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Naveen Shanker Pandey
Department of Entomology, Sam Higginbottom University of Agriculture, Technology and Science, Naini, Allahabad, Uttar Pardesh, India

Sasya Thakur
Department of Biological Sciences, Sam Higginbottom University of Agriculture, Technology and Science, Naini, Allahabad, Uttar Pardesh, India

Correspondence
Sasya Thakur
Department of Biological Sciences, Sam Higginbottom University of Agriculture, Technology and Science, Naini, Allahabad, Uttar Pardesh, India

Bioefficacy of some plant products against Brinjal (*Solanum melongena* L.) Shoot and Fruit borer, [*Leucinodes orbonalis* (Guenee)]

Naveen Shanker Pandey and Sasya Thakur

Abstract
A field experiment was conducted to study the bioefficacy of some plant product against Brinjal shoot and fruit borer Leucinodes orbonalis on Brinjal during *kharif* season of 2016-2017.The experiment was conducted in the research field of Sam Higginbottom University of Agriculture Technology and Science, Allahabad. Total two sprays were applied to protect the crop from *Leucinodes orbonalis* with three replications. Neem leaf extract 0.5%, NSKE 2.5%, Garlic extract 5%, Pongamia extract 5%, Tobacco Leaf extract 1%, Leaf extract of lantana camara 1%, Cypermethrin 25 EC were evaluated against *Leucinodes orbonalis* infesting Brinjal. The observations on infestation of *Leucinodes orbonalis* 24 hours before (Pre-treatment) and 3, 7 and 14 days after treatment (Post-treatment) at each spraying were recorded for computing the infestation percent over control. The treatment with recommended insecticide Cypermethrin 0.2% was of the most effective treatment followed with and Neem leaf extract 0.5%, Pongamia 5%, NSEK 2.5%, Garlic extract 5%, Tobacco leaf extract 1.0%, lantana camara Leaf extract 5%. The treatments with Cypermethrin25 EC, and NSKE 2.5 %, Conc. also performed well against this pest. Neem leaf extract, Pongamia leaf extract, Tobacco leaf extract, Leaf extract of lantana camara and Garlic extract were found less effective against *Leucinodes orbonalis*. Cypermethrin 25 EC (1:11.85) followed by NSKE 2.5%, (1:10.13) Neem Leaf extract 5%, (1:9.67), Pongamia 5% (1:9.18), Tobacco leaf extract 1. 0%(1:8.60), Leaf extract of lantana camara (1:8.33),Garlic extract (1:7.90) untreated control (1:7.23). Among the treatments the highest cost benefit ratio (C:B) of (1:11.85) was obtained with of. Cypermethrin 25 EC.

Keywords: benefit cost ratio, *Leucinodes orbonalis*, incidence, plant product, brinjal shoot and fruit borer

1. Introduction

Brinjal or eggplant or Aubergine (*Solanum melongena* L) has been cultivated in the country for the last 4000 years. It is widely grown in the warmer regions hemispheres, although it is often as a Mediterranean or mid-Estern vegetable. Eggplant is a versatile vegetable. Among the solanaceous vegetables, brinjal is the one of the most popular and economically important vegetables among small-scale farmers and it is a source of cash income for resource-poor farmers. India is the second largest producer of vegetable with 10563000 tonnes production after China with production 24501936 tons in 2010. The existing area under vegetable cultivation in India is around 4.5 million ha. Majority of Indians are vegetarian, with a per capita consumption 135 g per day as against the recommended 300 g per day. It is still very less than recommended diet level Dhandapani *et.al.* (2003) [2]. Like any other crops, brinjal is also attacked by a number of insect pests at various stages of its growth, which affects the cultivation of brinjal and act as a limiting factor in the profitable cultivation of brinjal crop. The crop is attacked by about 140 species of insect and non-insect pests belonging to 50 families**.** listed 53 insects whereas 36 insects attacking on brinjal. Out of which numerous insect pests *viz.* shoot and fruit borer, (*Leucinodes orbonalis* Guenee), leaf hopper *(Amrasca biguttula bigttula),* aphid *(Aphid gossypii),* Hadda beetle (*Epilachna spp.)* and brinjal stem borer (*Euzophera particrlla* Rag) have been reported as important pests of the brinjal by Butani and jotwani (1984) [10]. Among these brinjal shoot and fruit borer, *Leucinodes orbonalis* Guenee. is the most destructive and the major limiting factor in quantative as well as qualitative harvest of brinjal fruits. Eggplant fruit and shoot borer (EFSB) was first described as *Leucinodes orbonalis* by Guenée. in 1854. There are no known synonyms of *L. orbonalis*, but several other species of *Leucinodes* have been described. This insect belongs to family Pyralidae of the insect order Lepidoptera. This pest is widely distributed in Malaysia, Myanmar, Sri Lanka, India, Pakistan, Germany and East Africa Atwal and Dhaliwal (2005) [1].

Materials and Methods

Experimental site

The present investigation was conducted at the central Research Farm of "Sam Higginbottom University of Agriculture, Technology and Sciences" Allahabad, Uttar Pradesh during *Kharif* season 2016. The research farm is situated on the right side of Allahabad Rewa road at 20 degree and 15^0 North, 60^0 east longitude city and is about 129.2 cm above sea level. The site selected was uniform, cultivable with typical sandy loam soil having good drainage.

Preparation of insecticidal spray solution:

The insecticidal spray solution of desired concentration as per treatments was freshly prepared every time at the site of experiment just before the start of spraying operations. The quantity of spray materials required for crop was gradually increased as the crop advanced in age.

The spray solution of desired concentration was prepared by adoption the following formula:

$$V = \frac{C \ x \ A}{a.i.\%}$$

Where,

V= Volume of a formulated pesticide required.

C= Concentration required.

A= Volume of total solution to be prepared.

% a.i. = given Percentage strength of a formulated pesticide.

Bioefficacy of treatments

The population of *Leucinodes orbonalis* was recorded before 1 day spraying and on 7th day and 14th day after insecticidal application. The population of shoot and fruit borer had been recorded from 5 plants, randomly selected and tagged from each plot.

Percent shoot infestation

Observations was record on the number of infested shoots in each plot a day before spray 3rd 7th and 14th days after spraying on selected plants in a plot. The per cent shoot damage was worked syntax using the formula (Number basis).

$$\text{Percent shoot damage} = \frac{\text{Number of damaged shoots} \times 100}{\text{Total number of shoots}}$$

Percent fruit infestation -

Observations was recorded on the number of infested fruits and total number of marketable fruits on selected plants in a plot picking wise. The per cent fruit damage was worked out by using the formula (Number basis),

$$\text{Percent fruits damage} = \frac{\text{Number of damaged shoots} \times 100}{\text{Total number of fruits}}$$

Results and Discussion

All the treatments were found to be significantly superior to control in reducing percent shoot and fruit infestation. The minimum shoot and fruit infestation were recorded in cyparmethrin 25 EC from 5.853% to 4.111%.These result were similar to the finding reported by Yadav *et al.* (2015) [12].

Neem leaf extract was found less effective in reducing shoot and fruit damage. The present investigation supports the observation of Murugesan and murugesh (2009) [11]. The most effective treatment was Pongamia extrct, Lantana leaf extract, Tobacco extract and Garlic extract.

Neem Seed Kernal Extract was found to be next effective treatment and its results are supported by Yadav *et al.*(2015) [12].

Table 1: Bioeffcecy of some plant product against shoot and fruit borer (*Leucinodes orbonalis*) on brinjal. Shoot

			% Infestation				
S. No.	**Treatments symbol**	**Treatments**	**Before**	**3 DAS**	**7 DAS**	**14 DAS**	**Mean**
1	T_0	Untreated/water spray	24.304	21.779	23.032	24.270	23.027
			(29.573)*	(27.819)*	(28.680)*	(29.514)*	(28.676)*
2	T_1	Neem leaf extract	20.219	10.958	9.461	11.507	10.642
			(26.772)*	(19.331)*	(17.914)*	(19.829)*	(19.039)*
3	T_2	Lantana leaf extract	20.046	11.944	10.566	11.934	11.481
			(26.598)*	(20.218)*	(18.969)*	(20.210)*	(20.074)*
4	T_3	Garlic extract	23.480	12.631	11.203	13.772	12.535
			(28.983)*	(20.818)*	(19.555)*	(21.784)*	(20.735)*
5	T_4	Pongamia leaf extract	22.134	11.220	9.940	11.842	11.000
			(28.064)*	(19.570)*	(18.377)*	(20.128)*	(19.370)*
6	T_5	Tobacco leaf extract	20.833	12.314	10.893	12.5	11.902
			(27.157)*	(20.543)*	(19.272)*	(20.704)*	(20.182)*
7	T_6	Neem Seed Kernal extract	21.333	10.902	7.404	9.183	9.163
			(27.508)*	(19.280)*	(15.789)*	(17.640)*	(17.620)*
8	T_7	Cypermethrin	22.295	6.186	5.772	5.546	5.835
			(28.175)*	(14.402)*	(13.901)*	(13.621)*	(13.978)*
	Overall Mean			12.241	11.033	12.681	11.985
	F- test		NS	S	S	S	S
	S. Ed. (±)		3.29	1.13	0.97	1.20	0.76
	C. D. (P = 0.05)		9.98	3.43	2.93	3.64	2.29

*Figures in parenthesis are arc sin transformed value

Table 2: Bioefficacy of some plant product against shoot and fruit borer (on fruit)

% Infestation						
Treatments symbol	**Treatments**	**Before**	**3DAS**	**7 DAS**	**14 DAS**	**Mean**
T_0	Untreated/water spray	22.227	24.242	29.487	26.657	26.795
		(28.125)*	(29.496)*	(32.889)*	(31.084)*	(31.174)*
T_1	Neem leaf extract	19.298	8.119	9.697	9.379	9.361
		(26.059)*	(16.555)*	(18.144)*	(17.843)*	(17.816)*
T_2	Lantana leaf extract	20.339	9.235	10.675	11.716	10.485
		(26.807)*	(17.691)*	(19.070)*	(19.865)*	(18.894)*
T_3	Garlic extract	16.981	11.716	11.778	12.247	11.914
		(24.334)*	(20.016)*	(20.071)*	(20.485)*	(20.192)*
T_4	Pongamia leaf extract	18.965	8.870	9.980	10.926	9.873
		(25.816)*	(17.161)*	(18.421)*	(19.320)*	(18.313)*
T_5	Tobacco leaf extract	19.047	10.413	11.239	12.002	11.218
		(25.876)*	(18.826)*	(19.588)*	(20.27)*	(19.568)*
T_6	Neem Seed Kernal extract	19.403	7.445	9.103	8.534	8.360
		(26.135)*	(15.834)*	(17.560)*	(16.985)*	(16.807)*
T_7	Cypermethrin	15.189	3.572	3.949	5.711	4.411
		(22.938)*	(10.895)*	(11.463)*	(13.827)*	(12.124)*
Overall Mean			10.385	12.132	12.86	11.792
F- test		NS	S	S	S	S
S. Ed. (±)		1.53	0.52	1.16	0.50	0.51
C. D. (P = 0.05)		4.63	1.58	3.53	1.51	1.55

*Figures in parenthesis are arc sin transformed value

Summary & Conclusion

Three sprays revealed that Cypermethrin 25 EC @ 0.02% was found to be more effective than other botanicals insecticides. NSKE and Neem leaf extract were at par with the cypermethrin. Treatments like pongamia, lantana leaf extract, tobacco leaf extract and Garlic bulb extract were par with each other and followed next effective treatments. Garlic extract recorded least effective among the treatments but significant and superior over control.

Cypermethrin, NSKE and Neem leaf extract recorded the shoot infestation 5.546, 7.404 and 9.461 percent, respectively. Cypermethrin, NSKE and Neem leaf extract recoded the fruit infestation by 3.57, 7.445 and 8.119 percent, respectively. The highest yield was noticed in cypermethrin followed by NSKE and Neem leaf extract.

Maximum net returns of Rs 512000 from cypermetrin followed by NSKE and Neem leaf extract.

The shoot and fruit borer (*Leucinodes orbonalis*) population on brinjal increased with maximum temperature and decreased with decline in maximum temperature during 34th standard week (August third week) in Allahabad. Cypermethrin was found to be the most effective treatment against shoot and fruit borer. It also gave the highest cost benefit ratio under the Allahabad Agro climatic conditions. The present findings are limited to one crop season (July2016-November 2016) under Allahabad Agro climatic conditions as such more trials are required in future to validate the findings.

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