ABSTRACT

Bio-ecological studies on *Maconellicoccus hirsutus* (Green) and its exotic natural enemies, *Anagyrus kamali* (Moursi), *Cryptolaemus montrouzieri* (Mulsant) and *Scymnus coccivora* (Ayyar)

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Laboratory, semi-field and field evaluations were carried out on the pink hibiscus mealybug, *Maconellicoccus hirsutus* Green (Homoptera: Pseudococcidae), *Anagyrus kamali* Moursi (Hymenoptera: Encyrtidae), *Cryptolaemus montrouzieri* Mulsant (Coleoptera: Coccinellidae) and *Scymnus coccivora* Ayyar (Coleoptera: Coccinellidae). These studies were conducted with the objective of deriving data on biological parameters and interactions with host-host plant and natural enemies for a new pest and its introduced natural enemy complex.

Total life cycles of 22-25 days, 17-18 days, 31 days and 18 days were determined for *M. hirsutus*, *A. kamali*, *C. montrouzieri* and *S. coccivora* respectively, in the laboratory at 27.0 ± 3.0 °C and 58.0 ± 3.0% R.H. Lower threshold temperatures of 14.03 °C, 10.70 °C, 16.71 °C and 11.55 °C were derived for *M. hirsutus*, *A. kamali*, *C. montrouzieri* and *S. coccivora* respectively and equations of developmental rate with temperature were determined for each species.

Fecundity life tables were determined for each species and various life table parameters were also reported. The cohort generation times and net
reproductive rates for *M. hirsutus*, *A. kamali*, *C. montrouzieri* and *S. coccivora* were 34.91 and 18.45, 20.50 and 745.37, 42.92 and 286.93, and 36.74 and 220.02 respectively. The generation time of *A. kamali* was lowest (20 days) while that of *C. montrouzieri* was highest (40 days) in the host–natural enemy complexes investigated.

A field evaluation was conducted on *M. hirsutus* infested plants of *Hibiscus sabdariffa* L in a cage exclusion experiment with and without *A. kamali* and *C. montrouzieri*. This investigation demonstrated that a combination of *A. kamali* and *C. montrouzieri* exerted maximum control on both nymphal and adult stages of *M. hirsutus*. Highest yields of *H. sabdariffa* flowers and fruit in *M. hirsutus* infested treatments however, were obtained from *M. hirsutus* infested plants controlled solely by *A. kamali*.

An aggregation preference profile was developed in the laboratory for 24 plants affected by *M. hirsutus* in Trinidad. The most preferred plants were *H. rosa-sinensis* and *H. sabdariffa* while the *Citrus* spp. Were least preferred. Olfactory cues originating from infested plants as stimulus for host location was tested for both *A. kamali* and *C. montrouzieri* adults in an olfactometer. *A. kamali* females displayed the keenest olfactory senses and responded to semiochemicals emitted by uninfested parts of *M. hirsutus* infested plants. *C. montrouzieri* was tested as the representative coccinellid generalist predator and both sexes of adults unlike *A. kamali* were able to locate honeydew produced by *M. hirsutus*.

An evaluation of some of the common insecticides used for *M. hirsutus* control in Trinidad revealed that Fipronil® may be utilized under specific
conditions for general control of *M. hirsutus* in conjunction with *A. kamali*, *C. montrouzieri* and *S. coccivora*. A rhythm of hatch of *M. hirsutus* populations in the field over a three year period revealed a trend in crawler emergence. Crawlers emerged in the earlier part of the night during the early and late months of the year, while peak emergence occurred in the later part of the night and into the early morning during the middle months of the year.

Key words: *Maconellicoccus hirsutus*, *Anagyrus kamali*, *Cryptolaemus montrouzieri*, *Scymnus coccivora*, life tables, predator-prey interactions.