Compounds of formula (I) wherein R₁, R₂, R₃, R₄ and R₅ are as defined in claim 1, can be used as agrochemical active ingredients and can be prepared by extraction of Aglaia roxburghiana.
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Insecticidal polycyclic compounds

The present invention relates to compounds of formula

![Chemical Structure](image)

(1)

wherein either

$R_1$ is hydrogen or methoxy, $R_2$ and $R_3$ together are a group of the formula

$$\text{CON(CH}_3\text{)}_2$$

(Ia) and $R_4$ and $R_5$ together are a group of the formula

$\text{-OCH}_2\text{O-}$

or $R_1$ is hydrogen, $R_2$ and $R_3$ together are a group of the formula

$$\text{N}-\text{O}$$

(Lb) and

$R_4$ and $R_5$ together are a group of the formula

$\text{-OCH}_2\text{O-}$

or $R_1$ and $R_4$ are hydrogen, $R_5$ is methoxy and $R_2$ and $R_3$ together are a group of the

![Chemical Structure](image)

formula

(1c),

wherein the carbon atom designated $c$ in each of the groups of formulae Ia, Ib and Ic is bonded to the carbon atom designated $a$ in formula I and the carbon atom designated $d$ in each of the groups of formulae Ia, Ib and Ic is bonded to the carbon atom designated $b$ in formula I.
in free form or in salt form, to a process for the preparation of those compounds and to the
use of those compounds, to pesticidal compositions the active ingredient of which is
selected from those compounds, in free form or in agrochemically acceptable form, to a
process for the preparation of those compositions and to the use of those compositions, to
plant propagation material treated with those compositions and to a method of controlling
pests.

In the literature, the compound Rocaglamide is proposed as an active ingredient in
pesticidal compositions. The biological properties of that known compound are not,
however, entirely satisfactory and there is therefore a need to provide further compounds
having pesticidal properties, especially for controlling insects or representatives of the
order Acarina; that problem is solved according to the invention by the provision of the
present compounds I.

Compounds I having at least one basic centre are capable, for example, of forming acid
addition salts. Those salts are formed, for example, with strong inorganic acids, such as
mineral acids, for example perchloric acid, sulfuric acid, nitric acid, nitrous acid, a
phosphoric acid or a hydrohalic acid, with strong organic carboxylic acids, such as
unsubstituted or substituted, for example halo-substituted, C₁⁻C₄ alkanecarboxylic acids,
for example acetic acid, or saturated or unsaturated dicarboxylic acids, for example oxalic,
amalic, succinic, maleic, fumaric or phthalic acid, or hydroxycarboxylic acids, for
example ascorbic, lactic, malic, tartaric or citric acid, or benzoic acid, or with organic
sulfonic acids, such as unsubstituted or substituted, for example halo-substituted,
C₁⁻C₄ alkanesulfonic or arylsulfonic acids, for example methanesulfonic or p-toluene-
sulfonic acid. Furthermore, compounds I having at least one acidic group are capable of
forming salts with bases. Suitable salts with bases are, for example, metal salts, such as
alkali metal or alkaline earth metal salts, for example sodium, potassium or magnesium
salts, or salts with ammonia or an organic amine, such as morpholine, piperidine, pyrrol-
dine, a mono-, di- or tri-lower alkylamine, for example ethylamine, diethylamine,
triethylamine or dimethylpropylamine, or a mono-, di- or tri-hydroxy-lower alkylamine,
for example mono-, di- or tri-ethanolamine. It may also be possible to form corresponding
internal salts. Preference is given within the scope of the invention to agrochemically
advantageous salts, but salts that have disadvantages for agrochemical purposes, for
example salts that are toxic to bees or to fish, are also included; the latter salts are used,
for example, in the isolation or purification of free compounds I or the agrochemically
acceptable salts thereof. In view of the close relationship between the compounds I in free
form and in the form of their salts, hereinbefore and hereinafter any reference to the free compounds I or their salts should be understood as including also the corresponding salts or the free compounds I, respectively, where appropriate and expedient. The free form is generally preferred.

Compounds of formula I are, for example, those wherein \(R_1\) is hydrogen or methoxy, \(R_2\) and \(R_3\) together are a group of the formula \(\text{HO} \quad c \\ \quad d \quad \text{CON} (\text{CH}_3)_{2} \) (Ia) and \(R_4\) and \(R_5\) together are a group of the formula \(-\text{OCH}_2\text{O}-\)

or \(R_1\) is hydrogen, \(R_2\) and \(R_3\) together are a group of the formula \(\begin{array}{c} \text{N} \\ \quad c \quad b \quad \text{O} \end{array}\) (Ib) and \(R_4\) and \(R_5\) together are a group of the formula \(-\text{OCH}_2\text{O}-\), wherein the carbon atom designated \(c\) in each of the groups of formulae Ia and Ib is bonded to the carbon atom designated \(a\) in formula I and the carbon atom designated \(d\) in each of the groups of formulae Ia and Ib is bonded to the carbon atom designated \(b\) in formula I.

The invention relates also to the process for the preparation of the compounds of formula I, in free form or in salt form, which process comprises, for example, extracting parts of Aglaia roxburghiana plants, working up the extract, isolating the compound of formula I in free form and, if desired, converting a compound of formula I in free form thus obtainable into a salt and, if desired, converting a salt of a compound of formula I thus obtainable into a different salt or into the free compound of formula I.

Advantageously, there may be used for the extraction the roots, blossom, fruit, leaves, twigs, seed or bark, especially the bark, for example the roots, blossom, leaves or the bark, preferably the seed or the bark, especially the bark, of Aglaia roxburghiana.

Suitable extraction solvents are water, aromatic, aliphatic and alicyclic hydrocarbons and halogenated hydrocarbons, such as benzene, toluene, xylene, mesitylene, Tetratin, chlorobenzene, dichlorobenzene, bromobenzene, petroleum ether, hexane, cyclohexane, dichloromethane, trichloromethane, tetrachloromethane, dichloroethane, trichloroethene or tetrachloroethene; esters, such as ethyl acetate; ethers, such as diethyl ether, dipropyl ether, diisopropyl ether, dibutyl ether, tert-butyl methyl ether, ethylene glycol monomethyl
ether, ethylene glycol monoethyl ether, ethylene glycol dimethyl ether, dimethoxydiethyl ether, tetrahydrofuran or dioxane; ketones, such as acetone, methyl ethyl ketone or methyl isobutyl ketone; and alcohols, such as methanol, ethanol, isopropanol or n-butanol and mixtures thereof. Preference is given to halogenated hydrocarbons, especially dichloromethane, and alcohols, especially methanol, and to mixtures thereof.

Suitable temperatures for the extraction are approximately from 0° to the boiling point of the extraction solvent, preferably from approximately room temperature to approximately 60°, especially room temperature.

The working-up of the extract and the isolation of the compounds I in free form are advantageously carried out in a manner known per se, for example by filtration, chromatographic separation and/or crystallisation.

In a preferred form of the invention, finely ground bark of Aglaia roxburghiana is extracted at room temperature with a 1:1 mixture of dichloromethane and methanol, the extract is separated and the desired compound of formula I is isolated in free form.

Especially advantageous preparation conditions are to be found in Preparation example P1.

Salts of compounds I can be prepared in a manner known per se. For example, acid addition salts of compounds I are obtained by treatment with a suitable acid or a suitable ion exchange reagent, and salts with bases are obtained by treatment with a suitable base or a suitable ion exchange reagent.

Salts of compounds I can be converted into the free compounds I in customary manner: acid addition salts, for example, by treatment with a suitable basic agent or a suitable ion exchange reagent, and salts with bases, for example, by treatment with a suitable acid or a suitable ion exchange reagent.

Salts of compounds I can be converted into different salts of compounds I in a manner known per se: acid addition salts, for example, can be converted into different acid addition salts, for example by treatment of a salt of an inorganic acid, such as a hydrochloride, with a suitable metal salt, such as a sodium, barium or silver salt, of an acid, for example with silver acetate, in a suitable solvent in which an inorganic salt being formed,
for example silver chloride, is insoluble and therefore separates out from the reaction mixture.

The compounds I can also be obtained in the form of their hydrates and/or may include other solvents, for example solvents used for the crystallisation of compounds in solid form.

In the area of pest control, the compounds I according to the invention are valuable preventive and/or curative active ingredients having a very advantageous biocidal spectrum even at low rates of concentration, while being well tolerated by warm-blooded animals, fish and plants. The compounds of the invention are effective against all or individual development stages of normally sensitive animal pests, but also of resistant animal pests, such as insects or representatives of the order Acarina. The insecticidal or acaricidal action of the compounds of the invention may manifest itself directly, i.e. in the mortality of the pests, which occurs immediately or only after some time, for example during moulting, or indirectly, for example in reduced oviposition and/or hatching rate, good activity corresponding to a mortality of at least 50 to 60 %.

The mentioned animal pests include, for example:

of the order Lepidoptera, for example,

of the order Coleoptera, for example,
Agriotes spp., Anthonomus spp., Atomaria linearis, Chaetocnema tibialis, Cosmopolites
spp., Curculio spp., Dermestes spp., Diabrotica spp., Epilachna spp., Eremmus spp.,
Leptinotarsa decemlineata, Lissorhoptrus spp., Melolontha spp., Orycaephilus spp.,
Otiorthynchos spp., Phlyctinus spp., Popillia spp., Psylliodes spp., Rhizopertha spp.,
Scarabaeidae, Sitophilus spp., Sitotroga spp., Tenebrio spp., Tribolium spp. and
Trogoderma spp.;
of the order Orthoptera, for example,
Blatta spp., Blattella spp., Gryllotalpa spp., Leucophaea maderae, Locusta spp.,
Periplaneta spp. and Schistocerca spp.;
of the order Isoptera, for example,
Reticulitermes spp.;
of the order Psocoptera, for example,
Liposcelis spp.;
of the order Anoplura, for example,
Haematoptinus spp., Linognathus spp., Pediculus spp., Pemphigus spp. and Phyllophaga
spp.;
of the order Mallophaga, for example,
Damalinea spp. and Trichodectes spp.;
of the order Thysanoptera, for example,
Frankliniella spp., Hercinothrips spp., Taeniothrips spp., Thrips palmi, Thrips tabaci and
Scirtothrips aurantii;
of the order Heteroptera, for example,
Cimex spp., Distantiella theobroma, Dysdercus spp., Euchistus spp., Eurygaster spp.,
Leptocorisa spp., Nezara spp., Piesma spp., Rhodnius spp., Sahlbergella singularis,
Scotinophara spp. and Triatoma spp.;
of the order Hemiptera, for example,
Aleurothrixus floccosus, Aleyrodidae brassicae, Aonidiella spp., Aphididae, Aphis spp.,
Aspidiotus spp., Bemisia tabaci, Ceroplastes spp., Chrysomphalus aonidium,
Chrysomphalus dictyospermi, Coccus hesperidum, Empoasca spp., Eriosoma larigerum,
Erythroneura spp., Gascardia spp., Laodelphax spp., Lecanium corni, Lepidosaphes spp.,
Macrocephus spp., Myzus spp., Nephotettix spp., Nilapavata spp., Paratoria spp.,
Pulvinaria aethiopica, Quadraspidiotus spp., Rhopalaropsis spp., Saissetia spp.,
Scaphoideus spp., Schizaphis spp., Sitobion spp., Trialeurodes vaporariorum, Trioza
ertryae and Unaspis citri;
of the order Hymenoptera, for example,
Acromyrmex, Atta spp., Cephus spp., Diprion spp., Diprionidae, Gilpinia polytoma,
Hoplocampa spp., Lasius spp., Monomorium pharaonis, Neodiprion spp., Solenopsis spp. and Vespa spp.;
of the order Diptera, for example,
Oscinella frit, Pegomyia hyoscyami, Phorbia spp., Rhagoletis pomonella, Sciara spp.,
Stomoxys spp., Tabanus spp., Tannia spp. and Tipula spp.;
of the order Siphonaptera, for example,
Ceratophyllum spp. and Xenopsylla cheopis;
of the order Thysanura, for example,
Lepisma saccharina;
of the order Acarina, for example,
Acarus siro, Aceria sheldoni, Aculus schlechtendali, Amblyomma spp., Argas spp.,
Boophilus spp., Brevipalps spp., Bryobia praetiosa, Caliptrimerus spp., Chorioptes spp.,
Dermanyssus gallinae, Eotetranychus carpini, Eriophyes spp., Hyalomma spp., Ixodes spp.,
Olygonychus pratensis, Ornithodoros spp., Panonychus spp., Phyllocoptruta oleivora,
Polyphagotarsonemus latus, Psoroptes spp., Rhipicephalus spp., Rhizoglyphus spp.,
Sarcoptes spp., Tarsonemus spp. and Tetranychus spp..

With the compounds according to the invention it is possible to control, i.e. to inhibit or
destroy, pests of the mentioned type occurring especially on plants, especially on useful
plants and ornamentals in agriculture, in horticulture and in forestry, or on parts of such
plants, such as the fruit, blossom, leaves, stems, tubers or roots, while some of the parts of
the plants which grow later are also protected against those pests.

Target crops are especially cereals, such as wheat, barley, rye, oats, rice, maize and
sorghum; beet, such as sugar beet and fodder beet; fruit, such as pomes, stone fruit and
soft fruit, such as apples, pears, plums, peaches, almonds, cherries, or berries, for example
strawberries, raspberries or blackberries; leguminous plants, such as beans, lentils, peas
and soybeans; oil plants, such as rape, mustard, poppy, olives, sunflowers, coconut, castor
oil plants, cocoa beans and groundnuts; cucumber plants, such as marrows, cucumber and
melons; fibre plants, such as cotton, flax, hemp and jute; citrus fruit, such as oranges,
lemons, grapefruit and mandarins; vegetables, such as spinach, lettuce, asparagus,
cabbages, carrots, onions, tomatoes, potatoes and paprika; lauraceae, such as avocados,
cinnamon and camphor; and tobacco, nuts, coffee, aubergines, sugar cane, tea, pepper, vines, hops, bananas and natural rubber plants, as well as ornamentals.

The compounds of the invention are suitable especially for controlling Anthonomus grandis, Aphis craccivora, Diabrotica balteata, Heliothis virescens, Nilaparvata lugens, Spodoptera littoralis, Plutella xylostella and Myzus persicae in crops of cotton, vegetables, maize, rice and soybeans.

Further areas of use of the compounds according to the invention are the protection of stored goods and stocks and materials, and also in the hygiene sector, especially the protection of domestic animals and productive livestock against pests of the mentioned type.

The invention therefore relates also to pesticidal compositions, such as emulsifiable concentrates, suspension concentrates, directly sprayable or dilutable solutions, coatable pastes, dilute emulsions, wettable powders, soluble powders, dispersible powders, wettable powders, dusts, granules or encapsulations in polymer substances, comprising - at least - one of the compounds of the invention, the type of formulation being chosen in accordance with the intended objectives and prevailing circumstances.

The active ingredient is used in those compositions in pure form, a solid active ingredient, for example, in a specific particle size, or preferably together with - at least - one of the adjuvants customary in formulation technology, such as extenders, for example solvents or solid carriers, or surface-active compounds (surfactants), it being possible to use as active ingredient also an extract obtained during the preparation of a compound I and comprising at least one compound of formula I, for example a crude extract or a concentrated extract in accordance with Example P1 below.

Suitable solvents are, for example: optionally partially hydrogenated aromatic hydrocarbons, preferably the fractions of alkylbenzenes containing 8 to 12 carbon atoms, 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 or ethylene glycol monomethyl or 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, vegetable oils or epoxidised vegetable oils, such as rape oil, castor oil, coconut oil or soybean oil or epoxidised rape oil, castor oil, coconut oil or soybean oil, and silicone oils.

The solid carriers used, e.g. for dusts and dispersible powders, are normally natural mineral fillers such as calcite, talcum, kaolin, montmorillonite or attapulgite. In order to improve the physical properties it is also possible to add highly dispersed silicic acids or highly dispersed absorbent polymers. Suitable granulated adsorptive carriers are porous types, such as pumice, broken brick, sepiolite or bentonite; and suitable nonsorbent carriers are calcite or sand. In addition, a great number of granulated materials of inorganic or organic nature can be used, especially dolomite or pulverised plant residues.

Depending on the nature of the compound to be formulated, suitable surface-active compounds are non-ionic, cationic and/or anionic surfactants or mixtures of surfactants having good emulsifying, dispersing and wetting properties. The surfactants listed below are to be regarded merely as examples; many more surfactants customarily employed in formulation technology and suitable for use according to the invention are described in the relevant literature.

Non-ionic surfactants are preferably polyglycol ether derivatives of aliphatic or cycloaliphatic alcohols, saturated or unsaturated fatty acids and alkylphenols, said derivatives containing 3 to 30 glycol ether groups and 8 to 20 carbon atoms in the (aliphatic) hydrocarbon moiety and 6 to 18 carbon atoms in the alkyl moiety of the alkylphenols. Further suitable non-ionic surfactants are water-soluble adducts of polyethylene oxide with polypropylene glycol, ethylenediaminopolypropylene glycol and alkylpolypropylene glycol containing 1 to 10 carbon atoms in the alkyl chain, which adducts contain 20 to 250 ethylene glycol ether groups and 10 to 100 propylene glycol ether groups. These compounds usually contain 1 to 5 ethylene glycol units per propylene glycol unit. Representative examples of non-ionic surfactants are nonylphenol polyethoxylated, castor oil polyglycol ethers, polypropylene/polyethylene oxide adducts, tributylphenoxypolyethoxyethanol, polyethylene glycol and octyphenoxypolyethoxyethanol. Fatty acid esters of polyoxyethylene sorbitan, e.g. polyoxyethylene sorbitan trioleate, are also suitable non-ionic surfactants.

Cationic surfactants are preferably quaternary ammonium salts which contain, as substituent, at least one C8-C22 alkyl radical and, as further substituents, unsubstituted or
halogenated lower alkyl, benzyl or hydroxy-lower alkyl radicals. The salts are preferably in the form of halides, methyl sulfates or ethyl sulfates. Examples are stearyltrimethylammonium chloride and benzyldi(2-chloroethyl)ethylammonium bromide.

Both water-soluble soaps and water-soluble synthetic surface-active compounds are suitable anionic surfactants. Suitable soaps are the alkali metal salts, alkaline earth metal salts or unsubstituted or substituted ammonium salts of higher fatty acids (C\textsubscript{10}-C\textsubscript{22}), e.g. the sodium or potassium salts of oleic or stearic acid or of natural fatty acid mixtures which can be obtained e.g. from coconut oil or tall oil; mention may also be made of fatty acid methyltaurin salts. More frequently, however, so-called synthetic surfactants are used, especially fatty sulfonates, fatty sulfates, sulfonated benzimidazole derivatives or alkylarylsulfonates. The fatty sulfonates or sulfates are usually in the form of alkali metal salts, alkaline earth metal salts or unsubstituted or substituted ammonium salts and generally contain a C\textsubscript{8}-C\textsubscript{22} alkyl radical, which also includes the alkyl moiety of acyl radicals; there may be mentioned by way of example the sodium or calcium salt of lignosulfonic acid, or dodecyl sulfate or of a mixture of fatty alcohol sulfates obtained from natural fatty acids. These compounds also comprise the salts of sulfated and sulfonated fatty alcohol/ethylene oxide adducts. The sulfonated benzimidazole derivatives preferably contain 2 sulfonic acid groups and one fatty acid radical containing approximately 8 to 22 carbon atoms. Examples of alkylarylsulfonates are the sodium, calcium or triethanolammonium salts of dodecylbenzenesulfonic acid, dibutynaphthalenesulfonic acid or of a condensate of naphthalenesulfonic acid and formaldehyde. Also suitable are corresponding phosphates, e.g. salts of the phosphoric acid ester of an adduct of p-nonylphenol with 4 to 14 mol of ethylene oxide, or phospholipids.

The compositions usually comprise 0.1 to 99 %, preferably 0.1 to 95 %, of active ingredient, and 1 to 99.9 %, preferably 5 to 99.9 %, of - at least - one solid or liquid adjuvant, it generally being possible for 0 to 25 %, preferably 0.1 to 20 %, of the composition to be surfactants (in each case percentages are by weight). Whereas commercial products will preferably be formulated as concentrates, the end user will normally employ dilute formulations which have considerably lower active ingredient concentrations. Preferred formulations have especially the following composition (throughout, percentages are 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 %

The activity of the compositions according to the invention can be substantially broadened and adapted to prevailing circumstances by the addition of other insecticidal or acaricidal active ingredients. Examples of suitable additional insecticidal or acaricidal active ingredients include representatives of the following classes of compounds: organophosphorus compounds, nitrophenols and derivatives, formamidines, acylureas, carbamates, pyrethroids, nitroenamines and derivatives, pyrroles, thioureas and derivatives, chlorinated hydrocarbons, and Bacillus thuringiensis preparations. The compositions according to the invention may also comprise further solid or liquid adjuvants, such as stabilisers, for example vegetable oils or epoxidised vegetable oils (e.g. epoxidised coconut oil, rape oil or soybean oil), antifoams, for example silicone oil, preservatives, viscosity regulators, binders and/or tackifiers, as well as fertilisers or other active ingredients for obtaining special effects, for example bactericides, fungicides, nematicides, molluscicides or selective herbicides.
The compositions according to the invention are prepared in known manner, in the absence of adjuvants, for example by grinding, sieving and/or compressing a solid active ingredient or mixture of active ingredients, for example to a specific particle size, and in the presence of at least one adjuvant, for example by intimately mixing and/or grinding the active ingredient or mixture of active ingredients with the adjuvant(s). The invention relates also to those processes for the preparation of the compositions according to the invention and to the use of the compounds I for the preparation of those compositions.

The invention relates also to the methods of application of the compositions, i.e. the methods of controlling pests of the mentioned type, such as spraying, atomising, dusting, coating, dressing, scattering or pouring, which are selected in accordance with the intended objectives and prevailing circumstances, and to the use of the compositions for controlling pests of the mentioned type. Typical rates of concentration are from 0.1 to 1000 ppm, preferably from 0.1 to 500 ppm, of active ingredient. The rates of application per hectare are generally from 1 to 2000 g of active ingredient per hectare, especially from 10 to 1000 g/ha, preferably from 20 to 600 g/ha.

A preferred method of application in the area of plant protection is application to the foliage of the plants (foliar application), the number of applications and the rate of application depending on the risk of infestation by the pest in question. However, the active ingredient can also penetrate the plants through the roots (systemic action) if the locus of the plants is impregnated with a liquid formulation or if the active ingredient is incorporated in solid form into the locus of the plants, for example into the soil, e.g. in granular form (soil application). In paddy rice crops, such granules may be applied in metered amounts to the flooded rice field.

The compositions according to the invention are also suitable for protecting plant propagation material, e.g. seed material, such as fruit, tubers or grains, or plant cuttings, from animal pests. The propagation material can be treated with the formulation before planting: seed, for example, can be dressed before being sown. The compounds of the invention can also be applied to grains (coating), either by impregnating the grains with a liquid formulation or by coating them with a solid formulation. The formulation can also be applied to the planting site when the propagation material is being planted, for example to the seed furrow during sowing. The invention relates also to those methods of treating plant propagation material and to the plant propagation material thus treated.
The Examples that follow serve to illustrate the invention. They do not limit the invention. Temperatures are given in degrees Celsius.

**Preparation example**

*Example P1:* 2,3,3a,9b-tetrahydro-1,9b-dihydroxy-9-methoxy-3a-(4-methoxyphenyl)-N,N-dimethyl-3-phenyl-1H-cyclopenta[1',2':2,3]furo[4,5-f]benzodioxole-2-carboxamide ("Aglaroxin A"),
2,3,3a,9b-tetrahydro-1,9b-dihydroxy-3a-(3,4-dimethoxyphenyl)-9-methoxy-N,N-dimethyl-3-phenyl-1H-cyclopenta[1',2':2,3]furo[4,5-f]benzodioxole-2-carboxamide ("Aglaroxin B"),
1,2,3,6,6a,12b-hexahydro-12b-hydroxy-12-methoxy-6a-(4-methoxyphenyl)-6-phenyl-4H-1,3-dioxolo[4',5':5,6']benzofurano[3',2':1,2]cyclopenta[5,4-d]pyrrolo[1,2-a]-pyrimidin-5-one ("Aglaroxin C") and
9,11-dimethoxy-11b-hydroxy-6a-(4-methoxyphenyl)-1,2,3,12,12a-pentahydro-6-phenyl-4H,12H-benzofurano[3',2':1,2]cyclopenta[5,4-d]pyrrolo[1,2-a]pyrimidin-5-one ("Aglaroxin D")

22 kg of bark from Aglaia roxburghiana (Meliaceae) are finely ground and stirred at room temperature with dichloromethane/methanol (1:1) for 10 hours. After filtration through diatomaceous earth the filtrate is concentrated by evaporation *in vacuo* at room temperature. 360 g of crude extract are obtained. The extract is purified further over silica gel in a Büchner funnel with a dichloromethane/methanol gradient. 21 g of concentrated extract remain; after medium-pressure chromatography on silica gel with ethyl acetate/dichloromethane (1:1, with methanol gradient), subsequent flash chromatography on silica gel first with 15 % hexane in ethyl acetate, followed by 10 % toluene in ethyl acetate, and concentration by evaporation, 500 mg of greyish-white powder and 100 mg of a relatively apolar secondary fraction remain. Further separation of the relatively apolar secondary fraction by means of high-pressure chromatography on RP silica gel with a water/acetonitrile gradient yields 68 mg of pure Aglaroxin A. Separation of the main fraction using identical separating conditions yields 186 mg of Aglaroxin B, 117 mg of Aglaroxin C, 11 mg of Aglaroxin D and 78 mg of Rocaglamide.
Physical data:
(Definition of the abbreviations: s=singlet, d=doublet, t=triplet, q=quadruplet)

**Aglaroxin A:**

![Aglaroxin A structure](image)

UV (acetonitrile): $\lambda_{\text{max}}$(nm)(\(\epsilon\))=298 (4000).

$^{13}$C-NMR (CDCl$_3$, 75 MHz): \(\delta=170.0\) s, 158.7 s, 154.6 s, 152.1 s, 140.0 s, 137.6 s, 130.1 s, 128.9 d, 127.83 d, 127.79 d, 127.2 s, 126.4 d, 112.8 d, 110.1 s, 101.6 s, 101.2 t, 94.6 s, 88.3 d, 78.5 d, 59.9 q, 56.4 d, 55.1 q, 47.3 d, 37.2 q, 35.9 q.

FD-MS (benzonitrile-activated tungsten emitter, approx. 15 mA BAT): m/z=519 (M$^+$).

(HR-FAB)-MS (thioglycerol matrix, resolution 10 000): [C$_{29}$H$_{29}$NO$_8$+H] calculated 520.1912, found 520.1983.

**Aglaroxin B:**

![Aglaroxin B structure](image)

UV (acetonitrile): $\lambda_{\text{max}}$(nm)(\(\epsilon\))=205 (11200), 287 (4200), 297 (3700).

$^{13}$C-NMR (CDCl$_3$, 75 MHz): \(\delta=169.7\) s, 154.4 s, 152.1 s, 148.2 s, 148.0 s, 139.9 s, 137.6 s, 130.2 s, 127.8 d, 127.7 d, 127.4 s, 126.5 d, 120.0 d, 112.0 d, 110.4 s, 109.8 d, 101.3 s, 101.2 t, 94.6 s, 88.4 d, 78.6 d, 59.9 q, 56.2 d, 55.8 q, 55.7 q, 47.2 d, 37.0 q, 35.8 q.

FD-MS (benzonitrile-activated tungsten emitter, approx. 15 mA BAT): m/z=549 (M$^+$).
Aglaroxin C:

UV (acetonitrile): $\lambda_{\text{max}}$(nm)($\varepsilon$)=274 (9600).

$^{13}$C-NMR (CDCl$_3$, 75 MHz): $\delta$=166.3 s, 166.2 s, 159.1 s, 158.6 s, 154.2 s, 151.3 s, 140.8 s, 137.0 s, 130.7 s, 129.3 d, 129.0 d, 127.8 d, 127.0 s, 126.8 d, 122.1 s, 112.2 d, 110.2 s, 103.2 s, 101.1 t, 90.9 s, 88.3 d, 59.9 q, 57.0 d, 55.0 q, 46.7 t, 32.8 t, 19.6 t.

FD-MS (benzonitrile-activated tungsten emitter, approx. 15 mA BAT): m/z=538 (M$^+$).

Aglaroxin D:

UV (acetonitrile): $\lambda_{\text{max}}$(nm)($\varepsilon$)=280 (7900).

$^1$H-NMR (CDCl$_3$, 500 MHz): $\delta$= 7.14, 7.11, 7.03, 6.96, 6.60, 6.29, 6.10, 5.26, 5.24, 4.61, 3.85, 3.84, 3.68, 3.65, 3.52, 2.49, 2.04.

FD-MS (benzonitrile-activated tungsten emitter, approx. 15 mA BAT): m/z=526 (M$^+$).
Formulation examples (throughout, percentages are by weight)

**Example F1: Emulsifiable concentrates**

<table>
<thead>
<tr>
<th>Active Ingredient</th>
<th>a)</th>
<th>b)</th>
<th>c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>active ingredient</td>
<td>25</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>calcium dodecylbenzenesulfonate</td>
<td>5</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>castor oil polyethylene glycol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ether (36 mol of ethylene oxide)</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tributylphenol polyethylene glycol</td>
<td></td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>ether (30 mol of ethylene oxide)</td>
<td></td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>cyclohexanone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xylene mixture</td>
<td>65</td>
<td>25</td>
<td>20</td>
</tr>
</tbody>
</table>

The finely ground active ingredient is mixed with the adjuvants to give an emulsifiable concentrate from which emulsions of any desired concentration can be prepared by dilution with water.

**Example F2: Solutions**

<table>
<thead>
<tr>
<th>Active Ingredient</th>
<th>a)</th>
<th>b)</th>
<th>c)</th>
<th>d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>active ingredient</td>
<td>80</td>
<td>10</td>
<td>5</td>
<td>95</td>
</tr>
<tr>
<td>ethylene glycol monomethyl ether</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>polyethylene glycol (mol. wt. 400)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N-methylpyrrolid-2-one</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>epoxidised coconut oil</td>
<td></td>
<td></td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>petroleum fraction (boiling range 160-190°)</td>
<td></td>
<td></td>
<td>94</td>
<td></td>
</tr>
</tbody>
</table>

The finely ground active ingredient is mixed with the adjuvants to give a solution that is suitable for application in the form of micro-drops.

**Example F3: Granules**

<table>
<thead>
<tr>
<th>Active Ingredient</th>
<th>a)</th>
<th>b)</th>
<th>c)</th>
<th>d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>active ingredient</td>
<td>5</td>
<td>10</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>kaolin</td>
<td>94</td>
<td></td>
<td>79</td>
<td>54</td>
</tr>
<tr>
<td>highly dispersed silicic acid</td>
<td>1</td>
<td></td>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>attapulgite</td>
<td></td>
<td>90</td>
<td></td>
<td>18</td>
</tr>
</tbody>
</table>
The active ingredient is dissolved in dichloromethane, the solution is sprayed onto the carrier mixture, and the solvent is evaporated off in vacuo.

**Example F4: Dusts**

<table>
<thead>
<tr>
<th></th>
<th>a)</th>
<th>b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>active ingredient</td>
<td>2 %</td>
<td>5 %</td>
</tr>
<tr>
<td>highly dispersed silicic acid</td>
<td>1 %</td>
<td>5 %</td>
</tr>
<tr>
<td>talcum</td>
<td>97 %</td>
<td>-</td>
</tr>
<tr>
<td>kaolin</td>
<td>-</td>
<td>90 %</td>
</tr>
</tbody>
</table>

The active ingredient is mixed with the carriers to give ready-for-use dusts.

**Example F5: Wettable powders**

<table>
<thead>
<tr>
<th></th>
<th>a)</th>
<th>b)</th>
<th>c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>active ingredient</td>
<td>25 %</td>
<td>50 %</td>
<td>75 %</td>
</tr>
<tr>
<td>sodium lignosulfonate</td>
<td>5 %</td>
<td>5 %</td>
<td>-</td>
</tr>
<tr>
<td>sodium lauryl sulfate</td>
<td>3 %</td>
<td>-</td>
<td>5 %</td>
</tr>
<tr>
<td>sodium diisobutylinaphthalene-sulfonate</td>
<td>-</td>
<td>6 %</td>
<td>10 %</td>
</tr>
<tr>
<td>octylphenol polyethylene glycol ether (7-8 mol of ethylene oxide)</td>
<td>-</td>
<td>2 %</td>
<td>-</td>
</tr>
<tr>
<td>highly dispersed silicic acid</td>
<td>5 %</td>
<td>10 %</td>
<td>10 %</td>
</tr>
<tr>
<td>kaolin</td>
<td>62 %</td>
<td>27 %</td>
<td>-</td>
</tr>
</tbody>
</table>

The active ingredient is mixed with the adjuvants and the mixture is ground in a suitable mill, affording wettable powders which can be diluted with water to give suspensions of the desired concentration.

**Example F6: Emulsifiable concentrate**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>active ingredient</td>
<td>10 %</td>
</tr>
<tr>
<td>octylphenol polyethylene glycol ether (4-5 mol of ethylene oxide)</td>
<td>3 %</td>
</tr>
<tr>
<td>calcium dodecybenzenesulfonate</td>
<td>3 %</td>
</tr>
<tr>
<td>castor oil polyethylene glycol ether (36 mol of ethylene oxide)</td>
<td>4 %</td>
</tr>
<tr>
<td>cyclohexanone</td>
<td>30 %</td>
</tr>
<tr>
<td>xylene mixture</td>
<td>50 %</td>
</tr>
</tbody>
</table>
The finely ground active ingredient is mixed with the adjuvants to give an emulsifiable concentrate from which emulsions of any required concentration can be obtained by dilution with water.

**Example F7: Dusts**

<table>
<thead>
<tr>
<th></th>
<th>a)</th>
<th>b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>active ingredient</td>
<td>5 %</td>
<td>8 %</td>
</tr>
<tr>
<td>talcum</td>
<td>95 %</td>
<td>-</td>
</tr>
<tr>
<td>kaolin</td>
<td></td>
<td>92 %</td>
</tr>
</tbody>
</table>

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

**Example F8: Extruder granules**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>active ingredient</td>
<td>10 %</td>
</tr>
<tr>
<td>sodium lignosulfonate</td>
<td>2 %</td>
</tr>
<tr>
<td>carboxymethylcellulose</td>
<td>1 %</td>
</tr>
<tr>
<td>kaolin</td>
<td>87 %</td>
</tr>
</tbody>
</table>

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

**Example F9: Coated granules**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>active ingredient</td>
<td>3 %</td>
</tr>
<tr>
<td>polyethylene glycol (mol. wt. 200)</td>
<td>3 %</td>
</tr>
<tr>
<td>kaolin</td>
<td>94 %</td>
</tr>
</tbody>
</table>

The finely ground active ingredient is uniformly applied, in a mixer, to the kaolin moistened with polyethylene glycol to give non-dusty coated granules.

**Example F10: Suspension concentrate**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>active ingredient</td>
<td>40 %</td>
</tr>
<tr>
<td>ethylene glycol</td>
<td>10 %</td>
</tr>
<tr>
<td>nonylphenol polyethylene glycol ether (15 mol of ethylene oxide)</td>
<td>6 %</td>
</tr>
</tbody>
</table>
sodium lignosulfonate 10 %
carboxymethylcellulose 1 %
aqueous formaldehyde solution (37 %) 0.2 %
aqueous silicone oil emulsion (75 %) 0.8 %
water 32 %

The finely ground active ingredient is mixed with the adjuvants, giving a suspension concentrate from which suspensions of any desired concentration can be obtained by dilution with water.

Biological Examples

Example B1: Action against Diabrotica balteata larvae
Maize seedlings are sprayed with an aqueous emulsion comprising 12 ppm of test compound. After the spray coating has dried, the maize seedlings are populated with 10 Diabrotica balteata larvae in the second stage and placed in a plastics container. Evaluation is made 6 days later. The percentage reduction in the population (% activity) is determined by comparing the number of dead larvae on the treated plants with that on untreated plants.
The compounds of formula I exhibit good activity in this test. In particular, Aglaroxin A is 100 % effective, while Aglaroxin D is still 80 % effective.

Example B2: Action against Spodoptera littoralis caterpillars
Young soybean plants are sprayed with an aqueous emulsion comprising 12 ppm of test compound. After the spray coating has dried, the soybean plants are populated with 10 Spodoptera littoralis caterpillars in the third stage and placed in a plastics container. Evaluation is made 3 days later. The percentage reduction in the population or the percentage reduction in feeding damage (% activity) is determined by comparing the number of dead caterpillars and the feeding damage on the treated plants with that on untreated plants.
The compounds of formula I exhibit good activity in this test. In particular, Aglaroxin A and D are 100 % effective, while Aglaroxin B and C are still 80 % effective.

Example B3: Action against Plutella xylostella caterpillars
Young cabbage plants are sprayed with an aqueous emulsion comprising 12 ppm of test compound. After the spray coating has dried, the cabbage plants are populated with
10 Plutella xylostella caterpillars in the third stage and placed in a plastics container. Evaluation is made 3 days later. The percentage reduction in the population or the percentage reduction in feeding damage (% activity) is determined by comparing the number of dead caterpillars and the feeding damage on the treated plants with that on untreated plants.

In this test Aglaroxins A, B, C and D are 100 % effective.

**Example B4: Action against Heliothis virescens (ovicidal/larvicidal)**

Egg deposits of Heliothis virescens on cotton wool are sprayed with an aqueous emulsion comprising 3 ppm of test compound. After 8 days, the percentage of eggs which have hatched and the survival rates of the caterpillars are evaluated in comparison with untreated control batches (% reduction in the population).

In this test Aglaroxins A, B and C are 100 % effective.

**Example B5: Action against Heliothis virescens**

Young soybean plants are sprayed with an aqueous emulsion comprising 50 ppm of test compound. After the spray coating has dried, the plants are populated with 10 Heliothis virescens caterpillars in the first stage and placed in a plastics container. Evaluation is made 6 days later. The percentage reduction in the population or the percentage reduction in feeding damage (% activity) is determined by comparing the number of dead caterpillars and the feeding damage on the treated plants with that on untreated plants.

The Aglaroxins exhibit good activity in this test. Aglaroxins A, B and C are 100 % effective, while Aglaroxin D is still 70 % effective.

**Example B6: Action against Anthonomus grandis**

Young cotton plants are sprayed with an aqueous emulsion comprising 100 ppm of test compound. After the spray coating has dried, the plants are populated with 10 Anthonomus grandis adults and placed in a plastics container. Evaluation is made 3 days later. The percentage reduction in the population or the percentage reduction in feeding damage (% activity) is determined by comparing the number of dead beetles and the feeding damage on the treated plants with that on untreated plants.

In this test Aglaroxins B and C are 100 % effective.

**Example B7: Action against Myzus persicae (systemic)**

Pea seedlings are infested with Myzus persicae and then placed with their roots in a spray mixture comprising 12 ppm of test compound and incubated at 20°. Evaluation is made 3
and 6 days later. The percentage reduction in the population (% activity) is determined by comparing the number of dead aphids on the treated plants with that on untreated plants. The Aglaroxins exhibit good activity in this test. In particular, Aglaroxin A is 100 % effective.

**Example B8: Action against Nilaparvata lugens (systemic)**
Pots containing rice plants are placed in an aqueous emulsion comprising 100 ppm of test compound. The plants are then populated with larvae in the second and third stages. Evaluation is made 6 days later. The percentage reduction in the population (% activity) is determined by comparing the number of plant hoppers on the treated plants with that on untreated plants. The Aglaroxins exhibit good activity in this test. In particular, Aglaroxin A is 100 % effective.
What is claimed is:

1. A compound of formula

   \[ \text{structure image} \]  

   wherein either

   R₁ is hydrogen or methoxy, R₂ and R₃ together are a group of the formula

   \[ \text{structure image} \]  

   (Ia) and R₄ and R₅ together are a group of the formula -OCH₂O-

   or R₁ is hydrogen, R₂ and R₃ together are a group of the formula

   \[ \text{structure image} \]  

   (Ib) and

   R₄ and R₅ together are a group of the formula -OCH₂O-

   or R₁ and R₄ are hydrogen, R₅ is methoxy and R₂ and R₃ together are a group of the

   \[ \text{structure image} \]  

   (Ic),

   wherein the carbon atom designated c in each of the groups of formulae Ia, Ib and Ic is

   bonded to the carbon atom designated a in formula I and the carbon atom designated d in

   each of the groups of formulae Ia, Ib and Ic is bonded to the carbon atom designated b in

   formula I,

   in free form or in salt form.

2. A compound according to claim 1 of formula I in free form.

3. A compound according to claim 1 of formula I wherein
either \( R_1 \) is hydrogen or methoxy, \( R_2 \) and \( R_3 \) together are a group of the formula

\[
\text{HO} \quad \text{CON}(\text{CH}_3)_2 \quad \text{(Ia)}
\]

and \( R_4 \) and \( R_5 \) together are a group of the formula \(-\text{OCH}_2\text{O}-\)

or \( R_1 \) is hydrogen, \( R_2 \) and \( R_3 \) together are a group of the formula \( \text{(Ib)} \)

\[
\text{c} \quad \text{N} \quad \text{c} \quad \text{d}
\]

\( R_4 \) and \( R_5 \) together are a group of the formula \(-\text{OCH}_2\text{O}-\), wherein the carbon atom designated \( c \) in each of the groups of formulae Ia and Ib is bonded to the carbon atom designated \( a \) in formula I and the carbon atom designated \( d \) in each of the groups of formulae Ia and Ib is bonded to the carbon atom designated \( b \) in formula I.

4. A compound according to claim 1 of the formula

![Image of compound 1](image)

5. A compound according to claim 1 of the formula

![Image of compound 2](image)

6. A compound according to claim 1 of the formula

![Image of compound 3](image)
7. A compound according to claim 1 of the formula

8. A process for the preparation of a compound according to claim 1 of formula I, in free form or in salt form, which process comprises extracting parts of Aglaia roxburghiana plants, working up the extract, isolating the compounds of formula I in free form and, if desired, converting a compound of formula I in free form thus obtainable into a salt and, if desired, converting a salt of a compound of formula I thus obtainable into a different salt or into the free compound of formula I.

9. A process according to claim 8, which comprises extracting roots, blossom, fruit, leaves, twigs, seed or bark of Aglaia roxburghiana.

10. A process according to claim 8, which comprises extracting bark of Aglaia roxburghiana.

11. A process according to claim 8, which comprises carrying out the extraction with water, an aromatic, aliphatic or alicyclic hydrocarbon or halogenated hydrocarbon, an ester, an ether, a ketone or an alcohol, or with a mixture of two or more of those extraction solvents.
12. A process according to claim 11, which comprises carrying out the extraction with a halogenated hydrocarbon or an alcohol or with a mixture thereof.

13. A process according to claim 12, which comprises carrying out the extraction with a mixture of dichloromethane and methanol.

14. A process according to claim 8, which comprises carrying out the extraction in a temperature range of from approximately 0°C to the boiling point of the extraction solvent or solvents.

15. A process according to claim 14, which comprises carrying out the extraction in a temperature range of from approximately room temperature to approximately 60°C.

16. A process according to claim 15, which comprises carrying out the extraction at room temperature.

17. A process according to claim 8, which comprises working up the extract and isolating the compound of formula I in free form by filtration, chromatographic separation and/or crystallisation.

18. A pesticidal composition, which comprises as active ingredient at least one compound according to claim 1 of formula I, in free form or in agrochemically acceptable salt form, and at least one adjuvant.

19. A composition according to claim 18 for controlling insects or representatives of the order Acarina.

20. A composition according to claim 18, which comprises as active ingredient an extract that is obtained in the preparation of a compound of formula I and that comprises at least one compound of formula I.

21. A composition according to claim 18, which comprises plant propagation material as adjuvant.

22. A process for the preparation of a composition according to claim 18, which comprises intimately mixing and/or grinding the active ingredient with the adjuvant or adjuvants.
23. The use of a compound according to claim 1 of formula I, in free form or in agrochemically acceptable salt form, for the preparation of a composition according to claim 18.

24. The use of a composition according to claim 18 in the control of pests.

25. The use according to claim 24 in the protection of plant propagation material.

26. A method of controlling pests, which comprises applying a composition according to claim 18 to the pests or to the habitat thereof.

27. A method according to claim 26 of protecting plant propagation material against pests, which method comprises treating the propagation material or the site of planting of the propagation material.

28. Plant propagation material treated in accordance with the method described in claim 27.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 C07D/493/04 C07D491/147 C07D491/22 A01N43/90

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)

IPC 6 C07D A01N

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
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<tbody>
<tr>
<td>X</td>
<td>JOURNAL OF THE CHEMICAL SOCIETY, CHEMICAL COMMUNICATIONS., no. 6, 21 March 1994, LETCHWORTH GB pages 773 - 774 U. KOKPOL ET AL 'Isolation and X-ray structure determination of a novel pyrimidinone from Aglaia odorata' see page 773 ---</td>
<td>1</td>
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<tr>
<td>X</td>
<td>PHYTOCHEMISTRY, vol. 32, no. 2, 1993 pages 307 - 310 F. ISHIBASHI ET AL 'Insecticidal 1H-cyclopentatetrahydro(b)benzofurans from Aglaia odorata' see page 307 ---</td>
<td>1, 18, 19</td>
</tr>
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Further documents are listed in the continuation of box C.

Special categories of cited documents:

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'&': document member of the same patent family

Date of the actual completion of the international search

11 October 1995

Date of mailing of the international search report

17.10.1995

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HJ Rijswijk Tel: (+31-70) 340-2040, Tx: 31-651 epo nl, Fax: (+31-70) 340-3016

Authorized officer

Voyiazoglou, D

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<tr>
<td>X</td>
<td>JOURNAL OF THE CHEMICAL SOCIETY, PERKIN TRANSACTIONS 1, no. 20, 1992, LETCHWORTH GB pages 2657 - 2666 A. E. DAVEY ET AL 'Synthesis of the novel anti-leukemic tetrohydrocyclopenta(b)benzofuran rocaglamide and related synthetic studies' see page 2661</td>
<td>1</td>
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