5-bromo-6-[1-(3,5-difluorophenyl)ethoxy]-2-methyl-3-pyridyl]-*N*-ethyl-*N*-methyl-formamidine (K.1.31), *N*'-[5-bromo-6-(4-isopropylcyclohexoxy)-2-methyl-3-pyridyl]-*N*-ethyl-*N*-methyl-formamidine (K.1.32), *N*'-[5-bromo-2-methyl-6-(1-phenylethoxy)-3-pyridyl]-*N*-ethyl-*N*-methyl-formamidine (K.1.33), *N*'-(2-methyl-5-trifluoromethyl-4-(3-trimethylsilanyl-propoxy)-phenyl)-*N*-ethyl-*N*-methyl formamidine (K.1.34), *N*'-(5-difluoromethyl-2-methyl-4-(3-trimethylsilanyl-propoxy)-phenyl)-*N*-ethyl-*N*-methyl formamidine (K.1.35), 2-(4-chloro-phenyl)-*N*-[4-(3,4-dimethoxy-phenyl)-isoxazol-5-yl]-2-prop-2-ynyloxy-acetamide (K.1.36), 3-[5-(4-chloro-phenyl)-2,3-dimethyl-isoxazolidin-3-yl]-pyridine (pyrisoxazole) (K.1.37), 3-[5-(4-methylphenyl)-2,3-dimethyl-isoxazolidin-3 yl]-pyridine (K.1.38), 5-chloro-1-(4,6-dimethoxy-pyrimidin-2-yl)-2-methyl-1*H*-benzoimidazole (K.1.39), ethyl (*Z*)-3-amino-2-cyano-3-phenyl-prop-2-enoate (K.1.40), picarbutrazox (K.1.41), pentyl *N*-[6-[[(*Z*)-[(1-methyltetrazol-5-yl)-phenyl-methylene]amino]oxymethyl]-2-pyridyl]carbamate (K.1.42), but-3-ynyl *N*-[6-[[(*Z*)-[(1-methyltetrazol-5-yl)-phenyl-methylene]amino]oxymethyl]-2-pyridyl]carbamate (K.1.43), ipflufenoquin (K.1.44), quinofumelin (K.1.47), benziothiazolinone (K.1.48), bromothalonil (K.1.49), 2-(6-benzyl-2-pyridyl)quinazoline (K.1.50), 2-[6-(3-fluoro-4-methoxy-phenyl)-5-methyl-2-pyridyl]quinazoline (K.1.51), dichlobentiazox (K.1.52), *N*'-(2,5-dimethyl-4-phenoxy-phenyl)-*N*-ethyl-*N*-methyl-formamidine (K.1.53), pyrifenamine (K.1.54), fluopimomide (K.1.55), *N*-[5-bromo-2-methyl-6-(1-methyl-2-propoxy-ethoxy)-3-pyridyl]-N-ethyl-N-methyl-formamidine (K.1.56).

The fungicides described by common names, their preparation and their activity e.g. against harmful fungi is known (cf.: http://www.alanwood.net/pesticides/); these substances are commercially available.The compounds described by IUPAC nomenclature, their preparation and their pesticidal activity are also known (cf. Can. J. Plant Sci. 48(6), 587-94, 1968; EP-A 141 317; EP-A 152 031; EP-A 226 917; EP-A 243 970; EP-A 256 503; EP-A 428 941; EP-A 532 022; EP-A 1 028 125; EP-A 1 035 122; EP-A 1 201 648; EP-A 1 122 244, JP 2002316902; DE 19650197; DE 10021412; DE 102005009458; US 3,296,272; US 3,325,503; WO 98/46608; WO 99/14187; WO 99/24413; WO 99/27783; WO 00/29404; WO 00/46148; WO 00/65913; WO 01/54501; WO 01/56358; WO 02/22583; WO 02/40431; WO 03/10149; WO 03/11853; WO 03/14103; WO 03/16286; WO 03/53145; WO 03/61388; WO 03/66609; WO 03/74491; WO 04/49804; WO 04/83193; WO 05/120234; WO 05/123689; WO 05/123690; WO 05/63721; WO 05/87772; WO 05/87773; WO 06/15866; WO 06/87325; WO 06/87343; WO 07/82098; WO 07/90624, WO 10/139271, WO 11/028657, WO 12/168188, WO 07/006670, WO 11/77514; WO 13/047749, WO 10/069882, WO 13/047441, WO 03/16303, WO 09/90181, WO 13/007767, WO 13/010862, WO 13/127704, WO 13/024009, WO 13/24010, WO 13/047441, WO 13/162072, WO 13/092224, WO 11/135833, CN 1907024, CN 1456054, CN 103387541, CN 1309897, WO 12/84812, CN 1907024, WO 09094442, WO 14/60177, WO 13/116251, WO 08/013622, WO 15/65922, WO 94/01546, EP 2865265, WO 07/129454,

WO 12/165511, WO 11/081174, WO 13/47441, WO 16/156241, WO 16/162265). Some compounds are identified by their CAS Registry Number which is separated by hyphens into three parts, the first consisting from two up to seven digits, the second consisting of two digits, and the third consisting of a single digit.

If the mixtures of the present invention are mixed with one or more fungicides, the mixtures are also suitable for combating or controlling plant diseases, as caused by phytophathogenic fungi. Examples of phytophathogenic fungi in rice are
Alternaria species on rice, *Bipolaris* (e.g. *Bipolaris oryzae*), and *Drechslera* species on rice, *Cercospora oryzae*, *Cochliobolus miyabeanus*, *Curvularia lunata, Sarocladium oryzae*, *S attenuatum*, *Entyloma oryzae*, *Fusarium* spp such as *Fusarium semitectum* (and/or *moniliforme Gibberella fujikuroi (bakanae)*, *Grainstaining* complex (various pathogens), and/or *Pythium* ssp. *Helminthosporium*. spp, for example *Helminthosporium oryzae, Microdochium oryzae, Pyricularia grisea* (syn. *Pyricularia oryzae), Rhizoctonia* species, for example *Rhizoctonia solani* (syn in rice *Pellicularia sasakii*), *Corticium sasakii* and *Ustilaginoidea virens.*

Formulations

The invention also relates to methods, wherein the compounds of the mixtures according to the invention are provided or applied in agrochemical compositions comprising an auxiliary and a mixture according to the invention. The compounds may be present together in one formulation (for simultaneous use) or in two separate formulations (either for mixing immediately before the simultaneous application, or for separate application).

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

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

Examples for suitable auxiliaries are solvents, liquid carriers, solid carriers or fillers, surfac-tants, dispersants, emulsifiers, wetters, adjuvants, solubilizers, penetration enhancers, protec-tive colloids, adhesion agents, thickeners, humectants, repellents, attractants, feeding stimu-lants, compatibilizers, bactericides, anti-freezing agents, anti-foaming agents, colorants, tackifi-ers and binders.

Suitable solvents and liquid carriers are water and organic solvents, such as mineral oil fractions of medium to high boiling point, e.g. kerosene, diesel oil; oils of vegetable or animal origin; aliphatic, cyclic and aromatic hydrocarbons, e. g. toluene, paraffin, tetrahydronaphthalene, alkylated naphthalenes; alcohols, e.g. ethanol, propanol, butanol, benzylalcohol, cyclo¬hexanol; glycols; DMSO; ketones, e.g. cyclohexanone; esters, e.g. lactates, carbonates, fatty acid esters, gamma-butyrolactone; fatty acids; phosphonates; amines; amides, e.g. N-methylpyrrolidone, fatty acid dimethylamides; and mixtures thereof.

Suitable solid carriers or fillers are mineral earths, e.g. silicates, silica gels, talc, kaolins, limestone, lime, chalk, clays, dolomite, diatomaceous earth, bentonite, calcium sulfate, magnesium sulfate, magnesium oxide; polysaccharide powders, e.g. cellulose, starch; fertilizers, e.g. ammonium sulfate, ammonium phosphate, ammonium nitrate, ureas; products of vegetable origin, e.g. cereal meal, tree bark meal, wood meal, nutshell meal, and mixtures thereof.

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

Suitable anionic surfactants are alkali, alkaline earth or ammonium salts of sulfonates, sul-fates, phosphates, carboxylates, and mixtures thereof. Examples of sulfonates are alkylaryl-sulfonates, diphenylsulfonates, alpha-olefin sulfonates, lignine sulfonates, sulfonates of fatty acids and oils, sulfonates of ethoxylated alkylphenols, sulfonates of alkoxylated arylphenols, sulfonates of condensed naphthalenes, sulfonates of dodecyl- and tridecylbenzenes, sulfonates of naphthalenes and alkyl¬naphthalenes, sulfosuccinates or sulfosuccinamates. Examples of sulfates are sulfates of fatty acids and oils, of ethoxylated alkylphenols, of alcohols, of ethoxylated alcohols, or of fatty acid esters. Examples of phosphates are phosphate esters. Examples of carboxylates are alkyl carboxylates, and carboxylated alcohol or alkylphenol ethoxylates.

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

Suitable cationic surfactants are quaternary surfactants, for example quaternary ammonium compounds with one or two hydrophobic groups, or salts of long-chain primary amines. Suitable amphoteric surfactants are alkylbetains and imidazolines. Suitable block polymers are block polymers of the A-B or A-B-A type comprising blocks of polyethylene oxide and polypropylene

oxide, or of the A-B-C type comprising alkanol, polyethylene oxide and polypropylene oxide. Suitable polyelectrolytes are polyacids or polybases. Examples of polyacids are alkali salts of polyacrylic acid or polyacid comb polymers. Examples of polybases are polyvinylamines or polyethyleneamines.

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

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

Suitable bactericides are bronopol and isothiazolinone derivatives such as alkylisothiazoli-nones and benzisothiazolinones.

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

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

Suitable colorants (e.g. in red, blue, or green) are pigments of low water solubility and water-soluble dyes. Examples are inorganic colorants (e.g. iron oxide, titan oxide, iron hexacyanofer-rate) and organic colorants (e.g. alizarin-, azo- and phthalocyanine colorants).

Suitable tackifiers or binders are polyvinylpyrrolidons, polyvinylacetates, polyvinyl alcohols, polyacrylates, biological or synthetic waxes, and cellulose ethers.

Examples for composition types and their preparation are:

i) Water-soluble concentrates (SL, LS)

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

ii) Dispersible concentrates (DC)

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

iii) Emulsifiable concentrates (EC)

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

iv) Emulsions (EW, EO, ES)

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

v) Suspensions (SC, OD, FS)

In an agitated ball mill, 20-60 wt% of a compound I or II or a mixture according to the invention are comminuted with addition of 2-10 wt% dispersants and wetting agents (e.g. sodium

lignosulfonate and alcohol ethoxylate), 0,1-2 wt% thickener (e.g. xanthan gum) and up to 100 wt% water to give a fine active substance suspension. Dilution with water gives a stable suspension of the active sub-stance. For FS type composition up to 40 wt% binder (e.g. polyvinylalcohol) is added.

vi) Water-dispersible granules and water-soluble granules (WG, SG)

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

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

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

viii) Gel (GW, GF)

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

ix) Microemulsion (ME) or nano-emulsion

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

x) Microcapsules (CS)

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

xi) Dustable powders (DP, DS)

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

xii) Granules (GR, FG)

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

xiii) Ultra-low volume liquids (UL)

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

The compositions types i) to xiii) may optionally comprise further auxiliaries, such as 0.1-1 wt% bactericides, 5-15 wt% anti-freezing agents, 0.1-1 wt% anti-foaming agents, and 0.1-1 wt% colorants.

The agrochemical compositions generally comprise between 0.01 and 95%, preferably between 0.1 and 90%, and most preferably between 0.5 and 75%, by weight of active sub-stance. The active substances are employed in a purity of from 90% to 100%, preferably from 95% to 100% (according to NMR spectrum).

Various types of oils, wetters, adjuvants, fertilizer, or micronutrients, and other pesticides (e.g. herbicides, insecticides, fungicides, growth regulators, safeners) may be added to the active substances or the compositions com¬prising them as premix or, if appropriate not until immediately prior to use (tank mix). These agents can be admixed with the compositions according to the invention in a weight ratio of 1:100 to 100:1, preferably 1:10 to 10:1.

In one embodiment, a suspoconcentration (SC) is preferred for the application in crop protection. In one sub-embodiment thereof, the SC agrochemical composition comprises between 50 to 500 g/L (grams per Litre), or between 100 and 250 g/L, or 100 g/L or 150g/L or 200g/L or 250 g/L.

In a further embodiment, the granules according to formulation type xii are used for the application in rice according to the present invention.

In a further embodiment, the dispersible concentrates DC according to formulation type ii are used for the application in rice according to the present invention.

In a further embodiment, the emulsifiable concentrates EC according to formulation type iii are used for the application in rice according to the present invention. ix. ME).

In a further embodiment, the microemulsions ME according to formulation type ix are used for the application in rice according to the present invention.

In a further embodiment, nano-emulsions are used for the application in rice according to the present invention.

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

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

In a further embodiment, either individual components of the composition according to the invention or partially premixed components, e. g. components comprising compounds or mixtures of the present invention and/or further mixing partners as defined above, may be mixed by the user in a spray tank and further auxiliaries and additives may be added, if appropriate.

In a further embodiment, either individual components of the composition according to the invention or partially premixed components, e. g. components comprising compounds or mixtures of the present invention and/or further mixing partners as defined above, can be applied jointly (e.g. after tank mix) or consecutively.

Application methods

The invention also relates to methods, wherein the mixtures according to the invention are suitable for use in protecting crops and their plant propagation materials such as seed, especially rice, rice plants, rice plant propagation materials, such as seeds, or soil or water, in which the plants or rice plants are growing, from attack or infestation by pests or rice pests, especially rice pest invertebrates. Therefore, the present invention also relates to a plant protection methods, which comprises contacting the crops or plant propagation material, rice, rice plants, rice plant propagation materials, such as seeds, or soil or water, in which the plants are growing, to be protected from attack or infestation by rice pests, especially rice pest invertebrates, with a pesticidally effective amount of a mixture according to the invention.

The present invention also relates to a method of combating or controlling pests, especially rice pests, especially rice pest invertebrates, which comprises contacting the pests, especially rice pests, especially rice pest invertebrates, their habitat, breeding ground, or food supply, or the crops and their plant propagation materials such as seed, especially rice, rice plants, rice plant propagation materials, such as seeds, or soil or water, or the area, material or environment in which the pests or rice pests, especially rice pest invertebrates, are growing or may grow, with a pesticidally effective amount of a compound of the present invention.

The mixtures of the present invention are effective through both contact and ingestion. Furthermore, the mixtures of the present invention can be applied to any and all developmental stages, such as egg, larva, pupa, and adult.

The mixtures of the present invention can be applied as such or in form of compositions comprising them as defined above. Furthermore, the mixtures of the present invention can be applied together with a further mixing partner as defined above or in form of compositions comprising said mixtures as defined above. The components of said mixture can be applied simultaneously, jointly or separately, or in succession, that is immediately one after another and thereby creating the mixture “in situ” on the desired location, e.g. the plant, the sequence, in the case of separate application, generally not having any effect on the result of the control measures.

The application can be carried out both before and after the infestation of the crops and their plant propagation materials such as seed, especially rice, rice plants, rice plant propagation materials, such as seeds, soil, or the area, material or environment by the pests.

Suitable application methods include inter alia soil treatment, seed treatment, in furrow application, water inlet application and foliar application. Soil treatment methods include drenching the soil, dipping roots, or soil injection. Seed treatment techniques include seed

dressing, seed coating, seed dusting, seed soaking, and seed pelleting. In furrow applications typically include the steps of making a furrow in cultivated land, seeding the furrow with seeds, applying the pesticidally active compound to the furrow, and closing the furrow. Foliar application refers to the application of the pesticidally active compound to plant foliage, e.g. through spray equipment. For foliar applications, it can be advantageous to modify the behavior of the pests by use of pheromones in combination with the mixtures of the present invention. Suitable pheromones for specific crops and pests are known to a skilled person and publicly available from databases of pheromones and semiochemicals, such as http://www.pherobase.com.

In the context of rice cultivation and rice crops, the following application types are of special relevance:

- "Granular application" involves manual or mechanical scattering or throwing of insecticide granules or mixtures of insecticides/fungicides and nematicides, directly into a field or nursery box, either on the surface of the soil or on standing water. The granular formulation may be mixed with a filler, carrier or fertilizer to allow for uniform distribution in the field.
- "Floating packet application" refers to the application of an insecticide or mixtures of insecticides/fungicides and nematicides in a water soluble sachet/packet by throwing into the paddy field in standing water.
- "Seedling box applications" refers to manual or mechanical incorporation of insecticide formulations (for eg. Granules, liquid) in nursery boxes or seedling boxes containing rice seedlings before being transplanted into the main field.
- "Seed treatment" involves the soaking/mixing of rice seeds in a solution of an insecticide or insecticide/nematicide/fungicide mixture. This application is carried out before sowing, either before or after seed germination.
- "Foliar application" refers to application of an insecticide or an insecticide/fungicide/nematicide/selective herbicides in water or oil as a spray application using various application equipment (eg. knapsack, power sprayer, boom sprayer, etc).
- "Soil application" refers to the application of an insecticide or a mixture of an insecticide/fungicide/nematicide/selective herbicide into the soil either as drench application, water inlet application or as a granular application.
- "Aerial application" refers to the application of a granular or liquid application of an insecticide or a mixture of an insecticide/fungicide/nematicide/selective herbicide to the field using aeroplanes, helicopters or drones.
- "Dust application" involves the directed application of an insecticide or a mixture of an insecticide/fungicide/nematicide/selective herbicide as a dust formulation using specialized applicators (eg. Power dusters) directly into the field.
- "Water inlet application" is the application of a liquid formulation of an insecticide or or a mixture of an insecticide/fungicide/nematicide/selective herbicide at the point where irrigation water is released into the paddy field.
- "Encircling application" is a type of application where a liquid or granular formulation of an insecticide or a mixture of an insecticide/fungicide/nematicide/selective herbicide is applied to standing water, in a clockwork or anti clockwork direction, to the inside borders of a paddy field.

Preferred applications are granular application, seedling box application and foliar application.
In one embodiment, the invention relates to methods, in which the pesticide is applied by granular application.
In one embodiment, the invention relates to methods, in which the pesticide is applied by seedling box application.
In one embodiment, the invention relates to methods, in which the pesticide is applied by foliar application.

As used herein, the term "contacting" includes both direct contact (applying the compounds/compositions directly on the animal pest or plant - typically to the foliage, stem or roots of the plant) and indirect contact (applying the compounds/compositions to the locus, i.e. habitat, breeding ground, plant, seed, soil, area, material or environment in which a pest is growing or may grow, of the animal pest or plant).
In the context of the present invention, the term “animal pest” includes arthropods, gastropods, and nematodes, which are pests, especially rice pests, especially rice pest invertebrates, especially rice pest insects as described above. Arthropods are preferably insects and arachnids, in particular insects. Insects, which are of particular relevance, are typically referred to as crop insect pests or rice pest insects.
The term "crop" refers to both, growing and harvested rice.
In the context of the present invention, the term “plant” means preferably rice plant (Oryza species, preferably Oryza sativa). Two species of rice are most frequently cultivated, Oryza sativa and Oryza glaberrima. Numerous subspecies of Oryza sativa are commercially important including Oryza sativa subsp. indica, Oryza sativa subsp. japonica, Oryza sativa subsp. javanica, Oryza sativa subsp. glutinosa (glutinous rice), Oryza sativa Aromatica group (e.g., basmati), and Oryza sativa (Floating rice group). The term “plant” is to be understood as including wild type plants and plants, which have been modified by either conventional breeding, or mutagenesis or genetic engineering, or by a combination thereof.
Plants, which have been modified by mutagenesis or genetic engineering, and are of particular commercial importance, include rice. In plants, which have been modified by mutagenesis or genetic engineering, one or more genes have been mutagenized or integrated into the genetic material of the plant. The one or more mutagenized or integrated genes are preferably selected from pat, epsps, cry1Ab, bar, cry1Fa2, cry1Ac, cry34Ab1, cry35AB1, cry3A, cryF, cry1F, mcry3a, cry2Ab2, cry3Bb1, cry1A.105, dfr, barnase, vip3Aa20, barstar, als, bxn, bp40, asn1, and ppo5. The mutagenesis or integration of the one or more genes is performed in order to improve certain properties of the plant. Such properties, also known as traits, include abiotic stress tolerance, altered growth/yield, disease resistance, herbicide tolerance, insect resistance, modified product quality, and pollination control. Of these properties, herbicide tolerance, e.g. imidazolinone tolerance, glyphosate tolerance, or glufosinate tolerance, is of particular importance.
It has surprisingly been found that the pesticidal activity of the mixtures of the present invention may be enhanced by the insecticidal trait of a modified plant. Furthermore, it has been found that the mixtures of the present invention are suitable for preventing insects to become resistant

to the insecticidal trait or for combating pests, which already have become resistant to the insecticidal trait of a modified plant. Moreover, the mixtures of the present invention are suitable for combating pests, against which the insecticidal trait is not effective, so that a complementary insecticidal activity can advantageously be used.

The term "plant propagation material" refers to all the generative parts of the plant such as seeds, sprouted seeds, seedlings and ratooning. Seedlings and young plants, which are to be transplanted after germination or after emergence from soil, may also be included. These plant propagation materials may be treated prophylactically with a plant protection compound either at or before planting or transplanting.

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

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

In the case of soil treatment, in furrow application or of application to the pests dwelling place or nest, the quantity of active ingredient ranges from 0.0001 to 500 g per 100 m^2, preferably from 0.001 to 20 g per 100 m^2.

For use in treating rice plants, e.g. by foliar application, the rate of application of the active ingredients of this invention may be in the range of 0.0001 g to 4000 g per hectare, e.g. from 1 g to 2 kg per hectare or from 1 g to 750 g per hectare, desirably from 1 g to 100 g per hectare, more desirably from 10 g to 50 g per hectare, e.g., 10 to 20 g per hectare, 20 to 30 g per hectare, 30 to 40 g per hectare, or 40 to 50 g per hectare.

The mixtures of the present invention are particularly suitable for use in the treatment of seeds in order to protect the seeds from insect pests, in particular from soil-living insect pests, and the resulting seedling’s roots and shoots against soil pests and foliar insects. The present invention therefore also relates to a method for the protection of seeds from insects, in particular from soil insects, and of the seedling's roots and shoots from insects, in particular from soil and foliar insects, said method comprising treating the seeds before sowing and/or after pregermination with a compound of the present invention. The protection of the seedling's roots and shoots is preferred. More preferred is the protection of seedling’s shoots from piercing and sucking insects, chewing insects and nematodes.

The term “seed treatment” comprises all suitable seed treatment techniques known in the art, such as seed dressing, seed coating, seed dusting, seed soaking, seed pelleting, and in-furrow application methods. Preferably, the seed treatment application of the active compound is carried out by spraying or by dusting the seeds before sowing of the plants and before emergence of the plants.

The present invention also comprises seeds coated with or containing the active compound. The term "coated with and/or containing" generally signifies that the active ingredient is for the most part on the surface of the propagation product at the time of application, although a greater or lesser part of the ingredient may penetrate into the propagation product, depending on the method of application. When the said propagation product is (re)planted, it may absorb the active ingredient.

In the context of the present invention, the seed is seed of rice. The active compounds of the invention may also be used for the treatment of seeds from plants, which have been modified by mutagenisis or genetic engineering, and which e.g. tolerate the action of herbicides or fungicides or insecticides. Such modified plants have been described in detail above.

Conventional seed treatment formulations include for example flowable concentrates FS, solutions LS, suspoemulsions (SE), powders for dry treatment DS, water dispersible powders for slurry treatment WS, water-soluble powders SS and emulsion ES and EC and gel formulation GF. These formulations can be applied to the seed diluted or undiluted. Application to the seeds is carried out before sowing, either directly on the seeds or after having pregerminated the latter. Preferably, the formulations are applied such that germination is not included.

The active substance concentrations in ready-to-use formulations, which may be obtained after two-to-tenfold dilution, are preferably from 0.01 to 60% by weight, more preferably from 0.1 to 40 % by weight.

In a preferred embodiment a FS formulation is used for seed treatment. Typically, a FS formulation may comprise 1-800 g/l of active ingredient, 1-200 g/l Surfactant, 0 to 200 g/l antifreezing agent, 0 to 400 g/l of binder, 0 to 200 g/l of a pigment and up to 1 liter of a solvent, preferably water.

Especially preferred FS formulations of the mixtures of the present invention for seed treatment usually comprise from 0.1 to 80% by weight (1 to 800 g/l) of the active ingredient, from 0.1 to 20 % by weight (1 to 200 g/l) of at least one surfactant, e.g. 0.05 to 5 % by weight of a wetter and from 0.5 to 15 % by weight of a dispersing agent, up to 20 % by weight, e.g. from 5 to 20 % of an anti-freeze agent, from 0 to 15 % by weight, e.g. 1 to 15 % by weight of a pigment and/or a dye, from 0 to 40 % by weight, e.g. 1 to 40 % by weight of a binder (sticker /adhesion agent), optionally up to 5 % by weight, e.g. from 0.1 to 5 % by weight of a thickener, optionally from 0.1 to 2 % of an anti-foam agent, and optionally a preservative such as a biocide, antioxidant or the like, e.g. in an amount from 0.01 to 1 % by weight and a filler/vehicle up to 100 % by weight.

In the treatment of seed, the application rates of the compounds of the invention are generally from 0.1 g to 10 kg per 100 kg of seed, preferably from 1 g to 5 kg per 100 kg of seed, more preferably from 1 g to 1000 g per 100 kg of seed and in particular from 1 g to 200 g per 100 kg of seed, e.g. from 1 g to 100 g or from 5 g to 100 g per 100 kg of seed.

The invention therefore also relates to seed comprising a compound of the present invention, or an agriculturally useful salt thereof, as defined herein. The amount of the compound of the present invention or the agriculturally useful salt thereof will in general vary from 0.1 g to 10 kg per 100 kg of seed, preferably from 1 g to 5 kg per 100 kg of seed, in particular from 1 g to 1000 g per 100 kg of seed.

In the present invention, the mixtures of the present invention may also be used for improving the health of a plant. Therefore, the present invention also relates to a method for improving plant health by treating a rice plant, rice plant propagation material and/or the locus where the rice plant is growing or is to grow with an effective and non-phytotoxic amount of a compound of the present invention.

As used herein “an effective and non-phytotoxic amount” means that the compound is used in a quantity which allows to obtain the desired effect but which does not give rise to any phytotoxic symptom on the treated plant or on the plant grown from the treated propagule or treated soil. The terms “plant” and “plant propagation material” are defined above.

"Plant health" is defined as a condition of the plant and/or its products which is determined by several aspects alone or in combination with each other such as yield (for example increased biomass and/or increased content of valuable ingredients), quality (for example improved content or composition of certain ingredients or shelf life), plant vigour (for example improved plant growth and/or greener leaves (“greening effect”), tolerance to abiotic (for example drought) and/or biotic stress (for example disease) and production efficiency (for example, harvesting efficiency, processability).

The above identified indicators for the health condition of a plant may be interdependent and may result from each other. Each indicator is defined in the art and can be determined by methods known to a skilled person.

Examples

The compounds benzpyrimoxan and oxazosulfyl are described in the Pesticide Manual and are either commercially available, or their synthesis is known.

Biological tests

Synergism can be described as an interaction where the combined effect of two or more compounds is greater than the sum of the individual effects of each of the compounds (zero-interaction). To quantify the degree of drug synergy, several models have been proposed, such as those based on the Highest single agent model (HAS, or Gaddum additivity) (Berenbaum, 1989), the Loewe additivity model (Loewe, 1953) and the Bliss independence model (Bliss, 1939).

In the present case, the two mixing partners are acting mutually non-exclusively active, i.e. the Bliss independence model seems to be most appropriate to describe the zero-interaction effect (Greco et al., 1992), where yBLISS is the expected effect based on the single effects of compound y1 and y2, respectively (1).

$$yBLISS = y1 + y2 - y1y2 \quad (1)$$

A reference model is used, particularly useful for the analysis of matrix data from plate-based high throughput experiments (Yadav et al., 2015). The model is named zero interaction potency (ZIP), which overcomes many of the limitations of the existing models and is based on independent dose-response curves for each of the two mixing partners. By combining the advantages of both the Loewe and Bliss models, the ZIP model assumes that two non-

interacting drugs are expected to incur minimal changes in their dose–response curves. In the ZIP model (Yadav et al., 2015, Formula 16) the zero-interaction situation (yZIP) is defined following formula (2), where X1 and X2 are the doses of compound 1 and 2, m1 and m2 are the doses that produces the midpoint effect also known as relative EC50 or IC50 of compound 1 and 2 and λ1 and λ2 (λ > 0) are the shape parameters indicating the sigmoid property or slope of the curves for compound 1 and 2.

$$IP = \frac{\left(\frac{x_1}{m_1}\right)^{\lambda_1}}{1+\left(\frac{x_1}{m_1}\right)^{\lambda_1}} + \frac{\left(\frac{x_2}{m_2}\right)^{\lambda_2}}{1+\left(\frac{x_2}{m_2}\right)^{\lambda_2}} - \frac{\left(\frac{x_1}{m_1}\right)^{\lambda_1}}{1+\left(\frac{x_1}{m_1}\right)^{\lambda_1}}\frac{\left(\frac{x_2}{m_2}\right)^{\lambda_2}}{1+\left(\frac{x_2}{m_2}\right)^{\lambda_2}} \qquad 2$$

An average delta score is calculated from the expectation of ZIP (δ) and observed values, for each dose combination in the matrix. This allows for a surface plot of delta scores, to visualize the interaction landscape for a drug combination, aiming to identify synergistic and antagonistic dose regions for further dose optimization in a validation screen. The delta score have a unit of percentage inhibition and are directly comparable within and between drug combinations. Finally, the average of all dose combination delta scores in the matrix can be calculated. The average score in percent, is called “ZIP synergy score” for the ZIP model or “Bliss synergy score” for the Bliss model.
An R-script called “syngergyfinder” based on the model above was published by He, L. et al. (2018). It can be also downloaded from Bioconductor.org: http://bioconductor.org/packages/release/bioc/html/synergyfinder.html

The following tests demonstrate the control efficacy of compounds, mixtures or compositions of this invention on specific pests. However, the pest control protection afforded by the compounds, mixtures or compositions is not limited to these species. In certain instances, combinations of a compound of this invention with other invertebrate pest control compounds or agents are found to exhibit synergistic effects against certain important invertebrate pests. The mixtures tested comprise the two components benzpyrimoxan and oxazosulfyl, which belong to two different modes of action (IRAC classes).

Test 1: Tobacco budworm (*Heliothis virescens*)
For evaluating control of tobacco budworm (*Heliothis virescens*) the test unit consisted of 96-well-microtiter plates containing an insect diet and 15-25 *H. virescens* eggs.
The compounds or mixtures were formulated using a solution containing 75% water and 25% DMSO. Different concentrations of formulated compounds or mixtures were sprayed onto the insect diet at 10µl, using a custom-built micro atomizer.
For experimental mixtures in these tests, identical volumes of both mixing partners at the desired concentrations respectively, were mixed together. Mixture applications were replicated 4 times into 4 separate microtiter plates.
After application, microtiter plates were incubated at 28 ± 1°C, 80 ± 5 % RH for 5 days. Both, egg and larval mortality was then visually assessed and given a score (0, 50, or 100% control effect).

Table 1.1 Observed mortalities (in %) in *H. virescens* after application of mixtures of Oxazosulfyl and Benzpyrimoxan at different rates

		Oxazosulfyl					
		0 ppm	4 ppm	10 ppm	25.2 ppm	63.6 ppm	160 ppm
Benzpyrimoxan	0 ppm	0.0	50.0	50.0	62.5	100.0	100.0
	63 ppm	0.0	50.0	56.3	68.8	75.0	100.0
	158 ppm	0.0	50.0	56.3	75.0	93.8	100.0
	397 ppm	0.0	50.0	56.3	81.3	93.8	100.0
	996 ppm	0.0	50.0	50.0	87.5	100.0	100.0
	2500 ppm	0.0	37.5	50.0	87.5	100.0	100.0

Table 1.2.a Expected mortalities (in %) in *H. virescens* after application of mixtures of Oxazosulfyl and Benzpyrimoxan at different rates, according to the Bliss model

		Oxazosulfyl					
		0 ppm	4 ppm	10 ppm	25.2 ppm	63.6 ppm	160 ppm
Benzpyrimoxan	0 ppm	0.0	50.0	50.0	62.5	100.0	100.0
	63 ppm	0.0	43.9	45.2	57.3	97.5	100.0
	158 ppm	0.0	43.9	45.2	56.9	100.8	100.0
	397 ppm	0.0	43.9	45.2	55.6	100.8	100.0
	996 ppm	0.0	43.9	43.9	53.3	100.0	100.0
	2500 ppm	0.0	38.6	43.9	53.3	100.0	100.0

Table 1.2.b Synergy scores (in %), resulting from mortalities in *H. virescens* after application of mixtures of Oxazosulfyl and Benzpyrimoxan at different rates, according to the Bliss model

		Oxazosulfyl					
		0 ppm	4 ppm	10 ppm	25.2 ppm	63.6 ppm	160 ppm
Benzpyrimoxan	0 ppm	0.0	0.0	0.0	0.0	0.0	0.0
	63 ppm	0.0	12.1	19.6	16.6	-30.0	0.0
	158 ppm	0.0	12.1	19.6	24.1	-7.5	0.0
	397 ppm	0.0	12.1	19.6	31.6	-7.5	0.0
	996 ppm	0.0	12.1	12.1	39.1	0.0	0.0
	2500 ppm	0.0	-2.9	12.1	39.1	0.0	0.0

Table 1.3.a Expected mortalities (in %) in *H. virescens* after application of mixtures of Oxazosulfyl and Benzpyrimoxan at different rates, according to the ZIP model

		Oxazosulfyl					
		0 ppm	4 ppm	10 ppm	25.2 ppm	63.6 ppm	160 ppm
Benzpyrimoxan	0 ppm	0.0	50.0	50.0	62.5	100.0	100.0
	63 ppm	0.0	41.9	56.1	72.1	78.7	94.9
	158 ppm	0.0	43.1	55.8	73.6	88.4	93.1
	397 ppm	0.0	43.9	55.5	76.5	83.2	93.1
	996 ppm	0.0	46.3	49.8	78.1	84.3	93.1
	2500 ppm	0.0	37.6	51.7	71.7	84.1	93.1

Table 1.3.b Synergy scores (in %), resulting from mortalities in *H. virescens* after application of mixtures of Oxazosulfyl and Benzpyrimoxan at different rates, according to the ZIP model

		Oxazosulfyl					
		0 ppm	4 ppm	10 ppm	25.2 ppm	63.6 ppm	160 ppm
Benzpyrimoxan	0 ppm	0.0	0.0	0.0	0.0	0.0	0.0
	63 ppm	0.0	16.1	0.3	-4.9	-5.0	5.1
	158 ppm	0.0	13.8	0.7	1.8	5.7	6.9
	397 ppm	0.0	12.2	1.4	5.9	11.2	6.9
	996 ppm	0.0	7.3	0.3	10.8	15.7	6.9
	2500 ppm	0.0	-0.2	-3.3	18.1	15.9	6.9

Test 2: Greenhouse Whitefly (*Trialeurodes vaporariorum*)

For evaluating control of Greenhouse Whitefly (*Trialeurodes vaporariorum*) the test unit consisted of 96-well-microtiter plates containing a leaf disk of egg plant leaf disk with white fly eggs. The compounds or mixtures were formulated using a solution containing 75% water and 25% DMSO. Different concentrations of formulated compounds or mixtures were sprayed onto the insect diet at 2.5µl, using a custom-built micro atomizer. For experimental mixtures in these tests, identical volumes of both mixing partners at the desired concentrations respectively, were mixed together. Mixture applications were replicated 4 times into 4 separate microtiter plates. For experimental mixtures in these tests, identical volumes of both mixing partners at the desired concentrations respectively, were mixed together.

After application, microtiter plates were incubated at 23 + 1°C, 65 + 5 % RH for 6 days. Mortality of hatched crawlers was then visually assessed and given a score (0, 50, or 100% control effect).

Table 2.1 Observed mortalities (in %) in *T. vaporariorum* after application of mixtures of Oxazosulfyl and Benzpyrimoxan at different rates

		Oxazosulfyl					
		0 ppm	4 ppm	10 ppm	25.2 ppm	63.6 ppm	160 ppm
Benzpyrimoxan	0 ppm	0.0	12.5	18.8	56.3	56.3	87.5
	63 ppm	0.0	0.0	25.0	68.8	81.3	87.5
	158 ppm	6.3	6.3	56.3	93.8	100.0	93.8
	397 ppm	0.0	0.0	75.0	93.8	75.0	87.5
	996 ppm	0.0	0.0	31.3	81.3	93.8	100.0
	2500 ppm	12.5	12.5	12.5	81.3	81.3	93.8

Table 2.2.a Expected mortalities (in %) in *T. vaporariorum* after application of mixtures of Oxazosulfyl and Benzpyrimoxan at different rates, according to the Bliss model

		Oxazosulfyl					
		0 ppm	4 ppm	10 ppm	25.2 ppm	63.6 ppm	160 ppm
Benzpyrimoxan	0 ppm	0.0	12.5	18.8	56.3	56.3	87.5
	63 ppm	0.0	0.0	22.1	57.7	57.5	86.8
	158 ppm	6.3	6.7	34.2	56.8	53.9	87.6
	397 ppm	0.0	0.0	26.4	53.9	58.0	86.8
	996 ppm	0.0	0.0	25.5	57.5	53.9	86.0
	2500 ppm	12.5	13.3	14.1	62.5	62.5	88.4

Table 2.2.b Synergy scores (in %) resulting from mortalities in *T. vaporariorum* after application of mixtures of Oxazosulfyl and Benzpyrimoxan at different rates, according to the Bliss model

		Oxazosulfyl					
		0 ppm	4 ppm	10 ppm	25.2 ppm	63.6 ppm	160 ppm
Benzpyrimoxan	0 ppm	0.0	0.0	0.0	0.0	0.0	0.0
	63 ppm	0.0	-7.7	11.8	16.0	29.3	0.8
	158 ppm	0.0	-7.2	39.2	39.4	46.1	6.5
	397 ppm	0.0	-7.7	64.8	42.5	22.6	0.8
	996 ppm	0.0	-7.7	18.4	29.3	42.5	14.0
	2500 ppm	0.0	-6.7	-12.9	23.1	23.1	5.7

Table 2.3.a Expected mortalities (in %) in *T. vaporariorum* after application of mixtures of Oxazosulfyl and Benzpyrimoxan at different rates, according to the ZIP model

		Oxazosulfyl					
		0 ppm	4 ppm	10 ppm	25.2 ppm	63.6 ppm	160 ppm
Benzpyrimoxan	0 ppm	0.0	12.5	18.8	56.3	56.3	87.5
	63 ppm	0.0	0.0	25.8	44.7	57.7	77.8
	158 ppm	6.3	6.5	46.9	45.8	71.1	82.9
	397 ppm	0.0	0.0	55.1	45.9	53.5	76.2
	996 ppm	0.0	0.0	31.4	47.2	67.4	84.2
	2500 ppm	12.5	12.9	13.2	49.0	59.7	77.6

Table 2.3.b Synergy scores (in %), resulting from mortalities in *T. vaporariorum* after application of mixtures of Oxazosulfyl and Benzpyrimoxan at different rates, according to the ZIP model

		Oxazosulfyl					
		0 ppm	4 ppm	10 ppm	25.2 ppm	63.6 ppm	160 ppm
Benzpyrimoxan	0 ppm	0.0	0.0	0.0	0.0	0.0	0.0
	63 ppm	0.0	-1.7	-3.3	35.0	29.0	11.1
	158 ppm	0.0	-4.1	16.5	51.1	28.9	11.6
	397 ppm	0.0	-4.4	26.5	51.0	28.7	13.0
	996 ppm	0.0	-0.9	-0.5	41.9	28.1	15.8
	2500 ppm	0.0	-3.3	-5.7	39.7	26.5	17.2

For *H. virescens* synergistic effects were observed adding between 40% mortality according to the Bliss model and 18% mortality according to the ZIP model control for certain dose combinations between oxazosulfyl and benzpyrimoxan (tables 1.2b and 1.3b).
For *T vaporartiorum* synergistic effects were observed adding between 65% mortality according to the Bliss model and 51% mortality according to the ZIP model control for certain dose combinations between Oxazosulfyl and Benzpyrimoxan (tables 2.2b and 2.3b).

References:

Berenbaum, M., C. (1989). What is synergy. Pharmacol Rev 41: 93-141

Loewe, S. (1953). The problem of synergism and antagonism of combined drugs. Arzneimittelforschung 3: 285-290

Bliss, C., I. (1939). The toxicity of poisons applied jointly. Ann Appl Biol 26: 585-615

Yadav, B.; Wennerberg, K.; Aittokallio, T.; Tang, J. (2015). Computational Searching for drug synergy in complex dose–response landscapes using an interaction potency model. Structural Biotechnology Journal 13: 504–513

Greco, W. ; Unkelbach, H. -D.; Pöch, G.; Sühnel, J.; Kundi, M.; Bödeker, W. (1992) Consensus on concepts and terminology for combined-action assessment: The Saariselkä agreement. Archives of Complex Environmental Studies. 4: 65-69

He, L.; Kulesskiy, E.; Saarela, J.; Turunen, L.; Wennerberg, K.; Aittokallio, T.; Tang, J. (2018). Methods for High-Throughput Drug Combination Screening and Synergy Scoring. In von Stechow, L.(ed.), Cancer Systems Biology: Methods and Protocols, chapter 17, 351-398. Springer New York.

Claims:

1. Agrochemical mixtures comprising benzpyrimoxan and oxazosulfyl.

2. Mixtures according to claim 1, wherein benzpyrimoxan and oxazosulfyl are the only active ingredients.

3. Mixtures according to any of claims 1 to 2, wherein the ratio of the mixture partners is between 1000:1 and 1:1000; preferably 100:1 to 1:100, 50:1 to 1:50, 20:1 to 1:20.

4. A pesticidal composition, comprising a liquid or solid carrier and a mixture as defined in any of claims 1 to 3.

5. A method for combating or controlling invertebrate pests, which method comprises contacting said pest or its food supply, habitat or breeding grounds with a pesticidally effective amount of a pesticidal mixture according to any one of claims 1 to 3.

6. A method for protecting growing plants or plant propagation materials from attack or infestation by invertebrate pests, which method comprises contacting a plant, a plant propagation material or soil or water in which the plant is growing, with a pesticidally effective amount of a pesticidal mixture according to any one of claims 1 to 3.

7. Plant propagation material comprising a pesticidal mixture according to any one of claims 1 to 3 in an amount of from 0.1 g to 10 kg per 100 kg of seed.

8. A method for protection of plant propagation material comprising contacting the plant propagation material with a pesticidal mixture according to any one of claims 1 to 3 in an amount of from 0.1 g to 10 kg per 100 kg of plant propagation material.

9. A method of controlling rice pest invertebrates in rice, which method comprises applying to said rice pest invertebrates a mixture according to any of claims 1 to 3.

10. Method according to claim 9, wherein the rice pest invertebrate is selected from the group of
Hemiptera:
brown planthopper – *Nilaparvata lugens*
small brown planthopper – *Laodelphax striatellus*
white-backed planthopper – *Sogatella furcifera*
white leafhopper – *Cofana spectra*
green leafhopper – *Nephotettix virescens, N. nigriceps, N. cincticeps, N. malayanus*
zig zag leafhopper – *Recilia dorsalis*
maize orange leafhopper – *Cicadulina bipunctata*
aster leafhopper - *Macrosteles fascifrons*

rice earhead bug, *Leptocorisa oratorius, L. acuta*
rice stink bugs – *Nezara viridula, Pygomenida varipennis, Eysarcoris, Tibraca limbativentris, Eysarcoris ventralis*
small stink bug - *Oebalus poecilus, O. pugnax*
coreid bug – *Eysarcoris* sp
chinch bug - *Blissus leucopterus leucopterus*
rice mealybug, *Brevennia rehi, Pseudococcus saccharicola*
rice aphids, *Rhopalosiphum rufiabdominalis, Macrosiphum avenae, Hysteroneura setariae, Tetraneuro nigriabdominalis*
bean root aphid - *Smynthurodes betae*

Lepidoptera:
rice skipper – *Parnara guttata, Melanitis leda ismene*
rice stem borer / striped stem borer – *Chilo suppressalis, Chilo polychrusus, Chilo partellus, Chilo plejadellus*
rice stalk borer – *Chilotraea polychrysa*
pink rice borer – *Sesamia inferens*
yellow rice borer – *Tryporyza (=Scirpophaga) incertulas*
white rice borer – *Tryporyza innotata*
rice leafroller / leaf folder – *Cnaphalocrocis medinalis, Marasmia patnalis, M. exigua*
rice ear-cutting caterpillar / armyworm– *Pseudaletia separate*
green caterpillar – *Xanthodes transversa*
green rice caterpillar – *Narnaga aenescens*
green horned caterpillars - *Melanitis leda ismene, Mycalesis sp*
fall army worm – *Spodoptera frugiperda*
cutworm – *Mythimna separata*
rice case worm- *Nymphula depunctalis*
black hairy caterpillar, *Amata sp.*
hairy caterpillar- *Mocis frugalis*
yellow caterpillar, *Psalis pennatula*
rice semi-brown looper, *Mocis frugalis*
rice semi-looper, *Chrysodeixis chalcites*
grass webworm - *Herpetogramma licarsisalis*
sugarcane borer - *Diatraea saccharalis*
corn stalk borer – *Elasmopalpus lignosellus*
striped grass looper – *Mocis latipes*
european corn borer – *Ostrinia nubilalis*
Mexican rice borer – *Eoreuma loftini*

Coleoptera:
water weevil – *Lissorhopterus oryzophilus*
rice plant weevil – *Echinocnemus squamous*
rice weevil - *Oryzophagus oryzae*

rice hispa – *Diclodispa armigera*
rice leaf beetle – *Oulema oryzae*
rice blackbug – *Scotinophora vermidulate, S. vermidulate, S. lurida, S. latiuscula*
rice flea beetle – *Chaetocnima basalis*
grubs - *Leucopholis irrorata, Leucopholis irrorata, Phyllophaga sp, Heteronychus sp*
scarab beetle (bicho torito) - *Diloboderus abderus*
billbugs - *Sphenophorus spp*
grape colaspis - *Colaspis brunnea, C. louisianae*
rice pollen beetle, *Chilolaba acuta*

Diptera:
stem maggot – *Chlorops oryzae*
leafminer – *Agromyza oryzae*
rice whorl maggot / rice stem maggot – *Hydrellia sasakii*
rice whorl maggot / small rice leafminer – *Hydrellia griseola*
rice gall midge – Orseolia (=*Pachydiplosis) oryzae*
rice shoot fly- *Atherigona oryzae*
rice seed midge – *Chironomus cavazzai, Chironomus spp, Cricotopus spp*

Thysanoptera:
rice thrips- *Chloethrips oryzae*, *Stenochaetothrips biformis, Perrisothrips sp., Hoplothrips sp.,*

Orthoptera:
rice grasshoppers, *Hieroglyphus banian, Hieroglyphus nigrorepletus, Catantops pinguis, Attractomorpha burri, A. crenulate, A. psittacina psittacina, A. Bedeli, Oxya adenttata, Oxya ebneri, Oxya hyla intricata, Acrida turricata*
locusts – *Locusta migratoria manilensis*
mole cricket, *Grylotalpa africana*
field cricket: *Gryllus bimaculatus, Teleogryllus occipitalis, Euscyrtus concinus*
katydid – *Conocephalus longipennis*

Isoptera:
termites – *Macrotermes gilvus, Syntermes molestans*

Hymenoptera:
ants – *Solenopsis geminata*
rice white tip nematode – *Aphelenchoides besseyi*

Acari:
rice panicle mite - *Steotarsonemus pinki*

Crustacea:

tadpole shrimp - *Triops longicaudatus. T. cancriformis*
rice crayfish - *Procambarus clarkii, Orconectes virilis.*

11. Method according to any of claims 9 or 10, wherein the rice pest invertebrate is from the order Hemiptera, Lepidoptera or Coleoptera;
preferably selected from hoppers,
or preferably selected from brown planthopper (*Nilaparvata lugens*), small brown planthopper (*Laodelphax striatellus*), white-backed planthopper (*Sogatella furcifera*), green leafhopper (*Nephotettix virescens*), rice stink bugs (*Nezara viridula, Pygomenida varipennis, Eysarcoris, Tibraca limbatriventris, Eysarcoris ventralis*), small stink bug (*Oebalus poecilus, O. pugnax),* rice stem borer (*Chilo suppressalis*), yellow rice borer (*Tryporyza (=Scirpophaga) incertulas*); rice leafroller / leaf folder (*Cnaphalocrocis medinalis, Marasmia patnalis, M. exigua*), water weevil (*Lissorhopterus oryzophilus*), rice weevil (*Oryzophagus oryzae*).

12. Method according to any of claims 9, 10 or 11, wherein the method comprises granular application, seedling box application or foliar application.

13. Method for increasing the health of plants, especially rice plants, especially in paddy rice fields, comprising the treatment with a mixture as defined in any of claims 1 to 3.

14. Method for increasing the yield of plants, especially rice plants, comprising the treatment with a mixture as defined in any of claims 1 to 3.

15. Method for protecting rice plants, using a mixture as defined defined in any of claims 1 to 3.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/062047

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01N43/54 A01N47/02 A01P7/00 A01P7/02 A01P7/04
A01P3/00
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

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

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data, BIOSIS, 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	DATABASE WPI Week 201821 Thomson Scientific, London, GB; AN 2018-212205 XP002782336, -& JP 2018 039745 A (NIHON NOHYAKU CO LTD) 15 March 2018 (2018-03-15) abstract paragraphs [0057] - [0091], [0105] - [0114] ----- -/--	1-15

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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

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

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

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

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Date of the actual completion of the international search	Date of mailing of the international search report
29 May 2019	11/06/2019

Name and mailing address of the ISA/	Authorized officer
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DATABASE WPI Week 201365 Thomson Scientific, London, GB; AN 2013-M18343 XP002782341, -& WO 2013/115391 A1 (NIHON NOHYAKU CO LTD) 8 August 2013 (2013-08-08) abstract CAS-RN 1449021-97-9 -----	1-15
A	DATABASE WPI Week 201631 Thomson Scientific, London, GB; AN 2016-25554Q XP002782337, & JP 2016 056197 A (SUMITOMO CHEM CO LTD) 21 April 2016 (2016-04-21) abstract -----	1-15
A	WO 2014/125651 A1 (SUMITOMO CHEMICAL CO [JP]) 21 August 2014 (2014-08-21) claims 1-3 page 5, lines 5-21 page 51, lines 1-25 -----	1-15
A	WO 2015/059039 A1 (SYNGENTA PARTICIPATIONS AG [CH]) 30 April 2015 (2015-04-30) cited in the application claims 1-14 page 14, paragraph 3 page 15, lines 1-39 -----	1-15

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2019/062047

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2018039745 A	15-03-2018	NONE	
WO 2013115391 A1	08-08-2013	AR 089871 A1	24-09-2014
		AU 2013215867 A1	21-08-2014
		CA 2863003 A1	08-08-2013
		CN 104185628 A	03-12-2014
		EP 2810939 A1	10-12-2014
		JP 6147196 B2	14-06-2017
		JP WO2013115391 A1	11-05-2015
		KR 20140117680 A	07-10-2014
		MY 166820 A	23-07-2018
		PH 12014501680 A1	10-11-2014
		TW 201338705 A	01-10-2013
		US 2015005257 A1	01-01-2015
		UY 34605 A	02-09-2013
		WO 2013115391 A1	08-08-2013
		ZA 201405673 B	28-10-2015
JP 2016056197 A	21-04-2016	NONE	
WO 2014125651 A1	21-08-2014	AU 2013378362 A1	13-08-2015
		BR 112015018966 A2	18-07-2017
		CA 2899402 A1	21-08-2014
		CN 104981164 A	14-10-2015
		EP 2961275 A1	06-01-2016
		JP 2016511220 A	14-04-2016
		KR 20150118994 A	23-10-2015
		PH 12015501771 A1	07-12-2015
		RU 2015138924 A	20-03-2017
		US 2016000081 A1	07-01-2016
		WO 2014125651 A1	21-08-2014
WO 2015059039 A1	30-04-2015	NONE	