



(51) International Patent Classification:
A01N 43/56 (2006.01)

(21) International Application Number:
PCT/US2015/061556

(22) International Filing Date:
19 November 2015 (19.11.2015)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant: **DOW AGROSCIENCES LLC** [US/US];
9330 Zionsville Road, Indianapolis, Indiana 46268 (US).

(72) Inventors: **GOMEZ, Luis E.**; 9330 Zionsville Road, Indianapolis, IN 46268 (US). **SRIGIRIRAJU, Lakshmipathi**; 9330 Zionsville Road, Indianapolis, IN 46268 (US). **WANG, Peng**; #936 Zhangheng Road, Zhangjiang Hi-Tech Park, Shanghai, Zhejiang 201203 (CN). **HUANG, Ta I.**; 7F, No.2, Sec 1, Dunhua S Rd., Taipei, 105 (TW). **REN, Lu**; Dow Agrosciences (China) Co., 936, Zhangheng Road Zhangjiang Hi-Tech Park, Shanghai, Zhejiang 201203 (CN).

(74) Agent: **CORVIN, Carl**; Dow AgroSciences LLC, 9330 Zionsville Road, Indianapolis, Indiana 46268 (US).

(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, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, 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, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, 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, 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).

Published:

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

(54) Title: MOLECULES HAVING PESTICIDAL UTILITY, PESTICIDAL COMPOSITIONS, AND PROCESSES, RELATED THERETO

(57) Abstract: This disclosure relates to the field of molecules having pesticidal utility against pests in Phyla Arthropoda, Mollusca, and Nematoda, pesticidal compositions containing such molecules, and processes of using such pesticidal compositions against such pests. A process comprising applying a pesticidally effective amount of a pesticidal composition to a locus to control a pest wherein: (a) said applying is by foliar application; (b) said pesticidally effective amount is from about 20 grams of active ingredient per hectare to about 100 grams of active ingredient per hectare.



Molecules having pesticidal utility, pesticidal compositions, and processes, related thereto

Field of this disclosure

- 5 This disclosure relates to the field of molecules having pesticidal utility against pests in Phyla Arthropoda, Mollusca, and Nematoda, pesticidal compositions containing such molecules, and processes of using such pesticidal compositions against such pests.

Background of this disclosure

- 10 In WO2013/162716 A9 the following molecules having pesticidal utility, and intermediates, compositions, and processes, related thereto are disclosed.

653	
861	
862	

Definitions used in this disclosure

- 15 The examples given in these definitions are generally non-exhaustive and must not be construed as limiting this disclosure.

The phrase "**pesticidally effective amount**" means the amount of a pesticide needed to achieve an observable effect on a pest, for example, the effects of necrosis, death, retardation, prevention, removal, destruction, or otherwise diminishing the occurrence and/or activity of a pest in a locus. This effect may come about when pest populations are repulsed from a locus, pests are incapacitated in, or around, a locus, and/or pests are exterminated in, or around, a locus. Of course, a combination of these effects can occur. Generally, pest populations, activity, or both are desirably reduced more than fifty percent, preferably more than 90 percent, and most preferably more than 99 percent. In general, a pesticidally effective amount, for agricultural purposes, is from about 0.0001 grams per hectare to about 10000 grams per hectare, preferably from about 0.0001 grams per hectare to about 1000 grams per hectare, and it is even more preferably from about 0.0001 grams per hectare to about 100 grams per hectare.

The term "**locus**" means a habitat, breeding ground, plant, seed, soil, material, or environment, in which a pest is growing, may grow, or may traverse. For example, a locus may be: where crops, trees, fruits, cereals, fodder species, vines, turf, and/or ornamental plants, are growing; where domesticated animals are residing; the interior or exterior surfaces of buildings (such as places where grains are stored); the materials of construction used in buildings (such as impregnated wood); and the soil around buildings.

The term "**pest**" means an organism that is detrimental to humans, or human concerns (such as, crops, food, livestock, etc.), where said organism is from Phyla Arthropoda, Mollusca, or Nematoda. Particular examples are ants, aphids, bed bugs, beetles, bristletails, caterpillars, cockroaches, crickets, earwigs, fleas, flies, grasshoppers, grubs, hornets, jassids, leafhoppers, leaf miners, lice, locusts, maggots, mealybugs, mites, moths, nematodes, plantbugs, planthoppers, psyllids, sawflies, scales, silverfish, slugs, snails, spiders, springtails, stink bugs, symphylans, termites, thrips, ticks, wasps, whiteflies, and wireworms.

Additional examples are pests in

(1) **Subphyla Chelicerata, Myriapoda, and Hexapoda.**

(2) **Classes of Arachnida, Symphyla, and Insecta.**

(3) **Order Hemiptera.** A non-exhaustive list of particular genera includes, but is not limited to, *Adelges* spp., *Aulacaspis* spp., *Aphrophora* spp., *Aphis* spp., *Bemisia* spp., *Brevicoryne* spp., *Cacopsylla* spp., *Ceroplastes* spp., *Chionaspis* spp., *Chrysomphalus* spp., *Coccus* spp., *Diaphorina* spp., *Dysaphis* spp., *Empoasca* spp., *Erythroneura* spp., *Euschistus* spp., *Hyalopterus* spp., *Jacobiasca* spp., *Lecanium* spp., *Lepidosaphes* spp., *Lagynotomus* spp., *Lygus* spp., *Macrosiphum* spp., *Myzus* spp.,

Nasonovia spp., *Nephotettix* spp., *Nezara* spp., *Nilaparvata* spp., *Paracoccus* spp., *Paratrioza* spp., *Philaenus* spp., *Phytocoris* spp., *Piezodorus* spp., *Planococcus* spp., *Pseudococcus* spp., *Quadraspidotus* spp., *Rhopalosiphum* spp., *Saissetia* spp., *Therioaphis* spp., *Toumeyella* spp., *Toxoptera* spp., *Trialeurodes* spp., *Triatoma* spp., and *Unaspis* spp. A non-exhaustive list of particular species includes, but is not limited to, *Acrosternum hilare*, *Acyrtosiphon pisum*, *Aleyrodes proletella*, *Aleurodicus dispersus*, *Aleurothrixus floccosus*, *Amrasca biguttula biguttula*, *Aonidiella aurantii*, *Aphis fabae*, *Aphis gossypii*, *Aphis glycines*, *Aphis pomi*, *Aulacorthum solani*, *Bactericera cockerelli*, *Bagrada hilaris*, *Bemisia argentifolii*, *Bemisia tabaci*, *Blissus leucopterus*, *Boisea trivittata*, *Brachycorynella asparagi*, *Brevennia rehi*, *Brevicoryne brassicae*, *Cacopsylla pyri*, *Cacopsylla pyricola*, *Calocoris norvegicus*, *Ceroplastes rubens*, *Cimex hemipterus*, *Cimex lectularius*, *Coccus pseudomagnoliarum*, *Dagbertus fasciatus*, *Dichelops furcatus*, *Diuraphis noxia*, *Diaphorina citri*, *Dysaphis plantaginea*, *Dysdercus suturellus*, *Edessa meditabunda*, *Empoasca vitis*, *Eriosoma lanigerum*, *Erythroneura elegantula*, *Eurygaster maura*, *Euschistus conspersus*, *Euschistus heros*, *Euschistus servus*, *Halyomorpha halys*, *Hyalopterus pruni*, *Helopeltis antonii*, *Helopeltis theivora*, *Icerya purchasi*, *Idioscopus nitidulus*, *Jacobiasca formosana*, *Laodelphax striatellus*, *Lecanium corni*, *Leptocorisa oratorius*, *Leptocorisa varicornis*, *Lygus hesperus*, *Maconellicoccus hirsutus*, *Macrosiphum euphorbiae*, *Macrosiphum granarium*, *Macrosiphum rosae*, *Macrosteles quadrilineatus*, *Mahanarva frimbiolata*, *Megacopta cribraria*, *Metopolophium dirhodum*, *Mictis longicornis*, *Myzus persicae*, *Nasonovia ribisnigri*, *Nephotettix cincticeps*, *Neurocolpus longirostris*, *Nezara viridula*, *Nilaparvata lugens*, *Paracoccus marginatus*, *Paratrioza cockerelli*, *Parlatoria pergandii*, *Parlatoria ziziphi*, *Peregrinus maidis*, *Phylloxera vitifoliae*, *Physokermes piceae*, *Phytocoris californicus*, *Phytocoris relativus*, *Piezodorus guildinii*, *Planococcus citri*, *Planococcus ficus*, *Poecilocapsus lineatus*, *Psallus vaccinicola*, *Pseudacysta perseae*, *Pseudococcus brevipes*, *Quadraspidotus perniciosus*, *Rhopalosiphum maidis*, *Rhopalosiphum padi*, *Saissetia oleae*, *Scaptocoris castanea*, *Schizaphis graminum*, *Sitobion avenae*, *Sogatella furcifera*, *Trialeurodes vaporariorum*, *Trialeurodes abutiloneus*, *Unaspis yanonensis*, and *Zulia entrerriana*.

(4) Order Diptera. A non-exhaustive list of particular genera includes, but is not limited to, *Aedes* spp., *Agromyza* spp., *Anastrepha* spp., *Anopheles* spp., *Bactrocera* spp., *Ceratitis* spp., *Chrysops* spp., *Cochliomyia* spp., *Contarinia* spp., *Culex* spp., *Culicoides* spp., *Dasineura* spp., *Delia* spp., *Drosophila* spp., *Fannia* spp., *Hylemya* spp., *Liriomyza* spp., *Musca* spp., *Phorbia* spp., *Pollenia* spp., *Psychoda* spp., *Simulium* spp., *Tabanus* spp., and *Tipula* spp. A non-exhaustive list of particular species includes, but is not limited to, *Agromyza frontella*, *Anastrepha suspensa*, *Anastrepha ludens*, *Anastrepha obliqua*, *Bactrocera cucurbitae*, *Bactrocera dorsalis*, *Bactrocera invadens*, *Bactrocera zonata*, *Ceratitis capitata*, *Dasineura brassicae*, *Delia platura*, *Fannia canicularis*, *Fannia*

scalaris, *Gasterophilus intestinalis*, *Gracillia perseae*, *Haematobia irritans*, *Hypoderma lineatum*, *Liriomyza brassicae*, *Liriomyza sativa*, *Melophagus ovinus*, *Musca autumnalis*, *Musca domestica*, *Oestrus ovis*, *Oscinella frit*, *Pegomya betae*, *Piophilha casei*, *Psila rosae*, *Rhagoletis cerasi*, *Rhagoletis pomonella*, *Rhagoletis mendax*, *Sitodiplosis mosellana*, and

5 *Stomoxys calcitrans*.

- (5) **Order Lepidoptera.** A non-exhaustive list of particular genera includes, but is not limited to, *Adoxophyes* spp., *Agrotis* spp., *Argyrotaenia* spp., *Cacoecia* spp., *Caloptilia* spp., *Chilo* spp., *Chrysodeixis* spp., *Colias* spp., *Crambus* spp., *Diaphania* spp., *Diatraea* spp., *Earias* spp., *Ephestia* spp., *Epimecis* spp., *Feltia* spp., *Gortyna* spp.,
- 10 *Helicoverpa* spp., *Heliothis* spp., *Indarbela* spp., *Lithocolletis* spp., *Loxagrotis* spp., *Malacosoma* spp., *Nemapogon* spp., *Ostrinia* spp., *Peridroma* spp., *Phyllonorycter* spp., *Pseudaletia* spp., *Plutella* spp., *Scirpophaga* spp., *Sesamia* spp., *Spodoptera* spp., *Synanthedon* spp., and *Yponomeuta* spp. A non-exhaustive list of particular species includes, but is not limited to, *Achaea janata*, *Adoxophyes orana*, *Agrotis ipsilon*,
- 15 *Alabama argillacea*, *Amorbia cuneana*, *Amyelois transitella*, *Anacamptodes defectaria*, *Anarsia lineatella*, *Anomis sabulifera*, *Anticarsia gemmatalis*, *Archips argyrospila*, *Archips rosana*, *Argyrotaenia citrana*, *Autographa gamma*, *Bonagota cranaodes*, *Borbo cinnara*, *Bucculatrix thurberiella*, *Capua reticulana*, *Carpocapsa niponensis*, *Chlumetia transversa*, *Choristoneura rosaceana*, *Cnaphalocrocis medinalis*, *Conopomorpha cramerella*, *Corcyra cephalonica*, *Cossus cossus*, *Cydia caryana*, *Cydia funebrana*, *Cydia molesta*, *Cydia nigricana*, *Cydia pomonella*, *Darna diducta*, *Diaphania nitidalis*, *Diatraea saccharalis*,
- 20 *Diatraea grandiosella*, *Earias insulana*, *Earias vittella*, *Ecdytolopha aurantianum*, *Elasmopalpus lignosellus*, *Ephestia cautella*, *Ephestia elutella*, *Ephestia kuehniella*, *Epinotia aporema*, *Epiphyas postvittana*, *Erionota thrax*, *Estigmene acrea*, *Eupoecilia ambiguella*, *Euxoa auxiliaris*, *Galleria mellonella*, *Grapholita molesta*, *Hedylepta indicata*, *Helicoverpa armigera*, *Helicoverpa zea*, *Heliothis virescens*, *Hellula undalis*, *Keiferia lycopersicella*, *Leucinodes orbonalis*, *Leucoptera coffeella*, *Leucoptera malifoliella*, *Lobesia botrana*, *Loxagrotis albicosta*, *Lymantria dispar*, *Lyonetia clerkella*, *Mahasena corbetti*, *Mamestra brassicae*, *Manduca sexta*, *Maruca testulalis*, *Metisa plana*, *Mythimna*
- 25 *unipuncta*, *Neoleucinodes elegantalis*, *Nymphula depunctalis*, *Operophtera brumata*, *Ostrinia nubilalis*, *Oxydia vesulia*, *Pandemis cerasana*, *Pandemis heparana*, *Papilio demodocus*, *Pectinophora gossypiella*, *Peridroma saucia*, *Perileucoptera coffeella*, *Phthorimaea operculella*, *Phyllocnistis citrella*, *Phyllonorycter blancardella*, *Pieris rapae*, *Plathypena scabra*, *Platynota idaeusalis*, *Plodia interpunctella*, *Plutella xylostella*,
- 30 *Polychrosis viteana*, *Prays endocarpa*, *Prays oleae*, *Pseudaletia unipuncta*, *Pseudoplusia includens*, *Rachiplusia nu*, *Scirpophaga incertulas*, *Sesamia inferens*, *Sesamia nonagrioides*, *Setora nitens*, *Sitotroga cerealella*, *Sparganothis pillariana*, *Spodoptera*

exigua, *Spodoptera frugiperda*, *Spodoptera eridania*, *Thecla basilides*, *Tinea pellionella*, *Tineola bisselliella*, *Trichoplusia ni*, *Tuta absoluta*, *Zeuzera coffeae*, and *Zeuzera pyrina*.

(6) Order Thysanoptera. A non-exhaustive list of particular genera includes, but is not limited to, *Caliothrips* spp., *Frankliniella* spp., *Scirtothrips* spp., and *Thrips* spp.

5 A non-exhaustive list of particular species includes, but is not limited to, *Caliothrips phaseoli*, *Frankliniella bispinosa*, *Frankliniella fusca*, *Frankliniella occidentalis*, *Frankliniella schultzei*, *Frankliniella tritici*, *Frankliniella williamsi*, *Heliothrips haemorrhoidalis*, *Rhipiphorothrips cruentatus*, *Scirtothrips citri*, *Scirtothrips dorsalis*, *Taeniothrips rhopalantennalis*, *Thrips hawaiiensis*, *Thrips nigropilosus*, *Thrips orientalis*,
10 *Thrips palmi*, and *Thrips tabaci*.

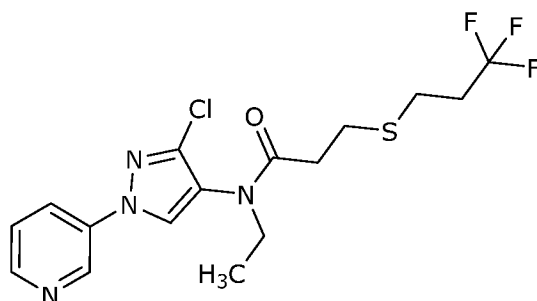
(7) Order Coleoptera. A non-exhaustive list of particular genera includes, but is not limited to, *Acanthoscelides* spp., *Agriotes* spp., *Anthonomus* spp., *Apion* spp., *Apogonia* spp., *Araecerus* spp., *Aulacophora* spp., *Bruchus* spp., *Cerosterna* spp., *Cerotoma* spp., *Ceutorhynchus* spp., *Chaetocnema* spp., *Colaspis* spp., *Ctenicera* spp.,
15 *Curculio* spp., *Cyclocephala* spp., *Diabrotica* spp., *Dinoderus* spp., *Gnathocerus* spp., *Hemicoelus* spp., *Heterobostrichus* spp., *Hypera* spp., *Ips* spp., *Lyctus* spp., *Megascelis* spp., *Meligethes* spp., *Mezium* spp., *Niptus* spp., *Otiorhynchus* spp., *Pantomorus* spp., *Phyllophaga* spp., *Phyllotreta* spp., *Ptinus* spp., *Rhizotrogus* spp., *Rhynchites* spp., *Rhynchophorus* spp., *Scolytus* spp., *Sphenophorus* spp., *Sitophilus* spp., *Tenebrio* spp.,
20 and *Tribolium* spp. A non-exhaustive list of particular species includes, but is not limited

to, *Acanthoscelides obtectus*, *Agilus planipennis*, *Ahasverus advena*, *Alphitobius diaperinus*, *Anoplophora glabripennis*, *Anthonomus grandis*, *Anthrenus verbasci*, *Anthrenus falvipes*, *Ataenius spretulus*, *Atomaria linearis*, *Attagenus unicolor*, *Bothynoderes punctiventris*, *Bruchus pisorum*, *Callosobruchus maculatus*, *Carpophilus*
25 *hemipterus*, *Cassida vittata*, *Cathartus quadricollis*, *Cerotoma trifurcata*, *Ceutorhynchus assimilis*, *Ceutorhynchus napi*, *Conoderus scalaris*, *Conoderus stigmaticus*, *Conotrachelus nenuphar*, *Cotinis nitida*, *Crioceris asparagi*, *Cryptolestes ferrugineus*, *Cryptolestes pusillus*, *Cryptolestes turcicus*, *Cylindrocopturus adspersus*, *Deporaus marginatus*, *Dermestes lardarius*, *Dermestes maculatus*, *Epilachna varivestis*, *Euvrilletta peltata*,
30 *Faustinus cubae*, *Hylobius pales*, *Hylotrupes bajulus*, *Hypera postica*, *Hypothenemus hampei*, *Lasioderma serricorne*, *Leptinotarsa decemlineata*, *Limonius canus*, *Liogenys fuscus*, *Liogenys suturalis*, *Lissorhoptrus oryzophilus*, *Lophocateres pusillus*, *Lyctus planicollis*, *Maecolaspis jolivetii*, *Melanotus communis*, *Meligethes aeneus*, *Melolontha melolontha*, *Necrobia rufipes*, *Oberea brevis*, *Oberea linearis*, *Oryctes rhinoceros*,
35 *Oryzaephilus mercator*, *Oryzaephilus surinamensis*, *Oulema melanopus*, *Oulema oryzae*, *Phyllophaga cuyabana*, *Polycaon stoutii*, *Popillia japonica*, *Prostephanus truncatus*, *Rhyzopertha dominica*, *Sitona lineatus*, *Sitophilus granarius*, *Sitophilus oryzae*, *Sitophilus zeamais*, *Stegobium paniceum*, *Tenebroides mauritanicus*, *Tribolium castaneum*,

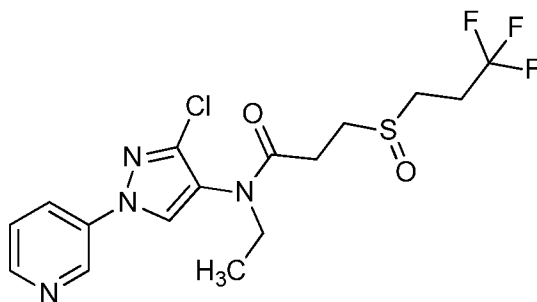
Tribolium confusum, *Trogoderma granarium*, *Trogoderma variabile*, *Xestobium rufovillosum*, and *Zabrus tenebrioides*.

Detailed description of this disclosure

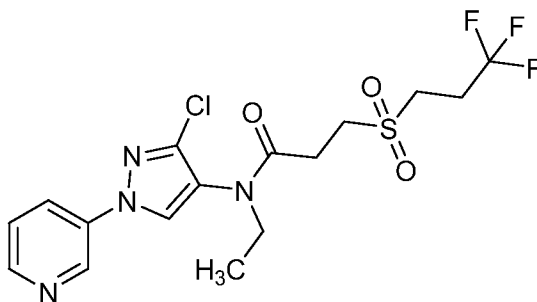
5 The following molecules having pesticidal utility are used herein



M-I,



M-II, and



M-III.

M-I, M-II, and M-III, each of which is a pesticide, each of which is an active ingredient, and all of which are collectively defined as "AIGA."

Formulations

A pesticide is many times not suitable for application in its pure form. It is usually necessary to add other substances so that the pesticide may be used at the required concentration and in an appropriate form, permitting ease of application, handling, transportation, storage, and maximum pesticide activity. Thus, pesticides are formulated

into, for example, baits, concentrated emulsions, dusts, emulsifiable concentrates, fumigants, gels, granules, microencapsulations, seed treatments, suspension concentrates, suspoemulsions, tablets, water soluble liquids, water dispersible granules, soluble granules, wettable powders, and ultra-low volume solutions.

5 Pesticides are applied most often as aqueous suspensions or oil in water emulsions prepared from concentrated emulsion formulations (EW) of such pesticides. Such water-soluble, water-suspendable, or emulsifiable formulations are either solids, usually known as wettable powders, water dispersible granules (WG), or liquids usually known as emulsifiable concentrates (EC), or aqueous suspension concentrates (SC).

10 Wettable powders (WP), which may be compacted to form water dispersible granules, comprise an intimate mixture of the pesticide, a carrier, and adjuvants, and/or surfactants. The concentration of the pesticide is usually from about 10% to about 90% by weight. The carrier is usually selected from among the attapulgite clays, the montmorillonite clays, the diatomaceous earths, kaolinite clay, or the purified silicates.

15 Effective surfactants, comprising from about 0.5% to about 15% of the wettable powder, are found among sulfonated lignins, condensed naphthalenesulfonates, naphthalenesulfonates, alkylbenzenesulfonates, alkyl sulfates, and non-ionic surfactants such as ethylene oxide adducts of C-4 and longer carbon chain length alcohols.

 Emulsifiable concentrates of pesticides comprise a convenient concentration of a
20 pesticide, such as from about 50 grams per liter to about 500 grams per liter of liquid dissolved in a carrier that is either a water miscible solvent or a mixture of an essentially water-immiscible organic solvent and emulsifiers. Useful organic solvents include aromatics, especially xylenes and petroleum fractions, especially the high-boiling naphthalenic and olefinic portions of petroleum such as heavy aromatic naphtha. Other
25 organic solvents may also be used, such as the terpenic solvents including rosin derivatives, aliphatic ketones such as cyclohexanone, and complex alcohols such as 2-ethoxyethanol. Suitable emulsifiers for emulsifiable concentrates are selected from conventional anionic and non-ionic surfactants.

 Aqueous suspensions comprise suspensions of water-insoluble pesticides
30 dispersed in an aqueous carrier at a concentration in the range from about 5% to about 50% by weight. Suspensions are prepared by finely grinding the pesticide and vigorously mixing it into a carrier comprised of water and surfactants. Ingredients, such as inorganic salts and synthetic or natural gums may, also be added to increase the density and viscosity of the aqueous carrier. It is often most effective to wet mill and mix the
35 pesticide at the same time by preparing the aqueous mixture and homogenizing it in an implement such as a sand mill, ball mill, or piston-type homogenizer.

 Oil dispersions (OD) comprise suspensions of organic solvent-insoluble pesticides finely dispersed in a mixture of organic solvent and emulsifiers at a concentration in the

range from about 2% to about 50% by weight. One or more pesticide might be dissolved in the organic solvent. Useful organic solvents include aromatics, especially xylenes and petroleum fractions, especially the high-boiling naphthalenic and olefinic portions of petroleum such as heavy aromatic naphtha. Other solvents may include vegetable oils, seed oils, and esters of vegetable and seed oils. Suitable emulsifiers for oil dispersions are selected from conventional anionic and non-ionic surfactants. Thickeners or gelling agents are added in the formulation of oil dispersions to modify the rheology or flow properties of the liquid and to prevent separation and settling of the dispersed particles or droplets.

Pesticides may also be applied as granular compositions that are particularly useful for applications to the soil. Granular compositions (GR) usually contain from about 0.5% to about 10% by weight of the pesticide, dispersed in a carrier that comprises cellulosic materials, naturally occurring minerals including gypsum or limestone, or similar substances. Such compositions are usually prepared by melting the pesticide or dissolving the pesticide in a suitable solvent and applying it to a granular carrier such as a granular fertilizer such as urea, which has been pre-formed to the appropriate particle size, in the range of from about 0.5 mm to about 3 mm. Such compositions may also be formulated by making a dough or paste of the carrier and molecule, and then crushing and drying to obtain the desired granular particle size. Another form of granules is a water emulsifiable granule (EG). It is a formulation consisting of granules to be applied as a conventional oil-in-water emulsion of the active ingredient(s), either solubilized or diluted in an organic solvent, after disintegration and dissolution in water. Water emulsifiable granules comprise one or several active ingredient(s), either solubilized or diluted in a suitable organic solvent that is (are) absorbed in a water soluble polymeric shell or some other type of soluble or insoluble matrix.

Dusts containing a pesticide are prepared by intimately mixing the pesticide in powdered form with a suitable dusty agricultural carrier, such as kaolin clay, ground volcanic rock, and the like. Dusts can suitably contain from about 1% to about 10% of the pesticide. Dusts may be applied as a seed dressing or as a foliage application with a dust blower machine.

It is equally practical to apply a pesticide in the form of a solution in an appropriate organic solvent, usually petroleum oil, such as the spray oils, which are widely used in agricultural chemistry.

Pesticides can also be applied in the form of an aerosol composition. In such compositions, the pesticide is dissolved or dispersed in a carrier, which is a pressure-generating propellant mixture. The aerosol composition is packaged in a container from which the mixture is dispensed through an atomizing valve.

Pesticide baits are formed when the pesticide is mixed with food or an attractant or both. When the pests eat the bait, they also consume the pesticide. Baits may take the form of granules, gels, flowable powders, liquids, or solids. Baits may be used in pest harborages.

5 Fumigants are pesticides that have a relatively high vapor pressure and hence can exist as a gas in sufficient concentrations to kill pests in soil or enclosed spaces. The toxicity of the fumigant is proportional to its concentration and the exposure time. They are characterized by a good capacity for diffusion and act by penetrating the pest's respiratory system or being absorbed through the pest's cuticle. Fumigants are applied
10 to control stored product pests under gas proof sheets, in gas sealed rooms or buildings, or in special chambers.

Pesticides may be microencapsulated by suspending the pesticide particles or droplets in plastic polymers of various types. By altering, the chemistry of the polymer or by changing factors in the processing, microcapsules may be formed of various sizes,
15 solubility, wall thicknesses, and degrees of penetrability. These factors govern the speed with which the active ingredient within is released, which in turn, affects the residual performance, speed of action, and odor of the product. The microcapsules might be formulated as a capsule suspension (CS) concentrates or water dispersible granules.

Oil solution concentrates are made by dissolving pesticide in a solvent that will
20 hold the pesticide in solution. Oil solutions of a pesticide usually provide faster knockdown and kill of pests than other formulations due to the solvents themselves having pesticidal action and the dissolution of the waxy covering of the integument increasing the speed of uptake of the pesticide. Other advantages of oil solutions include better storage stability, better penetration of crevices, and better adhesion to greasy
25 surfaces.

Another embodiment is an oil-in-water emulsion, wherein the emulsion comprises oily globules which are each provided with a lamellar liquid crystal coating and are dispersed in an aqueous phase, wherein each oily globule comprises at least one molecule which is agriculturally active, and is individually coated with a monolamellar or
30 oligolamellar layer comprising: (1) at least one non-ionic lipophilic surface-active agent, (2) at least one non-ionic hydrophilic surface-active agent, and (3) at least one ionic surface-active agent, wherein the globules having a mean particle diameter of less than 800 nanometers.

35 Applications

Molecules selected from AIGA may be applied to any locus. General loci to apply such molecules include loci where crops, trees, fruits, cereals, fodder species, vines, turf, and/or ornamental plants, are growing or may be planted. Particular loci to apply such

molecules include loci where alfalfa, almonds, apples, barley, beans, canola, citrus (for example Grapefruit and Lemons), corn, cotton, crucifers (for example, Broccoli, Cabbage, and Cauliflower), cucurbits (for example, Cantaloupe, Cucumber, Squash, and various melons), flowers, fodder species (Rye Grass, Sudan Grass, Tall Fescue, Kentucky Blue Grass, and Clover), fruits, grapes, leaf vegetables (for example Salad Greens and Pigweed), lettuce, oats, oil seed crops, oranges, papayas, peanuts, peaches, pears, peppers, plums, potatoes, rice, sorghum, soybeans, strawberries, sugarcane, sugarbeets, sunflowers, teas, tobacco, tomatoes, wheat (for example, Hard Red Winter Wheat, Soft Red Winter Wheat, White Winter Wheat, Hard Red Spring Wheat, and Durum Spring Wheat), and other valuable crops are growing or the seeds thereof are going to be planted.

Molecules selected from AIGA may also be applied where plants, such as crops, are growing and where there are levels of pests that can commercially damage such plants. Applying such molecules in such locus is to benefit the plants being grown in such locus. Such phytotonic benefits, may include, but are not limited to: helping the plant grow a better root system; helping the plant better withstand stressful growing conditions; improving the health of a plant; improving the yield of a plant (*e.g.* increased biomass and/or increased content of valuable ingredients); improving the vigor of a plant (*e.g.* improved plant growth and/or greener leaves); improving the quality of a plant (*e.g.* improved content or composition of certain ingredients); and improving the tolerance to abiotic and/or biotic stress of the plant.

Specifically, molecules selected from AIGA may also be applied where rice plants are growing and where there are levels of pests that can commercially damage such plants. Applying such molecules in such a locus is to benefit the plants being grown in such a locus. Such phytotonic benefits, may include, but are not limited to: a reduction of deadhearts (a yellowing and drying of the central shoot); and a reduction in whiteheads (a rice panicle not filled with grain).

Molecules selected from AIGA may also be applied where plants, such as crops, are growing and where there are low levels (even no actual presence) of pests that can commercially damage such plants. Applying such molecules in such locus is to benefit the plants being grown in such locus. Such phytotonic benefits, may include, but are not limited to: helping the plant grow a better root system; helping the plant better withstand stressful growing conditions; improving the health of a plant; improving the yield of a plant (*e.g.* increased biomass and/or increased content of valuable ingredients); improving the vigor of a plant (*e.g.* improved plant growth and/or greener leaves); improving the quality of a plant (*e.g.* improved content or composition of certain ingredients); and improving the tolerance to abiotic and/or biotic stress of the plant.

Molecules selected from AIGA may be applied to the foliar and/or fruiting portions of plants to control pests. Either such molecules will come in direct contact with the pest, or the pest will consume such molecules when eating the plant or while extracting sap or other nutrients from the plant.

5 Systemic movement of pesticides in plants may be utilized to control pests on one portion of the plant by applying (for example by spraying a locus) molecules selected from AIGA to a different portion of the plant. For example, control of foliar-feeding or stem feeding pests may be achieved by flood irrigation, furrow irrigation, or drip (trickle) irrigation, by sprinkler methods, by treating the soil with a drench or an injection, by
10 treating the seeds of a plant before planting. For these types of applications, a pesticide may be diluted in water to the target dilution rate to achieve the desired rate of active ingredient per hectare, after which time the solution is evenly distributed in the growing area among all plants or in the growing area prior to introduction of the plants (seedlings) or seeds. These types of applications may be performed using, ditches with
15 siphon tubes, ditches with spiles (small straight pipes), irrigation pipes with outlets, buried pipe with vertical pipe outlets, sprinkler systems, sprayers such as backpack sprayers or mist sprayers, or simple containers such as watering cans.

Molecules selected from AIGA may also be applied to the soil via the process of chemigation, and when applied in this manner, root and stem feeding pests may be
20 controlled. For example, control of root and stem feeding pests may be achieved by flood irrigation, furrow irrigation, or drip (trickle) irrigation, by sprinkler methods, by treating the soil with a drench or an injection, by treating the seeds of a plant before planting. For these types of applications, a pesticide may be diluted in water to the target dilution rate to achieve the desired rate of active ingredient per hectare, after which time the
25 solution is evenly distributed in the growing area among all plants or in the growing area prior to introduction of the plants (seedlings) or seeds. These types of applications may be performed using, ditches with siphon tubes, ditches with spiles (small straight pipes), irrigation pipes with outlets, buried pipe with vertical pipe outlets, sprinkler systems, sprayers, or simple containers. The roots may absorb such active ingredients thereby
30 taking it up into the foliar portions of the plant (leaves and stems) to control above ground chewing and sap feeding pests. Soil applications may be performed prior to the transplant of plants.

Chemigation is an application of a pesticide by an irrigation method. Chemigation offers a series of advantages over foliar spray application methods including but not
35 limited to uniform distribution of pesticide throughout the plant; a reduction in pesticide application inputs including man-power and machinery fuel; and a reduction in soil compaction, plant disturbance, and applicator exposure to pesticides.

Foliar applications are performed either during the transplant of plants or after the plants have already been transplanted into the field or at any time in the lifecycle of the plant. In a foliar application, the concentrated pesticide is usually diluted in water to achieve the desired concentration of active ingredient. The desired amount of the
5 pesticide and water mixture is then deposited on the foliar and/or fruiting portions of plants to control pests using a sprayer, such as a backpack sprayer or a sprinkler, or by dipping.

Granular applications are performed either during the transplant of plants or after the plants have already been transplanted into the field or at any time in the lifecycle of
10 the plant. In certain granular applications, the concentrated pesticide is diluted in water to achieve the desired concentration of active ingredient. The desired concentration is then added to a granular carrier and the resulting composition is then dried to form a granular composition. The granular composition may be applied by a scattering method such as by hand or any type of granular spreader.

15 Drench applications are performed either prior to the transplants of plants, during the transplant of plants, after the plants have already been transplanted into the field, or at any time in the lifecycle of the plant. A drench application may be a residual drench or a soil or root drench.

In a residual drench, the desired amount of a residual pesticide and water
20 mixture is deposited to the soil prior to the transplant of plants or planting of seeds. Residual pesticides remain active in pesticidally effective amounts from about 1 week to about 3 weeks after application. A residual drench is useful when insects are a continual problem or chemical application needs to be performed in advance of an expected infestation. Residual pesticides in soil offers other benefits such as at-planting treatment,
25 soil shank injection at planting (direct seeded or at-planting), in-furrow spray at planting and/or surface band at planting. Residual pesticide in soil in many cases reduces the number of foliar sprays to control pests.

In a soil or root drench, the desired amount of the pesticide and water mixture may be deposited in the transplant hole followed by the transplant of the plant allowing
30 the pesticide to be close to the root zone of the treated plant. Alternatively, the desired amount of the pesticide and water mixture may be deposited at the base of the plant sometime after the transplant of the plant allowing the pesticide to be close to the root zone of the treated plant.

Injection applications are performed either during the transplant of plants or after
35 the plants have already been transplanted into the field or at any time in the lifecycle of the plant. In an injection application, the concentrated pesticide is usually diluted in water to achieve the desired concentration of active ingredient. The desired amount of

the pesticide and water mixture is then deposited into the soil via injection apparatus at the base of the plant.

Root soak applications are routinely preformed prior to the transplant of plants. In a root soak (seedling drench, transplant drench, or tray drench); the concentrated pesticide is usually diluted in water to achieve the desired concentration of active ingredient. The transplant seedling roots are then immersed into the solution for a specified period of time to allow the solution to be translocated into the growing media of the transplant seedlings as well as to allow the seedlings to uptake by the root system some of the pesticide being applied by this method. The period of time may be from about 1 hour to about 24 hours. The seedlings are then planted.

Drip (trickle) irrigation applications are performed after the plants have already been transplanted or seeded into the field, or at any time in the lifecycle of the plant. In a drip irrigation application the desired amount of the concentrated pesticide is usually diluted in water to achieve the desired concentration of active ingredient. The application is made using a network of plastic pipes or drip tape to carry a low flow of the pesticide and water mixture under low pressure to plants either above or below the soil surface. The pesticide and water mixture is applied through orifices called emitters much more slowly than with sprinkler irrigation.

Molecules selected from AIGA may be applied as seed treatments. Seed treatments may be applied to all types of seeds, including those from which plants genetically modified to express specialized traits will germinate. Representative examples include those expressing proteins toxic to invertebrate pests, such as *Bacillus thuringiensis* or other insecticidal toxins, those expressing herbicide tolerance, such as "Roundup (glyphosate) Ready" seeds or glyphosate and 2,4-D tolerant Enlist™ seeds, or those with "stacked" foreign genes expressing insecticidal toxins in both crystal and vegetative stage, herbicide tolerance, nutrition-enhancement, drought tolerance, or any other beneficial traits. Furthermore, such seed treatments with molecules of Formula One may further enhance the ability of a plant to withstand stressful growing conditions better. This results in a healthier, more vigorous plant, which can lead to higher yields at harvest time. Generally, about 1 gram of such molecules to about 500 grams per 100,000 seeds is expected to provide good benefits, amounts from about 10 grams to about 100 grams per 100,000 seeds is expected to provide better benefits, and amounts from about 25 grams to about 75 grams per 100,000 seeds is expected to provide even better benefits.

Consequently, in light of the above, the following embodiments (**D**) are envisioned.

1D. A process comprising applying a pesticidally effective amount of a pesticidal composition to a locus to control a pest wherein:

(a) said applying is by foliar application, granular application, drench application, injection application, root soak application, drip irrigation application, or seed treatment application;

(b) said pesticidally effective amount is from about 10 grams of active ingredient per hectare to about 420 grams of active ingredient per hectare;

(c) said pesticidal composition comprises

(1) an active ingredient selected from the group consisting of **M-I, M-II, M-III**, and mixtures thereof, and

(2) a carrier;

(d) said locus is where crops, trees, fruits, cereals, fodder species, vines, turf, and/or ornamental plants are growing or may be planted; and

(e) said pest is selected from the group consisting of *Acrosternum hilare*,

Acyrtosiphon pisum, *Aleyrodes proletella*, *Aleurodicus dispersus*, *Aleurothrix floccosus*, *Amrasca biguttula biguttula*, *Aonidiella aurantii*, *Aphis fabae*, *Aphis gossypii*, *Aphis glycines*, *Aphis pomi*, *Aulacorthum solani*, *Bactericera cockerelli*, *Bagrada hilaris*, *Bemisia argentifolii*, *Bemisia tabaci*, *Blissus leucopterus*, *Boisea trivittata*, *Brachycorynella asparagi*, *Brevinnia rehi*, *Brevicoryne brassicae*, *Cacopsylla pyri*, *Cacopsylla pyricola*, *Calocoris norvegicus*, *Ceroplastes rubens*, *Cimex hemipterus*, *Cimex lectularius*, *Coccus pseudomagnoliarum*, *Dagbertus fasciatus*, *Dichelops furcatus*, *Diuraphis noxia*, *Diaphorina citri*, *Dysaphis plantaginea*, *Dysdercus suturellus*, *Edessa meditaunda*, *Empoasca vitis*, *Eriosoma lanigerum*, *Erythroneura elegantula*, *Eurygaster maura*, *Euschistus conspersus*, *Euschistus heros*, *Euschistus servus*, *Halyomorpha halys*, *Hyalopterus pruni*, *Helopeltis antonii*, *Helopeltis theivora*, *Icerya purchasi*, *Idioscopus nitidulus*, *Jacobiasca formosana*, *Laodelphax striatellus*, *Lecanium corni*, *Leptocorisa oratorius*, *Leptocorisa varicornis*, *Lygus hesperus*, *Maconellicoccus hirsutus*, *Macrosiphum euphorbiae*, *Macrosiphum granarium*, *Macrosiphum rosae*, *Macrosteles quadrilineatus*, *Mahanarva frimbiolata*, *Megacopta cribraria*, *Metopolophium dirhodum*, *Mictis longicornis*, *Myzus persicae*, *Nasonovia ribisnigri*, *Nephotettix cincticeps*, *Neurocolpus longirostris*, *Nezara viridula*, *Nilaparvata lugens*, *Paracoccus marginatus*, *Paratrioza cockerelli*, *Parlatoria pergandii*, *Parlatoria ziziphi*, *Peregrinus maidis*, *Phylloxera vitifoliae*, *Physokermes piceae*, *Phytocoris californicus*, *Phytocoris relativus*, *Piezodorus guildinii*, *Planococcus citri*, *Planococcus ficus*, *Poecilocapsus lineatus*, *Psallus vaccinicola*, *Pseudacysta perseae*, *Pseudococcus brevipes*, *Quadraspidiotus perniciosus*, *Rhopalosiphum maidis*, *Rhopalosiphum padi*, *Saissetia oleae*, *Scaptocoris castanea*, *Schizaphis graminum*, *Sitobion avenae*, *Sogatella furcifera*, *Trialeurodes vaporariorum*, *Trialeurodes abutiloneus*, *Unaspis yanonensis*, *Zulia entrerriana*, *Agromyza frontella*,

- Anastrepha suspensa*, *Anastrepha ludens*, *Anastrepha obliqua*, *Bactrocera cucurbitae*,
Bactrocera dorsalis, *Bactrocera invadens*, *Bactrocera zonata*, *Ceratitis capitata*,
Dasineura brassicae, *Delia platura*, *Fannia canicularis*, *Fannia scalaris*, *Gasterophilus*
intestinalis, *Gracillia perseae*, *Haematobia irritans*, *Hypoderma lineatum*, *Liriomyza*
5 *brassicae*, *Liriomyza sativa*, *Melophagus ovinus*, *Musca autumnalis*, *Musca domestica*,
Oestrus ovis, *Oscinella frit*, *Pegomya betae*, *Piophilha casei*, *Psila rosae*, *Rhagoletis cerasi*,
Rhagoletis pomonella, *Rhagoletis mendax*, *Sitodiplosis mosellana*, *Stomoxys calcitrans*,
Achaea janata, *Adoxophyes orana*, *Agrotis ipsilon*, *Alabama argillacea*, *Amorbia cuneana*,
Amyelois transitella, *Anacamptodes defectaria*, *Anarsia lineatella*, *Anomis sabulifera*,
10 *Anticarsia gemmatilis*, *Archips argyrospila*, *Archips rosana*, *Argyrotaenia citrana*,
Autographa gamma, *Bonagota cranaodes*, *Borbo cinnara*, *Bucculatrix thurberiella*, *Capua*
reticulana, *Carposina niponensis*, *Chlumetia transversa*, *Choristoneura rosaceana*,
Cnaphalocrocis medinalis, *Conopomorpha cramerella*, *Corcyra cephalonica*, *Cossus*
cossus, *Cydia caryana*, *Cydia funebrana*, *Cydia molesta*, *Cydia nigricana*, *Cydia*
15 *pomonella*, *Darna diducta*, *Diaphania nitidalis*, *Diatraea saccharalis*, *Diatraea*
grandiosella, *Earias insulana*, *Earias vittella*, *Ecdytolopha aurantianum*, *Elasmopalpus*
lignosellus, *Ephestia cautella*, *Ephestia elutella*, *Ephestia kuehniella*, *Epinotia aporema*,
Epiphyas postvittana, *Erionota thrax*, *Estigmene acrea*, *Eupoecilia ambiguella*, *Euxoa*
auxiliaris, *Galleria mellonella*, *Grapholita molesta*, *Hedylepta indicata*, *Helicoverpa*
20 *armigera*, *Helicoverpa zea*, *Heliopsis virescens*, *Hellula undalis*, *Keiferia lycopersicella*,
Leucinodes orbonalis, *Leucoptera coffeella*, *Leucoptera malifoliella*, *Lobesia botrana*,
Loxagrotis albicosta, *Lymantria dispar*, *Lyonetia clerkella*, *Mahasena corbeti*, *Mamestra*
brassicae, *Manduca sexta*, *Maruca testulalis*, *Metisa plana*, *Mythimna unipuncta*,
Neoleucinodes elegantalis, *Nymphula depunctalis*, *Operophtera brumata*, *Ostrinia*
25 *nubilalis*, *Oxydia vesulia*, *Pandemis cerasana*, *Pandemis heparana*, *Papilio demodocus*,
Pectinophora gossypiella, *Peridroma saucia*, *Perileucoptera coffeella*, *Phthorimaea*
operculella, *Phyllocnistis citrella*, *Phyllonorycter blancardella*, *Pieris rapae*, *Plathypena*
scabra, *Platynota idaeusalis*, *Plodia interpunctella*, *Plutella xylostella*, *Polychrosis viteana*,
Prays endocarpa, *Prays oleae*, *Pseudaletia unipuncta*, *Pseudoplusia includens*,
30 *Rachiplusia nu*, *Scirpophaga incertulas*, *Sesamia inferens*, *Sesamia nonagrioides*, *Setora*
nitens, *Sitotroga cerealella*, *Sparganothis pilleriana*, *Spodoptera exigua*, *Spodoptera*
frugiperda, *Spodoptera eridania*, *Thecla basilides*, *Tinea pellionella*, *Tineola bisselliella*,
Trichoplusia ni, *Tuta absoluta*, *Zeuzera coffeae*, *Zeuzera pyrina*, *Caliothrips phaseoli*,
Frankliniella bispinosa, *Frankliniella fusca*, *Frankliniella occidentalis*, *Frankliniella*
35 *schultzei*, *Frankliniella tritici*, *Frankliniella williamsi*, *Heliethrips haemorrhoidalis*,
Rhipiphorothrips cruentatus, *Scirtothrips citri*, *Scirtothrips dorsalis*, *Taeniothrips*
rhopalantennalis, *Thrips hawaiiensis*, *Thrips nigropilosus*, *Thrips orientalis*, *Thrips palmi*,
Thrips tabaci, *Acanthoscelides obtectus*, *Agrilus planipennis*, *Ahasverus advena*,

Alphitobius diaperinus, *Anoplophora glabripennis*, *Anthonomus grandis*, *Anthrenus verbasci*, *Anthrenus falvipes*, *Ataenius spretulus*, *Atomaria linearis*, *Attagenus unicolor*, *Bothynoderes punctiventris*, *Bruchus pisorum*, *Callosobruchus maculatus*, *Carpophilus hemipterus*, *Cassida vittata*, *Cathartus quadricollis*, *Cerotoma trifurcata*, *Ceutorhynchus assimilis*, *Ceutorhynchus napi*, *Conoderus scalaris*, *Conoderus stigmaticus*, *Conotrachelus nenuphar*, *Cotinis nitida*, *Crioceris asparagi*, *Cryptolestes ferrugineus*, *Cryptolestes pusillus*, *Cryptolestes turcicus*, *Cylindrocopturus adspersus*, *Deporaus marginatus*, *Dermestes lardarius*, *Dermestes maculatus*, *Epilachna varivestis*, *Euvrilletta peltata*, *Faustinus cubae*, *Hylobius pales*, *Hylotrupes bajulus*, *Hypera postica*, *Hypothenemus hampei*, *Lasioderma serricorne*, *Leptinotarsa decemlineata*, *Limonius canus*, *Liogenys fuscus*, *Liogenys suturalis*, *Lissorhoptrus oryzophilus*, *Lophocateres pusillus*, *Lyctus planicollis*, *Maecolaspis jolivetii*, *Melanotus communis*, *Meligethes aeneus*, *Melolontha melolontha*, *Necrobia rufipes*, *Oberea brevis*, *Oberea linearis*, *Oryctes rhinoceros*, *Oryzaephilus mercator*, *Oryzaephilus surinamensis*, *Oulema melanopus*, *Oulema oryzae*, *Phyllophaga cuyabana*, *Polycaon stoutii*, *Popillia japonica*, *Prostephanus truncatus*, *Rhyzopertha dominica*, *Sitona lineatus*, *Sitophilus granarius*, *Sitophilus oryzae*, *Sitophilus zeamais*, *Stegobium paniceum*, *Tenebroides mauritanicus*, *Tribolium castaneum*, *Tribolium confusum*, *Trogoderma granarium*, *Trogoderma variable*, *Xestobium rufovillosum*, and *Zabrus tenebrioides*.

2D. A process according **1D**, wherein:

- (a) said applying is by foliar application;
- (b) said pesticidally effective amount is from about 20 grams of active ingredient per hectare to about 100 grams of active ingredient per hectare;
- (c) said pesticidal composition comprises
 - (1) an active ingredient selected from the group consisting of **M-I**, **M-II**, **M-III**, and mixtures thereof, and
 - (2) a carrier;
- (d) said locus is where crops, trees, fruits, cereals, fodder species, vines, turf, and/or ornamental plants are growing or may be planted; and
- (e) said pest is selected from the group consisting of *Aphis fabae*, *Aphis gossypii*, *Aphis glycines*, *Bemisia argentifolii*, *Bemisia tabaci*, *Brevicoryne brassicae*, *Cacopsylla pyri*, *Cacopsylla pyricola*, *Coccus pseudomagnoliarum*, *Empoasca vitis*, *Erythroneura elegantula*, *Euschistus servus*, *Hyalopterus pruni*, *Jacobiasca formosana*, *Lecanium corni*, *Myzus persicae*, *Dysaphis plantaginea*, *Nilaparvata lugens*, *Paracoccus marginatus*, *Paratrioza cockerelli*, *Planococcus citri*, *Planococcus ficus*, *Quadraspidiotus perniciosus*, *Trialeurodes vaporariorum*, *Liriomyza sativa*, *Cydia pomonella*, *Grapholita*

molesta, *Scirpophaga incertulas*, *Spodoptera exigua*, *Caliothrips phaseoli*, *Meligethes aeneus*, and *Oulema melanopus*.

3D. A process according to **1D** or **2D**, wherein:

- (a) said applying is by foliar application;
- (b) said pesticidally effective amount is from about 37.5 grams of active ingredient per hectare to about 100 grams of active ingredient per hectare;
- (c) said pesticidal composition comprises **M-I**;
- (d) said locus comprises tea plants; and
- (e) said pest is *Jacobiasca formosana*.

4D. A process according to **1D** or **2D**, wherein:

- (a) said applying is by foliar application;
- (b) said pesticidally effective amount is from about 37.5 grams of active ingredient per hectare to about 100 grams of active ingredient per hectare;
- (c) said pesticidal composition comprises **M-I**;
- (d) said locus comprises tea plants; and
- (e) said pest is *Empoasca vitis*.

5D. A process according to **1D** or **2D**, wherein:

- (a) said applying is by foliar application;
- (b) said pesticidally effective amount is from about 20 grams of active ingredient per hectare to about 80 grams of active ingredient per hectare;
- (c) said pesticidal composition comprises **M-I**;
- (d) said locus comprises grapes; and
- (e) said pest is *Erythroneura elegantula*.

EXAMPLES

Method 1: Foliar application of **M-I** to control small green leafhopper

(*Jacobiasca formosana*) on tea plants

An emulsifiable concentrate formulation solution of **M-I** was prepared. A formulated rate was then applied via a foliar application to tea plants in a plot. Foliar application of **M-I** at rates of 37.5, 50, 75, and 100 grams active ingredient per hectare (gai/ha) was performed. Each plot comprised 4 rows of tea plants with an area of 5 m x 10 m. Plots were arranged in a randomized block design for a total of four replicates. Back to back applications were conducted at a 7 day interval. Samplings were conducted at 1, 3, and 7 days after first application; and 3, 7, and 14 days after second application.

Table 1: Percent Control of foliar application of molecule I to control small green leafhopper (*Jacobiasca formosana*) on tea plants

Active	Rate (gai/ha)	1 DAAA	3 DAAA	7 DAAA	3 DAAB	7 DAAB	14 DAAB
M-I	37.5	93	93	74	96	98	92
M-I	50	95	99	91	95	98	96
M-I	75	96	98	92	99	99	98
M-I	100	99	100	98	100	100	97
Untreated Control	-	0	0	0	0	0	0

5

DAAA = days after first application

DAAB = days after second application

This example shows the unexpected long lasting effect of **M-I** against *Jacobiasca formosana* on tea plants.

10

Method 2: Foliar application of M-I to control green leafhopper (*Empoasca vitis*) on tea plants

An emulsifiable concentrate formulation solution of **M-I** was prepared. Foliar application of the solution to potted tea plants was initiated at early infestation of tea green leafhopper. Foliar application of **M-I** at rates of 50, 75, and 100 gai/ha was performed. Assessments were performed at 7, 14, and 21 days after foliar application.

15

Table 2: Percent Control of foliar application of M-I to control green leafhopper (*Empoasca vitis*) on tea plants

20

Active	Rate (gai/ha)	7 DAA	14 DAA	21 DAA
M-I	50	87	84	83
M-I	75	87	86	84
M-I	100	93	87	84
Untreated Control	-	0	0	0

DAA= Days After Application

This example shows the unexpected long lasting effect of **M-I** against *Empoasca vitis* on tea plants.

5 **Method 3: Foliar application of M-I to control grape leafhopper (*Erythroneura elegantula*) on grapes**

Foliar application, using a backpack sprayer, of **M-I** at rates of 20, 40, 60, and 80 grams per hectare (gai/ha) was evaluated. The plot area was 25 m². The first application was done at 15 days after transplanting. Assessments were done at 24 days after first
10 application.

Table 3: Percent Control of foliar application of M-I to control grape leafhopper (*Erythroneura elegantula*) on grapes

Active	Rate (gai/ha)	1 DAA	6 DAA	14 DAA
M-I	20	84	92	93
M-I	40	84	77	81
M-I	60	87	83	90
M-I	80	93	91	87
Untreated Control	-	0	0	0

15 DAAA= Days After First Application

This example shows the unexpected long lasting effect of **M-I** against *Erythroneura elegantula* on grapes.

20

CLAIMS

1. A process comprising applying a pesticidally effective amount of a pesticidal composition to a locus to control a pest wherein:

- 5 (a) said applying is by foliar application;
- (b) said pesticidally effective amount is from about 20 grams of active ingredient per hectare to about 100 grams of active ingredient per hectare;
- (c) said pesticidal composition comprises
 - (1) an active ingredient selected from the group consisting of **M-I**, **M-II**, **M-III**, and mixtures thereof, and
 - 10 (2) a carrier;
- (d) said locus is where crops, trees, fruits, cereals, fodder species, vines, turf, and/or ornamental plants are growing or may be planted; and
- (e) said pest is selected from the group consisting of *Aphis fabae*, *Aphis gossypii*, *Aphis glycines*, *Bemisia argentifolii*, *Bemisia tabaci*, *Brevicoryne brassicae*,
 15 *Cacopsylla pyri*, *Cacopsylla pyricola*, *Coccus pseudomagnoliarum*, *Empoasca vitis*, *Erythroneura elegantula*, *Euschistus servus*, *Hyalopterus pruni*, *Jacobiasca formosana*, *Lecanium corni*, *Myzus persicae*, *Dysaphis plantaginea*, *Nilaparvata lugens*, *Paracoccus marginatus*, *Paratrioza cockerelli*, *Planococcus citri*, *Planococcus ficus*, *Quadraspidiotus perniciosus*, *Trialeurodes vaporariorum*, *Liriomyza sativa*, *Cydia pomonella*, *Grapholita molesta*, *Scirpophaga incertulas*, *Spodoptera exigua*, *Caliothrips phaseoli*, *Meligethes aeneus*, and *Oulema melanopus*.

2. A process according to claim 1, comprising applying a pesticidally effective amount of a pesticidal composition to a locus to control a pest wherein:

- 25 (a) said applying is by foliar application;
- (b) said pesticidally effective amount is from about 37.5 grams of active ingredient per hectare to about 100 grams of active ingredient per hectare;
- (c) said pesticidal composition comprises **M-I**;
- 30 (d) said locus comprises tea plants; and
- (e) said pest is *Jacobiasca formosana*.

3. A process according to claim 1, comprising applying a pesticidally effective amount of a pesticidal composition to a locus to control a pest wherein:

- 35 (a) said applying is by foliar application;
- (b) said pesticidally effective amount is from about 37.5 grams of active ingredient per hectare to about 100 grams of active ingredient per hectare;
- (c) said pesticidal composition comprises **M-I**;

- (d) said locus comprises tea plants; and
- (e) said pest is *Empoasca vitis*.

4. A process according to claim 1, comprising applying a pesticidally effective
5 amount of a pesticidal composition to a locus to control a pest wherein:

- (a) said applying is by foliar application;
- (b) said pesticidally effective amount is from about 20 grams of active
ingredient per hectare to about 80 grams of active ingredient per hectare;

(c) said pesticidal composition comprises **M-I**;

- 10
- (d) said locus comprises grapes; and
 - (e) said pest is *Erythroneura elegantula*.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2015/061556

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A01N 43/56 (2016.01)

CPC - A01N 43/40 (2016.02)

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(8) - A01N 43/40, 43/56; C07D 401/04 (2016.01)

CPC - A01N 43/40, 43/56; C07D 401/04 (2016.02)

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

USPC - 424/405; 514/277, 341 ; IPC(8) - A01N 43/40, 43/56; C07D 401/04 (2016.01); CPC - A01N 43/40, 43/56; C07D 401/04 (2016.02) (keyword delimited)

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

PatBase, Google Patents, Google Scholar

Search terms used: pesticide, pyridyl, pyrrolyl, aphid fabae, bean aphid, foliar

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2013/0291227 A1 (DOW AGROSCIENCES LLC) 31 October 2013 (31.10.2013) entire document	1
Y	US 7,332,509 B2 (SCHAPER et al) 19 February 2008 (19.02.2008) entire document	1
A	US 9,113,630 B2 (E I DU PONT DE NEMOURS AND COMPANY) 25 August 2015 (25.08.2015) entire document	1

☐ 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

"E" earlier application or patent but published on or after the international filing date

"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

07 March 2016

Date of mailing of the international search report

16 MAR 2016

Name and mailing address of the ISA/

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450

Facsimile No. 571-273-8300

Authorized officer

Blaine R. Copenheaver

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2015/061556

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See Extra Sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Continued from Box No. III Observations where unity of invention is lacking

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees need to be paid.

Group I+: claims 1-4 are drawn to processes.

The first invention of Group I+ is restricted to a process comprising applying a pesticidally effective amount of a pesticidal composition to a locus to control a pest wherein: (a) said applying is by foliar application; (b) said pesticidally effective amount is from about 20 grams of active ingredient per hectare to about 100 grams of active ingredient per hectare; (c) said pesticidal composition comprises (1) an active ingredient selected from the group consisting of M-I, and (2) a carrier; (d) said locus is where crops are growing; and (e) said pest is selected from the group consisting of *Aphis fabae*. It is believed that claim 1 reads on this first named invention and thus this claim will be searched without fee to the extent that they read on the above embodiment.

Applicant is invited to elect additional formula(e) for each additional compound to be searched in a specific combination by paying an additional fee for each set of election. An exemplary election would be a process comprising applying a pesticidally effective amount of a pesticidal composition to a locus to control a pest wherein: (a) said applying is by foliar application; (b) said pesticidally effective amount is from about 20 grams of active ingredient per hectare to about 100 grams of active ingredient per hectare; (c) said pesticidal composition comprises (1) an active ingredient selected from the group consisting of M-II, and (2) a carrier; (d) said locus is where crops are growing; and (e) said pest is selected from the group consisting of *Aphis fabae*. Additional formula(e) will be searched upon the payment of additional fees. Applicants must specify the claims that read on any additional elected inventions. Applicants must further indicate, if applicable, the claims which read on the first named invention if different than what was indicated above for this group. Failure to clearly identify how any paid additional invention fees are to be applied to the "+" group(s) will result in only the first claimed invention to be searched/examined.

The inventions listed in Groups I+ do not relate to a single general inventive concept under PCT Rule 13.1, because under PCT Rule 13.2 they lack the same or corresponding special technical features for the following reasons:

The Groups I+ formulae do not share a significant structural element requiring the selection of alternatives for the active ingredient, locus, and pest.

The Groups I+ share the technical features of a process comprising applying a pesticidally effective amount of a pesticidal composition to a locus to control a pest wherein: (a) said applying is by foliar application; (b) said pesticidally effective amount is from about 20 grams of active ingredient per hectare to about 100 grams of active ingredient per hectare; (c) said pesticidal composition comprises (1) an active ingredient selected from the group consisting of M-I, M-II, M-III, and mixtures thereof, and (2) a carrier; (d) said locus is where crops, trees, fruits, cereals, fodder species, vines, turf, and/or ornamental plants are growing or may be planted; and (e) said pest is selected from the group consisting of *Aphis fabae*, *Aphis gossypii*, *Aphis glycines*, *Bemisia argentifolii*, *Bemisia tabaci*, *Brevicoryne brassicae*, *Cacopsylla pyri*, *Cacopsylla pyricola*, *Coccus pseudomagnoliarum*, *Empoasca vitis*, *Erythroneura elegantula*, *Euschistus servus*, *Hyalopterus pruni*, *Jacobiasca formosana*, *Lecanium corni*, *Myzus persicae*, *Dysaphis plantaginea*, *Nilaparvata lugens*, *Paracoccus marginatus*, *Paratrioza cockerelli*, *Planococcus citri*, *Planococcus ficus*, *Quadraspidotus perniciosus*, *Trialeurodes vaporariorum*, *Liriomyza sativa*, *Cydia pomonella*, *Grapholita molesta*, *Scirpophaga incertulas*, *Spodoptera exigua*, *Caliothrips phaseoli*, *Meligethes aeneus*, and *Oulema melanopus*. However, these shared technical features do not represent a contribution over the prior art.

Specifically, US 2013/0291227 A1 to Dow Agrosiences LLC teaches a process comprising applying a pesticidally effective amount of a pesticidal composition to a locus to control a pest (See Para. [0002]; Para. [0797]; Claim 20) wherein: (a) said applying is by foliar application (See Para. [0895]); (b) said pesticidally effective amount is from about 20 grams of active ingredient per hectare to about 100 grams of active ingredient per hectare (See Para. [0891]); (c) said pesticidal composition comprises (1) an active ingredient selected from the group consisting of M-I, and (2) a carrier (See Para. [0689], Example 160; Paras. [0843] and [0844]); (d) said locus is where crops, trees, fruits, cereals, fodder species, vines, turf, and/or ornamental plants are growing or may be planted (See Paras. [0892] and [0895]); and (e) said pest is selected from the group consisting of *Aphis gossypii* (See Para. [0878])....In another embodiment, the molecules of Formula One may be used to control pests of the Order...*Aphis gossypii*...).

The inventions listed in Groups I+ therefore lack unity under Rule 13 because they do not share a same or corresponding special technical feature.