(12) PATENT APPLICATION PUBLICATION
(19) INDIA
(22) Date of filing of Application :14/02/2022

(21) Application No.202211007629 A
(43) Publication Date : 25/02/2022

(54) Title of the invention : SYNERGISTIC PESTICIDAL COMPOSITION COMPRISING PYMETROZINE, DINOTEFURAN AND SUITABLE STROBILURIN FUNGICIDE

(51) International classification :A01N0043707000, A01N0047240000, A01N0043560000, A01N0059020000, A01N0051000000
(86) International Application No :NA
Filing Date :NA
(87) International Publication No : NA
(61) Patent of Addition to Application Number :NA
Filing Date :NA
(62) Divisional to Application Number :NA
Filing Date :NA

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(57) Abstract :
The present invention relates to synergistic pesticidal composition for the control of plant pests. More particularly, the present invention relates to novel synergistic pesticidal composition comprising (A) Pymetrozine or its agrochemically acceptable salts; and (B) Dinotefuran or its agrochemically acceptable salts; and (C) Pyraclostrobin or its agrochemically acceptable salts. The present invention further relates to the said synergistic pesticidal composition comprising urea formaldehyde resin, with one or more agrochemically acceptable excipients. The present invention further relates to process of preparing said synergistic pesticidal composition.

No. of Pages : 59 No. of Claims : 17

FORM 2

THE PATENTS ACT, 1970

(39 of 1970)

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THE PATENTS RULES, 2003

COMPLETE SPECIFICATION

(See Section 10 and Rule 13)

SYNERGISTIC PESTICIDAL COMPOSITION COMPRISING PYMETROZINE, DINOTEFURAN AND SUITABLE STROBILURIN FUNGICIDE

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The following specification particularly describes the invention and manner in which it is to be performed:

FIELD OF THE INVENTION

The present invention relates to synergistic pesticidal composition for the control of plant pests. More particularly, the present invention relates to novel synergistic pesticidal composition comprising (A) Pymetrozine or its agrochemically acceptable salts; and (B) Dinotefuran or its agrochemically acceptable salts; and (C) Pyraclostrobin or its agrochemically acceptable salts. The present invention further relates to the said synergistic pesticidal composition comprising urea formaldehyde resin, with one or more agrochemically acceptable excipients. The present invention further relates to process of preparing said synergistic pesticidal composition.

BACKGROUND OF THE INVENTION

Occurrence of pest and disease together is another major concern for the agriculturist. In many areas, fungicidal and insecticidal infestation including that of sheath blight, brown plant hopper, leaf folder and stem borer occur at the same stage of the crop growth. Therefore, a combined application of effective insecticides and fungicides is a practical need for effective pest control.

Combination of insecticides and fungicides are used to broaden the spectrum of control of insect and fungal pests, reduce dosage, thereby reducing environmental impact, and decrease chances of development of resistance. The combination of insecticides and fungicides results in an improved control of insects as well as fungal pests. Damage to seeds from insect and fungal pests is another major concern for agriculturalist. There are various diseases such as seed rot etc. which reduce germination rates and cause considerable decrease in yield. Treating the crops with insecticidal and fungicidal active ingredient compositions helps reduce damage from such soil pests. Another advantage of treating crops or specific plant propagation material is the improvement in germination rates, increased yield and improved plant health.

The control of phytopathogenic fungi along with insects is of great economic importance since fungal growth on plants or on parts of plants inhibit production of foliage, fruit or seed, and the overall quality of a cultivated crop.

There are many combinations of fungicides and insecticides known in the art. There is however a need for improvement of these combinations. Single active compositions used over a long period of time has resulted in resistance. On account of such resistance development, more concentrated formulations are required to be applied resulting in various adverse effects on plant health and crop yield. With the onset of resistance to certain pests, there is a need in the

art for a combination of actives that decreases chances of resistance and improves the spectrum of pests and diseases controlled.

Reference can be made to CN106818841, wherein the disclosure relates to a seed coating containing Pyraclostrobin, Metalaxyl-M and Clothianidin.

Reference can also be made to CN103766386, wherein the disclosure relates to the suspended seed coating wherein active components include Dinotefuran and Pyraclostrobin.

As it is known from prior arts that strobilurin fungicides are the most widely used class of fungicides. Strobilurin fungicides are globally used to combat white mold, rot, early and late leaf spot, rusts and rice blast. All strobilurin fungicides inhibit fungal respiration by binding to the cytochrome b complex III at the Q0 site in mitochondrial respiration. Simply said, strobilurin fungicides works by inhibiting the fungi's ability undergo normal respiration. The strobilurin chemistries have a very specific target site, or mode-of-action (MOA). Amongst the different strobilurins; fungicides like azoxystrobin, trifloxystrobin and kresoxim-methyl have been very popular and widely used in various pesticidal combinations, however due to their narrow spectrum of action they show reduced effectiveness against rust diseases and downy mildews. Moreover, repeated application increases the risk of resistance development. Thus, it is important that some strobilurin fungicide chemistries aren't overused.

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

Accordingly, there exists a need for combining insecticides with suitable strobilurin fungicides having different fungicide chemistries in combination with suitable excipients which lead to enhanced pesticidal activity of formulation. Moreover, proper fungicides rotations are necessary when fungicides with specific mechanism of actions are used for controlling important diseases.

However still there is a need for a composition of specific pesticides which can overcome some of the existing problems and can be prepared easily without much complex manufacturing process.

Further, the disadvantage of Pyraclostrobin composition is its low melting point. Pyraclostrobin has a melting point between 63.7 to 65.2 degree Celsius. Low melting solid pesticides pose difficulties and challenges to the formulator. Compositions comprising such actives have drawbacks such as caking, less active loading and reduced stability problems upon extended storage.

Hence, there is a need in the art to provide a pesticidal composition that ameliorates the above problems in the art.

Accordingly, the present invention provides a synergistic pesticidal composition which reduces amount of pesticide used, is environmentally friendly, easy to formulate, is stable and is safe to use.

For the reasons mentioned above, there exist a need to provide a stable pesticidal composition comprising Pymetrozine, Dinotefuran with a specific suitable strobilurin fungicide i.e. Pyraclostrobin, having synergistic pest control properties. Thus, there is a need for a synergistic pesticidal composition which exhibits fungicidal and insecticidal properties and thus has broad spectrum control of pests. In particular, there exists in the art for a pesticidal composition comprising (A) Pymetrozine or its agrochemically acceptable salts; and (B) Dinotefuran or its agrochemically acceptable salts; and (C) Pyraclostrobin or its agrochemically acceptable salts.

This object is achieved according to the invention by providing the present composition. Pymetrozine, Dinotefuran and Pyraclostrobin when combined in a specific ratio along with suitable agrochemical excipients such as additives and fillers/ anti-caking agents provides a storage stable composition along with quick knock down action against sucking pests including plant hoppers, brown pant hopper, Jassids, Aphids, White fly, thrips and fungal diseases.

OBJECTS AND ADVANTAGES OF THE INVENTION

It is an object of the present invention to provide a novel and effective synergistic pesticidal composition demonstrating high efficacy and high selectivity.

It is an object of the present invention to provide improved combinations of insecticides and fungicide for the broad spectrum control of pests. This leads to lower rounds of sprays in a crop

cycle. The object of present invention is to further reduce the costs of pest management operations and thus improvement in benefit cost ratio.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition that requires lesser rounds of sprays in a crop cycle.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition which can be easily formulated.

It is another object of the present invention to provide a method and a synergistic pesticidal composition for controlling insect pests and fungal diseases.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition which has enhanced pesticidal activity.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition which is active against all life stages of major plant pathogens.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition that saves crop & environmental damage due to reduced application rate and dose.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition that provides increased crop yield and/or improved plant health.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition that improves quality and quantity of the targeted crops.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition which is ideal for pest resistance management and enhanced disease control.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition which uses lesser amounts of the actives in the composition as compared to the actives when used alone.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition which controls blast disease and insects attacking various crops including rice crop.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition which is prophylactic and curative.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition which has improved stability and performance.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition which is environmentally safe, possesses broad spectrum bio-efficacy, is less toxic in terms of phytotoxicity and also imparts greening effect to the crops.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition which is stable at various temperature ranges and variable environmental changes.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition which uses thermoset resin including urea formaldehyde resin.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition which uses polyterpene resins in combination with green surfactants.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition which has enhanced efficacy and penetration capacity.

It is another object of the present invention to provide a novel and effective synergistic pesticidal composition which uses green surfactants including silicone ethoxylated oils and suitable bio-based efficacy enhancing agents including blend of polyterpene resin.

Yet another object of the present invention is to provide a novel and effective synergistic pesticidal composition which promotes plant health.

Another object of the present invention is to provide a novel and effective synergistic pesticidal composition which reduce the number of sprayings by providing longer duration control of pest complexes.

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

The synergistic pesticidal composition of the present invention is found to be useful in protecting a wide range of crops like fruits, vegetables, cereals, flowers etc. against major plant

diseases. The present composition achieves improved biological efficacy by enhancing overall control of plant/crop pests over a shorter period of time. Additional benefits of using the pesticidal composition of the present invention include reduced risk of occupational hazard, lower cost of application, better cost: benefit ratio to the end user, reduced fuel and labour cost, saving in applicator's time and reduced wear of equipment and loss caused by mechanical damage to the crop and soil.

SUMMARY OF THE INVENTION

In one embodiment, the present invention provides a novel and synergistic pesticidal composition comprising bioactive amounts of

a) Pymetrozine or its agrochemically acceptable salts; and

b) Dinotefuran or its agrochemically acceptable salts; and

c) Pyraclostrobin or its agrochemically acceptable salts and

d) one or more agrochemically acceptable excipients.

In one other embodiment, the present invention provides a novel and synergistic pesticidal composition comprising bioactive amounts of

a) Pymetrozine or its agrochemically acceptable salts; and

b) Dinotefuran or its agrochemically acceptable salts; and

c) Pyraclostrobin or its agrochemically acceptable salts, and

d) Thermoset resin including urea formaldehyde resin; and

e) one or more agrochemically acceptable excipients.

In another embodiment of the present invention, the pesticidal composition comprises:

a) Pymetrozine or its agrochemically acceptable salts in the range of 1-50% by weight of the composition;

b) Dinotefuran or its agrochemically acceptable salts in the range of 1-16% by weight of the composition;

c) Pyraclostrobin or its agrochemically acceptable salts in the range of 1-40% by weight of the composition; and

d) Thermoset resin including urea formaldehyde resin in the range of 0.1 to 5% by weight of the composition.

In another embodiment of the present invention, the pesticidal composition comprises:

a) Pymetrozine or its agrochemically acceptable salts in the range of 1-50% by weight of the composition; and

b) Dinotefuran or its agrochemically acceptable salts in the range of 1-16% by weight of the composition; and

c) Pyraclostrobin or its agrochemically acceptable salts in the range of 1-40% by weight composition;

d) Thermoset resin including urea formaldehyde resin in the range of 0.1 to 5% by weight of the composition; and

e) one or more of agrochemically acceptable excipients.

In another embodiment of the present invention, the pesticidal composition comprises:

a) Pymetrozine or its agrochemically acceptable salts in the range of 1-50% by weight of the composition; and

b) Dinotefuran or its agrochemically acceptable salts in the range of 1-16% by weight of the composition; and

c) Pyraclostrobin or its agrochemically acceptable salts in the range of 1-40% by weight composition;

d) Thermoset resin including urea formaldehyde resin in the range of 0.1 to 5% by weight of the composition;

e) green surfactants including silicone ethoxylated oils;

e) bio based efficacy enhancing agents including blend of polyterpene resin; and

f) one or more of agrochemically acceptable excipients.

In another embodiment, the present invention provides a method of protecting a plant propagation material, a plant, parts of a plant and/or plant organs that grow at a later point in time against pathogenic damage or pest damage by applying to the plant propagation material a composition of the present invention.

In further embodiment of the present invention, pesticidal composition of the present invention further comprises agriculturally acceptable excipients selected from the group consisting of anti-freezing agents, dispersing agents, wetting agents, antifoaming agents, biocides, thickeners, surfactants, binders, anti-caking agent and solvents. Additional components may also be included, e.g., green surfactants, protective colloids, adhesives, thickeners, thixotropic agents, penetration agents, stabilisers, sequestering agents, spreading & stocking agents and

bio-efficacy enhancing agents. More generally, the active materials can be combined with any solid or liquid additive, which complies with usual formulation techniques.

In another embodiment of the present invention, the pesticidal composition of the present invention further comprises one or more of suitable thermoset resin including urea formaldehyde resin.

In another embodiment of the present invention, the pesticidal composition of the present invention further comprises urea formaldehyde resin as a filler and/or anti-caking agent.

In another embodiment of the present invention, the pesticidal composition of the present invention further comprises trisiloxane ethoxylate as organosilicone surfactant/adjuvant.

In another embodiment of the present invention, the pesticidal composition of the present invention further comprises blend of polyterpene resin (natural oils) as bio based efficacy enhancing agents.

In an embodiment of the present invention the present pesticidal composition controls various pests in field crops, vegetables, oil seed and pulses, horticulture & forestry, veterinary, etc.

In yet another embodiment of the present invention, the present pesticidal composition can be applied as a foliar spray to cotton, wheat, rice, chilli, horticultural and vegetable crops soybean, pulses and vegetables including but not limited to okra, tomato, sugar beet, egg-plants, lettuce, iceberg lettuce, pepper, cucumber, squash, melon, bean, dry-beans, peas, leek, garlic, onion, cabbage, carrot, tuber such as potato, sugar cane, tobacco, coffee, turf and forage, cruciferous, cucurbits, grapevines, pepper, fodder beet, oil seed rape, pansy, impatiens, petunia and geranium, etc.

In an embodiment of the present invention the present pesticidal composition can be applied as a foliar spray, soil drenching, seed dressing, application as paste of the targeted plants/ trees, broadcasting, spraying, rubbing, atomizing, irrigating, evaporating, dusting, fogging, broadcasting, pouring, mist blowing, soil mixing, foaming, painting, spreading-on, drenching, dipping or drip irrigation.

In yet another embodiment of the present invention, the pesticidal composition is formulated as but not limited to Capsule suspension (CS), Dispersible concentrate (DC), Dustable powder (DP), Powder for dry seed treatment (DS), Emulsifiable concentrate (EC), Emulsifiable granule (EG), Emulsion water-in-oil (EO), Emulsifiable powder (EP), Emulsion for seed treatment

(ES), Emulsion oil-in-water (EW), Flowable concentrate for seed treatment (FS), Granules (GR), Micro-emulsion (ME), Oil-dispersion (OD), Oil miscible flowable concentrate (OF), Oil miscible liquid (OL), Oil dispersible powder (OP), Suspension concentrate (SC), Suspension concentrate for direct application (SD), Suspo-emulsion (SE), Water soluble granule (SG), Soluble concentrate (SL), Spreading oil (SO), Water soluble powder (SP), Water soluble tablet (ST), Ultra-low volume (ULV) suspension, Tablet (TB), Ultra-low volume (ULV) liquid, Water dispersible granules (WG), Wettable powder (WP), Water dispersible powder for slurry seed treatment (WS), Water dispersible tablet (WT), a mixed formulation of CS and SC (ZC) or a mixed formulation of CS and SE (ZE) and a mixed formulation of CS and EW (ZW).

In yet another embodiment of the present invention, the invention further provides the process for preparation of the said composition wherein, the said composition can be one or more of Capsule suspension (CS), Dispersible concentrate (DC), Dustable powder (DP), Powder for dry seed treatment (DS), Emulsifiable concentrate (EC), Emulsifiable granule (EG), Emulsion water-in-oil (EO), Emulsifiable powder (EP), Emulsion for seed treatment (ES), Emulsion oil-in-water (EW), Flowable concentrate for seed treatment (FS), Granules (GR), Micro-emulsion (ME), Oil-dispersion (OD), Oil miscible flowable concentrate (OF), Oil miscible liquid (OL), Oil dispersible powder (OP), Suspension concentrate (SC), Suspension concentrate for direct application (SD), Suspo-emulsion (SE), Water soluble granule (SG), Soluble concentrate (SL), Spreading oil (SO), Water soluble powder (SP), Water soluble tablet (ST), Ultra-low volume (ULV) suspension, Tablet (TB), Ultra-low volume (ULV) liquid, Water dispersible granules (WG), Wettable powder (WP), Water dispersible powder for slurry seed treatment (WS), Water dispersible tablet (WT), a mixed formulation of CS and SC (ZC) or A mixed formulation of CS and SE (ZE) and a mixed formulation of CS and EW (ZW).

DETAILED DESCRIPTION OF THE INVENTION

Discussed below are some representative embodiments of the present invention. The invention in its broader aspects is not limited to the specific details and representative methods.

All technical and scientific terms used herein have the same meanings as commonly understood by someone ordinarily skilled in the art to which the present subject matter belongs.

The terminology used, in the present disclosure, is only for the purpose of explaining a particular embodiment and such terminology shall not be considered to limit the scope of the present disclosure. As used in the present disclosure, the forms "a," "an," and "the" may be intended to include the plural forms as well, unless the context clearly suggests otherwise.

Thus, for example, reference to a composition containing “a compound” includes a mixture of two or more compounds. It should also be noted that the term “or” is generally employed in its sense including “and/or” unless the content clearly dictates otherwise. The terms "comprises," "comprising," “including,” and “having,” are open ended transitional phrases and therefore specify the presence of stated features, integers, steps, operations, elements, but do not forbid the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. The particular order of steps disclosed in the method and process of the present disclosure is not to be construed as necessarily requiring their performance as described or illustrated. It is also to be understood that additional or alternative steps may be employed.

Variations or modifications to the composition of this invention, within the scope of the invention, may occur to those skilled in the art upon reviewing the disclosure herein. Such variations or modifications are well within the spirit of this invention.

The expression of various quantities in terms of “% w/w” or “%” means the percentage by weight, relative to the weight of the total solution or composition unless otherwise specified.

The term “active ingredient” (a.i.) or “active agent” used herein refers to that component of the composition responsible for control and killing of pest.

The terms “plants” and “vegetation” include, but are not limited to, germinant seeds, emerging seedlings, plants emerging from vegetative propagules, and established vegetation.

The term “crop” shall include a multitude of desired crop plants or an individual crop plant growing at a locus.

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

“Bioactive amounts” as mentioned herein means that amount which, when applied for treatment of crops, is sufficient to give effect in such treatment.

The term “seed treatment” comprises all suitable seed treatment techniques known in the art, such as, but not limited to, seed dressing, seed coating, seed dusting, seed soaking, seed film coating, seed multilayer coating, seed encrusting, seed dripping, and seed pelleting.

The term “control” means to inhibit the ability of pests to survive, grow, feed and/or reproduce, or to limit the pests related damage or loss in crop plants. To “control” pests may or may not mean killing the insects although, it preferably means killing the pests.

The term “health of a plant” or “plant health” is defined as a condition of the plant and/or its products. As a result of the improved health; yield, plant vigour, quality and tolerance to abiotic or biotic stress is increased. As a result, the health of a plant is increased even in the absence of pest pressure.

Accordingly, in an especially preferred embodiment of the method according to the invention, the health of a plant is increased both in the presence and absence of biotic or abiotic stress factors. The above identified indicators for the health condition of a plant may be interdependent or they may result from each other. An increase in plant vigor may for example result in an increased yield and/or tolerance to abiotic or biotic stress.

One indicator for the condition of the plant is the yield. “Yield” is to be understood as any plant product of economic value that is produced by the plant such as grains, fruits, vegetables, nuts, grains, seeds, wood (e.g. in the case of silviculture plants) or even flowers (e.g. in the case of gardening plants, ornamentals). The plant products may in addition be further utilized and/or processed after harvesting.

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

In another preferred embodiment of the invention, the yield of the plants treated using the composition of the present invention, is increased synergistically.

According to the present invention, “increased yield” of a plant, in particular of an agricultural, silvicultural and/or horticultural plant means that the yield of a product of the respective plant is increased by a measurable amount over the yield of the same product of the plant produced under the same conditions, but without the application of the composition according to the invention.

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

leaf index. According to the present invention, the yield is increased by at least 4 %, preferable by 5 to 10 %, more preferable by 10 to 20 %, or even 20 to 30 % compared to the untreated control plants or plants treated with pesticides with compositions different from the composition of the present invention. In general, the yield increase may even be higher.

The term “benefit: cost” refers to a ratio used in a cost-benefit analysis to summarize the overall relationship between the relative costs and benefits of a proposed composition. If a treatment has a benefit-cost ratio greater than 1.0, the treatment is expected to deliver a positive and better outcome.

A further indicator for the condition of the plant is the plant vigour. The plant vigour manifests in several aspects such as the general visual appearance. Improved plant vigour can be characterized, among others, by the following improved properties of the plant: improved vitality of the plant, improved plant growth, improved plant development, improved visual appearance, improved plant stand (less plant verse/lodging), improved emergence, enhanced root growth and/or more developed root system, enhanced nodulation, in particular rhizobial nodulation, bigger leaf blade, bigger size, increased plant weight, increased plant height, increased tiller number, increased number of side shoots, increased number of flowers per plant, increased shoot growth, increased root growth (extensive root system), increased yield when grown on poor soils or unfavourable climate, enhanced photosynthetic activity (e.g. based on increased stomatal conductance and/or increased CO2 assimilation rate), increased stomatal conductance, increased CO2 assimilation rate, enhanced pigment content (e.g. chlorophyll content), earlier flowering, earlier fruiting, earlier and improved germination, earlier grain maturity, improved self-defence mechanisms, improved stress tolerance and resistance of the plants against biotic and abiotic stress factors such as fungi, bacteria, viruses, insects, heat stress, cold stress, drought stress, UV stress and/or salt stress, less non-productive tillers, less dead basal leaves, less input needed (such as fertilizers or water), greener leaves, complete maturation under shortened vegetation periods, less fertilizers needed, less seeds needed, easier harvesting, faster and more uniform ripening, longer shelf-life, longer panicles, delay of senescence, stronger and/or more productive tillers, better extractability of ingredients, improved quality of seeds (for being seeded in the following seasons for seed production), better nitrogen uptake, improved reproduction, reduced production of ethylene and/or the inhibition of its reception by the plant.

In another especially preferred embodiment of the invention, the plant vigour of the treated plant is increased. In another preferred embodiment of the invention, the plant vigour of the plants treated according to the composition of the present invention is increased synergistically.

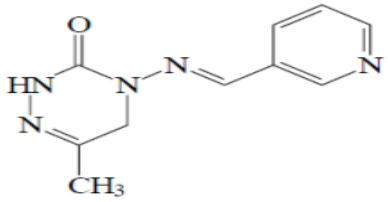
The improvement of the plant vigour according to the present invention particularly means that the improvement of any one or several or all of the above mentioned plant characteristics are improved.

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

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

According to the present invention, enhanced quality means that certain plant characteristics such as the content or composition of certain ingredients are increased or improved by a measurable or noticeable amount over the same factor of the plant produced under the same conditions. Enhanced quality can be characterized, among others, by following improved properties of the plant or its product: increased nutrient content, increased protein content, increased content of fatty acids, increased metabolite content, increased carotenoid content, increased sugar content, increased amount of essential amino acids, improved nutrient composition, improved protein composition, improved composition of fatty acids, improved metabolite composition, improved carotenoid composition, improved sugar composition, improved amino acids composition, improved or optimal fruit colour, improved leaf colour, higher storage capacity, higher processability of the harvested products.

Pymetrozine was first disclosed in US4931439 and US4996325. Pymetrozine is a member of the class of 1,2,4-triazines [from a chemical class (pyridine azomethines)] and is chemically known as (E)-4,5-dihydro-6-methyl-4-(3-pyridylmethyleneamino)- 1,2,4-triazin-3(2H)-one and having chemical structure as below:

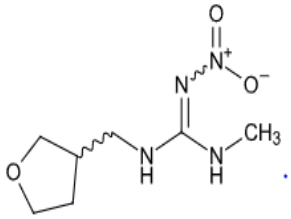


Pymetrozine

Pymetrozine is the only representative of the pyridine azomethines, highly active and specific against sucking pests such as whiteflies, hoppers and aphids. It has a unique mode of action and can be applied as both foliar and soil application. It has no direct toxicity against insects, but it blocks stylet penetration of sucking pests, which may cause immediate and irreversible cessation of feeding within few hours of application of the pesticide, followed eventually by starvation and death.

The mode of action of Pymetrozine in insects has not been precisely determined biochemically, but it may involve effects on neuroregulation or nerve-muscle interaction. Physiologically, it appears to act by preventing these insects from inserting their stylus in to the plant tissue. Pymetrozine is selective against Homoptera, causing them to stop feeding. Pymetrozine is used in control of aphids and whitefly in vegetables, potatoes, ornamentals, cotton, deciduous and citrus fruit, tobacco, hops; both juvenile and adult stages are susceptible and also control planthoppers in rice.

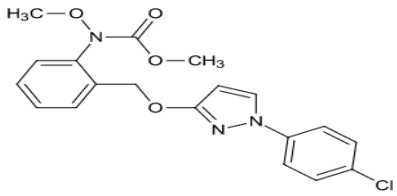
Dinotefuran belongs to Neonicotinoid class of compounds. It is chemically known as (N-methyl-N′-nitro-N″-[(tetrahydro-3-furanyl)methyl)]guanidine) and having chemical structure formula represented as below:



Dinotefuran

Dinotefuran belongs to furanicotinyl insecticide which represents the third generation of neonicotinoid group. Dinotefuran is a contact poison and does not require ingestion by the insect to be effective. Its mechanism of action involves disruption of the insect's nervous system by inhibiting nicotinic acetylcholine receptors.

Pyraclostrobin is a strobilurin fungicide developed by BASF. Pyraclostrobin is chemically known as methyl 2-({[1-(4-chlorophenyl)-1H-pyrazol-3-yl]oxy}methyl)-N-methoxycarbanilate and having chemical structure formula represented as below:



Pyraclostrobin

Pyraclostrobin is a quinone outside inhibitor (QoI)-type fungicide. Due to its low toxicity, chemical stability and broad-spectrum pesticidal properties, it can be used for various crops, such as rice, wheat, peanut and fruit tree, and has strong preventive action for powdery mildew, downy mildew sheath blight, gray mold, leaf spot disease and other diseases. Pyraclostrobin controls the main phytopathogen such as wheat septoria (Septoria in cereal Tritici), Puccinia strain (Puccinia spp.), Drechslera (Drechslera tritici-repentis) and Circle nuclear cavity bacteria (Pyrenophora teres).

In another embodiment of the present invention, the pesticidal composition further comprises urea formaldehyde resin as filler and/or anti-caking agent.

In another embodiment of the present invention, the pesticidal composition of the present invention further comprises blend of polyterpene resin (natural oils) as bio-based efficacy enhancing agents.

In another embodiment of the present invention, the pesticidal composition of the present invention further uses green surfactants including silicone ethoxylated oils and suitable bio-based efficacy enhancing agents including blend of polyterpene resin.

In accordance with an embodiment of the invention, there is provided a synergistic pesticidal composition comprising active ingredients present in the weight percentage range as given below:

Pymetrozine or its agrochemically acceptable salts	**Dinotefuran** or its agrochemically acceptable salts	**Pyraclostrobin** or its agrochemically acceptable salts
1-50%	**1-16%**	**1-40%**

The composition of the present invention can be formulated as one or more of Capsule suspension (CS), Dispersible concentrate (DC), Powder for dry seed treatment (DS), Emulsifiable concentrate (EC), Emulsion, water in oil (EO), Emulsion for foliar spray (ES), Emulsion, oil in water (EW), Flowable suspension/concentrate for foliar spray (FS), Granule/ soil applied (GR), Controlled (Slow or Fast) release granules (CR), Jambo balls or bags (bags in water soluble pouch), Solution for foliar spray (LS), Micro-emulsion (ME), Oil dispersion (OD), Oil miscible flowable concentrate (oil miscible suspension (OF), Oil miscible liquid (OL), Suspension concentrate (flowable concentrate) (SC), Suspo-emulsion (SE), Water soluble granule (SG), Soluble concentrate (SL), Water soluble powder (SP), Water dispersible granule (WG or WDG), Wettable powder (WP), Water dispersible powder for slurry treatment (WS), A mixed formulation of CS and SC (ZC), A mixed formulation of CS and SE (ZE), A mixed formulation of CS and EW (ZW).

In another embodiment of the present invention, the composition can be applied as a foliar spray, soil drenching, seed dressing, application as paste of the targeted plants/ trees, broadcasting, spraying, rubbing, atomizing, irrigating, evaporating, dusting, fogging, broadcasting, pouring, mist blowing, soil mixing, foaming, painting, spreading-on, drenching, dipping or drip irrigation.

The composition of the present invention controls insects pests from the following orders: Lepidoptera, for example Agrotis ypsilon, Anticarsia gemmatalis, Chilo partellus, Cnaphalocrosis medinalis, Cydia pomonella, Diaphania nitidalis, , Earias insulana, Elasmopalpus lignosellus, Heliothis armigera, Heliothis virescens, Heliothis zea, Hellula undalis, Hyphantria cunea, Hyponomeuta malinellus, Leucoptera coffeella, Leucoptera scitella, Ostrinia nubilalis, Panolis flammea, Pectinophora gossypiella, Peridroma saucia, Phalera bucephala, Phthorimaea operculella, Phyllocnistis citrella, Pieris bras-sicae, Plutella xylostella, Sitotroga cerealella, Sesamia inferans, Sparganothis pilleriana, Spodoptera frugiperda, Spodoptera littoralis, Spodoptera litura, Thaumatopoea pityocampa, Tortrix viridana, Trichoplusia ni, beetles (Coleoptera), for example Agrilus sinuatus, Agriotes lineatus, Agriotes obscu-rus, Amphimallus solstitialis, Anisandrus dispar, Anthonomus grandis, Anthonomus pomorum, Aphthona euphoridae, Apogonia aerea, Athous haemorrhoidalis, Atomaria linearis, Blasto-phagus piniperda, Blitophaga undata, Brahmina coriacea , Bruchus rufimanus, Bruchus pisorum, Bruchus lentis, Bycticus betulae, Cassida nebulosa, Cerotoma

trifurcata, Cetonia aurata, Ceuthorrhynchus assimilis, Ceuthorrhynchus napi, Chaetocnema tibialis, Conoderus vespertinus, Crioceris asparagi, Ctenicera ssp., Diabrotica longicornis, Diabrotica semipunctata, Diabrotica punctata Diabrotica speciosa, Diabrotica virgifera, Epilachna varivestis, Epitrix hirtipennis, Eutinobothrus brasiliensis, White grub species, Holotrichia consanguinea , Holotrichia serrata, Holotrichia longipennis, Hylobius abietis, Hypera brunneipennis, Hypera postica, Ips typographus, Lema bilineata, Lema melanopus, Lepidiota stigma, Leptinotarsa decemlineata, Limonius califomicus, Lissorhoptrus oryzophilus, Melanotus communis, Meligethes aeneus, Melolontha hippocastani, Melolontha melolontha, Oberea (Obereopsis) brevis, Oulema oryzae, Ortiorrhynchus sulcatus, Otiorrhynchus ovatus, Phaedon cochleariae, Phyllobius pyri, Phyllotreta chrysocephala, Phyllophaga sp., Phyllopertha horticola, Phyllotreta nemorum, Phyllotreta striolata, Popillia japonica, Sitona lineatus and Sito-philus gran aria, flies, (Diptera), e.g. Atherigona orientalis, Atherigona soccata, Athalia lugen proxima, Dacus cucurbi-tae, Dacus oleae, Glossina palpalis, Haematobia irritans, Haplodiplosis equestris, Hippelates spp., Hylemyia platura, Hypoderma lineata, Leptoconops torrens, Leaf miner, Liriomyza sativae, Liriomyza trifolii, Lucilia caprina, Lucilia cuprina, Lucilia sericata, Lycoria pectoralis, Mansonia titillanus, Mayetiola destructor, Oscinella frit, Phorbia brassicae, Prosimulium mixtum, Rhagoletis cerasi, Sarcophaga sp., Simulium vittatum, Stomoxys calcitrans, Tabanus bovinus, Tabanus atratus, Tabanus lineola, and Tabanus similis, Tipula oleracea, and Tipula paludosa, thrips (Thysanoptera), e.g. Dichromothrips corbetti, Dichromothrips ssp , Frankliniella fusca, Frankliniella occidentalis, Frankliniella tritici, Scirtothrips citri, Scirtothrips dorsalis, Thrips oryzae, Thrips palmi and Thrips tabaci, termites (Isoptera), e.g. Calotermes flavicollis, Coptotermes formosanus, Heterotermes aureus, Leucotermes flavipes, Microtermes spp., Odontotermes, Reticulitermes flavipes, Reticulitermes virginicus, Reticulitermes lucifugus and Termes natalensis; true bugs (Hemiptera), e.g. Acrosternum hilare, Amrasca biguttula biguttula, Amrasca devastans, Blissus leucopterus, Dysdercus cingulatus, Eurygaster integriceps, Euschistus impictiventris, Leptoglossus phyllopus, Lygus lineolaris, Lygus pratensis, Nezara viridu-la, Piesma quadrata, Solubea insularis , Thyanta perditor, Acyrthosiphon onobrychis, Adelges laricis, Aphidula nasturtii, Aphis fabae, Aphis forbesi, Aphis pomi, Aphis gossypii, Aphis crassivora, Aphis grossulariae, Aphis schneideri, Aphis spiraecola, Aphis sambuci, Acyrtho-siphon pisum, Aulacorthum solani, Bemisia argentifolii, Bemisia tabaci, Brachycaudus cardui, Brachycaudus helichrysi, Brachycaudus persicae, Brachycaudus prunicola, Brevicoryne brassicae, Capitophorus horni, Cerosipha gossypii, Chaetosiphon fragaefolii, Cryptomyzus ribis, Dreyfusia nordmannianae, Dreyfusia piceae, Dysaphis radicola, Dysaulacorthum

pseudosolani, Dysaphis plantaginea, Dysaphis pyri, Empoasca fabae, Hyalopterus pruni, Hyperomyzus lactucae, Macrosiphum avenae, Macrosiphum euphorbiae, Ma-crosiphon rosae, Megoura viciae, Melanaphis pyrarius, Metopolophium dirhodum, Myzus persicae, Myzus ascalonicus, Myzus cerasi, Myzus varians, Nasonovia ribis-nigri, Nilaparvata lugens, Pemphigus bursarius, Perkinsiella saccharicida, Phorodon humuli, Psylla mail, Psylla piri, Rhopalomyzus ascalonicus, Rhopalosiphum maidis, Rhopalosi-phum padi, Rhopalosiphum insertum, Sappaphis mala, Sappaphis mail, Schizaphis graminum, Schizoneura lanuginosa, Sitobion avenae, Trialeurodes vaporariorum, Toxoptera aurantiia d, Viteus vitifolii, Cimex lectularius, Cimex hemipterus, Reduvius senilis, Triatoma spp., and Arilus critatus, Trialeurodes vaporariorum, Amrasca biguttula, Empoasca spp., Myzus spp., Nephotettix spp., Nilaparvata spp., Planococcus spp., Pseudococcus spp., Psylla spp., Rhopalosiphum spp., Sitobion spp., Amritodus atkinsoni, Idioscopus spp., ants, bees, wasps, sawflies (Hymenoptera), e.g. Athalia rosae, Atta cephalotes, Atta capiguara, Atta cephalotes, Atta laevigata, Atta robusta, Atta sexdens, Atta texana, Crematogaster spp., Hoplocampa minuta, Hoplocampa testudinea, Monomorium pha-raonis, Solenopsis geminata, Solenopsis invicta, Solenopsis richteri, Solenopsis xyloni, Pogonomyrmex barbatus, Pogonomyrmex californicus, Pheidole megacephala, Dasy-mutilla occidentalis, Bombus spp. Vespula squamosa, Paravespula vulgaris, Paraves-pula pennsylvanica, Paravespula germanica, Dolichovespula maculata, Vespa crabro, Polistes rubiginosa, Camponotus floridanus, and Linepithema humile, crickets, grasshoppers, locusts (Orthoptera), e.g. Acheta domestica, Gryllotalpa gryllo-talpa, Locusta migratoria, Melanoplus bivittatus, Melanoplus femurrubrum, Melanoplus mexicanus, Melanoplus sanguinipes, Melanoplus spretus, Nomadacris septemfasciata, Schistocerca americana, Schistocerca gregaria, Dociostaurus maroccanus, Tachycines asynamorus, Oedaleus senegalensis, Zonozerus variegatus, Hieroglyphus daganensis, Kraussaria angulifera, Calliptamus italicus, Chortoicetes terminifera, and Locustana pardalina, plant parasitic nematodes such as root-knot nematodes, Meloidogyne arenaria, Meloidogyne incognita, Meloidogyne javanica; cyst nematodes, Globodera rostochiensis, Heterodera avenae; seed gall nematodes, Anguina funesta, Anguina tritici and other Anguina species; stem and foliar nematodes, Aphelenchoides besseyi, sting nematodes, Belonolaimus longicaudatus and other plant parasitic nematode species.

The composition of the present invention controls insects pests such as Brown plant hopper, Whitefly, Jassids, Aphids & Thrips, leafminers, sawflies, mole cricket, white grubs, lacebugs, billbugs, beetles including Hemipteran and Homopteran insect pests species.

The compositions of the present invention provides control of diseases caused by a broad spectrum of fungal plant pathogens in Basidiomycete, Ascomycete, Oomycete and Deuteromycete classes. They are effective in controlling a broad spectrum of plant diseases, particularly foliar pathogens of ornamental, vegetable, field, cereal, and fruit crops. These pathogens include:

Oomycetes, including Phytophthora diseases such as Phytophthora infestans, Phytophthora megasperma, Phytophthora parasitica, Phytophthora cinnamoni, Phytophthora capsici; Pythium diseases such as Pythium aphani dermatum; and diseases in the Peronosporaceae family, Such as Plasmopara viticola, Peronospora sp.(including Peronospora tabacina and Peronospora parasitica), Pseudop eronospora sp.(including Pseudoperonospora cubensis), and Bremia lactucae;

Ascomycetes, including Alternaria diseases such as Alternaria Solani and Alternaria brasicae, Curvularia lunata, Guignardia diseases such as Guignardia bidwel. Venturia diseases such as Venturia inaequalis, Septoria diseases such as Septoria nodorum and Septoria tritici; powdery mildew diseases such as Erysiphe sp.(including Erysiphe graminis and Erysiphe polygoni), Uncinula necatur, Sphaerotheca filigena, and Podosphaera leucotricha, Pseudocercosporella herpotrichoides, Botrytis diseases such as Botrytis cinerea, Monilinia fructicola, Sclerotinia diseases such as Sclerotinia sclerotiorum, Magnaporthe grisea, Pyricularia oryzae, Phomopsis viti cola, Helminthosporium diseases such as Helminthosporiumtritici repentis, Pyrenophora teres; anthracnose diseases such as Glomerella or Colletotrichum sp. (Such as Colletotrichum graminicola); and Gaeumannomyces graminis;

Basidiomycetes, including rust diseases caused by Puccinia sp. (such as Puccinia recondita, Puccinia striformis, Puccinia hordei, Puccinia graminis, and Puccinia arachidis); Hemileia vastatrix; and Phakopsora pachyrhizi; Other pathogens including Rhizoctonia spp (such as Rhizoctonia solani); Fusarium diseases such as Fusarium roseum, Fusarium graminearum, Fusarium oxysporum, Verticilium dahliae, Sclerotium rolfsi. Rynchosporium secalis, Cercosporidium personatum, Cercospora arachidicola and Cercospora beticola, and other genera and species closely related to these pathogens

The composition according to the invention can be applied to any and all developmental stages of pests, such as egg, larva, pupa, and adult. The pests may be controlled by contacting the

target pest, its food supply, habitat, breeding ground or its locus with a bioactive amount of the present composition.

Suitable targets for seed treatment are various crop seeds, fruit species, vegetables, spices and ornamental seed, for example corn/maize (sweet and field), durum wheat, soybean, Groundnut, wheat, barley, oats, rye, triticale, bananas, rice, cotton, sunflower, potatoes, pasture, alfalfa, grasses, turf, sorghum, rapeseed, Brassica spp., sugar beet, egg-plants, tomato, lettuce, iceberg lettuce, pepper, cucumber, squash, melon, bean, dry-beans, peas, leek, garlic, onion, cabbage, carrot, tuber such as sugar cane, tobacco, coffee, turf and forage, cruciferous, cucurbits, grapevines, pepper, fodder beet, oil seed rape, pansy, impatiens, petunia and geranium.

The composition of the present invention is effective for the management of Cotton (Gossypium spp.), Paddy (Oryza sativa), Wheat (Triticum aestavum), Maize (Zea mays), Sugarcane (Saccharum officinarum) , Soybean (Glycin max), Peanut (Arachis hypogaea), Mustard (Brassica juncea), Green gram (Vigna radiate), Black gram (Vigna mungo), Chickpea (Cicer aritinum), Redgram (Cajanus cajan), Brinjal (Solanum melongena), Cabbage (Brassica oleracea var. capitata), Cauliflower (Brassica oleracea var. botrytis), Okra (Abelmoschus esculentus), Onion (Allium cepa L.), Tomato (Solanum lycopersicun) , Potato (Solanum tuberosum) , Chilly (Capsicum annum), Garlic (Allium sativum), Cucumber (Cucumis sativus), Muskmelons (Cucumis melo), Watermelon (Citrullus lanatus), Bottle gourd (Lagenaria siceraria), Apple (Melus domestica), Banana (Musa spp.), Citrus groups (Citrus spp.), Grape (Vitis vinifera), Mango (Mangifera indica), Pomegranate (Punica granatum), Tea (Camellia sinensis), Cumin (Cuminum cyminum), Fenugreek (Trigonella foenum-graecum), Fennel (Foeniculum vulgare), Coriander (Coriandrum sativum), Ajwain (Trachyspermumammi), Psyllium (Plantago ovate), Black Pepper (Piper nigrum), Stevia (Stevia rebaudiana), Safedmusli (Chlorophytumtuberosum), Drum stick (Moringaoleifera), Coconut (Coco nucifera), Mentha (Mentha spp.), Rose (Rosa spp.), Jasmine (Jasminum spp.), Marigold (Tagetes spp.), Common daisy (Bellisperennis), Dahlia (Dahlia hortnesis), Gerbera (Gerbera jamesonii), Carnation (Dianthus caryophyllus) or GMO form thereof.

The novel composition of the present invention has very advantageous, preventive, curative and systemic pesticidal properties for protecting cultivated plants and crops. As has been mentioned, said active ingredient composition can be used to inhibit or destroy the pathogens that occur on plants or parts of plants (fruit, blossoms, leaves, stems, tubers, roots) of different crops or useful plants, while at the same time those parts of plants which grow later are also

protected from attack by such pathogens. Active ingredient composition of the present invention has the special advantage of being highly active against diseases in the soil that mostly occur in the early stages of plant development.

The compositions of the present invention provides control of diseases caused by a broad spectrum of fungal plant pathogens and are effective in controlling a broad spectrum of plant diseases, particularly foliar pathogens of ornamental, vegetable, field, cereal, and fruit crops.

The composition of the present invention also provides control of diseases caused by a broad spectrum of fungal plant pathogens preventatively or curatively by applying an effective amount of the composition either pre-or post-infection.

Plant disease control is ordinarily accomplished by applying an effective amount of a synergistic composition of the present invention either pre-or post-infection, to the portion of the plant to be protected such as the roots, stems, foliage, fruit, seeds, tubers or bulbs, or to the media (soil or sand) in which the plants to be protected are growing. The composition can also be applied to the seed to protect the seed and seedling. Typically, the composition is applied in the form of a composition comprising at least one additional component selected from the group consisting of fillers, surfactants/ adjuvants, sticking agents and anti-caking agents.

Composition of the present invention can be in any form as described above and is effective for management of mixed infestation of various insects and fungal diseases on crops, plants.

The synergistic pesticidal composition of the present invention is used to protect crops from insects pests such as Brown plant hopper, Whitefly, Jassids, Aphids & Thrips, and also fungal diseases such as Dirty panicle, Early and late blight, Powdery mildew, Downy mildew, Septoria leaf blotch, Frog eye leaf spot (Cercospora) & Alternaria leaf spot, Alternaria Leaf blight, Tikka disease, Turcicum leaf blight, Sigatoka leaf spot, Blast Disease, etc.

In yet another embodiment of the present invention, the agrochemically acceptable excipients of the formulation are selected from the group consisting of anti-freezing agent, dispersing agents, wetting agents, antifoaming agents, biocides, thickening agent, adjuvants and solvents. One or more agrochemically acceptable excipient is selected from including but not limited to dispersant, anti-freezing agent, anti-foam agent, wetting agent, suspension aid, anti-microbial agent, thickener, quick coating agent or sticking agents (also referred to as “stickers” or

“binders”), spreading agents, buffering agent, binders, adjuvants, fillers, emulsifiers, colouring pigments, dyes, anti-caking agents, preservatives and mixtures thereof.

An adjuvant used in the present invention is any material that is added to an agrochemical formulation to enhance or modify the performance of the formulation. An adjuvant used in the present invention to make it safer to ecological environmental, having low toxicity and having no phytotoxicity effects on any part of the plant. Adjuvants used herein are selected from but not limited to Silicone Ethoxylated Oil, Polyvinyl Pyrrolidone, Polyvinyl Alcohol or mixtures thereof

Extender or sticker/sticking agent keeps pesticides active on a target for an extended period or on waxy foliage. Sticker allows pesticides to stay on a treated surface longer. Some stickers help to hold solid particles to a treated surface. This reduces the amount that washes off due to rain or irrigation. Others reduce evaporation and/or slow breakdown by sunlight.

Spreader allows a pesticide to form a uniform layer over a treated surface. Spreaders such as Silicone Ethoxylated Oil lowers the surface tension of spray solutions beyond that which is achievable with conventional non-ionic surfactants. In fact, it has the potential to provide adequate coverage in many low volume spray applications at rates between 0.025% and 0.1%. It decreases the surface tension of spray solutions to much lower values, in comparison to conventional adjuvants. This results in significantly enhanced spreading of spray solutions over the treated plant surfaces which carries tank mix products to morphologically complex and thus difficult-to- to-reach parts of the plant.

Advantages of organosilicone adjuvants (OSSA):

- Quick spreading and wetting
- Uniform droplet distribution
- Absorption on leaf and stem surfaces
- Increases pesticide efficacy

In another embodiment of the present invention, the pesticidal composition of the present invention further comprises organosilicone surfactants/adjuvant as spreading and sticking agents and bio based efficacy enhancing agents.

In another embodiment of the present invention, the pesticidal composition of the present invention further comprises trisiloxane ethoxylate as organosilicone surfactant/adjuvant.

In another embodiment of the present invention, the pesticidal composition of the present invention further comprises blend of polyterpene resin (natural oils) as bio based efficacy enhancing agents.

Surfactants that are used as dispersants have the ability to adsorb strongly onto a particle surface and provide a charged or stearic barrier to re-aggregation of particles. The most commonly used surfactants are anionic, non-ionic, or mixtures both the types. Tristyrylphenolethoxylate phosphate esters are also used. Nonionics such as alkylarylethylene oxide condensates and EO-PO block copolymers are sometimes combined with anionics as dispersants for suspension concentrates. In recent years, new types of very high molecular weight polymeric surfactants have been developed as dispersants. Examples of dispersants used herein include but not limited to sodium lignosulphonates, calcium ligno sulphate, sodium naphthalene sulphonate formaldehyde condensates, Polyarylphenyl ether phosphate, ethoxylated fatty alcohol, Tristyrylphenol Ethoxylate Amine salt of phosphate, tristyryl phenol ethylate, Acrylic Copolymer, Ethoxylated Tristryl phenol Sulphate, Naphthalene sulfonic acid, sodium salt condensate with formaldehyde, Ethoxylated oleyl cetyl alcohol, Polyalkelene glycol ether, EO-PO block copolymers, and graft copolymers or mixtures thereof.

Emulsifiers are added to buffering agent as used herein is selected from group consisting of calcium hydroxyapatite, Potassium Dihydrogen Phosphate, Sodium Hydroxide, carbonated apatite, calcium carbonate, sodium bicarbonate, tricalcium phosphate, calcium phosphates, carbonated calcium phosphates, amine monomers, lactate dehydrogenase and magnesium hydroxide. Emulsifier are further added to Oil Dispersion formulations for uniform emulsions and are selected from Castor oil ethoxylates, Calcium alkyl benzene sulfonate or mixtures thereof.

Anti-freezing agent as used herein can be selected from the group consisting of glycols, monoethylene glycol, diethylene glycol, propylene glycol, polyethylene glycols, methoxypolyethylene glycols, polypropylene glycols, polybutylene glycols, glycerine and ethylene glycol. Water-based formulations often cause foam during mixing operations in production. In order to reduce the tendency of foaming; anti-foaming agents are often added either during the production stage or before filling into bottles. Generally, there are two types of anti-foaming agents, namely silicones and non-silicones. Silicones are usually aqueous emulsions of dimethyl polysiloxane while the nonsilicone anti-foam agents are water-insoluble

oils, such as octanol and nonanol, or silica. In both cases, the function of the anti-foam agent is to displace the surfactant from the air-water interface.

A wetting agent is a substance that when added to a liquid increases the spreading or penetration power of the liquid by reducing the interfacial tension between the liquid and the surface on which it is spreading. Wetting agents are used for two main functions in agrochemical formulations: during processing and manufacture to increase the rate of wetting of powders in water to make concentrates for soluble liquids or suspension concentrates; and during mixing of a product with water in a spray tank or other vessel to reduce the wetting time of wettable powders and to improve the penetration of water into water-dispersible granules. Examples of wetting agents used in wettable powder, suspension concentrate, and water-dispersible granule formulations include but not are limited to Tristyrylphenol ethoxylate non-ionic emulsifier, mixture of non-ionic surfactants & Alkoxylated Alcohol/Block copolymer, sodium lauryl sulphate, sodium dioctylsulphosuccinate, alkyl phenol ethoxylates and aliphatic alcohol ethoxylates and the salts thereof.

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

Filler is added to the composition to improve the handling and storage characteristics of the composition. Fillers also add mass and/or volume to the active ingredient in order to facilitate precise measurement of the doses. Suitable fillers that may be used in the composition of the present invention include, but not limited to, urea formaldehyde resin, silicon dioxide, bentonite clay, china clay, silica, kaolin, talc, starch, diatomaceous earth and mixtures thereof.

The anti-bacterial agents are used to eliminate or reduce the effect of microorganisms. Examples of such agents include, but are not limited to propionic acid and its sodium salt, sorbic acid and its sodium or potassium salts, sodium o-phenyl phenate, benzoic acid and its sodium salt, hydroxy benzoic acid sodium salt, methyl p-hydroxy benzoate, and biocide such as sodium benzoate, 1,2-benzisothiazoline-3-one, 2-methyl-4-isothiazolin-3-one, 5-chloro-2-

methyl-4-isothiazolin-3-one, potassium sorbate, parahydroxy benzoates, Benzisothiazolin-3-one, formaldehydes or mixtures thereof.

Thickening agents or gelling agents are used mainly in the formulation of suspension concentrates, emulsions and suspo-emulsions to modify the rheology or flow properties of the liquid and to prevent separation and settling of the dispersed particles or droplets. Thickening, gelling, and anti-settling agents generally fall into two categories, namely water-insoluble particulates and water-soluble polymers. It is possible to produce suspension concentrate formulations using clays and silicas. Examples of these types of materials, include, but are limited to, montmorillonite, bentonite, magnesium aluminium silicate, and attapulgite. Water soluble polysaccharides most commonly used as thickening-gelling agents are natural extracts of seaweeds, synthetic derivatives of cellulose or mixtures thereof. Examples of these types of materials include, but are not limited to, guar gum, locust bean gum, carrageenan, xanthan gum, alginates, methyl cellulose, carboxymethyl cellulose (CMC), hydroxyethyl cellulose (HEC) or mixtures thereof. Other types of anti-settling agents are based on modified starches, polyacrylates, polyvinyl alcohol and polyethylene oxide or mixtures. Thickening agents used herein include but not limited to polysaccharide, bentonite clay, CMC, aluminium magnesium silicate or mixtures thereof.

Defoamer/Antifoaming agent are used in agro-chemical formulations to prevent foaming during mixing and spraying stage and generally added to the composition as foam formation prevents the efficient filling of a container. Antifoaming agent are selected form the group consisting of silicon emulsion based anti-foam agents, Siloxane polyalkyleneoxide, Polydimethyl Siloxane, trisiloxane ethoxylates and mixtures thereof

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

The quick coating agent can be a conventionally available sticker, for example polyesters, polyamides, poly- carbonates, polyurea and polyurethanes, acrylate polymers and copolymers, styrene copolymers, butadiene copolymers, polysaccharides such as starch and cellulose derivatives, vinylalcohol, vinylacetate and vinylpyrrolidone polymers and copolymers, polyethers, epoxy, phenolic and melamine resins, polyolefins and define copolymers and

mixtures thereof. Examples of preferred polymers are acrylate polymers such as poly(methacrylate), poly(ethyl methacrylate), poly(methylmethacrylate), acrylate copoylmers and styrene-acrylic copolymers as defined herein below, poly(styrenecomaleic anhydride), cellulosic polymers such as ethyl cellulose, cellulose acetate, cellulose acetatebutyrate, acetylated mono, di, and triglycerides, poly(vinylpyrrolidone), vinyl acetate polymers and copolymers, poly(alkylene glycol), styrene butadiene copolymers, poly(orthoesters), alkyd resins, and mixtures of two or more of these. Polymers that are biodegradable are also useful in the present invention. As used herein, a polymer is biodegradable if is not water soluble, but is degraded over a period of several weeks when placed in an application environment. Examples of biodegradable polymers that are useful in the present invention include biodegradable polyesters, starch, polylactic acid starch blends, polylactic acid, poly(lactic acid-glycolic acid) copolymers, polydioxanone, cellulose esters, ethyl cellulose, cellulose acetate butyrate, starch esters, starch ester aliphatic polyester blends, modified corn starch, polycaprolactone, poly(n-amylmethacrylate), wood rosin, polyanhydrides, polyvinylalcohol, polyhydroxybutyratevalerate, biodegradable aliphatic polyesters, and polyhydroxybutyrate or mixtures thereof.

The solvent for the composition of the present invention may include water, 1-octanol, water soluble alcohols. The water-soluble alcohol which can be used in the present invention may be lower alcohols or water-soluble macromolecular alcohols. The term "lower alcohol", as used herein, represents an alcohol having 1-4 carbon atoms, such as methanol, ethanol, n-propanol, isopropanol, n-butanol, tert-butanol, etc. Macromolecular alcohol is not limited, as long as it may be dissolved in water in a suitable amount range, polyethylene glycol, sorbitol, glucitol, etc. The examples of suitable dihydroxy alcohol ethers used in the present invention may be dihydroxy alcohol alkyl ethers or dihydroxy alcohol aryl ethers. The examples of dihydroxy alcohol alkyl ether include ethylene glycol methyl ether, diethylene glycol methyl ether, propylene glycol methyl ether, dipropylene glycol methyl ether, ethylene glycol ethyl ether, diethylene glycol ethyl ether, propylene glycol ethyl ether, dipropylene glycol ethyl ether, etc. The examples of dihydroxy alcohol aryl ethers include ethylene glycol phenyl ether, diethylene glycol phenyl ether, propylene glycol phenyl ether, dipropylene glycol phenyl ether, and the like. The present invention may include aromatic solvent, such as the xylene, naphtha, C9 and C10 solvents or other proprietary hydrocarbon solvents; green solvents such as ester solvents like glycerol carbonate, ethyl lactate, etc.

Any of the above mentioned solvent can be used either alone or in combination thereof.

Spray colourants/ dyes are used as crop protectants as it helps in identification of areas where product has previously been applied, and for health & safety precaution & awareness.

In yet another embodiment of the present invention, the adjuvants are bio based performance enhancing agents which promote sticking and spreading of the pesticidal composition and also improves rainfastness of the pesticide composition.

In yet another embodiment the adjuvants further consist of castor oil ethoxylates, polyterpene resin and emulsifier blend.

In yet another embodiment of the present invention, there is higher benefit: cost ratio.

In one embodiment, the compositions according to the present invention acts synergistically to control fungi and insect pests in various crops.

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

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

The composition of the present invention also provides control of diseases caused by a broad spectrum of fungal plant pathogens and insect pests preventatively or curatively by applying an effective amount of the composition either pre-or post-infection.

In order that the present invention may be more readily understood, reference will now be made, by way of example, to the following description. It will be understood that the specification and examples are illustrative but not limitative of the present invention and that other embodiments within the spirit and scope of the invention will suggest themselves to those skilled in the art. Other embodiments can be practiced that are also within the scope of the present invention. The following illustrations of examples are intended to illustrate a stable synergistic pesticidal composition, but in no way limit the scope of the present invention.

Examples

A stable Suspension Concentrate (SC) formulation of Dinotefuran, Pymetrozine and Pyraclostrobin according to the present invention was prepared as follows:

SC (Suspension Concentrate)						
Sr. No.	Component	Composition				
		1	2	3	4	5
1	Pymetrozine Technical	15	5	1	10	20
2	Dinotefuran Technical	1	5	4	5	10
3	Pyraclostrobin Technical	5	1	2	5	6
4	Acrylic graft Copolymer	3.00	3.00	3.00	3.00	3.00
5	Naphthalene sulfonic acid,sodium salt condensate with formaldehyde	4.00	4.00	4.00	4.00	4.00
6	Blend of Poly terpene Resin	1.00	1.00	1.00	1.00	1.00
7	Silicone Antifoam	0.50	0.50	0.50	0.50	0.50
8	Benzisothiazoline	0.10	0.10	0.10	0.10	0.10
9	Glycol	5.00	5.00	5.00	5.00	5.00
10	Polysaccharides	0.10	0.10	0.10	0.10	0.10
11	Urea formaldehyde resin	0.10	0.10	0.10	0.10	0.10
12	DM water	QS to Make 100	QS to Make 100	QS to Make 100	QS to Make 100	QS to Make 100

Example 1:

Suspension Concentrate (SC)		
Sr. No.	**Raw Materials details**	**% w/w**
1	Pymetrozine Technical	1-50%
2	Dinotefuran Technical	1-16%
3	Pyraclostrobin Technical	1-40%
4	Dispersing Agent- Polyarylphenyl ether phosphate, tristyryl phenol ethylated /Acrylic Copolymer/ Ethoxylated Tristryl phenol Sulphate,Naphthalene sulfonic acid,sodium salt condensate with formaldehyde,Ethoxylated oleyl cetyl alcohol, Polyalkelene glycol ether,Ethoxylated Fatty alcohol	0.5-10%
5	Wetting Agent- Tristyrylphenol ethoxylate nonionic emulsifier/ Mixture of non-ionic surfactants & Alkoxyleted Alcohol/Block copolymer,	0.5-10%
6	Antifoaming Agent-Siloxane polyalkyleneoxide	0.01-1%
7	Antifreezing Agent- Glycol,Propylene Glycol,Mono ethylene glycol,Glycerin,Diethylene glycol	0.1-10%

8	Adjuvants-Silicone Ethoxylated Oil, Polyvinyl Pyrrolidon,Poly vinyl Alcohol, Blend of poly terpene resin	0.1-10%
9	Filler- Silicon Dioxide/China - Clay/Kaolin/Talc/starch/Urea formaldehyde resin	0.1-5%
10	Anti-bacterial – Benzisothiazolin-3-one / Formaldehyde/Sodium benzoate/Sodium o-phenylphenate, 5-chloro-2-methyl-4-isothiazolin-3-one & 2-methyl-4-isothiazolin-3-one	0.01-1%
11	Polysaccharides/carboxymethyl cellulose/Bentonite Clay/Aluminum Magnesium Silicate	0.01-3%
12	DM water	Q.s to make 100
	Total	100

Example 2:

Suspension Concentrate (SC)		
Sr. No.	**Raw Materials details**	**% w/w**
1	Pymetrozine Technical	1.00%
2	Dinotefuran Technical	9.00%
3	Pyraclostrobin Technical	5.00%
4	Dispersing Agent- Tristyrylphenol Ethoxylate Amine salt of phosphate	3%
5	Wetting Agent- Block copolymer,	2%
6	Antifoaming Agent-Siloxane polyalkyleneoxide	0.20%
7	Antifreezing Agent- Propylene Glycol	5%
8	Adjuvants-Blend of poly terpene resin	1%
9	Filler- Urea formaldehyde resin	1%
10	Anti-bacterial – Benzisothiazolin-3-one	0.10%
11	Polysaccharides	0.10%
12	DM water	Q.s to make 100
	Total	100

Process: Required quantity of water, biocide, and defoamer followed by addition of gum powder are homogenized with stirring to obtain a gum solution (Gum Solution should be made 12-18 hour prior to use). Required quantity of DM water, wetting agent, dispersing agent & suspending agents, colourant/dye was added into the charged vessel followed by homogenization for a period of ranging between 45 – 60 minutes using high shear homogeniser

to obtain a homogenized slurry. Technical and other remaining adjuvants excluding 'antifreeze & thickeners' were added into the homogenized slurry to obtain a uniform slurry. Half of the quantity of required antifoam agent was added into the slurry. The uniform slurry mixture was then passed through appropriate particle size reduction equipment (Dyno-Mill) until the granule material of the desired particle size was achieved. Remaining half of the quantity of required antifoam agent along with the antifreeze agent was added to the granule material as obtained. Gum solution as obtained in the first step was then added to obtain the Suspension Concentrate formulation.

A stable Water Dispersible Granule (WG) formulation of Dinotefuran, Pymetrozine and Pyraclostrobin according to the present invention was prepared as follows:

WG (Water Dispersible Granule)						
Sr. No.	Component	Composition				
		1	2	3	4	5
1	Pymetrozine Technical	30	1	50	20	30
2	Dinotefuran Technical	10	16	10	15	1
3	Pyraclostrobin Technical	20	40	10	1	10
4	Sodium Polycarboxylate	8.00	11.00	10.00	1.00	10.00
5	Sodium Lauryl Sulfate	6.00	7.00	4.00	5.00	4.00
6	Sodium ligno sulfonate	2.00	1.00	1.00	1.00	1.00
7	Sodium alkylnaphthalenesulfonate, formaldehyde condensate	0.50	0.50	0.50	0.50	0.50
8	Silicone based antifoam	0.10	0.10	0.10	0.10	0.10
9	Urea formaldehyde resin	1.00	1.00	1.00	1.00	1.00
10	Precipitated Silica	0.10	0.10	0.10	0.10	0.10
11	China Clay	QS to Make 100	QS to Make 100	QS to Make 100	QS to Make 100	QS to Make 100

Example 3:

WG (Water Dispersible Granule)		
Sr. No.	Component	**% w/w**
1	Pymetrozine Technical	30.00%
2	Dinotefuran Technical	10.00%
3	Pyraclostrobin Technical	1.00%
5	Dispersing Agent-Sodium Polycarboxylate	3.00
6	Wetting Agent-Sodium Lauryl Sulfate	4.00
7	DispersingSodium alkyl naphthalene sulfonate blend	1.00
8	Adjuvants-Polyvinyl pyrolliddone	0.10

9	Antifoam-Polydimethyl Siloxane	0.10
10	Filler- Urea formaldehyde resin	1.00
11	Filler-China Clay	QS to Make 100

Process: Required quantity of filler, wetting agent, dispersing agent, and suspending agent, & technical was mixed in a premixing blender for homogenization for a period of 30 minutes to obtain a pre-blended material. The pre-blended material as obtained in the first step was blended through Jet mill/ air classifier mills followed by blending in post blender for a period of ~1.5 hour to obtain a homogeneous mixture. Required quantity of water (qs) was then added to make a dough. The dough was then passed through the extruder to obtain granules of required size. Wet granules as obtained were passed through the fluidised bed drier followed by grading using vibrating screens to obtain the wettable granules.

A stable Flowable concentrate for seed treatment (FS) of Dinotefuran, Pymetrozine and Pyraclostrobin according to the present invention was prepared as follows:

FS (Flowable Slurry)						
Sr. No.	Component	Composition				
		1	2	3	4	5
1	Pymetrozine Technical	15	5	1	10	20
2	Dinotefuran Technical	1	5	4	5	10
3	Pyraclostrobin Technical	5	1	2	5	6
4	Acrylic Copolymer	3.00	3.00	3.00	3.00	3.00
5	Naphthalene sulfonic acid, sodium salt condensate with formaldehyde	4.00	4.00	4.00	4.00	4.00
6	Urea formaldehyde resin	1.00	1.00	1.00	1.00	1.00
7	Silicone Antifoam	0.50	0.50	0.50	0.50	0.50
8	Benzisothiazoline	0.10	0.10	0.10	0.10	0.10
9	Glycol	5.00	5.00	5.00	5.00	5.00
10	Polysaccharides	0.10	0.10	0.10	0.10	0.10
11	DM water	QS to Make 100	QS to Make 100	QS to Make 100	QS to Make 100	QS to Make 100

Example 4:

Flowable Slurry (FS)		
Sr. No.	**Raw Materials details**	**% w/w**
1	Pymetrozine Technical	1.00%
2	Dinotefuran Technical	1.00%

3	Pyraclostrobin Technical	5%
4	Dispersing Agent- Tristyrylphenol Ethoxylate Amine salt of phosphate	3%
5	Wetting Agent- Block copolymer,	2%
6	Antifoaming Agent-Siloxane polyalkyleneoxide	0.20%
7	Antifreezing Agent- Propylene Glycol	5%
8	Filler- Urea formaldehyde resin	1%
9	Anti-bacterial – Benzisothiazolin-3-one	0.10%
10	Adjuvants-Blend of poly terpene resin	1%
11	Polysaccharides	0.10%
12	DM water	Q.s to make 100
	Total	100

Process: Required quantity of water, biocide, and defoamer followed by addition of gum powder are homogenized with stirring to obtain a gum solution (Gum Solution should be made 12-18 hour prior to use). Required quantity of DM water, wetting agent, dispersing agent & suspending agents, colourant/dye was added into the charged vessel followed by homogenization for a period of ranging between 45 – 60 minutes using high shear homogeniser to obtain a homogenized slurry. Technical and other remaining adjuvants excluding 'antifreeze & thickeners' were added into the homogenized slurry to obtain a uniform slurry. Half of the quantity of required antifoam agent was added into the slurry. The uniform slurry mixture was then passed through appropriate particle size reduction equipment (Dyno-Mill) until the granule material of the desired particle size was achieved. Remaining half of the quantity of required antifoam agent along with the antifreeze agent was added to the granule material as obtained. Gum solution as obtained in the first step was then added to obtain the Flowable concentrate for seed treatment (FS).

A stable Granule (GR) formulation Dinotefuran, Pymetrozine and Pyraclostrobin according to the present invention was prepared as follows:

GR (Granule)						
Sr. No.	Component	Composition				
		1	2	3	4	5
1	Pymetrozine Technical	10	5	7	1	10
2	Dinotefuran Technical	3	5	1	5	2
3	Pyraclostrobin Technical	2	5	6	3	1
4	Sodium Polycarboxylate	3.00	3.00	3.00	3.00	3.00
5	Sodium Lauryl Sulfate	4.00	4.00	4.00	4.00	4.00
6	Pigment blue	0.10	0.10	0.10	0.10	0.10

7	Urea formaldehyde resin	0.50	0.50	0.50	0.50	0.50
9	China Clay	5.00	5.00	5.00	5.00	5.00
10	DM water	1.00	2.00	1.00	2.00	1.00
11	Sand	QS to Make 100	QS to Make 100	QS to Make 100	QS to Make 100	QS to Make 100

Example 5:

Granule (GR)		
Sr. No.	**Raw Materials details**	**% w/w**
1	Pymetrozine Technical	5.00%
2	Dinotefuran Technical	5.00%
3	Pyraclostrobin Technical	1.00%
4	Dispersing Agent- Calcium Ligno sulphate	3%
5	Pigment Blue	0.20%
6	Filler- Urea formaldehyde resin	1%
7	Adjuvants-Polyvinyl pyrolliddone	0.10%
8	DM water	1%
9	Sand	Q.s to make 100
	Total	100

Process: Required quantity of filler, wetting agent, dispersing agent, and suspending agent, & technical was mixed in a premixing blender for homogenization for a period of 30 minutes to obtain a pre-blended material. The pre-blended material as obtained in the first step was blended through Jet mill/ air classifier mills followed by blending in post blender for a period of ~1.5 hour to obtain a homogeneous mixture. Then required quantity of sand was charged in the granulator, later DM water sticking agent and remaining material was added till it became homogeneous. The finely grinded material was then completely coated on sand and the resulting formulation was blended for 30 minutes to obtain the granule formulation.

A stable Wettable Powder (WP) of Dinotefuran, Pymetrozine and Pyraclostrobin according to the present invention was prepared as follows:

WP (Wettable Powder)						
Sr. No.	Component	Composition				
		1	2	3	4	5
1	Pymetrozine Technical	30	1	50	20	30
2	Dinotefuran Technical	10	16	10	15	1
3	Pyraclostrobin Technical	20	40	10	1	10
4	Sodium Polycarboxylate	8.00	8.00	8.00	8.00	8.00

5	Sodium Lauryl Sulfate	5.00	5.00	5.00	5.00	5.00
6	Urea formaldehyde resin	1.00	1.00	1.00	1.00	1.00
7	Sodium alkylnaphthalenesulfonate, formaldehyde condensate	0.50	0.50	0.50	0.50	0.50
8	Silicone based antifoam	0.10	0.10	0.10	0.10	0.10
9	Starch	5.00	5.00	5.00	5.00	5.00
10	Precipitated Silica	0.10	0.10	0.10	0.10	0.10
11	China Clay	QS to Make 100	QS to Make 100	QS to Make 100	QS to Make 100	QS to Make 100

Example 6:

WP (Wettable Powder)		
Sr. No.	Component	**% w/w**
1	Pymetrozine Technical	10.00%
2	Dinotefuran Technical	15.00%
3	Pyraclostrobin Technical	20.00%
5	Dispersing Agent-Sodium ligno sulfonate	3.00
6	Wetting Agent-Sodium Lauryl Sulfate	4.00
7	DispersingSodium alkyl naphthalene sulfonate blend	1.00
8	Adjuvants-Polyvinyl pyrolliddone	1.00
9	Antifoam-Polydimethyl Siloxane	0.10
10	Filler- Urea formaldehyde resin	1.00
11	Filler-China Clay	QS to Make 100

Process: Required quantity of filler, wetting agent, dispersing agent, and suspending agent, & technical were charged in premixing blender for homogenization for a period of 30 minutes to obtain a pre-blended material. The pre-blended material was grinded through Jet mill/ air classifier mills followed by blending in post blender for a period of ~1.5 hr to obtain a homogeneous material. The homogenous material as obtained was unloaded and analysed.

A stable Suspo-emulsion (SE) of Dinotefuran, Pymetrozine and Pyraclostrobin according to the present invention was prepared as follows:

SE (Suspo Emulsion)						
Sr. No.	Component	Composition				
		1	2	3	4	5
1	Pymetrozine Technical	15	5	1	10	20
2	Dinotefuran Technical	1	5	4	5	10

3	Pyraclostrobin Technical	5	1	2	5	6
4	Acrylic Copolymer	3.00	3.00	3.00	3.00	3.00
5	Naphthalene sulfonic acid,sodium salt condensate with formaldehyde	4.00	4.00	4.00	4.00	4.00
6	Urea formaldehyde resin	1.00	1.00	1.00	1.00	1.00
7	Silicone Antifoam	0.50	0.50	0.50	0.50	0.50
8	Benzisothiazoline	0.10	0.10	0.10	0.10	0.10
9	Glycol	5.00	5.00	5.00	5.00	5.00
10	1-Octanol	15.00	20.00	20.00	15.00	15.00
11	Polysaccharides	0.10	0.10	0.10	0.10	0.10
12	DM water	QS to Make 100	QS to Make 100	QS to Make 100	QS to Make 100	QS to Make 100

Example 7:

Suspo Emulsion (SE)		
Sr. No.	**Raw Materials details**	**% w/w**
1	Pymetrozine Technical	2.00%
2	Dinotefuran Technical	3.00%
3	Pyraclostrobin Technical	5%
4	Dispersing Agent- Tristyrylphenol Ethoxylate Amine salt of phosphate	3%
5	Wetting Agent- Block copolymer,	2%
6	Antifoaming Agent-Siloxane polyalkyleneoxide	0.20%
7	Antifreezing Agent- Propylene Glycol	5%
8	1-octanol	10%
9	Anti-bacterial – Benzisothiazolin-3-one	0.10%
10	Filler- Urea formaldehyde resin	1%
11	Polysaccharides	0.10%
12	DM water	Q.s to make 100
	Total	100

Process: Required quantity of water, biocide, and defoamer followed by addition of gum powder are homogenized with stirring to obtain a gum solution (Gum Solution should be made 12-18 hour prior to use). Required quantity of DM water is charged, wetting agent, dispersing agent & suspending agents, colorant/dye was added into the charged vessel followed by homogenization for a period of ranging between 45 – 60 minutes using high shear homogeniser to obtain a homogenized slurry. Technical and other remaining adjuvants excluding 'antifreeze & thickeners' were added into the homogenized slurry to obtain a uniform slurry. Half of the

quantity of required antifoam agent was added into the slurry. The uniform slurry mixture was then passed through appropriate particle size reduction equipment (Dyno-Mill) until the granule material of the desired particle size was achieved. Remaining half of the quantity of required antifoam agent along with the antifreeze agent was added to the granule material as obtained. Gum solution as obtained in the first step was then added to obtain the suspo-emulsion composition.

A stable Oil-Dispersion (OD) of Dinotefuran, Pymetrozine and Pyraclostrobin according to the present invention was prepared as follows:

OD (Oil Dispersion)						
Sr. No.	Component	Composition				
		1	2	3	4	5
1	Pymetrozine Technical	15	5	1	10	20
2	Dinotefuran Technical	1	5	4	5	10
3	Pyraclostrobin Technical	5	1	2	5	6
4	Ethoxylated oleyl cetyl alcohol	3.00	3.00	3.00	3.00	3.00
5	Polyalkelene glycol ether	4.00	4.00	4.00	4.00	4.00
6	Polyvinylpyrrolidone	1.00	1.00	1.00	1.00	1.00
7	Calcium alkyl benzene sulfonate	3.00	3.00	3.00	3.00	3.00
8	Castor oil ethoxylates	2.00	2.00	2.00	2.00	2.00
9	Silicone based antifoam	0.10	0.10	0.10	0.10	0.10
10	Propylene glycol	5.00	5.00	5.00	5.00	5.00
11	Urea formaldehyde resin	0.10	0.10	0.10	0.10	0.10
12	Soyabean Oil	QS to Make 100	QS to Make 100	QS to Make 100	QS to Make 100	QS to Make 100

Example 8:

OD (Oil Dispersion)		
Sr. No.	**Raw Materials details**	**% w/w**
1	Pymetrozine Technical	15.00%
2	Dinotefuran Technical	5.00%
3	Pyraclostrobin Technical	5%
4	Dispersing Agent- Tristyrylphenol Ethoxylate Amine salt of phosphate	3%
5	Dispersing Agent Ethoxylated oleyl cetyl alcohol	3.00
6	Sticking Agent-Polyvinylpyrrolidone	1.00
7	Emulsifier-Calcium alkyl benzen sulfonate	5.00
8	Emulsifier-Castor oil ethoxylates	4.00
9	Antifoam-Polydimethyl Siloxane	0.00

10	Antifreezing Agent- Propylene Glycol	0.00
11	Filler- Urea formaldehyde resin	0.10
12	Vegetable Oil-Soyabean Oil	Q.s to make 100
	Total	100

Process: Required quantity of vegetable oil was charged in a vessel and polyvinyl pyrrolidone was added and mixed well for 30 minutes using high shear homogenizer. Required quantity of wetting agent, dispersing agent & suspending agents were added and homogenised for 45 – 60 minutes using high shear homogeniser. Then all the technicals were added and again homogenised for further 30 minutes. This homogenised material was passed through horizontal bead mill to get required particle size. After completion of grinding cycles, the sample was analysed for particle size analysis.

Biological Examples:

Bio-efficacy studies

The presence of a synergistic effect between three active ingredients is established with the aid of the Colby equation (se S. R. Colby, "Calculating Synergistic and Antagonistic Responses of Herbicide Combinations', Weeds,1967,15,20-22). The action expected for a given combination of two active components can be calculated as follows:

$$p = A + B + C - \{\frac{AB+AC+BC}{100}\} + \{\frac{ABC}{10000}\}$$

Using the method of Colby, the presence of a synergistic interaction between three active ingredients is established by first calculating the predicted activity, p, of the composition based on activities of the three components applied alone. If 'p' is lower than the experimentally established efficacy, Synergism has occurred. In the equation above, A is the pesticidal activity in percentage control of one component applied alone at rate x. The term B is the pesticidal activity in percentage control of the second component applied at rate 'y' & similarly C is the corresponding value for the third component applied at rate z. The equation estimates p, the pesticidal activity of the combination of A at rate X with B at rate y & C at rate z if their effects are strictly additive then no interaction has occurred.

Table 1:

Details of Experiment	
Experiment design:	Randomized Block Design (RBD)
Replication:	Three
Treatments:	26 including Control plot
Plot size:	4 M X 3 M
Plant Spacing:	Row to Row 75 cm, Plant to plant 45 cm
Crop & Variety	Rice (Variety: BPT-5204)
Application Time :	Treatment were started based on the ETL level of Brown plant hopper (BPH) in the field selected which coincides with first spray on 65 DAT followed by second and third sprays at 75 and 85 DAT respectively.
Observations	Pre-treatment count (PTC) of BPH and then 1, 3, 5, 7 & 10 Days after each spray was recorded from 20 hills per treatment. Average of 3 replication was calculated for further analysis.
Spray volume:	500 Litre water per hectare or 0.6 Lt per plot
Application Equipment	Hand operated Knapsack sprayer fitted with Flat fan nozzle.

Experimental Methodology: Paddy crop was raised as per the standard agronomic practices in the field to conduct a trial to assess phytotoxicity, pest population control of different compositions such as tank mixture as well ready to use ternary composition of the present invention. The trial was laid out in Randomized Block Design (RBD) with 26 treatments including untreated check (UTC), replicated three times. For each treatment plot size of 40 sq. mt was maintained. The application of different treatments with prescribed doses was done with manually operated knapsack sat 0,1,3,5,7 & 10 days. Further, only 5th Day's observations have been mentioned in respect of phytotoxicity data. The phytotoxicity was evaluated after spraying the composition of present invention, by adopting 0-10 rating scale as below:

Table 2:

Rating	**% of phytotoxicity**
0	No phytotoxicity
1	1-10%
2	11-20%
3	21-30%
4	31-40%
5	41-50%,
6	51-60%
7	61-70%
8	71-80%
9	81-90%
10	91-100%

Table 3:

Active Compound	Dose Rate	**Active compound - Dinotefuran**				Active Compound	Dose Rate
	g a.i./ha	Dose Rate (g a.i./ha)					g a.i./ha
Pymetrozine	0	0	25.00	37.5	50	**Pyraclostrobin**	0
	60	0	25.00	37.5	50		50
	112.5	0	25.00	37.5	50		75
	175	0	25.00	37.5	50		100

Following formulations used as conventional practices for the control of Dirty Panicle and Blast diseases were also included for comparison:

1. Azoxystrobin 25% SC - Score @ 1ml/ litre
2. Difenoconazole 13.9%+ Propiconazole13.9%-EC (Tapsa) @0.75 ml/ litre
3. Binary composition of Dinotefuran + Pymetrozine (37.5+112.5 g a.i./ha)
4. Binary composition of Dinotefuran + Pyraclostrobin (37.5+75 g a.i./ha)

5. Binary composition of Pyraclostrobin + Pymetrozine (75+112.5 g a.i./ha)

TEST COMPOSITIONS PREPARATION:

Test suspensions comprising a single active ingredient are sprayed to demonstrate the control efficacy of the active ingredient individually. To demonstrate the control efficacy of a combination-

a) the active ingredients can be combined in the appropriate amounts in a single test Suspension,
b) stock solutions of individual active ingredients can be prepared and then combined in the appropriate ratio, and diluted to the final desired concentration to form a test Suspension or
c) test Suspensions comprising single active ingredients can be sprayed sequentially in the desired ratio.
d) test Suspensions of ready to use formations comprising multiple active ingredients can be sprayed in the desired concentration.

MATERIALS AND METHODS:

In kharif 2020 and 2021 the field trials were conducted at Farmers field in Kampasagar, Nalgonda District with variety BPT- 5204. Twenty-six treatments including control were evaluated and each treatment was replicated thrice. Seedlings were transplanted at 30 days after sowing with inter and intra row spacing of 30 × 15 cm. The fertilizers N:P:K were used at 120:60:40 kg/ ha and all the recommended package of practices except insecticidal sprayings were followed. The treatment details are given in below mentioned tables, wherein, Dinotefuran 20 SG@ 25, 37.5 and 50 g a.i./ha, market standards, Pymetrozine 50% WG @ 60, 112.5 and 175 g a.i./ha, Pyraclostrobin 10% CS @ 50, 75 and 100 g a.i./ha solo and binary treatments. Two other standard fungicidal compositions used conventionally for the treatment of Dirty Panicle and Blast in rice crop viz. Azoxystrobin 25% SC and Difenoconazole 13.9% + Propiconazole 13.9% EC along with other compositions such as ternary tank mixtures, a synergistic premix composition as per the present invention comprising Dinotefuran, Pymetrozine and Pyraclostrobin, and a control were sprayed and tested. Spray schedule of these treatments was followed based on ETL(expected threshold level). First, second and third sprays were imposed at 40, 50 and 60 days after transplanting and a spray formulation of 500 L/ha

was used to ensure thorough coverage of the plants with the help of knapsack sprayer fitted with hollow cone nozzle. Care was taken to prevent the drift.

Table 4:

Synergistic effect of composition comprising Dinotefuran + Pymetrozine + Pyraclostrobin against Brown Plant Hoppers (BPH) Nilaparvata lugens in Paddy									
Treatments	Dinotefuran	Pymetrozine	Pyraclostrobin	PTC	1DAS	3DAS	5DAS	7DAS	10 DAS
	g a.i./ha			Brown Plant Hopper (average nos./ 20 Hills after 1st Spray					
T_1	**25**	0	0	42.25	37.50	40.00	39.13	38.50	39.00
T_2	**37.5**	0	0	41.63	35.10	34.50	35.00	34.00	35.13
T_3	**50**	0	0	42.08	35.14	33.00	33.00	31.50	30.20
T_4	**0**	60	0	44.45	38.67	38.13	37.45	35.50	33.88
T_5	**0**	112.5	0	43.34	37.20	41.22	40.00	41.33	27.44
T_6	**0**	175	0	44.24	36.45	30.13	26.77	24.13	25.00
T_7	**0**	0	50	42.09	44.00	46.44	49.67	51.33	54.25
T_8	**0**	0	75	49.49	47.97	49.97	50.97	53.30	55.80
T_9	**0**	0	100	42.13	43.52	45.52	46.52	48.85	51.35
T_{10}	Azoxystrobin 25% SC		1ml/l	41.00	43.10	45.00	46.90	51.00	55.40
T_{11}	Difenoconazole 13.9% + Propiconazole 13.9%- EC		0.75ml/l	42.30	45.00	45.00	47.80	49.00	53.40
T_{12}	37.5	112.5	0	43.13	35.70	34.00	26.33	19.66	23.00
T_{13}	37.5	0	75	40.45	34.50	32.00	29.67	31.00	32.87
T_{14}	0	112.5	75	39.90	37.13	35.66	27.13	22.00	24.67
T_{15}	**25**	60	50	43.30	39.84	37.84	28.97	20.64	23.14
T_{16}	**25**	112.5	75	42.80	38.00	36.00	27.34	18.80	20.80
T_{17}	**25**	175	100	42.46	38.20	36.20	28.20	19.98	23.13
T_{18}	**37.5**	60	50	43.92	36.01	34.01	24.24	15.91	18.41
$T_{19\ (Tank\text{-}mix)}$	**37.5**	112.5	75	41.46	36.33	36.00	33.13	28.12	22.33
T_{20}	**37.5**	175	100	43.13	35.00	33.00	23.50	15.28	18.43
***T_{21}**	**37.5**	112.5	75	40.67	35.38	32.88	20.23	9.90	9.90
#T_{22}	**37.5**	112.5	75	41.80	35.53	33.53	24.87	16.33	18.33
T_{23}	**50**	60	50	45.80	38.00	31.00	24.38	16.49	17.64
T_{24}	**50**	112.5	75	42.94	36.50	32.50	21.84	12.30	14.30
T_{25}	**50**	175	100	42.30	34.10	32.10	21.60	11.38	13.53
T_{26}	**0**	**0**	0	46.59	48.37	53.91	53.24	56.52	58.74

**T_{21} - Ready to use WG formulation with UFR(urea formaldehyde resin)*

#T_{22} - Ready to use WG formulation without UFR

PTC: pre-treatment count

Table 5:

Synergistic effect of composition comprising Dinotefuran + Pymetrozine + Pyraclostrobin against Brown Plant Hoppers (BPH) Nilaparvata lugens in Paddy									
Treatments	Dinotefuran	Pymetrozine	Pyraclostrobin	PTC	1DAS	3DAS	5DAS	7DAS	10 DAS
	g a.i./ha			Brown Plant Hopper (average nos./ 20 Hills after 2nd Spray					
T_1	**25**	0	0	42.25	37.50	35.00	34.13	34.67	30.67
T_2	**37.5**	0	0	41.63	33.63	31.00	31.12	30.67	23.00
T_3	**50**	0	0	42.08	28.70	30.00	29.87	29.00	22.00
T_4	**0**	60	0	44.45	32.38	31.50	30.13	29.13	28.00
T_5	**0**	112.5	0	43.34	29.33	39.00	40.13	41.13	24.88
T_6	**0**	175	0	44.24	34.50	37.13	39.90	42.33	23.22
T_7	**0**	0	50	42.09	55.00	51.25	58.66	60.12	64.00
T_8	**0**	0	75	49.49	57.13	58.13	60.13	62.57	65.07
T_9	**0**	0	100	42.13	52.68	53.68	55.68	58.12	60.62
T_{10}	Azoxystrobin 25% SC		1ml/l	41.00	53.00	51.30	56.70	59.00	63.00
T_{11}	Difenoconazole 13.9% + Propiconazole 13.9%- EC		0.75ml/l	42.30	55.50	59.00	59.00	60.30	64.10
T_{12}	37.5	112.5	0	43.13	20.00	14.87	11.00	12.75	13.25
T_{13}	37.5	0	75	40.45	30.00	26.33	20.13	22.00	23.00
T_{14}	0	112.5	75	39.90	22.00	18.13	16.87	19.00	22.50
T_{15}	**25**	60	50	43.30	24.47	21.26	14.93	12.73	14.23
T_{16}	**25**	112.5	75	42.80	22.13	18.73	13.73	13.00	14.25
T_{17}	**25**	175	100	42.46	24.46	21.36	14.47	12.72	12.72
T_{18}	**37.5**	60	50	43.92	19.74	16.53	12.20	10.00	11.50
T_{19}	**37.5**	112.5	75	41.80	19.33	15.93	10.93	8.93	10.18
T_{20}	**37.5**	175	100	43.13	18.43	15.33	8.44	6.69	6.69
***T_{21}**	**37.5**	112.5	75	40.67	17.64	14.54	7.65	5.90	5.90
#T_{22}	**37.5**	112.5	75	41.46	14.71	14.00	10.00	8.33	9.00
T_{23}	**50**	60	50	45.80	10.90	9.69	7.36	7.16	8.16
T_{24}	**50**	112.5	75	42.94	15.30	11.90	6.90	4.90	6.15
T_{25}	**50**	175	100	42.30	15.00	11.43	6.54	4.79	6.73
T_{26}	**0**	**0**	0	46.59	60.24	62.57	65.24	68.11	69.48

**T_{21} - Ready to use WG formulation with UFR*

#T_{22} - Ready to use WG formulation without UFR

Table 6:

Synergistic effect of composition comprising Dinotefuran + Pymetrozine + Pyraclostrobin against Brown Plant Hoppers (BPH) Nilaparvata lugens in Paddy											
Treatments	Dinotefuran	Pymetrozine	Pyraclostrobin	1 DAS	3 DAS	5 DAS	7 DAS	10 DAS	Observed% population reduction over control at 10 days after 3rd Spray	Expec-ted % decrease in BPH popula-tion over control	Observed /Expected control % = Colby Ratio
	g a.i./ha			Brown Plant Hopper (average nos./ 20 Hills) after 3rd Spray							
T_1	25	0	0	31.33	27.33	25.20	26.20	29.20	61.07	-	-
T_2	37.5	0	0	23.00	18.50	15.37	16.37	19.04	74.61	-	
T_3	50	0	0	20.46	15.23	11.40	12.06	14.06	81.25	-	-
T_4	0	60	0	30.00	26.16	24.16	25.16	28.49	62.01	-	-
T_5	0	112.5	0	22.67	18.17	14.67	15.87	18.37	75.51	-	
T_6	0	175	0	21.00	14.77	10.44	10.44	12.44	83.41	-	-
T_7	0	0	50	64.88	61.04	60.04	61.04	64.37	14.17	-	-
T_8	0	0	75	66.00	63.50	61.00	62.20	64.70	13.73	-	-
T_9	0	0	100	63.50	62.27	59.94	59.94	61.94	17.41	-	
T_{10}	Azoxystrobin 25% SC		1ml/l	63.10	64.50	64.00	66.70	68.40	8.80	-	-
T_{11}	Difenoconazole 13.9% + Propiconazole 13.9%-EC		0.75ml/l	64.70	66.40	68.90	71.00	70.60	5.87	-	-
T_{12}	37.5	112.5	0	11.33	9.50	6.87	6.50	6.00	92.00	93.78	0.98
T_{13}	37.5	0	75	21.50	17.50	16.00	14.50	18.00	76.00	78.10	0.97
T_{14}	0	112.5	75	20.50	17.33	15.87	16.00	18.50	75.33	78.87	0.96
T_{15}	25	60	50	15.66	11.82	10.82	7.95	10.66	85.79	87.31	0.98
T_{16}	25	112.5	75	12.00	9.50	7.00	5.80	8.13	89.16	91.77	0.97
T_{17}	25	175	100	10.87	9.64	7.31	6.31	4.18	94.43	98.56	0.96
T_{18}	37.5	60	50	11.00	7.16	6.16	2.29	2.29	96.95	91.72	1.06

T_{19}	37.5	112.5	75	8.87	6.37	5.33	4.50	3.50	95.33	94.64	1.01
T_{20}	37.5	175	100	6.00	4.77	2.44	1.57	0.44	99.41	96.52	1.03
***T_{21}**	37.5	112.5	75	4.50	1.66	1.00	0.13	0.13	99.83	94.64	1.05
#T_{22}	37.5	112.5	75	8.12	6.40	4.33	3.00	2.13	97.16	94.64	1.03
T_{23}	50	60	50	7.66	4.82	4.16	3.29	3.29	95.61	93.89	1.02
T_{24}	50	112.5	75	4.50	3.00	2.67	2.67	0.20	99.80	97.00	1.02
T_{25}	50	175	100	4.13	2.90	0.90	0.23	0.10	99.87	97.43	1.02
T_{26}	0	0	0	70.50	69.33	72.50	74.66	75.00	-	-	-

**T_{21} - Ready to use WG formulation with UFR*

#T_{22} - Ready to use WG formulation without UFR

It can be observed from Table 4, 5 and 6 that the compositions of the present invention showed synergistic effect and increased disease control as compared to binary and solo treatments. The synergistic compositions comprising Dinotefuran + Pymetrozine + Pyraclostrobin showed better disease control at 10 DAS after both 1st, 2nd and 3rd spray as compared to conventionally used compositions including solo and binary compositions and Azoxystrobin 25% SC (T_{10}) and Difenoconazole 13.9% + Propiconazole 13.9% EC (T_{11}) against BPH. Further, T_{19} is a tank mix comprising 10% Dinotefuran + 30% Pymetrozine + 20% Pyraclostrobin and $T_{21,}$ T_{22} are compositions as per the present invention with the same concentration of actives applied at the same dose. From the tables above, it is evident that T_{21} and T_{22} (pre-formulated composition as per the present invention) show better control of BPH and synergistic effect as compared to T_{19} (tank-mix).

Furthermore, a comparison is further been made between T_{21} and T_{22}, wherein T_{21} is a pre-formulated composition with the use of UFR (Urea Formaldehyde Resin) and T_{22} is a pre-formulated composition without the use of UFR. From the tables above, T_{21} shows better control of BPH and synergistic effect as compared to T_{22}. Hence, the use of UFR as an anti-caking agent/ filler has shown to increase the suspensibility of the actives, enhanced the flowability of the formulation along with ease of application and hence improved efficacy.

Effect of treatments against Blast disease (Pyricularia oryzae) in rice crop under field conditions

"Field experiments under natural infection were conducted at Nalgonda district of Telangana. The distance between plots was 1.5 m. Each row consisted of 13 hills with 20-day-old rice

seedlings (cv. BPT-5204) per hill. When rice blast disease symptoms appeared in 5–10% of the plants under natural infection at the early bootleaf stage, the rice plants were treated for the first time with the tested fungicides and insecticides + fungicides combinations at the recommended rate, and water was applied as a negative control. Three applications were made, with rice leaves treated the second time 10 days after the first application and the third time after 10 days of the second spray. The rice plants were sprayed with 0.6 L of each treatment spray solution (or water for the control) per plot with separate portable sprayers, and each treatment consisted of three plots (replicates).

Seven days after each application, a total of 30 leaves of the treated rice plants from each plot were hand harvested to assess disease incidence. Disease incidence was recorded in accordance with the scoring scale (0–9) presented by the International Rice Research Institute. The percentage of disease incidence was analysed using the formula:

$$\mathbf{[S(r \times nr)/9 \times Nr] \times 100}$$

where r = rating value (0–9); nr = number of infected leaves with a rating of r; and Nr = total number of leaves tested in each replication.

The experiments were conducted during July and October in two successive years, 2020 and 2021.

Table 7:

Synergistic effect of composition comprising Dinotefuran + Pymetrozine + Pyraclostrobin against Blast (Pyricularia oryzae) in Paddy

Treatments	Dinotefuran	Pymetrozine	Pyraclostrobin	7 days after First Applica-tion	7 days after Second Applica-tion	7 days after Third Applica-tion	Observed % reduction in disease incidence over control	Expec-ted % reducti on in blast inciden ce over control	Observ ed /Expec ted control % = Colby Ratio
	g a.i./ha			Blast (Pyricularia oryzae) % disease incidence on Rice crop after each spray					
T_1	25	0	0	40.00	51.40	54.30	-5.83	-	-
T_2	37.5	0	0	40.90	50.00	52.40	-2.12	-	-

T_3	50	0	0	39.60	46.70	50.40	1.77	-	-
T_4	0	60	0	40.00	44.40	50.70	1.19	-	-
T_5	0	112.5	0	41.50	47.50	52.30	-1.93	-	-
T_6	0	175	0	42.10	47.00	49.50	3.53	-	-
T_7	0	0	50	16.50	11.00	10.40	79.73	-	-
T_8	0	0	75	10.40	8.80	7.10	86.16	-	-
T_9	0	0	100	7.86	5.10	4.80	90.65	-	-
T_{10}	Azoxystrobin 25% SC		1ml/l	18.67	16.00	12.30	76.03	-	-
T_{11}	Difenoconazole 13.9% + Propiconazole 13.9%- EC		0.75ml/l	24.87	19.30	15.40	69.99	-	-
T_{12}	37.5	112.5	0	46.00	46.33	44.50	13.27	-4.09	-3.24
T_{13}	37.5	0	75	11.25	8.67	8.13	84.16	85.87	0.98
T_{14}	0	112.5	75	10.00	9.00	9.25	81.97	85.90	0.95
T_{15}	25	60	50	16.80	10.80	12.80	75.05	78.80	0.952
T_{16}	25	112.5	75	11.00	9.10	7.70	84.99	85.07	0.999
T_{17}	25	175	100	7.10	5.00	5.10	90.06	90.45	0.996
T_{18}	37.5	60	50	15.20	6.50	10.40	79.73	79.55	1.002
T_{19}	37.5	112.5	75	12.50	3.60	3.20	93.76	85.60	1.095
T_{20}	37.5	175	100	6.00	3.10	3.00	94.15	90.78	1.037
***T_{21}**	37.5	112.5	75	4.20	2.10	2.10	95.91	85.60	1.120
#T_{22}	37.5	112.5	75	5.00	2.70	2.60	94.93	85.60	1.109
T_{23}	50	60	50	14.00	8.00	8.90	82.65	80.33	1.029
T_{24}	50	112.5	75	10.60	62.00	**5.80**	88.70	86.15	1.030
T_{25}	50	175	100	6.30	3.90	3.60	92.98	91.14	1.020
T_{26}	0	**0**	0	41.11	45.18	51.31	-	-	-

**T_{21} - Ready to use WG formulation with UFR*

#T_{22} - Ready to use WG formulation without UFR

From Table 7 it can be seen that the ternary compositions as per the present invention i.e. T_{15-25} show better control of Blast disease in rice as compared to other solo and binary treatments. The compositions as per the present invention have reduced incidence of blast disease in paddy crop as compared to conventionally used fungicide treatments such as T_{10} and T_{11}. Inventors of the present invention have succeeded in formulating a synergistic and stable composition comprising Dinotefuran + Pymetrozine + Pyraclostrobin.

For instance, comparison can be made between T_{19} (tank-mix) and T_{21}, T_{22} (pre-formulated compositions with same amount of actives as T_{19}) wherein it can be observed that T_{21} and T_{22} show less incidence of blast disease in rice crops and synergistic effect as compared to T_{19} after 1st, 2nd and 3rd spray.

Furthermore, a comparison is further been made between T_{21} and T_{22}, wherein T_{21} is a pre-formulated composition with the use of UFR (Urea Formaldehyde Resin) and T_{22} is a pre-formulated composition without the use of UFR. From the table above, T_{21} shows better control of Blast disease and synergistic effect as compared to T_{22}. Hence, the use of UFR as an anti-caking agent/ filler has shown to increase the suspensibility of the actives, enhanced the flowability of the formulation along with ease of application and hence improved efficacy.

Effect of treatments against Dirty Panicle disease (Curvularia lunata) in rice crop under field conditions.

The efficacy of fungicides against dirty panicle disease under field conditions has been previously described. The experiment was conducted in a lowland rice field in Nalgonda district of Telangana. Each plot was 4 m × 3 m in size with 0.30 m between rows and a total of 13 rows per plot. Each row consisted of 13 hills with five rice seedlings (cv. BPT-5204) per hill and 0.30 m distance between hills. The distance between plots was 1.5 m, and the plots were in a completely randomized design. Conventional cultivation practices were applied. The rice plants were sprayed with each treatment including with or without Pyraclostrobin fungicide at the tested recommended rates, with water applied as the negative control (Table 2). The first treatment was applied at the early boot stage, while the second treatment was applied 10 days after the first and similarly the third spray at an interval of 10 days from the second spray. Rice panicles were sprayed with 0.6 L of each spray solution (or water for the control) per plot with separate portable sprayers, and each treatment consisted of three plots (replicates). When the rice panicles were aged 40 days, the treated rice panicles of each treatment were hand harvested and dried in the shade for 3 days. Infection by disease pathogens was observed using the International Seed Testing Association 40 method. Two hundred dried rice seeds from each treatment were randomly selected and placed in Petri dishes containing a water-soaked blotter (25 seeds per dish). They were then incubated for 7 days at room temperature under a cycle of 12 h of light and 12 h of darkness. The pathogens of dirty panicle disease were observed on the rice seeds using a stereo microscope (Olympus SZ51) and identified based on their

morphological characteristics. Their incidence in each treatment was recorded. The experiment was conducted in two successive years, 2020 and 2021, during the July–November period.

Table 8:

Synergistic effect of composition comprising Dinotefuran + Pymetrozine + Pyraclostrobin against Dirty Panicle disease (Curvularia lunata)											
Treatments	Dinotefuran	Pymetrozine	Pyraclostrobin	Yield (q/ha)	Observed % increase in yield over control	Expected % increase in yield over control	Observed /Expected yield increase % = Colby Ratio	**Dirty Panicle (*Curvularia lunata)* cumulative % disease incidence after third spray**			
	g a.i./ha							Dirty Panicle % Disease incidence	Observed % Reduction in Disease Incidence	Expected % reduction in disease incidence	Observed /Expected Reduction in Disease Incidence % = Colby Ratio
T_1	25	0	0	38.50	15.96	-	-	66.70	3.40	-	
T_2	37.5	0	0	40.87	23.10	-	-	65.00	5.87	-	
T_3	50	0	0	42.10	26.81	-	-	69.40	-0.51	-	
T_4	0	60	0	37.90	14.16	-	-	68.40	0.94	-	
T_5	0	112.5	0	43.80	31.93	-	-	64.90	6.01	-	
T_6	0	175	0	44.60	34.34	-	-	67.00	2.97	-	
T_7	0	0	50	35.00	5.42	-	-	13.10	81.03	-	
T_8	0	0	75	36.87	11.05	-	-	7.10	89.72	-	
T_9	0	0	100	39.50	18.98	-	-	6.00	91.31	-	
T_{10}	Azoxystrobin 25% SC		1ml/l	35.60	7.23	-	-	20.30	70.60	-	
T_{11}	Difenoconazole 13.9% + Propiconazole 13.9%- EC		0.75ml/l	34.33	3.40	-	-	26.50	61.62	-	
T_{12}	37.5	112.5	0	46.67	40.57	47.65	0.85	64.50	6.59	11.52	0.57
T_{13}	37.5	0	75	42.50	28.01	31.60	0.89	6.87	90.05	90.32	1.00
T_{14}	0	112.5	75	43.87	32.14	39.45	0.81	7.00	89.86	90.34	0.99
T_{15}	25	60	50	43.10	29.82	31.77	0.94	13.00	81.17	81.85	0.99

T_{16}	25	112.5	75	46.90	41.27	49.12	0.84	6.60	90.44	90.66	1.00
T_{17}	25	175	100	48.80	46.99	55.29	0.85	5.70	91.75	91.86	1.00
T_{18}	37.5	60	50	52.13	57.02	37.57	1.52	10.20	85.23	90.90	0.94
T_{19}	37.5	112.5	75	51.60	55.42	53.44	1.04	5.60	91.89	92.06	1.00
T_{20}	37.5	175	100	59.87	80.33	59.09	1.36	3.90	94.35	94.75	1.00
T_{21}	37.5	112.5	75	61.87	86.36	53.44	1.62	2.66	96.15	92.06	1.04
T_{22}	37.5	112.5	75	54.87	65.27	53.44	1.22	4.00	94.21	92.06	1.02
T_{23}	50	60	50	53.10	59.94	40.58	1.48	8.80	87.26	91.53	0.95
T_{24}	50	112.5	75	60.33	81.72	55.68	1.47	3.60	94.79	94.39	1.00
T_{25}	50	175	100	59.50	79.22	61.06	1.30	2.90	95.80	96.03	1.00
T_{26}	0	**0**	0	33.20	-	-	-	69.05	-		

From Table 8 it can be seen that the ternary compositions as per the present invention i.e. T_{15-25} show better control of dirty panicle in rice as compared to other solo and binary treatments. The compositions as per the present invention have reduced incidence of dirty panicle in paddy crop and better yield of paddy as compared to conventionally used fungicide treatments such as T_{10} and T_{11}. Furthermore, a comparison is further been made between T_{21} and T_{22}, wherein T_{21} is a pre-formulated composition with the use of UFR (Urea Formaldehyde Resin) and T_{22} is a pre-formulated composition without the use of UFR. From the table above, T_{21} shows higher reduction in disease incidence of dirty panicle in rice apart from synergistic effect as compared to T_{22}. Hence, the use of UFR as an anti-caking agent/ filler has shown to increase the suspensibility of the actives, enhanced the flowability of the formulation along with ease of application and hence improved efficacy.

<u>The Effect of UFR on the Suspensibility of the Actives in composition of present invention</u>

Table 9:

Composition			
Sr. No.	**Test**	**With Urea formaldehyde resin**	**Without urea formaldehyde resin**
1	Appearance	Free flowable off white to light brown colour powder	Off white to light brown colour powder with sticky lumps
2	Pymetrozine Content	30.37	30.35

3	Dinotefuran Content	10.23	10.26
4	Pyraclostrobin Content	20.16	20.19
5	Pymetrozine Suspensibility	87.65%	43.6%
6	Dinotefuran Suspensibility	99.78%	95.67%
7	Pyraclostrobin Suspensibility	78.20%	37.28%
8	Wet Sieve (Passes through 45 micron)	99.10%	54.32%

The addition of UFR to the composition of the present invention has shown to act as an anti-caking agent resulting in improved flowability and ease of application. Thus, addition of UFR to the composition of the present invention has shown to improve the efficacy resulting in increased yield and better control of BPH, Blast disease and Dirty panicle as is demonstrated in the tables above.

Phytotoxicity Studies:

Table 10:

Treatments	Dinotefuran	Pymetrozine	Pyraclostrobin	**5 Days after first spray**			
	g a.i./ha			Yellowing %	Stunting %	Epinasty %	Hyponasty %
T_1	25	0	0	0.00	0.00	0.00	0.00
T_2	37.5	0	0	0.00	0.00	0.00	0.00
T_3	50	0	0	0.00	0.00	0.00	0.00
T_4	0	60	0	0.00	0.00	0.00	0.00
T_5	0	112.5	0	0.00	0.00	0.00	0.00
T_6	0	175	0	0.00	0.00	0.00	0.00
T_7	0	0	50	0.00	0.00	0.00	0.00
T_8	0	0	75	0.00	0.00	0.00	0.00
T_9	0	0	100	0.00	0.00	0.00	0.00
T_{10}	Azoxystrobin 25% SC		1ml/l	0.00	0.00	0.00	0.00
T_{11}	Difenoconazole 13.9% + Propiconazole 13.9%- EC		0.75ml/l	0.00	0.00	0.00	0.00
T_{12}	37.5	112.5	0	0.00	0.00	0.00	0.00
T_{13}	37.5	0	75	0.00	0.00	0.00	0.00
T_{14}	0	112.5	75	0.00	0.00	0.00	0.00
T_{15}	25	60	50	0.00	0.00	0.00	0.00
T_{16}	25	112.5	75	0.00	0.00	0.00	0.00
T_{17}	25	175	100	0.00	0.00	0.00	0.00
T_{18}	37.5	60	50	0.00	0.00	0.00	0.00

T_{19}	37.5	112.5	75	0.00	0.00	0.00	0.00
T_{20}	37.5	175	100	0.00	0.00	0.00	0.00
T_{21}	37.5	112.5	75	0.00	0.00	0.00	0.00
T_{22}	37.5	112.5	75	0.00	0.00	0.00	0.00
T_{23}	50	60	50	0.00	0.00	0.00	0.00
T_{24}	50	112.5	75	0.00	0.00	0.00	0.00
T_{25}	50	175	100	0.00	0.00	0.00	0.00
T_{26}	0	0	0	0.00	0.00	0.00	0.00

Table 11:

Treatments	Dinotefuran	Pymetrozine	Pyraclostrobin	**5 Days after Second spray**			
	g a.i./ha			Yellowing %	Stunting %	Epinasty %	Hyponasty %
T_1	25	0	0	0.00	0.00	0.00	0.00
T_2	37.5	0	0	0.00	0.00	0.00	0.00
T_3	50	0	0	0.00	0.00	0.00	0.00
T_4	0	60	0	0.00	0.00	0.00	0.00
T_5	0	112.5	0	0.00	0.00	0.00	0.00
T_6	0	175	0	0.00	0.00	0.00	0.00
T_7	0	0	50	0.00	0.00	0.00	0.00
T_8	0	0	75	0.00	0.00	0.00	0.00
T_9	0	0	100	0.00	0.00	0.00	0.00
T_{10}	Azoxystrobin 25% SC		1ml/l	0.00	0.00	0.00	0.00
T_{11}	Difenoconazole 13.9% + Propiconazole 13.9%- EC		0.75ml/l	0.00	0.00	0.00	0.00
T_{12}	37.5	112.5	0	0.00	0.00	0.00	0.00
T_{13}	37.5	0	75	0.00	0.00	0.00	0.00
T_{14}	0	112.5	75	0.00	0.00	0.00	0.00
T_{15}	25	60	50	0.00	0.00	0.00	0.00
T_{16}	25	112.5	75	0.00	0.00	0.00	0.00
T_{17}	25	175	100	0.00	0.00	0.00	0.00
T_{18}	37.5	60	50	0.00	0.00	0.00	0.00
T_{19}	37.5	112.5	75	0.00	0.00	0.00	0.00
T_{20}	37.5	175	100	0.00	0.00	0.00	0.00
T_{21}	37.5	112.5	75	0.00	0.00	0.00	0.00
T_{22}	37.5	112.5	75	0.00	0.00	0.00	0.00
T_{23}	50	60	50	0.00	0.00	0.00	0.00

T_{24}	50	112.5	75	0.00	0.00	0.00	0.00
T_{25}	50	175	100	0.00	0.00	0.00	0.00
T_{26}	0	0	0	0.00	0.00	0.00	0.00

Table 12:

Treatments	Dinotefuran	Pymetrozine	Pyraclostrobin	**5 Days after Third spray**			
	g a.i./ha			Yellowing %	Stunting %	Epinasty %	Hyponasty %
T_1	25	0	0	0.00	0.00	0.00	0.00
T_2	37.5	0	0	0.00	0.00	0.00	0.00
T_3	50	0	0	0.00	0.00	0.00	0.00
T_4	0	60	0	0.00	0.00	0.00	0.00
T_5	0	112.5	0	0.00	0.00	0.00	0.00
T_6	0	175	0	0.00	0.00	0.00	0.00
T_7	0	0	50	0.00	0.00	0.00	0.00
T_8	0	0	75	0.00	0.00	0.00	0.00
T_9	0	0	100	0.00	0.00	0.00	0.00
T_{10}	Azoxystrobin 25% SC		1ml/l	0.00	0.00	0.00	0.00
T_{11}	Difenoconazole 13.9% + Propiconazole 13.9%- EC		0.75ml/l	0.00	0.00	0.00	0.00
T_{12}	37.5	112.5	0	0.00	0.00	0.00	0.00
T_{13}	37.5	0	75	0.00	0.00	0.00	0.00
T_{14}	0	112.5	75	0.00	0.00	0.00	0.00
T_{15}	25	60	50	0.00	0.00	0.00	0.00
T_{16}	25	112.5	75	0.00	0.00	0.00	0.00
T_{17}	25	175	100	0.00	0.00	0.00	0.00
T_{18}	37.5	60	50	0.00	0.00	0.00	0.00
T_{19}	37.5	112.5	75	0.00	0.00	0.00	0.00
T_{20}	37.5	175	100	0.00	0.00	0.00	0.00
T_{21}	37.5	112.5	75	0.00	0.00	0.00	0.00
T_{22}	37.5	112.5	75	0.00	0.00	0.00	0.00
T_{23}	50	60	50	0.00	0.00	0.00	0.00
T_{24}	50	112.5	75	0.00	0.00	0.00	0.00
T_{25}	50	175	100	0.00	0.00	0.00	0.00
T_{26}	0	0	0	0.00	0.00	0.00	0.00

From tables 10, 11 and 12, it is observed that no signs of phytotoxicity or any incidence of flower/fruit drop was observed on even at the bioactive amounts/dosage of the ternary composition of the present invention.

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 limitations with respect to the specific embodiments illustrated is intended or should be inferred. It should be understood that all such modifications and improvements have been deleted herein for the sake of conciseness and readability but are properly within the scope of the following claims.

Dated this 12th day of February, 2022

Dr. Shilpa Arora
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To
The Controller of Patents
The Patent Office
At New Delhi

WE CLAIM:

[CLAIM 1]. A synergistic pesticidal composition comprising:

a. Pymetrozine or its agrochemically acceptable salts; and
b. Dinotefuran or its agrochemically acceptable salts; and
c. Pyraclostrobin or its agrochemically acceptable salts and
one or more agrochemically acceptable excipients.

[CLAIM 2]. The pesticidal composition as claimed in claim 1 comprising:

a. Pymetrozine or its agrochemically acceptable salts in the range of 1-50% by weight of the composition; and
b. Dinotefuran or its agrochemically acceptable salts in the range of 1-16% by weight of the composition; and
c. Pyraclostrobin or its agrochemically acceptable salts in the range of 1-40% by weight of the composition; and
d. One or more of agrochemically acceptable excipients.

[CLAIM 3]. A synergistic pesticidal composition comprising:

a. Pymetrozine or its agrochemically acceptable salts in the range of 1-50% by weight of the composition; and
b. Dinotefuran or its agrochemically acceptable salts in the range of 1-16% by weight of the composition; and
c. Pyraclostrobin or its agrochemically acceptable salts in the range of 1-40% by weight; of the composition and
d. Thermoset resin comprising urea formaldehyde resin in the range of 0.1 to 5% by weight of the composition; and
e. One or more of agrochemically acceptable excipients.

[CLAIM 4]. The pesticidal composition as claimed in claim 1 to 3, wherein the agrochemically acceptable excipients are surfactant/dispersing agent, anti-freezing agent, anti-foaming agent, wetting agent, suspension aid, antimicrobial/anti-bacterial agent, thickening agent, quick coating agent or sticking agents/sticker, spreader, binders, anti-caking

agents, adjuvants, fillers, emulsifiers, colouring pigments, dyes, preservatives, buffering agent and solvent thereof.

[CLAIM 5]. The pesticidal composition as claimed in claim 4, wherein wetting agent is selected form the group consisting of sodium lauryl sulphate, sodium dioctylsulphosuccinate, Tristyrylphenol ethoxylate, non-ionic emulsifier, mixture of non-ionic surfactants & Alkoxylated Alcohol, Block copolymer, alkyl phenol ethoxylates, and aliphatic alcohol ethoxylates, their salts and mixtures thereof and is present in the range of 0.5-10% weight of the total composition.

[CLAIM 6]. The pesticidal composition as claimed in claim 4, wherein surfactants/dispersing agent is selected form the group consisting of sodium polycarboxylate, sodium lignosulphonates, calcium ligno sulphate, Polyarylphenyl ether phosphate, Tristyrylphenol Ethoxylate Amine salt of phosphate, tristyryl phenol ethylate, Acrylic Copolymer, Ethoxylated Tristryl phenol Sulphate, Naphthalene sulfonic acid, sodium salt condensate with formaldehyde, Ethoxylated oleyl cetyl alcohol, Polyalkelene glycol ether, naphthalene sulphonate formaldehyde condensates, tristyrylphenolethoxylate phosphate, ethoxylated fatty alcohol, alky ethoxylates, EO-PO block copolymers, and graft copolymers or mixtures thereof and present in the range of 0.5-10% weight of the total composition.

[CLAIM 7]. The pesticidal composition as claimed in claim 4, wherein antifoaming agent is selected form the group consisting of silicon emulsion based anti-foam agents, Siloxane polyalkyleneoxide, trisiloxane ethoxylates and mixtures thereof and present in the range of 0.01-1% weight of the total composition.

[CLAIM 8]. The pesticidal composition as claimed in claim 4, wherein anti-freezing agent is selected from the group consisting of glycols, monoethylene glycol, diethylene glycol, polyethylene glycols, methoxypolyethylene glycols, propylene glycol, polypropylene glycols, polybutylene glycols, glycerine, ethylene glycol and mixtures thereof and present in the range of 0.1-10% weight of the total composition.

[CLAIM 9]. The pesticidal composition as claimed in claim 4, wherein emulsifiers are selected from Castor oil ethoxylates, Calcium alkyl benzene sulfonate or mixtures thereof and present in the range of 0.1-10% weight of the total composition.

[CLAIM 10]. The pesticidal composition as claimed in claim 4, wherein thickening agent is selected from the group consisting of montmorillonite, bentonite clay, magnesium aluminium silicate, attapulgite, natural extracts of seeds and seaweeds, guar gum, locust bean gum, carrageenam, xanthan gum, alginates, polysaccharides, methyl cellulose, carboxymethyl cellulose (CMC), hydroxyethyl cellulose (HEC), bentonite clay, modified starches, polyacrylates, polyvinyl alcohol and polyethylene oxide or mixtures thereof and present in the range of 0.01-3% weight of the total composition

[CLAIM 11]. The pesticidal composition as claimed in claim 4, wherein antimicrobial/anti-bacterial agent is selected from the group consisting of propionic acid and its sodium salt; sorbic acid and its sodium or potassium salts; benzoic acid and its sodium salt, hydroxy benzoic acid sodium salt, methyl p-hydroxy benzoate, and biocide such as sodium benzoate, sodium o-phenyl phenate, 1,2-benzisothiazoline-3-one, 2-methyl-4-isothiazolin-3-one, 5-chloro-2-methyl-4-isothiazolin-3-one, potassium sorbate, parahydroxy benzoates, Benzisothiazolin-3-one, Formaldehyde or mixtures thereof and present in the range of 0.01-1% weight of the total formulation.

[CLAIM 12]. The pesticidal composition as claimed in claim 4, wherein filler is selected from the group consisting of Silicon Dioxide, bentonite clay, china clay, silica, kaolin, talc, starch and diatomaceous earth and mixtures thereof and present in the range of 0.1-5% weight of the total composition.

[CLAIM 13]. The pesticidal composition as claimed in claim 4, wherein the agrochemically acceptable adjuvants are selected from Silicone Ethoxylated Oil, Polyvinyl Pyrrolidone, Polyvinyl Alcohol, Blend of poly terpene resin or mixtures thereof and present in the range of 0.1-10% weight of the total composition.

[CLAIM 14]. The pesticidal composition as claimed in claim 4, wherein solvent is selected from glucitol, sorbitol, methanol, ethanol, n-propanol, dihydroxy alcohol alkyl ether, dihydroxy alcohol aryl ethers, 1-octanol and the like and present in the range of 10-30% weight of the total composition.

[CLAIM 15]. The pesticidal composition as claimed in claim 1 to 14, wherein the composition is in the form of Capsule suspension (CS), Dispersible concentrate (DC), Powder for dry seed treatment (DS), Emulsifiable concentrate (EC), Emulsion, water in oil (EO), Emulsion for foliar spray (ES), Emulsion, oil in water (EW), Flowable suspension/concentrate for

foliar spray (FS), Granule/ soil applied (GR), Controlled (Slow or Fast) release granules (CR), Jambo balls or bags (bags in water soluble pouch), Solution for foliar spray (LS), Micro-emulsion (ME), Oil dispersion (OD), Oil miscible flowable concentrate (oil miscible suspension (OF), Oil miscible liquid (OL), Suspension concentrate (flowable concentrate) (SC), Suspo-emulsion (SE), Water soluble granule (SG), Soluble concentrate (SL), Water soluble powder (SP), Water dispersible granule (WG or WDG), Wettable powder (WP), Water dispersible powder for slurry treatment (WS), A mixed formulation of CS and SC (ZC), mixed formulation of CS and SE (ZE), mixed formulation of CS and EW (ZW) or combination thereof.

[CLAIM 16]. The pesticidal composition as claimed in claim 1 to 15, wherein the composition is applied to a plant/crop by spraying, rubbing, atomizing, irrigating, evaporating, dusting, fogging, broadcasting, pouring, mist blowing, soil mixing, foaming, painting, spreading-on, drenching, dipping or drip irrigation.

[CLAIM 17]. A kit-of-parts comprising a plurality of components, wherein said plurality of components comprises:

a. Pymetrozine or its agrochemically acceptable salts in the range of 1-50% by weight of the composition; and
b. Dinotefuran or its agrochemically acceptable salts in the range of 1-16% by weight of the composition; and
c. Pyraclostrobin or its agrochemically acceptable salts in the range of 1-40% by weight composition and
d. one or more agrochemically acceptable excipients.

Dated this 12th day of February 2022



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ABSTRACT

SYNERGISTIC PESTICIDAL COMPOSITION COMPRISING PYMETROZINE, DINOTEFURAN AND SUITABLE STROBILURIN FUNGICIDE

The present invention relates to synergistic pesticidal composition for the control of plant pests. More particularly, the present invention relates to novel synergistic pesticidal composition comprising (A) Pymetrozine or its agrochemically acceptable salts; and (B) Dinotefuran or its agrochemically acceptable salts; and (C) Pyraclostrobin or its agrochemically acceptable salts. The present invention further relates to the said synergistic pesticidal composition comprising urea formaldehyde resin, with one or more agrochemically acceptable excipients. The present invention further relates to process of preparing said synergistic pesticidal composition.