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EFFECT OF COW URINE AND SOME INDIGENOUS PLANT EXTRACTS ON FEEDING BEHAVIOUR OF *SPILARCTIA OBLIQUA* (WALKER)

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ABSTRACT

The effect of cow urine and indigenous plant leaf extracts on feeding behaviour of 10 day-old larvae of *Spilarctia obliqua* (Walker) was studied under laboratory conditions at Pantnagar. Castor leaves treated with lantana, and citrus extracts and cow urine (5%) were significantly consumed more. The consumption of leaves was the minimum in neem (10%) followed by eucalyptus (10%). The antifeeding activity was 64.37 per cent and the feeding inhibition was 43.46 per cent when neem (10%) treated leaves were provided. The antifeedant activity was dose-dependent; however no mortality was recorded within 24-hour period. The antifeedant activity in a decreasing order for the treatments was neem > eucalyptus > tulsi > parthenium > taratej > bichhu grass > bhang > cow urine > citrus > lantana.

Key Words: Cow urine, feeding behaviour, plant extracts, *Spilarctia obliqua*

INTRODUCTION

The Bihar hairy caterpillar, *Spilarctia obliqua* (Walker) (Arctiidae: Lepidoptera) is a polyphagous pest (Mandal and Bhattacharya, 2003). Use of chemicals for pest control indeed has been a boon for agriculture; however, their indiscriminate use has tremendously increased various problems. Use of botanical pesticides in pest management is gaining importance as they are eco-friendly. Besides, animal originated products such as cow urine and butter milk have also been reported to be effective against insect pests and diseases of agricultural crops. Hence, the present study was designed to assess the effect of cow urine and indigenous plant extracts on feeding behaviour of *Spilarctia obliqua* (Walker).

MATERIALS AND METHODS

The present study was carried out in the Department of Entomology, College of Agriculture, GB Pant University of Agriculture and Technology, Pant Nagar, Uttarakhand.

Culture of the test insect : The culture of *Spilarctia obliqua* (Walker) was raised in glass jars on leaves of castor, *Ricinus communis* Linn. The nucleus culture of the test insect larvae was collected from university premises and brought to the laboratory that were reared on fresh castor leaves till pupation. The healthy pupae were procured for the next generation. The culture was maintained at 28 ± 1 C and 80 ± 5% RH. The adults obtained from this culture were released in separate glass jars (21 × 15 cm), the walls of which were lined with white paper for egg laying. White paper strips were also kept in the jars for egg laying. The jars were covered with muslin cloth and fastened with rubber bands. The muslin cloth and strips were checked daily for egg laying and eggs were removed and placed in separate jars on fresh succulent castor leaves for hatching. The neonate larvae were reared on fresh castor leaves to maintain the test culture of *S. obliqua*. The adult moths were maintained on 10% honey solution as food. To get a homogenous population larvae after one generation were used for the experiment.

Extraction of bioactive compounds : Cow urine was collected from local breed of cow and the test plants were collected from the University campus and nearby areas of Pantnagar. The leaves from different plants collected were Taratej (*Coronopus dedymus*), Parthenium (*Parthenium hysterophorous*), Lantana (*Lantana camara*), Bhang (*Cannabis sativa*), Eucalyptus (*Eucalyptus globosa*), Citrus (*Citrus limonium*), Neem (*Azadirachta indica*), Bichhu grass (*Girardinia heterophylla*). The leaves of collected plants were first washed with water to remove the dust particles or foreign matter, dried in shade just to remove excess water. Fifty grams of leaves of each plant were weighed by using a top pan electric balance, macerated in the electrical grinder and extracted in distilled

water. The ground material was then filtered using double-layered muslin cloth twice. Two concentrations (5% and 10%) of all plant extracts and cow urine were evaluated against the test insect.

Bioassay : The effect of various extracts and cow urine on the feeding behavior of freshly molted 4th instar larvae was investigated through no- choice bioassay using 4.0 cm^2 leaf discs. The 10 day-old larvae were subjected to bioassay using leaf disc residue technique. All experiments were conducted at 29 ± 0.5 C and 75 ± 5% RH. The experiment was carried out taking 11 treatments including control. Each treatment was replicated 3 times. The area of leaf consumed by the larvae in 24 hours was recorded with the help of graph paper. The preference of plant extract treated castor leaf by the larvae of *S. obliqua* was examined through the leaf disc choice test (Jermy, 1961). For this purpose, the leaf disc (4 cm^2) of standard plant (castor) untreated or treated with different plant extracts were used as food for 5-hour starved 10 day-old larvae released individually.

The effect of cow urine and different plant extracts on feeding of *S. obliqua* larvae was evaluated by using no-choice test method as suggested by Singh *et al.* (1995). Fresh castor leaf discs (4 cm^2) were treated with cow urine and crude plant extract, separately, with the help of atomizer and placed in tilted orientation under ceiling fan air dried at room temperature in the laboratory to evaporate water from the leaf. After complete evaporation of water of the castor leaves they were kept in pertidishes lined with moist filter paper to maintain the humidity. Thereafter, single 10 day-old larva of *S. obliqua*, starved for 6 hours were released into each petri dish (90 mm dia.) containing treated leaf disc and allowed to feed. Each treatment was replicated thrice. In control, the leaf discs were dipped in distilled water and drip dried before being given to larvae. Observations were recorded on the leaf area eaten on treated and untreated leaves by the larva in 24 h with the help of graph paper. The experiment was conducted in CRD and the data analysed following Snedecor and Cochron (1959).

Feeding in each treatment over control was worked out using the following formula:

Antifeedant activity was compared using the following formula:

Feeding inhibition (FI%) was calculated as per method suggested by Pande and Shrivastav (2003)

Where C = Consumption of control leaves

T = Consumption of treated leaves

Preference index was calculated according to Kogan and Geoden (1970).

Where C = Preference index

A = area eaten on the treated leaf

M = area eaten on the untreated leaf

The antifeedant activity of each plant extract was worked out on the basis of preference indices (C-values) according to the following scale:

C - value	Class
0.1 - 0.25	Extremely strong antifeedant activity
0.26 - 0.50	Strong antifeedant activity
0.51 - 0.75	Moderately antifeedant activity
0.76 - 0.99	Slightly antifeedant activity
> 1	Preferred plant extract

RESULTS AND DISCUSSION

Bihar hairy caterpillar (*S. obliqua*) larvae fed on all plant extracts treated discs and cow urine treated discs in different proportions (Table 1). Differences in feeding rates among the treatments was evinced. It was clear that lantana (5%), citrus (5%) and cow urine (5%) were significantly consumed more. It was also apparent that the consumption was reduced at higher concentration. The consumption of leaves was very less in neem (10%) followed by eucalyptus (10%), neem (5%), tulsi (10%) and parthenium (10%). Mean feeding was less in neem followed by eucalyptus. The antifeedant activity and feeding inhibition was more in both concentrations of neem; whereas, preference index was less. Leaf area was consumed more at lower concentrations than at higher concentrations in all the treatments, which shows the antifeedant activity was dose-dependent. No mortality was recorded within 24h of the observed period. The efficacy of antifeedants in a decreasing order was neem > eucalyptus > tulsi > parthenium > taratej > bichhu grass > bhang > cow urine > citrus > lantana.

The preference indices for cow urine and different plant extracts have been presented in Table 1. The max preference index was for lantana (0.96) and citrus (0.95). Overall mean preference index indicated that neem (5% and 10%) and tulsi (10%) were significantly different than the other treatments.

Table 1. Comparative antifeedant activity of cow urine and different plant extracts against larvae of *S.obliqua* (leaf area provided = 16 cm^2)

S. No.	Treatments	Conc. (%)	MLAC (cm^2)	Mean feeding (%)	Antifeedant activity (%)	Protection over control (%)	Feeding inhibition (%)	Preference Index
T_1	Cow urine	5	12.50	78.13	21.87	18.98	18.99	0.89
		10	11.17	69.81	30.19	27.61	17.82	0.82
T_2	Eucalyptus	5	8.43	52.69	47.31	45.36	45.37	0.70
		10	6.87	42.93	57.07	60.08	39.92	0.60
T_3	Citrus	5	13.87	86.68	13.32	10.12	10.11	0.95
		10	12.60	78.75	21.25	18.34	11.88	0.88
T_4	Bhang	5	11.97	74.81	25.19	22.43	22.42	0.87
		10	10.70	66.88	33.12	30.65	19.85	0.80
T_5	Neem	5	7.00	43.75	56.25	54.63	54.63	0.62
		10	5.70	35.63	64.37	63.05	43.46	0.52
T_6	Lantana	5	14.30	89.38	10.62	7.32	7.32	0.96
		10	12.53	78.13	21.87	18.99	12.28	0.87
T_7	Parthenium	5	9.27	57.94	42.06	39.92	39.92	0.75
		10	7.93	49.56	50.44	48.61	33.89	0.66
T_8	Taratej	5	9.23	57.69	42.31	40.18	40.18	0.75
		10	8.77	54.81	45.19	43.17	29.03	0.70
T_9	Tulsi	5	8.30	51.88	48.12	46.20	46.20	0.70
		10	7.60	47.50	52.50	50.75	35.60	0.64
T_{10}	Bichhu grass	5	10.50	65.63	34.37	31.95	31.95	0.81
		10	9.23	57.69	42.31	40.18	26.98	0.73
T_{11}	Control	5	15.43	96.44	3.56	—	—	1.0
		10	16.00	100.00	0.00			1.0
	SEm±		0.356					
			0.491					
	CD at 1%		1.960					
			1.420					
	CD at 5%		1.442					
			1.045					

MLAC = Mean leaf area consumed

Based on the leaf area of the disc consumed under neem leaf extract (5 and 10%), the anti-feeding activity ranged from 56.25 to 64.37 per cent. In the control, leaf discs were almost completely eaten (15.43 cm^2 and 16.00cm^2).

The leaf area consumed at the lower concentration (5%) was more than that at the higher concentration (10%) in all of the treatments which clearly demonstrated that these leaf extracts at their higher concentrations were having higher antifeedant activity. Earlier reports indicate that neem leaf extract and cow urine showed reduction in budfly (*Dasyneura lini*) incidence in linseed and increase in grain yield (Gupta and Rawat, 2004). Many indigenous plant extracts have been reported to possess antifeedant properties against various insect pests (Rao *et al.*, 2000).

The present data indicate that none of the plant extracts and cow urine belonged to the extremely antifeedant category. However, neem, eucalyptus, tulsi, parthenium, taratej (5% and 10%) and bichhu grass (10%) showed moderate antifeedant activity (C-values, 0.52, 0.62, 0.60, 0.70, 0.66-0.75, 0.64, 0.70, 0.70, 0.75 and 0.73, respectively) whereas citrus, bhang, lantana and cow urine (5% and 10%) and bichhu grass (5%) showed slight antifeedant activity (C – values, 0.95, 0.88, 0.87, 0.80, 0.96, 0.87, 0.89, 0.82 and 0.81, respectively.

Earlier, Panwar and Chibber (2006) studied the effect of plant extracts on feeding potential of *Spilarctia obliqua*. They found leaf extracts of *A. indica* and *Eucalyptus globulus* and green foliage of *Lantana camara* had suppressant and deterrent properties against this pest. However, strong repellant activity was noticed in case of neem only. Leaf extracts of *A. indica, Ocimum sanctum* and *Parthenium hysterophorus* were effective on *Spilosoma obliqua* (Ahmed and Bhattacharya, 1991).

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