



## Research Article

# Evaluation of some microbial pesticides against apple stem borer, *Aeolesthes* sp. in Himachal Pradesh

USHA CHAUHAN\*, P. L. SHARMA, P. R. GUPTA, K. C. SHARMA and S. P. VERMA

Department of Entomology and Apiculture, Dr YS Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh 173 230, India.

\*E mail: uchauhan97@rediffmail.com

**ABSTRACT:** Apple stem borer, *Aeolesthes* sp. is a serious pest in apple orchards in Himachal Pradesh. For its suppression, microbial biopesticides viz., *Beauveria bassiana*, *Beauveria brongniartii*, *Metarhizium anisopliae* ( $5 \times 10^7$  conidia/gallery), *Steinernema feltiae*, *Heterorhabditis bacteriophora* (5000 infective juveniles (IJ)/ live gallery) and econeem plus (having 1% azadirachtin @ 0.5%) were evaluated. The experiment was conducted for two years during 2007-08 and 2008-09 at Temperate Horticulture Research station, Kotkhai, District Shimla. These biopesticides were compared with the recommended insecticides, dichlorvos (0.1%) and chlorpyrifos (0.04%) and control (emulsified water, 0.02%). Before applying the treatments, all the holes except one present in each branch were plugged with mud paste. The leftover hole was then cleared with the help of flexible aluminium wire and the treatment was given with the help of syringe. Thereafter, the leftover hole was also plugged with mud paste. To calculate percent mortality, the larvae which opened any of the holes in the branch or made new hole to push out the excreta were considered as live and those which remained closed throughout as dead. In this experiment, *B. bassiana*, *B. brongniartii*, *M. anisopliae*, *H. bacteriophora*, *S. feltiae*, econeem, chlorpyrifos, dichlorvos and control resulted in 33.3, 66.7, 37.5, 80, 20, 100, 100, 100 and 40 percent mortality during 2007-08 and 33.3, 33.3, 66.7, 33.3, 33.3, 66.7, 100, 100 and 0.00 per cent mortality during 2008-09 respectively. Among different biopesticides, *M. anisopliae*, *B. brongniartii* and econeem plus were the best treatments resulting in 66.7 and 100 per cent mortality of stem borer larvae

**KEY WORDS:** *Aeolesthes* sp., apple, biopesticides, stem borer

(Article chronicle: Received: 15-06-2013; Revised: 21-08-2013; Accepted: 10-09-2013)

## INTRODUCTION

Apple is an important fruit crop in Himachal Pradesh. The crop is successfully grown in higher temperate zone (1800-3000m) of the state, thus improve the economy of the farmers. The productivity of this fruit crop is limited by many factors, of which insect pests are important. The crop is attacked by over two dozen insect pests, of which the apple stem borer, *Aeolesthes* sp. (Cerambycidae: Coleoptera) is a serious problem in some areas of the state where apple is grown. It is polyphagous pest and has a wide host range of host plant including forest, deciduous fruit trees and ornamentals. Infested plant can be identified from the frass coming out from the borings on the branches. In apple it causes considerable damage to tree trunks and branches (Verma and Thapa, 2005). Although synthetic insecticides are effective against this pest, the role of bio pesticides is not explored till now in Himachal Pradesh. In view of this the present study was carried out for the ecofriendly management of *Aeolesthes* sp.

## MATERIALS AND METHODS

The experiments were carried out in the university apple orchard at the Temperate Horticulture Research Station, Kotkhai during the years 2007-08 and 2008-09. Forty two apple trees infested with the apple stem borer were selected during 2007-08, while, twenty seven infested apple trees were selected during 2008-09. The trial was laid in randomized block design. There were nine treatments which were replicated six times. A single branch was treated as one replication. The number of holes per branch varied from 1–6. The treatments were, *Beauveria bassiana*, *Beauveria brongniartii*, *Metarhizium anisopliae* each at  $5 \times 10^7$  conidia per live gallery; *Steinernema feltiae*, *Heterorhabditis bacteriophora* each at 5000 (IJ) per live gallery; econeem 1% (0.5%); chlorpyrifos 0.04 per cent; dichlorvos 0.1 per cent and emulsified water as a control. Before the application of treatments, all the holes except second from the bottom were plugged with

mud paste in order to avoid the leakage of pesticides and further ensure the larval contact with the pesticide. There after desired concentration of each treatment was injected with the help of needleless syringe into the borer holes. This hole was also plugged with mud paste after injecting the pesticide. In control, only emulsified water was injected. The observations were recorded at weekly intervals from the first week of November to mid March for the opening of any of the closed holes by the borers to push out the frass. The tree branches in which the borer has opened the hole or made the new hole were treated as live gallery, whereas, the branches with closed holes were treated as dead gallery. The final count of the live galleries was recorded during March when larvae resumed their activities.

## RESULTS AND DISCUSSION

The data presented in Table 1 revealed that the treatments *viz.*, *Beauveria bassiana*, *Beauveria brongniartii*, *Metarhizium anisopliae* each at  $5 \times 10^7$  conidia per live gallery, *Heterorhabditis bacteriophora*, *Steinernema feltiae* each at 5000 (IJ) per live gallery, econeem plus at 0.5 per cent, chlorpyrifos at 0.04 per cent and dichlorvos at 0.1 per cent resulted in 33.3, 66.7, 37.5, 80, 20, 100, 100 and 100 per cent mortality of *Aeolesthes* sp., respectively, during 2007-08. Among the biopesticides, econeem plus was the best treatment giving 100 per cent mortality followed by *B. brongniartii* which caused 66.7 per cent mortality. In control, the mortality was 40 per cent. During 2008-09, maximum mortality of 66.7 per cent was recorded both in Econeem plus and *M. anisopliae* (Table 1). Insecticidal treatments of chlorpyrifos and

dichlorvos resulted in 100 per cent mortality, whereas, in control no mortality was recorded. These results revealed that among different biopesticides, Econeem plus was the best treatment during both the years resulting 66.7 and 100 per cent mortality. Mohi-Uddin *et al.* (2009) reported that the neem extract caused 69.50 per cent mortality of apple stem borer in Jammu & Kashmir on par with the present studies. However, in the present study a great difference was observed in the mortality caused by entomopathogenic fungi and EPNs during 2008 and 2009. *B. brongniartii* caused 66.7 per cent mortality during 2008, whereas, the same treatment caused only 33.3 per cent mortality during 2009. *M. anisopliae* also caused high mortality of 66.7 per cent during 2009, whereas, it caused only 37.5 per cent mortality during 2008. Mohi-Uddin *et al.* (2009) found mortality of apple stem borer upto 47.80 and 47.50 per cent when treated with *B. bassiana* and *M. anisopliae*, respectively.

Similarly, *H. bacteriophora* caused 80.0% mortality during 2008 and 33.3% mortality during 2009. In present studies insecticides *viz.*, chlorpyrifos and dichlorvos gave 100 per cent mortality of apple stem bore. Khamraev and Davenport (2004) also reported upto 96.7 per cent mortality of stem bore with pyrethroids.

## ACKNOWLEDGEMENTS

The authors are thankful to Professor and Head, Department of EAP, UHF Nauni for providing the necessary facilities to carry out this experiment and to the Director, NBAII, for the financial help.

**Table 1: Evaluation of some microbial pesticides against apple stem borer, *Aeolesthes* sp**

Pesticide	Dose or conidia/ gallery	Branches with dead galleries (%)	
		2007-08	2008-09
<i>Beauveria bassiana</i>	$5 \times 10^7$	33.3 (35.2) <sup>c</sup>	33.3 (30.0) <sup>c</sup>
<i>Beauveria brongniartii</i>	$5 \times 10^7$	66.7 (60.0) <sup>b</sup>	33.3 (30.0) <sup>c</sup>
<i>Metarhizium anisopliae</i>	$5 \times 10^7$	37.5 (37.8) <sup>c</sup>	66.7 (60.0) <sup>b</sup>
<i>Heterorhabditis bacteriophora</i>	5000 IJ/hole	80.0 (63.4) <sup>b</sup>	33.3 (30.0) <sup>c</sup>
<i>Steinernema feltiae</i>	5000 IJ/hole	20.0 (26.6) <sup>d</sup>	33.3 (30.02) <sup>c</sup>
Econeem Plus (1% azadirachtin)	0.5%	100.0 (90.0) <sup>a</sup>	66.7 (60.0) <sup>b</sup>
Dichlorvos	0.1%	100.0 (90.0) <sup>a</sup>	100.0 (90.0) <sup>a</sup>
Chlorpyrifos	0.04%	100.0 (90.0) <sup>a</sup>	100.0 (90.0) <sup>a</sup>
Control (emulsified water)	0.02%	40.0 (39.2) <sup>c</sup>	0.0 (0.0)

Figures in parentheses are arc-sine transformed values and those with same letter do not differ significantly from each other.

Some microbial pesticides against apple stem borer, *Aeolesthes* sp.

## REFERENCES

- Chamrev, AS and Davenport, CF. 2004. Identification and control of agricultural plant pests and diseases in Khorezm and Republic of Karakalpakstan, Uzbekistan (8) ZEF Work Papers Sustainable Development in Central Asia, 1–32.
- Mohi-Uddin S, Munazah Yaqoob, Ahmed MDJ, Ahmed SB. 2009. Management of apple stem borer, *Aeolesthes sarat* Solsky (Coleoptera: Cerambycidae) in Kashmir. *Env Ecol.* **27**: 931–933.
- Verma SC, Thapa CD. 2005. Present status of major insect-pests and diseases of apple in Chamba district and technological interventions by Krishi Vigyan Kendra, Chamba. *Acta Horticulturae* **696**: 415–418.