

## PARASITIDS ATTACK MEALYBUGS (HOMPTERA: COCCOIDEA : PSEUDOCOCCIDAE) IN EGYPT

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### Abstract

Twenty six hymenopterus parasitoid species (Hymenoptera : Aphelinidae, Encyrtidae, Platygastridae, Signiphoridae) attack twenty mealybug species (Homoptera : Coccoidea : Pseudococcidae) are recorded in Egypt. The other twenty-five recorded mealybug species in Egypt have no records of parasitoids. Keys to these parasitoids were structured for each species of mealybugs. Identification was based on the taxonomic characters of the adult female. Detailed figures were constructed for some key characters. List of eighteen parasitoids and eight hyperparasitoids of Egyptian mealybugs are given.

### INTRODUCTION

Mealybugs comprise some of the worst pests of fruit and shade trees in many parts of the world especially in tropical and subtropical countries.

Parasitoids play a good role in controlling mealybug species. This statement agree with findings of Noyes & Hayat (1994), Mc Fadyen (1979), Katsoyannos (1993) and Lohr *et al.* (1990), Priesner & Hosny (1940), Moursi (1948 a,b,c), Compere (1938), Atia (1997) and Abd-Rabou (2000 a, b), whom recorded nine parasitoids associated with mealybugs in Egypt.

This work stresses on hymenopterus parasitoids attacking mealybugs in Egypt. Identification of collected species during the last three years associated with mealybugs as well as keys of the parasitoids of each species of mealybugs are given.

### LIST OF MEALYBUGS IN EGYPT AND THEIR PARASITIDS

1. **Amonostherium arabicum Ezzat:** One encyrtid parasitoid was collected from samples of *A. arabicum*. This species is *Acerophagus* sp.
2. **Antonina graminis (Maskell):** Six species of signiphorids and encyrtids were recorded and collected from concerned specimen under investigation. These are: *Acerophagus* sp., *Anagyrus shahidi* Hayat, *A. pseudococci* (Girault), *Chartocerus sub-*

*aeneus* (Foerster), *Cheiloneurus* sp. and *Prochiloneurus* sp.

#### KEY TO SPECIES OF PARASITIDS OF *A. GRAMINIS*

1. Funicle present .....*Encyrtidae* .....2  
 - Funicle absent, but with 1-4 anelli; forewing 3 times as long as wide, longest marginal cilia 1/2-2/3 width of disc, submarginal vein with 2 setae.....  
 .....*Chartocerus subaeneus* (Foerster) (Fig. 9)  
 2(1). Funicle 5-segmented.....*Acerophagus* sp. (Fig. 1)  
 - Funicle at least 6-segmented.....3  
 3(2). Forewing shortened, clearly not reaching apex of gaster.....  
 .....*Cheloneurus* sp. (Fig. 10)  
 - Forewing normal, at least very nearly reaching apex of gaster .....4  
 4(3). Forewing without hyaline fasciae distad of apex of venation.....  
 .....*Prochiloneurus* sp. (Fig. 25)  
 - Forewing more or less generally suffused pale fuscous or with only longitudinal infuscate streaks adjacent to venation or with a pattern of dark and pale setae.....5  
 5(4). Frontoververtex less than one-third head width.....  
 .....*Anagyrus pseudococci* (Girault) (Fig. 5)  
 - Frontoververtex about half head width .....*Anagyrus shahidi* Hayat (Fig. 7)

3. *Antonina natalensis* Brain: No parasitoids were collected from this species.

4. *Brevennia rehi* (Lindinger): Two species of encyrtids were collected and recorded from concerned specimen under investigation. These are: *Rhopus nigriclavus* (Girault) and *Cheiloneurus* sp.

#### KEY TO SPECIES OF PARASITIDS OF *B. REHI*

1. Hypopygium reaching apex of gaster at least four-fifths along gaster, clava not longer than funicle .....*Rhopus nigriclavus* (Girault) (Fig. 26)  
 - Hypopygium reaching apex of gaster not more than two-thirds .....*Cheiloneurus* sp.  
 5. *Chorizococcus halli* Mckenzie & Williams: One encyrtid parasitoid was collected from samples of *C. halli*. This species is *Leptomastix* sp.  
 6. *Crisicoccus delotti* Ezzat: No parasitoids were collected from this species.

7. *Crisicoccus mangrovicus* Ben-Dov: No parasitoids were collected from this species.

8. *Dysmicoccus boninsis* (Kuwana): Two species of encyrtids were collected from concerned specimen under investigation. These are: *Rhopus nigriclavus* (Girault) and *Anagyrus* sp.

#### KEY TO SPECIES OF PARASITIDS OF *D. BONINSIS*

1. Scape normally from 2-3 times as long as broad, lineal calva interrupted.....*Anagyrus* sp.
- Scape normally 5 times as long as broad, lineal calva not interrupted, clava not longer than funicle..... *Rhopus nigriclavus* (Girault)

9. *Dysmicoccus brevipes* (Cockerell): Four species of signiphorids, and encyrtids were collected and recorded from concerned specimen under investigations. These are: *Anagyrus pseudococci* (Girault), *Leptomastidae abnormis* (Girault), *Leptomastix dactylopii* Howard and *Chartocerus subaeneus* (Foerster).

#### KEY TO SPECIES OF PARASITIDS OF *D. BREVIPES*

1. Funicle present .....*Encyrtidae* .....2
- Funicle absent, but with 1-4 anelli; forewing 3 times as long as wide, longest marginal cilia 1/2-2/3 width of disc, submarginal vein with 2 setae.....  
.....*Chartocerus subaeneus* (Foerster)
- 2(1). Scape normally from 2-3 times as long as broad, lineal calva interrupted, fronto-vertex less than one-third head width.....*Anagyrus pseudococci* (Girault)
- Scape normally 5 times as long as broad, lineal calva not interrupted.....3
- 3(2). First funicle segment not longer than pedicel, marginal vein is shorter than the stigmal.....*Leptomastidae abnormis* (Girault) (Figs, 18-19)
- First funicle segment at least 1.5 times as long as pedicel, forewing not more than about 2.5 times as long as broad.....  
.....*Leptomastix dactylopii* Howard (Figs, 16-17)

10. *Dysmicoccus trispinosus* (Hall): No parasitoids were collected from this species.

11. *Erimococcus limoniastris* (Priesner & Hosny): No parasitoids were collected from this species.

12. *Euripersia artemisiae* (Hall): No parasitoids were collected from this species.
13. *Ferrisia virgata* (Cockerell): Nine species of encyrtids were collected and recorded from concerned specimen under investigations. These are: *Acerophagus* sp., *Anagyrus kamali* Moursi, *Blepyrus insularis* (Cameron), *Gyranusoidea indica* Shafee, Alam and Agarwal, *Homalotylus vicinus* Silvestri, *Leptomastidae abnormis* (Girault), *Leptomastix dactylopii* Howard, *Prochiloneurus aegyptiacus* (Mercet) and *Chartocerus subaeneus* (Foerster).

#### KEY TO SPECIES OF PARASITIDS OF *F. VIRGATA*

1. Funicle present .....*Encyrtidae* .....2
- Funicle absent, but with 1-4 anelli; forewing 3 times as long as wide, longest marginal cilia 1/2-2/3 width of disc, submarginal vein with 2 setae .....  
.....*Chartocerus subaeneus* (Foerster)
- 2(1). Funicle 5-segment.....*Acerophagus* sp.
- Funicle at least 6-segmented.....3
- 3(2). Forewing shortened, clearly not reaching apex of gaster .....*Cheiloneurus* sp.
- Forewing normal, at least very nearly reaching apex of gaster .....4
- 4(3). Scutellum without a distinct tuft or bundle of setae or scale like setae.....5
- Scutellum with a group of coarse, long dark setae arranged in a more or less compact tuft or bundle or with two or more scale like setae, marginal vein at least nearly as long as stigmal vein .....*Prochiloneurus aegyptiacus* (Mercet)
- 5(4). First funicle segment not longer than broad .....  
.....*Blepyrus insularis* (Cameron) (Fig. 8)
- First funicle segment longer than broad.....6
- 6(5). Notaular lines present. Funicle 7-segmented .....  
.....*Homalotylus vicinus* Silvestri (Figs, 14-15)
- Notaular lines absent.....7
- 7(6). Scape more than 3 times as long as broad, forewing not more than about 2.5 times as long as broad.....*Leptomastix dactylopii* (Howard)
- Scape not more than 3 times as long as broad.....8
- 8(7). Forewing with one or two distinct fuscus bands, marginal vein shorter than the stigmal.....*Leptomastidae abnormis* (Girault)
- Forewing with infuscation limited to longitudinal streaks adjacent to venations.....9
- 9(8). Forewing with postmarginal vein at least a little longer than stigmal vein, marginal vein distinctly longer than stigmal vein .....

- .....*Gyranusoidea indica* Shafee, Alam and Agarwal (Figs, 12-13)
- Forewing with postmarginal vein not longer than stigmal vein, first funicle segment dark brown, remainder of flagellum brown.....
- .....*Anagyrus kamali* Moursi (Fig. 4)
14. *Greenoripersia kaiseri* Bodenheimer: No parasitoids were collected from this species.
15. *Heliococcus osborni* (Sanders): No parasitoids were collected from this species.
16. *Heterococcus cyperi* (Hall): No parasitoids were collected from this species.
17. *Humococcus machenziei* Ezzat: No parasitoids were collected from this species.
18. *Kirishenkella sacchari* (Green): Two species of encyrtids were collected and recorded from concerned specimen under investigation. These are: *Rhopus nigriclavus* (Girault) and *Anagyrus saccharicola* Timberlake.

#### KEY TO SPECIES OF PARASITIDS OF *K. SACCHARI*

- 2(1). Scape normally from 2-3 times as long as broad, lineae calvae interrupted, stigmal vein about as long as marginal vein .....
- .....*Anagyrus saccharicola* Timberlake (Fig. 6)
- Scape normally 5 times as long as broad, lineae calvae not interrupted, clava not longer than funicle.....*Rhopus nigriclavus* (Girault)
19. *Maconellicoccus hirsutus* (Green): Twelve species of aphelinids, encyrtids, signiphorids and platygastriids were collected and recorded from concerned specimen under investigation. These are: *Allotropa* sp., *Anagyrus greeni* (Howard), *A. kamali* Moursi, *A. pseudococci* (Girault), *Gyranusoidea indica* Shafee, Alam and Agarwal, *Homalotylus vicinus* Silvestri, *Leptomastix nigrocoxalis* Compere, *Rhopus nigriclavus* (Girault), *Chartocerus subaeneus* (Foerster), *Marietta leopardina* Motschulsky, *Prochiloneurus annulatus* (Ferriere) and *Prochiloneurus avanicus* (Ferriere).

#### KEY TO SPECIES OF PARASITIDS OF *M. HIRSUTUS*

1. Pronotum quadrate, not reaching tegulae; antennae usually elbowed, number of antennal segments, forewing with five or fewer cells .....Chalcidoidea.....2

- Pronotum triangular in a lateral view, reaching tegulae; antennae elbowed or filiform, number of antennal segments (7-15); forewings with five or fewer closed cells, submarginal vein without setae.....*Allotropa* sp. (Fig. 27)
- 2(1). Funicle present .....3
- Funicle absent, but with 1-4 anelli; forewing 3 times as long as wide, longest marginal cilia 1/2-2/3 width of disc, submarginal vein with 2 setae .....*Chartocerus subaeneus* (Foerster)
- 3(2). Mesopleuron large and without a femoral groove.....4
- Mesopleuron impressed and with a femoral groove, antennal scape slender, or moderately flattened, not less than twice as long as wide .....*Marietta leopardina* Motschulsky (Fig. 23)
- 4(3). Forewing shortened, clearly not reaching apex of gaster .....5
- Forewing normal, at least very nearly reaching apex of gaster; Hypopygium reaching or very nearly reaching apex of gaster; scape normally 5 times as long as broad; linea calva not interrupted and clava not longer than funicle.....*Rhopus nigriclavus* (Girault)
- 5(4). Scutellum without a distinct tuft or bundle of setae or scale like setae.....7
- Scutellum with a group of coarse, long dark setae, arranged in a more or less compact tuft or bundle or with two or more scale like setae, marginal vein at least nearly as long as stigmal vein.....6
- 7(5). Notaular lines present. Funicle 7-segmented.....*Homalotylus vicinus* Silvestri
- Notaular lines absent.....8
- 8(7). Scape more than 3 times as long as broad, forewing with linea calva interrupted by at least five setae .....*Leptomastix nigrocoxalis* Compere (Figs. 20-21)
- Scape not more than 3 times as long as broad.....9
- 9(8). Forewing with one or two distinct fuscous bands, marginal vein shorter than the stigmal.....*Leptomastidae abnormis* (Girault)
- Forewing with infuscation limited to longitudinal streaks adjacent to venations ....
- .....10
- 10(9). Forewing with postmarginal vein at least a little longer than stigmal vein, marginal vein distinctly longer than stigmal vein.....*Gyranusoidea indica* Shafee, Alam and Agarwal
- Forewing with postmarginal vein not longer than stigmal vein.....11
- 11(10) First funicle segment dark brown, remainder of flagellum brown.....*Anagyrus kamali* Moursi
- First funicle segment brown or dark brown, remainder of flagellum white.....12
- 12(11) Gaster longer than thorax.....*Anagyrus greeni* (Howard) (Fig. 3)

- Gaster about as long as thorax, second funicle segment white .....  
.....*Anagyryus pseudococci* (Giarult)
- 20. *Mirococcus inermis* (Hall):** No parasitoids were collected from this species.
- 21. *Misericoccus imperatae* (Hall):** No parasitoids were collected from this species.
- 22. *Naiacoccus minor* Green:** No parasitoids were collected from this species.
- 23. *Nipaecoccus nipae* (Maskell):** No parasitoids were collected from this species.
- 24. *Nipaecoccus viridis* (Newstaed):** Eight species of aphelinids, encyrtids and signiphorids were collected and recorded from concerned specimen under investigation. These are: *Acerophagus* sp., *Anagyryus aegyptiacus* Moursi, *Anagyryus pseudococci* (Giarult), *Leptomastix flava* Mercet, *L. nigrocoxalis* Compere, *Chartocerus subaeneus* (Foerster), *Marietta leopardina* Motschulsky and *Prochiloneurus* sp.

#### KEY TO SPECIES OF PARASITIDS OF *N. VIRIDIS*

- 1. Funicle present .....2
- Funicle absent, but with 1-4 anelli; forewing 3 times as long as wide, longest marginal cilia 1/2-2/3 width of disc, submarginal vein with 2 setae .....  
.....*Chartocerus subaeneus* (Foerster)
- 2(1). Mesopleuron large and without a femoral groove.....3
- Mesopleuron impressed and with a femoral groove, antennal scape slender, or moderately flattened, not less than twice as long as wide .....  
.....*Marietta leopardina* Motschulsky
- 3(2). Funicle 5-segmented.....*Acerophagus* sp.
- Funicle at least 6-segmented.....4
- 4(3). Scutellum without a distinct tuft or bundle of setae or scale like setae.....5
- Scutellum with a group of coarse, long dark setae arranged in a more or less compact tuft or bundle or with two or more scale like setae, marginal vein at least nearly as long as stigmal vein .....*Prochiloneurus* sp.
- 5(4). Scape more than 3 times as long as broad.....6
- Scape not more than 3 times as long as broad.....7
- 6(5) Second funicle segment with sensila .....*Leptomastix flava* Mercet (Fig. 22)
- Second funicle segment without sensila.....*Leptomastix nigrocoxalis* Compere
- 7(5). Second funicle segment dark brown .....*Anagyryus aegyptiacus* Moursi
- Second funicle segment white.....*Anagyryus pseudococci* (Giarult)

25. ***Octococcus salsolicola* (Priesner & Hosny)**: Two species of encyrtids were collected and recorded from concerned specimen under investigation. These are: *Gyranusoidea* sp. and *Prochiloneurus* sp.

#### KEY TO SPECIES OF PARASITIDS OF *O. SALSOLICOLA*

1. Scutellum without a distinct tuft or bundle of setae or scale like setae, marginal vein distinctly longer than stigmal vein.....*Gyranusoidea* sp.
  - Scutellum with a group of coarse, long dark setae arranged in a more or less compact tuft or bundle or with two or more scale like setae, marginal vein at least nearly as long as stigmal vein .....*Prochiloneurus* sp.
26. ***Peliococcus priesneri* (Laing)**: No parasitoids were collected from this species.
27. ***Peliococcus zillae* (Hall)**: No parasitoids were collected from this species.
28. ***Phenacoccus gypsophilae* Hall**: No parasitoids were collected from this species.
29. ***Phenacoccus pyramidensis* Ezzat**: No parasitoids were collected from this species.
30. ***Planococcoides lindingeri* (Bodenheimer)**: One encyrtid parasitoid was collected from sample of *P. lindingeri*; this species is *Leptomastidae bifasciata* (Mayr).
31. ***Planococcus citri* (Risso)**: Eleven species of aphelinids and encyrtids were collected and recorded from concerned specimen under investigation. These are: *Anagyrus greeni* (Howard), *A. pseudococci* (Girault), *Blepyrus insularis* (Cameron), *Encyrtus* sp., *Gyranusoidea* sp., *Leptomastidae abnormis* (Girault), *Leptomastix dactylopii* Howard, *L. flava* Mercet, *Cheiloneurus* sp., *Marietta picta* (Andre) and *Prochiloneurus aegyptiacus* (Mercet).

#### KEY TO SPECIES OF PARASITIDS OF *P. CITRI*

1. Mesopleuron large and without a femoral groove.....2
- Mesopleuron impressed and with a femoral groove, antennal scape flattened and expanded beneath, not more than twice as long as wide .....  
.....*Marietta picta* (Andre) (Fig. 24)
- 2(1). Forewing shortened, clearly not reaching apex of gaster .....3
- Forewing normal, at least very nearly reaching apex of gaster; mesoscutum without a transverse posterior depression, neither mesoscutum with a median bundle



- of setae nor posterior margin of pronotum with a line of stiff black bristles  
 .....*Cheiloneurus* sp.
- 3(2). Scutellum without a distinct tuft or bundle of setae or scale like setae.....4  
 - Scutellum with a group of coarse, long dark setae arranged in a more or less  
 compact tuft or bundle or with two or more scale like setae.....5
- 4(3). Marginal vein at least nearly as long as stigmal vein.....  
 .....*Prochiloneurus aegyptiacus* (Mercet)  
 - Marginal shorter than stigmal vein.....*Encyrtus* sp. (Fig. 11)
- 5(3) First funicle segment not longer than broad .....  
 .....*Blepyrus insularis* (Cameron)  
 - First funicle segment longer than broad.....6
- 6(5). Scape more than 3 times as long as broad.....7  
 - Scape not more than 3 times as long as broad.....8
- 7(6). Forewing more than 2.5 times as long as broad.....*Leptomastix flava* Mercet  
 - Forewing not more than 2.5 times as long as broad .....  
 .....*Leptomastix dactylopii* Howard
- 8(6). Forewing with one or two distinct fuscus bands, marginal vein shorter than the  
 stigmal .....*Leptomastidae abnormis* (Girault)  
 - Forewing with infuscation limited to longitudinal streak adjacent to venations .....  
 .....9
- 9(8). Forewing with postmarginal vein at least a little longer than stigmal .....  
 .....*Gyranusoidea* sp.  
 - Forewing with postmarginal vein not longer than stigmal .....10
- 10(9). Gaster longer than thorax .....*Anagyrus greeni* (Howard)  
 - Gaster about as long as thorax, second funicle segment white .....  
 .....*Anagyrus pseudococci* (Girault)

**32. *Plancococcus ficus* (Signoret):** Seven species of aphelinids and encyrtids were collected and recorded from concerned specimen under investigation. These are: *Anagyrus pseudococci* (Girault), *Leptomastidae abnormis* (Girault), *Leptomastix dactylopii* Howard, *L. flava* Mercet, *Chartocerus subaeneus* (Foerster), *Marietta picta* (Andre) and *Prochiloneurus aegyptiacus* (Mercet).

#### KEY TO SPECIES OF PARASITIDS OF *P. FICUS*

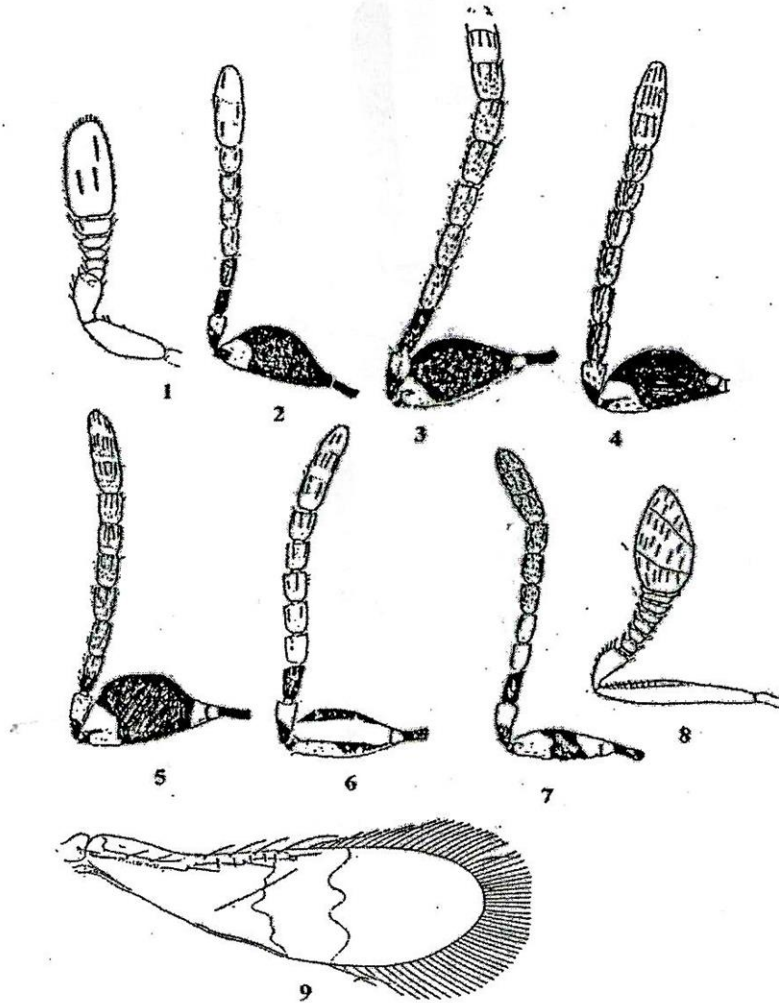
1. Funicle present .....2  
 - Funicle absent, but with 1-4 anelli; forewing 3 times as long as wide, longest marginal  
 cilia 1/2-2/3 width of disc, submarginal vein with 2 setae .....

- .....*Chartocerus subaeneus* (Foerster)
- 2(1). Mesopleuron large and without a femoral groove.....3
- Mesopleuron impressed and with a femoral groove, antennal scape flattened and expanded beneath, not more than twice as long as wide .....
- .....*Marietta picta* (Andre)
- 3(2). Scutellum without a distinct tuft or bundle of setae or scale like setae.....4
- Scutellum with a group of coarse, long dark setae arranged in a more or less compact tuft or bundle or with two or more scale like setae, marginal vein at least nearly as long as stigmal vein .....*Prochiloneurus aegyptiacus* (Mercet)
- 4(3). Scape more than 3 times as long as broad.....5
- Scape not more than 3 times as long as broad.....6
- 5(4). Forewing more than 2.5 times as long as broad.....*Leptomastix flava* Mercet
- Forewing not more than 2.5 times as long as broad.....
- .....*Leptomastix dactylopii* Howard
- 6(4). Forewing with one or two distinct fuscus bands, marginal vein shorter than the stigmal .....*Leptomastidae abnormis* (Girault)
- Forewing with infuscation limited to longitudinal streaks, adjacent to venations, postmarginal vein not longer than stigmal, gaster about as long as thorax, second funicle segment white.....*Anagyrus pseudococci* (Girault)

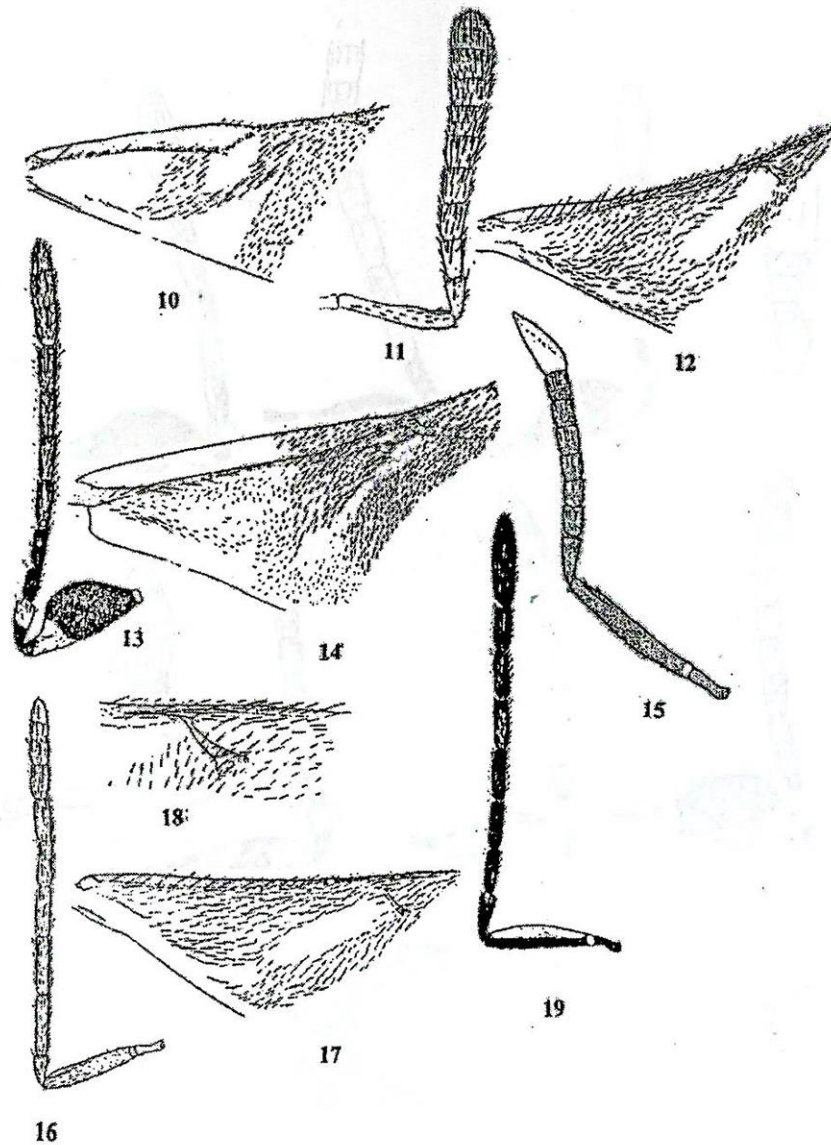
**33. *Pseudococcus comstocki* (Kuwana):** Six species of encyrtids were recorded and collected from concerned specimen under investigation. These are: *Anagyrus* sp. *Anagyrus pseudococci* (Girault), *Leptomastidae abnormis* Girulat, *Leptomastix dactylopii* Howard, *L. flava* Mercet and *Prochiloneurus aegyptiacus* (Mercet).

#### KEY TO SPECIES OF PARASITIDS OF *P. COMSTOCKI*

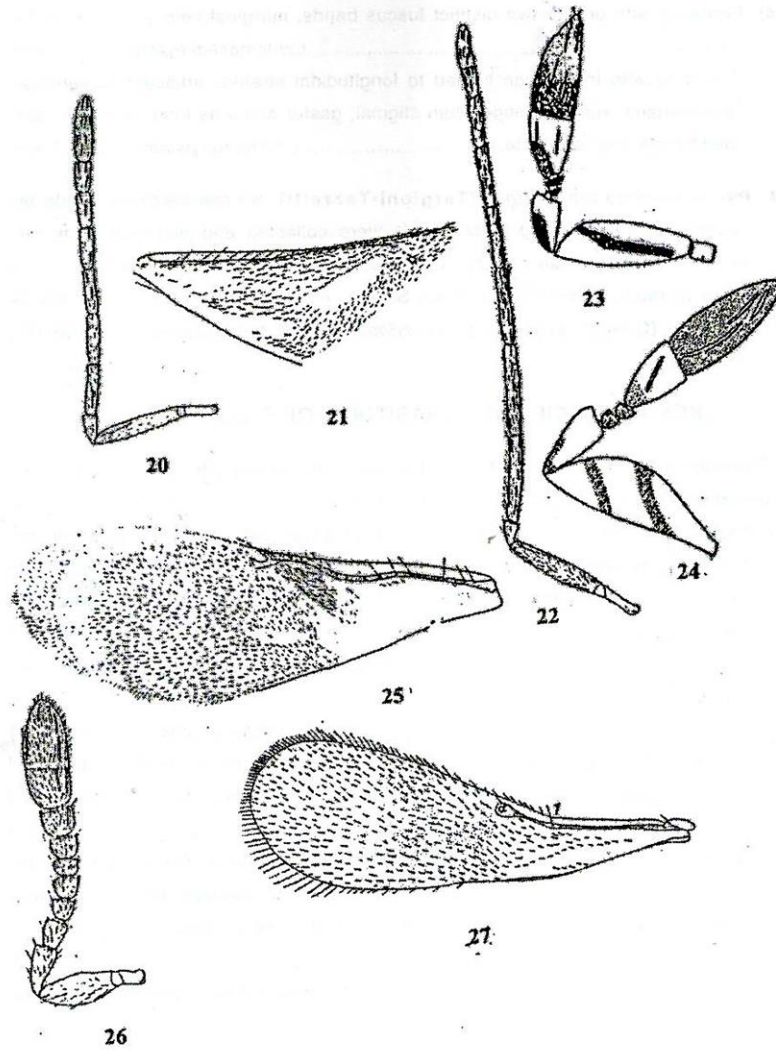
1. Funicle 5-segmented .....*Acerophagus* sp.
- Funicle at least 6-segmented .....2
- 2(1). Scutellum without a distinct tuft or bundle of setae or scale like setae.....3
- Scutellum with a group of coarse, long dark setae arranged in a more or less compact tuft or bundle or with two or more scale like setae, marginal vein at least nearly as long as stigmal vein .....*Prochiloneurus aegyptiacus* (Mercet)
- 3(2). Scape more than 3 times as long as broad.....4
- Scape not more than 3 times as long as broad.....5
- 4(3). Forewing more than 2.5 times as long as broad.....*Leptomastix flava* Mercet
- Forewing not more than 2.5 times as long as broad.....
- .....*Leptomastix dactylopii* Howard



Figs. 1-9. Fig 1. Antennae of *Acerophagus* sp., Fig. 2. Antennae of *Anagyrus aegyptiacus*, Fig. 3. Antennae of *A. greeni*, Fig. 4. Antennae of *A. kamali*, Fig. 5. Antennae of *A. pseudococci*, Fig. 6. Antennae of *A. saccharicola*, Fig. 7. Antennae of *A. shahidi*, Fig. 8. Antennae of *Belpyrus insularis*, Fig. 9. Forewing of *Chartocerus subaeneus* (Forester).



Figs. 10-19. Fig. 10. *Cheiloneurus* sp., Fig. 11. *Encyrtus* sp., Figs. 12-13. *Gyranusoidea indica*, Fig. 12. Forewing, Fig. 13. Antenna, Figs. 14-15. *Homalotylus vicinus*, Fig. 14. Forewing, Fig. 15. Antennae, Figs. 16-17. *Leptomastix dactylopii*, Fig. 16. Antennae, Fig. 17. Forewing, Figs. 18-19. *Leptomastidae abnormis*, Fig. 18. Forewing, Fig. 19. Antennae.



Figs. 20-27. Figs. 20-21. *Leptomastix nigrocoxalis*, Fig. 20. Antennae, Fig. 21 Forewing, Fig. 22. Antennae of *Leptomastix flava*, Fig. 23. *Marietta Leopardina*, Fig. 24. *Marietta picta*, Fig. 25. *Prochiloneurus* sp., Fig. 26. Antennae of *Rhopus nigriclavus*, Fig. 27. Forewing of *Allotropia* sp.

- 5(4). Forewing with one or two distinct fuscus bands, marginal vein shorter than the stigmal ..... *Leptomastidae abnormis* (Girault)
- Forewing with infuscation limited to longitudinal streaks, adjacent to venation, postmarginal vein not longer than stigmal, gaster about as long as thorax, second funicle segment white..... *Anagyrus pseudococci* (Girault)
- 34. *Pseudococcus longispinus* (Targioni-Tazzetti):** Six species of aphelinids, encyrtids, signiphorids and platygastriids were collected and recorded from concerned specimen under investigation. These are: *Allotropa* sp., *Anagyrus pseudococci* (Girault), *Gyranusoidea indica* Shafee, Alam and Agarwal, *Leptomastidae abnormis* (Girault), *Leptomastix dactylopii* Howard and *Chartocerus subaeneus* (Foerster).

#### KEY TO SPECIES OF PARASITIDS OF *P. LONGISPINUS*

1. Pronotum quadrate, not reaching tegulae; antennae usually elbowed, number of antennal segments, forewing with five or fewer cells ..... Chalcidoidea .....2
- Pronotum triangular in a lateral view, reaching tegulae; antennae elbowed or filiform, number of antennal segments (7-15), forewing with five or fewer cells closed, submarginal vein without setae..... *Allotropa* sp.
- 2(1). Funicle present .....3
- Funicle absent, but with 1-4 anelli; forewing 3 times as long as wide, longest marginal cilia 1/2-2/3 width of disc, submarginal vein with 2 setae..... *Chartocerus subaeneus* (Foerster)
- 3(2). Scape more than 3 times as long as broad, forewing not more than about 2.5 times as long as broad..... *Leptomastix dactylopii* Howard
- Scape not more than 3 times as long as broad.....4
- 4(3). Forewing with one or two distinct fuscus bands, marginal vein shorter than the stigmal..... *Leptomastidae abnormis* (Girault)
- Forewing with infuscation limited to longitudinal streaks, adjacent to venations.....5
- 5(4). Forewing with postmarginal vein at least a little longer than stigmal vein, marginal vein distinctly longer than stigmal vein..... *Gyranusoidea indica* Shafee, Alam and Agarwal
- Forewing with postmarginal vein not longer than stigmal vein, first funicle segment brown or dark brown, remainder of flagellum white, gaster about as long as thorax, second funicle segment white..... *Anagyrus pseudococci* (Girault)

35. ***Saccharicoccus sacchari* (Cockerell)**: Eight species of encyrtids and signiphorids were collected and recorded from concerned specimen under investigation. These are: *Anagyrus greeni* (Howard), *A. pseudococci* (Girault), *A. saccharicola* Timberlake, *Leptomastidae abnormis* (Girault), *Microterys* sp., *Rhopus nigriclavus* (Girault), *Chartocerus subaeneus* (Foerster) and *Paraphaenaodiscus* sp.

#### KEY TO SPECIES OF PARASITIDS OF *S. SACCHARI*

1. Funicle present ..... Encyrtidae.....2  
 - Funicle absent, but with 1-4 anelli; forewing 3 times as long as wide, longest marginal cilia 1/2-2/3 width of disc, submarginal vein with 2 setae.....  
 ..... *Chartocerus subaeneus* (Foerster)  
 2(1). Forewing shortened, clearly not reaching apex of gaster .....5  
 - Forewing normal, at least very nearly reaching apex of gaster .....3  
 3(2). Hypopygium reaching or very nearly reaching apex of gaster.....  
 ..... *Rhopus nigriclavus* (Girault)  
 - Hypopygium not reaching more than two-thirds along gaster.....4  
 4(3). Scutellum without a distinct apical flange ..... *Microterys* sp.  
 - Scutellum with a thin apical flange ..... *Paraphaenaodiscus* sp.  
 5(2). Forewing with one or two distinct fuscus bands, marginal vein shorter than the stigmal ..... *Leptomastidae abnormis* (Girault)  
 - Forewing with infuscation limited to longitudinal streaks, adjacent to venations, forewing with postmarginal vein not longer than stigmal vein.....6  
 6(5). Stigmal vein about as long as marginal vein..... *Anagyrus saccharicola* Timberlake  
 - Stigmal vein longer than marginal vein.....7  
 7(6). Gaster longer than thorax ..... *Anagyrus greeni* (Howard)  
 - Gaster about as long as thorax, second funicle segment white.....  
 ..... *Anagyrus pseudococci* (Girault)

36. ***Spilococcus alhagii* (Hall)**: Two species of encyrtids were recorded and collected from concerned specimen under investigation. These are: *Acerophagus* sp. and *Leptomastidae* sp.

#### KEY TO SPECIES OF PARASITIDS OF *S. ALHAGII*

1. Funicle 5-segmented ..... *Acerophagus* sp.  
 - Funicle 11-segmented ..... *Leptomastidae* sp.

37. *Spinococcus convolvuli* Ezzat: Three species of encyrtids were collected and recorded from concerned specimen under investigation. These are: *Gyranusoidea* sp., *Leptomastix* sp. and *Prochiloneurus* sp.

#### KEY TO SPECIES OF PARASITIDS OF *S. CONVOLVULI*

1. Scutellum without a distinct tuft or bundle of setae.....3  
 - Scutellum with a group of coarse, long dark setae arranged in a more or less compact tuft or bundle or with two or more scale like setae, marginal vein at least nearly as long as stigmal vein .....*Prochiloneurus* sp.  
 2(1). Scape more than three times as long as broad.....*Leptomastix* sp.  
 - Scape more than three times as long as broad, forewing with postmarginal vein at least or little longer than stigmal .....*Gyranusoidea* sp.
38. *Trabutina manipara* (Hemprich & Ehrenberg): No parasitoids were collected from this species.
39. *Trionymus angustifrons* Hall: Two species of encyrtids were collected and recorded from concerned specimen under investigation here found in Egypt. These are: *Rhopus* sp. and *Cheiloneurus* sp.

#### KEY TO SPECIES OF PARASITIDS OF *T. ANGUSTIFRONS*

1. Hypopygium reaching or very nearly reaching apex of gaster.....*Rhopus* sp.  
 - Hypopygium not reaching more than two-thirds a long gaster.....*Cheiloneurus* sp.
40. *Trionymus cressae* (Hall): No parasitoids were collected from this species.
41. *Trionymus internodii* (Hall): No parasitoids were collected from this species.
42. *Trionymus masrensis* Hall: No parasitoids were collected from this species.
43. *Trionymus phragmitis* (Hall): No parasitoids were collected from this species.
44. *Trionymus williamsi* Ezzat: One encyrtid parasitoid was collected from samples of *T. williamsi*. This species is *Rhopus* sp.
45. *Vryburgia amaryllidis* (Bouche'): Two species of encyrtids were recorded and collected from concerned specimen under investigation. These are: *Anagyrs* sp. and *Rhopus* sp.



**KEY TO SPECIES OF PARASITOIDS OF *V. AMARYLLIDIS***

- 7(6). Gaster about as long as thorax .....*Anagyrus* sp.
- Gaster about as long as head and thorax together.....*Rhopus* sp.

The previous Egyptian parasitoids fauna of mealybugs were studied by Priesner & Hosny (1940), Moursi (1948 a,b,c), Rashad (1975), Noyes and Hayat (1994), Atia (1997) and Abd-Rabou (2000 a,b).

It is clear from Table 1 that *M. hirsutus* acquire the largest number of parasitoids and only 6 species recorded without acquiring any hyperparasitoids. The role of hyperparasitism in suppressing parasitoids of mealybugs is given. *A. graminis*, *M. hirsutus*, *N. viridis*, *P. citri*, *P. ficus* and *S. sacchari* acquire the largest number of hyperparasitoids, being 4,3,3,3,3 and 3, respectively.

*A. pseudococci* and *L. nigrocoxalis* were recorded associated with the largest number of mealybug species. *Prochiloneurus* sp. as a hyperparasitoid has shown a wide range of association with parasitoids of mealybug species.

Parasitoid	Number of Mealybug Species	Number of Hyperparasitoid Species
<i>Anagyrus</i> sp.	1	0
<i>Rhopus</i> sp.	1	0
<i>M. hirsutus</i>	6	0
<i>A. graminis</i>	1	4
<i>N. viridis</i>	1	3
<i>P. citri</i>	1	3
<i>P. ficus</i>	1	3
<i>S. sacchari</i>	1	3
<i>A. pseudococci</i>	1	0
<i>L. nigrocoxalis</i>	1	0
<i>Prochiloneurus</i> sp.	1	0

Table 1. List of Egyptian mealybugs parasitoids and hyperparasitoids.

Family and Species	Code	Type of parasitism
<b>Family : Aphelinidae</b>		
<i>Marietta leopardini</i> Motschulsky	1	Hyperparasitoid
<i>Marietta picta</i> (André)	2	Hyperparasitoid
<b>Family : Encyrtidae</b>		
<i>Acerophagus</i> sp.	3	Primary parasitoid
<i>Anagyrus agyptiacus</i> Moursi	4	"
<i>A. greeni</i> (Howard)	5	"
<i>A. kamali</i> Moursi	6	"
<i>A. pseudococci</i> (Girault)	7	"
<i>A. saccharicola</i> Timberlake	8	"
<i>A. shahidi</i> Hayat	9	"
<i>Anagyrus</i> sp.	10	"
<i>Blepyrus insularis</i> (Cameron)	11	"
<i>Cheiloncirus</i> sp.	12	Hyperparasitoid
<i>Encyrtus</i> sp.	13	Primary parasitoid
<i>Gyranusoidea indica</i> Shaffee, Alam & Agarwal	14	"
<i>Gyranusoidea</i> sp.	15	"
<i>Homalotylus vicinus</i> Silvestri	16	Hyperparasitoid
<i>Leptomastidae abnormis</i> (Girault)	17	Primary parasitoid
<i>Leptomastidae bifasciata</i> (Mayr)	18	"
<i>Leptomastidae</i> sp.	19	"
<i>Leptomastix dactylopii</i> Howard	20	"
<i>L. flava</i> Mercet	21	"
<i>L. nigrocoxalis</i> Compere	22	"
<i>Leptomastrix</i> sp.	23	"
<i>Microterys</i> sp.	24	"
<i>Paraphaenaodiscus</i> sp.	25	"
<i>Prochiloneurus aegyptiacus</i> (Mercet)	26	Hyperparasitoids
<i>P. annulatus</i> (Ferriere)	27	"
<i>P. avanicus</i> (Ferriere)	28	"
<i>Prochiloneurus</i> sp.	29	"
<i>Rhopus nigriclavus</i> (Girault)	30	Primary parasitoid
<i>Rhopus</i> sp.	31	"
<b>Family : Platyhastridae</b>		
<i>Allotropa</i> sp.	32	Primary parasitoid
<b>Family : Signiphoridae</b>		
<i>Chartocerus subaeneus</i> (Foerster)	33	Hyperparasitoid

Table 2. Egyptian mealybugs and their parasitoids.

Mealybug species	parasitoids Codes	Hyperparasitoids Codes
<i>Amonostherium arabicum</i> Ezzat	3	-
<i>Antonina graminis</i> (Maskell)	3, 7, 9	12, 29, 23
<i>Antonina natalensis</i> Brain	-	-
<i>Brevennia rehi</i> (Lindinge)	30	12
<i>Chorizococcus halli</i> Mckenzie & Williams	23	-
<i>Crisicoccus delotti</i> Ezzat	-	-
<i>Crisicoccus mangrovicus</i> Ben-Dov	-	-
<i>Dysmicoccus boninsis</i>	10, 30	-
<i>D. brevipes</i> (Cockerell)	7, 17, 20	33
<i>D. trispinosus</i> (Hall)	-	-
<i>Erimococcus limoniastris</i> (Priesner & Hosny)	-	-
<i>Euripersia artemisiae</i>	-	-
<i>Ferrisia virgata</i> (Cockerell)	3, 6, 11, 14, 17, 20	16, 26, 23
<i>Greenoripersia kaiseri</i> Bodenheimer	-	-
<i>Helicococcus osborni</i> (Sanders)	-	-
<i>Heterococcus cyperi</i> (Hall)	-	-
<i>Humococcus machenziei</i> Ezzat	-	-
<i>Kirishekella sacchari</i> (Green.)	8, 30	-
<i>Maconellicoccus hirsutus</i> (Green)	5, 6, 7, 14, 22, 30, 32	1, 16, 27, 28 33
<i>Micrococcus inermis</i> (Hall)	-	-
<i>Micrococcus imperatae</i> (Hall)	-	-
<i>Naiacoccus minor</i> Green	-	-
<i>Nipaecoccus nipae</i> (Maskell)	-	-
<i>Nipaecoccus viridis</i> (Newstead)	3, 4, 7, 21, 22	1, 29, 33
<i>Octococcus salsolicola</i> (Priesner & Hosny)	15	29
<i>Peliococcus priesneri</i> (Laing)	-	-

Table 2. Continued.

Mealybug species	parasitoids Codes	Hyperparasitoids Codes
<i>Peliococcus zillae</i> (Hall)	-	-
<i>Phenacoccus gypsophillae</i> Hall	-	-
<i>Phenacoccus pyramidensis</i> Ezzat	-	-
<i>Planococcoides lindingeri</i> (Bodenheimer)	18	-
<i>Planococcus citri</i> (Risso)	5, 7, 11, 13, 15 17, 20, 21	2, 12, 26
<i>Planococcus ficus</i> (Singoret)	7, 17, 20, 21	2, 26, 33
<i>Pseudococcus comstocki</i> (Kuwana)	7, 10, 17, 20, 21	26
<i>P. longispinus</i> (Targioni-Tozzetti)	7, 14, 17, 20, 32	33
<i>Saccharicoccus sacchari</i> (Cockerell)	5, 7, 8, 17, 24, 30	25, 33
<i>Spilococcus alhagii</i> (Hall)	3	-
<i>Spinococcus convolvuli</i> (Ezzat)	15, 23	29
<i>Trabutina manipara</i> (Hemprich & Ehrenberg)	-	-
<i>Trionymus angustifrons</i> (Hall)	31	29
<i>Trionymus cressae</i> (Hall)	-	-
<i>T. internodii</i> (Hall)	-	-
<i>T. masrensis</i> (Hall)	-	-
<i>T. phragmitis</i> (Hall)	-	-
<i>T. williamsi</i> Ezzat	31	-
<i>Vrybugia amaryllidis</i> (Bouche)	10, 31	-

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## الطفيليات التي تتطفل علي البق الدقيقي في مصر

شعبان عبد ربه

معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقي - الجيزة.

تم تسجيل ٢٦ نوعا تتطفل علي أنواع البق الدقيقي في مصر. تم تصميم مفاتيح تصنيفيه لطفيليات كل نوع علي حده من أنواع البق الدقيقي المختلفه. تم عرض الرسوم التوضيحيه لبعض الصفات التصنيفيه الهامه المتواجده داخل المفاتيح التصنيفيه. ثم أيضا عرض لعدد ١٨ طفيل أولي و ٨ طفيليات ثانوية التي تهاجم الأنواع المختلفه من البق الدقيق في مصر. والتي يبلغ عددها ٤٥ نوعا لم يسجل عليه ايه طفيليات.