OLIVE PESTS AND THEIR INTEGRATED MANAGEMENT IN EGYPT

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I. INTRODUCTION

The origin of the olive tree is lost in time, coinciding and mingling with the expansion of the Mediterranean civilizations which for centuries governed the destiny of mankind and left their imprint on Western culture. According to the IOOC there are 789 million trees worldwide, 95 per cent of them in the Mediterranean region (IOOC 2001). Although greater than 125 arthropod species attack olive plants, the olive fly, *Bactrocera oleae* Gmelin (Diptera: Tephritidae), is the major threat to olives worldwide.(3) In table olives, the larval damage is largely cosmetic but can also increase rot, and only minimal infestations are tolerated. Acceptable levels of damage in olives destined for oil production are higher (about 10%).(3) Less important pests attacking olives include Lepidoptera: olive moth, *Prays oleae* (Bernard), jasmine moth, *Palpita unionalis* Hübner, olive pyralid moth, *Euzophera pinguis* Haworth, and leopard moth, *Zeuzera pyrina* L., Homoptera: black scale, *Saissetia oleae* (Olivier), olive scale, *Parlatoria oleae* Colvée, and oleander scale, *Aspidiotus nerii* (Bouche), and Coleoptera: olive bark beetle, *Phloeotribus scarabaeoides* Bern, and twig cutter beetle, *Rhynchites cribripennis* (Desbrocher des Loges), as well as the olive thrips, *Liothrips oleae* Costa, and olive psylla, *Euphyllura olivina* Costa. The importance of these pests varies with location, climate, and the intended use of the olives.

A total of 12 arthropod species was found on the leaves of olive trees on 2 sites in Alexandria, 2 in Tora and 4 in Fayoum districts of Egypt (El-Hakim and Helmy, 1982). The species of insects and mites associated with olive trees in an irrigated olive plantation in Egypt are listed. Eighteen of the species encountered were pests of the tree, and the other 13 were parasitoids and/or predators of these (Moursi and Mesbah ,1985). A list of the hymenopteran parasitoids of common pests of olive in Egypt. The present work deat with the status of ocuurence of pests of olive as well as their management control in Egypt (El-Khawas *et al.*, 2000). This research article includes a review of economic importance, survey, bionomics, IPM of the pests on olive in Egypt (Chemical control, biological , agricultural and mechanical control).

II. COLEOPTERA

a. Economic Importance of Coleoptera on olive:

There are two different kinds of damage, the first affecting debilitated or weakened olive trees and the second well-developped, vigourous trees. In the first instance, damage is caused by larval feeding and by adults which attack the already weakened stems and branches of debilitated olive trees, increasing damage and causing further decline and sometimes death of trees. In the second, losses are due to adults producing incisions on small, healthy branches when feeding, causing the tips to dessicate, or to adults damaging axillary buds when trying to initiate small galleries or holes in which to hibernate.

b. Survey of Coleoptera:

Hylesinus taranio Bernard , *Leperisinus fraxini* Panz. and *Phloeotribus scarabaeoides* Bernard (Coleoptera: Scolytidae) recorded for first time in Egypt (Hamza ,1975).

c. Bionomics of Coleoptera:

It was found that females initiated egg tunnel construction, copulation takes place either on the bark in the initial phase of egg tunnel construction, or inside the tunnel system. Observations of one male copulating with several females and of solitary females in galleries with eggs suggested that the males sometimes leave after copulation.

d. IPM of Coleoptera:

*** Chemical control:**

The effect of cypermethrin, a pyrethroid insecticide, on *P. scarabaeoides* (Coleoptera: Scolytidae), an important olive insect pest, has been studied in the laboratory to evaluate its use in the management of this scolytid. Three olive trees were sprayed with a 0.1%, 0.01% and 0.001% solution of cypermethin and a forth tree with water for the control. At 1, 3, 5, 7, 10 and 13 weeks after spraying, a randomly-selected twig cut from each tree, and 5 bark beetles were placed in a glass bottle and kept at 24°C. After 48h mortality was recorded and the twigs were examined for feeding galleries. Results show that the solutions of cypermethrin caused 80%–100% beetle mortality over the entire test period with the exception of the 0.001% solution, in which the mortality was similar to the control after the 7th week. The olive twigs were analysed by GC-MS to quantify the insecticide residues.

Different insecticides have been tested for the control of the olive bark beetle, *P. scarabaeoides* . This scolytid can be managed at two points in its biological cycle: in pruned logs, where it excavates reproduction galleries, or in living trees, after emergence from the logs, where it digs feeding galleries. In mortality laboratory bioassays, the efficiency of organophosphorus insecticides has been ranked as follows: chlorpyrifos + dimethoate < formothion < methidathion. Formothion and methidathion, the two most efficient, were sprayed on olive logs together with a pyrethroid insecticide, deltamethrin, and a formulation which combined an organophosphorus (fenitrothion) and a pyrethroid (cypermethrin) insecticide. Deltamethrin inhibited the excavation of new reproduction galleries and induced a repellent effect on the olive pest. In contrast, none of the organophosphorus insecticides or the combination, fenitrothion + cypermethrin, were able to control the olive bark beetle. In olive trees, deltamethrin controlled this olive pest without showing the repellent effect observed for logs. Ethylene, a plant hormone, has been reported as an attractant for the olive bark beetle. The use of dispensers which released ethylene increased the number of *P scarabaeoides* approaching the treated olive trees, thus favouring its use in a lure-and-trap control system.

*** Biological control:**

The semiochemical system of the olive bark beetle Phloeotribus scarabaeoides was investigated. During the course of their life-cycle, whole insects, excised hindguts, frass, wood and leaves were collected, from both the field and from a laboratory rearing system. Samples were analysed by capillary GC/MS, after solvent extraction, collection of air volatiles on a sorbent or solid sample injection. Olfactometer bioassays were used to test the different samples and individual compounds for attraction to both sexes. Decanal, undecanal, 2-decanone, 2-nonanone and 2-undecanone, as well as α - and β -pinene, were identified as attractive compounds.

Observations on the biology of *Cheiropachus quadrum* (Hym: Pteromalidae) and *Dendrosoter protuberans* (Hym: Braconidae), were conducted. Both species are the main parasites of the olive bark beetles *Hylesinus varius* and *P. scarabaeoides* (Col: Scolytidae) in the South of Spain. Results have shown that an increase in body size of the host does not imply an increase in parasite efficiency. In fact, host size inversely affects parasite efficiency for *C. quadrum*. Bearing in mind this fact, the abundance of the host and the ease of its rearing in the lab, it is therefore advisable to use *P. scarabaeoides* as the host for mass rearing of the parasites studied here. On the other hand, the presence of white light is a negative factor for parasite longevity and fecundity. The pupae and all larval instars are parasitised. *C. quadrum* does not have a preference for any particular stage or larval instar of the host whilst there is a preference for the third and fifth larval instar by *D. protuberans*. With respect to the sex ratio of parasites, an increase in the number of males increases the fecundity of the females. The results obtained in this study can be considered essential in the development of a biological control system for olive bark beetle pests based on an increase in the population of *C. quadrum* and *D. protuberans*.

The survey was conductd on parasitoids of *P. scarabaeoides* on olive *Cerocephala eccoptogastri* Masi, *Cheiropachus colon* L. (Pteromalidae) and *Eurytoma morio* Boh. (Eurytomidae) (Batt, 2006).

***Agricultural and mechanical control:**

Trapping is one method that has been used for control purposes but this has proved not to work. Research has shown that traps will actually lure more beetles in and more damage can occur in areas with traps. The traps, which are commercially available, should only be used for surveys. Homeowners could use mechanical methods on selected plants, such as knocking beetles off into soapy water.

III. DIPTERA

a. Economic Importance of Diptera on olive:

On crop intended for oil extraction there are 4 different kinds of damage: a) premature drop of attacked fruits, b) direct pulp destruction caused by larvae developing in the fruits c) acidity increase and other secondary effects associated with larval development, including the development of pulp infections and oviposition resulting from holes in the skin. The olive fruit fly (*Bactrocera oleae* (Gmelin), 1788) (formerly *Dacus oleae*) is a serious pest of olives in most of the countries around the Mediterranean Sea. The larvae are monophagous, and feed exclusively on olive fruits. Adults feed on nectar, honey dew, and other opportunistic sources of liquid or semi-liquid food. The damage caused by tunneling of larvae in the fruit results in about 30 percent loss of the olive crop in Mediterranean countries, and especially in Greece and Italy where large commercial production occurs.

b. Survey of Diptera:

Bactrocera oleae (Gmelin) recorded for first time in Egypt (Effatoun, 1924).

c. Bionomics of Diptera:

Dacus oleae reported as a monophagous insect pest (El- Ezaby, 1973). He stated that the peak of *D. oleae* was recorded by the end of May. The flies disappeared completed during June and July and occurred again by August in low numbers till February. Donia *et al.* (1971) showed that the population of *D. oleae* reached its peak during the second half of September and a high population continued until the middle of November. One peak of *D. oleae* was reported found by mid- September and that the pest existed all year in Fayoum Governorate (Awadallah, 1973). The development of *D. oleae* was studied by El-Ezaby (1973). Incubation period of eggs and duration of larval and pupal stages decreased with increase of temperature. Relative humidity affected percentage of egg hatching, pupation of larvae and emergence of adults. Longevity of both female and male adult flies was equal, the shortest and the longest being 4 and 118 days, respectively. The control of *D. oleae* in Kom-Oshim district (Fayoum Governorate) for two successive years by using four insecticides. These insecticides showed almost equal effects against *D. oleae*, a long residual effect and no injuries neither to the fruits nor to the leaves. Two or three applications of the insecticides were enough to protect the olive fruits against *D. oleae* infestation was studied (Awadallah and Nadium, 1970). Large sizes of olive fruits were preferred than the small ones for *Dacus pleae* oviposition this statement stated by (Atalla ,1958).

The population densities of the tephritid Dacus oleae on olive was studied for a year in 3 localities in Egypt by means of traps baited with diammonium phosphate. Populations were low in August and September, especially in Tora and Fayoum owing to the hot dry weather. Populations were 3 times as large in olive groves containing large trees as in those with small trees. Infestation of fruits began in early July in Alexandria, in August in Tora and in September in Fayoum (El-Hakim and El-Sayed,1982) . The 1st infestation of *Dacus oleae* [*Bactrocera oleae*] was recorded in July on Weteken and in August on Pecual, with the maximum percentage infestation occurring in October for both varieties. There was no significant difference in the rate of infestation between the 2 olive varieties (Abdel-Rahman,1995) .

The "Attract and Kill" pheromone lures were evaluated in Fayoum and Behera experimental olive orchards in Egypt during the 2001 and 2002 seasons, respectively, for controlling the olive fruit fly *B. oleae*. Methods used were field efficacy, gravimetric measurements (weighing), and residual analysis. Field results indicated that "Attract and Kill" pheromone lures performed better in Fayoum olive grove than in Behera groves, while gravimetric and residual analysis showed no significant differences in the pheromone release rates between lure dispensers aged in the two olive groves. The overall results indicated that in semi-isolated olive groves or in regions where the fly develops low or moderate populations per year, the use of one lure per four olive trees was sufficient and self effective, while in regions where the fly develops high population density, additional control measures were needed (Al-Elimi, 2003) . Field studies were carried out during 1995-96 in Egypt to investigate the infestation of olives (cvs. Aghizi Shami, Manzanillo, Picudo and Mission) by *D. oleae* [Bactrocera oleae]. Olives were sampled before infestation (7-9 weeks old), at the beginning of infestation (15-17 weeks old) and at the peak (24-26 weeks old). Infestation started early (July) in cvs. Aghizi Shami and Manzanillo. The percentage of damaged fruits increased during the season, and infestations were more severe in 1996. Cv. Aghizi Shami was the most infested, followed by cv. Manzanillo, cv. Picudo, and cv. Mission

(El-Bassiouny *et al.*, 1996).. The effect of infestation by *Bactrocera (Dacus)* oleae to olive fruits of the variety Aghizi (Shami) was investigated in Fayoum Governorate, Egypt. Samples containing 0, 20, 40, 60, 80 and 100% infested fruits were analyzed for moisture content, oil content and physical properties. Infested samples were used for oil extraction. The resultant oil was analyzed for iodine value, peroxide value, acid value and refractive index. Infestation decreases the weight, volume and pulp percent of olive fruits. Oil content, refractive index and iodine value were decreased with increasing infestation, the highest peroxide value was at 60% infestation. There is no appreciable change in acidity and moisture content. The fly preferred the fruits which contain a high proportion of pulp. El-Heneidy *et al.*, (2001) Olive is one of the important crops in Egypt, which is liable to be attacked by many species of insect pests. Of which, the olive fruit fly, *Bacterocera (Dacus) oleae* [*Bactrocera oleae*], is the most important. A study was conducted to survey and study the seasonal abundance of the parasitoids of the pest in Egypt. Periodical samples of infested fruits were collected for two successive seasons: 1997/98 and 1998/99 (Salama *et al.*, 1997).

d. IPM of Diptera:

Management of olive fruit flies depends on bait sprays, trapping of adult flies, harvest timing, fruit sanitation after harvest, and biological control (Van Steenwky *et al.* 2003).

***Chemical control:**

Insecticides are used in bait-sprays or as sprays from the air to control the olive fruit fly. More environmentally benign techniques that are being tested or used in limited areas are use of radiation sterilized males and pheromones.

***Biological control:**

Infested fruits were kept under laboratory conditions until emergence of parasitoid adults. The survey showed that eight parasitoid species, on the immature stages of the fly (larvae and pupae), all belonged to the order Hymenoptera: Cyrtoptyx latipes, Cyrtoptyx sp., Eupelmus sp., Eurytoma sp., Eurytoma martelli, Macroneura [Eupelmus] sp., Pnigalio agraules and Opius concolor. The first seven species were recorded for the first time in Egypt. The eight parasitoid species were recorded in the fresh fruits, while only six were recovered from the fallen fruits. All species were recorded from July to November. The mean percentages of parasitism of O. concolor and P. agraules reached 38.9 and 10.8%, respectively (El-Heneidy *et al.*, 2001). Parasitism by a braconid (Opius sp.) was found only in Alexandria. (El-Hakim and El-Sayed .1982). The parasitoids, Opius concolor, Pnigalio agraules, Eupelmus sp., Macroneura sp., Eurytoma martellii, Eurytoma sp. and Cyrtoptyx latipes on *Bactrocera oleae* (El-Khawas *et al.*, 2000).

***Agricultural and mechanical control:**

More environmentally benign techniques that are being tested or used in limited areas are use of radiation sterilized males and pheromones. Both sexes can be sterilized with 8 to12 krad (80 to 120 Gy radiation) when late pupae are exposed to the irradiation. Synthesis of 1,5,7-trioxaspiro[5.5]undecane, an analog of the major pheromone component, has been synthesized and tested, and under optimal conditions it was as attractive as the natural compound, but it did not last as long in traps as the natural material. Small plywood rectangles dipped in 0.1% (a.i.) aqueous solution of deltamethrin for 15 minutes and added to bait stations containing either sex pheromone or ammonium bicarbonate, a food attractant, gave cost-effective control in a large test orchard. In California, management depends on bait sprays, trapping of adult flies, harvest timing, fruit sanitation after harvest, and biological control (Van Steenwky *et al.* 2003).

IV. HOMOPTERA

1. Scale insects:

a. Economic Importance of scale insects on olive:

Scales and some other species excrete honeydew, a sweet, sticky liquid produced by insects that ingest large quantities of plant sap. Sticky honeydew and the blackish sooty mold growing on honeydew can bother people even when scale populations are not harming plants. When plants are heavily infested with scales, leaves may look wilted, turn yellow, and drop prematurely. Scales sometimes curl leaves or cause deformed blemishes or discolored halos in fruit, leaves, or twigs. Bark infested with armored scales may crack and exude gum. Certain armored scales also feed on fruit, but this damage is often just aesthetic. Soft scales infest leaves and twigs but rarely feed on fruit. A major concern with soft scales is their excretion of abundant honeydew, which contaminates fruit, leaves, and surfaces beneath plants. Honeydew encourages the growth of black sooty mold and attracts ants, which in turn protect scales from natural enemies. When numerous, some scale species weaken plants and cause them to grow slowly. Branches or other plant parts may die if they remain heavily infested with scales. If plant parts die quickly, dead brownish leaves may remain on branches, giving them a scorched appearance. Several years of severe infestations may kill young plants. Certain armored scales may be more likely to kill plants. Soft scales reduce plant vigor, but seldom kill trees or shrubs (Gill,1997).

b. Survey of scale insects:

Survey of scale insects attacking olive trees in Egypt has been attracted many researchers and scientists e.g. Ezzat(1957), Amin(1966), Mourdi & Mesbah (1985), Hamza (1975), Amin and Saleh(1975), : El-Hakim and Helmy (1982) and Moursi and Hegazi (1983).

c. Bionomics of scale insects :

The study of the population densities of the diaspidids showed that Leucaspis riccae Targ.had 4 population peaks in Tora and Fayoum and 3 in Alexandria, and *Parlatoria oleae* had 3 peaks in Tora and Fayoum and 2 in Alexandria. The scale insects migrated from the leaves to the fruits at the beginning of July (El-Hakim and Helmy, 1982). *L. riccae* differences in susceptibility to it were observed between different olive cultivars. *L. riccae* had 2 overlapping generations a year (Moursi and Hegazi، 1983). *H. lataniae*, sampled on olive, was a common pest in the Nile Delta, Egypt. Three peaks of abundance occurred at 2 monthly intervals from mid-April, and a 4th in mid-December ((Hassanein and Hamed,1984) .

The common scale insect pests which were found on leaves, branches and fruits throughout the year were the 4 diaspidids *Leucaspis riccae*, *Parlatoria oleae*, *Aspidiotus hedera* auct. [*A. nerii*] and *Aonidiella aurantii*. The population fluctuations of these 4 diaspidids were studied between February and May (Moursi and Mesbah, 1985). The prepupa, pupa and adult of the male of *L. riccae,* which is considered to be one of the major pests of olive in Egypt, are described and illustrated, and the similarities and differences between the genera Leucaspis and Parlatoria are discussed(Nada and Mohammed, 1984) .

Aspidiotus hederae [*A. nerii*] and *Saissetia hemispherica* [*S. coffeae*] were the main species of hemipterans attacking olive trees, while *S. olea* was rarely observed. *A. nerii* occurred throughout the year on leaves and branches of both olive varieties with population peaks in February and March, September, October and November. It was also found attacking fruits from August and the infestation increased until harvest (Abdel-Rahman, 1995)

The population fluctuations of *P. oleae* were studied in two regions of Assiut Governorate (Sahel-Selim and Assiut College Farm). The pest population decreased gradually from January till April and then increased to reach its maximum level of abundance in September in Sahel-Selim. The average mean number of *P. oleae* was 512.83 and 626.5 individuals/50 leaves during the two years under consideration, respectively. Approximately, the same trend occurred in Assiut College Farm, except that the population of the pest was very low compared with that at Sahel-Selim (Abou-Elhagag, 2004).

d. IPM of scale insects:

*** Chemical control:**

The Triona oil (2%) or Malathion (0.3%) gives satisfactory results on *P. oleae.* Rexona (dimethoate) (0.15%), methyl-parathion (0.15%) and Pacol (mineral oil plus parathion) (1.25%) were recommended. The author also concluded that insecticides could be generally applied on trees as long as the temperature did not exceed 31°C (Soliman, 1970).

*** Biological control:**

Natural enemies or beneficial insects are commercially available for release against California red scale and perhaps certain other scales. However, conserving resident natural enemies is a more efficient and longer lasting strategy than buying and releasing beneficial in gardens and landscapes. Grow flowering plants near scale-infested trees and shrubs to help attract and support natural enemies. Adults of predatory bugs, lacewings, lady beetles, and parasitic wasps live longer, lay more eggs, and kill more scales when they have plant nectar or pollen and insect honeydew to feed on. Minimize dust, which interferes with natural enemies. For example, wash plant surfaces midseason, or when the foliage is covered with dust. Depending on the scale species and the extent to which biological control has been disrupted, it will take several months of conservation efforts (such as controlling ants and dust and avoiding application of persistent insecticides), or until the next season or longer, before scale populations are reduced by biological control. If current levels of scales are intolerable, use a short residual insecticide such as oil or soap to reduce scale populations while conserving natural enemies. Parasitic wasps are often the most important natural enemies of scales. Parasites include many species of *Aphytis, Coccophagus, Encarsia*, and *Metaphycus.* The female wasp lays one or several eggs in or on each scale, where the tiny maggotlike wasp larvae feed. When parasitized, some scales are darker-colored than normal. Estimate parasite activity before making a treatment decision. Check for discolored (parasitized) scales and scale covers with round exit holes made by emerging adult parasites. Lift the covers of armored scales and examine beneath them for immature parasites. Predatory *Chilocorus, Hyperaspis,* and *Rhyzobius* species lady beetles (ladybugs) can easily be overlooked because many are tiny, colored and shaped like scales, or feed beneath scales. *Hyperaspis* species are tiny, shiny, black lady beetles with several red, orange, or yellow spots on the back. *Rhyzobius lophanthae* has a reddish head and underside, and a grayish back densely covered with tiny hairs. The twicestabbed lady beetle, *Chilocorus orbus,* is shiny black with two red spots on its back, and reddish underneath. The multicolored Asian lady beetle, *Harmonia axyridis,* is a relatively large, variably colored species. It is mostly orange, red, or yellow with 19 large dark spots, or fewer, smaller, or no spot on its wing covers. The alligatorlike larvae of lady beetles often occur openly on plants. In certain species, small larvae are hidden under the female scale body or cover where they feed on scale eggs and crawlers (Gill, 1997).

Parasitism by a species of *Aphytis* was observed only during the rainy season, when the relative humidity was high, it thus had little influence in regulating populations of L. riccae on rain-fed olive (Moursi and Hegazi, 1985). The encyrtid parasitoid, *Habrolepis aspidioti* was the only significant natural enemy and reached peak abundance in mid-June, parasitizing 58% of scale *H. lataniae* (Hassanein and Hamed, 1984). The aphelinid parasitoid *Aphytis maculicornis* was found attacking *P. oleae* while *A. chrysomphali* attacked *Aspidiotus nerii* and *Aonidiella aurantii.* L. riccae was attacked by *Aphytis* sp. (Moursi and Mesbah, 1985)

S. oleae is an important pest of olive trees in Egypt. A survey of the parasitoids of *S. oleae* was carried out monthly between April 1995 and March 1997 in three different locations (Northern coast, Matruh and El-Arish) in Egypt. Five species of Encyrtidae (*Diversinervus elegans, Metaphycus flavus, M. zebratus* and 2 other species of *Metaphycus*), a species of Pteromalidae (*Scutellista caerulea*) and an aphelinid hyperparasite (*Marietta leopardina*) were found. The two *Metaphycus* spp. and *Marietta leopardina* are new records for Egypt (Abd-Rabou, 1999).

Aphytis sp. on *L. riccae*, and *Marietta* sp. and *Habrolepis* sp. on Aonidiella aurantii. All parasitoids, except Opius concolor, Apanteles syleptae and Aphytis sp., are new records for the country (El-Khawas *et al.*, 2000).

The aphelinid parasitoids, *Aphytis paramaculicornis*, *A. chrysomphali* and *Encarsia aurantii* were mass reared and released at monthly intervals in olive groves infested with *Parlatoria oleae* at five locations in Egypt. A total of about 115 000 adult parasitoids were argumentatively released between March and February. Although the percentage parasitism of the scale increased in the experimental plots compared with the control plots after parasitoid release, there was no apparent reduction in the scale populations at any site. Only *E. aurantii* populations continued to increase during March to September and this appeared to be the parasitoid best adapted to attack the P. oleae populations when they were near their peak, however, it did not become established at two of the sites. It is concluded that further augmentative releases are unlikely to improve the present biological control of *P. oleae* at any of these sites (Abd-Rabou, 2001a).

The Mediterranean black scale, *Saissetia oleae* is the most important pest of olive in Egypt. Indigenous parasitoids of *S. oleae* from different localities were collected, reared and mass produced, about 113 000 parasitoids were released for augmentative biological control. At three locations in Egypt, several releases of the following indigenous parasitoids were made: *Alaptus* sp., *Baeoanuisa* sp., *Coccophagus lycimnia, Diversinervus elegans, Metaphycus bartletti, Metaphycus flavus, Metaphycus helvolus, Metaphycus zebratus, Microterys flavus, Parechthrodryinus coccidiphagus* and *Scutellista caerulea.* The indigenous parasitoid Metaphycus bartletti plays an important role in controlling *S. oleae* in Egypt. Maximum parasitism rates by this species reached 83, 56, and 33% on the Northern Coast, at Mersa Matruh and El-Arish, respectively (Abd-Rabou, 2001b).

Twenty-nine natural enemies (11 parasitoids and 18 predators) of the Mediterranean black scale (Saissetia oleae) was recorded in a survey conducted in Egypt during 1998-2000. The population dynamics of the five hymenopterus parasitoids, i.e. Metaphycus bartletti, M. flavus, Microterys flavus [M. nietneri], Diversinervus elegans and Scutellista cyanea [S. caerulea], were studied in a Northern Coast site during 1998-99 and 1999-2000. *Metaphycus bartletti* was the most effective parasitoid of Saissetia oleae on olive trees with maximum rates of parasitism of 23.0 and 24.5% during 1998-99 and 1999-2000, respectively. The population dynamics of 6 predators were studied at the same site. Two peaks were recorded annually for *Chilocorus bipustulatus, Chrysoperla carnea, Coccinella undecimpunctata,* Orius sp., and *Scymnus syriacus. Exochomus flavipes* and *Orius* sp. were recorded at low populations throughout the study (Abd-Rabou, *et al.*, 2003)

Three *P. oleae* parasitoids, *Encarsia aurantii, Aphytis chrysomphali and Aphytis diaspidis*, were found in Sahel Selim, while *A. diaspidis* was the only parasitoid species recovered from Assiut College Farm. The first two parasitoids, *E. aurantii* and *A. chrysomphali*, are considered as first record on the olive scale insect in Assiut. The effects of weather factors (minimum and maximum temperatures as well as relative humidity) on the population of the pest and its parasitoids and the effects of these parasitoids on the population of the pest were also determined in Sahel-Selim (Abou-Elhagag, 2004).

The Mediterranean black scale, Saissetia oleae is the most important pest of olive in Egypt. Indigenous parasitoid Metaphycus lounsburyi from different localities in Egypt, were manipulated, reared and mass-produced for classical biological control in Egypt, more than 193 130 parasitoids were released. Several releases were made between May 1999 and April 2001. Increases of the parasitism from 17.4 to 42.0 and from 6.4 to 19.2 during the first year (1999-2000) and the second year (2000-01), respectively, in the Northern Coast. This parasitoid became established in some of the release sites in El-Arish and Matruh Governorates (Abd-Rabou, 2004a) .

The Mediterranean black scale, Saissetia oleae is an important pest of olive in Egypt. Approximately 113 250 indigenous parasitoids of S. oleae from different localities in Egypt, were mass produced and released at 3 locations, from April 1999 to April 2000. Among all the indigenous parasitoids released, only Metaphycus bartletti established itself on S. oleae with parasitism rates of 83, 56, and 33% in the Northern Coast, Marsa Matruh and El-Arish, respectively (Abd-Rabou, 2004b).

The hemispherical soft scale, *Saissetia coffeae* (Walker) (Homoptera: Coccidae), is one of the most important pests attacking olive trees in Egypt. During the period 2001-2003, a total of about 300,000 individuals of the parasitoid *Coccophagus cowperi* Girault (Hymenoptera: Aphelinidae), obtained from India, was released at 35 sites for the biological control of S. coffeae on olive trees in Egypt. The maximum parasitism rates reached 53 and 62%, while average parasitism rates were 17.2 and 30.8% in the Marsy Mattrouh and El-Arish locations, respectively. These results indicate establishment of this parasitoid on this important economic plant in Egypt (Abd-Rabou, 2005).

***Agricultural and mechanical control:**

Provide plants with good growing conditions and proper cultural care, especially appropriate irrigation, so they are more resistant to scale damage. Prune off heavily infested twigs and branches to eliminate scales when infestations are on limited parts of the plant. Pruning to open up tree canopies helps to control scales and possibly other species in areas with hot summers, such as the Central Valley of California. This pruning increases scale mortality as a result of heat exposure. When landscaping, choose plants that are relatively pest-free and well adapted to local conditions. Consider replacing problem prone plants. Most pests are highly host specific. Scales that can feed on many different plants usually damage only certain of these plant species and though present, do not damage other species or cultivars in the same plant genus (Gill, 1997)

2. Whiteflies:

a. Economic Importance of whiteflies on olive:

The whitefly injures the plant by consuming large quantities of sap, which it obtains with its sucking mouth parts. Further injury is caused by sooty mold fungus which grows over fruit and foliage in the copious amount of honeydew excreted by the whitefly. This black fungus may cover the leaves and fruit so completely that it interferes with the proper physiological activities of the trees. Heavily-infested trees become weak and produce small crops of insipid fruit. Also, fruit covered with sooty mold will be retarded in ripening and late in coloring, especially the upper part, which may remain green after the lower portion has assumed the color of ripe fruit. The fruit often must be washed before it is put on the market. A secondary injury to the trees may result from an excessive increase of the common scales of olive which find protection under the sooty mold that covers leaves and branches.

b. Survey of whiteflies:

Only three species of whiteflies have been recorded attacking olive trees in Egypt. These are *Aleurolobus olivinus* (Silvestri) (Abd-Rabou, 1996), *Bemisia tabaci* (Gennadius) (Abd-Rabou, 1997) and *Siphoninus phillyreae* (Haliday) (Abd-Rabou, 2003).

c. Bionomics of whiteflies:

Aleurolobus olivinus (Silvestri) has only one generation per year. Adults are active in June and July. Natural enemies usually suffice to keep populations of this whitefly at a very low level.

d. IPM of whiteflies:

Management of heavy whitefly infestations is very difficult. Whiteflies are not well controlled with any available insecticides. In many situations, natural enemies will provide adequate control of whiteflies, outbreaks may occur if natural enemies that provide biological control of whiteflies are disrupted by insecticide applications, dusty conditions, or interference by ants.

***Chemical control:**

If you choose to use insecticides, insecticidal soaps or oils such as neem oil may reduce but not eliminate populations.

***Biological control:**

Whiteflies have many natural enemies, and outbreaks frequently occur when these natural enemies have been disturbed or destroyed by pesticides, dust buildup, or other factors. General predators include lacewings, bigeyed bugs, and minute pirate bugs. Several small lady beetles including *Clitostethus arcuatus* (on ash whitefly) and scale predators such as *Scymnus* or *Chilocorus* species, and the Asian multicolored lady beetle, *Harmonia axyridis*, feed on whiteflies. Whiteflies have a number of naturally occurring parasites that can be very important in controlling some species. *Encarsia* spp. parasites are commercially available for release

***Agricultural and mechanical control:**

Yellow sticky traps can be posted around the field to trap adults. Such traps won't eliminate damaging populations but may reduce them somewhat as a component of an integrated management program relying on multiple tactics. Whiteflies do not fly very far, so many traps may be needed.

3. Psyllidae :

a. Economic Importance of psyllids on olive:

The pest causes severe damage to the olive trees. The 2nd generation, being associated with the new fowering and fruiting olive branches, is the most harmful not only because the direct feeding activity affects yield but also because indirect action by producing waxy secretions induces many of the flowers to abort, even those not attacked directly. The presence of honey-dew and sooty moulds aggravate the latter situation. Psyllids suck plant juices. Some secrete a white wax and all produce honeydew, sometimes in palletized or crystallized form, on which blackish sooty mold grows. High psyllid populations reduce plant growth or cause terminals to distort, discolor, or die back. High populations of certain species, such as olive psyllid, can cause defoliation. A few species cause galls on leaves or buds, for example when psyllid feeding causes the plant to form a pit around where each nymph settles. Early damage typically occurs on young foliage where most eggs are laid.

b. Survey of psyllids:

The olive psyllid, *Euphyllura straminea* Log. is an economic important insect pest on olive trees in Egypt.

c. Bionomics of psyllids:

The seasonal abundance of *E. straminea* on olives was investigated. The effect of weather parameters on the insect population was also evaluated. The first and second instars nymphs appeared in November or Early December until late June and were most abundant in March or April. The third and fourth instars appeared in December-January and January, respectively, and were abundant in April. The adults occurred the whole year and were abundant in April. Weather factors were significantly and negatively correlated with nymphal and adult populations, respectively, in both years (Elwan, 2001).

d. IPM of psyllids:

Most native species of psyllids require no management, even when populations are abundant, plants can tolerate substantial feeding and psyllid populations will decline naturally (Dreistadt, 1994).

*** Chemical control:**

Because beneficial often do not become abundant until after psyllids are common and weather has warmed, supplemental control may be desired in certain situations. However, psyllids are difficult to control effectively with insecticides because they reproduce year-round in much in different countries and can infest large plants or those with dense canopies, which prevents good spray coverage. Limit use of insecticides to situations where psyllids and their damage cannot be tolerated.

Azadirachtin (Azatin, Neemazad), neem oil, insecticidal soap (potassium salts of fatty acids), and horticultural oil (an insecticide labeled narrow range, superior, or supreme oil) can provide temporary control of psyllids that are directly contacted by the spray. Infested new growth must be thoroughly covered with the insecticide spray. The low toxicity and short persistence of these "organically acceptable" materials does not kill natural enemies that migrate in after the spray has dried, so application of these materials early in the season before natural enemies buildup on (and migrate from) nearby unsprayed plants is compatible with later-season biological control. However, an additional treatment may be necessary within several weeks if psyllid populations rebound and the plants produce a new growth flush.

*** Biological control:**

Natural enemies, including lady beetles, lacewing , small predaceous bugs, and parasitic wasps (Dahlsten,1995 and Dahlsten, *et al.* 1998) , which attack only certain psyllids, provide at least partial control of all the psyllids. Conserve psyllid natural enemies by using appropriate cultural practices and only low toxicity, short-persistence pesticides or, whenever possible, inject insecticides instead of spraying if direct control action is needed. The introduced species of natural enemies now occur naturally throughout different countries of the world.

***Agricultural and mechanical control:**

Yellow sticky traps are the best way to monitor psyllids infesting olive.

Excess irrigation and fertilize established woody plants unless foliage appearance or plant growth is unsatisfactory because of a confirmed nutrient deficiency. Most nutrient deficiency symptoms are caused by poor root health (such as infection by fungal pathogens) or improper soil conditions (such as inappropriate soil pH, inadequate drainage, and excess irrigation). These adverse root conditions cause unhealthy looking foliage even when nutrient levels in soils are sufficient for plants, adding fertilizer will not remedy these problems. Irrigating appropriately and avoiding fertilization discourages the excessive succulent foliage that promotes increased populations of phloem-sucking insects such as psyllids. Minimize shearing or pruning of terminals reducing the populations.

V. LEPIDOPTERA

a. Economic Importance of Lepidoptera on olive:

The olive moth *Prays oleae* (Bern) (Lepidoptera: Yponomeutidae), is one of the most important insect pest of olives in the Mediterranean basin. The type of damage depends on the attacked tissue. The damage (leaf drop) done by the leaf or winter generation (phyllophagous) is seldom serious. On the contrary damage caused by the flower (anthophagous) generation can be important. These larvae directly destroy the flowers or cause the abortion of the flower bunches covered by silken threads spun by the larvae when passing from one bud to the next. The fruit (or carpophagous) generation larvae cause the premature drop of the fruits when they bore into the kernel of the olive fruit or later when they try to vacate the fruit to pupate.

The leopard moth (*Zeuzera pyrina* (L.)) is one of the most important pests of apple and pear orchards in Mediterranean regions **(*)** (and, in certain countries, of olive). The seriousness of the attacks varies according to the age of the plantations: - On young trees: 1 caterpillar is enough to kill a tree, 3-year-old trees can lose part of their structure. The attacked trees become extremely vulnerable to wind damage and the central axis system is permanently affected. - Old trees are sverely damaged, particularly in dry years and on dry ground. Healthy trees resist attacks better (favourable influence of irrigation and of a balanced mineral supply). - Trees weakened by leopard moth attacks are frequently subject to other xylophagous pests: hornet clearwing moth (*Synanthedon myopaeformis*), goat moth (*Cossus cossus*), bark beetles. Furthermore, the old larval galleries serve as a refuge to the woolly aphid (*Eriosoma lanigerum*), which thus partially escapes from chemical treatments.

b. Survey of Lepidoptera:

Fahmy (1953) recorded *Palpita unionalis* Hb.for first time in Egypt. On olive. Amin& Saleh (1975) recorded *Prays oleae* Bern. for first time in Egypt. On olive. El-Sherif (1975) recorded *Zelleria oleastrella* (MilliŐre) for first time in Egypt. El-Hakime & El- Sayed (1982/ 1983b) recorded *Zeuzera pyrina* (L.) (Lepidoptera, Cossidae). for first time in Egypt. Moursi& Mesbah (1985) recorded *Lobesia botrana* (Denis & Schiffermüller) (Lepidoptera, Tortricidae) for first time in Egypt. On olive. Badr *et al.*, (1986) collected (P. oleae) from olives,

c. Bionomics of Lepidoptera:

The biology of two important lepidopterous pests, *Prays oleae* Bernard and *Palpita unionalis* Hübner. The target pests were reared on olive plants, *Oleae europaea* L. (Oleaceae) under laboratory conditions for two successive generations, from March to June 2002. For *P. oleae*, the duration of larval stage development in the first generation was 21.4 ± 0.18 days at 19.3–20.9 °C, 65–68 % R.H, while in the second generation it was 14.8 ± 0.10 days at 20.8–24.2 °C, 65–69 % R.H. The number of eggs laid per female ranged from 58 to 109 eggs in the first generation, and from 47 to 113 in the second. The larval stage duration of *P. unionalis* was 16.3 ± 0.12 days at 16.8–22.9 °C, 65–69 % R.H. and 15.5 ± 0.12 days at 21.6–25.5 °C, 66–69 % R.H. for the first and second generations, respectively. Also, the number of eggs laid per female ranged from 630 to 653 eggs, and from 425 to 493 eggs in the second generation under the same previous laboratory conditions. *P. oleae* laid eggs at night mostly singly on flower-buds, more on the calyx. than on the petals. The larvae mined on leaves and damaged groups of flowers. Abdel-Rahman (1995) The population dynamics of several insect pests attacking 2 olive cultivars (Weteken and Pecual) grown in 6 groves in the El-Qasr region, Matrouh Governorate, Egypt, was studied. The immature stages of Prays oleae were observed throughout the year and populations began to increase from April, with peak numbers occurring in May on Pecual and June on Weteken, with Pecual being more susceptible than Weteken. *Phloeotribus oleae* [*P. scarabaeoides*] became active from April to October and caused the highest amount of damage between June and August. Pecual was more susceptible to this pest than Weteken.

P. unionalis adults were active at night, laid eggs singly at twilight usually on the lower surface of foliage. Larvae fed on leaves spinning several leaves together to form shelter for the pupa (Shehata, *et al.* 2003).

The peak of *P. unionalis* infestation at Alexandria Governorate was estimated during May and July (Badaawi *et al.*,1976). *P. unionalis* eggs were laid in groups of 2-86 in the laboratory and singly or in small groups of 2-6 in the field (El-Kifl *et al.*,1974). Total number of eggs per female reached 141-882 eggs. *P. unionalis* moths preferred the terminal rows of olive leaves for eggs laying (Foda, 1973 and Badaawi *et al.*,1976).

In Egypt, Z. pyrina is a serious polyphagous pest in fruit and wood trees. Larvae were reared on its natural hosts (apple, pear, pomegranate and olive) as well as on artificial medium diets, each containing saw dust of one of the previously mentioned hosts. Number of larvae and pupae completed their development, percentage of pupation, larval and pupal durations, rate of moth emergence, mating, oviposition, longevity, incubation period and percentage of hatchability were studied in details on natural hosts and artificial medium diets. The approximated life cycles were 336.7 (318-370), 344.8 (337-367), 328.7 (321-360) and 377.3 (366-398) days on natural hosts and 126.0 (121-137), 132.8 (123-146), 136.3 (126-158) and 144.1 (141-162) days on artificial medium diets when reared on apple, pear, pomegranate and olive, respectively. Out of 100 eggs each reared on their natural hosts (apple, pear, pomegranate or olive) were 20, 24, 18 and 20% completed their development to adult moths. The percentage recovery when reared on the respective artificial diets were 68, 58, 64 and 61%. Rearing Z. pyrina on artificial diets reduced the total period of the life cycle by approximately 2/3 compared to rearing on their natural hosts (Tadros, *et al.*, 2003).

The cossid *Zeuzera pyrina* (a trunk pest of various forest, fruit and ornamental trees) on olive in Egypt showed that it severely infested olive groves in the Tora district, where larval density averaged 7.05 larvae/tree, but it was absent from the Fayoum district, where the regular pruning and fertilization programme that was carried out was presumed to have eliminated newly hatched larvae and rendered the trees less susceptible to attack. Adults emerged throughout the year in Tora and were most abundant from April to September (El-Hakim and El-Sayed ,1982). Emergence of adults of the cossid *Zeuzera pyrina*, a very important pest of olives in Egypt, began in the 2nd half of April and continued until December. Four generations were observed in this period. The north-eastern aspect of the trees was preferred for adult emergence. Temperature proved to be the principal prevailing weather factor that influenced moth activity, while relative humidity had a lesser effect. Spraying the olive trees with Tombel [a mixture of quinalphos with thiometon], parathion-methyl or Cidial [phenthoate], 3 times at 3-weekly intervals beginning in the 2nd week of July, was effective and economic (Ismail, *et al.*, 1992) .

The leopard moth, *Z. pyrina*, is a polyphagous pest attacking more than 70 shrub species belonging to over 30 botanical families including olive. It seriously attacks both young and old olive trees and presents continuously threat for olive farming on almost all olive growing areas in Egypt. The damage caused by the *Zeuzera pyrina* L . larvae has already led to uprooting of many olive groves in Egypt. Infestation rates by *Z. pyrina* of a large olive farm (ca. 450 feddans) of young and fruitful olive trees (61 774 trees) of nine table olive cultivars were studied for two successive years (2002-03). The farm was divided into 88 uniform plots (5-7 feddans each). Each plot was surrounded by windbreak trees (*Casuarina* sp.) isolating each plot from the others. Each plot contained 2, 3 or 5 olive cultivars of total 780-900 trees per plot. All trees of 21 plots were carefully inspected at the peak period of adult emergence of leopard moth. The results suggest three categories of olive cultivars: (1) susceptible (Toffahi, Hamedy and Sennara), (2) intermediate (Kalamata, Dolce, Becual and Manzanillo), and (3) resistant (Aks and Shamy). Interestingly, the co-existence of one olive cultivar may decrease or increase the rate of infestation by *Z. pyrina* larvae. The study may provide information about colonization of the leopard moth on specific olive cultivar in multiple cultivar cropping olive farm system. The present work suggests that using cultivar diversity of olive trees in olive groves is a good method for reducing crop losses due to leopard moths. Discovery of allomones in resistant cultivars, which drive away egg laying of Zeuzera females, may be fruitful in protecting the susceptible olive cultivars, i.e., olive farms from the leopard moth (Hegazi and Khafagi, 2004).

A study was carried out on a large ecological olive area situated near Cairo (177 km, south Alexandria, Egypt). Ten comparable plots which cultivated each with 2 or more table olive cultivars in lines side by side were selected to study the varietal sensitivity of olive trees to the leopard moth, *Zeuzera pyrina* L. (Lepidoptera: Cossidae). The olive cultivars could be categorized into 3 groups, each in descending order of sensitivity as follows: (1) sensitive, Toffahi, Becual, Sennara and Manzanilla, (2) intermediate, Kalamata and Dolce, and (3) resistant, Hamedy, Aks and Shamy. Infestation of olive trees by the leopard moth concentrated in the north-west side than in the south-east. The results justify the effect of wind direction on the egg-laying behaviour of *Z. pyrina* females during the peak of their flight activity (September-October). Interestingly, the co-existence of one olive cultivar in lines side by side with another cultivar and the grown cultivars on the neighbouring farm to the farm of interest may decrease or increase the rate of infestation by Z. pyrina larvae. Discovery of allomones in resistant cultivars which drive away egg laying of Z. pyrina females may be fruitful in protecting sensitive olive cultivars (Hegazi and Khafagi, 2005).

d. IPM of Lepidoptera:

Various methods are used for the suppression of the moth population. The larvae of the first generation are susceptible to standard strains of *Bacillus thuriengiensis* (var. *kurstaki*) (Yiambrias et al. 1986). The control measures for the second generation are insecticide treatments. The mating disruption technique evaluated during the last five years was effective in suppressing the moth population. The pheromone {(Z)-7-hexadecenal} (Campion *et al.* 1979), formulated in â-cyclodextrin and dispensed in olive groves at a rate of 40 to 50 g/ha, prior to the onset of the 2 nd generation inhibited male catches in pheromone traps. The fruit infestation remained below the economic threshold level (Mazomenos *et al.* 1999). The number of males caught in the pheromone traps in September (3 rd generation) was also low. This indicated that the pheromone concentration within the treated grove remained at relatively high levels resulting in a high proportion of trap catches inhibition. *Palpita unionalis* Hb. peaked during March in November Tahrir district (Behria Governorate) (Hamza,1975).

*** Chemical control :**

When larvae of *Palpita unionalis* were exposed for 2 days in the laboratory to deposits of a formulation of Bacillus thuringiensis on olive leaves, the LC50s were 6.8 x 10superscript 3, 15.0 x 10superscript 3 and 10.8 x 10superscript 3 units/ml for the 1st, 3rd and 5th instars, respectively. Sublethal doses increased the duration of the larval stage (especially when treatment took place in the 3rd instar) and reduced the consumption of foliage (El-Hakim and Hanna, 1982) .

Field experiments were conducted in Egypt in 1991 to evaluate the efficacy of the entomophilic nematodes *Steinernema carpocapsae*, *Heterorhabditis heliothidis* and *H. bacteriophora* against the cossid *Zeuzera pyrina* on olive trees. The nematodes were applied either by spraying (at 5000 or 10 000 infective stages of distilled water) or by injection (at 2500 or 5000 infective stages per ml of distilled water) into larval galleries of the pest. *S. carpocapsae* was the most effective nematode species against larvae of Z. pyrina using both methods of application, followed by *H. heliothidis* and *H. bacteriophora*. Mortality ranged from 31 to 88%, depending on the method and time of application, and concn of the nematode suspension. Injecting the nematodes directly into larval galleries was more effective than spraying in the summer. Spraying was, however, very effective in the autumn (October and November) when the temperature ranged between 15 and 28 degrees C. The rates of mortality were positively correlated with the concn of the nematode suspension. Better control of larvae of *Z. pyrina* using the nematodes was achieved on olive trees (Abdel-Kawy, *et al.*, 1992).

Field studies on the cossid *Zeuzera pyrina* were carried out on infested olive trees at Giza, Egypt, and laboratory experiments were conducted on *Phloeotribus scarabaeoides* with olive tree cuttings to investigate the population dynamics of the 2 species. Adults of *P. scarabaeoides* emerged from the 1st week of May until the 3rd week of December. Four broods were detected throughout the following periods: April-July, June-November, September-November and November-December. The activity of the scolytid seemed to be affected by the combined action of climatic factors rather than by individual factors. Emergence of *Z. pyrina* started in the 2nd half of April and continued until December, and during this period 4 broods were observed. Moth emergence was highest on north-east facing olive trees. Temperature was the principal factor influencing moth activity, with relative humidity having a lesser effect (Ismail, *et al.*, 1988) .

The biology of *Phloeotribus scarabaeoides* was studied in the laboratory at 20, 25 and 30 degrees C and 55, 65, 75 and 85% RH. The egg period averaged 5-11 days. The larvae burrowed galleries under the bark at right angles from the parent gallery. The larval stage lasted 26-75 days and the pupal stage 5-29 days. Females laid an average of 55 eggs. The total life cycle varied from 45 to 105 days (Ismail, *et al.*, 1991) .

Results are presented of a study, investigating the efficacy of 3 Bacillus thuringiensis (Bt) products, i.e. Dipel 2X, Delfin and Bactospeine, against the olive leaf moth, *P. unionalis*. The percentage egg hatch was slightly affected by the egg treatment (Dipel 2X at 0.0625 and 2.000 g/l) while the resultant larvae were strongly affected. Larval mortality was 78.5 and 8.3% for 24-h-old eggs, while it was 56.9% and 8.7% for 48-h-old eggs treated with 2.000 g Dipel 2X and the control, respectively. The lifespan of males and females developed from treated 24-h-old eggs was highly increased in comparison with the control moths, while the reverse was true for treated 48-h-old eggs. The pre-oviposition period for moths developed from the treated eggs was increased, while the reverse was true for the oviposition period and number of deposited eggs per female. Treatment of larvae with all the Bt products caused an increase in larval and pupal durations, and reduction in percentage pupation and moth emergence. Pre-oviposition and post-oviposition periods of moths developed from the treated larvae increased significantly while the reverse was true for the oviposition period, fecundity and fertility. Comparing the results at the LC50 levels revealed that Dipel 2X was the most effective product, where the larval mortalities reached 96.67 and 93.11%, followed by Delfin (86.21 and 82.67%) and Bactospeine (65.52 and 65.52%) for 2nd and 4th instars, respectively. The results of an investigation on the persistence of Dipel 2X in the field under natural environmental conditions in Egypt is also presented. Three groups of olive branches were sprayed with 3 concentrations of Dipel 2X (0, 0.0625 and 2.000 g/l). A sample of small branches was picked up from each group after 2, 4 and 7 days of treatment. The mortality of P. unionalis larvae on the 5th day of feeding increased significantly as the concentration increased in all the tested periods: feeding on treated leaves for 5 days, and feeding on treated leaves for one day then on untreated leaves for 4 days. The percentage mortalities decreased significantly as the time between spraying olive trees and collecting leaf samples increased. Mortalities of 68.9, 60.0 and 24.4 and 44.4, 22.2 and 15.6 were obtained at 2, 4, 7 days at 2.000 and 0.0625 g/l, respectively. Feeding for 5 days recorded the highest rate of mortality (62.2 and 91.1%) at 0.0625 and 2.000 g/l, respectively (Ghoniemy *et al.*, 1998) .

In Egypt, Z. pyrina is a serious polyphagous pest in fruit and wood trees. Larvae were reared on its natural hosts (apple, pear, pomegranate and olive) as well as on artificial medium diets, each containing saw dust of one of the previously mentioned hosts. Number of larvae and pupae completed their development, percentage of pupation, larval and pupal durations, rate of moth emergence, mating, oviposition, longevity, incubation period and percentage of hatchability were studied in details on natural hosts and artificial medium diets. The approximated life cycles were 336.7 (318-370), 344.8 (337-367), 328.7 (321-360) and 377.3 (366-398) days on natural hosts and 126.0 (121-137), 132.8 (123-146), 136.3 (126-158) and 144.1 (141-162) days on artificial medium diets when reared on apple, pear, pomegranate and olive, respectively. Out of 100 eggs each reared on their natural hosts (apple, pear, pomegranate or olive) were 20, 24, 18 and 20% completed their development to adult moths. The percentage recovery when reared on the respective artificial diets were 68, 58, 64 and 61%. Rearing Z. pyrina on artificial diets reduced the total period of the life cycle by approximately 2/3 compared to rearing on their natural hosts (Tadros,*et al.*, 2003).

Six insecticides (Malathion, Quik, Cidial, Dimethoate, Actellic, Deltamethrin) and two mineral oils (Super misrona and Kemesol) are currently used to control the most important pests in Mediterranean olive cultivation (olive fly, olive moth and black scale). Potential side-effects of these compounds were tested on the egg parasitoid Trichogramma cacoeciae Marchal, following recommendations of the working group 'Pesticides and Beneficial Organisms' of the International Organization for Biological Control, West Palaearctic Regional Section (IOBC/WPRS). In the present study, three different types of test methods were carried out: (1) initial toxicity dose-response test on adult wasps, (2) initial toxicity test on pupae, using field recommended rates, and (3) persistent test on olive foliage to assess the duration of harmful activity. The six insecticides tested reduced parasitism by 80-95% and rated as moderately harmful at the field recommended doses. The two mineral oils reduced parasitism up to 25% and were therefore rated as harmless to the adult stage of the parasitoid. The results of the pupal test (parasitoid pupa inside the host egg) showed that Malathion was harmless, Quik, Actellic and Cidial were slightly harmful, while Dimethoate and Deltamethrin were moderately harmful. The results of the persistence test on olive foliage showed that Malathion, Quik and Actellic were slightly persistent, while Cidial, Dimethoate and Deltamethrin were moderately persistent. (Youssef, *et al.*, 2004) .

*** Biological control:**

A list of the hymenopteran parasitoids of common pests of olive in Egypt: *Opius concolor, Pnigalio agraules, Eupelmus sp., Macroneura sp., Eurytoma martellii, Eurytoma sp. and Cyrtoptyx latipes* on *Bactrocera oleae* (El-Khawas *et al.*, 2000) .

Apanteles syleptae and *Brachymeria aegyptiaca* on *Palpita unionalis, Apanteles sp. and Bracon* sp. on *Prays oleae* (El-Khawas *et al.*, 2000) .

Several ectoprepupal and pupal hymenopteran parasites of *P. scarabaeoides* were recorded in Egypt for the first time: the pteromalids *Cerocaephala cornigera, Cheiropachus quadrum, Rhaphitelus maculatus*, the encyrtid *Litomastix truncatellus* [*Copidosoma truncatellum*], *Eupelmus* sp. and *Eurytoma* sp. (Ismail, *et al.*, 1988) .

A survey of the natural enemies associated with the olive leaf moth, Palpita unionalis, and the olive moth, Prays oleae, was conducted in two olive groves

(Paradise Park, Giza and Borg El-Arab, Alexandria) in Egypt. Samples from the two target pests were collected weekly from both locations from March to October 2002. Samples were kept under laboratory conditions until emergence of parasitoid adults and/or occurrence of any of pathogen symptoms. Ten hymenopterous parasitoid species were recorded, five on each of *Palpita unionalis* (*Apanteles xanthostigma* and *A. syleptae*, *Xanthopimpla punctata* and *Brachymeria euploeae* and *Brachymeria* spp.) and *Prays oleae* (*Apanteles xanthostigma* and *Opius concolor*, *Tetrastichus amethystinus* and *Hockeria bispinosa* and *Chalcis modesta*). Of the 10 parasitoid species, *A. xanthostigma*, *X. punctata*, *Brachymeria* spp. and *Brachymeria euploeae*, are thought to be the first records for Egypt. Moreover, for the first time in Egypt, *Bacillus thuringiensis* was isolated from the larvae of both *Palpita unionalis* and *Prays oleae*, while the polyhedrosis virus was isolated only from the larvae and pupae of *Palpita unionalis* (Nasr, *et al.*, 2002)

Preliminary field trials were conducted in 2003 in Cairo, Egypt on the effect of creating vegetation islands with flowering plants on the populations of beneficial insects in olive agro-ecosystem, with emphasis on the natural enemies of some lepidopterous olive pests. Islands of flowering plants (2x2 m) were created alternatively between olive trees, in four rows. Six different treatments were considered: (1) bare soil (control), (2) summer squash, *Cucurbita pepo*, (3) radish, *Raphanus sativus*, (4) roquette, *Eruca sativa* [*E. vesicaria*], (5) turnip, *Brassica rapa* [*B. campestris* var. rapa], and (6) wild flora (groundsel, *Senecio vulgaris*). Occurrence of several groups of beneficial insects was significantly increased in the vegetation islands in comparison to the uncovered soil (control). The catches using sticky traps were recorded as follows: 41.32% hymenopterous parasitoids (Ichneumonidae, Chalcididae, Braconidae, Philanthidae, Tephiidae, Chrysididae, Eulophidae, Blasticotonidae and Pemphredonidae), 45.89% predators (Coccinellidae, Syrphidae, Anthocoridae and Chrysopidae) and 12.79% hymenopterous pollinators (Andrenidae). Radish, roquette and squash, in addition to wild groundsel, were highly attractive to the most abundant natural enemies of olive pests, i.e. the hymenopterous parasitoids and coccinellid predators, as well as the pollinators. So, olive growers could be recommended to encourage inter-planting such flowering plants among olive trees to enhance natural enemies associated in olive orchards (Nasr, *et al.*, 2004).

A survey of two-year studies (2001-2003) was carried out in two olive groves sited at two representative olive growing areas, namely Paradise Park (arid area) and Burg El-Arab farm (semi-arid area) to monitor the frequency of endemic *Trichogramma* species on olive moth (*Prays oleae*) and jasmine moth (*Palpita unionalis*). The suspended host bait traps were found to be a more practical and effective tool for collecting *Trichogramma* wasps than the attached ones. Four naturally occurring *Trichogramma* species were collected for the first time in Egypt from the olive groves, where releases have never been conducted. *T. bourarachae* was collected exclusively from Burg El-Arab farm. It seems that this wasp species adapts well to the semi-arid area. Three species, namely *T. cordubensis*, *T. nr.* pretiosum and *T. cacociae* were isolated from Paradise Park farm. All of these wasps were also bred from naturally parasitized host eggs during favorable and even at unfavorable temperature conditions of June-August. However, these endemic species did not occur naturally in sufficient numbers to keep the pest populations from reaching damaging levels. The excessive usage of insecticides and the oophagous predators (e.g., ants and lacewing larvae) are some factors that affect the performance of *Trichogramma* wasps in olive farms. The presence of warm weather wasp strains suggests the existence of well-adapted wasp species or strains which may be appropriate candidates for the control of target pests in olive groves. Additional study is required to determine the best "habitat-specific" species/strains of *Trichogramma* for augmentative release of naturally occurring wasps and to incorporate them into integrated pest management programs. Efforts should be made to conserve these endemic species from oophagous predators, hot weather and insecticides. The olive and jasmine moth-larvae and pupae found under tree canopies were bred and emerged parasitoids were listed. (Hegazi, *et al.*, 2005)

Field releases of 900 000 *T. evanescens* per ha per release were applied against the anthophagous (9 and 26 March, and 4 and 22 April) and carpophagous (13 and 27 May, and 10 and 24 June) generations of the olive moth, P. oleae, in 2001 in Egypt. A comparable olive grove (0.5 ha) of the same olive cultivars (Toffahi and Shamy) was chosen as the control site. The flight phenology of the olive moth males was weekly monitored with sex pheromone traps. Estimation of infestation rates by target pest on olive leaves, flowers, fruits and pre-mature fallen fruits, as well as parasitism by *T. evanescens,* was weekly recorded. Olive fruit yield of treated and untreated areas was carefully gathered and weighed. The male catches in the treated sites were greatly reduced from the third release of the first flight to the last release of the second flight of the olive moth. The reduction of male catches in the treated plots resulted in decreasing number of eggs of target species on olive shoots in the treated sites compared to the control site. The maximum percentage of parasitism in P. oleae eggs occurred on 27 May. The results of the efficacy of releasing wasps on the number of pre-mature fallen fruits and fruit yield per tree (weight and number) at the treated and control sites offer encouraging data concerning the protection of olive yield by inundative releases of T. evanescens. Importantly, a thelytokous strain of T.

cordubensis was reared for the first time in Egypt from naturally parasitized P. oleae eggs and will be tested in the near future (Hegazi, *et al.*, 2004)

In Egypt, *Zeuzera pyrina* L. (Lepidoptera: Cossidae) is a serious polyphagous pest in fruit and wood trees. Larvae were reared on its natural hosts (apple, pear, pomegranate and olive) as well as on artificial medium diets, each containing saw dust of one of the previously mentioned hosts. Number of larvae and pupae completed their development, percentage of pupation, larval and pupal durations, rate of moth emergence, mating, oviposition, longevity, incubation period and percentage of hatchability were studied in details on natural hosts and artificial medium diets. The approximated life cycles were 336.7 (318-370), 344.8 (337-367), 328.7 (321-360) and 377.3 (366-398) days on natural hosts and 126.0 (121-137), 132.8 (123-146), 136.3 (126-158) and 144.1 (141-162) days on artificial medium diets when reared on apple, pear, pomegranate and olive, respectively. Out of 100 eggs each reared on their natural hosts (apple, pear, pomegranate or olive) were 20, 24, 18 and 20% completed their development to adult moths. The percentage recovery when reared on the respective artificial diets were 68, 58, 64 and 61%. Rearing *Z. pyrina* on artificial diets reduced the total period of the life cycle by approximately 2/3 compared to rearing on their natural hosts (Tadros, *et al.,* 2003).

***Agricultural and mechanical control:**

An olive farm of 240 ha near Cairo (Egypt) was selected to control the olive moth, *Prays oleae* Bern., by an integration of egg parasitoids and pheromones upon a promise of the farm's owner to keep his farm pesticide-free. During the 2nd flight of the olive moth, its population density in olive groves other than the experimental ones, exceeded our expectations. Therefore, 2 black light traps namely UV-sticky (BLS) and UV-water (BLW) traps were constructed from materials generally available around the farm. When 3 traps/each type were used, unexpected mass-trapping of the olive moth was recorded. The traps saved the fruit yield of the whole farm by sweeping over most population of *P. oleae* moths from the farm without using any insecticide. The BLS traps proved to be safer for the environment than the BLW. The trap may be integrated with other approaches to control the olive moth, e.g., the mating disruption method. Additional careful testing is required to fully reveal and document the basic trap's true potential (Hegazi and Khafagi, 2005)

VI. MITES

a. Economic Importance of mites on olive:

Overseas, at least nine species of eriophyoid mites belonging to seven genera are known to occur on olives. The most harmful species, in addition to *O. maxwelli*, are

Aceria oleae (Nalepa), *Tegolophus hassani* (Keifer) and *Ditrymacus athiasella* Keifer. It is difficult to estimate the amount and type of injury which is caused by each different species because they occur in mixed populations and have similar feeding habits (Castagnoli & Oldfield 1996). However, heavy infestations of *O. maxwelli* can cause the premature fall of olive flowers, spotting and distortion of leaves (Russo 1972). In nurseries and young plantations, spring and autumn infestations of buds can lead to serious disorders in growth and even block the development of young plants (Castagnoli & Oldfield 1996).

b. Survey of mites:

Eriophyoid mite infestation is commonly found on indigenous or exotic olive cultivars in different nurseries in Egypt. Investigations carried out for three years in Menufiya Governorate revealed the presence of *Aceria olivi* (Zaher and Abou-Awad), *Oxycenus niloticus* Zaher and Abou-Awad (El-Laithy , 1999) .

Mites from an abandoned olive nursery in Egypt were observed for two years, during which species diversity, seasonal fluctuations and biological aspects of specific eriophyid species were studied. Two eriophyid species - the olive bud mite *Aceria oleae* Nalepa and the olive rust mite *Tegolophus hassani* (Keifer), *Oxycenus maxwelli* (Keifer) (Acari: Eriophyidae) (Abou-Awad *et al.*, 2005).

c. Bionomics of mites:

El-Laithy (1999) The eriophyoid mite *A. olivi* was predominant especially during summer and autumn, while *O. niloticus* was almost rare.

Population abundance of the eriophyid mites the olive bud mite *Aceria oleae* Nalepa and the olive rust mite *Tegolophus hassani* (Keifer) were affected by climatic conditions, predation, shady and sunny zones, leaf age and vertical distribution. About 12, 5, 15 and 4 generations were recorded for both eriophyid species during the two successive years, respectively. A control measure of one spring pesticide (abamectin) seemed to be the most successful against the harmful mites. Life table parameters showed that the population of T. hassani multiplied 9.92 times in a generation time of 14.42 days at 31 degrees C and 80% r. H., while the A. oleae population increased 16.70 times in a generation time of 13.50 days at the same conditions. Field and laboratory studies indicated that the olive bud mite is considered to be a disastrous mite on shrub and young olive trees .

Generally, overwintering females of *O. maxwelli* are found on the upper surfaces of leaves. Only about 1 to 4 mites are found per apical leaf at that stage. With the onset of spring, females move to the buds and new leaflets where they start to reproduce rapidly. In a short space of time, all life stages are found. Throughout the flowering stage, individuals migrate to the developing buds, calyx and ovaries.

Densities can reach as many as a hundred mites per flower. Individuals then move onto the young fruits. When the fruit reaches more than 0.5 cm in diameter they move to the persistent flower sepals. During summer, olive bud mites return to the leaves and populations decrease again (Castagnoli & Oldfield 1996).

d. IPM of mites:

***Chemical control:**

Insecticidal soaps and oils should be carefully considered when a pesticide is required. They are effective against mites and the least toxic to people, other non-target organisms and the environment. Most miticides are not effective on eggs. Therefore two or more applications of the miticide will be required at five-day intervals during the summer or seven-day intervals during the winter. For the most current insecticide recommendations to control these pests, please contact the local county office of the Cooperative Extension Service. If you have access to the World Wide Web you can consult the University of Florida's Insect Management Guide

***Biological control:**

During a survey of predatory mites on olive in Egypt as potential natural enemies of arthropod pests, a new phytoseiid was found that is described from the adults as Amblyseius olivi sp. n. and illustrated. A key to the females of all species of Amblyseius known in Egypt is given (Nasr and Abou-Awad . 1984) .

The development of individuals of the phytoseiid *Amblyseius olivi* on all stages of the olive pest *Eriophyes olivi,* nymphs of Tetranychus urticae and on pollen grains of castor (*Ricinus communis*) at 27 degrees C and 70-80% RH was studied in Egypt. The average developmental period was shorter in individuals reared on the eriophyid (4.7 days) than on the tetranychid (5.7 days) or the pollen (4.9 days). The lifespan of adult females was about 33 days on all diets. The average number of eggs laid per female in 10 days was higher on those reared on the eriophyid (35.3) than on the tetranychid (8.3). Adult females consumed an average of 120.1 eriophyids or 7.5 tetranychids per day (Abou-Awad and El-Banhawy, 1986).

The African Raphignathoidea are reviewed. The superfamily includes predators, semi-aquatic and aquatic species and litter-living species. *Saniosulus nudas, Exothorhis sudanicus, Eupalopsellus olearius* (on olives in Egypt) (Meyer and Ueckermann, 1989).

Some biological parameters and the predaceous capacity of *Agistemus exsertus*, *Amblyseius swirskii* and *Phytoseius finitimus* were determined in the laboratory at 27 degrees C and 60-80% RH. The predatory mites successfully fed on *Eriophyes olivi* [*Aceria olivi*]. The developmental time of the predaceous mites averaged 10.5, 5.7 and 7.9 days, respectively. The phytoseiid *A. swirskii* was more voracious than the other predators, with a prey consumption rate of 144.4 prey individuals/female per day. The stigmaeid Agistemus exsertus had the highest fecundity rate of 66.6 eggs/female, followed by Amblyseius swirskii 44.4 and P. finitimus 23.5 eggs/female, during an oviposition period of 18.58, 20.06 and 16.0 days, respectively. The net reproductive rate and finite rate of increase were 40.59 and 1.24, respectively, for Agistemus exsertus, 23.78 and 1.32 for Amblyseius swirskii and 16.32 and 1.12 for P. finitimus (El-Laithy, 1998).

Two predatory mites, the phytoseiid Amblyseius swirskii Athias-Henriot and the stigmaeid Agistemus exsertus Gonzales, collected from olive cv. 'Eigezy'. The predatory mites were more frequent in 1995-1996 than in 1996-1997. Introduction of (or inoculation with) predatory mites onto olive seedlings and young olive trees may replace miticide applications against eriophyoid mite infestation (El-Laithy, 1999).

Mites from an abandoned olive nursery in Egypt were observed for two years, during which species diversity, seasonal fluctuations and biological aspects of specific eriophyid species were studied. Two eriophyid species - the olive bud mite *Aceria oleae* Nalepa and the olive rust mite *Tegolophus hassani* (Keifer), representing a basic trophic level - were fed upon by two predacious mites - *Neoseiulus cydnodactylon* (Shehata and Zaher) and *Agistemus olivi* Romeih (Abou-Awad *et al.*, 2005).

The life table and prey consumption of the predatory phytoseiid mite *Neoseiulus cydnodactylon* Shehata and Zaher as affected by feeding on the motile stages of the olive bud mite *Aceria oleae* Nalepa, the olive rust mite *Tegolophus hassani* Keifer (Acari: Eriophyidae) and nymphs of the two-spotted spider mite *Tetranychus urticae* Koch (Acari: Tetranychidae), had been studied in the laboratory at different temperatures and relative humidities. The rise of different temperatures and relative humidities from 15 degrees C and 50% to 25 degrees C and 70% and 31 degrees C and 80% shortened development and increased reproduction and prey consumption. Individuals of eriophyid olive mites promoted the different stages to develop faster than tetranychid nymphs did. The maximum reproduction (2.84, 2.7 and 2.39 eggs/[female]/day) was recorded at the highest temperature, while the minimum reproduction (1.35, 1.15 and 0.79 eggs/[female]/day) was observed at the lowest temperature with all prey species. Life table parameters indicated that feeding of *N. cydnodactylon* on *A. oleae* led to the highest reproduction rate (rm=0.225 and 0.122 females/female/day), while feeding on *T. urticae* gave the lowest reproduction rate (rm=0.158 and 0.098) at 31 degrees C and 80% relative humidity and 15 degrees C and 50% relative humidity, respectively. *N. cydnodactylon* seems to be a voracious predator of both eriophyid and tetranychid mites. The adult female daily consumed on average 136 A. oleae, 99 T. hassani and 12 T. urticae at 31 degrees C and 80%

relative humidity, while it devoured 72, 52 and 6 individuals, respectively, at 15 degrees C and 50% relative humidity. Both eriophyid and tetranychid mites are thought to be profitable prey species of N. cydnodactylon as a facultative predator(Metwally *et al,.*, 2005) .

VII. THYSANOPTERA

a. Economic Importance of Thysanoptera on olive:

The thrips feed by rupturing the epidermal cells and imbibing the sap. The destruction of the attacked cells results in the yellowing and the dessication of damaged areas. The severity of damage caused by nymphs and adults depends upon the timing of attack. Leaves become deformed by the asymmetric and hardened growth of their tissues. The fruits also become deformed and smaller than normal. On young trees or during the emergence of new shoots, attacks on new terminal buds may prevent development or cause deformation. On floral buds or young fruits the attack can cause abortion or their destruction with considerable effect on yield.

b. Survey of Thysanoptera:

Liothrips oleae Costa recorded for first time in Egypt (Moursi& Mesbah,1985).

c. Bionomics of Thysanoptera:

Liothrips oleae (COSTA) (Thysanoptera, Phlaeothripidae) in an olive-growing area The number of *L. oleae* specimens captured in the olive-groves was fairly small during early April and early June samplings, but greater in the late April and early August samplings. Their abundant presence in the late April sampling could be due to the numerous specimens of the overwintering generation.

d. IPM of Thysanoptera:

*** Biological control:**

The predators of Liothrips oleae (COSTA) were Chrysopa , Chrysoperla spp. and Orius spp., *Franklinothrips orizabensis* and *Franklinothrips vespiformis* .

***Agricultural and mechanical control:**

Monitor thrips adults and nymphs by branch beating or shaking foliage or flowers onto a sheet of paper, a beating tray, sheet, or clipboard. Adult thrips can also be monitored using bright yellow sticky traps. Blue sticky traps are most effective for capturing western flower thrips, but thrips are harder to discern on this darker background.

Thrips often move into olive when plants in weedy areas or grasslands begin to dry in spring or summer, so it is wise to avoid planting susceptible plants next to these areas or to control nearby weeds that are alternate hosts of certain thrips. Vigorous plants normally outgrow thrips damage, keep plants well irrigated, but avoid excessive applications of nitrogen fertilizer, which may promote higher populations of thrips. Remove and dispose of old, spent flowers. The agricultural practies like, pruning. row Covers. row covers and Reflective Mulch. Managing vegetation in and around olive groves in important in reducing the potential for damage from western flower thrips. Avoid discing orchard cover crops while trees are in bloom. Disc open areas adjacent to groves as early as possible to prevent thrips' development and migration to olive trees. There is no current California registration for any chemical treatment. In years when this pest is particularly damaging and a special local need registration is approved, apply treatments at full bloom if thrips are migrating to olives and their presence has been noted in the bloom.

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IX. REFERENCES

1. Abdallah, S. A., H. M. A. Badawy, A. A. Barakat and T. N. El-Sabaay. 2001. Efficacy of certain vegetable oils as wheat grain protectants against the lesser grain borer, Rhyzopertha dominica (F.). Bulletin-of-Faculty-of-Agriculture,-Cairo-University. 52(1): 167-182
2. Abdel-Kawy, A. G. M., M. H. El-Bishry and T. A. H. El-Kifl. 1992. Controlling the leopard moth borer, Zeuzera pyrina by three entomopathogenic nematode species in the field. Bulletin-of-Faculty-of-Agriculture,-University-of-Cairo. 43(2): 769-780
3. Abdel-Rahman, A G. 1995. Seasonal abundance of some pests attacking olives and their control under El-Qasr conditions, Matrouh Governorate. Annals-of-Agricultural-Science,-Moshtohor. 33(4): 1553-1564.
4. Abd-Rabou, S. 1996. Egyptian Aleyrodidae. Acta Phytopathologica et Entomologica Hungarica, 31 (3-4): 275-285.
5. Abd-Rabou, S. 1997. Hosts, distribution and vernacular names of whiteflies (Homoptera : Aleyrodidae) in Egypt. Annals of Agric. Sci., Moshtohor, 35 (2): 1029-1048.
6. Ábd-Rabou, S. 1999. Parasitoïds attacking the Mediterranean black scale, Saissetia oleae (Hemiptera: Coccidae) on olive in Egypt. Entomologica-. 33: 169-172

7. Abd-Rabou, S. 2001. Biological control of the Mediterranean black scale Saissetia oleae (Olivier) (Hemiptera: Coccidae) on olive in Egypt. Bollettino-di-Zoologia-Agraria-e-di-Bachicoltura. 33(3): 483
8. Abd-Rabou, S. 2001. The effect of augmentative releases of indigenous parasitoids on populations of Parlatoria oleae (Colvee) (Hemiptera: Coccoidea) in olive groves in Egypt.Bollettino-di-Zoologia-Agraria-e-di-Bachicoltura.33(3):473-481
9. Abd-Rabou, S. 2003. First record of pomegranate whitefly, Siphoninus phillyreae (Haliday) (Homoptera: Aleyrodidae) on olive in North Sinai, Egypt. Egyptian-Journal-of-Agricultural-Research. 81(4): 1577-1579
10. Abd-Rabou, S. 2004. Augmentative releases of indigenous parasitoids of the Mediterranean black scale Saissetia oleae (Oliver) (Hemiptera: Coccidae) on olive in Egypt. Shashpa-. 11(1): 51-56
11. 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
12. Abd-Rabou, S. 2005. Importation, colonization and establishment of Coccophagus cowperi Gir. (Hymenoptera: Aphelinidae) on Saissetia coffeae (Walk.) (Homoptera: Coccidae). in Egypt Journal-of-Pest-Science. 78(2): 77-81
13. Abd-Rabou, S., A. A. Hafez and H. Badary. 2003. Survey and dynamics of natural enemies of the Mediterranean black scale, Saissetia oleae (Homoptera: Coccidae) in Egypt. Egyptian-Journal-of-Agricultural-Research. 2003, 81(1): 113-123
14. Abou-Awad, B. A. and E. M. El-Banhawy. 1986. Biological studies of Amblyseius olivi, a new predator of eriophyid mites infesting olive trees in Egypt (Acari: Phytoseiidae). Entomophaga-. 31(1): 99-103
15. Abou-Awad, B. A., A. M. Metwally and M. M. Al-Azzazy. 2005. Environmental management and biological aspects of two eriophyid olive mites in Egypt: Aceria oleae and Tegolophus hassani. Zeitschrift-fur-Pflanzenkrankheiten-und-Pflanzenschutz. 112(3): 287-303
16. Abou-Elhagag, G. H. 2004. Abundance of olive scale insect, Parlatoria oleae Clovee (Homoptera: Diaspididae) and its parasitoids in Upper Egypt. Assiut-Journal-of-Agricultural-Sciences. 2004, 35(3): 197-208
17. Albalkhi, M., F. Farawati, A. Altoune, M. Salman, M. Attiah and G. Zeeni. 2004. Influence"of olive cake forms against root-knot nematodes on tomato in greenhouses in Syrian coast. Egyptian-Journal-of-Agricultural-Research. 82(2(Special Issue)): 19-25

18. Al-Elimi, M. H. 2003. Field and chemical evaluation of "Attract and Kill" pheromone lures for controlling the olive fruit fly, Bactrocera oleae (Gmelin.) (Diptera: Tephritidae), in two Egyptian Governorates. Egyptian-Journal-of-Biological-Pest-Control. 13(1/2): 41-46

19. Alfazairy, A. A., R. Hendi, A. M. El-Minshawy and H. H. Karam. 2003. Entomopathogenic agents isolated from 19 coleopteran insect pests in Egypt. Egyptian-Journal-of-Biological-Pest-Control. 2003, 13(1/2): 125

20. Al-Sayed, A. A. and S. H. Abdel-Hameed. 1991. Resistance and susceptibility of olives to Meloidogyne incognita and Rotylenchulus reniformis. Annals-of-Agricultural-Science,-Moshtohor. 29(3): 1221-1226

21. Amin, A. R. H. 1966. Biological and ecological studies on the olive scale, *Parlatoria oleae* (Clovee) in Egypt (Homoptera: Coccoidea). M. Sc. Thesis, Fac. of Agric., Ain Shams Univ., Egypt.

22. Amin, A.H. and M. R. A. Saleh. 1975. Seasonal activity of the olive leaf moths, *Palpita unionalis* (Hbuner) (Lepidoptera: Pyralidae), in Kharga-Oasis, New- Vally, Egypt. Ann. of Agric. Sci., Fac. Agric., Ain Shams Univ. 20 (1): 35- 41.

23. Amin, A.H., A. Emam and A. S. Youssef. 1994. Morphological and histoligical changes in grapevine due to the infestion with *Maconellicoccus hirsutus* (Green) (Homoptera: Pseudococcidae). Internation Symposium on Crop Protecion. Facultier Landbouw en Toegepaste Biologisch Wetenschappen Univ. Gent Belgium.

24. Amin, A. W. and M. M. A. Youssef. 1997. Efficiency of certain plant leaves for controlling Meloidogyne javanica and Rotylenchulus reniformis infecting sunflower in Egypt. International-Journal-of-Nematology. 7(2): 198-200

25. Asfoor, M. A. M. 1997. Seasonal abundance and control of the plum scale insect *Parlatoria oleae* (Colvee) on some deciduous trees. Ph. D. Thesis, Fac. of Agric. Zagazig Univ. Egypt, 398 pp.

26. Asran, A. A. 1993. Effect of some additives on food consumption of the house mouse, Mus musculus L., in new reclaimed area. Egyptian-Journal-of-Agricultural-Research. 1993, 71(4): 901-906

27. Atalla, E. A. R. 1958. Studies on the ecology and control of the olive fruit-fly in Egypt Agric. Res. Rev. 36 (1): 120-137.

28. Awadallah, A. 1973. Seasonal abundance of the olive fruit fly *D. oleae* (Gmel.). Agric. Res. Rev. 51 (1): 69-78.

29. Awadallah, A. and A. L. Nadium. 1970. The chemical control of the olive fruit- fly, *D. oleae* Gmel., in Kom-Oshim district (Fayoum Governorate) during 1963 and 1964 seasons. Bull. Ent. Soc. Egypt, Econ. Ser., 4: 135-141.

30. Badaawi, A., A. M. Awadallah and S. M. Foda. 1976. On the biology of the olive leaf moth *Palpita unionalis* Hb. (Lep., Pyralidae). Z. Angew. Entomol. 80 (1): 103-110.

31. Badr, M. A., A. A. Oshaibah, M. M. Al-Gamal and M. M. Salem. 1986. Taxonomy of five species of superfamily Yponomeutoidea - Lep. in Egypt Agricultural-Research-Review. 61(1): 257-272.

32. Batt, A. M. 2006. Survey of some entomological parasitoids and predators attacking fruit and wood tree borers in Egypt. Egypt. J. Agric. Res., 84(4): 1079-1093.

33. Campion, D. C., L. O. McVmeich, J. Polyrakis, S. Michelakis, G. Stavrakis, P. Beevor, D. R. Hall and B. F. Nesbitt. 1979. Laboratory and field studies of the female sex pheromone of the olive moth *Prays oleae*. Experientia *5*: 1146-1147.

34. Castagnoli, M. and G. N. Oldfield. 1996. Chapter 3.2.3. Other fruit trees and nut trees. In: World Crop Pests, Vol.6, Eriophyoid Mites — Their Biology, Natural Enemies and Control (eds EE Lindquist, MW Sabelis & J Bruin) pp. 543–559. Elsevier Science BV, Amsterdam.

35. Darwish, A. A., S. A. Said, A. M. Abdel-Kawy and A. M. Attia. 1998. Biological control of insects with insect parasitic nematodes. Annals-of-Agricultural-Science,-Moshtohor. 36(1): 603-618.

36. Dahlsten, D. L., D. L. Rowney, W. A. Copper, R. L. Tassan, W. E. Chaney, K. L. Robb, S. Tjosvold, M. Bianchi and P. Lane. 1998. Parasitoid wasp controls blue gum psyllid. Calif. Agric. 52(1):31-34.

37. Dahlsten, D. L., D. M. Kent, D. L. Rowney, W. A. Copper, T. E. Young, and R. L. Tassan. 1995. Parasitoid shows potential for biocontrol of eugenia psyllid. Calif. Agric. 49(4):36-40.

38. Dreistadt, S. H., J. K. Clark and M. L. Flint. 1994. Pests of Landscape Trees and Shrubs: An Integrated Pest Management Guide. Oakland: Univ. Calif. Agric. Nat. Res. Publ. 3359

39. Donia, A.R., S.K. Sawaf and M.E. Abu- Ghadir. 1971. Number of generations and seasonal abundance of the olive fruit fly, *D. oleae* (Gmel.) and the susceptibility of different olive varieties to infestation. Bull. Ent. Soc. Egypt. 55: 201-209.

40. Effatoun, H. G. 1924. A monograph of Egyptian Diptera. (Part II. Fam., Trypaneidae). Men. Soc. R. ent. Egypte. 2 (2): 132 pp.

41. El-Bassiouny, M. N., F. H. Negm and M. M. Salem. 1996. Susceptibility of the olive varieties for the infestation by Dacus oleae (G.) as related to their physical and chemical properties. Annals-of-Agricultural-Science,-Moshtohor. 34(4): 1935-1942

42. El-Borai, F. E. and L. W. Duncan. 2005. Nematode parasites of subtropical and tropical fruit tree crops. Plant-parasitic-nematodes-in-subtropical-and-tropical-agriculture. (Ed.2): 467-492

43. El-Hakim, A. M. and E. I. Helmy. 1982. Survey of and population studies on olive leaf pests in Egypt. Bulletin-de-la-Societe-Entomologique-d'-Egypte. (64): 213-220

44. El-Hakim, A.M. and S. El-Sayed. 1985. Studies on the infestation of olive fruits with the olive fruit fly Dacus oleae Gmel, in Egypt (Tephrytidae: Diptera). Bulletin-de-la-Societe-Entomologique-d'-Egypte. (64): 221-225

45. El-Hakim, A. M. and S. El-Sayed. 1982. The infestation of olive trunks by Zeuzera pyrina (L.) in Egypt (Lepidoptera: Cossidae). Bulletin-de-la-Societe-Entomologique-d'-Egypte. (64): 227-229

46. El-Hakim, A. M. and S. Hanna. 1982. Evaluation of Bacillus thuringiensis Berliner against the olive-leaf moth Palpita unionalis Hb. (Pyralidae, Lepidoptera). Agricultural-Research-Review. 60(1): 17-28

47. El-Hakim, A. M., S. K. Hanna and A. M. Z. Mosallam. 2003. Ecological studies on some important insect pests of olive trees in El-Fayoum Governorate, Egypt. Egyptian-Journal-of-Agricultural-Research. 81(2): 563-571

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

49. El-Khawas, M. A., A. H. El-Heneidy, A. H. Omar and H. El-Sherif. 2000. A recent record of parasitoids on common olive pests in Egypt. Egyptian-Journal-of-Biological-Pest-Control. 10(1/2): 137-138

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

51. El-Laithy, A. Y. M. 1998. Laboratory studies on growth parameters of three predatory mites associated with eriophyid mites in olive nurseries. Zeitschrift-fur-Pflanzenkrankheiten-und-Pflanzenschutz. 105(1): 78-83

52. El-Laithy, A. Y. M. 1999. Population abundance and spatial distribution of eriophyoid mites and associated predatory mites inhabiting olive seedlings. Phytophaga-Palermo. 9: 93-102

53. El- Minshawy, A. M., S. K. El- Sawaf and A. Donia. 1972. The biology of *Hemiberlesia lataina* (Sing.) in Alexandria district. Bull. Ent. Soc., Egypt, 56: 461- 467.

54. El-Sherif, L. S. 1975. Biological and ecological studies on the Jasminium moth, *Palpita unionalis* Hb., and the olive moth, *Zelleria oleastrella* Mill. Ph. D. Fac. of Science, Ain Shams Univ., Egypt.

55. El-Wakil, A. A., I. A. Radwan, M. A. Zayed and M. M. Satour. 1985. Morphological and cultural characteristics of some isolates of Sclerotium bataticola (Taub.) Butl. from peanut. Agricultural-Research-Review. 63(2): 71-88

56. Elwan, E. S. A. H. 2001. Ecological studies on the olive psyllid, Euphyllura straminea Loginova (Homoptera:Psylloidea: Aphalaridae) in Al-Arish, North Sinai, Egypt. Egyptian-Journal-of-Agricultural-Research. 79(1): 161-178

66. Ezzat, Y. M. 1957. Biological studies on the olive scale, *Parlatoria oleae* (Clovee). Bull. Entom. Egypte. 41: 351.

67. Fahmy, I. 1953. Olive pests hitoherto unrecorded from Egypt (Lepidoptera: Tineidae). Bull. Soc. Fouad ler. Entom. 37: 487- 488.

68. Foda, S. M.A. 1973. Studies on *Margaronia* (*Glyphodes*) *unionalis* and its control. M.Sc. Thesis, Fac. of Agric., Ain Shams Univ., Egypt.

69. Gill, R. J. 1997. *The Scale Insects of California Parts 1-3.* Sacramento: Calif. Dept. Food Agric.

70. Kamel, A., S. Abd-Rabou, N. Hilmy, S. Allam and M. Moustafa. 2003. Seasonal abundance of certain Aphytis species (Hymenoptera: Aphelinidae) from Egypt. Egyptian-Journal-of-Agricultural-Research. 81(3): 1009-1023

71. Gabr, M. R. M. 1983. Association of bacteria with a new tomato blossom end rot. Annals-of-Agricultural-Science,-Ain-Shams-University. 28(3): 1143-1162

72. Kassab, A. S. and K. Abdel-Kader. 1996. Suppressing root-knot, citrus and reniform nematodes by use of less irrigation frequency and predacious nematode in olive. Annals-of-Agricultural-Science-Cairo. 41(1): 511-520

73. Kassis, S. R. and S. A. Shemais. 2002. Chemical and biological studies on wheat grains treated with plant oils and plant oil-malathion mixture against Sitophilus oryzae and Rhyzopertha dominica during storage. Egyptian-Journal-of-Agricultural-Research. 2002, 80(4): 1551-1561

74. Ghoneim, S. S. H., M. I. Abdel-Massih and F. A. F. Mahmoud. 1996. Interaction between root-knot nematode and root rot on olive trees. Annals-of-Agricultural-Science-Cairo. 1996, 41(1): 445-461

75. Ghoniemy, H. A., A. A. M. Etman, F. F. Moustafa and R. H. A. Solaiman. 1998. Evaluation of Bacillus thuringiensis biocides against Palpita unionalis (Hubn). Annals-of-Agricultural-Science,-Moshtohor. 36(1): 643-662

76. Hall, W. J. 1923. Further observations on the Coccidae of Egypt. Minist. Of Agric. Tech. And Sci. Service, 36: 39- 52.

77. Hall, W. J. 1924. The insect pests of citrus trees in Egypt. Minist. Of Agric. Tech. and Sci. Service, 45: 2- 10.

78. Hamza, M. M. 1975. Studies on certain insect pests attacking olive trees. M. Sc. Thesis, Fac. of Agric., Alexandria Univ., Egypt.

79. Hassan, N. A., S. M. El-Imery, E. I. El-Sisi and E. I. Helmy. 1995. Acetic acid as an amendment for bade effects of Arich water use dilution of mineral oils to control *Saissetia oleae* (Olivier) on olive trees. 1st . Int. conf. pest control. Mansoura. 243-247.

80. Hassanein, F. A. and A.R. Hamed. 1984. On the population dynamics of *Hemiberlesia latania* (Signoret) and its parasite Habrolepis aspidioti Compare & Annecke in Egypt (Homoptera: Diaspididae, Hymenoptera, Encyrtidae). Bulletin-of-the-Entomological-Society-of-Egypt,-Economic-Series. 14: 63-72

81. Hegazi, E. M., E. Agamy, S. Hassan, A. Herz, W. Khafagi, S. Shweil, L. Abo-Abdala, A. Zaitoun, S. El-Said, A. El-Shazly, A. El-Menshawy, H. Karam, N. Khamis and El-Kemny. 2004. Application of inundative releases of Trichogramma evanescens to control the olive moth, Prays oleae (Bern). Egyptian-Journal-of-Biological-Pest-Control. 14(1): 1-7

82. Hegazi, E. M. and W. E. Khafagi. 2004. Effect of varietal diversity in olive groves on the population of leopard moth, Zeuzera pyrina L . Egyptian-Journal-of-Biological-Pest-Control. 14(1): 207-212

83. Hegazi, E. M., E. Agamy, S. Hassan, A. Herz, W. Khafagi, S. Shweil, L. Abo-Abdala, A. Zaitoun, M. Hafez, A. El-Shazly, S. El-Saied, A. El-Menshawy, H. Karam, N. Khamis and S. El-Kemny. 2004. Preliminary study on the combined effect of mating disruption and inundative releases of Trichogramma evanescens (West.) against the olive moth, Prays oleae (Bern). Egyptian-Journal-of-Biological-Pest-Control. 14(1): 9-14

84. Hegazi, E. M. and W. E. Khafagi. 2005. Unexpected mass collection of the olive moth, Prays oleae Bern. by non-traditional black light traps. Bulletin-OILB/SROP. 28(9): 109-116

85. Hegazi, E. M. and W. E. Khafagi. 2005. Varietal sensitivity of olive trees to the leopard moth, Zeuzera pyrina L. (Lepidoptera: Cossidae). Bulletin-OILB/SROP. 28(9): 121-131

86. Hegazi, E. M., A. Herz, S. Hassan, E. Agamy, W. Khafagi, S. Shweil, A. Zaitun, S. Mostafa, M. Hafez, A. El-Shazly, S. El-Said, L. Abo-Abdala, N. Khamis and S. El-Kemny. 2005. Naturally occurring Trichogramma species in olive farms in Egypt. Insect-Science. 12(3): 185-192

87. Hindi, A., A. Amer, F. Rofail, S. Rawhy and A. Madkour. 1964. the effect of formulation of local mineral oils used alone or in combination with phosphorous compounds on the black scale, *Chrysomphalus ficus* and other scale insects. Agric. Res. Rev., 42: 27- 43.

88. IOOC. 2001. International Olive Oil Council p://www.internationaloliveoil.org)

89. Ismail, I. I., N. A. Abou-Zeid and F. F. Abdallah. 1990. Population dynamics of the leopard moth, Zeuzera pyrina L., on olive trees in Egypt. Bulletin-de-la-Societe-Entomologique-d'-Egypte. 69: 73-80

90. Ismail, I. I., N. A. Abu-Zeid and F. F. Abdallah. 1988. Ecological and behavioural studies on olive tree borers and their parasites. Agricultural-Research-Review. 66(1): 145-152

91. Ismail, I. I. and F. F. Abdallah. 1990. Field trials [in Egypt] to evaluate four organophosphorus insecticides for the control of the leopard moth, Zeuzera pyrina L., on olive trees. Bulletin-of-the-Entomological-Society-of-Egypt,-Economic-Series. (18): 137-148

92. Ismail, I. I., N. A. Abou-Zeid and F. F. A. Abdallah. 1991. On the biology of the olive shot hole borer, Phloeotribus scarabaeoides Bern. (Coleoptera: Scolytidae). Egyptian-Journal-of-Agricultural-Research. 69(1): 225-234

93. Ismail, I. I., N. A. Abou-Zeid and F. F. Abdallah. 1992. Population dynamics of the leopard moth, Zeuzera pyrina L., and its control on olive trees in Egypt. Zeitschrift-fur-Pflanzenkrankheiten-und-Pflanzenschutz. 99(5): 519-524

94. Levinson, H. and A. Levinson. 1999. Pest control of stored grain in antiquity . Informatore-Fitopatologico., 49(9): 13-18

95. Mansour, M. M., A. Shahein, M. A. El- Deeb and A. S. Hassan. 1991. Population dynamics and seasonal abundance of *Hemiberlesia latania* (Signoret) and its parasites on Guava trees in Sharkia region, Egypt. J. Appl. Sci., 96 (7): 323-335.

96. Metwally, A. M., B. A. Abou-Awad and M. M. A. Al-Azzazy. 2005. Life table and prey consumption of the predatory mite Neoseiulus cydnodactylon Shehata and Zaher (Acari: Phytoseiidae) with three mite species as prey. Zeitschrift-fur-Pflanzenkrankheiten-und-Pflanzenschutz. 112(3): 276-286

97. Meyer, M. K. P. S. and E. A. Ueckermann. 1989 . African Raphignathoidea (Acari: Prostigmata) Entomology-Memoir,-Republic-of-South-Africa,-Department-of-Agriculture. (74): v + 58

98. Moursi, K.S and E. M. Hegazi. 1983. The olive-tree scale, Leucaspis riccae Targ. (Hom., Diaspididae) as a key pest of olive trees in dry farm system in the

Egyptian western desert. Bollettino-del-Laboratorio-di-Entomologia-Agraria-'-Filippo-Silvestri', 40: 119-124

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

100. Moustafa, A. S. H. 1998. Studies on some scale insects and mealybugs infesting certain horticulture crops in newly reclamed areas. Ph.D. Thesis, Fac. Of. Agric. Zagazig Univ., Egypt 151 pp.

101. Nada, S. M. A. and Z. K. Mohammed. 1984. Description of male stages of Leucaspis riccae Targioni (Homoptera: Coccoidea: Diaspididae). Bulletin-de-la-Societe-Entomologique-d'-Egypte. (65): 251-258

102. Nada, S. and Z. K. Mohamed. 1992. Survey of scale insects attacking olive trees in Egypt. Egypt J. Appl. Sci., 7(4): 532- 535.

103. Nasr, A. K. and B. A. Abou-Awad. 1984. A new species of genus Amblyseius Berlese from Egypt (Acari: Phytoseiidae), Bulletin-de-la-Societe-Entomologique-d'-Egypte. (65): 245-249

104. Nasr, F. N. , S. S. Abou-Elkhair and S. S. Stefanos. 2002. New record of some biological control agents of *Palpita unionalis* Hubn. (Lepidoptera: Pyralidae) and *Prays oleae* Bern. (Lepidoptera: Yponomeutidae) in olive groves in Egypt. Egyptian-Journal-of-Biological-Pest-Control. 12(2): 129.

105. Nasr, F. N., S. S. Stefanos, S. S. Abou-Elkhair, W. A. Shehata, A. I. Awad and A. I. Youssef. 2004. Preliminary field trials for enhancement of natural enemies of olive pests in Egypt. Egyptian-Journal-of- Biological- Pest-Control. 14(1): 201-206

106. Rakha, M. A. and C. W. McCoy. 1985. Eupalopsellid mites on Florida citrus, with a description of Exothorhis caudata Summers development stages (Eupalopsellidae: Raphignathoidea. Florida-Entomologist, 68(1): 141-144.

107. Russo, L. F. 1972. *Oxypleurites maxwelli* Keifer (Acarina: Eriophyidae) in Campania. Bollettino del Laboratorio di Entomologia Agraria 'Filippo Sivestri' Portici.. 30: 165–168.

108. Salem, H. A. 1994. Factors contributing to the distribution and level of attack of scale insects which infections some different varieties of mango fruit trees. M. Sc. Thesis., Zagazig Univ. Fac. Agric. Egypt. 194 pp.

109. Salama, H. S. and M. K. Hamdy. 1974. Studies on the population of two scale insects infesting fig trees in Egypt (Coccoidea). Zeitschrift fur Angewandte Entomologie, 75 (2): 200- 204.

110. Salama, R. A. K., N. A. Elneary and F. F. Mostafa. 1997. Influence of olive fly, Bactrocera (Dacus) oleae (Gmel). infestation on some physical and chemical characteristics of olive fruits and their virgin oil. Egyptian-Journal-of-Food-Science. 25(1): 99-106

111. Saleh, M. R., A. G. Aly and Z. K. Mohammad. 1987. Relationship between population activity of the olive scale, *Leucaspis riccae* Targ. and certain weather factors in Egypt. Bulletin-de-la-Societe-Entomologique-d'-Egypte. 67: 43-46.

112. Saleh, M. R., A. G. Aly and Z. K. Mohammad. 1987. Morphlogical studies on the olive scale insect, Leucaspis riccae Targ.(Homoptera : diaspididae).Egypt. J. Appl. Sci.,10(3):577-586.

113. Shawky, S. M., M. A. M. El-Sawi and Y. M. Nabil. 2004. Effect of some nematicides on controlling root knot nematodes and determine their residues in olive fruits and soil. Annals-of-Agricultural-Science-Cairo. 49(1): 389-399

114. Shehata, W. A., S. S. Abou-Elkhair, S. S. Stefanos, A. A. Youssef and F. N. Nasr. 2003. Biological studies on the olive leaf moth, Palpita unionalis Hubner (Lepid., Pyralidae), and the olive moth, Prays oleae Bernard (Lepid., Yponomeutidae). Anzeiger-fur-Schadlingskunde. 76(6): 155-158

115. Shenishen, Z. and E. M. El-Zanaty, 1987. Differential effects of radiation on the egg parasitoid Trichogramma evanescens (Westwood), (Hymenoptera, Trichogrammatidae) and its host Sitotroga cerealella Oliver, (Lepidoptera, Gellichiidae) Bulletin-of-the-Entomological-Society-of-Egypt,-Economic-Series. (16): 143-150

116. Shawky, S. M., M. A. M. El-Sawi and Y. M. Nabil. 2004. Effect of some nematicides on controlling root knot nematodes and determine their residues in olive fruits and soil. Annals-of-Agricultural-Science-Cairo. 49(1): 389-399

117. Solaiman, A. F. 1970. Studies on the morphology, biology and control of certain coccids in Egypt. M. Sc. Thesis, Fac. of Agric., Ain Shams Univ., Egypt 318 pp.

118. Solaiman, R. H. A. 1997. Ecological, Biological Studies and microbial Control of some Insect Pests of Olive trees at Fayoum Governorate. M. Sc. Thesis, Fac. of Agr., Fayoum, Cairo Univ., Egypt.

119. Tadros, A. W., A. M. A. Rahman and R. M. Abdel-Moaty. 2003. Rearing fruit borers on natural hosts and artificial medium diets: 1-Zeuzera pyrina L. (Lepidoptera: Cossidae. Egyptian-Journal-of-Agricultural-Research. 81(4): 1535-1548

120. Tawfik, M. H. 1985. Studies on the scale insect *Parlatoria ziziphus* (Lucas) (Diaspididae: Homoptera). Ph. D. Thesis, Fac. of Agric. Cairo Univ. Egypt, 126 pp.

121. Tawfik, M. H. 1990. The relation between foliar fertilizer treatments population density of the scale insect *Lepidosaphes beckii* (Newman) and the photosynthetic pigments of orange leaves. Fayoum J. Agric. Res. And Dev. Vol. 14, No. (2) pp. 40- 52

122. Tawfik, M. H., Victor J. French and R. L. Meagher. 1995. Studies on the citrus black fly *Aleurocanthus woglumi* Ashibee (Aleurodidae- Homoptera). Egyptian J. of Biol. Pest Con., 5, 61- 66.

123. Tawfik, M. H. 1996. The effect of *Lepidosaphes beckii* (Newman) infestation on leaf components and fruit quality of different varieties of citrus. Fayoum J. Agric. Res. And Dev. Vol. 10, No. 11- 11 pp.

124. Tawfik, M. F. S. and M. M. El-Husseini. 2002. Natural enemies of commonly distributed insect pests in Egyptian agroecosystems Egyptian-Journal-of-Biological-Pest-Control. 12(2): 131-144.

125. Van Steenwyk R. A., L. Ferguson, F. G. Zalom. 2002. Olive fruit fly. University of California Pest Management Guidelines. http://www.ipm.ucdavis.edu/PMG/r583301311.html .

126. Yassa, I. A. 1995. Some factors affecting mold growth and aflatoxin production in olives. Annals-of-Agricultural-Science-Cairo. 40(1): 59-65

127. Yassa, A. I., E. A. M. Abdalla and S. Y. Aziz. 1994. Aflatoxin B1 production by molds isolated from black table olives.Annals-of-Agricultural-Science-Cairo. 39(2): 525-5.

128. Yiambrias, C., T. Broumas, C. Liaropoulos and M. Anagnou. 1986. Lutte contre la teigne de l'olivier avec une preparation biologique. Annales l'Institut Phytopathologique Benaki 15: 1-10.

129. Youssef, M. M. A. and W. A. Amin. 1997. Effect of soil amendment in the control of Meloidogyne javanica and Rotylenchulus reniformis infection on cowpea. Pakistan-Journal-of-Nematology. 15(1/2): 55-63

130. Youssef, A. I., F. N. Nasr, S. S. Stefanos, S. S. A. Elkhair, W. A. Shehata, E. Agamy, A. Herz and S. A. Hassan. 2004. The side-effects of plant protection products used in olive cultivation on the hymenopterous egg parasitoid Trichogramma cacoeciae Marchal. Journal-of-Applied-Entomology. 128(9/10): 593-599

131. Zewar, M. M. 1986. Treatment of cowpea seeds with oils for the control of the southern cowpea weevil, Callosobruchus chinensis (L.) Bulletin-of-the-Entomological-Society-of-Egypt,-Economic-Series. (15): 177-185

آفات الزيتون و طرق مكافحتها تكامليا فى مصر

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يعتبر محصول الزيتون من المحاصيل الأقتصادية الهامة فى مصر والتى تؤثر تأثير بالغآ على الدخل القومى. يتضمن هذا العمل المرجعى مراجعة شاملة لآفات الزيتون فى مصر الى جانب الأهمية الأقتصادية لكل آفة و الحصر و التوزيع الموسمى و البيولوجى و المكافحة البيولوجية و الزراعية و الميكانيكية و ذلك فى اطار المكافحة المتكاملة لهذة الآفات . تضمن العمل أيضآ الدراسات المستقبلية المتوقعة لمكافحة هذة الآفات بالطرق التكنولوجية الحديثة.