

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property

Organization

International Bureau

(43) International Publication Date

26 January 2023 (26.01.2023)



(10) International Publication Number

WO 2023/002497 A1

(51) International Patent Classification:

A01N 43/88 (2006.01)

A01N 43/40 (2006.01)

A01N 47/40 (2006.01)

Published:

- with international search report (Art. 21(3))
- in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE

(21) International Application Number:

PCT/IN2022/050403

(22) International Filing Date:

29 April 2022 (29.04.2022)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

202111032780

21 July 2021 (21.07.2021)

IN

(71) Applicant: REDSON RETAIL & REALITY PVT. LTD.

[IN/IN]; A-88 Ashok Vihar Phase-I, Delhi, New Delhi 110052 (IN).

(72) Inventor: TRIPATHI, Dr. SAURABH; A-88 Ashok Vi-

har Phase-I Delhi, New Delhi 110052 (IN).

(74) Agent: SAHNEY, Garima; Saikrishna & Associates Ad-

vocates, B-140, Sector 51, Uttar Pradesh, Noida 201301 (IN).

(81) Designated States (unless otherwise indicated, for every

kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every

kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- of inventorship (Rule 4.17(iv))

(54) Title: SYNERGISTIC INSECTICIDAL COMPOSITION

(57) Abstract: The present invention provides a novel and synergistic insecticidal composition comprising Flonicamid, Diafenthiuron, soy protein, and potassium laurate, which can be formulated into various formulations and provides effective control against agricultural pests. The composition of the present invention is efficacious over the application of known pests.



WO 2023/002497 A1

SYNERGISTIC INSECTICIDAL COMPOSITION

FIELD OF INVENTION

The present invention relates to a synergistic insecticidal combination. In particular, the present invention provides an insecticidal combination comprising Flonicamid and Diafenthiuron useful against harmful pests in plants.

BACKGROUND OF THE INVENTION

The protection of crops and its produce from insect pest damage is essential in agriculture produce enhancement. Chemical control by the use of various chemicals and formulations is an important tool in agriculture for the prevention and control of pests. Insecticides of many types and groups are reported in the literature and a large number are in use, commercially, for control of pests in agriculture. Jassids (Hemiptera: Cicadellidae) are wedge shaped insects which walk diagonally and suck the cell sap from piercing type of mouth parts. While sucking the cell sap they inject toxins into the plant body which results yellowing and curling of leaves, dropping down of flowering and fruiting bodies. They secrete honey dew like sticky substance which create sooty mould on leaves and affect photosynthesis, growth and finally the yield of the crop.

The whitefly (*Trialeurodes vaporariorum*) is a sap-sucking insect that is often found in thick crowds on the undersides of leaves. When infested plants are disturbed, great clouds of the winged adults fly into the air. Both nymphs and adults damage plants by sucking the juices from new growth causing stunted growth, leaf yellowing and reduced yields. Plants become weak and susceptible to disease.

Like aphids, whiteflies secrete honeydew, so leaves maybe sticky or covered with a black sooty mold. They are also responsible for transmitting several plant viruses.

Flonicamid is a pyridine organic compound used as an insecticide on aphids, whiteflies and thrips. It disrupts insect chordotonal organs that can affect hearing, balance, movement to cause cessation of feeding, but the specific target site of the chemical is unknown.

Diafenthiuron is an aromatic ether that is 1,3-diisopropyl-5-phenoxybenzene in which the hydrogen atom at position 2 is substituted by a (tert-butylcarbamoithioyl)nitrilo group. An agricultural proinsecticide which is used to control mites, aphids and whitefly in cotton.

Soy protein extract contains various amino acids – Aspartic, Threonine, Serine, Glutamic acid, Proline, Glycine, Valine, Cystine, Isoleucine, Methionine, Tyrosine, Phenylalanine, Lysine, Histidine, Arginine, and the percentage of each amino acid may vary in the mixture. Soy protein Work as immunity enhancer on the health of crops.

Potassium salt formation provides water solubility for the fatty acids. The lipophilic carbon chains of the fatty acids penetrate and disrupt the lipoprotein matrix of the insects cellular membranes. The membrane disruption leads to evacuation of cellular contents, causing the cell to dehydrate and die. Fatty acid toxicity increases with increasing carbon chain length, typically peaking at C10, and then decreasing. Fatty acid chain lengths of 18 carbons with one or two double bonds (unsaturated) also display insecticidal activity.

There is however an ever-increasing need for novel broad spectrum pesticidal combinations that not only provide protection against the pests i.e., Insect but also lead to increased vigor and strength in the germinated crops. Further, historic use of single active ingredient compositions has resulted in development of resistance. With the onset of resistance in certain pests, there is a need in the art for novel combination of actives that decreases chances of resistance and improves the spectrum of disease and pest control while also providing increased crop vigor. The present invention aims at providing such a insecticidal composition comprising selected insecticidal combination for use in variety of agricultural crops particularly in tomato (*Solanum lycopersicum*) crop.

OBJECTS OF THE INVENTION

It is an object of the present invention to provide a novel and effective insecticidal combination demonstrating a high efficacy and a high selectivity.

It is another object of the present invention to provide a novel and effective insecticidal combination for controlling the harmful pests in plants.

It is another object of the present invention to provide a novel and effective insecticidal combination which is environmentally safe.

It is another object of the present invention to provide a method for controlling pests in plants.

Those skilled in the art will be aware that the invention described herein is subject to variations and modifications other than those specifically described. It is to be understood that the

invention described herein includes all such variations and modifications. The invention also includes all such steps, features, compositions and compounds referred to or indicated in this specification, individually or collectively, and all combinations of any two or more of said steps or features.

5 Unless otherwise specified, all terms used in disclosing the invention, including technical and scientific terms, have the meaning as commonly understood by one of the ordinary skill in the art to which the invention belongs, for further guidance term definitions may be included to better appreciate the teaching of the present invention guidance, term definitions may be included to better appreciate the teaching of the present invention.

10 As used herein, the term “plant” refers to any plant or part thereof including aerial and subterranean parts of the plant. It is contemplated that the parts of the plant may be for example, flowers, fruits or vegetables, shoots, leaves, needles, stalks, stems, fruiting bodies, seeds also roots and that parts of the plants may or may not be attached to the remainder of the plant

15 The term ‘disease control’ as used herein denotes control and prevention of a disease. Controlling effects include all deviation from natural development, for example: killing, retardation, decrease of the pests. The term ‘plants’ refers to all physical parts of a plant, including seeds, seedlings, saplings, roots, tubers, stems, stalks, foliage and fruits.

20 The term “locus” of a plant as used herein is intended to embrace the place on which the plants are growing, where the plant propagation materials of the plants are sown or where the plant propagation materials of the plants will be placed into the soil. The term “plant propagation material” is understood to denote generative parts of a plant, such as seeds, vegetative material such as cuttings or tubers, roots, fruits, tubers, bulbs, rhizomes and parts of plants, germinated plants and young plants which are to be transplanted after germination or after emergence
25 from the soil. These young plants may be protected before transplantation by a total or partial treatment by immersion.

It is to be understood that the singular forms “a,” “an,” and “the” include plural referents unless the context clearly dictates otherwise.

30 Features that are described and/or illustrated with respect to one embodiment may be used in the same way or in a similar way in one or more other embodiments and/or in combination with

or instead of the features of the other embodiments.

It should be emphasized that the term “comprises/comprising” when used in this specification is taken to specify the presence of stated features, steps or components but does not preclude the presence or addition of one or more other features, steps, components or groups thereof.

5 The term "insects" as used herein, includes all organisms in the class "Insecta"

The term "insecticidal" as used herein, refers to the ability of a pesticide to increase mortality or inhibit growth rate of insects.

10 The terms “weight percent”, “wt-%”, “percent by weight”, “% by weight” and variations thereof, as used herein, refer to the concentration of a substance as the weight of that substance divided by the total weight of the composition and multiplied by 100. It is understood that, as used here, “percent”, “%” and the like are intended to be synonymous with “weight percent”, “wt. %”, etc.

15 The present invention provides an insecticidal composition comprising a) Flonicamid; b) Diafenthiuron; c) soy protein; and d) potassium laurate, wherein Flonicamid is present in an amount ranging from 5-25% w/w, Diafenthiuron is present in an amount ranging from 25-50% w/w, soy protein is present in an amount ranging from 0.5-5% w/w, and potassium laurate is present in an amount ranging 0.5-10% w/w of the insecticidal composition.

In a preferred embodiment, Flonicamid is present in an amount of 11.7% w/w, Diafenthiuron is present in an amount of 36% w/w, soy protein is present in an amount of 2% w/w, and potassium laurate is present in an amount of 1% w/w of the insecticidal composition.

20 In an embodiment, the insecticidal composition of the present invention comprising the said actives exhibits synergistic effect in control of insects in agricultural crops, particularly in tomato crop.

25 In an embodiment, the insecticidal composition of the present invention further comprises at least one agriculturally acceptable excipient. In an embodiment, the at least one excipient is selected from the group consisting of at least a wetting agent, at least a dispersing agent, at least a defoaming agent, at least a binder, at least a suitable carrier, and combinations thereof. In a preferred embodiment, the insecticidal composition is in the form of a wettable granule formulation further comprising at least a wetting agent, at least a dispersing agent, at least a defoaming agent, at least a binder, and at least a suitable carrier.

In an embodiment, the at least a dispersing agent is selected from the group comprising sodium lignosulphonates, sodium naphthalene sulphonate- formaldehyde condensates, aliphatic alcohol ethoxylates, tristyrylphenol ethoxylates and esters, ethylene oxide/propylene oxide block copolymers. In a preferred embodiment, the at least a dispersing agent is sodium salt of naphthalene sulfonate condensate. The at least a dispersing agent weight concentration in said insecticidal composition is in the range of 3-8%w/w.

In an embodiment, the at least a wetting agent is selected from the group consisting of blend of naphthalene sulfonate, sodium salt, sodium laurel sulphate and combination thereof. In a preferred embodiment, the at least a wetting agent is sodium laurel sulphate. The at least wetting agent weight concentration in said insecticidal composition is in range of 1-5% w/w.

In an embodiment, the at least an anti-foaming is selected from the group consisting of silicone emulsions, long-chain alcohols, fatty acids, organic fluorine compounds, and combination thereof. The at least an anti-foaming agent weight concentration in said insecticidal composition is in the range of 0.2- 1%w/w.

In an embodiment, the at least a carrier is selected from the group consisting of dextrose, lactose, soluble starch, galactose, amyloextrin, ammonium sulfate, maltose, mannitol, sucrose, sorbitol, china clay, and combinations thereof.

In an embodiment, the insecticidal composition is formulated in a form selected from the group comprising water-soluble concentrates (SL), emulsifiable concentrates (EC), emulsions (EW), micro-emulsions (ME), Suspension concentrates (SC), oil-based suspension concentrates (OD), flowable suspensions (FS), water-dispersible granules (WG), water-soluble granules (SG), wettable powders (WP), water soluble powders (SP), granules (GR), encapsulated granules (CG), fine granules (FG), macrogranules (GG), dry flowables (DF), aqueous Suspo- emulsions (SE), capsule suspensions (CS) and microgranules (MG). In a preferred embodiment, the insecticidal composition is in the form of suspension concentrates (SC), water-dispersible granule (WDG) and wettable powder (WP).

In a more preferred embodiment, the insecticidal composition of the present invention is formulated in the form of water dispersible granule (WDG) comprising a wetting agent, a dispersing agent, a defoaming agent, a binder, and a suitable carrier.

The present invention also provides a process of preparing a insecticidal composition

comprising a) Flonicamid b) Diafenthiuron and c) Soyprotein and d) Potassium laurate, wherein flonicamid is present in an amount ranging from 5- 25% w/w, Diafenthiuron is present in an amount ranging from 25-50% w/w, soy protein is present in an amount ranging from 0.5-5%% w/w and potassium laurate is present in an amount ranging from 0.5 to 10 % of the insecticidal composition; as a water-dispersible formulation, said process comprising: (1) preparing a blend of Flonicamid, Diafenthiuron, Soy protein, potassium laurate , and suitable agriculturally acceptable excipients to obtain a first pre-mix; (2) grinding the first pre-mix by jet-milling to obtain a second pre-mix having mean particle size of less than 10 microns; (3) preparing a dough from the second pre-mix; (4) subjecting the second pre-mix to an extruder to obtain granules; and (5) drying the granules to obtain the water-dispersible formulation

EXAMPLES

The examples below are given solely for the purpose of illustration and are not to be construed as limitations of the present invention, as many variations thereof are possible without departing from the spirit and scope of the invention.

Example 1:

Preparation of insecticidal composition as Wettable dispersible granules (WDG) (CI-1136 WDG)

Table 1 below provides an insecticidal composition as described in the present specification, formulated as a Wettable Dispersible granules (WDG)

Table 1 Composition of the insecticidal composition (CI 1136 WDG)

| Ingredient | Percentage w/w |
|---|----------------|
| Flonicamid Technical (basis of 100%) | 11.70% m/m |
| Diafenthiuron technical (basis of 100%) | 36% m/m |
| Soy protein (100% basis) | 2.00% m/m |
| Potassium laurate | 1.00% m/m |
| Ammonium sulfate | 5.00% m/m |
| Lactose (Binder) | 0.50% |
| Dispersing agent (Sodium salt of naphthalene sulfonate condensate) | 5.00% m/m |

| | |
|--|---------------------|
| Wetting agent (Sodium laurel sulphate) | 2.00% m/m |
| Antifoam | 0.05% m/m |
| Corn starch | 10.00% m/m |
| China clay | QS to make % m/m |
| Total Quantity | 100.00% m/m |

Preparation method of WDG

The desired quantity of the active ingredients and excipients were weighed and mixed in a blender. The mixture was then subjected to grinding through a jet mill and grinding was carried out until a mean particle size of below 10 micron was obtained. After grinding, the homogenous mix was again put in a blender and a dough was prepared by dough mixer. After this step, granules were prepared by carrying the dough through an extruder. The granules thus prepared were then dried by using hot air or oven. The dried granules were then checked for quality parameters.

The WDG formulation as described above in Table 2(a) was tested for the below mentioned quality parameters as listed.

Table 1(b): Quality parameters of WDG formulation

| Parameter | Desired quality |
|---|---|
| Physical appearance | The material should consist of dry, free flowing granules, which should wet on mixing with water, thereby resulting into a solution suitable for spray. The material shall be free from visible extraneous matter |
| A.I. Content- | Flonicamid -11.7% m/m ((±5%) Diafenthiuron- 36% m/m (+5, -3%) Soya protein -2% m/m (+5, -3%) Potassium laurate - 1% m/m (±10%) |
| Wettability | Max. for 120 secs |
| Suspensibility | Min 60% |
| Acidity as H ₂ SO ₄ | 0.5% max |

Example 2: Field evaluation of the bio efficacy of the present insecticidal composition

The presently disclosed insecticidal trimix (coded as CI-1136 WG) was tested for its bioefficacy against Insects on Tomato crop and variety local and kharif season. The plants were aligned in a plot size of 50 sq. meter. The trial was laid out in a random block design consisting of a total of 8 treatments in three replications. The trial was conducted at a temp. of 31.5°C under 70% relative humidity, no winds and under optimum soil moisture conditions. The application of the insecticidal trimix was carried out at day of planting.

Measured quantity of the chemical was added to required volume of water @ 375 lit. /ha for spray. The spray tank was filled with ½ the quantity of clean required volume of water and then the measured chemical (according to the dose) was added followed by the rest half quantity of water. The solution was stirred well before application.

Table 2(a) below provides the treatment details of the Tomato crop in the trial experiment conducted. For purposes of convenience, the present composition has been represented by the code “CI-1163 WG”.

| Treat | Treatment details | Dose a.i./hectare | Dose/hectare |
|-------|------------------------|------------------------------|--------------|
| T-1 | Untreated | - | - |
| T-2 | CI-1136 WG (Sample -1) | 65.81 + 202.5 + 11.25 + 5.62 | 562.5 |
| T-3 | CI-1136 WG | 73.13 + 225 + 12.5 + 6.25 | 625 |
| T-4 | CI-1136 WG | 80.43 + 247.5 + 13.75 + 6.87 | 687.5 |
| T-5 | CI-1136 WG | 87.75 + 270 + 15 + 7.50 | 750 |
| T-6 | CI-1136 WG (Sample -2) | 65.81 + 202.5 | 562.5 |
| T-7 | CI-1136 WG | 73.13 + 225 | 625 |
| T-8 | CI-1136 WG | 80.43 + 247.5 | 687.5 |
| T-9 | CI-1136 WG | 87.75 + 270 | 750 |
| T-10 | Diafenthiuron 50 WP | 300 | 600 |
| T-11 | Flonicamid 50 WG | 75 | 150 |

Note: Sample-1 Flonicamid 11.7% + Diafenthiuron 36% + Soy Protein 2%+ Potassium laurate 1% WG.

Sample-2 Flonicamid 11.7% + Diafenthiuron 36% WG.

Table 2(b) below provides the treatment details of the Tomato crop in the trial experiment conducted.

For purposes of convenience, the present composition has been represented by the code “CI-1163 WG”.

5 Note: Sample-1 Flonicamid 11.7% + Diafenthiuron 36% + Soy Protein 2%+ Potassium laurate 1%

| Treat | Treatment details | Dose (gm) a.i. /ha | Dose (gm)/ha |
|-------|-----------------------|------------------------------|--------------|
| T-1 | Untreated | - | - |
| T-2 | CI-1136 WG (Sample-1) | 65.81 + 202.5 + 11.25 + 5.62 | 562.5 |
| T-3 | CI-1136 WG | 73.13 + 225 + 12.5 + 6.25 | 625 |
| T-4 | CI-1136 WG | 80.43 + 247.5 + 13.75 + 6.87 | 687.5 |
| T-5 | CI-1136 WG | 87.75 + 270 + 15 + 7.50 | 750 |
| T-6 | CI-2045 WG (Sample-2) | 112.5 + 253 + 28 + 16.9 | 562.5 |
| T-7 | CI-2045 WG | 125 + 281 + 31.3 + 18.8 | 625 |
| T-8 | CI-2045 WG | 137 + 30.9.6 + 34.4 + 20.6 | 687.5 |
| T-9 | CI-2045 WG | 150 + 338 + 37.5 + 22.5 | 750 |
| T-10 | CI-0745 WG (Sample-3) | 39.37 + 253 + 5.63 + 16.9 | 562.5 |
| T-11 | CI-0745 WG | 43.8 + 281.3 + 6.25 + 31.3 | 625 |
| T-12 | CI-0745 WG | 48.16 + 309.6 + 6.88 + 34.4 | 687.5 |
| T-13 | CI-0745 WG | 52.5 + 338 + 7.5 + 37.5 | 750 |
| T-14 | CI-0730 WG (Sample-4) | 39.37 + 168.8 + 5.63 + 16.9 | 562.5 |
| T-15 | CI-0730 WG | 43.8 + 187.5 + 6.25 + 31.3 | 625 |
| T-16 | CI-0730 WG | 48.16 + 206.3 + 6.88 + 34.4 | 687.5 |
| T-17 | CI-0730 WG | 52.5 + 225 + 7.5 + 37.5 | 750 |
| T-18 | CI-1136 WG (Sample-5) | 65.81 + 202.5 | 562.5 |
| T-19 | CI-1136 WG | 73.13 + 225 | 625 |
| T-20 | CI-1136 WG | 80.43 + 247.5 | 687.5 |
| T-21 | CI-1136 WG | 87.75 + 270 | 750 |
| T-22 | Diafenthiuron 50 WP | 300 | 600 |
| T-23 | Flonicamid 50 WG | 75 | 150 |

WG

Sample-2 Flonicamid 20% + Diafenthiuron 45% + Soy Protein 5%+ Potassium laurate 3% WG

Sample-3 Flonicamid 7 % + Diafenthiuron 45% + Soy Protein 1 %+ Potassium laurate 5% WG

Sample-4 Flonicamid 7 % + Diafenthiuron 30 % + Soy Protein 1 %+ Potassium laurate 5%

10 WG

Sample -5 Flonicamid 11.7% + Diafenthiuron 36%WG

EVALUATION OF BIO-EFFICACY IN TOMATO CROP

For white fly and Jassids:

The number of counts of live white fly and jassids from 10 tagged plants before application and at 1,3 ,5, 7,and 10 days after application also after 5 days interval period till reinfestation.

Percent control: The percent live population control was calculated based on no. of live sucking pest population.

$$\text{Percent Insect control} = \frac{C - T}{C} \times 100$$

Where C = No. of live white fly and jassids population in plant control.

T = No. of live white fly and jassids population in treated plants.

10 Table 2(c) Effect of insecticidal treatment against whitefly (Nymphs + Adults) leaves on tomato

| Treat | Treatment details | Dose (gm a.i.)/ha | 0 DAA | 3 DAA | % Control | 7 DAA | % Control | 10 DAA | % Control |
|-------|-----------------------|-----------------------|-------|-------|-----------|-------|-----------|--------|-----------|
| T-1 | Untreated | - | 9.5 | 11.5 | - | 14.4 | - | 16 | - |
| T-2 | CI-1136 WG (Sample-1) | 65.81 + 202.5 + 11.25 | 8.0 | 2.50 | 78.26 | 3.2 | 77.78 | 3.8 | 76.25 |
| T-3 | CI-1136 WG | 73.13 + 225 + 12.5 | 9.2 | 1.35 | 88.26 | 1.5 | 89.58 | 1.9 | 88.13 |
| T-4 | CI-1136 WG | 80.43 + 247.5 + 13.75 | 7.5 | 1.20 | 89.57 | 1.4 | 90.28 | 1.8 | 88.75 |
| T-5 | CI-1136 WG | 87.75 + 270 + 15 | 8.0 | 1.10 | 90.43 | 1.35 | 90.63 | 1.75 | 89.06 |
| T-6 | CI-1136 WG (Sample-2) | 65.81 + 202.5 | 8.5 | 3.30 | 71.30 | 4.25 | 70.49 | 4.4 | 72.50 |
| T-7 | CI-1136 WG | 73.13 + 225 | 7.5 | 1.70 | 85.22 | 2.2 | 84.72 | 3.2 | 80.00 |
| T-8 | CI-1136 WG | 80.43 + 247.5 | 8.5 | 1.60 | 86.09 | 2.1 | 85.42 | 3.1 | 80.63 |
| T-9 | CI-1136 WG | 87.75 + 270 | 8.0 | 1.40 | 87.83 | 2.1 | 85.42 | 3.05 | 80.94 |
| T-10 | Diafenthion 50 WP | 300 | 7.0 | 2.50 | 78.26 | 3.0 | 79.16 | 3.5 | 78.13 |
| T-11 | Flonicamid 50 WG | 75 | 8.3 | 4.50 | 60.87 | 5.2 | 63.88 | 5.5 | 65.63 |

Note: TM- Tank Mix, MKTS- Market standards

Table 2(d) Effect of insecticidal treatment against Jassids (Nymphs +Adults) leaves on tomato

| | Treatment details | Dose (gm a.i.) /ha | 0 DAA | 3 DAA | % Control | 7 DAA | % Control | 10 DAA | % Control |
|--|-----------------------|-----------------------|-------|-------|-----------|-------|-----------|--------|-----------|
| T-1 | Untreated | - | 7.5 | 7.5 | - | 8.8 | - | 9.0 | - |
| T-2 | CI-1136 WG (Sample-1) | 65.81 + 202.5 + 11.25 | 6.0 | 2.0 | 73.33 | 2.2 | 75.00 | 2.4 | 73.33 |
| T-3 | CI-1136 WG | 73.13 + 225 + 12.5 | 7.2 | 1.30 | 82.67 | 1.4 | 84.09 | 1.6 | 82.22 |
| T-4 | CI-1136 WG | 80.43 + 247.5 + 13.75 | 7.8 | 1.20 | 84.00 | 1.3 | 85.23 | 1.5 | 83.33 |
| T-5 | CI-1136 WG | 87.75 + 270 + 15 | 8.5 | 1.15 | 84.67 | 1.35 | 84.66 | 1.45 | 83.89 |
| T-6 | CI-1136 WG (Sample-2) | 65.81 + 202.5 | 6.5 | 2.50 | 66.67 | 2.8 | 68.18 | 3.0 | 66.67 |
| T-7 | CI-1136 WG | 73.13 + 225 | 5.5 | 1.40 | 81.33 | 1.8 | 79.55 | 1.9 | 78.89 |
| T-8 | CI-1136 WG | 80.43 + 247.5 | 5.8 | 1.35 | 82.00 | 1.6 | 81.82 | 1.8 | 80.00 |
| T-9 | CI-1136 WG | 87.75 + 270 | 5.7 | 1.25 | 83.33 | 1.55 | 82.39 | 1.75 | 80.56 |
| T-10 | Diafenthiuron 50 WP | 300 | 6.5 | 3.25 | 56.67 | 3.6 | 59.09 | 3.9 | 56.67 |
| T-11 | Flonicamid 50 WG | 75 | 6.2 | 1.25 | 83.33 | 1.7 | 80.68 | 1.9 | 78.89 |
| Note: TM- Tank Mix, MKTS- Market standards | | | | | | | | | |

Table2(e): Bio efficacy of various mixtures of Flonicamid + Diafenthuron against whitefly (Nymphs + Adults) / leaves on Tomato.

| | Treatment details | Dose (gm a.i.) /ha | 0 DAA | 3 DAA | % Control | 7 DAA | % Control | 10 DAA | % Control |
|-----|-----------------------|------------------------------|-------|-------|-----------|-------|-----------|--------|-----------|
| T-1 | Untreated | - | 9.5 | 11.5 | 0.0 | 14.4 | 0.0 | 16 | 0.0 |
| T-2 | CI-1136 WG (Sample-1) | 65.81 + 202.5 + 11.25 + 5.62 | 8.0 | 2.50 | 78.3 | 3.2 | 77.8 | 3.8 | 76.3 |
| T-3 | CI-1136 WG | 73.13 + 225 + 12.5 + 6.25 | 9.2 | 0.85 | 0.75 | 94.8 | 89.6 | 1.40 | 91.3 |
| T-4 | CI-1136 WG | 80.43 + 247.5 + 13.75 + 6.87 | 7.5 | 0.80 | 0.60 | 95.8 | 90.3 | 1.30 | 91.9 |
| T-5 | CI-1136 WG | 87.75 + 270 + 15 + 7.50 | 8.0 | 0.80 | 0.50 | 96.5 | 90.6 | 1.20 | 92.5 |
| T-6 | CI-2045 WG (Sample-2) | 112.5 + 253 + 28 + 16.9 | 9.1 | 1.20 | 89.6 | 1.80 | 87.5 | 1.50 | 90.6 |
| T-7 | CI-2045 WG | 125 + 281 + 31.3 + 18.8 | 8.5 | 0.85 | 92.6 | 0.75 | 94.8 | 1.40 | 91.3 |
| T-8 | CI-2045 WG | 137 + 30.9.6 + 34.4 | 8.2 | 0.80 | 93.0 | 0.60 | 95.8 | 1.30 | 91.9 |

| | Treatment details | Dose (gm a.i.) /ha | 0 DAA | 3 DAA | % Control | 7 DAA | % Control | 10 DAA | % Control |
|--|-----------------------|-----------------------------|-------|-------|-----------|-------|-----------|--------|-----------|
| | | + 20.6 | | | | | | | |
| T-9 | CI-2045 WG | 150 + 338 + 37.5 + 22.5 | 7.8 | 0.80 | 93.0 | 0.50 | 96.5 | 1.20 | 92.5 |
| T-10 | CI-0745 WG (Sample-3) | 39.37 + 253 + 5.63 + 16.9 | 6.5 | 0.95 | 91.7 | 0.80 | 94.4 | 2.50 | 84.4 |
| T-11 | CI-0745 WG | 43.8 + 281.3 + 6.25 + 31.3 | 8.2 | 0.80 | 93.0 | 0.70 | 95.1 | 2.20 | 86.3 |
| T-12 | CI-0745 WG | 48.16 + 309.6 + 6.88 + 34.4 | 7.5 | 0.75 | 93.5 | 0.65 | 95.5 | 1.80 | 88.8 |
| T-13 | CI-0745 WG | 52.5 + 338 + 7.5 + 37.5 | 7.0 | 0.75 | 93.5 | 0.60 | 95.8 | 1.60 | 90.0 |
| T-14 | CI-0730 WG (Sample-4) | 39.37 + 168.8 + 5.63 + 16.9 | 8.0 | 4.20 | 63.5 | 5.50 | 61.8 | 5.70 | 64.4 |
| T-15 | CI-0730 WG | 43.8 + 187.5 + 6.25 + 31.3 | 10.0 | 4.00 | 65.2 | 4.50 | 68.8 | 4.70 | 70.6 |
| T-16 | CI-0730 WG | 48.16 + 206.3 + 6.88 + 34.4 | 8.5 | 3.80 | 67.0 | 4.30 | 70.1 | 4.60 | 71.3 |
| T-17 | CI-0730 WG | 52.5 + 225 + 7.5 + 37.5 | 7.6 | 3.60 | 68.7 | 4.20 | 70.8 | 4.65 | 70.9 |
| T-18 | CI-1136 WG (Sample-5) | 65.81 + 202.5 | 8.5 | 3.30 | 71.3 | 4.25 | 70.5 | 4.4 | 72.5 |
| T-19 | CI-1136 WG | 73.13 + 225 | 7.5 | 1.70 | 85.2 | 2.2 | 84.7 | 3.2 | 80.0 |
| T-20 | CI-1136 WG | 80.43 + 247.5 | 8.5 | 1.60 | 86.1 | 2.1 | 85.4 | 3.1 | 80.6 |
| T-21 | CI-1136 WG | 87.75 + 270 | 8.0 | 1.40 | 87.8 | 2.1 | 85.4 | 3.05 | 80.9 |
| T-22 | Diafenthiuron 50 WP | 300 | 7.0 | 2.50 | 78.3 | 3.0 | 79.2 | 3.5 | 78.1 |
| T-23 | Flonicamid 50 WG | 75 | 8.3 | 4.50 | 60.9 | 5.2 | 63.9 | 5.5 | 65.6 |
| Note: TM- Tank Mix, MKTS- Market standards | | | | | | | | | |

Table 2(f): Bio efficacy of various mixtures of Flonicamid + Diafenthiuron against Jassids (Nymphs + Adults) / leaves on Tomato.

| Treat. | Treatment details | Dose (gm a.i.) /ha | 0 DAA | 3 DAA | % Control | 7 DAA | % Control | 10 DAA | % Control |
|--------|-----------------------|------------------------------|-------|-------|-----------|-------|-----------|--------|-----------|
| T-1 | Untreated | - | 7.5 | 7.5 | 0.0 | 8.8 | 0.0 | 10.0 | 0.0 |
| T-2 | CI-1136 WG (Sample-1) | 65.81 + 202.5 + 11.25 + 5.62 | 6.0 | 2.0 | 73.3 | 2.2 | 75.0 | 2.4 | 76.0 |
| T-3 | CI-1136 WG | 73.13 + 225 + 12.5 + 6.25 | 7.2 | 0.90 | 88.0 | 1.00 | 88.6 | 1.6 | 84.0 |
| T-4 | CI-1136 WG | 80.43 + 247.5 + 13.75 + 6.87 | 7.8 | 0.75 | 90.0 | 0.85 | 90.3 | 1.80 | 82.0 |
| T-5 | CI-1136 WG | 87.75 + 270 + 15 + 7.50 | 8.5 | 0.75 | 90.0 | 0.85 | 90.3 | 1.90 | 81.0 |

| | | | | | | | | | |
|--|-----------------------|-----------------------------|------|------|------|------|------|------|------|
| T-6 | CI-2045 WG (Sample-2) | 112.5 + 253 + 28 + 16.9 | 9.5 | 1.10 | 85.3 | 1.20 | 86.4 | 2.90 | 71.0 |
| T-7 | CI-2045 WG | 125 + 281 + 31.3 + 18.8 | 8.0 | 0.90 | 88.0 | 1.00 | 88.6 | 2.20 | 78.0 |
| T-8 | CI-2045 WG | 137 + 30.9.6 + 34.4 + 20.6 | 7.0 | 0.85 | 88.7 | 0.95 | 89.2 | 1.90 | 81.0 |
| T-9 | CI-2045 WG | 150 + 338 + 37.5 + 22.5 | 7.5 | 0.75 | 90.0 | 0.85 | 90.3 | 1.80 | 82.0 |
| T-10 | CI-0745 WG (Sample-3) | 39.37 + 253 + 5.63 + 16.9 | 9.0 | 4.25 | 43.3 | 4.25 | 51.7 | 4.80 | 52.0 |
| T-11 | CI-0745 WG | 43.8 + 281.3 + 6.25 + 31.3 | 11.0 | 4.20 | 44.0 | 4.20 | 52.3 | 4.45 | 55.5 |
| T-12 | CI-0745 WG | 48.16 + 309.6 + 6.88 + 34.4 | 6.5 | 4.10 | 45.3 | 4.10 | 53.4 | 4.30 | 57.0 |
| T-13 | CI-0745 WG | 52.5 + 338 + 7.5 + 37.5 | 7.8 | 4.00 | 46.7 | 4.00 | 54.5 | 4.10 | 59.0 |
| T-14 | CI-0730 WG (Sample-4) | 39.37 + 168.8 + 5.63 + 16.9 | 7.0 | 3.50 | 53.3 | 3.50 | 60.2 | 3.90 | 61.0 |
| T-15 | CI-0730 WG | 43.8 + 187.5 + 6.25 + 31.3 | 8.0 | 3.20 | 57.3 | 3.20 | 63.6 | 3.60 | 64.0 |
| T-16 | CI-0730 WG | 48.16 + 206.3 + 6.88 + 34.4 | 9.0 | 3.00 | 60.0 | 3.00 | 65.9 | 3.20 | 68.0 |
| T-17 | CI-0730 WG | 52.5 + 225 + 7.5 + 37.5 | 6.5 | 2.80 | 62.7 | 2.80 | 68.2 | 3.00 | 70.0 |
| T-18 | CI-1136 WG (Sample-5) | 65.81 + 202.5 | 6.5 | 2.50 | 66.7 | 2.8 | 68.2 | 3.0 | 70.0 |
| T-19 | CI-1136 WG | 73.13 + 225 | 5.5 | 1.40 | 81.3 | 1.8 | 79.5 | 1.9 | 81.0 |
| T-20 | CI-1136 WG | 80.43 + 247.5 | 5.8 | 1.35 | 82.0 | 1.6 | 81.8 | 1.8 | 82.0 |
| T-21 | CI-1136 WG | 87.75 + 270 | 5.7 | 1.25 | 83.3 | 1.55 | 82.4 | 1.75 | 82.5 |
| T-22 | Diafenthiur on 50 WP | 300 | 6.5 | 3.25 | 56.7 | 3.6 | 59.1 | 3.9 | 61.0 |
| T-23 | Flonicamid 50 WG | 75 | 6.2 | 1.25 | 83.3 | 1.7 | 80.7 | 1.9 | 81.0 |
| Note: TM- Tank Mix, MKTS- Market standards | | | | | | | | | |

Table 2(g): Plant yields (Kg/Plants) Average 10 plants/plots (Average 3 pickings)

| Treat | Treatment details | Dose gm a.i./ha | No. of fruits (Per plants) | % Increase | plant yields (Kg/plants) | % Increase |
|-------|-----------------------|-----------------------|----------------------------|------------|--------------------------|------------|
| T-1 | Untreated | - | 26 | - | 1.60 | - |
| T-2 | CI-1136 WG(Sample-1) | 65.81 + 202.5 + 11.25 | 29 | 11.54 | 2.10 | 31.25 |
| T-3 | CI-1136 WG | 73.13 + 225 + 12.5 | 30 | 15.38 | 2.40 | 50.00 |
| T-4 | CI-1136 WG | 80.43 + 247.5 + 13.75 | 30 | 15.38 | 2.42 | 51.25 |
| T-5 | CI-1136 WG | 87.75 + 270 + 15 | 28 | 7.69 | 2.47 | 54.38 |
| T-6 | CI-1136 WG (Sample-2) | 65.81 + 202.5 | 27 | 3.85 | 1.89 | 18.13 |
| T-7 | CI-1136 WG | 73.13 + 225 | 28 | 7.69 | 1.95 | 21.88 |
| T-8 | CI-1136 WG | 80.43 + 247.5 | 29 | 11.54 | 2.00 | 25.00 |

| | | | | | | |
|------|---------------------|-------------|------|-------|------|-------|
| T-9 | CI-1136 WG | 87.75 + 270 | 29 | 11.54 | 2.05 | 28.13 |
| T-10 | Diafenthiuron 50 WP | 300 | 27 | 3.85 | 1.85 | 15.63 |
| T-11 | Flonicamid 50 WG | 75 | 27.5 | 5.77 | 1.90 | 18.75 |

Table 2g: Plant yields (Kg/Plants) Average 10 plants/plots (Average 3 pickings)

| Treat. | Treatment details | Dose gm a.i./ha | No. of fruits (Per plants) | % Increase | Plant yields (Kg/plants) | % Increase |
|--------|-----------------------|------------------------------|----------------------------|------------|--------------------------|------------|
| T-1 | Untreated | - | 26.00 | 0.0 | 1.60 | 0.0 |
| T-2 | CI-1136 WG (Sample-1) | 65.81 + 202.5 + 11.25 + 5.62 | 29 | 11.53 | 1.95 | 21.9 |
| T-3 | CI-1136 WG | 73.13 + 225 + 12.5 + 6.25 | 29.95 | 15.2 | 2.00 | 25.0 |
| T-4 | CI-1136 WG | 80.43 + 247.5 + 13.75 + 6.87 | 30 | 15.4 | 2.05 | 28.1 |
| T-5 | CI-1136 WG | 87.75 + 270 + 15 + 7.50 | 30.15 | 16.0 | 2.10 | 31.3 |
| T-6 | CI-2045 WG (Sample-2) | 112.5 + 253 + 28 + 16.9 | 29.12 | 12.0 | 2.01 | 25.6 |
| T-7 | CI-2045 WG | 125 + 281 + 31.3 + 18.8 | 29.25 | 12.5 | 2.04 | 27.5 |
| T-8 | CI-2045 WG | 137 + 30.9.6 + 34.4 + 20.6 | 29.3 | 12.7 | 2.11 | 31.9 |
| T-9 | CI-2045 WG | 150 + 338 + 37.5 + 22.5 | 29.4 | 13.1 | 2.20 | 37.5 |
| T-10 | CI-0745 WG (Sample-3) | 39.37 + 253 + 5.63 + 16.9 | 29.5 | 13.5 | 2.08 | 30.0 |
| T-11 | CI-0745 WG | 43.8 + 281.3 + 6.25 + 31.3 | 29.55 | 13.7 | 2.16 | 35.0 |
| T-12 | CI-0745 WG | 48.16 + 309.6 + 6.88 + 34.4 | 29.65 | 14.0 | 2.20 | 37.5 |
| T-13 | CI-0745 WG | 52.5 + 338 + 7.5 + 37.5 | 29.7 | 14.2 | 2.24 | 40.0 |
| T-14 | CI-0730 WG (Sample-4) | 39.37 + 168.8 + 5.63 + 16.9 | 29.32 | 12.8 | 2.07 | 29.4 |
| T-15 | CI-0730 WG | 43.8 + 187.5 + 6.25 + 31.3 | 29.38 | 13.0 | 2.11 | 31.9 |
| T-16 | CI-0730 WG | 48.16 + 206.3 + 6.88 + 34.4 | 29.45 | 13.3 | 2.16 | 35.0 |
| T-17 | CI-0730 WG | 52.5 + 225 + 7.5 + 37.5 | 29.5 | 13.5 | 2.23 | 39.4 |
| T-18 | CI-1136 WG (Sample-5) | 65.81 + 202.5 | 27.01 | 3.90 | 1.89 | 18.1 |
| T-19 | CI-1136 WG | 73.13 + 225 | 28 | 7.70 | 1.95 | 21.9 |

| | | | | | | |
|------|---------------------|---------------|------|-------|------|------|
| T-20 | CI-1136 WG | 80.43 + 247.5 | 29 | 11.53 | 2.00 | 25.0 |
| T-21 | CI-1136 WG | 87.75 + 270 | 29 | 11.53 | 2.05 | 28.1 |
| T-22 | Diafenthiuron 50 WP | 300 | 26.5 | 1.92 | 1.85 | 15.6 |
| T-23 | Flonicamid 50 WG | 75 | 27.2 | 4.61 | 1.90 | 18.8 |

Example 3: Evaluation of phytotoxicity of the present insecticidal composition

Visual observations were recorded at 3, 7 and 10 days after application (DAA) of testing products. The parameters observed were leaf injury on tip/surface, necrosis, vein clearing, epinasty, hyponasty and wilting. The score scale (1-10) followed for leaf injury on tips/surface is given below in Table ...

Phytotoxicity symptoms scoring and rating for leaf injury on tip/surface

| Leaf injury on tips/surface | Rating |
|-----------------------------|--------|
| 0% | 0 |
| 1-10% | 1 |
| 11-20% | 2 |
| 21-30% | 3 |
| 31-40% | 4 |
| 41-50% | 5 |
| 51-60% | 6 |
| 61-70% | 7 |
| 71-80% | 8 |
| 81-90% | 9 |
| 91-100% | 10 |

Table 3: Phytotoxicity of CI-1136 WG on Tomato crop

| Treat | Treatment details | Dose gm a.i./ha | Dose/ha | 12 hrs | 1 DAA | 3 DAA | 5 DAA | 7 DAA | 10 DAA |
|-------|-----------------------|-----------------|---------|--------|-------|-------|-------|-------|--------|
| T-1 | Untreated | - | - | 0 | 0 | 0 | 0 | 0 | 0 |
| T-2 | CI-1136 WG (Sample-1) | 65.81+ 11.25 | 202.+ | 600 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | |
|------|-----------------------|-----------------------|-----------|---|---|---|---|---|---|
| T-3 | CI-1136 WG | 73.13 + 225 + 12.5 | 700 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-4 | CI-1136 WG | 80.43 + 247.5 + 13.75 | 750 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-5 | CI-1136 WG | 87.75 + 270 + 15 | 800 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-6 | CI-1136 WG (Sample-2) | 65.81 + 202.5 | 900 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-7 | CI-1136 WG | 73.13 + 225 | 150 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-8 | CI-1136 WG | 80.43 + 247.5 | 375 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-9 | CI-1136 WG | 87.75 + 270 | 750 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-10 | Diafenthiur on 50 WP | 300 | 150 + 375 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-11 | Flonicamid 50 WG | 75 | 375 + 750 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 4: Phytotoxicity of various mixtures of Flonicamid + Diafenthiuron on Tomato

| Treat | Treatment details | Dose gm a.i./ha | 12 hrs | 1 DAA | 3 DAA | 5 DAA | 7 DAA | 10 DAA |
|-------|-----------------------|------------------------------|--------|-------|-------|-------|-------|--------|
| T-1 | Untreated | - | 0 | 0 | 0 | 0 | 0 | 0 |
| T-2 | CI-1136 WG (Sample-1) | 65.81 + 202.5 + 11.25 + 5.62 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-3 | CI-1136 WG | 73.13 + 225 + 12.5 + 6.25 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-4 | CI-1136 WG | 80.43 + 247.5 + 13.75 + 6.87 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-5 | CI-1136 WG | 87.75 + 270 + 15 + 7.50 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-6 | CI-2045 WG (Sample-2) | 112.5 + 253 + 28 + 16.9 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-7 | CI-2045 WG | 125 + 281 + 31.3 + 18.8 | 0 | 3 | 3 | 3 | 1 | 0 |
| T-8 | CI-2045 WG | 137 + 309.6 + 34.4 + 20.6 | 0 | 5 | 3 | 3 | 3 | 1 |
| T-9 | CI-2045 WG | 150 + 338 + 37.5 + 22.5 | 0 | 5 | 3 | 3 | 3 | 1 |
| T-10 | CI-0745 WG | 39.37 + 253 + 5.63 + | 0 | 0 | 0 | 0 | 0 | 0 |

| Treat | Treatment details | Dose gm a.i./ha | 12 hrs | 1 DAA | 3 DAA | 5 DAA | 7 DAA | 10 DAA |
|-------|-----------------------|-----------------------------|--------|-------|-------|-------|-------|--------|
| | (Sample-3) | 16.9 | | | | | | |
| T-11 | CI-0745 WG | 43.8 + 281.3 + 6.25 + 31.3 | 0 | 3 | 3 | 3 | 1 | 0 |
| T-12 | CI-0745 WG | 48.16 + 309.6 + 6.88 + 34.4 | 0 | 5 | 3 | 3 | 3 | 1 |
| T-13 | CI-0745 WG | 52.5 + 338 + 7.5 + 37.5 | 0 | 5 | 3 | 3 | 3 | 1 |
| T-14 | CI-0730 WG (Sample-4) | 39.37 + 168.8 + 5.63 + 16.9 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-15 | CI-0730 WG | 43.8 + 187.5 + 6.25 + 31.3 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-16 | CI-0730 WG | 48.16 + 206.3 + 6.88 + 34.4 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-17 | CI-0730 WG | 52.5 + 225 + 7.5 + 37.5 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-18 | CI-1136 WG (Sample-5) | 65.81 + 202.5 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-19 | CI-1136 WG | 73.13 + 225 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-20 | CI-1136 WG | 80.43 + 247.5 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-21 | CI-1136 WG | 87.75 + 270 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-22 | Diafenthiuron 50 WP | 300 | 0 | 0 | 0 | 0 | 0 | 0 |
| T-23 | Flonicamid 50 WG | 75 | 0 | 0 | 0 | 0 | 0 | 0 |

Phytotoxicity studies:

In table 4 sample 1, 2, 3, 4 observed phytotoxic symptoms in tomato crop. However in Sample 5 showed no phytotoxic symptoms

5 Results and conclusion:

As shown in the above data, application of the novel insecticidal composition coded as CI-1136 WG (Flonicamid 11.7% + Difenthiuron 36% + Soy protein 2% + potassium laurate 1%) at a dosage range of 73.13 + 225 + 12.5 gm + 6.25 a.i./hectare to 80.43 + 247.5 + 13.75 gm + 6.87 gm a.i./hectare was shown to provide effective control of both nymphs and adults of white fly and jassids and no phytotoxicity were observed in tomato crop.

10

I/We Claim:

- 1) An insecticidal composition comprising a) Flonicamid; b) Diafenthiuron; c) Soy protein; and d) potassium laurate, wherein Flonicamid is present in an amount ranging from 5-25% w/w, Diafenthiuron is present in an amount ranging from 25-50% w/w, soy protein is present in an amount ranging from 0.5-5% w/w, and potassium laurate is present in an amount ranging from 0.5-10% w/w.
- 2) The insecticidal composition as claimed in claim 1, further comprising at least one agriculturally acceptable excipient.
- 3) The insecticidal composition as claimed in claim 1, wherein said insecticidal composition is formulated in a form selected from the group consisting of water-soluble concentrates (SL), emulsifiable concentrates (EC), emulsions (EW), micro-emulsions (ME), Suspension concentrates (SC), oil-based suspension concentrates (OD), flowable suspensions (FS), water-dispersible granules (WG), water-soluble granules (SG), wettable powders (WP), water soluble powders (SP), dry flowables (DF), granules (GR), encapsulated granules (CG), fine granules (FG), macrogranules (GG), aqueous suspoemulsions (SE), capsule suspensions (CS) and microgranules (MG).
- 4) The insecticidal composition as claimed in claim 3, wherein said insecticidal composition is in the form of wettable granule (WG) formulation.
- 5) The insecticidal composition as claimed in claim 4, wherein said insecticidal composition further comprises at least a wetting agent, at least a dispersing agent, at least a defoaming agent, at least a binding agent, and at least a carrier.
- 6) The insecticidal composition as claimed in claim 5, wherein said at least a dispersing agent is selected from the group consisting of sodium lignosulphonates, sodium naphthalene sulphonate- formaldehyde condensates, aliphatic alcohol ethoxylates, tristerylphenol ethoxylates and esters, ethylene oxide/propylene oxide block copolymers, and combinations thereof; and wherein said at least a dispersing agent is present in an amount ranging from 3-8% w/w of the insecticidal composition.
- 7) The insecticidal composition as claimed in claim 5, wherein said at least a wetting agent is selected from the group consisting of blend of alkyl naphthalene sulfonate, sodium salt,

sodium laurel sulphate, and combinations thereof; and wherein said wetting agent is present in an amount ranging from 1-5% w/w of the insecticidal composition.

8) The insecticidal composition as claimed in claim 5, wherein said at least an defoaming agent is selected from the group consisting of silicone emulsions, long-chain alcohols, fatty acids, organic fluorine compounds, and combinations thereof; and wherein said at least a defoaming agent is present in an amount ranging from 0.2-1% w/w of the insecticidal composition.

9) The insecticidal composition as claimed in claim 5, wherein said an at least a carrier is selected from the group consisting of dextrose, lactose, soluble starch, galactose, amyloextrin, ammonium sulfate, maltose, mannitol, sucrose, sorbitol, china clay and combinations thereof, and wherein said a carrier is present in an amount ranging from 0.01-10%w/w of the insecticidal composition.

10) The insecticidal composition as claimed in claim 1, wherein Flonicamid is present in an amount of 11.7% w/w, Diafenthiuron is present in an amount of 36% w/w, soy protein is present in an amount of 2% w/w and potassium laurate is present in an amount of 1% w/w of the insecticidal composition.

11) A process for preparing an insecticidal composition as claimed in claim 1 as a water-dispersible formulation, said process comprising:

- a) preparing a blend of Flonicamid, Diafenthiuron, soy-protein, potassium laurate, and suitable agriculturally acceptable excipients to obtain a first pre-mix;
- b) grinding the first pre-mix by jet-milling to obtain a second pre-mix having mean particle size of less than 10 microns;
- c) preparing a dough from the second pre-mix;
- d) subjecting the second pre-mix to an extruder to obtain granules; and
- e) drying the granules to obtain the water-dispersible formulation.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2022/050403

A. CLASSIFICATION OF SUBJECT MATTER

A01N43/88, A01N47/40, A01N43/40 Version=2022.01

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A01N

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

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

PatSeer, IPO Internal Database

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|---|-----------------------|
| Y | CN103766363A (GUANGDONG ZHONGXUN AGRI SCIENCE CORP, 07 MAY, 2014) Abstract, claims 1-2, embodiments 1-6, Tables 1-2 | 1-11 |
| Y | WO2002037964A1 (SYNGENTA PARTICIPATIONS AG, 08 NOVEMBER, 2001) Claim 1, Example F5, page 12 para 3 | 1-11 |
| Y | Dubey, S et. al. "Studies on Efficacy of Eco-Friendly Insecticide Obtained from Plant Products Against Aphids Found on Tomato Plant" In: Khemani, L., Srivastava, M., Srivastava, S. (eds) Chemistry of Phytopotentials: Health, Energy and Environmental Perspectives, 2012, Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-23394-4_56 . Abstract | 1-11 |
| Y | Amirkhani, M et.al. "Investigation of Soy Protein-based Biostimulant Seed Coating for Broccoli Seedling and Plant Growth Enhancement", HortScience, 2016, 51(9), 1121-1126, | 1-11 |



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"D" document cited by the applicant in the international application

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

14-07-2022

Date of mailing of the international search report

14-07-2022

Name and mailing address of the ISA/

Indian Patent Office

Plot No.32, Sector 14, Dwarka, New Delhi-110075

Facsimile No.

Authorized officer

Ravi S

Telephone No. +91-1125300200

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IN2022/050403

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| | doi:10.21273/HORTSCI10913-16. Abstract | |

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IN2022/050403

| Citation | Pub.Date | Family | Pub.Date |
|------------------|------------|------------------|------------|
| WO 2002037964 A1 | 08-11-2001 | AU 2002214045 A1 | 21-05-2002 |