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OVIPOSITION BY *METAMASIUS HEMIPTERUS SERICEUS* (COLEOPTERA: DRYOPHTHORIDAE: RHYNCHOPHORINAE)

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ABSTRACT

Metamasius hemipterus sericeus (Olivier) is a widely distributed weevil in Central and South America, as well as the West Indies. It was introduced into Florida, Miami-Dade County, in 1984. This insect generally is regarded as a secondary pest of sugarcane, bananas, palms and several other tropical plants grown as ornamentals. Larvae bore into stems and petioles, thus weakening the plant and providing a pathway for penetration by fungi or other pests. In addition to investigating the biology, this study was conducted to gather basic information to help optimize culturing efforts for large numbers of *M. h. sericeus* to be used for mass rearing of potential biological control organisms. After pairing males and females, it took an average of 27.0 days for females to begin oviposition. The oviposition period lasted 56.8 days. Females lived 142.3 days and laid an average of 51.6 eggs. Mean generation time was 63 days. Mean egg production during the oviposition period was 1.1 eggs/day. Egg eclosion averaged 81.3% during the oviposition period.

Key Words: Dryophthoridae, Rhynchophorinae, silky cane weevil, fertility, fecundity

RESUMEN

El picudo rayado *Metamasius hemipterus sericeus* (L.) esta ampliamente distribuido en Centro y Suramerica, así como también en las Indias Occidentales. Fué introducido en el condado de Miami-Dade, Florida en 1984. Se le considera una plaga de segunda importancia en caña de azucar, banano, palmas y en varias plantas ornamentales tropicales. La larva perfora los tallos y peciolos, debilitando la planta y brindando un puerto de entrada a hongos y otras plagas. Ademas de investigar la biologia basica durante este estudio, hemos generado información con el fin de ayudar a la optimizacion de metodos de crianza masiva de *M. h. sericeus*. Las hembras comienzan a ovipositar en un promedio de 27 días despues de aparear con los machos. El periodo de oviposición dura 56.8 días. Las hembras viven 142.3 días y ovipositan un promedio de 51.6 huevos. El promedio de produccion diaria de huevos por hembra fué de 1.1. El porcentaje promedio de eclosión de huevos durante el período de oviposición fué de 81.3%.

Translation provided by author.

Metamasius hemipterus sericeus (Olivier), a weevil that is widely distributed in Central and South America, as well as the West Indies, was introduced into Florida and reported there for the first time in Miami-Dade County in 1984 (Woodruff & Baranowski 1985). Generally it is regarded as a secondary pest of sugarcane, bananas, palms and many other tropical plants grown as ornamentals. The larvae bore into stems and petioles, thus weakening the plant and providing a pathway for penetration by fungi or other pests.

According to the literature, *M. h. sericeus* adults live for 60 days and females lay 500 eggs (Castrillon & Herrera 1986). Females are attracted to and oviposit in damaged or stressed host tissues (Giblin-Davis et al. 1994). Eggs hatch in about 4 days and larvae begin to feed. In sugarcane, larvae feed in the pith, sometimes boring into healthy tissue. Larval tunneling in palms starts in the petioles, crown, or stem, usually in wounds, and extend into healthy tissue. After about 7 weeks, larvae construct a fibrous pupal case. After 10 days, pupae transform to adults, which may immediately break free of the cocoon, or may remain within the cocoon until conditions are favorable for emergence. The mean generation time is 63 days (Woodruff & Baranowski 1985). Adults of *M. h. sericeus* are free living, and often are found on or within banana pseudostems, palm fronds, sugarcane sheaths, and leaf litter.

Metamasius hemipterus sericeus poses a significant threat to the economic establishment of the

sugarcane cultivar 'CP-85-1382' (Sosa et al. 1997) and nursery grown palms. The expense of control with traditional insecticides or with biopesticides can increase production costs substantially. Biological control, however, offers the potential of long term, relatively inexpensive control of *M. h. sericeus*. A logical candidate for classical biological control of *M. h. sericeus* in Florida is *Lixophaga sphenophori* (Villeneuve), a tachinid parasitoid used to manage a sugarcane weevil species, *Rhabdoscelus obscurus* (Boisduval), in New Guinea (Waggy & Beardsley 1972) and Hawaii that is closely related to *M. h. sericeus*. Assuming *L. sphenophori* will parasitize *M. h. sericeus*, large numbers of host larvae need to be reared.

This study was conducted to gather basic information to help optimize culturing efforts for large numbers of *M. h. sericeus* to be used for mass-rearing *L. sphenophori* or other potential biological control organisms. In addition, we are studying the biology of this pest as part of a long-range objective leading to management.

Materials and Methods

Metamasius hemipterus sericeus adults were collected December 1998-March 1999 in Broward Co., FL using optimized pheromone bucket traps described by Giblin-Davis et al. (1996). As they became available, trapped weevils were placed in 68-l plastic storage tubs (usually 30 or more weevils were caged per tub). Each tub was provisioned with 3 kg of sugarcane stem cut into 0.2 m length pieces, and covered with screening to provide ventilation and prevent weevil escape. Tubs were left outdoors in a location sheltered from rainfall and sunlight. *Metamasius hemipterus sericeus* cocoons were periodically collected from sugarcane stem pieces and held in an incubator set at 27°C until adults emerged. Upon emergence, adults were sexed by the presence of tufts of hair on the apical segment of the abdomen (males) or the absence of these tufts (females) (Vaurie 1966). Males and females were paired and placed in 200 ml cups covered by lids with a 4.5 cm diam. hole covered by aluminum screen (14 mm opening). To prepare an ovipositional substrate, sugarcane stems were peeled and thinly sliced (1.4-1.8 mm thick). Preliminary observations demonstrated that eggs laid in thin slices could be removed easily and counted. Cane slices much thicker than this resulted in poor or inaccurate egg recovery. Cane slices (1 per oviposition cup) were placed over the screened cup opening and covered with a water-moistened piece of filter paper. Cups were inverted and placed outdoors [mean low 24.5 ± 1.4°C (SD); mean high 29.4 ± 1.5°C (SD); range 20-33°C] in a location protected from sunlight and rain. Cane slices were replaced daily, and old slices were dissected for eggs. Males were removed from oviposition cups the first day after eggs were found on cane slices. Eggs were carefully removed from the cane and individually placed in petri dishes (15 × 100 mm) lined with water-moistened filter paper. Individual confinement was determined to be necessary as a preventative measure against possible larval cannibalism. Petri dishes containing eggs were placed in an incubator set at 27°C and checked daily for eclosion. A total of 29 cups were monitored daily for oviposition, and for female longevity. Measurements were made on 14 eggs to determine dimensions.

Descriptive statistics (means, standard deviation and range) were calculated and used to help describe observed parameters. Linear regression was used to determine if eclosion changed through time.

Results and Discussion

Eggs are oblong and measure 1.31 mm (± 0.08 [SD]; range = 1.17-1.44 mm) in length and 0.44 mm (± 0.05 [SD]; range = 0.39-0.51 mm) in width. Twenty-two of the 29 weevils (76%) observed laid eggs. After pairing newly emerged males with females, it took an average of 27.0 d (± 11.3 [SD]; range = 7-95 days) for females to begin laying eggs. Of the females that laid eggs, the oviposition period lasted an average of 59.4 d (± 5.7 [SD]; range = 12-128 days). Females lived on average 142.3 d (± 7.8 [SD]; range = 40-204 days) and laid an average of 51.6 eggs (± 1.4 [SD]; range = 0-192 eggs). Mean egg production per female during the oviposition period was 1.1 eggs/day (± 0.02 [SD]; range = 0.08-3.3 eggs/days).

Fecundity observed in this study was considerably less than that reported by Castrillon & Herrera (1986) who observed up to 500 eggs laid per *M. h. sericeus* female. However, it is unclear how these data were collected. Observed fecundity between this work and that of Castrillon & Herrera (1986) may be due to differences in ovipositional substrates offered to weevils. For example, Giblin-Davis et al. (1989) using pineapple as an oviposition medium estimated fecundity of *R. cruentatus* to be substantially less than fecundity observed when weevils were allowed to oviposit in apples (Weissling & Giblin-Davis 1994). In preliminary experiments, *M. h. sericeus* females were offered many ovipositional substrates, including apple slices, banana stem, agar, and various arrangements of sugarcane chunks and slices. Resulting oviposition was poor and results were variable. However, females readily oviposited in thin sugarcane slices (1.4-1.8 mm thick) and the eggs were easy to locate and remove from the tissue.

Newly-emerged *M. h. sericeus* females laid few if any eggs during the first two-weeks of confinement with males. The greatest number of eggs were laid during the third through eleventh weeks, after which egg production generally declined (Fig. 1). There was a slight increase in oviposition 19

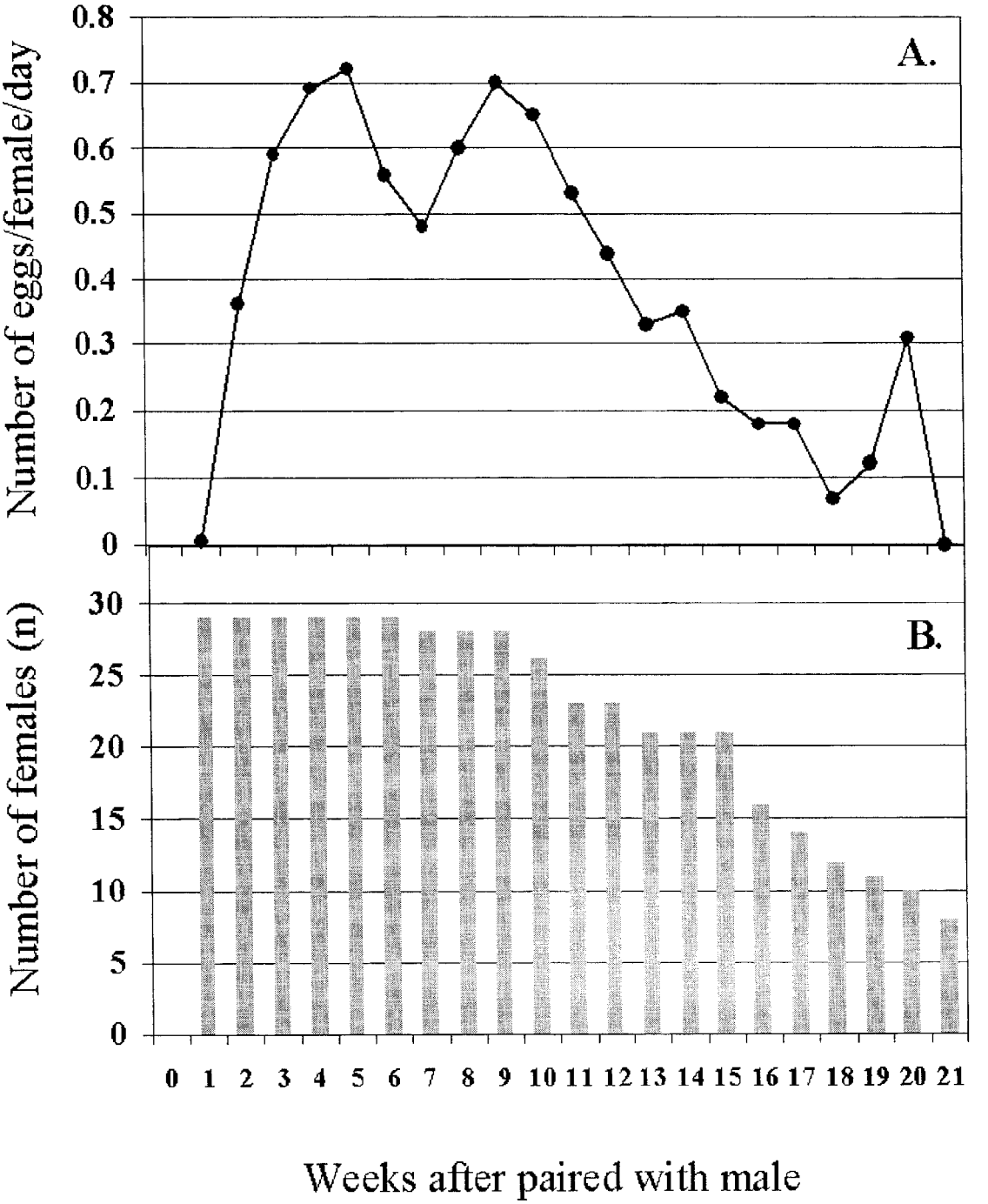

Fig. 1. Mean weekly egg production by *M. h. sericeus* females (A) and number of females observed (B) confined individually on sugarcane slices.

and 20 weeks after pairing. A similar trend in late-oviposition period productivity was observed with *R. cruentatus* (Weissling & Giblin-Davis 1994). Reasons are unclear for this observation.

Fertility of eggs laid by *M. h. sericeus* varied through time but remained at a fairly high level during the 15 weeks of observation (Fig. 2). Regression analysis over time revealed no clear

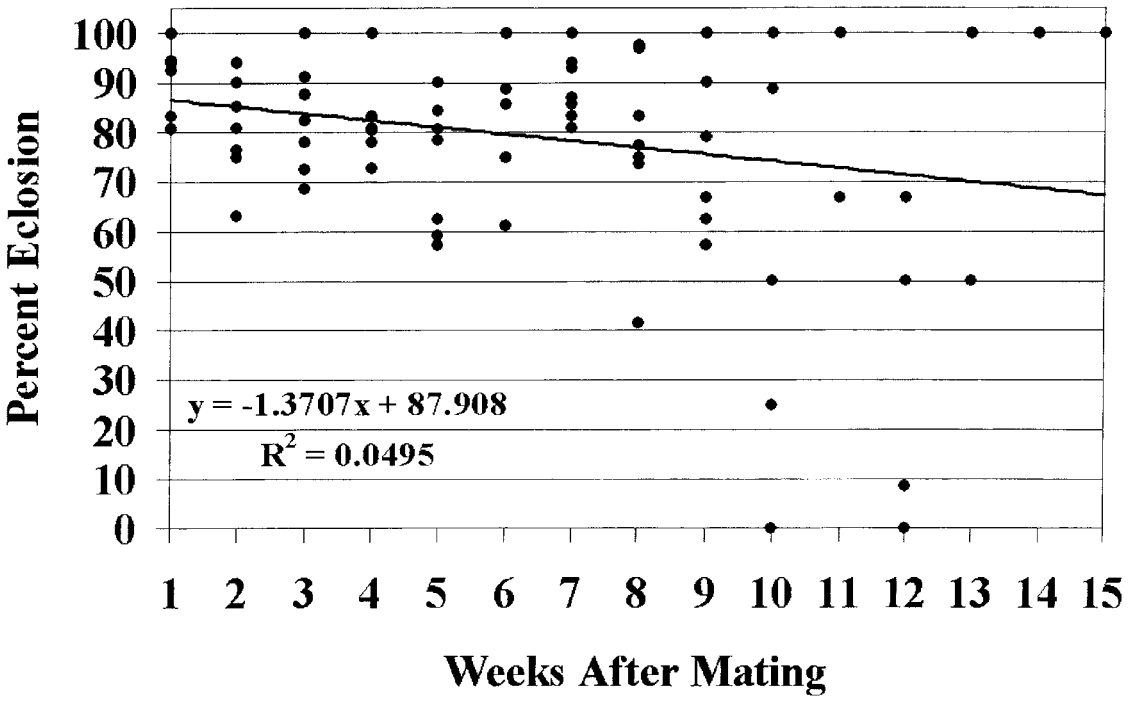

Fig. 2. Percent eclosion of eggs produced by *M. h. sericeus* females through time.

linear trend ($R^2 < 0.05$). Throughout the experimental period, eclosion averaged 81.3%. These results indicate that mating during the preoviposition period resulted in the transfer of adequate quantities of sperm to fertilize eggs without subsequent mating. In contrast, fertility of *R. cruentatus* eggs declined to zero 9 weeks after mating (Weissling and Giblin-Davis 1994).

The observed mean fecundity of *M. h. sericeus*, although lower than that reported by Castrillon & Herrera (1986), is at levels high enough to make mass rearing for the production of parasitoids feasible. Based on specifics of this study, weevil culture can be optimized by providing females with thin sugarcane slices for oviposition. These slices could then be transferred to large sugarcane pieces for larval feeding.

Acknowledgments

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