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(54) Title: INSECTICIDE COMPOSITION AND METHOD FOR INSECT CONTROL

(57) Abstract: The present disclosure relates to insecticidal combinations and compositions for controlling insect pests, which combinations and compositions comprise one or more insecticides, especially acetamiprid and bifenthrin, in addition to a plant growth regulator, especially gibberellic acid, or a fertiliser or a nutrient, or combinations thereof. The disclosure further relates to a process for preparing insecticidal combinations/compositions and to a method for controlling insect pests.

INSECTICIDE COMPOSITION AND METHOD FOR INSECT CONTROL

FIELD OF THE INVENTION:

[0001] The present disclosure relates to insecticidal combinations. The present disclosure more particularly relates to insecticidal combinations and compositions for controlling insect pests. The present disclosure further relates to a process for preparing insecticidal combinations/compositions and to a method for controlling insect pests.

BACKGROUND OF THE INVENTION:

[0002] Methods of controlling or eradicating insect pests are desirable in many instances, particularly in crops of commercial interest. Insects are destructive to crop plants and can cause significant damage and loss of yield.

[0003] For example, insect pests can cause significant damage to standing crops and agricultural crops, which are intended for use as human food and animal feeds. In addition, to the direct losses caused by insects to plant systems, fruits, and seeds, insects cause indirect losses because they leave contaminants such as body parts or exoskeletons, insect eggs, and off-odours on the produce. According to the Food and Agricultural Organisation (FAO) of the United Nations (UN), pests, including insects, cause considerable losses to food crops globally. The total loss of food grains, for example, is approximately 1.3 billion tonnes per year.

[0004] The key to achieve efficient insect pest management is to understand their biology and behaviour, the kinds of damage they produce, and/or application of proper integrated pest management. Understanding these factors allows one to achieve a crop production system that optimizes the use of natural resources, protects the environment, and maximizes output in a sustainable way.

[0005] Combinations of insecticides have been used to broaden the spectrum of insect control and reduce dosage of the insecticides, provide better plant protection thereby reducing environmental impact, and decreased chances of development of resistance. Combinations of insecticides at times demonstrate an additive or synergistic effect that results in an improved control of the pests. However, phytotoxic effects of the application of some insecticides have also been noted, which adversely affect crop health and yield.

[0006] One consideration in insect control is that generally, plants require proper nourishment for their growth and development. Soil nutrients such as macronutrients and micronutrients are usually used by plants. Deficiency of these soil nutrients make plants prone to several diseases. Plant growth regulators (PGRs) can be used to help plants make efficient use of soil nutrients, which will make the plants resistant to a variety of diseases including those caused by insects.

[0007] An urgent need remains in the art to predominantly control insect infestation at the locus of a crop and in agricultural produce, while also increasing crop yield. There also exists a need for insect control agents that combine knock-down activity with prolonged control, that is, fast action with long lasting insect control efficacy.

[0008] An exemplary insect pest is *Euschistus heros*, also known as the neotropical brown stink bug of the Hemiptera order belonging to the Pentatomidae family, which is a significant economic pest for many agricultural crops and is frequently one of the most difficult pests to control in crops such as soybean (*Glycine max*), cotton (*Gossypium hirsutum*), tomato (*Solanum lycopersicum*), and many food crops. *E. heros* is known to inflict serious economic injury to agricultural commodities. Even though attempts have been made to control the growth of *E. heros* by employing combinations of insecticides, its adverse effect on standing crops and agricultural produce still persists.

[0009] The present disclosure adequately addresses the challenges countered with insect pest management with an effective insecticidal combination/composition and a method to control insect infestation on crops and agricultural produce.

OBJECTIVES OF THE INVENTION:

[0010] It is a primary objective of the present disclosure to provide insecticidal combinations/compositions possessing enhanced efficacy compared to the individual insecticides.

[0011] It is another objective of the present disclosure to provide insecticidal combinations/compositions achieving increased yield in the crops to which they are applied.

[0012] It is yet another objective of the present disclosure to provide insecticidal combinations/compositions reducing the incidence of insect pests in the crops to which they are applied.

[0013] It is yet another objective of the present invention to provide a method for controlling insect infestation, for increasing harvest yields, and/or for improving the quality of the harvested material by applying insecticidal combinations/compositions to said plant or a plant propagation material or to a locus thereof.

SUMMARY OF THE INVENTION:

[0014] Accordingly, the present disclosure provides an agrochemical combination/ composition for reducing the damage caused to plants and/or parts of plants by insects; and for reducing the losses in harvested crops.

[0015] In an aspect, the present disclosure provides an agrochemical combination for insect control comprising:

(a) at least one insecticide; and

(b) at least one agrochemically active ingredient comprising a plant growth regulator, a fertilizer, a nutrient, or combinations thereof.

[0016] In an aspect, the present disclosure provides an agrochemical combination for insect control comprising:
(a) at least two insecticides; and
(b) at least one agrochemically active ingredient comprising a plant growth regulator, a fertilizer, a nutrient, or combinations thereof.

[0017] In an aspect, the present disclosure provides an agrochemical combination for insect control comprising:
(a) at least one insecticide; and
(b) a plant growth regulator.

[0018] In an aspect, the present disclosure provides an agrochemical combination for insect control comprising:
(a) at least two insecticides; and
(b) a plant growth regulator.

[0019] In an aspect, the present disclosure provides an agrochemical composition for insect control comprising:
(a) at least one insecticide;
(b) at least one agrochemically active ingredient selected from a plant growth regulator, a fertilizer, a nutrient, or combinations thereof; and
(c) at least one agrochemically acceptable excipient.

[0020] In an aspect, the present disclosure provides an agrochemical composition for insect control comprising:
(a) at least two insecticides;

(b) at least one agrochemically active ingredient selected from a plant growth regulator, a fertilizer, a nutrient, or combinations thereof; and
(c) at least one agrochemically acceptable excipient.

[0021] In another aspect, a method of controlling insects comprises applying to the insects or locus thereof, an agrochemical composition comprising at least two insecticides; and a plant growth regulator.

[0022] In another aspect, the present disclosure provides a method of controlling insects, the method comprising applying the insecticidal combination/composition of the present disclosure to a crop or to an infested locus of a crop, or to plant propagation material or to the surface of agricultural produce.

[0023] In another aspect, the present disclosure provides a method of increasing the yield of the crop, the method comprising applying the insecticidal combination/composition of the present disclosure to a crop, or to plant propagation material or to the surface of agricultural produce.

[0024] In another aspect, the present disclosure provides use of an insecticidal combination/composition as disclosed herein to control the pests.

[0025] In another aspect, the present disclosure provides a kit. The kit comprises a plurality of components, each of which components may include at least one, or more, of the ingredients of the insecticidal combination/composition of the present disclosure.

DETAILED DESCRIPTION OF THE INVENTION:

[0026] The following description is provided to assist in a comprehensive understanding of exemplary embodiments of the invention. It includes various

specific details to assist in that understanding but these are to be regarded as merely exemplary.

[0027] Accordingly, those of ordinary skill in the art will recognize that various changes and modifications of the embodiments described herein can be made without departing from the scope of the invention. In addition, descriptions of well-known functions and constructions are omitted for clarity and conciseness.

[0028] The terms used in the following description and claims are not limited to the bibliographical meanings but are merely used by the inventor to enable a clear and consistent understanding of the invention. Accordingly, it should be apparent to those skilled in the art that the following description of exemplary embodiments of the present disclosure are provided for illustration purpose only and not for limiting the scope of the invention as defined by the appended claims and their equivalents.

[0029] Thus, before describing the present disclosure in detail, it is to be understood that this invention is not limited to particularly exemplified systems or process parameters that may of course, vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments of the invention only and is not intended to limit the scope of the invention in any manner. The use of examples anywhere in this specification including examples of any terms discussed herein is illustrative only, and in no way limits the scope and meaning of the invention or of any exemplified term.

[0030] Prior to setting forth the present subject matter in detail, it may be helpful to provide definitions of certain terms used herein. Unless defined otherwise, all technical and scientific terms used herein have the same meaning as is commonly understood by one of skill in the art to which this subject matter pertains. The following definitions are provided for clarity.

[0031] Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this disclosure belongs. Although methods and materials similar or equivalent to those described herein can be used in the practice or testing of the disclosure, suitable methods and materials are described herein.

[0032] Recitation of ranges of values are merely intended to serve as a shorthand method of referring individually to each separate value falling within the range, unless otherwise indicated herein, and each separate value is incorporated into the specification as if it were individually recited herein. The endpoints of all ranges are included within the range and independently combinable. As used herein, all numerical values or numerical ranges include integers within such ranges and fractions of the values or the integers within ranges unless the context clearly indicates otherwise. Thus, for example, reference to a range of 1-80%, includes 1.5%, 2%, 2.5%, 3%, 3.5% etc., and so forth. All methods described herein can be performed in a suitable order unless otherwise indicated herein or otherwise clearly contradicted by context.

[0033] The use of the terms “a” and “an” and “the” and similar referents (especially in the context of the following claims) are to be construed to cover both the singular and the plural, unless otherwise indicated herein or clearly contradicted by context. The terms first, second etc. as used herein are not meant to denote any particular ordering, but simply for convenience to denote a plurality of, for example, components. The terms “comprising”, “having”, “including”, and “containing” are to be construed as open-ended terms (i.e., meaning “including, but not limited to”) unless otherwise noted. “About” or “approximately” as used herein is inclusive of the stated value and means within an acceptable range of deviation for the particular value as determined by one of ordinary skill in the art, considering the measurement in question and the error associated with measurement of the particular quantity

(i.e., the limitations of the measurement system). For example, "about" can mean within one or more standard deviations, or within ± 10% or ± 5% of the stated value.

[0034] Recitation of ranges of values are merely intended to serve as a shorthand method of referring individually to each separate value falling within the range, unless otherwise indicated herein, and each separate value is incorporated into the specification as if it were individually recited herein. The endpoints of all ranges are included within the range and independently combinable. It is understood that where a parameter range is provided, all integers within that range, and tenths thereof, are also provided. For example, "0.1-80%" includes 0.1%, 0.2%, 0.3%, etc., up to 80%.

[0035] The use of any and all examples, or exemplary language (e.g., "such as"), is intended merely to better illustrate the invention and does not pose a limitation on the scope of the invention unless otherwise claimed. No language in the specification should be construed as indicating any non-claimed element as essential to the practice of the invention as used herein.

[0036] While the invention has been described with reference to an exemplary embodiment, it will be understood by those skilled in the art that various changes may be made, and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention is not limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims. Any combination of the above-described elements in all possible variations thereof is encompassed by the invention unless otherwise indicated herein or otherwise clearly contradicted by context. The terms "comprising", "having", "including", and "containing" are to be construed as open-ended terms (i.e., meaning "including, but not limited to") unless otherwise noted.

[0037] As used herein, the term “agrochemical” is understood to denote an agricultural chemical such as pesticides, fungicides, insecticides, acaricides, herbicides, nematicides, plant growth regulators and can be used interchangeably.

[0038] As used herein, the term “agrochemical combination” refers to a mixture of more than one component mixed and intended to be applied onto plants with and without further dilution.

[0039] As used herein, the term “insecticide” refers to the ability of a substance to decrease or inhibit growth of insects or pests.

[0040] As used herein the term “plant” or “crop” refers to whole plants, plant organs (e.g., leaves, stems, twigs, roots, trunks, limbs, shoots, fruits etc.), plant cells, and plant seeds. This term also encompasses plant crops such as fruits.

[0041] The term “plant” may further include the propagation material thereof, which may include all the generative parts of the plant such as seeds and vegetative plant material such as cuttings and tubers, which can be used for the multiplication of the plant. This includes seeds, tubers, spores, corms, bulbs, rhizomes, sprouts basal shoots, stolons, and buds and other parts of plants, including seedlings and young plants, which are to be transplanted after germination or after emergence from soil.

[0042] The term “plant” is further to be understood as including plants which have been modified by either conventional breeding, or mutagenesis or genetic engineering, or by a combination thereof.

[0043] The term “plant propagation material” refers to all the generative parts of the plant such as seeds and vegetative plant material or propagule, which can be used for the multiplication of the plant. This includes seeds, roots, grains, fruits, tubers, bulbs, rhizomes, shoots, sprouts and other parts of plants. Seedlings and young plants, which are to be transplanted after germination or after emergence from soil, may also be included. These

plant propagation materials may be treated prophylactically with a plant protection compound either at or before planting or transplanting.

[0044] The term “seed” embraces seeds and plant propagules of all kinds including but not limited to true seeds, seed pieces, suckers, corms, bulbs, fruit, tubers, grains, cuttings, cut shoots and the like and means in a preferred embodiment true seed.

[0045] The term “locus” as used herein denotes the vicinity or area designated for growth of a desired crop susceptible to or likely to be susceptible to infestation by insects, and in which control of the insect is desired. The locus includes the vicinity of desired crop plants wherein insect infestation has either occurred or is most likely to occur or is yet to occur.

[0046] As used herein, the term “insecticidal” refers to the ability of a substance to control or modify the growth of insects.

[0047] The term “insecticidally effective amount” means the amount of the composition needed to achieve an observable adverse effect on growth, including the effects of necrosis, death, retardation, prevention, and removal, destruction, insect pest mortality, insect pest weight loss, insect pest reduced plant defoliation, and other behavioural and physical changes of an insect pest after feeding and exposure for an appropriate length of time.

[0048] The term “adverse effect’” includes one or more of a deviation from natural development of the insect, killing of the insect, structural damage to the insect and/or growth retardation.

[0049] The term “invertebrate pest” includes arthropods, gastropods, nematodes and helminths of economic importance as pests.

[0050] As used herein, an “agriculturally acceptable salt” means a salt which is known and accepted for use in agricultural or horticultural use.

[0051] The term “agriculturally acceptable amount of active" refers to an amount of an active that kills or inhibits the pest on which control is desired, in an amount not significantly toxic to the plant being treated.

[0052] The term “insects” includes all organisms in the class "Insecta”. Insecticidal refers to the ability of a substance to increase mortality of insects and/or inhibit the growth rate of insects.

[0053] As used herein, the term “contacting” includes both direct contact (applying the compositions directly on the animal pest or plant - typically to the foliage, stem or roots of the plant) and indirect contact (applying the active compounds/compositions to the locus, i.e., habitat, breeding ground, plant, seed, soil, area, material or environment in which a pest is growing or may grow, of the animal pest or plant).

[0054] The term “control” or “controlling” insects refers to inhibition of insects, through a toxic effect, the ability of insect pests to survive, grow, feed, and/or reproduce, or to limit insect-related damage or loss in crop plants. To “control” insects may or may not mean killing the insects, although it preferably means reducing insect population by killing the insects.

[0055] The common names of active ingredients as mentioned in this specification are known from the “handbook of insecticides” 13th edition, British crop protection commission (2003).

[0056] As used herein, the expression of various quantities in terms of "%" or "% w/v" or "% w/w" means the percentage by weight of the total solution or composition unless otherwise specified.

[0057] The term "stable" referred to herein refers to chemical and/or physical stabilization of the composition in terms of achieving chemical stability of the active ingredient and desired suspensibility and dispersibility of the composition by maintaining homogeneity of the components that imparts better shelf life.

[0058] As used herein, the term "increased yield" of an agricultural plant means that the yield of a product of the respective plant is increased by a measurable amount over the yield of the same product of the plant produced under the same conditions, but without the application of the compositions described herein. According to the present disclosure, it is preferred that the crop yield be increased by at least 0.5%, preferably at least 2%, more preferably at least 5%, upon application of the combinations and compositions described herein. The composition also increases the vigour/yield of the plant.

[0059] As used herein, the term "bioavailable phosphorus" means phosphorus available in any natural form. Orthophosphate (or phosphate) is the most bioavailable form of phosphorus, such that it is most easily used and taken up by plants.

[0060] The present disclosure relates to an insecticidal combination/composition. The disclosure also relates to a process for preparing the combination/composition as well as a method for controlling insect pests with the said combination/composition.

[0061] The combinations/compositions are suitable for protecting plants and plant parts, for controlling insect infestation, for increasing harvest yields, and/or for improving the quality of the harvested material.

[0062] The present disclosure provides an agrochemical combination comprising:
(a) at least one insecticide; and
(b) at least one agrochemically active ingredient.

[0063] In an aspect, the present disclosure provides an agrochemical combination comprising:
(a) at least one insecticide; and
(b) at least one agrochemically active ingredient selected from a nutrient, a fertilizer, a plant growth regulator, or combinations thereof.

[0064] In an aspect, the present disclosure provides an agrochemical combination comprising:
(a) at least one insecticide; and
(b) at least one agrochemically active ingredient comprising a plant growth regulator, a fertilizer, a nutrient, or combinations thereof.

[0065] In an aspect, the present disclosure provides an agrochemical combination comprising:
(a) at least two insecticides; and
(b) at least one agrochemically active ingredient comprising a plant growth regulator, a fertilizer, a nutrient, or combinations thereof.

[0066] In an aspect, the present disclosure provides an agrochemical combination comprising:
(a) a combination of insecticides; and

(b) at least one agrochemically active ingredient comprising a plant growth regulator, a fertilizer, a nutrient, or combinations thereof.

[0067] In an embodiment, the insecticide is selected from the group comprising an organophosphate insecticide, a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof.

[0068] In yet another embodiment, the organophosphate insecticide is selected from the group comprising chlorpyrifos, diazinon, dimethoate, fenitrothion, malathion, methamidophos, monocrotophos, acephate, parathion-methyl, profenofos, terbufos, or combinations thereof.

[0069] In an embodiment, the organophosphate insecticide is acephate.

[0070] In an embodiment, the neonicotinoid insecticide comprises clothianidin, dinotefuran, imidacloprid, imidaclothiz, nitenpyram, acetamiprid, nithiazine, thiacloprid, thiamethoxam, hexahydro-1,3,5-triazine (AKD-1022), nicotine, or combinations thereof.

[0071] In an embodiment, the neonicotinoid insecticide is selected from the group comprising acetamiprid, clothianidin, dinotefuran, imidacloprid, or combinations thereof.

[0072] In an embodiment, the neonicotinoid insecticide is acetamiprid.

[0073] In an embodiment, the neonicotinoid insecticide is imidacloprid.

[0074] In an embodiment, the pyrethroid insecticide comprises flupropathrin, allethrin (d-cis-trans, d-trans), beta-cyfluthrin, bifenthrin, bioallethrin-threo cyclopentyl isomer, flubenthrin (bioethanenomethrin), biothrin, bioresmethrin, dichlorometrythrin (chloreporthrin), cis-cypermethrin, cis-resmethrin, cis-

permethrin, cyhalothrin (clocythrin), cycloprothrin, cyfluthrin, cyhalothrin, cypermethrin cyphenothrin, deltamethrin, prallethrin (1R-isomer), S-fenvalerate, etofenprox, pentafluorothrin, fenpropathrin, cypermethrin, fenvalerate, fluvalinate, cyhalothrin, trifluoroether, flumethrin, cyhalothrin, esfenvalerate (1R-isomer), etofenvalerate, esfen, fenvalerate flumethrin, benzofenapyr (fubfenprox), gamma-cyfluthrin, sumicidin, kadethrin, lambda-cyfluthrin, metofluthrin, permethrin (cis, transfer), phenothrin (1R-trans isomer), propargyl, proferfluthrin, protifenbute, pyresmethrin, bifenthrin, RU15525, silafluothrin, tau-fluvalinate, tefluthrin, cyclopentene allethrin, tetramethrin (-1R-isomer), tetrabromthrin, transfluthrin, ZXI 8901, pyrethrin, eflusilat, or combinations thereof.

[0075] In an embodiment, the pyrethroid insecticide may be selected from the group comprising bifenthrin, allethrin, deltamethrin, cypermethrin, cyfluthrin, or combinations thereof.

[0076] In an embodiment, the pyrethroid insecticide is bifenthrin.

[0077] According to an embodiment, the insecticide is selected from the group comprising acephate, acetamiprid, imidacloprid, bifenthrin, or combinations thereof.

[0078] According to an embodiment, the neonicotinoid insecticide and the pyrethroid insecticide are present in a weight ratio of about 1000:1, between from about 1:500 to about 500:1, between from about 1:300 to about 300:1, between from about 1:100 to about 100:1, between from about 1:50 to about 50:1, or from about 1:25 to about 25:1, between from about 1:10 to about 10:1, between from about 1:5 to about 5:1, between from about 1:3 to about 3:1, from about 1:2.5 to about 2.5:1, or preferably of about 1:1.

[0079] According to an embodiment, the agrochemical combination comprises at least one agrochemically active ingredient selected from a nutrient, a fertilizer, a plant growth regulator, or combinations thereof.

[0080] In another aspect, the fertilizer comprises potassium, phosphorus, magnesium, nitrogen, a salt or oxide thereof, or combinations thereof.

[0081] In an embodiment, the fertilizer comprises a nitrogen source, ammonium sulfate, ammonium nitrate, ammonium chloride, urea, lime nitrogen, or combinations thereof.

[0082] In an embodiment, the fertilizer comprises a nitrogen source, a phosphorus source, a potassium source, a trace element, sulfur, or combinations thereof.

[0083] In a preferred embodiment, the fertilizer is selected from the group comprising a nitrogen source, a phosphorus source, and/or a potassium source.
In a preferred embodiment, the fertilizer comprises a phosphorus source comprising oxides of phosphorus selected from phosphorus pentoxide, phosphorus trioxide, phosphorus monoxide or phosphate salts such as organophosphates, potassium or sodium phosphate, or combinations thereof.

[0084] In a preferred embodiment, the fertilizer comprises a potassium source comprising potassium phosphate, potassium chloride, potash, potassium oxides, or combinations thereof.

[0085] In a preferred embodiment, the fertilizer is selected from the group comprising phosphorus pentoxide, phosphorus trioxide, phosphorus monoxide, organophosphates, potassium phosphate, monopotassium phosphate, sodium phosphate, potassium chloride, potash, potassium oxide, ammonium sulfate,

ammonium nitrate, ammonium chloride, urea, lime, nitrogen, sulfur, magnesium, or combinations thereof.

[0086] In a preferred embodiment, the fertilizer comprises K-Fol® (phosphorus pentoxide and potassium oxide).

[0087] In an embodiment, the nutrient is selected from the group comprising zinc, nickel, molybdenum, copper, boron, calcium, manganese, iron, disodium octaborate tetrahydrate, magnesium sulfate monohydrate, or combinations thereof.

[0088] In an embodiment the nutrient source comprises a micronutrient, a macronutrient, or combinations thereof.

[0089] In an embodiment, the micronutrient comprises salts and oxides of nitrogen, phosphorus, potassium, zinc, nickel, molybdenum, copper, boron, calcium, manganese, iron, magnesium, or combinations thereof.

[0090] In an embodiment, the macronutrient comprises nitrogen, phosphorus, potassium, calcium, sulphur, magnesium, carbon, oxygen and hydrogen, its salts or oxides, or combinations thereof.

[0091] In an embodiment, the plant growth regulator is selected from the group comprising auxin, gibberellin, gibberellic acid, cytokinin, abscisic acid, ethylene, or combinations thereof.

[0092] In an embodiment, suitable gibberellin comprises gibberellic acid and others. More generally, the term “gibberellins” encompasses diterpenoids having a tetracyclic ring system. In terms of their nomenclature, gibberellins were numbered in order of their discovery, so the numbering does not signify the position of one

particular substituent. The gibberellin(s) may be selected from the group comprising gibberellin A2 (GA2), gibberellin A3 (GA3), gibberellin A5 (GA5), gibberellin A7 (GA7), gibberellin A14 (GA14), and combinations thereof.

[0093] According to an embodiment, the present disclosure provides an agrochemical composition.

[0094] In an aspect, the present disclosure provides an agrochemical composition comprising:

(a) at least one insecticide;

(b) at least one agrochemically active ingredient selected from a nutrient, a fertilizer, a plant growth regulator, or combinations thereof; and

(c) at least one agrochemically acceptable excipient.

[0095] In an aspect, the present disclosure provides an agrochemical composition comprising:

(a) at least two insecticides;

(b) at least one agrochemically active ingredient selected from a nutrient, a fertilizer, a plant growth regulator, or combinations thereof; and

(c) at least one agrochemically acceptable excipient.

[0096] In an aspect, the present disclosure provides an agrochemical composition comprising:

(a) a combination of insecticides;

(b) at least one agrochemically active ingredient selected from a nutrient, a fertilizer, a plant growth regulator, or combinations thereof; and

(c) at least one agrochemically acceptable excipient.

[0097] In an embodiment, the insecticide comprises an organophosphate insecticide, neonicotinoid insecticide, pyrethroid insecticide, or combinations thereof.

[0098] In an embodiment, the present disclosure provides an agrochemical composition comprising:

(a) at least one insecticide selected from an organophosphate insecticide, a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof;
(b) at least one agrochemically active ingredient selected from a nutrient, a fertilizer, a plant growth regulator, or combinations thereof; and
(c) at least one agrochemically acceptable excipient.

[0099] In an embodiment, the present agrochemical composition comprises:

(a) at least one insecticide selected from an organophosphate insecticide, a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof;
(b) a plant growth regulator; and
(c) at least one agrochemically acceptable excipient.

[0100] In an embodiment, the present agrochemical composition comprises:

(a) at least one insecticide selected from an organophosphate insecticide, a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof;
(b) a fertilizer; and
(c) at least one agrochemically acceptable excipient.

[0101] In an embodiment, the present agrochemical composition comprises:

(a) at least one insecticide selected from an organophosphate insecticide, a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof;
(a) a nutrient; and
(b) at least one agrochemically acceptable excipient.

[0102] In an embodiment, the present agrochemical composition comprises:

(a) at least one insecticide selected from an organophosphate insecticide, a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof;
(b) a fertilizer;
(c) a nutrient;
(d) a plant growth regulator; and
(e) at least one agrochemically acceptable excipient.

[0103] In an embodiment, the present agrochemical composition comprises:

(a) at least two insecticides selected from an organophosphate insecticide, a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof;
(b) a fertilizer;
(c) a plant growth regulator; and
(d) at least one agrochemically acceptable excipient.

[0104] In an embodiment, the present agrochemical composition comprises:

(a) at least two insecticides selected from an organophosphate insecticide, a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof;
(b) a nutrient;
(c) a plant growth regulator; and
(d) at least one agrochemically acceptable excipient.

[0105] In an embodiment, the present agrochemical composition comprises:

(a) at least one insecticide comprising an organophosphate insecticide, a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof;
(b) a fertilizer comprising potassium, phosphorus, magnesium, nitrogen, or combinations thereof; or
(c) a nutrient comprising potassium, phosphorus, magnesium, nitrogen, zinc, nickel, molybdenum, copper, boron, calcium, manganese, iron, magnesium, an oxide or salt thereof, or combinations thereof;

(d) a plant growth regulator comprising an auxin, a gibberellin, a cytokinin, abscisic acid, ethylene, or combinations thereof; and
(e) at least one agrochemically acceptable excipient.

[0106] In an embodiment, the present agrochemical composition comprises:
(a) at least two insecticides comprising an organophosphate insecticide, a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof;
(b) a fertilizer comprising potassium, phosphorus, magnesium, nitrogen, or combinations thereof; or
(c) a nutrient comprising potassium, phosphorus, magnesium, nitrogen, zinc, nickel, molybdenum, copper, boron, calcium, manganese, iron, magnesium, an oxide or salt thereof, or combinations thereof;
(d) a plant growth regulator comprising an auxin, a gibberellin, a cytokinin, abscisic acid, ethylene, or combinations thereof; and
(e) at least one agrochemically acceptable excipient.

[0107] In an embodiment, the present agrochemical composition comprises:
(a) a combination of insecticides comprising an organophosphate insecticide, a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof;
(b) a fertilizer comprising potassium, phosphorus, magnesium, nitrogen, or combinations thereof; or
(c) a nutrient comprising potassium, phosphorus, magnesium, nitrogen, zinc, nickel, molybdenum, copper, boron, calcium, manganese, iron, magnesium, an oxide or salt thereof, or combinations thereof;
(d) a plant growth regulator comprising an auxin, a gibberellin, a cytokinin, abscisic acid, ethylene, or combinations thereof; and
(e) at least one agrochemically acceptable excipient.

[0108] In an embodiment, the present agrochemical composition comprises:
(a) at least two insecticides;

(b) a plant growth regulator; and
(c) at least one agrochemically acceptable excipient.

[0109] In an embodiment, the present agrochemical composition comprises:
(a) at least two insecticides comprising acetamiprid and bifenthrin;
(b) a plant growth regulator comprising gibberellic acid; and
(c) at least one agrochemically acceptable excipient.

[0110] In an embodiment, the present agrochemical composition comprises:
(a) a combination of insecticides comprising acetamiprid and bifenthrin;
(b) a fertilizer comprising potassium, phosphorus, magnesium, nitrogen, or combinations thereof;
(c) a nutrient comprising potassium, phosphorus, magnesium, nitrogen, zinc, nickel, molybdenum, copper, boron, calcium, manganese, iron, magnesium, an oxide or salt thereof, or combinations thereof;
(d) a plant growth regulator comprising an auxin, a gibberellin, a cytokinin, abscisic acid, ethylene, or combinations thereof; and
(e) at least one agrochemically acceptable excipient.

[0111] In an embodiment, the present agrochemical composition comprises:
(a) a combination of insecticides comprising acetamiprid and bifenthrin;
(b) a plant growth regulator comprising gibberellic acid; and
(c) at least one agrochemically acceptable excipient.

[0112] In an embodiment, the present agrochemical composition comprises:
(a) at least one insecticide;
(b) a fertilizer
(c) a plant growth regulator; and
(d) at least one agrochemically acceptable excipient.

[0113] In an embodiment, the present agrochemical composition comprises:
(a) at least two insecticide;
(b) a fertilizer
(c) a plant growth regulator; and
(d) at least one agrochemically acceptable excipient.

[0114] In an embodiment, the present agrochemical composition comprises:
(a) a combination of insecticides;
(b) a fertilizer
(c) a plant growth regulator; and
(d) at least one agrochemically acceptable excipient.

[0115] In an embodiment, the present agrochemical composition comprises:
(a) at least two insecticides comprising acephate, acetamiprid, bifenthrin, or combinations thereof;
(b) a fertilizer comprising potassium oxide, phosphorus pentoxide, or combinations thereof;
(c) a plant growth regulator comprising gibberellic acid; and
(d) at least one agrochemically acceptable excipient.

[0116] In an embodiment, the present agrochemical composition comprises:
(a) acephate, acetamiprid, and bifenthrin;
(b) potassium oxide and phosphorus pentoxide;
(c) gibberellic acid; and
(d) at least one agrochemically acceptable excipient.

[0117] In an embodiment, the agrochemical composition comprises an insecticide in an amount from about 1% w/w to about 80% w/w of total weight of the composition. In an embodiment, the insecticide is present in an amount from about 1% w/w to about 75% w/w of total weight of the composition. In an embodiment, the

insecticide is present in an amount from about 1% w/w to about 60% w/w of total weight of the composition. In an embodiment, the insecticide is present in an amount from about 1% w/w to about 50% w/w of total weight of the composition. In an embodiment, the insecticide is present in an amount from about 1% w/w to about 30% w/w of total weight of the composition. In an embodiment, the insecticide is present in an amount from about 1% w/w to about 20% w/w of total weight of the composition. In an embodiment, the insecticide is present in an amount from about 1% w/w to about 10% w/w of total weight of the composition.

[0118] In another embodiment, the agrochemical composition comprises acetamiprid in an amount ranging from about 5.625% w/w to about 6.875% w/w of total weight of the composition.

[0119] In a preferred embodiment, the agrochemical composition comprises acetamiprid in an amount of about 5.625% w/w of total weight of the composition.

[0120] In a preferred embodiment, the agrochemical composition comprises acetamiprid in an amount of about 6.38% w/w of total weight of the composition.

[0121] In a preferred embodiment, the agrochemical composition comprises acetamiprid in an amount of about 6.875% w/w of total weight of the composition.

[0122] In another embodiment, the agrochemical composition comprises bifenthrin in an amount ranging from about 5.625% w/w to about 6.875% w/w of total weight of the composition.

[0123] In a preferred embodiment, the agrochemical composition comprises bifenthrin in an amount of about 5.625% w/w of total weight of the composition.

[0124] In a preferred embodiment, the agrochemical composition comprises acetamiprid in an amount of about 6.38% w/w of total weight of the composition.

[0125] In a preferred embodiment, the agrochemical composition comprises bifenthrin in an amount of about 6.875% w/w of total weight of the composition.

[0126] In an embodiment, the agrochemical composition comprises the fertilizer in an amount from about 0.01% w/w to about 80% w/w of total weight of the composition. In an embodiment, the fertilizer is present in an amount from about 0.01% w/w to about 70% w/w of total weight of the composition. In an embodiment, the fertilizer is present in an amount from about 0.01% w/w to about 50% w/w of total weight of the composition. In an embodiment, the fertilizer is present in an amount from about 0.01% w/w to about 30% w/w of total weight of the composition. In an embodiment, the fertilizer is present in an amount from about 0.01% w/w to about 20% w/w of total weight of the composition. In an embodiment, the fertilizer is present in an amount from about 0.01% w/w to about 10% w/w of total weight of the composition.

[0127] In another preferred embodiment, the fertilizer is present in an amount from about 0.1% w/w to about 50% w/w of total weight of the composition. Preferably, the fertilizer is present in an amount from about 1% w/w to about 50% w/w of total weight of the composition.

[0128] In an embodiment, the agrochemical composition comprises the nutrient in an amount from about 0.01% w/w to about 80% w/w of total weight of the composition. In an embodiment, the agrochemical composition comprises nutrient in an amount from about 0.1% w/w to about 50% w/w of total weight of the composition. In an embodiment, the agrochemical composition comprises nutrient in an amount from about 0.1% w/w to about 30% w/w of total weight of the composition. In an embodiment, the agrochemical composition comprises nutrient

in an amount from about 0.1% w/w to about 20% w/w of total weight of the composition. In an embodiment, the agrochemical composition comprises nutrient in an amount from about 0.1% w/w to about 10% w/w of total weight of the composition.

[0129] In another preferred embodiment, the nutrient is present in an amount from about 1% w/w to about 50% w/w of total weight of the composition.

[0130] In an embodiment, the agrochemical composition comprises plant growth regulator in amount from about 0.0001% w/w to about 50% w/w of total weight of the agrochemical composition. In an embodiment, the agrochemical composition comprises the plant growth regulator in a range from about 0.0001% w/w to about 40% w/w of total weight of the composition. In an embodiment, the agrochemical composition comprises the plant growth regulator in a range from about 0.0001% w/w to about 30% w/w of total weight of the composition. In an embodiment, the agrochemical composition comprises plant growth regulator in a range from about 0.0001% w/w to about 20% w/w of total weight of the composition. In an embodiment, the composition comprises plant growth regulator in a range from about 0.0001% w/w to about 10% w/w of total weight of the composition. In an embodiment, the composition comprises plant growth regulator in a range from about 0.0001% w/w to about 5% w/w of total weight of the composition. In an embodiment, the composition comprises plant growth regulator in a range from about 0.0001% w/w to about 2% w/w of total weight of the composition. In an embodiment, the composition comprises plant growth regulator in a range from about 0.0001% w/w to about 1% w/w of total weight of the composition. In an embodiment, the composition comprises plant growth regulator in a range from about 0.0001% w/w to about 0.005% w/w of total weight of the composition. In an embodiment, the composition comprises plant growth regulator in a range from about 0.0001% w/w to about 0.004% w/w of total weight of the composition. In an embodiment, the composition comprises plant growth regulator in a range from

about 0.0001% w/w to about 0.003% w/w of total weight of the composition. In an embodiment, the composition comprises plant growth regulator in a range from about 0.0001% w/w to about 0.002% w/w of total weight of the composition. In an embodiment, the composition comprises plant growth regulator in a range from about 0.0001% w/w to about 0.001% w/w of total weight of the composition.

[0131] In an embodiment, the fertilizer is a phosphorus compound or bioavailable phosphorus.

[0132] In an embodiment, the composition comprises from about 15% w/w to about 30% w/w phosphorus compound as fertilizer of total weight of the composition.

[0133] In another embodiment, the agrochemical composition comprises from about 2% w/w to about 50% w/w bioavailable phosphorus as fertilizer of total weight of the composition.

[0134] In another embodiment, the present composition comprises from about 4% w/w to about 30% w/w bioavailable phosphorus as fertilizer of total weight of the composition.

[0135] In another embodiment, the present composition comprises from about 5% w/w to about 20% w/w bioavailable phosphorus as fertilizer of total weight of the composition.

[0136] According to an embodiment, the fertilizer or the nutrient comprises potassium oxide and phosphorus pentoxide, or combinations thereof.

[0137] In an embodiment, the fertilizer comprises potassium compound, soluble potassium salt, water-soluble potassium salt, or their salts or oxides thereof.

[0138] In an embodiment, the fertilizer is a potassium compound.

[0139] In an embodiment, the agrochemical composition comprises from about 25% w/w to about 50% w/w potassium compound as fertilizer of total weight of the composition.

[0140] In an embodiment, the agrochemical composition comprises from about 5% w/w to about 80% w/w water-soluble potassium salt as fertilizer of total weight of the composition.

[0141] In another embodiment, the present composition comprises from about 20% w/w to about 60% w/w water-soluble potassium salt as fertilizer of total weight of the composition.

[0142] In another embodiment, the present composition comprises from about 25% w/w to about 50% w/w water-soluble potassium salt as fertilizer of total weight of the composition.

[0143] In an embodiment, the agrochemical composition comprises from about 2% w/w to about 50% w/w potassium, or its salts or oxides as fertilizer of total weight of the composition.

[0144] In an embodiment, the agrochemical composition comprises at least one component selected from about 5% w/w to about 25% w/w phosphorus; from about 20% w/w to about 60% w/w potassium or their salts or oxides as fertilizer or combinations thereof, of total weight of the agrochemical composition.

[0145] In an embodiment, the agrochemical composition comprises at least one component selected from about 5% w/w to about 25% w/w phosphorus; from about

30% w/w to about 50% w/w potassium; or their salts or oxides as fertilizer or combinations thereof.

[0146] Accordingly, the present disclosure provides an agrochemical composition comprising:

(a) about 1% w/w to about 80% w/w of an insecticide; and

(b) about 5% w/w to about 40% w/w of a fertilizer or a nutrient comprising phosphorus and from about 30% w/w to about 60% w/w of a water-soluble potassium salt.

[0147] Accordingly, the present disclosure provides an agrochemical composition comprising:

(a) about 1% w/w to about 70% w/w of the insecticide; and

(b) about 10% w/w to about 25% w/w of a fertilizer or a nutrient comprising phosphorus and from about 10% w/w to about 50% w/w of a water-soluble potassium salt.

[0148] Accordingly, the present disclosure provides an agrochemical composition comprising:

(a) about 1% w/w to about 70% w/w of the insecticide; and

(b) a fertilizer or a nutrient comprising from about 10% w/w to about 50% w/w of phosphorus and from about 10% w/w to about 25% w/w of a water-soluble potassium salt of total weight of the agrochemical composition.

[0149] In an embodiment, the present composition comprises from about 0.0001% w/w to about 25% w/w of the plant growth regulator of total weight of the agrochemical composition.

[0150] In an embodiment, the present composition comprises:

(a) about 1% w/w to about 70% w/w of at least one insecticide;

(b) about 0.0001% w/w to about 25% w/w of the plant growth regulator; and
(c) at least one agrochemically acceptable excipient.

[0151] In an embodiment, the present composition comprises:
(a) about 1% w/w to about 70% w/w of at least two insecticides;
(b) about 0.0001% w/w to about 25% w/w of the plant growth regulator and
(c) at least one agrochemically acceptable excipient.

[0152] In an embodiment, the present composition comprises from about 0.0001% w/w to about 25% w/w of a plant growth regulator of total weight of the agrochemical composition.

[0153] In another embodiment, the present composition comprises from about 0.0001% w/w to about 15% w/w of a plant growth regulator of total weight of the agrochemical composition.

[0154] In another embodiment, the present composition comprises from about 0.0001% w/w to about 10% w/w of a plant growth regulator of total weight of the agrochemical composition.

[0155] In another embodiment, the present composition comprises from about 0.0001% w/w to about 5% w/w of a plant growth regulator of total weight of the agrochemical composition.

[0156] In an embodiment, the plant growth regulator is gibberellin. Preferably, the plant growth regulator is gibberellic acid.

[0157] In an embodiment, the composition comprises of about 0.0001% w/w of a gibberellin of total weight of the agrochemical composition.

[0158] In an embodiment, the composition comprises of about 0.0001% w/w of gibberellic acid of total weight of the agrochemical composition.

[0159] In another embodiment, the agrochemical composition comprises gibberellic acid in an amount ranging from about 0.0012% w/w to about 0.0048% w/w of total weight of the composition.

[0160] In another embodiment, the agrochemical composition comprises gibberellic acid in an amount ranging from about 12 ppm to about 48 ppm w/w of total weight of the composition.

[0161] In a preferred embodiment, the agrochemical composition comprises gibberellic acid in an amount of about 0.0012% w/w of total weight of the composition.

[0162] In a preferred embodiment, the agrochemical composition comprises gibberellic acid in an amount of about 12 ppm w/w of total weight of the composition.

[0163] In a preferred embodiment, the agrochemical composition comprises gibberellic acid in an amount of about 0.0036% w/w of total weight of the composition.

[0164] In a preferred embodiment, the agrochemical composition comprises gibberellic acid in an amount of about 36 ppm w/w of total weight of the composition.

[0165] In a preferred embodiment, the agrochemical composition comprises gibberellic acid in an amount of about 0.0040% w/w of total weight of the composition.

[0166] In a preferred embodiment, the agrochemical composition comprises gibberellic acid in an amount of about 40 ppm w/w of total weight of the composition.

[0167] In a preferred embodiment, the agrochemical composition comprises gibberellic acid in an amount of about 0.0048% w/w of total weight of the composition.

[0168] In a preferred embodiment, the agrochemical composition comprises gibberellic acid in an amount of about 48 ppm w/w of total weight of the composition.

[0169] Accordingly, the present disclosure provides an agrochemical composition comprising:
(a) about 1% w/w to about 80% w/w of an insecticide; and
(b) about 0.0001% w/w to about 25% w/w of the plant growth regulator.

[0170] Accordingly, the present disclosure provides an agrochemical combination/composition comprising:
(a) about 1% w/w to about 70% w/w of the insecticide; and
(b) about 0.0001% w/w to about 10% w/w of the plant growth regulator.

[0171] Accordingly, the present disclosure provides an agrochemical combination/composition comprising:
(a) about 3% w/w to about 15% w/w of the insecticide;
(b) about 0.0001% w/w to about 10% w/w of plant growth regulator; and
(c) a fertilizer comprising from about 10% w/w to about 20% w/w of phosphorus and from about 10% w/w to about 50% w/w of water-soluble potassium salt of total weight of the composition.

[0172] Accordingly, the present disclosure provides an agrochemical combination/composition comprising:

(a) about 1% w/w to about 80% w/w of the insecticide; and
(b) a fertilizer or nutrient comprising from about 5% w/w to about 40% w/w of phosphorus and from about 30% w/w to about 60% w/w of a water-soluble potassium salt of total weight of the composition.

[0173] Accordingly, the present disclosure provides an agrochemical composition comprising:
(a) about 1% w/w to about 80% w/w of the insecticide; and
(b) a fertilizer or nutrient comprising from about 5% w/w to about 40% of phosphorus and from about 10% w/w to about 50% w/w of a water-soluble potassium salt of total weight of the composition.

[0174] Accordingly, the present disclosure provides an agrochemical composition comprising:
(a) about 1% w/w to about 80% w/w of the insecticide; and
(b) a fertilizer or nutrient comprising from about 15% w/w to about 20% w/w of phosphorus and from about 25% w/w to about 40% w/w of a water-soluble potassium salt of total weight of the composition.

[0175] Accordingly, the present disclosure provides an agrochemical composition comprising:
(a) about 1% w/w to about 80% w/w of the insecticide;
(b) a fertilizer or nutrient comprising from about 5% w/w to about 40% w/w of phosphorus and from about 10% w/w to about 50% w/w of a water-soluble potassium salt, and
(c) about 0.0001% w/w to about 10% w/w of the plant growth regulator of total weight of the composition.

[0176] In an aspect, the present disclosure provides an agrochemical composition comprising:

(a) an insecticide selected from a neonicotinoid insecticide, a pyrethroid insecticide, organophosphate insecticide, or combinations thereof; and
(b) a nutrient.

[0177] In an aspect, the present disclosure provides an agrochemical composition for insect control, the composition comprising:
(a) an insecticide selected from a neonicotinoid insecticide, a pyrethroid insecticide, organophosphate insecticide, or combinations thereof;
(b) a nutrient; and
(c) a fertilizer.

[0178] In an aspect, the present disclosure provides an agrochemical composition comprising:
(a) an insecticide selected from a neonicotinoid insecticide, a pyrethroid insecticide, organophosphate insecticide, or combinations thereof;
(b) a nutrient;
(c) a fertilizer; and
(d) a plant growth regulator.

[0179] In an embodiment, the insecticide can be selected from at least one from the group of neonicotinoid insecticide, a pyrethroid insecticide, an organophosphate insecticide, or combinations thereof.

[0180] In an embodiment, the organophosphate insecticide is selected from the group comprising acephate, azinphos, chlorpyrifos, diazinon, dichlorvos, dicrotophos, dimethoate, fenitrothion, malathion, monocrotophos, parathion, phenthoate, quinalphos, and combinations thereof.

[0181] In a preferred embodiment, the organophosphate insecticide is acephate.

[0182] In an aspect, the present disclosure provides an agrochemical composition comprising:
(a) an insecticide selected from a neonicotinoid insecticide, a pyrethroid insecticide, organophosphate insecticide, or combinations thereof;
(b) a nutrient;
(c) a fertilizer;
(d) a plant growth regulator; and
(e) at least one agrochemically acceptable excipient.

[0183] In another embodiment, the insecticidal compositions of the present invention may further comprise at least one agrochemically acceptable excipient (additive) which include one or more stabilizers, emetic agents, disintegrating agents, antifoaming agents, wetting agents, dispersing agents, binding agents, dye(s), fillers, carriers, dispersant/surfactants, adjuvants, safeners, wetting agents, adhesives, emulsifiers, antifreeze agent, anticaking agents, pH-regulating agents, preservatives, biocides, and if required other formulation aids known to a skilled person for making a formulation. The composition content of these components is not particularly limiting and may be determined by any skilled person in the art in order to make a formulation for its use as an insecticide according to the conventional method.

[0184] In another embodiment, the dispersants/surfactants may be selected from ionic and nonionic dispersants such as salts of polystyrene sulphonic acids, salts of polyvinyl sulphonic acids, salts of naphthalene sulphonic acid/formaldehyde condensates, salts of condensates of naphthalene sulphonic acid, phenol sulphonic acid and formaldehyde, and salts of lignosulphonic acid, polyethylene oxide/polypropylene oxide block copolymers, sulphonic acid derivatives such as dodecylbenzene sulphonate, mixture of linear dodecylbenzene sulphonic acid, calcium salt and isobutyl alcohol, polyethylene glycol ethers of linear alcohols, reaction products of fatty acids with ethylene oxide and/or propylene oxide,

furthermore polyvinyl alcohol, polyvinylpyrrolidone, copolymers of polyvinyl alcohol and polyvinylpyrrolidone and copolymers of (meth)acrylic acid and (meth)acrylic esters, furthermore alkyl ethoxylates and alkyl aryl ethoxylates ethoxylated alkyl aryl phosphated and sulphated ester such as tristrylphenol ethoxylate; polycarboxylates, such as sodium polycarboxylate, The preferred dispersing agents include derivative of ethoxylates of vegetable oil or a mixture of one or more of these; or styrene acrylic polymers or mixtures thereof.

[0185] Typically, the non-ionic surfactants include polyalkyleneoxide siloxanes, ethoxylated derivatives of fatty alcohols, alkyl glucosides, alkyl phenols, polyalkylene glycol ethers and condensation products of alkyl phenols, amines, fatty acids, fatty esters, mono-, di-, or triglycerides, various block copolymeric surfactants derived from alkylene oxides such as ethylene oxide/propylene oxide, aliphatic amines or fatty acids with ethylene oxides and/or propylene oxides such as the ethoxylated alkyl phenols or ethoxylated aryl or polyaryl phenols, carboxylic esters solubilized with a polyol or polyvinyl alcohol/polyvinyl acetate copolymers, polyvinyl alcohol, polyvinyl pyrrolidinones and acrylic acid graft copolymers and mixtures, reaction products, and/or copolymers thereof, and combinations thereof.

[0186] Typically, the non-ionic surfactant comprises block copolymeric surfactants derived from alkylene oxides such as ethylene oxide/propylene oxide, aliphatic amines or fatty acids with ethylene oxides and/or propylene oxides such as the ethoxylated alkyl phenols or ethoxylated aryl or polyaryl phenols, their mixtures, reaction products, and/or copolymers thereof.

[0187] In another embodiment, the examples of wetting agents may be selected from soaps; salts of aliphatic monoesters of sulphuric acid including but not limited to sodium lauryl sulphate; sulfoakylamides and salts thereof including but not limited to N-methyl-N-oleoyltaurate Na salt; akylarylsulfonates including but not limited to akylbenzenesulfonates; akylnaphthalenesulfonates and salts thereof and salts of

ligninsulfonic acid; including but are not limited to: polyarylalkoxylated phosphate esters and their potassium salts. Other exemplary wetting agents include sodium dioctylsulfosuccinates, sodium diisopropyl naphthalene sulfonate, and ethoxylated alcohols.

[0188] In another embodiment, the anionic surfactants include alkyl and aryl sulfates and sulfonates, including sodium alkyl sulfates, sodium mono- and di-alkyl naphthalene sulfonates, sodium diisopropyl naphthalene sulfonate, sodium naphthalene sulfonate modified, sodium alpha-olefin sulfonate, lignin and its derivatives (such as lignosulfonate salts), sodium lignosulfonate, sodium alkane sulfonates, polyoxyalkyene alkylether sulfate, polyoxyalkylene alkylaryl ether sulfates, polyoxy-alkylene styrylphenyl ether sulfate, mono- and di- alkylbenzene sulfonates, alkylnaphthalene sulfonate, alkylnaphthalene sulfonate formaldehyde condensate, alkyl diphenylether sulfonates, olefme sulfonates, alkylphosphates, polyoxyalkylene alkyl phosphates, polyoxyalkylene phenylether phosphate, polyoxyalkylphenol phosphates, poly-carboxylates, fatty acids and salts thereof, alkyl glycinates, sulfonated methyl esters, sulfonated fatty acids, sulfosuccinates and their derivatives, acyl glutamates, acyl sarcosinates, alkyl sulfoacetates, acylated peptides, alkyl ether carboxylates, acyl lactylates, anionic fluorosurfactants, amid ether sulfates, N-methyl fatty acid taurides, mixtures thereof and the like, including sodium, potassium, ammonium and amine salts, and the leike, and mixtures thereof.

[0189] In an embodiment, the present composition comprises from about 0.1% w/w to about 50% w/w of ionic/non-ionic surfactant based on total weight of the composition.

[0190] In another embodiment, the present composition comprises from about 1% w/w to about 40% w/w of ionic/non-ionic surfactant based on total weight of the composition.

[0191] In an embodiment, the present composition comprises from about 1% w/w to about 30% w/w of non-ionic surfactant of the total weight of the composition.

[0192] Examples of antifreeze agents that can be added to the composition are liquid polyols, for example ethylene glycol, propylene glycol or glycerol.

[0193] In an embodiment, fillers may be selected from insoluble fillers and soluble fillers.

[0194] In an embodiment, fillers may be selected preferably from precipitated silica and diatomaceous earth kaolin, dibasic ammonium phosphate. Examples of fillers may include an organic or inorganic solid inert substance such as talc, clay, diatomaceous earth, magnesium aluminium silicate, aluminum silicate, white carbon black, pyrophyllite, light calcium carbonate, high clay, organic bentonite, and the like, and mixtures thereof.

[0195] In an embodiment, binders may be selected preferably from polyvinylpyrrolidone, lactose, lactose monohydrate, sucrose and the like. Other examples of binders include lactose monohydrate, alkylated vinyl pyrrolidone copolymers cross-linked polyvinylpyrrolidones copolymers of vinyl acetate and vinylpyrrolidone lignosulfonates and sodium or calcium salts thereof, unsulfonated lignin; clays, microcrystalline celluloses; methyl cellulose ethers; ethyl cellulose polymers; starch (natural or modified); gluten; silicates and sodium or calcium salts thereof; magnesium aluminum silicates; natural or modified lecithin; sugar alcohols and polyethylene glycols, among others.

[0196] Examples of antifoaming or defoamers that are employed to prevent any unwanted foam generated while manufacturing the compositions. Exemplary antifoaming agents include silicone-based compounds, alcohols, glycol ethers,

mineral spirits, acetylene diols, polysiloxanes, organosiloxanes, siloxane glycols, reaction products of silicon dioxide and organosiloxane polymer, polydimethylsiloxanes, polydimethylsiloxane emulsion, or polyalkylene glycols alone or in combination. Exemplary defoamers include silicone antifoam emulsions.

[0197] Examples of thickening agents based on anionic heteropolysaccharides from the xanthan gum group are inter alia the standard grade xanthan gum, granular and dust free grade of Xanthan Gum, xanthan Gum that turns into viscous colloidal solution on dispersion in water, etc.,

[0198] Preservatives used may be benzisothiazolinone or phonols, 2-bromo-2-nitropropane-1,3-diol, 5-chloro-2-methyl-4-isothiazolin-3-one & 2 methyl-4-isothiazolin -3 one, glutaraldehyde, chloromethylisothiazolinone (CMIT)/ Methylisothiazolinone (MIT), 2.2-dibromo-3-nitrilopropioamide, natamycin & nisin, bronopol/CMIT/MIT.

[0199] Exemplary colorants (for example in red, blue and green) are, for example, pigments, which are sparingly soluble in water, and dyes, which are water-soluble. Examples are inorganic coloring agents (for example iron oxide, titanium oxide, and iron hexacyanoferrate) and organic coloring agents (for example alizarin, azo and phthalocyanin coloring agents).

[0200] The compositions that can be used in the present invention include both solid and liquid based compositions. The compositions of the present invention can be formulated in a manner which suits the specific application. The formulation may be solid or liquid formulations. Non-limiting examples of suitable liquid formulations may be emulsion concentrates (EC), suspension concentrates (SC), capsule suspensions (CS), oil dispersion (OD); suitable solid formulations may be water dispersible granules (WG) and wettable powders (WP), dusts and the like.

[0201] In an embodiment, the composition of the present invention is present in a form of water dispersible granules (WDG).

[0202] In an embodiment, the composition of the present invention is present in a form of soluble granules (SG).

[0203] In an embodiment, the composition of the present invention is present in a form of water dispersible granules, soluble granules, or combinations thereof.

[0204] In an embodiment, the water dispersible granular composition comprises:

(a) at least one insecticide comprising an organophosphate insecticide, a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof;
(b) a fertilizer comprising potassium, phosphorus, magnesium, nitrogen, or combinations thereof; or
(c) a nutrient comprising potassium, phosphorus, magnesium, nitrogen, zinc, nickel, molybdenum, copper, boron, calcium, manganese, iron, magnesium, an oxide or salt thereof, or combinations thereof;
(d) a plant growth regulator comprising an auxin, a gibberellin, a cytokinin, abscisic acid, ethylene, or combinations thereof; and
(e) at least one agrochemically acceptable excipient.

[0205] In an embodiment, the soluble granular composition comprises:

(a) at least one insecticide comprising an organophosphate insecticide, a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof;
(b) a fertilizer comprising potassium, phosphorus, magnesium, nitrogen, or combinations thereof; or
(c) a nutrient comprising potassium, phosphorus, magnesium, nitrogen, zinc, nickel, molybdenum, copper, boron, calcium, manganese, iron, magnesium, an oxide or salt thereof, or combinations thereof;

(d) a plant growth regulator comprising an auxin, a gibberellin, a cytokinin, abscisic acid, ethylene, or combinations thereof; and
(e) at least one agrochemically acceptable excipient.

[0206] According to an embodiment, the present disclosure provides a process for preparation of the insecticidal composition.

[0207] According to an embodiment, the present disclosure provides a process for preparation of the insecticidal composition, the process comprising:

a) adding at least one insecticide and other ingredients sequentially under constant stirring to obtain a mixture;
b) stirring the mixture until complete homogenization;
c) grinding the mixture to get required particle size;
d) adding sufficient amount of water to obtain granules; and
e) drying the granules to obtain the insecticidal composition.

[0208] According to an embodiment, the present disclosure provides a process for preparation of the insecticidal composition, the process comprising:

a) adding at least two insecticides and other ingredients sequentially under constant stirring to obtain a mixture;
b) stirring the mixture until complete homogenization;
c) grinding the mixture to get required particle size;
d) adding sufficient amount of water to obtain granules; and
e) drying the granules to obtain the insecticidal composition.

[0209] According to an embodiment, the present disclosure provides a process for preparation of the insecticidal composition, the process comprising:

a) adding combination of insecticides and other ingredients sequentially under constant stirring to obtain a mixture;
b) stirring the mixture until complete homogenization;

c) grinding the mixture to get required particle size;
d) adding sufficient amount of water to obtain granules; and
e) drying the granules to obtain the insecticidal composition.

[0210] According to an embodiment, the present disclosure provides a process for preparation of the insecticidal composition, the process comprising:

a) adding combination of insecticides and a plant growth regulator sequentially under constant stirring to obtain a mixture;
b) stirring the mixture until complete homogenization;
c) grinding the mixture to get required particle size;
d) adding sufficient amount of water to obtain granules; and
e) drying the granules to obtain the insecticidal composition.

[0211] According to an embodiment, the present disclosure provides a process for preparation of the insecticidal composition, the process comprising:

a) adding acetamiprid, bifenthrin and gibberellic acid sequentially under constant stirring to obtain a mixture;
b) stirring the mixture until complete homogenization;
c) grinding the mixture to get required particle size;
d) adding sufficient amount of water to obtain granules; and
e) drying the granules to obtain the insecticidal composition.

[0212] According to an embodiment, the particle size of the WDG composition comprises D_{90} in a range from about 1 µm to about 20 µm.

[0213] According to an embodiment, the particle size of the WDG composition comprises D_{90} in a range of about 13 µm.

[0214] According to an embodiment, in step e) the granules are dried at a temperature in a range from about 20°C to about 50°C.

[0215] According to an embodiment, in step e) the granules are dried at a temperature in a range from about 40°C to about 45°C.

[0216] According to another embodiment, the agrochemical formulation of the present disclosure is found to be highly active against a wide variety of chewing, boring and sucking insects in crops.

[0217] In an embodiment, the crops can be selected from, but not limited to, cereals, such as wheat, oats, barley, spelt, triticale, rye, maize, millet, rice; crops such as sugarcane, soybean, sunflower, rape, canola, tobacco, sugar beet, fodder beet; tuber crops such as potatoes, sweet potatoes, etc.; crops such as asparagus, hops, etc.; fruit plants such as apples, pears; stone- fruits such as, for example, peaches, nectarines, cherries, plums, apricots; citrus fruits such as oranges, grapefruit, limes, lemons, kumquats, mandarins, satsumas; nuts such as pistachios, almonds, walnuts, pecan nuts; tropical fruits such as mango, papaya, pineapple, dates, bananas etc.; grapes; vegetables such as endives, lettuce, fennel, globe and loose-leaf salad, chard, spinach, chicory, cauliflower, broccoli, Chinese cabbage, kale (winter kale or curly kale), kohlrabi, Brussel sprouts, red cabbage, white cabbage and savoy; fruiting vegetables such as aubergines, cucumbers, paprika, marrow, tomatoes, courgettes, sweetcorn; root vegetables such as celeriac, turnip, carrots, swedes, radishes, horseradish, beetroot, salsify, celery; pulses such as peas, beans, etc.; bulb vegetables such as leeks, onions, etc.; oil crops such as mustard, poppy, olives, sunflowers, coconut, castor oil plants, cocoa beans, groundnuts; fibre crops such as cotton, jute, flex, hemp; crops such as tea, coffee, rubber; ornamentals including shrubs and flowering plants; vines; rangeland; and pastures.

[0218] In an embodiment, the target insect pest is a Lepidopteran, a Coleopteran, a Hemipteran, or a Homopteran.

[0219] In an embodiment, Lepidopteran pest species which negatively impact agriculture include, but are not limited to, *Achoea janata, Adoxophyes spp., Adoxophyes orana, Agrotis spp.* (cutworms), *Agrotis ipsilon* (black cutworm), *Alabama argillacea* (cotton leafworm), *Amorbia cuneana, Amyelosis transitella* (navel orangeworm), *Anacamptodes defectaria, Anarsia lineatella* (peach twig borer), *Anomis sabulifera* (jute looper), *Anticarsia gemmatalis* (velvetbean caterpillar), *Archips argyrospila* (fruittree leafroller), *Archips rosana* (rose leaf roller), *Argyrotaenia* spp. (tortricid moths), *Argyrotaenia citrana* (orange tortrix), *Autographa gamma, Bonagota cranaodes, Borbo cinnara* (rice leaf folder), *Bucculatrix thurberiella* (cotton leafperforator), *Caloptilia* spp. (leaf miners), *Capua reticulana, Carposina niponensis* (peach fruit moth), *Chilo spp., Chlumetia transversa* (mango shoot borer), *Choristoneura rosaceana* (obliquebanded leafroller), *Chrysodeixis spp., Cnaphalocerus medinalis* (grass leafroller), *Colias spp., Conpomorpha cramerella, Cossus cossus* (carpenter moth), *Crambus spp.* (Sod webworms), *Cydia funebrana* (plum fruit moth), *Cydia molesta* (oriental fruit moth), *Cydia nignicana* (pea moth), *Cydia pomonella* (codling moth), *Darna diducta, Diaphania* spp. (stem borers), Diatraea spp. (stalk borers), *Diatraea saccharalis* (sugarcane borer), *Diatraea graniosella* (southwester corn borer), *Earias spp.* (bollworms), Earias insulata (Egyptian bollworm), *Earias vitella* (rough northern bollworm), *Ecdytopopha aurantianum, Elasmopalpus lignosellus* (lesser *cornstalk borer), Epiphysias postruttana (light brown apple moth), Ephestia spp. (flour moths), Ephestia cautella (almond moth), Ephestia elutella (tobbaco moth), Ephestia kuehniella (Mediterranean flour moth), Epimeces spp., Epinotia aporema, Erionota thrax (banana skipper), Eupoecilia ambiguella (grape berry moth), Euxoa auxiliaris (army cutworm), Feltia spp. (cutworms), Gortyna spp. (stemborers), Grapholita molesta (oriental fruit moth), Hedylepta indicata (bean leaf webber), Helicoverpa spp. (noctuid moths), Helicoverpa armigera (cotton bollworm), Helicoverpa zea (bollworm/corn earworm), Heliothis spp. (noctuid moths), Heliothis virescens (tobacco budworm), Hellula undalis (cabbage webworm), Indarbela spp. (root borers), Keiferia lycopersicella (tomato pinworm), Leucinodes orbonalis (eggplant*

fruit borer), Leucoptera malifoliella, Lithocollectis spp., Lobesia botrana (grape fruit moth), Loxagrotis spp. (noctuid moths), Loxagrotis albicosta (western bean cutworm), Lymantria dispar (gypsy moth), Lyonetia clerkella (apple leaf miner), Mahasena corbetti (oil palm bagworm), Malacosoma spp. (tent caterpillars), Mamestra brassicae (cabbage armyworm), Maruca testulalis (bean pod borer), Metisa plana (bagworm), Mythimna unipuncta (true armyworm), Neoleucinodes elegantalis (small tomato borer), Nymphula depunctalis (rice caseworm), *Operophthera brumata* (winter moth), *Ostrinia nubilalis* (European corn borer), *Oxydia vesulia, Pandemis cerasana* (common currant tortrix), *Pandemis heparana* (brown apple tortrix), *Papilio demodocus, Pectinophora gossypiella* (pink bollworm), *Peridroma* spp. (cutworms), *Peridroma saucia* (variegated cutworm), *Perileucoptera coffeella* (white coffee leafminer), *Phthorimaea operculella* (potato tuber moth), *Phyllocnisitis citrella, Phyllonorycter spp.* (leafminers), *Pieris rapae* (imported cabbageworm), *Plathypena scabra, Plodia interpunctella* (Indian meal moth), *Plutella xylostella* (diamondback moth), *Polychrosis viteana* (grape berry moth), *Prays endocarpa, Prays oleae* (olive moth), *Pseudaletia* spp. (noctuid moths), *Pseudaletia unipunctata* (armyworm), *Pseudoplusia includens* (soybean looper), *Rachiplusia nu, Scirpophaga incertulas, Sesamia* spp. (stemborers), *Sesamia inferens* (pink rice stem borer), *Sesamia nonagrioides, Setora nitens, Sitotroga cerealella* (Angoumois grain moth), *Sparganothis pilleriana, Spodoptera cosmioides* (lepidoptera), *Spodoptera spp.* (armyworms), *Spodoptera exigua* (beet armyworm), *Spodoptera fugiperda* (fall armyworm), *Spodoptera oridania eridania* (southern armyworm), *Spodoptera littoralis Diaphania nitidalis*, *Synanthedon spp.* (root borers), *Thecla basilides*, *Thermisia gemmatalis*, *Tineola bisselliella* (webbing clothes moth), *Trichoplusia ni* (cabbage looper), *Tuta absoluta, Yponomeuta spp., Zeuzera coffeae* (red branch borer) and *Zeuzera pyrina* (leopard moth).

[0220] In yet another embodiment, the insect pests are of the order Orthoptera, such as *Anabrus simplex* (Mormon cricket), *Gryllotalpidae* (mole crickets), *Locusta migratoria, Melanoplus* spp. (grasshoppers), *Microcentrum retinerve*

(angularwinged katydid), Pterophylla spp. (kaydids), *Chistocerca* gregaria, *Scudderia furcata* (forktailed bush katydid) and *Valanga nigricorni.*

[0221] In yet another embodiment, the insect pests are of the order Thysanoptera, such as Frankliniella fusca (tobacco thrips), Frankliniella occidentalis (western flower thrips), Frankliniella shultzei Frankliniella williamsi (corn thrips), *Heliothrips haemorrhaidalis* (greenhouse thrips), *Riphiphorothrips cruentatus, Scirtothrips spp., Scirtothrips citri* (citrus thrips), *Scirtothrips dorsalis* (yellow tea thrips), *Taeniothrips rhopalantennalis* and *Thrips* spp. *Diloboderus abderus* (coleoptera) and *Diabrotica speciosa* (coleoptera).

[0222] In an embodiment, Coleopteran insect pests may be selected from but not limited to *Acanthoscelides spp. (weevils), Acanthoscelides obtectus (common bean weevil), Agrilus planipennis (emerald ash borer), Agriotes spp. (wireworms), Anoplophora glabripennis (Asian longhorned beetle), Anthonomus spp. (weevils), Anthonomus grandis (boll weevil), Aphidius spp., Apion spp. (weevils), Apogonia spp. (grubs), Ataenius spretulus (Black Turgrass Ataenius), Atomaria linearis (pygmy mangold beetle), Aulacophore spp., Bothynoderes punctiventris (beet root weevil), Bruchus spp. (weevils), Bruchus pisorum (pea weevil), Cacoesia spp., Callosobruchus maculatus (southern cow pea weevil), Carpophilus hemipteras (dried fruit beetle), Cassida vittata, Cerosterna spp, Cerotoma spp. (chrysomeids), Cerotoma trifurcata (bean leaf beetle), Ceutorhynchus spp. (weevils), Ceutorhynchus assimilis (cabbage seedpod weevil), Ceutorhynchus napi (cabbage curculio), Chaetocnema spp. (chrysomelids), Colaspis spp. (soil beetles), Conoderus scalaris, Conoderus stigmosus, Conotrachelus nenuphar (plum curculio), Cotinus nitidis (Green June beetle), Crioceris asparagi (asparagus beetle), Cryptolestes ferrugineus (rusty grain beetle), Cryptolestes pusillus (flat grain beetle), Cryptolestes turcicus (Turkish grain beetle), Ctenicera spp. (wireworms), Curculio spp. (weevils), Cyclocephala spp. (grubs), Cylindrocpturus adspersus (sunflower stem weevil), Deporaus marginatus (mango leaf-cutting weevil), Dermestes*

lardarius (la rder beetle), Dermestes maculates (hide beetle), Diloboderus abderus (coleoptera), Diabrotica speciosa (coleoptera), Diabrotica spp. (chrysolemids), Epilachna varivestis (Mexican bean beetle), Faustinus cubae, Hylobius pales (pales weevil), Hypera spp. (weevils), Hypera postica (alfalfa weevil), Hyperdoes spp. (Hyperodes weevil), Hypothenemus hampei (coffee berry beetle), Ips spp. (engravers), Lasioderma serricorne (cigarette beetle), Leptinotarsa decemlineata (Colorado potato beetle), Liogenys futscus, Liogenys suturalis, Lissorhoptrus oryzophilus (rice water weevil), Lyctus spp. (wood beetles/powder post beetles), Maecolaspis joliveti, Megascelis spp., Melanotus communis, Meligethes spp., Meligethes aeneus (blossom beetle), Melolontha melolontha (common European cockchafer), Oberea brevis, Oberea linearis, Oryctes rhinoceros (date palm beetle), Oryzaephilus mercator (merchant grain beetle), Oryzaephilus surinamensis (sawtoothed grain beetle), Otiorhynchus spp. (weevils), Oulema melanopus (cereal leaf beetle), Oulema oryzae, Pantomorus spp. (weevils), Phyllophaga spp. (May/June beetle), Phyllophaga cuyabana, Phyllotreta spp. (chrysomelids), Phynchites spp., Popillia japonica (Japanese beetle), Prostephanus truncates (larger grain borer), Rhizopertha dominica (lesser grain borer), Rhizotrogus spp. (Eurpoean chafer), Rhynchophorus spp. (weevils), Scolytus spp. (wood beetles), Shenophorus spp. (Billbug), Sitona lineatus (pea leaf weevil), Sitophilus spp. (grain weevils), Sitophilus granaries (granary weevil), Sitophilus oryzae (rice weevil), Stegobium paniceum (drugstore beetle), Tribolium spp. (flour beetles), Tribolium castaneum (red flour beetle), Tribolium confusum (confused flour beetle), Trogoderma variabile (warehouse beetle) and Zabrus tenebioides.

[0223] In an embodiment, the insect pests are of the order Hemiptera, such as *Acrosternum hilare (green stink bug), Blissus leucopterus (chinch bug), Calocoris norvegicus (potato mind), Cimex hemipterus (tropical bed bug), Cimex lectularius (bed bug), Diaphorina citri e Tibraca limbativentris (hemíptera), Dagbertus fasciatus, Dichelops furcatus, Dichelops melacanthus, Dysdercus suturellus (cotton stainer), Edessa meditabunda, Eurygaster maura (cereal bug), Euschistus heros, Euschistus*

servus (brown stink bug), Helopeltis antonii, Helopeltis theivora (tea blight plantbug), Lagynotomus spp. (stink bugs), Leptocorisa oratorius, Leptocorisa varicornis, Lygus spp. (plant bugs), Lygus hesperus (western tarnished plant bug), Maconellicoccus hirsutus, Neurocolpus longirostris, Nezara viridula (southern green stink bug), Paratrioza cockerelli, Phytocoris spp. (plant bugs), Phytocoris californicus, Phytocoris relativus, Piezodorus guildinii, Poecilocapsus lineatus (fourlined plant bug), Psallus vaccinicola, Pseudacysta perseae, Scaptocoris castanea and Triatoma spp. (bloodsucking conenose bugs/kissing bugs).

[0224] In an embodiment, the insect pests are of the order Homoptera, such as *Acrythosiphon pisum (pea aphid), Adelges spp. (adelgids), Aleurodes proletella (cabbage whitefly), Aleurodicus disperses, Aleurothrixus floccosus (woolly whitefly), Aluacaspis spp., Amrasca bigutella, Aphrophora spp. (leafhoppers), Aonidiella aurantii (California red scale), Aphis spp. (aphids), Aphis gossypii (cotton aphid), Aphis pomi (apple aphid), Aulacorthum solani (foxglove aphid), Bemisia spp. (whiteflies), Bemisia argentifolii, Bemisia tabaci (sweet potato whitefly), Brachycolus noxius (Russian aphid), Brachycorynella asparagi (asparagus aphid), Brevennia rehi, Brevicoryne brassicae (cabbage aphid), Ceroplastes spp. (scales), Ceroplastes rubens (red bawax scale), Chionaspis spp. (scales), Chrysomphalus spp. (scales), Coccus spp. (scales), Dalbulius maidis (homóptera), substituir Mahanarva fimbriolata, por Mahanarva sp., Dysaphis plantaginea (rosy apple aphid), Empoasca spp. (leafhoppers), Eriosoma lanigerum (woolly apple aphid), Icerya purchasi (cottony cushion scale), Idioscopus nitidulus (mango leafhopper), Laodelphax striatellus (smaller brown planthopper), Lepidosaphes spp., Macrosiphum spp., Macrosiphum euphorbiae (potato aphid), Macrosiphum granarium (English grain aphid), Macrosiphum rosae (rose aphid), Macrosteles quadrilineatus (aster leafhopper), Mahanarva frimbiolata, Metopolophium dirhodum (rose grain aphid), Mictis longicornis, Myzus persicae (green peach aphid), Nephotettix spp. (leafhoppers), Nephotettix cinctipes (green leafhopper), Nilaparvata lugens (brown planthopper), Parlatoria pergandii (chaff scale),*

Parlatoria ziziphi (ebony scale), Peregrinus maidis (corn delphacid), Philaenus spp. (spittlebugs), Phylloxera vitifoliae (grape phylloxera), Physokermes piceae (spruce bud scale), Planococcus spp. (mealybugs), Pseudococcus spp. (mealybugs), Pseudococcus brevipes (pine apple mealybug), Quadraspidiotus perniciosus (San Jose scale), Rhapalosiphum spp. (aphids), Rhapalosiphum maida (corn leaf aphid), Rhapalosiphum padi (oat bird-cherry aphid), Saissetia spp. (scales), Saissetia oleae (black scale), Schizaphis graminum (greenbug), Sitobion avenae (English grain aphid), Sogatella furcifera (white-backed planthopper), Therioaphis spp. (aphids), Toumeyella spp. (scales), Toxoptera spp. (aphids), Trialeurodes spp. (whiteflies), Trialeurodes vaporariorum (greenhouse whitefly), Trialeurodes abutiloneus (bandedwing whitefly), Unaspis spp. (scales), Unaspis yanonensis (arrowhead scale) and Zulia entreriana.

[0225] In an embodiment, the preferred insect pest controlled is from the family of *Pentatonidae*.

[0226] In an embodiment, the preferred insect pest controlled is a stink bug.

[0227] In an embodiment, the present disclosure provides use of the agrochemical composition for controlling insects.

[0228] According to an aspect the present combinations/compositions are useful for controlling pests, particularly stink bugs.

[0229] In an embodiment the present combinations/compositions are useful for controlling adult and stink bug insects at the nymph stage, particularly in soybean plants.

[0230] In an embodiment, compositions according to the disclosure are applied to any and all developmental stages, such as egg, larva, pupa, and adult for prevention or control of insect pests.

[0231] In an embodiment, the pests may be controlled by contacting the target pest, its food supply, habitat, breeding ground or its locus with an insecticidally effective amount of the compositions described herein.

[0232] According to another aspect, the present disclosure provides a method of controlling or preventing unwanted pests on plants or propagation material thereof, said method comprising applying an agrochemically effective amount of the present combinations/compositions to the pests or to the plants or to their locus thereof.

[0233] In an embodiment, the present disclosure provides a method of predominantly controlling insect infestation at a locus, said method comprising administering to the locus the present combinations/compositions.

[0234] In another aspect of the present invention, there is provided a method of increasing yield in a crop by application of the present method using the present insecticide combination/compositions as described herein.

[0235] Yet another aspect of the present invention, provides a method of improving the crop health by application of the insecticide combination/composition.

[0236] In another aspect, the present invention provides a complete strategy towards managing and controlling targeted insects for agricultural sustainability as well as rising crop yield rates.

[0237] In an embodiment, the present combinations/compositions are effective for controlling stink bug in soybean plants.

[0238] In an embodiment, the present combinations/compositions are effective for controlling adult and stink bug insects at the nymph stage in soybean plants.

[0239] Stink bugs feed on numerous plants, which include native and ornamental trees, shrubs, vines, weeds, and other cultivated crops such as corn and cotton, as well as numerous uncultivated plants, and their preferred hosts are nearly all wild plants.

[0240] Stink bugs (order of Hemiptera, family of Pentatomidae) are animal pests and true bugs found as green stink bugs or brown stink bugs. These bugs are one of the most common pest problems in soybean plants. Among brown stink bugs, *Euschistus heros* is currently considered to be the most abundant species in Brazil, and it is a significant problem in soybean. Therefore, control of stinkbugs in soybean is often vital to prevent significant economic damage. However, there are increasing problems with insecticide resistance.

[0241] Thus, in this embodiment, the present disclosure can provide a method of controlling insect infestation at a locus, said method comprising contacting the target insect with the present combinations/compositions comprising:
(a) at least one insecticide selected from an organophosphate insecticide, neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof; and
(b) at least one plant growth regulator, a fertilizer, a nutrient, or combinations thereof.

[0242] In an embodiment, the method of the present disclosure may be carried out by applying the present combinations/compositions at the locus of the infestation.

[0243] Suitable application methods include inter alia soil treatment, seed treatment, in furrow application, and foliar application. Soil treatment methods include drenching the soil, drip irrigation (drip application onto the soil), dipping roots, tubers

or bulbs, or soil injection. Seed treatment techniques include seed dressing, seed coating, seed dusting, seed soaking, and seed pelleting. In furrow applications typically include the steps of making a furrow in cultivated land, seeding the furrow with seeds, applying the composition to the furrow, and closing the furrow. Foliar application refers to the application of the composition to plant foliage, e.g., through spray equipment. For foliar applications, it can be advantageous to modify the behaviour of the pests by use of pheromones in combination with the compounds of the present invention. Suitable pheromones for specific crops and pests are known to a skilled person.

[0244] For use in treating crop plants, for example by foliar application, the rate of application of the composition of this invention may be in the range from about 0.0001 grams per hectare (g/ha) to about 4000 g/ha.

[0245] In another embodiment, the rate of application of the composition of this invention may be in the range from about 1 g/ha to about 4000 g/ha.

[0246] In another embodiment, the rate of application of the composition of this invention may be in the range from about 50 g/ha to about 3500 g/ha.

[0247] In another embodiment, the rate of application of the composition of this invention may be in the range from about 100 g/ha to about 3000 g/ha.

[0248] In another embodiment, the rate of application of the composition of this invention may be in the range from about 500 g/ha to about 2500 g/ha.

[0249] In another embodiment, the rate of application of the composition of this invention may be in the range from about 1000 g/ha to about 2000 g/ha.

[0250] The active substance concentrations in ready-to-use formulations, which may be obtained after two-to-tenfold dilution, are preferably from about 0.01% w/w to about 80% w/w of total weight of the formulation.

[0251] Preferably, the method of controlling the insects comprises applying/administering to a crop, the locus thereof, or propagation material thereof with an insecticidally effective amount of present combinations/compositions, wherein the method is for controlling and/or preventing infestation of crop by insects preferably *Euschistus heros*. The administration is preferably by application either when first signs of infestation are seen, or when insect pests begin to reappear.

[0252] In a further aspect the invention provides a method of controlling and/or preventing infestation of *Euschistus heros* in soybean comprising applying to a crop of soybean plants, the locus thereof, or propagation material thereof, the composition comprising:
(a) at least one insecticide selected from an organophosphate insecticide, neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof; and
(b) at least one component selected from a plant growth regulator, a fertilizer, a nutrient, or combinations thereof.

[0253] The present invention also relates to a method of protecting plants from attack or infestation by *Euschistus heros* comprising contacting the plant, or the soil in which the plant is growing, with present agrochemical combination/compositions.

[0254] The invention also provides a method for the protection of plant propagation material, preferably seeds, and the seedlings' roots and shoots from *Euschistus heros* which comprises contacting the plant propagation material e.g., the seeds before sowing and/or after pre-germination with combinations/compositions of present invention.

[0255] In another aspect, the present invention provides a method of controlling insects wherein said method comprises applying concurrently or sequentially, insecticidally effective amounts of at least two insecticides, directly or indirectly to target insects, in the presence of at least one component selected from plant growth regulator, a fertilizer, a nutrient, or combinations thereof.

[0256] In another aspect, the present invention provides a method of preventing or controlling insects, wherein said method comprises applying concurrently or sequentially at a locus of a crop plant, the present combination comprising:
(a) at least one insecticide selected from an organophosphate insecticide, neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof; and
(b) at least one plant growth regulator, a fertilizer, a nutrient, or combinations thereof.

[0257] Preferably, the method comprises applying at least one insecticide selected from an organophosphate insecticide with a sequential application comprising:
(a) at least one insecticide selected from an organophosphate insecticide, neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof; and
(b) at least one plant growth regulator, a fertilizer, a nutrient, or combinations thereof, for effectively protecting plants from attack or infestation by *Euschistus heros*.

[0258] In an embodiment, the method of present invention significantly controls target insects within a period from about 0 days to about 30 days.
In an embodiment, the method of present invention significantly controls target insects within a period from about 0 days to about 15 days.

[0259] In an embodiment, the method of present invention significantly controls target insects within a period of from about 1 days to about 14 days.

[0260] In an embodiment, the method of present invention significantly controls target insects within a period of from about 2 days to about 12 days.

[0261] In an embodiment, the method of present invention significantly controls target insects within a period of from about 3 days to about 10 days.

[0262] In an embodiment, the method comprises applying an insecticidally effective amount of the combination comprising:
(a) at least one insecticide selected from an organophosphate insecticide, neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof; and
(b) at least one plant growth regulator, a fertilizer, a nutrient, or combinations thereof, within a period from about 0 days to about 30 days from the date of application of the insecticide(s).

[0263] In an embodiment, the method comprises applying the agrochemical composition comprising:
(a) from about 1% w/w to about 80% w/w of the insecticide;
(b) a fertilizer or a nutrient comprising from about 5% w/w to about 40% w/w of phosphorus and from about 10% w/w to about 50% w/w of a water-soluble potassium salt of total weight of the agrochemical composition; and
(c) from about 0.0001% w/w to about 10% w/w of the plant growth regulator of total weight of the agrochemical composition;
wherein the insecticide is selected from pyrethroid insecticide, neonicotinoid insecticide, or combinations thereof.

[0264] In an embodiment, the method comprises applying any one of the compositions as mentioned in the examples.

[0265] In an embodiment, the method comprises applying an insecticidally effective amount of the combination comprising:
(a) at least one insecticide selected from an organophosphate insecticide, neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof; and

(b) at least one plant growth regulator, a fertilizer, a nutrient or combinations thereof, concurrently or sequentially within a period from about 0 days to about 15 days.

[0266] In an embodiment, the method comprises applying an insecticidally effective amount of the combination comprising:
(a) at least one insecticide selected from an organophosphate insecticide, a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof; and
(b) at least one plant growth regulator, a fertilizer, a nutrient or combinations thereof, concurrently or sequentially within a period from about 3 days to about 10 days.

[0267] According to the method of the present invention, adults and nymphs of *Euschistus heros* were best controlled with the sequential application of an insecticidal combination/composition comprising:
(a) at least one insecticide selected from an organophosphate insecticide, a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof; and
(b) at least one plant growth regulator, a fertilizer, a nutrient or combinations thereof, within a period from about 3 days to about 7 days.

[0268] The present combinations may be applied to the locus of the plant in an insecticidally effective amount. The selection of the appropriate effective amounts depends on the density of insect infestation.

[0269] In an embodiment, the insecticides can be used in an amount of from about 1 g/ha to about 5000 g/ha.

[0270] In an embodiment, the insecticides can be used in an amount from about 5 g/ha to about 500 g/ha.

[0271] Therefore, in an embodiment, the present invention provides a method of controlling insects at a locus of a plant, the method comprising:

(a) applying at least one insecticide selected from an organophosphate insecticide, at the locus; and
(b) within about 3 days to about 15 days, applying at least one insecticide selected from a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof; and at least one plant growth regulator, a fertilizer, a nutrient, or combinations thereof, to the locus.

[0272] In another embodiment, the present invention provides a method of controlling insects at a locus of a plant, the method comprising:
(a) applying at least one insecticide selected from an organophosphate insecticide to the locus; and
(b) applying at least one insecticide selected from a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof; and at least one plant growth regulator, a fertilizer, a nutrient, or combinations thereof, to the locus, said application is at least about 3 days after the application of at least one insecticide selected from an organophosphate insecticide.

[0273] In another embodiment, the present invention provides a method of controlling insects at a locus of a plant, the method comprising:
(a) applying at least one insecticide selected from an organophosphate insecticide to the locus; and
(b) applying at least one insecticide selected from a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof; and at least one plant growth regulator, a fertilizer, a nutrient, or combinations thereof, to the locus, said application is at least about 7 days after the application of at least one insecticide selected from an organophosphate insecticide.

[0274] In an embodiment, the method of the present disclosure may be carried out by an application of a combination of acetamiprid, bifenthrin and a fertilizer composition, sequentially to the plants or parts thereof or at the locus or on the

surface of plant propagation material, wherein a subsequent application of the fertilizer is carried out, at a time interval of at least about 7 days.

[0275] In an embodiment, the method of the present disclosure may be carried out by an application of a combination of acetamiprid, bifenthrin and a fertilizer composition, sequentially at the plants or parts thereof or at the locus or on the surface of plant propagation material, wherein a subsequent application of the fertilizer is carried out, at a time interval of at least about 10 days after the preceding (or first) application.

[0276] In an embodiment, the method of the present disclosure may be carried out by an application of a combination of acetamiprid, bifenthrin and a subsequent application of a fertilizer, wherein the subsequent application of the fertilizer is carried out, at a time interval of at least about 10 days after the preceding application.

[0277] In an embodiment, the method of the present disclosure may be carried out by an application of a combination of acetamiprid, bifenthrin and a subsequent application of at least one component selected from a fertilizer, a nutrient a plant growth regulator or combinations thereof, wherein the subsequent application of the at least one component selected from a fertilizer, a nutrient a plant growth regulator is carried out, at a time interval of at least about 10 days after the preceding application.

[0278] In an embodiment, the method of the present disclosure may be carried out by an application of a composition of acetamiprid, bifenthrin and an agrochemical ingredient selected from a plant growth regulator, a fertilizer and a nutrient, wherein the said agrochemical ingredient selected from a plant growth regulator, a fertilizer and a nutrient, is sequentially applied at a time interval of at least about 10 days after the preceding application.

[0279] In another embodiment, the present invention provides a method of controlling insects at a locus of a plant, the method comprising:

(a) applying at least two insecticides selected from a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof to the locus;

(b) applying at least one insecticide selected from a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof and at least one component selected from a plant growth regulator, a fertilizer, a nutrient, or combinations thereof, to the locus; and

(c) applying at least one insecticide selected from an organophosphate insecticide, wherein each application is at about 10 days interval.

[0280] In an embodiment, the present invention provides a method of controlling insects at a locus of a plant, the method comprising:

(a) applying acephate and bifenthrin to the locus; and

(b) applying acetamiprid and bifenthrin and at least one component selected from a plant growth regulator, a fertilizer, a nutrient or combinations thereof, to the locus, said application is at least about 3 days after the application of acephate and bifenthrin.

[0281] In another embodiment, the present invention provides a method of controlling insects at a locus, the method comprising:

(a) applying acephate and bifenthrin to the locus;

(b) applying acetamiprid and bifenthrin and at least one component selected from a plant growth regulator, a fertilizer, a nutrient or combinations thereof, to the locus, said application is at least about 3 days after the application of acephate and bifenthrin; and

(c) applying acephate to the locus, said application is at least 3 days after the application of acetamiprid and bifenthrin and at least one component selected from a plant growth regulator, a fertilizer, a nutrient, or combinations thereof.

[0282] In another embodiment, the present invention provides a method of controlling insects at a locus of a plant, the method comprising:

(a) applying acephate and bifenthrin to the locus; and

(b) applying combination of at least one insecticide selected from a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof and at least one plant growth regulator, a fertilizer, a nutrient or combinations thereof, to the locus, said application is at least about 10 days after the application of at least one insecticide selected from an organophosphate insecticide.

[0283] In an embodiment, the insecticide selected from a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof, is applied from about 0.5 g/ha to about 3000 g/ha.

[0284] In an embodiment, the insecticide selected from a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof, is applied from about 0.5 g/ha to about 1500 g/ha.

[0285] In another embodiment, the insecticide selected from a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof, is applied from about 1.0 g/ha to about 1200 g/ha.

[0286] In another embodiment, the agrochemical composition comprises at least two insecticides selected from a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof. In an embodiment the neonicotinoid insecticide and the pyrethroid insecticide or a combination thereof are applied in a weight ratio from about 1 to about 1000.

[0287] In an embodiment, the neonicotinoid insecticide is acetamiprid and the pyrethroid insecticide is bifenthrin.

[0288] In an embodiment, the present composition comprises the insecticides, acetamiprid and bifenthrin in a weight ratio from about 1:1000 to about 1000:1.

[0289] In another embodiment, the present composition comprises the insecticides, acetamiprid and bifenthrin in a weight ratio of about 1000:1, from about 1:500 to about 500:1, from about 1:300 to about 300:1, from about 1:100 to about 100:1, from about 1:50 to about 50:1 or from about 1:25 to about 25:1, from about 1:10 to about 10:1, from about 1:5 to about 5:1, from about 1:3 to about 3:1, from about 1:2.5 to about 2.5:1, or preferably of about 1:1.

[0290] In an embodiment, the present disclosure may be carried out by an application of a composition comprising a fertilizer in an amount from about 0.01% to about 50% w/w of total weight of the composition.

[0291] The combinations of the invention or the pesticidal compositions comprising them may be used to protect growing plants and crops from attack or infestation by animal pests, especially from stink bugs, in particular from *Euschistus*, more particularly from *E. heros*, by contacting the plant/crop with an insecticidally effective amount of compositions of the invention.

[0292] Described herein are pesticidal compositions for the control of *Pentatomidae* pests, particularly stink bugs, comprising an agrochemical pesticide in combination with at least one another active component selected from plant growth regulator, fertilizer, micronutrients, or combinations thereof.

[0293] Thus, in an embodiment, the method of the present disclosure may be carried out by applying the composition to the locus of the infestation.

[0294] In an embodiment, the composition is applied at an application rate of about 1000 g/ha.

[0295] Typically, the active ingredient concentration is 62.5 g a.i./ha of bifenthrin and 62.5 g a.i./ha of acetamiprid.

[0296] The method of the present disclosure can be carried out by application of the compositions to the soil or foliar applications at a preferred rate of application from about 50 L/ha to about 200 L/ha. In an embodiment, the application rate is preferably from about 100 L/ha to about 150 L/ha.

[0297] The method of the present disclosure can be carried out by application of the compositions to the soil at a preferred rate of application from about 0.10 L/ha to about 10 L/ha.

[0298] The method of the present disclosure can be carried out by application of the compositions to the soil at a preferred rate of application is from about 1 L/ha to about 4 L/ha.

[0299] The method of the present disclosure can be carried out by application of the compositions to the soil at a preferred rate of application is from about 1 L/ha to about 3 L/ha.

[0300] In an embodiment, the method comprises use of the compositions of the invention include those prepared by premixing prior to application, e.g., as a ready mix or tank mix, or by simultaneous application or sequential application to the plant.

[0301] For use in treating crop plants, e.g., by foliar application, the rate of application of the composition of this invention may be in the range of 0.0001 g/ha to 4000 g/ha.

[0302] Typically, the composition according to the disclosure are applied from a pre-dosage device, a knapsack sprayer, a spray tank, a spray plane, or an irrigation system. Typically, the agrochemical composition is made up with water, buffer, and/or further auxiliaries to the desired application concentration and the ready-to-use spray liquor or the agrochemical composition according to the disclosure is thus obtained.

[0303] In an embodiment, the method of the present disclosure may be carried out by applying the combination either sequentially or together, either in the form of a tank mix or a pre-formulated (pre-mix) composition.

[0304] The method of application comprises contacting the pests, their food supply, habitat or breeding grounds with a pesticidal composition comprising an agrochemical active ingredient and at least one plant growth regulator or fertilizer or a micronutrient.

[0305] The administration is preferably by application either when first signs of infestation are seen or when insect pests begin to reappear.

[0306] In an aspect, the present disclosure provides a method of improving yield of a plant, said method comprising application of compositions of present disclosure at the locus of the plant, such that the combination controls harmful insects.

[0307] In an aspect, the present disclosure provides a kit-of-parts comprising a component of an insecticide comprising a neonicotinoid, a pyrethroid, or a combination thereof; a second component comprising an agrochemical ingredient comprising a nutrient or a fertilizer or a plant growth regulator, or combinations thereof.

[0308] In another aspect, the present disclosure can provide a multi-pack insecticidal product for controlling insects at a locus, said product comprising:
(a) a first container comprising one or more insecticides,
(b) a second container comprising a composition of plant health regulator, fertilizer, micronutrient, or combination thereof; and
(c) an instruction manual instructing a user to mix the contents of said first and second containers and administer the compositions to the locus.

[0309] The method of the present disclosure can offer some particular advantages over the prior art. The novel method of the present disclosure helps improves yields and promotes plant health and has no measurable phytotoxicity.

[0310] In view of the above, it will be seen that the several advantages of the invention are achieved, and other advantageous results attained. Although the present invention has been disclosed in full, it will be understood that numerous additional modifications and variations could be made thereto without departing from the scope of the invention. The embodiments may be combined together for better understanding of the invention, without departing from the scope of the invention.

[0311] In another embodiment, alternative or multiple embodiments of the invention disclosed herein are not to be construed as limitations. Each embodiment can be referred to and claimed individually or in any combination with other embodiments of the invention. One or more embodiments of the invention can be included in, or deleted from, the invention for reasons of convenience and/or patentability.

[0312] The invention will now be described in more details with reference to the following examples. While the foregoing written description of the invention enables one of ordinary skill to make and use what is considered presently to be the best mode thereof, those of ordinary skill will understand and appreciate the existence of variations, combinations, and equivalents of the specific embodiment, method, and

examples herein. The invention should therefore not be limited by the above-described embodiment, method, and following examples, but by all embodiments and methods within the scope and spirit of the invention.

EXAMPLES:

[0313] Example 1: Acetamiprid-Bifenthrin-Gibberellic acid WDG composition

Sr. No.	Ingredients	Quantity (% w/w)
1.	Acetamiprid	5.625
2.	Bifenthrin	5.625
3.	Sodium Naphthalene sulfonate modified	5.10
4	Gibberellic Acid	0.0012
5.	Sodium diisopropyl naphthalene sulfonate	0.85
6.	Potassium phosphate	14.71
7.	Potassium chloride	27.08
8.	Filler	Q.S.
Total		100

[0314] Process: Acetamiprid, bifenthrin, gibberellic acid and other ingredients were added sequentially under constant stirring. The mixture was stirred until complete homogenization. The mixture was then grinded in the air mill. The dough was prepared by adding sufficient amount of water to obtain granules. The granules thus obtained were dried to obtain the WDG composition.

[0315] Example 2: Acetamiprid-Bifenthrin-Gibberellic acid WDG composition

Sr. No.	Ingredients	Quantity (% w/w)
1.	Acetamiprid	6.875
2.	Bifenthrin	6.875
3.	Sodium Naphthalene sulfonate modified	6.90
4.	Gibberellic Acid	0.0048
5.	Sodium diisopropyl naphthalene sulfonate	1.15
6.	Potassium phosphate	19.91
7.	Potassium chloride	36.64
8.	Filler	Q.S.
Total		100

[0316] The process of preparation of the composition in Example 2 is same as Example 1.

[0317] Example 3: Acetamiprid-Bifenthrin-Gibberellic acid WDG composition

[0318]

Sr. No.	Ingredients	Quantity (% w/w)
1.	Acetamiprid	5.625 – 6.875
2.	Bifenthrin	5.625 – 6.875
3.	Sodium Naphthalene sulfonate modified	5.10 – 6.90
4.	Ammonium sulfate	3.67 – 4.97

5.	Sodium diisopropyl naphthalene sulfonate	0.85 – 1.15
6.	Potassium phosphate	14.71 – 19.91
7.	Potassium chloride	27.08 – 36.64
8	Gibberellic acid	0.0012 – 0.0048
9.	Filler	Q.S.
Total		100

[0319] The process of preparation of the composition in Example 3 is same as Example 1.

[0320] Example 4: Bio-efficacy study - % Control of nymph insect pests of *Euschistus heros* in soybean

[0321] Trials were conducted to evaluate the efficacy of control for *Euschistus heros* in soybean. The components of the agrochemical combinations were applied at a dose rate of (spray volume) about 150 L/ha.

Methodology:

[0322] 3 sprays (ABC) with 10 days interval, the first (A) at the beginning of the infestation (1 stink bug/beat/plot). Pest infestation, before first spray (0 DA-A) and 3 and 10 days after each spray (BC).

Table 1: % Control on pests of *E. heros*

Pest Scientific Name				*Euschistus heros*		
Crop Name				Soybean		
Description				3 DA-B	3 DA-C	10 DA-C
Part Rated				Nymph Insect	Nymph insect	Total insect
Rating Type				Control	Control	Control
Rating Unit				%	%	%
Sr. No.	**Treatment Name**	**Rate (g a.i. /ha)**	**Application Code**			
1	Untreated check	--	--	0.00	0.00	0.00
2	Acephate + Bifenthrin	880	A	62.50	40.00	36.39
	Acetamiprid +	125	BC			
3	Acephate + Bifenthrin	880	A	82.50	88.75	56.11
	Acetamiprid + Bifenthrin	125	BC			
	Potassium oxide + Phosphorus pentoxide	680	BC			

**Total insect control refers to control of adult and nymph stink bugs.*

[0323] It was concluded that the treatment with combination of acetamiprid and bifenthrin and the fertilizers effectively controlled stink bugs at the nymph stage as well as improved the plant health and crop yield.

Example 5: Bio-efficacy study - % Control of nymph insect pests of *Euschistus heros* in soybean

[0324] Trials were conducted to evaluate the efficacy of control for *Euschistus heros* in soybean. The components of the agrochemical combinations were applied for the same.

Table 2: % Control on pests of *E. heros*

Sr. No.	**Treatment Name**	**Rate (g a.i./ ha)**	**Application code**	***Euschistus heros* in Soybean Nymph Control (%) 3 DA-B**
1	Untreated Check	0	--	0
2	Acephate + Bifenthrin	880	A	67.57
	Acetamiprid + Bifenthrin	125	B	
	Acephate	970	C	
4	Acephate + Bifenthrin	880	A	85.29
	Acetamiprid + Bifenthrin	125	B	
	Acephate	970	C	
	Potassium oxide + Phosphorus pentoxide	680	B	

[0325] It was concluded that the treatment with combination of acetamiprid, bifenthrin, acephate and the fertilizers effectively controlled stink bugs at the nymph stage in soybean crop.

Example 6: Bio-efficacy study - % Control of nymph and adult insect pests of *Euschistus heros* in soybean

[0326] Trials were conducted to evaluate the efficacy of control for *Euschistus heros* in soybean. The components of the agrochemical combinations were applied for the same.

Table 3: % Control on pests of *E. heros*

Sr. No.	**Treatment Name**	**Rate (g a.i./ ha)**	**Application Code**	***Euschistus heros* Soybean**	
				Control (%)	
				Nymph	**Adult**
				10 DA-B	**10 DA-C**
1	Untreated Check	0	--	0	0
2	Acephate + Bifenthrin	880	A	50.00	50.00
	Acetamiprid + Bifenthrin	125	B		
	Acephate	970	C		
4	Acephate + Bifenthrin	880	A	91.03	89.74
	Acetamiprid + Bifenthrin	125	B		
	Acephate	970	C		
	Potassium oxide + Phosphorus pentoxide	680	B		

[0327] It was concluded that the treatment with combination of acephate + bifenthrin, followed by acetamiprid + bifenthrin, followed by fertilizers effectively controlled stink bugs at the nymph stage and the adult stage in soybean crop.

Example 7: Bio-efficacy study - % Control of nymph insect pests of *Euschistus heros* in soybean

[0328] Trials were conducted to evaluate the efficacy of control for *Euschistus heros* in soybean. The components of the agrochemical combinations were applied for the same.

Table 4: % Control on pests of *E. heros*

Sr. No.	**Treatment Name**	**Rate (g a.i./ Ha)**	**Application Code**	**Control (%)**	
				Adult insect 3 DA-B	**Total insect 3 DA-B**
				***Euschistus heros* soybean**	
1	Untreated Check	0	--	0.00	0.00
2	Acephate + Bifenthrin	880	A	75.00	75.00
	Acetamiprid + Bifenthrin	125	BC		
3	Acephate + Bifenthrin	880	A	87.50	93.75
	Acetamiprid + Bifenthrin	125	BC		
	Potassium oxide + Phosphorus pentoxide	680	BC		

[0329] It was concluded that the treatment with combination of acephate + bifenthrin; followed by acetamiprid + bifenthrin; and the fertilizers effectively controlled stink bugs at the adult stage along with control in total insects in the soybean crop.

Example 8: Bio-efficacy study - % Control of insect pests of *Euschistus heros* in soybean

[0330] Trials were conducted to evaluate the efficacy of control for *Euschistus heros* in soybean. The components of the agrochemical combinations were applied for the same.

Table 5: % Control on pests of *E. heros*

Sr. No.	**Treatment**	**Rate g ai/ha**	**Application Code**	**Total insect Control (%) 10 DA-C**
1	Untreated Check	0	--	0.00
2	Acephate + Bifenthrin	880	A	52.78
	Acetamiprid + Bifenthrin	125	B	
	Acephate	970	C	
3	Acephate + Bifenthrin	880	A	75.68
	Acetamiprid + Bifenthrin	125	B	
	Acephate	970	C	
	Potassium oxide + Phosphorus pentoxide	680	B	

[0331] It was concluded that the treatment with combination of acephate + bifenthrin; followed by acetamiprid + bifenthrin; followed by acephate; and the fertilizers effectively controlled stink bugs for total insects in the soybean crop.

Example 9: Bio-efficacy study - % Control of adult insect pests

[0332] Trials were conducted to evaluate the efficacy of control for adult insect pests. The components of the agrochemical combinations were applied for the same.

Table 6: % Control of adult insect pests

Sr. No.	**Treatment Name**	**Rate (g a.i./ha)**	**Application Code**	**Adult insect Control (%) 3 DA-B**	**Adult insect Control (%) 3 DA-C**
1	Untreated Check	0	--	0.00	0.00
2	Acephate + Bifenthrin	880	A	43.75	62.50
	Acetamiprid + Bifenthrin	125	B		
	Acephate	970	C		
3	Acephate + Bifenthrin	880	A	68.75	100.00
	Acetamiprid + Bifenthrin	125	B		
	Acephate	970	C		
	Potassium oxide + Phosphorus pentoxide	680	B		

[0333] It was concluded that the treatment with combination of acephate & bifenthrin; acetamiprid & bifenthrin; acephate; and the fertilizers effectively controlled adult insect pests.

Example 10: Acetamiprid-Bifenthrin-Gibberellic acid WDG composition

Sr. No.	Ingredients	Quantity (% w/w)
1.	Acetamiprid	6.38
2.	Bifenthrin	6.38
3.	Gibberellic Acid	0.0040
4	Sodium naphthalene sulfonate modified	6.00
5.	Sodium lignosulfonate	6.00
6.	Sodium diisopropyl naphthalene sulfonate	1.00
7.	Monopotassium phosphate	17.31
8.	Potassium chloride	31.86
9.	Ammonium sulfate	4.32
10.	Lactose Monohydrate	8.00
11.	Disodium octaborate tetrahydrate	0.0050
12.	Magnesium sulfate monohydrate	0.150
13.	Polydimethylsiloxane emulsion	0.50
14.	Filler	Q.S.
Total		100

[0334] Process: Acetamiprid, bifenthrin, gibberellic acid and other ingredients were added sequentially under constant stirring. The mixture was stirred until complete homogenization. The mixture was then grinded in the air mill. The dough was prepared by adding sufficient amount of water to obtain granules. The granules thus obtained were dried to obtain the WDG composition.

Example 11: Physico-chemical stability study

[0335] The composition in Example 10 was evaluated for its physico-chemical stability at accelerated heat stability (AHS) conditions.

Table 7: Physico-chemical stability study

Parameters	**Initial**	**14 days (54°C)**
Moisture (%)	1.86	1.46
pH (Solution 1% 20 ppm)	5.60	5.43
Suspensibility @20 ppm, % m/m	100.00	100.00
Suspensibility @342 ppm, % m/m	100.00	98.00
Wet sieve (100 mesh) % w/w	0.00	0.02
Particle size, D_{50}	2.90	3.09
Particle size, D_{90}	8.10	8.30
Assay Acetamiprid, g/Kg	64.06	63.30
Acetamiprid degradation, %	-	-1.19
Assay Bifenthrin, g/Kg	62.54	62.10
Bifenthrin degradation, %	-	-0.70

[0336] It was observed that the composition exhibits physico-chemical stability at AHS conditions. The composition is stable for 14 days AHS at 54°C.

Example 12: Evaluation of gibberellic acid on the yield in soybean

[0337] Trials were conducted to evaluate the yield in soybean for compositions of acetamiprid, bifenthrin and gibberellic acid; wherein the compositions comprise different concentrations of gibberellic acid. The compositions were applied at a dose rate (spray volume) of about 150 L/ha for single spray (A) application.

Table 8: Yield (bags/ha) in soybean

Sr. No.	**Treatment Name**	**Rate (g a.i./ha)**	**Formulation Type**	**Yield (bags/ha)**
1	Acetamiprid + Bifenthrin	62.5, 62.5	WDG	75.7

2	Acetamiprid + Bifenthrin + Potassium oxide + Phosphorus pentoxide + Gibberellic acid	62.5, 62.5, 500, 180, 0.012 ppm	WDG	72.1
3	Acetamiprid + Bifenthrin + Gibberellic acid	62.5, 62.5, 0.012 ppm	WDG	75.6
4	Acetamiprid + Bifenthrin + Gibberellic acid	62.5, 62.5, 0.024 ppm	SC	72.7
5	Acetamiprid + Bifenthrin + Gibberellic acid	62.5, 62.5, 0.036 ppm	WDG	76.7
6	Acetamiprid + Bifenthrin + Gibberellic acid	62.5, 62.5, 0.048 ppm	WDG	72.2

[0338] It was concluded that the treatment with the composition comprising acetamiprid + bifenthrin + gibberellic acid provided improved yield in soybean crop.

Example 13: Evaluation of gibberellic acid on thousand kernel weight (TKW) of soybean

[0339] Trials were conducted to evaluate the TKW of soybean for compositions of acetamiprid, bifenthrin and gibberellic acid; wherein the compositions comprise different concentrations of gibberellic acid. The compositions were applied at a dose rate (spray volume) of about 150 L/ha for single spray (A) application.

Table 9: TKW of soybean

Sr. No.	Treatment Name	Rate (g a.i./ha)	TKW in soybean	
			Trial 1	Trial 2
1	Acetamiprid + Bifenthrin	62.5, 62.5	162.3	128.5
2	Acetamiprid + Bifenthrin + Potassium oxide + Phosphorus pentoxide + Gibberellic acid	62.5, 62.5, 500, 180, 0.012 ppm	161.3	127.5
3	Acetamiprid + Bifenthrin + Gibberellic acid	62.5, 62.5, 0.012 ppm	162.1	128.8
4	Acetamiprid + Bifenthrin + Gibberellic acid	62.5, 62.5, 0.024 ppm	156.8	128.4
5	Acetamiprid + Bifenthrin + Gibberellic acid	62.5, 62.5, 0.036 ppm	164.0	129.5
6	Acetamiprid + Bifenthrin + Gibberellic acid	62.5, 62.5, 0.048 ppm	159.8	127.8

[0340] It was concluded that the treatment with the composition comprising acetamiprid + bifenthrin + gibberellic acid provided improved TKW of soybean crop.

Example 14: Evaluation of gibberellic acid for % control of nymphs + adult insects in soybean

[0341] Trials were conducted to evaluate the % control of nymphs + adult insects in soybean for compositions of acetamiprid, bifenthrin and gibberellic acid; wherein the

compositions comprise different concentrations of gibberellic acid. The compositions were applied at a dose rate (spray volume) of about 150 L/ha for three sprays (ABC). The first at the beginning of the infestation; the second and third at 3 and 10 days after each spray.

Table 10: % control of nymphs + adult insects in soybean

Sr. No.	**Treatment Name**	**Rate (g a.i./ha)**	**% Control of Nymphs + Adults**
1	Acetamiprid + Bifenthrin	62.5, 62.5	62.7
2	Acetamiprid + Bifenthrin + Potassium oxide + Phosphorus pentoxide + Gibberellic acid	62.5, 62.5, 500, 180, 0.012 ppm	68.6
3	Acetamiprid + Bifenthrin + Gibberellic acid	62.5, 62.5, 0.012 ppm	55.8
4	Acetamiprid + Bifenthrin + Gibberellic acid	62.5, 62.5, 0.024 ppm	56.5
5	Acetamiprid + Bifenthrin + Gibberellic acid	62.5, 62.5, 0.036 ppm	73.6
6	Acetamiprid + Bifenthrin + Gibberellic acid	62.5, 62.5, 0.048 ppm	68.8

[0342] It was concluded that the treatment with the composition comprising acetamiprid + bifenthrin + gibberellic acid provided improved % control of nymphs + adult insects.

Example 15: Evaluation of gibberellic acid for % grain without damage

[0343] Trials were conducted to evaluate the % grain without damage for compositions of acetamiprid, bifenthrin and gibberellic acid; wherein the compositions comprise different concentrations of gibberellic acid. The compositions were evaluated based on Tetrazolium test. The compositions were applied at a dose rate (spray volume) of about 150 L/ha for three sprays (ABC). The first at the beginning of the infestation; the second and third at 3 and 10 days after each spray.

Table 11: % grain without damage

Sr. No.	**Treatment Name**	**Rate (g a.i./ha)**	**% Grain without damage**
1	Acetamiprid + Bifenthrin	62.5, 62.5	80.8
2	Acetamiprid + Bifenthrin + Potassium oxide + Phosphorus pentoxide + Gibberellic acid	62.5, 62.5, 500, 180, 0.012 ppm	80.0
3	Acetamiprid + Bifenthrin + Gibberellic acid	62.5, 62.5, 0.012 ppm	73.8
4	Acetamiprid + Bifenthrin + Gibberellic acid	62.5, 62.5, 0.024 ppm	77.3
5	Acetamiprid +	62.5,	87.5

	Bifenthrin + Gibberellic acid	62.5, 0.036 ppm	
6	Acetamiprid + Bifenthrin + Gibberellic acid	62.5, 62.5, 0.048 ppm	78.3

[0344] It was concluded that the treatment with the composition comprising acetamiprid + bifenthrin + gibberellic acid provided improved % grain without damage.

Claims

We Claim:

1. An agrochemical combination for insect control, the combination comprising:
   (a) at least one insecticide; and
   (b) at least one agrochemically active ingredient comprising a plant growth regulator, a fertilizer, a nutrient, or combinations thereof.

2. The combination as claimed in claim 1, wherein the insecticide is selected from the group comprising an organophosphate insecticide, a neonicotinoid insecticide, a pyrethroid insecticide, or combinations thereof.

3. The combination as claimed in claim 2, wherein the insecticide is selected from the group comprising acephate, acetamiprid, imidacloprid, bifenthrin, or combinations thereof.

4. The combination as claimed in claim 1, wherein the plant growth regulator is selected from the group comprising auxin, gibberellin, gibberellic acid, cytokinin, abscisic acid, ethylene, or combinations thereof.

5. The combination as claimed in claim 1, wherein the fertilizer is selected from the group comprising phosphorus pentoxide, phosphorus trioxide, phosphorus monoxide, organophosphates, potassium phosphate, monopotassium phosphate, sodium phosphate, potassium chloride, potash, potassium oxide, ammonium sulfate, ammonium nitrate, ammonium chloride, urea, lime, nitrogen, sulfur, magnesium, or combinations thereof.

6. The combination as claimed in claim 1, wherein the nutrient is selected from the group comprising zinc, nickel, molybdenum, copper, boron, calcium, manganese,

iron, disodium octaborate tetrahydrate, magnesium sulfate monohydrate, or combinations thereof.

7. The combination as claimed in claim 1, wherein the combination comprises:
   (a) at least two insecticides; and
   (b) at least one agrochemically active ingredient comprising a plant growth regulator, a fertilizer, a nutrient, or combinations thereof.

8. An agrochemical composition for insect control, the composition comprising:
   (a) at least two insecticides;
   (b) a plant growth regulator; and
   (c) at least one agrochemically acceptable excipient.

9. The composition as claimed in claim 8, wherein the composition comprises:
   (a) at least two insecticides comprising acetamiprid and bifenthrin;
   (b) the plant growth regulator comprising gibberellic acid; and
   (c) at least one agrochemically acceptable excipient.

10. The composition as claimed in claim 8, wherein the insecticide is present in an amount from about 1% w/w to about 70% w/w of total weight of the composition.

11. The composition as claimed in claim 8, wherein the plant growth regulator is present in an amount from about 0.0001% w/w to about 10% w/w of total weight of the composition.

12. The composition as claimed in claim 9, wherein acetamiprid and bifenthrin are present in a weight ratio from about 1:10 to about 10:1.

13. The composition as claimed in claim 8, wherein the composition is present in a form of water dispersible granules.

14. Use of the agrochemical composition as claimed in claim 8, for controlling insects.

15. A method of controlling insects comprises applying to the insects or locus thereof, an agrochemical composition comprising at least two insecticides; and a plant growth regulator.

16. The method as claimed in claim 15, wherein the composition is applied in a range from about 500 g/ha to about 2500 g/ha.

INTERNATIONAL SEARCH REPORT

International application No
PCT/BR2023/050132

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01N47/40 A01N53/00 A01N45/00 A01N47/04 A01N25/14
A01P7/04
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A01N A01P

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, CHEM ABS Data, WPI Data, BIOSIS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2018/130900 A1 (UPL LTD [IN]) 19 July 2018 (2018-07-19)	1-3,7
Y	abstract page 1, lines 4-6 page 3, lines 1-16 page 9, lines 1-12 page 12, lines 17-25 page 14, lines 15-18 example 2	1-16

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[x] Further documents are listed in the continuation of Box C.

[x] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
19 June 2023	29/06/2023

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Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2016/087499 A1 (AKZO NOBEL CHEMICALS INT BV [NL]) 9 June 2016 (2016-06-09)	1-3,5,6
Y	abstract page 4, line 30 - page 9, line 14 page 10, line 15 - page 12, line 18; table 1 Imiadcloprid, bifenthrin; page 19 - page 21; example 1; table 2 examples 3-4, 9-10	1-16
X	Anon.: "Imid-Bifen 01.5 Lawn + Fertiliser", , 29 June 2009 (2009-06-29), pages 1-10, XP093053031, Retrieved from the Internet: URL:https://www3.epa.gov/pesticides/chem_search/ppls/042750-00156-20091006.pdf [retrieved on 2023-06-09]	1-3,7
Y	pages 3-4, 6	1-16
X	JAN SADAF ET AL: "Plant growth regulators: a sustainable approach to combat pesticide toxicity", 3 BIOTECH, vol. 10, no. 11, 8 October 2020 (2020-10-08), XP093053018, DE ISSN: 2190-572X, DOI: 10.1007/s13205-020-02454-4 Retrieved from the Internet: URL:https://link.springer.com/article/10.1007/s13205-020-02454-4/fulltext.html>	1-3
Y	abstract page 465 - page 466; table 1 page 466, right-hand column, line 32 - left-hand column, line 10	1-16
X	CN 104 814 030 A (SHANDONG PEANUT RES INST) 5 August 2015 (2015-08-05)	1-4
Y	abstract paragraphs [0001], [0007], [0013], [0048] - [0050]; claims 1-8	1-16

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INTERNATIONAL SEARCH REPORT

International application No
PCT/BR2023/050132

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	STEINHAUS EDUARDO A ET AL: "Intra- and Interspecific Variation in the Susceptibility to Insecticides of Stink Bugs (Hemiptera: Pentatomidae) That Attack Soybean and Maize in Southern Brazil", JOURNAL OF ECONOMIC ENTOMOLOGY, vol. 115, no. 2, 13 April 2022 (2022-04-13), pages 631-636, XP093052987, US ISSN: 0022-0493, DOI: 10.1093/jee/toac013 Retrieved from the Internet: URL:https://academic.oup.com/jee/article-pdf/115/2/631/43375270/toac013.pdf> abstract page 631, left-hand column, line 1 - page 632, left-hand column, line 38 page 633; table 2 page 634, left-hand column, line 1 - page 634, left-hand column, line 4 page 635, left-hand column, lines 38-49 -----	1-16
X	WO 2022/018765 A1 (RAJDHANI PETROCHEMICALS PRIVATE LTD [IN]) 27 January 2022 (2022-01-27) abstract page 1, lines 3-8 page 2, lines 17-20 page 2, line 25 - page 3, line 20 examples 1, 3-5, 7 -----	1-16

INTERNATIONAL SEARCH REPORT

Information on patent family members

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