

Survey of the Scale Insects and Mealybugs Species and its Associated Natural Enemies on Mango Trees in Different Governorates in Egypt

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Abstract

Studies on survey of scale insects and mealybugs infested mango trees and its associated parasitoids and predators were carried out at five governorates in Egypt during two successive years (2013- 2014 and 2014-2015). The obtained results provided the occurrence of ten scale insects and mealybugs species found on mango trees. These species were *Kilifia acuminata* (Signoret), *Ceroplastes floridensis* Comstock, *Aulacaspis tubercularis* Newstead, *Pulvinaria psidii* (Maskell), *Aonidiella aurantii* (Maskell), *Lepidosaphes pallidula* (Maskell), *Planococcus citri* Risso, *Icerya seychellarum* (Westwood), *Maconellicoccus hirsutus* (Green) and *Hemiberlesia lataniae* (Signoret). Also, We recorded many species of parasitoids were associated with scale insects and mealybugs during two years of study. The parasitoids species were *Metaphycus flavus* (Haward), *Habrolepis aspidioti* (Compere & Annecke), *Encarsia citrine* Craw, *Aphytis chrysomphali* Mercet and *Aphytis lepidosaphes* Compere and we recorded several of predators were associated with scale insects and mealybugs, *Rodalia cardinalis* (Mulsant), *Scymnus syriacus* (Marseul), *Exochomus flavipes* (Thunberg) and *Hemisarcophaga coccophagus* (Meyer).

Key words: Survey, Scale insects and mealybugs, Parasitoids and predators, Mango trees, Egypt.

1. Introduction

Mango *Mangifera indica* L. (Anacardiaceae) is one of the most widespread tropical fruits trees in Egypt and came after citrus and grapes in terms of production, marketing and consumption. The importance of this crop increase after yield [7]. In Egypt the total area cultivated with mango about 209000 feddans. The fruiting area is 151000 feddans, producing 506000 ton fruits. [5]. Mango is being worldwide in distribution in the world, which produced in more than 100 countries throughout both tropical and the subtropical regions, where in many of these countries it is produced as an export crop. [6]. Several insects infest mango trees such as *Aulacaspis tubercularis* which attack mango trees at high level of infestations, causing considerable damages and consequently reduce mango production as well as bring down the marketing value and decreasing quantity and quality of fruits[3&8]. Heavy infestation of such pests cause defoliation and drought branches. Therefore, the present work was carried out to study of scale insects and mealybugs and its associated natural enemies infesting mango trees, in Egypt [9].

2. Materials and methods

A survey of scale insects and mealybugs species infesting mango trees in five Governorates were conducted throughout a period of two years from January 2013 to December 2015. The selected orchards for the present investigation did not receive any chemical control treatments. The following 13 districts at five Egyptian Governorates were chosen

for survey study during the period from January 2013 to December 2014:

1. El- Fayoum (Sanhur).
2. Ismailia (Fayed- Kantrah-Shark- Al-Tall alKabir).
3. Monoufia (Monof- Shibin-Elkoum).
4. Qaliobiya(Benha- El-khanka- El- Qanater alkhiria- Shebeen El-Qanater).
5. Sharqiya (Abou – Hammad- Belbais – Zagazig).

Sampling methods

Five mango trees which are almost similar in size, age, shape, height (8- 10m) and vegetative growth and also received the same horticultural practices, were selected in each districts for carrying out this study. Samples were taken through the year randomly at bimonthly intervals. Sample size of 100 leaves were randomly taken from each orchard represent the three highs of the trees and four directions, collected in polyethylene bags and immediately transferred to laboratory for inspection by the aid of a stereoscopic microscope. Scale insects and mealybugs on the upper and lower surface of leaves were individually sorted into alive crawlers, adult females and gravid females then counted and recorded. The associated predators and parasitoids of scale insects and mealybugs, were also examined, identified and recorded. The scale insects were collected from the samples of infested leaves were *Aonidiella aurantii* (Mask.) and *Kilifia acuminata* (Sign.) and *Aulacaspis tubercularis* (Newstead), *Ceroplastes floridensis* (Comstock), *Coccus hesperidum* (Linnaeus), *Lepidosaphes*

pallidula (Williams), *Pulvinaria psidii* (Maskell), *Hemiberlesia lataniae* (Signoret) and mealybugs, *Icerya seychellarum* (Westwood), *Planococcus citri* (Risso) and *Maconellicoccus hirsutus* (Green) were put in glass jars and kept under 25-30°C and 65-70% R.H. for securing any emerging parasitoids. As well as, Five species of parasitoids were associated with scale insects on mango leaves, these parasitoids were, *Aphytis chrysomphali*, *Aphytis lepidosaphes*, *Habrolepis aspidioti*, *Encarsia citrine* and *Metaphycus flavus* and five species of predators were also recorded, these predators were *Chilocorus bipustulatus*, *Scymnus syriacus*, *Rodolia cardinalis*, *Chrysoperla carnae* and *Hemisarcoptes coccophagus*.

3. Results and discussion

3.1 Fayoum governorate

Data in Table (1) showed different scale insects species and one mealybugs species were recorded on mango trees at Sanhur district during two seasons of study 2013- 2014 and 2014- 2015. These insects' species were *Kilifia acuminata* (Signoret), *Ceroplastes floridensis* Comstock, *Coccus hesperidum* Linnaeus, *Aulacaspis tubercularis* Newstead, *Lepidosaphes pallidula* (Maskell), *Pulvinaria psidii* (Maskell) and *Icerya seychellarum* (Westwood). The parasitoids species associated scale insects on mango leaves, showed in (Table 2). These parasitoid are, *Encarsia citrine* Craw, *Aphytis lepidosaphes* Compere, *Habrolepis aspidioti* (Compere & Annecke) and *metaphycus flavus* (Haward). As well as, Five predator species were recorded at Sanhur during seasons 2013- 2014 and 2014- 2015. The predator species are *Rodolia cardinalis* (Mulsant), *Cryptolaemus montrouzieri* Mulsant *Exochomus flavipes* (Thunberg), *Chrysopa sp.* and *Chrysoperlla carnae* (Steph).

3.2 Ismailia governorate

Data in Table (1) reported that there were different scale insects and mealybugs species on mango trees during 2013-2014 and 2014- 2015 at Ismailia Governorate. These species were *Kilifia acuminata* (Signoret), *Ceroplastes floridensis* Comstock, *Aulacaspis tubercularis* Newstead, *Pulvinaria psidii* (Maskell), *Aonidiella aurantii* (Maskell), *Hemiberlesia lataniae* (Signoret) and *Icerya seychellarum* (Westwood) were recorded at Fayed, Kantrah-Shark and Al-Tall alKabir districts during two successive seasons 2013-2014 and 2014-2015. Meanwhile, *Lepidosaphes pallidula* (Maskell) was only recorded at Fayed district, at Al-Tall alKabir districts during two successive seasons 2013-2014 and 2014- 2015.

Three species of parasitoids were recorded on scale insects on mango leaves, Table (2). The parasitoid species are *Metaphycus flavus* Compere, *Habrolepis aspidioti* (Compere & Annecke), and *Encarsia citrine* Craw at Fayed, Kantrah-Shark and

Al-Tall alKabir districts during two successive seasons 2013-2014 and 2014- 2015. As well as, *Aphytis lepidosaphes* Compere was recorded only at Fayed and Al-Tall alKabir during previous seasons of study. Three species of predators were recorded. These predators are *Rodolia cardinalis* (Mulsant), *Scymnus syriacus* (Marseul), *Hemisarcoptes coccophagus* (Meyer) at Fayed, Kantrah-Shark and Al-Tall alKabir districts during years 2013- 2014 and 2014- 2015, showed in Table (3). While, *Cryptolaemus montrouzieri* Mulsant and *Coccinella undecimpunctata* L. were recorded at Fayed and *Chilocorus bipustulatus* (Linnaeus) was only recorded at Al-Tall alKabir districts during years 2013- 2014 and 2014- 2015.

3.3 Monoufia governorate

Ten scale insects and mealybugs species were recorded on mango trees during 2013-2014 at Monoufia Governorate. These species are *Kilifia acuminata* (Signoret), *Aulacaspis tubercularis* Newstead, *Pulvinaria psidii* (Maskell), *Lepidosaphes pallidula* (Maskell), *Parlatoria oleae* Colvee, *Aonidiella aurantii* (Maskell), *Hemiberlesia latania* (Signoret), *Icerya seychellarum* (Westwood), *Planococcus citri* Risso and *Maconellicoccus hirsutus* (Green), Table(1).

As well as, two species of parasitoids were recorded with scale insects on mango leaves. The parasitoid species are *Habrolepis aspidioti* (Compere & Annecke), *Aphytis chrysomphali* Mercet at Monof and Shibin-Elkoum during two years of study 2013-2014 and 2014- 2015. *Encarsia citrine* Craw and *Aphytis lepidosaphes* Compere were recorded only at Monof. Whereas, *Metaphycus flavus* (Haward) was recorded at Shibin-Elkoum during two years of study 2013-2014 and 2014-2015, Table (2).

Also, Data on Table (3) showed that two species of predators were recorded. These predators are *Rodolia cardinalis* (Mulsant) and *Chilocorus bipustulatus* (Linnaeus) were recorded at Monof and Shibin-Elkoum during seasons 2013-2014 and 2014-2015 and *Hemisarcoptes coccophagus* (Meyer) was recorded only at Shibin-Elkoum.

3.4 Qalyubla governorate

Data in Table (1) show the scale insects and mealybugs species were found on mango trees at Qaliobiya Governorate during 2013- 2014 and 2014- 2015, These insects are: *Kilifia acuminata* (Signoret), *Ceroplastes floridensis* Comstock, *Aulacaspis tubercularis* Newstead, *Pulvinaria psidii* (Maskell), *Lepidosaphes pallidula* (Maskell), *Parlatoria oleae* Colvee, *Chrysomphalus onidum* (Linnaeus) and *Icerya seychellarum* (Westwood) at Benha, El -Khanka, El- Qanater Alkhiria and Shebeen El- Qanater. Meanwhile, *Planococcus citri* Risso, was also, recorded at Benha, El -Khanka, and Shebeen El-

Qanater districts. While, *Aonidiella aurantii* (Maskell) was only recorded at Benha and El-Qanater Alkhiria. As well as, *Maconellicoccus hirsutus* (Green) was recorded at Benha and El-Khanka districts during seasons 2013- 2014 and 2014- 2015.

Three species of parasitoids were recorded with scale insects on mango leaves. These parasitoid species are *Aphytis lepidosaphes* Compere, *Metaphycus flavus* (Haward) and *Encarsia citrine* Craw Table (2) at Benha, El –Khanka, El- Qanater Alkhiria and Shebeen El- Qanater during two seasons 2013- 2014 and 2014 -2015. Meanwhile, *Habrolepis aspidioti* (Compere & Annecke) was recorded at Shebeen El- Qanater and, El- Qanater Alkhiria and *Aphytis chrysomphali* Mercet at Benha, district during previous seasons.

Data in Table (3) showed that there were four species of predators recorded at Benha district during 2013- 2014 and 2014- 2015. These predators are *Rodalia cardinalis* (Mulsant), *Scymnus syriacus* (Marseul), *Chrysoperlla carnae* (Stephens) and *Hemisarcopetes coccophagus* (Meyer). Whereas *Rodalia cardinalis* (Mulsant), *Chilocorus bipustulatus* (Linnaeus) and *Hemisarcopetes coccophagus* (Meyer) were recorded at El-khanka district. As well as, five species of predators were recorded at El- Qanater Alkhiria *Rodalia cardinalis* (Mulsant), *Chilocorus bipustulatus* (Linnaeus), *Hemisarcopetes coccophagus* (Meyer), *Chrysoperlla carnae* (Steph) and *Orius sp.* Finally, *Rodalia cardinalis* (Mulsant), *Scymnus syriacus* (Marseul) and *Hemisarcopetes coccophagus* (Meyer) were recorded at Shebeen El-Qanater district during 2013- 2014 and 2014- 2015.

3.5 Sharqiya Governorate

Various scale insects and mealybugs species were found infested mango trees at Sharqiya governorate. These species were *Kilifia acuminata* (Signoret), *Ceroplastes floridensis* Comstock, *Aulacaspis tubercularis* Newstead, *Lepidosaphes pallidula* (Maskell), *Chrysomphalus aonidum* Linnaeus, *Pulvinaria psidii* (Maskell), *Icerya seychellarum* (Westwood) and *Planococcus citri* Risso at Abou – Hammad, Belbais and Zagazig. *Lepidosaphes pallidula* (Maskell) was only recorded at Abou – Hammad and Belbais and *Parlatoria oleae* Colvee was recorded at Zagazig district during 2013- 2014 and 2014- 2015. Also, there were two species of parasitoids species recorded on scale insects on mango leaves at Abou – Hammad, Table (1).

Two parasitoid species were *Metaphycus flavus* (Haward) and *Habrolepis aspidioti* (Compere &

Annecke) were observed during the two years of study 2013- 2014 and 2014 -2015, Table (2). As well as, three species of predators were recorded at Belbais district, *Metaphycus flavus* (Haward), *Encarsia citrine* (Craw) and *Aphytis lepidosaphes* Compere. Also, *Metaphycus flavus* (Haward) and *Encarsia citrine* (Craw) were found at Zagazig district during 2013- 2014 and 2014- 2015. Finally, Data in Table (3) showed that *Rodalia cardinalis* (Mulsant) and *Scymnus syriacus* (Marseul) were recorded at Abou – Hammad, Belbais and Zagazig. While, *Exochomus flavipes* (Thunberg) was recorded at Abou – Hammad district at previous seasons of study.

Finally, the most widely distributed scale insects in all investigated governorates, are *Aulacaspis tubercularis*, *Kilifia acuminata*, *Icerya seychellarum*, *Ceroplastes floridensis*. While *Lepidosaphes pallidula* present only in Fayoum and Sharqiya governorates, meanwhile, *Pulvinaria psidii* present only in Monofia governorate. Fig.(6) clearly show that mango trees in Ismailia harbour the highest percentages of the scale insects and mealybugs (35% of the grand total), followed by Sharqiya and Qaliobyia (28% and 26%), respectively. While, mango trees in Monofia (8%) and Fayoum (3%), received the lowest percentages of the grand total of scale insects and mealybugs.

These results agreed with [3 & 4]. Finally we were found mealybug species was observed on the lower surface of mango leaves with high density and occurred all over the months of the year, causing severe damage to mango trees. It was found on leaves, branches, flower clusters and fruits, but the heavy infestation was on leaves. This result was agreeable with the finding of As well as, [1&2] scale insects are the most important pests on orchards trees in Egypt. Two species parasitized on *H. lataniae*. These were *A. mytilaspidis* and *H. aspidioti*. He collected *Coccophagus bivittatus* Compere recorded on *K. acuminata* in September 1992 on mango at Giza governorate. Many species of predators were also recorded. These predators were *Chilocorus bipustulatus*, *Exochomus flavipes*, *Scymnus syriacus*, *Coccinella undecimpunctata* L., *Rodalia cardinalis*, *Chrysoperlla carnae*, *Orius sp.* and *Hemisarcopetes coccophagus*. Also, [9] studied the predaceous mite, *Hemisarcopetes coccophagus* Meyer associated with the diaspidid, *Fiorrinia phoenicis* Balachowsky infested two varieties of date palm. The preferred diaspidid prey for *Hemisarcopetes coccophagus* mites recorded on different fruits are *Aonidiella aurantii* (Mask) on citrus orchards and *Aulacaspis tubercularis* (Newstead) on mango trees.

Table (1) Surveyed of the scale insect and mealybug species recorded on mango trees at different 13 localities in Five Governorates of Egypt during two successive years 2013 – 2014 and 2014-2015

Family	Insect species	Governorate	Locality
Coccidae	Kilifia acuminata (Signoret)		
Coccidae	Ceroplastes floridensis Comstock		
Coccidae	Coccus hesperidum Linnaeus		
Coccidae	Pulvinaria psidii (Maskell)		
Diaspididae	Aulacaspis tubercularis(Newstead)	Fayoum	Sanhur
Diaspididae	Lepidosaphes pallidula (Maskell)		
Monophilibidae	Icerya seychellarum (Westwood)		
Coccidae	Kilifia acuminata (Signoret)		
Coccidae	Ceroplastes floridensis Comstock		
Coccidae	Pulvinaria psidii (Maskell)		
Diaspididae	Aulacaspis tubercularis (Newstead)		
Diaspididae	Aonidiella aurantii (Maskell)		Fayed
Diaspididae	Lepidosaphes pallidula (Maskell)		
Diaspididae	Hemiberlesia lataniae (Signoret)		
Monophilibidae	Icerya seychellarum (Westwood)		
Coccidae	Kilifia acuminata (Signoret)		
Coccidae	Ceroplastes floridensis Comstock		
Coccidae	Pulvinaria psidii (Maskell)		
Diaspididae	Aulacaspis tubercularis(Newstead)		Kantrah-Shark
Diaspididae	Aonidiella aurantii (Maskell)		
Diaspididae	Hemiberlesia lataniae(Signoret)		
Monophilibidae	Icerya seychellarum(Westwood)	Ismailia	
Coccidae	Kilifia acuminata(Signoret)		
Coccidae	Ceroplastes floridensisComstock		
Coccidae	Pulvinaria psidii (Maskell)		
Diaspididae	Aulacaspis tubercularis(Newstead)		Al-Tall El-Kabir
Diaspididae	Aonidiella aurantii (Maskell)		
Diaspididae	Hemiberlesia lataniae (Signoret)		
Diaspididae	Lepidosaphes pallidula (Maskell)		
Monophilibidae	Icerya seychellarum(Westwood)		
Coccidae	Kilifia acuminata (Signoret)		
Coccidae	Pulvinaria psidii (Maskell)		
Diaspididae	Aulacaspis tubercularisNewstead		
Diaspididae	Lepidosaphes pallidula(Maskell)		
Diaspididae	Parlatoria oleae(Colvée)		
Diaspididae	Hemiberlesia lataniae (Signoret)		Monof
Diaspididae	Aonidiella aurantii (Maskell)		
Monophilibidae	Icerya seychellarum (Westwood)		
Pseudococcidae	Planococcus citri(Risso)		
Pseudococcidae	Maconellicoccus hirsutus (Green)	Monoufia	
Coccidae	Kilifia acuminata (Signoret)		
Coccidae	Pulvinaria psidii (Maskell)		
Diaspididae	Lepidosaphes pallidula(Maskell)		
Diaspididae	Aulacaspis tubercularis(Newstead)		
Diaspididae	Parlatoria oleae(Colvée)		
Diaspididae	Aonidiella aurantii(Maskell)		Shibin-Elkoum
Diaspididae	Hemiberlesia latania(Signoret)		
Monophilibidae	Icerya seychellarum(Westwood)		
Pseudococcidae	Planococcus citri(Risso)		
Pseudococcidae	Maconellicoccus hirsutus(Green)		

Table (1) Cont.,

Coccidae	Kilifia acuminata (Signoret)	
Coccidae	Ceroplastes floridensis Comstock	
Coccidae	Pulvinaria psidii (Maskell)	
Diaspididae	Aulacaspis tubercularis(Newstead)	
Diaspididae	Parlatoria oleae(Colvée)	
Diaspididae	Lepidosaphes pallidula (Maskell)	Banha
Diaspididae	Hemiberlesia latania(Signoret)	
Diaspididae	Aonidiella aurantii (Maskell)	
Diaspididae	Chrysomphalus aonidum(Linnaeus)	
Monophilibidae	Icerya seychellarum(Westwood)	
Pseudococcidae	Planococcus citri(Risso)	
Pseudococcidae	Maconellicoccus hirsutus(Green)	
Coccidae	Kilifia acuminata (Signoret)	
Coccidae	Ceroplastes floridensis Comstock	
Coccidae	Pulvinaria psidii(Maskell)	
Diaspididae	Aulacaspis tubercularis (Newstead)	
Diaspididae	Lepidosaphes pallidula (Maskell)	El-khanka
Diaspididae	Parlatoria oleae (Colvée)	
Diaspididae	Chrysomphalus aonidum (Linnaeus)	
Pseudococcidae	Planococcus citri (Risso)	
Monophilibidae	Icerya seychellarum (Westwood)	
Pseudococcidae	Maconellicoccus hirsutus (Green)	Qalyubiya
Coccidae	Kilifia acuminata (Signoret)	
Coccidae	Coccus hesperidum Linnaeus	
Coccidae	Ceroplastes floridensis Comstock	
Diaspididae	Aulacaspis tubercularis(Newstead)	El-Qanater
Diaspididae	Pulvinaria psidii (Maskell)	Al-Khayria
Diaspididae	Chrysomphalus aonidum (Linnaeus)	
Diaspididae	Aonidiella aurantii(Maskell)	
Monophilibidae	Icerya seychellarum (Westwood)	
Coccidae	Kilifia acuminata(Signoret)	
Coccidae	Ceroplastes floridensis Comstock	
Coccidae	Pulvinaria psidii (Maskell)	
Diaspididae	Aulacaspis tubercularis (Newstead)	ShebeenAl-Qanater
Diaspididae	Lepidosaphes pallidula (Maskell)	
Diaspididae	Chrysomphalus aonidumLinnaeus	
Monophilibidae	Icerya seychellarum(Westwood)	
Pseudococcidae	Planococcus citri(Risso)	
Coccidae	Kilifia acuminata (Signoret)	
Coccidae	Ceroplastesf loridensis Comstock	
Coccidae	Pulvinaria psidii (Maskell)	
Diaspididae	Aulacaspis tubercularis(Newstead)	Abou – Hammad
Diaspididae	Lepidosaphes pallidula (Maskell)	
Diaspididae	Chrysomphalus aonidum Linnaeus	
Monophilibidae	Icerya seychellarum (Westwood)	
Pseudococcidae	Planococcus citri(Risso)	
Coccidae	Kilifia acuminata(Signoret)	
Coccidae	Ceroplastes floridensis Comstock	
Coccidae	Pulvinaria psidii (Maskell)	
Diaspididae	Aulacaspis tubercularis(Newstead)	Sharqiya
Diaspididae	Lepidosaphes pallidula (Maskell)	Belbais
Diaspididae	Chrysomphalus aonidum Linnaeus	
Monophilibidae	Icerya seychellarum (Westwood)	
Pseudococcidae	Planococcus citri(Risso)	
Coccidae	Kilifia acuminata(Signoret)	
Coccidae	Ceroplastes floridensis Comstock	
Coccidae	Pulvinaria psidii (Maskell)	
Diaspididae	Aulacaspis tubercularis (Newstead)	Zagazig
Diaspididae	Chrysomphalus aonidum Linnaeus	
Diaspididae	Lepidosaphes pallidula(Williams)	
Diaspididae	Parlatoria oleae(Colvée)	
Monophilibidae	Icerya seychellarum (Westwood)	
Pseudococcidae	Planococcus citri(Risso)	

Table (2) Survey of the parasitoids species associated with the scale insect and mealybug species on mango trees at different Governorates during two successive seasons 2013 - 2014 and 2014-2015

Family	Parasitoid species	Governorate	Locality	Insect hosts
Aphelinidae	<i>Encarsia citrine</i> Craw	Fayoum	Sanhur	<i>Aonidiella aurantii</i> Maskell
Aphelinidae	<i>Aphytis lepidosaphes</i>			<i>Lepidosaphes pallidula</i> (Maskell)
Aphelinidae	Compere			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Encyrtidae</u>	<i>Habrolepis diaspidi</i> (Risbec) <i>Metaphycus flavus</i> (Haward)			<i>Kilifia acuminata</i> (Signoret)
Aphelinidae	<i>Encarsia citrine</i> Craw	Fayed	Aulacaspis tubercularis (Newstead)	
Aphelinidae	<i>Aphytis lepidosaphes</i> Compere			<i>Lepidosaphes pallidula</i> (Maskell)
Aphelinidae	<i>Habrolepis diaspidi</i>			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Encyrtidae</u>	(Risbec) <i>Metaphycus flavus</i> (Haward)			<i>Kilifia acuminata</i> (Signoret)
Aphelinidae	<i>Habrolepis diaspidi</i>	Ismailia	Kantrah-Shark	<i>Aulacaspis tubercularis</i> (Newstead)
Aphelinidae	(Risbec)			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Encyrtidae</u>	<i>Encarsia citrine</i> Craw			<i>Kilifia acuminata</i> (Signoret)
	<i>Metaphycus flavus</i> (Haward)			
Aphelinidae	<i>Encarsia citrine</i> Craw	Al-Tall	Al-Kabir	<i>Aulacaspis tubercularis</i> (Newstead)
Aphelinidae	<i>Aphytis lepidosaphes</i>			<i>Lepidosaphes pallidula</i> (Maskell)
<u>Encyrtidae</u>	Compere			<i>Kilifia acuminata</i> (Signoret)
	<i>Metaphycus flavus</i> (Haward)			
Aphelinidae	<i>Habrolepis diaspidi</i>	Monof	Monof	<i>Aulacaspis tubercularis</i> (Newstead)
Aphelinidae	(Risbec)			<i>Aulacaspis tubercularis</i> (Newstead)
Aphelinidae	<i>Encarsia citrine</i> Craw			<i>Aulacaspis tubercularis</i> (Newstead)
Aphelinidae	<i>Aphytis chrysomphali</i> Mercet			<i>Lepidosaphes pallidula</i> (Maskell)
	<i>Aphytis lepidosaphes</i> Compere			
Aphelinidae	<i>Aphytis chrysomphali</i> Mercet	Monoufia	Shibin-Elkoum	<i>Aulacaspis tubercularis</i> (Newstead)
Aphelinidae	<i>Habrolepis diaspidi</i>			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Encyrtidae</u>	(Risbec)			<i>Kilifia acuminata</i> (Signoret)
	<i>Metaphycus flavus</i> (Haward)			
Aphelinidae	<i>Aphytis lepidosaphes</i>	Banha	Banha	<i>Lepidosaphes pallidula</i> (Maskell)
Aphelinidae	Compere			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Encyrtidae</u>	<i>Encarsia citrine</i> Craw			<i>Kilifia acuminata</i> (Signoret)
	<i>Metaphycus flavus</i> (Haward)			
<u>Encyrtidae</u>	<i>Metaphycus flavus</i> (Haward)	El -Khanka	El -Khanka	<i>Kilifia acuminata</i> (Signoret)
Aphelinidae	<i>Encarsia citrine</i> Craw			<i>Aulacaspis tubercularis</i> (Newstead)
Aphelinidae	<i>Aphytis lepidosaphes</i>			<i>Lepidosaphes pallidula</i> (Maskell)
Aphelinidae	Compere			<i>Aulacaspis tubercularis</i> Newstead
	<i>Aphytis chrysomphali</i> Mercet			
Aphelinidae	<i>Encarsia citrine</i> Craw	Qalyubiya	El- Qanater Al-Khayria	<i>Aulacaspis tubercularis</i> (Newstead)
Aphelinidae	<i>Habrolepis diaspidi</i> (Risbec)			<i>Aulacaspis tubercularis</i> (Newstead)
Aphelinidae	<i>Aphytis lepidosaphes</i>			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Encyrtidae</u>	Compere			<i>Kilifia acuminata</i> (Signoret)
	<i>Metaphycus flavus</i> (Haward)			
Aphelinidae	<i>Habrolepis diaspidi</i> (Risbec)	Shebeen Al-Qanater	Shebeen Al-Qanater	<i>Aulacaspis tubercularis</i> (Newstead)
<u>Encyrtidae</u>	<i>Metaphycus flavus</i> (Haward)			<i>Kilifia acuminata</i> (Signoret)
Aphelinidae	<i>Habrolepis diaspidi</i> (Risbec)	Abou – Hammad	Abou – Hammad	<i>Aulacaspis tubercularis</i> (Newstead)
<u>Encyrtidae</u>	<i>Metaphycus flavus</i> (Haward)			<i>Kilifia acuminata</i> (Signoret)
Aphelinidae	<i>Encarsia citrine</i> (Craw)	Sharqiya	Belbais	<i>Kilifia acuminata</i> (Signoret)
Aphelinidae	<i>Aphytis lepidosaphes</i>			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Encyrtidae</u>	Compere			<i>Lepidosaphes pallidula</i> (Maskell)
	<i>Metaphycus flavus</i> (Haward)			
Aphelinidae	<i>Encarsia citrine</i> (Craw)	Zagazig	Zagazig	<i>Aulacaspis tubercularis</i> (Newstead)
<u>Encyrtidae</u>	<i>Metaphycus flavus</i> (Haward)			<i>Kilifia acuminata</i> (Signoret)

Table (3) Survey of the predators species associated with scale insect and mealybug species on mango trees during two successive seasons 2013 – 2014 and 2014- 2015

Family	Predator species	Governorate	Locality	Insects preys
<u>Coccinellidae</u>	<i>Rodalia cardinalis</i> (Mulsant)	Fayoum	Sanhur	<i>Icerya seychellarum</i> (Westwood)
<u>Coccinellidae</u>	<i>Cryptolaemus montrouzieri</i>			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	Mulsant			<i>Aulacaspis tubercularis</i> (Newstead)
Chrysopidae	<i>Exochomus flavipes</i> (Thunberg)			<i>Pulvinaria psidii</i> (Maskell)
Chrysopidae	<i>Chrysopa sp.</i>			<i>Aulacaspis tubercularis</i> Newstead
<u>Coccinellidae</u>	<i>Chrysoperlla carnae</i> (Steph)	Fayed	Icerya seychellarum (Westwood)	
<u>Coccinellidae</u>	<i>Rodalia cardinalis</i> (Mulsant)			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>Scymnus syriacus</i> (Marseul)			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>Cryptolaemus montrouzieri</i>			<i>Pulvinariapsidii</i> (Maskell)
<u>Coccinellidae</u>	Mulsant			<i>Aulacaspis tubercularis</i> (Newstead)
Hemisarcoptidae	<i>Coccinella undecimpunctata</i> L.	Ismailia	Kantrah-Shark	<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>Hemisarcoptes coccophagus</i> (Meyer)			<i>Icerya seychellarum</i> (Westwood)
<u>Coccinellidae</u>	<i>Rodalia cardinalis</i> (Mulsant)			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>Scymnus syriacus</i> (Marseul)			<i>Aulacaspis tubercularis</i> (Newstead)
Hemisarcoptidae	<i>Hemisarcoptes coccophagus</i> (Meyer)			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>Rodalia cardinalis</i> (Mulsant)	Al-Tall	Al-Kabir	<i>Icerya seychellarum</i> (Westwood)
<u>Coccinellidae</u>	<i>Chilocorus</i>			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>bipustulatus</i> (Linnaeus)			<i>Icerya seychellarum</i> (Westwood)
<u>Coccinellidae</u>	<i>Scymnus syriacus</i> (Marseul)			<i>Aulacaspis tubercularis</i> (Newstead)
Hemisarcoptidae	<i>Hemisarcoptes coccophagus</i> (Meyer)			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>Rodalia cardinalis</i> (Mulsant)	Monoufia	Monof	<i>Icerya seychellarum</i> (Westwood)
<u>Coccinellidae</u>	<i>Chilocorus</i>			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>bipustulatus</i> (Linnaeus)			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>Rodalia cardinalis</i> (Mulsant)			<i>Aulacaspis tubercularis</i> (Newstead)
Hemisarcoptidae	<i>Chilocorus</i>			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>bipustulatus</i> (Linnaeus)	Banha	El-khanka	<i>Icerya seychellarum</i> (Westwood)
<u>Coccinellidae</u>	<i>Chilocorus</i>			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>Rodalia cardinalis</i> (Mulsant)			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>Chilocorus</i>			<i>Aulacaspis tubercularis</i> (Newstead)
Hemisarcoptidae	<i>bipustulatus</i> (Linnaeus)			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>Hemisarcoptes coccophagus</i> (Meyer)	Qalyubiya	El-Qanater	<i>Icerya seychellarum</i> (Westwood)
<u>Coccinellidae</u>	<i>Rodalia cardinalis</i> (Mulsant)			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>Chilocorus bipustulatus</i> (Linnaeus)			<i>Aulacaspis tubercularis</i> (Newstead)
Hemisarcoptidae	<i>Hemisarcoptes coccophagus</i> (Meyer)			<i>Kilifia acuminata</i> (Signoret)
Chrysopidae	<i>Chrysoperlla carnae</i> (Steph)			<i>Icerya seychellarum</i> (Westwood)
Anthracoidae	<i>Orius sp.</i>	Shebeen	Al-Qanater	<i>Lepidosaphes pallidula</i> (Maskell)
<u>Coccinellidae</u>	<i>Rodalia cardinalis</i> (Mulsant)			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>Scymnus syriacus</i> (Marseul)			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>Hemisarcoptes coccophagus</i> (Meyer)			<i>Aulacaspis tubercularis</i> (Newstead)
Hemisarcoptidae	<i>Hemisarcoptes coccophagus</i> (Meyer)			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>Rodalia cardinalis</i> (Mulsant)	Sharqiya	Belbais	<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>Exochomus flavipes</i> (Thunberg)			<i>Aonidiella aurantii</i> (Maskell)
<u>Coccinellidae</u>	<i>Scymnus syriacus</i> (Marseul)			<i>Icerya seychellarum</i> (Westwood)
<u>Coccinellidae</u>	<i>Rodalia cardinalis</i> (Mulsant)			<i>Icerya seychellarum</i> (Westwood)
<u>Coccinellidae</u>	<i>Scymnus syriacus</i> (Marseul)			<i>Aulacaspis tubercularis</i> (Newstead)
<u>Coccinellidae</u>	<i>Rodalia cardinalis</i> (Mulsant)	Zagazig	Zagazig	<i>Icerya seychellarum</i> (Westwood)
<u>Coccinellidae</u>	<i>Scymnus syriacus</i> (Marseul)			<i>Aulacaspis tubercularis</i> (Newstead)

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