

NATURAL ENEMIES OF *BEMISIA TABACI*  
(HOMOPTERA: ALEYRODIDAE) IN CUBA

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The sweet potato whitefly, *Bemisia tabaci* (Guennadius), reached pest status in Cuba during the growing season of 1989-90, seriously damaging tomato, eggplant, squash, cucumber and other vegetable crops. Taxonomic status of the genus *Bemisia* in Cuba is currently under study. As the correct identity of the species damaging crops is yet to be determined, the name *B. tabaci* will be used in this note.

Several parasitoids (Aphelinidae, Platygasteridae, Encyrtidae), predators (Chrysopidae, Anthocoridae, Coccinellidae, Phytoseiidae, Stigmaeidae) and the entomopathogenic fungus *Paecilomyces farinosus* (Dickson & Fries) Brown & Smith have been reported as natural enemies of *B. tabaci* from different countries (Cock 1993). Polaszek et al. (1992) noted parasitoids collected from the Caribbean region, but there are no records of biological control agents of *B. tabaci* from Cuba.

Surveys for natural enemies were conducted in the most important agricultural areas located at the Western, Central and Eastern regions of Cuba, and on the Isle of Pines, from January to April 1990, 1991 and 1992. The climate in Cuba during this period is characterized by temperatures of 23-25°C, 80-85% relative humidity and less than 5 mm rainfall. Sampled plots (1 ha) were selected from eggplant, tomato, pepper, cabbage, squash, cucumber, and sweet potato fields not heavily sprayed with chemical insecticides, or only treated with *Bacillus thuringiensis* (Berl.). Samples consisted of one mature leaf, taken at random from each 50 plants on an X-shaped design, once in each growing season. A total of 5,000 leaves were collected from 100 fields every year. More than 10,000 whitefly nymphs per year were collected. All leaf parts with whiteflies were cleaned of other insects, cut and kept in vials until adult parasitoids emerged. Whiteflies were considered parasitized only when a parasitoid emerged from a nymph. When fungal parasites were found, only dead nymphs surrounded by mycelium were considered infected. The fungus was isolated, identified, and inoculated on healthy nymphs in the laboratory to corroborate its pathogenic effect. Immature predators (except spiders) were fed with whitefly larvae until development was completed. Material from the surveys was identified at the Institute of Plant Protection (Ministry of Agriculture) and the National Museum of Natural History (Academy of Sciences), Havana, Cuba.

Four parasitoids, an entomopathogenic fungus, one hyperparasitoid, and five predators were found (Table 1).

*Encarsia luteola* Howard, *E. nigricephala* Dozier and *E. quaintancei* Howard.—*E. luteola* and *E. quaintancei* were the parasitoids most frequently found in Cuba during the growing seasons of 1989-92. They were present on all seven crop species on which whiteflies were collected. Less abundant than the former two species, *E. nigricephala* was only found in the Western region of the country. According to Polaszek et al. (1992), *E. nigricephala*, *E. luteola* and *E. quaintancei* are well represented in the Caribbean Basin, but the three species had not been documented from Cuba before.

*Eretmocerus* sp. (Aphelinidae), and *Signiphora* sp. (Signiphoridae).—Parasitoids of the genus *Eretmocerus* are frequently associated with sweet potato whitefly (Polas-

TABLE 1. NATURAL ENEMIES OF *BEMISIA TABACI* IN CUBA, EFFECT ON THE HOST, AND DISTRIBUTION.

Natural Enemies	Parasitism or Predation	Distribution			
		Western	Central	Eastern	Isle of Pines
<i>Encarsia luteola</i> Howard	20-30%	X	X	X	X
<i>E. nigricephala</i> Dozier	15-20%	X			
<i>E. quaintancei</i> Howard	25-35%	X	X	X	X
<i>Eretmocerus</i> sp.	Not evaluated		X	X	
<i>Signiphora</i> sp.	Not evaluated	X	X		
<i>Paecilomyces fumosoroseus</i> (Wize)	70-80%	X			
<i>Theridula gonygaster</i> Simon	5-10 adults/web	X	X		
<i>Theridula</i> sp.	5-10 adults/web		X		
<i>Delphastus pallidus</i> LeC.	Not evaluated	X	X	X	X
<i>Chrysopa exterior</i> Navas	Not evaluated	X	X	X	X
<i>Cyrtopeltis varians</i> (Dist.)	Not evaluated		X	X	X

zek et al. 1992). Some species, such as *E. haldemani* Howard (Gerling 1967) or *E. mundus* Mercet (Kapadia & Puri 1990), are major constituents of the parasitoid complex of *B. tabaci* in different countries. In Cuba, *Eretmocerus* sp. was only found once, on peppers, in the Central and Eastern regions in 1991. *Signiphora* sp. is a hyperparasitoid and it was collected from samples taken from tomato, cabbage, squash, cucumber and sweet potato from the Western and Central agricultural areas of Cuba.

*Paecilomyces fumosoroseus* (Wize).—*P. fumosoroseus* is considered a potential biological control agent of the sweet potato whitefly (Osborne et al. 1990). First epizootics of *P. fumosoroseus* were found in April 1990 in the South Havana area after a period of heavy rain. The same situation was observed in 1991 and 1992 when the weather was very humid. Osborne et al. (1990) found over 90% mortality of fourth instar nymphs treated with the fungus in the laboratory. In Cuba, natural epizootics killed 70-80% of nymphs in the field. The fungus also appeared spontaneously on *B. tabaci* in some of the greenhouses in the Institute of Plant Protection in Havana.

*Theridula gonygaster* Simon and *Theridula* sp.—These spiders of the family Theridiidae build small webs on the lower surface of the leaves where they catch adults of the sweetpotato whitefly. They were observed very frequently in heavily infested cucumber, squash, sweet potato and tomato fields in the Western and Central regions of the country.

*Delphastus pallidus* LeC. (Coccinellidae), *Chrysopa exterior* Navas (*Chrysopidae*) and *Cyrtopeltis varians* (Dist.) (Miridae).—Despite their wide distribution in Cuba these predators were not frequently associated with *B. tabaci*. Immatures found on infested sweet potato and cucurbit leaves in the field completed their development in the laboratory when they were fed on sweetpotato whitefly larvae. In California, *D. pusillus* is under study for use in management programs for *B. tabaci* (Heinz et al. 1994).

In general, parasitoids and predators did not seem to have a strong effect as limiting factors of the sweet potato whitefly populations. Apparently crop species did not affect parasitism, but a greater diversity of natural enemies was found in cucurbits, tomato and sweet potato. The fungus *P. fumosoroseus* showed a high percentage of parasitism, but only during very humid periods, making it a good candidate for bio-control in greenhouses.

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#### SUMMARY

Surveys for natural enemies of the sweet potato whitefly, *Bemisia tabaci* (Guenn.), were conducted in Cuba from January to April 1990, 1991 and 1992. Four parasitoids (*Encarsia luteola* Howard, *E. nigricephala* Dozier, *E. quaintancei* Howard and *Eretmocerus* sp.), one hyperparasitoid (*Signiphora* sp.), an entomopathogenic fungus (*Paecilomyces fumosoroseus* (Wize)) and five predators (*Theridula gonygaster* Simon, *Theridula* sp. *Delphastus pallidus* LeC., *Chrysopa exterior* Navas, and *Cyrtopeltis varians* (Dist.)) were detected.

#### REFERENCES CITED

- COCK, J. M. 1993. (Ed.) *Bemisia tabaci*-an update 1986-1992 on the cotton whitefly with an annotated bibliography. International Institute of Biological Control., Ascot, Berks, UK. 78 pp.
- GERLING, D. 1967. Bionomics of the whitefly-parasite complex associated with cotton in Southern California (Homoptera:Aleurodidae; Hymenoptera:Aphelinidae). *Ann. Entomol. Soc. America* 60:1306-1321.
- HEINZ, K. M., J. R. BRAZZLE, C. H. PICKETT, E. T. NATWICK, J. M. NELSON, AND M. P. PARELLA. 1994. Predatory beetle may suppress silverleaf whitefly. *California Agric.* 48:35-40.
- KAPADIA, M. N., AND S. N. PURI. 1990. Development, relative proportions and emergence of *Encarsia transvena* (Timberlake) and *Eretmocerus mundus* Mercet, important parasitoids of *Bemisia tabaci* (Guennadius). *Entomol.* 15:235-239.
- OSBORNE, L. S., G. K. STOREY, C. W. MCCOY, AND J. F. WALTEW. 1990. Potential for controlling the sweet potato whitefly, *Bemisia tabaci*, with the fungus, *Paecilomyces fumosoroseus*. Proceedings and abstracts, Vth International Colloquium on Invertebrate Pathology and Microbial Control, Adelaide, Australia, 20-24 August 1990. Adelaide, Australia, pp. 386-390.
- POLASZEK, A., G. A. EVANS, AND F. D. BENNETT. 1992. *Encarsia* parasitoids of *Bemisia tabaci* (Hymenoptera:Aphelinidae, Homoptera: Aleyrodidae): a preliminary guide to identification. *Bull. Entomol. Res.* 82:375-392.