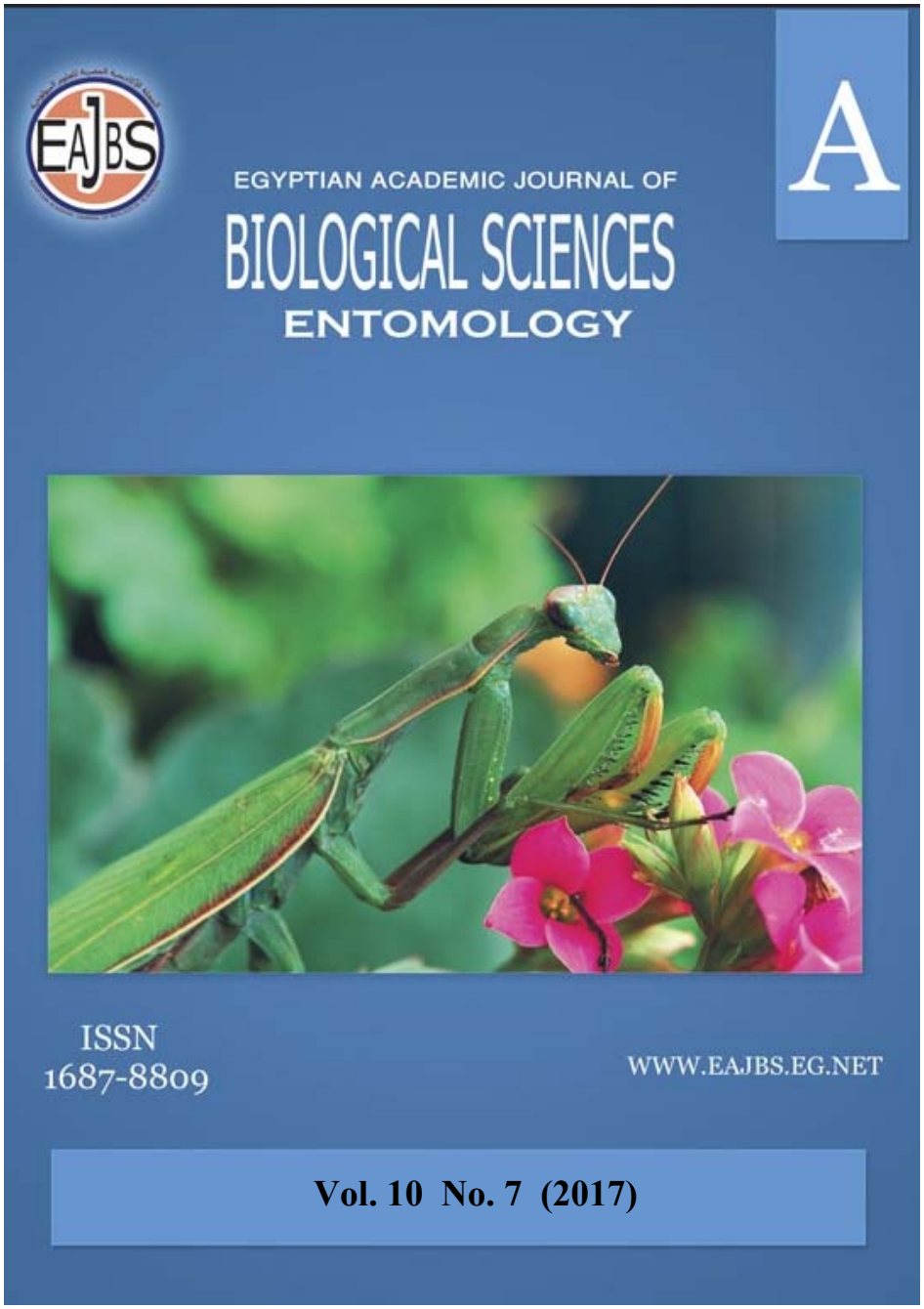

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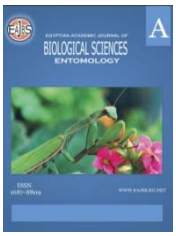

Survey of the Olive Pests and Their Control in Egypt: A Review

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ABSTRACT

This work aimed to identify the olive insect pests and their associated natural enemies recorded in Egypt by using the available literatures. Determination of the mites associated with olive groves is also took a beam of light. The collected articles exhibited the presence of 15 hexapod species belonging to 14 genera, 9 families and 4 orders in association with olive groves. Three predatory Acarid species were also recorded. The obtained data clear that, 60% of the recorded arthropod pests were belonging to order Homoptera. However, 20%, 13.33% and 6.67% of the recovered species were belonging to orders Lepidoptera, Diptera and Coleoptera, respectively. Fifty five parasitoid species belonging to 9 Hymenopteran families were recorded in association with arthropods infesting olive trees. The obtained data showed that 30.90% of the total identified parasitoid species were belonging to family Aphilinidae. It followed by family Encyrtidae by (27.27%). The remaining families can be arranged in descending order as follows: Pteromalidae by 10.91% > Braconidae by 9.10% > both of Euritomidae and Trichogrammatidae by 7.27% > Eupelmidae by 3.64% > both of Bethylidae and Chalcididae by 1.82%. The role of biological and chemical control procedures used to manage olive pests was determined. Parasitism of certain parasitoid species on the main olive arthropod pests was investigated. The impact of chemical and safe alternative compounds to reduce olive pests and their associated natural enemies has been discussed in more details.

INTRODUCTION

Olive (*Olea europaea* L.) is one of the most economically horticultural crops in Egypt. The cultivated area of olive trees in Egypt has been rapidly expanded year after year. More than 108 thousand feddans (45360 hectare) were cultivated by olive during 2002 and reached 163273 feddan (6857.34 hectare) in 2010. The quantity of production reached about 281745 tons in 2000 and 390932 tons in 2010 (Ibraheem *et al.*, 2012).

Olive trees are subjected to attack by several insect pests that had harmful effect on olive yield quality and quantity. Faunistic composition of certain olive arthropod pests was studied by Moursy and Mesbah (1985). Dispersal ability and field activity of the olive naturally occurring biological control agents associated with olive insect pests was investigated by several authors in Egypt, e.g. Abd-Rabou

(1999); El-Khawas *et al*. (2000); El-Heneidy *et al*. (2001); Nasr *et al*. (2004); Fadl *et al*. (2010) and Hegazi *et al*. (2011).

The aim of this work is to identify the previously recorded olive insect pests and their associated natural enemies, in Egypt. Also, the role of certain biological and/or chemical control procedures in managing olive pests was in consideration.

MATERIALS AND METHODS

Study outlines:

Several authors studied the population diversity of the main insect pests inhabiting olive trees. Others have been concerned with the naturally occurring biological control agents as a promising tool for olive pest's managements. Toxicology of insecticides as an effective method against olive pests took attention by few investigators. Survey of the Acarid mites associated with olive groves took a bean of light by few investigators.

RESULTS AND DISCUSSION

Survey and faunistic composition of olive pests:

General survey of arthropod pests associated with olive groves has been reviewed by the writer (Table 1). Rather than 3 predatory Acarid species inhabiting olive groves, 15 arthropod species belonging to 14 genera, 9 families and 4 orders were found to be associated with olive groves in Egypt. The greatest number of arthropod species infesting olive was belonging to order Homoptera (60%). However, 20%, 13.33% and 6.67% of the recovered species were belonging to orders Lepidoptera, Diptera and Coleoptera, respectively. The highest number of arthropod species attacking olive trees was belonging to the homopteran family Diaspididae (4 species).

Thirty one species of insects and mites associated with olive trees in an irrigated olive plantation in Egypt are listed by Moursi and Mesbah (1985). They reported that eighteen of species encountered were pests of the tree and the other 13 were parasitoids and/or predators. However, (El-Hakim and Helmy, 1985) reported that a total of 12 arthropod species were found to be attack the leaves of olive trees in Alexandria, Tora and Fayoum districts. On the other hand, Abd-Rabou (2003) collected olive leaves heavily infested with the whitefly *Siphoninus phillyreae* which recorded at the first time on olive in Al-Arish region, North Sinai.

Population trends of the main olive pests:

As shown in Table (1) several authors have been concerned with the population trends of certain olive pests in different localities all over Egypt. During their ecological studies on the kernel olive moth *Prays oleae* (Born.) in Alexandria, El-Saadany *et al*. (1983) stated that this moth was found to have 9 overlapping generations a year. They reported that the most abundant and economically important generation was the 3rd, 4th and 5th, ones, which occurred during the fruiting periods.

In Assiut, Upper Egypt, Abou-Elhagag (2004) reported that the kernel olive moth *P. oleae* populations decreased gradually till April and then increased to reach its maximum levels of abundance in September and October. Also, he studied the effects of temperature and relative humidity on the pest populations and its associated parasitoids.

Seasonal fluctuations of the olive whitefly, *Aleurolobus olivinus* (Silvestri) was studied by Morsi *et al*. (2010). They reported that peaks of the pest numbers

were recorded by early April, June, November, 2006 and January 2007. Correlation between the climatic factors and the population of *A. olivinus* and its parasitoids was statistically analyzed.

Seasonality in the occurrence of the kernel olive moth *P. oleae* and the Jasmine olive leaf moth *Palpita unionalis* (Hubner) was studied by Hegazi *et al*. (2011). A 3-year monitoring study using six pheromone traps in semi-arid and arid olive groves was performed. Their results showed that *P. unionalis* had 3 generations annually with higher densities in the arid olive groves than those in the semi-arid one. The male flight and egg laying trend of *P. unionalis* on different olive varieties was determined by Hegazi *et al*. (2012). Their results suggested that the Shamy variety discouraged graved females from ovipositing, when compared with the other tested varieties. This study clear that, olive variety, cropping system and trapping season are among factors affect this insect pest.

Table 1. A partial taxonomic list of olive pests in Egypt.

Order, family & scientific name	Common name	Scope of study	Author(s) & year
Order: Homoptera			
Fam.: Coccidae			
Saissetia coffeae (Walker)	Hemispherical soft scale insect	Biological control	Abd-Rabou (2005). Morsi (2010). Abd-Rabopu and Ahmed (2011).
Saissetia oleae (Olivier)	The Mediterranean black scale	Biological control	Abd-Rabou (1999). Hegazi *et al*. (2004). Abd-Rabou and Ahmed (2011). Ibraheem *et al*. (2012).
Fam: Diaspididae			
Aonidiella aurantii Maskell	Red scale	Survey	Moursy and Mesbah (1985).
Leucaspis riccae Targioni-Tozzetti	White olive scale	Survey	El-Hakim and Helmy (1985). Moursi and Mesbah (1985).
		Biological control	El-Khawas *et al*. (2000). Abd-Rabou and Ahmed (2011).
*Parlatoria olea*e (Colvee)	Olive scale	Survey	El-Hakim and Helmy (1985); Moursi and Mesbah (1985).
		Biological control	Abd-Rabou and Ahmed (2011).
		Survey	Abou-Elhagag (2004).
		Chemical control	Ammar *et al*. (2013).
*Aspidiotus hedera*e Leonardi	Scale insect	Survey	Moursi and Mesbah (1985).
Fam: Aleyrodidae			
Siphoninus phillyrea (Haliday)	Pomegranate whitefly	Ecology	Abd-Rabou (2003).
		Biological control	Abd-Rabou and Ahmed (2011).
Aleurolobus olivinus Silvestri	Olive whitefly	Ecology	Morsi *et al*. (2010).
		Biological control	Abd-Rabou and Ahmed (2011).
Fam.: Aphalaridae			
Euphyllura straminea (Longinova)	Olive psyllid	Control	Youssef *et al*. (2011); Amin *et al*. (2013a, b).
Order: Coleoptera	Olive bark borer		
Fam.: Scolytidae			
Phloeotribus scarabaeoides (Bern)		Ecology	Ismail *et al*. (1988).
		Biological control	Fadl *et al*. (2010).
Order: Lepidoptera			
Fam.: Cossidae			
Zeuzera pyrina (L.)	The leopard moth	Ecology	Ismail *et al*. (1988); Hegazi *et al*. (2010).

Table 1. Cont.

Order, family & scientific name	Common name	Scope of study	Author(s) & year
Fam.: Pyralidae			
Palpita unionalis (Hubner)	Olive leaf moth	Biology	El-Kifl *et al*. (1974).
		Biological control	El-Khawas *et al*. (2000).
			Hegazi *et al*. (2007a, b). Eid and Wafaa (2008).
		Ecology	Hegazi *et al*. (2011 & 2012).
		Survey	El-Hakim and Helmy(1985).
Fam: Yponometidae			
Prays oleae (Bernard)	Kernel olive moth	Ecology	El-Saadany *et al*. (1983). Hegazi *et al*. (2011).
		Survey	El-Hakim and Helmy (1985).
		Biological control	El-Khawas *et al*. (2000).
			Hegazi *et al*. (2004).
			Agamy (2007).
			Hegazi *et al*. (2007 b).
		Biological control	Sabbour (2013).
		Control	Amin *et al.* (2013a,b); Hegazi (2013).
Order: Diptera			
Fam: Tephritidae			
Bactrocera (*Dacus*) *oleae* (Gmelin)	Olive fruit fly	Biological control	El-Khawas *et al*. (2000).
			El-Heneidy *et al*. (2001).
			Moustafa *et al*. (2009).
			Sabbour (2013).
		Chemical control	Awadallah and Nadim (1970).
Ceratitis capitata (Widemann)	Mediterranean fruit fly	Biological control	Sabbour (2013).
Order: Acari			
Fam: Phytoseiidae			
Amblyseius olivia	Olive mite	Survey	Nasr and Abou-Awad (1987).
Fam.: Eriophydae			
Eriophyes olivia	Olive bud mite	Survey	Zaher and Abou-Awad (1980).
Oxypleurites maxwelli Keifer	Olive bud mite		Attiah (1970).

Biology of certain olive pests:

Scarce information was collected about the life history of olive insect pests. The principal olive pest *P. unionalis* took high attention by the earlier, El-Kifl *et al*. (1974). They reared this pest on olive in the laboratory. They observed that this pest laid its eggs in groups of 2-86 in the laboratory while, it laid 2-6 eggs only/each group in the field. In summer the eggs hatched in about 3 days, however 9 days were needed to hatchability in winter. They observed that the larvae fed on the leaves at the end of twig formatting silken webs in which they sheltered and later pupated. Each female can laid 141-882 eggs.

Bionomic and life table parameters of the olive psyllid *Euphyllura straminea* (Longinova) were carried out by Amin *et al*., (2103a) at three constant temperatures (20, 25 and 30°C) on olive seedlings throughout one complete generation. Durations and percentage of mortalities for different development stages were estimated. Results revealed that, egg incubation period, durations of nymphal stage and the five nymphal instars were decreased as temperature increased from 20°C to 30°C. Moreover, the highest percentage of mortality was occurred throughout 1st nymphal instar at 30°C, while the lowest percentage was occurred throughout 4th nymphal instar.

Olive pests and their associated natural enemies (parasitoids):

Fifty five parasitoid species were reviewed in association with arthropod pests infesting olive groves in Egypt (Table 2). These parasitoids were belonging to 9 Hymenopteran families. The obtained data revealed that, 30.90% of the total determined parasitoids were belonging to family Aphilinidae. It followed by family Encyrtidae by 27.27%. The remaining families can be arranged in descending order as follows: Pteromalidae by 10.91 > Braconidae by 9.10> both of Euritomidae and Trichogrammatidae by 7.27 > Eupelmidae by 3.64 > both of Bethylidae and Chalcididae by 1.82%.

During the last three decades several trials have been conducted to investigate the role of parasitoid species in suppressing olive pest's populations in Egypt. Abb-Rabou (1999) recorded five encyrtid parasitoid species in addition to one pteromalid and one aphelinid hyper parasitoid species in association with the coccid *Saissetia oleae* (Olivier).

The role of augmentative release of the indigenous encyrtid parasitoid *Metaphycus loynsburyi* in enhancing the biological control of the coccid *S. oleae* infesting olive in Egypt has been declared by Abd-Rabou (2004). Several releases of the insect parasitoid were made between May 1999 and April 2001during this manuscript. The obtained results revealed that, augmentative release of the parasitoid increased the parasitism percentage from 17.4 to 42.2% and from 6.4 to 19.2% during the first and the second years of study, respectively. Afterward, this parasitoid becomes established of some of the released sites in El-Arish (South Sinai) and Matroh (Western Egyptian desert) Governorates.

Importation, colonization and establishment of the aphelinid *Coccophagus cowperi* Gir parasitized the hemispherical soft scale *Saissetia coffeae* (Walker) have been investigated by Abd-Rabou (2005). During the period 2001-2002, a total of about 300,000 parasitoid individuals imported from India, were released at 35 sites on olive trees in Egypt. Parasitism rate of this parasitoid on *S. coffleae* was measured. The maximum parasitism rate reached 53 and 62%, while average parasitism rate were 17.2 and 30.8% in Marsa Matrouh and El-Arish localities, respectively. This result can be considered as a proof of the establishment suitability of this parasitoid to manage this important olive insect pest.

Seasonal abundance of *S. coffeae* and its parasitoids was estimated on olive leaves by Morsi (2010). He estimated six parasitoid species as declared in Table (2). Total rate of parasitism on *S. coffeae* showed 3 peaks with an average of 52, 55 and 39% during mid-June, early August and early March, respectively. In the second year of study, also 3 peaks were represented by 45, 46 and 41% parasitism during early July, September and January, respectively.

Concerning the tephritid flies infesting olive, El-Heneidy *et al*. (2001) surveyed eight parasitoid species on the immature stages of the tephritid fruit fly *Bactrocera oleae* (Gmelin) (Larvae and pupae). All of the recorded parasitoids were belonging to order Hymenoptera as clarified in Table (2). The mean parasitism percentage is estimated.

Several studies were obtained about the lepidopterous eggs parasitoid *Trichogramma* spp. Application of inundative releases of *Trichogramma evanescens* West.to control the olive moth *P. oleae* was conducted by Hegazi *et al*. (2004). The reduction of male catches in the treated plots resulted in reducing number of eggs of target species on olive shoots in the treated sites as compared with the control site. The maximum percentage of parasitism in *P. oleae* eggs occurred on 27 May. The efficacy of releasing wasps on premature fallen fruits and fruit yield per tree was

discussed in more details. In a similar study, Agamy (2007) evaluated the efficacy of inundative release of *T. evanescens* against *P. oleae* in the field and its impact on the olive fruit yield. The obtained results indicated that the pest attacks on olive groves were decreased. Also, treated yielded had significantly greater olive fruits by 10.5 and 12.5% than untreated trees in 2002 and 2004 olive seasons, respectively.

The commercial strain of *T. evanescens* was compared with three indigenous species i.e. *T. bourarachae; T. cordubensis* and *T. euproctidis* on the field to control olive moth *P. oleae* and Jasmin moth *P. unionalis* by Hegazi *et al*. (2007a). Impact of the release was monitored by recording egg parasitism, pest larval densities, fruit damage and fruit yield. Their results proved that the indigenous *Trichogramma* species accomplished higher egg parasitism (up to 91%) than the commercial strain. Larval densities of the target pest were significantly reduced up to 83% in *Trichogramma* release trees in comparison to control trees. Fruit damage ranged below 10% infested fruits and fruit yield was significantly increased on trees where indigenous wasps had been applied. In general, the obtained results suggested that release of indigenous *Trichogramma* species could improve control of lepidopterous pests on olive.

In the same approach, Hegazi *et al*. (2007b) compared the release of the aforementioned species in the field and laboratory. The emerged *T. evanescene* was significantly greater under field conditions (41%) than under laboratory (23%). However, the remaining indigenous species showed better adaptation to warm and dry weather conditions than the first one.

To select suitable conditions for control lepidopterous olive pests, the aforementioned indigenous and commercial *Trichogramma* species were compared by Hegazi *et al*. (2011). Dispersal and/or progeny production of these species was monitored using sentinel eggs placed at different heights in the release tree canopies, as well as, in neighboring trees. The obtained results indicated that the field progeny production was higher for *T. bourarache* followed by *T. euproctidis* and *T. cardubensis*. The commercial strain *T. evanescens* propagation was the least under field conditions.

Concerning the olive bark borers, Fadl *et al*. (2010) determined the population density of the olive bark borer, *Phloeotribus scarabaeoides* (Bern) and its associated parasitoids at Fayoum Governorate. Six species of hymenopterous parasitoids were recorded as reported in Table (2). Their obtained results showed that parasitism percentage ranged between 0.2 and 52.9% in the first season of study (2008), while it ranged between 0.07 and 29.9% during the second season. The highest percentage of parasitism (52.9% and 24.9%) was recorded in January 2008 and February 2009, respectively.

Toxicological studies:

Impact of chemical and safe alternative compounds on olive pests and their associated natural enemies has been studied by several investigators e.g. Youssef *et al*. (2004); Eid and Wafaa (2008); Moustafa *et al*. (2009); Youssef *et al*. (2011); Ibraheem *et al*. (2012); Ammar *et al*. (2013); Sabbour (2013); Hegazi (2013) and Amin *et al*. (2013b).

Effect of the bio-insecticide, bio-gard (*Bacillus thuringiensis*) and the insecticide agrothweet on *P. unionalis* at olive groves in Rafah region, North Sinai, had been conducted by Eid and Wafaa (2008). The pest infestation was reduced by 26.43% when the bio-gard was used when compared with agrothweet which reduce the pest numbers by 64.07%.

Spinosad, Lufenuron and Malathion were evaluated by Moustafa *et al*. (2009) to

control the olive fruit fly *Bactrocera oleae* under field conditions. They used partial bait spray and killing bags during fruiting seasons of 2008 and 2009. The obtained results showed that the percentages of *B. oleae* populations and fruit infestation were obviously low in treated plots with Lufenuron, Spinosad and Malathion, respectively. Youssef *et al*. (2011) evaluated the efficacy of six insecticides against the olive psyllid, *Euphyllure straminea* longevity on olive trees. The obtained results showed that, the tested insecticides were highly effective against this insect pest and protected the new emerged flowers from insect damage. Effectiveness of each insecticide was determined. They suggested that the post spraying count must be continue 4 weeks after application to determine the efficacy of the evaluated insecticides for control their insect pest.

Concerning the alternative compounds, an experiment was carried out by Ibraheem *et al*. (2012) to investigate the effect of some bio pesticides for controlling the olive black scale insect *Saissetia oleae* on olive trees at Giza Governorate. Four biopesticides (Biovar, Stanes-biocatch, Stanes-biomagic and Bioranza) and one plant extract (Nimbecidine) were tested. The obtained results showed that all tested bio pesticides and one extract were able to decrease the infestation with the olive black scale insect on olive trees through the three pest treatment counts. Data clearly showed no significant differences among their efficiency (over 85%) and Nembicidine gave 80%.

Recently, the use of entomopathogenic fungi against olive insect pests took attention by very few investigators. In this approach Sabbour (2013) tested the isolates of the entomopathogenic fungus, *Isaria fumosorosea* against the olive insect pests, *Bactrocera oleae*; *Ceratitis capitata* and *Prays oleae* under laboratory and field conditions. The percentage of *P. oleae*, *C. capitata* and *B. oleae*, infestations were significantly decreased in plots treated with *I. fumosorosea* to 15±4.1; 19±3.7 and 12±3.2 individuals as compared to 40±4.4; 36±5.4 and 35±3.6 individuals of the corresponding pests in the control.

Information about varietal resistance of olive against its insect pests was scarce. Inducing resistance on olive seedlings against olive psyllid, *Euphyllura straminea* by using natural phenol compound was studied by Amin *et al*. (2013b). They evaluated the toxic and repellent effect of a natural phenol compound (3, 4 dihydroxy phenol ethanol) to control and induce resistance to olive seedling against *E. straminea* under insectary conditions. Results showed that percentages of reduction of insect population were increased as the phenol compound concentrations increased. The reduction percentages of nymphs and adults were reached 100% after 15, 18 and 21 days at concentrations of 1.0; 0.75 and 0.5 mm, respectively. Also, this compound was found to be more effective on nymphal stage than adults. Therefore, they recommended using this compound to induce resistance of olive trees against olive psyllid infestation.

Little information about the side effects of chemical insecticides and alternative compounds against parasitoids associated with olive pests were obtained. Potential side-effects of six insecticides and two mineral oils which currently used against olive fly, olive moth and black scale was examined against their parasitoid *Trichogramma caroeciae* by Youssef *et al.* (2004). All of the tested insecticides reduced parasitism by 80-90% and rates as moderately harmful at the field recommended doses. The examined mineral oils reduced parasitism up to 25% and were therefore rated as harmless to adult stage of the parasitoid.

Table 2: A partial list of olive pests and their associated parasitoids recorded in Egypt.

Host insect	Associated Hymenopteran parasitoids	Parasitoid family	Author(s) & year
Saissetia coffeae (Walker) (=*Saissetia hemispherica* (Targ.) (Homoptera: Coccidae)	*Coccophagus lycinnia* Walker	Aphelinidae	Morsi (2010).
	Coccophagus cowperi Gir.	Aphelinidae	Abd-Rabou (2005).
	Encyrtus inflex (Embleton)	Encyrtidae	Morsi (2010).
	Marietta leopardina Match Hyper parasitoid	Apheliniae	
	Metaphycus flavus (Howard)	Encyrtidae	Abd-Rabou and Ahmed (2011).
	Metaphycus helvolus Comp.	Encyrtidae	Morsi (2010).
	Microterys flavus (Howard)	Encyrtidae	
	Scutellista caynea Motch	Pteromalidae	
Sissetia oleae (Olivier) (Homoptera: Coccidae))	*Diversinerus elegans* Silv.	Encyrtidae	Abd-Rabou (1999).
	Marietta leopardina Motschulsky Hyper parasitoid	Aphelinidae	
	Metaphycus spp.	Encyrtidae	
	Metaphycus bartletti (Anneck & Mynhartd)	Encyrtidae	Abd-Rabou (1999).
	Metaphycus flavus (Howard)	Encyrtidae	Abd-Rabou (1999).
	Metaphycus lounsburyi (Howard)	Encyrtidae	Hegazi *et al*. (2004); Abd-Rabou (2004); Abd-Rabou and Ahmed (2011).
	Metaphycus zebratus Mercet	Encyrtidae	Abd-Rabou (1999).
	Scutellista caerulea Fonscolombe	Pteromalydae	
Aonidiella aurantii (Hyomoptera: Diaspididae)	*Habrolepis* sp.	Encyrtidae	El-Khawas *et al*. (2000).
	Marietta sp. Hyper parasitoid	Aphelinidae	
Leucaspis riccae Targioni-Tozzetti (Homoptera: Diaspididae)	*Aphytis* sp.	Aphelinidae	El-Khawas *et al*. (2000).
	Aphytis libanicus Traboulsi	Aphelinidae	Abd-Rabou and Ahmed (2011).
Parlataria oleae (Colvee) (Homoptera: Dispididae)	*Aphytis lignaneonsis* Comper	Aphelinidae	Abd-Rabou and Ahmed (2011).
	Aphytis chrysomphali Mercet	Aphelinidae	
	Aphytis diaspidis Howard	Aphelinidae	
	Encarsia aurantii Howard	Aphelinidae	Abou-Elhagag (2004).
	Habrolepis aspidioti Campere & Anneck	Encyrtidae	Abd-Rabou and Ahmed (2011).
Aspidiotus herii (Hedera) (Homoptera: Diaspididae)	*Aphytis maculicornis* (Masi)	Aphelinidae	Moursi and Mesbah (1985).
Siphoninus phillyreae (Halidy) (Homoptera: Aleyrodidae)	*Encarsia inaron* Walker	Aphelinidae	Abd-Rabou and Ahmed (2011).

Table 2: Cont.

Host insect	Associated Hymenopteran parasitoids	Parasitoid family	Author(s) & year
Aleuvobus olivinus Silvestri (Homoptera: Aleyrodidae)	*Encarsia elegans* Masi	Aphelinidae	Abd-Rabou and Ahmed (2011).
	Encarsia oliviana (Masi)	Aphelinidae	
	Ertmocerus sp.	Aphelinidae	
Phloetribus sacaraeoides (Bern.) (Coleoptera: Scolytidae)	*Cephalonomia* sp.	Bethylidae	Fadl *et al*. (2010).
	Cerocephala comigera Westw	Pteromalydae	Fadl *et al*. (2010).
	Cheiropatchus quadrum L.	Pteromalydae	Ismail *et al*. (1988).
	Dendrosotes protuberous Ness	Bracanidae	Fadl *et al*. (2010).
	Eupelmus sp.	Eupelmidae	Ismail *et al*. (1988).
	Eurytoma sp.	Encyrtidae	Fadl *et al*. (2010).
	Eurytoma morio Bohenumen	Encyrtidae	Fadl *et al*. (2010).
	Litomastix truncatellus Dalman	Encyrtidae	Ismail *et al*. (1988).
	Plaphitelus maculates	Pteromalydae	Fadl *et al*. (2010).
Palpita unionalis (Hub.) (Lepidoptera: Pyralidae)	*Apanteles syleptae* Ferriere	Braconidae	El-Hakim and Helmi (1985); El-Khawas *et al*. (2000).
	Brachymeria aegypticae Masi	Chalcididae	El-Khawas *et al*. (2000).
Prays oleae (Born.) (Lepidoptera: Yponometidae)	*Apanteles* sp.	Braconidae	Hegazi *et al*. (2007a)
	Bracon sp.	Braconidae	
	Trichogramma bourarachae Pentureau & Babault	Trichogra-mmatidae	
	Trichogramma cardubensis Vargas &Cabella	Trichogra-mmatidae	
	Trichogramma euproctidis Girault	Trichogra-mmatidae	
	Trichogramma evanescens Westwood	Trichogra-mmatidae	
Bactrocera (*Dacus*) *oleae* Gmel. (Diptera: Tephritidae)	*Cyrtoptyx* sp.	Peteromalidae	El-Heneidy *et al*. (2001).
	Cyrtoptyx latipes (Rondani)	Peteromalidae	El-Khawas *et al*. (2000); El-Heneidy *et al*. (2001).
	Eupelmus sp.	Eupelmidae	
	Eurytoma sp.	Eurytomidae	
	Eurytoma martellit Domenichini	Eurytomidae	
	Macroneura (*Eupelmus* sp.)	Eurytomidae	
	Opius concolor Szépligeti	Braconidae	
	Pnigolio agraules (Walker)	Eurytomidae	

REFERENCES

Abou-Elhagag, G. H. 2004. Abundance of olive scale insect, *Parlatoria oleae* Clovee (Homoptera: Diaspididate) and its parasitoids in Upper Egypt. Assiut J. Agric. Sci., 35 (3): 197-208.

Abd-Rabou, S. 1999. Parasitoids attacking the Mediterranean black scale, *Saissetia oleae* (Hempitera: Coccidae) on olive in Egypt. Entomologica, 33: 169-172.

Abd-Rabou, S. 2003. First record of Pomegranate whitefly, *Siphoninus phillyreae* (Haliday) (Homoptera: Aleyrodidae) on olive in North Sinai. Egypt. J. Agric. Res., 81 (4): 1577-1579.

Abd-Rabou, S. 2004. The role of augmentative releases of indigenous parasitoid *Metaphycus lounsburyi* (Hymenoptera: Encyrtidae) in enhancing the biological

control of *Saissetia oleae* (Homoptera: Coccidae) on olive in Egypt. Archives of Phytopathology and Plant Protection, 37 (3): 233-237.

Abd-Rabou, S. 2005. Importation, colonization and establishment of *Coccophagus cowperi* Gir (Hymenoptera: Aphelinidae) on *Saissetia coffeae* (Walk) (Homoptera: Coccidae) in Egypt. J. Pest Sci., 78: 77-81.

Abd-Rabou, S. and Ahmed, N. 2011. Seasonal incidence of scale insects, whiteflies and Psyllids (Hemiptera) of olive and their natural enemies in Egypt. Egypt. Acad. J. Biolog. Sci., 4 (1): 59-74.

Agamy, E. 2007. Field evaluation of egg parasitoid, *Trichogramma evanescens* West. against the olive moth, *Prays oleae* (Bern) in Egypt. Egypt. J. Biol. Pest Cont., 17 (1/2): 21-27.

Amin, A. H.; Helmi, A.; El-Wan, E. A. and Youssef, A. S. 2013a. Bionomics and life table parameters of olive psyllid, *Euphyllura straminea* on olive seedlings under three constant temperatures. Mun. Ent. Zool., 8 (1): 294- 304.

Amin, A. H.; . Helmi, A. and Youssef, A. S. 2013b. Inducing resistance in olive seedlings against olive Psyllid, *Euphyllura straminea* using natural phenol compound. Greener J. Agric. Sci., 3 (4): 295-298.

Ammar, A. E.; Hindy, M. A. and Helmy, M.M. 2013. Qualitative distribution of spray deposit by using some ground spraying techniques on olive trees for controlling *Parlatoria oleae* (Clovee) (Hemiptera: Diaspididae). Egypt. J. Agric. Res., 91 (2): 481-493.

Attiah, H.H. 1970. New records of Eriophyid mites from Egypt (Acarina). Bull. Ent. Soc. Egypt, 54: 43-47.

Awadallah, A. and Nadim, A. L. 1970. The chemical control of the fruit-fly *Dacus oleae* Gmel. in Kom-Oshim district (Fayoum Governorate) during 1963 and 1964 seasons (Diptera: Trypetidae). Bull. Ent. Soc. Egypt, Economic Ser., 4: 135-141.

Eid, F. M. and Wafaa, O. G. 2008. Effect of the bio-insecticide, bio-gard (*Bacillus thuringiensis*) and the insecticide agrothweet on *Palpita unionalis* Hb. (Lepidoptera: Pyralidae) at olive groves in Rafah region, North Sinai, Egypt. Egypt. J. Biol. Pest Cont., 18 (2): 337-380.

El-Hakim, A.M. and Helmy, E.I. 1985. Survey of and population studies on olive leaf pests in Egypt. Bull. Ent. Soc. Egypt, 64: 213-220.

El-Heneidy, A. H.; Omar, A. H.; El-Sherif, H. and El-Khawas, M.A. 2001. Survey and seasonal abundance of the parasitoids of the olive fruit fly, *Bactrocera* (*Dacus*) *oleae* Gmel. (Diptera: Trypetidae) in Egypt. Arab J. Plant Protect., 19 (2): 80-85.

El-Khawas, M. A.; El-Heneidy, A. H.; Omar, A. H. and El-Sherif, H. 2000. A recent record of parasitoids on common olive pests in Egypt. Egypt. J. Biol. Pest Cont., 10 (1/2): 137-138.

El-Kifl, A. H.; Abdel-Salam, A. L. and Rahhal, A. M. 1974. Biological studies on the olive leaf-moth, *Palpita unionalis* Hb. (Lepidoptera: Pyralidae). Bull. Ent. Soc. Egypt, 58: 337-344.

El-Saadany, G.; Badawy, A.; Abdel-Fattah, M. and Hayder, F. 1983. Some ecological aspects of the kernel olive moth, *Prays oleae* Bern., in Egypt. Bull. Ent. Soc. Egypt, 62: 127-133.

Fadl, H. A.; Ibrahim, A. M.; Afify, A. I. and Ahmed, M. M. 2010. Some ecological aspects of the olive bark borer, *Phloeotribus scarabaeoides* (Bern.) (Coleoptera: Scolytidae), and its parasitoids. Egypt. J. Biol. Pest Cont., 20 (2): 171-174.

Hegazi, E. M. 2013. Pheromones for sustainable control of lepidopterous pests in olive farms in Egypt. 2nd Int. Conf on Biodiversity & Sustainable Energy

Development, Aug. 12-14, USA.

Hegazi, E. M.; Agamy, E.; Hassan, S.; Herz, A.; Khafagi, W.; Showeil, S.; Abo-Abdala, L.; Zaitoun, A.; El-Said, S.; Shazly, A.; El-Menshawy, A.; Karam, H.; . Khamis, N. and El-Kemny, S. 2004. Application of inundative releases of *Trichogramma evanescens* to control the olive moth, *Prays oleae* (Bern.). Egypt. J. Biol. Pest. Cont., 14 (1): 1-7.

Hegazi, E. M.; Herz, A.; Hassan, S. A.; Agamy, E.; Khafagi, W.E.; Zaiton, A.; El-Aziz, G.M.A.; El-Said, S. and Shewiel, S. 2007b. Optimization of the field performance of release *Trichogramma* spp. in olive groves in Egypt. Egypt. J. Biol. Pest Cont., 17 (1/2): 51-55.

Hegazi, E. M.; Herz, A.; Hassan, S.A.; Khafagi, W. E.; Agamy, E.; Zaitun, A.; Abd El-Aziz, G.; Showeil, S.; El-Said, S. and Khamis, N. 2007a. Field efficacy of indigenous egg parasitoids (Hymenotpera: Trichogrammatidae) to control the olive moth (*Prays oleae*, Lepidoptera, Hyponomeutidae) and the Jasmin moth (*Palpita unionalis*, Lepidoptera, Pyralidae) in an olive plantation in Egypt. Biol. Cont., 43 (2): 171-187.

Hegazi, E. M.; Khafagi, W.; Herz, A.; Konstantopoulou, M.; Hassan, S.; Agamy, E.; Atwa, A. and Showeil, S. 2011. Dispersal and field progeny production of *Trichogramma* species released in an olive orchard in Egypt. Biocontrol (IOBC-Abst.).

Hegazi, E. M.; Khafagi, W. E.; Konstantopoulou, M. A.; Raptopoulos, D. G.; Showeil, S.; Abd El-Rahman, S.; Atwa, A. and Tawfik, M. 2010. Suppression of leopard moth (Lepidoptera: Cossidae) populations in olive trees through mating disruption. J. Econ. Entomol., 103 (5): 1621-1627.

Hegazi, E. M.; Konstantopoulou, M. A.; Herz, A.; Khafagi, W. E.; Agamy, E.; Showiel, S.; Atwa, A.; Abd El-Aziz, G. M. and Abdel-Rahman, S.M.. 2011. Seasonality in the occurrence of two lepidopterous olive pests in Egypt. FAO. Abst.

Hegazi, E. M.; Konstantopoulou, M. A.; Khafagi, W. E.; Schlyter, F.; Herz, A.; Raptopoulos, D.G.; Hassan, S. and Atwa, A. 2012. The population trend of *Palpita unionalis* in different olive varieties in Egypt. Phytoparasitica, 40 (5): 451-459.

Ibraheem, A.M.; Al-Arnaouty, S.A.G.; Moussa, S.F.M. and Helmy, S.M.Y. 2012. Efficiency of certain biopesticides against the olive black scale insect, *Saissetia oleae* (Olivier) on olive trees at Giza Governorate, Egypt. Egypt. Acad. J. Biol. Sci., 5 (2): 87-93.

Ismail, I. I.; Abu-Zeid, N. A. and Abdallah, F.F. 1988. Ecological and behavioral studies on olive tree borers and their parasites. Agric. Res. Rev., 66 (1): 145-152.

Morsi, G. A. 2010. Seasonal abundance of the hemispherical soft scale insect *Saissetia coffeae* (Walker) (Homoptera: Coccidae) and its parasitoids on olive in middle Egypt. Egypt. J. Biol. Pest Cont., 20 (2): 139-142.

Morsi, G. A.; Moussa, S.P. and Serag, A. M. 2010. Population dynamics of olive whitefly, *Aleurolobus olivinus* (Silvestri) (Homoptera: Aleyrodidae) and its parasitoids in middle Egypt. Egypt. J. Biol. Pest Cont., 20 (2): 143-148.

Moursy, K. S. and Mesbah, H. A. 1985. Olive pests of irrigated-farm systems in the Egyptian western desert with special references to armored scale insects. Ann. Agric. Sci. Moshtohor, 23 (2): 901-911.

Moustafa, S. A.; Abd El-Mageed, A. E.; El-Metwally, M. M. and Ghanim, N. M. 2009. Efficacy of Spinosad, Lubenuron and Malathion against olive fruit fly *Bactrocera oleae* (Gmelin) (Diptera: Tephritidae). Egypt. Acad. J. Biol. Sci., 2

(2): 171-178.
Nasr, A. K. and Abou-Awad, B. A. 1987. A new species of genus *Amblyseius* Berlese from Egypt (Acari: Phytoseiidae). Bull. Ent. Soc. Egypt, 65: 245-249.
Nasr, F. N.; Stefanos, S.S.; Abou-ElKhair, S. S.; Shehata, W. A.; Awad, A.I. and Youssef, I.A. 2004. Preliminary field trials for enhancement of natural enemies of olive pests in Egypt. Egypt. J. Biol. Pest. Cont., 14 (1): 201-206.
Sabbour, M.M. 2013. Efficacy of *Isaria fumosorosea* against olive pests under laboratory and field conditions in Egypt. Int. J. Dev., 2 (1): 55-61.
Youssef, A. S.; Amin, A. H.; El-Wan, E. A. and Helmi, A. 2011. Field evaluation of some insecticides against the olive psyllid, *Euphyllura straminea* Longinova (Homoptera: Psylloidea, Aphalaridae) on olive trees in Ismailia Governorate, Egypt. Egypt. J. Agric. Res., 89 (1): 73-80.
Youssef, A. I.; Nasr, F. N.; Stefanos, S. S.; ElKhair, S. S. A.; Shehata, W. A.; Agamy, E.; Herz, A. and Hassan, S. A. 2004. The side-effects of plant protection products used in olive cultivation on the hymenopterous egg parasitoid *Trichogramma cocoeciae* Marchal. J. Appl. Entomol., 128 (9-10): 593-599.
Zaher, M. A. and Abou-Awad, B. A. 1980. Two new eriophyid species infesting olive trees in Egypt (Eriophyoidea: Eriophyidae). Acarologia, 21 (1): 65-69.

ARABIC SUMMARY

حصر لآفات الزيتون ومكافحتها في مصر: دراسة مرجعية

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يهدف هذا البحث إلي التعريف بآفات الزيتون والأعداء الحيوية المصاحبة لها في مصر. كما يلقي الضوء علي تعريف الأكاروسات المصاحبة لبساتين الزيتون. وقد ألقت الدراسة الضوء علي طرق المكافحة الحيوية والكيميائية التي أستخدمت للتحكم في آفات الزيتون. ومن خلال الأبحاث التي تم التحصل عليها وجد أن ١٥ نوع من مفصليات الأرجل والتابعة لـ ١٤ جنس و ٩ عائلات و ٤ رتب تتواجد علي أشجار الزيتون. أيضاً ٣ أنواع من الأكاروسات سجلت مرافقة للزيتون. وقد وجد أن ٦٠% من الأنواع المسجلة علي الزيتون تتبع رتبة متجانسة الأجنحة Homoptera . تلاها رتب حرشفية الأجنحة Lepidoptera و ذات الجناحين Diptera وغمدية الأجنحة Coleoptera والتي أشتملت علي ٢٠% ، ١٣,٣٣% ، ٦,٦٧% من الأنواع المسجلةعلي التوالي. كما سجل ٥٥ نوع من الطفيليات الحشرية كأعداء حيوية مصاحبة لآفات الزيتون. أظهرت النتائج أن ٣٠,٩٠% من المجموع الكلي للطفيليات كانت تابعه لعائلة Aphilinidae. تلاها عائلة Encyrtidae (٢٧,٢٧%) . أما باقي العائلات فأمكن ترتيبها تنازليا علي النحو التالي: Pteromalidae <١٠,٩١% Braconidae <٩,١٠% كلا من Trichogrammatidae , Euritomidae <٧,٢٧% Eupelmidae <٣,٦٤% كلا من Bethylidae و Chalcididae ١,٨٢%.
تم أستعراض مرجعي لفعالية بعض أنواع الطفيليات في القدرة علي خفض أعداد آفات الزيتون. كما تم أستعراض لبعض الأبحاث التي تتناول تأثير بعض المبيدات والمركبات الآمنة علي آفات الزيتون والأعداء الحيوية المصاحبة لها.