



BIOEFFICACY OF ETHANOL AND WATER EXTRACTS OF PLANT MATERIAL AGAINST GRAM POD BORER, *HELI COVERPA ARMIGERA* (HÜBNER)

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ABSTRACT

Bioefficacy of water and ethanol extracts of Margosa seed, Margosa leaf, Night jasmine, Forest jasmine and Datura at higher and lower concentration were tested against 3rd instars of *H. armigera*. The plant materials at higher concentration and ethanol extracts at lower concentration reduced the consumption of food by the larvae and their body weight significantly in comparison to control. Larval pupal deformities among different extracts ranged from 5.0 to 40 per cent as against 5 percent in control. It was also significantly higher in higher concentration of margosa seed (2000 ppm) followed by margosa leaf. The experiment clearly indicates that ethanol extract of seed at higher concentration was more effective causing higher antifeedant activity, reduced larval-pupal weight and deformities which ultimately led to reduction in adult emergence.

Key words: Antifeedant activity, Bioefficacy, Deformity, Pest, Plant extracts

INTRODUCTION

Madhya Pradesh is the leading state in production of pulses (Gram, Pigeon pea, Urd and Moong). It is grown in 3513 hectares in the state with the production of 2933 thousand tones. Of which area and production of gram was 2746 hectares and 2549 thousand tones, respectively with the productivity of only 929kg/hectare. *Helicoverpa armigera* (Hübner) (*Lepidoptera: Noctuidae*) is one of the most serious insect pests in Asia. It has a wide range, covering more than 180 plant species, belonging to 45 families in India, including major crops such as cotton, pigeon pea, tomato and chickpea. Gram pod borer, *H. armigera* causes heavy loss every year in chickpea. Neem products are not only economical but also ecologically safe and have been found effective against this pest. The effectiveness of extracted material of different plants varied in effectiveness.

MATERIALS AND METHODS

The experiment was conducted under laboratory condition, in the Department of Entomology, College of agriculture, Gwalior (M.P.) in 2006-07. The five plant materials viz., seed and leaves of margosa (*Azadirachta indica*), Night jasmine (*Nyctanthus arbortristis*), Forest jasmine (*Chlorodendron enermi*) and Datura (*Datura fastuosa*) were collected locally and dried at room

temperature. The dried plant material were ground to make their powder. Ten gram dried powder of each plant material was kept in 100ml. of respective solvent for 7 days and filtered with the help of filter paper and then the filtrates were dried. From dried extracts 10% stock solution in ethanol and water were prepared. One and two thousand ppm concentrations of each extract of ethanol and water were used for the soaking of chickpea seeds and seeds were kept for 24 hrs in different extracts. Treated seeds were used as diet for the caterpillars. Five larvae of third instar were released on the seeds kept in Petri dishes. Fresh treated seeds in different extracts were provided in each Petri dish at 2 days interval starting from their release. At the time of changing of seeds observations were recorded on weight of food consumed by the larvae as well as weight of larvae. Observation on larval-pupal deformities and weight of pupae were also recorded. The data were subjected to angular or arc sign transformations for statistical analysis.

RESULTS AND DISCUSSION

Effect of plant extracts food consumed by larvae

All the plant extracts except lower concentration (1000ppm) of water extracts and higher concentration (2000ppm) of ethanol extract of of all plant materials reduced the consumption of food by larvae (Table 1). Babu (2006) reported neem seed and neem leaf extract as an

antifeedant and growth inhibitor against larvae of *H. armigera*. Among the plant extracts, 2000ppm concentration of ethanol extract of margosa seed was significantly effective. Dubey *et al.* (1991) compared nine plant extracts with 2 chemical insecticides as sprays against the noctuid, *H. armigera* on chickpea. Among the plant extracts neem seed kernel extract and neem rind extract, due to their antifeedant action, provided maximum protection giving higher yields. Hussein (1999) reported strong antifeedant activity of neem for the control of *H. armigera* (Hübner).

Effect of plant extracts on weight gained by larvae

Plant extracts influenced the feeding which finally resulted in reduction of larval weight. All the plant extracts reduced the weight gained by the larvae significantly. The

minimum larval weight was recorded in higher concentration of ethanol extract of margosa seed followed by margosa leaf (Table 1). Bhagat (2001) reported thuja, bergera, neem and datura leaf extracts to be effective against *H. armigera*. Babu *et al.* (1996) reported that *Azadirachtin* significantly inhibited feeding, food consumption and larval growth being concentration dependent. The larval weight in higher concentration in ethanol extract was significantly less than their lower concentration as well as over plant materials with water extract. This indicates that ethanol is better solvent than water for preparation of the extracts of plant material. The reduction in larval weight due to these plant extracts indicates their growth inhibiting effects against *H. armigera*. Singh *et al.* (2005) reported water and ethanol

Table 1. Bioefficacy of Ethanol and Water Extracts of Plant Material against Gram Pod Borer, *Helicoverpa armigera* (Hübner)

S.No.	Treatment	Dose (ppm)	Food consumption by larvae	Weight gained by larvae (g)	Weight of excreta (g)	Larval-pupal deformities (%)	Weight of Pupae (Mean) (g)
WATER							
1.	MARGOSA SEED	1000	1.022	0.139	0.418	30.0 (35.01)*	0.206
2.	MARGOSA LEAF	1000	1.026	0.141	0.546	25.0 (29.73)	0.207
3.	NIGHT JASMINE	1000	1.059	0.146	0.563	5.0 (6.64)	0.209
4.	FOREST JASMINE	1000	1.108	0.150	0.580	5.0 (6.64)	0.210
5.	DATURA	1000	1.116	0.151	0.584	10 (13.28)	0.212
6.	MARGOSA SEED	2000	0.822	0.111	0.224	35.0 (36.06)	0.186
7.	MARGOSA LEAF	2000	0.852	0.123	0.265	40.0 (32.90)	0.189
8.	NIGHT JASMINE	2000	0.860	0.126	0.277	10.0 (13.28)	0.191
9.	FOREST JASMINE	2000	0.901	0.125	0.299	10.0 (13.28)	0.192
10.	DATURA	2000	0.909	0.127	0.305	15.0 (19.92)	0.194
ETHANOL							
11.	MARGOSA SEED	1000	0.922	0.130	0.327	35.0 (36.06)	0.196
12.	MARGOSA LEAF	1000	0.928	0.131	0.339	30.0 (32.90)	0.197
13.	NIGHT JASMINE	1000	0.967	0.134	0.347	10.0 (13.28)	0.199
14.	FOREST JASMINE	1000	0.976	0.136	0.376	5.0 (6.64)	0.201
15.	DATURA	1000	1.019	0.137	0.393	10.0 (13.28)	0.204
16.	MARGOSA SEED	2000	0.576	0.105	0.097	40.0 (39.23)	0.175
17.	MARGOSA LEAF	2000	0.622	0.106	0.160	35.0 (36.06)	0.178
18.	NIGHT JASMINE	2000	0.714	0.108	0.181	10.0 (13.28)	0.178
19.	FOREST JASMINE	2000	0.752	0.115	0.182	10.0 (13.28)	0.180
20.	DATURA	2000	0.782	0.112	0.205	15.0 (19.92)	0.185
21.	MONOCROTOPHOS	?	0.081	0.000	0.000	0.0 (0.00)	–
22.	UNTREATED (CONTROL)	–	1.187	0.171	0.647	5.0 (6.64)	0.242
S.E. (m) ±		0.070	0.0007	0.048	(4.32)	0.0004	
C.D. (at 5%)		0.197	0.002	0.136	(12.22)	0.0013	

extracts of Night jasmine, Forest jasmine, Spurge, Biskhakra, Chinese orboritae, Datura and Neem seed to be most effective with regard to larval mortality and reduction in weight of larvae of *H. armigera*.

Effect of plant extracts on weight of excreta

All the plant extracts resulted in significantly weight less of excreta except at 1000ppm concentration of water extract of margosa leaf, night jasmine, forest jasmine and datura. Among the plant extracts higher concentration of ethanol extracts of all the plant material and higher concentration of water extracts of margosa seed proved equally effective Babu (2006) also reported less weight of excreta in water and ethanol extract of margosa seed and margosa leaf treatments.

Effect of plant extracts on larval pupal deformities

The larval pupal deformities were significantly minimum and equal (5%) to the control of lower concentration of night jasmine, forest jasmine and ethanol extract of forest jasmine. It was followed by water extracts of lower concentration of datura and higher concentration of night jasmine, forest jasmine, and ethanol extracts of lower concentration of night jasmine, datura and higher concentrations of night jasmine and forest jasmine. Observed that Cheema *et al.* (2009) NSKE (5%) was effective and statistically at par with endosulphan in reducing larval population and pod damage. Maximum larval pupal deformities (40%) were recorded in higher concentration of ethanol extract of margosa seed and water extract of margosa leaf respectively.

Lower concentration of water extract of night jasmine and forest jasmine was not effective with regards to larval pupal deformities. Joglan *et al.* (1997) evaluated chloroform: methanol (9:1) extracts of neem seeds and green leaves against *H. armigera*. Various concentrations of methanol extract of neem was used to treat leaves and pods/balls of chickpea, pigeonpea and cotton. However, neem seed extract in chloroform: methanol (9:1) was the most promising in causing adverse morphogenic effects on various biological parameters of *H. armigera*. Early stage larvae were more sensitive to the exposure of neem extracts than advanced stage larvae. Dhingra *et al.* (2002) and Rathore (2003) found neem oil micro emulsion to be more bioactive than its macro emulsion against *H. armigera*. It reduced the larval and pupal weight gain, pupal development and adult emergence, and increased the larval mortality, larval-pupal intermediates and the pupal deformity in the 3rd instar treated-larvae of the insect.

Effect of plant extracts on weight of pupae

Data recorded on the weight of pupae showed significant influence of plant extracts on reduction of pupal weight over control. Minimum and significantly less pupal

weight were recorded on the seeds treated with higher concentration of ethanol extracts of margosa seed than rest of the treatments (Table 1). Whereas maximum and significantly higher pupal weight was recorded in lower concentrations of water extracts of datura which found significantly than rest of the extracts except lower concentration of water extract of forest jasmine. Kapadia and Butani (2005) reported neem, bitter gourd, lantana, custard apple, garlic bulb, kadvi mehndi, karanj, mamejava, jatropa extracts and 0.1% cartaphydrochloride very effective against *H. armigera*. Kulat *et al.* (1999) studied the control of pod borer (*H. armigera*) in chick pea with biopesticide and neem seed extract along with insecticide and revealed that Endosulfan 0.07 per cent exhibited minimum larval population with significant higher yield. Gujar (1997) investigated *Azadirachtin* a complex for tetranthinterpenoid from the neem tree, *Azadirachta indica* and *Plumbagin*, 2-methyl 5 hydroxyl, 1,4-naphthoquinone forms the medicinal plant. *Plumbago* spp. For their biological effects on the American bollworm. *H. armigera*. *Azadirachtin* sample SPIC SSF 22 was effective against the second instar larvae.

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