

NOTE

NATURAL ENEMIES OF COTTON WHITEFLY, *BEMISIA TABACI* (GENNADIUS) (HOMOPTERA: ALEYRODIDAE), IN FARS PROVINCE OF IRAN

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ABSTRACT

In a 1991-1993 study, 27 species of natural enemies were found attacking cotton whitefly, *Bemisia tabaci* (Gennadius) in Fars province of Iran. Among parasitoids, *Eretmocerus mundus* Mercet and *Encarsia lutea* (Masi) and among predators, *Coccinella undecimpunctata* (L.), *Hippodamia variegata* (Goeze), *Nabis palifer* Seidenstucker and *Chrysoperla carnea* (Stephens) were the most frequently found natural enemies of *B. tabaci* in cotton growing areas of Fars province. All species except *E. mundus* are reported as natural enemies of *B. tabaci* for the first time from Iran.

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دشمنان طبیعی مگس سفید پنبه (*Bemisia tabaci* (Gennadius)
(Homoptera : Aleyrodidae)، در استان فارس

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به ترتیب دانشجوی سابق کارشناسی ارشد حشره شناسی کشاورزی و دانشیار بخش گیاه پزشکی
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چکیده

مطالعه انجام شده بین سالهای ۱۳۷۰ تا ۱۳۷۲ مشخص کرد که ۲۷ گونه دشمن طبیعی به مگس سفید پنبه، (*Bemisia tabaci* (Gennadius)، در استان فارس حمله می کنند. از بین پارازیتوئیدها گونه های *Eretmocerus mundus* Mercet و *Encarsia lutea* (Masi) و از شکارچی ها گونه های *Coccinella undecimpunctata* (L.)، *Hippodamia variegata* (Goeze)، *Nabis palifer* Seidenstucker و *Chrysoperla carnea* (Stephens) فراوانترین دشمنان طبیعی *B. tabaci* در پنبه کاری های استان فارس بودند. تمام گونه ها بجز *E. mundus* برای اولین بار به عنوان دشمنان طبیعی *B. tabaci* از ایران گزارش می شوند.

INTRODUCTION

Cotton whitefly, *Bemisia tabaci* (Gennadius), ranks among the most destructive insects attacking cotton and a wide variety of subsistence crops around the world, especially throughout the tropics and subtropics (18). It is a major pest of cotton in Iran (2, 12, 20). Nymphs and adults feed on sap of more than 500 species of plants (10), reducing production directly by

consuming sap and secreting honeydew which contaminates cotton lint or fruit allowing subsequent development of sooty mold (3). *B. tabaci* is also vector of more than 19 plant viruses (6) which can lead to dramatic losses.

Major efforts are now under way, in many parts of the world, to locate appropriate biocontrol agents for controlling this pest (1, 9, 19). The development or improvement of non-chemical methods for whitefly control requires a thorough understanding of the relationship between the pest and its natural enemies.

The present work was carried out to determine the natural enemy complex of *B. tabaci* to develop a non-chemical control method in Fars province of Iran.

MATERIALS AND METHODS

Surveys for natural enemies of *B. tabaci* were conducted in cotton growing areas of Fars province from July 1991 to June 1993. Infested leaf samples were taken once a week from various localities and host plants, placed in polyethylene bags, and transferred to the laboratory in a cool container. Parasitized pupae were separately placed in small glass tubes (25 × 8 mm) covered with a piece of gauze. Glass tubes containing parasitized pupae were placed in a container and kept under laboratory conditions at $26 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ RH. The adult parasitoids were preserved in Kryger's solution after they died. The key presented by Hayat (14, 15) was used for identification.

Adult and immature stages of predators were collected from cotton whitefly infested fields. The immature stages were reared to adult under

laboratory conditions. All adult insects collected as predators were offered *B. tabaci* in the laboratory. Those which fed on the whitefly were considered as the predators.

RESULTS

Four primary endoparasitoids and 23 predators were recorded as natural enemies of *B. tabaci* in Fars province of Iran (Table 1). The maximum number of whitefly and its natural enemies were found at Bakhtagerd Research Station, Darab, 250 km south east of Shiraz, in an unsprayed cotton field. The parasitoids belonged to two genera, *Eretmocer* Haldeman and *Encarsia* Foerster, of the family Aphelinidae. Of the four parasitoid species *Eretmocer mundus* Mercet and *Encarsia lutea* (Masi) were widely distributed and were found on all plants infested with whitefly and gave a good control of the whitefly especially at the end of the growing season. The other two species, *Encarsia inaron* (Walker) and *Encarsia adrianae* Lopez-Avila occurred in Gelian (Fassa) only sporadically and in very low numbers on *B. tabaci* on cotton. *E. inaron* is a major parasitoid of ash whitefly, *Siphoninus phyllyreae* (Haliday) on *Fraxinus* spp. and *Aleyrodes singularis* Danzig on *Lactuca scariola* in many parts of Fars province (unpublished data). *B. tabaci* on *Euphorbia petiolata* was heavily parasitized only by

Table 1. Natural enemies of cotton whitefly, *Bemisia tabaci*, collected in Fars province (Iran).

PARASITOIDS

Aphelinidae

- Eretmocerus mundus* Mercet
- Encarsia lutea* (Masi)
- Encarsia adrianae* Lopez-Avila
- Encarsia inaron* (Walker)

PREDATORS

Coccinellidae

- Coccinella septempunctata* (L.)
- Coccinella undecimpunctata* (L.)
- Hippodamia variegata* (Goeze)
- Oenopia conglobata* (L.)
- Oenopia oncina* (Oliver)
- Chilocorus bipustulatus* (L.)
- Exochomus nigripennis* Er.
- Exochomus pubescens* Kuster
- Clitostethus arcuatus* (Rossi)
- Scymnus apetzi* Mulsant
- Scymnus flavicollis* Redtenbacher
- Scymnus levaillanti* Mulsant
- Scymnus rubromaculatus* (Goeze)
- Scymnus syriacus* Marseul
- Nephus bipunctatus* (Kugelann)

Nabidae

- Nabis palifer* Seidenstucker

Lygaeidae

- Geocoris megacephalus sculus* (Fieber)

Miridae

- Deraeocoris punctulatus* (Fallen)

Anthoridae

- Orius albidipennis* (Reuter)

Chrysopidae

- Chrysoperla carnea* (Stephen)
- Mallada flavifrons* (Brauer)

Thripidae

- Scolothrips* sp.

E. adrianae in Kazeroon (160 km west of Shiraz).

The most abundant cotton whitefly predators in the unsprayed cotton field included three coccinellids, *Coccinella septempunctata* (L.), *C. undecimpunctata* (L.), *Hippodamia variegata* (Goeze), one nabid, *Nabis palifer* Seidenstucker, and one chrysopid, *Chrysoperla carnea* (Stephens). The other cotton whitefly predators listed in Table 1 were not found in sufficient numbers to be considered important in the control of *B. tabaci* in Fars province.

DISCUSSION

Although a large number of parasitoids and predators have been reported attacking *B. tabaci* in other parts of the world (8, 9, 16, 18, 19, 22), natural enemy fauna in Iran was not fully known. In the present investigation 27 species of natural enemies, 4 parasitoids and 23 predators were collected from cotton growing areas of Fars province. Parasitoids *E. mundus* and *E. lutea* are the most important biocontrol agents of *B. tabaci* in Fars province.

Records of parasitoids of *B. tabaci* including these four species indentified by Lopez-Avila (16), was an update of the summary provided by Greathead and Bennett (11) until 1986. *Encarsia* was also recorded by Polaszek *et al.* (22). *Eretmoceris mudus* was recorded from Kenya, Malawi, Zimbabwe, Egypt, India, Jordan, Pakistan, Sudan, Syria, the former USSR (16), and Iran (20). *E. lutea* was reported from Israel, Italy, Pakistan and Sudan (16). Polaszek *et al.* (22) stated that *E. lutea* is a cosmopolitan species.

Eretmoceris mundus and *E. lutea* were active throughout the year on different host plants. The degree of parasitism was low in August and September and high in November and December. Although *E. mundus*

appeared to be more abundant than *E. lutea*, it is still difficult to assess its effectiveness upon host puparia because it competes for its host with *E. lutea*. A similar competition between *E. mundus* and *Encarsia* sp. and between *E. mundus* and *E. lutea* for parasitization of preimaginal stages of *B. tabaci* has been reported by Sharaf (24) and Gerling (7), respectively.

E. inaron (as *E. partenopea*), a parasitoid of *B. tabaci*, was recorded from Pakistan (19), Egypt (23), and Morocco (17). Although this species is very abundant on ash whitefly *S. phillyreae* on *Fraxinus* spp. and *Aleyrodes singularis* Danzig on *Lactuca scariola* in many parts of Fars province, we collected few specimens from *B. tabaci* in cotton growing areas of Fassa.

E. adrianae was recorded from *B. tabaci* on sweet potato in Japan and on *Lantana camara* in Pakistan (22). This species was rare on *B. tabaci* on cotton in Darab and Fassa, where *E. mundus* and *E. lutea* were abundant, but in Kazeroon, *B. tabaci* on *Euphorbia petiolata* was parasitized only by this species. None of these parasitoids, except *E. mundus* which was recorded from Gorgan (north of Iran) (20), have previously been recorded for Iran.

Thirty insect and mite species (10 coccinellids, 7 chrysopids, 1 anthocorid, 11 phytoseiids, and 1 stigmatid) have been reported as predators of *B. tabaci* (5). Gerling (9) completed the list of *B. tabaci* predators by adding four more species (one mirid, two empidids and one conipterygid). In our studies 23 species of predators were recorded. All of these predators except *C. septempunctata*, *Scymnus syriacus*, *O. albidipennis*, *M. flavifrons*, and *C. carnea* are new records as natural enemies of *B. tabaci*. *C. septempunctata* has been recorded from Pakistan (4), *C. carnea* from Israel, Pakistan and Sudan (1, 4, 21), *M. flavifrons* from Morocco (17), *Scymnus syriacus* from Egypt (13), and *O. albidipennis* from Sudan (1) as predators of *B. tabaci*.

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