



Research Article

**ANTIFEEDANT ACTIVITY OF LEAF EXTRACTS OF  
*CATHARANTHUS ROSEUS* AND *OCIMUM SANCTUM* AGAINST  
FOURTH INSTAR LARVAE OF *SPODOPTERA LITURA***

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**ABSTRACT**

Plants were evaluated for their antifeeding properties against *Spodoptera litura* reared in the laboratory on the host plant cabbage. In the present study antifeeding activity of leaf extracts of two plants *Catharanthus roseus* and *Ocimum sanctum* was evaluated against fourth instar larvae of *Spodoptera litura*. Experiments to evaluate antifeeding potential of plants were conducted under choice and no-choice situations. In choice situation larvae were given choice to feed on extract treated and untreated cabbage leaves and under no-choice condition only treated leaves were provided as food to the larvae. Data pertaining to the experiments clearly revealed that all the plants showed varying degree of feeding detergency. *Catharanthus roseus* and *Ocimum sanctum* showed similar but less profound trends in antifeedant activity against fourth instar larvae of *Spodoptera litura*. Antifeedant index of *Catharanthus roseus* was 48.42 percent on treated leaf disc and 18.19 percent on untreated leaf disc in choice experiment. *Ocimum sanctum* showed higher antifeedant activity compared to *Catharanthus roseus* and in choice experiment antifeedant index was 57.61 and 19.21 percent in treated and untreated leaf discs respectively at the 5 % of the extract.

**Keywords:** *Spodoptera litura*, *Catharanthus roseus*, *Ocimum sanctum*, Antifeedant.

**INTRODUCTION**

Plants have been extensively evaluated against tobacco cutworm *Spodoptera litura* and *Spodoptera littoralis*, both of which are highly destructive to vegetable crops. Bai and Kandasamy (1985) evaluated the effect of acetone and diethyl ether extracts of *Vitex negundo* and *Stachytarpheta urticifolia* against third instar larvae of *Spodoptera litura*. Two antifeedant compounds identified as coumarin and xanthyletin have been isolated from the petroleum ether extract of *Clausena aniseta* (Rutaceae) and assayed against the larvae of African armyworm *Spodoptera exempta* (Gebreyesus and Chapya, 1989). Saradamma (1989), Devaprasad *et al.* (1990) and Dayrit *et al.* (1995) reported the insecticidal effects of *Vitex negundo* and other plants against *Spodoptera*

*litura*. Behra and Satpathy (1997) studied the effect of some indigenous plant extracts on growth and development of *Spodoptera litura*.

*Catharanthus roseus* Linn. also called periwinkle belongs to the family Apocynaceae and is an important medicinal plant. It contains more than 70 different types of alkaloids and chemotherapeutic agents. The biopesticidal potential of *C. roseus* has been reported earlier against some important insect pests. Also, work on the isolation of a possible insect growth regulator (IGR) from *C. roseus* is in progress *Ocimum sanctum* Linn. belonging to family Labiatae is also called Tulsi in India and is ubiquitous in Indian tradition. In addition to its medicinal uses it has shown biological activities against insects. Plants were evaluated for their antifeeding properties against *Spodoptera litura*

reared in the laboratory on the host plant cabbage.

Feeding deterrents or antifeedant chemicals are those chemicals which inhibit feeding of insect on a treated food material without necessarily killing or repelling them. Plants with antifeeding properties are increasingly being used against phytophagous insect pests for protection of crops. In the present study antifeeding activity of leaf extracts of two plants, *Catharanthus roseus* and *Ocimum sanctum* was evaluated against fourth instar larvae of *Spodoptera litura*.

## MATERIAL AND METHOD

### Feeding Deterrent effect of plants:

**Method of treatment:** Leaf-disc method in both choice and no-choice situation.

**Number of larvae tested:** 75 fourth instar larvae at each concentration in each situation (3 replicates of 25 larvae each).

**Duration of treatment:** 24 hrs

**Test formulation used:** Leaf extracts of the plants.

**Doses applied :** 1, 2, 3, 4, 5%

**Temperature :** 28±2°C

**Humidity :** 80±5%

**Dark: Light period:** 14:10 (in hours)

Antifeedant activity of the leaf extracts of the plants was assayed against fourth instar larvae of *Spodoptera litura* using a leaf disc bioassay in both choice and no-choice situations. The experiment was done in plastic container (12cm diameter and 8 cm height). A moist paper towel was kept at the bottom of each container in order to maintain high humidity and to keep the cabbage leaves fresh.

The percent feeding was calculated according to the formula as follows:

$$\text{Percent feeding} = \frac{\text{Area given for feeding} - \text{Corrected area left}}{\text{Area given for feeding}} \times 100$$

Antifeedant activity was assessed by calculating the antifeedant Index by the formula of Isman *et al.* (1990).

$$\text{Antifeedant Index} = \frac{\text{Leaf area consumed in control} - \text{Leaf area consumed in treated}}{\text{Leaf area consumed in control} + \text{Leaf area consumed in treated}} \times 100$$

## RESULTS

### *Catharanthus roseus*

**Leaf Extract:** Leaf extract of *Catharanthus roseus* was less effective in inhibiting feeding in fourth instar larvae of *Spodoptera litura*, both in choice and no-choice situations, when compared to *Ocimum sanctum*. In choice experiment feeding was 45.06 percent at the highest concentration of 5% extract compared to 82.47 percent in control (Table 1). Feeding was not affected at lower concentration of 1% (80.89 percent compared to 82.16 percent in control). At 2, 3 and 4% extract, percent feeding reported on treated leaves was 73.40, 62.81 and 60.03 respectively. Antifeedant index was highest of 48.42 percent at 5% extract and lowest of 12.84 percent at 1%. At 2, 3 and 4% extract antifeedant indices were 18.76, 28.44 and 31.06 percent respectively.

Feeding on untreated cabbage leaves was higher in choice situation compared to feeding in control experiments. At 1, 2 and 3% extract, percent feeding observed on untreated leaf disc was 95.46, 92.99 and 85.27 percent (82.16, 82.64 and 82.32 percent in control). At 4% and 5% extract percent feeding was 80.33 and 74.04 respectively. Antifeedant index was highest of 18.19 percent at 5% and lowest of 2.78 percent at 1% extract.

In no-choice situation where only treated cabbage leaf disc was provided as food to larvae, it was observed that at 5% extract percent feeding was reduced to 47.77 compared to 82.47 in control. Percent feeding at 1, 2, 3 and 4% extract was 79.77, 75.47, 66.71 and 56.52 respectively.

Antifeedant index at highest concentration of 5% was 44.89 percent and lowest of 13.71 percent at 1% extract. At 2, 3 and 4% extract, antifeedant indices were 17.02, 24.57 and 34.71 percent respectively.

***Ocimum sanctum***

**Leaf Extract:** Leaf extract of *ocimum sanctum* showed significant feeding deterrent effect against fourth instar larvae of *Spodoptera litura* (Table 2). In choice situation, percent feeding on treated leaf disc reduced to 57.61 at the concentration of 5% extract. Feeding was 71.33 percent at 1% extract compared to 82.31 percent

feeding in control larvae. At 2, 3 and 4% extract feeding reported was 71.97, 55.17 and 48.80 percent respectively. Antifeedant index at the highest concentration of 5% extract was 57.61 percent whereas it was minimum of 20.55 percent at 1% extract. At 2, 3 and 4% antifeedant index was 23.70, 36.17 and 43.81 percent respectively.

**Table 1.** Antifeedant action of leaf extract of *Catharanthus roseus* on fourth instar larvae of *Spodoptera litura*.

Doses %	Choice situation						No choice situation			Control	
	Treated leaf disc			Untreated leaf disc			Treated leaf disc			Leaf area consumed cm <sup>2</sup> Mean ± SE	Percent feeding
	Leaf area consumed cm <sup>2</sup> Mean ±SE	Percent feeding	Antifeedant Index	Leaf area consumed cm <sup>2</sup> Mean ± SE	Percent feeding	Antifeedant Index	Leaf area consumed cm <sup>2</sup> Mean ±SE	Percent feeding	Antifeedant Index		
1	7.97 ± 0.48	80.89	12.84	9.76± 0.22	95.46	2.78	7.83±0.45	79.77	13.71	10.32±0.17	82.16
2	7.10±0.24	73.4	18.76	9.51±0.15	92.99	4.37	7.36±0.11	75.47	17.02	10.38±0.13	82.64
3	5.78 ± 0.25	62.81	28.44	8.55 ±0.11	85.27	9.47	6.26±0.31	66.71	24.57	10.34± 0.16	82.32
4	5.46±0.42	60.03	31.06	7.96 ±0.41	80.33	13.19	5.03±0.48	56.52	34.71	10.38±0.13	82.63
5	3.60 ±0.25	45.06	48.42	7.17 ±0.26	74.04	18.19	3.94±0.38	47.77	44.89	10.36± 0.13	82.47

**Table 2.** Antifeedant action of Leaf extract of *Ocimum sanctum* on fourth instar larvae of *Spodoptera litura*.

Doses %	Choice situation						No choice situation			Control	
	Treated leaf disc			Untreated leaf disc			Treated leaf disc			Leaf area consumed cm <sup>2</sup> Mean ± SE	Percent feeding
	Leaf area consumed cm <sup>2</sup> Mean ±SE	Percent feeding	Antifeedant Index	Leaf area consumed cm <sup>2</sup> Mean ± SE	Percent feeding	Antifeedant Index	Leaf area consumed cm <sup>2</sup> Mean ±SE	Percent feeding	Antifeedant Index		
1	6.82±0.33	71.33	20.55	9.42±0.12	92.43	4.7	7.14±0.41	73.88	18.35	10.35±0.14	82.31
2	6.34±0.11	71.97	23.7	8.90± 0.33	91.16	7.19	6.65± 0.16	70.46	21.44	10.28±0.08	81.76
3	4.87±0.39	55.17	36.17	8.33±0.13	83.28	11	5.62±0.44	61.22	29.79	10.39±0.11	83.12
4	4.04±0.39	48.8	43.81	7.77±0.36	79.14	14.19	4.19±0.41	50.23	42.32	10.34±0.14	82.31
5	2.77±0.28	57.61	57.61	6.98±0.37	73	19.21	3.5±0.31	44.74	49.16	10.31±0.07	82.24

**DISCUSSION**

*Catharanthus roseus* and *Ocimum sanctum* showed similar but less profound trends in antifeedant activity against fourth instar larvae of *Spodoptera litura*. Antifeedant index of *Catharanthus roseus* was 48.42 percent on treated leaf disc and 18.19 percent on untreated leaf disc in choice experiment. *Ocimum sanctum* showed higher antifeedant activity compared to *Catharanthus roseus* and in choice experiment antifeedant index was 57.61 and 19.21 percent in treated and untreated leaf discs respectively at the 5 % of the extract.

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**REFERENCE**

- Bai, K.S. and Kandasamy, C., 1985. Laboratory induced mortality of *Spodoptera litura* fed on the leaf discs of castor treated with the extracts of *Vitex negundo* and *Stachytarpheta urticifolia*. *Indian J. Agr. Sci.*, 55(IZ): 76-76.
- Behra, U.K. and Satapathy, C.R., 1997. Effect of

- indigenous plant extracts on growth and development of *Spodoptera litura* Fab. *Environ. Ecol.*, 15(1):12-16.
- Dayrit, F.M., Corazon, M., Trono, M., Rejeson, B.M. and Maini, H., 1995. Anti - pest compounds from the volatile oil of *Vitex negundo* Lin. *Philippines J. Sci.*, 124(1): 15-27.
- Devaprasad, V., Jayaraj, S., Rabindra, R.J. and Reddy, G.P.V., 1990. Studies on the interaction of certain botanicals and nuclear polyhedrosis virus against tobacco caterpillar, *Spodoptera litura* F. In. Botanical Pesticides in Integrated Pest Management. Eds. Chari, M.S. and Ram Prasad, G. CTRI, Rajmundry, India, pp. 190-196.
- Gebreyesus, T. and Chapya, A., 1989. Antifeedants from *Clausena anisata*, (willd). Hook Fex Bent (Rutaceae) in "Natural products for Innovative Pest Management", (Whitehead, D.L. and Bowers, W.S. eds) Pergamon Press, Oxford, p. 237-242.
- Isman, B., Koul, O., Luczynski, A. and Kaminski, J., 1990. Insecticidal and antifeedant bioactivities of neem oils and their relationship to Azadirachtin content. *J. Agri. Food Chem.*, 38: 1407-1411.
- Saradamma, K., 1989. Biological activity of different plant extracts with particular reference to their insecticidal, hormonal and antifeeding actions. Ph.D. Thesis, Kerala Agricultural University, Thiruvananthapuram, pp. 199.