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**SURVEY, INCIDENCE AND TAXONOMIC KEY FOR NATURAL  
 ENEMIES OF THE CABBAGE WHITEFLY, *ALEYRODES PROLETILLA*  
 (LINNAEUS) (HOMOPTERA: ALEYRODIDAE) IN EGYPT  
 BY**

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**ABSTRACT**

The cabbage whitefly, *Aleyrodes proletella* (Linnaeus) (Homoptera: Aleyrodidae) is an important pest of *Brassica* plants in Egypt. During 2004 –2006 a survey of *A. proletella* parasitoids and predators was conducted. The abundance of natural enemies of *A. proletella* was carried out from August, 2004 – July, 2006 on *Lawsonia alba*, *Brassica oleracea botrytis* (cabbage), *Brassica oleracea capitata* (cauliflower) and *Solanum nigrum* in five localities, namely, Behira, Giza, Minufiya, North Sinai (El-Arish) and Qalyubiya.

The following eight parasitoid and predator species of aphelinids, eulophids and coccinellids were recorded and collected from concerned specimen under investigation in Egypt. These are: seven parasitoids i.e., *Encarsia davidi* Viggiani and Mazzon, *Encarsia formosa* Gahan, *Encarsia inaron* (Walker), *Encarsia lutea* Masi, *Eretmocerus eremicus* Rose & Zolnerowich, *Eretmocerus mundus* (Mercet), *Euderomphale chelidonii* Erdős and one predator, *Clitostethus arcuatus* (Rossi).

Abundance of these parasitoid and predator species was evaluated. The results indicated that *E. mundus* was the most effective natural enemies of *A. proletella* with maximum parasitism rates of 61 and 55% during the first and the second year periods (2004-2005 and 2005-2006), respectively..

**INTRODUCTION**

*Aleyrodes proletella* (Linnaeus) (Homoptera: Aleyrodidae) has two common names; Brassica whitefly (Hill, 1994) and cabbage whitefly (Abd-Rabou, 1997a and Penrose, 2001). The cabbage whitefly was recorded in Egypt for the first time by El-Helaly *et al.* (1972b). This species attacks 37 host plants distributed in 27 countries all over the world (Mound and Halsely, 1978; De Barro and Carver 1997 and Nakahara and Hilburn, 1989). In Egypt, Ahmed (1997) and Abd-Rabou (2001a) tabulated *A. proletella* attacking 10 host plants in 4 locations. Morphological and biological studies studied by El-Helaly *et al.* (1972 a, b). Twelve species have been recorded as natural enemies of cabbage whitefly (Mound and Halsely, 1978). Many researchers discussed the effectiveness of

natural enemies in biological control of this species (Abd-Rabou, 2000; Carden, 1972; Hommes, 1983; Williams, 1991, 1995 and 1996).

Aim of this investigation is to survey and study the role of the natural enemies in controlling *A. proletella* in Egypt, beside presentation of a taxonomic key for the recorded parasitoids.

## MATERIALS AND METHODS

During 2004 –2006, a survey of *A. proletella* parasitoids and predators was conducted. Materials were also kept in a well-ventilated container until the emergence of any natural enemies. Identification of natural enemies was made by examining their mounted adults in Hoyer's medium and on card (Noyes, 1982).

A survey of natural enemies of *A. proletella* specially their abundance was carried out from August, 2004 – July, 2006 on *Lawsonia alba*, *Brassica oleracea botrytis* (Cabbage), *Brassica oleracea capitata* (Cauliflower) and *Solanum nigrum* in five localities, namely, Behira, Giza, Minufiya, North Sinai (El-Arish) and Qalyoubia.

Five locations heavily infested by second, third larval and pupal stages of *A. proletella* were selected to achieve investigations and were sampled monthly. During the study, no chemical control for the pest was performed on these plants.

Thirty leaves of the aforementioned each plant were collected and transferred to the laboratory. *A. proletella* eggs and first larval stages were eliminated, as well as any other insect species. The second, third larval and pupal stages of *A. proletella* were recorded per leaf. Each leaf was stored in well ventilated emergence glass tubes and monitored daily for parasitoids emergency. Percentages of parasitism were calculated according to Abd-Rabou, 1997b, while, the predators were examined and counted in the field.

## RESULTS AND DISCUSSION

### I. Survey and incidence

#### Parasitoids

Seven species of aphelinids and euphilids emerged from sampled material of *A. proletella*: 1. *Encarsia davidi* Viggiani and Mazzon, 2. *Encarsia formosa* Gahan, 3. *Encarsia inaron* (Walker), 4. *Encarsia lutea* Masi, 5. *Eretmocerus eremicus* Rose & Zolnerowich, 6. *Eretmocerus mundus* (Mercet), 7. *Euderomphale chelidonii* Erdős

#### 1. *Encarsia davidi* Viggiani and Mazzon

In Giza, *A. proletella* on *Lawsonia alba* was parasitized by this species recording numbers of 50 and 45 individuals during the first and second years, respectively. Abd-Rabou and Abou-Setta (1998) recorded this species on *Siphoninus phillyrae* in El-Arish with maximum parasitism rates of 8% in

August; and Abd-Rabou (1998e) recorded *E. davidi* on *B. tabaci* in El-Arish with average parasitism rate of 6%.

### **2. *Encarsia formosa* Gahan**

In Qalyoubia, *A. proletella* on cabbage was parasitized by this species where 47 and 97 individuals emerged during the first and second years of the study, respectively. This species was recorded for the first time in Egypt by Abd-Rabou (1998b). Abd-Rabou (1998f) introduced (from United Kingdom), reared and released about 30000 individuals from this species to control *B. argentifolii* (*Bemisia tabaci* Biotype B) on *Lantana camara* in Giza. Maximum parasitism rate reached 83%. The same author (1998g), also introduced (from Italy), reared and released about 23000 individuals from *E. formosa* on *T. ricini* (misidentification as *Trialeurodes vaporariorum*) and maximum parasitism rates reached 70%.

### **3. *Encarsia inaron* (Walker)**

In North Sinai (El-Arish), *A. proletella* on *Lawsonia alba* was parasitized by this species with average parasitism rates of 14.5 and 12% during the first and second years, respectively. Parasitism peaks were 41 and 39%, respectively (Figs 1&2). This species was recorded for the first time in Egypt by Priesner & Hosny (1940). Abd-Rabou (1998d) concluded that the parasitoid *E. inaron* has some potential for suppressing population of *S. phillyreae* on pomegranate. Thus to be successful in pomegranate orchards, the use of relatively selective pesticides is required. Later, Abd-Rabou (2001b) recorded two strains of *E. inaron* in Egypt and he reared, released and evaluated these strains on *P. granatum* and *Ricinus communis* in different localities in Egypt.

### **4. *Encarsia lutea* Masi**

In Behira, *A. proletella* on cauliflower was parasitized by this species with average parasitism rates of 7.3 and 9.4% during the first and second years of the study, respectively. Parasitism peaks were 20 and 23%, respectively (Figs 1&2). This species was recorded for the first time in Egypt by Abd-Rabou (1998b). This species attacks *B. argentifolii* with maximum parasitism rate of 24% (Abd-Rabou, 1998e); *A. marlattii* by 27.2% (Abd-Rabou, 1997b); *S. phillyreae* by 6% (Abd-Rabou and Abou-Setta, 1998); *Acaudaleyrodes rachipora* (23%) and *Parabemisia myricae* (22%) (Abd-Rabou, 1998a and 1999b).

### **5. *Eretmocerus eremicus* Rose & Zolnerowich**

In Minufiya, *A. proletella* on *L. alba* was parasitized by this species with average parasitism rates of 6.8 and 9.9% during the first year and second years, respectively. Parasitism peaks were 20 and 55%, respectively (Figs 1&2). This species was recorded for the first time in Egypt by Abd-Rabou (1998b). This parasitoid was introduced in Egypt from the Netherlands, mass reared and colonized to control *B. argentifolii* on three crops, eggplants, tomatoes and cucumbers. Maximum parasitism rates reached 60, 50 and 36% on these crops, respectively (Abd-Rabou 1999a).

### 6. *Eretmocerus mundus* (Mercet)

In Qalyoubia, *A. proletella* on cabbage was parasitized by this species with average parasitism rates of 28.8 and 25.3% during the first and second years, respectively. Parasitism peaks were 61 and 55%, respectively (Figs 1&2). This species was recorded for the first time in Egypt by El-Helaly *et al.*, (1972a). Abd-Rabou (1998e) recorded this species on *B. argentifolii* in El-Arish region with average parasitism rate of 17% and the same author (2000 and 2001b) manipulated this species from El-Arish emerged from *S. phillyreae* to different localities in Upper Egypt to control the same pest. Results indicated that *E. mundus* was recovered in all regions in Upper Egypt. Abd-Rabou (2003) compared the efficacy of indigenous and imported of *E.mundus*. He showed that the introduced strain of the parasitoid was relatively more effective than the indigenous one.

### 7. *Euderomphale chelidonii* Erdős

In Giza, *A. proletella* on *S. nigrum* showed small numbers of 23 and 80 during the first and second years, respectively. This species was firstly recorded in Egypt by Abd-Rabou (1998b).

## Predators

One coccinellid species, *Clitostethus arcuatus* (Rossi) was recorded in association with *A. proletella* from Egypt.

### 8. *Clitostethus arcuatus* (Rossi)

#### Diagnosis:

Small pubescent species, less than 2 mm long. Antennae short, at most about two-thirds as long as head width. Legs generally and tibiae especially slender, simple, not angulated externally. Abdomen with six visible sternites. Prosternum very short in front of anterior coxae so that mouthparts capable or nearly capable of touching anterior coxae when head in repose. Postcoxal plates on first visible abdominal sternite not complete. Tarsi trimerous or pseudotrimerous. Antennae relatively longer, from half to two-thirds head width and with basal two segments smaller, accounting for one-third or less of antennal length

#### Role in the biological control:

In Giza *A. proletella* on *S. nigrum* was associated by *C. arcuatus* with average numbers of 1.5 and 11.2 individuals /30 leaves during the first and second years (, respectively. Peak numbers were 33 and 26 individuals/ 30 leaves, respectively (Fig.3). In the Mediterranean, *C. arcuatus* plays an important role as predators of the whiteflies, *A. proletella*, *Dialeurodes citri* (Ashmead), *S. phillyreae* in France, Italy, USA (California: introduced), and of *Trialeurodes ricini* (Misra). This coccinellid beetle was used for the control of ash whitefly in California (Bellows *et al.* 1990). Metwally *et al.* 1999.) studied the effective role of this predator on *D. citri* in Egypt. The effective role of *C. arcuatus* on different species of whiteflies including *S. phillyreae* was observed by Bellows *et al.* 1991 and 1992; Agreyan, 1977; Liotta, 1981 and Loi, 1978.

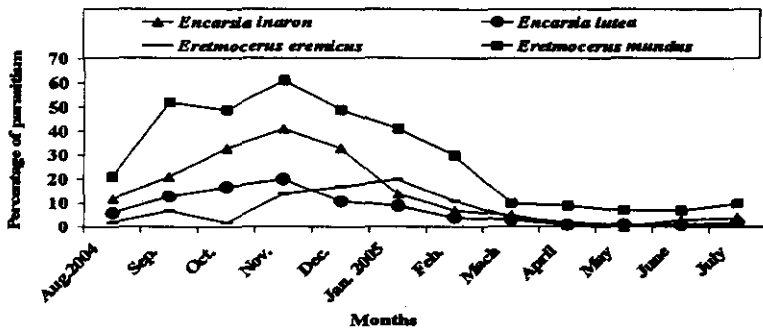


Fig. (1): Percentage of parasitism by different parasitoids attacking *Aleyrodes proletella* in different localities in Egypt during 2004-2005

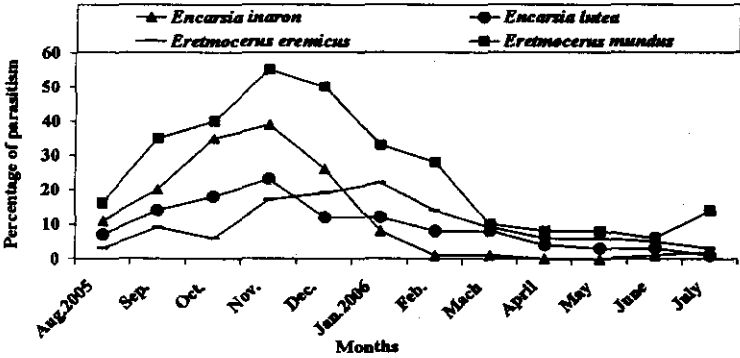


Fig. (2): Percentage of parasitism by different parasitoids attacking *Aleyrodes proletella* in different localities in Egypt during 2005-2006

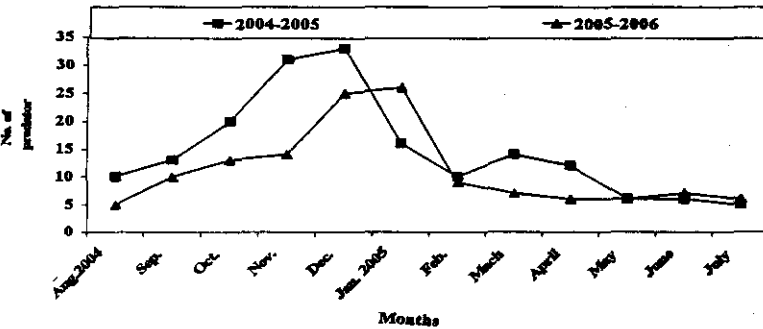


Fig. (3): Number of the predator, *Clioctethus arcuatus* / 30 leaves attacking *Aleyrodes proletella* in Giza during the period of study (2004-2005 and 2005-2006

**Key to the species of parasitoids attacking *Aleyrodes proletella*  
(Modified after Abd-Rabou, 1998 c and 2001a)**

- 1.- Gaster sessile, i.e. its base almost as broad as the propodeum; the petiole, if present, very difficult to see; postendophragma extending at least slightly, usually forward, into the gaster; postmarginal vein absent or rudimentary; stigmal vein usually forming a very acute angle with the costal edge of the wing; body nonmetallic, black, or partly to entirely yellow or brown, scutellum without submedian impressed longitudinal lines..... Aphelinidae..... 2
- Gaster distinctly constricted at its junction with the propodeum, and a petiole always present very through sometimes strongly transverse; postendophragma not extending into the gaster; postmarginal vein present; stigmal vein forming an angle of not less than about 35° with the costal edge of the wing; body most often at least partly metallic, if nonmetallic, then the scutellum usually with a pair of impressed submedian longitudinal lines Length body less than 1 mm; first funicular segment shorter than second funicular segment; length of fore wing 0.8-1.0 mm Postmarginal vein present, length of marginal fringe at least 20% of the greatest width of the wing ..... *Euderomphale chelidonii* Erdos
2. Antenna 5-segmented, with one elongated club segment; trasi 4-segmented; forewing with slightly curved asetose stripe (sepiculum); male antenna 3-segmented..... *Eretmocerus* Haldeman..... 3
- Antenna 8-segmented, all trasi 5-segmented; or only mid tarsi 4-segmented; fore wing with uniformly setose; male antenna 8 or 7-segmented..... *Encarsia* Foerster..... 4
3. First funicle segment quadrate second funicle segment longer than wide. Female antennal club 8 times as long as wide. Mesoscutum with 6 setae. Marginal vein longer than stigmal vein, submarginal vein with 3 setae, marginal fringe 1/3 width of disc. Tibial spur of middle leg twice as long as basitarsus. Male antennal club 7.5 times as long as wide..... *Eretmocerus mundus* (Mercet)
- First funicle segment different, Marginal vein longer than stigmal vein; Female antennal club 6.8 times as long as wide, mesoscutum with 6 setae; pedicel 2.4-3.1 times as long as wide and 0.3-0.39 times as long as club ..... *Eretmocerus eremicus* Rose & Zolnerowich
4. Antennal club 3-segmented..... 5
- Antennal club 2-segmented..... 6
5. Head and thorax light-lemon yellow, gaster pale-brown. Female with antennal club 3-5 segmented, first 2 funicular segments longer than wide (each about, one 2-2.5 times as long as wide. Gaster with distinctly pale, unpigmented areas. Third valvulae dark, in contrast to the remainder of the ovipositor, shorter, not more than 0.35X as long as the ovipositor and usually less. Male antenna with strongly developed sensorial complex on funicular segments ..... *Encarsia lutea* (Masi)

- Head and thorax light-lemon yellow, gaster brown. Gaster with distinctly pale, unpigmented areas, third valvulae dark and elongate. Gonostyli short, about 3/4-4/5 of the inner plate length; first 2 funicular segments square or wider than long each about 1-2/3 times as long as wide); mid-tibial subequal to basitarsus. Third valvulae approximately 0.40x as long as the ovipositor .....*Encarsia davidi* Viggiani
- 6. Head and thorax largely brown or black, gaster largely yellow. Female with antennal club 2-5segmented. Mesoscutum with 24 setae. Mid tarsi 4-segmented. Tarsal formula 5-4-5. Tibial supr of middle leg about 1/2 as long as the corresponding basitarsus. Each axilla with at least 6 reticulated cells longitudinally. Male antenna 7-segmented. Fourth and fifth funicular segments of male antenna separate... ..*Encarsia formosa* Gahan
- Head, thorax and gaster brown to black. Female with antennal club 2-segmented. Mesoscutum 12 setae. Mid tarsi 5-segmented. Stigmal vein of fore wing without an evident a setose area proximally. At least one small seta proximal to the stigmal vein. F1 with at least one longitudinal sensillum. Male antenna 8-segmented. Fifth and sixth funicular segments of male antenna separate... ..*Encarsia inaron* (Walker)

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الحصر والتأثير التواجدي والمفتاح التصنيفي للأعداء الحيوية  
علي ذبابة الكرنب البيضاء في مصر

شعبان عبد ربه ونها أحمد

مركز البحوث الزراعية-معهد بحوث وقاية النباتات- الدقي - جيزة

تعتبر ذبابة الكرنب البيضاء من أهم الآفات التي تصيب الكرنب في مصر .  
وأثناء الفترة من ٢٠٠٤-٢٠٠٦ تم عمل حصر للطفيليات والمفترسات التي تتطفل  
وتفترس هذه الآفة في مصر. تم أيضا عمل دراسة موسمية لهذه الطفيليات والمفترسات  
في خمس محافظات وهم البحيرة والمنوفية وشمال سيناء (العريش) والقليوبية والجيزة

على نباتات الكرنب والقنبيط وعنب الديب . ومن نتائج الحصر تم تسجيل ٨ من الطفيليات والمفترسات مصاحبة لهذه الآفة في مصر وهي الطفيليات : *Encarsia davidi* Viggiani and Mazzon, *Encarsia formosa* Gahan, *Encarsia inaron* (Walker), *Encarsia lutea* Masi, *Eretmocerus eremicus* Rose & Zolnerowich, *Eretmocerus mundus* (Mercet), *Euderomphale chelidonii* Erdős , *Clitostethus arcuatus* (Rossi) وهو : ١ مفترس وهو :  
 وقد اتضح أيضا من هذه الدراسة أن الطفيل *E. mundus* يعتبر من أهم الطفيليات التي تتطفل على هذه الآفة في مصر وحقيقت أعلى نسبة تطفل ٦١ و ٥٥ % خلال عامي الدراسة على الترتيب لهذا الطفيل.