MITES ASSOCIATED WITH HONEYBEE, 
APIS MELLIFERA IN EGYPT

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(Manuscript received 1st January 2008)

Abstract

In the present study, an intensive survey of hive debris, honeybee brood combs, bee-collected pollen, live and dead adult bees was carried out during two successive years 2005-2006, throughout Egyptian Governorates. For determining the incidence, diversity, host associations and ecological distribution of mites associated with honeybees. Data proved the occurrence of 42 mite species belonging to 4 suborders: Mesostigmata, Prostigmata, Astigmata and Cryptostigmata and 19 families associated with honeybees in Egypt, including house guests, phoretic, and parasitic. Varroa destructor and Acarapis woodi are the most important parasitic species. A list of all recorded species is given with their geographic distribution and information on economic importance and type of association is provided. The majority of these species were rarely collected from hives, hives products and honey combs, as well as plant and soil mites and incidental visitors.

INTRODUCTION

Honeybees are considered the most important beneficial insects which have direct and indirect roles in agricultural production. Honey is the main product of this insect besides additional products such as: royal jelly, pollen, wax, propolis and poison. The roles of honeybees in the pollinator of flowering plants lead to an increase in agricultural products and improvements in the product quality (Allam, 1994).

The honeybee, Apis mellifera is accompanied by numerous arthropods, a great number of which belong to mites. Relationships between mites and bees are of diverse characters. These mites may be parasitic, phoretic or house guests. Many species of parasitic mites are the cause of economic important diseases to bees. The parasitic mite, Varroa destructor previously named Varroa jacobsoni Oud. is considered the most widespread ectoparasite of the honeybee, Apis mellifera and it causes serious problems in the world of beekeeping due to its parasitic relationship with bees (Ritter, 1981; Donze and Guerin, 1994; Anderson and Trueman, 2000). The literature on these species is very rich but the knowledge on other mite species associated with bees, their nests and stored hive products is rather poor (Chmielewski, 1989). So, the objective of the present work is to investigate the prevalence, host associations and diversity of mites associated with honeybees in Egypt.
MATERIALS AND METHODS

A survey of mites associated with the honeybee, *Apis mellifera* was carried out during two successive (2005-2006) throughout most Egyptian Governorates. Several methods have been used during the period of the study: A sheet of strong white paper or plastic with a screen can be placed under the brood combs to continuously monitor colonies in the areas of suspected infestations. The screen prevents the bees from removing the dead mites falling on the paper (Mautz, 1979; De Jong, 1980; De Jong et al., 1982). Brood combs of infested bees were banged on a table covered with a piece of dark paper. Dislodged mites may be seen running over the paper and picked up with a fine brush wetted with alcohol (Morse, 1978). Adult bees can be sampled directly by brushing them from the brood combs into jars filled with alcohol and shaken for one to thirty minutes. The bees were strained out and the filtrate passed through a white cloth where mites can be examined. For collecting *Acarapis woodi*, bee's prothoracic collar was removed to expose the two largest tracheae in the body, and then examined by a stereo microscope. Adult mites or their developmental stages were collected by a fine camel hair brush no. "00" (De Jong et al., 1982). Mites from random samples of hive debris, pollen, dead bees and brood combs can be extracted also, using the modified Tullgren funnels for 24 hours. The mites were received in Petri-dishes filled with water.

Adult mites and their developmental stages were picked up, cleared in Nesbitt's solution or lactic acid, then mounted in Hoyer's medium on glass slides and examined by stereo microscope for identification. Directories of Acarologists of the World (Hughes, 1961; Chant, 1965; Lindquist & Evans, 1965; Summers & Price, 1970; Hughes, 1976; Krantz, 1976; Zaher, 1984; Zaher, 1985; Smiley, 1992; Lindquist, 1998) were used.

RESULTS AND DISCUSSION

The honeybee, *Apis mellifera* is considered one of the most important and beneficial insects, whose damage has serious negative economic implications for both beekeeping industry and agriculture (Melathopoulos et al., 2000). The study of prevalence, diversity, host associations and distribution of mites associated with honeybee is necessary to monitor the economically important species, and manage their effects on beehives.

In the present study it is clear that the Acarofauna associated with honeybee, *Apis mellifera* L. in Egypt is numerous and comparatively rich in its species. A survey of hive debris, honeybee brood combs, bee-collected pollen, live and dead adult bees, during the period of the study shows that 42 species of mites are commonly...
associated with honeybees in Egypt. Most of these mites have been rarely collected, and are of no ecological concern. Mites that are found in beehives may be house guests, phoretic or parasitic. *Varroa destructor* and *Acarapis woodi* are the most important parasitic species. Phoretic mites are flower or leaf feeding mites that use honeybees just for transport from one plant to another and arrive to beehives accidently. Among the many house guests are those mite species that feed on old provisions and others that are predators on other mites. It was noticed that mites are rarely fed on stored pollen; however, large numbers of pollen-feeding mites are found in stored combs (De Jong et al., 1982; Sammataro et al., 2000; Refaai, 2001).

The collected mite species in this work were belonged to four suborders: Mesostigmata (Gamasida), Prostigmata (Actinidae), Astigmata (Acarida), and Cryptostigmata (Oribatida) (tables 1-3).

**A- Suborder: Mesostigmata**

16 mesostigmatid mite species from 6 families were collected from beehives (table 1).

**1- Family Varrooidae:**

This family was represented by only one species *V. destructor* (Anderson and Trueman, 2000) which is considered as the most serious known ectoparasitic mite of the honeybee, *Apis mellifera*. It was first described in 1904 from *A. cerana* in Indonesia and later on, it was found distributed worldwide in several countries (Grobov, 1975; De Jong et al., 1982; Chrimelewski, 1989; Bailey and Ball, 1991; Hussein, 1991).

*Varroa mite* is believed to arrive to South America on queens of *A. mellifera* that were taken to Paraguay by Japanese beekeepers (De Jong et al., 1984). Female mites of *V. destructor* deposit their eggs in cells containing late instars honeybee larvae. In their nymphal stages, mites attach to bees and feed on the haemolymph. Not all infested broods are killed but adult infested bees have deformed wings as a result of heavy parasitism in colonies. Mites are most commonly attached to the thorax and can be easily seen with unaided eye as they are larger than most other mites Akatanakul and Burgett (1975).

In the present study, *Varroa* mites were normally distributed throughout most of Egyptian apiaries visited and the average number of mites in infested colonies was quite high.

**2- Family Ascidiae:**

The ascid mites are mostly predators and occur in soil, humus, moss, stored products, bee nests and plants. They prey on acrid mites, eggs of insects and also can feed on fungus, saprophytic arthropods and pollen. Some species of this family are
parasitic (Egan and Moss, 1969).

Several acarine mites were recorded in association with honeybees in Egypt. *Blattisocius keegani, B. tarsalis* and *Lasioseius* sp were found associated with dead bees and hive debris. The genera *Lasioseius* and *Blattisocius* were recorded from beehives all over the world (Brgetova, 1977; Haragim et al., 1978; De Jong et al., 1982; Crozier, 1989; Chinniah and Mehanasundaram, 1995). On the other hand, *Protogamasellus minutus*, *Proctolaelaps orientalis* and *Proctolaelaps* sp were found associated with dead bees and brood combs. Similarly, several *Proctolaelaps* species were recorded in bee nests feeding on small arthropods, fungi, pollen or phoretic on adult bees without causing any harmful effects (El-Banhawy and Nasr, 1984; Davydova, 1988; Klimov, 1998; O'Connor and Klimov, 2004).

3- **Family Laelapidae:**

This family contains a diverse assemblage of free living and insect associated mites (Eickwort, 1990). Species belonging to this family are partially cephaloparasitic through predation on astigmatid mites. These mites feed on provisions in beehives without harming the brood. They also feed on injured bees and on pollen (Eickwort, 1979). However, the genus *Tropilaelaps* includes mites that are obligate parasites on different species of Apis inflicting significant damage to apiculture (Eickwort, 1993).

The present results showed that five laelapid species were found associated with beehives in Egypt. Likewise, numerous genera of laelapid mites were found associated with bees all over the world (De Jong et al., 1982; Eickwort, 1994; O'Connor and Klimov, 2004).

4- **Family Parasitidae:**

The parasitid mites occur in a wide range of habitats including soil, humus and various organic debris where they feed on eggs, immature microarthropods and nematodes (Zaher, 1986). In addition, parasitid deutonymphs are often phoretic on insects and they also utilize them for transport from one feeding locale to another (Krantz, 1978). The members of the genus *Parasitus* are phoretic on adult bees feed on other arthropods and wax (Richards and Richards, 1976). *Parasitus* species occur in 96% of bumblebee nests in Canada and 25-28% in overwintering queens in Denmark (Schoutsboe, 1987).

In the present work, *Parasitus consanguineus* was rarely collected from samples of hive debris.

Similarly, many authors recorded this genus from bees in different countries including Europe, North America (Hyatt, 1960; De Jong et al., 1982; Davis and McRoy, 1987; O'Connor and Klimov, 2004) and Egypt (Refaeli, 2001). The nature of associations between these mites and bees is uncertain, although predatory behaviour
towards acarid mites and microarthropods was suggested by Richards and Richards (1976) and this may be beneficial to the colonies.

5- Family Phytoseiidae:

The members of this family are widely distributed predators inhabiting a variety of plants and prey on phytophagous mites, insects and pollen grains (Zaher, 1986). Two phytoseiid species were recorded from Egyptian beehives with a low abundance. These were *Euseius scutalis* and *Typhlodromus athiasae*. Likewise, El-Banhawy and Nasr (1984) collected the phytoseiid mite, *Amblyseius okanagensis* from beehives in the state of New York. All previous studies and the present study revealed that this family is not bee associated; however, it may be transported to beehives by bees visiting plants and flowers causing no harm to bees (Chmielewski, 1991).

6- Family Uropodidae:

The members of this family are free-living mites inhabiting soil, debris, moss, organic manures, nests of insects, and they feed on fungi, housefly larvae and free living nematodes. Of special interest is the discovery of uropodid mites in Egyptian beehives.

*Trichouropoda* sp. was rarely collected from hive debris and adult bee samples without causing any damage to beehives (table, 1). The phoretic association between uropodid mites and bees is presumed to be transitory because both happen to be migrants and both are exploiting the same temporary habitat (Rubink et al., 1991). Similarly, Chmielewski (1989) recorded uropodid mite, *Urobourella marginata* from Polish beehives and El-Erksousy (1996) collected *Trichouropoda* sp. from Egyptian beehives.

B- Suborder: Prostigmata

The prostigmatid mites vary greatly in their biology, structures and habitats. This diverse suborder has evolved an important relationship with bees.

Table (2) shows 13 prostigmatid mite species belonging to seven families were found associated with honeybees in Egypt.

1- Families Cheyletidae and Cunaxidae:

These families are considered as predaceous Prostigmata and may be facultatively occurring in beehives where they feed predominantly on Astigmata (Eickwort, 1994). Several cheyletid genera were recorded as phoretic on bees (O'Connor and Klimov, 2004); *Cheyletophyes* species were restricted with large carpenter bees (Putzundra and Kapil, 1988; Walter et al., 2002). While species of the genera *Hemicheyleta*, *Cheyletus* and *Cunaxa* (Cunaxidae) were recorded associated with honeybees worldwide (De Jong et al., 1982; El-Naggar, 1982; Davis and McRoy, 1987; El-Erksousy, 1996), but the levels of associations were unknown.
The work presented herein recorded six prostigmatid mite species belonging to the families Cheyletidae and Cunaxidae from bees in Egypt. These species included Cheletogenes ornatus and C. lepidopterorum were found associated with adult bees and hive debris. C. erulitius and C. melaccensis and Hemicheyletia bakeri were recorded from hive debris. Finally, Cunaxa sp was found attached to the thorax of honeybee workers. These mites can prey on other mites and small arthropods without conspicuous damage or harm to bees or broods; so they may be useful to the colonies.

2- Family Tarsonemidae:

This family was represented in the present study by three species, Acarapis woodi, Tarsonemus granaries and T. apis. The most serious one is the parasitic mite, A. woodi which completes its life cycle within the prothoracic tracheae of the honeybee. A. woodi has been detected in several countries all over the world (Delfinado-Baker et al., 1989; Lozano et al., 1989; Gerson et al. 1994). It feeds on the haemolymph of their host by piercing the tracheal walls with their mouthparts (Örösi-Pal, 1934). This mite is posing a serious threat to honeybee health and also affects foraging and survivorship of honeybees (Gary and Page, 1989).

In the present study, few numbers of A. woodi were detected in the tracheae of the worker honeybee. Species of Tarsonemus sp was rarely collected from hive debris. Similarly, several species of the genus Tarsonemus were recorded previously from honeybees [De Jong et al. (1982, Europe); Senna (1997, Egypt)]. The structure of their mouth parts suggested that these mites are not parasites but possibly feeding commensally on pollen and they are of little or no adverse effects on bees (Lindquist, 1968).

3- Family Scutacaridae:

Several members of this large family are associated with insects or their nests including bees and wasps (Delfinado et al, 1976). All scutcarid mites have been observed feeding on fungi (OConnor and Klimov, 2004). Both, Imparipes and Scutacarines genera include fungivores species that are closely associated with bees and may introduce fungi to bees (Delfinado and Baker, 1976; De Jong et al., 1982). Only S. sp. was recorded from bees in Egypt where it was collected from hive debris in very few numbers (table, 2).

4- Families Raphignathidae, Eupodidae and Bdeilidae:

These three prostigmatid families are not bee associated; however, their species frequently invade bee hives (El-Naggar, 1982). Most of these mites are predators as they may feed on other mites and small insects in bee hives without harming bees or broods.
The family Raphignathidae was represented by two species, *R. bakeri* and *R. sp.*, collected from dead workers. Also, family Eupodidae represented by *Eupodes sp.* which was found associated with brood combs and adult bees.

Members of the family Bdeillidae are common predators in the soil. One species *Spinibdella bifurcata* was rarely collected from hive debris herein (Table, 2). Most of the above mentioned mite genera of the families Raphignathidae, Eupodidae and Bdeillidae were collected previously from Egyptian beehives where El-Naggar (1977 & 1982) collected *Raphignathus* sp. and *S. bifurcata* from honeybee colonies at Schag and Gharbia Governorates, respectively.

C- Suborder: Astigmata

Astigmata is represented in the present study by 10 species of the families Acaridae, Checotodactylidae, Glycyphagidae and Hemisarcoptidae (Table 3). Astigmata are typically the most abundant obligate bee-associate mites in nests of bees (Eickwort, 1990; O'Connor and Klimov, 2004).

1- Families Acaridae and Glycyphagidae:

The Acaridae and Glycyphagidae include numerous mites that occur as scavengers and deetoparasites in hives of bees feeding on fungi, honey, pollen and other detritus (Veichi, 1936; Grobov, 1979; Baker et al., 1983; Chmielewski, 1989). Many of these are stored-product pests but can become the most numerous mites in the bee hives (Eickwort, 1993). In the present study, the genera *Acarus*, *Caloglyphus*, *Glycyphagus*, *Rhizoglyphus* and *Tyrophagus* were the most common mites collected from hives of honeybees in different localities in Egypt.

2- Family Checotodactylidae and Hemisarcoptidae:

Members of this family are restricting to associate with bees (Eickwort, 1994), their species are primary obligate deetoparasites (O'Connor and Klimov, 2004). The checotodactylid mite, *Sennertia* was found in the cell of *Xylocopa* apparently feeding on pollen (Skaife, 1952). Hypopus of this genus was collected from the abdominal pouch of the carpenter bee, *Xylocopa aestuans* (El-Badry, 1971) and from the honeybee, *A. mellifera* samples (Baker et al., 1983). At the same time, Lombert et al. (1987) hypothesized that this mite may kill the brood, while others mentioned that it may develop without killing the brood (Skaife, 1952; O'Connor, 1988). In the present study, the hypopus of *Sennertia egyptiaca* and *Hemisarcoptes* sp were rarely collected from abdomen of dead bees.

Most astigmatid mites are scavengers and cleptoparasites. In the present study, high abundance of these mites was collected from hive debris, where they may feed on fungi, pollen, stored pollen and honey and may introduce fungi to colonies which become harmful.

D- Suborder: Cryptostigmata

This suborder is cosmopolitan and inhabits a variety of habitats including forest, litter, humus and soil surface (Krantz, 1978). These mites are primary fungivorous or saprophagous and also can feed on algae, bacteria and higher plants (Luxton, 1972). In the present study, three species from two families of this suborder were recorded from Egyptian beehives (Table 3), whereas the honeybee is considered a new host record for this suborder herein.

1- Family Opiliones:

Members of this family are considered to be microphytophagous and commonly inhabit moss, humus and litter. In the present study, only Opipia sticta was rarely collected from Egyptian beehives debris at Giza Governorate.

2- Family Oribatulidae:

Members of this family are diverse and feed on a variety of microbial fauna, fungi and old provisions and in organic layers of the forest floor (Luxton, 1972; Krantz, 1978). In the present survey, Schelobates laevipes and Schelobates sp were rarely collected from the abdomen of dead bees and brood comb samples surveyed from different apiaries Giza and Menofia Governorates, respectively. Similarly, Chmielewski (1989) collected Schelobates (Oribatida) from Polish beehives.

In general, cryptostigmid mites were rarely collected from bee samples worldwide and their significance in the bee hives is still unknown. But it could be suggested that these mites can enter the hives from the soil or plants attached to the bodies of bees and/or other insects visiting hives.
Table 1. Prevalence of mesostigmatid mites associated with the honeybee Apis mellifera

<table>
<thead>
<tr>
<th>Family</th>
<th>Mite species</th>
<th>Locality</th>
<th>Abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varroidae</td>
<td>Varroa destructor Anderson &amp; Trueman</td>
<td>All studied</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Governorates</td>
<td></td>
</tr>
<tr>
<td>Ascidae</td>
<td>Blattisocius keegani Fox</td>
<td>Giza,</td>
<td>++</td>
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<tr>
<td></td>
<td>Blattisocius tarsalis (Berlese)</td>
<td>Giza</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>Lasioseius sp</td>
<td>Giza, Beni-Suef</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>Protophasmatellus minus Nasr</td>
<td>Giza</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Proctoecolops orientalis Nasr</td>
<td>Fayoum</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>Proctoecolops sp</td>
<td>Beni-Suef</td>
<td>++</td>
</tr>
<tr>
<td>Laeopiidae</td>
<td>Androlaelaps casalis (Berlese)</td>
<td>Giza</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>Androlaelaps aegypticus Hafez, El-Badry &amp; Nasr</td>
<td>Dakahlia</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Dinogamasus sp</td>
<td>Fayoum</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Hypoaspis Kosei Hafez, El-Badry &amp; Nasr</td>
<td>Fayoum</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Oloecolops sp</td>
<td>Sharkia</td>
<td>+</td>
</tr>
<tr>
<td>Parasitidae</td>
<td>Parasitus Consanguineus Odumans &amp; Viogts</td>
<td>Giza</td>
<td>+</td>
</tr>
<tr>
<td>Phytoseiidae</td>
<td>Euseius scutalis (Athias-Henriot)</td>
<td>Giza</td>
<td>4</td>
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<tr>
<td></td>
<td>Typhlodromus athiassae Porath &amp; Swirski</td>
<td>Giza</td>
<td>+</td>
</tr>
<tr>
<td>Uropodidae</td>
<td>Trichouropoda sp</td>
<td>Dakahlia</td>
<td>+</td>
</tr>
</tbody>
</table>

+ : rare (1-3 mites)
++: moderate (3-9 mites)
+++ : high (more than 9 mites)
Table 2. Prevalence of prostigmatic mites associated with the honeybee *Apis mellifera*

<table>
<thead>
<tr>
<th>Family</th>
<th>Mite species</th>
<th>Locality</th>
<th>Abundance</th>
</tr>
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<tbody>
<tr>
<td>Bdellidae</td>
<td><em>Spinobdella bifurcata Myeoe</em></td>
<td>Sharkia</td>
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<tr>
<td>Cheyletidae</td>
<td><em>Cheyletogenes ornatus</em> (Can. &amp; Fanz.)</td>
<td>Giza</td>
<td>+</td>
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<tr>
<td></td>
<td><em>Cheletomorpha lepidopterorum</em> (Shaw)</td>
<td>Dakahlia</td>
<td>++</td>
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<tr>
<td></td>
<td><em>Cheyletus eximius</em> (Schrank)</td>
<td>Kafir El-Sheikh</td>
<td>++</td>
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<td></td>
<td><em>Cheyletus malaccensis</em> Oudemans</td>
<td>Giza</td>
<td>++</td>
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<tr>
<td></td>
<td><em>Hemichyeloidea bakeri</em> (Ehara)</td>
<td>Menofia</td>
<td>+</td>
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<tr>
<td>Cunaxidae</td>
<td><em>Cunaxa sp</em></td>
<td>Giza</td>
<td>+</td>
</tr>
<tr>
<td>Eupodidae</td>
<td><em>Eupodes sp</em></td>
<td>Dakahlia</td>
<td>+</td>
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<tr>
<td>Raphignathidae</td>
<td><em>Raphignathus bakeri</em> Zalber &amp; Gomaa</td>
<td>Giza</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td><em>Raphignathus sp.</em></td>
<td>Menofia</td>
<td>+</td>
</tr>
<tr>
<td>Scutazaridae</td>
<td><em>Scutacarus sp.</em></td>
<td>Ismailia</td>
<td>+</td>
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<tr>
<td>Tarsonomidae</td>
<td><em>Acarapis woodi</em></td>
<td>Gharbia</td>
<td>+</td>
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<tr>
<td></td>
<td><em>Tarsonemus granaries</em></td>
<td>Giza</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td><em>Tarsonemus apis</em></td>
<td>Giza</td>
<td>+</td>
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</table>

+: rare (1-3 mites)  ++: moderate (3-9 mites)  +++: High (more than 9 mites)
<table>
<thead>
<tr>
<th>Family</th>
<th>Mite species</th>
<th>Locality</th>
<th>Abundance</th>
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<tr>
<td>Suborder:</td>
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<td></td>
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<tr>
<td>Astigmata</td>
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</tr>
<tr>
<td>Acaridae</td>
<td><em>Acarus siro</em> L.</td>
<td>Fayoum</td>
<td>+</td>
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<tr>
<td></td>
<td>Caloglyphus mycophagus (Mégnin)</td>
<td>Fayoum</td>
<td>+++</td>
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<td></td>
<td><em>Caloglyphus</em> sp.</td>
<td>Beni-Suef</td>
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<tr>
<td></td>
<td><em>Rhizoglyphus robini</em> Claparede</td>
<td>Menofia</td>
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<td><em>Tyrophagus. putrescentia</em> (Schrank)</td>
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<td>Chaetodactylidae</td>
<td><em>Sennertia egyptiaca</em> El-Badry</td>
<td>Dakahlia</td>
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<td>Glycyphagidae</td>
<td><em>Glycyphagus domesticus</em> (DeGeer)</td>
<td>Menofia</td>
<td>++</td>
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<td></td>
<td><em>Glycyphagus ornatus</em> Kramer</td>
<td>Giza, Fayoum</td>
<td>++</td>
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<td><em>Oppia sticta</em> Popp</td>
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<td>+</td>
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<td></td>
<td><em>Scheloribates</em> sp</td>
<td>Menofia</td>
<td>+</td>
</tr>
</tbody>
</table>

+ : rare (1-3 mites)  ++ : moderate (3-9 mites)  +++ : high (more than 9 mites)
REFERENCES


حشرة الأكواراس المرتبطة بنحل العسل في مصر

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تعتبر حشرة نحل العسل من أهم الحشرات وأسهمها انتشاراً فهي تعيش مجتمعية اجتماعية في بيئة غنية بالمواد الغذائية ويساهم هذا تترفعها للعديد من الأخطار والأمراض والأكواراس وغيرها. ونظراً لأهمية هذه الحشرة في عملية نقل أزهار المحاصيل الزراعية الحرية كانت أو مستقلة مؤثرة بذلك على كمية وحجم الإنتاج وبالتالي الدخل القومي، بالإضافة إلى أهمية منتاجها من عسل، ورحيق، ورذع، وحليب النحل، وعبوة لحاج، وسعود.

أجرى هذا البحث لدراسة الأنساك:

1. حشرة الأكواراس المرتبطة بنحل العسل في مصر:

أظهرت عملية الحشر في معظم محافظات مصر على مدار سنوات متتاليتين 2005-2006 عن وجود 42 نوع من الأكواراس مرتبطة بنحل العسل في مصر منها ما هو مطلقة (داخلية أو خارجية)، مترم أو مستخدماً الحشرة كوسيلة انتقال مع مكان آخر. هذا وقد أظهرت عملية الحشر والتصنيف أن هذه الأكواراس تتغذى تحت رئة النحل ذات النهر المتوسط، النحل ذات النهر الأمامي، النحل عديم النهر، والحلق الخفيف، وكان أصعبها على الإطلاق وكثرها اكتشاف كلاً من Acarapis woodi و Varroa destructor. طقبل