Whitefly (*Bemisia tabaci*) and aphid (*Aphis gossypii*) management on lady’sfinger (*Abelmoschus esculentus* L.) by using safe insecticides

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Abstract

Lady’sfinger *Abelmoschus esculentus* (L.) Moench is an annual kharif vegetable crop belongs to the family Malvaceae. This crop is cultivated in various parts of tropical and sub-tropical areas of the world. In West Bengal, India it is cultivated in a commercial scale but its pest complex is very high which limit its production. Contribution of whitefly (*Bemisia tabaci*) and aphid (*Aphis gossypii*) as sucking pest in this case is of great importance. Three doses of dinotefuron 20 SG @ 20, 30 and 40 a.i. g /ha) two doses of imidacloprid 70 WG @ 21 and 24.5 a.i. g /ha) and two doses of fipronil 5% SC @ 25 and 37.5 a.i. g /ha) were applied to control whitefly and aphid. From overall observation it was revealed that dinotefuron 20 SG @ 40 a.i./ha, fipronil 5% SC @ 37.5 g a.i./ha imidacloprid 70 WG @ 24.5 g a.i./ha provided best suppression of whitefly (83.46 %, 82.59 % and 68.94 % white fly population suppression respectively) and aphid (79.02 %, 76.96 % and 70.46 % population suppression respectively). These insecticides may be recommended for farmers use to control sucking pest.

Keywords: dinotefuran, fipronil, imidacloprid, persistency, phytotoxicity

1. Introduction

Lady’sfinger *Abelmoschus esculentus* (L.) Moench is an annual kharif vegetable crop belongs to the family Malvaceae and grown in various parts of tropical and sub-tropical areas of the world. In the sub-Himalayan region of north east India lady’sfingers is cultivated at a commercial scale but insect pest damage constitutes a limiting factor in successful production (Ghosh, 2013 [7], Ghosh, et al., 2013 [18]). Lady’sfnger is infested by a large number of sucking pest viz. jassid, thrips, mites, whitefly, aphid etc. Damage caused by whitefly may be directly through phloem feeding, or indirectly by transmission of viruses (Mehta et al., 1994 [20]). White fly was found active throughout the year and highest population of whitefly infesting tomato was during 11th - 18th standard week with peak population (0.47/leaf). They also reported that population of white fly on tomato showed non-significant negative correlation (p=0.05) with temperature and weekly total rainfall and significant negative correlation with relative humidity. Ghosh (2014) [8] reported that the *Bemisia tabaci* on lady, sfinger was active throughout the growing period with a peak population (3.98 white fly /leaf), Thakoor et al. (2020) [26] reported that highest population of whitefly on lady’sfnger was recorded on 7th standard meteorological week and the population showed positive correlation with temperature maximum and negative correlation with relative humidity. Severe aphid infestations cause stunting, crinkling and curling of leaves, delayed flowering, resulting in yield reduction. Ghosh et al. (2004 [14]) reported that *Aphis gossypii* was found active throughout the year with highest population in August and positively correlated with average temperature, relative humidity and rainfall. For the effective control of whitefly, aphid in vegetable field farmers usually use a lot of pesticides chemicals indiscriminately and frequently (Ghosh, 1999 [5]). Ghosh et al. (2009) [15] reported that imidacloprid was found most effective (91.15 %) against aphid three days after treatment. Imidacloprid was the most effective in providing more than 80% aphid suppression followed by azadirachtin (Ghosh et al., 2016) [17], Ghosh (2017) [11] reported that acetamiprid was found highly efficacious against aphid and found to suppress 85.11% aphids
closely followed by neem + Spilanthes (73.29%). It is reported that maximum reduction of whitefly population was found in imidacloprid treated plot followed by spinosad (Ghosh, 2012) [6]. Das et al. (2010) [1] and Ghosh et al. (2012) [10] reported that a rapid degradation of persistency was observed in imidacloprid which had a greater importance as fruits and vegetables are consumed after little cooking. Most of the Conventional chemicals viz. organochlorines and ryanophosphates are broad spectrum, persistent in nature and having long residual action (Subba et al., 2017 [24]; Nayar, et al., 1992 [21]). Acharya et al. (2002) [3] reported that the efficacy of new molecules like imidacloprid, abamectin were safer to lady bird beetles. The objective of the study was to formulate suitable management of sucking pests of lady’s finger with the use of some new safe molecules and less harmful to beneficial insects and environment.

2.2. Treatment Details

| Treatment | Dose g or ml. a.i. / ha | Dose (g or ml/ha) | Spray fluid used |
|-----------|------------------------|------------------|------------------|
| T1: Untreated Control | ~ | ~ | 500 |
| T2: Dinotefuron 20 SG | 20 | 100 | 500 |
| T3: Dinotefuron 20 SG | 30 | 150 | 500 |
| T4: Dinotefuron 20 SG | 40 | 200 | 500 |
| T5: Imidacloprid 70WG | 21 | 30 | 500 |
| T6: Imidacloprid 70 WG | 24.5 | 35 | 500 |
| T7: Fipronil 5% SC | 25 | 500.0 | 500 |
| T8: Fipronil 5% SC | 37.5 | 750.0 | 500 |
| T9: Dinotefuron 20 SG | 80 | 400 | 500 |
| T10: Imidacloprid 70 WG | 49 | 70 | 500 |
| T11: Fipronil 5% SC | 75 | 1500 | 500 |

* For phytotoxicity study-- T9, T10 and T11

2.3. Lay out of the experiment

Season of experiment: Kharif - 2018
Variety of lady’s finger: Samrat
Date of sowing: 12.07.2018
Plot size: 5m X 5m
Spacing: P-P X R-R = 5 cm X 20 cm
Fertilizers: N: P: K @ 100:60:60
Design of experiment: Randomized Block Design (RBD)
Number of replications: Three
Number of spraying: Two
Application date of spray: First spray: 10.08.2018 and second spray: 25.08.2018
Application method: ASPEE Knapsack Sprayer with hollow cone nozzle
Harvesting: Multiple picking

2.4. Methodology for Bio-efficacy data recording against pests

The data of target pests were recorded from randomly selected five plants in each plot. Observations of total number of whitefly and aphid on lady’s finger were recorded from five top young leaves of each plant per plot and converted to number of insect pest/leaf. First count was taken one day before first spray and post treatment counts were recorded on 3, 7, 10 and 14 days after each spray. All the observations were recorded with the help of a hand lens (10X). Reduction of insect population in different treatments over control was used as an indicator of insecticidal efficacy which was calculated from the following formula (Abbott, 1925) [1]:

\[ \frac{P_o - P_c}{P_o} = \frac{100}{P_c} \times 100 \]

Where, \( P_t = \) Corrected mortality, \( P_o = \) Observed mortality and \( P_c = \) Control mortality.

Data were analyzed by using INDO-STAT- software for analysis of variance following randomized block design (RBD) treatment means were separated by applying CD Test (critical difference) at 5 % level of significance.

2.5. Methodology for phytotoxicity studies

The observations on phyto-toxicity symptoms (viz., leaf injury, wilting, vein clearing, necrosis, epinasty and hyponasty), if any, on the crop due to application of dinotefuron 20 SG @ 80 g a.i. / ha imidacloprod 70 WG @ 49 g a.i. / ha and fipronil 5% SC @ 75 g a.i. / ha were recorded at 1, 3, 5, 7, 10 & 15 days after first and second spray using the scores shown below.

| Rating | 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          |

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2.6. Yield recording
The yield of marketable fruit was recorded separately for each plot at each plucking. Yield obtained cumulative of all the plucking was converted into t/ha and presented in Table-5. Besides this, Percent (%) increase in yield over control was also calculated using the following formula.

\[ \text{Percent (%) increase in yield} = \frac{T - C}{C} \times 100 \]

Where, \( T \) = Yield of respective treatment (t/ha); \( C \) = Yield of Control (t/ha)

3. Results and Discussion
Three doses of dinotefuron 20 SG (@ 20, 30 and 40 a.i. g/ha) and two doses of fipronil 5% SC (@ 25 and 37.5 a.i. g/ha) were sprayed to work out their efficacy against whitefly (Bemisia tabaci) and aphid (Aphis gossypii). To work out phytotoxicity effect on lady's finger plant high dose of dinotefuron 20 SG (@ 80 a.i. g/ha), imidacloprod 70 WG (@ 49 a.i. g/ha) and fipronil 5% SC (@ 75 a.i. g/ha) were sprayed. Two round spraying has been done where first round was initiated during second week of July and subsequent spraying has been done at 15 days interval. The data on the result of bio-efficacy of insecticides has been presented in chart 1-4, yield potentiality in table- 5 and phytotoxicity of insecticides on plant in the table-6.

3.1. Efficacy evaluation of insecticides against whitefly (Bemisia tabaci)
Data presented in Table 1 and 2 revealed that all the insecticide treatments significantly reduced the infestation of whitefly as compared to untreated control (5.32-8.94 whitefly/leaf). From the two round spray it was revealed that dinotefuron 20 SG @ 40 g a.i./ha provided best suppression of whitefly population (first spray 79.46 % and second spray 87.45 % with a mean of 83.46 % suppression) closely followed by fipronil 5% SC @ 37.5 g a.i./ha (first spray 78.13 % and second spray 87.04 % with a mean of 82.59 % suppression) and imidacloprod 70 WG @ 24.5 g a.i./ha (first spray 65.26 % and second spray 72.61 % with a mean of 68.94 % suppression).

Three days after first spraying lowest population was recorded in dinotefuron 20 SG @ 40 g a.i./ha treated plot (1.03whitefly/L) closely followed by fipronil 5% SC @ 37.5 g a.i./ha (1.04 whitefly/L) and imidacloprod 70 WG @ 24.5 g a.i./ha (1.67whitefly/L). There were no significant differences among these three treatments. Similar trend was followed 7 days, 10 days and 14 days after first spraying.

Three days after second spraying lowest population was recorded in dinotefuron 20 SG @ 40 g a.i./ha treated plot (0.23 whitefly/L) closely followed by fipronil 5% SC @ 37.5 g a.i./ha (0.24 whitefly/L) and imidacloprod 70 WG @ 24.5 g a.i./ha (0.67 whitefly/L). There were no significant differences among these three treatments. Similar trend was followed 7 days and 10 days after second spraying. Fourteen days after second spraying lowest population was recorded in dinotefuron 20 SG @ 40 g a.i./ha treated plot (0.57 whitefly/L) closely followed by fipronil 5% SC @ 37.5 g a.i./ha (0.59 whitefly/L). There were no significant differences between these two treatments but significant differences from imidacloprod treatments.

Table 1: Effect of insecticides on the population abundance of whitefly (Bemisia tabaci) in lady's finger Kharif-2018 (1st spray)

| Treatments   | Dose/ha (g or ml a.i.) | Formulation (g or ml) | Pre-treatment Count (w. fly/L) | Post mean | % reduction over control |
|--------------|------------------------|-----------------------|-------------------------------|-----------|-------------------------|
|              |                        |                       | 1st Spray                     |           |                         |
|              |                        |                       | 3 DAS | 7 DAS | 10 DAS | 14 DAS |                     |                       |
| T1: Untreated Control | --                     | --                    | 4.32 | 4.78 | 5.87 | 6.23 | 7.35 | 5.32 | 0.00 |
| T2: Dinotefuron 20 SG | 20                     | 100                   | (2.59) | (2.70) | (2.93) | (3.01) | (3.22) | 3.62 | 32.57 |
| T3: Dinotefuron 20 SG | 30                     | 150                   | 4.35 | 3.45 | 3.78 | 3.98 | 4.02 | 3.29 | 42.43 |
| T4: Dinotefuron 20 SG | 40                     | 200                   | (2.60) | (2.37) | (2.45) | (2.50) | (2.51) | 1.13 | 79.46 |
| T5: Imidacloprod 70WG | 21                     | 30                    | 4.46 | 1.03 | 1.23 | 1.44 | 1.67 | 3.54 | 39.61 |
| T6: Imidacloprod 70WG | 24.5                   | 35                    | (2.62) | (1.52) | (1.62) | (1.71) | (1.80) | 1.77 | 65.26 |
| T7: Fipronil 5% SC   | 25                     | 500                   | 4.75 | 3.40 | 3.67 | 3.92 | 4.01 | 1.80 | 43.72 |
| T8: Fipronil 5% SC   | 37.5                   | 750                   | (2.69) | (2.35) | (2.43) | (2.49) | (2.51) | 1.14 | 78.13 |
| S Em (±)              | --                     | 0.23                  | 0.22 | 0.21 | 0.26 | -- | -- | -- | -- |
| C.D (p<0.05)          | NS                     | 0.66                  | 0.65 | 0.59 | 0.74 | -- | -- | -- | -- |

Figures in parentheses indicate √X+0.5 transformed value, L=leaf, DAS: Days after spraying.
3.2. Efficacy evaluation of insecticides against aphid (*Aphis gossypii*)

Data presented in Table 3 and 4 revealed that, all the insecticide treatments significantly reduced the infestation of thrips as compared to untreated control (9.27-16.84 aphid/leaf). From the two round spray it is revealed that dinofeturon 20 SG @ 40 g a.i./ha provided best suppression of thrips population (first spray 87.81 % and second spray 70.22 % with a mean of 79.02 % suppression) closely followed by fipronil 5% SC @ 37.5 g a.i./ha (first spray 83.88 % and second spray 70.04 % with a mean of 76.96 % suppression) and imidacloprid 70 WG @ 24.5 g a.i./ha (first spray 75.91 % and second spray 65.01 % with a mean of 70.46 % suppression).

Three days after first spray lowest population was recorded in dinofeturon 20 SG @ 40 g a.i./ha treated plot (0.82 aphid/L) closely followed by fipronil 5% SC @ 37.5 g a.i./ha (0.83 aphid/L) and imidacloprid 70 WG @ 24.5 g a.i./ha (1.54aphid/L). There were no significant differences among these three treatments. Similar trend was followed 7 days and 10 days after first spraying. Fourteen days after first spraying lowest population was recorded in dinofeturon 20 SG @ 40 g a.i./ha treated plot (2.08 aphid/L) closely followed by fipronil 5% SC @ 37.5 g a.i./ha (2.10 aphid/L). There were no significant differences between these two treatments. But these two treatment were significant different from imidacloprid treatment.

Three days after second spraying lowest population was recorded in dinofeturon 20 SG @ 40 g a.i./ha treated plot (0.58 aphid/L) closely followed by Fipronil 5% SC @ 37.5 g a.i./ha (0.59 aphid/L) and imidacloprid 70 WG @ 24.5 g a.i./ha (0.98 aphid/L). There were no significant differences among these three treatments. Similar trend was followed 7 days and 10 days after second spraying. Fourteen days after second spraying lowest population was recorded in dinofeturon 20 SG @ 40 g a.i./ha treated plot (1.02 aphid/L) closely followed by fipronil 5% SC @ 37.5 g a.i./ha (1.11 aphid/L). There were no significant differences between these two treatments. But these two treatment were significant different from imidacloprid treatment.

### Table 2: Effect of insecticides on the population abundance of whitefly (*Bemisia tabaci*) in lady’s finger *Kharif*-2018 (2nd Spray)

| Treatments          | Dose/ha | Pre-treatment Count (w.Fly/L) | Mean no. of whitefly/leaf | Post mean | % reduction over control |
|---------------------|---------|------------------------------|---------------------------|-----------|-------------------------|
|                     | (g.or ml a.i.) | (Formulation (g or ml) | 3 DAS | 7 DAS | 10 DAS | 14 DAS |          |          |
| T1: Untreated Control | --       | --                           | 4.32 (2.59) | 8.43 | 9.45 | 10.23 | 10.67 | 8.94 | 0.00 |
| T2: Dinofeturon 20 SG | 20       | 100                          | 3.45 (2.60) | 2.12 | 2.34 | 2.68 | 3.01 | 2.23 | 54.42 |
| T3: Dinofeturon 20 SG | 30       | 150                          | 4.63 (2.66) | 1.23 | 1.35 | 1.68 | 1.98 | 1.29 | 73.17 |
| T4: Dinofeturon 20 SG | 40       | 200                          | 4.46 (2.62) | 0.23 | 0.28 | 0.34 | 0.57 | 0.26 | 87.45 |
| T5: Imidacloprid 70WG | 21       | 30                           | 4.75 (2.69) | 2.11 | 2.31 | 2.62 | 3.00 | 2.21 | 54.72 |
| T6: Imidacloprid 70WG | 25       | 500                          | 4.13 (2.54) | 0.67 | 0.89 | 1.02 | 1.34 | 0.78 | 72.61 |
| T7: Fipronil 5% SC   | 37.5     | 750                          | 4.23 (2.56) | 0.24 | 0.29 | 0.36 | 0.59 | 0.27 | 87.04 |

Figures in parentheses indicate √X=0.5 transformed value, L=leaf, DAS: Days after spraying

### Table 3: Effect of insecticides on the population abundance of aphid (*Aphis gossypii*) in lady’s finger *Kharif*-2018 (1st Spray)

| Treatments          | Dose/ha | Pre-treatment Count (w.Fly/L) | Mean no. of aphid/leaf | Post mean | % reduction over control |
|---------------------|---------|------------------------------|------------------------|-----------|-------------------------|
|                     | (g.or ml a.i.) | (Formulation (g or ml) | 3 DAS | 7 DAS | 10 DAS | 14 DAS |          |          |
| T1: Untreated Control | --       | --                           | 8.82 (3.48) | 8.98 | 9.56 | 12.45 | 15.32 | 9.27 | 0.00 |
| T2: Dinofeturon 20 SG | 20       | 100                          | 8.84 (3.48) | 3.54 | 4.13 | 4.37 | 5.26 | 3.83 | 58.73 |
| T3: Dinofeturon 20 SG | 30       | 150                          | 8.76 (3.47) | 3.17 | 3.76 | 4.15 | 5.17 | 3.46 | 62.39 |
| T4: Dinofeturon 20 SG | 40       | 200                          | 8.12 (3.36) | 0.82 | 1.26 | 1.52 | 2.08 | 1.04 | 87.81 |
| T5: Imidacloprid 70WG | 21       | 30                           | 8.83 (3.48) | 3.48 | 4.01 | 4.31 | 5.25 | 3.74 | 59.65 |
| T6: Imidacloprid 70WG | 24.5     | 35                           | 6.95 (3.15) | 1.54 | 1.98 | 2.08 | 2.99 | 1.76 | 75.91 |
| T7: Fipronil 5% SC   | 25       | 500                          | 8.77 (3.47) | 3.19 | 3.78 | 4.16 | 5.18 | 3.49 | 62.19 |
| T8: Fipronil 5% SC   | 37.5     | 750                          | 6.21 (2.99) | 0.83 | 1.27 | 1.53 | 2.10 | 1.05 | 83.88 |

Figures in parentheses indicate √X=0.5 transformed value, L=leaf, DAS: Days after spraying

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The insecticidal treatment for controlling pinastyl and elyly which... Figures in parentheses indicate √X+0.5 transformed value, pest population reduction was found in the imidacloprid. Pavan finding that imidacloprid was effective treatment for potato aphid supports the present investigation. Ghosh and Chakraborty (2015) reported that imidacloprid was effective treatment for potato aphid (Aphis gossypii) in ladysfinger Kharif (2018, 2nd Spray).

### Table 4: Effect of insecticides on the population abundance of aphid (Aphis gossypii) in ladysfinger Kharif (2018, 2nd Spray)

| Treatments | Dose/ha (g or ml a.i.) | Formulation (g or ml) | Pre-treatment Count (wfly/L) | Mean no. of aphid/leaf 2nd Spray | Post mean | % reduction over control |
|------------|------------------------|-----------------------|-----------------------------|---------------------------------|----------|-------------------------|
| T1: Untreated Control | -- | -- | 8.82 | 3.48 | 16.23 | 3.88 | 0.43 |
| T2: Dinotefuron 20 SG | 20 | 100 | 8.84 | (3.48) | 3.64 | 17.45 | 3.92 | 0.43 |
| T3: Dinotefuron 20 SG | 30 | 150 | 8.70 | (3.47) | 3.22 | 18.23 | 3.95 | 0.43 |
| T4: Dinotefuron 20 SG | 40 | 200 | 8.12 | (3.36) | 0.58 | 22.32 | 4.01 | 0.43 |
| T5: Imidacloprid 70WG | 21 | 30 | 8.83 | (3.48) | 3.57 | 4.79 | 4.07 | 0.43 |
| T6: Imidacloprid 70 WG | 24.5 | 35 | 6.95 | (3.15) | 0.98 | 5.64 | 5.10 | 0.43 |
| T7: Fipronil 5% SC | 25 | 500 | 8.77 | (3.47) | 3.25 | 6.40 | 6.00 | 0.43 |
| T8: Fipronil 5% SC | 37.5 | 750 | 6.21 | (2.99) | 0.59 | 6.73 | 6.13 | 0.43 |

C.D (p<0.05) -- 0.69 0.67 0.75 0.82 --

Figures in parentheses indicate √X+0.5 transformed value, L=leaf, DAS: Days after spraying

#### 3.3. Effect of treatments on Yield

The yield of healthy lady’s finger fruits recorded in different treatments is presented in Table 5. All the insecticidal treatments significantly increased the yield as compared to the control (6.43 t/ha in Kharif 2018). Dinotefuron 20 SG @ 40 g a.i./ha gave the maximum yield (10.34 t/ha) and it was at per with dinotefuron 20 SG @ 30 g a.i./ha (9.67 t/ha), fipronil 5% SC @ 37.5 g a.i./ha (9.64 t/ha) and imidacloprod 70 WG @ 24.5 g a.i./ha (9.32 t/ha). Yield obtained in other treatments were as follows: fipronil 5% SC @ 25 g a.i./ha (8.52 t/ha), imidacloprod 70% WG @ 21 g a.i./ha (8.98 t/ha) and dinotefuron 20 SG @ 20 g a.i./ha (7.65 t/ha).

### Table 5: Effects of different treatment on fruit yield, Kharif-2018

| Treatments | Dose/ha (g or ml a.i.) | Formulation (g or ml) | Yield (t/ha) | % yield increase over control |
|------------|------------------------|-----------------------|--------------|-------------------------------|
| T1: Untreated Control | -- | -- | 6.43 | 0.00 |
| T2: Dinotefuron 20 SG | 20 | 100 | 7.65 | 18.97 |
| T3: Dinotefuron 20 SG | 30 | 150 | 9.67 | 50.39 |
| T4: Dinotefuron 20 SG | 40 | 200 | 10.34 | 60.81 |
| T5: Imidacloprid 70WG | 21 | 30 | 8.98 | 39.66 |
| T6: Imidacloprod 70 WG | 24.5 | 35 | 9.32 | 44.95 |
| T7: Fipronil 5% SC | 25 | 500 | 8.52 | 32.50 |
| T8: Fipronil 5% SC | 37.5 | 750 | 9.64 | 49.92 |

S Em (+) 0.43 --

C.D (p<0.05) 1.27 --

#### 3.4. Phytotoxicity studies

No phytotoxic symptoms were observed as irrespective doses of different treatments and untreated control in respect of leaf injury, wilting, vein clearing, necrosis, epinasty and hyponasty.

### Table 6: Evaluation phytotoxicity on ladysfinger during Kharif-2018

| Sl. No. | Treatments | Leaf injury on tips/s surface | Wilting | Vein clearing | Necrosis | Epinasty | Hyponasty |
|---------|------------|------------------------------|---------|---------------|----------|----------|-----------|
| 1       | T1: Untreated Control | 0 | 0 | 0 | 0 | 0 | 0 |
| 2       | T2: Dinotefuron 20 SG @ 80 g a.i./ha | 0 | 0 | 0 | 0 | 0 | 0 |
| 3       | T3: Imidacloprid 70 WG @ 49 g a.i./ha | 0 | 0 | 0 | 0 | 0 | 0 |
| 4       | T4: Fipronil 5% SC @ 75 a.i./ha | 0 | 0 | 0 | 0 | 0 | 0 |

No phytotoxicity = 0; *Mean observations recorded at 1, 3, 5, 7, 10 and 15 days after each spraying

From overall observation it was found that Dinotefuron 20 SG @ 40 g a.i./ha, Fipronil 5% SC @ 37.5 g a.i./ha and imidacloprod 70 WG @ 24.5 g a.i./ha provided best suppression of whitefly and aphid population. There were no significant differences among these treatments. These findings were supported by some research works. Thakoor Pavan et al. (2019) [25] reported that maximum tomato sucking pest population reduction was found in the imidacloprid. Ghosh and Chakraborty (2015) [12] reported that imidacloprid was found the most effective treatment for controlling lady’s finger jassids, followed by the microbial insecticide spinosad. Ghosh (2020) [10] reported that fipronil 5% SC @ 37.5 a.i. g/ha recorded 72.14 % and 73.88 % aphid control at one day and three days after spraying respectively which supports the present investigation. Ghosh, (2015) [9] reported that imidacloprid was effective treatment for potato aphid.
control followed by plant extract. Das et al. (2010) reported that a rapid degradation of persistency was observed in Imidacloprid which had a greater importance as fruits and vegetables are consumed after little cooking. This also supports the present investigation.

4. Conclusion/Recommendation

Dimetofuron 20 SG @ 40 g a.i./ha, Fipronil 5% SC @ 37.5 g a.i./ha and imidacloprod 70 WG @ 24.5 g a.i./ha provided best suppression of whitefly and aphid population. Dimetofuron 20 SG @ 40 g a.i./ha gave the maximum yield (10.34 t/ha) and it was at par with dimetofuron 20 SG @ 30 g a.i./ha (9.67 t/ha), fipronil 5% SC @ 37.5g a.i./ha (9.64 t/ha) and imidacloprod 70 WG@ 24.5 g a.i./ha(9.32 t/ha). These may be recommended for general farmers use for control of sucking pest of lady’s finger.

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