



(51) International Patent Classification:

A01N 25/14 (2006.01) A01N 43/56 (2006.01)

A01N 43/40 (2006.01)

(21) International Application Number:

PCT/EP2023/063171

(22) International Filing Date:

16 May 2023 (16.05.2023)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

22174578.9 20 May 2022 (20.05.2022) EP

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- of inventorship (Rule 4.17(iv))

Published:

- with international search report (Art. 21(3))

(54) Title: PESTICIDAL COMPOSITIONS

(57) Abstract: A pesticidal composition comprising: (i) 25 to 35% by weight of spiropidion; (ii) 15 to 25% by weight of cyantraniliprole; and (iii) 15 to 30% by weight of 4-O-β-D-galactopyranosyl-α-D-glucopyranose, as a filler component.

WO 2023/222723 A1

Pesticidal compositions

The present invention relates to a composition comprising a combination of insecticidal active ingredients, to the preparation of such compositions, and to a method of using such a composition to control pests in crops of useful plants.

Insecticidal compositions containing a combination of the insecticidal active ingredients spiropidion and cyantraniliprole are known, eg, from WO 2013/079564. Such a pesticidal composition is considered to have, for practical purposes, a very advantageous level of activity in controlling insect pests in crops of useful plants, whilst also maintaining acceptable crop safety (phytotoxicity) outcomes. Accordingly, suitable formulated compositions (eg, solid granular) comprising this insecticidal active ingredient combination have been sought.

Amongst a range of other requirements, there is a strong preference for an agrochemical composition (in diluted/dispersed form) for spray application not to leave behind solid residues on the spray application apparatus, eg, nozzles, hoses, tanks, etc, after use. Such deposits make the cleaning of the spray application apparatus more burdensome, and the longer-term accumulation of such residues may in time contaminate future spray applications, or even result in blockages. Likewise, if such a dispersion of an agrochemical composition (eg, a water-dispersible granule) in a spray tank is not evenly distributed or if this feature develops over the longer term due to the poor suspensibility properties of the composition, this can result in uneven application of active ingredient material to a crop field upon application.

Therefore, compositions with (i) substantially residue-free outcomes for the spray application apparatus after use, and with (ii) good suspension properties of the solid-state components and non-volatile ingredients upon dispersion of the composition in a spray tank, are highly desirable.

According to the present invention, there is provided a pesticidal composition comprising:

- (i) 25 to 35% by weight of spiropidion;
- (ii) 15 to 25% by weight of cyantraniliprole; and
- (iii) 15 to 30% by weight of 4-O- β -D-galactopyranosyl- α -D-glucopyranose, as a filler component.

Surprisingly it has been found for the present invention that the use of certain amounts of 4-O- β -D-galactopyranosyl- α -D-glucopyranose as the filler component in pesticidal compositions results in substantially residue-free outcomes on spray application apparatus compared with the use of compositions which contain other conventionally used fillers. As well, the pesticidal compositions of the present invention have been shown to possess beneficial suspensibility properties when diluted for a spray application to a crop.

Further according to the invention, there is provided an aqueous composition comprising the pesticidal composition according to the invention, optionally further comprising one or more adjuvants or carriers.

Still further according to the invention, there is provided a (non-therapeutic) method of combating and controlling pests which comprises applying to a pest, to a locus of a pest, or to a crop of a useful plant susceptible to attack by a pest a composition according to the invention.

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Spiropidion ([3-(4-chloro-2,6-dimethyl-phenyl)-8-methoxy-1-methyl-2-oxo-1,8-diazaspiro[4.5]dec-3-en-4-yl] ethyl carbonate. CAS no.: 1229023-00-0) is known *inter alia* from WO 2010/066780, WO 2018/114648 and WO 2018/114649. Cyantraniliprole (4-bromo-1-(3-chloropyridin-2-yl)-N-[4-cyano-2-methyl-6-(methylcarbamoyl)phenyl]-1H-pyrazole-5-carboxamide. CAS no.: 736994-10 63-1) is known *inter alia* from EP 1 599 463. Certain pesticidal mixtures comprising spiropidion and cyantraniliprole as active ingredients are known from WO 2013/079564.

Preferably, the compositions according to the invention comprise as the pesticidal active ingredient component (i) 28 to 32% by weight of spiropidion and (ii) 20 to 25% by weight of 15 cyantraniliprole, and more preferably (i) 29 to 31% by weight of spiropidion and (ii) 21 to 24% by weight of cyantraniliprole. The compositions according to the invention comprise as the pesticidal active ingredient component spiropidion and cyantraniliprole, respectively, in a weight ratio of 1:1 to 7:3, and preferably a weight ratio of 1:1 to 3:2.

20 Preferably the compositions of the invention comprise 20 to 25% by weight of 4-O- β -D-galactopyranosyl- α -D-glucopyranose of the filler component. 4-O- β -D-galactopyranosyl- α -D-glucopyranose (CAS no.: 63-42-3) may also be referred to as 4-O- β -D-Galactopyranosyl- α -D-glucose or lactose monohydrate.

25 In preferred embodiments, the compositions of the invention further comprise based on the total weight of the composition (ie, up to 100% by weight):

- (iv) 10 to 20% by weight of one or more dispersants;
- (v) 1 to 5% by weight of an anti-foaming agent; and
- 30 (vi) 5 to 10% by weight of a buffer.

In other preferred embodiments, the compositions of the invention may comprise 1 to 3% by weight of an anti-foaming agent, and preferably 1.5 to 2.5% by weight of an anti-foaming agent.

35 When a buffering agent component is present in the composition of the invention, there may be included an alkali metal sulfate or an alkaline earth metal sulfate, or else a combination of an alkali metal sulfate and an alkaline earth metal sulfate. Preferably, the alkali metal sulfate used in the compositions of the invention is potassium sulfate or sodium sulfate, and most preferably sodium sulfate. The buffering agent may also include an organic acid, such as citric acid.

40

Preferably, the composition of the invention is a water-dispersible granule (WG), which may be defined as a solid, granular formulation which can disperse or dissolve quickly when added to water in a spray tank, thus providing a fine particle suspension comprising a pesticidal active ingredient or ingredients. A water-dispersible granule comprising the composition according to the present invention
5 may be prepared according to standard methods. The water-dispersible granule may take the form of an extruded granule or a spray-agglomerated granule.

Preferably, in an aqueous composition according to the invention (eg, a tank mix preparation for applying to a crop), the adjuvant is selected from a mineral oil, a vegetable oil, an esterified vegetable
10 oil, a methylated vegetable oil or an alkyl ester phosphate-based adjuvant. A pesticide adjuvant may be defined as a substance present in a pesticidal composition (eg, a concentrated active ingredient formulation diluted in water in a tank for a foliar spray application on a crop), which improves pesticidal active ingredient performance, for example by facilitating the spreading of the active ingredient on a leaf surface or penetration into the leaf of the crop plant.

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Examples of adjuvant classes, which may be used in accordance with the present invention include a mineral oil, a vegetable oil, an esterified vegetable oil, a methylated vegetable oil or an alkyl ester phosphate-based adjuvant. Commercially-available adjuvant products which may be tank-mixed to yield a spray formulation with the composition of the present invention include HASTEN™ (Victorian
20 Chemical Co. Pty. Ltd. - blend of an esterified vegetable oil and non-ionic surfactants), OCHIMA® (Syngenta - alkyl ester of phosphoric acid (EC formulation)), LEDNA™ (Polaquimia - EC formulation comprising a methyl ester of soybean oil), Atplus® 463 (CRODA Europe Limited - 60% paraffin oil with surfactant blend), Actirob® B (Bayer AG - rapeseed oil methyl ester (esterified vegetable oil)), Destiny® HC (Winfield Solutions LLC - methylated soybean oil), DYNE-AMIC® (HELENA - blend of (methylated)
25 vegetable oil and organosilicone-based nonionic surfactants), and FS Optique™ (GROWMARK, Inc - methyl ester of canola oil).

A dispersant or a dispersing agent is typically a surfactant substance, which when added to a suspension of solid particles in a liquid better enables the separation of the particles to avoid
30 their settling or clumping together. Dispersants which may be used in accordance with the present invention include, but are not limited to, lignosulphonate salts (eg, Ufoxane 3A, Borregard AS; Borresperse NA, Borregard AS; Polyfon™ H, Ingevity; Marasperse CBOS-4 powder, LignoTech), naphthalene sulfonic acid salts (eg, Dispergator B Gran, TFL Ledertechnik GmbH), a co-polymer of 2,5-furandione and 2,4,4-trimethylpentene (eg, Geroon® Ta/72, Solvay).

35

An anti-foaming agent is a chemical additive that reduces and hinders the formation of foam in a composition, such as a pesticidal formulation. Anti-foaming agents which may be used in accordance with the present invention include, but are not limited to, polydimethylsiloxanes (eg, XIAMETER™ ACP-1500, Dow, Inc; Antifoam MSA, Univar; Xiameter ACP-0001, Dow Brasil; Xiameter ACP-0100, Dow
40 Chemical).

In addition to 4-O- β -D-galactopyranosyl- α -D-glucopyranose, minor amounts of other conventional fillers may be used in accordance with the present invention. Preferably, the filler component of the compositions does not comprise a diatomaceous earth material (eg, Ceilte™), or the compositions comprise less than 10% by weight, or less than 5% by weight, of a diatomaceous earth material as filler.

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Examples of pests which may be controlled in accordance with the compositions of the present invention include those:

from the order *Acarina*, for example, *Acalitus* spp, *Aculus* spp, *Acaricalus* spp, *Aceria* spp, *Acarus siro*, *Amblyomma* spp., *Argas* spp., *Boophilus* spp., *Brevipalpus* spp., *Bryobia* spp, *Calipitimerus* spp., *Chorioptes* spp., *Dermanyssus gallinae*, *Dermatophagoides* spp, *Eotetranychus* spp, *Eriophyes* spp., *Hemitarsonemus* spp, *Hyalomma* spp., *Ixodes* spp., *Olygonychus* spp, *Omithodoros* spp., *Polyphagotarsonus latus*, *Panonychus* spp., *Phyllocoptruta oleivora*, *Phytonemus* spp, *Polyphagotarsonemus* spp, *Psoroptes* spp., *Rhipicephalus* spp., *Rhizoglyphus* spp., *Sarcoptes* spp., *Steneotarsonemus* spp, *Tarsonemus* spp. and *Tetranychus* spp.;

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

from the order *Coleoptera*, for example, *Agriotes* spp., *Amphimallon majale*, *Anomala orientalis*, *Anthonomus* spp., *Aphodius* spp, *Astylus atromaculatus*, *Ataenius* spp, *Atomaria linearis*, *Chaetocnema tibialis*, *Cerotoma* spp, *Conoderus* spp, *Cosmopolites* spp., *Cotinis nitida*, *Curculio* spp., *Cyclocephala* spp, *Dermestes* spp., *Diabrotica* spp., *Diloboderus abderus*, *Epilachna* spp., *Eremnus* spp., *Heteronychus arator*, *Hypothenemus hampei*, *Lagria vilosa*, *Leptinotarsa decemlineata*, *Lissorhoptrus* spp., *Liogenys* spp, *Maecolaspis* spp, *Maladera castanea*, *Megascelis* spp, *Meligethes aeneus*, *Melolontha* spp., *Myochrous armatus*, *Orycaephilus* spp., *Otiorhynchus* spp., *Phyllophaga* spp, *Phlyctinus* spp., *Popillia* spp., *Psylliodes* spp., *Rhyssomatus aubtilis*, *Rhizopertha* spp., *Scarabeidae*, *Sitophilus* spp., *Sitotroga* spp., *Somaticus* spp, *Sphenophorus* spp, *Sternechus subsignatus*, *Tenebrio* spp., *Tribolium* spp. and *Trogoderma* spp.;

from the order *Diptera*, for example, *Aedes* spp., *Anopheles* spp, *Antherigona soccata*, *Bactrocea oleae*, *Bibio hortulanus*, *Bradysia* spp, *Calliphora erythrocephala*, *Ceratitis* spp., *Chrysomyia* spp., *Culex* spp., *Cuterebra* spp., *Dacus* spp., *Delia* spp, *Drosophila melanogaster*, *Fannia* spp., *Gastrophilus* spp., *Geomyza tripunctata*, *Glossina* spp., *Hypoderma* spp., *Hyppobosca* spp., *Liriomyza* spp., *Lucilia* spp., *Melanagromyza* spp., *Musca* spp., *Oestrus* spp., *Orseolia* spp., *Oscinella frit*, *Pegomyia hyoscyami*, *Phorbia* spp., *Rhagoletis* spp, *Rivelia quadrifasciata*, *Scatella* spp, *Sciara* spp., *Stomoxys* spp., *Tabanus* spp., *Tannia* spp. and *Tipula* spp.;

from the order *Hemiptera*, for example, *Acanthocoris scabrator*, *Acrosternum* spp, *Adelphocoris* spp, *lineolatus*, *Amblypelta nitida*, *Bathycoelia thalassina*, *Blissus* spp, *Cimex* spp., *Clavigralla tomentosicollis*, *Creontiades* spp, *Distantiella theobroma*, *Dichelops furcatus*, *Dysdercus* spp., *Edessa* spp, *Euchistus* spp., *Eurydema pulchrum*, *Eurygaster* spp., *Halyomorpha halys*, *Horcias nobillellus*, *Lep-tocoris* spp., *Lygus* spp, *Margarodes* spp, *Murgantia histrionic*, *Neomegalotomus* spp, *Nesidiocoris*

tenuis, *Nezara* spp., *Nysius simulans*, *Oebalus insularis*, *Piesma* spp., *Piezodorus* spp, *Rhodnius* spp., *Sahlbergella singularis*, *Scaptocoris castanea*, *Scotinophara* spp. , *Thyanta* spp , *Triatoma* spp., and *Vatiga illudens*;

from the order *Homoptera*, for example, *Acyrtosium pisum*, *Adalges* spp, *Agalliana ensigera*,
 5 *Agonosцена targionii*, *Aleurodicus* spp, *Aleurocanthus* spp, *Aleurolobus barodensis*, *Aleurothrixus floccosus*, *Aleyrodes brassicae*, *Amarasca biguttula*, *Amritodus atkinsoni*, *Aonidiella* spp., *Aonidiella auranti*, *Aphididae*, *Aphis* spp., *Aspidiotus* spp., *Aulacorthum solani*, *Bactericera cockerelli*, *Bemisia* spp, *Brachycaudus* spp, *Brevicoryne brassicae*, *Cacopsylla* spp, *Cavariella aegopodii* Scop., *Ceroplaster* spp., *Chrysomphalus aonidium*, *Chrysomphalus dictyospermi*, *Cicadella* spp, *Cofana spectra*,
 10 *Cryptomyzus* spp, *Cicadulina* spp, *Coccus hesperidum*, *Dalbulus maidis*, *Dialeurodes* spp, *Diaphorina citri*, *Diuraphis noxia*, *Dysaphis* spp, *Empoasca* spp., *Eriosoma larigerum*, *Erythroneura* spp., *Gascardia* spp., *Glycaspis brimblecombei*, *Hyadaphis pseudobrassicae*, *Hyalopterus* spp, *Hyperomyzus pallidus*, *Idioscopus clypealis*, *Jacobiasca lybica*, *Laodelphax* spp., *Lecanium corni*, *Lepidosaphes* spp., *Lopaphis erysimi*, *Lyogenys maidis*, *Macrosiphum* spp., *Mahanarva* spp, *Metcalfa pruinosa*,
 15 *Metopolophium dirhodum*, *Myndus crudus*, *Myzus* spp., *Neotoxoptera* sp, *Nephotettix* spp., *Nilaparvata* spp., *Nippolachnus piri* Mats, *Odonaspis ruthae*, *Oregma lanigera* Zehnter, *Parabemisia myricae*, *Paratrioza cockerelli*, *Parlatoria* spp., *Pemphigus* spp., *Peregrinus maidis*, *Perkinsiella* spp, *Phorodon humuli*, *Phylloxera* spp, *Planococcus* spp., *Pseudaulacaspis* spp., *Pseudococcus* spp., *Pseudatomoscelis seriatus*, *Psylla* spp., *Pulvinaria aethiopica*, *Quadrastpidiotus* spp., *Quesada gigas*,
 20 *Recilia dorsalis*, *Rhopalosiphum* spp., *Saissetia* spp., *Scaphoideus* spp., *Schizaphis* spp., *Sitobion* spp., *Sogatella furcifera*, *Spissistilus festinus*, *Tarophagus Proserpina*, *Toxoptera* spp, *Trialeurodes* spp, *Tridiscus sporoboli*, *Trionymus* spp, *Trioza erytrae* , *Unaspis citri*, *Zygina flammigera*, and *Zyginidia scutellaris*;

from the order *Hymenoptera*, for example, *Acromyrmex*, *Arge* spp, *Atta* spp., *Cephus* spp.,
 25 *Diprion* spp., *Diprionidae*, *Gilpinia polytoma*, *Hoplocampa* spp., *Lasius* spp., *Monomorium pharaonis*, *Neodiprion* spp., *Pogonomyrmex* spp, *Slenopsis invicta*, *Solenopsis* spp. and *Vespa* spp.;

from the order *Isoptera*, for example, *Coptotermes* spp, *Cornitermes cumulans*, *Incisitermes* spp, *Macrotermes* spp, *Mastotermes* spp, *Microtermes* spp, *Reticulitermes* spp.; *Solenopsis geminate*;

from the order *Lepidoptera*, for example, *Acleris* spp., *Adoxophyes* spp., *Aegeria* spp., *Agrotis*
 30 spp., *Alabama argillaceae*, *Amylois* spp., *Anticarsia gemmatalis*, *Archips* spp., *Argyresthia* spp, *Argyrotaenia* spp., *Autographa* spp., *Bucculatrix thurberiella*, *Busseola fusca*, *Cadra cautella*, *Carposina nipponensis*, *Chilo* spp., *Choristoneura* spp., *Chrysoteuchia topiaria*, *Clysia ambiguella*, *Cnaphalocrocis* spp., *Cnephasia* spp., *Cochylis* spp., *Coleophora* spp., *Colias lesbia*, *Cosmophila flava*, *Crambus* spp, *Crociodomia binotalis*, *Cryptophlebia leucotreta*, *Cydalima perspectalis*, *Cydia* spp., *Diaphania*
 35 *perspectalis*, *Diatraea* spp., *Diparopsis castanea*, *Earias* spp., *Eldana saccharina*, *Ephestia* spp., *Epinotia* spp, *Estigmene acrea*, *Etiella zinckinella*, *Eucosma* spp., *Eupoecilia ambiguella*, *Euproctis* spp., *Euxoa* spp., *Feltia jaculiferia*, *Grapholita* spp., *Hedya nubiferana*, *Heliothis* spp., *Hellula undalis*, *Herpetogramma* spp, *Hyphantria cunea*, *Keiferia lycopersicella*, *Lasmopalpus lignosellus*, *Leucoptera scitella*, *Lithocollethis* spp., *Lobesia botrana*, *Loxostege bifidalis*, *Lymantria* spp., *Lyonetia* spp.,

Malacosoma spp., *Mamestra brassicae*, *Manduca sexta*, *Mythimna* spp., *Noctua* spp., *Operophtera* spp., *Omiodes indica*, *Ostrinia nubilalis*, *Pammene* spp., *Pandemis* spp., *Panolis flammea*, *Papaipema nebris*, *Pectinophora gossypiella*, *Perileucoptera coffeella*, *Pseudaletia unipuncta*, *Phthorimaea operculella*, *Pieris rapae*, *Pieris* spp., *Plutella xylostella*, *Prays* spp., *Pseudoplusia* spp., *Rachiplusia* nu,
 5 *Richia albicosta*, *Scirpophaga* spp., *Sesamia* spp., *Sparganothis* spp., *Spodoptera* spp., *Sylepta derogate*, *Synanthedon* spp., *Thaumetopoea* spp., *Tortrix* spp., *Trichoplusia ni*, *Tuta absoluta*, and *Yponomeuta* spp.;

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

from the order *Orthoptera*, for example, *Blatta* spp., *Blattella* spp., *Gryllotalpa* spp., *Leucophaea*
 10 *maderae*, *Locusta* spp., *Neocurtilla hexadactyla*, *Periplaneta* spp., *Scapteriscus* spp., and *Schistocerca* spp.;

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

from the order *Siphonaptera*, for example, *Ceratophyllus* spp., *Ctenocephalides* spp. and *Xenopsylla cheopis*;

15 from the order *Thysanoptera*, for example, *Calliothrips phaseoli*, *Frankliniella* spp., *Heliothrips* spp., *Hercinothrips* spp., *Parthenothrips* spp., *Scirtothrips aurantii*, *Sericothrips variabilis*, *Taeniothrips* spp., *Thrips* spp.; and/or

from the order *Thysanura*, for example, *Lepisma saccharina*.

Examples of soil-inhabiting pests, which can damage a crop in the early stages of plant
 20 development, are:

from the order *Lepidoptera*, for example, *Acleris* spp., *Aegeria* spp., *Agrotis* spp., *Alabama argillaceae*, *Amylois* spp., *Autographa* spp., *Busseola fusca*, *Cadra cautella*, *Chilo* spp., *Crocidolomia binotalis*, *Diatraea* spp., *Diparopsis castanea*, *Elasmopalpus* spp., *Heliothis* spp., *Mamestra brassicae*, *Phthorimaea operculella*, *Plutella xylostella*, *Scirpophaga* spp., *Sesamia* spp., *Spodoptera* spp. and
 25 *Tortrix* spp.;

from the order *Coleoptera*, for example, *Agriotes* spp., *Anthonomus* spp., *Atomaria linearis*, *Chaetocnema tibialis*, *Conotrachelus* spp., *Cosmopolites* spp., *Curculio* spp., *Dermestes* spp., *Diabrotica* spp., *Dilopoderus* spp., *Epilachna* spp., *Eremnus* spp., *Heteronychus* spp., *Lissorhoptrus* spp., *Melolontha* spp., *Orycaephilus* spp., *Otiorhynchus* spp., *Phlyctinus* spp., *Popillia* spp., *Psylliodes*
 30 spp., *Rhizopertha* spp., *Scarabeidae*, *Sitotroga* spp., *Somaticus* spp., *Tanymecus* spp., *Tenebrio* spp., *Tribolium* spp., *Trogoderma* spp. and *Zabrus* spp.;

from the order *Orthoptera*, for example, *Gryllotalpa* 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 *Homoptera*, for example, *Eriosoma larigerum*;

from the order *Hymenoptera*, for example, *Acromyrmex*, *Atta spp.*, *Cephus spp.*, *Lasius spp.*,
5 *Monomorium pharaonis*, *Neodiprion spp.*, *Solenopsis spp.* and *Vespa spp.*;

from the order *Diptera*, for example, *Tipula spp.*;

crucifer flea beetles (*Phyllotreta spp.*), root maggots (*Delia spp.*), cabbage seedpod weevil (*Ceutorhynchus spp.*) and aphids.

In particular, the compositions of the invention may be applied against insects from the order
10 *Homoptera* (in particular, white flies, aphids, psyllids and armoured and soft scales), *Thysanoptera* (thrips), *Acarina* (mites) and *Lepidoptera* (butterflies and moths, and larva thereof). Preferably, the compositions of the invention may be applied against white flies, aphids, thrips, in particular, silverleaf whitefly (*Bemisia tabaci*), greenhouse whitefly (*Trialeurodes vaporariorum*), western flower thrips (*Frankliniella occidentalis*), onion thrips (*Thrips tabaci*), tomato thrips (*Frankliniella schultzei*), jassid,
15 melon thrips (*Thrips palmi*), cluster caterpillar (*Spodoptera litura*) and potato moth (*Phthorimaea operculella*).

Crops of useful plants in which the compositions according to the invention can be used include perennial and annual crops, such as berry plants for example blackberries, blueberries, cranberries, raspberries and strawberries; cereals for example barley, maize (corn), millet, oats, rice, rye, sorghum
20 triticale and wheat; fibre plants for example cotton, flax, hemp, jute and sisal; field crops for example sugar and fodder beet, coffee, hops, mustard, oilseed rape (canola), poppy, sugar cane, sunflower, tea and tobacco; fruit trees for example apple, apricot, avocado, banana, cherry, citrus, nectarine, peach, pear and plum; grasses for example Bermuda grass, bluegrass, bentgrass, centipede grass, fescue, ryegrass, St. Augustine grass and Zoysia grass; herbs such as basil, borage, chives, coriander,
25 lavender, lovage, mint, oregano, parsley, rosemary, sage and thyme; legumes for example beans, lentils, peas and soya beans; nuts for example almond, cashew, ground nut, hazelnut, peanut, pecan, pistachio and walnut; palms for example oil palm; ornamentals for example flowers, shrubs and trees; other trees, for example cacao, coconut, olive and rubber; vegetables for example asparagus, aubergine, broccoli, cabbage, carrot, cucumber, garlic, lettuce, marrow, melon, watermelon, okra, onion,
30 leek, pepper, potato, pumpkin, squash, rhubarb, spinach and tomato; and vines for example grapes. The compositions of the invention can also be applied on turf, lawn and pastures.

Preferably, the compositions of the invention may be applied to a crop of a useful plant selected from:

- 35
- the order Solanaceae (including tomato, potato, aubergine, chilli, pepper, tobacco);
 - the order Cucurbitaceae (including squash, pumpkin, watermelon, melon, cucumber);
 - the order Alliaceae (including onion, garlic, leek);
 - the order Asparagaceae (including asparagus)

- the order Brassicaceae (including broccoli, cauliflower, cabbage).

Preferably, the composition of the invention may be applied to a crop of a useful plant selected from cotton, cucumber, tomato, pepper, chili, broccoli, cauliflower, cabbage.

5

In some embodiments of the method of the invention, applying the composition is to the soil (or other growth substrate) of the crop of the useful plant by drip, drenching or injection.

The rate at which the agrochemical compositions of the invention are applied will depend upon the particular type of insect, etc, to be controlled, the degree of control required and the timing and method of application and can be readily determined by the person skilled in the art. In general, the compositions of the invention can be applied at an application rate of between 0.005 kilograms/hectare (kg/ha) and about 5.0 kg/ha, based on the total amount of active ingredient in the composition. An application rate of between about 0.1 kg/ha and about 1.5 kg/ha is preferred, with an application rate of between about 0.3 g/ha and 0.8 kg/ha being especially preferred.

The pesticidal compositions of the present invention may be used as an insecticide to control pests on cotton plants, in particular for the control of insects from the order *Homoptera* (in particular, white flies, aphids, psyllids and armoured and soft scales), *Thysanoptera* (thrips) and *Acarina* (mites).

The pesticidal compositions of the present invention may be used as an insecticide to control pests on cotton plants, in particular for the control of insects from the order *Homoptera* (in particular, white flies, aphids, psyllids and armoured and soft scales), *Thysanoptera* (thrips) and *Acarina* (mites).

In particular, transgenic cotton events expressing useful traits which may be used in combination with the compositions of the invention, include BXN10211, BXN10215, BXN10222, BXN10224, COT102, COT67B, GHB614, GHB119, LLCotton25, MON531, MON757, MON15985, MON1445, MON88913, MON1076, MON1698, MON88701, T304-40, 281-24-236, 3006-210-23, 31707, 31803, 31808, 42317, and the like. Such combinations of the compositions of the invention with cotton events expressing one or more useful traits may provide more durable yield protection, provide a resistance management strategy for target pest control, and reduce farmer inputs, saving considerable expense in time and monetary value.

In an aqueous composition comprising the pesticidal composition according to the invention (eg, a tank-mix composition) there may be added a further component comprising a pesticidal active ingredient selected from one or more of:

Abamectin, Acequinocyl, Acetamiprid, Acetoprole, Acrinathrin, Acynonapryr, Afidopyropen, Afoxalaner, Alanycarb, Allethrin, Alpha-Cypermethrin, Alphamethrin, Amidoflumet, Aminocarb, Azocyclotin, Bensultap, Benzoximate, Benzpyrimoxan, Betacyfluthrin, Beta-cypermethrin, Bifenazate, Bifenthrin, Binapacryl, Bioallethrin, Bioallethrin S)-cyclopentylisomer, Bioresmethrin, Bistrifluron, Broflanilide, Brofluthrin, Bromophos-ethyl, Buprofezine, Butocarboxim, Cadusafos, Carbaryl, Carbosulfan, Cartap, CAS number: 1472050-04-6, CAS number: 1632218-00-8, CAS number:

1808115-49-2, CAS number: 2032403-97-5, CAS number: 2044701-44-0, CAS number: 2128706-05-6, CAS number: 2249718-27-0, Chlorantraniliprole, Chlordane, Chlorfenapyr, Chloroprallethrin, Chromafenozide, Clenpirin, Cloethocarb, Clothianidin, 2-chlorophenyl N-methylcarbamate (CPMC), Cyanofenphos, Cyclaniliprole, Cyclobutrifluram, Cycloprothrin, Cycloxaprid, Cycloxaprid, 5 Cyenopyrafen, Cyetpyrafen (or Etpyrafen), Cyflumetofen, Cyfluthrin, Cyhalodiamide, Cyhalothrin, Cypermethrin, Cyphenothrin, Cyproflanilide, Cyromazine, Deltamethrin, Diafenthiuron, Dialifos, Dibrom, Dicloromezotiaz, Diflovidazine, Diflubenzuron, dimpropyridaz, Dinactin, Dinocap, Dinotefuran, Dioxabenzofos, Emamectin, Empenthrin, Epsilon - momfluorothrin, Epsilon-metofluthrin, Esfenvalerate, Ethion, Ethiprole, Etofenprox, Etoxazole, Famphur, Fenazaquin, Fenfluthrin, Fenitrothion, Fenobucarb, 10 Fenothiocab, Fenoxycarb, Fenpropathrin, Fenpyroxymate, Fensulfothion, Fenthion, Fentinacetate, Fenvallerate, Fipronil, Flometoquin, Flonicamid, Fluacrypyrim, Fluazaindolizine, Fluazuron, Flubendiamide, Flubenzimine, Flucitrate, Flucycloxuron, Flucythrinate, Fluensulfone, Flufenerim, Flufenprox, Flufiprole, Fluhexafon, Flumethrin, Fluopyram, Flupyradifurone, Flupyrimin, Fluralaner, Flupentiofenox, Fluvalinate, Fluxametamide, Fosthiazate, Gamma-Cyhalothrin, 15 Gossypure™, Guadipyr, Halofenozide, Halofenozide, Halofenprox, Heptafluthrin, Hexythiazox, Hydramethylnon, Imicyafos, Imidacloprid, Imiprothrin, Indoxacarb, Iodomethane, Iprodione, Isocycloseram, Isothioate, Ivermectin, Kappa-bifenthrin, Kappa-tefluthrin, Lambda-Cyhalothrin, Lepimectin, Lufenuron, Metaflumizone, Metaldehyde, Metam, Methomyl, Methoxyfenozide, Metofluthrin, Metolcarb, Mexacarbate, Milbemectin, Momfluorothrin, nicofluprole Niclosamide, 20 Nitenpyram, Nithiazine, Omethoate, Oxamyl, Oxazosulfl, Parathion-ethyl, Permethrin, Phenothrin, Phosphocarb, Piperonylbutoxide, Pirimicarb, Pirimiphos-ethyl, Polyhedrosis virus, Prallethrin, Profenofos, Profenofos, Profluthrin, Propargite, Propetamphos, Propoxur, Prothiophos, Protrifenbute, Pyflubumide, Pymetrozine, Pyraclofos, Pyrafluprole, Pyridaben, Pyridalyl, Pyrifluquinazon, Pyrimidifen, Pyrimostrobilin, Pyriprole, Pyriproxifen, Resmethrin, Sarolaner, Selamectin, Silafluofen, Spinetoram, 25 Spinosad, Spirodiclofen, Spiromesifen, Spirotetramat, Sulfoxaflo, Tebufenozide, Tebufenpyrad, Tebupirimiphos, Tefluthrin, Temephos, Tetrachloraniliprole, Tetradiphon, Tetramethrin, Tetramethylfluthrin, Tetranactin, Tetraniliprole, Theta-cypermethrin, Thiacloprid, Thiamethoxam, Thiocyclam, Thiodicarb, Thiofanox, Thiometon, Thiosultap, Tioxazafen, Tolfenpyrad, Toxaphene, Tralomethrin, Transfluthrin, Triazamate, Triazophos, Trichlorfon, Trichloronate, Trichlorphon, 30 Triflumezopyrim, Tyclopyrazoflo, Zeta-Cypermethrin.

As already indicated, the pesticidal compositions of the present invention have, for practical purposes, a very advantageous level of activity in controlling insect pests in crops of useful plants after foliar or soil application, whilst also maintaining acceptable crop safety (phytotoxicity) outcomes. Further, 35 the compositions of the present invention when in an agrochemical formulation may possess any number of other benefits compared to other compositions including, *inter alia*, the prevention of sedimentation, thickening, phase separation, cloudiness, foaming or crystal growth, chemical stability of the active ingredients (degradation), long-term formulation stability (eg, at high temperature, such as 45 °C), and spray drift.

Figure 1 shows sieve (300 µm and 150 µm) residues of drainings from Compositions A and B as described according to the method outlined in the below residue study (i).

EXAMPLES:

The Examples which follow serve to illustrate the invention and in particular demonstrate the surprising effect of the use of specific amounts of 4-O-β-D-galactopyranosyl-α-D-glucopyranose in compositions according to the invention in:

- (i) minimising solid residue deposits on surfaces such as in nozzle filters, spray tanks (including a knapsack sprayer), etc, used in the application of a pesticidal composition to a crop; and
- (ii) improving the suspensibility of a water-disperable granule composition once dispersed in a bulk water volume for application to a crop.

4-O-β-D-galactopyranosyl-α-D-glucopyranose (CAS no.: 63-42-3), otherwise known as (+)-lactose is commercially available, eg, as PHARMATOSE 200M (DFE Pharma International, Germany). Celite™ 209 (CAS no.: 61790-53-2) is commercially available from a range of sources, eg, Celite France, France.

Referring to Table 1 below, Composition A is a composition as a water-dispersible granule not according to the invention (including a Celite™ (diatomaceous earth) filler) and Composition B is a composition as a water-dispersible granule according to the invention (with no Celite™ filler present). Composition A and Composition B are otherwise substantially the same, with the exception of the inclusion of additional lactose filler at the expense of Celite™ 209 in Composition B.

The composition according to the present invention (Composition B) and as a comparative example (Composition A) are prepared according to known formulation methods for a water-dispersible (wetttable) granule using a 0.6 mm diameter basket extruder.

Table 1:

Component	Composition A (% by weight) <i>Comparative example</i>	Composition B (% by weight) <i>According to the invention</i>
Spiropidion	30	30
Cyantraniliprole	22.5	22.5
Dispersant mixture (lignosulphonate salt & naphthalene sulfonic acid salt)	15	15
Buffer mixture (alkali metal sulfate & organic acid)	7	7
Surfactant	2	2

(co-polymer of 2,5-furandione and 2,4,4-trimethylpentene)		
Anti-foaming agent (Antifoam MSA)	2	2
Filler (PHARMATOSE 200M)	10.5	21.5
Filler (Celite™ 209)	11	-

(i) Residue study

A knapsack spray test using a Cooper Pegler 3 Knapsack sprayer was carried out on
 5 Compositions A and B (80 g product in 20 L) to assess performance in terms of residue formation at
 spray completion and cleaning. In separate experiments, the sprayer tank was half-filled with water (10
 L), then composition A or B (80 g) added to the tank which was agitated gently to disperse the granular
 compositions. The tank was filled (20 L) and the contents further agitated prior to the commencement
 of a spray application. At the end of the spraying process when the tank was emptied, the drainings
 10 (water to rinse and clean the knapsack apparatus) were visually assessed.

In particular, the drainings were filtered through 150 µm and 300 µm sieves (see Figure 1). For
 composition A, as can be clearly seen in Figure 1, some white solid residue was observed that was not
 apparent (or at a very low level) for the drainings of the test using composition B. It is to be noted, that
 the Celite™ material comprised in Composition A has an average particle diameter in the range of about
 15 10 to 15 µm, significantly less than the sieve pore diameter.

These enhanced spray application properties for the composition according to the invention
 leading to almost no residues is considered unusual for an extruded water-dispersible granule. A
 possible explanation for this observation may be that residue formation results from the Celite™ 209
 component of Composition A absorbing some of the dispersant/surfactant component of the
 20 composition.

(ii) Suspensibility study

Suspensibility of Compositions A and B is defined in the present example as the percentage of
 25 solid particles and non-volatile ingredients remaining in suspension after a defined time period standing
 in a cylindrical column of water (250 mL) at 30°C (initial suspensibility analysis). In the present example,
 the water-dispersible granules of Compositions A and B were tested at a 1% w/v dilution in water.

At the end of the 30-minute standing period, the top 9/10th (225 mL) of the test sample volume
 was drawn off avoiding turbulence and discarded. The remaining 1/10th (25 mL) was retained and the
 30 suspensibility determined by routine gravimetric analysis by evaporating water from the sample,
 weighing the dried sample and then calculating the suspensibility percentage based on the observed
 weight versus expected weight for an optimal suspensibility, ie, 10% of the original weight of
 Compositions A and B. Tests were also conducted in accordance with this procedure with standing of
 the suspensions for 2 weeks at 54 °C and for 8 weeks at 40 °C.

The higher the suspensibility percentage (see Table 2), the better performed the composition in terms of an even distribution of the solid particles and non-volatile ingredients throughout the volume of the sample (ie, 100% = optimal suspension. 0% = settled and no suspension/fully settled contents).

5 Table 2:

Composition	After time (weeks) at temperature (°C)	Suspensibility (%)
A	Initial	59
A	2 weeks at 54 °C	57
A	8 weeks at 40 °C	58
B	Initial	95
B	2 weeks at 54 °C	96
B	8 weeks at 40 °C	96

It is clear from the suspensibility data in Table 2 that Composition B according to the invention has far superior suspensibility properties to Composition A.

Claims:

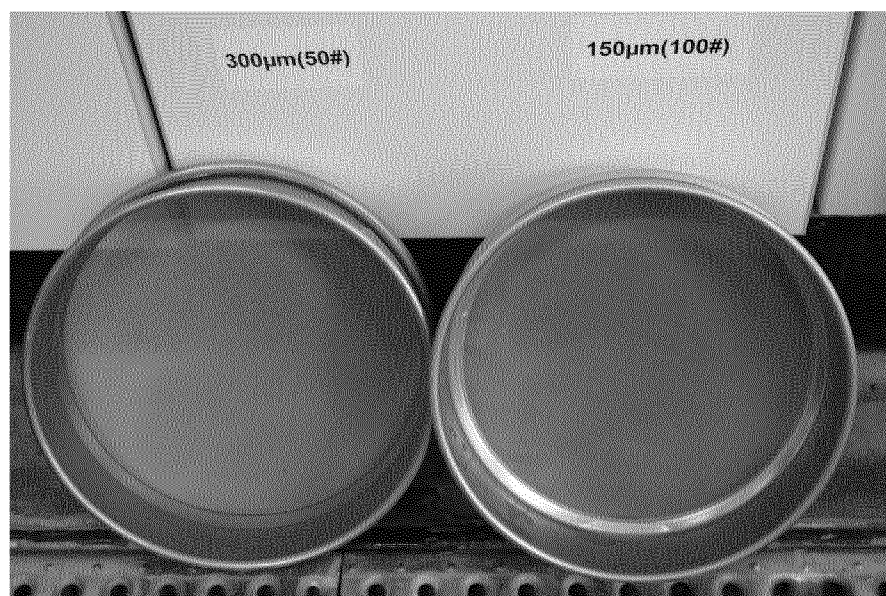
1. A pesticidal composition comprising:
 - 5 (i) 25 to 35% by weight of spiropidion;
 - (ii) 15 to 25% by weight of cyantraniliprole; and
 - (iii) 15 to 30% by weight of 4-O- β -D-galactopyranosyl- α -D-glucopyranose, as a filler component.
- 10 2. The pesticidal composition according to claim 1, comprising:
 - (i) 28 to 32% by weight of spiropidion; and
 - (ii) 20 to 25% by weight of cyantraniliprole.
- 15 3. The pesticidal composition according to claim 1 or claim 2, comprising:
 - (iii) 20 to 25% by weight of 4-O- β -D-galactopyranosyl- α -D-glucopyranose.
4. The pesticidal composition according to any one of claims 1 to 3, wherein the filler component
20 comprises less than 5% by weight of a diatomaceous earth material (eg, CeliteTM), or does not comprise a diatomaceous earth material.
5. The pesticidal composition according to any one of claims 1 to 4, further comprising:
 - 25 (iv) 10 to 20% by weight of one or more dispersants;
 - (v) 1 to 5% by weight of an anti-foaming agent; and
 - (vi) 5 to 10% by weight of a buffer.
6. The composition according to any one of claims 1 to 5, further comprising one or more additional
30 ingredients selected from wetting agents, biocides, stabilizers and pigments.
7. The pesticidal composition according to any one of claims 1 to 6, further comprising an additional insecticidal active ingredient.
- 35 8. The pesticidal composition according to any one of claims 1 to 7, which is a water-disperable granule.
9. An aqueous composition comprising the pesticidal composition according to any one of claims 1 to 8, optionally further comprising one or more adjuvants or carriers.

10. The aqueous composition according to claim 9, wherein the adjuvant is selected from a mineral oil, a vegetable oil, an esterified vegetable oil, a methylated vegetable oil or an alkyl ester phosphate-based adjuvant.
- 5 11. A method of combating and controlling pests which comprises applying to a pest, to a locus of a pest, or to a crop of a useful plant susceptible to attack by a pest, a composition according to any one of claims 1 to 10.
12. The method according to claim 11, wherein the pest is selected from the order *Homoptera*,
10 *Thysanoptera*, *Acarina* or *Lepidoptera*.
13. The method according to claim 12, wherein the pest is selected from white flies, aphids, thrips.
14. The method according to any one of claims 11 to 13, wherein the plant is selected from:
15 (i) cotton; or
(ii) fruit and vegetables, in particular Cucurbita, Brassicaceae or Solanaceae,

and preferably the plant is selected from cotton, cucumber, tomato, pepper, chili, broccoli,
20 cauliflower, cabbage.
15. The method according to any one of claims 11 to 14, wherein applying the composition is to the soil of the crop of the useful plant by drip, drenching or injection.



Composition A



Composition B

FIGURE 1

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2023/063171

A. CLASSIFICATION OF SUBJECT MATTER

INV. A01N25/14 A01N43/40 A01N43/56

ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A01N

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search

14 July 2023

Date of mailing of the international search report

24/07/2023

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INTERNATIONAL SEARCH REPORT

International application No

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A	EP 2 446 742 A1 (BAYER CROPSCIENCE AG [DE]) 2 May 2012 (2012-05-02) the whole document -----	1-15

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