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YELLOW OLEANDER *(THEVETIA NERIIFOLIA* JUSS.) A BIO-ANTIFEEDANT FOR EPILACHNA BEETLE *(HENOSEPILACHNA VIGINTIOCTOPUNCTATA* L.)

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Abstract : Fresh and dried leaves and seeds of *Thevetia neriifolia* Juss. were evaluated for their antifeedant activity against *Henosepilachna vigintioctopunctata* L. using acetone, benzene, ethanol, hexane, methanol and water as extractants. Based on the percentage of leaf protection, seed extracts were found superior to the leaf extracts. Fresh and dried leaf extracts were on par. Among the solvents, ethanol and methanol gave maximum leaf protection closely followed by water. Based on larval starvation, seed extracts were superior to leaf extracts and fresh leaf extracts were significantly better than dried leaf extracts. Soaking of powdered plant material in solvents for 48 h and filtration was found as effective as soxhlet method for extracting antifeedant components from leaves and seeds of *T. neriifolia*

Key words: Antifeedant, *Henosepilachna, vigintioctopunctata, Thevetia neriifolia*

INTRODUCTION

Plant protection technologists are now relying on tactics that increase mortality in pest population but are less hazardous to the agro-ecosystem. In this context, phytochemicals are being recently explored extensively as desirable components of pest management systems. Though more than 200 plant species have been reported to contain bioactive principles effective against insect pests, presently the only plant exploited for practical pest control programme is the neem tree. However, this single plant species is not likely to meet the global requirement of pesticides. Other indigenous sources of botanical pesticides have to be identified and exploited. The yellow oleander *T. neriifolia* is one such potential plant. Antifeedant activity of seeds of *T. neriifolia* to *Athalia proxima* Klug (Pandey *et al*., 1977) and leaves to *H. vigintioctopunctata* (Saradamma, 1989) have been reported. However, detailed studies on the antifeedant activity, comparative efficacy of the different plant parts and extractants and mode of extraction which all have a direct bearing on the effectiveness of the phytochemical has not been done. Hence, the present study was taken up to ascertain these facts.

MATERIALS AND METHODS

Fresh mature leaves of *T. neriifolia* were collected, chopped and macerated (40 g) in an electric grinder and soaked in 100 ml of acetone, benzene, ethanol, hexane, methanol and water for 48 hours for obtaining extracts of fresh leaves. Shade dried and finely powdered leaves (20 g) and seeds (10 g) were shaken in 100 ml of the respective solvents in a reagent bottle for 10 min and then kept undisturbed for 48 hours for getting extracts of the dried products. These solutions were filtered through cheesecloth and Whatman No. 1 filter paper and the volume was made up to 100 ml. This served as the stock extract. The required dilutions were prepared from this with distilled water containing one per cent teepol. Powdered samples of dried leaf (20 g) were extracted with the respective solvents for 6 h in a soxhlet apparatus. The volume was made up to 100 ml to form the stock extract. Seed samples were first extracted with hexane to remove oil. The dried marc was then extracted with the respective solvents for 6 h and the stock solution was prepared as described above.

Pre-weighed bittergourd leaves of uniform age and size were dipped in the extracts and dried. Five third-instar grubs of epilachna beetle, pre-conditioned without food for 4 h were weighed and released to a leaf. After 48 h, the uneaten portions of leaves and the grubs were weighed. The difference between the pre-treatment and post feeding weights gave the weight of leaf consumed and the gain / loss in weight of the grubs respectively. Pre-weighed leaves dipped in the solvent alone and exposed to grubs served as control. The loss in weight of leaf in a similar set kept without exposure to larvae served to find the natural loss of leaf weight due to evaporation. Grubs kept without food served as starved larvae. Each treatment was replicated thrice. The percentage of leaf weight protected by

the extracts was estimated as (A-B)/A x 100 where A = weight of leaf consumed in control and B = weight of leaf consumed in treatment. Percentage of larval starvation in treatment was calculated as (C-E) x 100/(C-S) where C = weight gain of control larvae in 48 hours, E = weight gain of experimental larvae in 48 hours and S = weight gain of starved control larvae in 48 hours.

Table 1 Antifeedant action of leaf and seed extracts of *Thevetia neriifolia* on third-instar grubs of *Henosepilachna vigintioctopunctata*

Solvents dried	Plant part used			
	Dried leaf (2%)	Fresh leaf (4%)	Seed (1%)	Mean
	Leaf protection (percentage)			
Acetone	44.28 (6.73)	21.62 (4.75)	52.36(7.31)	38.19(6.26)
Benzene	55.39 (7.51)	60.28 (7.83)	66.54 (8.22)	60.78 (7.86)
Ethanol	80.09 (9.01)	84.87 (9.27)	96.61 (9.88)	86.98 (9.36)
Hexane	6.38 (2.72)	1.39(1.54)	12.06 (3.61)	5.86 (2.62)
Methanol	74.99 (8.72)	80.31 (9.02)	89.82 (9.53)	81.63 (9.09)
Water	63.64 (8.04)	69.41 (8.39)	79.05 (8.95)	70.57 (8.46)
Mean	49.69(7.12)	45.24 (6.8)	61.73 (7.92)	
	Larval starvation (percentage)			
Acetone	21.31 (4.72)	30.97 (5.65)	42.69 (6.61)	31.04 (5.66)
Benzene	66.6 (8.22)	80.92 (9.05)	88.7 (9.47)	78.57 (8.92)
Ethanol	77.71 (8.87)	90.3 (9.55)	100(10.05)	89.06 (9.49)
Hexane	0(1)	7.28 (2.88)	25.01 (5.1)	7.95 (2.99)
Methanol	84.44 (9.24)	92.09 (9.65)	100 (10.05)	92.12 (9.66)
Water	70.47 (8.45)	84.5 (9.25)	100 (10.05)	84.56 (9.25)
Mean	44.56 (6.75)	57.83 (7.67)	72.27 (8.56)	

CD (0.05)	Leaf protection	Larval starvation
Plant part	0.627	0.352
Solvent	0.887	0.498

Figures in parentheses are transformed values $\sqrt{x+1}$

RESULTS AND DISCUSSION

The percentage of leaf protection afforded indicated that seed extract was significantly superior to leaf extracts (Table 1). No significant difference was observed between dried and fresh leaf extracts. Among the solvents tested, maximum leaf protection was obtained with ethanol. It was on par with methanol and the letter was on par with water. These solvents proved equally effective in extracting the antifeedant principles from dried leaf, fresh leaf and seed. The extent of leaf protection given by these solvents was 80.09, 74.99 and 63.64 per cent respectively for dried leaf, 84.87, 80.31 and 96.41 per cent respectively for fresh leaf and 96.61, 89.92 and 79.05 per cent respectively for seed extracts.

Considering larval starvation, seed extract was significantly superior to leaf extracts (Table 1). Between the leaf extracts, fresh leaf extract was more effective than dr ed leaf extract. Among the solvents, methanol had the highest activity and it was on p ir wi h ethanol and water. The extent of lar al sta- vation induced by ethanol, methai ol ar water extracts of the different plant p rts w s 77.71, 84.44 and 70.47 per cent resp ective for dried leaf and 90.30, 92.09 and 8 .50 p r cent respectively for fresh leaf. See extr t

of all the three solvents caused 100 per cent larval starvation.

Antifeedant activity of seed extract of *T. neriifolia* to *A. proxima* and of dried leaf extracted with different solvents to *H. vigintioctopunctata* had been reported (Pandey *et al.*, 1977). The relative efficacy of different parts of *T. neriifolia* was being studied for the first time, though similar studies have been conducted in other plants (Rao, 1982; Singh and Sharma, 1987; Mwangi and Kabanu, 1993). Results indicated that leaves of *T. neriifolia* freshly harvested or dried under shade can be used with equal advantage and seeds when available can be used at 25% of the quantity of fresh leaves for protecting bittergourd from *H. vigintioctopunctata* infestation. Further, since the rankings of treatments based on leaf protection and larval starvation were on par, one of the criteria could be adopted for reliable screening of plants for their antifeedant potential. Though ethanol and methanol proved to be better extractants, on cost cum efficiency basis water extraction was the best. The results agreed with the findings of Saradamma (1989).

Table 2. Efficacy of soxhlet and crude extraction techniques in the assessment of bioactivity of *Thevetia neriifolia* on *Henosepilachna vigintioctopunctata* (as percentage of leaf protection)

Solvent	Solvent extraction		Crude extraction	
	Leaf (2%)	Seed (1%)	Leaf (2%)	Seed (1%)
	Leaf protection (percentage)			
Acetone	12.97	36.53	46.3	53.17
Benzene	54.7	67.43	55.57	66.67
Ethanol	71.87	84.83	80.1	96.67
Hexane	2.77	22.6	1.97	13
Methanol	75.93	87.5	75.1	90

CD (0.05) for method = 7.280; CD (0.05) for solvent = 4.511

Data presented in Table 2 revealed that maceration of the plant parts in an electric grinder followed by soaking in the solvents for 48 h was the better method of extraction compared to soxhlet extraction. Ethanol extract of seed and leaf obtained through crude extraction showed significantly better activity than soxhlet-extracted sample.

The extent of leaf protections were 71.87 and 84.83% for leaf and seed extracted in soxhlet method using ethanol, while 80.1 and 96.67% protections were observed in the corresponding crude extracts. Obviously, soaking ground plant tissues in any effective solvent for 48 h and filtering the same is an apt technology for extracting antifeedant factors from plants. This simple technique and soxhlet extraction were quantitatively compared for the first time though both the methods were being individually adopted by earlier workers (Saradamma, 1989; Mwangi and Kabanu, 1993).

The active principle of the yellow oleander which contributes to the antifeedant activity to pests is a cardiac glycoside (Mc Laughlin, 1980). This principle is known both for its poisonous and therapeutic values. While at high dose it is cardiotoxic, at low dose it is cardiotonic and has been used clinically in cases of cardiac decompensation (CSIR, 1990). Since only a very low dose of the extracts (seed, 1%; dried leaf 2%, fresh leaf 4%) showed antifeedant activity to pests, the possible toxic effect to human beings is remote. Besides, low persistence of plant extracts under field situations also limits the possible hazards from products of this plant. Hence, a provisional utilization of the leaf and seed extract of *T. neriifolia* for pest control programme can be considered favourably.

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