Antifeedant activity of selected medicinal plants on *Earias vittella*

R. Praveena,[1]* G. Devanand Venkatasubbu[2] and M. Jegadeesan[1]

ABSTRACT

The present investigation was carried out to screen various extracts of *Clausena dentata* and *Dodonea viscosa* and cultivated plants like *Anacardium occidentale* and *Nicotiana tobacum*. Among the various extracts tested, 5% concentration of extract gave 100% of FDI (Feeding Deterrence Index). Comparing the antifeedent activity of the plants mentioned above, pet ether extracts have *D. viscosa* (83.4%) and seed oil of *A. occidentale* (87.4%) showed greater antifeedent activity at 3% concentration.

Key words: Anti-feedent activity, *Anacardium occidentale, Dodonea viscosa, Nicotiana tabaum,* petroleum ether, water extract

INTRODUCTION

Higher plants are considered as the reservoir of effective drugs that can provide valuable sources of useful bio-pesticides. They are largely non-phototoxic, which means they will not harm plants, systemic and biodegradable. Extracts of onion, garlic, eucalyptus and tobacco are reported to control many plant pathogenic fungi and insects. The neem biopesticides is usually used for all biological materials and organisms, which can be formulated for use as pesticides for the control of pests. This includes microorganisms such as bacteria, fungi and viruses. An important advantage of botanical pesticides is that they are cheap and affordable for small-scale farmers. Compared to synthetic pesticides, botanical products are generally safer to use, but care should be taken as some plants contain very toxic substances. Farmers in their traditional wisdom have identified and used a variety of plant products and extracts for pest control. As many as 2121 plant species are reported to possess pest management properties, 1005 species of plants exhibiting insecticidal properties, 384 with antifeedent properties, 297 with repellent properties, 27 with attractant properties and 31 with growth inhibiting property have been identified (Prajapati *et al*., 1982).

Cotton spotted boll worm (SBW), *Earias vittella* C. Felder. is a major pest attacking cotton, bhindi and brinjal. It has pale white upper wings with greenish band in the middle. The larva of cotton spotted bollworm moth, known as cotton spotted bollworm, is a serious pest of cotton and lady's finger. It is also known as okra shoot and fruit borer (Wajid and Ansari, 2011). *Clausena dentata* (WIIA) ROEM.SYN., *Dodonaea viscosa* (Linn.) and *Anacardium occidentalae* (Linn.) are common plants available in this geographical area. *Nicotiana tobacum* (Linn.) has been used traditionally as bio-pesticide against many crop pests (Duke, 1985). The objective of the present work is to prepare different extracts of medicinal plants and to screen the plant extracts against *Earias vittella* for antifeedent activity. The aim of this work is to provide farmers with a new biological pesticide which will be a substitute for chemical pesticides.

MATERIALS AND METHODS

Plants to be screened for pesticidal activities were collected from wild at Tamil University Campus, Thanjavur. Leaves of *Nicotiana tobacum* and *Clausena dentata*, seeds of *Dodonea viscosa* and *Anacardium occidentale* were collected. The plants were identified using floras (Matthew, 1983; Gamble, 1957; Nair and Henry, 1983; Anonymous, 1976) and the Tamil University Herbarium. Identity of plants was authenticated by Dr. M. Jegadeesan, Head of the Department, Department of Environmental and Herbal Science, Tamil University, Thanjavur.

Table 1. Antifeedent activity of water & alcohol extracts of *N. tabacum* against *E.vittella.* The initial weight of the food is 10g

Concentration of extract (%)	Consumption of food by pest (g)								FDI (%)	
	Weight of food after 1 day				Food consumption					
	T		C		T		C		W	A
	W	A	W	A	W	A	W	A		
1	9.4	9.9	8.6	8.6	0.7±1.4**	0.4±1.6**	1.3±0.8	1.3±0.8	39.4	55.1
3	9.8	9.8	8.6	8.6	0.1±0.4**	0.1±1.0**	1.3±0.8	1.3±0.8	82.5	80.4
5	10.0	10.0	8.6	8.6	0	0	1.3±0.8	1.3±0.8	100	100

T- Treated, C- Control, W- Water extract, A- Alcohol extract, FDI- Feed Deterrence Index; Values are expressed as mean ± SD, n = 3 Compared to control; * *P d" 0.01

Processing of Plant materials

The leaves collected were air dried in shade for a week. The dried leaves were then powdered. The powdered plant materials were weighed and 50 g of plant material was taken in a glass beaker. To this plant material the appropriate solvent (ethanol or water) was added and kept for 48 hrs with frequent shaking. The plant extract was known as cold extraction method. The extract obtained was kept in a water bath for evaporation of the solvent and then in hot oven to obtain the extract. The extract obtained was weighed and the percentage of extract tabulated.

Collection and Rearing of Pest

The pest *Earias vittella* (larvae stage) was collected from bhendi field around Thanjavur. Pest was kept in a sterilized container with free airflow. The pests were grouped according to their stage of development. The pest was provided with feed regularly. They were maintained at room temperature (22±2^{o}C).

Antifeedent activity

Feeding deterrence index (FDI) for each concentration was calculated after 24 hrs using the formula of Isman *et al*. (1990). Antifeedent activity was calculated by taking 10g of feed and it was soaked in the plant extract at different concentrations and then dried to evaporate (24 hrs) the solvent. This was placed in a beaker (250 mL). Same amount of feed was soaked in solvent and dried and was used as control. Equal number of pests (No. 3) was placed in both the beakers and left undisturbed for 24 hrs. After 24 hrs the weight of feed consumed by pest in both control and treated beakers was found and then feeding deterrence index was calculated as above.

RESULT

The medicinal plants *N. tabacum, C. dentata* and *D. viscosa* were extracted. Leaves of *N. tabacum* had extractive values of 12.88% and 16.46% in alcohol and water respectively. Leaves of *C. dentata* yielded 16.92% and 12.5% in alcohol and water respectively. Seeds of *D. viscosa* had extractive values of 10.24%, 9.06% and 12.5 % in petroleum ether, alcohol and water respectively.

Table 2. Antifeedent activity of water and alcohol extracts of *C. dentata* against *E. vittella.* The initial weight of the food is 10g

Concentration of extract (%)	Consumption of food by pest (g)								FDI (%)	
	Weight of food after 1 day				Food consumption					
	T		C		T		C		W	A
	W	A	W	A	W	A	W	A		
1	9.4	9.6	8.6	8.6	0.6±1.5**	0.3±1.4**	1.3±0.8	1.3±0.8	42.6	58.3
3	9.8	9.8	8.6	8.6	0.1±0.4**	0.1±0.4**	1.3±0.8	1.3±0.8	81.8	77.2
5	0	0	8.6	8.6	0	0	1.3±0.8	1.3±0.8	100	100

T- Treated C- Control W- Water extract A- Alcohol extract FDI- Feed Deterrence Index; Values are expressed as mean ± SD, n = 3 Compared to control; ** P $\leq$ 0.01

Table 3. Antifeedent activity of petroleum ether, alcohol and water extracts of *D. viscosa* against *E. vittella.* The initial weight of the food is 10g

Conc (%)	Consumption of food by pest (g)												FDI (%)		
	Weight of food after 1 day						Food consumption								
	T			C			T			C			PE	A	W
	PE	A	W	PE	A	W	PE	A	W	PE	A	W			
1	9.7	9.6	9.7	8.6	8.6	8.6	0.2±1.5*	0.3±1.4*	0.3±1.8*	1.3±0.8	1.3±0.8	1.3±0.8	67.0	59.4	64.3
3	9.8	9.8	9.8	8.6	8.6	8.6	0.1±0.2*	0.1±1.3*	0.1±1.9*	1.3±0.8	1.3±0.8	1.3±0.8	83.4	83.5	81.6
5	10	10	10	8.6	8.6	8.6	0	0	0	1.3±0.8	1.3±0.8	1.3±0.8	100	100	100

T- Treated C- Control W- Water extract A- Alcohol extract PE- Petroleum ether FDI- Feed Deterrence Index
Values are expressed as mean ± SD, n = 3 Compared to control; * P $\leq$ 0.01

The Feeding Deterrence Index (FDI) of alcoholic extract of *N. tabacum* was 55.1%, 80.4% and 100% at 1% and 5% concentrations respectively. The FDI of water extract of *N. tabacum;* alcoholic and water extract of *C. dentata* and petroleum ether and water extract of *D. viscosa* were increased with increase of concentrations (Table 1-3). The FDI of seed oil of *A. occidentalae* was dose dependent one (Table 4).

DISCUSSION

Nicotiana tabacum is traditionally used as pesticides. It is well known for it's pesticidal activities. The presence of nicotine, nor-nicotine and other alkaloids is the main reason for its activity. Among the plant extracts *A. occidentalae* seed oil has the maximum FDI index followed by *D. viscosa* petroleum ether extract. The seed oil of *A. occidentalae* has anacardic acid which is the cause of its antifeedent property. *D. viscosa* follows *A. occidentalae* in antifeedent property. *D. viscosa* belonging to Sapindaceae family has diterpane acid which may be mainly responsible for its activity.

This work has proved the presence of pesticidal properties of the selected medicinal plants. In this work the antifeedent property of the medicinal plants has been proved. Further field study should be carried out to find out the efficiency of the plant material in field.

REFERENCES

Prajapti, Purohit, Sharma and Kumar, 1982. A Handbook of Medicinal Plants a Complete Source Book, 43, 120, 362.

Mathew, K.W. 1983. The Flora of Tamilnadu, *The Rapinat Herbarium*, St. Joseph College, Trichy.

Gamble, J.S. 1957. Flora of Presidency of Madras, Botanical Survey of India, Calcutta, **2** : 816 **P**.

Nair, N. C. and Henry, A. N. 1983. Flora of Tamil Nadu, Botanical Survey of India, **2**: 192 **P**.

Table 4. Antifeedent activity of seed oil of *A. occidentalae* against *E. vittella*. The initial weight of the food is 10g

Concentration of Extract (%)	Consumption of food by pest (g)				FDI (%)
	Weight of food after 1 day		Food consumption		
	T	C	T	C	
1	9.732	8.62	0.27 ± 1.655**	1.38 ± 0.85	67.5
3	9.887	8.62	0.11 ± 0.532**	1.38 ± 0. 85	84.4
5	10.0	8.62	0.0	1.38 ± 0.84	100

T- Treated C- Control W- Water extract A- Alcohol extract FDI- Feed Deterrence Index; Values are expressed as mean ± SD, n = 3 Compared to control; **P $\leq$ 0.01

Anonymous, 1976. Medicinal Plants of India, ICMR, New Delhi, **1:** 64-65.

Isman, M.B., Koul, O., Luczynski, A. and Kaminski, J. 1990. Insecticidal and antifeedant bioactivities of neem oils and their relationship to azadirachtin content. *Journal of Agricultural and Food Chemistry*, **38**: 1406-1411.

Duke, S. O. 1988. Glyphosate. In P. C. Kearney & D. D. Kaufman (Eds.), *Herbicides - Chemistry, Degradation and Mode of Action,* New York: Marcel Dekker, **3**: 1-70 **PP**.

Wajid, H. and Ansari, M.S. 2011. Evaluation of some insecticides against spotted bollworm, *Earias vittella* (Fab.) on different okra cultivars. **In**: *Proceedings of National Conference on 3rd Congress on Insect Science*, Punjab Agricultural University, Ludhiana, 178-178 **PP**.

R. Praveena[1]*, G. Devanand Venkatasubbu[2], and M. Jegadeesan[1]

*[1]Deptartment of Environmental and Herbal Science, Tamil University, Thanjavur– 613005, Tamil Nadu, India.

[2]Deptartment of Botany, Srimad Andavan Arts and Science College, Thiruvanikoil, Tiruchirappalli- 620 005, Tamil Nadu, India.

*E-mail: rpraveenaa@gmail.com.

Manuscript history

Received : 17.01.2012

Revised : 18.06.2012

Accepted : 20.04.2012