675957

SPRUSON & FERGUSON

AUSTRALIA

PATENTS ACT 1990

PATENT REQUEST: STANDARD PATENT

I/We, the Applicant(s)/Nominated Person(s) specified below, request I/We be granted a patent for the invention disclosed in the accompanying standard complete specification.

[70,71] Applicant(s)/Nominated Person(s):

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[54] Invention Title:

Method of Controlling Insects

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By:

Registered Patent Attorney

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Australia

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Notice Of Entitlement

I, John David O'Connor, of 31 Market Street, Sydney, New South Wales, 2000, Australia, Patent Attorney for the Applicant/Nominated Person in respect of an application entitled:

Method of Controlling Insects

state the following:-

The Applicant/Nominated Person has entitlement from the actual inventors as follows:-

The Applicant/Nominated Person is the assignee of the actual inventors.

The Applicant/Nominated Person is the applicant of the basic application listed on the Patent Request.

The basic application listed on the Patent Request is the first application made in a Convention Country in respect of the invention.

Dated 18 August 1993

John David O'Connor

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METHOD OF CONTROLLING INSECTS

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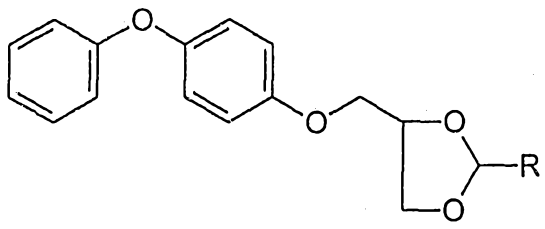
(56) Prior Art Documents
US 4097581
GB 1543396
US 5280041

(57) Claim

1. A method of controlling insects, in which there is applied, to the insects or their environment, an insecticidal composition which comprises at least one compound of the formula



(I)

in which R is ethyl or propyl, as active ingredient and at least one auxiliary, characterized in that insects of the family Aleyrodidae, Cicadellidae, Coccidae, Margarodidae or Psyllidae, insects of the genus Aonidiella, Aspidiotus, Aulacaspis, Chrysomphalus, Lepidosaphes, Parlatoria, Pseudaulacaspis, Quadraspidiotus, Selenaspidus or Unaspis, insects of the genus Planococcus or insects of the family Gracilariidae, Lyonetiidae, Olethreutidae, Psychidae or Tortricidae are controlled, with the proviso that (2*R*,4*S*)-2-ethyl-4-(4-phenoxy)phenoxymethyl-1,3-dioxolane in fully enantiomerically pure form and in predominantly enantiomerically pure form is excepted from the scope of the active ingredients in the composition.

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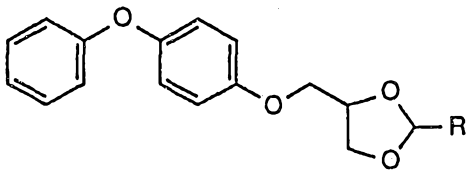
Method of controlling insects

The invention relates to a method of controlling insects, in which compounds of the formula

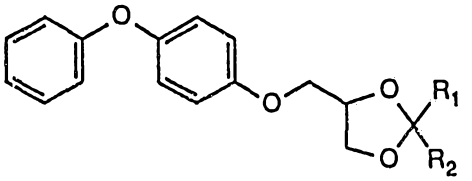


(I),

in which R is ethyl or propyl, are used,
characterised in that insects from the order Homoptera or from the order Lepidoptera are controlled,
to the use of these compounds for this purpose, to insecticidal compositions for this purpose whose active ingredient is selected from these compounds, and to a process for the preparation and the use of these compositions, with the proviso that *(2R,4S)*-2-ethyl-4-(4-phenoxy)phenoxymethyl-1,3-dioxolane in fully enantiomerically pure form and in predominantly enantiomerically pure form is excepted from the scope of all subject matters of the invention.

Within the scope of the present invention, the abovementioned *(2R,4S)* enantiomer is "in predominantly enantiomerically pure form", in which case, inter alia, the abovementioned proviso applies, when a mixture of compounds of the formula I comprises at least 90%, in particular at least 88%, more particularly at least 85%, preferably at least 80%, especially at least 70%, most preferably more than 50%, of this enantiomer relative to the total number of the molecules in this mixture.

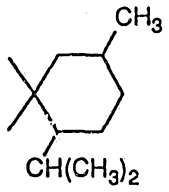
US-4,097,581 proposes compounds of the formula



(II),

in which R_1 is hydrogen, C_1-C_7alkyl, C_3-C_6cycloalkyl, C_2-C_3alkenyl, C_2-C_3alkynyl, C_2-C_4methoxyalkyl, chloromethyl or benzyl and
R_2 is hydrogen or C_1-C_6alkyl or

R_1 and R_2 together are the group $-(CH_2)_n-$, in which n is 4 or 5, or together with the carbon atom to which they are bonded are the group of the formula



(III),

as active ingredients in compositions for enhancing fruit abscission and as active ingredients in pesticidal compositions, such as insecticidal compositions, especially compositions for controlling insects from the order Diptera and especially from the order Coleoptera.

Unexpectedly and, bearing in mind the above described disclosure of US-4,097,581, entirely surprisingly, it has now been found that the compounds of the formula I are highly suitable for controlling insects of certain families and genera from the order Homoptera and of certain families from the order Lepidoptera, viz for controlling insects of the families Aleyrodidae, Cicadellidae, Coccidae, Margarodidae and Psyllidae, all of which belong to the order Homoptera,
insects of the genera Aonidiella, Aspidiotus, Aulacaspis, Chrysomphalus, Lepidosaphes, Parlatoria, Pseudaulacaspis, Quadraspidiotus, Selenaspidus and Unaspis from the family Diaspididae, which belongs to the order Homoptera,
insects of the genus Planococcus from the family Pseudococcidae, which belongs to the order Homoptera, and
insects of the families Gracilariidae, Lyonetiidae, Olethreutidae, Psychidae and Tortricidae, all of which belong to the order Lepidoptera.

The reason why this outstanding suitability of the compounds of the formula I for controlling insects of certain families and genera from the order Homoptera and of certain families from the order Lepidoptera is so surprising is that, although the compounds of the formula I fall within the scope of the compounds of the formula II disclosed in US-4,097,581 and are even disclosed specifically, in the form of diastereomer mixtures, in US-4,097,581 in the table in columns 9 and 10, US-4,097,581 makes no mention whatsoever of the outstanding activity of the compounds of the formula I according to the present invention, neither of a specifically marked activity of the compounds of the formula II against the insects, mentioned according to the invention, of certain families and genera from the order Homoptera and of certain families from the order Lepidoptera,

nor of a corresponding specifically marked activity of the present compounds of the formula I, which can be regarded as a specific sub-group of the compounds of the formula II which, however, is not disclosed in US-4,097,581.

Controlling insects of the type mentioned according to the invention is highly important for the user in the field of insect control, since, for example, enormous economical losses, for example due to the damage caused by these insects on agricultural produce, occur if these insects are not controlled in a targeted manner.

Preferred within the scope of the present invention is, on the one hand, a method of controlling insects of the type mentioned according to the invention, in which compounds of the formula I in which R is ethyl are employed.

Preferred within the scope of the present invention is, on the other hand, a method of controlling

(1) insects of the family Coccidae,
in particular of the genera Ceroplastes, Pulvinaria and Saissetia,
preferably of the species Ceroplastes floridensis, Ceroplastes sinensis, Pulvinaria psidii and Saissetia oleae,
in particular of the species Ceroplastes floridensis, Ceroplastes sinensis and Saissetia oleae,
particularly of the species Ceroplastes floridensis and Saissetia oleae,
especially of the species Ceroplastes floridensis,
especially of the species Saissetia oleae;

(2) insects of the species Ceroplastes rubens from the genus Ceroplastes from the family Coccidae;

(3) insects of the genera Aonidiella, Lepidosaphes, Parlatoria, Chrysomphalus, Aulacaspis, Aspidiotus, Selenaspidus, Pseudaulacaspis, Quadraspidiotus and Unaspis from the family Diaspididae,
preferably of the species Aonidiella aurantii, Lepidosaphes beckii, Lepidosaphes ulmi, Parlatoria pergandei, Parlatoria blanchardii, Parlatoria ziziphi, Chrysomphalus aonidum, Aulacaspis tubercularis, Aspidiotus hederae, Selenaspidus articulatus, Pseudaulacaspis pentagona, Quadraspidiotus perniciosus, Unaspis citri and Unaspis yanonensis,

in particular of the species Aonidiella aurantii, Lepidosaphes beckii, Parlatoria pergandei, Parlatoria blanchardii, Parlatoria ziziphi, Chrysomphalus aonidum, Aulacaspis tubercularis, Selenaspidus articulatus, Pseudaulacaspis pentagona, Quadraspidiotus perniciosus, Unaspis citri and Unaspis yanonensis,
more particularly of the species Aonidiella aurantii, Lepidosaphes beckii, Parlatoria pergandei, Pseudaulacaspis pentagona, Quadraspidiotus perniciosus, Unaspis citri and Unaspis yanonensis,
especially of the species Aonidiella aurantii and Lepidosaphes beckii,
very particularly of the species Aonidiella aurantii,
very particularly of the species Lepidosaphes beckii;

(4) insects of the family Margarodidae,
in particular of the genus Icerya,
preferably of the species Icerya purchasi;

(5) insects of the genus Planococcus from the family Pseudococcidae, of the genus Psylla from the family Psyllidae and of the genera Trialeurodes and Bemisia from the family Aleyrodidae,
preferably of the species Planococcus ficus, Planococcus citri, Psylla pyri, Psylla pyricola, Trialeurodes vaporariorum and Bemisia tabaci,
especially of the species Planococcus ficus, Psylla pyricola, Trialeurodes vaporariorum and Bemisia tabaci,
more especially of the species Psylla pyricola, Trialeurodes vaporariorum and Bemisia tabaci,
in particular of the species Psylla pyricola;

(6) insects of the family Olethreutidae,
in particular of the genera Cydia and Laspeyresia,
preferably of the species Cydia pomonella, Laspeyresia molesta and Laspeyresia funebrana,
in particular of the species Cydia pomonella and Laspeyresia molesta,
very particularly of the species Laspeyresia molesta,
very particularly of the species Cydia pomonella;

(7) insects of the genus Eupoecilia from the family Olethreutidae,
in particular of the species Eupoecilia ambiguella;

(8) insects of the family Tortricidae,
in particular of the genera Adoxophyes, Pandemis, Cacoecia and Eulia,
preferably of the species Adoxophyes reticulana, Pandemis heparana, Cacoecia costana, Cacoecia pronubana and Eulia sphaleropa,
in particular of the species Adoxophyes reticulana, Pandemis heparana and Cacoecia pronubana,
very particularly of the species Adoxophyes reticulana;

(9) insects of the family Lyonetiidae,
in particular of the genera Leucoptera and Lyonetia,
preferably of the species Leucoptera scitella and Lyonetia clerkella,
in particular of the species Leucoptera scitella;

(10) insects of the family Gracilariidae,
in particular of the genus Lithocolletis,
preferably of the species Lithocolletis blancardella and Lithocolletis corylifoliella,
in particular of the species Lithocolletis blancardella.

The compounds of the formula I which are used according to the invention are known and are described, for example, in US-4,097,581.

The compounds of the formula I which are used according to the invention are valuable active ingredients even at low rates of concentration when used preventively and/or curatively in the field of insect control while being well tolerated by warm-blooded species, fish and plants. The active ingredients which are used according to the invention are active against all or individual development stages of normally sensitive, but also of resistant, insects of the abovementioned type. The insecticidal activity of the active ingredients which are used according to the invention can become apparent directly, i.e. by a destruction of the insects, which happens immediately or only after some time has elapsed, for example during molting, or indirectly, for example by reduced oviposition and/or hatching rate, the good activity corresponding to a mortality of at least 50 to 60%.

The active ingredients which are used according to the invention can be used for controlling, i.e. containing or destroying, pests of the abovementioned type which can be found in particular on plants, especially on useful plants and ornamentals in agriculture,

horticulture and in forests, or on parts of such plants, such as fruit, flowers, foliage, stalks, tubers or roots, and in some cases the protection against these pests even extends to parts of the plants which are formed at a later point in time.

Suitable target crops are, in particular, crops of pome fruit, for example apples or pears, stone fruit, for example peaches, citrus fruit, for example lemons, oranges or grapefruits, vegetables, for example potatoes, beans, tomatoes or cucumbers, pepper, olives, mangoes, grapes, ornamentals, nuts, guavas, tea or avocados,
especially pome fruit, stone fruit, citrus fruit, vegetables, olives, mangoes, grapes, ornamentals or nuts,
preferably pome fruit, stone fruit or citrus fruit.

Other fields of application for the active ingredients which are used according to the invention are the protection of stored products or stores, the protection of material and, in the hygiene sector, in particular the protection of domestic animals or productive livestock against pests of the abovementioned type.

The invention therefore also relates to insecticidal compositions for use against pests of the abovementioned type, such as emulsifiable concentrates, suspension concentrates, ready-to-spray or ready-to-dilute solutions, spreadable pastes, dilute emulsions, wettable powders, soluble powders, dispersible powders, dusts, granules or encapsulations in polymeric substances, all of which comprise - at least - one of the active ingredients which are used according to the invention and which are to be selected depending on the intended aims and the prevailing circumstances.

In these compositions, the active ingredient is employed as pure active ingredient, for example a solid active ingredient in a specific particle size, or, preferably, together with - at least - one of the auxiliaries conventionally used in the art of formulations, such as extenders, for example solvents or solid carriers, or surface-active compounds (surfactants).

The following are examples of suitable solvents: partially hydrogenated or unhydrogenated aromatic hydrocarbons, preferably the fractions C_8 to C_{12} of alkylbenzenes, such as xylene mixtures, alkylated naphthalenes or tetrahydronaphthalene, aliphatic or cycloaliphatic hydrocarbons, such as paraffins or cyclohexane, alcohols, such as ethanol, propanol or butanol, glycols and their ethers and esters, such as propylene glycol, dipropylene glycol ether, ethylene glycol, ethylene glycol monomethyl ether or ethylene glycol

monoethyl ether, ketones, such as cyclohexanone, isophorone or diacetone alcohol, strongly polar solvents, such as N-methylpyrrolid-2-one, dimethyl sulfoxide or N,N-dimethylformamide, water, epoxidized or unepoxidized vegetable oils, such as epoxidized or unepoxidized rapeseed oil, castor oil, coconut oil or soya oil, and silicone oils.

Solid carriers which are used, for example for dusts and dispersible powders, are, as a rule, ground natural minerals, such as calcite, talc, kaolin, montmorillonite or attapulgite. To improve the physical properties, it is also possible to add highly-disperse silicas or highly-disperse sorptive polymers. Possible particulate, adsorptive carriers for granules are either porous types, such as pumice, brick grit, sepiolite or bentonite, and possible non-sorptive carrier materials are calcite or sand. Moreover, a large number of granulated materials of inorganic or organic nature, in particular dolomite or comminuted plant residues, can be used.

Suitable surface-active compounds are, depending on the nature of the active ingredient to be formulated, non-ionic, cationic and/or anionic surfactants or surfactant mixtures which have good emulsifying, dispersing and wetting properties. The surfactants listed below are only given by way of example; a large number of surfactants which are conventionally used in the art of formulation and suitable according to the invention are described in the specialist literature.

Suitable non-ionic surfactants are mainly polyglycol ether derivatives or aliphatic or cycloaliphatic alcohols, saturated or unsaturated fatty acids and alkylphenols, which can have 3 to 30 glycol ether groups and 8 to 20 carbon atoms in the (aliphatic) hydrocarbon radical and 6 to 18 carbon atoms in the alkyl radical of the alkylphenols. Other suitable non-ionic surfactants are water-soluble polyethylene oxide adducts with polypropylene glycol, ethylene diaminopolypropylene glycol and alkyl polypropylene glycol which have 1 to 10 carbon atoms in the alkyl chain and 20 to 250 ethylene glycol ether groups and 10 to 100 propylene glycol ether groups. The abovementioned compounds customarily have 1 to 5 ethylene glycol units per propylene glycol unit. Examples which may be mentioned are nonylphenolpolyethoxyethanols, castor oil polyglycol ethers, polypropylene/-polyethylene oxide adducts, tributylphenoxypolyethoxyethanol, polyethylene glycol and octylphenoxypolyethoxyethanol. Other substances which are suitable are fatty acid esters of polyoxyethylene sorbitan, such as polyoxyethylene sorbitan trioleate.

The cationic surfactants are mainly quaternary ammonium salts which have, as

substituents, at least one alkyl radical having 8 to 22 C atoms and, as further substituents, lower halogenated or unhalogenated alkyl, benzyl or lower hydroxyalkyl radicals. The salts are preferably in the form of halides, methylsulfates or ethylsulfates. Examples are stearyltrimethylammonium chloride and benzyldi(2-chloroethyl)ethylammonium bromide.

Suitable anionic surfactants can be either so-called water-soluble soaps or water-soluble synthetic surface-active compounds. Soaps which are suitable are the alkali metal salts, alkaline earth metal salts or substituted or unsubstituted ammonium salts of higher fatty acids (C_{10}-C_{22}), such as the sodium salts or potassium salts of oleic or stearic acid, or of natural mixtures of fatty acids which can be obtained from, for example, coconut oil or tall oil; mention must also be made of the fatty acid methyltaurinates. However, so-called synthetic surfactants are used more frequently, in particular fatty sulfonates, fatty sulfates, sulfonated benzimidazole derivatives or alkylarylsulfonates. The fatty sulfonates and fatty sulfates are, as a rule, in the form of alkali metal salts, alkaline earth metal salts or substituted or unsubstituted ammonium salts and have in general an alkyl radical having 8 to 22 carbon atoms, alkyl also including the alkyl moiety of acyl radicals; examples which may be mentioned are the sodium salt or calcium salt of ligninsulfonic acid, of the dodecylsulfuric ester or of a fatty alcohol sulfate mixture prepared with natural fatty acids. This group also includes the salts of the sulfuric esters and sulfonic acids of fatty alcohol/ethylene oxide adducts. The sulfonated benzimidazole derivatives have preferably 2 sulfonyl groups and a fatty acid radical having approximately 8 to 22 C atoms. Alkylarylsulfonates are, for example, the sodium salts, calcium salts or triethanolammonium salts of dodecylbenzenesulfonic acid, of dibutylnaphthalenesulfonic acid or of a naphthalenesulfonic acid/formaldehyde condensation product. Suitable phosphates, for example salts of the phosphoric ester of a p-nonylphenol/(4-14)ethylene oxide adduct, or phospholipids, are also suitable.

As a rule, the compositions comprise 0.1 to 99%, in particular 0.1 to 95%, of active ingredient and 1 to 99.9%, in particular 5 to 99.9%, of at least one solid or liquid auxiliary, it being possible as a rule, for 0 to 25%, in particular 0.1 to 20%, of the compositions to be surfactants (% in each case meaning percent by weight). While concentrated compositions are more preferred as commercially available goods, the end consumer uses, as a rule, dilute compositions whose active substance concentrations are considerably lower. Preferred compositions are in particular composed as follows (% = percent by weight):

Emulsifiable concentrates:

Active ingredient:	1 to 90%, preferably 5 to 20%
Surfactant:	1 to 30%, preferably 10 to 20 %
Solvent:	5 to 98%, preferably 70 to 85 %

Dusts:

Active ingredient:	0.1 to 10%, preferably 0.1 to 1%
Solid carrier:	99.9 to 90%, preferably 99.9 to 99%

Suspension concentrates:

Active ingredient:	5 to 75%, preferably 10 to 50%
Water:	94 to 24%, preferably 88 to 30%
Surfactant:	1 to 40%, preferably 2 to 30%

Wettable powders:

Active ingredient:	0.5 to 90%, preferably 1 to 80%
Surfactant:	0.5 to 20%, preferably 1 to 15%
Solid carrier:	5 to 99%, preferably 15 to 98%

Granules:

Active ingredient:	0.5 to 30%, preferably 3 to 15%
Solid carrier:	99.5 to 70%, preferably 97 to 85%

By adding other insecticidal active ingredients, the spectrum of action of the compositions according to the invention can be broadened considerably and adapted to prevailing circumstances. Suitable active ingredients which can be added are, for example, representatives of the following active ingredient classes: organophosphorus compounds, nitrophenols and derivatives, formamidines, ureas, carbamates, pyrethroids, chlorinated hydrocarbons and Bacillus thuringiensis preparations. The compositions according to the invention can also comprise other solid or liquid auxiliaries, such as stabilizers, for example epoxidized or unepoxidized vegetable oils (for example epoxidized coconut oil, rapeseed oil or soya oil), antifoams, for example silicone oil, preservatives, viscosity regulators, binders and/or tackifiers, and fertilizers or other active ingredients for achieving specific effects, for example bactericides, fungicides, nematicides, molluscicides or selective herbicides.

The compositions according to the invention are prepared in a known manner, for example in the absence of auxiliaries, grinding, screening and/or compressing of a solid active ingredient or active ingredient mixture, for example to give a specific particle size, and in the presence of at least one auxiliary for example by intimately mixing and/or grinding the active ingredient or active ingredient mixture with the additive(s). The invention also relates to these processes for the preparation of the compositions according to the invention and to the use of the compounds of the formula I for the preparation of these compositions.

The invention also relates to the methods of application for the compositions, that is to say the methods of controlling pests of the abovementioned type, such as spraying, atomizing, dusting, painting on, dressing, scattering or pouring, which are to be selected depending on the intended aims and the prevailing circumstances, and to the use of the compositions for the control of pests of the abovementioned type. Typical rates of concentration are between 0.1 and 1000 ppm, preferably between 0.1 and 500 ppm, of active ingredient. Spray mixtures are employed, in particular, at active ingredient concentrations of 50, 100, 150 or 200 ppm. The rates of application per hectare are generally 1 to 2000 g of active ingredient per hectare, in particular 10 to 1000 g/ha, preferably 20 to 600 g/ha. Rates of application of 300, 400 or 450 g of active ingredient per hectare are preferred. Rates of application of 0.25, 0.75, 1.0 to 2.0 g of active ingredient per tree are preferred.

A preferred method of application in the field of crop protection is application to the foliage of the plant (folia application), where frequency and rate of application can be adapted to suit the danger of infestation with the pest in question. However, the active ingredient can also reach the plants through the root system (systemic action) by drenching the locus of the plants with a liquid composition or incorporating the active ingredient in solid form into the locus of the plants, for example into the soil, for example in the form of granules (soil application).

The examples which follow are intended to illustrate the invention. They do not restrict the invention. Temperatures are given in degrees centigrade.

Formulation Examples (% = percent by weight)

Example F1: Emulsion concentrates	a)	b)	c)
Active ingredient	25 %	40 %	50 %
Calcium dodecylbenzenesulfonate	5 %	8 %	6 %

Castor oil polyethylene glycol ether (36 mol of EO)	5 %	-	-
Tributylphenol polyethylene glycol ether (30 mol of EO)	-	12 %	4 %
Cyclohexanone	-	15 %	20 %
Xylene mixture	65 %	25 %	20 %

Emulsions of any desired concentration can be prepared with such concentrates by dilution with water.

Example F2: Solutions	a)	b)	c)	d)
Active ingredient	80 %	10 %	5 %	95 %
Ethylene glycol monomethyl ether	20 %	-	-	-
Polyethylene glycol MW 400	-	70 %	-	-
N-Methyl-2-pyrrolidone	-	20 %	-	-
Epoxidized coconut oil	-	-	1 %	5 %
Petroleum ether (boiling range 160-190°)	-	-	94 %	-

The solutions are suitable for use in the form of microdrops.

Example F3: Granules	a)	b)	c)	d)
Active ingredient	5 %	10 %	8 %	21 %
Kaolin	94 %	-	79 %	54 %
Highly-disperse silica	1 %	-	13 %	7 %
Attapulgite	-	90 %	-	18 %

The active ingredient is dissolved in dichloromethane, the solution is sprayed onto the carrier, and the solvent is subsequently evaporated in vacuo.

Example F4: Dusts	a)	b)
Active ingredient	2 %	5 %
Highly-disperse silica	1 %	5 %
Talc	97 %	-
Kaolin	-	90 %

Ready-to-use dusts are obtained by intimately mixing the carriers with the active ingredient.

Example F5: Wettable powders	a)	b)	c)
Active ingredient	25 %	50 %	75 %
Sodium ligninsulfonate	5 %	5 %	-
Sodium lauryl sulfate	3 %	-	5 %
Sodium diisobutylnaphthalene-sulfonate	-	6 %	10 %
Octylphenol polyethylene glycol-ether (7-8 mol of EO)	-	2 %	-
Highly-disperse silica	5 %	10 %	10 %
Kaolin	62 %	27 %	-

The active ingredient is mixed with the additives and the mixture is ground thoroughly in a suitable mill. This gives wettable powders which can be diluted with water to give suspensions of any desired concentration.

Example F6: Emulsion concentrate	
Active ingredient	10 %
Octylphenol polyethylene glycoleether (4-5 mol of EO)	3 %
Calcium dodecylbenzenesulfonate	3 %
Castor oil polyglycol ether (36 mol of EO)	4 %
Cyclohexanone	30 %
Xylene mixture	50 %

Emulsions of any desired concentration can be prepared from this concentrate by dilution with water.

Example F7: Dusts	a)	b)
Active ingredient	5 %	8 %
Talc	95 %	-
Kaolin	-	92 %

Ready-to-use dusts are obtained by mixing the active ingredient with the carrier and grinding the mixture on a suitable mill.

Example F8: Extruder granules

Active ingredient	10 %
Sodium ligninsulfonate	2 %
Carboxymethylcellulose	1 %
Kaolin	87 %

The active ingredient is mixed with the additives, and the mixture is ground and moistened with water. This mixture is extruded and granulated, and the granules are subsequently dried in a stream of air.

Example F9: Coated granules

Active ingredient	3 %
Polyethylene glycol (MW 200)	3 %
Kaolin	94 %

In a mixer, the finely ground active ingredient is applied uniformly to the kaolin which has been moistened with polyethylene glycol. Dust-free coated granules are thus obtained.

Example F10: Suspension concentrate

Active ingredient	40 %
Ethylene glycol	10 %
Nonylphenol polyethylene glycol ether (15 mol of EO)	6 %
Sodium ligninsulfonate	10 %
Carboxymethylcellulose	1 %
37% aqueous formaldehyde solution	0.2 %
Silicone oil in the form of a 75% aqueous emulsion	0.8 %
Water	32 %

The finely ground active ingredient is mixed intimately with the additives. This gives a suspension concentrate from which suspensions of any desired concentration can be prepared by dilution with water.

Biological Examples (percentages are by weight, unless stated otherwise)

The active ingredient is used in each case in three different isomer ratios:

A = 29% 2R,4S-isomer, 29% 2S,4R-isomer, 21% 2S,4S-isomer and 21% 2R,4R-isomer

B = 28% 2R,4S-isomer, 28% 2S,4R-isomer, 22% 2S,4S-isomer and 22% 2R,4R-isomer

C = 27.5% 2R,4S-isomer, 27.5% 2S,4R-isomer, 22.5% 2S,4S-isomer and 22.5% 2R,4R-isomer

Example B1: Activity against Adoxophyes reticulana (ovicidal)

Adoxophyes reticulana eggs which have been deposited on filter paper are briefly immersed into a test solution of 400ppm of active ingredient in acetone/water. After the test solution has dried on, the eggs are incubated in Petri dishes. After 6 days, the percentage hatching rate of the eggs is evaluated by comparison with untreated control batches (% reduction in hatching rate).

In this test, compounds of the formula I are very effective. In particular the compound of the formula I in which R is ethyl has an activity of over 80%.

Example B2: Activity against Aonidiella aurantii

Potato tubers are populated with Aonidiella aurantii crawlers. After about 2 weeks, the potatoes are immersed into an aqueous emulsion spray mixture or suspension spray mixture which comprises 400ppm of active ingredient. After the tubers have dried, they are incubated in a plastic container. To evaluate the experiment after 10 to 12 weeks, the survival rate of the crawlers of the first subsequent generation of the treated population is compared with that of untreated control batches.

In this test, compounds of the formula I are very effective. In particular the compound of the formula I in which R is ethyl has an activity of over 80%.

Example B3: Activity against Aonidiella aurantii

Citrus trifoliata cuttings are populated with Aonidiella aurantii crawlers. After about 2 weeks, the cuttings are sprayed to drip point with an aqueous emulsion spray mixture comprising 50ppm of active ingredient. To evaluate the experiment after 10 to 12 weeks, the survival rate of the crawlers of the first subsequent generation of the treated population is compared with that of untreated control batches.

In this test, compounds of the formula I are very effective. In particular the compound of the formula I in which R is ethyl has an activity of over 80%.

Example B4: Activity against Bemisia tabaci

Dwarf bean plants are placed into gauze cages and populated with Bemisia tabaci adults. After oviposition, all adults are removed. 10 days later, the plants and the nymphs thereon are sprayed with an aqueous emulsion spray mixture comprising 400ppm of active ingredient. After a further 14 days, the percentage hatching rate of the eggs is evaluated by comparison with untreated control batches.

In this test, compounds of the formula I are very effective. In particular the compound of the formula I in which R is ethyl has an activity of over 80%.

Example B5: Activity against Bemisia tabaci

Dwarf bean plants are placed into gauze cages and populated with Bemisia tabaci adults. After oviposition, all adults are removed. 2 days later, the plants and the nymphs thereon are sprayed with an aqueous emulsion spray mixture comprising 400 ppm of active ingredient. After a further 10 days, the percentage hatching rate of the eggs is evaluated by comparison with untreated control batches.

In this test, compounds of the formula I are very effective. In particular the compound of the formula I in which R is ethyl has an activity of over 80%.

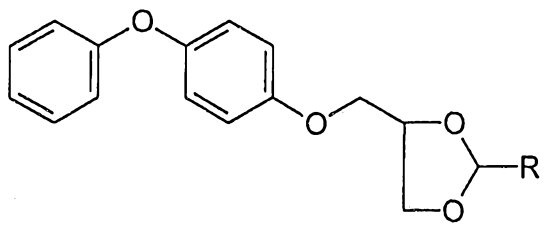
Example B6: Activity against Cydia pomonella (ovicidal)

Cydia pomonella eggs which have been deposited on filter paper are briefly immersed into a test solution of 400 ppm of active ingredient in acetone/water. After the test solution has dried on, the eggs are incubated in Petri dishes. After 6 days, the percentage hatching rate of the eggs is evaluated by comparison with untreated control batches (% reduction in hatching rate).

In this test, compounds of the formula I are very effective. In particular the compound of the formula I in which R is ethyl has an activity of over 80%.

The claims defining the invention are as follows:

1. A method of controlling insects, in which there is applied, to the insects or their environment, an insecticidal composition which comprises at least one compound of the formula



(I)

in which R is ethyl or propyl, as active ingredient and at least one auxiliary, characterized in that insects of the family Aleyrodidae, Cicadellidae, Coccidae, Margarodidae or Psyllidae, insects of the genus Aonidiella, Aspidiotus, Aulacaspis, Chrysomphalus, Lepidosaphes, Parlatoria, Pseudaulacaspis, Quadraspidiotus, Selenaspidus or Unaspis, insects of the genus Planococcus or insects of the family Gracilariidae, Lyonetiidae, Olethreutidae, Psychidae or Tortricidae are controlled, with the proviso that (2*R*,4*S*)-2-ethyl-4-(4-phenoxy)phenoxymethyl-1,3-dioxolane in fully enantiomerically pure form and in predominantly enantiomerically pure form is excepted from the scope of the active ingredients in the composition.

2. A method according to claim 1, wherein R in the compound of the formula I is ethyl.

3. A method according to claim 1 or 2 of controlling insects of the family Coccidae.

4. A method according to any one of claims 1 to 3 of controlling insects of the genus Ceroplastes, Pulvinaria or Saissetia.

5. A method according to claim 1 or 2 of controlling insects of the genus Aonidiella, Lepidosaphes, Parlatoria, Chrysomphalus, Aulacaspis, Aspidiotus, Selenaspidus, Pseudaulacaspis, Quadraspidiotus or Unaspis.

6. A method according to claim 1 or 2 of controlling insects of the family Margarodidae.

7. A method according to any one of claims 1, 2 and 6 of controlling insects of the genus Icerya.

8. A method according to claim 1 or 2 of controlling insects of the genus Planococcus, of the genus Psylla from the family Psyllidae or of the genera Trialeurodes and Bemisia from the family Aleyrodidae.

9. A method according to claim 1 or 2 of controlling insects of the family Olethreutidae.

10. A method according to any one of claims 1, 2 and 9 of controlling insects of the genus Cydia or Laspeyresia.

11. A method according to claim 1 or 2 of controlling insects of the family Tortricidae.

12. A method according to any one of claims 1, 2 and 11 of controlling insects of the genus Adoxophyes, Pandemis, Cacoecia or Eulia.

13. A method according to claim 1 or 2 of controlling insects of the family Lyonetiidae.

14. A method according to any one of claims 1, 2 and 13 of controlling insects of the genus Leucoptera or Lyonetia.

15. A method according to claim 1 or 2 of controlling insects of the family Gracilariidae.

16. A method according to any one of claims 1, 2 and 15 of controlling insects of the genus Lithocolletis.

17. A method of controlling insects, in which there is applied, to the insects or their environment, an insecticidal composition, substantially as hereinbefore described with reference to any one of the formulation examples wherein the active ingredient is a compound of the formula (I) as defined in claim 1.

18. A method according to claim 17 wherein R in the compound of formula (I) is ethyl.

Dated 23 December, 1996
Ciba-Geigy AG

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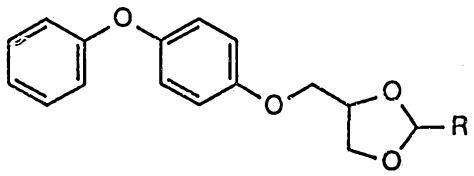
PI/5-19237/A

Method of controlling insects

Abstract

The invention relates to a method of controlling insects, in which compounds of the formula



(I),

in which R is ethyl or propyl, are used,
characterised in that insects from the order Homoptera or from the order Lepidoptera are controlled,
to the use of these compounds for this purpose, to insecticidal compositions for this purpose whose active ingredient is selected from these compounds, and to a process for the preparation and the use of these compositions, with the proviso that *(2R,4S)*-2-ethyl-4-(4-phenoxy)phenoxymethyl-1,3-dioxolane in fully enantiomerically pure form and in predominantly enantiomerically pure form is excepted from the scope of all subject matters of the invention.