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## **Insects and non Insects Species Associated with Pine Needle Trees in Alexandria Egypt**

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### **ABSTRACT**

A survey study was conducted on pine trees species in Egypt for the first time. The survey was comprised the insects and non insects species (spp.). The study was carried out between the two successive years 2009-2011 in Alexandria and north coast. It was revealed that a total of 39 spp. belonging to 19 families and 10 orders were identified. Order Hemiptera had the largest number of species (13 spp.) under four families. Order Mantodea came in the second place represented by 6 spp. Then in the next place Diptera represented by 5 spp., both Coleoptera and Hymenoptera each represented by 4 spp. Then, Thysanoptera represented by 3 spp., followed by Lepidoptera and Orthoptera each represented by 2 spp. *Lucaspis pusilla* was considered the most dominant insect in most regions of study, as it appeared with high frequency and high density. The non insect species was mainly represented by the dominant phytophagous mite *Cenopalpus fewstrüi* (Acarina: Tenuipalpidae), in addition to the true spider species. The most abundant natural enemies were: *Aphytis* sp. and *Encarsia* sp. as parasites and *Pharoscymnus varius* Kirsch, *Cydonia vicina* Mulsant and *Chilocorus bipustulatus* Linn. as predators. *Aspidiotus nerii* (Bouche) and *Chrysomphalus aonidum* (Linn.) were recorded for the first time on pine species as a host. Whereas, *Leucaspis pini* (Hartig) and *L. pusilla* (Low) were recorded for the first time on pine trees in Alexandria and north coast although they were recorded in other regions in Egypt.

**Key words:** Insects and non insects species, survey, ornamental pine trees, order hemiptera

### **INTRODUCTION**

In Alexandria and north coast the most dominant species of pine trees was *Pinus halepensis* (Aleppo pine) and *P. brutia* (Turkish pine). They were closely related species of Genus Pinus, Family Pinaceae. The study was done in two different areas. The first area was about two and half acres of mixed pine trees in Nubaria district south Alexandria. This cultivated area was the farm of Plant Protection Research Institute (PPRI). The second area was cultivated with about 125 trees of Aleppo pine species in Marina resort (94-114 km) west of Alexandria. They were public garden mixed with other ornamental trees.

The area belongs to Agency of tourist villages of the New Urban Communities Agency. They were cultivated during the period 2000-2004 (documentation paper in the Ministry of Housing and Construction). The rest of investigated pine trees were found in private gardens with mixed flora of other plants. The species *Pinus radiata* D. Don dose not included in this survey, for it is recently under investigation for cultivation experiments in Horticulture Research Centre (Mona, 2013).

Pine trees are medium sized tree, 3-5 m tall, their resin commercially used around the world as timber wood. Pine trees were mostly infested by many insects mainly scale insects; they are piercing and sucking insects which cause damage to their hosts directly by feeding

on the sap. Weakening of the trees by scale insects causes the infestation of trees by many pests. The needles become yellow, then red with translucent and glassy aspects, which causes the weakening of the trees and are susceptible for secondary pests. Species feed on needles and bark tissues, suck the sap, cause wilt symptoms and early fall of the needles and may be deadly to the young trees. Mature trees may cope with coccid pests but become vulnerable to bark beetles and other pests and diseases.

Due to the importance of woody trees, recently Horticulture Research Centre started co-operation with Environmental Affairs Agency for cultivating pine trees in economic scale irrigated with recycling water. The aim of the present work is to identify harmful different insect species infesting pine plants and their associated natural enemies in Alexandria and its vicinity for the first time. This study will help minimize the damage of the trees for economic purpose. The information given in this study is based upon the collecting species by the author herself and through a conducted literature search.

## **MATERIALS AND METHODS**

Survey study was performed in Alexandria and north coast at the period from 2009-2011, samples were collected from Nubaria, Antoniadis garden, the international garden and private gardens in El-Amriya district and from Marina resort in the north coast, every two weeks. The examined trees are identified in El-Orman Garden Herbarium Unit at Giza by Mrs. Treza Labib. Different methods were used to collect insects according to their habit, size and stage (Ibrahim *et al.*, 2001).

**Yellow sticky traps:** Yellow board sticky traps were used to monitor the population of the flying insects (Gerling and Horowitz, 1984; Awad *et al.*, 1998). One trap was placed in the center of the tree at a height of 40 cm from the center of the tree crown. These traps were then examined in the laboratory using a stereoscopic binocular for identifying and counting both insects and natural enemies.

**Picking method:** During the experiment, 10 leaves from upper, middle and lower portions of 10 randomized branches from each tree were picked up half monthly. The samples examined in the laboratory to survey the insects using a stereoscopic binocular microscope.

**Sweeping-net method:** Samples were also collected and poured onto white tray for counting and surveying the insects. The scale insects were prepared for microscopically studies using (Mckenzie, 1956) and were identified using the keys of Mckenzie (1956) and Ben-Dov (2005). Their existent in Egypt were confirmed according to the list of Shalaby (1958).

In the laboratory, each sample was placed in a closed cartoon jar with a clear emergence tube to which any emerging parasitoid would fly. For the following two weeks, all emerging hymenopterous parasitoid were removed and placed in pure lactic acid for 24 h, rinsed in distilled water and then mounted on a labeled glass slide in Hoyer's solution. Then, they wormed in oven 35-40°C for a week. After which they identified in the Plant Protection Institute Research (Taxonomy Department), Doki, Giza.

**Scanning electron microscope (SEM):** Samples were prepared for electron microscope and examined with GSM 5300, Scanning Electron Microscope in the Faculty of Science, Alexandria University.

**RESULTS AND DISCUSSION**

The present study surveyed most of the insect and non insects orders revealed that a total of 39 species belonging to 19 families under 10 orders. The insect fauna comprises 8 orders with 37 species. The non insect fauna represented by the orders Acarina and Araneae, the first by one species and the last one represented by the true spiders.

The different insects orders could be arranged in a descending orders as follow: Hemiptera were represented by the highest numbers of species (13 spp.), followed by Mantodea (6 spp.) (Salem *et al.*, 2001), followed by Diptera (5 spp.), Coleoptera was represented by (4 spp.) species also Hymenoptera (4 spp.), both orders Lepidoptera and Orthoptera each represented by (2 spp.) and Thysanoptera was represented by only (1) species. Meanwhile these insects depending on their economic value they were divided into harmful pests, visitors, predators and parasites (Table 1).

Table 1: A taxonomic list of collected insects, natural enemies, mites and true spiders from the pine needle trees during the two years 2009-2011 and with reference to their economic value and their time of occurrence through the surveyed period

Order	Family	Scientific name	Economic value	Date	
Coleoptera	Coccinellidae	<i>Chilocorus bipustulatus</i> L.	Predator	May-June-Aug	
		<i>Cydonia vicina</i> Muls.	Predator	Sep-Oct-Nov	
		<i>Pharoscygnus varius</i> Kirsch	Predator	Mid-July-Sept	
Diptera	Staphylinidae	<i>Paederus alfieri</i> (Koch)	Predator	May-June-Aug	
	Muscidae	<i>Musca</i> sp.	Visitor	All the year	
		<i>Stomoxys calcitrans</i> L.	Visitor	Mid July-Sept	
	Sarcophagidae	<i>Sarcophaga carnaria</i> (Meig)	Visitor		
	Syrphidae	<i>Syrphus corollae</i> Fabr.	Predator	Mid July-September	
Lepidoptera	Tachinidae	<i>Tachina larvarum</i> L.	Parasite		
	Nymphalidae	<i>Venessa cardui</i> L.	Visitor	From August-mid Sept	
	Pieridae	<i>Pieris rapae</i> L.	Visitor		
Mantodea	Mantidae	<i>Calidomantis savignyi</i> Saus.	Predator	April-October	
		<i>Embusa hedenberchii</i> St.	Predator	Rare	
		<i>Eremiaphila khamsin</i> Lef.	Predator	Rare	
		<i>Hypsicorypha gracilis</i> Bur.	Predator	Rare	
		<i>Iris oratoria</i> L.			
		<i>Sphodromantis bioculata</i> B.	Predator	September-August	
Orthoptera	Acrididae	<i>Acrotylus insubricus</i> (Scop.)	Pest	Late July to	
		<i>Aiolopus strepens</i> (Latr.)	Pest	September	
Thysanoptera	Thripidae	<i>Thrips tabaci</i> L.	Pest	Jan-September	
Hemiptera	Asterolecaniidae	<i>Russellaspis pustulans</i> (Cockerell)	Pest	Mid April-latesummer	
		Coccidae	<i>Coccus hesperidum</i> Linn.	Pest	April-June-August
			<i>Parthenolecanium persicae</i> (Fab.)	Pest	April-May
	Diaspididae	<i>Aspidiotus nerii</i> Bouche	Pest	Sept-March	
		<i>Chrysomphalus aonidum</i> (Linn.)	Pest	April-Late October	
		<i>Chry. dictyospermi</i> (Morgan)	Pest	April-Aug-Sep	
		<i>Fiorinia fioriniae</i> (TargioniTozzett)	Pest	Oct-Dec-April	
		<i>Lepidosaphues beckii</i> (Newman)	Pest	May-Dec-March	
	Margarodidae	<i>Leucaspis pini</i> (Hartig)	Pest	April-Late Jul	
		<i>Leuc. pusilla</i> Low	Pest	March-Sep	
		<i>Lindingaspis rossi</i> Mask	Pest	Jan-April-Sep	
<i>Parlatoria proteus</i> (Curtis)		Pest			
<i>Icyrria purchasi</i> Maskell		Pest	All the year		

Table 1: Continue

Order	Family	Scientific name	Economic value	Date
Hymenoptera	Formicidae	<i>Cataglyphus bicolor</i> Fab.	Predator	All the year
		<i>Monomorium pharaonis</i> L.	Predator	
	Aphelinidae	<i>Encarsia</i> spp.		Feb-Nov
		<i>Aphytis</i> spp.		Mar-May
	Arachnoidea			
	Mites			
Acarina	Tenuipalpidae	<i>Cenopalpus fewstreei</i> Zaher and Yousef	Pest	Late May-Oct
Araneae	(B) Truespiders		Predator	

**Harmful pests:** This group contained 17 species including in three orders of insects. They were Hemiptera, Orthoptera and Thysanoptera. One species only in the non insects in order Aranida, Order Hemiptera has the largest numbers of pests with 13 species, they belonging to 4 families they were Asterolecaniidae, Coccidae, Diaspididae and Margarodidae.

Family Diaspididae represents the largest family which includes major pests in Egypt (Mohammed and Ghabbour, 2008), the present survey revealed the presence of nine armored scales on pine trees in Alexandria, from these species *Chrysomphalus aonidum* (Lin.), *Chry. dictyospermi* (Morgan), *Fiorinia fioriniae* (TargioniTozzetti), *Lepidosaphues beckii* (Newman) and *Parlatoria proteus* (Curtis) were collected in few numbers, while the last species was collected in rare numbers. The most dominant of which was *Leucaspis pusilla* Low one of the most native pest to the pine trees around the world. It is reviewed in Egypt by Hall (1922) and Ezzat (1958) and in the Palearctic region by Kosztarab (1988), Dov *et al.*, 2003 and Ben-Dov (2005). This pest was collected with high frequency and high density, always associated with the phyto phagous mite *Cenopalpus fewstreei* Zaher and Yousef *Aspidiotus nerii* (Bouche), *Coccus hesperidum* and *Chrysomphalus aonidum* (Linn.) was recorded for the first time on pine specie in Alexandria although the last species recorded on citrus, date palm and jasmine in Alexandria (Ghabour and Mohammad, 1996), the other two species were recorded on a variety of plants. Whereas *Aspidiotus nerii* (Bouche), *Leucaspis pini* (Hartig) and *L. pusilla* Low, were registered for the first time as a host on pine trees in Alexandria and north coast. Whereas *Leucaspis pusilla* Low was collected on *Pinus canariensis* (King) at Cairo and Giza (Gezira) locality, also *L. pini* collected on *Pinus* sp. at Cairo and Qualubiya locality (Ghabour and Mohammad, 1996).

Both families Asterolecaniidae and Margarodidae were represented by one species each, *Russellaspis pustulans* (Cockerell) and *Icyria purhasi* Maskell, respectively. The first was the rarest one.

Family Coccidae represented here by 2 species, *Coccus hesperidum* Linn. and *Parthenolecanium persicae* (Fab.). The most numerous one of them was *Coccus hesperidum* Linn., which recorded on *Pinus* sp. as a new host in Alexandria for the first time in Egypt.

*Lindingaspis rossi* Mask., only surveyed from the literature (Swailem *et al.*, 1976). He mention the presence of the pest on *Pinus radiate* in ornamental gardens of the Faculties of Agriculture at Giza and Zagazig. Also Watson *et al.* (2002) reported the presence of the insect after the same author in her catalogue.

Order Orthopetra were represented by the two species the grass hopper *Acrotylus insubricus* (Scop.) and the rice hopper *Aiolopus strepens* (Latr.), they were collected by the sweeping-net strokes and the yellow sticky traps (Ibrahim *et al.*, 2001).

Order Thysanoptera represented by only the species *Thrips tabaci*.

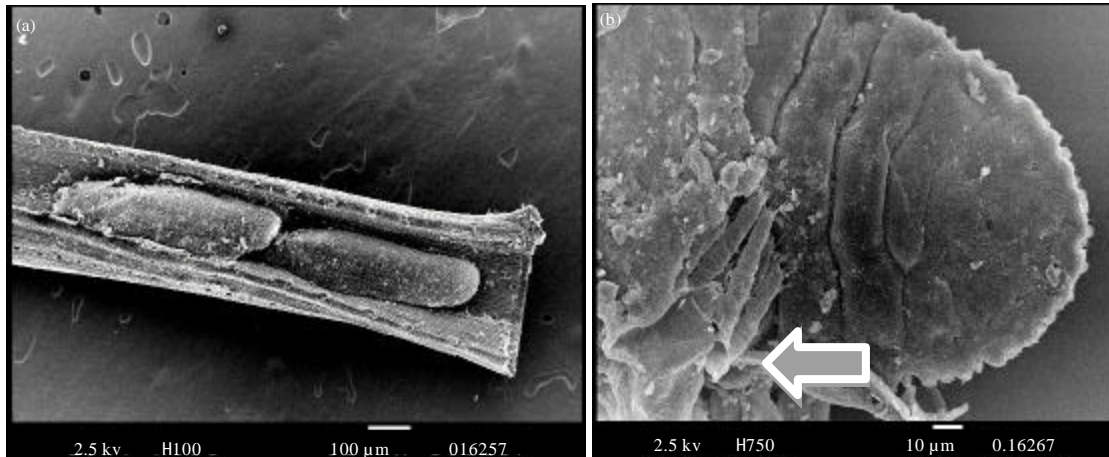


Fig. 1(a-b): (a) Illustrating the condensed infestation of scale insects *Leucaspis pusilla* on the needle leaf of pine tree and (b) Illustrating the mite *Cenopalpus fewstrii* under the armored Scale *Leucaspis pusilla*, the arrow monitor the mite under the insect body

For the non-insects species, the most dominant pest of the trees, associated with the scale insects was the mite *Cenopalpus fewstrii* Zaher and Yousef which lay eggs and lives under the test of the armored scale *Leucaspis pusilla* Low (Fig. 1b). The mite *Cenopalpus fewstrii* Zaher and Yousef, consider as a main pest came in the second class after *Leucaspis pusilla* Low the most common species in all of the sampling sites (Fig. 1a). Especially for the Aleppo pine *Pinus halipensis* in Amriya and Nubarria districts.

#### NATURAL ENEMIES

**Predators:** Thirteen insects predator belonging 5 families affiliated to 4 orders in addition to true spiders were collected in the present investigation. They are well known to feed on eggs larvae and adults of insects. These predators are classified as follows:

- *Chilocorus bipustulatus* L., *Cydoni avicina* Muls., *Pharoscymnus varius* Kirsch and *Paederus alfieri* (Koch), three coccinellid beetles and one staphylinid beetle, relatively existed in abundance (Badr *et al.*, 2001)
- Six species of order Mantodea all from family Mantidae were collected in relatively moderate abundance. They were *Calidomantis savignyi* Saus. (El-Shazly, 2006). *Embasa hedenberchii* St. *Eremiaphila khamsin* Lef., *Hypsicorypha gracilis* Bur. *Iris oratoria* L. and *Sphedromantis bioculata* B. The two *Sphedromantis bioculata* B. and *Iris oratoria* L. species were the most abundant than the others
- *Cataglyphus bicolor* Fab. and *Monomorium pharaonis* L. species were captured in moderate numbers according to the relation between ants and coccid insects for the honey dew. The syrphid dipterous spp. were collected in negligible numbers
- The non insects predator represented here by the true spiders were collected in negligible numbers (Ibrahim *et al.*, 2001). These above mentioned predators play very important role in controlling pests especially for scale insects (Abd-Rabou, 2003)

**Parasites:** All the collected parasites were collected by the yellow sticky traps. The most abundant parasites associated with the diaspidid scales of the Present work were the *Aphytis* spp. and the *Encarsia* spp. Parasites complete the role of predators as natural enemies in controlling the harmful pests.

**Visitors:** The insect visitors were not specific. They were captured in few numbers, except for species of family Muscidae. Visitors species were collected by two collecting methods, the yellow sticky traps and the sweeping net. They were 5 species. Among them *Venessa cardui* and *Pieris rapae* were the two species represented order Lepidoptera with non observed numbers all over the inspection period.

Their were 5 species which consider here as a visitor not a pest, *Venessa cardui* L. and *Pieris rapae* L. were the two species represented order Lepidoptera with non observed numbers all over the inspection period.

## CONCLUSION

Studying insect and non-insect fauna associated with pine trees in Alexandria and north coast in the period from (2009-2011). It was concluded that scale insect were the most dominant among them. The two insects *Leucaspis pini* (Hartig) and *L. pusilla* Low were recorded for the first time in Alexandria, while the two insects *Aspidiotus nerii* Bouche and *Chrysomphalus aonidum* (Linn.) were recorded as a new host on pine trees. The insect *Leucaspis pusilla* Low and the non-insect mite *Cenopalpus fewstrii* Zaher and Yousef were the most abundant through all the period of study, this mite lays the eggs under the test of the armored scale *Leucaspis pusilla*. Low especially on *Pinus halipensis* in Al-Amria District.

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