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Dr. Sudha summarwar
Department of Zoology, S.D. Government College Beawar M.D.S University Ajmer, Rajasthan, India

Dr. Jyotsana pandey
Department of Zoology, S.D. Government College Beawar M.D.S University Ajmer Rajasthan, India

Correspondence:
Dr. Sudha Summarwar,
H. No. 751/29, Anandpuri Dhola Bhata, Ajmer, Rajasthan, India

Impact of Oviposition Deterrent Effect of *Catharanthus Roseus* and *Ocimum Sanctum* on Adult Females of *Spodoptera Litura*

Dr. Sudha summarwar and Dr. Jyotsana pandey

Abstract
Oviposition deterrent effect of *Catharanthus roseus* and *Ocimum sanctum* was evaluated in choice and no-choice situations on adult females of *Spodoptera litura.* In choice condition adult females were given choice to lay eggs on treated and untreated oviposition substrate and total eggs laid in first two egg masses were counted. In no-choice condition only treated substrate was provided for egg laying to ovipositing females of *Spodoptera litura*. Results indicate that leaf extracts of the plants show varying degree of oviposition deterrent activity. In the choice situation, *Spodoptera litura* females preferred to lay a greater number of eggs on the untreated oviposition substrate compared with the treated substrate with different concentrations of extracts of the plants. As the concentration of the extract increased, egg laying was proportionately reduced. A significant observation was that a gradual decline in oviposition was reported even on the untreated substrate in choice situations. This could be attributed to deterrent effect of volatiles emanating from the treated substrate.

Keywords: Spodoptera litura, Plant extract, Leaf extract, Catharanthus roseus and Ocimum sanctum.

Introduction
The use of plants as tools for insecticide development came into practice long back. Tobacco was reported as one of the first materials to be used as an insecticide in 18th century (Metcalf *et al*. 1962, Jacobson and Crosby 1971) [5, 4]. Thereafter use of an increasing number of plants like pyrethrum, derris, quassia, hellebore etc. commenced and today a large number of plants with insecticidal properties are being evaluated against several insect pests.

Plants being co-evolved with insects and other animals have been equipped with plethora of chemical defences against them. Aware of this effect, the mankind has used plant parts or extracts to control insects since ancient times. Plant-derived products have been receiving increasing attention from the scientists and recently more and more plants have been screened for the insecticidal properties.

Plants with insecticidal properties are increasingly evaluated against lepidopteran pests of several important agricultural crops. Patel and Patel (2000) [6] evaluated the ovicidal effect of synthetic insecticides and neem formulations on *Helicoverpa armigera*. Larvicidal, growth inhibiting and antifeedant activities of several plants have been reported by Sundarajan and Kumullakalavalli (2001) [9], Zhong *et al*. (2001) [11] and Wheeler *et al*. (2001) [10]. Relative efficacy of plant extracts as antifeedant against gram pod borer *Heliothis (Helicoverpa) armigera* was evaluated by Singh *et al*. (2001) [8]. Ambethgar *et al*. (2001) [1] tested certain synthetic insecticides and neem products against cashew leaf folder *Sylepta aurantiacalis*. Comparative study on the efficacy of several biopesticides was conducted by Chen-WenRui and Chen (2001) [2] for the control of *Plutella xylostella.*

Spodoptera litura (Fabricius), the tobacco caterpillar is a sporadic pest of several plants with high mobility and reproductive potential. It is widely distributed in asia, australasia and pacific islands. Several outbreaks of this pest on cotton, tobacco and chillies have been reported in India (Rao *et al*. 1983) [7] causing great economic loss (Hosny *et al*. 1986) [3].

The present work was intended to evaluate the Oviposition deterrent effect of leaf extracts of *Catharanthus roseus* and *Ocimum sanctum* was evaluated under different situations, namely choice and no-choice on adult females of *Spodoptera litura.*

Material and Method

Experimental Insect

For laboratory rearing the egg masses of *Spodoptera litura* were procured from Agricultural Research Station, Durgapura, Jaipur. Rearing was done at the temperature of 27 ± 2 ^{0}C, 75 ± 5% RH and 10: 14 hrs of Light: Dark period. The eggs were surface sterilized with 0.02% sodium hypochloride solution, dried and allowed to hatch.

Oviposition deterrent action of Plants

Oviposition deterrent effect of leaf extracts of *Catharanthus roseus* and *Ocimum sanctum* was evaluated under different situations, namely choice and no-choice. The filter papers (20cmx10cm) to be used as oviposition substrate were dipped for 30 seconds in 1, 2, 3, 4 and 5 percent formulations to impregnate it with extract. These were then air-dried. Treated substrates were introduced into oviposition glass jars under choice (when only half of the oviposition substrate was treated) and no-choice (when all of the oviposition substrate was treated). Four pairs of well fed 1-day old adults (1:1) were released in each glass jar. Each treatment was replicated thrice and parallel controls with water treated filter papers as oviposition substrates were also run. The number of eggs deposited on filter paper was counted after 48 hrs. The observations recorded include following parameters:

1. Mean number of eggs laid per female
2. Percent reduction in egg laying

Result & Discussion

Catharanthus roseus

Leaf Extract

From the results it is evident that *Catharanthus roseus* was comparatively less effective in deterring oviposition in *Spodoptera litura* (Table 1). In choice situation where both treated and untreated substrates are available to female for egg laying, only 92.66 eggs were laid on treated substrate compared to 192.00 eggs on untreated. Eggs laid on treated and untreated substrate were 149.66 and 263.6 at 1%, 127.00 and 254.00 at 2%, 113.33 and 232.33 at 3% and 98.00 and 209.33 at 4% respectively. In control experiment a total of 586.00 eggs were laid.

Eggs laid on untreated substrate also showed a decrease with an increase in concentration of the extract in choice experiment. It was 263.6 at 1% and decreased to 192.0 at 5%.

Reduction in total eggs laid showed an increase with increasing concentration. Total eggs were reduced to 284.66 at 5% from 413.33 at 1% extract. At 2, 3 and 4% extract 381.00, 345.60 and 307.33 eggs were laid respectively.

In no-choice condition, eggs laid on treated substrate was reduced to 266.66 at 5% compared to 395.66 eggs at 1% and 586.00 at control substrate.

Table 1: Effect of *Catharanthus roseus* leaf extract treated oviposition substrate (filter paper) on oviposition of *Spodoptera litura* under choice and no-choice situations.

Doses %	Mean number of eggs laid by a female in first two egg batches				
	Choice Situation			Percent Reduction over treated	No-Choice Situation
	Treated Substrate	Untreated Substrate	Total Eggs laid in 2 egg batches		Treated Substrate
	Mean ± SE	Mean ± SE	Mean ± SE		Mean ± SE
1	149.66 ± 4.51	263.60 ± 6.33	413.33 ± 5.44	43.14	395.66 ±4.58
2	127.00 ± 5.57	254.00± 2.66	381.00 ± 6.00	49.97	370.32 ± 8.80
3	113.33 ± 5.33	232.33 ± 6.57	345.33 ± 3.60	51.18	326.33 ± 6.80
4	98.00 ±4.02	209.33 ± 4.00	307.33 ± 3.60	53.08	284.00 ±6.55
5	92.66 ± 5.57	192.10	284.66 ± 5.02	51.69	266.66 ± 8.53
Control	-	-	586.00 ± 4.45	-	-

Ocimum sanctum

Leaf Extract

In a choice situation females laid a significantly less number of eggs on the treated portion of the filter paper kept as oviposition substrate. (Table 2). At 5% extract only 79.66 eggs were laid on treated substrate compared to 182.33 eggs on untreated substrate and 591 eggs on control substrate. This discrimination in egg laying increased proportionately with increasing concentration of the extract. Eggs laid on treated and untreated substrates were 127.33 and 251.66 at 1%, 111.00 and 236.66 at 2%, 99.33 and 220 at 3% and 84.00 and 201.00 at 4% respectively.

Oviposition on untreated substrate also showed a decrease in egg laying with increasing concentration and it was reduced from 251.66 at 1% to 182.33 at 5%.

Total eggs laid in choice situation were reduced to 262.00 at 5% (compared to 591.00 eggs in control). At lowest concentration of 1% total eggs laid were 379.00 and at 2, 3 and 4% it was 347.66, 319.33 and 285 eggs respectively.

In no-choice situation, egg laying was suppressed at all the concentrations tested. At 5% extract total eggs laid on treated substrate was 220 compared to 591 eggs in control. At 1, 2, 3 and 4% extract eggs laid were 359.66, 320, 292.66 and 261.33 respectively.

Oviposition deterrent effect of *Catharanthus roseus* and *Ocimum sanctum* was evaluated in choice and no-choice situations. In choice condition adult females were given choice to lay eggs on treated and untreated oviposition substrate and total eggs laid in first two egg masses were counted. In no-choice condition only treated substrate was provided for egg laying to ovipositing females of *Spodoptera litura*. Results indicate that leaf and seed extracts of the plants show varying degree of oviposition deterrent activity.

Table 2: Effect of *Ocimum sanctum* leaf extract treated oviposition substrate (filter paper) on oviposition of *Spodoptera litura* under choice and no-choice situations.

Doses %	Mean number of eggs laid by a female in first two egg batches				
	Choice Situation			Percent Reduction over treated	No Choice Situation
	Treated Substrate	Untreated Substrate	Total Eggs laid in 2 egg batches		Treated Substrate
	Mean ± SE	Mean ± SE	Mean ± SE		Mean ± SE
1	127.33 ± 8.73	251.6 ± 6.89	379.00 ± 3.60	50.4	359.66 ± 5.50
2	111.00 ± 2.64	236.66 ± 3.21	347.66 ± 5.50	53.09	320.00 ± 2.00
3	99.33 ± 2.30	220.00 ± 7.21	319.33 ± 7.02	54.8	292.66 ± 6.80
4	84.00 ± 4.58	201.00 ± 7.81	285.00 ±5.56	58.07	261.33 ± 1.15
5	79.66 ± 4.58	182.33 ± 1.73	262.00 ± 6.00	59.88	220.00 ±2.00
Control	-	-	591.00 ± 7.54	-	-

Conclusion

Plant extracts were highly effective in disrupting the oviposition behaviour of adult females of *Spodoptera litura*. There was a significant reduction in egg laying and hatching on the oviposition substrates treated with the plant extracts.

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