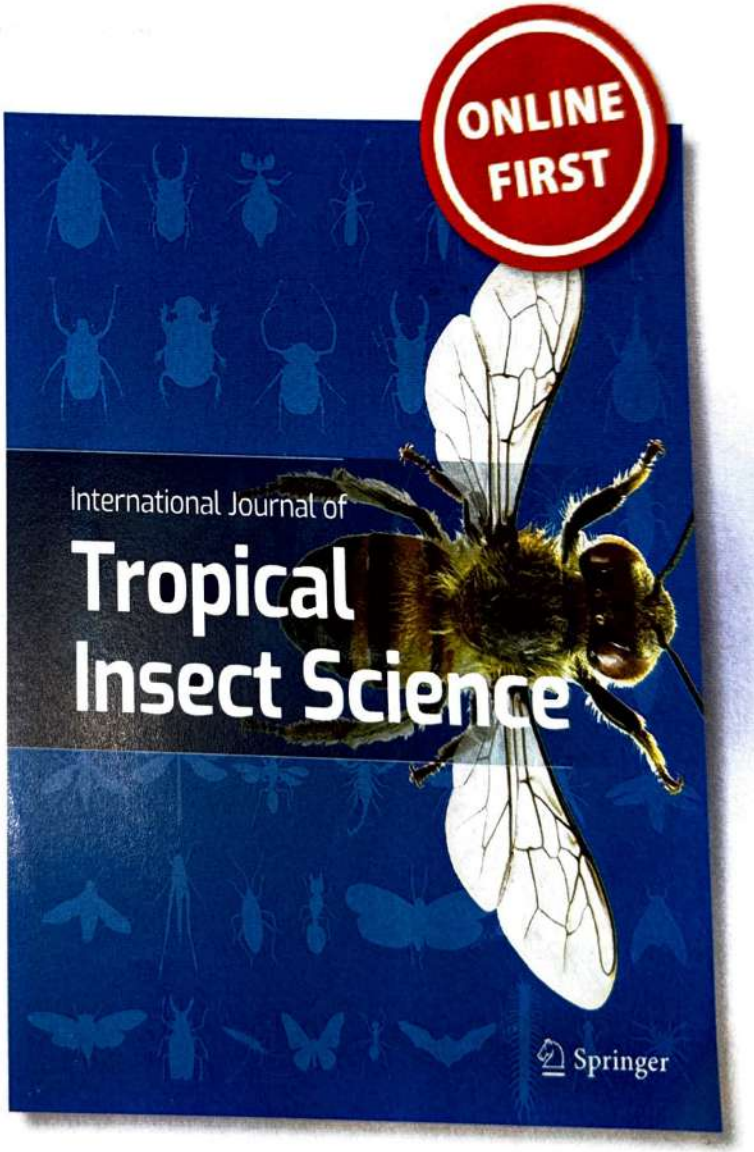
Bioactivity of Ageratum conyzoides *(L.) (Asteraceae) on feeding and oviposition behaviour of diamondback moth* Plutella xylostella *(L.) (Lepidoptera: Plutellidae)*

Tarun Kumar Vats, Vagisha Rawal, Sanjiv Mullick, Mayanglambam Rojina Devi, Priya Singh & Ashok Kumar Singh

International Journal of Tropical Insect Science

e-ISSN 1742-7592

Int J Trop Insect Sci
DOI 10.1007/s42690-019-00042-5



Springer

International Journal of Tropical Insect Science
https://doi.org/10.1007/s42690-019-00042-5

ORIGINAL RESEARCH ARTICLE

Bioactivity of *Ageratum conyzoides* (L.) (Asteraceae) on feeding and oviposition behaviour of diamondback moth *Plutella xylostella* (L.) (Lepidoptera: Plutellidae)

Tarun Kumar Vats[1] · Vagisha Rawal[1] · Sanjiv Mullick[1] · Mayanglambam Rojina Devi[1] · Priya Singh[1] · Ashok Kumar Singh[1]

Received: 12 April 2019 / Accepted: 21 August 2019

Abstract

Effects of foliage extracts of goat weed, *Ageratum conyzoides* (Family: Asteraceae) on feeding, oviposition and egg hatchability of diamondback moth, *Plutella xylostella* were assessed under standard laboratory conditions. Bioassays using aqueous, methanol and hexane crude extracts were conducted in no-choice and choice conditions. The larval feeding on 0.5% hexane extract treated leaf surface reduced to more than half relative to control in the choice condition; however, complete inhibition of feeding was recorded at 2% and higher concentration of extract. In no-choice bioassays, the larval feeding consistently decreased with increasing concentration of the hexane extract. Larval feeding on methanol extract treated leaves was also significantly reduced, although in the concentration dependent manner in both choice and no-choice bioassays. Likewise, the aqueous extract also reduced larval feeding at 3%, 4% and 5% concentrations of extracts in both no-choice and choice bioassays. The Antifeedant Index (AFI) for hexane extract was 100 at 2% concentration, while AFI values were 78.4 and 41.5 for 5% concentration of methanol and aqueous extracts, respectively. The egg laying on the leaf surface treated with hexane and methanol extracts was significantly reduced in the concentration dependent manner, as compared to the control in both choice and no-choice bioassays. However, the aqueous extract did not affect egg laying. The egg hatchability was completely inhibited at higher concentrations of the hexane extract, but not at any concentration of the methanol and aqueous extracts. The oviposition Deterrent Index values for the hexane and methanol extracts were statistically similar, however. These results indicate that the crude hexane and methanol extracts of *A. conyzoides* foliage could potentially be used for the management of diamondback moth.

Keywords *Plutella xylostella* · *Ageratum conyzoides* · Diamondback moth · Antifeedant · Oviposition deterrent

Introduction

The diamondback moth (DBM), *Plutella xylostella* (Lepidoptera: Plutellidae) is an invasive species which is considered to have European origin but now distributed throughout the world. This is one of the most destructive pest of crucifer plants (Li et al. 2016a; Thorsteinson 1953; Zalucki et al. 2012). DBM has also been reported to infest pea plant, *Pisum sativum* (L.) (Fabaceae) in Kenya (Henniges-Janssen et al. 2014). Management cost along with economic loss in crop production due to this insect has been estimated US $ 4-US $5 billion annually (Furlong et al. 2013; Li et al. 2016b; Verkerk and Wright 1996; Zalucki et al. 2012). Chemicals control strategies for the management of this pest has failed to produce a satisfactory result, since insect has developed resistance to all the classes of insecticides (Agboyi et al. 2016; Furlong et al. 2013; Talekar and Shelton 1993). This insect has also been reported to develop field resistance against biopesticide, *Bacillus thuringiensis* (Shelton et al. 1993; Tabashnik et al. 1990). Moreover, indiscriminate use of insecticides has led to environmental hazards (Mahmood et al. 2016). Therefore, this is necessary to search an alternative approach for the sustainable management of DBM.

Plants are important natural sources of bioactive compounds and many of them have been reported to possess insecticidal properties (Boulogne and Petit 2012; Isman 1995; Kraikrathok et al. 2013; Morallo-Rejesus 1986). These secondary

✉ Ashok Kumar Singh
singhak.du@gmail.com

[1] Insect Behaviour laboratory, Department of Zoology, University of Delhi, Delhi 110007, India

Published online: 29 August 2019