

## Antifeedant activity of different *Polygonum* species against *Helicoverpa armigera* (Hub.)

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(Received: April 19, 2007; Accepted: May 23, 2007)

### ABSTRACT

Laboratory studies were carried out to evaluate the antifeedant activity of different species of *Polygonum* i.e. *P. barbatum* (stem), *P. limbatum* (leaves & stem) *P. plebejum* (whole plant) against third instar larvae of *H. armigera*. The methanolic extracts of *P. barbatum* (stem) showed extremely significant antifeedant activity having C- value of 0.0266, 0.044 and 0.05 at 10,000, 7,000 & 5,000 ppm concentration respectively. At highest concentration the extract of *P. limbatum* (leaves) showed the significant antifeedant activity with C-values 0.434. Extremely antifeedant activity in *P. limbatum* (stem) and *P. plebejum* (whole plant) was observed at 10,000 ppm with C-values 0.192 & 0.297 respectively. Since the stem extract of *P. barbatum* showed significant antifeedant activity at lower concentration, thus, it can be used as better alternative to synthetic pesticides.

**Key words:** *Polygonum* species, *Helicoverpa armigera*, Antifeedant

### INTRODUCTION

*Helicoverpa armigera* has assumed the status of national pest because it is a voracious feeder, causes server damages to variety of crops including pigeon pea, chickpea, oil seeds and cotton etc. The estimated loses due to this pest alone to agricultural crops in India is nearly two thousand crore (Pawar, 1998). The indiscriminate, extensive and injudicious use of pesticide has resulted in the development of resistance in *H. armigera* population to various insecticide in India (Armes, 1996). This has attracted the attention of the researcher due to growing awareness of environmental hazards from synthetic pesticides. In recent years attention is being diverted towards use of botanicals as key component of Integrated Pest Management (IPM) as alternatives to synthetic pesticides (Rembold, 1988) because they are biodegradable and having low mammalian toxicity. Plant species are rich source of plant secondary

metabolites viz, alkaloids, flavonoids, anthraquinones, phenolics etc. some of them have shown diverse biological effects on insect pest. *Polygonum* species belonging to family Polygonaceae is a store house of diverse and structurally complex bioactive molecules, Different species have been evaluated for various biological activities however, they have not been explored for antifeedant activity. Taking the above fact in consideration the present study on antifeedant activity of methanolic extracts of different parts of *Polygonum* species against *H. armigera* was under taken.

### MATERIALS AND METHODS

Larvae of *H. armigera* were collected from crop research center (CRC), G.B. Pant University of Ag. and Tech. Pantnagar to maintain fresh laboratory culture. The 3<sup>rd</sup> instar larvae from laboratory culture were used for conducting experiment. Different species of *Polygonum* i.e.

*P. barbatum* (stem), *P. limbatum* (leaves & stem) and *P. plebejum* (whole plant) were collected from Agra and Dehradun. They were dried under shade and pulverized. The powdered material was subjected to hot percolation in Soxhlet apparatus using methanol as solvent. The methanolic extracts were concentrated under reduced pressure. The stock solution of 10,000 ppm has been prepared for each plant extract and they were further diluted as per requirement. To test the antifeedant activity, fresh undamaged disc of cabbage leaves (3cm<sup>2</sup> area) were treated with different concentration of the plant extract. The treated leaves were dried and placed in individual petridishes. A single 3<sup>rd</sup> instar larva was placed in each disc and allowed to feed for 24 hrs. All the treatments were replicated three

times along with methanol only. The observations were recorded for leaf area consumed by larvae. The preference index (C-value) for each treatment was calculated by using following

$$\text{Formula: } C = \frac{2A}{M + A}$$

where:

A = eaten area of test leaf

M = eaten area of the standard leaf

C value of 1 = feeding on test plant extract equals to standard.

C value > 1 = preference of test plant extract

C value < 1 = lesser acceptance to test plant extract.

**Table -1: Antifeedant effect of methanolic extract of *Polygonum* species against *H. armigera* (Hub).**

Different Concentration of <i>Polygonum</i> species (in ppm)	Preference Index (C-value)			
	<i>P. barbatum</i> (stem)	<i>P. limbatum</i> (stem)	<i>P. plebejum</i> (whole plant)	<i>P. limbatum</i> (leaves)
10,000	0.0266	0.192	0.297	0.434
7,000	0.044	0.293	0.492	0.584
5,000	0.25	0.343	0.591	0.616
3,000	0.27	0.542	0.643	0.635
2,000	0.28	0.662	0.673	0.684
1,000	0.45	0.694	0.687	0.696
Control	1.00	1.00	1.00	1.00
SEM	0.0016	0.0044	0.00152	0.00178
CD at 5%	0.0048	0.013	0.0046	0.0054

**C- Value**

1. Extremely significant antifeedant
2. Significant antifeedant
3. Moderately antifeedant
4. Slight antifeedant
5. Preferred plant

**Class**

- 0.01-0.25
- 0.25-0.50
- 0.51-0.75
- 0.76-0.99
- >1.0

## RESULTS AND DISCUSSION

The antifeedant activity of different species of *Polygonum* was evaluated against 3<sup>rd</sup> instars larvae of *H. armigera*. Different plant parts of viz. whole plant, stem, Stem and leaves of *P. plebejum*, *P. barbatum* and *P. limbatum* were extracted in methanol to test the antifeedant activity. It is evident from table-1 that methanolic extract of *P. barbatum* (stem) showed extremely significant antifeedant activity at 10,000 and 7,000 ppm with a C-values of 0.0266 and 0.044 as compared to *P. limbatum* (stem), having C-value of 0.192 at 10,000 ppm. Even at 3000, 2000 and 1000 ppm. Concentration the extract of *P. barbatum* (stem) showed significant antifeedant activity with the C-value 0.25, 0.27, 0.28 and 0.45. At these concentrations the extract of *P. limbatum* (stem), *P. plebejum* (whole plant) and *P. limbatum* (leaves) showed the moderate antifeedant activity with the C- value from 0.542 to 0.696 respectively. Thus, on the basis of significant antifeedants activity, the methanolic extract of stem

of *P. barbatum* can be recommended as eco-friendly, less expensive, easily biodegradable botanical pesticide for control of *H. armigera*. The antifeedant activity of neem leaves, seed and neem oil have been evaluated by Singh (2006) against larvae of *Spodoptera litura*. The activity may be due to prresent azadiractines present in neem. Datta *et al.*, (2001) have evaluated the pesticidal properties form Parthenium hysterophorus. Opende *et al.*, (2000) have evaluated the growth inhibitory activity of *Melia dubia* against *H. armigera*.

## ACKNOWLEDGMENTS

The authors are thankful to Head, Department of Chemistry, Agra College, Agra and Head., Entomology Department, G.B. Pant University of Agriculture and Technology, Pantnagar to provide the facility for chemical and entomological work respectively.

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