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(54) Titre : LUTTE CONTRE ELASMOPALPUS
(54) Title: CONTROL OF ELASMOPALPUS

(57) Abrégé/Abstract:
A method of protecting a plant propagation material and a plant, part of a plant and/or plant organ that grows at a later point in time against damage by Elasmopalpus applying to the plant propagation material a composition comprising abamectin.

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(54) Title: CONTROL OF ELASMOPALPUS

(57) Abstract: A method of protecting a plant propagation material and a plant, part of a plant and/or plant organ that grows at a later point in time against damage by Elasmopalpus applying to the plant propagation material a composition comprising abamectin.

Control of Elasmopalpus

The present invention relates to the use of abamectin for control of damage caused by *Elasmopalpus*, such as *Elasmopalpus lignosellus.*

The lesser cornstalk borer, *Elasmopalpus lignosellus*, was described by Zeller in 1848, but it was not considered of economic importance until 1881 (Riley 1882). It is a pest of several economically important crops.

The management of this pest is regularly achieved by insecticides applied in a granular formulation in the seed furrow or in a band over the seed bed. Liquid formulations can also be applied, but it is important that they be directed to the root zone. Modified planting practices have long been used to minimize crop loss. Populations tend to increase over the course of a season, so some damage can be avoided by early planting. Tillage and destruction of weeds are recommended prior to planting because this helps to destroy larvae that may be present in the soil and might damage seedlings, the stage most susceptible to destruction. However, crop culture that uses conservation tillage (i.e., retention of crop residue at the soil surface) experiences less injury from lesser cornstalk borer feeding because the larvae feed freely on crop residue and other organic matter, sparing the young crop plants. CROPSTAR® (imidacloprid and thiodicarb) and STANDAK® (fipronil) are generally applied in corn and soy respectively for control of *Elasmopalpus lignosellus*.

It is now been found that treatment of plant propagation material, such as a seed, by a composition comprising abamectin reduces the damage caused by *Elasmopalpus*.

Accordingly, in a first aspect the present invention provides a method of protecting a plant propagation material and a plant, part of a plant and/or plant organ that grow at a later point in time against damage by Elasmopalpus applying to the plant propagation material a composition comprising abamectin.

In a second aspect the present invention provides a method of controlling or preventing by Elasmopalpus damage in a plant propagation material, and a plant, part of a plant and/or

plant organ that grow at a later point in time, which comprises applying applying to the plant propagation material a composition comprising abamectin.

The control of the damage caused by the pest leads to improvement in the growing characteristics of a plant; therefore, in a further aspect, the invention provide a method of improving the growing characterictics of a plant, which comprises applying to the plant propagation material a composition comprising abamectin.

Controlling, preventing or protecting and its inflections, within the context of the present invention, mean reducing any undesired effect, such as

- pest infestation or attack of, and
- pest damage on,

a plant, part of the plant or plant propagation material to such a level that an improvement is demonstrated.

The composition is preferably applied or treated on the plant propagation material before it is sown or planted. Suitable treament and application techniquires for abamectin containing compositions to plant propagation material, such as a seed, are known.

The composition defined in the first aspect particularly controls Elasmopalpus in its larval stage.

The larve damage young plants, which can cause gaps in the stand and/or distort the stem/stalk.

The improvement in the growing (or growth) characteristics of a plant can manifest in a number of different ways, but ultimately it results in a better product of the plant. It can, for example, manifest in improving the yield and/or vigour of the plant or quality of the harvested product from the plant, which improvement may not be connected to the control of pests.

As used herein the phrase "improving the yield" of a plant relates to an increase in the yield of a product of the plant by a measurable amount over the yield of the same product of the plant produced under the same conditions, but without the application of the subject

method. It is preferred that the yield be increased by at least about 0.5%, more preferred that the increase be at least about 1%, even more preferred is about 2%, and yet more preferred is about 4%, or more. Yield can be expressed in terms of an amount by weight or volume of a product of the plant on some basis. The basis can be expressed in terms of time, growing area, weight of plants produced, amount of a raw material used, or the like.

As used herein the phrase "improving the vigour" of a plant relates to an increase or improvement of the vigour rating, or the stand (the number of plants per unit of area), or the plant height, or the plant canopy, or the visual appearance (such as greener leaf colour), or the root rating, or emergence, or protein content, or increased tillering, or bigger leaf blade, or less dead basal leaves, or stronger tillers, or less fertilizer needed, or less seeds needed, or more productive tillers, or earlier flowering, or early grain maturity, or less plant verse (lodging), or increased shoot growth, or earlier germination, or any combination of these factors, or any other advantages familiar to a person skilled in the art, by a measurable or noticeable amount over the same factor of the plant produced under the same conditions, but without the application of the subject method.

When it is said that the present method is capable of "improving the yield and/or vigour" of a plant, the present method results in an increase in either the yield, as described above, or the vigor of the plant, as described above, or both the yield and the vigor of the plant.

The composition of the invention can be formulated for a particular use. Preferably, the composition is formulated for protecting propagation materials.

Further, in an embodiment the present invention relates to a method which comprises (i) treating a plant propagation material, such as a seed, with a composition as defined in the first aspect, and (ii) planting or sowing the treated propagation material, wherein the composition protects against pest damage (for example by Elasmopalpus, such as Elasmopalpus lignosellus, a nematode from the class Insecta, such as Meloidogyne spp. Heterodera spp. Pratylenchus spp.) of the treated plant propagation material, or part of plant, plant organ and/or plant grown from the treated propagation material.

Also, in an embodiment the present invention relates to a method which comprises (i) treating a plant propagation material, such as a seed, with a composition as defined in the first aspect, and (ii) planting or sowing the treated propagation material, and (iii) achieving protection against pest damage (for example by Elasmopalpus, such as Elasmopalpus lignosellus, a nematode from the class Insecta, such as Meloidogyne spp. Heterodera spp. Pratylenchus spp.) of the treated plant propagation material, or part of plant, plant organ and/or plant grown from the treated propagation material.

The term "plant propagation material" is understood to denote all the generative parts of the plant, such as seeds, which can be used for the multiplication of the latter and vegetative plant materials such as cuttings and tubers (for example, potatoes). Accordingly, as used herein, part of a plant includes propagation material. There may be mentioned, *e.g.*, the seeds (in the strict sense), roots, fruits, tubers, bulbs, rhizomes, parts of plants. Germinated plants and young plants, which are to be transplanted after germination or after emergence from the soil, may also be mentioned. These young plants may be protected before transplantation by a total or partial treatment by immersion.

Parts of plant and plant organs that grow at later point in time are any sections of a plant that develop from a plant propagation material, such as a seed. Parts of plant, plant organs, and plants can also benefit from the pest damage protection achieved by the application of a composition on to the plant propagation material. In an embodiment, certain parts of a plant and certain plant organs that grow at later point in time can also be considered as plant propagation material, which can themselves be applied (or treated) with the composition; and consequently, the plant, further parts of the plant and further plant organs that develop from the treated parts of plant and treated plant organs can also benefit from the pest damage protection achieved by the application of the composition on to the certain parts of plant and certain plant organs.

Methods for applying or treating pesticidal active ingredients and mixtures thereof on to plant propagation material, especially seeds, are known in the art, and include dressing, coating, pelleting and soaking application methods of the propagation material. Such methods are also applicable to the present invention. In a preferred embodiment, the composition defined in the first aspect is applied or treated on to the plant propagation material by a method such that the germination is not induced; generally seed soaking induces germination because the

moisture content of the resulting seed is too high. Accordingly, examples of suitable methods for applying (or treating) a plant propagation material, such as a seed, is seed dressing, seed coating or seed pelleting and alike.

It is preferred that the plant propagation material is a seed.

Although it is believed that the present method can be applied to a seed in any physiological state, it is preferred that the seed be in a sufficiently durable state that it incurs no damage during the treatment process. Typically, the seed would be a seed that had been harvested from the field; removed from the plant; and separated from any cob, stalk, outer husk, and surrounding pulp or other non-seed plant material. The seed would preferably also be biologically stable to the extent that the treatment would cause no biological damage to the seed. It is believed that the treatment can be applied to the seed at any time between harvest of the seed and sowing of the seed or during the sowing process (seed directed applications). The seed may also be primed either before or after the treatment.

Even distribution of ingredients in the composition and adherence thereof to the seeds is desired during propagation material treatment. Treatment could vary from a thin film (dressing) of the formulation containing the composition, for example, a mixture of active ingredient(s), on a plant propagation material, such as a seed, where the original size and/or shape are recognizable to an intermediary state (such as a coating) and then to a thicker film (such as pelleting with many layers of different materials (such as carriers, for example, clays; different formulations, such as of other active ingredients; polymers; and colourants) where the original shape and/or size of the seed is no longer recognisable.

An aspect of the present invention includes application of the composition onto the plant propagation material in a targeted fashion, including positioning the ingredients in the composition onto the entire plant propagation material or on only parts thereof, including on only a single side or a portion of a single side. One of ordinary skill in the art would understand these application methods from the description provided in EP 954 213 B1 and WO 06/112700.

The composition described herein can also be used to enhance the growth of a plant through treating, or applying, a composition according to the present on to a “pill” or a suitable

substrate and placing, or sowing, the treated pill, or substrate, next to a plant propagation material . Such techniques are known in the art, particularly in EP 1 124 414, WO 07/067042, and WO 07/067044.

Application of the composition described herein onto plant propagation material also includes protecting the plant propagation material treated with the composition of the present invention by placing one or more pesticide-containing particles next to a pesticide-treated seed, wherein the amount of pesticide is such that the pesticide-treated seed and the pesticide-containing particles together contain an Effective Dose of the pesticide and the pesticide dose contained in the pesticide-treated seed is less than or equal to the Maximal Non-Phytotoxic Dose of the pesticide. Such techniques are known in the art, particularly in WO 05/120226.

Application of the composition onto the seed also includes controlled release coatings on the seeds, wherein the ingredients of the composition are incorporated into materials that release the ingredients over time. Examples of controlled release seed treatment technologies are generally known in the art and include polymer films, waxes, or other seed coatings, wherein the ingredients may be incorporated into the controlled release material or applied between layers of materials, or both.

The seed treatment occurs to an unsown seed, and the term "unsown seed" is meant to include seed at any period between the harvest of the seed and the sowing of the seed in the ground for the purpose of germination and growth of the plant.

Treatment to an unsown seed is not meant to include those practices in which the active ingredient is applied to the soil but would include any application practice that would target the seed during the planting process.

Preferably, the treatment occurs before sowing of the seed so that the sown seed has been pre-treated with the composition. In particular, seed coating or seed pelleting are preferred in the treatment of the composition according to the invention. As a result of the treatment, the ingredients in the composition are adhered on to the seed and therefore available for pest control.

The treated seeds can be stored, handled, sowed and tilled in the same manner as any other active ingredient treated seed.

Examples of crops suitable for use in the present invention are: cereals, such as wheat, barley, rye, oats, rice, maize (fodder maize and sugar maize / sweet and field corn) or sorghum; beet, such as sugar or fodder beet; fruit, for example pomaceous fruit, stone fruit, tree nut or soft fruit, such as apples, pears, plums, peaches, bananas, almonds, walnuts, pistachios, cherries or berries, for example strawberries, raspberries or blackberries; leguminous crops, such as beans, lentils, peas or soya; oil crops, such as oilseed rape, mustard, poppies, olives, sunflowers, coconut, castor, cocoa or ground nuts; cucurbits, such as pumpkins, marrow, cucumbers or melons; fibre plants, such as cotton, flax, hemp or jute; citrus fruit, such as oranges, lemons, grapefruit or tangerines; vegetables, such as spinach, lettuce, asparagus, cabbages, iceberg, carrots, onions, tomatoes, paprika, potatoes or bell peppers; Lauraceae, such as avocado, Cinnamonium or camphor; and also tobacco, nuts, coffee, eggplants, sugarcane, tea, pepper, grapevines, hops, the plantain family, latex plants, lawn, turf, fodder grass, and ornamentals roses, chrysanthemums, carnation, gerberas, petunias, geranium/pelargoniums, pansies and impatiens; and shrubs, broad-leaved trees and evergreens, such as conifers. In particular, the composition is suitable for sugar cane, soybean, corn, sugar beet, cotton, coffee, citrus, cereals ,stone fruits (especially apple, pears, plums, peaches), tree nuts (especially almonds and pistachios), and vegetable crops. Especially suitable crops are corn, soybean, cereals including dry land rice and cotton.

Suitable target crops also include transgenic crop plants of the foregoing types. The transgenic crop plants used according to the invention are plants, or propagation material thereof, which are transformed by means of recombinant DNA technology in such a way that they are - for instance - capable of synthesizing selectively acting toxins as are known, for example, from toxin-producing invertebrates, especially of the phylum Arthropoda, as can be obtained from Bacillus thuringiensis strains; or as are known from plants, such as lectins; or in the alternative capable of expressing a herbicidal or fungicidal resistance. Examples of such toxins, or transgenic plants which are capable of synthesizing such toxins, have been disclosed, for example, in EP-A-0 374 753, WO 93/07278, WO 95/34656, EP-A-0 427 529 and EP-A-451 878 and are incorporated by reference in the present application.

The rates of application (use) of the composition vary, for example, according to type of use, type of crop, but is such that the abamectin is an effective amount to provide the desired enhanced action (such as pest control of at least Elasmopalpus, such as Elasmopalpus lignosellus) and can be determined by trials and routine experimentation known to one of ordinary skill in the art.

In an embodiment, abamectin is used at a rate 0.1 to 1 mg Active Ingredient/seed, preferably 0.2 to 0.8 mg AI/seed, especially 0.4 to 0.7 mg AI/seed.

A single pesticidal active ingredient may have activity in more than one area of pest control, for example, a pesticide may have fungicide, insecticide and nematicide activity. Specifically, aldicarb is known for insecticide, acaricide and nematicide activity, while metam is known for insecticide, herbicide, fungicide and nematicide activity, and thiabendazole and captan can provide nematicide and fungicide activity.

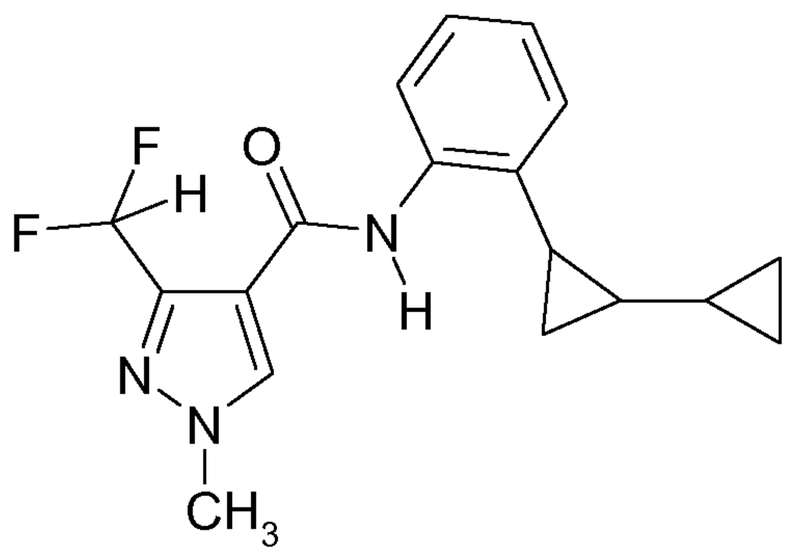
The abamectin containing composition of the present invention may be used alone or in combination with one or more other agents having pest control characteristics. Examples of such agents include pesticides (e.g. fungicide, insecticide, nematicide, bactericide, etc), biological agents (such as *Bacillus firmus* strain I-1582), and Harpin.

The abamectin containing composition of the present invention may also be used with agents that improve the growth of the crops, such as plant growth regulatory, plant growth activators, isoflavanones, and adjuvants (a substance which in itself doesn't show pesticidal activity but enhances the activity of the pesticide – usually crop oil concentrates and surfactants).

In an embodiment, the other agent is a pesticide.

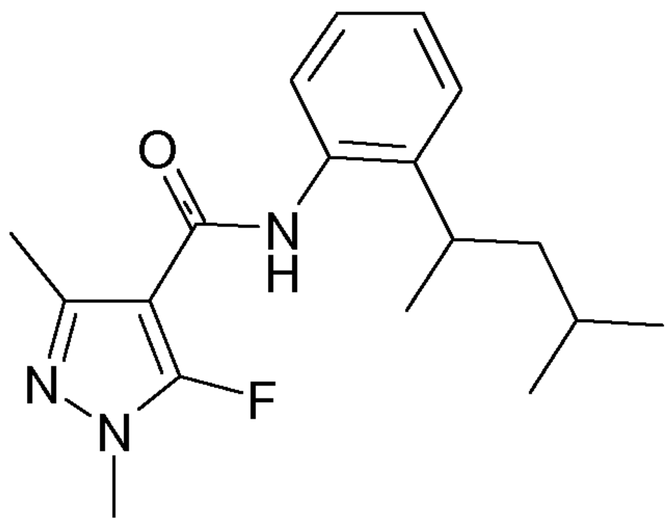
In the event one or more other pesticides are used in combination with the abamectin containing composition defined in the first aspect, the one or more other pesticides can be also applied or treated to the plant propagation material simultaneously, prior to, or in succession to, the abamectin-containing composition. In an embodiment, the abamectin-containing composition further comprises the one or more other agents having pest control characteristics.

Examples of pestcides include azoxystrobin, trifloxystrobin, fluoxastrobin, cyproconazole, difenoconazole, prothioconazole, tebuconazole, triticonazole, fludioxonil, thiabendazole, ipconazole, cyprodinil, myclobutanil, metalaxyl, metalaxyl-M (also known as mefenoxam), ortho-cyclopropyl-carboxanilide of formula (α), compound of formula (β), thiamethoxam, clothianidin, imidacloprid, abamectin, fipronil, pymetrozine, lambda-cyhalothrin, tefluthrin, beta-cyfluthrin, thiodicarb, compound of formula (δ), wherein compound (α) is



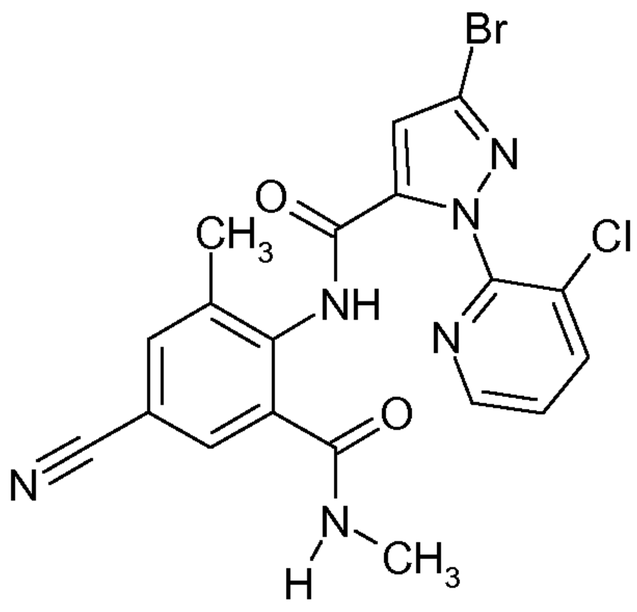
(α).

a compound (β) is



(β),

and compound (δ) is



(δ).

In an embodiment, preferred pesticides are azoxystrobin, fludioxonil, thiabendazole, metalaxyl, metalaxyl-M (also known as mefenoxam), ortho-cyclopropyl-carboxanilide of formula (α), thiamethoxam, clothianidin, imidacloprid, thiodicarb, fipronil, pymetrozine, thiodicarb and lambda-cyhalothrin.

Although abamectin and one or more other agents having pest control characteristics may be used either in pure form, i.e., as a solid active ingredient, for example, in a specific particle size, they are preferably used in the form of formulation comprising at least one of the auxiliary customary in formulation technology, such as extenders, *e.g.*, solvents or solid carriers, or surface-active compounds (surfactants) in the present invention.

In an embodiment, the abamectin containing composition and one or more other agents having pest control characteristics are applied as a composition. In an embodiment, the composition contains abamectin, one more oother agents having pest control characteristics, and one or more customary formulation auxiliarie, which composition may be in the form of a tank-mix or pre-mix composition. Preferably the composition is in the form of a pre-mix composition (or formulated product).

The weight ratio of abamectin to any other agents is selected as to give the desired, for example, synergistic action. In an embodiment, the weight ratio of abamectin to any agent is from 100:1 to 1:100, preferably 50:1 to 1:50, more preferably 1:1 to 1:50, especially 1:5 to 1:40, advantageously 1:7 to 1:40, such as 1:10 to 1:30.

The composition defined in the first aspect, as well as controlling Elasmopalpus, may control other pests selected from the class Insecta, Arachnida and Nematoda. Examples of such pests include:

from the order Lepidoptera, for example, Acleris spp., Adoxophyes spp., Aegeria spp., Agrotis spp., Alabama argillaceae, Amylois spp., Anticarsia gemmatalis, Archips spp., Argyrotaenia spp., Autographa spp., Busseola fusca, Cadra cautella, Carposina nipponensis, Chilo spp., Choristoneura spp., Clysia ambiguella, Cnaphalocrocis spp., Cnephasia spp., Cochylis spp., Coleophora spp., Crocidolomia spp., Cryptophlebia leucotreta, Crysodeixis includens, Cydia spp., Diatraea spp., Diparopsis castanea, Earias spp, Ephestia spp., Eucosma spp., Eupoecilia ambiguella, Euproctis spp., Euxoa spp., Grapholita spp., Hedya nubiferana, Heliothis spp., Hellula undalis, Hyphantria cunea, Keiferia lycopersicella, Leucoptera scitella, Lithocollethis spp., Lobesia botrana, Lymantria spp., Lyonetia spp., Malacosoma spp., Mamestra brassicae, Manduca sexta, Operophtera spp., Ostrinia nubilalis, Pammene spp., Pandemis spp., Panolis flammea, Pectinophora gossypiella, Phthorimaea operculella, Pieris rapae, Pieris spp., Plutella xylostella, Prays spp., Scirpophaga spp., Sesamia spp., Sparganothis spp., Spodoptera spp., Synanthedon spp., Thaumetopoea spp., Tortrix spp., Trichoplusia ni and Yponomeuta spp.;

from the order Coleoptera, for example, Agriotes spp., Anthonomus spp., Atomaria linearis, Ceutorhynchus spp., Chaetocnema tibialis, Cosmopolites spp., Curculio spp., Dermestes spp., Diabrotica spp., Epilachna spp., Eremnus spp., Gonocephalum spp., Heteronychus spp., Leptinotarsa decemlineata, Lissorhoptrus spp., Melolontha spp., Orycaephilus spp., Otiorhynchus spp., Phlyctinus spp., Phyllotreta spp., Popillia spp., Protostrophus spp., Psylliodes spp., Rhizopertha spp., Scarabeidae, Sitophilus spp., Sitotroga spp., Tenebrio spp., Tribolium spp. and Trogoderma spp.;

from the order Orthoptera, for example, Blatta spp., Blattella spp., Gryllotalpa spp., Leucophaea maderae, Locusta spp., Periplaneta spp. and Schistocerca spp.;

from the order Isoptera, for example, Reticulitermes spp.;

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

from the order Anoplura, for example, Haematopinus spp., Linognathus spp., Pediculus spp., Pemphigus spp. and Phylloxera spp.;

from the order Mallophaga, for example, Damalinea spp. and Trichodectes spp.;

from the order Thysanoptera, for example, Frankliniella spp., Hercinothrips spp., Taeniothrips spp., Thrips palmi, Thrips tabaci and Scirtothrips aurantii;

from the order Heteroptera, for example, Dichelops melacanthus, Distantiella theobroma, Dysdercus spp., Euchistus spp., Eurygaster spp., Leptocorisa spp., Nezara spp., Piesma spp., Rhodnius spp., Sahlbergella singularis, Scotinophara spp. and Triatoma spp.;
from the order Homoptera, for example, Aleurothrixus floccosus, Aleyrodes brassicae, Aonidiella spp., Aphididae, Aphis spp., Aspidiotus spp., Bemisia tabaci, Ceroplaster spp., Chrysomphalus aonidium, Chrysomphalus dictyospermi, Coccus hesperidum, Empoasca spp., Eriosoma larigerum, Erythroneura spp., Gascardia spp., Laodelphax spp., Lecanium corni, Lepidosaphes spp., Macrosiphus spp., Myzus spp., Nephotettix spp., Nilaparvata spp., Paratoria spp., Pemphigus spp., Planococcus spp., Pseudaulacaspis spp., Pseudococcus spp., Psylla spp., Pulvinaria aethiopica, Quadraspidiotus spp., Rhopalosiphum spp., Saissetia spp., Scaphoideus spp., Schizaphis spp., Sitobion spp., Trialeurodes vaporariorum, Trioza erytreae and Unaspis citri;

from the order Hymenoptera, for example, Acromyrmex, Athalia rosae, Atta spp., Cephus spp., Diprion spp., Diprionidae, Gilpinia polytoma, Hoplocampa spp., Lasius spp., Monomorium pharaonis, Neodiprion spp., Solenopsis spp. and Vespa spp.;

from the order Diptera, for example, Antherigona soccata, Bibio hortulanus, , Ceratitis spp., Chrysomyia spp., Culex spp., Cuterebra spp., Dacus spp., Delia spp., Drosophila melanogaster, , Liriomyza spp., , Melanagromyza spp., , Orseolia spp., Oscinella frit, Pegomyia hyoscyami, Phorbia spp., Rhagoletis pomonella, Sciara spp.,;

from the order Acarina, for example, Acarus siro, Aceria sheldoni, Aculus schlechtendali, Amblyomma spp., Argas spp., , Brevipalpus spp., Bryobia praetiosa, Calipitrimerus spp., Chorioptes spp., Dermanyssus gallinae, Eotetranychus carpini, Eriophyes spp., Hyalomma spp., Olygonychus pratensis, Ornithodoros spp., Panonychus spp., Phyllocoptruta spp. (such

as Phyllocoptruta oleivora), Polyphagotarsonemus latus, Psoroptes spp., Rhipicephalus spp., Rhizoglyphus spp., Sarcoptes spp., Tarsonemus spp. and Tetranychus spp.; and

from the class Nematoda, for example, the species of Meloidogyne spp. (for example, Meloidogyne incoginita and Meloidogyne javanica), Heterodera spp. (for example, Heterodera glycines, Heterodera schachtii, Heterodora avenae and Heterodora trifolii), Globodera spp. (for example, Globodera rostochiensis), Radopholus spp. (for example, Radopholus similes), Rotylenchulus spp., Pratylenchus spp. (for example, Pratylenchus neglectans and Pratylenchus penetrans), Aphelenchoides spp., Helicotylenchus spp., Hoplolaimus spp., Paratrichodorus spp., Longidorus spp., Nacobbus spp., Subanguina spp. Belonlaimus spp., Criconemella spp., Criconemoides spp. Ditylenchus spp., Dolichodorus spp., Hemicriconemoides spp., Hemicycliophora spp., Hirschmaniella spp., Hypsoperine spp., Macroposthonia spp., Melinius spp., Punctodera spp., Quinisulcius spp., Scutellonema spp., Xiphinema spp., and Tylenchorhynchus spp.

In particular the composition defined in the first aspect is suitable for control of one or more pests from class Nematoda.

In an embodiment, a composition comprising a mixture of abamectin and one or more of thiamethoxam, imidacloprid, clothianidin, fipronil and thiodicarb is suitable. In the instance the mixture is abamectin and thiamethoxam or clothianidin, the weight ratio is preferably from 1:1 to 1.5:1 respectively; whereas in instance the mixture is abamectin and imidacloprid, the weight ratio is preferably from 1:1 to 1:1.5 respectively; whereas in instance the mixture is abamectin and fipronil, the weight ratio is preferably from 1.5:1 to 1:1.5; and whereas in instance the mixture is abamectin and thiodicarb, the weight ratio is preferably from 1:4 to 1:5 respectively.

In the event an agent controlling pathogens is also present in the composition defined in the first aspect, the spectrum of control is broadened to include pathogens. Examples of phytopathogenic fungi, especially occurring in plants, including seedborne fungi belong to the following classes: Ascomycetes (e.g. Penicillium, Gaeumannomyces graminis); Basidiomycetes (e.g. the genus Hemileia, Rhizoctonia, Puccinia), Fungi imperfecti (e. g. Botrytis, Helminthosporium, Rhynchosporium, Fusarium, Septoria, Cercospora, Alternaria, Pyricularia and Pseudocercosporella herpotrichoides); Oomycetes (e. g. Phytophthora,

Peronospora, Bremia, Pythium, Plasmopara); Zygomycetes (e.g., Rhizopus spp.). A combination is especially effective against Alternaria spp., Aspergillus spp., Ascochyta spp., Botrytis cinerea, Cercospora spp., Claviceps purpurea, Cochliobolus spp. (such as Cochliobolus sativus), Colletotrichum spp., Diplodia maydis, Epicoccum spp., Erysiphe graminis, Fusarium spp. (such as Fusarium culmorum, Fusarium subglutinans, Fusarium oxysporium, Fusarium solani, Fusarium graminearum, Fusarium proliferatum, and Fusarium moniliforme), Gaeumannomyces graminis, Giberella fujikuroi, Giberella zeae, Helminthosporium graminearum, Microdochium nivale, Monographella nivalis, Penicillium spp., Puccinia spp., Pyrenophora spp. (such as Pyrenophora graminea), Peronosclerospora spp., Peronspora spp., Phakopsora pachyrhizi, Phythium spp., Phoma spp., Phomopsis spp., Rhizoctonia solani, Rhizoctonia cerealis, Septoria spp., Pseudocercosporella spp., Sclerotinia spp., Sphacelotheca reilliana, Tilletia spp., Rhizopus spp., Typhula spp., Ustilago spp., Urocystis occulta, Sphacelotheca spp. (e.g. Spacelotheca reilliani), Thielaviopsis basicola, Typhula incarnata, Thanatephorus cucumeris, and Verticillium spp.

Examples of foliar formulation types for pre-mix compositions are:

GR: Granules

WP: wettable powders

WG: water dispersable granules (powders)

SG: water soluble granules

SL: soluble concentrates

EC: emulsifiable concentrate

EW: emulsions, oil in water

ME: micro-emulsion

SC: aqueous suspension concentrate

CS: aqueous capsule suspension

OD: oil-based suspension concentrate, and

SE: aqueous suspo-emulsion.

Examples of formulation types suitable for tank-mix compositions are solutions, dilute emulsions, suspensions, or a mixture thereof, and dusts.

As with the nature of the formulations, the methods of application, such as foliar, drench, spraying, atomizing, dusting, scattering, coating or pouring, are chosen in accordance with the intended objectives and the prevailing circumstances.

The tank-mix compositions are generally prepared by diluting with a solvent (for example, water) the one or more pre-mix compositions containing different pesticides, and optionally further auxiliaries, including adjuvants.

Suitable carriers and adjuvants can be solid or liquid and are the substances ordinarily employed in formulation technology, e.g. natural or regenerated mineral substances, solvents, dispersants, wetting agents, tackifiers, thickeners, binders or fertilizers.

The formulations are prepared in known manner, e.g., by homogeneously mixing and/or grinding the active ingredients with extenders, e.g., solvents, solid carriers and, where appropriate, surface-active compounds (surfactants).

Suitable solvents are: aromatic hydrocarbons, preferably the fractions containing 8 to 12 carbon atoms, e.g. xylene mixtures or substituted naphthalenes, phthalates, such as dibutyl phthalate or dioctyl phthalate, aliphatic hydrocarbons, such as cyclohexane or paraffins, alcohols and glycols and their ethers and esters, such as ethanol, ethylene glycol, ethylene glycol monomethyl or monoethyl ether, ketones, such as cyclohexanone, strongly polar solvents, such as N-methyl-2-pyrrolidone, dimethyl sulfoxide or dimethylformamide, as well as vegetable oils or epoxidised vegetable oils, such as epoxidised coconut oil or soybean oil; or water.

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 acid or highly dispersed absorbent polymers. Suitable granulated adsorptive carriers are porous types, for example pumice, broken brick, sepiolite or bentonite, and suitable nonsorbent carriers are, for example, calcite or sand. In addition, a great number of pregranulated materials of inorganic or organic nature can be used, e.g., especially dolomite or pulverized plant residues.

Depending upon the nature of the active ingredient compounds to be formulated, suitable surface-active compounds are non-ionic, cationic and/or anionic surfactants having good emulsifying, dispersing and wetting properties. The term "surfactants" will also be understood as comprising mixtures of surfactants.

Particularly advantageous application-promoting adjuvants are also natural or synthetic phospholipids of the cephalin and lecithin series, e.g., phosphatidylethanolamine, phosphatidylserine, phosphatidylglycerol and lysolecithin.

Generally, a tank-mix formulation for foliar or soil application comprises 0.1 to 20%, especially 0.1 to 15 %, active ingredient compounds, and 99.9 to 80 %, especially 99.9 to 85 %, of a solid or liquid auxiliaries (including, for example, a solvent such as water), where the auxiliaries can be a surfactant in an amount of 0 to 20 %, especially 0.1 to 15 %, based on the tank-mix formulation.

Typically, a pre-mix formulation for foliar application comprises 0.1 to 99.9 %, especially 1 to 95 %, active ingredient compounds, and 99.9 to 0.1 %, especially 99 to 5 %, of a solid or liquid adjuvant (including, for example, a solvent such as water), where the auxiliaries can be a surfactant in an amount of 0 to 50 %, especially 0.5 to 40 %, based on the pre-mix formulation.

Normally, a tank-mix formulation for seed treatment application comprises 0.25 to 80%, especially 1 to 75 %, of the desired ingredients, and 99.75 to 20 %, especially 99 to 25 %, of a solid or liquid auxiliaries (including, for example, a solvent such as water), where the auxiliaries can be a surfactant in an amount of 0 to 40 %, especially 0.5 to 30 %, based on the tank-mix formulation.

Typically, a pre-mix formulation for seed treatment application comprises 0.5 to 99.9 %, especially 1 to 95 %, of the desired ingredients, and 99.5 to 0.1 %, especially 99 to 5 %, of a solid or liquid adjuvant (including, for example, a solvent such as water), where the auxiliaries can be a surfactant in an amount of 0 to 50 %, especially 0.5 to 40 %, based on the pre-mix formulation.

Preferred seed treatment pre-mix formulations are aqueous suspension concentrates. The formulation can be applied to the seeds using conventional treating techniques and machines, such as fluidized bed techniques, the roller mill method, rotostatic seed treaters, and drum coaters. Other methods, such as spouted beds may also be useful. The seeds may be presized before coating. After coating, the seeds are typically dried and then transferred to a sizing machine for sizing. Such procedures are known in the art.

In general, the pre-mix compositions of the invention contain 0.5 to 99.9 especially 1 to 95, advantageously 1 to 50 , %, by mass of the desired ingredients, and 99.5 to 0.1, especially 99 to 5, %, by mass of a solid or liquid adjuvant (including, for example, a solvent such as water), where the auxiliaries (or adjuvant) can be a surfactant in an amount of 0 to 50, especially 0.5 to 40, %, by mass based on the mass of the pre-mix formulation.

Whereas commercial products will preferably be formulated as concentrates (e.g., pre-mix composition (formulation)), the end user will normally employ dilute formulations (e.g., tank mix composition).

Preferred abamectin-containing compositions are aqueous suspension concentrates, emulsifiable concentrates and emulsion in water, particularly preferred are suspension concentrates.

In general, the pre-mix compositions of the invention contain 0.5 to 99.9 especially 1 to 95, advantageously 1 to 50 , %, by mass of active ingredient compounds, and 99.5 to 0.1, especially 99 to 5, %, by mass of a solid or liquid adjuvant (including, for example, a solvent such as water), where the auxiliaries (or adjuvant) can be a surfactant in an amount of 0 to 50, especially 0.5 to 40, %, by mass based on the mass of the pre-mix formulation.

The Examples which follow serve to illustrate the invention and are not intended to limit the invention.

<u>Flowable concentrate for seed treatment</u>

active ingredients	40 %
propylene glycol	5 %

copolymer butanol PO/EO	2 %
Tristyrenephenole with 10-20 moles EO	2 %
1,2-benzisothiazolin-3-one (in the form of a 20% solution in water)	0.5 %
monoazo-pigment calcium salt	5 %
Silicone oil (in the form of a 75 % emulsion in water)	0.2 %
Water	45.3 %

The finely ground combination is intimately mixed with the adjuvants, giving a suspension concentrate from which suspensions of any desired dilution can be obtained by dilution with water. Using such dilutions, living plants as well as plant propagation material can be treated and protected against infestation by microorganisms, by spraying, pouring or immersion.

The active ingredient composition of the present invention is distinguished by the fact that they are especially well tolerated by plants and are environmentally friendly.

In each aspect and embodiment of the invention, “consisting essentially” and inflections thereof are a preferred embodiment of “comprising” and its inflections, and “consisting of” and inflections thereof are a preferred embodiment of “consisting essentially of” and its inflections.

Use of a term in a singular form also encompasses that term in plural form and vice a versa.

The abamectin containing composition is for use in the agrochemical industry. A description of the abamectin and other agents (*e.g.*, fungicides, insecticides, nematicides, plant growth regulators) can be found in the e-Pesticide Manual, version 3.1, 13th Edition, Ed. CDC Tomlin, British Crop Protection Council, 2004-05.

Example 1: Elasmopalpus control by Abamectin seed treatment in corn

Large plot trials where placed at 13 locations. All seeds, including the check, were treated with a basic fungicide treatment (Fludioxonil, Mefenoxam and Thiabendazole at rates of 0.2, 0.17 & 1.25, grams AI/100 kg of seeds, respectively). Table 1 lists the treatment list and rates applied for the design. For each treatment four repeated samples were taken.

Table 1: Treatment list

No		grams AI /100 kg
1	Check	
2	Abamectin	67.7
3	Abamectin	83.3
4	CROPSTAR® (Imidacloprid & Thiodicarb)	75+225

The efficacy of the different seed treatment products were assessed 7 and 14 days after emergence based on stand. Furthermore yield differences at harvest were also assessed. The results are set forth in Tables 2 & 3.

Table 2: Control of Elasmopalpus attack in corn (average of 13 trials with high infestation).

Treatment	Control in %	
	7 days after emergance	14 days after emergence
2	81	53
3	89	51
4	85	34

Table 3: Yield effect of Elasmopalpus control in corn treated with Avicta and difference to the standard CROPSTAR® treatment in %.

Treatment	yield t/ha	yield *vs* CROPSTAR® %
1	7.86	-6
2	8.88	6
3	8.76	5
4	8.34	0

Example 2: Elasmopalpus control by Abamectin seed treatment in soy

Large plot trials were placed at 2 locations under natural infestation pressure. All seeds, including the check, were treated with a basic fungicide treatment (Fludioxonil and Mefenoxam at rates of 2.5 & 1.0, grams AI/100 kg of seeds, respectively). Table 4 lists the treatment list and rates applied for the design. Four repetitions where done per treatment.

Table 4: Treatment list

No		grams AI /100 kg
1	Check	
2	Abamectin+Thiamethoxam	50 + 35
3	Abamectin	50

4	Thiamethoxam	35
5	STANDAK 250 SC (Fipronil)	50

The efficacy of the different seed treatment products were assessed based on stand after 28DAE: the results are tabulated in Tables 5 & 6.

Table 5: Location 1: Stand loss and control %

Treatment	Stand loss (average of four repeats)	Control, %
1	3.1	0
2	0.85	73
3	1.00	68
4	5.83	-
5	2.44	21

Table 6: Location 2: Stand loss and control %

Treatment	Stand loss (average of four repeats)	Control, %
1	21.4	0
2	9.8	54
3	13.5	37
4	18.8	12
5	16.3	24

CLAIMS

1. A method of protecting a plant propagation material and a plant, part of a plant and/or plant organ that grows at a later point in time against damage by Elasmopalpus which comprises applying to the plant propagation material a composition comprising abamectin.

2. A method of controlling or preventing damage by Elasmopalpus to a plant propagation material, a plant, a part of a plant and/or a plant organ that grows at a later point in time, which comprises applying a composition comprising abamectin to the plant propagation material.

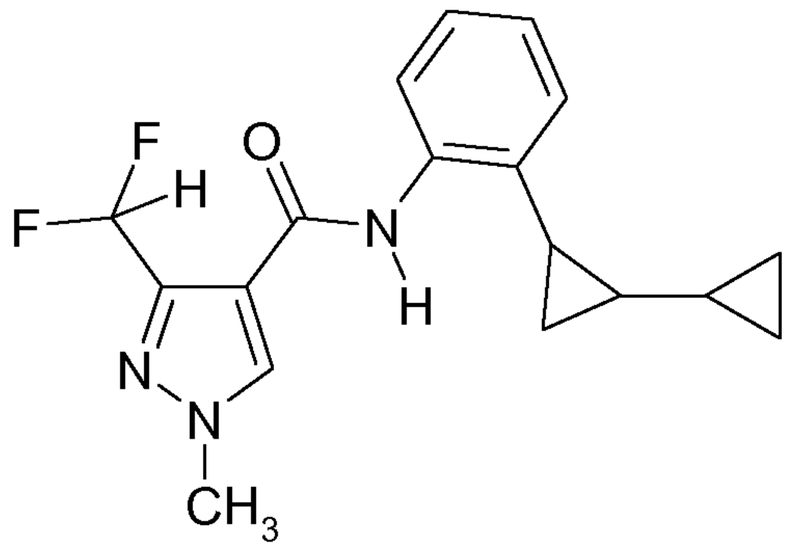
3. A method of improving the growing characterictics of a plant generated from a plant propagation material, which comprises applying a composition comprising abamectin to the plant propagation material.

4. A method according to any one of claims 1 to 3 wherein the composition comprising abamectin is applied to the plant propagation material before plant propagation material is sown or planted.

5. A method according to any one of claims 1 to 4 wherein the composition further comprises at least one other agent having pest control characteristics.

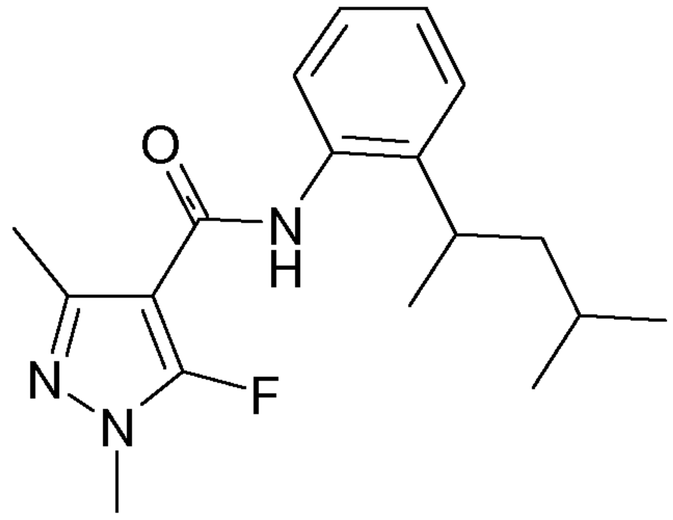
6. A method according to claim 5 wherein the at least one agent is at least one pesticide.

7. A method according to claim 6 wherein the at least one pesticide is selected from azoxystrobin, trifloxystrobin, fluoxastrobin, cyproconazole, difenoconazole, prothioconazole, tebuconazole, triticonazole, fludioxonil, thiabendazole, ipconazole, cyprodinil, myclobutanil, metalaxyl, metalaxyl-M (also known as mefenoxam), ortho-cyclopropyl-carboxanilide of formula (α), compound of formula (β), thiamethoxam, clothianidin, imidacloprid, abamectin, fipronil, pymetrozine, lambda-cyhalothrin, tefluthrin, beta-cyfluthrin, thiodicarb, compound of formula (δ), wherein compound (α) is



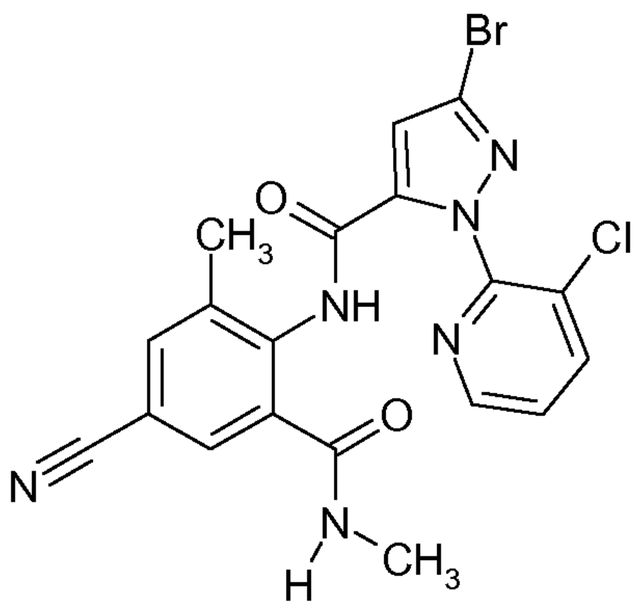
(α).

a compound (β) is



(β),

and compound (δ) is



(δ).

8. A method according to claim 7 wherein the at least one pesticide is selected from azoxystrobin, fludioxonil, thiabendazole, metalaxyl, metalaxyl-M (also known as mefenoxam),

ortho-cyclopropyl-carboxanilide of formula (α), thiamethoxam, clothianidin, imidacloprid, fipronil, pymetrozine, thiodicarb and lambda-cyhalothrin.