Biological Forum – An International Journal **15(4): 806-809(2023)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Field Efficacy of Cypermethrin with Combination of different Botanicals against Shoot and Fruit borer (*Leucinodes orbonalis* Guenee) of Brinjal (*Solanum melongena* L.)

Udai Pal Singh[1*], Anoorag R. Tayde[2], Sachin[3] and Ashok Sakharam Chandar[2]

[1]Department of Agricultural Entomology, College of Agriculture, Swami Keshwanand Rajasthan Agricultural University Bikaner (Rajasthan), India.

[2]Department of Entomology, Sam Higginbottom University of Agriculture, Sciences and Technology, Prayagraj (Uttar Pradesh), India.

[3]Department of Agricultural Entomology, Maharana Pratap University of Agriculture and Technology, Udaipur (Rajasthan), India.

(Corresponding author: Udai Pal Singh)*

(Received: 10 February 2023; Revised: 15 March 2023; Accepted: 19 March 2023; Published: 20 April 2023)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: The present investigation was conducted during July to December 2018 at Central Research Farm, SHUATS, Naini, Prayagraj as fruit and shoot borer is a major pest in brinjal causing severe damage to the crop in prayagraj. Regular use of chemical pesticides create problem in the natural ecosystem like environmental pollution, pest resistance and health hazard etc. Hence, the study was conducted to find out best combination of botanical along with chemical treatment. Eight treatments were evaluated against *Leucinodes orbonalis* i.e., Neem oil 2 mL/L, Garlic bulb extract 50 mL/L, Pongamia oil 5 mL/L, Neem oil 2 mL/L + Cypermethrin 10EC 1 mL/L, Garlic bulb extract 50 mL/L + Cypermethrin 10EC 1 mL/L, Pongamia oil 5 mL/L + Cypermethrin 10EC 1 mL/L, Cypermethrin 10EC 2 mL/L along with untreated control. Minimum per cent of shoot infestation, fruit infestation and highest B:C ratio were recorded in Neem oil + Cypermethrin with (15.04%, 10.62% and 1:8.10) followed by Pongamia oil + Cypermethrin (15.56%, 11.26% and 1:7.42), Garlic bulb Extract + Cypermethrin (16.04%, 12.33% and 1:6.86), Cypermethrin (16.70%, 12.82% and 1:6.69), Neem oil (17.99%, 13.00% and 1:6.37), Pongamia oil (18.62%, 13.66% and 1:6.13), Garlic bulb extract (19.65%, 14.66% and 1:5.20) and untreated control (25.67%, 20.70% and 1:3.10) respectively.

Keywords: *Leucinodes orbonalis*, Benefit cost ratio, Brinjal, Efficacy, Botanicals.

INTRODUCTION

Vegetable cultivation is one of the most profitable and dynamic branches of agriculture. It has become an important source of income for both farmers and field labours serving as a vehicle for reducing poverty in rural areas. Botanically brinjal is known as *Solanum melongena* L. (2n=24) popularly known as eggplant belongs to family Solanaceae. It is native of India and is grown throughout the country. It is an important vegetable grown in all the seasons. China ranks first (57.9% of world output) and India ranks second in the production of brinjal. In India, brinjal occupies total area of 728 thousand hectares and production of 1.27 million tonnes. The major brinjal growing states in India are Andhra Pradesh, Karnataka, West Bengal, Tamil Nadu, Maharashtra, Orissa, Uttar Pradesh, Bihar and Rajasthan.

Brinjal is subjected to attack by number of insect pest right from nursery stage, till harvesting. Among the insect pestsx infesting brinjal, the major ones are shoot and fruit borer, *Leucinodes orbonalis*, whitefly, *Bemicia tabaci*, leafhopper, *Amrasca biguttula* (Ishida), non-insect pest, red spider mite and *Tetranychus macfurlanei*. Of these, *L. orbonalis* is considered the main constraint as it damages the crop throughout the year (Kalawate and Dethe 2012). Brinjal shoot and fruit borer *(Leucinodes orbonalis* Guenee*)* is the most destructive insect pest of brinjal which caused 31-86% fruit damage (Alam *et al.*, 2003) reaching up to 90% (Rahman, 1997). It is reported that there will be reduction in vitamin C content to an extent of 68% in the infested fruits (Yadav *et al.*, 2015). Now-a-days, emphasis is given on the use of plant extracts as biopesticides in insect control measures (Singh *et al.*, 2007; Gupta and Raghuraman 2004; Oerke, 2006; Gokce, 2010). This is because that the use of plant based biopesticides in insect control is non-toxic and safe biodegradable alternatives to the conventional chemical control (Anil and Pandey 2001; Dolui and Debnat 2010). So, for ensuring food safety and minimization environmental hazards the present study was undertaken to determine the effectiveness of selected botanicals for the management of brinjal shoot and fruit borer**.** Therefore, the present experiment was conducted to evaluate some biorationals along with chemical insecticides for an effective integrated management of shoot and fruit borer in brinjal.

MATERIALS AND METHOD

The experiment was conducted at experimental field of Department of Entomology, Naini Agricultural institute, SHUATS, Prayagraj during *Kharif*-2018. The trial was laid out in randomized block design with eight treatments and three replications. The brinjal variety Banaras round was transplanted on 17 september, 2018 at 60 × 45 cm spacing. The plot size was kept 2 × 2 m. All recommended packages and practices were followed to raise the crop, except plant protection measures. The observation of the pests was recorded from five randomly selected plants from every plot. The treatments viz. Neem oil 2 mL/L, Garlic bulb extract 50 mL/L, Pongamia oil 5 mL/L, Neem oil 2 mL/L + Cypermethrin 10EC 1 mL/L, Garlic bulb extract 50 mL/L + Cypermethrin 10EC 1 mL/L, Pongamia oil 5 mL/L + Cypermethrin 10EC 1 mL/L, Cypermethrin 10EC 2 mL/L and Untreated control. The spraying was done after the population reaching its economic threshold level. As soon as the infestation of pest on the shoot was initiated, observations were recorded one day before spray, 3rd, 7th and 14th days after spraying. The assessment of the shoot damage was done by calculating the number of damaged shoots and total number of the healthy shoots observed from five randomly selected plants per plot and expressed in per cent (first spray). Brinjal fruits were harvested at weekly intervals. The percent fruit damage was total number of affected fruits and total number of the healthy fruits observed from five randomly selected plants per plot (second spray). The total yield of the marketable fruits obtained from different treatments was calculated and converted by considering the additional cost (cost of insecticides and operational charges) and benefit (compared to untreated control) in the respective treatments. The data recorded in the different treatments were subjected to statistical analysis after suitable transformation by following standard procedures of RBD experiment.

RESULT AND DISCUSSION

The botanicals are emerging as a new solution in the integrated pest management and also new botanicals products are introduced, to find the permanent solution to pesticidal resistance problem. The results showed that all the treatments were significantly superior in reducing the infestation of shoot and fruit borer resulting in increasing the yield, significantly as compared to control. In comparative studies Neem oil + Cypermethrin used as a standard check records the mean of the minimum shoot damage (15.04%) followed by Pongamia oil + Cypermethrin where 15.56% shoot damage was recorded, Garlic bulb extract + Cypermethrin was also effective which gave 16.04% shoot damage. Cypermethrin act as a conventional for shoot damage recording16.70%. Effectiveness was also observed in Neem oil, Pongamia oil and Garlic bulb extract in which 17.99%, 18.62% and 19.65% shoot damage was recorded, separately. The maximum shoot damage (25.67%) was recorded in control plot. The peak level of protection percent in controlling shoot damage was observed in Neem oil + Cypermethrin.

The effectiveness of Neem oil + Cypermethrin for the control of *L. orbonalis* has also been reported by Singh and Tayde (2017) and Yadav *et al.* (2017). Pongamia oil + Cypermethrin was found next effective treatment against *L. orbonalis* in present studies, which is in agreement with the results obtained by Mathur *et al.* (2012). Garlic bulb extract + cypermethrin found effective in present study is in accordance with the report Jyoti (2006). Cypermethrin is found to be the next best treatment which is in line with the findings of Kushwaha and Painkra (2016), Sharma *et al.* (2017). The efficacy of Neem oil, Pongamia oil and Garlic bulb extract was also found in reducing the infestation of shoot and fruit borer, which is in conformity with the finding of Murugesan and Murugesh (2009), Mathur *et al.* (2012) and Singh and Tayde (2017).

The second spray was applied after 15 days of first spray and data on fruit damage was recorded. Pre-treatment observations recorded one day before first spray; it was non-significant treatments with each other. The data for second spray shows that minimum fruit per cent damage recorded in (check) Neem oil + Cypermethrin was 10.62% followed by Pongamia oil + Cypermethrin 11.26 %, Garlic bulb extract + Cypermethrin 12.33 % and Cypermethrin 12.82 %. Effectiveness was also observed in Neem oil 13.00 %, Pongamia oil 13.66% and Garlic bulb extract 14.66%. The highest per cent fruit damage was recorded in control 20.70 %. The present findings are in agreement with the results of many researchers (Yadav *et al.*, 2017; Singh and Tayde (2017), who also reported that Neem oil + Cypermethrin as most effective chemical. Pongamia oil + Cypermethrin is found to be the next best treatment which is in line with the findings of Singh and Tayde (2017) and Kushwaha and Painkra (2016). Garlic bulb extract + cypermethrin found effective in present study is in accordance with the report Jyoti (2006). Cypermethrin is found to be the next best treatment which is in line with the findings of Mainali *et al.* (2013). Neem oil found effective in present study is in accordance with the report Dehariya *et al.*, (2017). Pongamia oil is found to be the next best treatment which is in line with the findings of Kushwaha and Painkra (2016). Garlic bulb extract was found to be least effective but comparatively superior over the control. These finding are in support with Jyoti (2006).

Table 1: Efficacy of cypermethrin with combination of different botanicals against shoot and fruit borer, (First spray) and (second spray).

Treatments		Shoot Infestation (%) 1ST Spray					Fruit Infestation (%) 2ND Spray				
		1DBS	3DAS	7DAS	14 DAS	Mean	1DBS	3DAS	7DAS	14 DAS	Mean
T_1	Neem oil @2ml/lit	18.61	19.03	18.08	16.88	17.99	15.38	14.12	12.82	12.08	13.00
T_2	Garlic bulb extract @50ml/lit	20.82	20.70	19.63	18.62	19.65	16.04	15.79	14.53	13.67	14.66
T_3	Pongamia oil @ 5 mL/L	22.08	20.24	18.55	17.41	18.62	15.98	14.66	13.53	12.81	13.66
T_4	Neem oil + Cypermethrin @ 2 mL/L + 1 mL/L	23.62	16.22	15.21	13.70	15.04	16.86	12.20	10.42	9.24	10.62
T_5	Garlic bulb extract + Cypermethrin @ 50 mL/L + 1 mL/L	22.84	17.19	16.43	14.52	16.04	16.50	13.59	12.06	11.34	12.33
T_6	Pongamia oil + Cypermethrin @ 5 mL/L + 1 mL/L	19.48	16.46	15.90	14.33	15.56	16.65	12.53	11.06	10.20	11.26
T_7	Cypermethrin @ 2 mL/L	20.97	18.03	16.87	15.30	16.70	15.95	13.92	12.58	11.98	12.82
T0	Control (Water Spray)	22.90	24.97	25.53	26.51	25.67	17.02	18.82	20.72	22.57	20.70
F- test		NS	S	S	S	S	NS	S	S	S	S
S. Ed. (±)		2.51	1.01	0.94	1.38	0.25	0.87	0.21	0.24	0.12	0.53
C. D. (P = 0.05)		5.38	2.57	2.48	2.99	1.29	1.87	1.17	1.26	0.90	1.87

Table 2: Economics of Cultivation.

Sr. No.	Treatment	Yield q/ha	Net Profit ₹ (B)	Common cost ₹	Treatment cost ₹	Total cost ₹ (C)	C: B ratio
01	Neem oil	170.2	**255300**	38840	1200	**40040**	1:6.37
02	Garlic bulb extract	140.4	**210600**	38840	1600	**40440**	1:5.20
03	Pongamia oil	162.4	**243600**	38840	850	**39690**	1:6.13
04	Neem oil + Cypermethrin	218.5	**327750**	38840	1605	**40445**	1:8.10
05	Garlic bulb extract + Cypermethrin	186.9	**280350**	38840	2005	**40845**	1:6.86
06	Pongamia oil + Cypermethrin	198.6	**297900**	38840	1255	**40095**	1:7.42
07	Cypermethrin	179.7	**269550**	38840	1410	**40250**	1:6.69
08	Control	80.4	**120600**	38840	---	**38840**	1:3.10

Cost of yield per quintal `1500.

CONCLUSION

The highest yield and benefit cost ratio was recorded in Neem oil + Cypermethrin (check) (218.5 q/ha and 1:8.10) supported by Yadav *et al.* (2017) followed by Pongamia oil + Cypermethrin (198.6 q/ha and 1:7.12), Garlic bulb extract + cypermethrin (186.9 q/ha and 1:6.86), Cypermethrin (179.7 q/ha and 1:6.69), were best three among treatment and these can be used alternatively for the management of brinjal pests (Table 2). From the critical analysis of the present findings it can be concluded that different Botanicals with Cypermethrin pesticides like Neem oil + Cypermethrin, Pongamia oil + Cypermethrin, Garlic bulb extract + cypermethrin and Cypermethrin were showing good result against *Leucinodes orbonalis* and can be used instead of solo use of chemical insecticides which causes environmental and ecological dent. It also has potential to be included in integrated pest management.

REFRENCES

Alam, S. N., Rashid, M. A., Rouf, F. M. A., Jhala, R. C., Patel, J. R., Satpathy, S., Shivalingaswamy, T. M., Rai, S., Wahundeniya, I., Cork, A., Ammaranan, C. and Talekar, N. S., (2003). Development of an integrated pest management strategy for eggplant fruit and shoot borer in South Asia. *Technical Bull*. *AVRDC-*

The world Vegetable Centre, Shanhua, Taiwan, 28(2), 56-59.

Anil, K. and Pandey, M. C. (2001). Role of Bio pesticides in plant protection system. *Biopest Conf. BET., Chandigarh, India, 6*(2), 113.

Dehariya, S. K., Shukla A. and Barde, S. K. (2017). Efficacy of Botanical Pesticides against Shoot and Fruit Borer, *Leucinodes orbonalis* in Brinjal. *Biosciences biotechnology research Asia, 14*(1), 721-725.

Dolui, A. K. and Debnath, M. (2010). Antifeedant activity of plant extracts to an insect *Helopeltis theivora*. *Journal of Environmental Biology, 31*(5), 557-559.

Gokce, A. (2010). Toxicity and Antifeedant activity of selected plant extract against larval oblique banded leaf roller *Choristoneurar osateana* (Harris). *The Open Entomology, 4*(1), 18-24.

Gupta, G. P. and Raghuraman, M. (2004). Utilization of biopesticides in cotton pest management In: Biopesticides for sustainable agriculture: prospects and constraints. *(Kaushik, N., Ed.) CAB abstracts Teri Press, The Energy and Resource Institute. 31*(4), 43.

Jyoti, D. P. (2006). Biorational Approaches for the management of brinjal shoot and fruit borer, University of agricultural sciences, Dharwad. *14*(1), 721-725.

Kalawate, A. and Dethe, M. D. (2012). Bio efficacy study of biorational insecticide on brinjal *Journal of Biopesticides*, *5*(1), 75-80.

Mainali, R. P. Thapa, R. B., Pokhrel, P., Dangi, N. and Aryal. S. (2013). Bio-rational management of eggplant fruit and shoot borer, *Leucinodes orbonalis* Guenee, (Lepidoptera: Pyralidae) in Lalitpur, Nepal, *Journal of Plant Protection Society*, *24*(4), 235-247.

Mathur, A., Singh, S., Singh, N. P. and Meena, M. (2012). Field evaluation of plant products and microbial formulations against brinjal shoot and fruit borer, (*Leucinodes orbonalis* Guenee) under semi-arid conditions of Rajasthan. *Journal of Biopesticides, 5*(1), 71-74.

Murugesan, N. and Murugesh, T. (2009) Bioefficacy of some plant products against brinjal fruit borer, *Leucinodes orbonalis* Guenee (Lepidoptera: Pyralidae). *Journal of Biopesticides*, *2*(1), 60-63.

Oerke, E. C. (2006). Crop losses to pests. *Journal of Agricultural Science*, *144*, 31-43.

Rahman, A. K. M. Z. (1997). Screening of 28 brinjal line for resistance/tolerance against the brinjal shoot and fruit borer. *Annual Report*. Entomology Division, Bangladesh Agricultural Research Institute, Joydebpur, Gazipur, Bangladesh. *2*(1), 32-35.

Sharma, J. H. and Tayde, A. R. (2017). Evaluation of biorational pesticides, against brinjal fruit and shoot borer, *Leucinodes orbonalis* Guen. on brinjal at Allahabad Agro climatic Region. *International Journal of Current Microbiology and Applied Sciences, 6*(6), 2049-2054.

Singh, K. I., Athokpam, S., Singh, M. P., Singh, T. R. and Singh, N. G. (2007). Effect of planting dates on incidence of the shoot and fruit borer, *Leucinodes orbonalis* (Guenee.) and its seasonal abundance in brinjal crop at Manipur climate. *Journal of Applied Zoological Research*, *18*(1), 15-20.

Singh, M. C. and Tayde, A. R. (2017). Efficacy of certain biorationals against shoot and ruit borer (*Leucinodes orbonalis* Guenee) of brinjal (*Solanum melongena* L.). *Journal of Pharmacognosy and Phytochemistry*, *6*(4), 1857-1859.

Yadav, R. and Tayde, R. A. (2017). Comparative efficacy of cypermethrin with combination of different botanicals against brinjal shoot and fruit borer (*Leucinodes orbonalis*) on brinjal. *Journal of Entomology and Zoology Studies, 6*(3), 1675-1677.

Yadav, R., Lyall, H. K. S. and Kumar, R. (2015). Efficacy of certain botanical insecticides against shoot and fruit borer, *Leucinodes orbonalis* (Guenee) on brinjal (*Solanum melongena*). *The Bioscan*, *10*(2), 987-990.

How to cite this article: Udai Pal Singh, Anoorag R. Tayde, Sachin and Ashok Sakharam Chandar (2023). Field Efficacy of Cypermethrin with Combination of different Botanicals against Shoot and Fruit borer (*Leucinodes orbonalis* Guenee) of Brinjal (*Solanum melongena* L.). *Biological Forum – An International Journal, 15*(4): 806-809.