International Journal of Advanced Biochemistry Research 2024; SP-8(1): 912-914

International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; SP-8(1): 912-914
www.biochemjournal.com
Received: 25-10-2023
Accepted: 29-12-2023

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Bio-efficacy of newer insecticide molecules against jassid (*Amrasca biguttula biguttula*)

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DOI: https://doi.org/10.33545/26174693.2024.v8.i1Sl.482

Abstract
Bio-efficacy of newer insecticide molecules against jassid (*Amrasca biguttula biguttula*) on brinjal crop research work were carried out during Rabi season of 2022-23 at the research cum instructional farm of department of Entomology, Indira Gandhi Krishi Viswavidyalaya, Raipur (C.G.). Bio-efficacy of different treatments *viz.*, Sulfoxaflor 3.7% + Bifenthrin 11.2% SC at three different doses of 22+67, 30+90, and 37+114 g. a.i. /ha along with single dose of Sulfoxaflor 24% SC (37 g. a.i. /ha), Bifenthrin 10% SC (114 g. a.i/ha), Fenvalerate 20.0% EC (100 g. a.i. /ha), and Cypermethrin 25.0% EC (50) g. a.i. /ha reveled that all the treatments were found significantly effective in reducing the population of jassid. The most effective treatment in reducing the population of jassid was Sulfoxaflor 3.7% + Bifenthrin 11.2% SC (37+114) g. a.i./ha followed by Sulfoxaflor 3.7% + Bifenthrin 11.2% SC (30+90) g. a.i./ha. The Cypermethrin 25.0% EC (50) g. a.i. /ha was found least effective but it was significantly superior over control.

Keywords: Bio-efficacy, insecticides, treatments, jassid, brinjal

Introduction

Brinjal (*Solanum melongena* L.) is a solanaceous crop which belongs to the family Solanaceae, also known as eggplant. The name eggplant has been derived from the shape of fruit of some varieties, which are white and resembles chicken eggs and it is the second most important solanaceous crop after tomato in the genus Solanum. There are several insect pests that attack on brinjal crop. The introduction of BT brinjal in year 2000 was an evolutionary step to reduce the infestation of brinjal shoot and fruit borer. Another such devastating pest is brinjal jassid which suck the plant sap in both nymph and adult stages. It causes damage at initial stage of crop growth and affect the transport system of conducting vessels. It also injects toxin materials into leaves which affects photosynthesis.

Brinjal is the most common and economically significant vegetable crop among low-income customers and small-scale farmers in South Asia and this region, which accounts for over 60% of the world's area and 53% of its production. The China and South East Asia shows its secondary diversity. Dhanadapani (2003) [11] claims that the majority of Indians are vegetarians, with daily consumption per person being 135 g as opposed to the suggested daily intake of 300 g.

Globally, with 28.4 million tonnes, or 57% of the entire production, China leads the globe in brinjal production, followed by India (13.4 million tonnes), Egypt (1.2 million tonnes), Turkey (0.82 million tonnes), and Iran (0.75 million tonnes). According to Frary *et al*. (2007) [12], one of the top 5 most significant vegetable crops in Asia and the Mediterranean is brinjal. In India, the area, yield, and productivity of brinjal were 7.35 lakh/ha, 129.87 lakh MT, and 1766 kg/ha, respectively, in 2018-19. According to the Indian Horticulture Database, Chhattisgarh has an area of around 37942 hectares, a productivity of 18.22 metric tonnes, and a production of 691245 MT.

The production of brinjal plants is reduced by 50% due to the voracious pest known as brinjal jassid, which attacks eggplants from the nursery to the fruiting stage. Amrasca biguttula biguttula, the brinjal jassid, lays its eggs in the midrib of leaves and feeds on the sap of the plant ceaselessly. Keeping in view of the seriousness of the pest and economic importance of this crop, the present investigation was planned to evaluate the efficacy of various newer insecticides against jassid under field condition.

Materials and Methods

The experiment was carried out during 2022-23 at research cum instructional farm of department of Entomology, Indira Gandhi Krishi Viswavidyalaya, Raipur (C.G.) located in Chhattisgarh's mid-eastern region, coordinates at 21.16º N and 81.36º E, at a height of 289 meters above mean sea level. The total area of 20 × 24 m^2 was laid out in uniformly sized plots measuring 5 m x 4 m (20 m2) with 24 plots for experiments. The brinjal variety "VNR-212" was used for the experiment. The treatments of different insecticides *viz*., Sulfoxaflor 3% + Bifenthrin 11.2% SC at three different doses of 22 + 67, 30+90, and 37+114 g. a.i. /ha along with single dose of Sulfoxaflor 24% Sc (37 g. a.i. /ha), Bifenthrin 10% SC (114 g. a.i/ha), Fenvalerate 20.0% EC (100 g. a.i. /ha), and Cypermethrin 25.0% EC (50) g. a.i. /ha were applied on appearance of sucking pests and subsequent spray were given at 15 days interval using manually operated knapsack sprayer. The observations on total number of jassids was recorded on top, middle and bottom leaves of five randomly selected plants from each treatment at one day before treatment and 1, 3, 7, 10 and 14 days after first, and second application of insecticides.

Results and Discussion

The data presented in Table 1 and Fig. 1 indicate that the mean Jassid population prior to the treatment application was consistent across treatments, as the data are statistically non-significant. However, all insecticides were found to be significantly more effective than the untreated control in reducing the Jassid population at 1, 3, 7, 10, and 14 days after insecticide application, as well as in the pooled data overall.

After two sprays of newer insecticides the treatment for the management of jassid revealed that Sulfoxaflor 3.7% + Bifenthrin 11.2% SC (37+114) g. a.i./ha (2.19 jassids / plant) was most effective followed by Sulfoxaflor 3.7% + Bifenthrin 11.2% SC (30+90) g. a.i./ha (3.42 jassids/plant), and Sulfoxaflor 24% Sc (37) g. a.i. /ha (4.29 jassids/plant). The treatment Cypermethrin 25.0% EC (50) g. a.i. /ha (7.04 jassids/plant) proved least effective.

The maximum reduction of jassids population was recorded in the Sulfoxaflor 3.7% + Bifenthrin 11.2% SC (37+114) g. a.i./ha (2.19 jassids/plant) treatment followed by Sulfoxaflor 3.7% + Bifenthrin 11.2% SC (30+90) g. a.i./ha (3.42 jassids/plant), Sulfoxaflor 24% Sc (37) g. a.i. /ha (4.29 jassids/plant), and Fenvalerate 20.0% EC (100) g. a.i. /ha (5.35 jassids/plant) treated plots. The minimum reduction was found in the plots treated with Sulfoxaflor 3.7% + Bifenthrin 11.2% SC (22 + 67) g. a.i./ha (5.82 jassids / plant), Bifenthrin 10% SC (114) g. a.i/ha (6.33 jassids/plant), and Cypermethrin 25.0% EC (50) g. a.i./ ha (7.04 jassids/plant). Reported that Sulfoxaflor 3.7% + Bifenthrin 11.2% SC (37+114) g. a.i./ ha. was highly effective followed by Sulfoxaflor 3.7% + Bifenthrin 11.2% SC (30+90) g. a.i./ha.

The descending order of effectiveness of treatments on the basis of mean pest population reduction was: Sulfoxaflor 3.7% + Bifenthrin 11.2% SC (37+114) g. a.i./ha > Sulfoxaflor 3.7% + Bifenthrin 11.2% SC (30+90) g. a.i./ha > Sulfoxaflor 24% Sc (37) g. a.i. /ha > Fenvalerate 20.0% EC (100) g. a.i. /ha > Sulfoxaflor 3.7% + Bifenthrin 11.2% SC (22+67) g. a.i./ha > Bifenthrin 10% SC (114) g. a.i/ha > Cypermethrin 25.0% EC (50) g. a.i. /ha.

Reduction over control (ROC)

The analysis of data obtained after two spraying indicate that Sulfoxaflor 3.7% + Bifenthrin 11.2% SC (37 + 114) g. a.i./ha was found maximum reduction over control (85.86%), followed by Sulfoxaflor 3.7% + Bifenthrin 11.2% SC (30 + 90) g. a.i./ha (77.92% ROC) and Sulfoxaflor 24% Sc (37) g. a.i. /ha (72.30% ROC). The least ROC % was found on untreated control plot (54.55% ROC).

Table 1: Bio-efficacy of newer insecticide molecules against jassid (*Amrasca biguttula biguttula*) in brinjal

S. No.	Treatments	Dose g a.i. / ha	Average no. Jassid / plant												ROC %
			First spray						Second spray						
			Pre treatment	1 DAS	3 DAS	7 DAS	10 DAS	14 DAS	1 DAS	3 DAS	7 DAS	10 DAS	14 DAS	Over all Mean	
T_1	Sulfoxaflor 3.7% + Bifenthrin 11.2% SC	22+67	11.80 (3.43)	3.98 (1.99)	4.76 (2.18)	6.15 (2.47)	7.23 (2.68)	8.08 (3.01)	4.12 (2.26)	4.72 (2.02)	5.23 (2.28)	6.66 (2.58)	7.23 (2.68)	5.82	62.47
T_2	Sulfoxaflor 3.7% + Bifenthrin 11.2% SC	30+90	11.98 (3.46)	3.77 (1.94)	3.26 (1.80)	3.05 (1.74)	3.66 (1.91)	3.98 (1.99)	2.98 (1.72)	2.62 (1.61)	2.96 (1.72)	3.86 (1.96)	4.02 (2.00)	3.42	77.92
T_3	Sulfoxaflor 3.7% + Bifenthrin 11.2% SC	37+114	12.15 (3.48)	3.06 (2.01)	2.56 (1.60)	2.19 (1.47)	2.28 (1.50)	2.44 (1.56)	2.06 (1.43)	1.52 (1.23)	1.66 (1.28)	1.98 (1.40)	2.19 (1.45)	2.19	85.86
T_4	Sulfoxaflor 24% SC	37	11.58 (3.40)	4.11 (2.26)	3.32 (1.82)	4.21 (2.28)	5.43 (2.53)	6.15 (2.47)	3.63 (1.90)	2.66 (1.63)	3.16 (1.89)	4.56 (2.35)	5.66 (2.58)	4.29	72.30
T_5	Bifenthrin 10% SC	114	12.56 (3.54)	4.06 (2.24)	4.98 (2.44)	6.11 (2.66)	7.42 (2.90)	8.50 (3.08)	4.39 (2.32)	5.09 (2.46)	6.23 (2.04)	7.82 (2.96)	8.65 (3.10)	6.33	60.00
T_6	Fenvalerate 20.0% EC	100	11.79 (3.43)	4.19 (2.27)	3.92 (2.21)	4.77 (2.40)	5.65 (2.57)	6.80 (2.79)	4.52 (2.34)	4.23 (2.28)	5.39 (2.89)	6.83 (2.79)	7.22 (2.89)	5.35	65.46
T_7	Cypermethrin 25.0% EC	50	13.01 (3.60)	4.55 (2.35)	5.62 (2.57)	6.36 (2.71)	7.29 (2.87)	8.96 (3.15)	5.16 (2.48)	6.32 (2.70)	7.69 (3.20)	8.92 (3.14)	9.56 (3.24)	7.04	54.55
T_8	Untreated control	-	13.18 (3.63)	13.86 (3.85)	13.70 (3.83)	14.58 (3.94)	15.76 (4.09)	16.18 (4.14)	15.98 (4.12)	16.15 (4.14)	16.96 (3.05)	15.56 (4.06)	16.13 (4.13)	15.49	
SEm			NS	0.17	0.17	0.19	0.21	0.23	0.19	0.19	0.21	0.22	0.23	0.20	
CD at 5%			-	0.52	0.52	0.57	0.65	0.70	0.56	0.58	0.63	0.66	0.70	0.60	

Note: Figure in parantheses are square root transformed values, NS = Non significant, PTO = Pretreatment observation, DAS = Days after spray

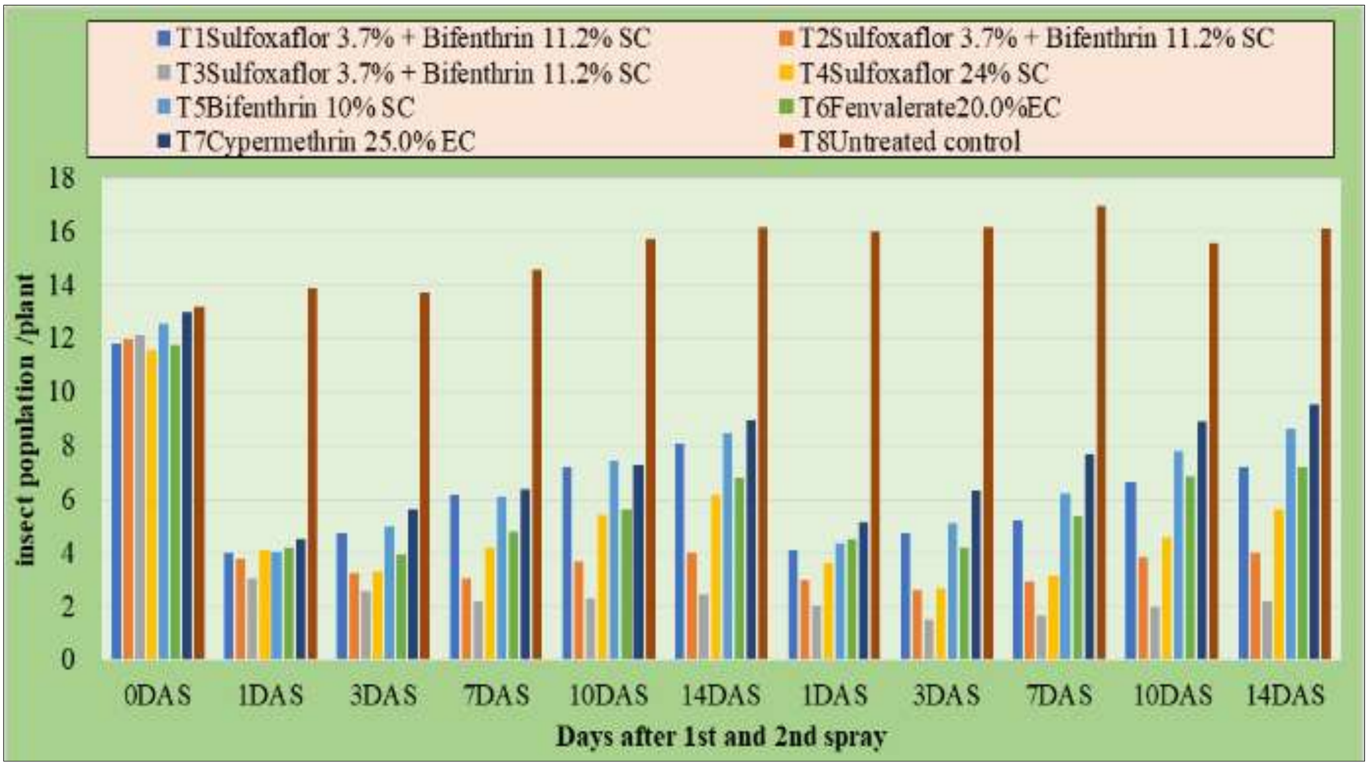

Fig 1: Bio-efficacy of newer insecticide molecules against Jassid (*Amrasca biguttula biguttula*)

Conclusion

The present study concluded that among the seven treatments, all the insecticide treatments were more effective than control in reducing the jassid population, treatments (T_3) Sulfoxaflor 3.7% + Bifenthrin 11.2% SC (37+114) g. a.i./ha was found to be the best treatment against jassid of brinjal followed by (T_2) Sulfoxaflor 3.7% + Bifenthrin 11.2% SC (30+90) g. a.i./ha. The maximum population of jassid was observed in untreated control (T_8).

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