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EVALUATUION OF BOTANICALS AGAINST CAPSULE BORER, *HELICOVERPA ARMIGERA* HUB. IN FCV TOBACCO

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Tobacco is one of the important commercial crops cultivated in Southern light soils of Andhra Pradesh under rainfed conditions. *Helicoverpa armigera* Hub. causes damage to green leaf of tobacco and also seed capsules late in the season, thus causing heavy loss to seed crop. It is reported that *H. armigera* damaged 26.62 % plants in FCV Tobacco in SLS region (Anon., 2002).

In view of the stringent regulations enforced on pesticide residues on tobacco leaf, there is an imperative need to explore botanicals in pest management. Hence, the present study is taken up to evaluate some plant extracts against *H. armigera*. Fresh leaf samples (100 g each) of 34 selected plant species were collected and allowed to dry under shade for 12 h. Dried leaf samples were cut into small pieces and extracted in a soxhlet apparatus using acetone as the solvent. The process was continued for 12 h and the solvent was separated by vacuum evaporator. Each crude extract was applied topically on the thoracic region of 3rd instar caterpillars of *H. armigera* @ 1, 2, 3, 5 and 10 µl/larvae using a micro pipette. There were two replications with 8 caterpillars each. The caterpillars were allowed to feed on fresh tobacco leaf. The experiment was conducted under laboratory conditions at 27±1°C during 2004-05. Mortality of caterpillar was recorded at 24h interval for three days. Earlier, the caterpillars were reared in the laboratory on cut tobacco leaf.

Field evaluation of promising crude plant extracts were conducted at 1, 2, 3, 5 and 10% spray during 2005-06 when the tobacco crop reached the capsule filling stage. Detergent (1%) was added to the crude extract during the preparation of spray solution using a sprayer. There were 36 plants in each treatment, planted at a spacing of 65 x 65 cm. The number of seed capsules damaged in each treatment was recorded. The results were subjected to analysis of variance.

Control of *H. armigera* by crude plant extracts

Mortality of *H. armigera* caused by different doses (5 and 10 µl/larvae) of crude acetone plant extract at 24, 48 and 72 h after treatment is given in Table 1. All the treatments differed significantly in causing mortality of the larvae. No larval mortality was observed when the extract was used at 1, 2 and 3 µl concentration even after of 72 h in all the treatments, except with *Acasia sefeda*, *Vinca rosea* var. *alba*, *Anona reticulate* (leaf). In general, the larval mortality increased with the increase in the dose of the extract and duration. The extracts of *A. reticulata* (seed), *Lantana camera* and a *Cuscuda* sp. had no effect on the larvae even after 72 h at all the doses and hence were not shown in Table 1. The mortality after 24 h at 10 µl dose was lowest (25%) in *Leucas* sp., *Adiantum* sp., *V. rosea* var. *ruby* and *Dendrobium* sp. No mortality of the larvae was recorded with ten other plant extracts at 5 µl dose. The highest mortality (75%) of larvae was recorded in the extracts of *Piper* sp., *Nishinda* sp. and *A. safeda* followed by *Calotropis procera, A. reticulata* (leaf), *Terminalia arjun and Juniperus* sp. Further, the mortality increased with the prolongation of exposure time (48 h) indicating delayed action of some extracts.

After 72 h of the treatment, highest mortality (90%) of larvae was recorded at 10 µl concentration with the extracts of *C. procera* and *D. aphyllum* followed by *Cleodendron unfortunatum, Adiantum* sp. *Nishinda* sp. *Cyda cordifolia, V. rosea* var. *alba, T. arjun.* Lowest mortality of larvae (25%) was recorded when they were treated with the extracts

of *Datura stramonium*, *Calamus* sp. and *Dendrobium* sp. Results showed that the crude acetone extracts of *C. procera*, *D. aphyllum*, *C.unfortunatum, Adiantum* sp. *Nishinda* sp. *C.cordifolia, V. rosea* var. *alba and T. arjun* might contain some compounds with insecticidal property that caused mortality of larvae of *H. armigera.*

Many plant species contain potent molecules which cause mortality of various insects (Koul, 2003). Some of them may work as anti-feedents or inhibitors of physiological processes or growth retardants etc. The methanol extract of *Cleome viscose* seeds totally deterred the egg laying in *S. litura* (Anon., 2004). Castor leaves treated with 2% extract (dimethyl sulfoxide) of *Calotropis* sp.

Table 1: Effect of plant extracts on larval mortality of *H. armigera*

Name of the plant	Larval mortality (%)					
	24 h		48 h		72 h	
	5 µl	10 µl	5 µl	10 µl	5 µl	10 µl
Leucas sp.	00 (00.0)	25 (29.9)	00 (00.0)	45 (42.1)	00 (00.0)	70 (57.1)
Metastomata malbathricum	00 (00.0)	30 (33.2)	00 (00.0)	30 (33.2)	00 (00.0)	30 (33.2)
Cleodendron unfortunatum	15 (22.5)	45 (42.1)	15 (22.5)	50 (44.9)	15 (22.5)	75 (60.1)
Nictanthus sp.	00 (00.0)	00 (00.0)	00 (00.0)	00 (00.0)	00 (00.0)	45 (42.1)
Piper sp.	35 (36.2)	75 (60.1)	40 (39.2)	70 (57.1)	40 (39.2)	70 (57.1)
Myconia sp.	00 (00.0)	30 (33.2)	00 (00.0)	45 (42.1)	00 (00.0)	50 (44.9)
Adiantum sp.	00 (00.0)	25 (29.9)	00 (00.0)	45 (42.1)	00 (00.0)	75 (60.1)
Thivita nerifolia	20 (26.6)	45 (42.1)	20 (26.6)	70 (57.1)	25 (29.9)	70 (57.1)
Adhatoda vasica	00 (00.0)	30 (33.2)	00 (00.0)	30 (33.2)	00 (00.0)	45 (42.1)
Nishinda sp.	30 (33.2)	75 (60.1)	30 (33.2)	75 (60.1)	30 (33.2)	75 (60.1)
Cyda cordifolia	10 (18.4)	45 (42.1)	10 (18.4)	75 (60.1)	10 (18.4)	75 (60.1)
Acasia safeda	30 (33.2)	70 (57.1)	35 (36.2)	70 (57.1)	35 (36.2)	70 (57.1)
Calotropis procera	15 (22.5)	50 (44.9)	15 (22.5)	90 (76.7)	15 (22.5)	90 (76.7)
Oxalis sp.	00 (00.0)	30 (33.2)	00 (00.0)	45 (42.1)	00 (00.0)	45 (42.1)
Datura stramonium	00 (00.0)	00 (00.0)	00 (00.0)	00 (00.0)	00 (00.0)	25 (29.9)
Calamus sp.	00 (00.0)	00 (00.0)	00 (00.0)	25 (29.9)	00 (00.0)	25 (29.9)
Vinca Rosea var. *alba*	30 (33.2)	50 (44.9)	30 (33.2)	50 (44.9)	35 (36.2)	75 (60.1)
Vinca Rosea var. *ruby*	05 (09.2)	25 (29.9)	05 (09.2)	70 (57.1)	05 (09.2)	70 (57.1)
Anona reticulata –leaf	20 (26.6)	45 (42.1)	20 (26.6)	45 (42.1)	20 (26.6)	45 (42.1)
Tagitus erecta var. *African*	15 (22.5)	45 (42.1)	15 (22.5)	45 (42.1)	15 (22.5)	50 (44.9)
Terminalia arjun	00 (00.0)	50 (44.9)	20 (26.6)	75 (60.1)	20 (26.6)	75 (60.1)
Ocimum sp.	00 (00.0)	00 (00.0)	00 (00.0)	30 (33.2)	00 (00.0)	45 (42.1)
Acacia auriculiformis	00 (00.0)	00 (00.0)	00 (00.0)	25 (29.9)	00 (00.0)	50 (44.9)
Juniperus sp.	15 (22.5)	45 (42.1)	15 (22.5)	45 (42.1)	20 (26.6)	45 (42.1)
Juniperus sp. –thorny	20 (22.6)	40 (39.1)	20 (26.6)	40 (39.1)	20 (26.6)	45 (42.1)
Dendrobium sp.	00 (00.0)	25 (29.9)	10 (18.4)	25 (29.9)	00 (00.0)	25 (29.9)
Aegle marmelos	00 (00.0)	00 (00.0)	00 (00.0)	00 (00.0)	00 (00.0)	70 (57.1)
Dendrobium aphyllum	00 (00.0)	30 (33.2)	10 (18.4)	45 (42.1)	10 (18.3)	90 (76.7)
Alstonia scholaris	00 (00.0)	25 (29.9)	10 (18.4)	30 (33.2)	10 (18.3)	70 (57.1)
Cestrum nocturnum	00 (00.0)	30 (33.2)	00 (00.0)	30 (33.2)	00 (00.0)	45 (42.1)
Cajanus cajan	00 (00.0)	30 (33.2)	00 (00.0)	30 (33.2)	00 (00.0)	50 (44.9)
SEm±	**3.6**	**1.6**	**4.6**	**4.04**	**4.8**	**3.2**
CD (P=0.05)	**11.2**	**4.7**	**13.6**	**11.2**	**14.3**	**9.3**
CV (%)	**20.1**	**5.6**	**26.3**	**12.8**	**26.4**	**9.1**

Table 2: Effect of plant extracts on seed capsule damage by *H. armigera*.

Plant extract	Concentration (%)					
	1	2	3	5	10	Mean
Vinca rosea var. *alba*	18.47 (4.26)	12.49 (3.49)	8.18 (2.83)	6.25 (2.50)	5.37 (2.20)	10.15 (3.06)
Terminalia arjun	23.33 (4.81)	22.11 (4.68)	14.21 (3.76)	13.61 (3.68)	15.62 (3.89)	17.78 (4.16)
Calotropis procers	26.42 (5.14)	22.54 (4.74)	18.55 (4.30)	13.47 (3.66)	10.55 (3.22)	18.31 (4.21)
Mean	18.02 (4.04)	15.25 (3.71)	11.20 (3.21)	9.3 (2.95)	8.8 (2.82)	12.51(3.35)
Chlorpyriphos (control) 0.05%	3.87 (1.95)	3.87 (1.95)	3.87 (1.95)	3.87 (1.95)	3.87 (1.95)	3.87 (1.95)
	SEm±	CD (P=0.05)	CV (%)			
Treatments	0.08	0.28	0.41			
Concentrations	0.08	0.21	0.28			
Interaction	0.15	0.50	0.76			

caused 90% mortality of *S. litura* larvae (Anon., 2007). Formulations based on crude extracts of *Eucalyptus* and neem formulations were significantly effective in reducing the larval populations of *H. armigera* and conversely increased the yield of chickpea (Raghuraman *et al.*, 2008). Similarly, spray of 10% crude extract of *Leucas* leaf was on par with chlorpyriphos spray (0.05%) in controlling the larval damage to plants by *S. litura* (Anon., 2007).

Field evaluation of promising crude plant extracts in controlling *H. armigera*

Based on above results, three plant species (*Calotropis* sp. *V. rosea* var. *Alba* and *T. arjun*) were selected for field evaluation. The results indicated that all the treatments differed significantly in controlling the insect attack on plants (Table 2). Capsules damaged by the larvae were the lowest (3.87%) in chlorpyriphos spray (0.05%), followed by the spray of 10% crude plant extract of *V. rosea* var. *Alba* (10.15%). No significant differences were found among these two treatments. Damage to capsules decreased with the increase in the concentration of crude extract. The damage caused by larvae treated with extracts of *V. rosea* var. *Alba* differed significantly with other plant extracts.

It is inferred that *V. rosea* var. *Alba* contains some compounds, which can control *H. armigera* and hence it can find a place in the IPM programme of *H. armigera*. Further purification/ refinement of plant extract (*V. rosea* var. *Alba*) and mixing of crude extracts of two or three plant species is required to study their potential.

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