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(54) Title: SYNERGISTIC PESTICIDAL COMPOSITION OF INSECTICIDES AND FUNGICIDES

(57) Abstract: A synergistic pesticidal composition comprising of bioactive amount of an insecticide selected from class of diamide, metadiamide, isoxazoline or mixtures thereof; a fungicide selected from class of triazoles; and at least one more insecticide selected from various class with different mode of action or mixture thereof. The present invention further relates to process for preparing the said compositions in specific ratio. The present invention further relates to the process for preparing the said composition along with at least one inactive excipient; and formulations thereof. The present invention further relates to the synergistic pesticidal compositions, wherein active ingredient present in fixed ratio shows synergy in a pesticidal activity.

WO 2022/034611 A1

Title– **SYNERGISTIC PESTICIDAL COMPOSITION OF INSECTICIDES AND FUNGICIDES**

FIELD OF THE INVENTION:

The present invention relates to a synergistic pesticidal composition comprising of bioactive amounts of (A) an insecticide selected from class of diamide, metadiamide, isoxazoline or mixtures thereof; (B) a fungicide selected from class of triazoles; and (C) at least one more insecticide selected from various class with different mode of action or mixture thereof. The present invention further relates to the preparation of the said composition in specific ratio. The present invention further relates to process of preparing said composition along with at least one inactive excipients and formulation thereof.

BACKGROUND OF THE INVENTION:

Combination of insecticides and fingicides are used to broaden the spectrum of control of insect and fungi, to improve the pest control with synergistc effect, reduce dosage, thereby reducing environmental impact, to broaden the spectrum of control, i.e. chewing and sucking insects and fungal disease at a time, decrease chances of resistance development and to enhance residual control so lesser the number of sprays for crop protections and minimizing the pesticidal load in ecosystem. The combination of insecticides and fungicide at times demonstrate an additive or synergistic effect that results in an improved control on insect-pests and diseases.

Insecticide or pesticides are used widely and very frequently in commercial agriculture and have enabled an enormous increase in crop yields and product quality which ultimately increased the ease to farmers in term of economic advantage as well as ease of farming activities.

There are many combinations of insecticide along with fungicides known in the art for the control of soil borne pests. For example, AU2011295864B2 relates to certain pyrazole derivatives, their N-oxides and salts, and to mixtures and compositions comprising such pyrazole derivatives and methods for using such pyrazole derivatives and their mixtures and compositions as fungicides. In the said invention the inventors show a synergistic mixture of chlorantraniliprole and prothioconazole.

US9149044B2 discloses combinations suitable for agricultural use can include (I) a nematode-antagonistic biocontrol agent and (II) one or more agents selected, independently of each other, from any one of (A) to (H): (A) at least one fungicide; (B) at least one insecticide; (C) at least one synthetic nematicide; (D) bacterium of the genus Bacillus; (E) Harpin; (F) Isoflavones; (G) Plant growth regulators; and/or (H) Plant activators. The aforesaid invention include Prothioconazole as one of the preferred fungicide and Pymetrozine as one of the preferred insecticidal compound.

US10076119B2 relates to pesticidal mixtures comprising one biological compound and at least one fungicidal, insecticidal or plant growth regulating compound as defined herein and respective agricultural uses thereof. The said invention discloses Prothioconazole as one of the preferred fungicidal compounds and triflumezopyrim as one of the preferred insecticidal compound.

EP2910126A1 relates to novel active compound combinations comprising at least one known compound of the formula (I) and at least one further active compound, which combinations are highly suitable for controlling animal pests such as unwanted insects and/or unwanted acarids. Triflumezopyrim is used as the preferred insecticide while, prothioconazole is used as active compound.

There is however a need for improvement of these combinations. Single active combinations used over a long period of time has resulted in resistance. With the onset of resistance to certain pests, there is a need in the art for a combination of actives that decreases chances of resistance and improves the spectrum of disease and pest control.

However still there is a need for a pesticidal composition comprises an insecticide selected from class of diamide, metadiamide, isoxazoline or mixtures thereof; a fungicide selected from class of triazoles; and at least one more insecticide selected from various class with different mode of action or mixture thereof which overcomes some of the existing problems and can be prepared easily without much complex manufacturing process.

In general use, the pesticide actives are used in the form of a dilute aqueous composition because it can attain a good interaction with the target organism, such as plants, fungi and insects. However, most active pesticide compounds that are used as pesticides are only sparingly or even insoluble in water. The low solubility of such compounds present the challenges and difficulties to formulator in formulating pesticide compounds in stable formulations that can be easily stored for a long time and which still have a high stability and

effective activity until end use. This problem especially occurs and may get worsen if more than one active compound is present in the composition.

Therefore, one object of the present invention is to provide improved combinations of insecticides and fungicide for the control of foliar feeder insects, soil born insects, sap suckers, foliar and soil born fungal diseases. Another object of the present invention is to provide a method and a composition for controlling insect pests.

Yet another object of the present invention is to provide improved combinations of insecticides and fungicide that promote plant health and to increase crop yield in the field condition.

Embodiment of the present invention can ameliorate one or more of the above mentioned problems.

Inventors of the present invention have surprisingly found that the novel synergistic pesticidal composition of an insecticide selected from class of diamide, metadiamide, isoxazoline or mixtures thereof; a fungicide selected from class of triazoles; and at least one more insecticide selected from various class with different mode of action or mixture thereof as described herein which can provide solution to the above mentioned problems.

SUMMARY OF THE INVENTION

Therefore an aspect of the present invention provides a synergistic pesticidal compositions comprising bioactive amounts of (A) an insecticide selected from class of diamide, metadiamide, isoxazoline or mixtures thereof; (B) a fungicide selected from class of triazoles; and (C) at least one more insecticide selected from various class with different mode of action or mixture thereof.

Further aspect of the present invention provides a synergistic fugicidal compositions comprising bioactive amounts of (A) Insecticide selected from the class of diamides, metadiamides or isoxazolines or mixture thereof; (B) fungicide(s) selected from the class of triazoles; (C) one or more Insecticide compound selected from the class of carbamates, organophosphates, phenylpyrazole, pyrethroids, nicotinic insecticides, spinosyns, mectins, juvenile hormone mimics, from the class of chordotonal organs modulators, mite growth inhibitors, microbial disruptors of insect midgut membrane, inhibitors of mitochondrial ATP synthase, uncouplers of oxidative phosphorylation, nereistoxin, chitin biosynthesis inhibitors, inhibitors of the chitin biosynthesis type 1, moulting disruptors, ecdyson receptor agonists,

octopamin receptor agonists, METI (mitochondrial electron transport inhibitors, voltage-dependent sodium channel blockers, tetronic and tetramic acid derivatives, from baculoviruses or from the compounds of unknown or uncertain mode of action or from the mixture thereof.

Accordingly, in a further aspect, the present invention provides a method of protecting a plant propagation material, a plant, parts of a plant and/or plant organs that grow at a later point in time against pathogenic damage or pest damage by applying to the plant propagation material a composition comprising a pesticidal composition defined in the first aspect.

As per one embodiment formulation for the pesticidal composition is selected from Capsule suspension (CS), Dispersible concentrate (DC), Powder for dry seed treatment (DS), Emulsifiable concentrate (EC), Emulsion, water in oil (EO), Emulsion for seed treatment (ES), Emulsion, oil in water (EW), Flowable suspension/concentrate for seed treatment (FS), Granule/ soil applied (GR), Controlled (Slow or Fast) release granules (CR), Solution for seed treatment (LS), Micro-emulsion (ME), Oil dispersion (OD), Oil miscible flowable concentrate (oil miscible suspension (OF), Oil miscible liquid (OL), Suspension concentrate (flowable concentrate) (SC), Suspo-emulsion (SE), Water soluble granule (SG), Soluble concentrate (SL), Water soluble powder (SP), Water dispersible granule (WG or WDG), Wettable powder (WP), Water dispersible powder for slurry treatment (WS), A mixed formulation of CS and SC (ZC), A mixed formulation of CS and SE (ZE), A mixed formulation of CS and EW (ZW); and and one or more customary formulation adjuvants such as a) dispersant b) wetting agent c) anti-foaming agent d) biocides e) anti-freezing agent f) suspending agent g) thickener h) coating agent and i) buffering agent.

The remainder of the aqueous formulation is preferably wholly water but may comprise other materials, such as inorganic salts. The formulation is preferably, completely free from organic solvents.

Accordingly, in a first aspect, the present invention provides a synergistic pesticidal compositions comprising bioactive amounts of (A) Insecticide selected from the class of diamides, metadiamides or isoxazolines or mixture thereof; (B) fungicide(s) selected from the class of triazoles; (C) one or more Insecticide compound selected from the class of carbamates, organophosphates, phenylpyrazole, pyrethroids, nicotinic insecticides, spinosyns, mectins, juvenile hormone mimics, from the class of chordotonal organs modulators, mite growth inhibitors, microbial disruptors of insect midgut membrane, inhibitors of mitochondrial ATP synthase, uncouplers of oxidative phosphorylation, nereistoxin, chitin biosynthesis inhibitors, inhibitors of the chitin biosynthesis type 1, moulting disruptors, ecdyson receptor agonists,

octopamin receptor agonists, METI (mitochondrial electron transport inhibitors, voltage-dependent sodium channel blockers, tetronic and tetramic acid derivatives, from baculoviruses or from the compounds of unknown or uncertain mode of action or from the mixture thereof; and one or more customary formulation adjuvants; shows synergistic activity.

DETAILED DESCRIPTION OF THE INVENTION:

The term "synergistic", as used herein, refers the combined action of two or more active agents blended together and administered conjointly that is greater than the sum of their individual effects.

"Bioactive amounts" as mentioned herein means that amount which, when applied treatment of crops, is sufficient to effect such treatment.

Therefore an aspect of the present invention provides a synergistic pesticidal compositions comprising bioactive amounts of (A) an insecticide selected from class of diamide, metadiamide, isoxazoline or mixtures thereof; (B) a fungicide selected from class of triazoles; and (C) at least one more insecticide selected from various class with different mode of action or mixture thereof.

More particulary a further aspect of the present invention provides an pesticidal compositions comprising bioactive amounts of (A) Insecticide selected from the class of diamides, metadiamides or isoxazolines or mixture thereof; (B) fungicide(s) selected from the class of triazoles; (C) one or more Insecticide compound selected from the class of carbamates, organophosphates, phenylpyrazole, pyrethroids, nicotinic insecticides, spinosyns, mectins, juvenile hormone mimics, from the class of chordotonal organs modulators, mite growth inhibitors, microbial disruptors of insect midgut membrane, inhibitors of mitochondrial ATP synthase, uncouplers of oxidative phosphorylation, nereistoxin, chitin biosynthesis inhibitors, inhibitors of the chitin biosynthesis type 1, moulting disruptors, ecdyson receptor agonists, octopamin receptor agonists, METI (mitochondrial electron transport inhibitors, voltage-dependent sodium channel blockers, tetronic and tetramic acid derivatives, from baculoviruses or from the compounds of unknown or uncertain mode of action or from the mixture thereof.

In an embodiment of the present invention an Insecticide from the class of diamide is selected from chlorantraniliprole, cyantraniliprole, cyclaniliprole, cyhalodiamide, cyproflanilide, flubendiamide, tetraniliprole, tetrachlorantraniliprole, tyclopyrazoflor.

In an embodiment of the present invention an Insecticide from the class of metadiamide is broflanilide.

In an embodiment of the present invention an Insecticide from the class of Isoxazolines is selected from fluxametamide, isocycloseram.

In an embodiment of the present invention a fungicide from the class of triazoles is selected from cyproconazole, difenoconazole, diniconazole, epoxiconazole, etaconazole, fenbuconazole, fluquinconazole, flusilazole, frutriafol, hexaconazole, imibenconazole, ipconazole, mefentrifluconazole, metconazole, myclobutanil, penconazole, propiconazole, prothioconazole, simconazole, tebuconazole, tetraconazole, tiradimefon, tiradimenol, triticonazole or tricyclazole or mixture thereof.

In an embodiment of the present invention an Insecticide from the class of carbamates is selected from carbaryl, carbofuran, carbosulfan, methomyl, oxamyl, pirimicarb, thiodicarb.

In an embodiment of the present invention an Insecticide from the class of organophosphates is selected from acephate, cadusafos, chlorpyrifos, chlorpyrifos-methyl, demeton-S-methyl, dimethoate, ethion, fenamiphos, fenitrothion, fenthion, fosthiazate, methamidophos, monocrotophos, oxydemeton-methyl, parathion, parathion-methyl, phenthoate, phorate, phosalone, phosphamidon, profenofos, quinalphos, and triazophos.

In an embodiment of the present invention an Insecticide from the class of Phenylpyrazole is selected from ethiprole, fipronil, flufiprole, nicofluprole, pyrafluprole, or pyriprole.

In an embodiment of the present invention an Insecticide from the class of pyrethroids is selected from bifenthrin, cyfluthrin, beta-cyfluthrin, cyhalothrin, lambda-cyhalothrin, gamma-cyhalothrin, cypermethrin, alpha-cypermethrin, beta-cypermethrin, theta-cypermethrin, zeta-cypermethrin, cyphenothrin, deltamethrin, fenpropathrin, fenvalerate, tau-fluvalinate, permethrin, phenothrin, prallethrin, profluthrin, and pyrethrin.

In an embodiment of the present invention an Insecticide from the class of nicotinic insecticides such as Neonicotinoids is selected from acetamiprid, clothianidin, dinotefuran, imidacloprid, nitenpyram, thiacloprid, thiamethoxam, flupyrimin, cycloxaprid, paichongding, guadipyr, cycloxylidin; Sulfoximines like sulfoxaflor; Butenolides like flupyradifurone; Mesoionics like triflumezopyrim, dichloromezotiaz.

In an embodiment of the present invention an Insecticide from the class of spinosyns is selected from spinosad, spinetoram.

In an embodiment of the present invention an Insecticide from the class of mectins is selected from abamectin, emamectin benzoate, ivermectin, lepimectin; Milbemycins like milbemectin.

In an embodiment of the present invention an Insecticide from the class of juvenile hormone mimics is selected from hydroprene, kinoprene, methoprene, fenoxycarb, pyriproxyfen.

In an embodiment of the present invention an Insecticide from the class of chordotonal organs modulators is selected from homopteran feeding blockers like pyridine azomethine: pymetrozine, pyrifluquinazon; pyropenes like afidopyropen; and flonicamid.

In an embodiment of the present invention an Insecticide from the class of mite growth inhibitors is selected from clofentezine, hexythiazox, diflovidazin or etoxazole.

In an embodiment of the present invention an Insecticide from the class of microbial disruptors of insect midgut membrane is selected from Bacillus thuringiensis and insecticidal proteins and their by-products.

In an embodiment of the present invention an Insecticide from the class of inhibitors of mitochondrial ATP synthase is selected from diafenthiuron, azocyclotin, cyhexatin, fenbutatin oxide, propargite, or tetradifon.

In an embodiment of the present invention an Insecticide from the class of uncouplers of oxidative phosphorylation is selected from chlorfenapyr, DNOC, or sulfluramid.

In an embodiment of the present invention an Insecticide from the class of nereistoxin is selected from bensultap, monosultap, cartap hydrochloride, thiocyclam, thiocyclam hydrogen oxalate, thiocyclam hydrochloride, thiosultap sodium.

In an embodiment of the present invention an Insecticide from the class of chitin biosynthesis inhibitors is selected from Benzoylureas-bistrifluron, chlorfluazuron, diflubenzuron, flucycloxuron, flufenoxuron, hexaflumuron, lufenuron, novaluron, noviflumuron, teflubenzuron, triflumuron.

In an embodiment of the present invention an Insecticide from the class of nereistoxin is selected from bensultap, monosultap, cartap hydrochloride, thiocyclam, thiocyclam hydrogen oxalate, thiocyclam hydrochloride, thiosultap sodium.

In an embodiment of the present invention an Insecticide from the class of chitin biosynthesis inhibitors is selected from Benzoylureas-bistrifluron, chlorfluazuron, diflubenzuron, flucycloxuron, flufenoxuron, hexaflumuron, lufenuron, novaluron, noviflumuron, teflubenzuron, triflumuron.

In an embodiment of the present invention an Insecticide from the class of moulting disruptors is cyromazine.

In an embodiment of the present invention an Insecticide from the class of ecdyson receptor agonists is selected from diacylhydrazines like methoxyfenozide, tebufenozide, halofenozide, fufenozide or chromafenozide.

In an embodiment of the present invention an Insecticide from the class of octopamin receptor agonists is amitraz.

In an embodiment of the present invention an Insecticide from the class of METI (mitochondrial electron transport inhibitors) is selected from fenazaquin, fenpyroximate, pyrimidifen, pyridaben, tebufenpyrad, tolfenpyrad, flufenerim, rotenone, cyenopyrafen, cyflumetofen, pyflubumidemm, hydramethylnon, acequinocyl, flometoquin, fluacrypyrim, pyriminostrobin or bifenazate.

In an embodiment of the present invention an Insecticide from the class of voltage-dependent sodium channel blockers is selected from oxadiazines like indoxacarb, semicarbazones like metaflumizone.

In an embodiment of the present invention an Insecticide from the class of inhibitors of the lipid synthesis, inhibitors of acetyl CoA carboxylase (Tetronic and tetramic acid derivatives) is selected from spirodiclofen, spiromesifen, spirotetramat or spiropidion.

In an embodiment of the present invention an Insecticide from the class of Baculoviruses is selected from Granuloviruses and Nucleopolyhedrosis viruses.

In an embodiment of the present invention an Insecticide from the class of compounds of unknown or uncertain mode of action is selected from azadirechtin, benzpyrimoxan (insect growth regulators), pyridalyl, oxazosulfyl, dimpropyridaz (pyrazole carboxamide insecticide), fluhexafon, acaricidal compounds-cyetpyrafen, flupentiofenox, acynonapyr; nematicidal compounds-cyclobutrifluram, fluazaindolizine, or tioxazafen.

Diamide group of insecticide:

Chlorantraniliprole: Chlorantraniliprole is a novel anthranilic diamide insecticide that functions via activation of the insect ryanodine receptors within the sarcoplasmic reticulum causing impaired regulation of muscle contraction. Sustained release of calcium levels within the cytosol leads to muscle contraction, paralysis and eventual death of the organism. While insects possess a single form of the ryanodine receptor distributed in muscle and neuronal tissue, mammals possess three forms which are widely distributed in muscle and non-muscle tissues.

Cyantraniliprole: Cyantraniliprole is an insecticide of the ryanoid class. It is approved for use in the United States, Canada, China, and India. Because of its uncommon mechanism of action as a ryanoid, it has activity against pests such as Diaphorina citri that have developed resistance to other classes of insecticides. Cyantraniliprole is highly toxic to bees. It is a new second-generation ryanodine receptor insecticide whose pesticidal mode of action is through unregulated activation of insect ryanodine receptor channels, which leads to internal calcium store depletion and impaired regulation of muscle contraction, causing paralysis and eventual death of the insect. Cyantraniliprole is used to control insect pests in fruit crops, tree nuts, oil seed crops, cotton, grapes, rice, vegetables, ornamentals and turf around the world.

Cyclaniliprole: Cyclaniliprole is an insecticide belonging to the chemical class of diamide insecticides and pyrazole insecticides. Despite its structural similarity to some of the phenylpyrazole insecticides, this substance has a different mode of action, which it shares with other diamide insecticides. Diamides act at the ryanodine receptor, which is critical for muscle contraction.

Metadiamide group of insecticide:

Broflanilide: Broflanilide is a compound with a novel mode of action (IRAC Group 30), demonstrating excellent efficacy in the control of many problematic chewing insect pests, including caterpillars and beetles in specialty and row crops, and non-crop pests such as termites, ants, cockroaches and flies. It has potential use applications in cereals as a seed treatment for control of wireworms, as well as for foliar use in leafy and fruiting vegetables, potato, soybean, cotton, corn and legumes.

Isoxazoline group of insecticides:

Isocycloseram: It is a broad spectrum insecticide and acaricide, including activity against lepidopteran, hemipteran, coleopteran, thysanopteran and dipteran pest species. Isocycloseram acts as a non-competitive GABA-gated chloride channel antagonist at a site different from known antagonists such as fiproles and cyclodienes.

Triazole group of Fungicides:

Prothioconazole: Prothioconazole is a synthetic compound of the triazolinthione family of compounds. It is a broad spectrum systemic fungicide, with curative, preventative and eradicative action. It can be used as both a seed treatment and a foliar treatment. After absorption it moves into cells of the target organisms, effecting sterol biosynthesis and thereby disrupting membrane structure. This ultimately effects hyphal growth and germ tube elongation. Fungi susceptible to prothioconazole include early leaf spot (Mycosphaerella arachidis), eyespot, Fusarium spp., powdery mildew, net blotch, phoma leaf spot, Rhynchosporium secalis, Sclerotinia sclerotiorum, Sclerotium rolfsii, Septoria tritici, Septoria nodorum, rust and tan spot. Prothioconazole is approved for use on barley, durum wheat, oats, oilseed rape (winter), rye (winter), and wheat.

Difenoconazole: Difenoconazole is a broad spectrum fungicide that controls a wide variety of fungi – including members of the Aschomycetes, Basidomycetes and Deuteromycetes families. It acts as a seed treatment, foliar spray and systemic fungicide. It is taken up through the surface of the infected plant and is translocated to all parts of the plant. It has a curative effect and a preventative effect. Difenoconazole can be applied to winter wheat, oilseed rape, Brussels sprouts, cabbage, broccoli/calabrese and cauliflower. It controls various fungi including Septoria tritici, Brown Rust, Light Leaf Spot, Leaf Spot, Pod Spot, Ring Spot and Stem canker. It also prevents Ear Discolouration in winter wheat. The mode of action of difenoconazole is that it is a sterol demethylation inhibitor which prevents the development of the fungus by inhibiting cell membrane ergosterol biosynthesis.

Tebuconazole: It is a broad spectrum systemic Triazole fungicide with protective, curative and eradicative mode of action. It is effective against wide range of diseases. It is very effective against brown rust, leaf blotch, Net blotch, septoria leaf spot& Yellow rust of cereals; Soybean-Asian rust, brown spot/Septoria leaf spot, Powdery mildew; Rice-Dirty panicle & grain discoloration.

Organophosphate group of Insecticide:

Acephate: Acephate is an organophosphate foliar and soil insecticide of moderate persistence with residual systemic activity of about 10–15 days at the recommended use rate. It is used primarily for control of aphids, including resistant species, in vegetables (e.g. potatoes, carrots, greenhouse tomatoes, and lettuce) and in horticulture (e.g. on roses and greenhouse ornamentals). It also controls leaf miners, caterpillars, sawflies, thrips, and spider mites in the previously stated crops as well as turf, and forestry. By direct application to mounds, it is effective in destroying imported fire ants. Acephate is sold as a soluble powder, as emulsifiable concentrates, as pressurized aerosol, and in tree injection systems and granular formulations.

Pyrethroid group of Insecticides:

Lambda-cyhalothrin: Lambda-cyhalothrin belongs to a group of chemicals called pyrethroids. Pyrethroids are manmade chemicals that are similar to the natural insecticides pyrethrins. Scientists developed pyrethroid insecticides to have properties better than those of the pyrethrins. Pyrethroids, including lambda-cyhalothrin, disrupt the normal functioning of the nervous system in an organism. By disrupting the nervous system of insects, lambda-cyhalothrin may cause paralysis or death. Temperature influences insect paralysis and the toxicity of lambda-cyhalothrin.

Nicotinic group of Insecticides:

Thiamethoxam: Thiamethoxam is a broad-spectrum, systemic insecticide, which means it is absorbed quickly by plants and transported to all of its parts, including pollen, where it acts to deter insect feeding. An insect can absorb it in its stomach after feeding, or through direct contact, including through its tracheal system. The compound gets in the way of information transfer between nerve cells by interfering with nicotinic acetylcholine receptors in the central nervous system, and eventually paralyzes the muscles of the insects.

Flupyrimin: A novel chemotype insecticide flupyrimin has unique biological properties, including outstanding potency to imidacloprid (IMI)-resistant rice pests together with superior safety toward pollinators. Intriguingly, FLP acts as a nicotinic antagonist in American cockroach neurons, and [3H]FLP binds to the multiple high-affinity binding components in house fly nicotinic acetylcholine (ACh) receptor (nAChR) preparation. One of the [3H]FLP receptors is identical to the IMI receptor, and the alternative is IMI-insensitive subtype. Furthermore, FLP is favorably safe to rats as predicted by the very low affinity to the rat $\alpha 4\beta 2$

nAChR. Structure-activity relationships of FLP analogues in terms of receptor potency, featuring the pyridinylidene and trifluoroacetyl pharmacophores, were examined, thereby establishing the FLP molecular recognition at the Aplysia californica ACh-binding protein, a suitable structural surrogate of the insect nAChR. These FLP pharmacophores account for the excellent receptor affinity, accordingly revealing differences in its binding mechanism from IMI.

Triflumezopyrim: Triflumezopyrim, a newly commercialized molecule belongs to the novel class of mesoionic insecticides. Triflumezopyrim is an extremely effective hopper insecticide with low impact on non-target organisms including pollinators. This unique class of mesoionic chemistry targets the nicotinic acetylcholine receptor, inducing a physiological action which is distinct from that of neonicotinoids.

Mectin group of Insecticide:

Emamectin benzoate: Emamectin is widely used in controlling lepidopterous pests (order of insects that as larvae are caterpillars and as adults have four broad wings including butterflies, moths, and skippers) in agricultural produce. The low-application rate of the active ingredient needed (~6 g/acre) and broad-spectrum applicability as an insecticide has gained emamectin significant popularity among farmers. Emamectin has been shown to possess a greater ability to reduce the colonization success of engraver beetles and associated wood borers in loblolly pines (Pinus taeda L). A 2006 study regarding bolt-injections of four types of pesticides found emamectin to be the greatest reducer against these species with respect to the amount of larval feeding, length, and number of egg galleries. Formation of long vertical lesions in the phloem and xylem surrounding emamectin injection points were found indicating some level of tree-toxicity to the emamectin.

Ecdysone receptor agonist group of Insecticides:

Methoxyfenozide: Methoxyfenozide is a carbohydrazide that is hydrazine in which the amino hydrogens have been replaced by 3-methoxy-2-methylbenzoyl, 3,5-dimethylbenzoyl, and tert-butyl groups respectively. It has a role as an environmental contaminant, a xenobiotic and an insecticide. It is a carbohydrazide and a monomethoxybenzene. Methoxyfenozide is the newest diacylhydrazine insecticide to reach the marketplace. It binds with very high affinity to the ecdysone receptor complex in lepidopteran insects, where it functions as a potent agonist, or mimic, of the insect molting hormone, 20-hydroxyecdysone (20E). Methoxyfenozide exhibits high insecticidal efficacy against a wide range of important caterpillar pests, including many

members of the family Pyralidae, Pieridae, Tortricidae and Noctuidae. It is most effective when ingested by the target caterpillar, but it also has some topical and ovicidal properties. It is modestly root systemic, but not significantly leaf-systemic. Evidence collected to date indicates that methoxyfenozide has an excellent margin of safety to non-target organisms, including a wide range of non-target and beneficial insects.

Unclassified group of Insecticide:

Dimpropyridaz: Dimpropyridaz chemically is a pyrazole carboxamide insecticide that has a pyridin-3-yl group, as in tyclopyrazoflor. Dimpropyridaz is effective against aphids. Dimpropyridaz mechanism of action is unknown.

The present inventors believe that the combination of the present invention surprisingly results in a synergistic action. The combinations of the present invention allow for a broad spectrum of pest control and has surprisingly improved plant vigour and yield. The broad spectrum of the present combination also provides a solution for preventing the development of resistance.

The synergistic composition has very advantageous curative, preventive and systemic pesticidal properties for protecting cultivated plants. As has been mentioned, said active ingredient composition can be used to inhibit or destroy the pathogens that occur on plants or parts of plants (fruit, blossoms, leaves, stems, tubers, roots) of different crops or useful plants, while at the same time those parts of plants which grow later are also protected from attack by such pathogens. Active ingredient composition has the special advantage of being highly active against diseases in the soil that mostly occur in the early stages of plant development.

The synergistic composition of pesticide are used to protect the crops and plants from insect and pests. The lists of the major crops includes but are not limited to GMO (Genetically Modified Organism) and Non GMO varieties of Cotton (Gossypium spp.), Paddy (Oryza sativa), Wheat (Triticum aestavum), Barley (Hordeum vulgare), Maize (Zea mays), Sorghum (Sorghum bicolor), Oat (Avena sativa), Pearl millet (Pennisetum glaucum), Sugarcane (Saccharum officinarum) , Sugarbeet (Beta vulgaris), Soybean (Glycin max), Peanut (Arachis hypogaea), Sunflower (Helianthus annuus) , Mustard (Brassica juncea), Rape seed (Brassica napus), Linseed (Linum usitatissimum), Sesame (Sesamum indicum), Green gram (Vigna radiata), Black gram (Vigna mungo), Chickpea (Cicer aritinum), Cowpea (Vigna unguiculata), Redgram (Cajanus cajan), Frenchbean (Phaseolus vulgaris), Indian bean (Lablab purpureus), Horse gram (Macrotyloma uniflorum), Field pea (Pisum sativum), Cluster bean (Cyamopsis tetragonoloba), Lentils (Lens culinaris), Brinjal (Solanum melongena), Cabbage (Brassica

oleracea var. capitata), Cauliflower (Brassica oleracea var. botrytis), Okra (Abelmoschus esculentus) , Onion (Allium cepa L.), Tomato (Solanum lycopersicun) , Potato (Solanum tuberosum) , Sweet potato (Ipomoea batatas), Chilly (Capsicum annum), Garlic (Allium sativum), Cucumber (Cucumis sativus), Muskmelons (Cucumis melo), Watermelon (Citrullus lanatus), Bottle gourd (Lagenaria siceraria), Bitter gourd (Momordica charantia), Radish (Raphanus sativus), Carrot (Dacus carota subsp. sativus), Turnip (Brassica rapa subsp rapa), Apple (Melus domestica), Banana (Musa spp.), Citrus groups (Citrus spp.), Grape (Vitis vinifera), Guava (Psidium guajava), Litchi (Litchi chinensis), Mango (Mangifera indica), Papaya (Carica papaya), Pineapple (Ananas comosus), Pomegranate (Punica granatum) , Sapota (Manilkara zapota), Tea (Camellia sinensis), Coffea (Coffea Arabica), Turmeric (Curcuma longa), Ginger (Zingiber officinale), Cumin (Cuminum cyminum), Fenugreek (Trigonella foenum-graecum), Fennel (Foeniculum vulgare), Coriander (Coriandrum sativum), Ajwain (Trachyspermum ammi), Psyllium (Plantago ovate), Black Pepper (Piper nigrum), Stevia (Stevia rebaudiana), Safed musli (Chlorophytum tuberosum), Drum stick (Moringa oleifera), Coconut (Coco nucifera), Mentha (Mentha spp.), Rose (Rosa spp.), Jasmine (Jasminum spp.), Marigold (Tagetes spp.), Common daisy (Bellis perennis), Dahlia (Dahlia hortnesis), Gerbera (Gerbera jamesonii), Carnation (Dianthus caryophyllus), vegetables: solanaceous vegetables such as eggplant, tomato, pimento, pepper, potato, etc., cucurbit vegetables such as cucumber, pumpkin, zucchini, water melon, melon, squash, etc., cruciferous vegetables such as radish, white turnip, horseradish, kohlrabi, Chinese cabbage, cabbage, leaf mustard, broccoli, cauliflower, etc., asteraceous vegetables such as burdock, crown daisy, artichoke, lettuce, etc, liliaceous vegetables such as green onion, onion, garlic, and asparagus, ammiaceous vegetables such as carrot, parsley, celery, parsnip, etc., chenopodiaceous vegetables such as spinach, Swiss chard, etc., lamiaceous vegetables such as Perilla frutescens, mint, basil, etc, strawberry, sweet potato, Dioscorea japonica, colocasia, etc., flowers, foliage plants, turf grasses, fruits: pome fruits such apple, pear, quince, etc, stone fleshy fruits such as peach, plum, nectarine, Prunus mume, cherry fruit, apricot, prune, etc., citrus fruits such as orange, lemon, rime, grapefruit, etc., nuts such as chestnuts, walnuts, hazelnuts, almond, pistachio, cashew nuts, macadamia nuts, etc. berries such as blueberry, cranberry, blackberry, raspberry, etc., grape, kaki fruit, olive, plum, banana, coffee, date palm, coconuts, etc. , trees other than fruit trees; tea, mulberry, flowering plant, trees such as ash, birch, dogwood, Eucalyptus, Ginkgo biloba, lilac, maple, Quercus, poplar, Judas tree, Liquidambar formosana, plane tree, zelkova, Japanese arborvitae, fir wood, hemlock, juniper, Pinus, Picea, and Taxus cuspidate, etc.

The synergistic combination of the present invention used to control the insects-pests and plant parasitic nematode. The major insects pests are belongs to the order Hemiptera, for example, rice leafhopper Nephotettix nigropictus, rice brown plant hopper Nilaparvata lugen, rice white backed plant hopper, Apple Mealy bug Phenococcus aceris, bean aphid Aphis fabae, black citrus aphid Toxoptera aurantii, citrus black scale Saissetia oleae, cabbage aphid Brevicoryne brassicae, Lipaphis erysimi, citrus red scale Aonidiella aurantii, yellow scale Aonidiella citrine, citrus mealybug Planococcus citri, corn leaf aphid Rhopalosiphum maidis, cotton aphid Aphis gossypii, cotton jassid Amrasca biguttula biguttla, cotton mealy bug Planococcus spp. And Pseudococcus spp., cotton stainer Dysdercus suturellus, cotton whitefly Bemisia tabaci, cowpea aphid Aphis crassivora, grain aphid Sitobion avenae, golden glow aphid Uroleucon spp., grape mealybug Pseudococcus maritimus, green peach aphid Myzus persicae, greenhouse whitefly Trialeurodes vaporariorum, papaya mealy bug Pracoccus marginatus, pea aphid Acyrthosiphon pisum, sugarcane mealybug Saccharicoccus sacchari, potato aphid Myzus persicae, potato leaf hopper Empoasca fabae, cotton whitefly Bemisia tabaci, tarnished plant bug Lygus lineolaris, wooly apple aphid Eriosoma lanigerum, mango hopper Amritodus atkinsoni, Idioscopus spp. ; order Lepidoptera, army worm Mythimna unipuncta, asiatic rice borer Chilo suppressalis, bean pod borer Maruca vitrata, beet armyworm Spodoptera exigua, black cutworm Agrotis ipsilon, bollworm Helicoverpa armigera , cabbage looper Trichoplusia ni, codling moth Cydia pomonella, croton caterpillar Achea janata, diamond backmoth Plutella xylostella, cabbage worm Pieris rapae, pink bollworm Pectinophora gossypiella, sugarcane borer Diatraea saccharalis, tobacco budworm Heliothis virescens, tomato fruitworm Helicoverpa zea, velvet bean caterpillar Anticarsia gemmatalis, yellow stem borer Scirpophaga incertulas, spotted bollworm Earias vittella, rice leaffolder Cnaphalocrocis medinalis, pink stem borer Sesamia spp., tobacco leafeating caterpillar Spodoptera litura; brinjal fruit and shoot borer Leucinodes orbonalis, bean pod borer Maruca vitrata, Maruca testulalis, armyworm Mythimna separata, cotton pinkbollworm Pectinophora gossypiella, citrus leafminer Phyllocnistis citrella, cabbage butterfly Pieris bras-sicae, diamond backmoth Plutella xylostella, paddy stem borer Scirpophaga excerptallis, Scirpophaga incertulas, Scirpophaga innotata, wheat stem borer Sesamia inferens, Sitotroga cerealella, Spilosoma obliqua, Spodoptera frugiperda, Spodoptera littoralis, Spodoptera litura, Trichoplusia ni, Tryporyza novella, Tuta absoluta.

from the order Coleoptera, for example, apple twig borer Amphicerus spp., corn root worm Diabrotica virgifera, cucumber beetle diabrotica balteata, boll weevil Anthonomus grandis, grape flea beetle Altica chalybea, grape root worm Fidia viticola, grape trunk borer Clytoleptus

albofasciatus, radish flea beetle Phyllotreta armoraciae, maize weevil Sitophilus zeamais, northern corn rootworm Diabrotica barberi, rice water weevil Lissorhoptrus oryzophilus, Anthonomus grandis, Bruchus lentis, Diabrotica semipunctata, Diabrotica virgifera, Dicladispa armigera, Epila-chna varivestis, various species of white grubs are Holotrichia bicolor, Holotrichia consanguinea, Holotrichia serrata, Leptinotarsa decemlineata, Phyllotreta chrysocephala, Popillia japonica etc; from the order Orthoptera, for example, Gryllotalpa spp., Locusta spp., and Schistocerca is spp.; from the order Thysanoptera, for example, Frankliniella spp., Thrips palmi, Thrips tabaci and Scirtothrips dorsalis; termites (Isoptera), e.g. Calotermes flavicollis, Coptotermes formosanus, Heterotermes aureus, Leucotermes flavipes, Microtermes obesi, Odontotermes obesus, Reticulitermes flavipes, Termes natalensis; from the order Heteroptera, for example, Dysdercus spp., Leptocorisa spp., from the order Hymenoptera, for example, Solenopsis spp. ; from the order Diptera, for example, Antherigona soccata, Dacus spp., Liriomyza spp., Melanagromyza spp., from the order Acarina, for example, Aceria mangiferae, Brevipalpus spp., Eriophyes spp., Oligonychus mangiferus, Oligonychus punicae, Panonychus citri, Panonychus ulmi, Polyphagotarsonemus latus, Tarsonemus spp., Tetranychus urticae, Tetranychus cinnabarinus;

The composition according to the present invention is also effective for controlling the following fungal and bacterial plant diseases:

Disease in rice: Blast (Magnaporthe grisea), Helminthosporium leaf spot (Cochliobolus miyabeanus), sheath blight (Rhizoctonia solani), bakanae disease (Gibberella fujikuroi) and grain discoloration (dirty panicles caused by Alternaria spp., Curvularia spp., Drechslera spp., Fusarium spp., Phoma spp. Etc.)

Diseases in wheat: powdery mildew (Erysiphe graminis) , Fusariuin head blight (Fusarium graminearum, F. avenacerum, F. culmorum, Microdochium nivale) , rust (Puccinia striiformis, P. graminis, P. recondita) , pink snow mold (Micronectriella nivale), Typhula snow blight (Typhula sp .) , loose smut (Ustilago tritici) , bunt (Tilletia caries) , eyespot (Pseudocercosporella herpotrichoides) , leaf blotch (Mycosphaerella graminicola) , glume blotch (Stagonospora nodorum) , septoria, and yellow spot (Pyrenophora tritici-repentis) .

Diseases of barley: powdery mildew (Erysiphe graminis), Fusarium head blight (Fusarium graminearum, F. avenacerum, F. culmorum, Microdochium nivale), rust (Puccinia striiformis, P. graminis, P. hordei), loose smut (Ustilago nuda), scald (Rhynchosporium secalis), net blotch

(Pyrenophora teres), spot blotch (Cochliobolus sativus), leaf stripe (Pyrenophora graminea), and Rhizoctonia damping-off (Rhizoctonia solani).

Diseases in corn: smut (Ustilago maydis), brown spot (Cochliobolus heterostrophus), copper spot (Gloeocercospora sorghi), southern rust (Puccinia polysora), gray leaf spot (Cercospora zeae-maydis), white spot (Phaeosphaeria mydis and/or Pantoea ananatis) and Rhizoctonia damping-off (Rhizoctonia solani).

Diseases of citrus: melanose (Diaporthe citri), scab (Elsinoe fawcetti), penicillium rot (Penicillium digitatum, P. italicum), and brown rot (Phytophthora parasitica, Phytophthora citrophthora).

Diseases of apple: blossom blight (Monilinia mali), canker (Valsa ceratosperma), powdery mildew (Podosphaera leucotricha), Alternaria leaf spot (Alternaria alternata apple pathotype), scab (Venturia inaequalis), powdery mildew, bitter rot (Colletotrichum acutatum), crown rot (Phytophtora cactorum), blotch (Diplocarpon mali), and ring rot (Botryosphaeria berengeriana).

Diseases of pear: scab (Venturia nashicola, V. pirina), powdery mildew, black spot (Alternaria alternata Japanese pear pathotype), rust (Gymnosporangium haraeanum), and phytophthora fruit rot (Phytophtora cactorum).

Diseases of peach: brown rot (Monilinia fructicola), powdery mildew, scab (Cladosporium carpophilum), and phomopsis rot (Phomopsis sp.).

Diseases of grape: anthracnose (Elsinoe ampelina), ripe rot (Glomerella cingulata), powdery mildew (Uncinula necator), rust (Phakopsora ampelopsidis), black rot (Guignardia bidwellii), botrytis, and downy mildew (Plasmopara viticola).

Diseases of Japanese persimmon: anthracnose (Gloeosporium kaki), and leaf spot (Cercospora kaki, Mycosphaerella nawae).

Diseases of gourd: anthracnose (Colletotrichum lagenarium), powdery mildew (Sphaerotheca fuliginea), gummy stem blight (Mycosphaerella melonis), Fusarium wilt (Fusarium oxysporum), downy mildew (Pseudoperonospora cubensis), Phytophthora rot (Phytophthora sp.), and damping-off (Pythium sp.).

Diseases of tomato: early blight (Alternaria solani), leaf mold (Cladosporium fulvum), and late blight (Phytophthora infestans).

Diseases of eggplant: brown spot (Phomopsis vexans), and powdery mildew (Erysiphe cichoracearum) Diseases of cruciferous vegetables: Alternaria leaf spot (Alternaria japonica), white spot (Cercosporella brassicae), clubroot (Plasmodiophora brassicae), and downy mildew (Peronospora parasitica).

Diseases of onion: rust (Puccinia allii), and downy mildew (Peronospora destructor).

Diseases of soybean: purple seed stain (Cercospora kikuchii), sphaceloma scad (Elsinoe glycines), pod and stem blight (Diaporthe phaseolorum var. sojae), septoria brown spot (Septoria glycines), frogeye leaf spot (Cercospora sojina), rust (Phakopsora pachyrhizi), Yellow rust, brown stem rot (Phytophthora sojae), and Rhizoctonia damping-off (Rhizoctonia solani).

Diseases of kidney bean: anthracnose (Colletotrichum lindemthianum). Diseases of peanut: leaf spot (Cercospora personata), brown leaf spot (Cercospora arachidicola) and southern blight (Sclerotium rolfsii).

Diseases of garden pea: powdery mildew (Erysiphe pisi), and root rot (Fusarium solani f. sp. pisi).

Diseases of potato: early blight (Alternaria solani), late blight (Phytophthora infestans), pink rot (Phytophthora erythroseptica), and powdery scab (Spongospora subterranean f. sp. subterranea).

Diseases of strawberry: powdery mildew (Sphaerotheca humuli), and anthracnose (Glomerella cingulata).

Diseases of tea: net blister blight (Exobasidium reticulatum), white scab (Elsinoe leucospila), gray blight (Pestalotiopsis sp.), and anthracnose (Colletotrichum theae-sinensis).

Diseases of tobacco: brown spot (Alternaria longipes), powdery mildew (Erysiphe cichoracearum), anthracnose (Colletotrichum tabacum), downy mildew (Peronospora tabacina), and black shank (Phytophthora nicotianae).

Diseases of rapeseed: sclerotinia rot (Sclerotinia sclerotiorum), and Rhizoctonia damping-off (Rhizoctonia solani). Diseases of cotton: Rhizoctonia damping-off (Rhizoctonia solani).

Diseases of sugar beat: Cercospora leaf spot (Cercospora beticola), leaf blight (Thanatephorus cucumeris), Root rot (Thanatephorus cucumeris), and Aphanomyces root rot (Aphanomyces cochlioides).

Diseases of rose: black spot (Diplocarpon rosae), powdery mildew (Sphaerotheca pannosa), and downy mildew (Peronospora sparsa). Diseases of chrysanthemum and asteraceous plants: downy mildew (Bremia lactucae), leaf blight (Septoria chrysanthemi-indici), and white rust (Puccinia horiana).

Diseases of various groups: diseases caused by Pythium spp. (Pythium aphanidermatum, Pythium debarianum, Pythium graminicola, Pythium irregulare, Pythium ultimum), gray mold. (Botrytis cinerea), and Sclerotinia rot (Sclerotinia sclerotiorum).

Disease of Japanese radish: Alternaria leaf spot (Alternaria brassicicola).

Diseases of turfgrass: dollar spot (Sclerotinia homeocarpa), and brown patch and large patch (Rhizoctonia solani).

Disease of banana: Black sigatoka (Mycosphaerella fijiensis), Yellow sigatoka (Mycosphaerella musicola).

Disease of sunflower: downy mildew (Plasmopara halstedii).

Seed diseases or diseases in the early stages of the growth of various plants caused by Aspergillus spp., Penicillium spp., Fusarium spp., Gibberella spp., Tricoderma spp., Thielaviopsis spp., Rhizopus spp., Mucor spp., Corticium spp., Phoma spp., Rhizoctonia spp. and Diplodia spp.

Viral diseases of various plants mediated by Polymixa spp. or Olpidium spp. and so on.

The composition according to the invention can be applied to any and all developmental stages of pests, such as egg, larva, pupa, and adult. The pests may be controlled by contacting the target pest, its food supply, habitat, breeding ground or its locus with a pesticidally effective amount of the inventive mixtures or of compositions comprising the mixtures.

The term "health of a plant" or "plant health" is defined as a condition of the plant and/or its products. As a result of the improved health, yield, plant vigor, quality and tolerance to abiotic or biotic stress are increased. Noteworthy, the health of a plant when applying the method according to the invention, is increased independently of the pesticidal properties of the active

ingredients used because the increase in health is not based upon the reduced disease pressure but instead on complex physiological and metabolic reactions which result for example in an activation of the plant's own natural defense system. As a result, the health of a plant is increased even in the absence of diseases pressure. Accordingly, in an especially preferred embodiment of the method according to the invention, the health of a plant is increased both in the presence and absence of biotic or abiotic stress factors. The above identified indicators for the health condition of a plant may be interdependent or they may result from each other. An increase in plant vigor may for example result in an increased yield and/or tolerance to abiotic or biotic stress. One indicator for the condition of the plant is the yield. "Yield" is to be understood as any plant product of economic value that is produced by the plant such as grains, fruits in the proper sense, vegetables, nuts, grains, seeds, wood (e.g. in the case of silviculture plants) or even flowers (e.g. in the case of gardening plants, ornamentals). The plant products may in addition be further utilized and/or processed after harvesting.

In an especially preferred embodiment of the invention, the yield of the treated plant is increased.

In another preferred embodiment of the invention, the yield of the plants treated according to the method of the invention, is increased synergistically.

According to the present invention, "increased yield" of a plant, in particular of an agricultural, silvicultural and/or horticultural 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 mixture according to the invention.

Increased yield can be characterized, among others, by the following improved proper-ties of the plant: increased plant, weight, increased plant height, increased biomass such as higher overall fresh weight (FW), increased number of flowers per plant, higher grain yield, more tillers or side shoots (branches), larger leaves, increased shoot growth, increased protein content, increased oil content, increased starch content, increased pigment content, increased leaf are index.

According to the present invention, the yield is increased by at least 5 %, preferable by 5 to 10 %, more preferable by 10 to 20 %, or even 20 to 30 % compared to the untreated control plants or plants treated with pesticides in a way different from the method according to the present invention. In general, the yield increase may even be higher.

A further indicator for the condition of the plant is the plant vigor. The plant vigor becomes manifest in several aspects such as the general visual appearance. In another especially preferred embodiment of the invention, the plant vigor of the treated plant is increased. In another preferred embodiment of the invention, the plant vigor of the plants treated according to the method of the invention, is increased synergistically. Improved plant vigor can be characterized, among others, by the following improved properties of the plant: improved vitality of the plant, improved plant growth, improved plant development, improved visual appearance, improved plant stand (less plant verse/lodging), improved emergence, enhanced root growth and/or more developed root system, enhanced nodulation, in particular rhizobium nodulation, bigger leaf blade, bigger size, increased plant weight, increased plant height, increased tiller number, increased number of side shoots, increased number of flowers per plant, increased shoot growth, increased root growth (extensive root system), increased yield when grown on poor soils or unfavorable climate, enhanced photosynthetic activity (e.g. based on increased stomatal conductance and/or increased C02 assimilation rate), increased stomatal conductance, increased C02 assimilation rate, enhanced pigment content (e.g. chlorophyll content), earlier flowering, earlier fruiting, earlier and improved germination, earlier grain maturity, improved self-defense mechanisms, improved stress tolerance and resistance of the plants against biotic and abiotic stress factors such as fungi, bacteria, viruses, heat stress, cold stress, drought stress, UV stress and/or salt stress, less non-productive tillers, less dead basal leaves, less input needed (such as fertilizers or water), greener leaves, complete maturation under shortened vegetation periods, less fertilizers needed, less seeds needed, easier harvesting, faster and more uniform ripening, longer shelf-life, longer panicles, delay of senescence, stronger and/or more productive tillers, better extractability of ingredients, improved quality of seeds (for being seeded in the following seasons for seed production), better nitrogen uptake, improved reproduction, reduced production of ethylene and/or the inhibition of its reception by the plant.

The improvement of the plant vigor according to the present invention particularly means that the improvement of any one or several or all of the above mentioned plant characteristics are improved independently of the pesticidal action of the mixture or active ingredients (components).

Another indicator for the condition of the plant is the "quality" of a plant and/or its products.

In an especially preferred embodiment of the invention, the quality of the treated plant is increased.

In another preferred embodiment of the invention, the quality of the plants treated according to the method of the invention, is increased synergistically.

According to the present invention, enhanced quality means that certain plant characteristics such as the content or composition of certain ingredients are increased or improved by a measurable or noticeable amount over the same factor of the plant produced under the same conditions, but without the application of the mixtures of the present invention. Enhanced quality can be characterized, among others, by following improved properties of the plant or its product: increased nutrient content, increased protein content, increased content of fatty acids, increased metabolite content, increased carotenoid content, increased sugar content, increased amount of essential amino acids, improved nutrient composition, improved protein composition, improved composition of fatty acids, improved metabolite composition, improved carotenoid composition, improved sugar composition, improved amino acids composition, improved or optimal fruit color, improved leaf color, higher storage capacity, higher processability of the harvested products.

Another indicator for the condition of the plant is the plant's tolerance or resistance to biotic and/or abiotic stress factors. Biotic and abiotic stress, especially over longer terms, can have harmful effects on plants. Biotic stress is caused by living organisms while abiotic stress is caused for example by environmental extremes. According to the present invention, "enhanced tolerance or resistance to biotic and/or abiotic stress factors" means (1.) that certain negative factors caused by biotic and/or abiotic stress are diminished in a measurable or noticeable amount as compared to plants exposed to the same conditions, but without being treated with a mixture according to the invention and (2.) that the negative effects are not diminished by a direct action of the mixture according to the invention on the stress factors, e.g. by its fungicidal action which directly destroys the microorganisms or diseases, but rather by a stimulation of the plants' own defensive reactions against said stress factors.

Formulation of the present invention can be in any of the formulations selected from Capsule suspension (CS), Dispersible concentrate (DC), Powder for dry seed treatment (DS), Emulsifiable concentrate (EC), Emulsion, water in oil (EO), Emulsion for seed treatment (ES), Emulsion, oil in water (EW), Flowable suspension/concentrate for seed treatment (FS), Granule/ soil applied (GR), Controlled (Slow or Fast) release granules (CR), Solution for seed treatment (LS), Micro-emulsion (ME), Oil dispersion (OD), Oil miscible flowable concentrate (oil miscible suspension (OF), Oil miscible liquid (OL), Suspension concentrate (= flowable concentrate) (SC), Suspo-emulsion (SE), Water soluble granule (SG), Soluble concentrate

(SL), Water soluble powder (SP), Water dispersible granule (WG or WDG), Wettable powder (WP), Water dispersible powder for slurry treatment (WS), A mixed formulation of CS and SC (ZC), A mixed formulation of CS and SE (ZE), A mixed formulation of CS and EW (ZW).

One or more of the active ingredients is encapsulated for various purposes, such as to increase the residual biological activity, or to reduce the acute toxicity, or to obtain a physical or chemically stable water-based formulation. The purpose determines whether the "free" active ingredient and the "release rate" are relevant properties of a specific product.

Further pesticidal composition comprising (A) Insecticide selected from the class of diamides, metadiamides or isoxazolines or mixture thereof; (B) fungicide(s) selected from the class of triazoles; (C) one or more Insecticide compound selected from the class of carbamates, organophosphates, phenylpyrazole, pyrethroids, nicotinic insecticides, spinosyns, mectins, juvenile hormone mimics, from the class of chordotonal organs modulators, mite growth inhibitors, microbial disruptors of insect midgut membrane, inhibitors of mitochondrial ATP synthase, uncouplers of oxidative phosphorylation, nereistoxin, chitin biosynthesis inhibitors, inhibitors of the chitin biosynthesis type 1, moulting disruptors, ecdyson receptor agonists, octopamin receptor agonists, METI (mitochondrial electron transport inhibitors, voltage-dependent sodium channel blockers, tetronic and tetramic acid derivatives, from baculoviruses or from the compounds of unknown or uncertain mode of action or from the mixture thereof are present in the said composition in specific fixed ratio.

In further aspect the present invention relates to the synergistic pesticidal composition comprising bioactive amounts of (A) is 0.1 to 30% w/w of the composition; (B) is 0.1 to 40% w/w of the composition; and (C) is 0.1 to 30% w/w of the composition.

Active Ingredients	**Compound A**	**Compound B**	**Compound C**
Examples	Insecticide(s) from diamides, metadiamides or isoxazolines class	Triazole fungicide	One more insecticide(s)
% of Active Ingredient	0.1 to 30%	0.1 to 40%	0.1 to 30%

The composition of the present invention in addition to bioactive amounts of active ingredients further comprises inactive excipients including but not limited to dispersant, anti-freezing agent, anti-foam agent, wetting agent, suspension aid, antimicrobial agent, thickener, quick coating agent or sticking agents (also referred to as "stickers" or "binders") and buffering agent.

A dispersant is a substance which adsorbs onto the surface of particles and helps to preserve the state of dispersion of the particles and prevents them from re-aggregating. Dispersants are added to agrochemical formulations to facilitate dispersion and suspension during manufacture, and to ensure the particles re-disperse into water in a spray tank. They are widely used in wettable powders, suspension concentrates and water-dispersible granules. Surfactants that are used as dispersants have the ability to adsorb strongly onto a particle surface and provide a charged or steric barrier to reaggregation of particles. The most commonly used surfactants are anionic, non-ionic, or mixtures of the two types. For wettable powder formulations, the most common dispersants are sodium lingo sulphonates. For suspension concentrates, very good adsorption and stabilization are obtained using polyelectrolytes, such as sodium naphthalene sulphonate formaldehyde condensates. Tristyrylphenolethoxylate phosphate esters are also used. Nonionics such as alkyl aryl ethylene oxide condensates and EO-PO block copolymers are sometimes combined with anionics as dispersants for suspension concentrates. In recent years, new types of very high molecular weight polymeric surfactants have been developed as dispersants. These have very long hydrophobic 'backbones' and a large number of ethylene oxide chains forming the 'teeth' of a 'comb' surfactant. These high molecular weight polymers can give very good long-term stability to suspension concentrates because the hydrophobic backbones have many anchoring points onto the particle surfaces. Examples of dispersants used herein for suspension concentrate formulation (SC) include but not limited to alkylated naphthalene sulfonate, sodium salt, sodium salt of naphthalene sulfonate condensate, naphthalenesulfonic acid , sodium salt of naphthalenesulfonic acid condensated with formaldehyde, sodium ligno sulfonate, sodium polycarboxylate, EO/PO based copolymer, phenol sulfonate, sodium methyl oleoyl taurate, styrene acrylic acid copolymer, propylene oxide-ethylene oxide-copolymer, polyethylene glycol 2,4,6-tristyrylphenyl ether, tristyrylphenol-polyglycol ether-phosphate, tristyrylphenole with 16 moles EO, tristyrylphenol-polyglycol ether-phosphate, oleyl-polyglycol ether with ethylene oxide, tallow fatty amine polyethylene oxide, nonylphenol polyglycol ether with 9-10 moles ethylene oxide.

Examples of dispersants used herein for Oil Dispersion formulation (OD) include but not limited to alkyl sulfonates, alkyl benzene sulfonates, alkyl aryl sulfonates, alkylphenolalkoxylates, tristyrylphenol ethoxylates, natural or synthetic fatty ethoxylate alcohols, natural or synthetic fatty acid alkoxylates, natural or synthetic fatty alcohols alkoxylates, alkoxylated alcohols (such as n-butyl alcohol poly glycol ether), block copolymers (such as ethylene oxide-propylene oxide block copolymers and ethylene oxide-butylene oxide

block copolymers), fatty acid-polyalkylene glycol condensates, polyamine-fatty acid condensates, polyester condensates, salts of polyolefin condensates, sodium ligno sulfonate, sodium ploycarboxylate, EO/PO based copolymer, phenol sulfonate, sodium methyl oleoyl taurate, styrene acrylic acid copolymer, propyleneoxide-ethyleneoxide-copolymer, polyethylene glycol 2,4,6-tristyrylphenyl ether, tristyrylphenol-polyglycolether-phosphate, tristyrylphenole with 16 moles EO, tristyrylphenol-polyglycolether-phosphate, oleyl-polyglycolether with ethylene oxide, tallow fattyamine polyethylene oxide, nonylphenol polyglycolether with 9-10 moles ethylene oxide.

Anti-freezing agent as used herein for suspension concentrate formulation (SC) can be selected from the group consisting of ethylene glycol, propane diols, glycerin or the urea, glycol (monoethylene glycol, diethylene glycol, polypropylene glycol, and polyethylene glycol), glycerin, urea, magnesium sulfate heptahydrate, sodium chloride etc.

Water-based formulations often cause foam during mixing operations in production. In order to reduce the tendency to foam, anti-foam agents are often added either during the production stage or before filling into bottles. Generally, there are two types of antifoam agents, namely silicones and non-silicones. Silicones are usually aqueous emulsions of dimethyl poly siloxane while the non-silicone anti-foam agents are water- insoluble oils, such as octanol and nonanol, or silica. In both cases, the function of the anti-foam agent is to displace the surfactant from the air-water interface. Examples of antifoaming agents used in suspension concentrate (SC) formulation and oil Dispersion (OD) formulation include but not limited to silicone oil, silicone compound, C10～C20 saturated fat acid compounds or C8～C10 aliphatic alcohols compound, silicone antifoam emulsion, dimethyl siloxane, polydimethyl siloxane, vegetable oil based antifoam, tallow based fatty acids, polyalkyleneoxide modified polydimethylsiloxane, etc.

A wetting agent is a substance that when added to a liquid increases the spreading or penetration power of the liquid by reducing the interfacial tension between the liquid and the surface on which it is spreading. Wetting agents are used for two main functions in agrochemical formulations: during processing and manufacture to increase the rate of wetting of powders in water to make concentrates for soluble liquids or suspension concentrates; and during mixing of a product with water in a spray tank or other vessel to reduce the wetting time of wettable powders and to improve the penetration of water into water-dispersible granules. Examples of wetting agents used in wettable powder, suspension concentrate, and water-dispersible granule formulations include but not limited to ethylene oxide/propylene oxide block copolymer, polyarylphenyl ether phosphate, polyalkoxylated butyl ether, ethoxylated fatty alcohol, sodium

dioctyl sulfosuccinate, sodium lauryl sulfate and sodium dodecyl benzene sulfonate, alkyl diphenyl sulfonates, sodium isopropyl naphthalene sulfonate, alkyl naphthalene sulfonate, organosilicons surfactants (as a wetting-spreading-penetrating agent) includes trisiloxane ethoxylate, polydimethylsiloxane, polyoxyethylene methyl polysiloxane, polyoxyalkylene methyl polysiloxane, polyether polymethyl siloxane copolymer, heptamethyl trisiloxane, Polyalkyleneoxide modified heptamethyl trisiloxane, polyether modified polysiloxane, may or may not be in modified form, may be liquid or powder form or mixture thereof etc.;

Examples of wetting agent used in Oil dispersion (OD) formulation include but not limited to ethylene oxide/propylene oxide block copolymer, polyarylphenyl ether phosphate, ethoxylated fatty alcohol, sodium dioctyl sulfosuccinate, sodium lauryl sulfate and sodium dodecyl benzene sulfonate, alkyldiphenyl sulfonates, sodium isopropyl naphthalene sulfonate, alkylnaphthalene sulfonate.

Examples of wetting-spreading-penetrating agent used in Oil dispersion (OD) formulation include but not limited to Organosilicone surfactants includes trisiloxane ethoxylate, polydimethylsiloxane, polyoxyethylene methyl polysiloxane, polyoxyalkylene methyl polysiloxane, polyether polymethyl siloxane copolymer, heptamethyl trisiloxane, Polyalkyleneoxide modified heptamethyl trisiloxane, polyether modified polysiloxane, 10 mole ethylene oxide adduct of octylphenol, may or may not be in modified form, may be liquid or powder form or mixture thereof etc;

Examples of emulsifying agent used herein for Oil Dispersion (OD) formulation includes but not limited to castor oil ethoxylates, alcohol ethoxylates, fatty acid ethoxylates, sorbitan ester ethoxylates, sulphosuccinate, calcium salts of dodecylbenzene sulphonate, alkylammonium salts of alkylbenzene sulphonate, alkylsulphosuccinate salts, ethylene oxide-propylene oxide block copolymers, ethoxylated alkylamines, ethoxylated alkyl phenols, polyoxyethylene sorbitan monolaurate etc;

Suspension aid in the present description denotes a natural or synthetic, organic or inorganic material with which the active substance is combined in order to facilitate its application to the plant, to the seeds or to the soil. This carrier is hence generally inert, and it must be agriculturally acceptable, in particular to the plant being treated. The carrier may be solid (clays, natural or synthetic silicates, silica, resins, waxes, solid fertilizers, and the like or mixtures thereof) or liquid (water, alcohols, ketones, petroleum fractions, aromatic or paraffinic hydrocarbons, chlorinated hydrocarbons, liquefied gases, and the like or mixtures thereof).

Examples of suspending agent used in suspension concentrate (SC) formulation include but not limited to aluminum magnesium silicate, bentonite clay, silica, attapulgite clay;

Biocides / Microorganisms cause spoilage of formulated products. Therefore antimicrobial agents are used to eliminate or reduce their effect. Examples of such agents include, but are not limited to, 1,2-benzisothiazolin-3(2H)-one, sodium salt, sodium benzoate, 2-bromo-2-nitropropane-1,3-diol, formaldehyde, sodium o-phenyl phenate, 5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one.

Thickeners or gelling agents are used mainly in the formulation of suspension concentrates, emulsions and suspoemulsions to modify the rheology or flow properties of the liquid and to prevent separation and settling of the dispersed particles or droplets. Thickening, gelling, and anti-settling agents generally fall into two categories, namely water-insoluble particulates and water-soluble polymers. It is possible to produce suspension concentrate formulations using clays and silicas. Examples of these types of materials, include, but are limited to, montmorillonite, e.g. bentonite; magnesium aluminum silicate; and attapulgite. Water-soluble polysaccharides have been used as thickening-gelling agents for many years. The types of polysaccharides most commonly used are natural extracts of seeds and seaweeds are synthetic derivatives of cellulose or mixtures thereof. Examples of these types of materials used herein for suspension concentrate (SC) formulation include, but are not limited to, guar gum; locust bean gum; carrageenam; xanthan gum; alginates; gelatin; methyl cellulose; PVK; carboxymethyl celluloses; sodium polyacrylate, sodium carboxymethyl cellulose (SCMC); hydroxyethyl cellulose (HEC) or mixtures thereof. Other types of anti-settling agents are based on modified starches, polyacrylates, polyvinyl alcohols and polyethylene oxide or mixtures.

Examples of stabilizers used herein Oil dispersion (OD) formulation include but not limited to hectorite clay, aluminium magnesium silicate, bentonite clay, silica, and attapulgite clay.

The quick coating agent can be a conventionally available sticker, for example polyesters, polyamides, poly- carbonates, polyurea and polyurethanes, acrylate polymers and copolymers, styrene copolymers, butadiene copolymers, polysaccharides such as starch and cellulose derivatives, vinyl alcohol, vinyl acetate and vinyl pyrrolidone polymers and copolymers, polyethers, epoxy, phenolic and melamine resins, polyolefins and define copolymers and mixtures thereof. Examples of preferred polymers are acrylate polymers such as poly(methacrylate), poly(ethyl methacrylate), poly(methyl methacrylate), acrylate copoylmers and styrene-acrylic copolymers as defined herein below, poly(styrene-co maleic anhydride),

cellulosic polymers such as ethyl cellulose, cellulose acetate, cellulose acetatebutyrate, acetylated mono, di, and triglycerides, poly(vinyl pyrrolidone), vinyl acetate polymers and copolymers, poly(alkylene glycol), styrene butadiene copolymers, poly(ortho esters), alkyd resins, and mixtures of two or more of these.

Polymers that are biodegradable are also useful in the present invention. As used herein, a polymer is biodegradable if is not water soluble, but is degraded over a period of several weeks when placed in an application environment. Examples of biodegradable polymers that are useful in the present invention include biodegradable polyesters, starch, polylactic acid starch blends, polylactic acid, poly(lactic acid-glycolic acid) copolymers, polydioxanone, cellulose esters, ethyl cellulose, cellulose acetate butyrate, starch esters, starch ester aliphatic polyester blends, modified corn starch, poly capro lactone, poly(namylmethacrylate), wood rosin, poly anhydrides, poly vinyl alcohol, poly hydroxyl butyrate valerate, biodegradable aliphatic polyesters, and poly hydroxyl butyrate or mixtures thereof.

Buffering agent as used herein is selected from group consisting of calcium hydroxyapatite, Potassium Dihydrogen Phosphate, Sodium Hydroxide, carbonated apatite, calcium carbonate, sodium bicarbonate, tricalcium phosphate, calcium phosphates, carbonated calcium phosphates, amine monomers, lactate dehydrogenase and magnesium hydroxide.

Carrier or diluting agent as solvent for the Oil Dispersion (OD) formulation is selected from and not limited to vegetable oil (plant, seed or tree) or its alkylated or ethoxylated or esterified. The alkylated vegetable oil may be methylated vegetable oil or ethylated vegetable oil. The vegetable oils include olive oil, kapok oil, castor oil, papaya oil, camellia oil, sesame oil, corn oil, rice bran oil, cotton seed oil, soybean oil, groundnut oil, rapeseed-mustard oil, linseed oil, tung oil, sunflower oil, safflower oil, coconut oil. The alkyl ester of vegetable oils includes methyl ester, ethyl ester, propyl ester or butyl ester of vegetable oils. Some of the examples are rapeseed oil methyl ester, rapeseed oil ethyl ester, rapeseed oil propyl esters, rapeseed oil butyl esters, soybean oil methyl ester, soybean oil ethyl ester, soybean oil propyl ester, soybean oil butyl ester, castor oil methyl ester, castor oil ethyl ester, castor oil propyl ester, castor oil butyl ester, cotton seed oil methyl ester, cotton seed oil ethyl ester, cotton seed oil butyl ester, cotton seed oil propyl ester, tall oil fatty acids esters-tallow methyl ester, tallow ethyl ester, tallow propyl ester, bio-diesel, mineral oil (aromatic solvents, isoparaffin, base solvent), fatty acid amides (e.g. C1 -C3 amines, alkylamines or alkanolamines with C6–C18 carboxylic acids), fatty acids, alkyl esters of fatty acids, methyl and ethyl oleate, methyl and ethyl soyate, alkyl benzenes and alkylnaphthalenes, polyalkylene glycol ethers, fatty acid diesters, fatty

alkylamides and diamides, dialkylene carbonates, ketones and alcohols. The above oil based carrier/diluting agents may be used as solo or mixture of two or more if desired.

The solvent for the formulation of the present invention may include water, water soluble alcohols and dihydroxy alcohol ethers. The water-soluble alcohol which can be used in the present invention may be lower alcohols or water-soluble macromolecular alcohols. The term "lower alcohol", as used herein, represents an alcohol having 1-4 carbon atoms, such as methanol, ethanol, n-propanol, isopropanol, n-butanol, tertbutanol, etc. Macromolecular alcohol is not limited, as long as it may be dissolved in water in a suitable amount range, e.g., polyethylene glycol, sorbitol, glucitol, etc. The examples of suitable dihydroxy alcohol ethers used in the present invention may be dihydroxy alcohol alkyl ethers or dihydroxy alcohol aryl ethers. The examples of dihydroxy alcohol alkyl ether include ethylene glycol methyl ether, diethylene glycol methyl ether, propylene glycol methyl ether, dipropylene glycol methyl ether, ethylene glycol ethyl ether, diethylene glycol ethyl ether, propylene glycol ethyl ether, dipropylene glycol ethyl ether, etc. The examples of dihydroxy alcohol aryl ethers include ethylene glycol phenyl ether, diethylene glycol phenyl ether, propylene glycol phenyl ether, dipropylene glycol phenyl ether, and the like. Any of the above mentioned solvent can be used either alone or in combination thereof.

The process for preparing the present novel synergistic composition can be modified accordingly by any person skilled in the art based on the knowledge of the manufacturing the formulation. However all such variation and modification is still covered by the scope of present invention.

EXAMPLE 1:

SC (Suspension Concentrate) formulation of Chlorantraniliprole 2%+Tebuconazole 12.5%+Flupyrimin 7.5%

Chemical composition		% (w/w)
Chloratraniliprole a.i.	Active ingredient	2.00
Tebuconazole a.i.	Active ingredient	12.50
Flupyrimin a.i.	Active ingredient	7.50
Trisiloxane ethoxylate	Wetting-spreading-penetrating agent	5.00
Naphthalenesulfonic acid, sodium salt condensated with formaldehyde	Dispersing agent 1	2.00
Tristyrylphenole with 16 moles EO	Dispersing agent 2	3.00
Bentonite clay	Suspending agent	1.50
Polydimethyl siloxane	Antifoaming agent	0.50

2-bromo-2-nitropropane-1,3-diol	Preservative	0.20
Polypropylene glycol	Antifreezing agent	5.00
Xanthan gum	Thickner	0.15
Diluent Water	Water	60.65
Total		100.00

Storage stability-

Chlorantraniliprole 2%+Tebuconazole 12.5%+Flupyrimin 7.5% SC (Suspension Concentrate)

Storage stability study in laboratory (at 54±2 C & At 0±2 C temp. for 14 days) and at room temperature (for 12 months) shows that Chlorantraniliprole 2%+Tebuconazole 12.5%+Flupyrimin 7.5% SC (Suspension Concentrate) formulation complies all the in-house parameters like active ingredients content, suspensibility, pH range, pourability, specific gravity, viscosity, particle size and anti-foaming.

Procedure: Manufacturing process of Suspension Concentrate (SC)

Preparation of Suspension Concentrate (SC) formulation:	
Step 1	2% Gel Preparation: Charge the required quantity of water to a vessel, equipped with a high shear stirrer and start the agitation. Add the required amount of preservative. Mix until homogenous. Add the required amount of thickener and mix vigorously until it is fully wetted.
Step 2	Charge the required quantity of water to a vessel, equipped with bulk agitator and a high shear homogenizer and start agitation. Add the required amount of ant freezing agent and mix until uniform. Add the antifoaming agent and ensure that it is well dispersed. Add the wetting and dispersing agent and mix until uniform. Ensure that the dispersing agent is fully dispersed.
Step 3	Now add the active ingredient and continue agitating the vessel contents until all components get dissolved. Mill this pre-mix through a Colloid mill and subsequently through a Dyno mill to meet the specified particle size.
Step 4	Now add remaining antifoaming agent to this SC mill base to a vessel, equipped with bulk agitator. Mix until uniform. Add the required amount of 2% aqueous pre-gel and suspending agent and continue agitation until the formulation is homogeneous and has the target viscosity is reached.
Step 5	Final product is sent for QC approval.
Step 6	After approval, material is packed in required pack sizes.

EXAMPLE 2:

SC (Suspension Concentrate) formulation of Chlorantraniliprole 2%+Prothioconazole 12.5%+Triflumezopyrim 2%

Chemical composition		% (w/w)
Chloratraniliprole a.i.	Active ingredient	2.00
Prothioconazole a.i.	Active ingredient	12.50
Triflumezopyrim a.i.	Active ingredient	2.00
Trisiloxane ethoxylate	Wetting-spreading-penetrating agent	5.00
Naphthalenesulfonic acid, sodium salt condensated with formaldehyde	Dispersing agent 1	2.00
Tristyrylphenole with 16 moles EO	Dispersing agent 2	3.00
Bentonite clay	Suspending agent	1.50
Polydimethyl siloxane	Antifoaming agent	0.50
2-bromo-2-nitropropane-1,3-diol	Preservative	0.20
Polypropylene glycol	Antifreezing agent	5.00
Xanthan gum	Thickner	0.15
Diluent Water	Water	60.15
Total		100.00

Storage stability-

Storage stability study in laboratory (at 54±2 C & At 0±2 C temp. for 14 days) and at room temperature (for 12 months) shows that Chlorantraniliprole 2%+Prothioconazole 12.5%+Triflumezopyrim 2% SC (Suspension Concentrate) formulation complies all the in-house parameters like active ingredients content, suspensibility, pH range, pourability, specific gravity, viscosity, particle size and anti-foaming.

Procedure: Manufacturing process of Suspension Concentrate (SC)

Preparation of Suspension Concentrate (SC) formulation:	
Step 1	2% Gel Preparation: Charge the required quantity of water to a vessel, equipped with a high shear stirrer and start the agitation. Add the required amount of preservative. Mix until homogenous. Add the required amount of thickener and mix vigorously until it is fully wetted.
Step 2	Charge the required quantity of water to a vessel, equipped with bulk agitator and a high shear homogenizer and start agitation. Add the required amount of ant freezing agent and mix until uniform. Add the antifoaming agent and ensure that it is well dispersed. Add the wetting and dispersing agent and mix until uniform. Ensure that the dispersing agent is fully dispersed.
Step 3	Now add the active ingredient and continue agitating the vessel contents until all components get dissolved. Mill this pre-mix through a Colloid mill and subsequently through a Dyno mill to meet the specified particle size.
Step 4	Now add remaining antifoaming agent to this SC mill base to a vessel, equipped with bulk agitator. Mix until uniform. Add the required amount of 2% aqueous pre-gel and suspending agent and continue agitation until the formulation is homogeneous and has the target viscosity is reached.
Step 5	Final product is sent for QC approval.

Step 6	After approval, material is packed in required pack sizes.

EXAMPLE 3:

List of preferred formulations:

Compound A	Compound B	Compound C	Active ingredients (%)			Formulation Strength (%)	Formulation Type
			A	B	C		
Chlorantraniliprole	Tebuconazole	Flupyrimin	2	12.5	7.5	22.00	SC
Cyantraniliprole	Tebuconazole	Flupyrimin	5	12.5	7.5	25.00	SC
Tetraniliprole	Tebuconazole	Flupyrimin	5	12.5	7.5	25.00	SC
Broflanilide	Tebuconazole	Flupyrimin	2	25	15	42.00	SC
Chlorantraniliprole	Prothioconazole	Triflumezopyrim	2	12.5	2	16.50	SC
Cyantraniliprole	Prothioconazole	Triflumezopyrim	5	12.5	2	19.50	SC
Tetraniliprole	Prothioconazole	Triflumezopyrim	5	12.5	2	19.50	SC
Broflanilide	Prothioconazole	Triflumezopyrim	2	25	4	31.00	SC
Broflanilide	Difenoconazole	Tolfenpyrad	1	8	10	19.00	SC
Broflanilide	Difenoconazole	Fipronil	1	8	8	17.00	SC
Broflanilide	Difenoconazole	Dimpropyridaz	1	8	6	15.00	SC
Broflanilide	Difenoconazole	Spiropidion	1	8	6	15.00	SC
Broflanilide	Difenoconazole	Abamectin	2	16	2	20.00	SC
Broflanilide	Hexaconazole	Methoxyfenozide	1.5	10	20	31.50	SC
Broflanilide	Hexaconazole	Chlorfluazuron	1.5	10	10	21.50	SC
Broflanilide	Hexaconazole	Lufenuron	1.5	10	10	21.50	SC
Broflanilide	Hexaconazole	Emamectin benzoate	1.5	10	1.5	13.00	SC
Broflanilide	Hexaconazole	Spinosad	1.5	10	8	19.50	SC
Chlorantraniliprole	Prothioconazole	Methoxyfenozide	2	10	10	22.00	OD
Chlorantraniliprole	Prothioconazole	Emamectin benzoate	2	10	0.75	12.75	OD
Chlorantraniliprole	Prothioconazole	Lambda cyhalothrin	2	10	2	14.00	ZC
Chlorantraniliprole	Prothioconazole	Indoxacarb	2	10	5	17.00	OD
Cyantraniliprole	Prothioconazole	Bifenthrin	5	10	5	20.00	SC
Cyantraniliprole	Prothioconazole	Fipronil	5	10	5	20.00	SC
Cyantraniliprole	Prothioconazole	Emamectin benzoate	5	10	0.75	15.75	SC
Cyantraniliprole	Prothioconazole	Methoxyfenozide	5	10	10	25.00	SC
Cyantraniliprole	Tebuconazole	Bifenthrin	5	10	5	20.00	SC
Cyantraniliprole	Tebuconazole	Fipronil	5	10	5	20.00	SC
Cyantraniliprole	Tebuconazole	Emamectin benzoate	5	10	0.75	15.75	SC
Cyantraniliprole	Tebuconazole	Methoxyfenozide	5	10	10	25.00	SC
Tetraniliprole	Difenoconazole	Emamectin benzoate	5	10	1	16.00	SC
Tetraniliprole	Difenoconazole	Methoxyfenozide	5	10	10	25.00	SC
Tetraniliprole	Difenoconazole	Indoxacarb	5	10	5	20.00	SC
Tetraniliprole	Difenoconazole	Novaluron	5	10	5	20.00	SC
Tetraniliprole	Difenoconazole	Tolfenpyrad	5	10	7.5	22.50	SC
Isocycloseram	Hexaconazole	Emamectin benzoate	10	10	2	22.00	SC
Isocycloseram	Hexaconazole	Methoxyfenozide	5	5	10	20.00	SC

Isocycloseram	Hexaconazole	Tolfenpyrad	5	5	10	20.00	SC
Fluxametamide	Hexaconazole	Emamectin benzoate	3	10	1.5	14.50	SC
Fluxametamide	Hexaconazole	Methoxyfenozide	1.5	5	10	16.50	SC
Fluxametamide	Hexaconazole	Abamectin	3	10	1.5	14.50	SC
Fluxametamide	Hexaconazole	Tolfenpyrad	3	10	15	28.00	SC
Fluxametamide	Hexaconazole	Fipronil	3	10	10	23.00	SC
Fluxametamide	Hexaconazole	Dimpropyridaz	3	10	10	23.00	SC
Fluxametamide	Hexaconazole	Spiropidion	3	10	10	23.00	SC

BIOLOGICAL EXAMPLES:

A synergistic effect exists wherever the action of a combination of active ingredient is greater than the sum of the action of each of the components alone. Therefore, a synergistically effective amount or an effective amount of a synergistic composition or combination is an amount that exhibits greater pesticidal activity than the sum of the pesticidal activities of the individual components.

In the field of agriculture, it is often understood that the term "synergy" is as defined by Colby S.R. in an article entitled " Calculation of the synergistic and antagonistic responses of herbicide combinations" published in the journal Weeds, 1967, 15, p.20-22, incorporated herein by reference in its entirety. The action expected for a given combination of two or three active components can be calculated as follows:

Colby's formula for calculating synergism between three active ingredients

$$E = (X + Y + Z) - \left(\frac{XY + XZ + YZ}{100}\right) + \left(\frac{X\ Y\ Z}{10000}\right)$$

Where, E = Expected % control by mixture/combination of Compound A, Compound B and Compound C in a defined dose
X = Observed % control by Compound A
Y = Observed % control by Compound B
Z = Observed % control by Compound C

$$\text{Ratio} = \frac{\text{Observed Value (\% control)}}{\text{Expected Value (\% control)}}$$

If ratio of O/E >1, means synergism observed

Colby's formula for calculating synergism between two active ingredients

$$E = X + Y - \frac{XY}{100}$$

Where, E= Expected % control by mixture/combination of Compound A and Compound B in a defined dose
X= Observed % control by Compound A
Y= Observed % control by Compound B

$$\text{Ratio} = \frac{\text{Observed value (\% control)}}{\text{Expected value (\% control)}}$$

Ratio of O/E > 1, means synergism observed

FIELD BIO-EFFICACY STUDIES:

The field studies have been conducted to judge the synergism and benefits of innovative ready-mix combinations in comparison to conventional combinations.

Experiment 1: Control of insect-pest and diseases in okra (Abelmoschus esculentus) crop

Crop : Okra

Location : Anand, Gujarat

Plot size : 40 sq. mt.

Number of Treatments: 24

Spray volume : 400 liter/h

Application method : Foliar spray with battery operated knap sack sprayer

Agronomic Practices : All agronomic practices followed as per the crop requirement except insect and disease control.

Observation Methods:

Fruit borer larval control (%)- Count the number of fruit borer (Helicoverpa armigera) larvae per plant and record the observations from randomly selected 10 plants per plot. Calculate larval control (%) as-

$$\% \text{ Larval control} = 100 - \frac{\text{Number of live larva in treatment}}{\text{Number of live larva in untreated control}} \times 100$$

Apply colby's formula to judge the synergism.

Powdery mildew (Erysiphe cichoracearum) disease control (%) - Calculate Percent Disease Index (PDI %) by observing 50 randomly selected leaves per plot. Assess the disease incidence and severity by following powdery mildew scale (0-5 grade). Grade 0-Healthy plants free from powdery mildew, Grade 1-Minute scattered spots on the leaf, Grade 2-Small spots coalesce with each other and covering nearly one fourth of the leaf surfaces. 25 percent leaf area of plant infected, Grade 3-Patches covering equal to the half of the leaf surface i.e. 26-50 percent leaf area of plant infected, Grade 4-More than three fourth of the leaf area under powdery mildew coating. Covering 51-75 percent leaf area of infected plant, Grade 5-Sever infection, powdery growth covering 75-100 percent leaf area and defoliation common.

$$\% \text{ Disease Index (PDI)} = \frac{\text{Sum of total rating} \times 100}{\text{Total plant observed} \times \text{Maximum disease rating}}$$

$$\% \text{ Disease Control (PDI)} = \frac{\text{PDI (\%) in untreated} - \text{PDI (\%) in treatment}}{\text{PDI (\%) in untreated}} \times 100$$

Fruit count- Count the number of healthy fruits per plant. Record the observation from 10 plants per plot.

Table 1: Treatment details

Treatment Number	Treatment details	Use Rate g.a.i./h
T1	Fluxametamide 1.5%+Hexaconazole 5%+Methoxyfenozide 10% SC	15+50+100
T2	Fluxametamide 3%+Hexaconazole 10%+Emamectin benzoate 1.5% SC	15+50+7.5
T3	Fluxametamide 3%+Hexaconazole 10%+Abamectin 1.5% SC	15+50+7.5
T4	Fluxametamide 3%+Hexaconazole 10%+Tolfenpyrad 15% SC	15+50+75
T5	Fluxametamide 3%+Hexaconazole 10%+Dimpropyridaz 10% SC	15+50+50
T6	Fluxametamide 10% L+Hexaconazole 5% SC (tank mix)	15+50
T7	Fluxametamide 10% L+Methoxyfenozide 24% SC (tank mix)	15+100
T8	Fluxametamide 10% L+Emamectin benzoate 5% SG (tank mix)	15+7.5
T9	Fluxametamide 10% L+Abamectin 1.9% EC (tank mix)	15+7.5
T10	Fluxametamide 10% L+Tolfenpyrad 15% EC (tank mix)	15+75
T11	Fluxametamide 10% L+Dimpropyridaz 20% SC (tank mix)	15+50
T12	Hexaconazole 5% SC+Methoxyfenozide 24% SC (tank mix)	50+100
T13	Hexaconazole 5% SC+Emamectin benzoate 5% SG (tank mix)	50+7.5
T14	Hexaconazole 5% SC+Abamectin 1.9% EC (tank mix)	50+7.5
T15	Hexaconazole 5% SC+Tolfenpyrad 15% EC (tank mix)	50+75
T16	Hexaconazole 5% SC+Dimpropyridaz 20% SC (tank mix)	50+50
T17	Fluxametamide 10% L	15
T18	Hexaconazole 5% SC	50
T19	Methoxyfenozide 24% SC	100
T20	Emamectin benzoate 5% SG	7.5
T21	Abamectin 1.9% EC	7.5
T22	Tolfenpyrad 15% EC	75
T23	Dimpropyridaz 20% SC	50
T24	UTC (Untreated Check)	0

Table 2: Fruit borer larval control and powdery mildew disease control in okra crop

Treatment Number	Fruit borer larval control (%)				Powdery mildew disease control (%)	Average number of fruits per 5 plants	% increase in fruits over T24
	Obs. Val.	Cal. Val.	Colby's Ratio	Synergism (Y/N)			
T1	100.00	91.17	1.10	Y	88.4	32.4	107.69
T2	100.00	90.63	1.10	Y	87.6	31.6	102.56
T3	97.40	88.72	1.10	Y	89.2	33.2	112.82
T4	98.20	89.68	1.10	Y	92.6	34.6	121.79
T5	92.60	88.19	1.05	Y	87.8	32.2	106.41
T6	68.80	70.17	0.98	N	86.4	28.8	84.62
T7	89.20	90.59	0.98	N	12.4	25.6	64.10
T8	89.20	90.01	0.99	N	11.6	24.8	58.97
T9	87.40	87.98	0.99	N	12.8	26.2	67.95

T10	88.20	89.00	0.99	N	54.2	25.2	61.54
T11	86.40	87.41	0.99	N	12.2	24.6	57.69
T12	71.40	72.24	0.99	N	86.8	26.4	69.23
T13	69.20	70.55	0.98	N	89.2	26.2	67.95
T14	63.60	64.54	0.99	N	86.4	25.8	65.38
T15	66.20	67.55	0.98	N	90.2	27.2	74.36
T16	61.20	62.86	0.97	N	84.2	24.8	58.97
T17	68.20				10.4	21.2	35.90
T18	6.20				82.6	20.6	32.05
T19	70.40				10.2	21.4	37.18
T20	68.60				11.4	20.8	33.33
T21	62.20				11.2	22.4	43.59
T22	65.40				52.8	23.2	48.72
T23	60.40				12.4	20.2	29.49
T24	0.00				0.0	15.6	0.00

All the ready-mix innovative combinations (T1, T2, T3, T4 and T5) provides synergistic control of fruit borer larvae and excellent (>87%) control of powdery mildew disease. The ready mix innovative combinations (T1, T2, T3, T4 and T5) also yielded higher number of healthy fruits. This is due to the synergism and excellent efficacy against fruit borer larvae, powdery mildew disease and sucking insects (jassid, whitefly and red spider mite).

Experiment 2: Control of insect-pest and diseases in paddy crop

Crop : Paddy

Location : Rajim, Chhattishgarh

Plot size : 40 sq. mt.

Number of Treatments: 20

Spray volume : 400 liter/h

Method of Application: Foliar spray with battery operated knap sack sprayer

Agronomic Practices : All agronomic practices followed as per the crop requirement except insect and disease control.

Observation Methods:

Stem borer (Scirpophaga incertulas) control (% reduction in white earhead)- Count the number of infested tillers (white ear) and healthy tillers per hill. Record such observations from 10 hills per plot. Calculate stem borer incidence (as % white ear incidence) and then re-calculate stem borer control (% reduction in white ear).

$$\text{White ear(WE\%)} = \frac{\text{Number of white ears per 10 hills}}{\text{Total number of panicle bearing tillers per 10 hills}} \times 100$$

$$\text{\% Stem borer control (White ear symptoms)} = 100 - \frac{\text{White ear(\%) in treatment}}{\text{White ear(\%) in untreated}} \times 100$$

Apply Colby's formula to % stem borer control data and judge the synergism.

Brown Plant Hopper (BPH, Nilaparvata lugens): The observation was recorded by counting the no. of live BPH per hill. Record the observations from 10 hills per plot. The percent insect control was worked out by below formula:

$$\text{\% Insect Control} = 100 - \frac{\text{Number of live insects in treated plot}}{\text{Number of live insects in untreated plot}} \times 100$$

Apply Colby's formula to % BPH control data and judge the synergism.

Grain discoloration (%)- Count the number of diseased (Infected) grain and healthy grains from randomly selected 10 panicles per plot. Calculate % grains discoloration and recalculate % grain discoloration control.

$$\text{Grain discoloration (\%)} = \frac{\text{Number of diseased/infected grains}}{\text{Total number of grains (diseased + healthy)}} \times 100$$

$$\text{Grain discoloration disease control (\%)} = \frac{\text{Grain discoloration (\%) in untreated} - \text{Grain discoloration (\%) in treatment}}{\text{Grain discoloration (\%) in untreated}} \times 100$$

Productive tiller count- Count the number of tillers bearing healthy panicles per hill. Record the observations from 10 hills per plot.

Table 3: Treatment details

Treatment Number	Treatment details	Use Rate g.a.i./h
T1	Chlorantraniliprole 2%+Tebuconazole 12.5%+Flupyrimin 7.5% SC	20+125+75
T2	Cyantraniliprole 5%+Tebuconazole 12.5%+Flupyrimin 7.5% SC	50+125+75
T3	Tetraniliprole 5%+Tebuconazole 12.5%+Flupyrimin 7.5% SC	50+125+75
T4	Broflanilide 2%+Tebuconazole 12.5%+Flupyrimin 7.5% SC	10+125+75
T5	Tebuconazole 25% EC + Flupyrimin 10% SC (tank mix)	125+75
T6	Chlorantraniliprole 20% SC + Flupyrimin 10% SC (tank mix)	20+75
T7	Cyantraniliprole 10.26% OD + Flupyrimin 10% SC (tank mix)	50+75

T8	Tetraniliprole 20% SC + Flupyrimin 10% SC (tank mix)	50+75
T9	Broflanilide 30% SC + Flupyrimin 10% SC (tank mix)	10+75
T10	Chlorantraniliprole 20% SC + Tebuconazole 25% EC (tank mix)	20+125
T11	Cyantraniliprole 10.26% OD + Tebuconazole 25% EC (tank mix)	50+125
T12	Tetraniliprole 20% SC + Tebuconazole 25% EC (tank mix)	50+125
T13	Broflanilide 30% SC + Tebuconazole 25% EC (tank mix)	10+125
T14	Flupyrimin 10% SC	75
T15	Tebuconazole 25% EC	125
T16	Chlorantraniliprole 20% SC	20
T17	Cyantraniliprole 10.26% OD	50
T18	Tetraniliprole 20% SC	50
T19	Broflanilide 30% SC	10
T20	UTC (Untreated Check)	0

Table 4: Stem borer, BPH control in paddy crop

Treatment Number	% Stem borer control (reduction in white earhead)				% BPH control		
	Obs. Val.	Cal. Val.	Colby's Ratio	Synergism (Y/N)	Obs. Val.	Cal. Val.	Colby's Ratio
T1	100.00	92.97	1.08	Y	92.40	74.20	1.25
T2	100.00	92.30	1.08	Y	88.80	73.83	1.20
T3	100.00	92.03	1.09	Y	89.20	74.32	1.20
T4	96.40	90.81	1.06	Y	86.40	73.89	1.17
T5	70.40	72.32	0.97	N	69.00	69.36	0.99
T6	90.60	91.97	0.99	N	70.80	71.20	0.99
T7	90.20	91.22	0.99	N	70.20	70.79	0.99
T8	88.80	90.90	0.98	N	70.80	71.34	0.99
T9	87.60	89.51	0.98	N	70.20	70.86	0.99
T10	75.60	77.75	0.97	N	24.00	24.56	0.98
T11	74.20	75.65	0.98	N	23.20	23.48	0.99
T12	73.20	74.77	0.98	N	24.60	24.92	0.99
T13	69.40	70.92	0.98	N	22.40	23.66	0.95
T14	68.40				65.80		
T15	12.40				10.40		
T16	74.60				15.80		
T17	72.20				14.60		
T18	71.20				16.20		
T19	66.80				14.80		
T20	0.00				0.00		

All the ready-mix innovative combinations (T1, T2, T3 and T4) provides synergistic control of stem borer and BPH.

Table 5: Grain discoloration and productive tillers

Treatment Number	Grain discoloration control (%)	Average number of productive tillers per hill	% increase in productive tillers over T20
T1	90.6	30.2	69.66
T2	91.2	31.2	75.28

T3	90.2	30.8	73.03
T4	92.2	31.4	76.40
T5	89.2	27.6	55.06
T6	18.2	25.4	42.70
T7	16.8	24.6	38.20
T8	17.4	24.8	39.33
T9	15.6	25.0	40.45
T10	88.2	28.2	58.43
T11	87.6	26.8	50.56
T12	88.4	27.4	53.93
T13	86.8	25.8	44.94
T14	18.4	22.4	25.84
T15	84.2	23.4	31.46
T16	16.8	23.4	31.46
T17	15.6	22.8	28.09
T18	17.2	23.2	30.34
T19	12.6	21.2	19.10
T20	0.0	17.8	0.00

All the ready-mix innovative combinations (T1, T2, T3 and T4) provides excellent control of grain discoloration disease and also produces higher number of productive tillers which directly contributes to the grain yield.

5

Experiment 3: Control of insect-pest and diseases in paddy crop

Experimental details and methodology were same as given in Experiment 2.

Table 6: Treatment details

Treatment Number	Treatment details	Use Rate g.a.i./h
T1	Chlorantraniliprole 2%+Prothioconazole 12.5%+Triflumezopyrim 2% SC	20+125+20
T2	Cyantraniliprole 5%+Prothioconazole 12.5%+Triflumezopyrim 2% SC	50+125+20
T3	Tetraniliprole 5%+Prothioconazole 12.5%+Triflumezopyrim 2% SC	50+125+20
T4	Broflanilide 2%+Prothioconazole 12.5%+Triflumezopyrim 7.5% SC	10+125+20
T5	Prothioconazole 25% EC +Triflumezopyrim 10% SC (tank mix)	125+20
T6	Chlorantraniliprole 20% SC +Triflumezopyrim 10% SC (tank mix)	20+20
T7	Cyantraniliprole 10.26% OD +Triflumezopyrim 10% SC (tank mix)	50+20
T8	Tetraniliprole 20% SC +Triflumezopyrim 10% SC (tank mix)	50+20
T9	Broflanilide 30% SC +Triflumezopyrim 10% SC (tank mix)	10+20
T10	Chlorantraniliprole 20% SC +Prothioconazole 25% EC (tank mix)	20+125
T11	Cyantraniliprole 10.26% OD +Prothioconazole 25% EC (tank mix)	50+125
T12	Tetraniliprole 20% SC +Prothioconazole 25% EC (tank mix)	50+125
T13	Broflanilide 30% SC +Prothioconazole 25% EC (tank mix)	10+125
T14	Triflumezopyrim 10% SC	20

T15	Prothioconazole 25% EC	125
T16	Chlorantraniliprole 20% SC	20
T17	Cyantraniliprole 10.26% OD	50
T18	Tetraniliprole 20% SC	50
T19	Broflanilide 30% SC	10
T20	UTC (Untreated Check)	0

Table 7: Stem borer and BPH control in Paddy crop

Treatment Number	% Stem borer control (reduction in white earhead)				% BPH control		
	Obs. Val.	Cal. Val.	Colby's Ratio	Synergism (Y/N)	Obs. Val.	Cal. Val.	Colby's Ratio
T1	99.80	83.31	1.20	Y	88.60	81.08	1.09
T2	98.20	82.07	1.20	Y	86.40	80.85	1.07
T3	96.40	81.38	1.18	Y	84.20	80.53	1.05
T4	93.40	79.68	1.17	Y	82.60	80.04	1.03
T5	42.40	43.25	0.98	N	76.40	77.42	0.99
T6	80.20	81.42	0.99	N	78.20	79.39	0.99
T7	78.80	80.03	0.98	N	77.80	79.14	0.98
T8	77.80	79.27	0.98	N	76.20	78.79	0.97
T9	76.40	77.37	0.99	N	77.40	78.25	0.99
T10	72.20	73.60	0.98	N	22.40	23.07	0.97
T11	71.20	71.62	0.99	N	21.40	22.15	0.97
T12	68.80	70.55	0.98	N	18.80	20.87	0.90
T13	66.80	67.85	0.98	N	17.80	18.85	0.94
T14	36.80				75.40		
T15	10.20				8.20		
T16	70.60				16.20		
T17	68.40				15.20		
T18	67.20				13.80		
T19	64.20				11.60		
T20	0.00				0.00		

All the ready-mix innovative combinations (T1, T2, T3 and T4) provides synergistic control of paddy stem borer and BPH.

Table 8: Grain discoloration and productive tillers

Treatment Number	Grain discoloration control (%)	Average number of productive tillers per hill	% increase in productive tillers over T20
T1	92.4	32.6	111.69
T2	91.6	31.2	102.60
T3	92.6	32.2	109.09
T4	91.8	31.6	105.19
T5	89.4	28.6	85.71
T6	10.4	24.2	57.14
T7	9.8	24.6	59.74
T8	11.2	23.4	51.95
T9	9.6	23.8	54.55

T10	84.2	26.4	71.43
T11	83.4	25.8	67.53
T12	84.0	26.2	70.13
T13	83.6	25.4	64.94
T14	10.4	19.2	24.68
T15	82.2	19.8	28.57
T16	9.6	18.4	19.48
T17	8.6	17.8	15.58
T18	8.2	18.2	18.18
T19	7.8	17.6	14.29
T20	0.0	15.4	0.00

All the ready-mix innovative combinations (T1, T2, T3 and T4) provides excellent control of grain discoloration disease and also produces higher number of productive tillers which directly contributes to the grain yield.

Experiment 4: Control of insect-pests and diseases in chilly (Capsicum annum)

Crop & Variety : Chilly, Rani

Location : Umreth, Dist. Anand, Gujarat

Treatments : 24

Plot size : 40 sq.m.

Crop age : 74 days after transplanting.

Spray water volume : 510 liter per hectare

Method of Application: Foliar spray with battery operated knapsack sprayer fitted with hollow cone nozzle.

Agronomic Practices : All agronomic practices followed as per the crop requirement except insecticidal and fungicidal sprays.

Observation Methods:

Fruit borer (mixed infestation of Helicoverpa armigera and Spodoptera exigua) larval control (%) - Count the number of live larvae per plant. Record observations from 10 plants per plot.

$$\% \text{ Larval control} = 100 - \frac{\text{Number of live larva in treatment}}{\text{Number of live larva in untreated control}} \times 100$$

Fruit rot (Colletotrichum capsici) control: Observations was recorded on disease severity in each treatment before and at 14 days after spray. The observations of severity of fruit rot disease

were recorded using 0-9 grade. 100 randomly selected fruits per plot were scored as per scale. The percent disease index (PDI) was calculated by the following formula.

$$\% \text{ Disease Index (PDI)} = \frac{\text{sum of numerical rating}}{\text{total no. of hills observed x maximum grade}} \times 100$$

$$\% \text{ Disease control} = 100 - \frac{\text{PDI (\% Disease severity) in treatment}}{\text{PDI (\% Disease severity) in untreated}} \times 100$$

Fruit rot disease grading (0-9 scale):

Grade	Symptoms
0	No incidence
1	Less than 1% fruit area infected
3	1-5% fruit area infected
5	6-25% fruit area infected
7	26-50% fruit area infected
9	51-100% fruit area infected

% Fruit borer larval control and fruit rot disease control data were used to check the synergism by applying Colby's formula given above.

Thrips (Scirtothrips dorsalis) control (%): Count the number of insects per twig by gently shaking the twig over black piece of paper. Record observations from such 3 twigs per plant and 10 plants per plot. Calculate % insect control by given formula.

$$\% \text{ Insect control} = 100 - \frac{\text{Number of live insects in treatment}}{\text{Number of live insects in untreated}} \times 100$$

% Insect control data used to check the synergism by applying Colby's formula given above.

Fruit count: Count the number of healthy fruits per plant. Record such observations from 10 plants per plot.

Table 9: Treatment details

Treatment Number	Treatment details	Use Rate g.a.i./h
T1	Broflanilide 1%+Difenoconazole 8%+Tolfenpyrad 10% SC	7.5+60+75
T2	Broflanilide 1%+Difenoconazole 8%+Fipronil 8% SC	7.5+60+60
T3	Broflanilide 1%+Difenoconazole 8%+Dimpropyridaz 6% SC	7.5+60+45

T4	Broflanilide 1%+Difenoconazole 8%+Spiropidion 6% SC	7.5+60+45
T5	Broflanilide 2%+Difenoconazole 16%+Abamectin 2% SC	7.5+60+7.5
T6	Broflanilide 30% SC+Difenoconazole 25% EC (tank mix)	7.5+60
T7	Broflanilide 30% SC+Tolfenpyrad 15% EC (tank mix)	7.5+75
T8	Broflanilide 30% SC+Fipronil 5% SC (tank mix)	7.5+60
T9	Broflanilide 30% SC+Dimpropyridaz 20% SC (tank mix)	7.5+45
T10	Broflanilide 30% SC+Spiropidion 10% SC (tank mix)	7.5+45
T11	Broflanilide 30% SC+Abamectin 1.9% EC (tank mix)	7.5+7.5
T12	Difenoconazole 25% EC+Tolfenpyrad 15% EC (tank mix)	60+75
T13	Difenoconazole 25% EC+Fipronil 5% SC (tank mix)	60+60
T14	Difenoconazole 25% EC+Dimpropyridaz 20% SC (tank mix)	60+45
T15	Difenoconazole 25% EC+Spiropidion 10% SC (tank mix)	60+45
T16	Difenoconazole 25% EC+Abamectin 1.9% EC (tank mix)	60+7.5
T17	Broflanilide 30% SC	7.5
T18	Difenoconazole 25% EC	60
T19	Tolfenpyrad 15% EC	75
T20	Fipronil 5% SC	60
T21	Dimpropyridaz 20% SC	45
T22	Spiropidion 10% SC	45
T23	Abamectin 1.9% EC	7.5
T24	UTC (Untreated Check)	0

Table 10: Control of fruit borer larvae and thrips in chilly crop

Treatment Number	% Fruit borer larval control				% Thrips control		
	Obs. Val.	Cal. Val.	Colby's Ratio	Synergism (Y/N)	Obs. Val.	Cal. Val.	Colby's Ratio
T1	98.40	91.35	1.08	Y	98.60	89.07	1.11
T2	97.80	90.39	1.08	Y	97.40	86.11	1.13
T3	99.20	89.57	1.11	Y	95.20	84.71	1.12
T4	98.20	88.51	1.11	Y	94.20	84.41	1.12
T5	97.40	87.83	1.11	Y	92.60	85.74	1.08
T6	75.40	75.85	0.99	N	62.40	63.07	0.99
T7	89.80	90.76	0.99	N	87.60	88.22	0.99
T8	88.60	89.73	0.99	N	84.60	85.04	0.99
T9	88.40	88.85	0.99	N	83.00	83.52	0.99
T10	87.20	87.72	0.99	N	82.60	83.20	0.99
T11	86.40	87.00	0.99	N	84.20	84.64	0.99
T12	66.00	66.49	0.99	N	72.00	72.53	0.99
T13	62.40	62.75	0.99	N	64.60	65.11	0.99
T14	59.20	59.56	0.99	N	61.20	61.58	0.99
T15	54.80	55.45	0.99	N	59.60	60.84	0.98
T16	51.60	52.83	0.98	N	63.40	64.18	0.99
T17	74.20				60.20		
T18	6.40				7.20		
T19	64.20				70.40		
T20	60.20				62.40		
T21	56.80				58.60		
T22	52.40				57.80		

T23	49.60				61.40		
T24	0.00				0.00		

All the ready-mix innovative combinations (T1, T2, T3, T4 and T5) provides synergistic control of chilly fruit borer larvae and thrips as compared to all conventional treatments.

Table 11: Chilly Fruit rot disease control and fruit count

Treatment Number	Fruit rot control (%)	Average number of fruits per plant	% increase in fruits over T24
T1	87.2	62.4	66.84
T2	88.4	63.4	69.52
T3	86.2	65.2	74.33
T4	87.0	62.6	67.38
T5	86.8	61.8	65.24
T6	83.6	58.4	56.15
T7	12.4	51.2	36.90
T8	13.6	52.6	40.64
T9	11.8	50.8	35.83
T10	12.6	51.2	36.90
T11	13.4	52.2	39.57
T12	81.2	55.6	48.66
T13	82.4	54.8	46.52
T14	81.6	56.2	50.27
T15	82.8	54.8	46.52
T16	81.4	56.2	50.27
T17	11.4	48.6	29.95
T18	78.2	47.2	26.20
T19	10.8	45.6	21.93
T20	11.2	47.2	26.20
T21	10.6	44.6	19.25
T22	12.4	43.8	17.11
T23	11.2	44.2	18.18
T24	0.0	37.4	0.00

All the ready-mix innovative combinations (T1, T2, T3, T4 and T5) provides excellent control of chilly fruit rot disease and also produces higher number of healthy chilly fruits per plant as compared to all conventional treatments.

Experiment 5: Control of insect-pests and diseases in chilly (Capsicum annum)

All experimental details and observations methodology followed as per the details given in experiment 4.

Table 12: Treatment details

Treatment Number	Treatment details	Use Rate g.a.i./h
T1	Broflanilide 1.5%+Hexaconazole 10%+Methoxyfenozide 20% SC	7.5+50+100
T2	Broflanilide 1.5%+Hexaconazole 10%+Chlorfluazuron 15% SC	7.5+50+50
T3	Broflanilide 1.5%+Hexaconazole 10%+Lufenuron 15% SC	7.5+50+50
T4	Broflanilide 1.5%+Hexaconazole 10%+Emamectin benzoate 1.5% SC	7.5+50+7.5
T5	Broflanilide 1.5%+Hexaconazole 10%+Spinosad 8% SC	7.5+50+40
T6	Broflanilide 30% SC+Hexaconazole 25% EC (tank mix)	7.5+50
T7	Broflanilide 30% SC+Methoxyfenozide 24% SC (tank mix)	7.5+100
T8	Broflanilide 30% SC+Chlorfluazuron 5.4% EC (tank mix)	7.5+50
T9	Broflanilide 30% SC+Lufenuron 5.4% EC (tank mix)	7.5+50
T10	Broflanilide 30% SC+Emamectin benzoate 5% SG (tank mix)	7.5+7.5
T11	Broflanilide 30% SC+Spinosad 45% SC (tank mix)	7.5+40
T12	Hexaconazole 25% EC+Methoxyfenozide 24% SC (tank mix)	50+100
T13	Hexaconazole 25% EC+Chlorfluazuron 5.4% EC (tank mix)	50+50
T14	Hexaconazole 25% EC+Lufenuron 5.4% EC (tank mix)	50+50
T15	Hexaconazole 25% EC+Emamectin benzoate 5% SG (tank mix)	50+7.5
T16	Hexaconazole 25% EC+Spinosad 45% SC (tank mix)	50+40
T17	Broflanilide 30% SC	7.5
T18	Hexaconazole 5% SC	50
T19	Methoxyfenozide 24% SC	100
T20	Chlorfluazuron 5.4% EC	50
T21	Lufenuron 5.4% EC	50
T22	Emamectin benzoate 5% SG	7.5
T23	Spinosad 45% SC	40
T24	UTC (Untreated Check)	0

Table 13: Control of chilly fruit borer larvae and healthy fruits

Treatment Number	% Fruit borer larval control				Average number of fruits per plant	% increase in fruits over T24
	Obs. Val.	Cal. Val.	Colby's Ratio	Synergism (Y/N)		
T1	99.20	91.20	1.09	Y	61.6	61.26
T2	98.80	90.46	1.09	Y	62.8	64.40
T3	99.60	90.37	1.10	Y	62.2	62.83
T4	98.80	89.29	1.11	Y	61.4	60.73
T5	98.20	91.30	1.08	Y	63.8	67.02
T6	74.60	75.42	0.99	N	57.8	51.31
T7	88.80	90.62	0.98	N	56.4	47.64
T8	87.60	89.83	0.98	N	55.8	46.07
T9	88.40	89.73	0.99	N	57.2	49.74
T10	87.20	88.58	0.98	N	55.2	44.50
T11	89.60	90.73	0.99	N	56.2	47.12
T12	65.80	66.42	0.99	N	57.2	49.74
T13	62.40	63.61	0.98	N	58.2	52.36
T14	62.80	63.23	0.99	N	57.8	51.31
T15	58.60	59.10	0.99	N	56.4	47.64
T16	65.20	66.79	0.98	N	58.8	53.93
T17	73.80				48.8	27.75
T18	6.20				49.2	28.80
T19	64.20				47.6	24.61
T20	61.20				46.2	20.94
T21	60.80				45.6	19.37
T22	56.40				44.8	17.28

T23	64.60				48.6	27.23
T24	0.00				38.2	0.00

All the ready-mix innovative combinations (T1, T2, T3, T4 and T5) provides excellent control of chilly fruit borer larvae and also produces higher number of healthy chilly fruits per plant as compared to all conventional treatments.

Experiment 4: Control of insect-pests and diseases in Tomato (Solanum lycoperiscum)

Crop & Variety : Tomato, Avinash

Location : Umreth, Dist. Anand, Gujarat

Treatments : 18

Plot size : 50 sq.m.

Crop age : 88 days after transplanting.

Spray water volume : 510 liter per hectare

Method of Application: Foliar spray with battery operated knapsack sprayer fitted with hollow cone nozzle.

Agronomic Practices : All agronomic practices followed as per the crop requirement except insecticidal and fungicidal sprays.

Observation Methods:

Fruit borer (Helicoverpa armigera) larval control (%) - Count the number of live larvae per plant. Record observations from 10 plants per plot on 7th day after application.

$$\% \text{ Larval control} = 100 - \frac{\text{Number of live larva in treatment}}{\text{Number of live larva in untreated control}} \times 100$$

Ealy blight (Alternaria solani) control: Observations was recorded on disease severity in each treatment before and at 14 days after spray. The observations of severity of early blight disease were recorded using 0-9 grade. 100 randomly selected trifoliate leaves per plot were scored as per scale. The percent disease index (PDI) was calculated by the following formula.

$$\% \text{ Disease Index (PDI)} = \frac{\text{sum of numerical rating}}{\text{total no. of hills observed x maximum grade}} \times 100$$

$$\% \text{ Disease control} = 100 - \frac{\text{PDI (\% Disease severity) in treatment}}{\text{PDI (\% Disease severity) in untreated}} \times 100$$

Early blight disease grading (0-9 scale):

Grade	Symptoms
0	No incidence
1	Less than 1% leaf area area infected
3	1-5% leaf area infected
5	6-25% leaf area infected
7	26-50% leaf area infected
9	51-100% leaf area infected

% Fruit borer larval control and early blight disease control data were used to check the synergism by applying Colby's formula given above.

Table 14: Treatment details

Treatment Number	Treatment details	Use Rate g.a.i./h
T1	Chlorantraniliprole 2%+Prothioconazol 10%+Methoxyfenozide 10% SC	20+100+100
T2	Chlorantraniliprole 2%+Prothioconazole 10%+Emamectin benzoate 0.75% SC	20+100+7.5
T3	Cyantraniliprole 5%+Prothioconazole 10%+Methoxyfenozide 10% SC	50+100+100
T4	Cyantraniliprole 5%+Prothioconazole 10%+Emamectin benzoate 0.75% SC	50+100+7.5
T5	Chlorantraniliprole 20% SC+Prothioconazole 25% EC (tank mix)	20+100
T6	Cyantraniliprole 10.26% OD+Prothioconazole 25% EC (tank mix)	50+100
T7	Chlorantraniliprole 20% SC+Methoxyfenozide 24% SC (tank mix)	20+100
T8	Cyantraniliprole 10.26% OD+Methoxyfenozide 24% SC (tank mix)	50+100
T9	Chlorantraniliprole 20% SC+Emamectin benzoate 5% SG (tank mix)	20+7.5
T10	Cyantraniliprole 10.26% OD+Emamectin benzoate 5% SG (tank mix)	50+7.5
T11	Prothioconazole 25% EC+Methoxyfenozide 24% SC (tank mix)	50+100
T12	Prothioconazole 25% EC+Emamectin benzoate 5% SG (tank mix)	50+7.5
T13	Chlorantraniliprole 20% SC	20
T14	Cyantraniliprole 10.26% OD	50
T15	Prothioconazole 25% EC	100
T16	Methoxyfenozide 24% SC	100
T17	Emamectin benzoate 5% SG	7.5
T18	UTC (Untreated Check)	0

Table 15: Control of fruit borer larvae and early blight disease in tomato

Treatment Number	% Fruit borer larval control				Early blight disease control (%)	Average number of fruits per plant	% increase in fruits over T18
	Obs. Val.	Cal. Val.	Colby's Ratio	Synergism (Y/N)			
T1	98.60	88.86	1.11	Y	84.2	46.2	104.42

T2	97.20	88.62	1.10	Y	85.6	47.4	109.73
T3	98.40	89.11	1.10	Y	83.8	45.8	102.65
T4	97.40	88.91	1.10	Y	84.4	46.8	107.08
T5	69.80	70.36	0.99	N	82.4	39.6	75.22
T6	70.60	71.11	0.99	N	83.6	38.8	71.68
T7	87.60	88.12	0.99	N	12.4	35.2	55.75
T8	87.40	88.42	0.99	N	13.2	34.8	53.98
T9	87.40	87.87	0.99	N	11.8	36.2	60.18
T10	87.20	88.17	0.99	N	12.6	35.8	58.41
T11	63.40	64.73	0.98	N	82.4	37.8	67.26
T12	63.40	63.98	0.99	N	81.8	37.4	65.49
T13	68.40				9.8	29.4	30.09
T14	69.20				10.2	28.8	27.43
T15	6.20				80.2	24.6	8.85
T16	62.40				11.4	27.6	22.12
T17	61.60				12.2	26.8	18.58
T18	0.00				0.0	22.6	0.00

All the ready-mix innovative combinations (T1, T2, T3 and T4) provides synergistic control of tomato fruit borer larvae, and also provides excellent control of tomato early blight disease and produces higher number of healthy tomato fruits per plant as compared to all conventional treatments.

Overall summery of field trials:

The field trials results shows many benefits/advantages of ready mix formulations. The synergism observed in terms of insect-pests and disease control.

- Provides higher level of insect and disease control (increase in % control)
- Provides longer duration of control (residual control)
- Increases plant growth, vigor, height, produces a greater number of tillers, shoots, branches, flowers, fruits, grains etc. and overall biomass of the crop, which directly increases the yield of the crop.

Terminology used in bio-efficacy trials are cm-centimetre, m- meter, g-gram, kg-kilogram, ml-millilitre, sq.mt. Square meter (m^2), DAS (Days after sowing), DAP (Days after planting), DATP (Days after transplanting), DAA (Days after application), T for Treatment, spp.-species, Ob. Value - observed value, Cal.Value - calculated value.

CLAIMS

We claim;

1. A synergistic pesticidal composition of insecticides and fungicides comprising:
   a. an insecticide selected from class of diamide, metadiamide, isoxazoline or mixtures thereof present in an amount of 0.1 to 30% by weight of the composition;
   b. a fungicide selected from class of triazoles present in an amount of 0.1 to 40% by weight of the composition;
   c. another insecticide selected from the class of carbamates, organophosphates, phenylpyrazole, pyrethroids, nicotinic insecticides, spinosyns, mectins, juvenile hormone mimics, from the class of chordotonal organs modulators, mite growth inhibitors, microbial disruptors of insect midgut membrane, inhibitors of mitochondrial ATP synthase, uncouplers of oxidative phosphorylation, nereistoxin, chitin biosynthesis inhibitors, inhibitors of the chitin biosynthesis type 1, moulting disruptors, ecdyson receptor agonists, octopamin receptor agonists, METI (mitochondrial electron transport inhibitors, voltage-dependent sodium channel blockers, tetronic and tetramic acid derivatives, from baculoviruses or from the compounds of unknown or uncertain mode of action or from the mixture thereof present in an amount of 0.1 to 30% by weight of the composition; and
   d. formulation excipients.

2. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein an insecticide from class of diamide is selected from chlorantraniliprole, cyantraniliprole, cyclaniliprole, cyhalodiamide, cyproflanilide, flubendiamide, tetraniliprole, tetrachlorantraniliprole and tyclopyrazoflor.

3. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein an insecticide from metadiamide is broflanilide.

4. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein an insecticide from class of isoxazoline is selected from fluxametamide; and isocycloseram.

5. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein a fungicide from the class of triazoles is selected from cyproconazole,

difenoconazole, diniconazole, epoxiconazole, etaconazole, fenbuconazole, fluquinconazole, flusilazole, frutriafol, hexaconazole, imibenconazole, ipconazole, mefentrifluconazole, metconazole, myclobutanil, penconazole, propiconazole, prothioconazole, simconazole, tebuconazole, tetraconazole, tiradimefon, tiradimenol, triticonazole or tricyclazole or mixture thereof.

6. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of carbamates is selected from carbaryl, carbofuran, carbosulfan, methomyl, oxamyl, pirimicarb and thiodicarb.

7. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of organophosphates is selected from acephate, cadusafos, chlorpyrifos, chlorpyrifos-methyl, demeton-S-methyl, dimethoate, ethion, fenamiphos, fenitrothion, fenthion, fosthiazate, methamidophos, monocrotophos, oxydemeton-methyl, parathion, parathion-methyl, phenthoate, phorate, phosalone, phosphamidon, profenofos, quinalphos, and triazophos.

8. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of phenylpyrazole is selected from ethiprole, fipronil, flufiprole, nicofluprole, pyrafluprole, or pyriprole.

9. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of pyrethroids is selected from bifenthrin, cyfluthrin, beta-cyfluthrin, cyhalothrin, lambda-cyhalothrin, gamma-cyhalothrin, cypermethrin, alpha-cypermethrin, beta-cypermethrin, theta-cypermethrin, zeta-cypermethrin, cyphenothrin, deltamethrin, fenpropathrin, fenvalerate, tau-fluvalinate, permethrin, phenothrin, prallethrin, profluthrin, pyrethrin.

10. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of nicotinic insecticides is selected from acetamiprid, clothianidin, dinotefuran, imidacloprid, nitenpyram, thiacloprid, thiamethoxam, flupyrimin, cycloxaprid, paichongding, guadipyr, cycloxylidin; Sulfoximines like sulfoxaflor; Butenolides like flupyradifurone; Mesoionics like triflumezopyrim, dichloromezotiaz.

11. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of spinosyns is selected from spinosad and spinetoram.

12. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of mectins is selected from abamectin, emamectin benzoate, ivermectin, lepimectin; Milbemycins like milbemectin.

13. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of juvenile hormone mimics is selected from hydroprene, kinoprene, methoprene, fenoxycarb, pyriproxyfen.

14. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of chordotonal organs modulators is selected from homopteran feeding blockers like pyridine azomethine: pymetrozine, pyrifluquinazon; pyropenes like afidopyropen; and flonicamid.

15. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of mite growth inhibitors is selected from clofentezine, hexythiazox, diflovidazin or etoxazole.

16. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of microbial disruptors of insect midgut membrane is selected from Bacillus thuringiensis and insecticidal proteins and their by-products.

17. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of inhibitors of mitochondrial ATP synthase is selected from diafenthiuron, azocyclotin, cyhexatin, fenbutatin oxide, propargite, or tetradifon.

18. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of uncouplers of oxidative phosphorylation is selected from chlorfenapyr, DNOC, or sulfluramid.

19. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of nereistoxin is selected from bensultap, monosultap, cartap hydrochloride, thiocyclam, thiocyclam hydrogen oxalate, thiocyclam hydrochloride, thiosultap sodium.

20. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of chitin biosynthesis inhibitors is selected from Benzoylureas-bistrifluron, chlorfluazuron, diflubenzuron, flucycloxuron, flufenoxuron, hexaflumuron, lufenuron, novaluron, noviflumuron, teflubenzuron and triflumuron.

21. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the moulting disruptors is cyromazine.

22. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of ecdyson receptor agonists is selected from diacylhydrazines like methoxyfenozide, tebufenozide, halofenozide, fufenozide or chromafenozide.

23. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of octopamin receptor agonists is amitraz.

24. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of METI (mitochondrial electron transport inhibitors) is selected from fenazaquin, fenpyroximate, pyrimidifen, pyridaben, tebufenpyrad, tolfenpyrad, flufenerim, rotenone, cyenopyrafen, cyflumetofen, pyflubumidemm, hydramethylnon, acequinocyl, flometoquin, fluacrypyrim, pyriminostrobin or bifenazate.

25. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of voltage-dependent sodium channel blockers is selected from oxadiazines like indoxacarb, semicarbazones like metaflumizone.

26. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of Tetronic and tetramic acid derivatives is selected from spirodiclofen, spiromesifen, spirotetramat or spiropidion.

27. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of Baculoviruses is selected from Granuloviruses and Nucleopolyhedrosis viruses.

28. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein another insecticide from the class of compounds of unknown or uncertain mode of action is selected from azadirechtin, benzpyrimoxan (insect growth regulators), pyridalyl, oxazosulfyl, dimpropyridaz (pyrazole carboxamide insecticide), fluhexafon, acaricidal compounds-cyetpyrafen, flupentiofenox, acynonapyr; nematicidal compounds-cyclobutrifluram, fluazaindolizine, or tioxazafen.

29. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1, wherein the formulation for the said composition is selected from Capsule suspension (CS), Dispersible concentrate (DC), Powder for dry seed treatment (DS), Emulsifiable concentrate (EC), Emulsion, water in oil (EO), Emulsion for seed treatment (ES), Emulsion, oil in water (EW), Flowable suspension/concentrate for seed treatment (FS), Granule/ soil applied (GR), Controlled (Slow or Fast) release granules (CR), Solution for seed treatment (LS), Micro-emulsion (ME), Oil dispersion (OD), Oil miscible flowable concentrate (oil miscible suspension (OF), Oil miscible liquid (OL), Suspension concentrate (= flowable concentrate) (SC), Suspo-emulsion (SE), Water soluble granule (SG), Soluble concentrate (SL), Water soluble powder (SP), Water dispersible granule (WG or WDG), Wettable powder (WP), Water dispersible powder for slurry treatment (WS), A mixed formulation of CS and SC (ZC), A mixed formulation of CS and SE (ZE), A mixed formulation of CS and EW (ZW).

30. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 1–claim 29, wherein the preferred compositions of active ingredients for the Suspension Concentrate (SC) formulation comprises:

i. Chlorantraniliprole 2% + Tebuconazole 12.5% + Flupyrimin 7.5%;
ii. Chlorantraniliprole 2% + Prothioconazole 12.5% + Triflumezopyrim 2%;
iii. Cyantraniliprole 5% + Tebuconazole 12.5% + Flupyrimin 7.5%;

iv. Tetraniliprole 5% + Tebuconazole 12.5% + Flupyrimin 7.5%;

v. Broflanilide 2% + Prothioconazole 25% + Triflumezopyrim 4%.

31. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 30, wherein the Suspension Concentrate (SC) formulation comprises:

a) an insecticide selected from Chlorantraniliprole, Cyantraniliprole, Tetraniliprole or Broflanilide present in an amount of 0.1 to 30% by weight of the composition;

b) a fungicide compound selected from Tebuconazole or Prothioconazole present in an amount of 0.1 to 40 % by weight of the composition;

c) an insecticide compound selected from Flupyrimin or Triflumezopyrim present in an amount of 0.1 to 30% by weight of the composition;

d) wetting-spreading-penetrating agent in an amount of 2 to 6 % by weight;

e) dispersing agent 1 in an amount of 1 to 3 % by weight;

f) dispersing agent 2 in an amount of 2 to 5 % by weight;

g) suspending agent in an amount of 1 to 4.0 % by weight;

h) antifoaming agent in an amount of 0.1 to 1.5 % by weight;

i) preservative in an amount of 0.1 to 0.5 % by weight;

j) antifreezing agent in an amount of 2 to 6 % by weight;

k) thickner in an amount of 0.1 to 1.0 % by weight; and

l) diluent water in an amount of 40 to 70 % by weight.

32. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 31, wherein wetting-spreading-penetrating agent is ethylene oxide/propylene oxide block copolymer, polyarylphenyl ether phosphate, polyalkoxylated butyl ether, ethoxylated fatty alcohol, sodium dioctyl sulfosuccinate, sodium lauryl sulfate and sodium dodecyl benzene sulfonate, alkyl diphenyl sulfonates, sodium isopropyl naphthalene sulfonate, alkyl naphthalene sulfonate, organosilicons surfactants (as a wetting-spreading-penetrating agent) includes trisiloxane ethoxylate, polydimethylsiloxane, polyoxyethylene methyl polysiloxane, polyoxyalkylene methyl polysiloxane, polyether polymethyl siloxane copolymer, heptamethyl trisiloxane, Polyalkyleneoxide modified heptamethyl trisiloxane, polyether modified polysiloxane in modified form, liquid or powder form or mixture thereof.

33. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 31, wherein dispersing agent is selected from alkylated naphthalene sulfonate, sodium salt,

sodium salt of naphthalene sulfonate condensate, sodium ligno sulfonate, sodium polycarboxylate, EO/PO based copolymer, phenol sulfonate, sodium methyl oleoyl taurate, styrene acrylic acid copolymer, propylene oxide-ethylene oxide-copolymer, polyethylene glycol 2,4,6-tristyrylphenyl ether, tristyrylphenol-polyglycol ether-phosphate, tristyrylphenole with 16 moles EO, tristyrylphenol-polyglycol ether-phosphate, oleyl-polyglycol ether with ethylene oxide, tallow fatty amine polyethylene oxide, nonylphenol polyglycol ether with 9-10 moles ethylene oxide.

34. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 31, wherein antifoaming agent is selected from silicone oil, silicone compound, C10～C20 saturated fat acid compounds or C8～C10 aliphatic alcohols compound, silicone antifoam emulsion, dimethyl siloxane, polydimethyl siloxane, vegetable oil based antifoam, tallow based fatty acids, polyalkyleneoxide modified polydimethylsiloxane.

35. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 31, wherein Preservative is selected from 1,2-benzisothiazolin-3(2H)-one, sodium salt, sodium benzoate, 2-bromo-2-nitropropane-1,3-diol, formaldehyde, sodium o-phenyl phenate, 5-chloro-2-methyl-4-isothiazolin-3-one & 2-methyl-4-isothiazolin-3-one.

36. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 31, wherein suspending agent is selected from Aluminum Magnesium Silicate, Bentonite clay, Silica or Attapulgite clay.

37. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 31, wherein anti-freezing agent is selected from ethylene glycol, propane diols, glycerin or the urea, glycol (monoethylene glycol, diethylene glycol, polypropylene glycol, and polyethylene glycol), glycerin, urea, magnesium sulfate heptahydrate, sodium chloride.

38. The synergistic pesticidal composition of insecticides and fungicides as claimed in claim 31, wherein thickner is selected from xanthan gum, PVK, carboxymethyl celluloses, polyvinyl alcohols, gelatin, sodium carboxymethylcellulose, hydroxyethyl cellulose, sodium polyacrylate, modified starch.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2021/050762

A. CLASSIFICATION OF SUBJECT MATTER
A01N25/30,A01N43/00 Version=2021.01

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A01N

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

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

PatSeer, IPO Internal Database

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO2018224914A1 (UPL LTD), 13 December 2018 abstract; claims 1-16; example 1; tables 1 &2; pages 8, 12-13, 33-34	1-38
Y	WO2015055757A1 (BASF SE), 23 April 2015 abstract; claims 1-3, 21-22, 27 ; pages 22-25	1-38
A	IN201731033800A (UPL LTD), 29 March 2019 claims 1-18	1-38

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26-11-2021	26-11-2021

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IN2021/050762

Citation	Pub.Date	Family	Pub.Date
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