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By

D. Mohan Kumar, Ajinkya Nimbalkar, Vinit Kamble and M.V. Santha Kumar

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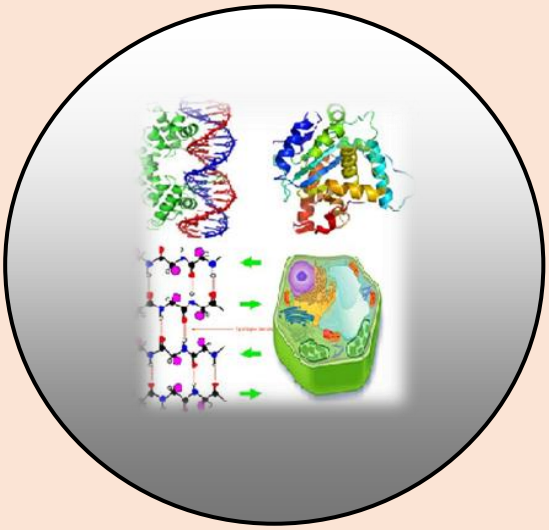

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Dr. M.V. Santha Kumar
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RESEARCH PAPER

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In-vitro Screening of *Barlaria accuminata*for its Antifeedant activity against Fall Armyworm (*Spodoptera frugiperda* (J.E. Smith)) (Lepidoptera: Noctuidae)

D. Mohan Kumar, Ajinkya Nimbalkar, *Vinit Kamble and *M.V. Santha Kumar

Department of Agrochemicals and Pest Management, Shivaji University, Kolhapur, Maharashtra, India
*Department of Zoology, Shivaji University, Kolhapur, Maharashtra, India

ABSTRACT

Plants are rich sources of phytochemicals which possess insecticidal, repellent and antifeedant activity. In this present article we screened an ornamental plant Barlaria accuminatafor its anti feedant efficacy against invasive pest fall armyworm (Spodoptera frugiperda), under laboratory conditions. Our results clearly indicated that, Ethyl acetate crude extract showed significant anti feedant activity against third instar larvae of fall armyworm. Rest of the solvents i.e. methanol, acetone, chloroform showed no significant antifeedant activity against test larvae.
Key words: Barlaria accuminata, Fall Armyworm, Antifeedant Activity and Crude Extracts.

INTRODUCTION

Agriculture is often pronounced as backbone of Indian economy, where nearly 70% of population directly or indirectly depend on agriculture and agriculture related industries. Agriculture plays a vital role in nullifying the hunger of huge population. Pests are considered as major threats for production and maintaining quality parameters of agricultural products. Pesticides are popular among the farmers to control various pests in agriculture. Indeed, synthetic pesticides are capable of control pest population and helps to hike in production, however, indiscriminate use of pesticides leads to many undesired results, such as swindling of natural enemies, articulate resistance to pesticides, resurgence of pests, toxic residues in food, water, air and soil which affects human health, inconsistent of the soil and environmental ecosystem and terminating soil microbes, [A. Jeyasankar*et.al*., 2005 and Rao *et al*., 2005]. As chemical pesticides are found deleterious, efforts have to be made to developeco-friendly pest management measures. For the last three decades many researchers screened several plants for biologically active phytochemicals and their capability to exploit against phytophagous insects. Plants are rich sources of alkaloids, phenols, saponins, and many other secondary metabolites [Silva *et al*., 2012] which possess insecticidal, anti-feedant, ovicidal activities against variety of agriculturally important pests [Santos et al., 2011]. These phenomenal properties of plants can be exploited for managing agriculturally important pests and diseases.

Fall armyworm (*Spodoptera frugiperda (J.E. Smith*)) (Lepidoptera: Noctuidae) is a polyphagous pest having wide range of hosts. It can infest maize, sugarcane, wheat, rice, sorghum and other Poaceae family weeds. It has been introduced to India in 2018 [A. N. Shylesha *et al*., 2018] and causing drastic damage to maize, sugarcane, sorghum, ground nut, soybean etc. The destructive feeding ability make host plants to become susceptible to FAW infestation. In this present study, we made an attempt to screen *Barlaria accuminata* for antifeedant property against FAW, using four different solvents for extraction.

MATERIAL AND METHODS

Insect rearing: Egg masses of FAW were collected from Maize fields of Agriculture College, Kolhapur and reared under laboratory conditions. The collected eggs were kept for incubation at 27±2^{0}C and 70±5% RH. Hatched larvae were provided with young and tender chopped maize leaves. Final instar larvae were identified and shifted to container filled with solarised soil for pupation. The emerged adults were provided with 2% honey solution in rearing chamber. Consequently, Fresh leaves were placed within rearing chamber for oviposition. The laid eggs then kept for incubation, after hatching their rearing was done. The third instar larvae from this batch were taken for assessing anti feedant bioassay.

Plant collection and extraction: Leaves of *B. accuminata* were collected from Botanical garden, Shivaji University, Kolhapur. Collected leaves were surface sterilised using Distilled water, and kept under sun light for 7 days. Dried leaves were fine powdered using electric mixer, and undergone extraction using Soxhlet's apparatus. Methanol, Chloroform, Acetone and Ethyl acetate were used as solvents. Soxhlet's apparatus was ran for 8-10 hours. Excessive solvent was removed using rotary vacuum evaporator, resultant semi solid extract was stored at 2-3 ^{0}C prior to further use.

Bioassay: Leaf disc method was exploited to determine the antifeedant properties of crude extracts, using Third instar larvae. Three different concentrations were prepared by dissolving the crude extract in acetone, distilled water was used for dilution. Tween 80 (polysorabant 80) was used as emulsifier at 0.05% to the extract. Tender and healthy Maize leaves of 5 cm diameter discs were prepared and dipped in 1%, 3%and 5% concentrations respectively and air dried for 10 minutes. These leaves were served to third instar larvae individually in a plastic container containing wet filter paper to avoid moisture loss. One larva was allowed in single plastic container to avoid cannibalism. The control larvae were served with leaves treated with acetone. The results were represented in Table-1. Ten replications were maintained for each concentration. The progressive feeding activity by larvae in treated and control was recorded after 24 hours duration using leaf area meter. Leaf area consumed in plant extract treatment was corrected from the control. The percentage of antifeedant index was calculated using the formula of [Ben Jannet *et al*. 2000].

$$\text{AFI} = C - T/C + T * 100$$

Where C and T represent the amount of leaf eaten by larva on control and treated discs respectively.

RESULTS AND DISCUSSION

Antifeedant property of B. *accuminata* was estimated by antifeedant index. Higher antifeedant index normally implies low consumption of leaves, which indicates high antifeedant activity of particular extract. Antifeedant ability of crude extracts varied with different solvents used for extraction and concentrations prepared. As illustrated in Table-1 four different solvents were used for extraction. 5% ethyl acetate extract caused more than 50% inhibition of feeding, meanwhile, 3% extract of same solvent caused above 25% inhibition of feeding, some authors reported similar results with B. buxifolia using ethyl acetate solvent against *S.litura* and *H.armigera* [T. Chinnamani and Jeyasankar 2018]. On the other hand, rest of solvents failed to cause significant antifeedant activity against FAW. Several authors reported the similar antifeedant properties of selected plants against lepidopteran insects [A. Jeyasankar *et al*., 2010, A. jeyasankar *et al* 2011 and K. Elumalai*et al*., 2013]. Antifeedant molecules are naturally occurring plant metabolite which makes the insects difficult to feed on. Plants having copious amounts of phytochemicals which possess insecticidal, antifeedant and repellent activity. Researchers have diverted their focus on plant based chemical molecules which can control, repel and regulate the growth of insects. The adverse effects of synthetic insecticides are also one of the reasons to screen plants for effective and biologically active phytochemicals.

Table 1. Antfeedant index of *B. accuminata* crude extracts using four different solvents.

Sr.no	Solvent used	Concentration of crude extract		
		1%	3%	5%
1	Acetone	+	+	++
2	Ethyl acetate	-	++	+++
3	Methanol	-	-	+
4	Chloroform	+	+	+

Note: - no antifeedant activity, + 25% antifeedant activity, ++ above 25% but below 50%, +++ above 50% but below 75% anifeedant activity.

CONCLUSION

The present investigation revealed that extracts of *B. accuminata*can be used as an antifeedant molecule. Among the solvents used for extraction, ethylacetate showed significant inhibition of feeding, thus same solvent can be used for extraction and identification of phytochemicals for further studies.

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Corresponding author: M.V. Santha Kmar, Department of Zoology, Shivaji University, Kolhapur, Maharashtra, India.
Email: mvdrsanthakumar@gmail.com