Ovipositional Deterrent, Antifeedant and Growth Inhibitory Effect of Plant Extracts Against Shoot and Fruit Borer, *Earias Vittella* (Fabricius), of Okra

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ABSTRACT

A field experiment was conducted at the Gwalior (Madhya Pradesh) during kharif-2008 to study the bio-efficacy of ethanol extracts of four plant materials viz., seed of neem, leaf and seed of datura, leaf of harsingar and flower of chrysanthemum in the three concentrations (0.5, 1.0. and 1.5%) and their interaction were tested against Earias vittella under laboratory conditions. The fruits of okra treated with different plant extracts were kept in jar for egg deposition by E. vittella. On the basis of number of eggs laid by the adults, datura extract showed higher ovipositional deterrent effect against E. vittella, followed by neem seed. The higher concentration of all the tested extracts showed higher ovipositional deterrent effect against the pests than their lower concentration. Antifeedant and growth inhibitory index were assessed by offering the treated fruits to five third instar larvae. The amount of unconsumed food and larval weight were recorded after 48 hours. On the basis of antifeedant index, neem seed extract was found the most effective, followed by datura. Chrysanthemum was not found effective significantly, whereas all the tested plant materials showed their growth inhibitory effect against the pest. Higher concentration of extracts showed higher antifeedant and growth inhibitory effect against the pests.

Keywords: Okra, Earias vittella, Antifeedant, Neem, Datura, Harsingar and Chrysanthemum

1. INTRODUCTION

The shoot and fruit borer, *Earias vittella* (Fabricius), is a serious pest of okra, cotton and some other Malvaceous plants. The use of synthetic insecticide is very effective for the control of insect-pests, but the excessive and injudicious use of these pesticides led to many problems like development of resistance, induction of resurgence and environmental pollution. The risks to human health and environmental side effects have forced to look for greener alternatives of chemical pesticides especially for vegetables like okra, where fruits are plucked at an interval of every 2-3 days. India being a major subtropical country with the great variation in climatic condition provides ample plant wealth sources. The research work on properties like toxicant, antifeedant and growth inhibitors of various plant species have been initiated on many insect

species of economic importance. In the last two decades, crude and refined extracts of different plants against both defoliators and sucking insects were tested and found effective against the pests.

The extracted material of different plants varied in effectiveness and properties against insect-pests. Therefore, ethanol extracts of some plant materials were tested against shoot and fruit borer, *E. vittella*, to find out the ovipositional deterrent, antifeedant and growth inhibitory effect.

2. MATERIALS AND METHODS

Laboratory experiment was conducted at College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Gwalior Campus, Jabalpur (Madhya Pradesh) during *kharif*-2008. Four plant materials viz., seed of neem *(Azadirachta indica*), fruit and leaf of datura *(Datura fastuosa*), leaf of harsingar *(Nyctanthus artabartristes*) and flower of chrysanthemum (*Chrysanthemum indicum*) were collected and dried at room temperature to make their powder. Dried powder of each plant material was kept in ethanol for 7 days and filtered with through Whatman No.1 filter paper and then filtrate was dried. From dried extracts 10 per cent stock solutions were prepared in ethanol. Infested fruits of okra were collected from the field and larvae were reared in laboratory. After getting the adults, fresh culture was produced for experimentation.

To assess the ovipositional deterrent effect of various extracts, okra fruits treated with different extracts were kept in glass jar and four pairs of adults were released in each jar replicated three times. At 48 hours after release, number of eggs laid on the fruit treated with different extracts including control was counted. Antifeedant and growth inhibitory effect of various extracts were assessed by offering the treated and untreated weighed fruits to five third instar larvae. The amount of consumed food was recorded after 48 hours and per cent antifeedancy was calculated. Weight of the larvae reared on fruits treated with different extracts was recorded to find out the growth inhibitory effect. Antifeedant index and growth inhibitory index were calculated by following formulae.

$$\text{Antifeerant Index (\%)} = \frac{\text{Consumption of Untreated Food} - \text{Consumption of Treated Food}}{\text{Consumption of Untreated Food}} \times 100$$

$$\text{Growth Inhibitory Index (GII)} = \frac{\text{Weight gained by the larvae on untreated food} - \text{Weight gained by the larvae on treated food}}{\text{Weight gained by the larvae on untreated food}} \times 100$$

3. RESULT AND DISCUSSION

The plant material extracts, concentrations and their interaction showed significant influence on egg deposition by shoot and fruit borer. Minimum egg deposition on the fruits treated with datura

extract showed their higher ovipositional deterrent effect against *E. vittella*, followed by neem seed extract. Among different combinations, minimum egg deposition was found on the food treated with higher concentration of neem seed extract, which indicate their higher ovipositional deterrent effect. Gajmer *et al.* (2003). also reported minimum egg deposition by *E. vittella* in different concentrations of neem seed extract. The higher concentration of extracts also showed higher ovipositional deterrent effect against the pest.

Data computed on antifeedant index indicated that all the plant extracts, concentrations and their interaction showed significant influence on the feeding by larvae of *E. vittella*. Maximum antifeedant index (40.06%) was recorded in neem seed, which showed their higher antifeedancy against *E. vittella,* followed by datura. Higher antifeedancy due to neem seed extract was also reported by Rao *et al.* (2002). The higher concentration of extracts also showed higher antifeedancy effect against the pest. It was recorded that the antifeedancy increased with the increase in concentration. Maximum antifeedant index (58.79%) was recorded in higher concentration of datura, followed by higher concentration of neem seed. The antifeedant index in medium concentration of neem seed was significantly at par with higher concentration of neem seed and datura. This indicates that neem seed extract in the concentration of 1.0% may be used against *E. vittella* on the basis of antifeedant effect of extract.

Data computed on growth inhibitory index showed significant influence of plant extracts, their concentrations and different combinations against larvae of *E. vittella.* Maximum growth inhibitory index (82.56%) was recorded on food treated with neem seed extract, which showed their higher growth inhibitory effect against the pest, followed by datura and chrysanthemum. Rao *et al.* (2002) also reported growth inhibitory effect of neem seed against *E. vittella*. Significantly higher growth inhibitory index (77.91%) was recorded in the higher concentration of extracts also showed their higher growth inhibitory effect against the pest than lower concentration. Among the different combinations, maximum growth inhibitory index (83.72%) was recorded in higher concentration of neem seed, which indicated their higher growth inhibitory effect against the pest, followed by lower and medium concentration of neem seed. Umesmageswari *et al.* (2008) also reported inhibitory activity of certain botanicals on *E. vittella*.

4. CONCLUSION

All the tested plant extracts showed ovipositional deterrent effect against the pest. However, datura and neem seed extracts showed higher ovipositional deterrent effect against *E. vittella.* Higher concentration of plant extracts showed higher ovipositional deterrent effect against the pest. Neem seed and datura extracts showed antifeedant effect against the pest. On the basis of ovipositional deterrent, antifeedant and growth inhibitory effects, neem seed and datura extracts may be used for the management of the *E. vittella.*

Table 1. Numbers of eggs deposited by the shoot and fruit borer on the fruits treated with different extracts

Plant extract	Number of eggs deposited			
	Concentration (%)			
	0.5	1.0	1.5	Mean
Neem seed	196.7	179.3	48.0	141.3
Datura	187.3	127.3	76.7	130.4
Chrysanthemum	256.0	228.7	159.7	214.8
Harsingar	254.7	238.7	159.7	217.7
Control	-	-	-	310.7
Mean	223.7	193.5	111.0	
Factor	S.Em.±	C.D. at 5%		
Plant extract	2.5	7.3		
Concentration	2.1	6.3		
P×C	4.3	12.7		

Table 2. Mortality of eggs (%) under different treatments

Plant material	Mortality of eggs (%)			
	Concentration (%)			
	0.5	1.0	1.5	Mean
Neem seed	6.67 (8.85)	13.33 (17.70)	26.67 (30.78)	15.56 (19.11)
Datura	20.00 (26.55)	26.67 (30.78)	33.33 (35.00)	26.66 (30.78)
Chrysanthemum	6.67 (8.86)	6.67 (8.85)	6.67 (8.85)	6.67 (5.90)
Harsingar	6.67 (8.85)	6.67 (8.85)	6.67 (8.85)	6.67 (8.85)
Control	-	-	-	0.00 (0.00)
Mean	10.00 (11.06)	13.33 (16.55)	18.33 (20.87)	
Factor	S.Em.±	C.D. at 5%		
Plant material	4.25	12.46		
Concentration	3.68	NS		
P×C	7.36	NS		

Table 3. Antifeedant index of larvae under different treatments

Plant material	Antifeedant index			
	Concentration (%)			
	0.5	1.0	1.5	Mean
Neem seed	49.90	53.20	57.98	53.69
Datura	36.65	44.18	58.79	46.54
Chrysanthemum	1.53	11.36	18.94	10.61
Harsingar	13.07	23.72	24.53	20.44
Mean	25.29	33.12	40.06	
Factor	S.Em.±	C.D. at 5%		
Plant material	1.13	3.31		
Concentration	0.98	2.87		
P×C	1.95	5.73		

Table 4. Growth inhibitory index of larvae under different treatments

Plant material	Antifeedant index (%)			
	Concentration (%)			
	0.5	1.0	1.5	Mean
Neem seed	82.56	81.40	83.72	82.56
Datura	73.26	77.91	80.23	77.13
Chrysanthemum	60.46	77.91	80.23	72.87
Harsingar	62.79	66.28	67.43	65.50
Mean	69.77	75.87	77.91	
Factor	S.Em.±	C.D. at 5%		
Plant material	0.47	1.37		
Concentration	0.40	1.18		
P×C	0.81	2.36		

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