Journal of Tropical Agriculture 42 (1-2): 45-47, 2004

Short communication

Juvenomimetic activity of extracts of *Thevetia neriifolia* Juss. to *Dysdercus cingulatus* F. (Hemiptera: Pyrrhocoreidae)

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Received 24 March 2001; received in revised form 5 July 2004; accepted 19 July 2004

Abstract

Ethanol extracts of fresh leaves and seeds of *Thevetia neriifolia* were tested for juvenomimetic action on red cotton bug, *Dsydercus cingulatus*, an important pest of cotton and okra. Conspicuous activity, based on larval mortality, duration of ovipositional period, emergence of malformed adults and reduced fecundity of the bugs, were noticed in 40% leaf and 10% seed extracts. Although moderate activity was seen in 20% leaf and 5% seed extracts, no significant effect was observed for the 10% leaf and 2.5% seed extract treatments.

Key words: Botanical pesticides, red cotton bug, ecological pest management

The red cotton bug, *Dysdercus cingulatus* F. is an important pest of cotton and okra. Although synthetic chemical insecticides can control it, the side effects are enormous. In view of this, less hazardous options such as use of resistant cultivars, behaviour modifiers and insect growth regulators have gained prominence in agricultural pest management protocols. Several plant-based compounds, which are potent sources of insect growth regulators and sterilants have been evaluated in this respect (Prabhu et al., 1973; Saradamma, 1989). Application of these phytochemicals cause multiple growth and reproductive aberrations in insects (Jaiswal and Srivastava, 1992). Unlike modern pesticides, they also have the potential to reduce population of insects in the succeeding generations; thus forming an ideal component of the ecological pest management systems. The present study attempts to evaluate the juvenomimetic activity of ethanol extracts of fresh leaves and seeds of *Thevetia neriifolia*, a common ornamental shrub in the humid tropics of peninsular India.

Forty grams of chopped fresh leaves and 10 g of seeds of *T. neriifolia* were macerated in an electric grinder and kept at room temperature in 100 ml of ethanol for 48h. These solutions were then filtered through cheesecloth and Whatman No.1 filter paper in succession and the volume was made up to 100 ml to form the stock extract. Disparate concentrations (10, 20, and 40% leaf and 2.5, 5, and 10% for seed extracts) of the solutions were prepared from the stock extracts and applied topically on the abdominal tergites of newly moulted, female fifth instar nymphs of *D. cingulatus* with a Hamilton micro-applicator. Groups of 10 insects, each treated with 2 µl extracts and confined in a glass jar formed one replicate and 2 µl of the solvent applied on 10 insects served as the control. All treatments were replicated five times. Post treatment nymphal mortality, nymphal duration and nature of adults emerged were monitored. The emerging adults were transferred individually to separate glass chimneys into which one newly emerged male obtained from untreated nymphs was also introduced. Ten such pairs were maintained for each treatment until death, allowing the adults to mate and lay eggs. The number of eggs laid by each isolated insect was counted to determine the fecundity.

The treatment caused mortality of nymphs to varying

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levels (Table 1). The lowest doses of leaf (10%) and seed (2.5%) extracts were generally ineffective. However, 20% leaf and 5% seed extracts resulted in 20 and 26% larval mortality respectively, albeit being statistically at par. The highest larval mortality rates were observed in 10% seed and 40% leaf extract treatments. Most of the treated nymphs developed black patches on the abdomen, failed to moult and died. Earlier, Schluter (1981) also observed such black spots on the grubs of *Epilachna varivestis* Muls. treated with some fractions of neem seed extract and attributed this to the cuticular disruption owing to juvenomimetic effect of the extracts.

Post-treatment duration of the surviving nymphs also was affected by the treatments. Although 10% leaf and 2.5% seed extracts did not cause significant variations in the duration of nymphal period, 40 and 20% leaf extracts significantly prolonged the nymphal duration (by 2-3 days). Likewise, 5 and 10% seed extracts increased the nymphal period by three days. Saradamma (1989) also observed a similar effect on the fifth instar nymphs of *D. cingulatus* treated with ether and benzene extracts of *T. neriifolia*.

Emergence of normal adults was significantly lower in seed extract (10%) and leaf extract (40%), compared to other treatments. The percentage of normal adults in these treatments was 22 and 38 respectively. Furthermore, leaf extract (40 and 20%) and seed extract (5%) recorded a significant increase in the percentage of abnormal adults (14.2 and 14 respectively), which survived only for one or two days. Extracts of many other plants too were reported to have similar effects on a number of other species of insects (Jaiswal and Srivastava, 1992).

Furthermore, a significant proportion (51%) of the normal adults emerged in the 40% leaf extract treatment died prior to oviposition. Adult mortality was 22 and 15% respectively in the 20 and 10% leaf extract treatments. In seed extract treatments, the adult mortality varied from 7% in 2.5% extract, 16% in 5% extract to 100% in 10% extract. Although females emerging from treated fifth instar nymphs in different treatments mated normally when released with normal males, their fecundity was generally lower. A normal *D. cingulatus* female laid on an average 193 eggs during its lifetime, 20% leaf extract treated females, however, laid only 107 eggs. A similar detrimental effect on the number of eggs laid per insect was noticed in the case of seed extract treatment too. This is consistent with the reports of

Table 1: Effect of ethanol extract of fresh leaf and seed of *Thevetia neriifolia* (2 µl of emulsion/insect) topically applied in the last instar nymphs of *Dysdercus cingulatus*

Treatment	Dose (%)	Nymphs			Adults				
		Mortality (%)	Duration		Normal (%)	Abnormal (%)	Mortality prior to oviposition	Mating	Number of eggs laid per female
			Days	Range					
Leaf extract	40	48^{a}(6.87)	9.06^{b}	8-11	38^{b}(61.8)	14^{ab}(3.15)	51.32^{b}(7.06)	N	58.40^{a}
Leaf extract	20	20^{b}(4.53)	9.64^{b}	6-11	60^{c}(7.77)	20^{a}(4.53)	22.44^{bc}(4.46)	N	107.70^{b}
Leaf extract	10	10^{c}(3.11)	7.42^{c}	6-9	88^{d}(9.42)	2^{c}(1.46)	14.94^{cd}(3.61)	N	200.06^{c}
Seed extract	10	70^{a}(8.37)	10.58^{a}	9-12	22^{a}(4.64)	8^{bc}(2.38)	100.00^{a}(10.00)	#	-
Seed extract	5	26^{b}(4.95)	10.50^{a}	9-12	60^{c}(7.79)	14^{ab}(3.77)	16.38^{c}(4.16)	N	93.26^{b}
Seed extract	2.5	14^{bc}(3.82)	6.82^{c}	6-0	80^{d}(8.99)	6^{c}(2.18)	7.22^{cd}(2.16)	N	186.19^{c}
Control		6^{c}(2.39)	6.76^{c}	6-8	94^{d}(9.74)	0^{c}(1.00)	5.00^{d}(1.47)	N	192.94^{c}
CD(0.05)		(1.51)	(0.70)		(1.01)		(2.63)		25.73

Figures in parenthesis are transformed values
N - Normal
#surviving adults did not mate
Means followed by the same superscript do not differ significantly

Saradamma (1989), who also found a significant reduction in the fecundity of *D. cingulatus* treated with extracts of dried *T. neriifolia* leaves.

Although the juvenomimetic activity of the extracts does not cause immediate kill of the target organisms, there is a considerable potential for reducing the pest population through such treatments, after a few generations. Obviously, *T. neriifolia* leaves and seeds are promising sources of juvenoids, which can be profitably exploited in plant protection. Overall, 40% leaf and 10% seed extracts emerged as the best treatments. Since juvenomimetic effects take longer time to manifest, these treatments, however, may not prove effective in the short run; yet, they form perfect components of an integrated pest management strategy.

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