# IV. RESULTS AND DISCUSSION

## 1. Survey Studies:

Data in Tables (1, 2 and 3) and illustrated in Figures (4, 5 and 6) summarized the status of the insect and mite pests associated with date palm trees together with the plant part(s) attacked and the seasonal occurrence in numerous date palm plantations scattered allover the governorates of Egypt.

### 1.1. Survey of the Insect and Mite Pests Associated with Date Palm Trees in Egypt:

Results in Table (1) and Figure (1) indicated that date palm trees were subjected to infestation with a total of 33 insect pest species belonging to 17 families from the orders of Isoptera (4 species), Hemiptera (4 species), Lepidoptera (4 species), Coleoptera (20 species), and Hymenoptera (1species). Moreover, 3 mites' species belonging to 2 families from order Prostigmata were also reported from date palm plantations of Egypt. Two insect species (***Potosia cuprea*** and ***Scarabaeus sacer***) were recorded in this study for the first time as pests threatening date palm tree stems.

Frequent field observation indicated that the most economically important major insect pests in date palm plantations in the different localities of Egypt were the termite ***Anacanthotermis ochraceus*** (Isoptera: Hodotermitidae), the mealy bug ***Planococcus citri*** (Hemiptera: Pseudococcidae), the scale insects ***Aonidiella aurantii*** and ***Parlatoria planchardii*** (Hemiptera: Diaspididae), the Lepidopterous fruit moths

***Viracola livia*** (Lepidoptera: Lecaenidae), ***Batrachedra amydraula*** (Lepidoptera: Momphidae), ***Ephestia cautella*** (Lepidoptera: Phycitidae) and ***Arenipses sabella*** (Lepidoptera: Pyralidae), the Coleopterous fruit beetle ***Coccotrypes dactyliperda*** (Coleoptera: Scolytidae), Coleopterous boring beetles ***Phonapate frontalis*** (Coleoptera: Bostrychidae), ***Macrotoma palmate*** (Coleoptera: Cerambycidae), and ***Rhynchophorus ferrugineus*** (Coleoptera: Curculionidae), the Coleopterous Scarabaeid grubs ***Oryctes sinaicus, Oryctes sahariensis, Phyllognathus excavatus, Scarabaeus sacer*** and ***Potosia cuprea*** (Coleoptera: Scarabaeidae), the wasp ***Vespa orientalis*** (Hymenoptera: Vespidae) and the mites ***Oligonychus afrasiaticus*** (Prostigmata: Tetranychidae) and ***Raoiella indica*** (Prostigmata: Tenuipalpidae).

On the other hand, the termites ***Kalotermis flavicola*** (Isoptera: Kalotermitidae), ***Psamotermis hypostoma*** (Isoptera: Rhinotermitidae) and ***Amitermis desertorum*** (Isoptera: Termitidae), the scale insect ***Chrysomphalus ficus*** (Hemiptera: Diaspididae), the Coleopterous fruit beetle ***Carpophilus hemipterus*** (Coleoptera: Nitidulidae), Coleopterous boring beetles ***Bostrychoplites zickli, Bostrychopsis reichei, Dinoderus bifoveolatus, Dinoderus minutus, Enneadesmus forficula, Enneadesmus obtusedentatus, Enneadesmus trispinosus*** (Coleoptera: Bostrychidae), ***Pseudophilus testaceus*** (Coleoptera: Cerambycidae), the Coleopterous Scarabaeid grubs ***Pachnoda fasciata*** and ***Pentodon bispinosus*** (Coleoptera: Scarabaeidae) and the mite ***Tetranychus*** **sp.** (Prostigmata: Tetranychidae) were economically of minor importance in date

palm plantations in the different localities in Egypt.

By the way, the Coleopterous Bostrychid borers which considered of minor importance on standing date palm trees in the field are of great value and considered major insect pests when used in wood industry factories as in New Valley industrial programs for the manufacturing of date palm wood.

**A. Termites:**

Termites are belonging to a special order (Isoptera) which included 4 subterranean termite species attacking date palm plantations in Egypt. It was recorded that termites attacking dead, dried and live date palm trees as well, especially in the new desert reclaimed lands. The obvious symptoms of termite infestation were the feeding tunnels in the roots, stem and leaves which covered with mud to protect the workers and the whole colony inside.

Family Hodotermitidae included the larger termite species in size and the most abundant. The workers of the termite ***Anacanthotermis ochraceus*** attacked date palm trees all the year round and caused serious damage to the off shoots, roots, stems, leaves and all parts of the standing tree, dried or dead. This species was found to attack date palm varieties of Zhaglol, Samani, Amhat, Hayiani, Sewi, Manthour, Tamer and males descending allover the governorates of Ismailia (New Khassasien and Tall el-Chubbier), Qalubia ( Kanaka), Giza ( El-Saff), Fayoum (Tamiyyah) and New Valley ( Kharga and Dhakla).

Family Kalotermitidae included the less important termite species ***Kalotermis flavicola*** which infested the date palm varieties of Amhat, Iraqi, Hegazi, Zhaglol and Sewi descending in the governorate of Qalubia (El-Khanater el Khieria, Kharga and Shebien El-Khanater).

***Psamotermis hypostoma*** was also of less majority species of the family Rhinotermitidae. This species attacked descending the varieties of Sewi, Manthour, Tamer and Amhat in New Valley (Dhakla), Fayoum (Tamiyyah) and Giza (El-Saff) governorates.

***Amitermis desertorum*** of the family Termitidae was also of less importance and was recorded infesting Sewi variety in Giza (El-Bah aria Oasis) governorate.

These results were in agreement with **El-Hemaesy (1976)** who surveyed the subterranean termite ***Amitermis desertorum*** on date palms and **Salman (1987)** who found that date palm leaf were resistant to ***Psamotermis hypostoma***, while the trunk of date palm trees was very highly susceptible to termite attack. Also, **Helal and El-Sebay (1994)** recorded the subterranean termite, ***Amitermis desertorum*** (Isoptera: Termitidae ) ,***Psamotermis hypostoma*** , (Isoptera: Rhinotermitidae) , ***Anacanthotermis ochraceus*** (Isoptera: Hodotermitidae). Moreover, **Batt and Girgis (1996)** surveyed three species belonging to Order Isoptera i.e., ***Amitermis desertorum*** (Termitidae), ***Kalotermis flavicola*** (Kalotermitidae) and ***Psamotermis* sp.** (Rhinotermitidae). However, the present study disagreed with **Helal and El-Sebay (1994)** who recorded the

subterranean termite, ***P. fascufemoralis*** and ***P. asswanensis*** (Isoptera: Rhinotermitidae). **El-Sebay (2001)** presented the biology, ecology and control as well as the description and behaviors of the different stages of the subterranean termites in Aswan, Egypt.

### B. Mealy bugs:

Species of the family Pseudococcidae of order Hemiptera severely attacked date palm off shoots, and leaves all the year round and fruits during fruiting season in autumn. ***Planococcus citri*** was much abundant on all leaves of off shoots (especially in wet and shaded areas). The insect caused serious damage by sucking the plant sap and secreted honeydew which dread sooty mould. ***P. citri*** was found attacking descending date palm varieties of Manthour, Seidi, Tamer, Zhaglol and Amhat as well as Males. It was recorded from the governorates of New Valley (Dhakla and Farafra), Qalubia (El-Khanater el Khieria and Shebien El-Khanater), Behera (Abu Homos) and Ismailia (Fayed).

Records on mealy bugs from Egypt were scant, but **Bitaw and Ben Saad (1990)** recorded ***Planococcus citri*** as a pest of date palms in Libya.

### C. Scale insects:

Species of the family Diaspididae (order: Hemiptera) infested date palm leaves especially the off shoots all the year round and to some extend fruits during late fruiting period in autumn. Scale insects caused considerable damage by sucking the plant sap and cover the infested plant parts with their scales and subsequently reduced photosynthesis. Three economically

important species were recorded during the present survey studies.

***Aonidiella aurantii*** was of major importance attacking descending the varieties of Zhaglol, Samani, Hayiani, Amhat, Hallawi, Oriebi, Iraqi, Hegazi and Sewi. Infestation was reported from the governorates of Behera (Rashid), Ismailia (Fayed and New Khassasien), Qalubia (El-Khanater el Khieria, Kanaka and Shebien El-Khanater) and Giza (El-Saff).

***Chrysomphalus ficus*** was of less importance and descending attacked the varieties of Zhaglol , Samani , Hayiani and Amhat. The following governorates were found to be attacked with the pest , Behera (Edquo) , Qalubia (El-Khanater el-Khieria and Shebien El-Khanater) and Ismailia (New Khassasien).

***Parlatoria planchardii*** was of major economical importance and infestation was concentrated on date palm off shoots and the short older trees where their leaves were more close to the soil surface. As trees grew taller, infestation was remarkably decreased. Severe infestation may kill the whole tree. ***P. planchardii*** descending attacking Males and the varieties of Zhaglol, Samani, Amhat, Hayiani, Ramly, Oriebi and Sewi. Infestation concentrated in the governorates of Ismailia (Tall el-Chubbier), Behera (Abu Homos and Rashid), Qalubia (Kanaka, Shebien El-Khanater and El-Khanater el Khieria), Giza (Badrashien and El-Saff) and Fayoum (Tamyyah).

In Egypt, **Mourad and Zanunciso (1998)** were in agreement with the present study that they found the scale insect ***Parlatoria blanchardii*** attacking date palm trees.

**D. Lepidopterous fruit moths:**

Four species of the order Lepidoptera were the economically major insect pests attacking date palm fruits and sometimes flowers, fruit bunches and terminal bud of the tree.

Larvae of ***Viracola livia*** (Family: Lecaenidae) was the harmful stage attacking descendingly the fruits of Sewi and Manthour varieties during the different stages of the fruit development. Infestation was reported from New Valley governorate (Kharga and Dhakla).

Moths of ***Batrachedra amydraula*** (Family: Momphidae) laid eggs on the newly formed date palm fruits. Larvae attacked green fruits, fed on the fruit bulb which turned red in color and secreted silken threads around the infested fruits. Infestation was descendingly found on Sewi, Manthour and Tamer varieties in the governorates of New Valley (Kharga, Dhakla and Farafra) and Giza (El-Baharia oasis).

***Ephestia cautella*** (Family: Phycitidae) was the most destructive insect pests attacking date palm fruits in the field and continued infestation in the store. Larvae fed on the inner bulb of fruits and reduce the fruit quantity and quality. Infestation was descendingly observed on Sewi and Tamer varieties in New Valley (Kharga, Dhakla and Farafra), Giza (El-Bah aria oasis and Badrashien) and Qalubia (El-Khanater el Khieria) governorates.

Larvae of ***Arenipses sabella*** (Family: Pyralidae) was found inside the flowering / fruiting bunches as well as inside the fruits. The pest was economically of major importance and descendingly attacked Sewi, Manthour, Tamer, Zhaglol, Iraqi,

Amhat and Hayiani varieties. Infestation was descendingly noticed allover the governorates of New Valley (Kharga, Dhakla and Farafra) and Giza (El-Bah aria oasis and El-Saff), Qalubia (El-Khanater el Khieria) and Behera (Rashid).

The present study on lepidopterous fruit moths agreed with previous authors since **Gough (1917)** who first recorded ***Ephestia*** sp. in Egypt.**Yassa (1967)** surveyed ***Cadra cautella***,***C. calidella***, ***C. figulilella***, ***Cryptoblabes gnidiella***, ***Carpophilus hemipterus***, ***Plodia interpunctella*** and ***Carpophilus dimidiatus*** as pests infesting dates in New Valley. Also,***Arenipses sabella*** (Lepidoptera: Pyralidae) was recorded by **Hosny et al. (1976)**. **Amin (1995)** stated that the most serious pest is lesser date moth ***Batrachedra amydraula*** (Lepidoptera: Momphidae), which attacks fruit in formation. Infestation rates may reach 40%, and tall tree were less affected than short. The pest can develop in fallen fruits. The pomegranate butterfly ***Viracola livia*** is an important late-season pest which causes up to 40% infestation. Acacia trees provide an alternate host. The fig moths (***Ephestia cautella*** and ***E. calidella***) are pre-harvest, Late-season pests of dates (Causing up to 20% infestation on the trees and 40% on fallen dates) and post-harvest storage pests.

### E. Coleopterous Fruit Beetles:

Two species of the Order: Coleoptera could be recorded on date palm fruits. The most economically important species was ***Coccotrypes dactyliperda*** (Family: Scolytidae) which attack

the fruits during their developmental stages. Adult beetles bore entrance tunnel inside the immature and unripe fruit flesh to reach the stones of the fruits. Female beetles laid their eggs on the surface of the stone. Larvae hatch and bore their tunnels inside the stone, then pupate and adult beetles emerged afterwards.

***C. dactyliperda*** did not cause direct damage to the fruit flesh but the invaluable thrown stones. The damage was mainly due to the fungus infections followed the entrance tunnels of the adult beetles which rotten the fruits and caused their fall. Infestation may exceed to the stored fruits. Sultani, Samani, Zhaglol and Seidi varieties were descendingly attacked by ***C. dactyliperda*** beetles.Infestation was descendingly reported from the governorates of Behera (Rashid and Edquo), Qalubia (Kanaka and Shebien El-Khanater), Giza (Badrashien and El-Saff) and Fayoum (Tamyyah).

***Carpophilus hemipterus*** (Family: Nitidulidae) was reported from the date palm fruits as a secondary pest. It was found on the previously injured fruits either on short standing palms or fallen fruits on the ground or in stored fruits. Both the adult beetles and larvae were the harmful stages of the insect. Most of the date palm varieties were liable to ***C. hemipterus*** infestation especially Seidi variety which wasn't recorded before. Infestation was descendingly found in the governorates of New Valley (Kharga, Dhakla and Farafra) and Giza (El-Baharia oasis).

Survey of Coleopterous fruit beetles were in agreement with **Hussein (1990)** studied the influence of date palm height on

unripe green date's infestation by the date stone beetle, ***Coccotrypes dactyliperda***. He found that the height had no effect on date's infestation. Also **Batt and Griggs (1996)** surveyed the Scolytidae ***Coccotrypes dactyliperda.*** **Tadros (1998)** stated that ***Coccotrypes dactyliperda*** severely attacked the stone of date palm fruits in all their developing stages and cause the retting and fall. **Amin (1995)** found that dried date fruit were attacked by the fruit beetles ***Carpophilus hemipterus*** and ***C. dimiatus*** which didn't reported in this study. **Yassa (1967)** also recorded ***Carpophilus dimidiatus*** as a pest infesting dates in New Valley.

F. **Coleopterous Boring Beetles:**

Several species from the Family: Bostrychidae were found attacking weekend date palm leaves as well as dried and semi-dried leaves. Larvae, and beetles to some extend, were the most destructive stages of the pest. Significantly economic losses in date palm leaves industry were due to Bostrychid pests' infestation which consume large amount of leaves tissues.

***Bostrychoplites zickli*** descendingly attacked the dry leaves of Zhaglol, Samani, Amhat and Sewi varieties. Leaves from trees more than 5 years old were more susceptible than younger leaves while the leaves of off shoots was not liable to infestation. ***B. zickli*** was reported from the governorates of Qalubia (Shebien El-Khanater and Kanaka), Giza (Badrashien) and Behera (Rashid).

***Bostrychopsis reichei*** were collected from dry, and sometimes from the semi-dry date palm leaves of Zhaglol, Samani, Sewi and Amhat varieties more than other varieties. ***B. reichei*** was more abundant than ***B. zickli*** but they were the same

concerning the infestation of the age of leaves. ***B. reichei*** existed in the governorates of Qalubia (Kanaka and El-Khanater el Khieria), Ismailia (Fayed), Behera (Edquo and Rashid), Fayoum (Sonorous) and Giza (El-Saff).

***Dinoderus bifoveolatus*** was found in the mid-rib of dried leaves of Seidi, Tamer, Males, Zhaglol and Amhat varieties. ***D. bifoveolatus*** attacked the dried leaves as well as the dried off shoots of all ages. Infestation was descendingly found in the governorates of New Valley (Dhakla and Farafra), Fayoum (Fayoum and Tamiyyah), Giza (El-Saff) and Qalubia (El-Khanater el Khieria).

***Dinoderus minutus*** bored their tunnels inside the mid-rib of the varieties of Seidi, Tamer, Males, Amhat, Zhaglol, Samani and Hayiani. Infestation was descendingly found in the governorates of New Valley (Dhakla and Farafra), Fayoum (Fayoum), Giza (El-Saff) and Qalubia (El-Khanater el Khieria) and Ismailia (New Khassasien).

The three species of the genus ***Enneadesmus (E. forficula, E. obtusedentatus*** and ***E. trispinosus)*** were seen boring inside the mid-rib of dried leave and the dried off shoots as well. ***E. trispinosus*** was the most abundant species among the three ***Enneadesmus*** species. As a result of the larval feeding, the inner fibers of the leaves tissues turns into saw dust.

***E. trispinosus*** attacked almost all the known varieties in all the surveyed localities of the six governorates under study.

***E. obtusedentatus*** was moderately spreading. It attached the varieties of Tamer, Males, Zhaglol, Samani, Sultani, Aglani and Hallawi. Infestation was descendingly found in the

governorates of New Valley (Farafra), Giza (Badrashien and El-Saff), Qalubia (Kanaka), Behera (Abu Homos) and Ismailia (Fayed).

***Phonapate frontalis*** was the most economically important Bostrychid borer since it infested the mid-rib of vigor leaves as well as semi-dry and dry leaves. Adult beetles' bored tunnels in which they oviposited eggs. Sometimes, in case of vigor leaves, gum exudates. Larvae were the most destructive stage and consumed large amount of the inner leave tissues. This boring insect also infested the base of the fruit bunches and caused their breakage and production losses. ***P. frontalis*** attacked Zhaglol, Males, Samani, Hayiani, Sewi, Bent Aasha, Ramly and Amhat. Infestation was descendingly found in the governorates of Ismailia (Fayed), Behera (Edquo), Qalubia (Shebien El-Khanater), Giza (El-Saff), Fayoum (Tamiyyah) and New Valley (Dhakla).

***Macrotoma palmate*** (Family: Cerambycidae) was also serious boring insect pest in date palm orchards. Infestation could easily be detected by the relatively large oval or semi-circular exit holes on the tree stem. Larvae were the noticed in different body sizes consuming huge amount of the trees inner fibers some of which were ejected outside the tree trunk. ***M. palmate*** attacked any date palm tree whatever its variety. Infestation was descendingly found in the governorates of Qalubia (Kanaka), Ismailia (Fayed) and Giza (El-Baharia oasis).

***Pseudophilus testaceus*** was surveyed only once on Sewi variety in New Valley (Dhakla) governorate.

***Rhynchophorus ferrugineus*** of the Family: Curculionidae was recently introduced to Egypt in 1990s and considered the most dangerous and destructive boring insect pest. ***R. ferrugineus*** attacked all parts of date palm trees (base of the vigor or weaken leaves, the terminal bud of the tree or off shoots, the stem and the roots. Any date palm variety was liable to ***R. ferrugineus*** infestation, with special preferences to Zhaglol, Samani, and Hayiani varieties. ***R. ferrugineus*** was surveyed in Ismailia (Tall el-Chubbier and New Khassasien), Qalubia (Shebien El-Khanater and El-Khanater el Khieria) as well as Sharkia (Abu Hammad) governorates.

Coleopterous boring beetles recorded in this study were in agreement with several authors in Egypt. **Cox (1993)** and **Amin (1995)** and reported ***Rhynchophorus ferrugineus,*** in 1992 in Egypt, which became a major pest infesting the trunks and growing points of young date palm trees(5 – 20 years of age). This was the first record if the Curculionid from Africa.

**Hussein (1998)** also carried out biological, ecological and control studies on the red palm weevil ***Rhynchophorus ferrugineus***. **El-Sebay (2002)** recorded two main activity seasons of ***Rhynchophorus ferrugineus*** in Egypt with peaks during April and November.

**Mostafa (1977)** recorded ***Macrotoma palmata*** in Egypt on date palm tree and stated that the adult beetle activity season from July to September. **Helal and El-Sebay (1994)** recorded 14 species of the wood borers attacking dale palm trees and their wood products. The wood-borers from standing date palm trees, infested timbers and wood products comprising approximately a total of 15 species included 9 families belong to 4 orders. These were ***Bostrychopsis reichei***, ***Enneadesmus obtusedentatus***, ***Phonapate frontalis*** (Coleoptera: Bostrychidae),***Macrotoma palmate*** (Coleoptera: Cerambycidae), ***Rhynchophorus ferrugineus*** (Coleoptera: Curculionidae). **Abd-Allah and Tadros (1995)** stated that ***Enneadesmus trispinosus*** caused considered economic damage to date palm leaves in Egypt, as these leaves were used in manufactures. They added that the adult beetles activity period were allover the whole year round. **Batt and Girgis (1996)** surveyed the borers attacking date palm trees in Egypt during 1994-1996. Their survey revealed the existence of 13 species belonging to Order Coleoptera and related families: Bostrychidae (***Bostrychoplites zickli***, ***Bostrychopsis reichei***, ***Dinoderus bifoveolatus***, ***Dinoderus minutus***, ***Enneadesmus forficula***, ***Enneadesmus obtusedentatus***, ***Enneadesmus trispinosus*** and ***Phonapate frontalis***); Cerambycidae (***Macrotoma palmate***); Curculionidae (***Rhynchophorus ferrugineus***) and Scolytidae (***Coccotrypes dactyliperda***).

However, the present study results disagreed with that of **Helal and El-Sebay (1994)** who recorded ***Sinoxylon sudanicum*** (Coleoptera: Bostrychidae), ***Lyctus africanus*** (Coleoptera: Lyctidae) and the two Hymenopterous, ***Componotus maculates*** var. ***egyptiacus*** (Hymenoptera: Formicidae) and ***Xylocopa aestuanus*** (Hymenoptera: Xylocopidae) and **Batt and Girgis (1996)** who recorded ***Xyleborus perforans*** for the first time in Egypt. Also, these results disagreed with the findings of Tadros **(1994)** who recorded the wasp beetle ***Chlorophorus varius*** on date palm in Egypt.

### G. Coleopterous Scarabaeid Grubs:

Family: Scarabaeidae contained numerous species which mostly of economic important. Mostly larvae were the damaging stage, sometimes adults and sometimes both of them. The following Scarabaeid species were surveyed in date palm plantations.

Larvae of ***Oryctes sinaicus*** were collected from the base area of the date palm trees in the root zone. Larvae fed and hid close to the off shoots beside the mother tree and with the newly planted off shoots. Adult beetles were the harmful stage where they gnaw and infested the leaves base and bunches. Also they attacked the terminal bud of shorter trees (1.5 – 2 meters high). ***O. sinaicus*** was surveyed on the Hayiani variety in the governorate of Ismailia (Fayed).

The same behavior was noticed in ***Oryctes sahariensis.*** It was recorded on Manthour variety in the governorate of New Valley (Kharga).

***Pachnoda fasciata*** adult beetles were seen on date palm fruits in the pre-mature stage. Beetles cause considerable damage through gnawing the matured fruits. ***P. fasciata*** attacked the varieties of Zhaglol, Samani, Hayiani, Amhat, Ramly, Oriebi and Ohm el-Frakh. Infestation largely spread in the governorates of Behera (Rashid), Qalubia (Shebien El-Khanater and El-Khanater el Khieria) and Ismailia (Fayed).

***Pentodon bispinosus*** was found in the rhizosphere area slightly under the soil surface. It was also found hiding in the off shoots and in the hollowed areas on the trees stems especially in the new desert reclaimed lands. Larvae were the harmful stage of the pest that fed on the roots and cause the weakness and death of the fruiting trees and the off shoots. Males and the varieties of Zhaglol, Samani, Amhat, Sewi, Manthour, Baladi, Iraqi and Hegazi were the preferable hosts of the pest. Wide spread of infestation was noticed in the governorates of Behera (Edquo), Ismailia (Tall el-Chubbier), Qalubia (Kanaka), Giza (El-Saff), New Valley (Farafra) and Fayoum (Sonorous).

***Phyllognathus excavatus*** attacked date palm trees in the newly desert reclaimed sandy soils. Negligible and weaken trees were more susceptible. Also date palm plantations rich in manuring and in the date palm nurseries were severely infested. Adult beetles infested the root zone of the trees and the leaves base where they gnaw these parts for feeding. Beetles were collected from the Males and Manthour, Sewi, Zhaglol and Samani varieties. Infestation was descendingly found in the governorates of New Valley (Kharga and Dhakla), Giza (El-Bah aria oasis) and Ismailia (Fayed).

During the present survey study, ***Scarabaeus sacer*** was first recorded on date palm trees. Ancient Egyptian sacred this Scarabaeid species since it aerated the soil. The adult beetle large in size (2.5 – 3.5 cm long and 1.5 – 2.5 cm width), black in color and had sharp teeth on the fore legs. The larva was white creamy, large in size (about 6 cm long and 3 cm wide) and live in the root zone under the soil surface. Larvae construct a spherical cocoon mad of mud 10 cm under the soil surface. The cocoon was rough, decorated, and measured about 7 cm diameter from outside but smooth and measured ca 6 cm diameter from inside. ***Scarabaeus sacer*** adult beetles fed on the date palm fruits during their developmental stages and caused their fall and rotten. Larvae also caused considerable damage to the roots of trees. Adult beetles attacked Sewi variety in Giza (Badrashien and El-Saff).

Figures (1), (2), and (3) showed some of the stages of the Scarabaeid beetle ***Scarabaeus sacer*** which severely attacked date palm trees.

Figure (1) referred to the unique outer morphology adult beetle of ***Scarabaeus sacer*** .

On the other hand, Figure (2) referred to the harmful stage of this Scarabaeid beetle ***Scarabaeus sacer*** which live under the soil surface near the fibrous roots of date palm of the Sewi variety. ***Scarabaeus sacer*** larvae attacked these roots and fed on them.

Figure (3), however, showed the muddy coccon which the larvae of ***Scarabaeus sacer*** constructed fifteen centimeters deep under the soil surface beside the root zone of the Sewi date palm. Moreover, the Figure showed also the pre-pupal stage inside the coccon which was opened artificially.

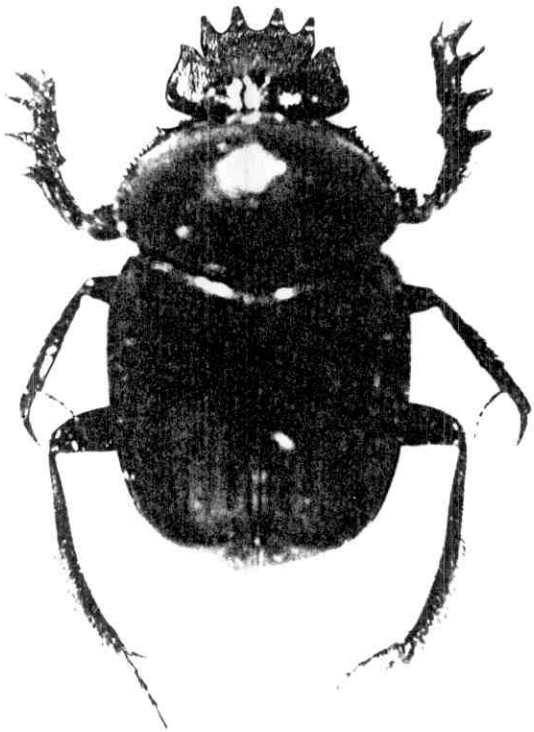

**Figure 1: Adult beetle of *Scarabaeus sacer***

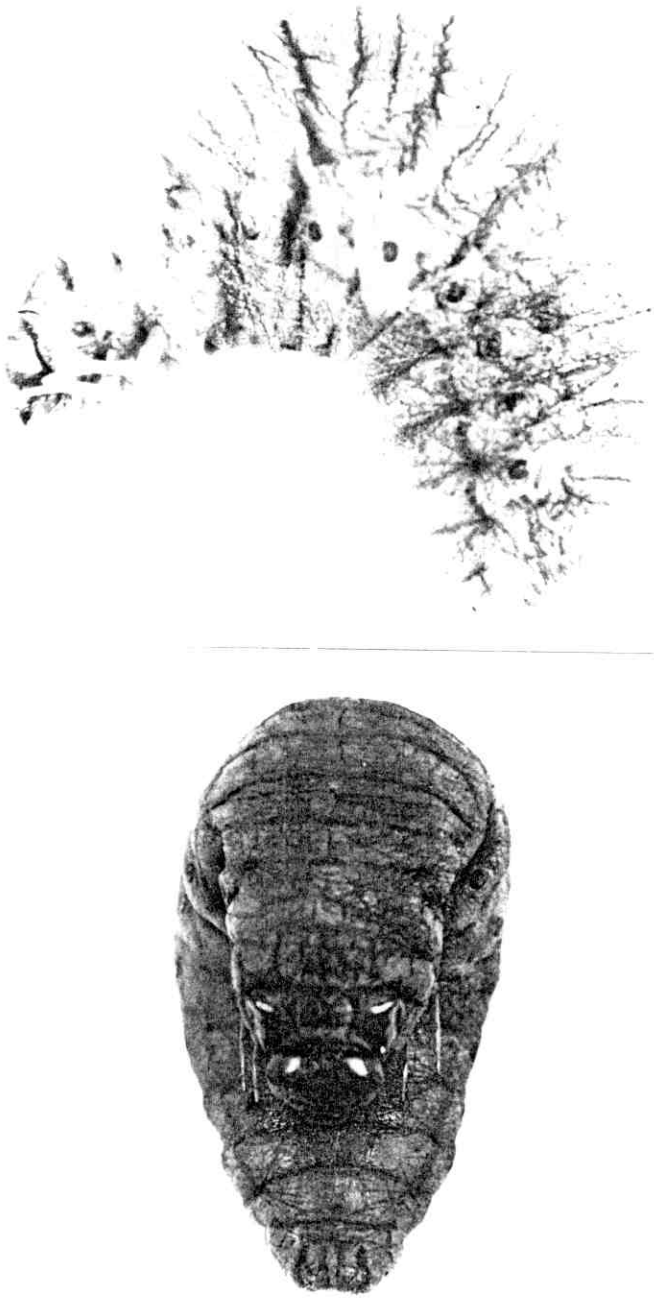

**Figure 2: Lateral (upper) and dorsal (down) view of *Scarabaeus sacer* larvae.**

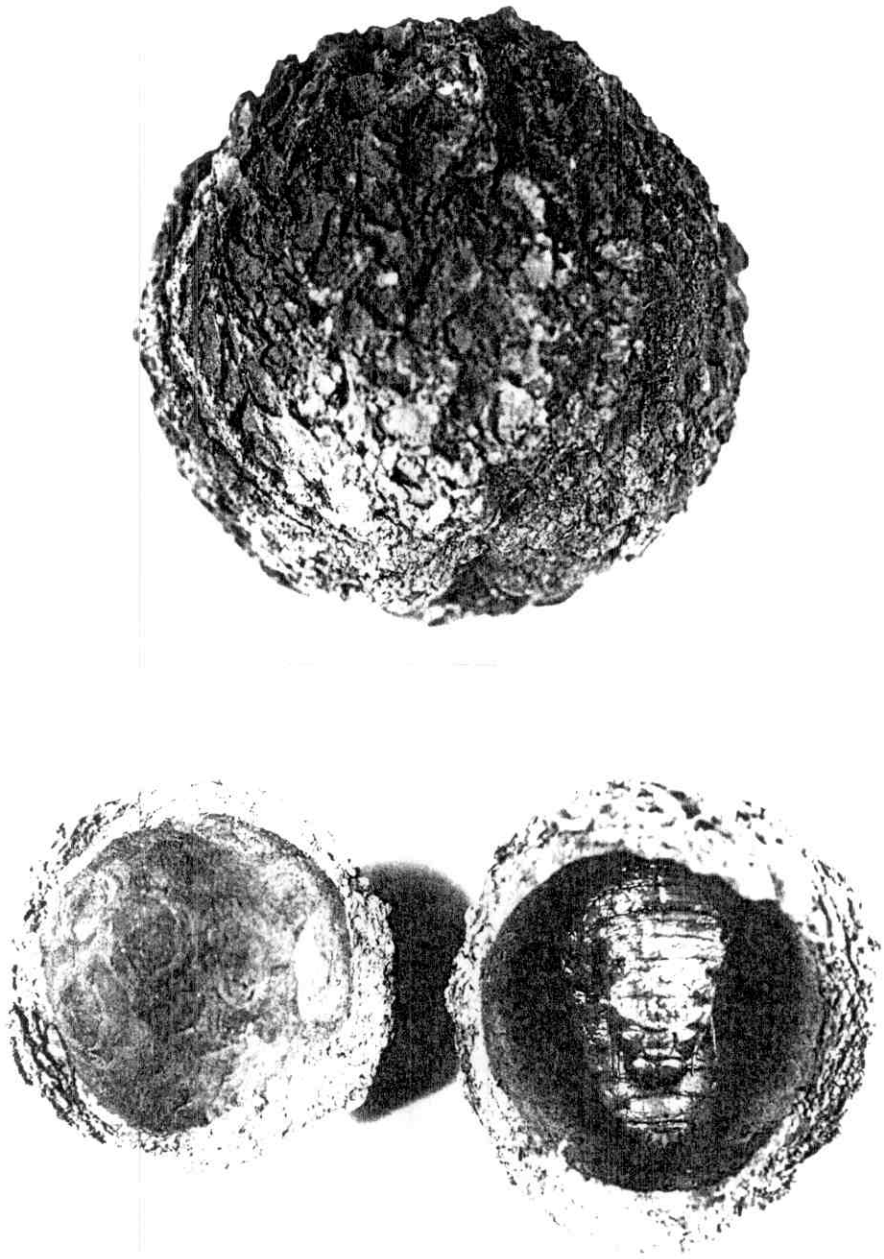

Figure 3: Closed coccon of *Scarabaeus sacer* (upper) and opened coccon with the larva inside before pupation (down).

Also, ***Potosia cuprea*** was recorded for the first time severely attacking date palm trees during this survey study. Until the very near, this species was of scant economic importance in fruit orchards. Now, it may kill and fall the entire tree throughout two years. Larvae fed on the inner tissues of date palm stem and completely hollowed them. ***P. cuprea*** was studied in details in Part Three of this thesis Owing to its increasing threads. Infestation was specified mainly on Hayiani variety in Ismailia (Fayed, Tall el-Chubbier and New Khassasien) and Qalubia (El-Khanater el Khieria) governorates. Part three, however, studied in details the different stages with photographic Figures together with the biology of this pest

The current study was in agreement with **Alfieri (1956)** who gave notes on ***Scarabaeus sacer***. He found also and **Batt and Girgis (1996)** who recorded the Scarabaeidae ***Oryctes sinaicus***. **Alfieri (1956)**, on the contrary, recorded other species of the genus ***Scarabaeus*** such as ***cristatus*** (=***corniforns***), ***gangeticus isidis***, ***puncticallis***, ***sacer*** and ***semipunctatus***. **Okil et al. (2000)** recorded ***Phyllognathus excavatus*** in date palm orchards in North Sinai Governorate in Egypt.

**H. Wasps:**

Although most of the species of the Order: Hymenoptera are beneficial insects which live in asocial life, yet some of them are harmful such as the species of Family: Vespidae. ***Vespa orientalis*** was one of these economically serious insect pests. Males and workers attack date palm fruits and fed on them during ripen stage. ***V. orientalis*** attack the fruits of Zhaglol,

Samani, Hayiani and Sewi varieties. ***V. orientalis*** was surveyed in the governorates of Behera (Abu Homos, Edquo and Rashid), Ismailia (Fayed and Tall el-Chubbier), Qalubia (Kanaka, Shebien El-Khanater and El-Khanater el Khieria), New Valley (Kharga) and Giza (El-Bah aria oasis and Badrashien).

Amin (1995) was in agreement with the present study that he presented the pomegranate butterfly Viracola livia as an important late-season pest which causes up to 40% infestation. Acacia trees provide an alternate host. Attack by V. livia may predispose date fruits to infestation with dried fruit beetles (Carpophilus hemipterus and C. dimiatus).

## I. Mites:

***Raoiella indica*** (Prostigmata: Tenuipalpidae) attack date palm leaflets and caused swelling and the leaflets curl and malformed. ***R. indica*** could transmit virus diseases. Zhaglol and Samani were the most susceptible date palm varieties.

***Oligonychus afrasiaticus*** (Family: Tetranychidae) was much abundant on the early stages (green fruits) of the fruit development. Infestation could be detected by the threads and dusty appearance on the infested fruits and leaves. Adults and nymphs fed by sucking the tissues sap thus fruits cracked and hinder ripening. ***O. afrasiaticus*** attacked the varieties of Sewi, Seidi, Manthour and Tamer. Infestation was descendingly found in the governorates of New Valley (Kharga, Dhakla and Farafra), Giza (El-Saff and Badrashien).

***Tetranychus*** **sp.** Was recorded attacking date palm fruits of the variety Samani in the governorate of Behera (Rashid).

**Amin (1995)** was also in agreement with this survey study that he recorded the date spider mites (***Oligonychus* sp.**) which damaged dates, especially under dry conditions, up to the Rutab stage. Heavy infestation made sour and unfit for human or animals consumption and affected the quality and marketability.

Table 1: **Insect pests associated with date palm trees in Egypt during winter, spring, summer and autumn together with the affected plant part(s) and status (S) of infestation (M: Major, m: minor).**

| No. | Order / Family / Species | S | Affected plant part(s) | | | |
|---|---|---|---|---|---|---|
| | | | Winter | Spring | Summer | Autumn |
| A | **Termites :** | | | | | |
| i. | **Order: Isoptera** | | | | | |
| a | **Family: Hodotermitidae** | | | | | |
| | 1. *Anacanthotermis ochraceus* | M | T | T | T | T |
| b | **Family: Kalotermitidae** | | | | | |
| | 2. *Kalotermis flavicola* | m | T | T | T | T |
| c | **Family: Rhinotermitidae** | | | | | |
| | 3. *Psamotermis hypostoma* | m | T | T | T | T |
| d | **Family: Termitidae** | | | | | |
| | 4. *Amitermis desertorum* | m | T | T | T | T |
| B | **Mealy bugs:** | | | | | |
| ii. | **Order: Hemiptera** | | | | | |
| e | **Family: Pseudococcidae** | | | | | |
| | 5. *Planococcus citri* | M | L,S | L,S | L,S | L,S,Fr |

**T**: All Parts of Trees, **R**: Roots, **S**: Stem, **L**: Leaves, **Fl**: Flowers, **Fr**: Fruits

**Table 1: Cont.**

| No. | Order / Family / Species | S | Affected plant part(s) | | | |
|---|---|---|---|---|---|---|
| | | | Winter | Spring | Summer | Autumn |
| C | **Scale Insects:** | | | | | |
| f | **Family: Diaspididae** | | | | | |
| | 6. *Aonidiella aurantii* | M | L,S | L,S | L,S | L,S,Fr |
| | 7. *Chrysomphalus ficus* | M | L,S | L,S | L,S | L,S,Fr |
| | 8. *Parlatoria planchardii* | M | L,S | L,S | L,S | L,S,Fr |
| D | **Lepidopterous Fruit Moths:** | | | | | |
| iii. | **Order: Lepidoptera** | | | | | |
| g | **Family: Lecaenidae** | | | | | |
| | 9. *Viracola livia* | M | - | - | Fr | Fr |
| h | **Family: Momphidae** | | | | | |
| | *10.Batrachedra amydraula* | M | - | - | Fr | Fr |
| i | **Family: Phycitidae** | | | | | |
| | *11.Ephestia cautella* | M | - | - | Fr | Fr |
| j | **Family: Pyralidae** | | | | | |
| | *12.Arenipses sabella* | M | - | - | Fr | Fr |

Table 1: Cont.

| No. | Order / Family / Species | S | Affected plant part(s) | | | |
|---|---|---|---|---|---|---|
| | | | Winter | Spring | Summer | Autumn |
| E | **Coleopterous Fruit Beetles:** | | | | | |
| iv. | **Order: Coleoptera** | | | | | |
| k | **Family: Scolytidae** | | | | | |
| | *13. Coccotrypes dactyliperda* | M | Fr | Fr | Fr | Fr |
| l | **Family: Nitidulidae** | | | | | |
| | *14. Carpophilus hemipterus* | m | - | - | Fr | Fr |
| F | **Coleopterous Boring Beetles:** | | | | | |
| | **Family: Bostrychidae** | | | | | |
| m | *15. Bostrychoplites zickli* | m | L | L | L | L |
| | *16. Bostrychopsis reichei* | m | L | L | L | L |
| | *17. Dinoderus bifoveolatus* | m | L | L | L | L |
| | *18. Dinoderus minutus* | m | L | L | L | L |
| | *19. Enneadesmus forficula* | m | L | L | L | L |
| | *20. Enneadesmus obtusedentatus* | m | L | L | L | L |
| | *21. Enneadesmus trispinosus* | m | L | L | L | L |
| | *22. Phonapate frontalis* | M | L | L | L | L |
| | **Family: Cerambycidae** | | | | | |
| n | *23. Macrotoma palmate* | M | S | S | S | S |
| | *24. Pseudophilus testaceus* | m | L,S | L,S | L,S | L,S |
| | **Family: Curculionidae** | | | | | |
| o | *25. Rhynchophorus ferrugineus* | M | S,L | S,L | S,L | S,L |

**Table 1: Cont.**

| No. | Order / Family / Species | S | Affected plant part(s) | | | |
|---|---|---|---|---|---|---|
| | | | Winter | Spring | Summer | Autumn |
| G P | **Coleopterous Scarabaeid Grubs:** **Family: Scarabaeidae** | | | | | |
| | *26. Oryctes sinaicus* | m | R | R | R | R |
| | *27. Oryctes sahariensis* | m | R | R | R | R |
| | *28. Pachnoda fasciata* | m | R | R,Fl | R,Fr | R,Fr |
| | *29. Pentodon bispinosus* | m | R | R | R | R |
| | *30. Phyllognathus excavatus* | M | R,L | R,L | R,L | R,L |
| | *31. Scarabaeus sacer* | m | R | R | R | R |
| | *32. Potosia cuprea* | M | R,S | R,S | R,S | R,S |
| H v. q | **Wasps:** **Order: Hymenoptera** **Family: Vespidae** | | | | | |
| | *33. Vespa orientalis* | M | - | Fl | Fr | Fr |
| I vi. r | **Mites:** **Order: Prostigmata** **Family: Tenuipalpidae** | | | | | |
| | *34. Raoiella indica* | M | L | L | L,Fr | L,Fr |
| s | **Family: Tetranychidae** | | | | | |
| | *35. Oligonychus afrasiaticus* | M | L | L | L,Fr | L,Fr |
| | *36. Tetranychus* sp. | m | L | L | L,Fr | L,Fr |

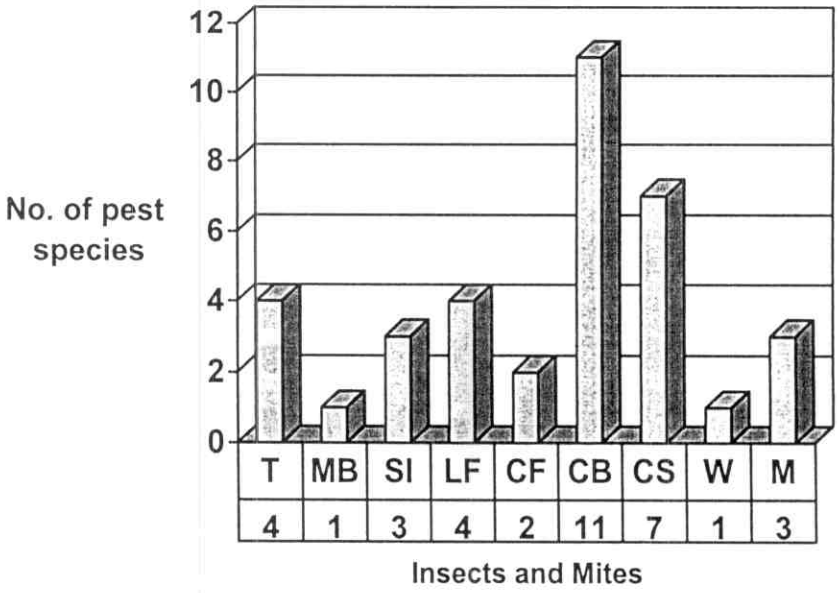


Fig. 4: Relative distribution of insects and mites associated with Date palm trees in Egypt (T: Termites, MB: Mealy Bugs, SI: Scale Insects, LF: Lepidopterous Fruit moths, CF: Coleopterous Fruit Beetles, CB: Coleopterous Boring Beetles, CS: Coleopterous Scarabaeid, W: Wasps and M: Mites).

## 1.2. Distribution of infestation with the insect and mite pests associated with date palm trees in the different governorates of Egypt:

Table (2) summarized the distribution of infestation with the different insect and mite pests associated with date palm trees allover the six representative governorates of Egypt.

Data indicated that termites infestation concentrated in Giza governorate (3 species) and descending decreased in New Valley, Qalubia, Fayoum, Ismailia and Behera governorates (2, 2, 1, 1, 0 species, respectively). The maximum mealy bug and scale insects infestation was noticed descending in the governorates of Qalubia, Behera and Ismailia (1 mealy bug species and 3 scale insects species were reported from each). Date palm trees in Giza, Fayoum and New Valley governorates harbored only 2 and 2 scale insect species and 1 mealy bug species, respectively.

Infestation with fruit insect pests was much abundant in Giza and New Valley governorates (6 species each). Moderate fruit insects infestation was recorded in Qalubia and Behera governorates (4and 3 species, respectively). The least fruit insect infestation was in Ismailia and Fayoum governorates where only one insect species was found on fruits in each locality.

Date palm tree borers' infestation was the most dominating pests as numerous species attacked trees in all localities of Egypt. Table (2) emphasized that the maximum

infestation with borers was in Qalubia governorate (10 species) and Giza governorate (9 species). Borers' infestation was relatively moderate in Ismailia governorate (7 species). Almost equally less borers' infestation was recorded in Behera, Fayoum and New Valley governorates (5 species in each locality).

In Ismailia governorate the Scarabaeid insect pests were much abundant (5 species). Infestation descending decreased in Qalubia, Giza and New Valley (3 species each), then Behera (2 species) and Fayoum (1 species) governorates.

Mites infestation was recorded only in the governorates of Behera, Ismailia, Giza and New Valley governorates (1 species each locality). It could be concluded from Table (2) that the maximum insects and mites infestation on date palm trees was in Giza and Qalubia governorates (24 and 23 species, respectively). Infestation in Ismailia, New Valley and Behera governorates was relatively less abundant but still high (19, 18 and 15 species, respectively). The minimum infestation (9 species) was recorded from Fayoum governorate.

Distribution of infestation with the pests associated with date palm trees in this study in the different governorates of Egypt were sometimes in agreement with **Gough (1917)** who noted that date crop of Khargeh Oasis suffered from the larvae of ***Ephestia*** sp., **El-Hemaesy (1976)** who recorded the subterranean termite ***Amitermis desertorum*** at Luxor locality (Quena governorate), **Hussein (1990)** who studied the date stone beetle, ***Coccotrypes dactyliperda*** in Baharian Oases and **Mourad and Zanunciso (1998)** who recorded the scale insect, ***Parlatoria blanchardii*** attacking date trees in Behera governorate (at two sites, Edquo and Rashid).

Table 2 : Distribution of infestation with the insect pests associated with date palm trees in the different governorates of Egypt.(Q: Qalubia, B: Behera, I: Ismailia, G: Giza, F: Fayoum and NV: New Valley)

| No | Order / Family / Species | Governorates | | | | | |
|---|---|---|---|---|---|---|---|
| | | Q | B | I | G | F | NV |
| A | **Termites :** | | | | | | |
| i. | **Order: Isoptera** | | | | | | |
| a | **Family: Hodotermitidae** | | | | | | |
| | *1-Anacanthotermis ochraceus* | * | - | * | * | - | * |
| b | **Family: Kalotermitidae** | | | | | | |
| | *2-Kalotermis hypostoma* | * | - | - | - | - | - |
| c | **Family: Rhinotermitidae** | | | | | | |
| | *3-Psamotermis hypostoma* | - | - | - | * | * | * |
| d | **Family: Termitidae** | | | | | | |
| | *4-Amitermis desertorum* | - | - | - | * | - | - |
| B | **Mealy bugs:** | | | | | | |
| ii. | **Order: Hemiptera** | | | | | | |
| e | **Family: Pseudococcidae** | | | | | | |
| | *5-Planococcus citri* | * | * | * | - | - | * |

## Table 2: Cont.

| No. | Order / Family / Species | Governorates | | | | | |
|---|---|---|---|---|---|---|---|
| | | Q | B | I | G | F | NV |
| C | **Scale Insects:** | | | | | | |
| F | **Family: Diaspididae** | | | | | | |
| | *6-Aonidiella aurantii* | * | * | * | * | - | - |
| | *7-Chrysomphalus ficus* | * | * | * | - | - | - |
| | *8-Parlatoria planchardii* | * | * | * | * | * | - |
| D | **Lepidopterous Fruit Moths:** | | | | | | |
| iii. | **Order: Lepidoptera** | | | | | | |
| g | **Family: Lecaenidae** | | | | | | |
| | *9-Viracola livia* | - | - | - | - | - | * |
| h | **Family: Momphidae** | | | | | | |
| | *10-Batrachedra amydraula* | - | - | - | * | - | * |
| | **Family: Phycitidae** | | | | | | |
| i | *11-Ephestia cautella* | * | - | - | * | - | * |
| | **Family: Pyralidae** | | | | | | |
| j | *12-Arenipses sabella* | * | * | - | * | - | * |

**Table 2: Cont.**

| No. | Order / Family / Species | Governorates | | | | | |
|---|---|---|---|---|---|---|---|
| | | Q | B | I | G | F | NV |
| E | **Coleopterous Fruit Beetles:** | | | | | | |
| iv. | **Order: Coleoptera** | | | | | | |
| k | **Family: Scolytidae** | | | | | | |
| | *13. Coccotrypes dactyliperda* | * | * | - | * | * | - |
| l | **Family: Nitidulidae** | | | | | | |
| | *14. Carpophilus hemipterus* | - | - | - | * | - | * |
| F | **Coleopterous Boring Beetles:** | | | | | | |
| m | **Family: Bostrychidae** | | | | | | |
| | *15. Bostrychoplites zickli* | * | * | - | * | - | - |
| | *16. Bostrychopsis reichei* | * | * | * | * | * | - |
| | *17. Dinoderus bifoveolatus* | * | - | - | * | * | * |
| | *18. Dinoderus minutus* | * | - | * | * | * | * |
| | *19. Enneadesmus forficula* | * | - | - | * | - | * |
| | *20. Enneadesmus obtusedentatus* | * | * | * | * | - | * |
| | *21. Enneadesmus trispinosus* | * | * | * | * | * | * |
| | *22. Phonapate frontalis* | * | * | * | * | * | - |
| n | **Family: Cerambycidae** | | | | | | |
| | *23. Macrotoma palmate* | * | * | * | * | - | - |
| | *24. Pseudophilus testaceus* | - | - | - | - | - | * |
| o | **Family: Curculionidae** | | | | | | |
| | *25. Rhynchophorus ferrugineus* | * | - | * | * | - | - |

Table 2: Cont.

| No. | Order / Family / Species | Governorates | | | | | |
|---|---|---|---|---|---|---|---|
| | | Q | B | I | G | F | NV |
| G | **Coleopterous Scarabaeid Grubs:** | | | | | | |
| p | **Family: Scarabaeidae** | | | | | | |
| | *26. Oryctes sinaicus* | - | - | * | - | - | - |
| | *27. Oryctes sahariensis* | - | - | - | - | - | * |
| | *28. Pachnoda fasciata* | * | * | * | - | - | - |
| | *29. Pentodon bispinosus* | * | * | * | * | * | * |
| | *30. Phyllognathus excavatus* | - | - | * | * | - | * |
| | *31. Scarabaeus sacer* | - | - | - | * | - | - |
| | *32. Potosia cuprea* | * | - | * | - | - | - |
| H | **Wasps:** | | | | | | |
| v. | **Order: Hymenoptera** | | | | | | |
| q | **Family: Vespidae** | | | | | | |
| | *33. Vespa orientalis* | * | * | * | * | - | * |
| I | **Mites:** | | | | | | |
| vi. | **Order: Prostigmata** | | | | | | |
| r | **Family: Tenuipalpidae** | | | | | | |
| | *34. Raoiella indica* | - | - | * | - | - | - |
| s | **Family: Tetranychidae** | | | | | | |
| | *35. Oligonychus afrasiaticus* | - | - | - | * | - | * |
| | *36. Tetranychus* sp. | - | * | - | - | - | - |
| | **Total** | **23** | **16** | **19** | **25** | **9** | **19** |

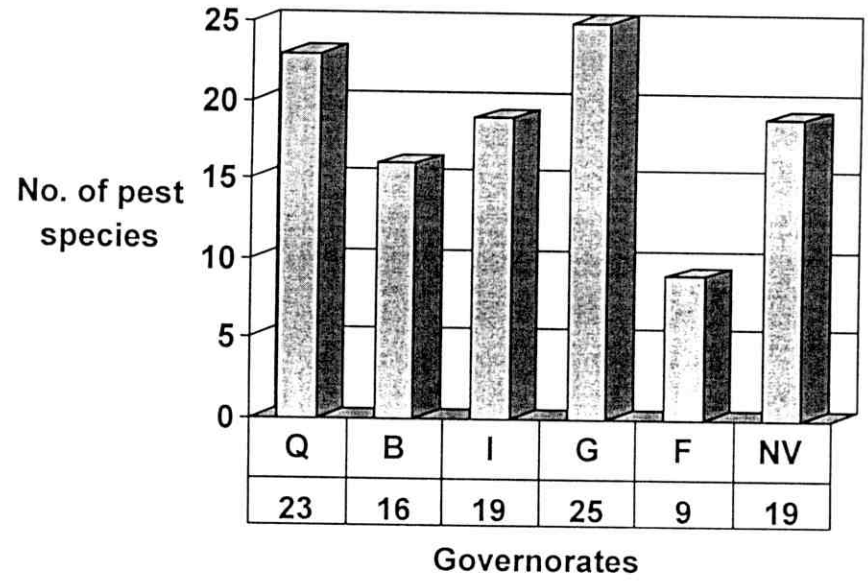


Fig. 5: Distribution of infestation with the insect pests associated with date palm trees in the different governorates of Egypt. Q: Qalubia, B: Behera, I: Ismailia, G: Giza, F: Fayoum and NV: New Valley)

## 1.3. Distribution of infestation with the insect pests associated with the different varieties of date palm trees in Egypt:

Table (3) clarified the relative distribution of infestation with the insect pests associated with the most dominating and wide spread varieties of date palm trees in Egypt, namely: Zhaglol, Hayiani, Samani, Sewi or Seidi, Amhat, Manthour and Tamer as well as Males. Moreover, Ramly, Hegazi, Iraqi, Oriebi, Hallawi, Baladi, Sultani, Aglani, Ohm el Frakh and Bent Aasha varieties were of less spreading in date palm plantations in Egypt.

The termite insects infestation attacked the varieties of Samani, and Amhat (3 species each) more than Zhaglol, Sewi, Manthour and Tamer varieties (2 species each). Only one termite insect species attacked both Hayiani and Males varieties. The other minor varieties (Hegazi, Iraqi and Baladi) attacked with one species while others didn't showed symptoms of termites' infestation.

The only recorded mealy bug insect species infested the varieties of Zhaglol, Sewi, Amhat, Manthour, Tamer and Males. Infestation did not recorded on Hayiani or Samani and other minor varieties.

Three scale insect species infested each of Zhaglol, Hayiani, Samani and Amhat varieties. Sewi and Oriebi varieties infested with 2 scale insect species. Males, however, attacked with only one scale insect species, whereas other minor varieties (Ramly, Hegazi, Iraqi, and Hallawi) also attacked with one scale insect species.

Fruits of Sewi date palm variety harbored the maximum number of insect species (4 Lepidopterous, 2 Coleopterous and 1 Hymenopterous species). Zhaglol, Manthour and Tamer varieties infested with 3 insect species each. However, 2 insect species attacked each of the varieties Hayiani, Samani and Amhat. Minor varieties (Iraqi and Sultani) either attacked with only one insect species or infestation did not recorded at all.

Date palm tree borers' infestation was dominating in Zhaglol variety (10 species). High rate of infestation was also recorded on Samani, Sewi and Males (8, 7 and 7 species, respectively). Moderate rate of borers' infestation was found in Hayiani, Amhat and Tamer varieties (6, 5 and 4 species, respectively). Two insect borers' species were recorded in Manthour variety and the other minor varieties (Ramly, Sultani, Aglani, Hallawi and Bent Aasha). Only one species of insect borers attacked the minor varieties of Hegazi, Iraqi, Oriebi, Hallawi and Baladi.

Three Scarabaeid insects were reported on the varieties of Zhaglol, Hayiani, Samani, Manthour and Sewi varieties. Amhat variety and Males attacked with 2 species. Minor varieties (Ramly, Hegazi, Iraqi, Oriebi, Ohm el Frakh and Baladi) attacked by 2 Scarabaeid insect species at most.

Mites infestation concentrated on Samani variety (2 species), decreased to one species on Zhaglol, Sewi, Manthour and Tamer varieties. On the contrary, Hayiani, Amhat, males and minor varieties did not attacked with mites.

Table (3) concluded that Sewi, Zhaglol and Samani varieties harbored the majority of the insect and mite pests (25,

23 and 21 species, respectively), followed by Amhat and Hayiani varieties (17 and 15 species, respectively). Moderate numbers of insect and mite pests (13, 12 and 12 species) attacked the varieties of Manthour, Tamer and Males, respectively. The minor varieties (Ramly, Hegazi, Iraqi, Oriebi, Hallawi, Sultani, Baladi, Aglani, Bent Aasha and Ohm el Frakh) attacked by a total of 21 (4, 4, 4, 4, 4, 3, 3, 2, 2 and 1, respectively) insect and mite pest species.

Differences between varieties were of some importance as **Hussein (1990)** studied the influence of date varieties on unripe green date's infestation by the date stone beetle, ***Coccotrypes dactyliperda***. He found that kakea and Sultani varieties were higher injured (24.9, 21.4%) than Seidi variety (3.24%). **Tadros (1998)** stated that ***Coccotrypes dactyliperda*** severely attacked date palm fruits especially in Behera governorate, Egypt. **Amin (1995)** noticed that the semi-dry variety Sewi (Seidi) was more susceptible with the lesser date moth ***Batrachedra amydraula*** than soft or dry dates. On the other hand, **Mourad and Zanunciso (1998)**

found that the scale insect ***Parlatoria blanchardii*** attacking date trees of Zhaglol and Samani varieties. Leaves of Zhaglol and Samani were more susceptible to infestation.

**Table 3 : Distribution of infestation with the insect pests associated with the different varieties of date palm trees in Egypt. (Z: Zhaglol, M: Manthour, H: Hayiani, S: Samani, Se: Sewi or Seidi, A: Amhat, T: Tamer, Ml: Males and O: Other varieties)**

| No | Order / Family / Species | Varieties | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Z | M | Se | H | S | A | T | Ml | O |
| A | **Termites :** | | | | | | | | | |
| i. | **Order: Isoptera** | | | | | | | | | |
| a | **Family: Hodotermitidae** | | | | | | | | | |
| | *1-Anacanthotermis ochraceus* | * | * | * | * | * | * | * | * | * |
| b | **Family: Kalotermitidae** | | | | | | | | | |
| | *2-Kalotermis hypostoma* | * | - | * | - | - | * | - | - | * |
| c | **Family: Rhinotermitidae** | | | | | | | | | |
| | *3-Psamotermis hypostoma* | - | * | - | - | * | * | * | - | * |
| d | **Family: Termitidae** | | | | | | | | | |
| | *4-Amitermis desertorum* | - | - | - | - | * | - | - | - | - |
| B | **Mealy bugs:** | | | | | | | | | |
| ii. | **Order: Hemiptera** | | | | | | | | | |
| e | **Family: Pseudococcidae** | | | | | | | | | |
| | *5-Planococcus citri* | * | * | * | - | - | * | * | * | * |

Table 3: Cont.

| No | Order / Family / Species | Varieties | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Z | M | Se | H | S | A | T | MI | O |
| C | **Scale Insects:** | | | | | | | | | |
| | **Family: Diaspididae** | | | | | | | | | |
| F | *6-Aonidiella aurantii* | * | - | * | * | * | * | - | - | * |
| | *7-Chrysomphalus ficus* | * | - | - | * | * | * | - | - | - |
| | *8-Parlatoria planchardii* | * | - | * | * | * | * | - | * | * |
| D | **Lepidopterous Fruit Moths:** | | | | | | | | | |
| iii. | **Order: Lepidoptera** | | | | | | | | | |
| g | **Family: Lecaenidae** | | | | | | | | | |
| | *9-Viracola livia* | - | * | * | - | - | - | - | - | * |
| h | **Family: Momphidae** | | | | | | | | | |
| | *10-Batrachedra amydraula* | - | * | * | | - | - | * | - | * |
| i | **Family: Phycitidae** | | | | | | | | | |
| j | *11-Ephestia cautella* | - | - | * | | - | - | * | - | - |
| | **Family: Pyralidae** | | | | | | | | | |
| | *12-Arenipses sabella* | * | * | * | * | - | * | * | - | * |

**Table 3: Cont.**

| No | Order / Family / Species | Varieties | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Z | M | Se | H | S | A | T | Ml | O |
| E | **Coleopterous Fruit Beetles:** | | | | | | | | | |
| iv. | **Order: Coleoptera** | | | | | | | | | |
| k | **Family: Scolytidae** | | | | | | | | | |
| | *13- Coccotrypes dactyliperda* | * | - | * | - | * | - | - | - | * |
| l | **Family: Nitidulidae** | | | | | | | | | |
| | *14. Carpophilus hemipterus* | - | - | * | - | - | - | - | - | - |
| F | **Coleopterous Boring Beetles:** | | | | | | | | | |
| m | **Family: Bostrychidae** | | | | | | | | | |
| | *15. Bostrychoplites zickli* | * | - | * | - | * | - | - | - | - |
| | *16. Bostrychopsis reichei* | * | - | * | - | * | * | - | - | - |
| | *17. Dinoderus bifoveolatus* | * | - | * | - | - | * | * | * | * |
| | *18. Dinoderus minutus* | * | - | * | * | * | * | * | * | * |
| | *19. Enneadesmus forficula* | * | * | * | * | - | - | - | * | * |
| | *20.Enneadesmus obtusedentatus* | * | - | - | - | * | - | * | * | - |
| | *21. Enneadesmus trispinosus* | * | - | * | * | * | * | * | * | * |
| | *22. Phonapate frontalis* | * | * | * | * | * | * | - | * | * |
| n | **Family: Cerambycidae** | | | | | | | | | |
| | *23. Macrotoma palmate* | * | * | * | * | * | * | * | * | * |
| | *24. Pseudophilus testaceus* | - | - | * | - | - | - | - | - | - |
| o | **Family: Curculionidae** | | | | | | | | | |
| | *25. Rhynchophorus ferrugineus* | * | - | - | * | * | - | - | - | - |

| No | Order / Family / Species | Varieties | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Z | M | Se | H | S | A | T | Ml | O |
| G | **Coleopterous Scarabaeid Grubs:** | | | | | | | | | |
| p | **Family: Scarabaeidae** | | | | | | | | | |
| | *26. Oryctes sinaicus* | - | - | - | * | - | - | - | - | - |
| | *27. Oryctes sahariensis* | - | * | - | - | - | - | - | - | * |
| | *28. Pachnoda fasciata* | * | - | - | * | * | * | - | - | * |
| | *29. Pentodon bispinosus* | * | * | * | - | * | * | - | * | * |
| | *30.Phyllognathus excavatus* | * | * | * | - | * | - | - | * | * |
| | *31. Scarabaeus sacer* | - | - | * | - | - | - | - | - | - |
| | *32. Potosia cuprea* | - | - | - | * | - | - | - | - | - |
| H | **Wasps:** | | | | | | | | | |
| v. | **Order: Hymenoptera** | | | | | | | | | |
| q | **Family: Vespidae** | | | | | | | | | |
| | *33. Vespa orientalis* | * | - | * | * | * | * | - | - | - |
| I | **Mites:** | | | | | | | | | |
| vi | **Order: Prostigmata** | | | | | | | | | |
| r | **Family: Tenuipalpidae** | | | | | | | | | |
| | *34. Raoiella indica* | * | - | - | - | * | - | - | - | - |
| s | **Family: Tetranychidae** | | | | | | | | | |
| | *35.Oligonychus afrasiaticus* | - | * | * | - | * | - | * | - | * |
| | *36. Tetranychus* sp. | - | - | - | - | - | - | - | - | - |
| | **Total** | **23** | **13** | **25** | **15** | **21** | **17** | **12** | **12** | **21** |

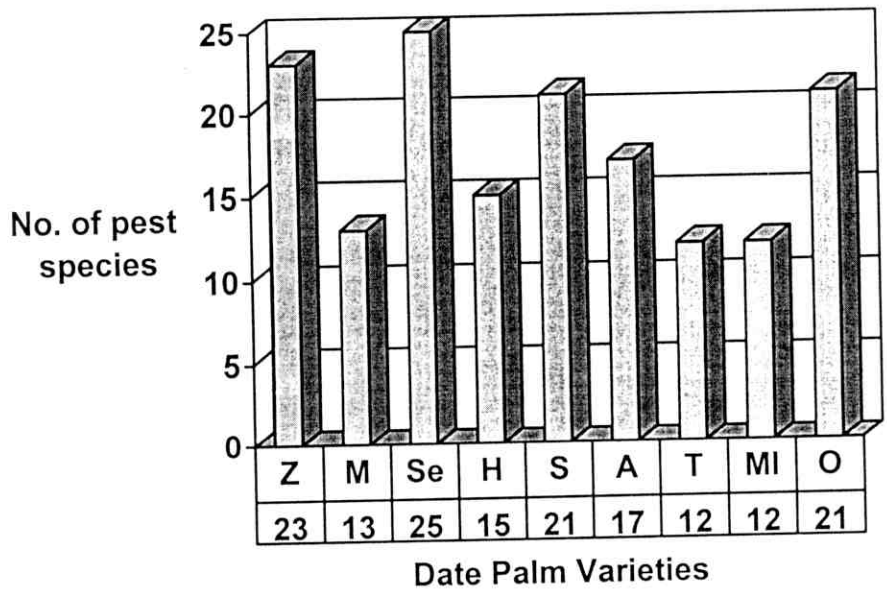


Fig. 6: Distribution of infestation with the insect pests associated with the different varieties of date palm trees in Egypt. (Z: Zhaglol, M: Manthour, H: Hayiani, S: Samani, Se: Sewi or Seidi, A: Amhat, T: Tamer, M: Males and O: Other varieties).