UNIVERSITY OF MAURITIUS RESEARCH JOURNAL – Volume 15 – 2009
University of Mauritius, Réduit, Mauritius

Response of Males of *Maruca vitrata* Fabricius(Lepidoptera: Pyralidae) to Synthetic Lures in Mauritius

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Paper Accepted on 24 November 2009

ABSTRACT

Maruca vitrata Fabricius (Lepidoptera: Pyralidae) is a key pest of bean in Mauritius. Their larvae feed within flowers and pods and are thus well protected from insecticidal sprays. To achieve effective control, farmers spray their bean fields on a prophylactic basis. This has consequently led to undesirable problems that threaten safe bean production, sustainability, health and the environment. Action threshold based on pheromone-baited trap catches have been developed to rationalize insecticide use against *M. vitrata* in cowpea fields in Benin and Ghana.

The study aimed at testing the attractiveness of four promising pheromone lures to males of *M. vitrata* in Mauritius. The lures were formulated by Natural Resources Institute (NRI) and consisted of a major component (EE 10,12-16:Ald) alone or in combination with one or both of two minor components (EE 10,12-16:OH and E 10-16:Ald). Two of these lures are reported to be effective in Africa (one in Benin and Ghana and the other in Burkina Faso). The four lures were tested in three types of traps in treated and untreated bean plots in Mauritius.

Males of *M. vitrata* did not respond to any of the four NRI lures but were attracted to caged virgin females. This leads to postulate that the pheromone released by virgin females were not similar to any of the synthetic lures. Results tend to indicate that the *M. vitrata* in Mauritius can represent another geographically distinct population from those in Benin, Ghana and Burkina Faso.

KEYWORDS: *Maruca vitrata*, virgin female, synthetic lures, pheromone-baited traps

1. INTRODUCTION

Maruca vitrata Fabricius (Lepidoptera: Pyralidae) is a key pest of bean in Mauritius. Larval infestation is highest in flowers and pod damage can reach up to 57% in untreated fields (Unmole, 2007). The use of chemical insecticides has been the only method of control in the country. However, control failures with contact insecticides have been related to untimely application by farmers and the concealed habit of feeding of larvae in flowers and pods. During the last decade, there have been cases of insecticide poisoning and even the introduced larval parasitoids have almost disappeared (Unmole, 2008). Insecticides can only be judiciously used if their application is based on action thresholds.

To rationalize the use of insecticides in legume fields, two types of action thresholds have been developed. The first one is based on larval infestation on flowers (Afun *et al*., 1991) and the second one on adult moth captures by pheromone-baited traps (Downham, 2006). The former can not be easily adopted by farmers because it is labour-intensive and is based on destructive sampling of flowers (Okeyo-Owuor and Ochieng, 1981). The later, on the other hand, is a simple alternative to pest scouting for farmers to time application of control measures.

Pheromone-baited traps, as such, were developed after the studies of Okeyo Owuor and Agwaro (1982) who found that virgin *M. vitrata* females produced and released a sex pheromone to attract its conspecific males for mating. This led to the identification of the pheromone components and eventual formulation of a blend by Natural Resources Institute (NRI) (Adati and Tatsuki, 1999; Downham *et al*., 2003). Pheromone-baited traps are, at present being, used as a monitoring tool by farmers in Benin and Ghana (Downham, 2006). However, one major drawback is that the synthesized blend for Benin and Ghana is reported to be ineffective in other countries. Its inefficacy is related to the possible existence of geographically isolated strains of *M. vitrata* (Hassan, 2007)

This aim of this study was to test the attractiveness of four promising NRI blends (effective in Africa) to *M. vitrata* males in Mauritius.

2. MATERIALS AND METHODS

2.1 Source of synthetic pheromone

Four coded pheromone blends (A, B, C and D) were procured from NRI, United Kingdom and each of them contained 0.1 mg of the pheromone. They were impregnated in 2-cm white natural rubber septa at varying proportions of the pheromone components. They were (E,E)-10, 12-hexadecadienal (EE 10, 12-16: Ald) alone, or in combination with one or

both of the two minor components, (E,E)-10, 12-hexadecadienol (EE 10, 12-16:OH) and (E)-10-hexadecenal (E 10-16:Ald), both of which were present at a level of 5% relative to the EE 10,12-16:Ald. One of them (EE 10, 12-16: Ald with EE 10, 12-16: OH and E 10-16: Ald in the ratio of 100:5:5) was effective in Benin and Ghana and the second one (EE 10, 12-16: Ald) effective in Burkina Faso.

2.2 Source of traps

Two types of delta traps (one transparent from Plant Resource International (PRI), Wageningen, The Netherlands and another yellow from Pest Control India (PCI), Mumbai, India) and a locally prepared water trap were used to test the four lures. The PRI and PCI trap were 21 cm x 11 cm x 9 cm and 32.5 cm x 20.5 cm x 15 cm in size respectively. The former had one disposable sticky insert at the bottom whereas the latter had three. A 5-L plastic jerry can was converted into a water trap as per method described by Downham *et al.* (2004). The septum was suspended within the centre of delta and water traps with a bending wire. Water (300 mL) with one mL of soap solution (to reduce surface tension) was poured in the water trap to capture moths.

Before fixing of lures in PRI traps, each of them was wrapped with aluminum foil except the lower-most surface being left exposed. This minimized the adverse effect of direct sunlight on lures in the field. However, lures in PCI and water traps were not shielded. These traps, as per their structure, offered shade and protection to lures from direct sunlight.

2.3 Source of virgin females of *Maruca vitrata*

Pupae (n=25) from the laboratory colony were placed in individual plastic containers and emerging moths were sexed. Virgin females (one-day old) were transferred into 30-ml plastic containers (two/container) with their lateral sides cut open and fitted with cotton mesh cloth. They were fed on 10% sugar solution. One container with two virgins was fixed in a trap and exposed in each field.

2.4 Setting of pheromone-baited traps in bean fields

The four synthetic lures were tested in PRI traps (1^{st} trial), water traps (2^{nd} trial) and in PCI traps (3^{rd} trial). In the first trial, the four types of septa were fixed in individual PRI traps. A set of four pheromone-baited traps was placed in each of the three treated bean fields of farmers (each $\leq$ 0.1 ha) in the North of the island (major bean growing area) and in an untreated bean plot (10 m x 10 m) at Reduit Crop Research Station (CRS). They were set on wooden stakes at about one metre from ground level and five metres

from one another. Septa were renewed fortnightly over five weeks. A blank PRI trap (without pheromone septa) was set as control in each field.

The second trial was run in an untreated bean plot (10m x 10m) at Reduit CRS with water traps as per method described above. In the third trial, PCI traps with septa were placed in an untreated bean plot intercropped with maize and another untreated bean plot as per method described above. A trap with two caged virgin females (fed on 10% sucrose solution) was also placed in the two plots. Traps were examined daily and catches were collected and identified in laboratory.

3. RESULTS

Testing of pheromone blends in delta traps (PRI)

No males of *M. vitrata* were caught in any of the pheromone-baited traps (irrespective of trap type) and in unbaited ones. On the other hand, males were captured in the traps (Plate 1) baited with virgin females. These females lived up to 14 days in the field. Catches were recorded as from the second night after emergence until the fourth night after emergence. Highest catches were recorded on the third night after emergence (Fig 1).

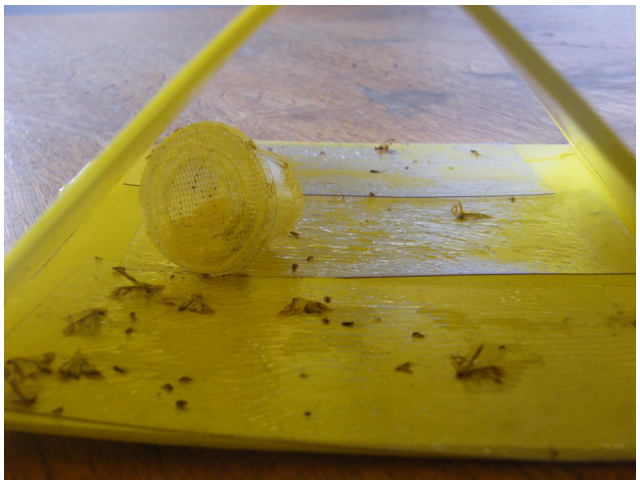

Plate 1. Males caught in PCI trap with caged virgin females

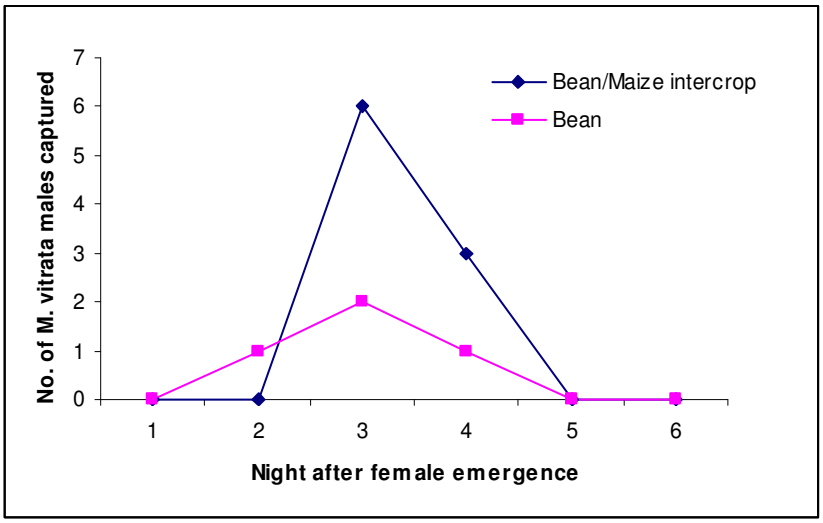

Fig 1. Number of males caught in PCI trap with caged virgin *M. vitrata* females

4. DISCUSSION

Males of *M. vitrata* population in Mauritius did not respond to the four NRI lures, two of which are reported to be attractive to male moths in Benin, Ghana and Burkina Faso. Such pheromone blend problem has been previously reported in other countries (India, Nigeria) and required modification to be effective (Hassan, 2007). The differential response to synthetic blends among *M. vitrata* population in Africa and Asia leads to presume that geographically separate populations can exist (Hassan, 2007). Such populations are referred as sympatric host-plant races by Srinivasan *et al*. (2007) and could have possibly developed as a result of differential host preference. *Maruca vitrata*, as such, prefers pigeon pea in India; cowpea in Africa and bean in Mauritius. This phenomenon has apparently occurred in another pyralid pest, *Ostrinia nubilalis* Hub. (Sorenson *et al*., 1992).

On the other hand, males were attracted to caged virgin females. This indicates that the pheromone released by virgin females were not similar to any of the synthetic lures.

5. ACKNOWLEDGEMENT

I wish to thank Dr D. Dumur, Director of AREU for providing funds for this research, to the Mauritius Research Council for partial funding my study and the staff of Entomology Division of AREU for their assistance during

research. I also extend my gratitude to Dr S. Ganeshan and Dr S. Facknath (Mrs), supervisors of project for their technical advice.

I am also grateful to Mr D. Abeeluck, Principal Research Scientist of Entomology Division, AREU for his support and assistance during research and in the preparation of this manuscript.

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