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(54) **Title:** NOVEL PESTICIDAL COMPOSITION

(57) **Abstract:** The present invention relates to a pesticidal composition comprising an effective amount of Triflumezopyrim; an effective amount of Tebuconazole; an effective amount of Tricyclazole; and at least one agrochemically acceptable excipient. The invention particularly relates to a pesticidal composition comprising Triflumezopyrim in the range of 0.1%w/w to 20% w/w of the total composition; Tebuconazole in the range of 1%w/w to 50% w/w of the total composition; Tricyclazole in the range of 10% w/w to 70% w/w of the total composition; and at least one agrochemically acceptable excipient. The present invention also relates to process of preparation of the pesticidal composition. The invention relates to a method of treating a plant, crop, plant propagation material, locus or parts thereof, a seed, seedling or surrounding soil with a pesticidal composition.

NOVEL PESTICIDAL COMPOSITION

1. FIELD OF THE INVENTION

The present invention relates to a pesticidal combination comprising Triflumezopyrim, Tebuconazole and Tricyclazole. The present invention relates to a pesticidal composition comprising combination of an effective amount of Triflumezopyrim; an effective amount of Tebuconazole; an effective amount of Tricyclazole; and at least one agrochemically acceptable excipient. The invention particularly relates to a pesticidal composition comprising: Triflumezopyrim in the range of 0.1%w/w to 20% w/w of the total composition; Tebuconazole in the range of 1%w/w to 50% w/w of the total composition; Tricyclazole in the range of 10%w/w to 70% w/w; and at least one agrochemically acceptable excipient. The pesticidal composition has particles in the size range of 0.1 micron to 75 microns.

The invention also relates to a process of preparing the pesticidal composition comprising Triflumezopyrim in the range of 0.1%w/w to 20% w/w of the total composition; Tebuconazole in the range of 1%w/w to 50% w/w of the total composition; Tricyclazole in the range of 10%w/w to 70% w/w; and at least one agrochemically acceptable excipient.

The invention also relates to a method of controlling fungal disease, crop protection or improving plant health or yield by treating a plant, crop, plant propagation material, locus or parts thereof, a seed, seedling or surrounding soil with the pesticidal composition of the present invention.

2. BACKGROUND OF THE INVENTION

In describing the embodiment of the invention, specific terminology is chosen for the sake of clarity. However, it is not intended that the invention be limited to the specific terms so selected and it is to be understood that each specific term include

all technical equivalents that operate in a similar manner to accomplish a similar purpose.

Rice serves as a staple diet for about half of the world's population. However, its production is affected largely by insects, pests and disease attacks. Insects damage crops by eating them directly, and infect the crops with bacterial and fungal infections. Though destructive viral diseases have not been observed in any of the rice-growing regions of the world, fungal and bacterial diseases are widely spread and affect the growth and yield of rice crops, sometimes even completely destroying the crop. These diseases lead to both direct and indirect loss of crops. For instance, direct loss includes spotted kernels, low number of grains, lodging, reduction in plant stands and reduction in plant efficiency while indirect losses include the application costs of pesticides used to control the insects and disease, yield reduction along with special agronomic practices etc. Thus, management of insects and diseases is vital in attaining sustainable rice production.

Use of agrochemicals, in particular pesticides, for protection of crops against fungi, insects and other pests has been an integral component of crop management. Current fungicides and insecticides available in the market do not meet the modern-day crop protection requirements, as they:

- lack in providing broad spectrum of action,
- exhibit increased resistance among the pests due to the repeated and prolonged administration of the individual actives or known chemistries at higher dosages,
- lead to environmental pollution and soil toxicity due to leaching of pesticides in soil and groundwater.

In addition, the repeated use of the current pesticidal products also exhibits problems such as pest resurgence, secondary pest outbreak, residue related problems, toxic effect on human beings along with reduced yield.

Further, the use of composition containing multiple pesticides having different chemical and physical properties poses various problems such as inappropriate ratio of mixing, incompatibilities of formulated products; potential hazard to people who are not trained to properly mix products. Further, combining and preparing stable formulation comprising multiple pesticides is also critical as the pesticides contained in the composition must not only be compatible but must also have prolonged shelf life with a high stability and demonstrate effective activity until end use.

Hence, there is a clear need for improved pesticidal products, which addresses the above drawbacks associated with the known chemistries. Further, it is desirable to develop a newer pesticidal composition with modern integrated pest management not only for an improved toxicological and environmental profile but also for substantial broadening of spectrum of crop protection along with increased stability and safety to the end users.

Triflumezopyrim, a mesoionic insecticide, exhibits efficient biological activity in controlling sucking insects, such as the planthopper in rice crops.

Tebuconazole, a systemic triazole fungicide, which inhibits the demethylation of the precursors of sterols, ergosterol in the fungus.

Tricyclazole, a systemic fungicide, which inhibits the melanin formation in fungi. Tricyclazole is known for control of rice blast disease in rice crops.

Two-way combinations of fungicidal actives namely Tricyclazole and Tebuconazole for controlling pathogens and pests in rice crops are commercially available and described in the literature. However, the biological properties of these known combinations are not entirely satisfactory in the areas of pathogenic control, phytotoxicity, and environmental exposure, for example.

CN101103724 relates to a synergistic sterilization composite comprising Tricyclazole and Tebuconazole.

WO2012092115A1 relates to mesoionic pyrido[1,2-A] pyrimidine pesticides. WO'115 discusses thousands of possible fungicidal combinations with mesoionic pyrido[1,2-A] pyrimidine compounds of formula (I). WO'115 discusses 2-way combination of Triflumezopyrim with Tricyclazole.

IN201721013568 relates to pesticidal combinations comprising A) pymetrozine, B) an insecticide and C) a fungicide.

However, these literatures are silent on the specific combination of Triflumezopyrim, Tebuconazole and Tricyclazole in a pesticidal effective amount with a specific particle size; and on the efficacy and the synergy of the said combination.

Thus, no pesticidal composition is known in the art that comprises a specific combination of Triflumezopyrim, Tebuconazole and Tricyclazole which can be effectively used with broad spectrum pesticidal activity and addresses the drawbacks discussed above with the known compositions.

That need is solved according to the present invention by the provision of the present stable and improved pesticidal combination.

3. SUMMARY OF THE INVENTION

The present invention relates to a synergistic combination comprising Triflumezopyrim, Tebuconazole and Tricyclazole.

The present invention relates to a pesticidal composition comprising an effective amount of Triflumezopyrim; an effective amount of Tebuconazole; an effective amount of Tricyclazole; and at least one agrochemically acceptable excipient.

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The invention relates to a pesticidal composition comprising Triflumezopyrim in the range of 0.1%w/w to 20% w/w of the total composition; Tebuconazole in the range of 1%w/w to 50% w/w of the total composition; Tricyclazole in the range of 10%w/w to 70% w/w of the total composition; and at least one agrochemically acceptable excipient.

The invention furthermore relates to a pesticidal composition comprising Triflumezopyrim in the range of 0.1%w/w to 20% w/w of the total composition; Tebuconazole in the range of 1%w/w to 50% w/w of the total composition; Tricyclazole in the range of 10%w/w to 70% w/w of the total composition; and at least one agrochemically acceptable excipient wherein the composition comprises particles in the size range of 0.1 micron to 75 microns.

The invention also relates to a process for preparing the pesticidal composition comprising Triflumezopyrim in the range of 0.1%w/w to 20% w/w of the total composition; Tebuconazole in the range of 1%w/w to 50% w/w of the total composition; Tricyclazole in the range of 10%w/w to 70% w/w of the total composition; and at least one agrochemically acceptable excipient.

According to another embodiment, the invention also relates to method of protection of crop or improving its health or yield, by treating at least one of a plant, crop, or parts thereof, a plant propagation material, seed, seedling or surrounding soil with a pesticidal composition comprising an effective amount of Triflumezopyrim; an effective amount of Tebuconazole; an effective amount of Tricyclazole; and at least one agrochemically acceptable excipient.

4. DETAILED DESCRIPTION OF THE INVENTION

In describing the embodiment of the invention, specific terminology is chosen for the sake of clarity. However, it is not intended that the invention be limited to the specific terms so selected and it is to be understood that such specific terms include all technical equivalents that operate in a similar manner to accomplish a similar purpose. It is understood that any numerical range recited herein is intended to include all subranges subsumed. Also, unless denoted otherwise percentage of components in a composition are presented as weight percent.

The terms "a" or "an", as used herein, are defined as one or more than one. The terms "including" and/or "having", as used herein, are defined as comprising (i.e., open language).

Triflumezopyrim used in the present invention refers to Triflumezopyrim or its salts or derivatives thereof.

Tebuconazole used in the present invention refers to Tebuconazole or its salts or derivatives thereof.

Tricyclazole used in the present invention refers to Tricyclazole or its salts or derivatives thereof.

The granules refer mainly to water dispersible granules, extruded granules or spheronised granules. As described herein, "GR" refers to extruded granules or spheronised granules. As described herein, "WG" or "WDG" refer to water dispersible granules.

As described herein, water dispersible granule is defined as a formulation which disperses or dissolves rapidly when added to water to give a fine particle suspension. Water-dispersible granules are formulated as small, easily measured

granules by blending and agglomerating ground active ingredients together with surfactants and other formulation excipients which disperses into finer/primary particles upon addition to water.

According to the invention, the term liquid suspension encompasses "aqueous suspension" or aqueous dispersion" or "suspension concentrates (SC)" composition. Liquid suspension is defined as a composition wherein solid particles are dispersed or suspended in a liquid. The liquid as a vehicle is water and/or a water miscible solvent.

As defined herein, WP refers to a wettable powder, which is a powder formulation to be applied as a suspension after dispersion in water.

As defined herein, WS refers to a water dispersible powder for slurry seed treatment.

As defined herein, aqueous suspo-emulsion is essentially a mixture of water-insoluble active constituents dispersed in a water-based solution; where one (or more) of the active constituents is a solid, formulated as a suspension form (SC) and one (or more) of the actives is an oil, formulated as an emulsion in water (EW).

The present invention relates to a synergistic combination comprising Triflumezopyrim, Tebuconazole and Tricyclazole.

The present invention relates to a pesticidal composition comprising an effective amount of Triflumezopyrim; an effective amount of Tebuconazole; an effective amount of Tricyclazole; and at least one agrochemically acceptable excipient.

The invention relates to a pesticidal composition comprising Triflumezopyrim in the range of 0.1%w/w to 20% w/w of the total composition; Tebuconazole in the range of 1%w/w to 50% w/w of the total composition; Tricyclazole in the range of

10%w/w to 70% w/w of the total composition; and at least one agrochemically acceptable excipient.

The invention furthermore relates to a pesticidal composition comprising Triflumezopyrim in the range of 0.1%w/w to 20% w/w of the total composition; Tebuconazole in the range of 1%w/w to 50% w/w of the total composition; Tricyclazole in the range of 10%w/w to 70% w/w of the total composition; and at least one agrochemically acceptable excipient wherein the composition comprises particles in the size range of 0.1 micron to 75 microns.

The inventors of the present invention have surprisingly found that the combination comprising Triflumezopyrim; Tebuconazole; and Tricyclazole demonstrated synergistic pesticidal activity compared to the activity of the individual active ingredient alone.

The inventors of the present invention have surprisingly developed a stable and synergistic pesticidal composition comprising combination of Triflumezopyrim; Tebuconazole; and Tricyclazole. The inventors found that when the composition comprising pesticidally effective amount of Triflumezopyrim; pesticidally effective amount of Tebuconazole; and pesticidally effective amount of Tricyclazole is found to be synergistic in nature and demonstrated excellent field efficacy in terms of protection of rice crop from very important pests and diseases viz., Brown plant hopper (BPH), White backed plant hopper (WBPH), Blast, Sheath blight, false smut and grain discoloration.

The inventors have surprisingly found that the composition comprising Triflumezopyrim; Tebuconazole; and Tricyclazole is not only synergistic, but is also a superior crop-protectant, non-phytotoxic. Besides, the pesticidal composition helps in resistance management of old pesticide chemistry and also demonstrates increased yield on field application.

In addition, the composition of the present invention exhibits superior physical characteristics such as suspensibility, dispersibility, flowability, wettability, pourability and improved viscosity. The compositions of the present invention also demonstrated superior performance under accelerated storage condition and was found to be effective in drip irrigation. The composition of the present invention not only provides surprising results as a crop protection agent but also acts as a yield enhancer.

In addition to the synergistic effect of the composition of the present invention, the inventors surprisingly determined that the composition comprising Triflumezopyrim in the range of 0.1%w/w to 20% w/w of the total composition; Tebuconazole in the range of 1%w/w to 50% w/w of the total composition; Tricyclazole in the range of 10%w/w to 70% w/w of the total composition; and at least one agrochemically acceptable excipient in the form of solid, liquid, or gel provides excellent pest control and improves yield when the particles in the composition are present in the size range of 0.1 micron to 75 microns.

According to an embodiment, Triflumezopyrim is in the range of 0.1%w/w to 20% w/w of the total composition. According to an embodiment, Triflumezopyrim is in the range of 0.1%w/w to 10% w/w of the total composition. According to an embodiment, Triflumezopyrim is in the range of 0.1%w/w to 8% w/w of the total composition.

According to an embodiment, Tebuconazole is in the range of 1% w/w to 50%w/w of the total composition. According to an embodiment, Tebuconazole is in the range of 1% w/w to 40%w/w of the total composition. According to an embodiment, Tebuconazole is in the range of 1% w/w to 30%w/w of the total composition. According to an embodiment, Tebuconazole is in the range of 1% w/w to 20%w/w of the total composition. According to an embodiment, Tebuconazole is in the range of 1% w/w to 10%w/w of the total composition.

According to an embodiment, Tricyclazole is in the range of 10% to 70%w/w of the total composition. According to an embodiment, Tricyclazole is in the range of 10% to 60% w/w of the total composition. According to an embodiment, Tricyclazole is in the range of 10% to %50w/w of the total composition. According to an embodiment, Tricyclazole is in the range of 10% to 40 %w/w of the total composition. According to an embodiment, Tricyclazole is in the range of 10% to 30 %w/w of the total composition. According to an embodiment, Tricyclazole is in the range of 10% to 20 %w/w of the total composition.

According to an embodiment, the liquid pesticidal composition can be in the form of solutions, suspension, emulsion, oil dispersion, liquid suspension, soluble liquid, flowable concentrate, emulsifiable concentrate, seed dressing, suspo-emulsion, capsulated suspension, emulsions in water, Ultra-low-volume concentrate (ULV), combination of capsulated suspension and suspension concentrate (ZC).

According to an embodiment, the liquid pesticidal composition can be preferably in the form of a suspension concentrate.

According to an embodiment, the liquid pesticidal composition can be preferably in the form of an emulsion concentrate.

According to an embodiment, the solid pesticidal composition can be in the form of powders, granules or dust.

According to an embodiment, the pesticidal composition can be in the form of powders including wettable powder, and dispersible powder. According to an embodiment, the pesticidal composition can be in the form of granules including broadcast granules, pellets, extruded granules, water dispersible granules, water disintegrable granules, dry capsulated suspension and a dry ZC composition (combination of capsulated suspension and suspension concentrate).

According to an embodiment, the pesticidal composition can preferably be in the form of a wettable granules.

According to an embodiment, the pesticidal composition can preferably be in the form of a water dispersible granules.

According to an embodiment, the pesticidal composition can preferably be in the form of a water disintegrable granules.

According to an embodiment, the pesticidal composition can comprise granules in the size range of 0.025mm to 6mm. According to an embodiment, the pesticidal composition can comprise granules in the size range of 0.025mm to 5mm. According to an embodiment, the pesticidal composition can comprise granules in the size range of 0.025mm to 4mm. According to an embodiment, the pesticidal composition can comprise granules in the size range of 0.025mm to 3mm. According to an embodiment, the pesticidal composition can comprise granules in the size range of 0.025mm to 2 mm. According to an embodiment, the pesticidal composition can have granule size in the range of 0.025mm to 1.5 mm.

According to an embodiment, the pesticidal composition can be in the form of water disintegrable granules, where the granules are in the size range of 0.025 mm to 6 mm. According to an embodiment, the pesticidal composition can be in the form of water disintegrable granules, where the granules are in the size range of 0.025 mm to 5 mm. According to an embodiment, the pesticidal composition can be in the form of water disintegrable granules, where the granules are in the size range of 0.025 mm to 4 mm. According to an embodiment, the pesticidal composition can be in the form of water disintegrable granules, where the granules are in the size range of 0.025 mm to 3.5 mm.

According to an embodiment, the pesticidal composition can be in the form of water dispersible granules, where the granules are in the size range of 0.025 mm to 3 mm.

According to an embodiment, the pesticidal composition can be in the form of water dispersible granules, where the granules are in the size range of 0.025 mm to 2.5 mm. According to an embodiment, the pesticidal composition can be in the form of water dispersible granules, where the granules are in the size range of 0.025 mm to 2.0 mm. According to an embodiment, the pesticidal composition can be in the form of water dispersible granules, where the granules are in the size range of 0.025 mm to 1.5 mm.

According to an embodiment, the pesticidal composition can comprise particles in the size range of 0.1 micron to 75 microns. According to further embodiment, the pesticidal composition can comprise particles in the size range of 0.1 micron to 50 microns. According to further embodiment, the pesticidal composition can comprise particles in the size range of 0.1 micron to 40 microns. According to further embodiment, the pesticidal composition can comprise particles in the size range of 0.1 micron to 25 microns. According to further embodiment, the pesticidal composition can comprise particles in the size range of 0.1 micron to 15 microns.

According to an embodiment, the pesticidal composition in the form of water disintegrable granules can comprise particles in the size range of 0.1 micron to 75 microns. According to an embodiment, the pesticidal composition in the form of water disintegrable granules can comprise particles in the size range of 0.1 micron to 50 microns. According to an embodiment, the pesticidal composition in the form of water disintegrable granules can comprise particles in the size range of 0.1 micron to 30 microns.

According to an embodiment, the pesticidal composition in the form of water dispersible granules can comprise particles in the size range of 0.1 micron to 50 microns. According to an embodiment, the pesticidal composition in the form of water dispersible granules can comprise particles in the size range of 0.1 micron to 30 microns. According to an embodiment, the pesticidal composition in the form of water dispersible granules can comprise particles in the size range of 0.1 micron to

25 microns. According to an embodiment, the pesticidal composition in the form of water dispersible granules can comprise particles in the size range of 0.1 micron to 20 microns.

According to an embodiment, the pesticidal composition comprises at least one agrochemically acceptable excipient.

According to an embodiment, the agrochemically acceptable excipient is in the range of from 1% w/w to 89% w/w of the total composition. According to an embodiment, the agrochemically acceptable excipient is in the range of from 1% w/w to 80% w/w of the total composition. According to an embodiment, the agrochemically acceptable excipient is in the range of from 5% w/w to 70% w/w of the total composition. According to an embodiment, the agrochemically acceptable excipient is in the range of from 1% w/w to 60% w/w of the total composition. According to an embodiment, the agrochemically acceptable excipient is in the range of from 1% w/w to 50% w/w of the total composition. According to an embodiment, the agrochemically acceptable excipient is in the range of from 1% w/w to 40% w/w of the total composition. According to an embodiment, the agrochemically acceptable excipient is in the range of from 1% w/w to 30% w/w of the total composition. According to an embodiment, the agrochemically acceptable excipient is in the range of from 1% w/w to 20% w/w of the total composition. According to an embodiment, the agrochemically acceptable excipient is in the range of from 1% w/w to 10% w/w of the total composition.

According to further embodiment, the agrochemically acceptable excipient can comprise at least one of adjuvants, surfactants, wetting agents, emulsifiers, binders or binding agents, disintegrating agents, fillers or carriers or diluents, coating agents, buffers or pH adjusters or neutralizing agents, antifoaming agents or defoamer, penetrant, UV protecting agents, stabilizers, pigments, colorants, structuring agents, chelating or complexing or sequestering agent, thickeners, suspending agents or suspension aid agents or anticaking agents or anti-settling agents, viscosity modifiers or rheology modifiers, tackifier, humectants, sticking

agents, anti-freezing agent or freeze point depressants, solvents and mixtures thereof. However, those skilled in the art will appreciate that it is possible to utilize additional agrochemically acceptable excipients without departing from the scope of the present invention.

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According to an embodiment, the pesticidal composition in the form of water dispersible or spheronised granules further comprises at least one agrochemical excipient which includes disintegrating agent, surfactant, binders or fillers or carriers or diluent, antifoaming agent, ultraviolet absorbents, UV ray scattering
10 agents, anticaking agent or anti-settling or suspension aid or suspending agent, penetrating agent, sticking agent, tackifier, pigments, colorants, stabilizers, dispersing and wetting agents. However, those skilled in the art will appreciate that it is possible to utilize additional agrochemically acceptable excipients without departing from the scope of the present invention.

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According to an embodiment, the liquid pesticidal composition further comprises at least one agrochemical excipient which includes at least one structuring agent, surfactant, humectants, water miscible solvents, suspending agents or suspension aid or anticaking agent or anti-settling, penetrating agent, sticking agents,
20 ultraviolet absorbents, UV ray scattering agents, buffer or pH adjuster or neutralizing agent, stabilizer, antifreezing agent or freeze point depressants, antifoaming agents,. However, those skilled in the art will appreciate that it is possible to utilize additional agrochemically acceptable excipients without departing from the scope of the present invention.

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However, those skilled in the art will appreciate that it is possible to utilize additional agrochemically acceptable excipients without departing from the scope of the present invention. The agrochemically acceptable excipients are commercially manufactured and available through various companies.

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According to an embodiment, the surfactants include one or more of emulsifiers, wetting agents and dispersing agents. According to an embodiment, the surfactants which are used in the pesticidal composition include one or more of anionic, cationic, non-ionic, amphoteric and polymeric surfactants.

The anionic surfactants include one or more of, but not limited to a salt of fatty acid, a benzoate, a polycarboxylate, a salt of alkylsulfuric acid ester, alkyl ether sulfates, an alkyl sulfate, an alkylarylsulfate, an alkyl diglycol ether sulfate, a salt of alcohol sulfuric acid ester, an alkyl sulfonate, an alkylaryl sulfonate, an aryl sulfonate, a lignin sulfonate, an alkyl diphenyl ether disulfonate, a polystyrene sulfonate, a salt of alkylphosphoric acid ester, an alkylaryl phosphate, a styrylaryl phosphate, sulfonate docusates, a salt of polyoxyethylene alkyl ether sulfuric acid ester, a polyoxyethylenealkylaryl ether sulfate, alkyl sarcosinates, alpha olefin sulfonate sodium salt, alkyl benzene sulfonate or its salts, sodium lauroylsarcosinate, sulfosuccinates, polyacrylates, polyacrylates – free acid and sodium salt, salt of polyoxyethylenealkylaryl ether sulfuric acid ester, a polyoxyethylene alkyl ether phosphate, a salt of polyoxyethylenealkylaryl phosphoric acid ester, sulfosuccinates -mono and other diesters, phosphate esters, alkyl naphthalene sulfonate-isopropyl and butyl derivatives,alkyl ether sulfates –sodium and ammonium salts; alkyl aryl ether phosphates, ethylene oxides and its derivatives, a salt of polyoxyethylene aryl ether phosphoric acid ester, mono-alkyl sulphosuccinates, aromatic hydrocarbon sulphonates, 2-acrylamido-2-methylpropane sulfonic acid, ammonium laurylsulphate, ammonium perfluorononanoate, Docusate, Disodium cocoamphodiacetate, Magnesium laurethsulfate, Perfluorobutanesulfonic acid, Perfluorononanoic acid, carboxylates, Perfluorooctanesulfonic acid, Perfluorooctanoic acid, Phospholipid, Potassium lauryl sulfate, Soap, Soap substitute, Sodium alkyl sulfate, Sodium dodecyl sulfate, Sodium dodecylbenzenesulfonate, Sodium laurate, Sodium laurethsulfate, Sodium lauroylsarcosinate, Sodium myrethsulfate, Sodium nonanoyloxybenzenesulfonate, alkyl carboxylates, Sodium stearate, alpha olefin sulphonates, naphthalene sulfonate salts, alkyl naphthalene sulfonate fatty acid salts, naphthalene sulfonate

condensates–sodium salt, fluoro carboxylate, fatty alcohol sulphates, alkyl naphthalene sulfonate condensates–sodium salt, Brij® 700 polyoxyethylene (100) stearylether, Silwet® L-77 silicone-polyether copolymer, Aerosol® OT-B sodium dioctyl sulfosuccinate, a naphthalene sulfonic acid condensed with formaldehyde or a salt of alkylnaphthalene sulfonic acid condensed with formaldehyde; or salts, derivatives thereof.

The non-ionic surfactants include one or more of but not limited to polyol esters, polyol fatty acid esters, polyethoxylated esters, polyethoxylated alcohols, ethoxylated and propoxylated fatty alcohols, ethoxylated and propoxylated alcohols, Ethylene oxide (EO)/ Propylene oxide (PO) copolymers; EO and PO block copolymers, di, tri-block copolymers; block copolymers of polyethylene glycol and polypropylene glycol, poloxamers, polysorbates, alkyl polysaccharides such as alkyl polyglycosidesand blends thereof, amine ethoxylates, sorbitan fatty acid ester, glycol and glycerol esters, glucosidyl alkyl ethers, sodium tallowate, polyoxyethylene glycol, sorbitan alkyl esters, sorbitan derivatives, fatty acid esters of sorbitan (Spans) and their ethoxylated derivatives (Tweens), and sucrose esters of fatty acids, Cetostearyl alcohol, Cetyl alcohol, Cocamide diethanolamine (DEA), Cocamide monoethanolamine (MEA), Decyl glucoside, Decylpolyglucose, Glycerol monostearate, Lauryl glucoside, Maltosides, Monolaurin, Narrow-range ethoxylate, Nonidet P-40, Nonoxynol-9, Nonoxynols, Octaethylene glycol monododecyl ether, N-Octyl beta-D-thioglucopyranoside, Octyl glucoside, Oleyl alcohol, PEG-10 sunflower glycerides, Pentaethylene glycol monododecyl ether, Polidocanol, Poloxamer, Poloxamer 407, Polyethoxylated tallow amine, Polyglycerol polyricinoleate, Polysorbate, Polysorbate 20, Polysorbate 80, Sorbitan, Sorbitanmonolaurate, Sorbitanmonostearate, Sorbitantristearate, Stearyl alcohol, Surfactin, glyceryl laureate, lauryl glucoside, nonylphenolpolyethoxyethanols, nonyl phenol polyglycol ether, castor oil ethoxylate, polyglycol ethers, polyadducts of ethylene oxide and propylene oxide, block copolymer of polyalkylene glycol ether and hydroxystearic acid, tributylphenoxypolyethoxy ethanol, octylphenoxypolyethoxy ethanol, etho-

propoxylatedtristyrlphenols, ethoxylated alcohols, polyoxy ethylene sorbitan, fatty acid polyglyceride, a fatty acid alcohol polyglycol ether, acetylene glycol, acetylene alcohol, an oxyalkylene block polymer, polyoxyethylene alkyl ether, polyoxyethylenealkylaryl ether, a polyoxyethylenestyrylaryl ether, a polyoxyethylene glycol alkyl ether, polyethylene glycol, a polyoxyethylene fatty acid ester, a polyoxyethylenesorbitan fatty acid ester, a polyoxyethyleneglycerin fatty acid ester, Alcohol ethoxylates- C6 to C16/18 alcohols, linear and branched, Alcohol alkoxylates- various hydrophobes and EO/PO contents and ratios, Fatty acid esters-mono and diesters; lauric, stearic and oleic; Glycerol esters- with and without EO; lauric, stearic, cocoa and tall oil derived, Ethoxylated glycerine, Sorbitan esters- with and without EO; lauric, stearic and oleic based; mono and trimesters, Castor oil ethoxylates-5 to 200 moles EO; non-hydrogenated and hydrogenated, Block polymers, Amine oxides- ethoxylated and non-ethoxylated; alkyl dimethyl, Fatty amine ethoxylates- coco, tallow, stearyl, oleyl amines, a polyoxyethylene hydrogenated castor oil or a polyoxypropylene fatty acid ester; salts or derivatives thereof.

Amphoteric or Zwitterionic surfactants include one or more of, but not limited to one or more of betaine, coco and lauryl amidopropyl betaines, Coco Alkyl Dimethyl Amine Oxides, alkyl dimethyl betaines; C8 to C18, Alkyl dipropionates -sodium lauriminodipropionate, Cocoamidopropyl hydroxyl sulfobetaine, imidazolines, phospholipids phosphatidylserine, phosphatidylethanolamine, phosphatidylcholine, and sphingomyelins, Lauryl Dimethylamine Oxide, alkyl amphoacetates and proprionates, alkyl Ampho(di)acetates, and di-proprionates, lecithin and ethanolamine fatty amides; or salts, derivatives thereof.

Surfactants that are commercially available under the trademark but are not limited to one or more of Atlas G5000, TERMUL 5429, TERMUL 2510, ECOTERIC®, EULSOGEN® 118, Genapol®X, Genapol®OX -080, Genapol® C 100, Emulsogen® EL 200, Arlacel P135, Hypermer 8261, Hypermer B239, Hypermer B261, Hypermer B246sf, Solutol HS 15, Promulgen™ D, Soprophor 7961P,

Soprophor TSP/461, Soprophor TSP/724, Croduret 40, Etocas 200, Etocas 29, Rokacet R26, Cetomacrogol 1000, CHEMONIC OE-20, Triton N-101, Triton X-100, Tween 20, 40, 60, 65, 80, Span20, 40, 60, 80, 83, 85, 120, Brij®, Atlox 4912, TERMUL 3512, TERMUL 3015, TERMUL 5429, TERMUL 2510, ECOTERIC® T85, ECOTERIC® T20, TERIC 12A4, IGEPAL CA-630 and Isoceteth-20.

However, those skilled in the art will appreciate that it is possible to utilize other conventionally known surfactants (ionic or non-ionic surfactants) without departing from the scope of the present invention. The surfactants are commercially manufactured and available through various companies.

According to an embodiment, the solvent is selected from water miscible solvents including but not limited to 1, 4-Dioxane, Ethylene glycol, N-Methyl-2-pyrrolidone, 1,3-Propanediol, 1,5-Pentanediol, Propylene glycol, Triethylene glycol, 1,2-Butanediol, 1,3-Butanediol, 1,4-Butanediol, Dimethylformamide, Dimethoxyethane, Dimethyloctanamide, glycerol, Dimethyldecanamide. However, those skilled in the art will appreciate that it is possible to utilize other water miscible solvents without departing from the scope of the present invention.

According to an embodiment, the disintegrating agents which are used in the agricultural composition include, but not limited to one or more of inorganic water soluble salts e.g. sodium chloride, nitrate salts; water soluble organic compounds such as agar, hydroxypropyl starch, carboxymethyl starch ether, tragacanth, gelatin, casein, microcrystalline cellulose, cross-linked sodium carboxymethyl cellulose, carboxymethyl cellulose, carboxymethyl cellulose calcium, sodium tripolyphosphate, sodium hexametaphosphate, metal stearates, a cellulose powder, dextrin, methacrylate copolymer, Polyplasdone® XL-10 (crosslinked polyvinylpyrrolidone), poly(vinylpyrrolidone),, sulfonated styrene-isobutylene-maleic anhydride copolymer, salts of polyacrylates of methacrylates, starch-polyacrylonitrile graft copolymer, sodium or potassium bicarbonates/ carbonates or

their mixtures or salts with acids such as citric and fumaric acid or salts, derivatives thereof. However, those skilled in the art will appreciate that it is possible to utilize different disintegrating agents without departing from the scope of the present invention. The disintegrating agents are commercially manufactured and available through various companies.

According to an embodiment, the binding agents or binders which are used in the agricultural composition include, but not limited to one or more of proteins, , gums, maltodextrin, carbohydrates such as monosaccharides, disaccharides, oligosaccharides and polysaccharides, complex organic substance, synthetic organic polymers or derivatives and combinations thereof. However, those skilled in the art will appreciate that it is possible to utilize different binding agents without departing from the scope of the present invention. The binding agents are commercially manufactured and available through various companies.

According to an embodiment, the carriers which are used in the agricultural composition include, but are not limited to one or more of solid carriers or fillers or diluents. According to another embodiment, the carriers include mineral carriers, plant carriers, synthetic carriers, water-soluble carriers. However, those skilled in the art will appreciate that it is possible to utilize different carriers without departing from the scope of the present invention. The carriers are commercially manufactured and available through various companies.

The solid carriers include natural minerals like clay such as china clay, acid clay, kaolin such as kaolinite, dickite, nacrite, and halloysite, serpentines such as chrysotile, lizardite, antigorite, and amesite, synthetic and diatomaceous silicas, montmorillonite minerals such as sodium montmorillonite, smectites, such as saponite, hectorite, sauconite, and hyderite, micas, such as pyrophyllite, talc, agalmatolite, muscovite, phengite, sericite, and illite, silicas such as cristobalite and quartz, such as attapulgite and sepiolite; vermiculite, laponite, pumice, bauxite, hydrated aluminas, perlite, sodium bicarbonate, volclay, vermiculites, limestone,

natural and synthetic silicates, charcoal, silicas, wet process silicas, dry process silicas, calcined products of wet process silicas, surface-modified silicas, mica, zeolite, diatomaceous earth, derivatives thereof;. chalks (Omya ®), fuller's earth, loess, mirabilite, white carbon, slaked lime, synthetic silicic acid, starch, modified starch (Pineflow, available from Matsutani Chemical industry Co., Ltd.), cellulose, plant carriers such as cellulose, chaff, wheat flour, wood flour, starch, rice bran, wheat bran, and soyabean flour, tobacco powder, a vegetable powder polyethylene, polypropylene, poly(vinylidene chloride), casein sodium, sucrose, salt cake, potassium pyrophosphate, sodium tripolyphosphate, maleic acid, fumaric acid, and malic acid or derivatives or mixtures thereof. Commercially available Silicates are Aerosil brands, Sipemat brands as Sipernat ® 50S and CALFLO E, and kaolin 1777. However, those skilled in the art will appreciate that it is possible to utilize different solid carriers without departing from the scope of the present invention. The solid carriers are commercially manufactured and available through various companies.

According to an embodiment, the pigments and colorants are selected from but not limited to synthetic chemicals obtained from various manufacturers. The pigments and colorants can be water soluble or water insoluble, in the form of lakes. Dyes can be solvent dyes, acid dyes or basic dyes. Examples of such products include, but not limited to Agrocer Red 112, Agrocer Blue 153, Agrocer Green 007, Agrocer Yellow 001, Agrocer violet 023, Unisperse black 0058, Unisperse Red 3855, Pigmosol Agro Red 3785.

According to an embodiment, the antifoaming agents or defoamers which are used in the agricultural composition include, but not limited to one or more of silica, siloxane, silicon dioxide, polydimethyl siloxane, alkyl polyacrylates, ethylene oxide/propylene oxide copolymers, polyethylene glycol, Silicone oils and magnesium stearate or derivatives thereof. Preferred antifoaming agents include silicone emulsions (such as, e.g., Silikon® SRE, Wacker or Rhodorsil® from Solvay), long-chain alcohols, fatty acids, fluoro-organic compounds. However,

those skilled in the art will appreciate that it is possible to utilize other conventionally known antifoaming agents without departing from the scope of the present invention. The antifoaming agents are commercially manufactured and available through various companies.

According to an embodiment, the pH-adjusters or buffers or neutralizing agents which are used in the agricultural composition include both acids and bases of the organic or inorganic type and mixtures thereof. According to further embodiment, pH-adjusters or buffers or neutralizing agents include, but not limited to one or more of organic acids, inorganic acids and alkali metal compounds or salts, derivatives thereof. According to an embodiment, the organic acids include, but not limited to one or more of citric, malic, adipic, fumaric, maleic, succinic, and tartaric acid, or salts, derivatives thereof; and the mono-, di-, or tribasic salts of these acids or derivatives thereof. Alkali metal compounds include, but not limited to one or more of hydroxides of alkali metals such as sodium hydroxide and potassium hydroxide, carbonates of alkali metals such as sodium carbonate, hydrogen carbonates of alkali metals such as sodium hydrogen carbonate and alkali metal phosphates such as sodium phosphate and mixtures thereof. According to an embodiment, the salts of inorganic acids include, but not limited to one or more of alkali metal salts such as lithium chloride, sodium chloride, potassium chloride, sodium nitrate, potassium nitrate, sodium sulfate, potassium sulfate, sodium monohydrogen phosphate, potassium monohydrogen phosphate, sodium dihydrogen phosphate, potassium dihydrogen phosphate and the like. Mixtures can also be used to create a pH-adjusters or buffers or neutralizing agents. However, those skilled in the art will appreciate that it is possible to utilize other conventionally known pH-adjusters or buffers or neutralizing agents without departing from the scope of the present invention. The pH-adjusters or buffers or neutralizing agents are commercially manufactured and available through various companies.

According to an embodiment, the spreading agents which are used in the agricultural composition include, but not limited to one or more of cellulose

powder, dextrin, modified starch, crosslinked poly(vinylpyrrolidone), a copolymer of maleic acid with a styrene compound, a (meth)acrylic acid copolymer, a half ester of a polymer consisting of polyhydric alcohol with dicarboxylic anhydride, a water-soluble salt of polystyrene sulfonic acid, fatty acids, latex, aliphatic alcohols, vegetable oils such as cottonseed, or inorganic oils, petroleum distillates, modified trisiloxanes, polyglycol, polyethers, clatharates. However, those skilled in the art will appreciate that it is possible to utilize other conventionally known spreading agents without departing from the scope of the present invention. The spreading agents are commercially manufactured and available through various companies.

According to an embodiment, the sticking agents which are used in the agricultural composition include, but not limited to one or more of paraffin, a polyamide resin, polyacrylate, polyoxyethylene, wax, polyvinyl alkyl ether, an alkylphenol-formalin condensate, fatty acids, latex, aliphatic alcohols, vegetable oils such as cottonseed, or inorganic oils, petroleum distillates, modified trisiloxanes, polyglycol, polyethers, clatharates, a synthetic resin emulsion. However, those skilled in the art will appreciate that it is possible to utilize other conventionally known sticking agents without departing from the scope of the present invention. The sticking agents are commercially manufactured and available through various companies.

According to an embodiment, the stabilizers which are used in the agricultural composition include, but not limited to one or more of peroxide compounds such as hydrogen peroxide and organic peroxides, alkyl nitrites such as ethyl nitrite and alkyl glyoxylates such as ethyl glyoxylate, zeolite, antioxidants such as phenol compounds, phosphoric acid compounds, EDTA, sodium sulphites, citric acid, citrates and the like. However, those skilled in the art will appreciate that it is possible to utilize other conventionally known stabilizers without departing from the scope of the present invention. The stabilizers are commercially manufactured and available through various companies.

According to an embodiment, the preservatives which are used in the agricultural composition include but not limited to, one or more of bactericides, anti-fungal agents, biocides, anti-microbial agents, and antioxidant. Non limiting examples of preservatives include one or more of paraben, its esters and salts, propionic acid and its salts, 2,4-hexadienoic acid (sorbic acid) and its salt, formaldehyde and paraformaldehyde, 2-hydroxybiphenyl ether and its salts, inorganic sulfites and bisulfites, sodium iodate, chlorobutanol, dehydraacetic acid, formic acid, 1,6-bis(4-amidino-2-bromophenoxy)-n-hexane and its salts, 5-amino-1,3-bis(2-ethylhexyl)-5-methylhexahydropyrimidine, 5-bromo-5-nitro-1,3-dioxane, 2-bromo-2-nitropropane-1,3-diol, 2,4-dichlorobenzyl alcohol, N-(4-chlorophenyl)-N′-(3,4-dichlorophenyl) urea, 4-chloro-m-cresol, 2,4,4′-trichloro-2′-hydroxy diphenyl ether, 4-chloro-3,5-dimethyl phenol, 1,1′-methylene-bis(3-(1-hydroxy methyl-2,4-di-oximidazolidin-5-yl)urea), poly(hexamethylenediguanide) hydrochloride, 2-phenoxyethanol, hexamethylenetetramine, 1-(3-chloroallyl)-3,5,7-triaza-1-azonia-adamantane chloride, 1(4-chlorophenoxy)-1-(1H-imidazol-1-yl)-3,3-dimethyl-2-butanone, 1,3-bis(hydroxymethyl)-5,5-dimethyl-2,4-imidazolidinedione, benzyl alcohol, octopirox, 1,2-dibromo-2,4-dicyanobutane, 2,2′-methylenebis(6-bromo-4-chlorophenol), bromochlorophene, dichlorophene, 2-benzyl-4-chlorophenol, 2-chloroacetamide, chlorhexidine, chlorhexidine acetate, chlorhexidine gluconate, chlorhexidine hydrochloride, 1-phenoxypropan-2-ol, N-alkyl(C12-C22)trimethylammonium bromide and chloride, 4,4-dimethyl-1,3-oxazolidine, N-hydroxymethyl-N-(1,3-di(hydroxymethyl)-2,5-dioxoimidazolidin-4-yl)-N′-hydroxymethylurea, 1,6-bis(4-amidinophenoxy)-n-hexane and its salts, glutaraldehyde, 5-ethyl-1-aza-3,7-dioxabicyclo(3.3.0)octane, 3-(4-chlorophenoxy)propane-1,2-diol, Hyamine, alkyl(C8-C18)dimethylbenzyl ammonium chloride, alkyl(C8-C18)dimethylbenzylammonium bromide, alkyl(C8-C18)dimethylbenzylammoniumsaccharinate, benzyl hemiformal, 3-iodo-2-propynyl butylcarbamate, sodium hydroxymethylaminoacetate, cetyltrimethylammonium bromide, cetylpyridinium chloride, and derivatives of 2H isothiazol-3-one (so-called isothiazolone derivatives) such as alkylisothiazolones (for example 2-methyl-2H-isothiazol-3-one, MIT; chloro-2-methyl-2H-isothiazol-

3-one, CIT), benzoisothiazolones (for example 1,2-benzoisothiazol-3(2H)-one, BIT, commercially available as Proxel® types from Arch Biocides Ltd.) or 2-methyl-4,5-trimethylene-2H-isothiazol-3-one (MTIT), C1-C4-alkyl para-hydroxybenzoate, an dichlorophene, Proxel® from Arch Biocides Ltd. or Acticide® RS from Thor Chemie and Kathon® MK from Lanxess, Bacto-100, thimerosal, Sodium Propinoate, Sodium Benzoate, Propyl Paraben,Propyl Paraben Sodum, Potassium Sorbate, Potassium Benzoate, Phenyl Mercuric Nitrate, Phenyl Etehyl Alcohol, Sodium, Ethylparaben, Methylparaben, Butylparaben, Bezyla Alcohol, Benzothonium Chloride, Cetylpyridinium Chloride, Benzalkonium Chloride, 1,2-benzothiazol-3-one, Preventol® (Lanxess®), potassium sorbate, iodine-containing organic compounds such as 3-bromo-2,3-diiodo-2-propenyl ethyl carbonate, 3-iodo-2-propynyl butyl carbamate, 2,3,3-triiodo allyl alcohol, and parachlorophenyl-3-iodopropargylformal; benzimidazole compounds and benzthiazole compounds such as 2-(4-thiazolyl)benzimidazole and 2-thiocyanomethylthiobenzo-thiazole; triazole compounds such as 1-(2-(2′,4′-dichlorophenyl)-1,3-dioxolane-2-ylmethyl)-1H-1,2,4-triazole, 1-(2-(2′,4′-dichloro phenyl)-4-propyl-1,3-dioxolane-2-ylmethyl)-1H-1,2,4-triazole, and α-(2-(4-chlorophenyl) ethyl)-α-(1,1-dimethyl ethyl)-1H-1,2,4-triazole-1-ethanol; and naturally occurring compounds such as 4-isopropyl tropolone (hinokitiol) and borax. Antioxidants includes but not limited to one or more of imidazole and imidazole derivatives (e.g. urocanic acid), 4,4′-thiobis-6-t-butyl-3-methylphenol, 2,6-di-t-butyl-p-cresol (BHT), penta erythrityl tetrakis[3-(3,5,-di-t-butyl-4-hydroxyphenyl)] propionate; amine antioxidants such as N,N′-di-2-naphthyl-p-phenylenediamine; hydroquinoline antioxidants such as 2,5-di(t-amyl)hydroquinoline; phosphorus-containing antioxidants such as triphenyl phosphate, caro- tenoids, carotenes (e.g. α-carotene, β-carotene, lycopene) and derivatives thereof, lipoic acid and derivatives thereof (e.g. dihydrolipoic acid), aurothioglucose, propylthiouracil and further thio compounds (e.g. thioglycerol, thiosorbitol, thioglycolic acid, thioredoxin, N-acetyl, methyl, ethyl, propyl, amyl, butyl, lauryl, palmitoyl, oleyl, γ-linoleyl, cholesteryl and glyceryl esters thereof), and salts thereof, dilaurylthiodipropionate, distearylthiodipropion- ate,

thiodipropionic acid and derivatives thereof (esters, ethers, lipids, nucleotides, nucleosides and salts), and sulfoximine compounds (e.g. buthioninesulfoximi- nes, homocysteine sulfoximine, buthionine sulfones, penta-, hexa-, heptathioninesulfoximine) in very low tolerated doses (e.g. pmol/kg to pmol/kg), α-hydroxy acids (e.g. citric acid, lactic acid, malic acid), humic acids, gallic esters (e.g. propyl, octyl and dodecyl gallate), unsaturated fatty acids and derivatives, hydroquinone and derivatives thereof (e.g. arbutin), ubiquinone and ubiquinol, and derivatives thereof, ascorbyl palmitate, stearate, di- palmitate, acetate, Mg ascorbyl phosphates, disodiumascorbyl phosphate and sulfate, potassium ascorbyltocopheryl phosphate, isoascorbic acid and derivatives thereof, the coniferyl benzoate of benzoin resin, rutin, rutinic acid and derivatives thereof, disodium rutinyldisulfate, dibutylhydroxytoluene, 4,4-thiobis-6-tert-butyl-3-methylphenol, butylhydroxy anisole, p-octylphenol, mono-(di- or tri-) methyl benzylphenol, 2,6-tert-butyl-4-methylphenol, pentaerythritol-tetrakis 3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate, butylhydroxyanisol, nordihydroguaiacic acid, nordihydroguaiaretic acid, trihydroxybutyrophenone, uric acid and derivatives thereof, mannose and derivatives thereof, selenium and selenium derivatives (e.g. selenomethionine), stilbenes and stilbene derivatives (e.g. stilbene oxide, trans-stilbene oxide). However, those skilled in the art will appreciate that it is possible to utilize other conventionally known preservatives without departing from the scope of the present invention. The preservatives are commercially manufactured and available through various companies.

According to an embodiment, the structuring agents which are used in the agricultural composition include, but not limited to one or more of thickeners, viscosity modifiers, tackifiers, suspension aids, rheological modifiers or anti-settling agents. A structuring agent prevents sedimentation of the active ingredient particles after prolonged storage.

According to an embodiment, the structuring agents which are used in the aqueous suspension composition include, but not limited to one or more polymers such as

polyacrylics, polyacrylamides, polysaccharides, hydrophobically modified cellulose derivatives, co-polymers of cellulose derivatives, carboxyvinyl or polyvinyl pyrrolidones, polyethylenes, polyethylene oxide, polyvinyl alcohol and derivatives; clays such as bentonite clays, kaolin, smectite, attapulgites, attaclays with high surface area silica and natural gums such as guar gum, xanthan gum, gum arabic, gum tragacanth, rhamsan gum, locust bean gum, carageenan, welan gum, veegum, gelatin, dextrin, collagen; polyacrylic acids and their sodium salts; the polyglycol ethers of fatty alcohols and polyethylene oxide or polypropylene oxide condensation products and mixtures thereof and include ethoxylated alkyl phenols (also designated in the art as alkylaryl polyether alcohols); ethoxylated aliphatic alcohols (or alkyl polyether alcohols); ethoxylated fatty acids (or polyoxyethylene fatty acid esters); ethoxylatedanhydrosorbitol esters (or polyethylene sorbitan fatty acid esters), long chain amine and cyclic amine oxides which are nonionic in basic solutions; long chain tertiary phosphine oxides; and long chain dialkyl sulfoxides, fumed silica, mixture of fumed silica and fumed aluminium oxide, swellable polymers, polyamides or its derivatives; polyols such as glycerine, poly(vinyl acetate), sodium polyacrylate, poly(ethylene glycol), phospholipid (for example, cephalin, and the like); stachyose, fructo-oligosaccharides, amylose, pectins, alginates, hydrocolloids and mixtures thereof. Also, celluloses such as hemicellulose, carboxymethylcellulose, ethylcellulose, hydroxyethylcellulose, hydroxy-methyl ethyl cellulose, hydroxyl ethyl propyl cellulose, methylhydroxyethylcellulose, methylcellulose; starches such, starch acetates, starch hydroxyethyl ethers, ionic starches, long-chain alkyl starches, dextrins, maltodextrin, corn starch, amine starches, phosphates starches, and dialdehyde starches; plant starches such as corn starch and potato starch; other carbohydrates such as pectin, dextrin, amylopectin, xylan, glycogen, agar, gluten, alginic acid, phycocolloids, or derivatives thereof. However, those skilled in the art will appreciate that it is possible to utilize other conventionally known structuring agents without departing from the scope of the present invention.

Preferred structuring agents include one or more of xanthan gum, guar gum, aluminum silicate, methyl cellulose and its derivatives, polysaccharide, alkaline earth metal silicate, and polyvinyl alcohol. The structuring agents are commercially manufactured and available through various companies.

According to an embodiment, the anticaking agents or anti-settling agent or suspending agents used include one or more of, but not limited to polysaccharides such as bentonite, starch, mannose, galactose, cellulose derivatives such as sodium carboxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, hydroxypropylmethyl cellulose and methyl cellulose; gums such as agar, carrageenan, alginates, arabic, tragacanth, karaya, ghatti , guar, dextran, starches including pregelatinized and modified starches, poly(vinylpyrrolidone), fumed silica (white carbon), ester gum, a petroleum resin, Foammaster® Soap L sodium stearate, sodium acetate, sodium metasilicate, sodium alkylsulfosuccinates, salts or derivatives thereof. However, those skilled in the art will appreciate that it is possible to utilize different anti caking agents without departing from the scope of the present invention. anticaking agents or anti-settling agent or suspending agents or suspension aids are commercially manufactured and available through various companies.

According to an embodiment, the antifreezing agents or freezing point depressants used in the aqueous suspension composition include, but are not limited to one or more of polyhydric alcohols such as ethylene glycol, diethylene glycol, dipropylene glycol, propylene glycol, butyrolactone, N,N-dimethyl-formamide, glycerol, monohydric or polyhydric alcohols, glycol ethers, glycol ethers, glycol monoethers such as the methyl, ethyl, propyl and butyl ether of ethylene glycol, diethylene glycol, propylene glycol and dipropylene glycol, glycol diethers such as methyl and ethyl diethers of ethylene glycol, diethylene glycol and dipropyleneglycol.or urea, glycerol, isopropanol, propylene glycol monomethyl ether, di- or tripropylene glycol monomethyl ether or cyclohexanol, carbohydrates such as glucose, mannose, fructose, galactose, sucrose, lactose, maltose, xylose, arabinose, sorbitol, mannitol,

trehalose, raffinose or derivatives thereof. However, those skilled in the art will appreciate that it is possible to utilize different antifreezing agents without departing from the scope of the present invention. The antifreezing agents are commercially manufactured and available through various companies. According to an embodiment, the antifreezing agent is present an amount of from 0.1% to 20% w/w of the total composition.

According to an embodiment, the penetrant which is used in the composition include, but not limited to one or more of alcohol, glycol, glycol ether, ester, amine, alkanolamine, amine oxide, quaternary ammonium compound, triglyceride, fatty acid ester, fatty acid ether, N-methyl pyrrolidone, dimethyl formamide, dimethyl acetamide, or dimethyl sulfoxide, polyoxyethylene trimethylol propane monooleate, polyoxyethylene trimethylol propanedioleate, polyoxyethylene trimethylol propanetrioleate, polyoxyethylene sorbitan monooleate, polyoxyethylene trisiloxane, sorbitol hexaoleate. However, those skilled in the art will appreciate that it is possible to utilize different penetrants without departing from the scope of the present invention.

According to an embodiment, the ultraviolet absorbent is selected from, but not limited to one or more of 2-(2'-hydroxy-5'-methylphenyl) benzotriazole, 2-ethoxy-2'-ethyloxazalic acid bisanilide, succinic acid dimethyl-1-(2-hydroxyethyl)-4-hydroxy-2,2,6,6-tetramethylpiperidine polycondensate, benzotriazole compounds such as 2-(2′-hydroxy-5′-methylphenyl)benzotriazole and 2-(2′-hydroxy-4′-n-octoxyphenyl)benzotriazole; benzophenone compounds such as 2-hydroxy-4-methoxybenzophenone and 2-hydroxy-4-n-octoxybenzophenone; salicylic acid compounds such as phenyl salicylate and p-t-butylphenyl salicylate; 2-ethylhexyl 2-cyano-3,3-diphenyl acrylate, 2-ethoxy-2′-ethyl oxalic bisanilide, and dimethyl succinate-1-(2-hydroxyethyl)-4-hydroxy-2,2,6,6-tetramethyl piperidine poly-condensate or derivatives or the like. However, those skilled in the art will appreciate that it is possible to utilize different ultraviolet absorbents, without

departing from the scope of the present invention. Such ultraviolet absorbents are commercially manufactured and available through various companies.

According to an embodiment, the UV ray scattering agents include, but not limited to titanium dioxide or the like may be used. However, those skilled in the art will appreciate that it is possible to utilize different UV ray scattering agents or mixtures thereof without departing from the scope of the present invention. Such UV ray scattering agents are commercially manufactured and available through various companies.

According to an embodiment, the humectant is selected from, but not limited to one or more of polyoxyethylene/polyoxypropylene copolymers, particularly block copolymers, such as the Synperonic PE series of copolymers available from Uniqema or salts, derivatives thereof. Other humectants are propylene glycol, monoethylene glycol, hexylene glycol, butylene glycol, ethylene glycol, diethylene glycol, poly (ethylene glycol), poly (propylene glycol), glycerol and the like; polyhydric alcohol or derivatives thereof. Also, other humectants include aloe vera gel, alpha hydroxyl acids such as lactic acid and salts thereof, albumin, glyceryl triacetate, honey, calcium chloride, etc. The non-ionic surfactants mentioned above also act as humectants. However, those skilled in the art will appreciate that it is possible to utilize other conventionally known humectants without departing from the scope of the present invention. The humectants are commercially manufactured and available through various companies.

According to an embodiment, the pesticidal composition can include at least one further active ingredient. According to an embodiment, the active ingredient can include at least one pesticidal active, fertilizer, micronutrients, macronutrients, organic acids or mixtures thereof. According to further embodiment, the pesticidal active can be one or more of insecticide, fungicide, insecticide, miticide, acaricide, nematicide, pheromone, plant growth regulator, etc. However, those skilled in the

art will appreciate that it is possible to utilize other further active ingredient without departing from the scope of the present invention.

According to further embodiment, the further active ingredient can be present in the concentration range of 0.1% w/w to 80% w/w of the total composition. According to further embodiment, the active ingredient can be present in the concentration range of 0.1% w/w to 70% w/w of the total composition. According to further embodiment, the active ingredient can be present in the concentration range of 0.1% w/w to 50% w/w of the total composition. According to further embodiment, the active ingredient can be present in the concentration range of 0.1% w/w to 30% w/w of the total composition. According to further embodiment, the active ingredient can be present in the concentration range of 0.1% w/w to 10% w/w of the total composition.

It has been surprisingly found that the pesticidal composition of the present invention has enhanced and improved physical properties of dispersibility, suspensibility, wettability, viscosity, pourability, storage stability, provides ease of handling and also reduces the loss of material while handling the product at the time of packaging as well as during field application.

Wettability is the condition or the state of being wettable and is defined as the degree to which a solid is wetted by a liquid, measured by the force of adhesion between the solid and liquid phases. The wettability of the granular composition is measured using the Standard CIPAC Test MT-53 which describes a procedure for the determination of the time of complete wetting of wettable formulations. A weighed amount of the granular composition is dropped on water in a beaker from a specified height and the time for complete wetting was determined. According to another embodiment, the pesticidal composition in the form of water dispersible granules or spheronised granules has wettability of less than 2 minutes. According to another embodiment, the pesticidal composition has wettability of less than 1 minute. According to another embodiment, the pesticidal composition has

wettability of less than 30 seconds. According to another embodiment, the pesticidal composition has wettability of less than 15 seconds.

The spheronised granular composition is formulated in a manner such that it is imparted with sufficient hardness which prevents the granules from crumbling during storage and transportation. The granular composition is formulated in a manner such that it is imparted with sufficient hardness which prevents the granules from crumbling during storage and transportation. The hardness exhibited by the granules is estimated by hardness testers such as the ones provided by Monsanto, Sotax, Erweka, Agilent, Vinsyst, Dr. Schleuniger, which work according to the principle defined in the pharmacopoeias such as United States Pharmacopoeia section<1217>. According to an embodiment, the hardness exhibited by the granules is less than 100 Newton.

Attrition resistance determines the resistance of a granular material to wear. The water disintegrable granular composition has good attrition resistance. The Samples can be tested for attrition as per the CIPAC Handbook specified test, "MT 178.2 - Attrition resistance of granules". According to an embodiment, the attrition resistance of the water disintegrable granular composition is at least 50%.

According to an embodiment, the pesticidal composition in the form of water dispersible granule or liquid suspension passes the wet sieve retention test. The test is used to determine the amount of non-dispersible material in formulations that are applied as dispersions in water. The wet sieve retention value of the agrochemical composition in the form of liquid suspension and granules is measured by using the Standard CIPAC Test MT-185 which describes a procedure for measuring the amount of material retained on the sieve. A sample of the formulation is dispersed in water and the suspension formed is transferred to a sieve and washed. The amount of the material retained on the sieve is determined by drying and weighing

According to an embodiment, the pesticidal composition in the form of water dispersible granule or liquid suspension has a wet sieve retention value on a 75-micron sieve of less than 0.5%. According to an embodiment, the pesticidal composition has a wet sieve retention value on a 75-micron sieve of less than 0.2%. According to an embodiment, the pesticidal composition has a wet sieve retention value on a 75-micron sieve of less than 0.1%. The wet sieve retention value of less than 0.5% indicate that the pesticidal composition helps in easy application of the formulation preventing clogging of the nozzles or filter equipment.

According to an embodiment, the pesticidal composition in the form of liquid suspension does not sediment or settle on storage and is easily pourable. This property is measured in terms of viscosity of the fluid which is a measure of its resistance to gradual deformation by shear stress or tensile stress.

According to an embodiment, viscosity of the liquid composition is determined as per CIPAC MT-192. A sample is transferred to a standard measuring system. The measurement is carried out under different shear conditions and the apparent viscosities are determined. During the test, the temperature of the liquid is kept constant.

According to an embodiment, the pesticidal composition has a viscosity at 20° C. of about 10 cps to about 3000 cps. According to an embodiment, the pesticidal composition has a viscosity at 20° C. of about 10 cps to about 2500 cps. According to an embodiment, the pesticidal composition has a viscosity at 20° C. of about 10 cps to about 2000 cps. According to an embodiment, the pesticidal composition has a viscosity at 20° C. of about 10 cps to about 1500 cps. According to an embodiment, the pesticidal composition has a viscosity at 20° C. of about 10 cps to about 1200 cps. According to an embodiment, the pesticidal composition has viscosity at 20° C. of about 10 cps to about 500 cps. According to an embodiment, the pesticidal composition has a viscosity at 20° C. of about less than 500 cps. According to an embodiment, the pesticidal composition has viscosity at 20° C. of

about 10 cps to about 400 cps. According to an embodiment, the pesticidal composition has viscosity at 20° C. of about 10 cps to about 300 cps.

According to an embodiment, the liquid suspension composition of the present invention is easily pourable. The pourability is the measure of percent of residue.

According to an embodiment, the pourability of the pesticidal composition is determined as per CIPAC MT-148.1 by allowing the liquid suspension to stand for 24-hour and the amount remaining in the container after a standardized pouring procedure is determined. The container is rinsed and the amount then remaining is determined and the maximum residue in percent is calculated. According to a further embodiment, the pourability of the pesticidal composition is less than 5% residue. According to further embodiment, the pourability of the pesticidal composition is preferably less than 2.5% residue. According to further embodiment, the pourability of the pesticidal composition is more preferably less than 2.0% residue.

Dispersibility of the pesticidal composition in the form of water dispersible or spheronised granule is a measure of percent dispersion. Dispersibility is calculated by the minimum percent dispersion. Dispersibility is defined as the ability of the granules to disperse upon addition to a liquid such as water or a solvent. Dispersibility of the granular composition of the present application, was determined as per the standard CIPAC test, MT 174. A known amount of the granular composition was added to a defined volume of water and mixed by stirring to form a suspension. After standing for a short period, the top nine-tenths are drawn off and the remaining tenth dried and determined gravimetrically. The method is virtually a shortened test of suspensibility and is appropriate for establishing the ease with which the granular composition dispersed uniformly in water.

According to an embodiment, the pesticidal composition has a dispersibility of at least 30%. According to an embodiment, the pesticidal composition has a

dispersibility of at least 40%. According to an embodiment, the pesticidal composition has a dispersibility of at least 50%. According to an embodiment, the pesticidal composition has a dispersibility of at least 60%. According to an embodiment, the pesticidal composition has a dispersibility of at least 70%. According to an embodiment, the pesticidal composition has a dispersibility of at least 80%. According to an embodiment, the pesticidal composition has a dispersibility of at least 90%. According to an embodiment, the pesticidal composition has a dispersibility of at least 99%. According to an embodiment, the pesticidal composition has a dispersibility of 100%.

According to an embodiment, the pesticidal composition in the form of water dispersible granule exhibits almost instantaneous dispersion.

According to an embodiment, the pesticidal composition in the form of spheronised granule makes the actives available instantaneously and also over a longer period which may extend throughout the crop cycle, providing an immediate and sustained release of actives eventually strengthening and protecting the crop at each and every stage of the crop cycle.

According to an embodiment, the pesticidal composition in the form of water dispersible granules, liquid suspension exhibits good suspensibility. Suspensibility is defined as the amount of active ingredient suspended after a given time in a column of liquid, of stated height, expressed as a percentage of the amount of active ingredient in the original suspension. The water dispersible granules is tested for suspensibility as per the CIPAC Handbook, "MT 184 Test for Suspensibility" whereby a suspension of known concentration of the composition in CIPAC Standard Water was prepared and placed in a prescribed measuring cylinder at a constant temperature, and allowed to remain undisturbed for a specified time. The top 9/10ths were drawn off and the remaining 1/10th was then assayed chemically, gravimetrically, or by solvent extraction, and the suspensibility was calculated.

The suspensibility of the liquid suspension is the amount of active ingredient suspended after a given time in a column of liquid, of stated height, expressed as a percentage of the amount of active ingredient in the original suspension. The suspensibility of liquid suspension concentrate is determined as per CIPAC MT-161 by preparing 250 ml of diluted suspension, allowing it to stand in a measuring cylinder under defined conditions, and removing the top nine-tenths. The remaining tenth is then assayed chemically, gravimetrically or by solvent extraction, and the suspensibility is calculated.

According to an embodiment, the pesticidal composition has a suspensibility of at least 30%. According to an embodiment, the pesticidal composition has suspensibility of at least 40%. According to an embodiment, the pesticidal composition has a suspensibility of at least 50%. According to an embodiment, the pesticidal composition has a suspensibility of at least 60%. According to an embodiment, the pesticidal composition has a suspensibility of at least 70%. According to an embodiment, the pesticidal composition has a suspensibility of at least 80%. According to an embodiment, the pesticidal composition has a suspensibility of at least 90%. According to an embodiment, the pesticidal composition has a suspensibility of at least 99%. According to an embodiment, the pesticidal composition has a suspensibility of 100%.

According to an embodiment, the pesticidal composition in the form of water dispersible granule or spheronised granule, liquid suspension demonstrates superior stability in terms of suspensibility under accelerated storage condition (ATS). According to an embodiment, the pesticidal composition demonstrates suspensibility of more than 90% under ATS. According to an embodiment, the pesticidal composition demonstrates suspensibility of more than 80% under ATS. According to an embodiment, the pesticidal composition demonstrates suspensibility of more than 70% under ATS. According to an embodiment, the pesticidal composition demonstrates suspensibility of more than 60% under ATS. According to an embodiment, the pesticidal composition demonstrates

suspensibility of more than 50% under ATS. According to an embodiment, the pesticidal composition demonstrates suspensibility of more than 40% under ATS. According to an embodiment, the pesticidal composition demonstrates suspensibility of more than 30% under ATS.

According to an embodiment, the pesticidal composition demonstrates dispersibility of more than 90% under ATS. According to an embodiment, the pesticidal composition demonstrates dispersibility of more than 80% under ATS. According to an embodiment, the pesticidal composition demonstrates dispersibility of more than 70% under ATS. According to an embodiment, the pesticidal composition demonstrates dispersibility of more than 60% under ATS. According to an embodiment, the pesticidal composition demonstrates dispersibility of more than 50% under ATS. According to an embodiment, the pesticidal composition demonstrates dispersibility of more than 40% under ATS. According to an embodiment, the pesticidal composition demonstrates dispersibility of more than 30% under ATS.

According to an embodiment, the pesticidal composition demonstrates superior stability towards heat, light, temperature and caking. The composition does not form a hard cake and exhibits enhanced stability even at extended storage under higher temperatures which in turn results in superior field performance. According to further embodiment, the stability exhibited by the pesticidal composition is at least 3 years. According to further embodiment, the stability exhibited by the pesticidal composition is at least 2 years. According to further embodiment, the stability exhibited by the pesticidal composition is at least 1 year. According to further embodiment, the stability exhibited by the pesticidal composition is at least 6 months.

According to an embodiment, the present invention relates to a process of preparing the pesticidal composition of the present invention comprising Triflumezopyrim in the range of 0.1%w/w to 20% w/w of the total composition; Tebuconazole in the

range of 1%w/w to 50% w/w of the total composition; Tricyclazole in the range of 10%w/w to 70% w/w of the total composition; and at least one agrochemically acceptable excipient.

According to a further embodiment the present invention relates to a process for preparing pesticidal composition in the form of water dispersible granules, spheronised granules, liquid suspension, wettable powder, suspo-emulsion, water dispersible powder for seed coating (WS), and suspension concentrate for seed coating (FS).

According to further embodiment, the pesticidal composition in the form of water dispersible granules or spheronised granules, is made by various techniques such as spray drying, fluidized bed granulation, disc pelletization, pan granulation, pin agglomerator, spheronizer, freeze drying or combinations. The granules can also be extruded through the extruded to obtain extruded granules.

The invention also relates to a process for preparing the pesticidal composition in the form of water dispersible granules, the process comprising: a) milling blend of Triflumezopyrim, Tebuconazole and Tricyclazole with at least one agrochemical excipient to obtain a slurry or wet mix, wherein the particles are in the size range of 0.1 to 50 microns and b) drying the wet mix, sieving the dried mix to remove the undersized and oversized granules to obtain water dispersible granules; wherein the granules of the composition comprise of granules in size range of 0.025mm to 3mm.

The invention also relates to a process for preparing the granular pesticidal composition, the process comprising:

a) milling blend of Triflumezopyrim, Tebuconazole and Tricyclazole with at least one agrochemical excipient to obtain a slurry or wet mix, wherein the particles are in the size range of 0.1 to 75 microns;
b) drying the wet mix to obtain dried mix; and

c) adding water to the dried mix and blended to obtain a dough or paste, which is extruded through an extruder to obtain the extruded granules in a size range of 0.025 mm to 6 mm; or
agglomerating the wet mix or dried mix obtained in step (b) in an agglomerator to obtain spheronised granular composition in a size range of 0.025 mm to 6 mm.

The wet mix obtained is dried, for instance in a spray dryer, fluid bed dryer or any suitable granulating equipment, followed by sieving to remove the undersized and oversized granules to obtain granules.

The invention relates to a process for preparing a wettable powder (WP) or 'wettable powder for seed coat (WS)' composition, wherein the process involves mixing effective amount of Triflumezopyrim with required diluents and inert ingredients to obtain a first mixture. The process involves mixing effective amount of Tebuconazole with required diluents and inert ingredients to obtain a second mixture. Tricyclazole is then mixed with the surfactants to obtain a third mixture. The three mixtures are then mixed using a suitable mass mixer for 30 minutes and passed through an air jet mill to obtain a wettable powder composition with the desired particle size range of 0.1 micron to 75 microns. Alternatively, the wettable powder composition is prepared by mixing effective amount of Triflumezopyrim, Tebuconazole and Tricyclazole with required diluents and inert ingredients using a suitable mass mixer for 30 minutes and then passed through an air jet mill to obtain a wettable powder composition with the desired particle size range of 0.1 micron to 75 microns.

The invention relates to a process for preparing the liquid suspension or 'Suspension concentrate for seed treatment (FS)' composition, the process comprising: homogenizing mixture of Triflumezopyrim in the range of 0.1%w/w to 20% w/w of the total composition; Tebuconazole in the range of 1%w/w to 50% w/w of the total composition; Tricyclazole in the range of 10%w/w to 70% w/w of the total composition and at least one agrochemically acceptable excipient to obtain

a suspension; and wet milling the obtained suspension to provide composition with a particle size range of 0.1 micron to 75 microns.

The process of preparing the liquid suspension, involves homogenization of one or more of excipients by feeding them into a vessel provided with stirring facilities. Triflumezopyrim, Tebuconazole and Tricyclazole are added to the homogenized blend and stirred continuously for about 5 to 10 minutes until the total mixture becomes homogeneous. Subsequently, the suspension obtained is passed through the wet mill to obtain a desired particle size in the range of 0.1 to 75 microns. Then, requisite quantity of the structuring agent is added to the obtained suspension, under continuous homogenization. However, those skilled in the art will appreciate that it is possible to modify or alter or change the process or process parameters to obtain liquid suspension composition without departing from the scope of the present invention.

The invention relates to a process for preparation of a suspoemulsion pesticidal composition, the process comprising dissolving wetting agent and dispersing agents in water to obtain a mixture followed by addition of humectant, antifoam agent, if required, Triflumezopyrim and Tricyclazole to obtain a homogenized suspension, which is further milled to obtain desired particle size (First fraction). Tebuconazole is dissolved in an oil or a solvent, followed by addition of surfactant to prepare a concentrated emulsion with required agrochemical excipients to obtain a second fraction. The two fractions obtained are then mixed using a homogenizer for 30 minutes to obtain the suspoemulsion composition with the desired particle size of 0.1 to 75 microns.

According to an embodiment, the composition of the present invention is at least one of a pesticide composition, a crop protection composition, a crop strengthener composition, a yield enhancer composition.

According to an embodiment, the invention further relates to a method of application of the composition.

According to an embodiment, the invention also relates to a method of protecting the crop, controlling insect pests and diseases, improving the crop health and growth, enhancing the crop yield, strengthening the plant, the method comprising treating at least one of a plant, crop, plant propagation material, locus or parts thereof, a seed, seedling or surrounding soil with the pesticidal composition which includes Triflumezopyrim in the range of 0.1%w/w to 20% w/w of the total composition; Tebuconazole in the range of 1%w/w to 50% w/w of the total composition; Tricyclazole in the range of 10%w/w to 70% w/w of the total composition. The composition may be sprayed directly to the plant, such as its foliage or applied to the plant propagation material, before it is sown or planted, or to the locus thereof.

The composition is applied through a variety of methods. Methods of applying to the soil include any suitable method, which ensures that the composition penetrates the soil, for example nursery tray application, in furrow application, soil drenching, soil injection, drip irrigation, sprinkler irrigation, seed treatment, seed painting and such other methods. The composition also is applied in the form of a foliar spray.

The rates of application or the dosage of the composition depends on the type of use, the variety of crop, or the form of composition but is such that the pesticidal active ingredient, is in an effective amount to provide the desired action such as crop protection, crop yield.

It was observed that the combination of the present invention provides good control on various pests and diseases viz., Brown plant hopper, White backed plant hopper, Blast, Sheath blight, false smut and grain discoloration as compared to application of individual actives and known combinations. Further the composition of the

present invention not only helps in improving the crop yield, but the plants also exhibit enhanced physiological parameters.

It has been observed that the compositions of the present invention, wherein the composition has a particle size in the range of 0.1 micron to 75 microns demonstrates enhanced, efficacious and superior behavior in the fields at reduced dosage. The pesticidal composition with a particle size range of 0.1 micron to 75 microns provides for increased surface area coverage on application to the foliage which enhances adhesion and provides better penetration of the actives when applied to the foliage and also facilitates better absorption by the roots when applied to the surrounding soil improving their efficacy and bioavailability. The pesticidal composition of Triflumezopyrim, Tebuconazole and Tricyclazole where the composition is formulated in a particle size range of 0.1 micron to 75 microns also results in enhanced dispersibility and suspensibility, resulting in the even distribution of the actives when applied to the target site of plants or their surrounding soil which leads to better assimilation or uptake of the actives by the crops and thereby leads to better efficacy of the formulation. The particle size of the composition not only provides an efficacious composition but also improves the physical properties of the composition.

Thus, it has been observed that the compositions of the present invention, demonstrate enhanced, efficacious and superior behavior in the fields at reduced dosage.

From the foregoing, it will be observed that numerous modifications and variations can be effectuated without departing from the true spirit and scope of the novel concepts of the present invention. It is to be understood that no limitation with respect to the specific embodiments illustrated is intended or should be inferred.

A. PREPARATION EXAMPLES:

The following examples illustrate the basic methodology and versatility of the composition of the invention. It should be noted that this invention is not limited to these exemplifications and is extrapolated to overall claimed concentration range of the components.

Example 1: Water Dispersible Granule composition of 3.78% Triflumezopyrim, 28.17% Tebuconazole and 45% Tricyclazole

Water dispersible granules were prepared by blending 4 parts of Triflumezopyrim technical with 30.3 parts of Tebuconazole technical, along with 48.5 parts of Tricyclazole technical, 4 parts of mixture blended with salt of naphthalene sulphonic acid and phenol sulphonic acid condensation product, 4 parts of sodium salt of naphthalene sulfonate condensate, 2 parts of sodium lauryl sulphate, 0.2 parts of antifoaming agent, 3 parts of clay in 100 parts of water and milled. The composition had an average particle size of less than 2.5 microns.

To the milled slurry under blending, 4 parts of sodium citrate is added and stirred for an hour, the material is than spray dried / fluid bed dried to obtain product. The composition had granule size less than 1.5 mm.

RT RESULTS

Suspensibility: 90%, Wet sieve retention: 0.21% on 75-micron sieve, Degree of dispersion: 85%, wetting out time 5 sec.

Accelerated storage stability results

Suspensibility: 85%, Wet sieve 0.25 % on 75-micron sieve, Degree of dispersion 76%, wetting out time 10 sec.

Example 2: Water Dispersible Granule composition of 2.5% Triflumezopyrim, 18.8% Tebuconazole and 30% Tricyclazole

Water dispersible granules were prepared by blending 2.75 parts of Triflumezopyrim technical with 20.25 parts of Tebuconazole technical, along with 32.50 parts of Tricyclazole technical. 6 parts of mixture was blended with salt of naphthalene sulphonic acid and phenol sulphonic acid condensation product, 5 parts of sodium salt of naphthalene sulfonate condensate, 2 parts of sodium lauryl

sulphate, 0.2 parts of antifoaming agent, 15 parts of clay in 100 parts of water and milled. The composition had an average particle size of less than 2.5 microns.

To the milled slurry under blending, 8 parts of sodium citrate, 8.3 parts of sodium ligno sulphonate is added and stirred for one hour, the material is than spray dried/ fluid bed dried to obtain product. The composition had granule size < 1.5 mm.

RT RESULTS

Suspensibility: 88%, Wet sieve retention 0.25% on 75-micron sieve, Degree of dispersion: 80%, wetting out time 4 sec

Accelerated storage stability results

Suspensibility: 82%, Wet sieve 0.22 % on 75-micron sieve, Degree of dispersion: 72%, wetting out time 8 sec.

Example 3: Suspension concentrate composition of 1.7% Triflumezopyrim, 12.5% Tebuconazole and 20% Tricyclazole

Suspension concentrate composition was prepared by adding 15 parts of alkyl naphthalene sulphonate condensate and 70 parts of propylene glycol to water and homogenized by feeding them into a vessel provided with stirring facilities.18.35 parts of Triflumezopyrim technical, 132.60 parts of Tebuconazole technical, 211.60 parts of Tricyclazole technical is further added to the homogenized blend and stirred continuously for approximately 10 minutes until the total mixture was homogeneous. To the above mixture, 20 parts of tristyrylphenol phosphate, 1 parts of polydimethylsiloxane emulsion was added under continuous homogenization to obtain liquid suspension. Subsequently, the suspension obtained was passed through the wet mill to reduce the particle size. Then, 1 part of xanthan gum, 1 part of 1,2-benzothiazolin-3-one, and 1 part of polydimethylsiloxane emulsion was added under continuous homogenization to obtain the liquid suspension.

The composition had a particle size of d(10): 0.83-micron d(50): 2.2 micron and d(90): 4.4-micron, viscosity of 300cps and suspensibility of 91%. Pourability rinsed residue was found to be 0.4%. Spontaneity of dispersion 90%, wet sieve retention on75 micron 0.02%

The composition had a particle size of d(10): 0.86micron d(50): 2.6 micron and d(90): 5.2 micron, viscosity of 350 cps and a suspensibility of 87% under accelerated storage condition. Pourability rinsed residue was found to be 0.52%, Spontaneity of dispersion 86%, wet sieve retention on 75 micron 0.03%

Example 4: Suspension concentrate composition of 3.15% Triflumezopyrim, 16.65% Tebuconazole and 25% Tricyclazole

Suspension concentrate composition was prepared by adding 10 parts of alkyl naphthalene sulphonate condensate and 80 parts of propylene glycol to water and homogenized by feeding them into a vessel provided with stirring facilities. 32.65 parts of Triflumezopyrim technical, 176.84 parts of Tebuconazole technical, 265.26 parts of Tricyclazole technical is further added to the homogenized blend and stirred continuously for approximately 10 minutes until the total mixture was homogeneous. To the above mixture, 25 parts of graft comb polymer, 5 parts of polyalkoxylated butyl ether, 10 parts of ethylene oxide/ propylene oxide block polymer mixture, 1 parts of polydimethylsiloxane emulsion was added under continuous homogenization to obtain liquid suspension. Subsequently, the suspension obtained was passed through the wet mill to reduce the particle size. Then 1.2 part of xanthan gum, 1 part of 1,2-benzothiazolin-3-one, 0.5 part of silica and 1 part of polydimethylsiloxane emulsion was added under continuous homogenization to obtain the liquid suspension.

The composition had a particle size of d(10): 0.93 micron d(50): 2.4 micron and d(90): 4.6 micron, viscosity of 720 cps and suspensibility of 89%. Pourability rinsed residue was found to be 0.6%. Spontaneity of dispersion 86%, wet sieve retention on75 micron 0.03%

The composition had a particle size of d(10): 0.97micron d(50): 2.8 micron and d(90): 5.6 micron, viscosity of 830 cps and a suspensibility of 82% under accelerated storage condition. Pourability rinsed residue was found to be 0.62%, Spontaneity of dispersion 84%, wet sieve retention on 75 micron 0.08%

Example 5: Wettable powder composition of 4.2% Triflumezopyrim, 31.3% Tebuconazole and 50% Tricyclazole

Wettable powder composition is prepared by blending 4.2 parts of Triflumezopyrim technical is blended with 4.85 parts of alkyl naphthalene sulphonate condensate, 2 parts of sodium ligno sulphonate, 3 parts of sodium lauryl sulphate, 33.15 parts of Tebuconazole technical and 52.8 parts of Tricyclazole technical in ribbon blender and this mixture is than jet milled to obtain Wettable powder composition having particle size less than 8 microns.

RT RESULTS

Suspensibility 65% , wetting out time 45 sec,

STABILITY RESULTS

Suspensibility 60%, wetting out time 60 sec

Example 6: Extruded granule composition of 1% Triflumezopyrim, 5% Tebuconazole and 70% Tricyclazole

1.15 parts of Triflumezopyrim technical is blended with 5.5 parts of Tebuconazole technical along with 73.8 parts of Tricyclazole technical, 6 gms of alkyl naphthalene sulphonate condensate, 4 parts of Sodium lauryl sulphate, 4 parts of Kraft lignin polymer and 2 parts of Sodium tripolyphosphate, 2 parts of sodium ligno sulphonate, 1.55 parts of clay in a Ribbon blender to obtain homogeneous powder. The mixture is than jet milled to obtain powder having particle size below 10 microns.

15 gms of water is added to the above mixture to prepare dough and the material is than extruded and dried to obtain granules having mesh size less than 1.2 mm

RT RESULTS

Suspensibility 65%, wetting out time 5 sec

STABILITY RESULTS

Suspensibility 62%, wetting out time 3 sec

A. FIELD STUDY:

Synergy Calculations:

The observation on crop damage caused by disease in Rice crop were recorded at 15 days interval after second application after planting of the rice plant from each plot and the percentage control was calculated using following formula:

Control (%) = [Damage in control plot –Damage in treated plot) /Damage in control plot] X 100

The mean data on control against the disease along with the rice yield was recorded at harvest and is presented in the Tables 1-4.

"Synergy" is as defined by Colby S. R. in an article entitled "Calculation of the synergistic and antagonistic responses of herbicide combinations" published in Weeds, 1967, 15, p. 20-22. The action expected for a given combination of two active components is calculated as follows:

$$E = X + Y - (XY/100)$$

Where,

E= Expected % effect by mixture of two products X and Y in a defined dose.

X= Observed % effect by product A

Y= Observed % effect by product B

The action expected for a given combination of three active components is calculated as follows:

$$E = (X + Y + Z) - (XY+YZ+XZ / 100) + (XYZ/10000)$$

Where,

E= Expected % effect by mixture of three products X, Y and Z in a defined dose.

X= Observed % effect by product A

Y= Observed % effect by product B

Z= Observed % effect by product C

The synergy factor (SF) is calculated by Abbott's formula (Eq.(2)(Abbott, 1925).

SF= Observed effect /Expected effect

Where, SF >1 for Synergistic reaction; SF<1 for antagonistic reaction; SF=1 for additive reaction.

When the percentage of yield effect observed (E) for the combination is greater than the expected percentage, synergistic effect of the combination is inferred. When the percentage of yield effect observed for the combination is equal to the expected percentage, merely an additive effect may be inferred, and wherein the percentage of yield effect observed for the combination is lower than the expected percentage, an antagonistic effect of the combinations is inferred.

Field trial 1: To study effect of Triflumezopyrim, Tebuconazole and Tricyclazole against Brown spot (*Helminthosporium oryzae*) in Rice crop.

The field trials were carried out to study the effect of the composition of Triflumezopyrim, Tebuconazole and Tricyclazole against Brown spot (*Helminthosporium oryzae*) in Rice crop. The trial was carried out by Randomized Block Design (RBD) with seventeen treatments including untreated control, replicated three times. The test product sample, Triflumezopyrim, Tebuconazole and Tricyclazole alone and in combination in prescribed dosages were applied by foliar application. The rice crop in trial field was raised following good agricultural practice.

Details of experiment

Trial location	Kaithal, Haryana
Crop:	Rice
Trial Design	RBD
Date of sowing	06.07.2022
Type of application	Foliar application
Water volume used:	500 lit/ha
Date of 1st application	30.08.2022
Date of 2nd application	15.09.2022
Time of application	8:00am to 11:00am
Target Pathogen	Brown spot (*Helminthosporium oryzae*)
Plot size	30 sqm
Assessment	Brown spot at 15 days after 2nd application
Yield	Quintal per ha

Table 1: Effect of WG composition comprising Triflumezopyrim, Tebuconazole and Tricyclazole for controlling Brown spot (*Helminthosporium oryzae*) in Rice

Sr No	Treatments	Total conc.	Triflumezopyrim	Tebuconazole	Tricyclazole	g.a.i/ha	Formulation dose (GAH)	Brown spot Disease (15 days after 2nd application)		Grain Yield (Qtl/ha)	% Increase Yield over control
								Disease intensity (%)	% Reduction over control		
T1	Tebuconazole 28.17 %w/w + Tricyclazole 45%w/w +Triflumezopyrim 3.7%w/w WG as per embodiment of the present invention	76.9	25	187.5	300	512.5	666.45	1.8	95.0* (85.1)	23.6	34.9* (29.7)
T2	Tebuconazole 25% w/w WG @ 187.5 GAH (750gm/ha)	25	0	187.5	0	187.5	750	10.5	70.7	20.8	18.9
T3	Tricyclazole 75% w/w WP @ 300 GAH (400gm/ha)	75	0	0	300	300	400	19.5	45.5	19.2	9.7
T4	Triflumezopyrim 10% w/w SC @ 25 GAH (250ml/ha)	10	25	0	0	25	250	33.5	6.4	18.2	4.0
T5	Tebuconazole 40%w/w + Tricyclazole 30%w/w +Triflumezopyrim 10%w/w WG as per embodiment of the present invention	80	67	267	200	534	667.5	2.3	93.6* (79.6)	23	34.3* (31.2)
T6	Tebuconazole 40%w/w WG	40	0	267	0	267	667.50	21	41.3	21.2	20.6

Sr No	Treatments	Total conc.	Triflumezopyrim	Tebuconazole	Tricyclazole	g.a.i/ha	Formulation dose (GAH)	Brown spot Disease (15 days after 2nd application)		Grain Yield (Qtl/ha)	% Increase Yield over control
								Disease intensity (%)	% Reduction over control		
T7	Tricyclazole 30%w/w WG	30	0	0	200	200	666.67	25	30.2	19.5	10.9
T8	Triflumezopyrim 10%w/w WG	10	67	0	0	67	670.00	31	13.4	18	2.7
T9	Tebuconazole 10%w/w + Tricyclazole 20%w/w + Triflumezopyrim 20%w/w WG as per embodiment of the present invention	50	67	135	135	337	666.01	2.1	94.1* (83.8)	23.2	32.6* (26.1)
T10	Tebuconazole 10%w/w WG	10	67	0	0	67	670.00	15	45.0	19.8	13.1
T11	Tricyclazole 20%w/w WG	20	0	0	135	135	675.00	20	35.0	19.2	9.7
T12	Triflumezopyrim 20%w/w WG	20	135	0	0	135	675.00	31	11.0	18.5	5.7
T13	Tebuconazole 5%w/w + Tricyclazole 65 %w/w +Triflumezopyrim 1.5 %w/w WG as per embodiment of the present invention	71.5	10	33	430	473	666.2	2	94.4* (85.5)	23	33.1* (30)
T14	Tebuconazole 5%w/w WG	5	0	33	0	33	660.00	15.6	56.4	20.5	17.1
T15	Tricyclazole 65 %w/w WG	65	0	0	430	430	661.54	24.3	32.1	19.6	12.0

Sr No	Treatments	Total conc.	Triflumezopyrim	Tebuconazole	Tricyclazole	g.a.i/ha	Formulation dose (GAH)	Brown spot Disease (15 days after 2nd application)		Grain Yield (Qtl/ha)	% Increase Yield over control
								Disease intensity (%)	% Reduction over control		
T16	Triflumezopyrim 1.5 %w/w WG	1.5	10	0	0	10	666.67	33	7.8	18.2	4.0
T17	Untreated check	0	0	0	0	0	0	35.8	0	17.5	0.0

WG: Water dispersible granule; * Synergy calculation

It is seen from table 1 that the application of Treatment 1 (T1) Tebuconazole 28.17 %w/w+ Tricyclazole 45%w/w +Triflumezopyrim 3.78%w/w WG as per the embodiment of present invention, Treatment 5 (T5) Tebuconazole 40%w/w + Tricyclazole 30%w/w +Triflumezopyrim 10%w/w WG as per embodiment of the present invention, Treatment 9 (T9) Tebuconazole 10%w/w + Tricyclazole 20%w/w + Triflumezopyrim 20%w/w WG as per embodiment of the present invention; Treatment 13 (T13) Tebuconazole 5%w/w + Tricyclazole 65%w/w +Triflumezopyrim 1.5%w/w WG as per embodiment of the present invention were highly effective in controlling the Brown spot (*Helminthosporium oryzae*) in Rice crop after application as compared to the individual treatments of Tebuconazole, Tricyclazole, Triflumezopyrim and untreated control. It is seen that Treatments T1, T5, T9 and T13 showed 95.0%, 93.6%, 94.1%, and 94.4% reduction in disease respectively over the untreated control and also showed better reduction of the disease as compared to individual treatments with Tebuconazole, Tricyclazole, Triflumezopyrim. The surprising synergistic result of treatments T1, T5, T9 and T13 is attributed to the composition as per the embodiments of the invention, where all three actives are present in a single composition at a specific concentration. The enhanced efficacy is further attributed to the form of the composition, i.e. water dispersible composition as shown in the present study, which includes particles in the size range of 0.1 micron to 75 microns.

Further, the composition as per the embodiment of the present invention, also shows a significant enhancement in the yield as well as other crop characteristics such as plant height, root length and improved foliage, as compared to the yield observed with individual applications of Tebuconazole, Triflumezopyrim and Tricyclazole.

Field Trial Data 2: To study the effect of combinations of Triflumezopyrim, Tebuconazole and Tricyclazole formulated as WP, SC and SE for controlling Sheath blight (*Rhizoctonia solani*) in Rice crop

The field trials were carried out to study the effect of combinations of Triflumezopyrim, Tebuconazole and Tricyclazole formulated as WP, SC and SE for controlling Sheath blight (*Rhizoctonia solani*) in Rice crop. The trial was laid out in Randomized Block Design (RBD) with thirteen treatments including untreated control, replicated three times. The test product sample with specific particle size was compared with untreated control. The treatments were applied as foliar application at 15 days after transplanting of rice crop in trial plot. The rice crop was raised in trial field following good agricultural practice.

Trial location	Midnapore, West Bengal
Crop:	Rice
Trial Design	RBD
Date of sowing	16.07.2022
Type of application	Foliar application
Water volume used:	500 lit/ha
Date of 1st application	15.09.2022
Date of 2nd application	30.09.2022
Time of application	8:00am to 11:00am
Target Pathogen	Sheath blight (*Rhizoctonia solani*)
Plot size	30 sqm
Assessment	Sheath blight intensity percentage at 15 days after 2nd application
Yield	Quintal per ha

Table 2: Effect of synergistic combinations of Triflumezopyrim, Tebuconazole and Tricyclazole formulated as WG, WP, SC and SE for controlling Sheath blight (*Rhizoctonia solani*) in Rice crop

Sr. No	Treatments	Total conc.	Triflumezopyrim	Tebuconzole	Tricylazole	g.a.i/ha	Formulation dose (GAH)	Sheath blight Disease (15 days after 2nd application)		Grain Yield (Qtl/ha)	% Increase Yield over control
								Disease intensity (%)	% Reduction over control		
T1	Tebuconazole 40%w/w + Tricyclazole 15%w/w + Triflumezopyrim 10%w/w SC (65%) as per embodiment of the present invention	65	67	266	100	433	666.15	6	84.4* (80.1)	26.9	19.6* (18.6)
T2	Tebuconazole 40% SC	40	0	266	0	266	665	15.7	59.2	25.4	12.9
T3	Tricyclazole 15% SC	15	0	0	100	100	666	20.4	47	23.4	4
T4	Triflumezopyrim 10%SC	10	67	0	0	67	670	35.5	7.8	23.1	2.7

Sr. No	Treatments	Total conc.	Triflumezopyrim	Tebuconazole	Tricylazole	g.a.i/ha	Formulation dose (GAH)	Sheath blight Disease (15 days after 2nd application)		Grain Yield (Qtl/ha)	% Increase Yield over control
								Disease intensity (%)	% Reduction over control		
T5	Tebuconazole 5%w/w + Tricyclazole 60%w/w + Triflumezopyrim 20%w/w WP as per embodiment of the present invention	85	133	33	400	566	666	8.9	76.9* (72.1)	32.1	42.7* (38.6)
T6	Tebuconazole 5% WP	5	0	33	0	33	660	15.4	60	28.5	26.7
T7	Tricyclazole 60% WP	60	0	0	400	400	666	28.4	26.2	25.3	12.4
T8	Triflumezopyrim 20% WP	20	133	0	0	133	665	36.4	5.5	23.5	4.4
T9	Tebuconazole 1%w/w + Tricyclazole 10%w/w +	11.1	1.5	15	150	167	1504.5	2.8	92.7* (88.3)	30.3	34.7* (32)

Sr. No	Treatments	Total conc.	Triflumezopyrim	Tebuconzole	Tricylazole	g.a.i/ha	Formulation dose (GAH)	Sheath blight Disease (15 days after 2nd application)		Grain Yield (Qtl/ha)	% Increase Yield over control
								Disease intensity (%)	% Reduction over control		
	Triflumezopyrim 0.1 %w/w SE as per embodiment of the present invention										
T10	Tebuconazole 1% SE	0.1	0	15	0	15	1500	10.5	72.7	27.5	22.2
T11	Tricyclazole 10% SE	1	0	0	150	150	1500	18.5	51.9	24.5	8.9
T12	Triflumezopyrim 0.1% SE	10	1.5	0	0	2	1500	34.5	10.4	23.4	4
T13	Untreated check	0	0	0	0	0	0	38.5	0	22.5	0

WP: Wettable Powder; SC: Suspension Concentrate; SE: Suspoemulsion; * Synergy calculation

It is seen from table 2 that the application of Treatment 1 (T1) Tebuconazole 40%w/w + Tricyclazole 15%w/w + Triflumezopyrim 10%w/w SC (65%) as per embodiment of the present invention, Treatment 5 (T5) Tebuconazole 5%w/w + Tricyclazole 60%w/w + Triflumezopyrim 20%w/w WP as per embodiment of the present invention, Treatment 9 (T9) Tebuconazole 1%w/w + Tricyclazole 10%w/w + Triflumezopyrim 0.1 %w/w SE as per embodiment of the present invention were highly effective in controlling the Sheath blight (*Rhizoctonia solani*) in Rice crop after application as compared to the individual treatments of Tebuconazole, Tricyclazole, Triflumezopyrim, and untreated control. It is seen that Treatments T1, T5, and T9 showed 84.4%, 76.9%, and 92.7% reduction in disease respectively over the untreated control and also showed better reduction of the disease as compared to individual treatments with Tebuconazole, Tricyclazole, Triflumezopyrim. The surprising synergistic result of treatments T1, T5, T9 is attributed to the composition as per the embodiments of the invention, where all three actives are present in a single composition at a specific concentration. The enhanced efficacy is further attributed to the form of the composition. The enhanced efficacy is further attributed to the form of the composition, i.e. WP, SC, SE as shown in the present study, which includes particles in the size range of 0.1 micron to 75 microns.

Further, the composition as per the embodiment of the present invention, also shows a significant enhancement in the yield as well as other crop characteristics such as plant height, root length and improved foliage, as compared to the yield observed with individual applications of Tebuconazole, Triflumezopyrim and Tricyclazole.

Field Trial Data 3: To study the effect of composition comprising Triflumezopyrim, Tebuconazole and Tricyclazole; known 2-way combinations of actives and individual actives for controlling Blast (*Pyricularia orizae*) in Rice crop

The field trials were carried out to compare the effect of composition comprising Triflumezopyrim, Tebuconazole and Tricyclazole; and known 2-way combinations

of actives and individual actives for controlling Blast (*Pyricularia orizae*) in Rice crop. The trial was laid out in Randomized Block Design (RBD) with eight treatments including untreated control, replicated three times. The test product sample with specific particle size was compared with untreated control. The treatments were applied as foliar application at 15 days after transplanting of rice crop in trial plot. The rice crop was raised in trial field following good agricultural practice.

Trial location	Midnapore, West Bengal
Crop:	Rice
Trial Design	RBD
Date of sowing	06.07.2022
Type of application	Foliar application
Water volume used:	500 lit/ha
Date of 1st application	30.08.2022
Date of 2nd application	15.09.2022
Time of application	8:00am to 11:00am
Target Pathogen	Blast (*Pyricularia orizae*)
Plot size	30 sqm
Assessment	Blast intensity percentage at 15 days after 2nd application
Yield	Quintal per ha

Table 3: Comparison of synergistic effect of composition comprising Triflumezopyrim, Tebuconazole and Tricyclazole; known 2-way combinations of actives and individual actives for controlling Blast (*Pyricularia orizae*) in Rice crop

Sr No	Treatments	Total conc.	Triflumezopyrim	Tebuconazole	Tricylazole	g.a.i./ha	Formulation dose	Blast Disease (15 days after 2nd application)		Grain Yield (Qtl/ha)	% Increase Yield over control
								Disease intensity (%)	% Reduction over control		
T1	Tebuconazole 28.17 %w/w + Tricyclazole 45%w/w + Triflumezopyrim 3.78%w/w WG as per embodiment of the present invention	76.9	25	187.5	300	512.5	666.45	1.2	96.9 * (84.0)	23.5	27* (17.4)
T2	Tebuconazole 28.17%w/w + Tricyclazole 45%w/w WG	73.17	0	187.5	300	487.5	667.75	6.2	83.9 (83.6)	21.5	16.2 (15.6)
T3	Tricyclazole 45%w/w + Triflumezopyrim 3.78%w/w	48.78	25	0	300	325	664	17.5	54.5 (53.4)	20.2	9.2 (9)

Sr No	Treatments	Total conc.	Triflumezopyrim	Tebuconazole	Tricylazole	g.a.i./ha	Formulation dose	Blast Disease (15 days after 2nd application)		Grain Yield (Qtl/ha)	% Increase Yield over control
								Disease intensity (%)	% Reduction over control		
T4	Tebuconazole 28.17%w/w + Triflumezopyrim 3.78%w/w WG	31.95	25	187.5	0	212.5	665	11.4	70.4 (70.1)	20.7	11.9 (11.2)
T5	Tebuconazole 25%w/w WG @ 187.5 GAH (750gm/ha)	25	0	187.5	0	187.5	750	12.5	67.5	20.2	9.2
T6	Tricyclazole 75%w/w WP @ 300 GAH (400gm/ha)	75	0	0	300	300	400	19.5	49.4	19.8	7
T7	Triflumezopyrim 10 %w/w SC @ 25 GAH (250ml/ha)	10	25	0	0	25	250	35.4	8.1	18.9	2.2
T8	Untreated check	0	0	0	0	0	0	38.5	0	18.5	0

WG: Water Dispersible granule; * Synergy calculation

It is seen from table 3 that the application of Treatments T1 having combination of Tebuconazole, Tricyclazole and Triflumezopyrim prepared as per the embodiment of present invention was highly effective in controlling the Blast (Pyricularia orizae) in Rice crop after application and demonstrated increased yield of cucumber as compared to the two-way combination treatments (T2, T3 and T4), and individual treatments of the actives (T5, T6 and T7). The surprising synergistic result of treatment T1 is attributed to the composition of Tebuconazole, Tricyclazole and Triflumezopyrim as per the embodiments of the invention, where all three actives are present in a single composition at a specific concentration. The enhanced efficacy is further attributed to the form of the composition Water dispersible granules as shown in the present study, which includes particles in the size range of 0.1 micron to 75 microns.

Further, the composition as per the embodiment of the present invention, also shows a significant enhancement in the yield as well as other crop characteristics such as plant height, root length and improved foliage, as compared to the yield observed with the known 2-way combinations and individual applications of Tebuconazole, Triflumezopyrim and Tricyclazole.

Field Trial Data 4: To study the effect of composition comprising Triflumezopyrim, Tebuconazole and Tricyclazole with a specific particle size for controlling Brown plant hopper (*Nilaparvata lugens*) in Rice.

The field trials were carried out to study the effect of composition comprising Triflumezopyrim, Tebuconazole and Tricyclazole with a specific particle size for controlling Brown plant hopper (*Nilaparvata lugens*) in Rice. The trial was laid out in Randomized Block Design (RBD) with seven treatments including untreated control, replicated three times. The test product sample with specific particle size was compared with untreated control. The treatments were applied as foliar application at 15 days after transplanting of rice crop in trial plot. The rice crop was raised in trial field following good agricultural practice.

Trial location	Rajamundry, Andhra Pradesh
Crop:	Rice
Trial Design	RBD
Date of sowing	06.07.2022
Type of application	Foliar application
Water volume used:	500 lit/ha
Date of 1st application	20.09.2022
Date of 2nd application	05.10.2022
Time of application	8:00am to 11:00am
Target Pathogen	Brown plant hopper (*Nilaparvata lugens*)
Plot size	30 sqm
Assessment	Brown plant hopper (BPH) count - 15 days after 2nd application
Yield	Quintal per ha

Table 4: Effect of composition comprising Triflumezopyrim, Tebuconazole and Tricyclazole with a specific particle size for controlling Brown plant hopper (BPH) (*Nilaparvata lugens*) in Rice

Sr No	Treatments	Particle size	Total conc.	Triflumezopyrim	Tebuconzole	Tricylazole	g.a..i / ha	Formulation dose	BPH count and damage (15 days after 2nd application)		Grain Yield (Qtl/ha)	% Increase Yield over control
									Avg BPH count per hill (10 hills/treat)	% Reduction over control		
T1	Tebuconazole 28.17 %w/w+ Tricyclazole 45%w/w +Triflumezopyrim 3.78%w/w WG as per embodiment of the present invention	0.1 to 75	76.9	25	187.5	300	512.5	666.45	4	96.4	25.8	56.4
T2	Tebuconazole 28.17%w/w + Tricyclazole 45%w/w +Triflumezopyrim 3.78%w/w WG	75 to 100	76.9	25	187.5	300	512.5	666.45	8.3	92.5	24.9	50.9
T3	Tebuconazole 28.17 %w/w+ Tricyclazole 45 %w/w+ Triflumezopyrim 3.78%w/w WG as	100 to 150	76.9	25	187.5	300	512.5	666.45	9	91.8	24.7	49.7

Sr No	Treatments	Particle size	Total conc.	Triflumezopyrim	Tebuconazole	Tricylazole	g.a..i / ha	Formulation dose	BPH count and damage (15 days after 2nd application)		Grain Yield (Qtl/ha)	% Increase Yield over control
									Avg BPH count per hill (10 hills/treat)	% Reduction over control		
	per embodiment of the present invention											
T4	Tebuconazole 25% WG @ 187.5 GAH (750gm/ha)	NA	25	0	187.5	0	187.5	750	95	13.6	19.5	18.2
T5	Tricyclazole 75% WP @ 300 GAH (400gm/ha)	NA	75	0	0	300	300	400	90	18.2	18.6	12.7
T6	Triflumezopyrim 10%SC @ 25 GAH (250ml/ha)	NA	10	25	0	0	25	250	30	72.7	20.5	24.2
T7	Untreated check	NA	0	0	0	0	0	0	110	--	16.5	--

WG: Water Dispersible granule

It is observed from Table 4, that that treatment 1 (T1) having particle size distribution in the range of 0.1 to 75 microns showed improved yield and better reduction of disease over control in rice crop as compared to treatment 2 (T2) having particle size range of 75 to 100 microns, and treatment 3 (T3) having particle size distribution in the range of 100 to 150 microns and untreated control.

Further, Treatment 1 having particle size of 0.1 to 75 microns; Treatment 2 having particle size of 75 to 100 microns; and Treatment 3 having particle size of 100 to 150 microns applied to Rice crop at a dose of 666.5 g/ha, exhibited about 56.4%, 50.9% and 49.7% increase in yield respectively over the control.

Thus, it was surprisingly noted that even amongst the WDG formulations, superior efficacy was observed with WDG formulation having specific particle size distribution of 0.1 to 75 microns in comparison to WDG formulations having different particle sizes in varied ranges.

We claim:

1. A synergistic pesticidal combination, comprising: Triflumezopyrim in the range of 0.1%w/w to 20% w/w of the total composition; Tebuconazole in the range of 1%w/w to 50% w/w of the total composition; and Tricyclazole in the range of 10%w/w to 70% w/w of the total composition.

2. A pesticidal composition, comprising:
Triflumezopyrim in the range of 0.1%w/w to 20% w/w of the total composition; Tebuconazole in the range of 1%w/w to 50% w/w of the total composition; Tricyclazole in the range of 10%w/w to 70% w/w of the total composition; and at least one agrochemically acceptable excipient; wherein the particle size of the composition is in the range of 0.1 micron to 75 microns.

3. The pesticidal composition as claimed in claim 2, wherein the composition is in the form of a solid or a liquid or a gel.

4. The pesticidal composition as claimed in claim 3, wherein the solid composition is in the form granules including spheronised granules, extruded granules, water disintegrable granules, wettable powders, water dispersible granules, dustable powder (DP), powders for dry seed treatment (DS), water disintegrable tablet or Water Dispersible powders for slurry seed treatment (WS).

5. The pesticidal composition as claimed in claim 3, wherein the liquid pesticidal composition is in the form of liquid suspension or suspension concentrate (SC); suspoemulsion (SE), oil dispersion (OD), flowable concentrate (FC), or a suspension concentrate for seed treatment (FS), Ultra-Low-Volume (ULV).

6. The pesticidal composition as claimed in claim 4, wherein the water dispersible granules are in the size range of 0.025 mm to 3 mm.

7. The pesticidal composition as claimed in claim 4, wherein the granules are in the size range of 0.025 mm to 6 mm.

8. The pesticidal composition as claimed in claim 2, wherein the composition further comprises at least one active ingredient selected from pesticidal actives, fertilizers, macronutrients, micronutrients, biostimulants, organic acids, plant growth regulators, algae and mixtures thereof.

9. The pesticidal composition as claimed in claim 2, wherein the agrochemically acceptable excipient is selected from at least one of surfactants, binders or binding agents, wetting agents, emulsifiers, fillers or carriers or diluents, coating agents, buffers or pH adjusters or neutralizing agents, antifoaming agents or defoamers, penetrants, UV protecting agents, UV absorbents, UV rays scattering agents, stabilizers, pigments, colorants, structuring agents, chelating or complexing or sequestering agent thickeners, suspending agents or suspension aid agents or anticaking agents or anti-settling agents, viscosity modifiers or rheology modifiers, tackifiers, humectants, spreading agents, sticking agents, anti-freezing agent or freeze point depressants, solvents, preservatives or bactericides or anti-fungal agents or biocides or anti-microbial agents or antioxidants, polymers, monomers, cross-linking agents, permeability enhancing agents, protective colloids and mixtures thereof.

10. The pesticidal composition as claimed in claim 5, wherein the liquid composition has viscosity of 10 cps to 3000 cps.

11. The pesticidal composition as claimed in claim 5, wherein the liquid composition has pourability of less than 5% residue.

12. The pesticidal composition as claimed in claim 4, wherein the dispersibility of the composition is at least 30%.

13. The pesticidal composition as claimed in claim 4, wherein the suspensibility of the composition is at least 30%.

14. The process for preparation of pesticidal composition in the form of water dispersible granules as claimed in claim 4, comprises:
a) milling a blend of Triflumezopyrim, Tebuconazole and Tricyclazole in water with at least one agrochemical excipient to obtain a slurry or wet mix, wherein the particles are in the size range of 0.1 to 75 microns; and
b) drying the wet mix, sieving the dried mix to remove the undersized and oversized granules to obtain water dispersible granules;
wherein the granules of the composition comprise of granules in size range of 0.025 mm to 3mm.

15. The process for preparation of pesticidal composition in the form of granules as claimed in claim 4, comprises:
a. milling blend of Triflumezopyrim, Tebuconazole and Tricyclazole in water with at least one agrochemical excipient to obtain a slurry or wet mix, wherein the particles are in the size range of 0.1 to 75 microns;
b. drying the wet mix to obtain the dry mix; wherein the granules of the composition comprise of granules in size range of 0.025mm to 3mm and
c. adding water to the dry mix and blended to obtain a dough or paste, which is extruded through an extruder to obtain the extruded granules in a size range of 0.025 mm to 6 mm; or
agglomerating the wet mix or dry mix obtained in step (b) in an agglomerator to obtain spheronised granular composition in a size range of 0.025mm to 6mm.

16. The process for preparation of pesticidal composition in the form of wettable powder or wettable powder for seed coat as claimed in claim 4, comprises:
a) mixing Triflumezopyrim, Tebuconazole and Tricyclazole with at least one agrochemical excipient;

b) milling the obtained mixture of step a) to obtain wettable powder;
wherein the particles are in the size range of 0.1 to 75 microns.

17. The process for preparation of pesticidal composition in the form of liquid suspension as claimed in claim 5, wherein the process comprises:
    a) homogenizing mixture of Triflumezopyrim, Tebuconazole and Tricyclazole with at least one agrochemical excipient to obtain a suspension; and
    b) wet milling the obtained suspension to provide composition with a particle size range of 0.1 micron to 75 microns.

18. The process for preparation of pesticidal composition in the form of suspoemulsion as claimed in claim 5, wherein the process comprises:
    a. homogenizing mixture of Triflumezopyrim and Tricyclazole with at least one agrochemical excipient to obtain a suspension; and wet milling the obtained suspension to provide suspension concentrate of Triflumezopyrim and Tricyclazole with a particle size range of 0.1 to 75 microns;
    b. dissolving Tebuconazole in oil or solvent and at least one agrochemically acceptable excipient to obtain emulsion concentrate of Tebuconazole;
    c. mixing the suspension concentrate of step a) and emulsion concentrate of step b) and agrochemical excipient to obtain suspoemulsion composition with a particle in the size range of 0.1 to 75 microns.

19. A method of controlling fungal disease, crop protection or improving the plant health and yield comprising treating at least one of a plant, crop, plant propagation material, locus, parts thereof or seed, seedling and soil with the pesticidal composition as claimed in claim 2.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2023/050456

A. CLASSIFICATION OF SUBJECT MATTER
A01N43/90,A01P3/00 Version=2023.01

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, A01P

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

Electronic database consulted during the international search (name of database 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.
A	WO 2022/034611 A1 (RAJDHANI PETROCHEMICALS PRIVATE LIMITED [IN]) 17 February, 2022 Whole document	1-19
A	IN 201721013568 A (GSP CROP SCIENCE PVT. LTD. [IN]) 12 July, 2019 Whole document	1-19
A	CN 100473277 C (JIANGSU ROTAM AGROCHEMICAL FIB [CN]) 01 April, 2009 Whole document	1-19

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28-07-2023	28-07-2023

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/IN2023/050456

Citation	Pub.Date	Family	Pub.Date
WO 2022/034611 A1	17-02-2022	IN 202011034341 A	11-02-2022
CN 100473277 C	01-04-2009	CN 101103724 A	16-01-2008