

EFFECTS OF CONSPECIFIC SEMIOCHEMICAL FOOTPRINTS ON FEEDING ATTRIBUTES AND DEVELOPMENT OF MEXICAN BEETLE, *ZYGOGRAMMA BICOLORATA* PALLISTER

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ABSTRACT : *Parthenium hysterophorus* is a toxic weed of agricultural farms and causes asthma, hay fever and allergies in humans. Amongst the known insect species for weed biocontrol, the Mexican beetle, *Zygogramma bicolorata* Pallister is the only cost effective biocontrol agent that suppresses the growth of the weed. In the present study, feeding attributes and development of immature stages of *Z. bicolorata* have been assessed in presence of conspecific semiochemical tracks of other co-existing members. Results revealed that the presence of conspecific semiochemical tracks on *P. hysterophorus* diminished the feeding attributes of *Z. bicolorata* larvae on the weed. Amongst all the larval instars, the fourth instars displayed the highest consumption rates and conversion efficiencies. Present findings therefore suggest that the presence of conspecific semiochemicals on *P. hysterophorus* impedes augmentative biological control of the weed by the larvae of *Z. bicolorata*. However, field based studies are still needed to validate the present findings.

Key words : Semiochemicals, *Parthenium hysterophorus*, *Zygogramma bicolorata*.

INTRODUCTION

Parthenium hysterophorus (Family: Asteraceae) is a toxic weed of agricultural farms. The weed is found abundantly in the Caribbean, North America, South America and major parts of Asia, Africa and Australia (Navie *et al*, 1996). The weed causes asthma, hay fever and allergies in humans (McFadyen, 1995; Das *et al*, 2007) and reduces the fertility of agricultural fields (Batish *et al*, 1997). Biological control of the weed was first initiated in Australia in 1977. Amongst the known exotic insect species that were introduced to Australia for the biological control trials, only the Mexican beetle, *Zygogramma bicolorata* Pallister (Coleoptera: Chrysomelidae) was found to be cost effective in suppressing the growth of the weed. Biological control trials for the management of *P. hysterophorus* using *Z. bicolorata* were initiated in India in 1983. The insect established readily after its releases in 1984 and became abundant within three years after its introduction resulting in significant reductions in *Parthenium* density in localized areas (Jayanth and Bali, 1994; Jayanth and Visalakshy, 1996).

Both the larvae and adults of the beetle feed voraciously on the aerial parts of the weed (Omkar and Afaq, 2011; Hasan *et al*, 2016a, b) and cause its destruction by excessive defoliation, and reduced seed and flower production (McConnachie, 2015; Chidawanyika *et al*, 2017). Host specificity tests have confirmed that *Z. bicolorata* is specialized to feed on *P. hysterophorus* rather than the cultivated crops. Thus, the largely host-specific nature of *Z. bicolorata* to exploit and detoxify weed alkaloids and toxins makes them the most promising biocontrol agent of *P. hysterophorus*.

Previous studies have demonstrated that the larvae and adults of coleopteran species have a tendency to deposit semiochemical tracks on the host plant as they walk (Magro *et al*, 2007, 2010; Mishra *et al*, 2012; Patel *et al*, 2019). These tracks are primarily composed of long-carbon chain alkanes and alkenes, and are dominated by methyl-branched and straight chain hydrocarbons (Hemptonne *et al*, 2001; Magro *et al*, 2007). The tracks deter the feeding stages of *Z. bicolorata* from defoliating the weed, thus impeding the weed biocontrol (Patel *et al*, 2019). Chemical analyses have shown that the tracks of different species vary greatly (Hemptonne *et al*, 2001; Michaud and Jyoti, 2007) and may act as signals for

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