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Efficacy of Different Insecticide Schedules Against Brinjal Shoot and Fruit Borer, *Leucinodes orbonalis Guenee*

B Srihari and B C Jena
Department of Entomology, College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar – 751 003

ABSTRACT

The field experiment was undertaken at Central Research Station, OUAT, Bhubaneswar during *Rabi,* 2002-03. Six newer insecticide schedules along with one check were evaluated against *Leucinodes orbonalis* Guenee in Brinjal. All the insecticides were significantly superior over untreated Check. Among the treatments T_3 (*carbaryl + cartap hydrohloride + endosulfan + diflubenzuron + multineem + chloripyriphos*) schedule was most effective in reducing shoot and fruit infestation of brinjal. Highest fruit yield (196.61 q/ha) was obtained from T_3 schedule and minimum yield (117.62 q/ha) was obtained from untreated check.

Key words : Insecticide Schedules, Leucinodes orbonalis

Brinjal (*Solanum melongena* L.) is the most important vegetable also known as egg plant which occupies an eminent place. Egg plant with large, pendent, ovoid, oblong or obvoid berries and having 5 – 30 cm long, shining, purple whitish or yellow in colour.

As far as vegetable production in global scenario is concerned, India occupies the second position after China. It is estimated approximately 32.3% area comes under local varieties. The average productivity of brinjal in India has been estimated to be 130.8 q/ha. Brinjal crop is ravaged by 140 species of insect pests. About 70 species of insect and non – insect pests have been reported to occur in India. Among these pests, the most disastrous insect pest is shoot and fruit borer, *Leucinodes orbonalis* Guenee. The pest causes 15 – 45% shoot damage and 30 – 99% of fruit damage (Frempong , 1978).

MATERIAL AND METHODS

The field experiment was conducted at Central Research Station, Orissa University of Agriculture and Technology, Bhubaneswar to evaluate the efficacy of different insecticidal schedules against *L. orbonalis* Gun. on brinjal crop during the cropping period from November 2002 to April 2003. The present investigation was mainly aimed at evaluating effective chemical control schedules against the pyralid borer. To record shoot damage before the initiation of the fruits, the shoots of all plants of each sub plots were examined and damaged shoots were counted. To record the damaged fruits, on the date of picking of fruits, the number of total fruits, number of healthy fruits and number of damaged fruits were counted from each harvested sub plots. Such types of observations were taken at 15 days interval on each date of pesticidal application. Recording of shoot infestation commenced from 30 DAT and continued upto 100 DAT in fortnightly interval. The shoot and fruit damage were converted into percentage of infestation. The fruit yield (q/ha) was recorded on different dates of harvest. The different treatments were presented in (Table 1).

The data recorded on various aspects of experiment were statistically analysed after appropriate transformations according to Snedecor and Cochran (1967) to test the level of significance of treatments. Squareroot transformations were employed when the percentage data was in between zero and 30% or 70 and 100 percent. In case of small figures on percentage data particularly when zeros were present, (x=%) was used for transformation.

RESULTS AND DISCUSSION

The recording of shoots infestation commenced from 25 DAT (Days After Transplanting) and continued upto 100 DAT. It was observed from the mean shoot infestation during the cropping period attained its peak activity at 55 DAT. During this period, the mean temperature (25.25^{o} C) and mean relative humidity (68%) were congenial to favour the pest to cause peak shoot infestation. The average range of shoot infestation during course of investigation varied from 3.65 to 9.70 per cent.

Table 1. Treatment schedule of the experiment:

Design – RBD

Replication -3

Treatments	**Dose (Kg. ai/ ha)**
T_1 : Carbofuran (Furadan) at 30 DAT	2.0
+ Cartap hydrochloride (Padan) at 45 DAT	0.5
+ Cypermethrin (Classic) at 60 DAT	0.1
+ Diflubenzuron (Dimilin) at 75 DAT	0.075
+ Endosulfan (Thiodan) at 90 DAT	0.5
+ Fenvalerate (Fenval) at 105 DAT	0.1
T_2 : Cartap hydrochloride (Padan) at 30 DAT	0.5
+ Monocrotophos (Nuvacron) at 45 DAT	0.5
+ Carbaryl (Sevin) at 60 DAT	1.0
+ Cypermethrin (Classic) at 75 DAT	0.1
+ Bt formulation (Halt) at 90 DAT	1.5 (Kg/ha)
+ Endosulfan (Thiodan) at 105 DAT	0.5
T_3 : Carbary 1 (Sevin) at 30 DAT	1.0
+ Cartap hydrochloride (Padan) at 45 DAT	0.5
+ Endosulfan (Thiodan) at 60 DAT	0.7
+ Diflubenzuron (Dimilin) at 75 DAT	0.07
+ Azadirachtin (Multineem) at 90 DAT	6 ppm/1t
+ Chlorpyriphos (Lethal) at 105 DAT	0.4
T_4 : Endosulfan (Thiodan) at 30 DAT	0.7
+ Morocrotophos (Nuvacron) at 45 DAT	0.5
+ Cartap hydrochloride (Padan) at 60 DAT	0.5
+ Cypermethrin (Classic) at 75 DAT	0.1
+ Bt formulation (Halt) at 90 DAT	1.5 (Kg/ha)
+ Cartap hydrochloride (Padan) at 105 DAT	0.5
T_5 : Chlorpyriphos (Lethal) at 30 DAT	0.4
+ Carbary 1 (Sevin) at 45 DAT	0.1
+ Bt formulation (Halt) at 60 DAT	1.5 (Kg/ha)
+ Diflubenzuron (Dimilin) at 75 DAT	0.075
+ Endosulfan (Thiodan) at 90 DAT	0.7
+ Carbary 1 (Sevin) at 105 DAT	1.0
T_6 : Azadirachtin (Neem Cake) at 30 DAT	250 (Kg/ha)
+ Carbaryl (Sevin) at 45 DAT	1.0
+ Diflubenzuron (Dimilin) at 60 DAT	0.07
+ Fenvalerate (Fenval) at 75 DAT	0.1
+ Cartap hydrochloride (Padan) at 90 DAT	0.5
+ Monocrotophos (Nuvacron) at 105 DAT	0.5
T_7 : Control	

Table 2. Incidence of shoot infestation (%) caused by brinjal shoot and fruit borer during *rabi*, 2002-03 at Bhubaneswar.

Treatments	25 DAT	40 DAT	55 DAT	70 DAT	85 DAT	100 DAT	Mean	% decrease over control (T_7)
T_1	2.51 (1.73)	2.04 (1.59)^{a}	6.53 (2.65)^{a}	6.20 (2.59)^{bc}	4.19 (2.17)^{bc}	2.76 (1.80)^{b}	4.04 (2.13)	58.35
T_2	2.00 (1.58)	2.00 (1.58)^{a}	7.84 (2.88)^{ab}	7.28 (2.79)^{cd}	4.24 (2.18)^{c}	2.70 (1.79)^{b}	4.34 (2.20)	55.25
T_3	1.95 (1.56)	2.17 (1.63)^{a}	8.57 (3.01)^{bc}	4.07 (2.13)^{a}	3.05 (1.88)^{a}	2.09 (1.61)^{b}	3.65 (2.04)	62.37
T_4	2.38 (1.70)	2.50 (1.73)^{a}	7.03 (2.74)^{a}	6.27 (2.60)^{bcd}	4.01 (2.12)^{b}	2.68 (1.78)^{ab}	4.14 (2.15)	57.32
T_5	2.54 (1.74)	2.27 (1.66)^{a}	9.01 (3.08)^{c}	8.50 (3.00)^{d}	7.69 (2.86)^{d}	5.71 (2.49)^{c}	5.95 (2.54)	38.66
T_6	2.42 (1.71)	2.67 (1.78)^{a}	7.37 (2.80)^{ab}	5.60 (2.47)^{b}	4.04 (2.13)^{bc}	2.70 (1.78)^{ab}	4.13 (2.15)	57.42
T_7	2.46 (1.72)	5.09 (2.36)^{b}	15.77 (4.03)^{d}	15.50 (3.56)^{e}	12.21 (3.56)^{e}	7.19 (2.77)^{d}	9.70 (2.19)	-
Mean	2.32 (1.68)	2.68 (1.78)	8.14 (2.94)	7.63 (2.85)	5.63 (2.48)	3.69 (2.05)	-	-
Sem (±)	0.043	0.086	0.081	0.065	0.017	0.057	-	-
CD (P = 0.05)	-	(0.27)	(0.25)	(0.20)	(0.05)	(0.17)	-	-

DAT : Days after transplanting

Means of three replications

Figures in parentheses are $\sqrt{(X + 0.5)}$

Similar superscripts in the column indicate that their differences are not statistically significant at P = 0.05.

Effect of Insecticidal Schedule on the brinjal shoot infestation.

It was revealed that the treatments T_1 (carbofuran 3G @ 2kg a.i/ha) and T_5 (chlorpyriphos 20 EC @ 0.4 kg a.i./ha) applied in the first spraying schedule reduced the shoot infestation to the extent of 18.72 and 10.63 per cent respectively. Application of pesticides *viz.,* cypermethrin, carbaryl, endosulfan, cartap hydrochloride, halt, diflubenzuron at 55 DAT reduced the shoot infestation to the extent of 5.05, 7.14, 52.51, 10.81, 5.66 and 24.02 per cent, respectively. It was also revealed that endosulfan, cartap hydrochloride and diflubenzuron were quite effective to minimize shoot infestation.

In order to summarize the shoot infestation the effectiveness of pesticidal schedules in reducing shoot damage after application of each pesticidal schedule was taken into consideration. The mean percentage of reduction of shoot infestation clearly indicated the effectiveness of pesticidal schedule. It was evident that the pesticidal schedule T_3 (carbaryl+ cartap hydrochloride+endosulfan+ diflubenzuron+Multineem + chlorphyriphos) proved to be most effective schedule to minimize the shoot infestation satisfactorily. Other promising pesticidal schedules were T_6 (Neemcake + carbaryl + diflubenzuron+ fenvalerate+ cartap hychloride+ monocrotophos) and T_4 (endosulfan + monocrotophos+ cartap hydrochloride+ cypermethrin+ Bt formulation + cartap hydrochloride.

To consider the effectiveness of different treatments during the course of shoot infestation the mean shoot infestation values were taken into

Table 3. Extent of fruit damage caused by brinjal shoot and fruit borer during *rabi*, 2002-03 at Bhubaneswar.

Treatments	75 DAT	90 DAT	105 DAT	120 DAT	135 DAT	150 DAT	165 DAT	Mean	Total Yield (q/ha)	Benefit Cost Ratio
T_1	12.47 (3.58)^{ab}	8.46 (2.99)^{a}	7.82 (2.88)^{a}	7.49 (2.82)^{bc}	15.27 (3.96)^{c}	19.74 (4.50)^{b}	19.86 (4.50)^{ab}	13.01 (3.68)	166.76	3.40:1
T_2	12.92 (3.63)^{ab}	9.52 (3.16)^{a}	9.31 (2.96)^{a}	8.88 (3.06)^{c}	13.67 (3.76)^{ab}	19.64 (4.48)^{b}	19.02 (4.42)^{ab}	13.14 (3.69)	168.87	3.06:1
T_3	9.73 (3.19)^{a}	9.73 (3.19)^{a}	6.14 (2.55)^{a}	7.85 (2.89)^{bc}	14.39 (3.85)^{bc}	14.56 (3.88)^{a}	18.30 (4.33)^{ab}	11.07 (3.40)	196.61	3.76:1
T_4	10.00 (3.24)^{a}	8.97 (3.07)^{a}	7.01 (2.73)^{a}	7.01 (2.74)^{bc}	11.63 (3.50)^{ab}	19.14 (4.43)^{b}	20.12 (4.54)^{b}	12.15 (3.56)	177.83	3.66:1
T_5	16.24 (4.09)^{b}	13.14 (3.69)^{b}	11.56 (3.47)^{b}	5.28 (2.37)^{a}	16.02 (4.06)^{c}	15.05 (3.94)^{a}	17.59 (4.25)^{ab}	13.55 (3.75)	140.20	2.61:1
T_6	11.11 (3.40)^{a}	8.89 (3.06)^{a}	7.63 (2.84)^{a}	6.09 (2.56)^{ab}	11.52 (3.46)^{a}	18.98 (4.41)^{b}	16.95 (4.41)^{b}	11.59 (3.48)	183.27	3.66:1
T_7	29.63 (5.48)^{c}	25.76 (5.12)^{c}	20.94 (4.63)^{c}	13.79 (3.78)^{d}	18.75 (4.39)^{d}	16.20 (4.09)^{a}	17.18 (4.20)^{a}	20.32 (4.56)	117.62	-
Sem ($\pm$)	0.188	0.130	0.137	0.114	0.120	0.087	0.106	-	-	-
CD (P = 0.05)	(0.58)	(0.40)	(0.42)	(0.35)	(0.37)	(0.27)	(0.33)	-	-	-

DAT : Days after transplanting

Means of three replications

Figures in parentheses are $\sqrt{(X + 0.5)}$

Similar superscripts in the column indicate that their differences are not statistically significant at P = 0.05.

account. It was revealed from the mean infestation values that treatment T_3 was quite effective to reduce shoot infestation. The mean shoot infestation caused by different treatments are arranged in the following order i.e., T_3 (365%) < T_1 (4.04%) < T_6 (4.13%) < T_4 (4.14%) < T_2 (4.34%)< T_5 (5.95%) < T_7 (9.70%). Application of endosulfan, cartap hydrochloride, diflubenzuron, *Bt* formulation (Halt) and azadirachtin (Multineem) were quite effective to decrease the shoot infestation satisfactorily. These findings corroborate with the findings of previous workers (Jagamohan, 1980; Choudhary, 1982; Gangwar and Roy 1985; Bothara and Dethe, 1991) The treatment, T_3 caused 62.37% reduction in shoot damage over control. Application of carbaryl, cartap hydrochloride, endosulfan, diflubenzuron, Multineem and chlorophyriphos at 15 days interval starting from 30 DAT to 105 DAT registered lowest fruit damage and highest fruit yield (Table 3).

Effect of pesticidal schedule on brinjal fruit infestation:

In order to know the extent of fruit infestation, periodical counting of damaged fruits including healthy fruits at fortightly interval commenced from 75 DAT and continued upto 165 DAT. The data were then converted into percentage of damage.

It was revealed that the third insecticidal schedule treatments *viz.,* T_1, T_2, T_5, and T_6 were effective to reduce fruit damage. Similarly at 90 DAT and 105 DAT the treatments *viz.,* T1, T2, T3, T4, and T5 produced same level of efficacy against the brinjal shoot and fruit borer. There was no significance difference among the treatments. Whereas, at 120 DAT the findings of the treatments of T1, T3, and T4 were at par. After the completion of last insecticidal schedule, the extent of fruit damage was within 5.28 to 8.88 per cent. Then there was an increase of fruit damage upto 165 DAT. Analyzing the mean percentage of fruit infestation during cropping period, it was evident from that out of all the treatments T3 (carbaryl+ cartap hydrochloride+ edosulfan+ diflubenzuron+ Multineem + chlorpyriphos) was most effective to reduce pest infestation. Other two promising pesticidal schedules were T6 (Neem cake+ carbaryl+ diflubenzuron+ fenvalerate+ cartap hydrochloride+ monocrotophos) and T4 (endosulfan+ monocrotophos+ cartap hydrochloride+ cypermethrin+ Halt+ cartap hydrochloride). In order to assess the extent of fruit infestation, periodical observations on fruit damage (%) commenced from 75 DAT and continued upto 165 DAT. It was revealed from the studies that application of cypermethrin, carbaryl, Halt and diflubenzuron at 60 DAT were equally effective. Similarly use of endosulfan, Halt and azadirachtin at 90 DAT and fenvalerate, endosulfan, chlorphyriphos, cartap hydrochloride and carbaryl at 105 DAT were also effective to reduce brinjal shoot and fruit borer damage. To evolve the suitable treatment schedule the mean fruit damage (%) during the cropping period was analysed critically. It is clearly noticed from the studies that T3 treatment was most effective to decrease fruit damage. The efficacy of different pesticidal treatment is presented as follows: T3 (11.07)> T6(11.59%)> T4 (12.15%) > T2 (13.14%) > T5 (13.55%).

Our studies indicated that application of endosulfan @ 0.5 Kg a.i.,/ha at 60 DAT produced promising results to reduce fruit damage. Whereas Choudhary et al. (1993) from Bangladesh pin pointed that use of endosulfan @ 0.7 kg a.i./ha at 20 DAT performed satisfactorily in suppressing the pest damage Table 3.

Yield of healthy fruits:

It was evident from table 3 that the highest fruit yield was found in T_3 followed by T_6, T_4, T_2, T_1 and T_5 treatment schedules. An increase the fruit yield upto 120 DAT was recorded in treatments like T_2, T_4,T_5 and T6 whereas, the treatment schedule *viz.,* T3 and T4 recorded the increasing higher yield upto 135 DAT. The last insecticidal schedule (105 DAT) of T2,T4, T5 and T6 were quite effective to increase fruit yield upto 120 DAT. After which there was a decline in the fruit yield.

Analysis of Benefit: Cost ratio:

It is revealed from above table that the most effective pesticidal schedule *viz.,* T3 produced the highest benefit: cost ratio 3.76:1. Other promising pesticidal schedules were T4, T5 and T1 which registered the benefit; cost ratio of 3.66:1. 3.66:1 and 3.40:1 respectively (Table 3).

LITERATURE CITED

Bothara P A and Dethe M D 1991. Bio- efficacy of different endosulfan formulations against brinjal shoot and fruit borer, *Leucinodes orbonalis* Guen: Jouranal Insect Science 4(1): 103-104.

Choudhary A B M N U, Islam N and Karim M A 1993. Efficacy of some pesticides against brinjal shoot and fruit borer, *Leucinodes orbonais* Guen; Bangladesh Journal of Zoo. 21(2): 133-139.

Choudhary R S 1982. Control of brinjal shoot and fruit borer *Leucinodes orbonalis* Guen. Entomon. 7(3): 257-259.

Frempong E 1978. The nature of damage to egg plants in Ghana by two important pests. *L. orbonalis and Ezophora villore, Bull DE institute fundamental De Afrique.* 41(20): 408-416.

Gangwar S K and Roy S 1985. Control of insect pests in NEH Region. *Indian Farming* 35-40.

Jaganmohan N, Krishna Kumar N K and Prasad V G 1980. Control of leaf hopper and fruit borer (*Leucinodes orbonalis* Guen.) on Brinjal pesticides 24(7): 19-21.

Snedecor G W and Cochran W G 1967. *In Statistical methods*, 6th Edn. The lowa state college, press, Ames, Lowa, Oxford IBH. Publ. CO, New Delhi.

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