

Original Research Article

<https://doi.org/10.20546/ijcmas.2018.705.142>

## Efficacy of Some New Insecticides against Brinjal Shoot and Fruit Borer *Leucinodes orbonalis* Guenee

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### ABSTRACT

#### Keywords

Brinjal, Insecticides, Fruit and shoot borer, Infestation

#### Article Info

##### Accepted:

10 April 2018

##### Available Online:

10 May 2018

A field experiment was conducted at the experimental field site of All India co-ordinated Research project on vegetable crops, Orissa University of Agriculture Technology, Bhubaneswar in RBD with 7 treatments replicated 3 times during *Kharif*, 2016 and summer, 2017, to study the field efficacy of six sprayable insecticides viz., rynaxypyr 20% SC @ 33.33 ml a.i./ha, spinosad 45 % SC @ 75 g a.i./ha, emamectin benzoate 5%SG @ 10 g a.i./ha, flubendiamide 480 SC @ 78.70 g a.i. /ha, thiamethoxam 25%WG @ 41.66 g a.i./ha and cartap hydrochloride 50SP@ 375g a..i/ha against brinjal shoot and fruit borer. All the test insecticides proved their efficacy but flubendiamide 480 SC @ 78.70 g a.i. /ha, rynaxypyr 20% SC @ 33.33 ml a.i/ha and spinosad 45%SC @ 10ml a.i/ha proved highly effective against shoot and fruit borer.

### Introduction

Brinjal is an important crop grown in all the seasons. Due to its nutritive value, consisting of minerals like iron, phosphorous, calcium and vitamins like A, B and C, unripe fruits are used primarily as vegetable in the country. It is also used as a raw material in pickle making (Singh, 1963) and as an excellent remedy for those suffering from liver complaints. In 2013, global production of eggplants was 49.4 million tonnes (FAOSTAT, 2013). More than 1,600,000 hectares (4,000,000 acres) are devoted to the cultivation of eggplants in the world. India constitutes 27% of world total (FAOSTAT, 2012). In India, Brinjal shoot and fruit borer (BFSB) is considered the most destructive pest causing huge losses in brinjal

(Patil, 1990). It causes severe damage in South Asia (Thapa, 2010), where yield losses may reach up to 85 to 90 percent (Misra, 2008; Jagginavar *et al.*, 2009). The larvae bore into tender shoots at the vegetative stage, flower and fruit (CABI, 2007).

Flower infestation is very rare, but infested flowers cannot produce fruit (Alam *et al.*, 2006). But once fruit setting has been initiated, shoot infestations become negligible (Kumar and Dharmendra, 2013) or completely disappear (Naqvi *et al.*, 2009).

The present study was carried out to evaluate the efficacy of different insecticides to find the best practice if insecticides have to be applied for management of the borer.

## Materials and Methods

The study was conducted at All India Co-ordinated project on vegetable crops, Bhubaneswar (20° 15' N and 85° 52' E) during *kharif* 2016 and *rabi* 2017. Brinjal variety "Utkalanushree" was used in *kharif* 2016 for experimental purpose. Utkal Anushree is a national release from OUAT. This cultivar is resistant against bacterial blight of brinjal and other sucking pests. The experiment was carried out in randomized complete block design with three replications and seven treatments. Seedlings of three to four leaf stage was transplanted into the field for *kharif* and *rabi* trail. Each subplot is measured 8.1m<sup>2</sup> (2.7m X 3 m). Each sub-plot was separated from each other by bunds. Light irrigation was given right after transplanting. The experiment plot was ploughed thoroughly. Farm Yard manure (FYM) @ 5 tonnes /ha was incorporated into the soil at the time of final land preparation.

A spacing of 60X45cm is maintained. Chemical fertilizers were applied @120:50:70kg of N: P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O per hectare. Full dose of P<sub>2</sub>O<sub>5</sub> and 20% K<sub>2</sub>O and Nitrogen are applied as basal dose. Rest of the fertilizers applied as two top dressings at an interval of 3 weeks. Three insecticide sprays were applied at 20 days intervals using a knapsack sprayer. Water was applied to control plots when insecticides were sprayed. Treatments were applied to the whole plots and data was recorded

For recording shoot infestation, healthy and infested shoots were counted on 10 randomly selected plants. Shoot damage caused by *L. orbonalis* was identified by wilting of the terminal shoots in vegetative stage. Data were recorded one day before spray and three, seven and fourteen days after treatment. Percent shoot infestation was calculated by using the following formula:

$$\text{Percent Shoot damage} = \frac{\text{No. of infested shoots}}{\text{Total no. of shoots}} \times 100$$

Data were analyzed by using analysis of variance (ANOVA) and mean separation was done by calculating least significance difference at P = 0.05.

## Results and Discussion

The attack of *L. orbonalis* (shoot infestation) was recorded only at 7 days in *kharif* after first spray, as there was no infestation by *L. orbonalis* (shoot and fruitborer) prior to 7 days. At 7 DAS, lowest shoot infestation (%) was observed in rynaxypyr (7.77), which was at par with emamectin benzoate (8.20) and flubendiamide (8.55). Highest shoot damage (14.2%) was recorded in untreated control which was significantly different from other treatments.

At 14 DAS, lowest shoot damage (%) was recorded in rynaxypyr (4.50) which was at par with flubendiamide (5.20) and emamectin benzoate (2.58). Moreover, all these insecticides were significantly different from untreated control (16.30). During the post spray period, highest % reduction over control was recorded in rynaxypyr (59.80), followed by flubendiamide (54.95).

The lowest % reduction over control was recorded in spinosad (42.49). All the insecticides were significantly superior to untreated control (11.93). At 7 DAS, the lowest shoot damage (2.10%) was recorded in case of rynaxypyr which was at par with flubendiamide (2.32%), spinosad (2.46%) and emamectin benzoate (2.61%).

However, thiamethoxam (3.85%) found to be least effective among the test insecticides. Highest infestation of shoot was observed in untreated control (11.92%) during summer (Table 1-3).

**Table.1** Effect of Insecticidal treatments on shoot infestation (%) by *L. orbonalis* during kharif 2016 and Summer 2017 at Bhubaneswar (1st Spray)

Tr.	Chemical	Dose	Kharif, 2016				Mean	%	Summer,2017				Mean	%
			1	3	7	14			1	3	7	14		
	Insecticide	(gm or ml a.i/ha)	DBS	DAS	DAS	DAS	infestation in post spray period	reduction over control period	DBS	DAS	DAS	DAS	infestation in post spray period	reduction over control period
T1	Rynaxypyr 20 SC	33.33	0.00	0.00	7.77	4.5	6.13	59.80	8.18	3.38	2.10	4.03	4.42	61.49
			(0.71)	(0.71)	(2.86)	(2.24)	(2.94)	(1.96)	(1.61)	(2.12)				
T2	Spinosad 45SC	75.00	0.00	0.00	9.45	8.10	8.77	42.49	9.00	4.31	2.46	6.23	5.50	52.09
			(0.71)	(0.71)	(3.15)	(2.93)	(3.08)	(2.19)	(1.72)	(2.39)				
T3	Emamectin benzoate 5SG	10.00	0.00	0.00	8.20	6.18	7.19	52.85	7.67	4.22	2.61	5.80	5.06	55.92
			(0.71)	(0.71)	(2.94)	(2.58)	(2.85)	(2.17)	(1.76)	(2.50)				
T4	Flubendiamide 480SC	80.00	0.00	0.00	8.55	5.20	6.87	54.95	7.00	4.00	2.32	6.36	4.92	57.14
			(0.71)	(0.71)	(3.00)	(2.38)	(2.73)	(2.12)	(1.67)	(2.61)				
T5	Thiamethoxam 25WG	41.66	0.00	0.00	9.92	7.50	8.71	42.88	6.33	5.33	3.85	7.20	5.67	50.60
			(0.71)	(0.71)	(3.22)	(2.82)	(2.61)	(2.41)	(2.08)	(2.77)				
T6	Cartap hydrochloride 50SP	375.00	0.00	0.00	9.10	7.10	8.10	46.88	8.26	4.52	2.78	7.43	5.70	50.34
			(0.71)	(0.71)	(3.09)	(2.75)	(2.75)	(2.24)	(1.81)	(2.81)				
T7	Untreated control		0.00	0.00	14.2	16.30	15.25		9.15	11.93	11.92	12.95	11.48	
			(0.71)	(0.71)	(3.83)	(4.09)	(3.10)	(3.52)	(3.52)	(3.66)				
SE(m)±			-	-	0.12	0.15			0.09	0.07	0.06	0.06		
CD (p=0.05)			-	-	0.38	0.46			NS	0.22	0.18	0.15		

**Table.2** Effect of insecticidal treatments on shoot infestation (%) by *L. orbonalis* during *kharif* 2016 and Summer 2017 at Bhubaneswar (2<sup>nd</sup> Spray)

Tr.	Chemical	Dose	<i>Kharif,2016</i>				Mean	%	<i>Summer,2017</i>				Mean	%
			1	3	7	14			1	3	7	14		
	Insecticide	(gm or ml a.i/ha)	DBS	DAS	DAS	DAS	infestation in post spray period	reduction over control	DBS	DAS	DAS	DAS	infestation in post spray period	reduction over control
T1	Rynaxypyr 20 SC	33.33	6.45	5.23	4.36	2.32	4.59	61.20	13.72	6.30	4.81	2.89	4.66	73.79
			(2.63)	(2.39)	(2.20)	(2.15)			(3.77)	(2.60)	(2.30)	(1.84)		
T2	Spinosad 45SC	75.00	6.10	5.07	4.50	3.20	4.71	60.18	13.92	9.20	5.29	3.63	6.04	66.02
			(2.56)	(2.36)	(2.23)	(1.92)			(3.80)	(3.11)	(1.84)	(2.03)		
T3	Emamectin benzoate 5SG	10.00	6.00	4.23	3.33	3.80	4.35	63.22	15.88	6.60	6.52	5.20	6.10	65.69
		(2.54)	(2.17)	(1.95)	(1.96)	(4.04)			(2.66)	(2.64)	(2.38)			
T4	Flubendiamide 480SC	80.00	6.96	5.20	4.72	2.20	4.77	59.67	14.89	7.15	6.86	5.53	6.51	63.38
			(2.73)	(2.38)	(2.28)	(1.69)			(3.92)	(2.75)	(2.71)	(2.45)		
T5	Thiamethoxam 25WG	41.66	7.80	6.05	5.13	4.49	5.86	50.46	15.53	9.81	5.17	4.62	6.53	63.27
			(2.88)	(2.55)	(2.37)	(2.23)			(4.00)	(3.21)	(2.38)	(2.26)		
T6	Cartap hydrochloride 50SP	375.00	7.93	6.55	6.00	4.23	6.17	47.84	16.00	7.45	8.33	6.43	7.04	60.40
			(2.90)	(2.65)	(2.54)	(2.17)			(4.06)	(2.81)	(2.97)	(2.63)		
T7	Untreated control		13.75	13.20	9.73	10.65	11.83		16.67	18.10	18.33	16.89	17.78	
			(3.77)	(3.70)	(3.19)	(3.33)			(4.14)	(4.31)	(4.33)	(4.17)		
	SE(m)±		0.15	0.12	0.09	0.10			0.22	0.20	0.17	0.10		
	CD (p=0.05)		0.42	0.35	0.27	0.28			NS	0.59	0.51	0.30		

**Table.3** Effect of insecticidal treatments on shoot infestation (%) by *L. orbonalis* during *kharif* 2016 and Summer 2017 at Bhubaneswar (3<sup>rd</sup> Spray)

Tr.	Chemical Insecticide	Dose (gm or ml a.i/ha)	Kharif,2016				Mean infestation in post spray period	% reductio n over control	Summer,2017				Mean infestation in post spray period	% reduction over control
			1 DBS	3 DAS	7 DAS	14 DAS			1 DBS	3 DAS	7 DAS	14 DAS		
T <sub>1</sub>	Rynaxypr 20 SC	33.33	4.10 (2.14)	1.60 (1.44)	1.00 (1.22)	0.72 (1.10)	1.13	87.26	4.10 (2.14)	2.20 (1.64)	1.82 (1.52)	0.00 (0.71)	2.01	86.35
T <sub>2</sub>	Spinosad 45SC	75.00	5.20 (2.38)	2.10 (1.61)	1.73 (1.49)	1.20 (1.30)	1.67	81.17	5.53 (2.45)	2.27 (1.79)	2.45 (1.71)	0.00 (0.71)	2.58	82.48
T <sub>3</sub>	Emamectin benzoate 5SG	10.00	4.33 (2.19)	2.46 (1.72)	2.00 (1.58)	1.33 (1.35)	1.93	78.24	5.66 (2.43)	3.00 (1.87)	2.63 (1.76)	0.00 (0.71)	2.81	80.92
T <sub>4</sub>	Flubendiamide 480SC	80.00	4.00 (2.12)	1.21 (1.31)	0.86 (1.16)	0.66 (1.07)	0.91	89.74	5.27 (2.40)	2.52 (1.82)	1.93 (1.55)	0.00 (0.71)	2.22	84.92
T <sub>5</sub>	Thiamethoxam 25WG	41.66	4.00 (2.12)	2.86 (1.83)	2.30 (1.67)	1.58 (1.44)	2.24	74.74	5.14 (2.37)	3.10 (1.89)	2.72 (1.79)	0.00 (0.71)	2.91	80.24
T <sub>6</sub>	Cartap hydrochloride 50SP	375.00	4.33 (2.19)	2.52 (1.73)	2.30 (1.67)	2.06 (1.60)	2.29	74.18	6.40 (2.62)	4.07 (2.13)	3.10 (1.89)	0.00 (0.71)	3.58	75.69
T <sub>7</sub>	Untreated control		10.07 (3.25)	10.00 (3.24)	9.35 (3.13)	7.26 (2.78)			17.70 (4.28)	15.27 (3.97)	14.20 (3.83)	0.00 (0.71)	14.73	
	SE(m)±		0.13	0.12	0.09	0.05			0.07	0.14	0.21	-		
	CD (p=0.05)		NS	0.40	0.26	0.15			0.20	0.44	0.60	-		

During the post spray period of second spray, highest % reduction over control was seen in case of rynaxypr (61.49), followed by flubendiamide (57.14). The lowest % reduction over control was noted in case of cartap hydrochloride (50.34). At 14 DAS, spinosad, emamectin benzoate and

flubendiamide are at par with each other. Highest infestation was observed in control (10.65%). 1 day before the second spray during summer season, the shoot damage (%) was found to the tune of 3.77-4.14 in different treatments. 1 day before the second spraying during *kharif* season, the shoot damage (%)

was found to the tune of 6.00-7.93 in different treatments. 1 day before the second spray during summer season, the shoot damage (%) was found to the tune of 3.77-4.14 in different treatments.

One day before third spray during *kharij* season, the shoot damage (%) was limited to 4.00-10.07 in different treatments. During the post spray period, highest reduction percent over control was found in flubendiamide (89.74), followed by 87.26 in rynaxypyr. Lower reduction (%) over control was obtained in cartap hydrochloride (74.18). 1 day before the third spray, during summer season, shoot damage (%) was found to the extent of 4.10-17.70 in different treatments. At 3DAS it was that, the shoot damage % in thiamethoxam (3.10) was found to be at par with rynaxypyr (2.20), spinosad (2.27), flubendiamide (2.52), emamectin benzoate (3.00).

Maximum infested shoot are observed in untreated control (15.27). At 7 DAS, all the treatments are significantly at par with each other and the percent infestation is 14.20%. During the post spray period, highest reduction (%) over control was founded in rynaxypyr (86.35) followed by (84.92) in case of flubendiamide. After 7 DAS the population was negligible hence it was not recorded. It is concluded that the tested insecticide reduced shoot and fruit infestation in treated as compared to those in untreated plots. For control of shoot infestation, flubendiamide (Belt 48SC) and emamectin benzoate (Timer 1.9EC) were better in both seasons.

The present findings revealed that flubendiamide and rynaxypyr showed up better results in controlling the shoot and fruit damage whereas spinosad and emamectin benzoate gave moderate control and cartap hydrochloride was found to be least effective. Latif *et al.*, (2009 and 2010); Abdullah *et al.*,

(2014) reported that flubendiamide is used effectively against shoot and fruit borer upto 80% of shoot infestation. Rajavel *et al.*, (2011); Mandal *et al.*, (2010) concluded that rynaxypyr is effective against eggplant fruit and shoot borer. Deshmukh and Bhamare (2006); Adiroubane and Raghuraman (2008) indicated that spinosad 45 EC was effective in reducing the shoot and fruit borer infestation. Dutta *et al.*, (2007) reported that emamectin benzoate showed moderate level of efficacy providing 62.8% reduction of brinjal fruit and shoot borer population over control.

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#### How to cite this article:

Reshma, M. and Behera, P.K. 2018. Efficacy of Some New Insecticides against Brinjal Shoot and Fruit Borer *Leucinodes orbonalis* Guenee. *Int.J.Curr.Microbiol.App.Sci*. 7(05): 1170-1176. doi: <https://doi.org/10.20546/ijcmas.2018.705.142>