

## Antifeedant activity of *Morinda citrifolia* L. (Noni) against *Helicoverpa armigera* (Hubner)

SHYAMVEER SINGH<sup>1</sup>, RICHA GUTPA<sup>1\*</sup>, ROOPENDRA KUMAR<sup>1</sup>,  
A.K. GUPTA<sup>1</sup>, A.K. GUPTA<sup>2</sup> and C.P. SINGH

<sup>1</sup>Department of Chemistry, Natural Product Laboratory, Agra College, Agra (India)

<sup>2</sup>Department of Entomology, College of Agriculture,  
G.B.Pant University of Agriculture and Technology, Pantnagar - 263 145 (India)

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

### ABSTRACT

During the investigation on antifeedant activity of *Morinda citrifolia* against third instar larvae of *Helicoverpa armigera*. The methanolic extract of leaves and root showed the extremely significant antifeedant activity at highest concentration 10,000 ppm with the C-value of 0.16 & 0.074. Whereas the extract of root bark showed the extremely significant antifeedant activity at 10,000, 7,000 ppm concentration with C-values of 0.035 & 0.043 and extract of stem bark showed the extremely significant antifeedant activity at 10,000 & 7,000, 5,000 & 3,000 ppm with C-value of 0.05, 0.118, 0.218 & 0.226. Stem bark extract was least preferred by the larvae because it showed the extremely significant antifeedant activity even at lower concentration. On the basis showed the extremely significant antifeedant activity even at lower concentration. On the basis of non preference by the larvae of *H. armigera*, the methanolic extract of stem bark can be used as an alternate to synthetic pesticide.

**Key words:** *Morinda citrifolia*, *Helicoverpa armigera*, antifeedant.

### INTRODUCTION

*Helicoverpa armigera* (Hubner) is one of the important polyphagous pest which causes severe losses to almost all the economical crops like cotton, tomato, pigeonpea, oilseeds etc. (Chavan *et al.*, 2003). A large number of synthetic, non selective toxic chemicals have been introduced during past several years to control this pest. However, their extensive and indiscriminate use has led to number of environmental, economic and human problems including the persistence of residues, development of pest resistance (Mc caffery *et al.*, 1989). It has become imperative to search other alternative measures for management of this pest. Amongst, many alternate approaches, the use of natural antifeedant of plant origin can be considered as potential alternative for insect pest management (Saxena, 1996) because they are rich source of natural chemical viz., flavanoids, anthraquinones, glycosides etc. Keeping the above fact in mind, the methanolic extract of leaves, stem

bark, root and root bark of indigenous plant *M. citrifolia* have been evaluated for antifeedant activity against gram pod borer (*H. armigera*). *Morinda citrifolia* L. (Noni) belonging to family Rubiaceae is one of the traditional folk medicinal plant that has been used over 2000 years in Polynesia (Whistler, 1985). It has been reported to have a broad range of therapeutic and nutritional value (Singh *et al.*, 1984) and have a broad range of health benefits for cancer, arthritis, diabetes, asthma, hypertension and pain (Whistler, 1992).

### MATERIALS AND METHODS

The larvae of *H. armigera* were collected from crop research center of G.B. Pant University, Pantnagar during the month of April. To maintain the fresh culture, insect were reared on semisynthetic diet prepared as per the method of Singh (*et al.*, 2001) freshly moulted 3<sup>rd</sup> instar larvae were used as a test insect. The test material i.e. *M. citrifolia* leaves, stem bark, root and root bark

were procured from Lucknow and Chennai. The plant material were dried under shade and pulverized. The powdered material was extracted with methanol in soxhlet apparatus. The known volume of the alcoholic extract was concentrated under vacuum using the rotaevaporator to find the percentage extractive. The stock solution of known concentration were prepared and further diluted with methanol 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 larvae was placed in each disc and allowed to feed for 24 hrs. All the treatment were replicated three times along with matter left

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 activity of methanol extracts of *M. citrifolia* L. (Noni). against *H. armigera* (Hub.)**

Different Concentration of <i>M.citrifolia</i> in Methanol (in ppm)	Preference Index (C-value)			
	Leaves	Stem Bark	Root	Root Bark
10,000	0.16	0.05	0.074	0.35
7,000	0.35	0.118	0.329	0.43
5,000	0.55	0.215	0.418	0.273
3,000	0.66	0.226	0.660	0.57
2,000	0.67	0.640	0.750	0.57
1,000	0.72	0.746	0.97	0.83
Control	1.00	1.00	1.00	1.00
SEM±	0.0054	0.00316	0.0057	0.0073
CD at 5%	0.0165	0.00959	0.0174	0.0223

**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
- >1.00

## RESULTS AND DISCUSSION

The antifeedant activity of methanolic extract of leaves, stem bark, root and root bark of *M. citrifolia* were evaluated against third instar larvae of *H. armigera*. The preference index (C-value) were recorded. From Table -1, it is evident that extremely significant antifeedant activity was observed for root bark followed by stem bark, root and leaves at 10000 ppm with C-value of 0.035, 0.05, 0.074 & 0.16. At 7000 ppm the root bark also showed extremely significant antifeedant activities with C-value of 0.043. However, at lower concentration i.e. 7000, 5000 & 3000 ppm stem bark showed better antifeedant activity as compared to root bark, root & leaves with C-value of 0.118, 0.218 & 0.226 respectively while at 2000, 1000 ppm stem bark

showed moderate antifeedant activity. Thus, the methanolic extract of stem bark of *M. citrifolia* can be recommended as nontoxic, less expensive, eco-friendly antifeedant for control of *H. armigera*. The antifeedant activity of *M. citrifolia* extract have not been reported. Although, the different extract of the *M. citrifolia* is thoroughly evaluated for various biological activity and number of bioactive molecule have been isolated.

## ACKNOWLEDGMENTS

The authors are thankful to Prof. and Head, Department of Entomology, College of Agriculture, G.B. Pant University of Agriculture and Technology, Pantnagar and Head of Chemistry, Agra College, Agra for providing facilities to carry out the work.

## REFERENCES

1. Chavan, V.M. Mibalkar, S.A. Response of *Helicoverpa armigera* (Hubner) to different insecticides in Akola region (Maharashtra). *Pesti-cides Research Journal*, **15(2)** 159-161 (2003).
2. Mc. Caffery, A.R. King, A.B.S. Walker, A. J. Nari, K.L. Resistance to synthesis pyrethroids in the bollworm, *Helicoverpa armigera* from Andhra Pradesh, India, *Pestic. Sci.*, **27**, 65-76 (1989).
3. R.C. Saxena Neem seed derivatives as low cost management in cowpea, maize and sorghum crops-abstract, International Neem conference held on Feb. 4-9, University of Queensland, Brisbane, Australia p-50 (1996).
4. I.B. Singh, K. Singh, H.N. Singh, Relative efficacy of certain plant extract as antifeedant against gram pod borber, *Helicoverpa armigera* (Hub.) *Bioved*, **12(1\2)**, 41-44 (2001).
5. Y. Singh, T. Ika hifo, T. Panuve, M. Slatter, C. Folk medicine in Tonga. A study on the use of herbal medicine for obstetric and gynaecological conditions and disorders, *J. Ethnopharm*, **12**, 305-25 (1984).
6. W.A. Whistler, Traditional and herbal medicine in the cook island, *J. Ethnopharm.*, **13**, 239-80 (1985).
7. W. Whistler, Tongan berbal medicine, *Isle Botanica Honolulu, Hawaii*, 89-90 (1992).