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Catharanthus roses interaction with development stages of *Spodoptera litura*

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ABSTRACT

In the present study the pesticidal effect of leaf extracts of Catharanthus roseus has been evaluated against the larvae of Spodoptera litura. Result show that in 3rd Instar Larvae, Larval mortality was 82.69 and 78.60 percent when larvae were treated at 2.5 % extract by topical and leaf-disc treatments respectively. In 5th Instar Larvae, Maximum mortality of 81.67 and 62.66 percent was observed at 2.5% extract. In 6th Instar Larvae, 78.66 and 57.33 percent mortality was recorded when larvae were treated by 2.5% extract. From the results, it is evident that the plant tested possessed significant larvicidal properties and caused high mortality in larvae of Spodoptera litura.

Key words: *Spodoptera litura, Leaf-disc treatments, Larvae, Leaf extracts.*

INTRODUCTION

Plants are endowed with a potential to produce a wide range of allelochemicals that protect the plants from insect-pests. However, production of phytochemicals has been reported to vary from plant to plant[2]. Further, parameters like age of the plant, part of the plant (root, stem, leaf, fruit, flower, seed and bark) have been reported to affect the production of such allelochemicals.

In recent years, tries are being created to spot plants, together with herbs and weeds, for his or her insecticidal property with a read to seek out appropriate alternatives to exchange unsafe artificial pesticides utilized in massive scale in India[4]. Insecticidal activity of the many plants against many insect pests has been incontestable. Tack, affect feeding and oviposition of insects on the plants[6].

The castor cut worm, *S. litura* is one in the entire necessary polyphagous crop pests distributed throughout south and Japanese world tropical infesting 112 species of plants happiness to forty four families[3] as well as groundout. In Republic of India it feeds on seventy four species of cultivated crops and a few wild plants[7]. *S. litura* may be a cosmopolitan and polyphagous tormenter moving many crops worldwide inflicting intensive loss of agricultural production.

Catharanthus roseus L (G) Don. (Madagascar periwinkle) belongs to the family Apocynaceae. Pharmacological studies have revealed that *C. roseus* contain more than 70 different types of alkaloids. Furthermore, *in vitro* studies have shown that this plant produces a large number of alkaloids upon elicitation[8]. With this background, in the present study the pesticidal effect of leaf extracts of *C. roseus* has been evaluated against the larvae of *Spodoptera litura.*

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MATERIALS AND METHODS

Leaf application method: The oral or systemic toxicity of the plant extracts was investigated against 3rd, 4th, 5th, and 6th instar larvae through no-choice bioassay using leaf discs (6 cm in diameter) prepared from cabbage leaves. Test formulation was prepared by dissolving the extract in distilled water and adding Tween-80 as an emulsifier.

For treatment, each leaf disc was dipped for 1 minute in the extract solution at each concentration, air dried to evaporate solvent and then placed in a plastic container. A moist filter paper was kept below the leaf disc to prevent it from drying. The plastic container was covered with fine muslin cloth held with rubber band. Three replicates each with 10 larvae were maintained for each treatment. Larval mortality was observed after 48 hours of treatment and percent mortality was corrected by Abbott's formula[1].

Topical application: Larvae were collected from rearing stock and were kept in ventilated plastic containers (20 cm diameter and 8 cm in height) for the bioassay. For topical application, 2 ul of the solvent extract was applied topically on each larva with the help of a micropipette. After treatment the larvae were released in the plastic container containing cabbage leaves. Three replicates were run for each concentration per solvent extract and controls treated with solvent were kept in each experiment. Ten larvae were treated in each replicate. Larval mortality was observed after 48 hours of treatment. Percent mortality was calculated and corrected using Abbott's formula[1]. The correction was done only when the death in control groups was between 5-20%.

$$\text{Abbott's corrected mortality} = \frac{\%\text{ mortality in control} - \%\text{ mortality in treated}}{100 - \%\text{mortality in control}}$$

RESULTS

Leaf Extract:

Third Instar Larvae: Larval mortality was 82.69 and 78.60 percent when larvae were treated at 2.5 % extract by topical and leaf-disc treatments respectively (Table 1). At 0.5% concentration mortality observed was low (15.33 and 10.66%) in both treatment methods. Percent mortality in control was 4.40 and 4.50 in topical and leaf –disc treatment experiments respectively.

Fourth Instar Larvae: At highest concentration of 2.5%, larval mortality observed was 82.68 and 73.33 percent in topical and leaf-disc treatment methods respectively (Table 1). Lower concentration of extract (0.5%) caused 13.36 and 6.66 percent mortality in topical and leaf-disc treatments respectively. In control 3.52 and 3.38 percent mortality was observed in topical and leaf-disc treatments respectively.

Fifth Instar Larvae: Maximum mortality of 81.67 and 62.66 percent was observed at 2.5% extract when larvae were treated with topical and leaf-disc treatment methods respectively (Table 1). Mortality observed was 10.66 and 6.66 percent when larvae were treated at 0.5% concentration by topical and leaf-disc treatment methods respectively. Control experiments showed 3.50 percent mortality in both types of treatments.

Sixth Instar Larvae: 78.66 and 57.33 percent mortality was recorded when larvae were treated by 2.5% extract by topical and leaf-disc treatments respectively (Table 1). Lower concentration of 0.5% was not effective and mortality observed was very low of 9.33 and 5.33 percent in topical and leaf-disc treatments respectively. In control mortality recorded was 2.05 and 2.15 percent in topical and leaf-disc experiments respectively.

DISCUSSION

Plants produce a wide spectrum of phytochemicals that specifically inhibit growth, morphogenesis, metamorphosis and reproduction[2]. Currently there is a resurgence of interest in plant derived compounds for developing them commercially as ecofriendly insecticides. Jacobson and Crosby[5], pointed out the use of plants as a promising source for the development of new insecticides.

From the results, it is evident that the plant tested possessed significant larvicidal properties and caused high mortality in larvae of *Spodoptera litura.* Mortality in larvae may be due to general toxicity of the chemical compounds present in the plant extracts.

Table 1 : Toxicity of *Catharanthus roseus* Leaf extract against different larval instars of *Spodoptera litura*

Doses in %	Percent Mortality during Larval Instars															
	III Instar Larvae				IV Instar Larvae				V Instar Larvae				VI Instar Larvae			
	Leaf-Disc Application		Topical Application		Leaf-Disc Application		Topical Application		Leaf-Disc Application		Topical Application		Leaf-Disc Application		Topical Application	
	Percent Mortality	Corrected Mortality	Percent Mortality	Corrected Mortality	Percent Mortality	Corrected Mortality	Percent Mortality	Corrected Mortality	Percent Mortality	Corrected Mortality	Percent Mortality	Corrected Mortality	Percent Mortality	Corrected Mortality	Percent Mortality	Corrected Mortality
0.5	10.66	6.44	15.33	11.43	6.66	3.39	13.36	10.19	6.66	3.25	10.66	7.41	5.33	3.24	9.33	7.43
1	21.33	17.62	22.6	19.03	18.6	15.75	21.3	18.42	17.3	14.28	20	17.09	14.6	12.72	17.34	15.61
1.5	37.3	34.34	38.59	35.76	34.59	32.3	37.34	35.05	30.6	28.06	33.36	30.94	29.31	27.75	32	30.57
2	59.32	57.71	65.33	63.73	58.66	57.21	61.33	59.91	54.59	52.93	57.3	55.75	50.66	49.57	53.33	52.35
2.5	78.6	77.59	82.69	81.89	73.33	72.39	82.68	82.04	62.66	61.29	81.67	81	57.33	56.39	78.66	78.21
Control	4.5		4.4		3.38		3.52		3.50		3.5		2.15		2.05	
F-Value	173.24		284		128		215.1		99.22		264.1		194		146..17	
CV at 5%	3.61		3.61		3.61		3.61		3.31		3.34		3.61		3.61	

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