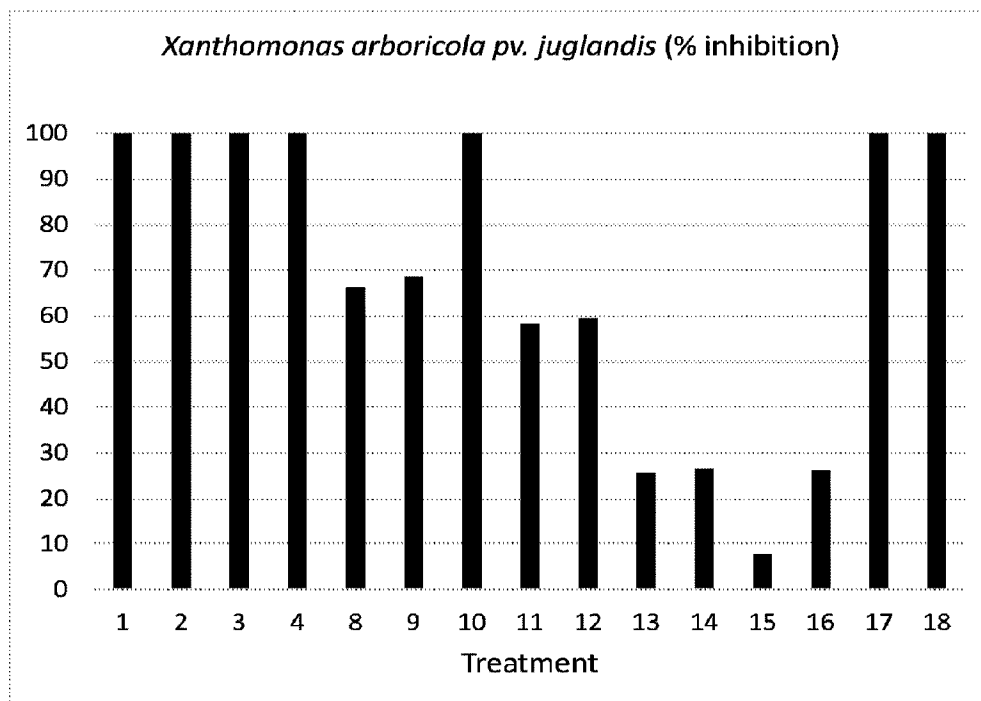




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(54) **Titre : COMPOSITION POUR L'AGRICULTURE ANTI-PATHOGENES LIQUIDE**
(54) **Title: A LIQUID ANTI-PATHOGENIC AGRICULTURAL COMPOSITION**



(57) **Abrégé/Abstract:**

A stable, safe and synergistic liquid anti-pathogenic agricultural composition is provided typically for use as an insecticide, fungicide, nematocide and/or miticide, characterized by having a high flash point and an epicuticular wax compatibility. The



(57) Abrégé(suite)/Abstract(continued):

composition is typically used in foliar applications and/or in irrigation systems. The liquid anti-pathogenic agricultural composition comprises at least one alkyl (C_1 - C_8) ester of an alkyl (C_{12} - C_{16}) acid; at least one anionic surfactant; and at least one nonionic surfactant. A method of preparing one or more anti-pathogenic compositions is also provided, and use of same as a treatment to control pathogens (in diluted form) applied to crop, trees, fruits, vegetables, leaves, stems, roots, seeds, flowers, animals, equipment, stockyards, feedlots, barns, animal housing units, farm buildings or storage areas.

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(54) Title: A LIQUID ANTI-PATHOGENIC AGRICULTURAL COMPOSITION

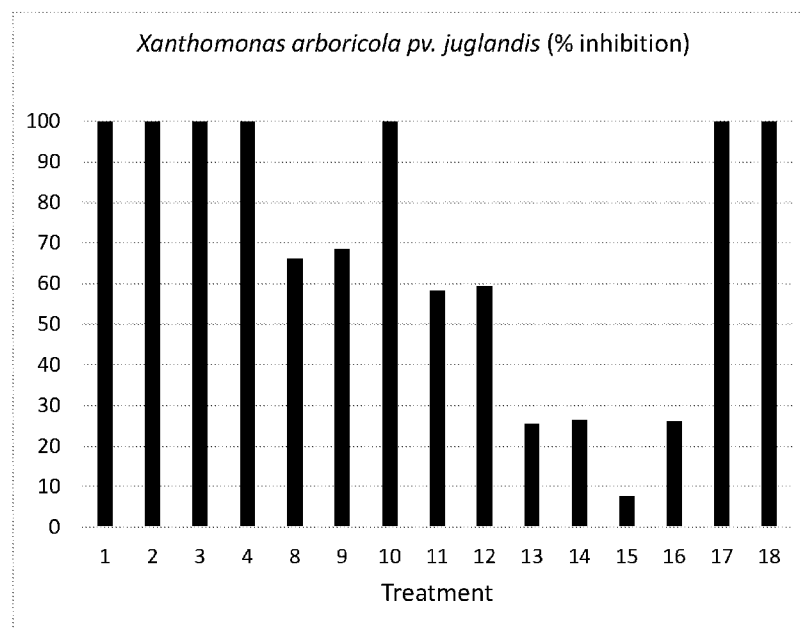


FIG. 8

(57) **Abstract:** A stable, safe and synergistic liquid anti-pathogenic agricultural composition is provided typically for use as an insecticide, fungicide, nematocide and/or miticide, characterized by having a high flash point and an epicuticular wax compatibility. The composition is typically used in foliar applications and/or in irrigation systems. The liquid anti-pathogenic agricultural composition comprises at least one alkyl ($C_1 - C_8$) ester of an alkyl ($C_{12} - C_{16}$) acid; at least one anionic surfactant; and at least one nonionic surfactant. A method of preparing one or more anti-pathogenic compositions is also provided, and use of same as a treatment to control pathogens (in diluted form) applied to crop, trees, fruits, vegetables, leaves, stems, roots, seeds, flowers, animals, equipment, stockyards, feedlots, barns, animal housing units, farm buildings or storage areas.

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A LIQUID ANTI-PATHOGENIC AGRICULTURAL COMPOSITION

FIELD OF THE DISCLOSURE

[0001] This disclosure relates to an anti-pathogenic agricultural composition, preferably a liquid which may be provided in a concentrate or diluted form. Particularly this disclosure relates to a liquid anti-pathogenic agricultural composition having a flashpoint greater than about 100°C. The composition typically comprises an at least one alkyl ($C_1 - C_8$) ester of an alkyl ($C_{12} - C_{16}$) acid, an anionic surfactant and a nonionic surfactant, wherein the at least one alkyl ($C_1 - C_8$) ester of an alkyl ($C_{12} - C_{16}$) acid safe for human and/or animal use.

BACKGROUND OF THE DISCLOSURE

[0002] Commercial farming of both plant crops and livestock may be very susceptible to disease causing pathogens, which when left uncontrolled may provide for food insecurity (by destroying crops and/or livestock) and/or pose a health risk to consumers. Pathogens may be microorganisms and may typically include, but are not limited to, fungi, bacteria, and viruses. Pathogens often proliferate due to unsuitable agricultural and/or animal husbandry practices and/or due to environmental factors such as high temperature and humidity that promote fast microorganism reproduction. Providing effective control of pathogens in agriculture and animal husbandry is imperative to ensure ongoing food security. Effective control of pathogens has been hampered by increased resistance to usual control measures or treatments using conventional bactericides or fungicides. Such bactericidal and/or fungicidal resistance poses a significant problem in the control and/or treatment and/or removal of pathogens from agricultural produce.

[0003] Similarly, insects and/or other pests often provide for significant problems and/or health risk due to improper farming practices. Some insects and/or pests have also been known to migrate from wild environments to cultivated land, and moreover typical control means have been hampered by resistance developed from genetic mutation. Within a cultivated landscape these insects and/or other pests often have no natural enemies and controlling their population is a difficult challenge.

[0004] In recent years, there has also been a move toward providing environmentally friendly agricultural compositions that may control and/or treat and/or reduce and/or remove pathogen populations from plant crops and animals. Consumers have become more conscious about purchasing food goods that have been grown, cultivated or produced in an environmentally friendly manner typically utilizing organic and/or biodegradable and/or human and animal safe products. As such, farmers and the agrochemicals sector have needed to develop environmentally friendly agricultural compositions that are stable and provide anti-pathogenic properties when administered to a seed and/or

plant and/or an animal, or part thereof.

[0005] There remains a need to provide for new and innovative agricultural compositions to control pathogen populations, and/or there remains a need to control and/or treat disease caused by said pathogens. Broadly, there remains a need to at least ameliorate disadvantages known in the prior art.

SUMMARY OF THE DISCLOSURE

[0006] Broadly, and in accordance with a first aspect of this disclosure there is provided a liquid anti-pathogenic agricultural composition comprising:

- at least one (C₁-C₈) alkyl ester of an (C₁₂ – C₁₆) alkyl acid;
- at least one anionic surfactant; and
- at least one nonionic surfactant.

wherein the liquid agricultural anti-pathogenic composition has a flash point higher than about 100°C; and

wherein the at least one alkyl (C₁ – C₈) esters of alkyl (C₁₂ – C₁₆) acid has a paraffinic wax dissolution capability of between about 2 wt.% to about 20 wt. % at 25°C.

[0007] The anti-pathogenic agricultural composition may provide a fungicide, bactericide, insecticide, miticide, nematocide, pesticide or a combination thereof. Typically, the anti-pathogenic agricultural composition may provide a fungicide and insecticide. The pathogens may include, but are not limited to, the group comprising: *Aspergillus niger*, *Botrytis cinerea*, *Colletotrichum fioriniae*, *Fusarium moniliforme*, *Fusarium oxysporum*, *Macrophomina phaseolina*, *Verticillium dahlia*, and *Xanthomonas arboricola* pv. *Juglandis*.

[0008] It is to be understood that the anti-pathogenic agricultural composition may be in a concentrate form providing a liquid concentrate anti-pathogenic agricultural composition. The liquid concentrate anti-pathogenic agricultural composition may be diluted with water and/or other solvents to provide a diluted liquid anti-pathogenic agricultural composition. The liquid concentrate anti-pathogenic agricultural composition may be formulated as an emulsifiable or microemulsified concentrate.

[0009] The term “microemulsified” as used herein, refers to a dispersion made of water and/or oil and/or surfactant(s) that is an isotropic and thermodynamically stable system. The liquid concentrate anti-pathogenic agricultural composition (preferably the liquid concentrate fungicidal and insecticidal agricultural composition) may be diluted for use in water or other chemistries, e.g., solutions of water, glycols and alcohol or other water- miscible liquids, e.g., methanol, ethanol, monoethylene glycol, propylene glycol, or the like, therein providing for the diluted liquid anti-pathogenic agricultural composition.

[0010] The at least one alkyl ($C_1 - C_8$) ester of an alkyl ($C_{12} - C_{16}$) acid may be selected from, but not limited to, the group comprising: a natural or synthetic, linear or branched, saturated or unsaturated, modified or unmodified, wherein the alkyl ester may be a compound selected from, but not limited to, the group: methyl esters, ethyl esters, propyl esters, butyl esters, isopropyl ester, isobutyl ester, isopentyl ester, 2-ethylhexyl esters or components or combinations thereof.

[0011] The at least one alkyl ($C_1 - C_8$) ester of an alkyl ($C_{12} - C_{16}$) acid may be derived from an alkyl acid selected from, but not limited to, the group comprising: lauric acid, tridecyl acid, myristic acid, pentadecanoic acid, palmitic acid, and combinations thereof.

[0012] The at least one alkyl ($C_1 - C_8$) ester of an alkyl ($C_{12} - C_{16}$) acid may be selected from, but not limited to, the group comprising: isobutyl laurate, isopentyl laurate, methyl laurate, 2-ethylhexyl laurate, 2-ethylhexyl palmitate, isopropyl laurate, isopropyl myristate, isopropyl palmitate, and combinations thereof. In a preferred embodiment the at least one alkyl ($C_1 - C_8$) ester of an alkyl ($C_{12} - C_{16}$) acid may be isopropyl myristate and/or isopropyl laurate.

[0013] The at least one anionic surfactant may be selected from, but not limited to, the group comprising: ($C_6 - C_{18}$) alkyl benzene sulfonic acid salts, calcium dodecylbenzene sulfonate, sodium dodecylbenzene sulfonate, amine ($C_6 - C_{18}$) alkyl benzene sulfonate, triethanolamine dodecylbenzene sulfonates, ($C_6 - C_{18}$) alkyl ether sulfates, ($C_6 - C_{18}$) alkyl ethoxylated ether sulfates, ($C_6 - C_{18}$) alkyl sulfates, lauryl ether polyethoxylated sodium sulfate, ($C_6 - C_{18}$) alkyl phosphate esters, ($C_6 - C_{18}$) alkoxyated sulfates, ($C_6 - C_{18}$) alkoxyated phosphate esters, xylene sulfonate salts, cumene sulfonate salts, and combinations thereof.

[0014] The at least one nonionic surfactant may be selected from, but not limited to, the group comprising: natural and/or synthetic ($C_8 - C_{22}$) alkoxyated fatty alcohols, ($C_8 - C_{22}$) ethoxylated fatty alcohols, ($C_8 - C_{22}$) propoxylated fatty alcohols, ($C_8 - C_{22}$) ethoxylated and propoxylated fatty alcohols, straight chain ($C_4 - C_{10}$) alkyl(poly)glycosides, branched chain ($C_4 - C_{10}$) alkyl(poly)glycosides; and alkoxyated sorbitan fatty esters, alkoxyated sorbitol fatty esters, ethoxylated sorbitan fatty esters, ethoxylated sorbitol fatty esters, polyoxyethylene sorbitan monolaurate, polyoxyethylene sorbitan monopalmitate, polyoxyethylene sorbitan monostearate, and combinations thereof.

[0015] The ethoxylated fatty alcohols of fatty acids may have a degree of ethoxylation of from 1 to 50, more preferably 2 to 30, most preferably 3 to 10.

[0016] Some alkoxyated alcohols contemplated for use include those based on branched alcohols, such as the Guerbet alcohols, e.g. 2-propylheptanol and 2-ethylhexanol, and C_{10} -OXO- alcohol or C_{13} OXO-alcohol, i.e. an alcohol mixture whose main component is formed by at least one branched C_{10} -alcohol or C_{13} -alcohol, and the alcohols commercially available as Exxal alcohols from Exxon Mobile Chemicals and Neodol alcohols from Shell Chemicals.

[0017] The liquid concentrate anti-pathogenic agricultural composition may further comprise an additive selected from, but not limited to, the group comprising: preservatives, clarifiers, anti-freezing agents, hydrotropes, stabilizers, antioxidants, acidifiers, chelates, complexing agents, dyes, rheology modifiers, antifoams, anti-drift and water, oil, terpene, terpene containing oil, or other solvents, and combinations thereof.

[0018] In certain embodiments of the liquid concentrate anti-pathogenic agricultural composition (preferably the liquid concentrate fungicidal and insecticidal agricultural composition), the at least one alkyl ($C_1 - C_8$) ester of an alkyl ($C_{12} - C_{16}$) acid may be present in an amount of between about 0.1 wt. % to about 30 wt. %, the at least one anionic surfactant may be present in an amount of between about 1 wt. % to about 50 wt. %, and the at least one nonionic surfactant may be present in an amount of between about 1 wt. % to about 50 wt. %. It is to be understood that the liquid concentrate anti-pathogenic agricultural composition may further be diluted with water or other solvents to provide the diluted liquid anti-pathogenic agricultural composition.

[0019] In other embodiments of the liquid concentrate anti-pathogenic agricultural composition (preferably the liquid concentrate fungicidal and insecticidal agricultural composition), the at least one alkyl ($C_1 - C_8$) ester of an alkyl ($C_{12} - C_{16}$) acid may be present in an amount of between about 0.1 wt. % to about 20 wt. %, preferably between about 2 wt.% to about 15 wt. %, the at least one anionic surfactants may be present in an amount of between about 3 wt.% to about 20 wt. %, and wherein the at least one nonionic surfactant is present in an amount of between about 5 wt. % to about 30 wt. %. It is to be understood that the liquid concentrate anti-pathogenic agricultural composition may further be diluted with water or other solvents to provide the diluted liquid anti-pathogenic agricultural composition.

[0020] The liquid concentrate anti-pathogenic agricultural composition (preferably the liquid concentrate fungicidal and insecticidal agricultural composition) may further comprise water and/or other additives, typically such that the liquid agricultural fungicidal and insecticidal may comprise from about 0.1 to about 20 wt.% of the at least one alkyl ($C_1 - C_8$) ester of an alkyl ($C_{12} - C_{16}$) acid; and from about 1 to about 50 wt.% of the at least one anionic surfactant, and from about 1 to about 50 wt.% of the at least one nonionic surfactant, and from about 2 to about 80wt. % of the water and/or other additives. This embodiment may still be the concentrate form of the composition. Further dilution with water or other chemistries may provide the diluted liquid anti-pathogenic agricultural composition.

[0021] In an example embodiment of the disclosure there is provided a liquid concentrate fungicidal and insecticidal agricultural composition comprising at least one alkyl ($C_1 - C_8$) ester of an alkyl ($C_{12} - C_{16}$) acid present in an amount of between about 0.1 wt.% to about 30 wt. %, preferably between about 2 wt. % to about 15 wt. %; an at least one anionic surfactant present in an amount of between about 3 wt.% to about

20 wt. %; and an at least one nonionic surfactant present in an amount of between about 5 wt.% to about 30 wt. %; and

wherein the at least one alkyl ($C_1 - C_8$) ester of an alkyl ($C_{12} - C_{16}$) acid is selected from, but not limited to, the group comprising: isobutyl laurate, isopentyl laurate, methyl laurate, 2-ethylhexyl laurate, 2-ethylhexyl palmitate, isopropyl laurate, isopropyl myristate, isopropyl palmitate, and combinations thereof; and

wherein the at least one anionic surfactant is selected from, but not limited to, the group comprising: ($C_6 - C_{18}$) alkyl benzene sulfonic acid salts, calcium dodecylbenzene sulfonate, sodium dodecylbenzene sulfonate, amine ($C_6 - C_{18}$) alkyl benzene sulfonate, triethanolamine dodecylbenzene sulfonates, ($C_6 - C_{18}$) alkyl ether sulfates, ($C_6 - C_{18}$) alkyl ethoxylated ether sulfates, ($C_6 - C_{18}$) alkyl sulfates, lauryl ether polyethoxylated sodium sulfate, ($C_6 - C_{18}$) alkyl phosphate esters, ($C_6 - C_{18}$) alkoxyated sulfates, ($C_6 - C_{18}$) alkoxyated phosphate esters, xylene sulfonate salts, cumene sulfonate salts, and combinations thereof; and

wherein the at least one nonionic surfactant is selected from, but not limited to, the group comprising: ($C_8 - C_{22}$) alkoxyated fatty alcohols, ($C_8 - C_{22}$) ethoxylated fatty alcohols, ($C_8 - C_{22}$) propoxylated fatty alcohols, ($C_8 - C_{22}$) ethoxylated and propoxylated fatty alcohols, straight chain ($C_4 - C_{10}$) alkyl(poly)glycosides, branched chain ($C_4 - C_{10}$) alkyl(poly)glycosides; and alkoxyated sorbitan fatty esters, alkoxyated sorbitol fatty esters, ethoxylated sorbitan fatty esters, ethoxylated sorbitol fatty esters, polyoxyethylene sorbitan monolaurate, polyoxyethylene sorbitan monopalmitate, polyoxyethylene sorbitan monostearate, and combinations thereof.

[0022] The example embodiment of the disclosure may further comprise water as a diluent and/or other additives, such that the composition comprises from about 0.1 wt.% to about 20 wt.% of the at least one alkyl ($C_1 - C_8$) ester of an alkyl ($C_{12} - C_{16}$) acid; and about 1 wt.% to about 50 wt.% of the at least one anionic surfactant, and about 1 wt.% to about 50 wt.% of the at least one nonionic surfactant, and about 2 wt.% to about 80wt. % of the water and/or other additives. This embodiment may still be the concentrate form of the composition. Further dilution with water or other chemistries may provide the diluted liquid anti-pathogenic agricultural composition.

[0023] The additives may be at least one selected from, but not limited to, the group comprising: preservatives, clarifiers, anti-freezing agents, hydrotropes, stabilizers, antioxidants, acidifiers, chelates, complexing agents, dyes, rheology modifiers, antifoams, anti-drift and water, oil or other solvents, and combinations thereof.

[0024] The oil may be a natural compound, modified by esterification or transesterification, such as an alkyl fatty acid ester, e.g., methyl esters, ethyl esters, propyl esters, butyl esters, 2-ethylhexyl esters or dodecyl esters, and is preferably a glycol or glycerol fatty acid, such as ($C_{10} - C_{22}$) fatty

acid esters, such as from vegetables oils, preferably oil-yielding plants species such as soybean, corn, sunflower, rapeseed oil, cottonseed oil, linseed oil, palm oil, safflower, coconut oil, castor oil, olive oil, canola oil among others pure or mixed with an essential or edible oil extracted from a variety of plants or parts of plants such as trees, shrubs, leaves, flowers, grasses, fluids, herbs, fruits and seeds, or mixed with each other that are combined with one or more oils.

[0025] The liquid concentrate anti-pathogenic agricultural composition may have a flash point over about 100°C measured in a closed cup device, and wherein the at least one alkyl ($C_1 - C_8$) ester of an alkyl ($C_{12} - C_{16}$) acid may have a paraffinic wax (CAS number 8002-74-2) dissolution capability of at least 2 wt. % at 25°C, and wherein the emulsifiable or microemulsified liquid concentrate anti-pathogenic agricultural composition may be diluted to be applied in tank mixes or irrigation system mixed with water or other chemistries at a rate of 1:5000 to 1:10, therein providing a diluted liquid anti-pathogenic agricultural composition to be applied via air assisted sprayers, conventional sprayers, ultra-low volumes equipment such as aerial, electrostatic, foggers and misting spray equipment and chemigation systems such as pivots and sprinklers.

[0026] The liquid concentrate anti-pathogenic agricultural composition **according to the first aspect** of this disclosure provides for a stable emulsifiable or microemulsified liquid, with a high flash point (greater than about 100°C) and an epicuticular wax compatibility that promotes bio-efficacy for use with industrial, turf, ornamental, horticultural and agricultural fields of endeavor. The anti-pathogenic composition is safe for human and/or animals. The liquid concentrate anti-pathogenic agricultural composition provides improvement of penetration of an active ingredients (including additionally fungicidal and insecticidal) through the epicuticular of a target crop or pest when in use, particularly as the diluted liquid anti-pathogenic agricultural composition. It is the unique chemical formulation of this disclosure that provides for a stable emulsifiable or microemulsifiable liquid which is advantageous to end users when applied or used.

[0027] **In accordance with a second aspect** of this disclosure there is provided a method of diluting a liquid anti-pathogenic agricultural composition according to the first aspect of this disclosure, the method comprising:

diluting the liquid concentrate anti-pathogenic agricultural composition according to the first aspect of the disclosure above with water at a ratio by weight of liquid concentrate anti-pathogenic agricultural composition to water from about 1:5000 to about 1:10 to yield a diluted liquid anti-pathogenic agricultural composition. The diluted liquid anti-pathogenic agricultural composition may be provided as a stable diluted emulsion and/or microemulsion. It is to be understood that the water may further contain at least one agricultural chemical compounds selected from, but not limited to, the group comprising: adjuvants, insecticides, fungicides, acaricides,

nutrients, miticides, bactericides, biocides, ovicides, nematocides, insect growth regulators, plant grow regulators and combinations thereof.

[0028] In accordance with a third aspect of this disclosure there is provided the liquid anti-pathogenic agricultural composition (in concentrate form and/or diluted form) of the first aspect of this disclosure described herein above for use in the control of pathogens and/or in the treatment of disease caused by said pathogens.

[0029] In accordance with a fourth aspect of this disclosure there is provided a method of controlling and/or treating pathogens and/or a method of treating disease caused by said pathogens, the method comprising the steps of applying the liquid anti-pathogenic agricultural composition of the first aspect of this disclosure described herein above onto, or adjacent to, a plant or seed.

[0030] The method wherein the liquid anti-pathogenic agricultural composition is the liquid concentrate anti-pathogenic agricultural composition and may be diluted in a at least one of, but not limited to, the following group: a mixing tank, a spray tank, a container, or an inline irrigation system, therein providing the diluted liquid anti-pathogenic agricultural composition which may be a stable diluted emulsion or microemulsion that facilitates rain-fastness through accelerated uptake into the plant or interaction with insects or fungi or other pathogens that cause diseases owing to for example wax dissolution capability of the adjuvant.

[0031] The method wherein the stable diluted emulsion and/or microemulsion may be applied on at least one member of, but not limited to, the group comprising: plants, weeds, seeds, soil, urban places, and forests, via an apparatus selected from, but not limited to, the group comprising: air assisted sprayers, conventional sprayers, ultra-low volumes equipment such as aerial, electrostatic, foggers and misting spray equipment and chemigation systems, pivots, sprinklers, and combinations thereof. The disclosure extends to uses of the liquid agricultural fungicidal and insecticidal.

BRIEF DESCRIPTION OF THE FIGURES

[0032] FIG 1 graphically shows a percentage inhibition of *Aspergillus niger* after exposure to (or treatment with) compositions of this disclosure and other compounds;

[0033] FIG 2 graphically shows a percentage inhibition of *Botrytis cinerea* after exposure to (or treatment with) compositions of this disclosure and other compounds;

[0034] FIG 3 graphically shows a percentage inhibition of *Colletotrichum fioriniae* after exposure to (or treatment with) compositions of this disclosure and other compounds;

[0035] FIG 4 graphically shows a percentage inhibition of *Fusarium moniliforme* after exposure to (or treatment with) compositions of this disclosure and other compounds;

[0036] FIG 5 graphically shows a percentage inhibition of *Fusarium oxysporum* after exposure to (or treatment with) compositions of this disclosure and other compounds;

[0037] FIG 6 graphically shows a percentage inhibition of *Macrophomina phaseolina* after exposure to (or treatment with) compositions of this disclosure and other compounds;

[0038] FIG 7 graphically shows a percentage inhibition of *Verticillium dahlia* after exposure to (or treatment with) compositions of this disclosure and other compounds; and

[0039] FIG 8 graphically shows a percentage inhibition of *Xanthomonas arboricola* pv. *juglandis* after exposure to (or treatment with) compositions of this disclosure and other compounds.

DETAILED DESCRIPTION OF DISCLOSURE

[0040] The content of the Summary is repeated herein by way of reference thereto to avoid repetition. Generally, there is provided a stable emulsifiable and/or microemulsified liquid fungicidal and insecticidal (in concentrate form and in diluted form) with a high flash point above about 100°C having epicuticular wax compatibility that promotes bio-efficacy and provides improvement of penetration of an active ingredient (nutrient, pesticide, or the like) through the epicuticular of a target crop or pest. A higher flash point is advantageous as this limits the amount of chemistry (active ingredient, adjuvant, surfactant and the like) that may evaporate from a plant surface. Often an improvement in one physico-chemical property (such as increasing the flash point) may negatively impact another (such as stability, solubility, volatility, dispersibility, viscosity, particle size, efficacy, and the like). The Applicant surprisingly found that the disclosure described herein provides a stable emulsifiable and/or microemulsified liquid anti-pathogenic agricultural composition which outperforms industry standards.

[0041] Generally, a first aspect of the disclosure provides for a liquid anti-pathogenic (preferably fungicidal and insecticidal) agricultural composition (in concentrate form), comprising: at least one alkyl ($C_1 - C_8$) ester of an alkyl ($C_{12} - C_{16}$) acid; at least one anionic surfactant; and at least one nonionic surfactant. The composition has a flash point higher than about 100°C; and the at least one alkyl ($C_1 - C_8$) esters of alkyl ($C_{12} - C_{16}$) acid has a paraffinic wax (CAS number 8002-74-2) dissolution capability of between 2 wt.% to 20 wt. % at 25°C. The concentrate composition may be diluted with water or other solvents to provide a diluted liquid anti-pathogenic agricultural composition which is typically applied to plants or parts thereof in agriculture.

[0042] The disclosure extends to a method of manufacturing the liquid anti-pathogenic agricultural composition according to the first aspect and methods of use, typically within an agricultural field of endeavor.

Definitions

[0043] The term “adjuvant” as used herein is a broad term, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a

special or customized meaning), and refers without limitation to an agent that modifies the effect of other agents and more particularly used to enhance the effectiveness of pesticides such as herbicides, insecticides, fungicides and other agents.

[0044] The term “stable” as used herein is a broad term, combined or related with the term “emulsion”, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a special or customized meaning), and refers without limitation to the emulsion stability, i.e. the ability of an emulsion to resist change in its properties over time so that the size of the droplets in emulsion does not change significantly with time, more specifically during the time of an application to the targets mixed with water, it is thus to be given its ordinary meaning that is customary to a person skilled in the art. The term “stable” as used herein is a broad term, combined or related with the term “accelerated storage stability”, means that the formulation keep similar performance in terms of physico-chemical properties after samples be stored during 15 days in at least 3 conditions: room temperature (around 20°C); cold temperature (0°C or 5°C); hot temperature (54°C). Storage stability tests were conducted according Method CIPAC MT 36.

[0045] The term “solvents” as used herein is a broad term, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a special or customized meaning), and refers without limitation to compounds with some characteristics of solvency for other compounds or means, that can be polar or non- polar, linear or branched, cyclic or aliphatic, aromatic, naphthenic and that includes but is no limited to: alcohols, esters, diesters, ketones, acetates, terpenes, sulfoxides, glycols, paraffins, hydrocarbons, anhydrides, heterocyclics, among others.

[0046] Whenever a group is described as being “optionally substituted” that group may be unsubstituted or substituted with one or more of the indicated substituents. Likewise, when a group is described as being “unsubstituted or substituted” if substituted, the substituent(s) may be selected from one or more the indicated substituents. If no substituents are indicated, it is meant that the indicated “optionally substituted” or “substituted” group may be substituted with one or more group(s) individually and independently selected from alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkenyl, cycloalkynyl, aryl, heteroaryl, heteroalicycyl, aralkyl, heteroaralkyl, (heteroalicycyl)alkyl, hydroxy, protected hydroxyl, alkoxy, aryloxy, acyl, mercapto, alkylthio, arylthio, cyano, halogen, thiocarbonyl, O- carbamyl, N-carbamyl, O-thiocarbamyl, N-thiocarbamyl, C-amido, N-amido, S-sulfonamido, N-sulfonamido, C-carboxy, protected C-carboxy, O-carboxy, isocyanato, thiocyanato, isothiocyanato, nitro, silyl, sulfenyl, sulfinyl, sulfonyl, haloalkyl, haloalkoxy, trihalomethanesulfonyl, trihalomethanesulfonamido, an amino, a mono-substituted amino and a di-

substituted amino group, and protected derivatives thereof.

[0047] The term “alkyl” as used herein is a broad term, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a special or customized meaning), and refers without limitation to a straight chain or branched, acyclic or cyclic, unsaturated or saturated aliphatic hydrocarbon containing 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36 or more carbon atoms, while the term “lower alkyl” has the same meaning as alkyl but contains 1, 2, 3, 4, 5, or 6 carbon atoms. Representative saturated straight chain alkyls include methyl, ethyl, n-propyl, n-butyl, n-pentyl, n-hexyl, and the like; while saturated branched alkyls include isopropyl, *sec*-butyl, isobutyl, *tert*-butyl, isopentyl, and the like. Unsaturated alkyls contain at least one double or triple bond between adjacent carbon atoms (referred to as an “alkenyl” or “alkynyl,” respectively). Representative straight chain and branched alkenyls include ethylenyl, propylenyl, 1-butenyl, 2-butenyl, isobutylenyl, 1-pentenyl, 2-pentenyl, 3-methyl-1-butenyl, 2-methyl-2-butenyl, 2,3-dimethyl-2-butenyl, and the like; while representative straight chain and branched alkynyls include acetylenyl, propynyl, 1-butyne, 2-butyne, 1-pentyne, 2-pentyne, 3-methyl-1 butyne, and the like. Typical alkyl groups include, but are in no way limited to, methyl, ethyl, propyl, isopropyl, butyl, isobutyl, tertiary butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, hentriacontyl, dotriacontyl, tritriacontyl, tetratriacontyl, pentatriacontyl, and hexatriacontanoic. The alkyl group may be substituted or unsubstituted.

[0048] The term “alkoxy” as used herein is a broad term, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a special or customized meaning), and refers without limitation to an alkyl moiety attached through an oxygen bridge (i.e., -O-alkyl) such as methoxy, ethoxy, and the like.

[0049] The term “thioalkyl” as used herein is a broad term, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a special or customized meaning), and refers without limitation to an alkyl moiety attached through a sulfur bridge (i.e., -S-alkyl) such as methylthio, ethylthio, and the like.

[0050] The term “alcohol” as used herein is a broad term, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a special or customized meaning), and refers without limitation to any compound as described herein incorporating one or more hydroxy groups, or being substituted by or functionalized to include

one or more hydroxy groups.

[0051] The term “ester” as used herein is a broad term, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a special or customized meaning), and refers without limitation to any compound as described herein incorporating one or more ester groups, e.g., monoester, diester, triester, or polyester, or being substituted by or functionalized to include one or more ester groups. Esters include but are not limited to fatty acid esters.

[0052] The term “acetates” as used herein is a broad term, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a special or customized meaning), and refers without limitation to any compound as described herein incorporating one or more acetate groups, such as salts, esters or other compounds incorporating a $\text{CH}_3\text{COO-}$ moiety.

[0053] The term “terpenes” as used herein is a broad term, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a special or customized meaning), and refers without limitation to any compound as derived from resins of plants such as conifers, or to synthetically produced compounds having the same structures as plant derived terpenes. Terpenes can include hydrocarbons as well as terpenoids containing additional functional groups, as well as essential oils. Terpenes can include compounds having a formula $(\text{C}_5\text{H}_8)_n$ where n is the number of linked isoprene units (e.g., 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or more).

[0054] The term “terpene containing natural oil” as used herein is a broad term, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a special or customized meaning), and refers without limitation to a natural oil containing at least 50% of a terpene selected from but not exclusively from the group consisting of orange oil, grapefruit oil, lemon oil, lime oil, tangerine oil, and pine oil or components thereof.

[0055] The term “sulfoxides” as used herein is a broad term, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a special or customized meaning), and refers without limitation to any compound as described herein incorporating one or more sulfinyl (SO) groups, or being substituted by or functionalized to include one or more sulfinyl groups.

[0056] The term “glycols” as used herein is a broad term, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a special or customized meaning), and can include diols, e.g., polyalkylene glycols such as polyethylene

glycols (polymers having the formula $H(OCH_2CH_2)_nOH$ where n is greater than three), polypropylene glycols, or glycols incorporating monomers comprising longer hydrocarbon chains.

[0057] The term “paraffins” as used herein is a broad term, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a special or customized meaning), and refers without limitation to heavier alkanes, such as alkanes forming a liquid or wax at room temperature, as well as functionalized paraffins, e.g., chlorinated paraffins, and mineral or synthetic oils comprising hydrocarbons. Room temperature as used herein refers to ambient conditions, e.g., in a climate controlled building, for example, approximately 20°C.

[0058] The term “hydrocarbons” as used herein is a broad term, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a special or customized meaning), and refers without limitation to any compound comprising only carbon and hydrogen atoms. A functionalized or substituted hydrocarbon has one or more substituents as described elsewhere herein.

[0059] The term “anhydrides” as used herein is a broad term, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a special or customized meaning), and refers without limitation to any compound as described herein incorporating one or more anhydride groups (of formula $(RC(O))_2O$), or being substituted by or functionalized to include one or more anhydride groups.

[0060] The term “sulfonic acid” as used herein is a broad term, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a special or customized meaning), and refers without limitation to, for example formic, acetic, succinic, lactic, malic, tartaric, citric, ascorbic, nicotinic, methanesulfonic, ethanesulfonic, p-toluensulfonic, salicylic or naphthalene sulfonic acid. Sulfonic acids can include hydrocarbyl sulfonic acids, such as aryl sulfonic acids, alkyl benzene sulfonic acid, among other.

[0061] The term “vegetable oil” as used herein is a broad term, and is to be given its ordinary and customary meaning to a person of ordinary skill in the art (and is not to be limited to a special or customized meaning), and refers without limitation to oleaginous fatty acid constituents of vegetable matter, e.g., saturated fatty acids, monounsaturated fatty acids, polyunsaturated fatty acids, etc. The vegetable oil can be functionalized, e.g., alkoxylated, hydroxylated, aminated, etc. A functionalized vegetable oil is a derivative of a vegetable oil or other fatty substance, or a substance having a similar composition regardless of the origin of the substance. In some embodiments, the functionalized vegetable oil is epoxidized unsaturated triglyceride. Epoxidized unsaturated triglyceride is a tri-ester of glycerine. The glycerine bonds to three linear or branched carboxylic acids,

wherein at least one of the carboxylic acids comprises an epoxide moiety. For example, the epoxidized unsaturated triglyceride may be a derivative of an unsaturated fatty acid triglyceride such as a vegetable or animal fat or oil, wherein at least one of the C=C moieties of the parent unsaturated fatty acid triglyceride is replaced with an epoxide moiety (i.e. a three-membered ring containing an oxygen). If the parent unsaturated fatty acid triglyceride has more than one C=C moiety, one, part, or all of the C=C moieties may be replaced by epoxide moieties. When the term “vegetable oil” is used herein, it is understood to include animal fats, or oils of synthetic origin, having a same chemical structure as a vegetable oil. Examples of vegetable or animal fats or oils include coconut oil, corn oil, cottonseed oil, olive oil, palm oil, peanut oil, rapeseed oil, canola oil, safflower oil, sesame oil, soybean oil, sunflower oil, castor oil, tallow oil, or the like.

[0062] As used herein, the abbreviations for any compound, is, unless indicated otherwise, in accord with its common usage, recognized abbreviations, or the IUPAC-IUB Commission on Biochemical Nomenclature (See, Biochem. 11:942-944 (1972)).

[0063] Any percentages, ratios or other quantities referred to herein are on a weight basis, unless otherwise indicated.

[0064] The cyclic systems referred to herein include fused ring, bridged ring, and spiro ring moieties, in addition to isolated monocyclic moieties.

EXAMPLES

[0065] The examples here below are not to be considered as limiting to the disclosure. The broad disclosures made in the Summary and Detailed Description herein above are repeated by way of reference. The Applicant envisages conducting further experimental protocols regarding the liquid anti-pathogenic agricultural composition described herein and its use.

WAX SOLUBILITY TEST

Method of preparation of the Paraffin Wax solubility test

[0066] A method to evaluate the capability of a solvent to dissolve paraffin wax was developed and it helps to understand how will be performed certain solvent when applied to an epicuticular surface of a plant or an insect.

[0067] The method for preparing a Paraffin Wax solubility test that define a speed which a solvent dissolve a paraffin wax (CAS number 8002-74-2) during the time, in a period of at least 24 hours. Steps to conduct the test are: a) weigh 98 grams of solvent into 8 oz glass jar along; b) place jar with solvent onto laboratory balance and tare weight; c) add 2 grams of molten (at 110°F or 43.3°C) paraffins wax into solvent, put a 1 inch magnetic stir bar inside and cap; d) place the jar containing the solvent with paraffins wax sample onto magnetic stir plate and begin stirring at 350 rpm – start a clock counter each sample; e) observe and record time when the entire amount of paraffins wax has dissolved, or not.

Table 1- Results of performance of solvents to dissolve paraffin wax

<u>Chemical name</u>	<u>Sample weight</u> <u>(g)</u>	<u>Temperature</u> <u>(°C)</u>	<u>Paraffin wax</u> <u>(g)</u>	<u>Dissolution Time</u> <u>(minutes)</u>	<u>Observation</u>
cold pressed orange oil	98	25	2.0	3	stable at 25°C
LPA 210 solvent	98	25	2.0	30	stable at 25°C
isopropyl laurate	98	25	2.0	102	stable at 25°C
Aromatic 200	98	25	2.0	197	stable at 25°C
methyl caprylate/caprate	98	25	2.0	205	stable at 25°C
methyl laurate	98	25	2.0	300	stable at 25°C
isobutyl laurate	98	25	2.0	340	stable at 25°C
isoamyl laurate	98	25	2.0	620	stable at 25°C
isopropyl myristate	98	25	2.0	627	stable at 25°C
2-ethylhexyl laurate	98	25	2.0	930	stable at 25°C
N, N-dimethyldecanamide	98	25	2.0	-	undissolved after 24-hours stirring
butyl cellusolve	98	25	2.0	-	undissolved after 24-hours stirring
tetrahydrofurfural alcohol	98	25	2.0	-	undissolved after 24-hours stirring
dimethyl sulfoxide	98	25	2.0	-	undissolved after 24-hours stirring
propylene carbonate	98	25	2.0	-	undissolved after 24-hours stirring
methyl palmitate/oleate	98	25	2.0	-	undissolved after 24-hours stirring
methyl soyate	98	25	2.0	-	undissolved after 24-hours stirring
cyclohexanone	98	25	2.0	-	undissolved after 24-hours stirring

EXAMPLES OF PRODUCTS ACCORDING THE PRESENT DISCLOSURE**Method of preparation of the fungicidal and insecticidal concentrate**

[0068] For the purpose of illustration, the method for preparing the liquid anti-pathogenic agricultural composition (preferably a liquid fungicidal and insecticidal agricultural composition) (in its concentrate form) as used in the non-limiting examples, includes the following steps: (i) admixing into

a vessel with a portion of water and/or oil, (ii) adding at least one anionic surfactant such as a sodium lauryl ether sulfate, (iii) adding at least one nonionic surfactant such a fatty alcohol ethoxylated, and (iv) adding at least one solvent from the group of alkyl ($C_1 - C_8$) esters of alkyl ($C_{12} - C_{16}$) acids such as isopropyl myristate and/or isopropyl laurate. The method may optionally include an additional further step (v) adding at least one additive such as, but not limited to, a preservative and/or a colorant. Typically, the steps above are conducted in sequence from step (i) to step (iv) and further the optional step (v). The admixture is continuously stirred. Heating is not necessarily required but may advantageously be employed depending on the physical state of each compound. For certain components, lower temperatures or higher temperatures may be employed. The temperature can be selected so as to facilitate mixing within a desired time period, while avoiding degradation or undesired reaction of the components. Other additives can also be added for specific purposes, such as, but not limited to, clarifiers, anti-foaming agents, anti-freezing agents, hydrotropes, UV stabilizers, colorants, nutrients, amino-acids, sea extract, anti-drift agents, anti-freezing agents, and water, oil, terpenes, terpene containing oils, or other solvents and combinations thereof.

[0069] The diluted liquid anti-pathogenic (fungicidal and insecticidal) agricultural composition may comprise various ratios of components, typically the fungicidal and insecticidal composition, in its concentrated liquid form, comprises from about 1 to about 30% of the at least one alkyl ($C_1 - C_8$) esters of alkyl ($C_{12} - C_{16}$) acids; from about 1 to about 30% by weight the at least one anionic surfactant; from about 1 to about 40% by weight of one or more nonionic surfactants; and from about 2 to about 80% of water, oils or other additives.

[0070] Specifically, the liquid concentrate anti-pathogenic (fungicidal and insecticidal) agricultural composition (i.e. the liquid anti-pathogenic agricultural composition in its concentrated liquid form), comprises from 1 to 30 wt. % of the at least one alkyl ($C_1 - C_8$) esters of alkyl ($C_{12} - C_{16}$) acids – preferably between to 3 to 12 wt. % by weight; the at least one anionic surfactant comprises from 1 to 30 wt. % by weight – preferably from 3 to 20% by weight; the at least one nonionic surfactant from 1 to 40 wt. % by weight – preferably from 5 to 30 wt. % by weight; and wherein the water, oils or other additives are from 20 to 70 wt. % by weight – preferably from 30 to 65 wt. % by weight. In other words, where the liquid concentrate anti-pathogenic (fungicidal and insecticidal) agricultural composition has a weight of 100 g it comprises 1 to 30g of the at least one alkyl ($C_1 - C_8$) esters of alkyl ($C_{12} - C_{16}$) acids – preferably between to 3 to 12g; the at least one anionic surfactant comprises from 1 to 30g – preferably from 3 to 20g; the at least one nonionic surfactant from 1 to 40g – preferably from 5 to 30g; and wherein the water, oils or other additives are from 20 to 70g – preferably from 30 to 65g. Any percentages, ratios or other quantities referred to herein are on a weight basis in grams, unless otherwise indicated.

Preparing the liquid concentrate anti-pathogenic (fungicidal and insecticidal) agricultural compositions according to this disclosure

[0071] Four different liquid concentrate anti-pathogenic (fungicidal and insecticidal) agricultural compositions (in concentrate form), were prepared according to some of the embodiments of this disclosure. The concentrates fungicidal and insecticidal with high flash point and an epicuticular wax compatibility are indicated by ORO-009-K, ORO-009-T, ORO-079-FB and ORO-296-A. The details of the specific embodiments are shown in Table 2. Various components were employed in the different formulations, including soybean methyl ester - oil; cold pressed orange oil - oil; polyoxyethylene sorbitan monolaurate – anionic surfactant; alcohol ethoxylated POE-6 – nonionic surfactant; triethanolamine dodecylbenzene sulfonate - anionic surfactant; calcium dodecyl benzene sulfonate – anionic surfactant; sodium dodecyl benzene sulfonate - anionic surfactant; sodium lauryl ether sulfate – anionic surfactant; alcohol ethoxylated and propoxylated EOPO 6/9 – nonionic surfactant; Isopropyl Myristate – oil, Methyl Laurate - oil, Isopropyl Laurate - oil.

Table 2: Fungicidal and insecticidal concentrates made according the present invention

Compound	ORO-009-K	ORO-009-T	ORO-079-FB	ORO-296-A
	Amount (weight/weight %)			
Isopropyl Myristate	7.00	-	8.00	5.00
Isopropyl Laurate	-	-	2.00	-
Methyl Laurate	-	4.00	-	-
Alcohol Ethoxylated 6 POE	9.00	15.00	25.00	12.00
Sodium Alkyl Benzene Sulfonate	10.00	-	-	11.00
Calcium Alkyl Benzene Sulfonate	-	5.00	-	-
Sodium lauryl ether sulfate	8.00	-	12.00	7.00
Polyoxyethylene sorbitan monolaurate	-	7.00	-	-
Other additives	5.00	5.00	5.00	5.00
Water	65.00	64.00	48.00	60.00
TOTAL (weight/weight %)	100.0	100.0	100.0	100.0
FORMULATION TYPE	Microemulsified	Microemulsified	Microemulsidifi	Microemulsidified

Physico-Chemical and Accelerated Stability Tests

[0072] Samples of products of certain embodiments were compared to commercially available products and analyzed to determine their physical chemical characteristics and their behavior when diluted in water – pH and stability of emulsion; and into the pure fungicidal and insecticidal, flash point using a closed cup using methodology described on CIPAC Handbook F – Collaborative International Pesticide Analytical Ltd, 1994, reprint in 2007. These commercially available products included from Oro Agri® the following products PREV-AM® (an insecticide and/or fungicide and/or miticide based on sodium tetraborohydrate decahydrate and orange oil); and from other companies - ABACUS™ (an insecticide and/or miticide based on Abamectin available from Rotam North America Inc.; SAFARI™ 20SG Insecticide an insecticide based on Dinotefuran available from Valent U.S.A. Corporated; and CAPSIL™ (a nonionic adjuvant based on dimethylsiloxane available from Aquatrols Corporation of America. It was determined that the products prepared according to the embodiments of this disclosure exhibited stability in accelerated storage stability testing, and all samples were stable even in cold (14 days @ 0°C) or hot conditions (14 days @ 54°C). The stability results are shown in Table 3 and Table 4.

Table 3: Physico-chemical properties and accelerated stability test results – compositions made in accordance with this disclosure

ANALYSIS	ORO-009-K	ORO-009-T	ORO-296-A	ORO-079-FB
Appearance (product)	Clear Golden	Clear Golden	Clear Golden	Clear Golden
Density @ 20°C	1.009	1.008	1.007	1.003
pH (product)	7.30	7.43	7.00	6.57
pH (1% v/v)	-	-	-	-
Viscosity @ 25°C	25 Cp	34 Cp	25 Cp	22 Cp
Flash Point Closed Cup – CIPAC MT12	>121.1°C (>250°F)*	>121.1°C (>250°F)*	>121.1°C (>250°F)*	>121.1°C (>250°F)*
Appearance (solution at 0.25% - distilled)	Clear	Clear	Clear	Clear
Emulsion Stability (CIPAC MT 36) 1% v/v 2 hours @ 30°C Water CIPAC A and D	No cream and No Oil	No cream and No Oil	No cream and No Oil	No cream and No Oil
Emulsion Stability Method CIPAC MT 36 1% v/v 24h30 hours re-emulsified at 30°C Water CIPAC A and D	No cream and No Oil	No cream and No Oil	No cream and No Oil	No cream and No Oil
Accelerated Storage Procedure Method CIPAC MT 46 (14 days at 0°, 20° and 54°C)	Stable	Stable	Stable	Stable

(*) – No flash point was achieved until the temperature described.

Table 4: Physio-chemical properties for commercially available products used as Standards treatment

ANALYSIS	PREV-AM®	ABACUS™	SAFARI™ 20SG Insecticide
Appearance (product)	Green liquid	Yellowish liquid	Off-white granules
Density @ 20°C	1.020	0.966	-
pH (product)	5.80	-	-
pH (1.0% v/v)	5.90	3.66	7.50
Viscosity @ 25°C	25 cP	8 cP	-
Flash Point - closed cup (@ 760 mmHg)	68.8 °C (>212°F)	76.5 °C (169.7°F)	-
Appearance (solution at 0.25% - distilled water)	Clear	Cloudy	Turbid suspension
Emulsion Stability Method CIPAC MT 36 1% v/v - 2 hours @ 30°C Water CIPAC A and D	No cream and No Oil	No cream and No Oil	-
Emulsion Stability Method CIPAC MT 36 1% v/v - 24h30 hours re-emulsified @ 30°C Water CIPAC A and D	No cream and No Oil	No cream and No Oil	-
Accelerated Storage Method CIPAC MT 46 (14 days at 0, 20 and 54°C)	Stable	Stable	Stable

PREV-AM® - by Oro Agri Inc. ABACUS™ - by Rotam North America Inc SAFARI™ 20SG Insecticide – supplied by Valent USA Corporation

Disease bio-efficacy screening

[0073] Samples of products of certain embodiments were evaluated in a disease bio-efficacy screening at University of California Davis/Kearney Agricultural Research and Extension Center in comparison with other products and samples to evaluate pH effect, adjuvancy effect and efficacy against most common or applicable plant pathogens in vitro. Sample identification is shown in Tables 5 and 6.

Table 5: Samples identification for various treatments for comparison purposes

Treatment	1	2	3	4	8	9	10
Fungicide	Fung.I *	Fung. I *	Fung.I *	Fung.I *	Fung.II **	Fung.II **	Fung.II **
Dosage (%v/v)	0.5	1	0.5	1	0.5	1	2
Chemical Activator (Adjuvant)	Adjv. I ***	Adjv. I ***	Adjv.II ****	Adjv.II ****	Citric Acid 50%	Citric Acid 50%	Citric Acid 50%
Dosage Adj. (%v/v)	0.25	0.5	0.25	0.5	Adjust pH to 5	Adjust pH to 5	Adjust pH to 5

* FUNG. I (Innovative fungicide based on Potassium Sorbate OR-159-B of PCT/IB2020/050112) **
 - FUNG. II (Innovative fungicide based on Potassium Sorbate – OR-159-G of PCT/IB2020/050112)
 *** - ADJV. I (Innovative acidifier adjuvant based on Alkyl Ester – OR-278-C of
 PCT/IB2020/050112) **** ADJV. II (Innovative acidifier adjuvant based on Alkyl Ester – OR-097-
 V of PCT/IB2020/050112)

Table 6: Samples identification for various treatments for comparison purposes, wherein Treatment 17 and 18 are embodiments according to this disclosure

Treatment	11	12	13	14	15	17	18	19
Code	EXP. I +	EXP. II ++	PREV- AM®	PREV- AM®	EXP.III +++	OR- 296-A	OR- 296-A	Untreated (UTC)
Dosage (%v/v)	0.25	0.25	0.25	0.4	0.25	1	0.5	-
Adjuvant	-	-	-	-	-	-	-	-
Dosage Adj. (%v/v)	-	-	-	-	-	-	-	-

+ EXP. I (Fungicide based on Natural Oil marketed as Transformer ®)

++ - EXP. II (Fungicide based on Natural Oil marketed as Oroboost ®)

+++ - EXP. III (Fungicide based on Natural Oil marketed as Wetcit ®). All commercially available products have known anti-pathogenic properties.

[0074] Growth inhibition was measured using potato dextrose agar (PDA) amended with the test compounds to compare colony growth of several fungi. Plain (unamended) PDA plates served as controls. Cultures of *Aspergillus niger*, *Botrytis cinerea*, *Colletotrichum fioriniae*, *Fusarium moniliforme*, *F. oxysporum*, *Macrophomina phaseolina*, *Verticillium dahlia*, and *Xanthomonas arboricola* pv. *juglandis* were grown on acidified potato dextrose agar. The amended and control plates were inoculated with mycelial plugs (5 mm diameter), then incubated at 25°C until the colonies in the controls neared the edge of the plates for each species. At that time, colony radius was measured and percent inhibition was calculated for each test compound in relation to the radius of control plates.

Table 7: Summary percent growth inhibition of various agricultural compositions and comparative products against a number of important plant pathogens.

	% inhibition in relation to untreated control																
Treatm ent	<i>Aspergil lus niger</i>			<i>Botrytis cinerea</i>		<i>Colletotric hum fiorinae</i>		<i>Fusariu m monilifor me</i>		<i>Fusariu m oxyspor um</i>		<i>Macropho mina phaseolina</i>		<i>Verticilli um dahliae</i>		<i>Xanthomo nas arboricol a pv. juglandis</i>	
1	94.8 1	a		90. 88	b		84.94	b	100	a	100	a	100	a	100	a	
2	100	a		100	a		97.22	a	100	A	100	a	100	a	100	a	
3	93.7 8	a		95. 43	a b		84.41	b	100	A	100	a	100	a	100	a	
4	100	a		100	a		100	a	100	A	100	a	100	a	100	a	
8	32.9	d		29. 51	h		31.48	e	27.6 3	G	28. 09	e f	78.05	c	54.0 6	e	66.1 8
9	0.73	e		34	g h		1.61	g	24.1 5	H	25. 97	f g	83.32	bc	39.0 8	f	68.5 4
10	5.14	e		38. 06	g		4.19	g	37.3 1	F	33. 72	e	100	a	52.8 7	e	100
11	78.2 8	b		58. 74	d		72.87	c	51.5 1	E	58. 68	d	55.61	d	80.3 4	c d	58.2 5
12	64.4 5	c		48. 86	e f		59.97	d	54.7 6	D	58. 74	d	4.82	e	84.2 7	b c	59.3 9
13	62.9 3	c		45. 54	f		73.91	c	78.5 5	C	70. 92	c	88.11	bc	89.5 7	b	25.6 1
14	61.6 1	c		51. 23	e		77.66	c	84.0 9	B	72. 76	b c	89.54	ab	88.2 9	b	26.5 1
15	65.1 2	c		44. 13	f		76.44	c	82.9	B	78. 74	b	85.98	bc	74.6 4	d	7.73
17	100	a		10 0	a		100	a	100	A	10 0	a	100	a	100	a	100
18	100	a		10 0	a		100	a	100	A	10 0	a	100	a	5.6 9	g	100

Values with same letter are not significantly different. Comparisons are made within pathogens

only, not between pathogens.

[0075] The results of these *in vitro* tests showed that some of these compounds are very effective in inhibiting the growth of some of the tested pathogens. For instance, treatments, OR-296-A (Treatments 17 and 18), FUNG.I at 0.5% mixed with ADJV. I at 0.25% and FUNG.I at 1% mixed with ADJV. I at 0.5% (Treatments 1 and 2) and FUNG.I at 0.5% at 0.25% mixed with ADJV. II at 0.25% and FUNG.I at 1% mixed with ADJV. II at 0.5% (Treatments 3 and 4) had a significantly greater inhibition against **all 8 plant pathogens** tested. *Fusarium moniliforme*, *F. oxysporum*, *Macrophomina phaseolina*, and *Xanthomonas arboricola* pv. *juglandis* were inhibited totally. *Verticillium dahlia* show an outlier result with OR-296-A at 0.5% and may be human error to be retested.

[0076] With some exceptions, reference treatments (Treatments 11 to 15) inhibited the majority of the fungi from 44% to 100%. Exp. I, Exp. II and Exp. III are based on volatile natural oil and do not perform satisfactorily. Treatments 13 and 14 are the reference product PREV-AM® based on sodium tetraborohydrate decahydrate and orange oil and had performance inferior to showed by products according this disclosure (Treatments 17 and 18).

[0077] The results obtained from this study are very promising because the majority of the compounds tested here can significantly inhibit a large number of serious plant pathogens. This indicates that after registration of these compounds, growers would have materials that could be effective against multiple important pathogens. The comparison per pathogen is showed at FIG. 1 to FIG. 8.

Field trials to evaluate products made according the invention and comparing against existing products and standard treatments

[0078] **Study 1.** Evaluate various insecticide formulations, comparing efficacy of a formulation of safe and friendly insecticide on controlling Silverleaf Whitefly (*Bemisia argentifolii*) on Poinsettia, performing in greenhouse.

[0079] **Methods summary:** A bifactorial trial was conducted consisting of 10 treatments, comprised of a combination of 03 insecticides (factor A) and 3 treatment rates (factor B), plus one reference treatment are shown in Table 8.

[0080] Insecticides application was done using a single-nozzle type TXVK-4 connected to a backpack CO₂ (carbon dioxide) pressurized system. Each plot measured 4 ft x 1.5 ft. The control of adults and nymphs was made by collecting and counting each stage. The phytotoxicity evaluation was made 4 days after A, 6 days and 17 days after B, poinsettia was evaluated visually using a 0-10 scale, where 0 corresponds to absence of injury symptoms and 10 corresponds to plant death. Additional information regarding application and other variables of field trials designed are shown in

Table 9.

Table 8: Field trial design – information regarding products, rates and dosages

Trt No.	Treatment Name	Form Type	Rate	Rate Unit	Appl Code	Spray Volume	Volume Unit	Mix Size	Mix Unit	Comment
1	UNTREATED	-	-	-	-	-	-	-	-	-
2	ABACUS™	EC	4	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
3	ABACUS™	EC	8	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
4	ABACUS™	EC	16	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
11	PREV-AM®	L	8	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
12	PREV-AM®	L	16	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
13	PREV-AM®	L	32	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
14	ORO-296-A	L	8	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
15	ORO-296-A	L	16	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
16	ORO-296-A	L	32	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
20	SAFARI™ 20SG	SG	8	oz wt/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
	CAPSIL™	L	6	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS

Replications: 5; Untreated treatments: 1; Design: Randomized Complete Block (RCB)

Table 9: Field trial design – Application information

Reference\ application	A	B
Application Method:	SPRAY	SPRAY
Application Timing:	POSPOS	POSPOS
Application Placement:	FOLIAR	FOLIAR
Equipment Type:	BACSPR	BACSPR
Operation Pressure, Unit:	50 PSI	50 PSI
Nozzle Type:	CONHOL	CONHOL
Nozzle Size:	TXVK-4	TXVK-4
Spray Volume, Unit:	150 GAL/AC	150 GAL/AC
Mix Size, Unit:	0.5 L	0.5 L
Propellant:	COMCO2	COMCO2
Tank Mix (Y/N):	Y yes	Y yes
Crop Stage (BBCH scale)	EPHPU BDIC	EPHPU BDIC
Pest 1 Code, disc., scale	BEMIAR I	BEMIAR I
Application Date:	Nov-1-2018	Nov-9-2018
Application start time:	09:30 AM	7:15AM
Air temperature, unit	71 F	60 F
% Relative Humidity	17	48
Drew presence	N no	N no
% Cloud cover	0	0

Collection Methodology

[0081] Live Adults: Leaf turn method performed by gently turning over a single leaf and counting all living adults on one whole leaf per plot. Leaf selection is on upper strata of plant (younger) where adults are found to be most active.

[0082] Nymphs: A total of two discs (one from each plant) measuring 5.64 cm² each for a total area of 11.28 cm² is taken from the mid strata of the plant where early instar nymphs are active. Sample discs are then taken into the lab then counted using a stereoscope. The total number of nymphs from the two discs is recorded as a single subsample.

Table 10: Data collection time and other information

Type	Time / type of collection
1	-2 to 0 DA-A / count of live nymphs.
2	-1 DA-A / count of live adults
3	0 DA-A / Living adults 3-6 hours after App A
4	4 DA-A /count of live nymphs
5	7 DA-A / count of live nymphs
6	0 DA-B / Living adults 3-6 hours after App B
7	7 DA-B / count of live nymphs
8	14 DA-B / count of live nymphs

Table 11. General information pest details, site and trials location and information

<i>Pest Description</i>	
Pest 1 Type:	I
Code:	BEMIAR (Bemisia argentifolii)
Common Name:	Silverleaf whitefly
Artificial Population:	N
<i>Site and Design</i>	
Site Type:	GREENH (Greenhouse)
Treated Plot Width:	1.5 FT
Treated Plot Length:	4 FT
Treated Plot Area:	6 sq.ft
Experimental Unit:	PLOT (plot)
<i>Trial Information</i>	
Trial ID:	US 1 ALEYF 2018 01
Discipline:	I - Insecticide
Trial Status:	F - one-year/final
Initiation Date:	Nov-1-2018
Completion Date:	Nov-26-2018
<i>Trial Location</i>	
City:	Valley Center
State/Prov.:	California
Country:	USA United States
Climate Zone:	USWARM US Warm Continental

Latitude of LL Corner °:	33.27692N
Longitude of LL Corner °:	117.042155 W
Altitude of LL Corner, Unit:	1532.00 FT

Table 12. Evaluation of numbers of nymphs and adults of Silverleaf whitefly – trials 1, 2 and 3.

Pest Code			BEMIR	BEMIR	BEMIR
Pest Scientific Name			Bemisia argent>	Bemisia argent>	Bemisia argent>
Pest Name			Silverleaf whi>	Silverleaf whi>	Silverleaf whi>
Crop Scientific Name			Euphorbia pulg>	Euphorbia pulg>	Euphorbia pulg>
Crop Name			Common poinset>	Common poinset>	Common poinset>
Crop Variety			Prestige Red	Prestige Red	Prestige Red
Part Rated			NYMLIV P	ADULIV P	ADULIV P
Rating Date			Oct-30-2018	Oct-31-2018	Nov-1-2018
Rating Type			COUNT	COUNT	COUNT
Rating Unit			NUMBER	NUMBER	NUMBER
Number of Subsamples			1	1	1
Days After First/Last Applic.			-2 -2	-1 -1	0 0
Trt-Eval Interval			-2 DA-A	-1 DA-A	0 DA-A
Trt Treatment No. Name	Rate Rate Unit	Appl Spray Volume Comment	Trial 1	Trial 2	Trial 3
1 UNTREATED	-	-	92.4 a	38.5 a	64.4 a
2 ABACUS™	4 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	89.6 a	34.9 a	14.8 b-f
3 ABACUS™	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	67.4 a	22.7 a	17.0 bc
4 ABACUS™	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	69.0 a	22.1 a	12.3 b-g
11 PREV-AM®	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	73.2 a	22.3 a	17.9 b

12 PREV-AM®	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	85.4 a	23.9 a	14.5 b-f
13 PREV-AM®	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	72.6 a	24.4 a	15.8 b-c
14 OR-296-A	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	82.0 a	32.5 a	8.2 c-h
15 OR-296-A	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	68.4 a	28.7 a	7.2 f-i
16 OR-296-A	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	67.2 a	19.8 a	5.5 hi
20 SAFARI™ 20SG CAPSIL™	8 oz wt/100 gal 6 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS 150 GAL/AC 2 @ 7 DAYS	75.4 a	26.5 a	3.2 i
LSD P=.05			41.58	15.90 - 17.11	4.28 - 33.08
Standard Deviation			33.01	0.20t	0.24t
CV			42.45	13.47t	21.77t
Levene's F			0.86	0.751	0.888
Levene's Prob(F)			0.631	0.756	0.598
Skewness			0.2774	0.3007	-0.0188
Kurtosis			-0.8178	0.3062	1.7348*
Replicate F			1.772	2.001	1.086
Replicate Prob(F)			0.1432	0.1028	0.3695
Treatment F			0.668	0.854	5.664
Treatment Prob(F)			0.8386	0.6382	0.0001

Table 13. Evaluation of numbers of nymphs and adults of Silverleaf whitefly – trials 4, 6 and 7.

Pest Code			BEM IAR	BEM IAR	BEM IAR
Pest Scientific Name			Bemisia argent>	Bemisia argent>	Bemisia argent>
Pest Name			Silverleaf whi>	Silverleaf whi>	Silverleaf whi>
Crop Scientific Name			Euphorbia pulc>	Euphorbia pulc>	Euphorbia pulc>
Crop Name			Common poinset>	Common poinset>	Common poinset>
Crop Variety			Prestige Red	Prestige Red	Prestige Red
Part Rated			NYMLIV P	NYMLIV P	ADULIV P
Rating Date			Nov-5-2018	Nov-8-2018	Nov-9-2018
Rating Type			COUNT	COUNT	COUNT
Rating Unit			NUMBER	NUMBER	NUMBER
Number of Subsamples			1	1	1
Days After First/Last Application			4 4	7 7	8 8
Trt-Eval Interval			4 DA-A	7 DA-A	0 DA-B
Trt Treatment No. Name	Rate / Rate Unit	Appl Spray Volume Comment	Trial 4	Trial 6	Trial 7
1 UNTREATED	-	-	108.4 a	274.9 a	87.8 a
2 ABACUS™	4 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	104.8 a	159.5 a	9.9 d
3 ABACUS™	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	69.7 a	126.1 a	12.7 bcd
4 ABACUS™	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	85.7 a	112.2 a	13.0 bcd
11 PREV-AM®	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	88.1 a	130.1 a	10.8 cd
12 PREV-AM®	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	65.4 a	152.2 a	10.1 cd
13 PREV-AM®	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	57.9 a	123.5 a	10.6 cd

14 OR-296-A	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	78.6 a	142.1 a	14.0 bcd
15 OR-296-A	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	82.6 a	160.8 a	11.2 bcd
16 OR-296-A	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	100.1 a	179.4 a	10.4 cd
20 SAFARI™ 20SG CAPSIL™	8 oz wt/100 gal 6 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS 150 GAL/AC 2 @ 7 DAYS	89.5 a	129.0 a	3.6 e
LSD P=.05			38.74 - 49.23	71.63 - 89.50	5.90 - 49.88
Standard Deviation			0.17t	2.35t	0.28t
CV			8.97t	19.06t	24.99t
Levene's F			0.622	0.312	0.869
Levene's Prob(F)			0.879	0.997	0.62
Skewness			0.0337	0.1322	0.8145*
Kurtosis			-0.1108	0.1368	1.3601*
Replicate F			2.406	10.943	1.105
Replicate Prob(F)			0.0567	0.0001	0.3602
Treatment F			1.265	1.628	3.759
Treatment Prob(F)			0.2322	0.0706	0.0001

Table 14. Evaluation of numbers of nymphs of Silverleaf whitefly – trials 8 and 10.

Pest Code			BEMIR	BEMIR
Pest Scientific Name			Bemisia argent>	Bemisia argent>
Pest Name			Silverleaf white fly	Silverleaf white fly
Crop Scientific Name			Euphorbia pulc>	Euphorbia pulc>
Crop Name			Common poinset>	Common poinset>
Crop Variety			Prestige Red	Prestige Red
Part Rated			NYMLIV P	NYMLIV P
Rating Date			Nov-15-2018	Nov-26-2018
Rating Type			COUNT	COUNT
Rating Unit			NUMBER	NUMBER
Number of Subsamples			1	1
Days After First/Last Application			14 6	25 17
Tri-Eval Interval			6 DA-B	6 DA-B
Tri Treatment No. Name	Rate Rate Unit	Appl Spray Volume Comment	Trial 8	Trial 10
1 UNTREATED	-	-	156.1 a	118.4 a
2 ABACUS™	4 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	81.7 a	92.8 a
3 ABACUS™	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	57.9 a	60.9 a
4 ABACUS™	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	51.8 a	55.6 a
11 PREV-AM®	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	61.5 a	75.5 a
12 PREV-AM®	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	89.6 a	68.5 a
13 PREV-AM®	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	80.3 a	81.1 a
14 OR-296-A	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	81.7 a	79.2 a

15 OR-296-A	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	70.3 a	85.1 a
16 OR-296-A	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	81.3 a	50.0 a
20 SAFARI™ 20SG CAPSIL™	8 oz wt/100 gal 6 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS 150 GAL/AC 2 @ 7 DAYS	42.7 a	28.4 a
LSD P=.05			51.08 - 68.70	46.64 - 61.33
Standard Deviation			2.49t	2.63t
CV			28.2t	30.78t
Levene's F			0.45	0.37
Levene's Prob(F)			0.974	0.992
Skewness			0.1761	0.4566
Kurtosis			-0.4821	0.1163
Replicate F			1.26	1.878
Replicate Prob(F)			0.293	0.123
Treatment F			1.159	1.371
Treatment Prob(F)			0.3147	0.1677

Table 15. Phytotoxicity evaluation after 5, 9 and 11 days after the second application.

Pest Code			BEMIR	BEMIR	BEMIR
Pest Scientific Name			Bemisia argent>	Bemisia argent>	Bemisia argent>
Pest Name			Silverleaf whi>	Silverleaf whi>	Silverleaf whi>
Crop Scientific Name			Euphorbia pulc>	Euphorbia pulc>	Euphorbia pulc>
Crop Name			Common poinset>	Common poinset>	Common poinset>
Crop Variety			Prestige Red	Prestige Red	Prestige Red
Part Rated			PLATOT C	PLATOT C	PLATOT C
Rating Date			Nov-5-2018	Nov-15-2018	Nov-26-2018
Rating Type			PHYGEN	PHYGEN	PHYGEN
Rating Unit			NUMBER	0-10	0-10
Number of Subsamples			1	1	1
Days After First/Last Applic.			4 4	14 6	25 17
Trt-Eval Interval			4 DA-A	6 DA-B	17 DA-B
Trt Treatment No. Name	Rate Rate Unit	Appl Spray Volume Comment	Trial 5	Trial 9	Trial 11
1 UNTREATED	-		0.0 d	0.0 d	0.0 e
2 ABACUS™	4 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	0.0 d	0.0 d	0.0 e
3 ABACUS™	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	0.0 d	0.0 d	0.0 e
4 ABACUS™	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	0.0 d	0.0 d	0.0 e
11 PREV-AM®	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	0.0 d	0.0 d	0.0 e
12 PREV-AM®	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	0.0 d	0.0 d	0.0 e
13 PREV-AM®	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	0.0 d	0.0 d	0.0 e

14 OR-296-A	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	0.0 d	0.0 d	0.0 c
15 OR-296-A	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	0.0 d	0.0 d	0.0 c
16 OR-296-A	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	0.8 c	1.0 c	1.2 c
20 SAFARI™ 20SG CAPSIL™	8 oz wt/100 gal 6 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS 150 GAL/AC 2 @ 7 DAYS	0.0 d	0.0 d	0.0 c

[0083] Conclusion a) The results of these *greenhouse* tests showed that OR-296-A is very effective in control of adults of Silverleaf whitefly, performing similar that the standard treatment SAFARI™20 SG and slightly better than both comparative treatments ABACUS™ and PREV-AM®. The results for control of nymphs was slightly inferior than the standard SAFARI™ and similar than both comparative treatments ABACUS™ and PREV-AM®.

[0084] Conclusion b) Phytotoxicity due to any Oro-Agri product application was not observed at any time during the treatments, with initial symptoms occurring in the high dosage (double dosage of the recommendation) of OR-296-A – not significantly.

[0085] Conclusion c) The results of these *greenhouse* tests showed that OR-296-A are very promising in control of adults of Silverleaf whitefly, and considering that this innovative, human and environmental safe compositions performing similar than conventional prior arts, this invention shows high potential to be a safe option to the agricultural market.

[0086] Other field trials and greenhouse trials are undergoing to get more data to support this invention.

[0087] Study 2. Evaluate various insecticide formulations, comparing efficacy of a formulation of safe and friendly insecticide on controlling Two-spotted spider mite (*Tetranychus urticae*) on Day-lily (*Hemerocallis sp.*), performing in greenhouse. Field trial performed in January and February of 2019.

[0088] Methods summary: A bifactorial trial was conducted consisting of 10 treatments, comprised of a combination of 03 insecticides (factor A) and 3 treatment rates (factor B), plus one reference treatment are shown in **Table 16**.

[0089] Plot Design: Each plot consisted of 2 *Hemerocallis* plants which were inoculated with the target pest prior to initiation of the trial. Plots were arranged in a RCB – randomized complete block design in a greenhouse setting. Plants were placed on wire mesh benches spaced on 24" centers. **Plant material:**

Data plants used in the trial were planted into 1 gallon pots. Media used was Sunshine #4 Mix, a peat moss/perlite mix. Irrigation: Plots were irrigated using a low volume spot splitter placed in each container with spray directed at soil surface. *Nutrients:* Plants were top dressed with a 4-6 mos. controlled released fertilizer. No further nutrients were applied during the trial period. *Application:* Treatments were applied using a CO₂ powered backpack sprayer using a hollow nozzle at 50 psi. A drift hood was placed over each plot while being treated in order to avoid contamination to adjacent plots. Spray application volume was 150 gal/ac which equates to approximately 80 mL/plot. Additional information regarding application and other variables of field trials designed are shown in **Table 16**.

Table 16: Field trial design – information regarding products, rates and dosages

Tri No.	Treatment Name	Form Type	Rate	Rate Unit	Appl Code	Spray Volume	Volume Unit	Mix Size	Mix Unit	Comment
1	UNTREATED	-	-	-	-	-	-	-	-	-
2	ABACUS™	EC	4	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
3	ABACUS™	EC	8	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
4	ABACUS™	EC	16	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
11	PREV-AM®	L	8	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
12	PREV-AM®	L	16	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
13	PREV-AM®	L	32	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
14	ORO-296-A	L	8	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
15	ORO-296-A	L	16	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
16	ORO-296-A	L	32	fl oz/100 gal	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS
20	OR-009-K	L	0.4	% v/v	AB	150	GAL/AC	0.5	liters	2 @ 7 DAYS

Replications: 4; Untreated treatments: 1; Design: Randomized Complete Block (RCB)

Table 17: Field trial design – Application information

Reference\ application	A	B
Application Method:	SPRAY	SPRAY
Application Timing:	POSPOS	POSPOS
Application Placement:	FOLIAR	FOLIAR
Equipment Type:	BACSPR	BACSPR
Operation Pressure, Unit:	50 PSI	50 PSI
Nozzle Type:	CONHOL	CONHOL
Nozzle Size:	TXVK-4	TXVK-4
Spray Volume, Unit:	150 GAL/AC	150 GAL/AC
Mix Size, Unit:	0.5 L	0.5 L
Propellant:	COMCO2	COMCO2
Tank Mix (Y/N):	Y yes	Y yes
Crop Stage (BBCH scale)	HEGSS BMON	HEGSS BMON
Pest 1 Code, disc., scale	TETRUR I	TETRUR I
Application Date:	Jan-19-2019	Jan-26-2019
Application start time:	07:00 AM	10:00 AM
Air temperature, unit	62 F	81 F
% Relative Humidity	77	17
Drew presence	N no	N no
% Cloud cover	0	0

Collection Methodology

[0090] Two leaves measuring 5"L x 1"W were collected from each plot. Leaves were then brushed using a mite brushing machine and viewed under a stereoscope. The pest nymphs (NYMLIV P) and adults (ADULIV P) were counted separately and reported individually and as a combined count of total motiles (MOTILE P).

Table 18: Data collection time and other information

Type	Time / type of collection
1	-2 to 0 DA-A / count of live adults.
2	3 DA-A / count of live adults after App A
3	6 DA-A / count of live adults after App A
4	3 DA-B / count of live adults after App B
5	6 DA-B / count of live adults after App B
6	13 DA-B / count of live adults after App B
7	6 DA-B / count of motiles totals after App B
8	13 DA-B / count of motiles totals after App B

Table 19. General information pest details, site and trials location and information

<i>Pest Description</i>	
Pest 1 Type:	I Insect
Code:	TETRUR (<i>tetranychus urticae</i>)
Common Name:	Day-lily (<i>Hemerocallis sp.</i>)
Artificial Population:	N no
<i>Site and Design</i>	
Site Type:	GREENH (Greenhouse)
Treated Plot Width:	1.5 FT
Treated Plot Length:	4 FT
Treated Plot Area:	6 sq.ft
Experimental Unit:	PLOT (plot)
<i>Trial Information</i>	
Trial ID:	18-ORO-TSSM
Discipline:	I - Insecticide
Trial Status:	F - one-year/final
Initiation Date:	Jan-19-2019
Completion Date:	Fev-08-2019
<i>Trial Location</i>	
City:	Valley Center
State/Prov.:	California
Country:	USA United States

Climate Zone:	USWARM US Warm Continental
Latitude of LL Corner °:	33.27692 N
Longitude of LL Corner °:	117.042155 W
Altitude of LL Corner, Unit:	1532.00 FT

Table 20. Evaluation of numbers of adults of Two-spotted spider mite – trials 2, 5, 8 and 11.

Pest Code			TETRUR	TETRUR	TETRUR	TETRUR
Pest Scientific Name			Tetranychus ur>	Tetranychus ur>	Tetranychus ur>	Tetranychus ur>
Pest Name			Two-spotted spider mite>	Two-spotted spider mite>	Two-spotted spider mite>	Two-spotted spider mite>
Crop Scientific Name			<i>Hemerocallis</i> sp.>	<i>Hemerocallis</i> sp.>	<i>Hemerocallis</i> sp.>	<i>Hemerocallis</i> sp.>
Crop Name			Day-lily>	Day-lily>	Day-lily>	Day-lily>
Crop Variety			Yangstizer	Yangstizer	Yangstizer	Yangstizer
Part Rated			ADULTLIV P	ADULTLIV P	ADULTLIV P	ADULTLIV P
Rating Date			Jan-17-2019	Jan-22-2019	Jan-25-2019	Jan-29-2019
Rating Type			COUNT	COUNT	COUNT	COUNT
Rating Unit			NUMBER	NUMBER	NUMBER	NUMBER
Number of Subsamples			1	1	1	1
Days After First/Last Applic.			-2 -2	3 3	6 6	10 3
Trt-Eval Interval			-2 DA-A	3 DA-A	6 DA-A	3 DA-B
Trt Treatment No. Name	Rate Rate Unit	Appl Spray Volume Comment	Trial 2	Trial 5	Trial 8	Trial 11
1 UNTREATED	-	-	53.9a	48.0a	51.0a	83.4a
2 ABACUS™	4 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	82.8a	15.0a	11.4a	21.7a
3 ABACUS™	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	52.2a	30.0a	18.9a	44.8a

4 ABACUS™	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	65.4a	36.0a	10.6a	43.9a
11 PREV-AM®	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	50.3a	48.0a	50.2a	23.9a
12 PREV-AM®	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	57.0a	78.0a	23.2a	44.5a
13 PREV-AM®	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	82.3a	33.0a	43.7a	47.0a
14 OR-296-A	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	39.3a	72.0a	35.1a	36.5a
15 OR-296-A	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	101.6a	60.0a	25.5a	67.9a
16 OR-296-A	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	88.2a	45.0a	25.9a	31.5a
20 OR-009-K	0.4% v/v	150 GAL/AC 2 @ 7 DAYS	35.4a	33.0a	38.3a	46.3A
LSD P=,05			68.33 - 69.91	36.87	31.09 - 35.39	41.16 - 48.96
Standard Deviation			3.04t	26.07	2.24t	2.30t
CV			37.88t	57.74	43.32t	34.88t
Levene's F			0.65	1.002	0.686	0.915
Levene's Prob(F)			0.858	0.472	0.824	0.57
Skewness			0.3043	0.1691	-0.1182	-0.2343
Kurtosis			-0.0528	-0.6403	0.2676	1.0219
Replicate F			4.770	2.005	2.013	0.625
Replicate Prob(F)			0.0048	0.1229	0.1216	0.6018
Treatment F			0.618	1.205	1.001	1.079
Treatment Prob(F)			0.8838	0.2822	0.4743	0.3943

Table 21. Evaluation of numbers of adults of Two-spotted spider mite – trials 14 and 17.

Pest Code			TETRUR	TETRUR
Pest Scientific Name			Tetranychus ur>	Tetranychus ur>
Pest Name			Two-spotted spider mite>	Two-spotted spider mite>
Crop Scientific Name			<i>Hemerocallis sp.></i>	<i>Hemerocallis sp.></i>
Crop Name			Day-lily>	Day-lily>
Crop Variety			Yangtizer	Yangtizer
Part Rated			ADULTLIV P	ADULTLIV P
Rating Date			Feb-1-2019	Feb-8-2019
Rating Type			COUNT	COUNT
Rating Unit			NUMBER	NUMBER
Number of Subsamples			1	1
Days After First/Last Application			13 6	20 13
Trt-Eval Interval			6 DA-B	13 DA-B
Trt Treatment No. Name	Rate / Rate Unit	Appl Spray Volume Comment	Trial 14	Trial 17
1 UNTREATED	-	-	99.6a	151.1a
2 ABACUS™	4 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	16.2a	40.0a
3 ABACUS™	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	43.9a	40.0a
4 ABACUS™	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	65.3a	38.8a
11 PREV-AM®	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	59.7a	75.8a
12 PREV-AM®	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	76.7a	92.0a
13 PREV-AM®	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	66.5a	70.5a
14 OR-296-A	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	67.5a	64.1a

15 OR-296-A	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	50.5a	68.6a
16 OR-296-A	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	40.9a	35.5a
20 OR-009-K	0.4% v/v	150 GAL/AC 2 @ 7 DAYS	66.3a	53.3a
LSD P=.05			39.47 - 56.61	52.13 - 73.51
Standard Deviation			2.41t	2.46t
CV			32.62t	32.74t
Levene's F			1.126	1.088
Levene's Prob(F)			0.348	0.384
Skewness			0.213	0.0254
Kurtosis			0.8072	0.0091
Replicate F			0.668	5.037
Replicate Prob(F)			0.5749	0.0035
Treatment F			1.444	1.726
Treatment Prob(F)			0.1382	0.0540

Table 22. Evaluation of numbers of motiles of Two-spotted spider mite – trials 3, 6, 9 and 12.

Pest Code	TETRUR	TETRUR	TETRUR	TETRUR
Pest Scientific Name	Tetranychus ur>	Tetranychus ur>	Tetranychus ur>	Tetranychus ur>
Pest Name	Two-spotted spider mite>	Two-spotted spider mite>	Two-spotted spider mite>	Two-spotted spider mite>
Crop Scientific Name	<i>Hemerocallis</i> sp.>	<i>Hemerocallis</i> sp.>	<i>Hemerocallis</i> sp.>	<i>Hemerocallis</i> sp.>
Crop Name	Day-lily>	Day-lily>	Day-lily>	Day-lily>
Crop Variety	Yangstizer	Yangstizer	Yangstizer	Yangstizer
Part Rated	MOTILES P	MOTILES P	MOTILES P	MOTILES P
Rating Date	Jan-17-2019	Jan-22-2019	Jan-25-2019	Jan-29-2019
Rating Type	COUNT	COUNT	COUNT	COUNT
Rating Unit	NUMBER	NUMBER	NUMBER	NUMBER
Number of Subsamples	1	1	1	1
Days After First/Last Applic.	-2 -2	3 3	6 6	10 3
Trt-Eval Interval	-2 DA-A	3 DA-A	6 DA-A	3 DA-B

Trt Treatment No. Name	Rate Rate Unit	Appl Spray Volume Comment	Trial 3	Trial 6	Trial 9	Trial 12
1 UNTREATED	-	-	338.0a	338.0a	338.0a	338.0a
2 ABACUS™	4 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	495.0a	495.0a	495.0a	495.0a
3 ABACUS™	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	267.0a	267.0a	267.0a	267.0a
4 ABACUS™	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	309.0a	309.0a	309.0a	309.0a
11 PREV- AM®	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	194.7a	194.7a	194.7a	194.7a
12 PREV- AM®	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	117.2a	117.2a	117.2a	117.2a
13 PREV- AM®	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	151.9a	151.9a	151.9a	151.9a
14 OR-296-A	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	147.9a	147.9a	147.9a	147.9a
15 OR-296-A	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	237.7a	237.7a	237.7a	237.7a
16 OR-296-A	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	73.4a	73.4a	73.4a	73.4a
20 OR-009-K	0.4% v/v	150 GAL/AC 2 @ 7 DAYS	252.0a	172.8a	175.9a	116.4a
LSD P=,05			192.34	128.51 - 142.58	67.02 - 113.09	92.03 - 99.81
Standard Deviation			135.98	3.42t	0.20t	2.88t
CV			39.32	25.0t	9.36t	25.37t
Levene's F			1.558	0.575	0.38	0.703
Levene's Prob(F)			0.093	0.916	0.991	0.808
Skewness			0.4091	0.1011	0.1331	0.3974
Kurtosis			-0.7171	-0.2663	0.0587	0.5896
Replicate F			16.075	2.325	1.238	2.073
Replicate Prob(F)			0.0001	0.0838	0.3040	0.1133

Treatment F	0.931	0.780	1.315	0.736
Treatment Prob(F)	0.5524	0.7258	0.2057	0.7733

Table 23. Evaluation of numbers and control of motiles of Two-spotted spider mite – trials 15, 18, 19 and 20.

Pest Code			TETRUR	TETRUR	TETRUR	TETRUR
Pest Scientific Name			Tetranychus ur>	Tetranychus ur>	Tetranychus ur>	Tetranychus ur>
Pest Name			Two-spotted spider mite>	Two-spotted spider mite>	Two-spotted spider mite>	Two-spotted spider mite>
Crop Scientific Name			<i>Hemerocallis</i> sp.>	<i>Hemerocallis</i> sp.>	<i>Hemerocallis</i> sp.>	<i>Hemerocallis</i> sp.>
Crop Name			Day-lily>	Day-lily>	Day-lily>	Day-lily>
Crop Variety			Yangstizer	Yangstizer	Yangstizer	Yangstizer
Part Rated			MOTILES P	MOTILES P	MOTILES P	MOTILES P
Rating Date			Feb-1-2019	Feb-8-2019	Jan-17-2019	Jan-22-2019
Rating Type			COUNT	COUNT	CONTROL	CONTROL
Rating Unit			NUMBER	NUMBER	% UNCK	% UNCK
Number of Subsamples			1	1	1	1
Days After First/Last Applic.			13 6	20 13	-2 -2	3 3
Tri-Eval Interval			6 DA-B	13 DA-B	-2 DA-A	3 DA-A
Tri Treatment No. Name	Rate Rate Unit	Appl Spray Volume Comment	Trial 15	Trial 18	Trial 19	Trial 20
1 UNTREATED	-	-	308.1ab	818.0a	0a	0a
2 ABACUS™	4 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	142.3cde	197.5cde		
3 ABACUS™	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	190.5a-d	143.9de		
4 ABACUS™	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	232.5a-d	242.8b-c		
11 PREV- AM®	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	240.3a-d	370.3bcd		

12 PREV-AM®	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	238.4a-d	451.6abc		
13 PREV-AM®	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	336.5a	287.3b-e		
14 OR-296-A	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	264.6abc	443.6abc		
15 OR-296-A	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	128.6cde	318.3b-e		
16 OR-296-A	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	189.6a-d	239.1b-e		
20 OR-009-K	0.4% v/v	150 GAL/AC 2 @ 7 DAYS	145.7cde	169.3de		
LSD P=,05			86.94 - 175.76	220.77 - 376.24	.	.
Standard Deviation			0.23t	5.36t	NaN	NaN
CV			9.97t	32.28t	0.0t	0.0t
Levene's F			0.477	1.086	0.00	0.00
Levene's Prob(F)			0.966	0.386	0.00*	0.00*
Skewness			0.2018	0.5349*	.	.
Kurtosis			-0.6142	0.1759	.	.
Replicate F			3.939	4.324	0.000	0.000
Replicate Prob(F)			0.0124	0.0080	1.0000	1.0000
Treatment F			1.774	2.656	0.000	0.000
Treatment Prob(F)			0.0457	0.0019	1.0000	1.0000

Table 24. Evaluation of % control of motiles of Two-spotted spider mite – trials 21, 22, 23 and 24.

Pest Code			TETRUR	TETRUR	TETRUR	TETRUR
Pest Scientific Name			Tetranychus ur>	Tetranychus ur>	Tetranychus ur>	Tetranychus ur>
Pest Name			Two-spotted spider mite>	Two-spotted spider mite>	Two-spotted spider mite>	Two-spotted spider mite>
Crop Scientific Name			<i>Hemerocallis</i> sp.>	<i>Hemerocallis</i> sp.>	<i>Hemerocallis</i> sp.>	<i>Hemerocallis</i> sp.>
Crop Name			Day-lily>	Day-lily>	Day-lily>	Day-lily>
Crop Variety			Yangstizer	Yangstizer	Yangstizer	Yangstizer
Part Rated			MOTILES P	MOTILES P	MOTILES P	MOTILES P
Rating Date			Jan-25-2019	Jan-29-2019	Feb-1-2019	Feb-8-2019
Rating Type			CONTROL	CONTROL	CONTROL	CONTROL
Rating Unit			% UNCK	% UNCK	% UNCK	% UNCK
Number of Subsamples			1	1	1	1
Days After First/Last Applic.			6 6	10 3	13 6	20 13
Trt-Eval Interval			6 DA-A	3 DA-B	6 DA-B	13 DA-B
Trt Treatment No. Name	Rate Rate Unit	Appl Spray Volume Comment	Trial 21	Trial 22	Trial 23	Trial 24
1 UNTREATED	-	-	0	0a	0a	0f
2 ABACUS™	4 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	68a	47a	38a	75ab
3 ABACUS™	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	33a	65a	16a	75ab
4 ABACUS™	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	22a	52a	19a	72abc
11 PREV- AM®	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	31a	50a	12a	50a-e
12 PREV- AM®	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	42a	45a	13a	37b-f
13 PREV- AM®	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	34a	44a	8a	64a-d

14 OR-296-A	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	36a	43a	28a	19ef
15 OR-296-A	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	28a	29a	39a	31c-f
16 OR-296-A	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	57a	67a	24a	67abc
20 OR-009-K	0.4% v/v	150 GAL/AC 2 @ 7 DAYS	23a	45a	35a	77ab
LSD P=.05			47.2 - 48.2	41.2	35.5 - 48.3	43.5
Standard Deviation			2.6t	25.0	2.6t	30.7
CV			42.63t	54.85	53.44t	53.93
Levene's F			0.673	3.111	0.624	1.001
Levene's Prob(F)			0.83	0.001*	0.88	0.473
Skewness			-1.2443*	-0.8109*	-0.3116	-2.3159*
Kurtosis			0.5107	0.1359	-1.7107*	7.199*
Replicate F			6.748	7.737	26.858	5.289
Replicate Prob(F)			0.0006	0.0014	0.0001	0.0028
Treatment F			0.603	1.469	1.534	2.402
Treatment Prob(F)			0.8888	0.1479	0.1031	0.0057

Table 25. Evaluation of numbers of nymphs of Two-spotted spider mite – trials 1, 4, 7 and 10.

Pest Code			TETRUR	TETRUR	TETRUR	TETRUR
Pest Scientific Name			Tetranychus ur>	Tetranychus ur>	Tetranychus ur>	Tetranychus ur>
Pest Name			Two-spotted spider mite>	Two-spotted spider mite>	Two-spotted spider mite>	Two-spotted spider mite>
Crop Scientific Name			<i>Hemerocallis</i> sp.>	<i>Hemerocallis</i> sp.>	<i>Hemerocallis</i> sp.>	<i>Hemerocallis</i> sp.>
Crop Name			Day-lily>	Day-lily>	Day-lily>	Day-lily>
Crop Variety			Yangstizer	Yangstizer	Yangstizer	Yangstizer
Part Rated			NYMLIV P	NYMLIV P	NYMLIV P	NYMLIV P
Rating Date			Jan-17-2019	Jan-22-2019	Jan-25-2019	Jan-29-2019
Rating Type			COUNT	COUNT	COUNT	COUNT
Rating Unit			NUMBER	NUMBER	NUMBER	NUMBER
Number of Subsamples			1	1	1	1
Days After First/Last Applic.			-2 -2	3 3	6 6	10 3
Trt-Eval Interval			-2 DA-A	3 DA-A	6 DA-A	3 DA-B
Trt Treatment No. Name	Rate Rate Unit	Appl Spray Volume Comment	Trial 1	Trial 4	Trial 7	Trial 10
1 UNTREATED	-	-	281.0a	144.9a	187.5a	118.5a
2 ABACUS™	4 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	405.0a	104.5a	59.7a	104.8a
3 ABACUS™	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	204.0a	124.3a	109.3a	95.5a
4 ABACUS™	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	240.0a	115.8a	142.7a	104.6a
11 PREV- AM®	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	273.0a	187.4a	108.3a	98.1a
12 PREV- AM®	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	291.0a	215.2a	107.5a	77.0a
13 PREV- AM®	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	276.0a	118.7a	92.6a	88.0a

14 OR-296-A	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	192.0a	176.3a	88.1a	77.8a
15 OR-296-A	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	321.0a	140.9a	110.9a	74.5a
16 OR-296-A	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	237.0a	104.0a	58.8a	59.8a
20 OR-009-K	0.4% v/v	150 GAL/AC 2 @ 7 DAYS	207.0a	143.1a	142.8a	64.5a
LSD P=.05			153.13	111.29 - 111.34	65.55 - 83.17	64.88 - 66.01
Standard Deviation			108.27	3.16t	2.46t	2.57t
CV			39.73	26.29t	23.99t	28.38t
Levene's F			1.366	0.515	0.576	1.103
Levene's Prob(F)			0.174	0.95	0.915	0.37
Skewness			0.4273	0.3945	0.8885*	0.4235
Kurtosis			-0.8035	-0.3637	1.9427*	0.086
Replicate F			16.842	2.047	2.690	4.298
Replicate Prob(F)			0.0001	0.1169	0.0542	0.0082
Treatment F			0.962	0.625	1.285	0.630
Treatment Prob(F)			0.5175	0.8784	0.2247	0.8740

Table 26. Evaluation of numbers of nymphs of Two-spotted spider mite – trials 13 and 16.

Pest Code	TETRUR	TETRUR
Pest Scientific Name	Tetranychus ur>	Tetranychus ur>
Pest Name	Two-spotted spider mite>	Two-spotted spider mite>
Crop Scientific Name	<i>Hemerocallis sp.></i>	<i>Hemerocallis sp.></i>
Crop Name	Day-lily>	Day-lily>
Crop Variety	Yangstizer	Yangstizer
Part Rated	NYMLIV P	NYMLIV P
Rating Date	Feb-1-2019	Feb-8-2019

Rating Type			COUNT	COUNT
Rating Unit			NUMBER	NUMBER
Number of Subsamples			1	1
Days After First/Last Application			13 6	20 13
Trt-Eval Interval			6 DA-B	13 DA-B
Trt Treatment No. Name	Rate / Rate Unit	Appl Spray Volume Comment	Trial 13	Trial 16
1 UNTREATED	-	-	238.2a	660.8a
2 ABACUS™	4 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	125.6a	154.0c-f
3 ABACUS™	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	153.6a	102.4ef
4 ABACUS™	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	175.4a	199.6b-f
11 PREV-AM®	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	188.3a	288.1b-c
12 PREV-AM®	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	163.8a	357.2abc
13 PREV-AM®	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	274.2a	215.7b-f
14 OR-296-A	8 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	201.7a	378.7abc
15 OR-296-A	16 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	79.5a	233.7b-f
16 OR-296-A	32 fl oz/100 gal	150 GAL/AC 2 @ 7 DAYS	156.0a	203.0b-f
20 OR-009-K	0.4% v/v	150 GAL/AC 2 @ 7 DAYS	97.0a	115.3def
LSD P=.05			115.38 - 151.05	179.58 - 330.06
Standard Deviation			3.86t	5.31t
CV			32.43t	36.37t
Levene's F			0.797	1.258
Levene's Prob(F)			0.708	0.241
Skewness			0.6649*	0.5943*

Kurtosis	0.046	0.1895
Replicate F	4.064	3.418
Replicate Prob(F)	0.0107	0.0229
Treatment F	1.356	2.671
Treatment Prob(F)	0.1815	0.0018

[0091] Conclusions and considerations during the trials - At initiation of the trial, the spider mite population was very active with most plots averaging ~250-350 motiles. At 6 DA-A, all treatments experienced a decrease in total motiles, including the untreated check. By the next evaluation at 3 DA-B, the mite population began to increase. Treatments with Abacus (the local standard), were the top performing treatments at this point in the trial. At the final evaluation at 13 DA-B, both nymph and adult populations surged, particularly within the untreated plots. Despite the increased pressure, treatment #20 (OR-295 @ 0.4 % v/v) was one of the best retained approximately 80% control.

[0092] Conclusion a) The results of these *greenhouse* tests showed that OR-296-A and OR-009-K is very effective in control of adults and nymphs of Two-spotted spider mite, performing similar and sometimes slightly better than both comparative treatments ABACUS™ and PREV-AM®. OR-009-K at 0.4% v/v is slightly better than OR-296-A even in the higher dosage, mainly in control of nymphs.

[0093] Conclusion c) The results of these *greenhouse* tests showed that both OR-296-A and OR-009-K are very promising in control of nymphs and adults of Two-spotted spider mite, and considering that this innovative, human and environmental safe compositions performing similar or better than conventional prior arts, this invention shows high potential to be a safe option to the agricultural market.

[0094] Unless otherwise defined, all terms (including technical and scientific terms) are to be given their ordinary and customary meaning to a person of ordinary skill in the art, and are not to be limited to a special or customized meaning unless expressly so defined herein. It should be noted that the use of particular terminology when describing certain features or aspects of the disclosure should not be taken to imply that the terminology is being re-defined herein to be restricted to include any specific characteristics of the features or aspects of the disclosure with which that terminology is associated. Terms and phrases used in this application, and variations thereof, especially in the appended claims, unless otherwise expressly stated, should be construed as open ended as opposed to limiting. As examples of the foregoing, the term ‘including’ should be read to mean ‘including, without limitation,’ ‘including but not limited to,’ or the like; the term ‘comprising’ as used herein is synonymous with ‘including,’ ‘containing,’ or ‘characterized by,’ and is inclusive or

open-ended and does not exclude additional, unrecited elements or method steps; the term ‘having’ should be interpreted as ‘having at least;’ the term ‘includes’ should be interpreted as ‘includes but is not limited to;’ the term ‘example’ is used to provide exemplary instances of the item in discussion, not an exhaustive or limiting list thereof; adjectives such as ‘known’, ‘normal’, ‘standard’, and terms of similar meaning should not be construed as limiting the item described to a given time period or to an item available as of a given time, but instead should be read to encompass known, normal, or standard technologies that may be available or known now or at any time in the future; and use of terms like ‘preferably,’ ‘preferred,’ ‘desired,’ or ‘desirable,’ and words of similar meaning should not be understood as implying that certain features are critical, essential, or even important to the structure or function of the invention, but instead as merely intended to highlight alternative or additional features that may or may not be utilized in a particular embodiment of the invention. Likewise, a group of items linked with the conjunction ‘and’ should not be read as requiring that each and every one of those items be present in the grouping, but rather should be read as ‘and/or’ unless expressly stated otherwise. Similarly, a group of items linked with the conjunction ‘or’ should not be read as requiring mutual exclusivity among that group, but rather should be read as ‘and/or’ unless expressly stated otherwise.

[0095] Where a range of values is provided, it is understood that the upper and lower limit, and each intervening value between the upper and lower limit of the range is encompassed within the embodiments.

[0096] With respect to the use of substantially any plural and/or singular terms herein, those having skill in the art can translate from the plural to the singular and/or from the singular to the plural as is appropriate to the context and/or application. The various singular/plural permutations may be expressly set forth herein for sake of clarity. The indefinite article “a” or “an” does not exclude a plurality. A single processor or other unit may fulfill the functions of several items recited in the claims. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage. Any reference signs in the claims should not be construed as limiting the scope.

[0097] It will be further understood by those within the art that if a specific number of an introduced claim recitation is intended, such an intent will be explicitly recited in the claim, and in the absence of such recitation no such intent is present. For example, as an aid to understanding, the following appended claims may contain usage of the introductory phrases “at least one” and “one or more” to introduce claim recitations. However, the use of such phrases should not be construed to imply that the introduction of a claim recitation by the indefinite articles “a” or “an” limits any

particular claim containing such introduced claim recitation to embodiments containing only one such recitation, even when the same claim includes the introductory phrases “one or more” or “at least one” and indefinite articles such as “a” or “an” (e.g., “a” and/or “an” should typically be interpreted to mean “at least one” or “one or more”); the same holds true for the use of definite articles used to introduce claim recitations. In addition, even if a specific number of an introduced claim recitation *is* explicitly recited, those skilled in the art will recognize that such recitation should typically be interpreted to mean *at least* the recited number (e.g., the bare recitation of “two recitations,” without other modifiers, typically means *at least* two recitations, or *two or more* recitations). Furthermore, in those instances where a convention analogous to “at least one of A, B, and C, etc.” is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., “a system having at least one of A, B, and C” would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). In those instances where a convention analogous to “at least one of A, B, or C, etc.” is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., “a system having at least one of A, B, or C” would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). It will be further understood by those within the art that virtually any disjunctive word and/or phrase presenting two or more alternative terms, whether in the description, claims, or drawings, should be understood to contemplate the possibilities of including one of the terms, either of the terms, or both terms. For example, the phrase “A or B” will be understood to include the possibilities of “A” or “B” or “A and B.”

[0098] All numbers expressing quantities of ingredients, reaction conditions, and so forth used in the specification are to be understood as being modified in all instances by the term ‘about.’ Accordingly, unless indicated to the contrary, the numerical parameters set forth herein are approximations that may vary depending upon the desired properties sought to be obtained. At the very least, and not as an attempt to limit the application of the doctrine of equivalents to the scope of any claims in any application claiming priority to the present application, each numerical parameter should be construed in light of the number of significant digits and ordinary rounding approaches.

[0099] Furthermore, although the foregoing has been described in some detail by way of illustrations and examples for purposes of clarity and understanding, it is apparent to those skilled in the art that certain changes and modifications may be practiced. Therefore, the description and

examples should not be construed as limiting the scope of the invention to the specific embodiments and examples described herein, but rather to also cover all modification and alternatives coming with the true scope and spirit of the invention.

WHAT IS CLAIMED IS:

1. Use of a liquid antifungal and/or insecticidal composition for control of fungi and/or insects and/or treatment of disease caused by fungi and/or insects, said liquid antifungal and/or insecticidal composition comprising:

isopropyl myristate as the sole active ingredient;

at least one anionic surfactant, wherein the at least one anionic surfactant is selected from the group consisting of: (C₆ – C₁₈) alkyl benzene sulfonic acid salts, calcium dodecylbenzene sulfonate, sodium dodecylbenzene sulfonate, amine (C₆ – C₁₈) alkyl benzene sulfonate, triethanolamine dodecylbenzene sulfonates, (C₆ – C₁₈) alkyl ether sulfates, (C₆ – C₁₈) alkyl ethoxylated ether sulfates, (C₆ – C₁₈) alkyl sulfates, lauryl ether polyethoxylated sodium sulfate, (C₆ – C₈) alkyl phosphate esters, (C₆ – C₁₈) alkoxyated sulfates, (C₆ – C₁₈) alkoxyated phosphate esters, xylene sulfonate salts, cumene sulfonate salts, and combinations thereof; and

at least one nonionic surfactant, wherein the at least one nonionic surfactant is selected from the group consisting of: (C₈ – C₂₂) alkoxyated fatty alcohols, (C₈ – C₂₂) ethoxylated fatty alcohols, (C₈ – C₂₂) propoxylated fatty alcohols, (C₈ – C₂₂) ethoxylated and propoxylated fatty alcohols, straight chain (C₄ – C₁₀) alkyl(poly)glycosides, branched chain (C₄ – C₁₀) alkyl(poly)glycosides; and alkoxyated sorbitan fatty esters, alkoxyated sorbitol fatty esters, ethoxylated sorbitan fatty esters, ethoxylated sorbitol fatty esters, polyoxyethylene sorbitan monolaurate, polyoxyethylene sorbitan monopalmitate, polyoxyethylene sorbitan monostearate, and combinations thereof; and

wherein the liquid antifungal and/or insecticidal composition has a flash point higher than 100°C.

2. The use of claim 1, wherein the nonionic surfactant is (C₈ – C₂₂) ethoxylated fatty alcohols that have a degree of ethoxylation of from 1 to 50.

3. The use of any one of claims 1 to 2, wherein the liquid antifungal and/or insecticidal composition further comprises an additive selected from the group comprising: preservatives, clarifiers, anti-freezing agents, hydrotropes, stabilizers, antioxidants, acidifiers, chelates, complexing agents, dyes, rheology modifiers, antifoams, anti-drift and water, oil or other solvents, and combinations thereof.

4. The use of any one of claims 1 to 3, wherein the isopropyl myristate is present in an amount of between 0.1 wt.% to 30 wt. %, wherein the at least one anionic surfactant is present in an amount of between 1 wt.% to 50 wt. %, and wherein the at least one nonionic surfactant is present in an amount of between 1 wt. % to 50 wt. %.

5. The use of claim 4, wherein the isopropyl myristate is present in an amount of between 2 wt. % to 15 wt. %, wherein the at least one anionic surfactants is present in an amount of between 3 wt.% to 20 wt. %, and wherein the at least one nonionic surfactant is present in an amount of between 5 wt. % to 30 wt. %.

6. The use of any one of claims 1 to 3, wherein the liquid antifungal and/or insecticidal composition further comprises water or other additives, wherein the liquid antifungal and/or insecticidal composition comprises from 0.1 wt. % to 20 wt.% of the isopropyl myristate; and 1 wt. % to 50 wt.% of the at least one anionic surfactant, and 1 wt. % to 50 wt.% of the at least one nonionic surfactant, and 2 wt. % to 80wt. % of the water or other additives.

7. A method of controlling fungi and/or insects and/or treating disease caused by fungi and/or insects, the method comprising the steps of applying a liquid antifungal and/or insecticidal composition onto, or adjacent to, a plant or seed, wherein the liquid antifungal and/or insecticidal composition comprises:

isopropyl myristate as the sole active ingredient;

at least one anionic surfactant, wherein the at least one anionic surfactant is selected from the group consisting of: (C₆ – C₁₈) alkyl benzene sulfonic acid salts, calcium dodecylbenzene sulfonate, sodium dodecylbenzene sulfonate, amine (C₆ – C₁₈) alkyl benzene sulfonate, triethanolamine dodecylbenzene sulfonates, (C₆ – C₁₈) alkyl ether sulfates, (C₆ – C₁₈) alkyl ethoxylated ether sulfates, (C₆ – C₁₈) alkyl sulfates, lauryl ether polyethoxylated sodium sulfate, (C₆ – C₈) alkyl phosphate esters, (C₆ – C₁₈) alkoxylated sulfates, (C₆ – C₁₈) alkoxylated phosphate esters, xylene sulfonate salts, cumene sulfonate salts, and combinations thereof; and

at least one nonionic surfactant, wherein the at least one nonionic surfactant is selected from the group consisting of: (C₈ – C₂₂) alkoxylated fatty alcohols, (C₈ – C₂₂) ethoxylated fatty alcohols, (C₈ – C₂₂) propoxylated fatty alcohols, (C₈ – C₂₂) ethoxylated and propoxylated fatty alcohols, straight chain (C₄ – C₁₀) alkyl(poly)glycosides, branched chain (C₄ – C₁₀) alkyl(poly)glycosides; and alkoxylated sorbitan fatty esters, alkoxylated sorbitol fatty esters, ethoxylated sorbitan fatty esters, ethoxylated sorbitol fatty esters, polyoxyethylene sorbitan monolaurate, polyoxyethylene sorbitan monopalmitate, polyoxyethylene sorbitan monostearate, and combinations thereof; and

wherein the liquid antifungal and/or insecticidal composition has a flash point higher than 100°C.

8. A liquid antifungal and/or insecticidal composition comprising:

isopropyl myristate as the sole active ingredient;

at least one anionic surfactant, wherein the at least one anionic surfactant is selected from the group consisting of: (C₆ – C₁₈) alkyl benzene sulfonic acid salts, calcium dodecylbenzene sulfonate, sodium dodecylbenzene sulfonate, amine (C₆ – C₁₈) alkyl benzene sulfonate, triethanolamine dodecylbenzene sulfonates, (C₆ – C₁₈) alkyl ether sulfates, (C₆ – C₁₈) alkyl ethoxylated ether sulfates, (C₆ – C₁₈) alkyl sulfates, lauryl ether polyethoxylated sodium sulfate, (C₆ – C₈) alkyl phosphate esters, (C₆ – C₁₈) alkoxyated sulfates, (C₆ – C₁₈) alkoxyated phosphate esters, xylene sulfonate salts, cumene sulfonate salts, and combinations thereof; and

at least one nonionic surfactant, wherein the at least one nonionic surfactant is selected from the group consisting of: (C₈ – C₂₂) alkoxyated fatty alcohols, (C₈ – C₂₂) ethoxylated fatty alcohols, (C₈ – C₂₂) propoxylated fatty alcohols, (C₈ – C₂₂) ethoxylated and propoxylated fatty alcohols, straight chain (C₄ – C₁₀) alkyl(poly)glycosides, branched chain (C₄ – C₁₀) alkyl(poly)glycosides; and alkoxyated sorbitan fatty esters, alkoxyated sorbitol fatty esters, ethoxylated sorbitan fatty esters, ethoxylated sorbitol fatty esters, polyoxyethylene sorbitan monolaurate, polyoxyethylene sorbitan monopalmitate, polyoxyethylene sorbitan monostearate, and combinations thereof;

wherein the liquid antifungal and/or insecticidal composition has a flash point higher than 100°C.

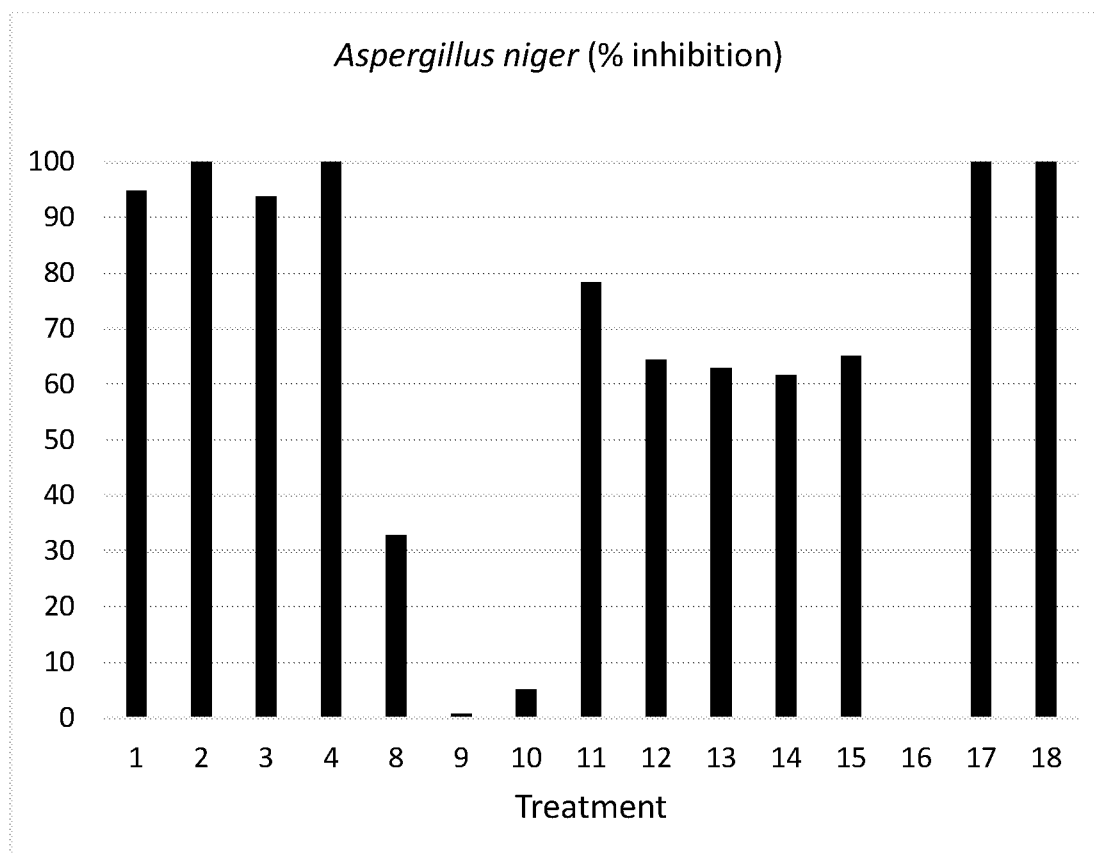


FIG. 1

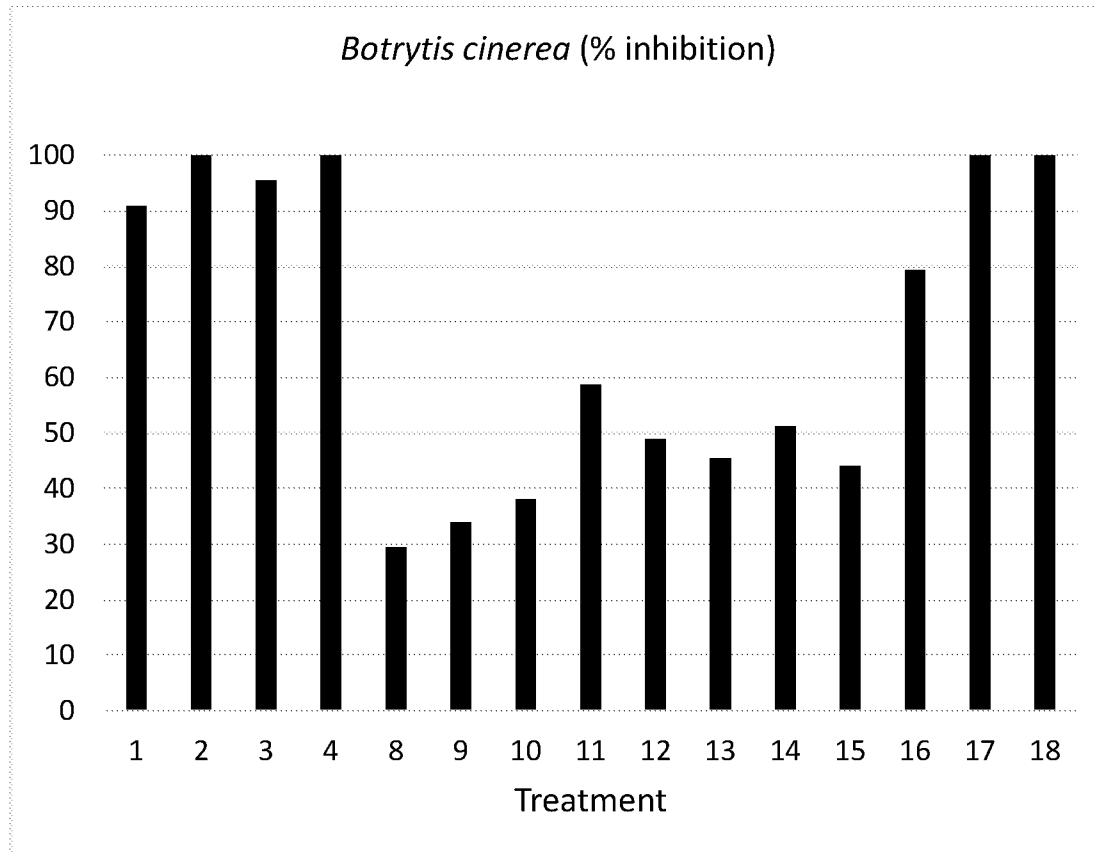


FIG. 2

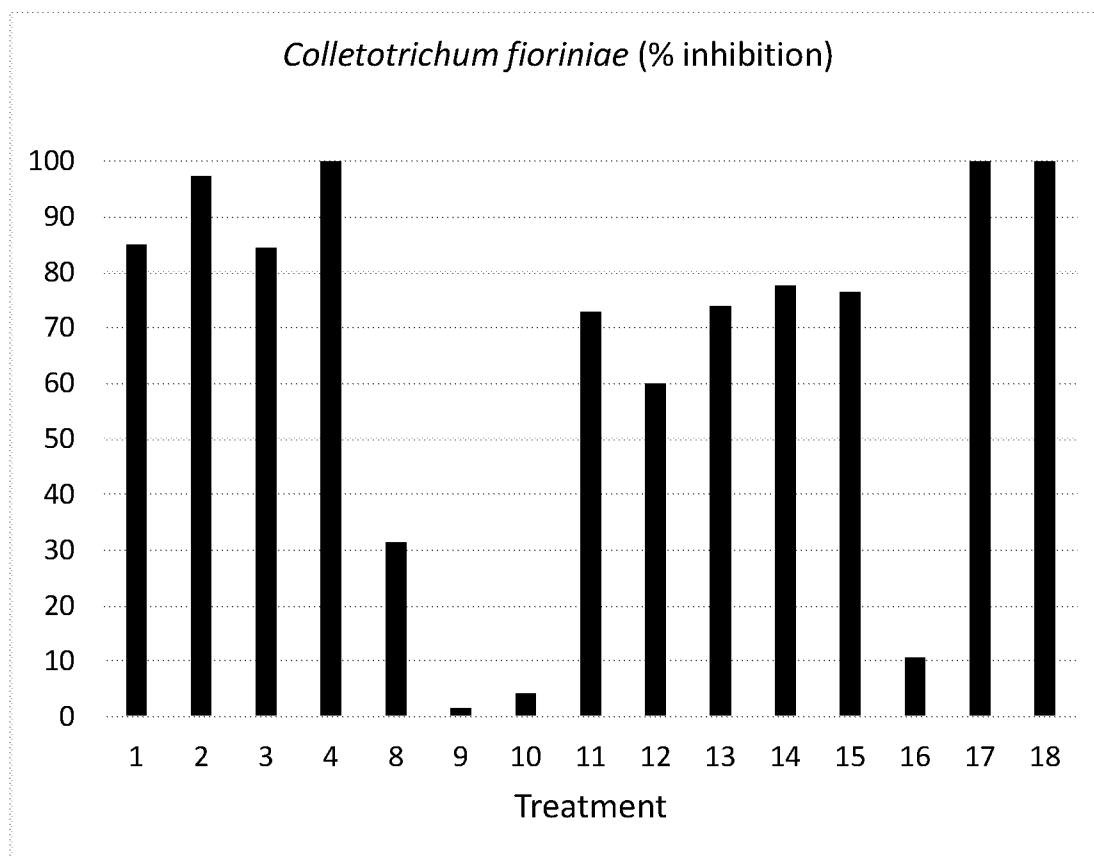


FIG. 3

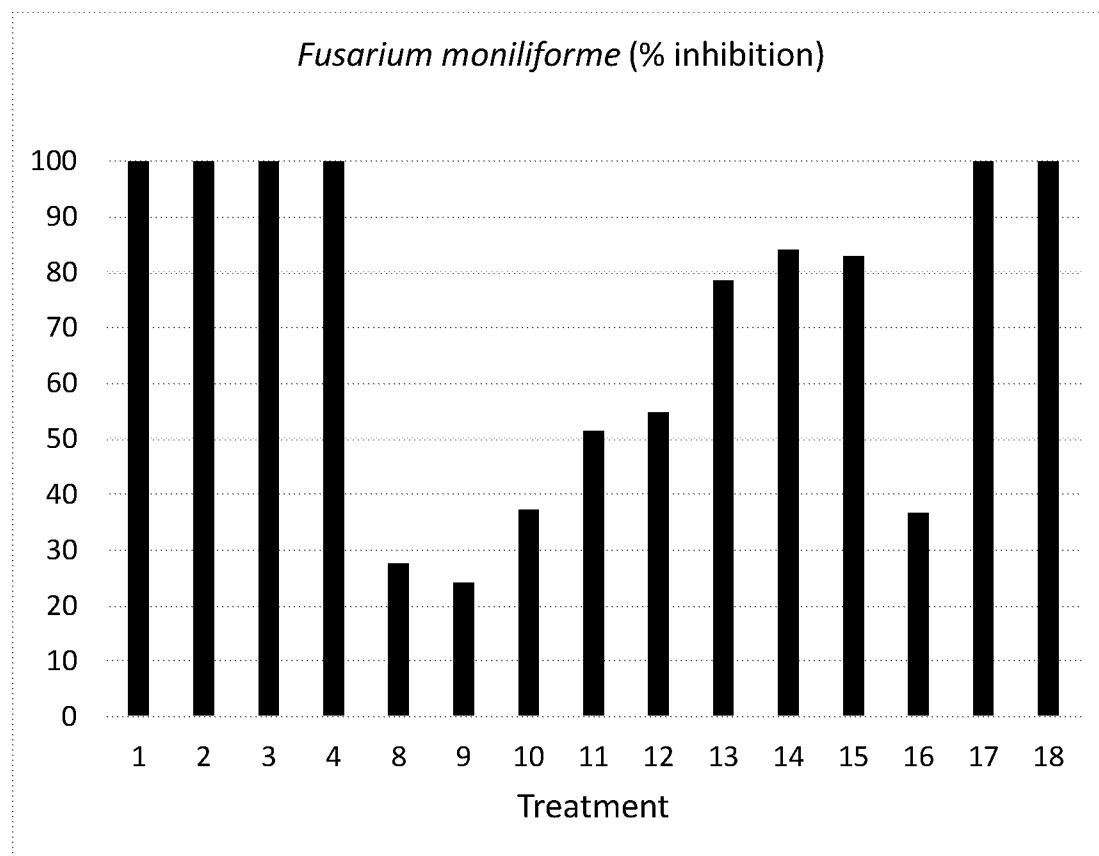


FIG. 4

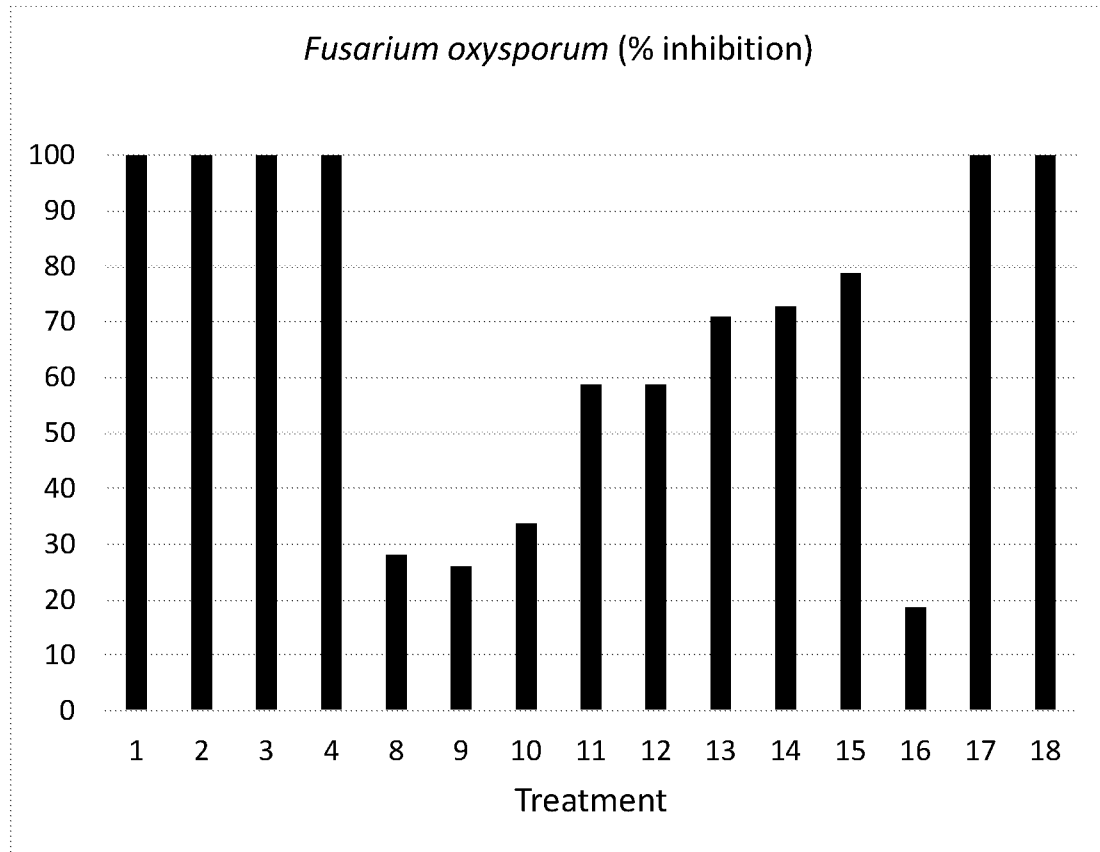


FIG. 5

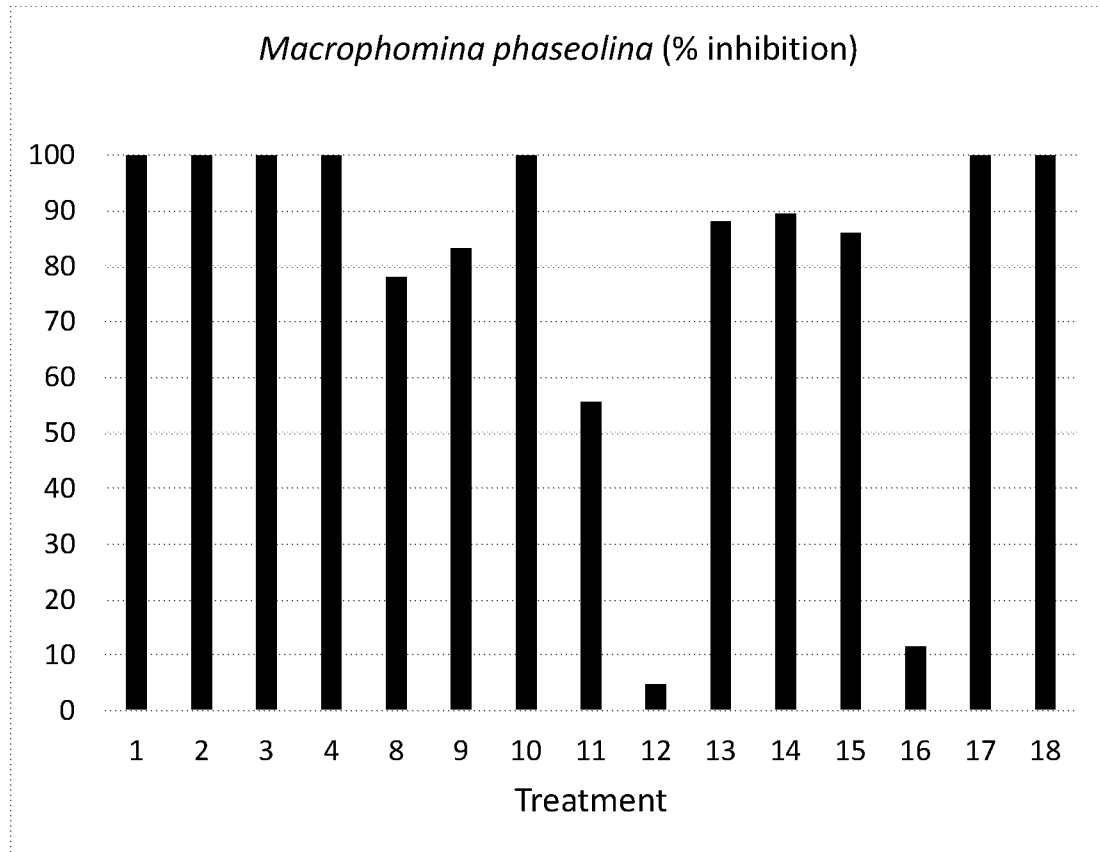


FIG. 6

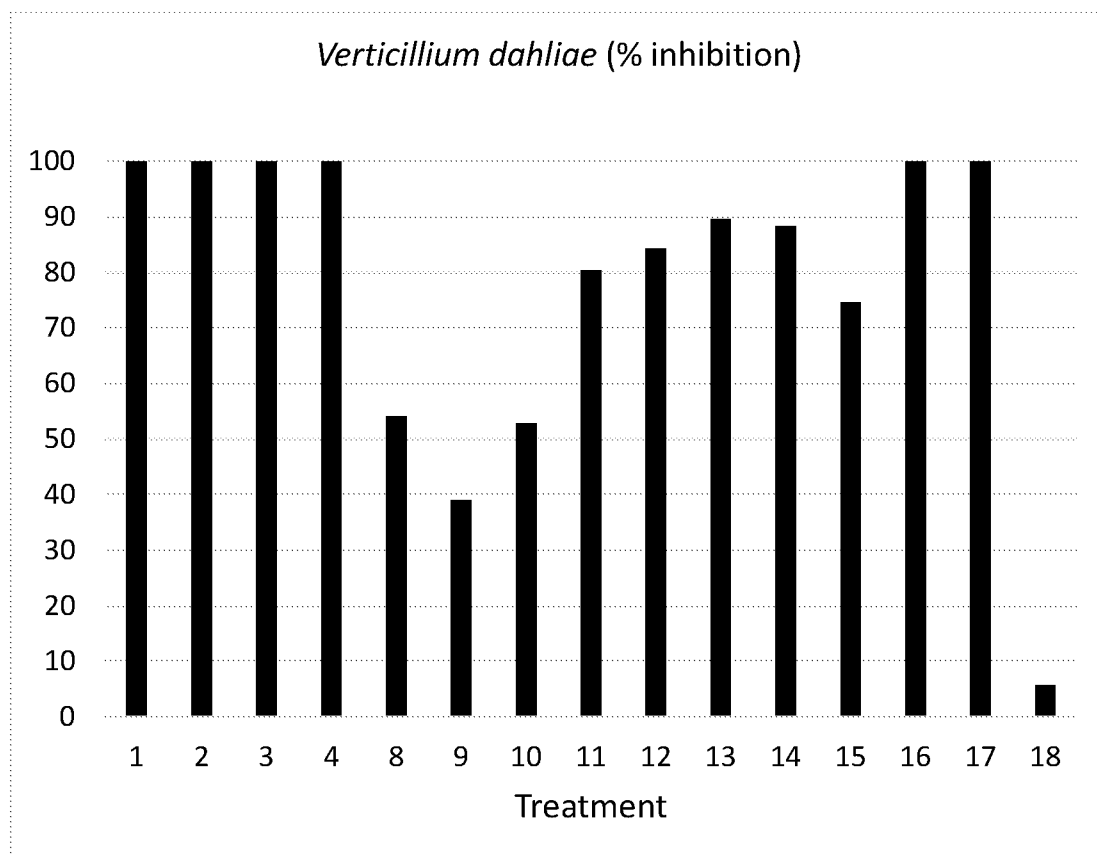


FIG. 7

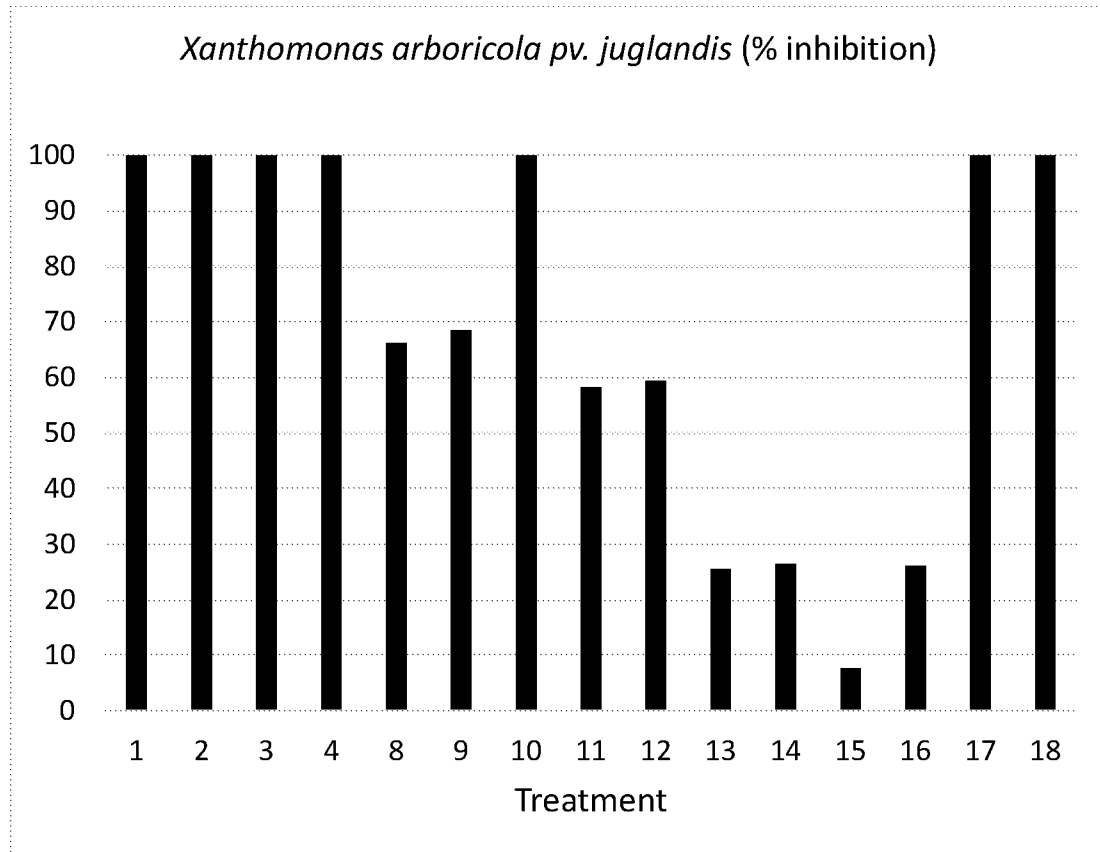


FIG. 8

Xanthomonas arboricola pv. *juglandis* (% inhibition)

