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Effect of pesticidal schedule to control the shoot and fruit borer *Leucinodes orbonalis* in brinjal

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ABSTRACT

To study the performance of various pesticidal schedules to evolve a suitable management strategy against brinjal shoot and fruit borer, the field experiment was carried out at The Central Research Station, OUAT, Bhubaneswar from January to June 2010. The findings of investigation revealed that the brinjal shoot and fruit borer caused highest fruit damage (80.22%) at 120 days after transplanting under unprotected condition. Under protected condition, the mean fruit infestation due to shoot and fruit borer varied from 46.44 to 53.15 per cent. Among all the treatment schedule, application of cartap hydrochloride, monocrotophos, carbaryl, azadirachtin, Bt formulation and triazophos at 30, 45, 60, 75, 90 and 105 days after transplanting at 15 days interval reduced the fruit infestation successfully and registered highest fruit yield and highest monetary value (Rs. 36,070/ha).

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INTRODUCTION

Vegetables are rapidly becoming an important source of income for the rural population. Brinjal, *Solanum melongena* L, is one such typical vegetable and its commercial cultivation not only helps to improve human nutrition, but also increase income generation for the grower. This crop is considered cosmopolitan in nature. In the hot wet monsoon season when other vegetables are in short supply, brinjal is practically the only vegetable that is available at an affordable price for rural and urban poor. In India, brinjal is grown over 0.75 million ha with a production of 8.04 million tonnes with an average yield of 16.84 t/ha. As far as vegetable production in global scenario is concerned, India retains the second position after China.The fruit is a good source of calcium, phosphorus, iron and vit. B. The roots are utilised in preparation of medicines. The seeds are utilised as stimulant to remove constipation. The brinjal is stated to stimulate the intrahepatic metabolism of cholesterol.Aqueous extract of the fruits inhibit choline esterase activity of human plasma. Dried fruits are reported to contain a goitrogenic principle.The essential amino acids present are argentine, histidine, lysine, tryptophan, phenylalanine, methionine, leucine, threonine, isoleucine and valine.The edible portion of fruits contains pectin, oxalic acid, trigonellin and β amino-4-ethylglyoxaline. Brinjal is often infested by a plethora of insect pests throughout Asia. A survey on vegetable pests by Asian Vegetable Research and Development Centre (AVRDC) indicated that brinjal fruit and shoot borer is the most destructive pest in major brinjal producing countries of South Asia, as the larvae tunnel inside the plant shoots or fruit.

MATERIAL AND METHODS

The present investigation was studied on the effect of pesticidal schedule to control the shoot and fruit borer (*Leucinodes orbonalis*) in brinjal at the Central Research Station, OUAT, Bhubaneswar during January to June 2010 in Randomized Block Design consisting of seven treatments and three replications. The size of each plot was 4m x 2.8m. Three week old seedlings were transplanted at a spacing of 60cmx45cm. The total area of the experimental plot is 331.2 m^2. The high yielding variety *i.e.* BB 45 C was selected for the experiment due to its popularity among the farming community. Eleven pesticides belonging to different chemical groups were selected for field experiments to test their efficacy against brinjal shoot and fruit borer damage. The various groups of pesticide selected were synthetic pyrethroids, organophosphates, chlorinated hydrocarbons, moulting hormones, nereistoxins, bacterial formulations, neem based pesticides and carbamates. The pesticides were applied at 15 days interval starting from 30 DAT to 105 DAT (Days after transplanting).The treatment details is given in Table A.

Table A : Treatment details

Sr. No.	Treatment details	Dose(kg a.i./ha)
1.	Carbofuran(Furadon) at 30 DAT+	2.0
	Cartap hydrochloride(Padan) at 45 DAT+	0.5
	Cypermethrin(classic) at 60 DAT+	0.1
	Carbaryl(Sevin) at 75 DAT+	1.0
	Triazophos(Nagphos) at 90 DAT+	2.0
	Fenvalerate(Fenval) at 105 DAT	0.1
2.	Cartap hydrochloride(Padan) at 30 DAT+	0.5
	Monocrotophos(Nuvacron) at 45 DAT+	0.5
	Carbaryl(Sevin) at 60 DAT+	0.1
	Azadirachtin(Multineem) at 75 DAT+	25 kg/ha
	Bt formulation(Halt) at 90 DAT+	1.5 kg/ha
	Triazophos(Nagphos) at 105 DAT	2.0
3.	Carbaryl(Sevin) at 30 DAT+	1.0
	Cartap hydrochloride(Padan) at 45 DAT+	0.5
	Triazophos(Nagphos) at 60 DAT+	2.0
	Diflubenzurion(Dimilin) at 75 DAT+	0.075
	Azadirachtin(Multineem) at 90 DAT+	2.5 kg/ha
	Chloropyriphos(Lethal) at 105 DAT	0.4
4.	Triazophos(Nagphos) at 30 DAT+	2.0
	Azadirachtin(Multineem) at 45 DAT+	2.5 kg/ha
	Cartap hydrochloride(Padan) at 60 DAT+	0.5
	Cypermethrin(classic) at 75 DAT+	0.1
	Fenvalerate(Fenval) at 90 DAT+	0.1
	Carbaryl(Sevin) at 105DAT	1.0
5.	Chloropyriphos(Lethal) at 30 DAT+	0.4
	Triazophos(Nagphos) at 45 DAT+	2.0
	Bt formulation(Halt) at 60 DAT+	1.5 kg/ha
	Diflubenzurion(Dimilin) at 75 DAT+	0.075
	Carbaryl(Sevin) at 90DAT+	1.0
	Cartap hydrochloride(Padan) at 105 DAT	0.5
6.	Azadirachtin(Multineem) at 30 DAT+	2.5 kg/ha
	Carbaryl(Sevin) at 45DAT+	1.0
	Diflubenzurion(Dimilin) at 60 DAT+	0.075
	Fenvalerate(Fenval) at 75 DAT+	0.1
	Cartap hydrochloride(Padan) at 90 DAT+	0.5
	Monocrotophos(Nuvacron) at 105 DAT	0.5
7.	Untreated check	-

RESULTS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under the following heads:

Performance of pesticidal schedule on brinjal shoot borer :

Application of pesticidal schedule revealed that brinjal shoot and fruit borer activity peaked (4.49%) at 90 days old crop. Cartap hydrochloride and Carbaryl produced the similar result in first application of pesticidal schedule (Table 1). The use of Cartap hydrochloride in second round spraying maintained its effectiveness considerably. Use of other effective pesticides against shoot and fruit borer were cypermethrin, Carbaryl, triazophos, Halt and Diflubenzurone. Analyzing the data on decrease of fruit damage over untreated check, it was quite evident that T_3 was most effective to cause maximum reduction of shoot damage (69.71%) (Table 1). The mean shoot infestation caused by different treatments are arranged in following orders *i.e.* $T_3<T_1<T_2<T_6<T_4<T_5<T_7$ (Table 3). The findings corroborates the findings of Dutta *et al.*(2007);

Table 1 : Incidence of shoot damage caused by brinjal shoot and fruit borer during *Rabi* 2010-11 at Bhubaneswar

Treatments	45 DAT	60DAT	75DAT	Mean	% decrease over untreated phase
T_1	0.96 (1.19)[a]	1.59 (1.43)[a]	1.99 (1.53)[a]	1.51 (1.38)	66.36%
T_2	1.07 (1.23)[ab]	3.47 (1.84)[ab]	1.66 (1.44)[a]	2.06 (1.05)	54.12%
T_3	1.05 (1.22)[ab]	1.83 (1.42)[a]	1.20 (1.30)[a]	1.36 (1.31)	69.71%
T_4	1.72 (1.44)[abc]	3.93 (2.08)[b]	0.83 (1.14)[a]	2.16 (1.55)	51.89%
T_5	2.41 (1.69)[bc]	4.04 (2.12)[b]	2.03 (1.54)[a]	2.82 (1.73)	37.19%
T_6	1.38 (1.33)[abc]	3.81 (2.03)[b]	1.25 (1.32)[a]	2.14 (1.54)	52.33%
T_7	4.19 (2.16)[d]	5.09 (2.35)[b]	4.21 (2.16)[b]	4.49 (2.22)	
Mean	1.82 (1.46)	3.39 (1.89)	1.88 (1.49)		
SEM(±)	0.124	0.168	0.154		
C.D. (P=0.05)	0.384	0.520	0.475		

DAT-Days after transplanting

Table 2 : Yield and economics of insecticidal management of brinjal shoot and fruit borer in brinjal during *Rabi* 2010-11 at Bhubaneswar

Treatments	Yield(q/ha)	Increase in yield over untreated check (%)	Incremental yield(q/ha)	Cost of treatment (Rs./ha)	Net return (Rs./ha)	B:C
T_1	148.04[b]	22.68	27.37	8030	8392	1.04:1
T_2	190.52[d]	57.88	69.85	5840	36070	6.17:1
T_3	150.42[b]	24.65	29.75	4760	13090	2.75:1
T_4	178.11[cd]	47.60	57.44	3460	31004	8.96:1
T_5	160.31[bc]	32.84	39.64	6420	17364	2.70:1
T_6	175.03[cd]	45.04	54.36	4220	12396	2.70:1
T_7	120.67[a]	-	-	-	-	-

CD=23.07 (P=0.05)

Table 3 : Extent of fruit damage caused by brinjal shoot and fruit borer during *Rabi* 2010-11 at Bhubaneswar

Treatments	45	60	75	90	105	120	135	150	Mean	% decrease over check
T_1	59.45 (50.44)[C]	38.76 (40.26)[ab]	56.85 (48.94)[bc]	53.70 (47.13)[bc]	55.99 (48.43)[bc]	59.7 (50.57)[bc]	49.37 (44.65)[a]	51.44 (45.83)[bc]	53.15 (47.03)	22.65
T_2	52.60 (46.54)[ab]	46.72 (43.16)[bc]	50.30 (45.18)[a]	34.52 (35.44)[a]	44.18 (41.63)[ab]	54.55 (47.68)[bc]	44.11 (41.88)[a]	44.56 (41.88)[a]	46.44 (42.88)	32.42
T_3	53.56 (47.05)[abc]	49.53 (44.78)[bc]	61.03 (51.36)[d]	41.96 (40.37)[ab]	45.26 (42.29)[ab]	61.44 (51.63)[c]	61.07 (51.40)[bc]	47.52 (43.38)[ab]	52.67 (46.53)	23.35
T_4	48.30 (44.05)[a]	25.73 (30.42)[a]	56.7 (48.84)[bc]	40.82 (39.64)[ab]	52.97 (46.84)[b]	49.96 (44.67)[b]	52.63 (46.50)[ab]	55.55 (48.18)[c]	47.83 (43.64)	30.39
T_5	52.81 (46.61)[ab]	42.59 (40.59)[ab]	53.11 (46.78)[ab]	36.89 (37.36)[a]	48.36 (43.35)[ab]	73.66 (59.10)[d]	49.52 (44.72)[a]	42.51 (40.68)[a]	49.93 (44.89)	27.34
T_6	56.55 (48.74)[bc]	46.66 (43.06)[bc]	60.3 (50.9)[cd]	49.19 (44.52)[ab]	37.77 (37.90)[a]	35.41 (36.49)[a]	52.67 (46.54)[ab]	54.89 (47.82)[c]	49.18 (44.50)	28.43
T_7	69.96 (56.74)[d]	65.22 (53.84)[c]	68.22 (55.91)[e]	67.40 (5.17)[c]	67.14 (55.01)[c]	80.22 (63.74)[d]	65.86 (54.27)[c]	65.81 (53.77)[d]	68.72 (56.05)	
Mean	56.17 (48.59)	45.03 (42.30)	58.07 (49.70)	46.35 (37.09)	50.23 (45.06)	59.27 (50.55)	53.60 (47.09)	51.75 (45.93)		
S.E.(±)	1.154	3.579	0.708	3.052	2.614	1.964	1.757	1.196		
C.D.(P=0.05)	3.556	11.030	2.183	9.407	8.057	6.053	5.417	3.687		

Figure in parenthesis are angular transformation values.
Similar superscripts in the feature indicates that their difference are not statistically significant at P=0.05

Chatterjee *et al.* (2009) and Latif *et al.* (2009) in brinjal crop.

Performance of pesticidal schedule on brinjal fruit infestation :

It was pertinent from the studies that the application of second pesticidal schedule resulted in decrease of fruit infestation. Out of all the pesticides applied azadirachtin @ 2.5 kg/ha brought down the fruit damage successfully. All the pesticides used in the third schedule were not effective to reduce fruit damage. Similarly fourth pesticidal schedule minimised the fruit damage. Application of pesticides under fifth and sixth schedules wer not effective to decrease the fruit damage. Spraying of cartap hydrochloride, monocrotophos, carbaryl, azadirachtin, halt and triazophos in T_2 resulted in highest reduction in fruit damage as compared to other treatments.Other promising treatment to cause appreciable quantum of reduction in fruit damage over check was T_3. Considering the importance of reduction of fruit damage over check the different treatments are arranged as follows. $T_2>T_4>T_6>T_5>T_3>T_1$. The results corroborate the findings of Satpathy *et al.* (2005), Sundaramurthy(2010), Chatterjee and Mondal (2012).

Effect of pesticidal schedule on fruit yield :

Out of several pesticidal schedule, T_2 produced the highest yield (190.52 q/ha). Other promising schedule were T_4 and T_6 which recorded 170.11 and 170.03 q/ha, respectively. Our research findings were in harmony with the findings of previous workers who have studied the effectiveness of various pesticides *i.e.* triazophos, monocrotophos, cypermethrin, fenvalerate, azadirachtin and cartap hydrochloride.

Analysis of benefit cost ratio :

It is pertinent from the above Table 2 that T_2 registered the highest fruit yield and highest net return of Rs. 36070/ ha. But the highest B: C was received from T_4 (8.96:1). It was due to the less investment of pesticidal cost in comparison to T_2. Other promising pesticidal schedule registering the highest B: C was T_6 (6.72:1). The pesticidal schedule T_1 was not able to record the highest B: C.

The result is in confirmation with Srinivasan and Babu (2000) and Chakraborty(2012).

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