International Journal of Entomology Research
www.entomologyjournals.com
ISSN: 2455-4758
Received: 18-03-2023, Accepted: 05-04-2023, Published: 19-04-2023
Volume 8, Issue 4, 2023, Page No. 24-26

Comparison of the antifedent properties with some plant-based methanol extract on gram pod borer, *Helicoverpa armigera* in Pali Region

Manohar Malviya*, Dhirender
Department of Zoology, Jai Narain Vyas University, Jodhpur, Rajasthan, India

Abstract
In the present study, Methanol extract of *Argemone mexicana* (satyanashi) and *Calotropis procera* (aak) were tested for antifeedant Indices against *Helicoverpa armigera* (Hübner) in gram field of Pali region of Rajasthan. Antifeedent index increased as methanol extract content increased. When 8% is used of *Calotropis procera* (aak), AFI was higher (77 %) while at 8 % concentration of *Argemone mexicana* (satyanashi), In comparison to the control group, the *H. armigera* larvae in their third instar had an AFI of 53%. Aak leaves consistently demonstrated a stronger antifeedant effect than Satyanashi leaves.

Keywords: *Helicoverpa armigera*, leaf methanol extract, *Argemone mexicana* (satyanashi), *Calotropis procera* (aak), antifeedant

Introduction
Helicoverpa armigera (Hübner) (Lepidoptera: Noctuidae) is a polyphagous pest of international plant agriculture that is multivoltine, cosmopolitan and economically significant. *H. armigera* larvae feed during their first and second instar on vegetative tissue like leaves or delicate branches before switching to most plant structures worldwide (including stems, leaves, flower heads, and fruits). (Reddy *et al*., 2004; Moral Garcia 2006; Rajapakse and Walter, 2007; Kotkar *et al.*, 2009; Namin *et al*., 2014) [10, 7, 9, 6, 8]. Due to the development of resistance against numerous pesticides, conventional chemical-based methods to control this pest have failed in addition to raising environmental issues (Gunning *et al*., 1984; Kazzari *et al*., 2005) [3, 5]. Due to their insecticidal and insect repellent properties and lower environmental toxicity, botanical pesticides have attracted interest in the development of alternative pest management techniques. (Zahid *et al*., 2016) [15]. It is necessary to promote the use of straightforward plant extracts, such as leaf, flower, or fruit extracts, which are safe for non-target organisms like people.

The perennial shrub, *Calotropis procera* (aak) and annual herb *Argemone mexicana* (satyanashi), was employed because of its biological effects on the pest *H. armigera*. This pest's anti-feeding behaviour has been investigated. The findings of this study will give important information for creating thorough pest management plans against *H. armigera*.

Materials And Methods
Collection of test insect
The 3rd instar larvae of *H. armigera* are collected from gram fields in Pali region are subjected for antifeedent effect of Bio-pesticides like plant extracts on gram pod borer are also to be carried out simultaneously for evaluating how pod borer pests are controlled without affecting the soil as well as crops and ecological niche.

Plant material extraction and collection
Fresh leaves of *Argemone mexicana* (satyanashi) and *Calotropis procera* (aak) were taken from the plants and properly cleaned to eliminate dirt and other debris. The leaves were then shade dried until all moisture had vanished and the leaves had become crisp. Leaves were finely pulverised after drying. Soxhlet technique was used for extraction. (Sharma, 1988) [12]. Leaf powder weighing 50 g was extracted. The soxhlet device was used for two hours. The extract-containing solvent was then put through a rotating evaporator. 250 mg of the thick, dark green extract were collected in total. For antifeedant investigations, this extract was then made into a 250 ppm solution by diluting it in 1000 ml of methanol. It was then appropriately stored in dark bottles.

Antifeedant effect
The third instar of the test insect was used to study the antifeedant impact of plant extracts. At the necessary concentrations of 1%, 2%, 4%, and 8%, the testing was carried out using the leaf-dip method. The test insects' third instar underwent a three-hour pre-starvation period. To avoid carnivorous behavior, three duplicates of a single starved larva were released in each of the five beakers covered in muslin cloth, one for the experiment and one for the control. After 24 hours, observations were recorded. After 24 hours, leaves that had not been consumed were collected, and Waldbauer's (1968) [14] (Modified by Scriber and Slansky Jr. (1981) [11].

Amount of food consumed and percent (%) reduction is food intake is worked out using the following formula.

Food consumed = Initial weight of food offered - Corrected final weight of food

$$\text{\% reduction in food intake} = \frac{Wc - Wt}{Wc} \times 100$$

Here,

Wc = Weight of food consumed in control

Wt = Weight of food consumed in treatment.

Results

The third instar larvae were used for the testing because they are the most voracious feeders and consume the most food compared to earlier stages. Data on feeding deterrence of *Calotropis procera* (aak) on 3rd instar larvae of *H. armigera* are presented in Table-1.

Food consumption in the control group went up.; however, it declined in the treated group. At 1% concentration, Antifeeding Index (AFI) was 67% in 3rd instar larvae. At 2% concentration, AFI was 70% in 3rd instar. At 4% concentration, AFI was 73% in 3rd instar. At 8% concentration, AFI was 77% in 3rd instar (Table-1).

Table 1: Antifeedant effect of the *Calotropis proceran* (aak) leaf extract on 3rd instar larvae of *Helicoverpa armigera* collected from different sources.

Treatment	Treatment % Conc. (g/L)	Consumed food (mg) (Control)	Consumed food (mg) (Treated)	Antifeedant (%)
Methanol	1%	300	100	67%
	2%	300	90	70%
	4%	300	80	73%
	8%	300	70	77%

Data on feeding deterrence of *Argemone mexicana* (satyanashi) on 3rd instar larvae of *H. armigera* are presented in Table-2.

Food consumption increased in the control group while declining in the treatment group. In third instar larvae, the Antifeeding Index (AFI) was 43% at 1% concentration. AFI in the third instar was 47% at 2% concentration. At 4% concentration, AFI was 50% in 3rd instar. At 8% concentration, AFI was 53% in 3rd instar (Table-2).

Table 2: Antifeedant effect of the *Argemone Mexicana* (satyanashi) leaf extract on 3rd instar larvae of *Helicoverpa armigera* collected from different sources.

Treatment	Treatment % Conc. (g/L)	Consumed food (mg) (Control)	Consumed food (mg) (Treated)	Antifeedant (%)
Methanol	1%	300	170	43%
	2%	300	160	47%
	4%	300	150	50%
	8%	300	140	53%

Discussion

As a result, the Antifeedant Index rose as the concentration of methanol extract fed larvae increased. Any agent that prevents insects from eating is referred to as an antifeedant. Antifeedants typically have negative effects on feeding behaviour, which leads to growth retardation and eventually insect death. (Hummel brunner and Isman, 2001) [4]. At 5% concentration, *Hygropia auriculata* ethyl acetate extract showed feeding deterrent activity (64.48%) against third-instar *Spodoptera litura* larvae. (Baskar *et al*., 2011) [1]. AFI was 72.32% in the third instar larvae and 28.66% in the fourth instar larvae in the methanol extract of *Lantana camara* L. at a concentration of 5%. (Singh *et al*., 2019) [13]. When administered to larvae in their second and third instar, *M. pulegium* essential oil shown strong antifeedant effect at 74.15% and 61.72%, respectively. (Boulamtat *et al*., 2020) [2]. Similar outcomes were seen in the current trial as well.

Conclusion

Due to environmental pollution, pest resistance and resurgence, and unfavourable impacts on non-target creatures brought on by the indiscriminate use of synthetic pesticides, plant-based natural products in insect pest management programmes have attracted a lot of interest in recent years. It has been demonstrated that a number of plant extracts or isolated active chemicals have antifeedant activity. Farmers have utilised plant-derived products in many nations since ancient times, which inspired scientists to look for environmentally benign insecticides in the plant kingdom. Some substances have an impact on how insects feed and prevent them from eating.

Acknowledgements

The authors are thankful to the Head, Department of Zoology, J.N. Vyas University, Jodhpur for providing necessary facilities.

Reference

1. Baskar K, Maheshwaran R, Kingsley M, Igancimuthu S. Bioefficacy of plant extracts against Asian army-worm *Spodoptera litura* Fab. (Lepidoptera:Noctuidae). J. Agric. Technology,2011:7(1):123-131. http://ijat-aatsea.com/pdf/January_v7_n1_11/13-IJAT2010_13R.pdf
2. Boulamtat R, Lhaloui S, Sabraoui A, Fakhouri KE, Oubayoucef A, Mesfioui A, *et al*. Antifeedant and larvicidal activities of *Mentha pulegium* on chickpea pod borer *Helicoverpa armigera* (Lepidoptera: Noctuidae). Int. J. Trop. Insect Sci,2020:40:151-156. https://doi.org/10.1007/s42690-019-00064-z
3. Gunning RV, Easton CS, Greenup LR, Edge VE. Pyrethroid resistance in *Heliothis armigera* (Hübner) (Lepidoptera:Noctuidae) in Australia. Journal of Economic Entomology,1984:77:1283-1287. http://ijat-aatsea.com/pdf/January_v7_n1_11/13-IJAT2010_13R.pdf
4. Hummel brunner LA, Isman MB. Acute, sublethal, antifeedant and synergetic effects of monoterpenoid essential oil components on the tobacco cutworm *Spodoptera litura* (Lepidoptera:Noctuidae). Journal of Agricultural and Food Chemistry,2001:49:715-720. https://doi.org/10.1021/jf000749t
5. Kazzari M, Bandani AR, Hosseibkhani S. Biochemical characterization of alpha amylase of Sunn pest *Eurygaster integriceps*. Entomological Science,2005:8:371-377. https://doi.org/10.1111/j.1479-8298.2005.00137.x
6. Kotkar HM, Sarate PJ, Vaijayant AT, Gupta VS, Giri AP. Responses of midgut amylases of *Helicoverpa armigera* to feeding on various host plants. Journal of Insect Physiology,2009:55:663-670. https://doi.org/10.1016/j.jinsphys.2009.05.004

7. Moral Garcia FJ. Analysis of the spatiotemporal distribution of *Helicoverpa armigera* (Hübner) in a tomato field using a stochastic approach. Biosystems Engineering,2006:93:253-259. https://doi.org/10.1016/j.biosystemseng.2005.12.011
8. Namin FR, Naseri B, Razmjou J. Nutritional performance and activity of some digestive enzymes of the cotton bollworm. *Helicoverpa armigera*, in response to seven tested bean cultivars. Journal of Insect Science,2014:14(93):1-18. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4212854/
9. Rajapakse CNK, Walter GH. Polyphagy and primary host plants: oviposition preference versus larval performance in the lepidopteran pest *Helicoverpa armigera*. Arthropod – Plant Interactions,2007:1:17-26. https://link.springer.com/article/10.1007/s11829-007-9003-6
10. Reddy KS, Rao GR, Rao PA, Rajasekhar P. Life table studies of the capitulum borer, *Helicoverpa armigera* (Hübner) infesting sunflower. Journal of the Entomological Research,2004:28:13-18. https://indianjournals.com/ijor.aspx?target=ijor:jer&volume=28&issue=1&article=003
11. Scriber JM, Slansky F. The nutritional ecology of immature insects. Annual Review of Entomology,1981:26:183-211. https://doi.org/10.1146/annurev.en.26.010181.001151
12. Sharma JD. Forensic Science and Toxicology. Suvidha Law House, 28 Malveeya Nagar, Roshanpura, Bhopal, India, 1988. Googlescholar
13. Singh M, Naik JH, Pande H, Kaushal BR. Biological effects of a plant extract on gram pod borer, *Helicoverpa armigera* (hübner) (lepidoptera: noctuidae). J. Env. Bio-Sci.,2019:33(1):177-183. Researchgate
14. Waldbauer GP. Quantitative relationships between the number of faecal pellets, faecal weights and the weight of the food eaten by horn worm, Protoparce sexta (Johan) (Lepidoptera: Sphingidae). Entomol. Exp. Appl,1964:7:310-314. https://doi.org/10.1111/j.1570-7458.1964.tb00732.x
15. Zahid SMA, Arshad M, Murtaza G, Ali S, Aaqib M, Yousaf RW, *et al*. Synergistic effect of plant extracts with synthetic insecticides against citrus mealy bug Planococcus citri (Pseudococcodae:Homoptera). Journal of Agricultural and Social Studies,2016:1(1):1-7. Googlescholar