

STONE FRUIT TREE PESTS: (3) SURVEY OF INSECT PESTS IN PLUM ORCHARDS

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Abstract

The present research aimed to survey the insects associated with plum trees in ecologically different growing areas in Egypt during 4 seasons of 3 successive years (2000-2002). The existing insects, their status (major / minor), the attacked part(s), and the activity season(s) were inspected and recorded. More than 18 dominating species belonging to 13 families and 6 orders were surveyed in plum orchards. Eleven species were first recorded in Egypt. Woodborers were the dominant pests that cause serious damage to the stem and branches (*Chlorophorus varius* and *Ptosima undecimmaculata*) the stem, branches and twigs (*Scolytus amygdali*), and the twigs (*Anarsia lineatella*). Moreover, *Sphenoptera trispinosa*, *Chrysobothris dorsata*, and *Macrotoma palmata*, were of less importance and abundance. Fruit flies (*Ceratitis capitata*) and fruit worm (*A. lineatella*) were major pests and were much abundant. They caused economic damage to fruit production. Adults of *Tropinota squalida* sometimes attacked the flowers. *Carpophilus hemipterus* and *Drosophila melanogaste* infested over ripening and fallen fruits. Different parts of plum trees were affected with the *Thrips major*, *Empoasca decedens*, *Bemesia tabaci*, *Aphis gossypii*, *Myzus persicae*, *Parlatoria oleae* and *Aonidiella orientalis*.

INTRODUCTION

In Egypt, plum (*Prunus domestica*) is a unique favourable stone-fruit species as well as all over the world. The area under cultivation approximated 3900 feddans producing yearly almost 16200 tons.

Literature refers that in the different parts of the world, more than 78 insects could be surveyed in plum orchards (Aluja and Birke, 1993; Hartfield et al., 1997; Khajuria and Sharma, 1998; Pluciennik et al., 1999; Shang et al., 2000; Ben Yehuda et al., 2000; Hai et al., 2000; Leskey et al., 2001; Polesny and Avilla, 2001; Arnaoudov et al., 2002; Milne and Walter, 2003). In Egypt, some of these insects are pests - especially boring insects - that cause serious and economic damage (main authors, Tadros et al., 1993; Tadros, 1994 a; Tadros, 1994 b; Batt, 1999; and Tadros et al., 2006). However, studies on these borers are few and scattered.

In an attempt to contribute to such a gap in the knowledge, the present comparative ecological survey studies are directed. The broad objective of investigation is to add new information that may help in planning of rather effective Integrated Control Programs for the management of tree borers in plum orchards.

MATERIALS AND METHODS

Survey of the insects associated with plum trees was carried out during three successive years from early January of 2000 until late December of 2002. Five orchards scattered all over the country and representing ecologically different growing areas at both old valley lands (Nile Delta and Valley) or the newly reclaimed desert lands were selected. The first district was at Behera governorate, representing the west Delta while the second was at Dakahlia, Sharkia, Ismailia and / or Suez governorates representing east Delta. The third was at Menoufia and / or Qalubia governorates representing middle Delta. In the north valley, the fourth district was represented by Giza and / or Fayoum governorates whereas in the south valley, the fifth district was represented by Minia, Asuit, and / or Sohag governorates.

Any selected orchard was at least 3 feddans in area, with trees more than 5 years old. Every selected orchard was visited 4 times each year, i.e., in winter (January to March), spring (April to June), summer (July to September) and autumn (October to December) seasons.

During every visit, about 50 trees, randomly distributed in every selected orchard were examined for insect infestation. Samples of all parts of the tree (e.g., roots, stems, branches, leaves, flowers and fruits) were carefully inspected. The existing season of each insect, status (major / minor), and the attacked part(s) were recorded.

Surveyed insect species were identified in the orchard as possible. However, in case of uncertainty, samples of the plant part(s) and / or existing insects were transferred to the laboratory for further examination. Whenever, taxonomic assistance was required, specimens were referred to the appropriate specialist(s) at "Insects Identification Research Division", Plant Protection Research Institute, ARC, MOA, Dokki, Giza governorate.

On the other hand, the scientific name, order and family of insects attacking plum trees together with the status of infestation (major and minor), affected plant part(s) (roots, stems, branches, twigs, buds, leaves, flowers and / or fruits), activity period and number of annual generations in addition to the references cited were listed.

RESULTS AND DISCUSSION

Data presented in Table (1) clarified that during the present field investigation, more than 18 species belonging to 13 families and 6 orders were surveyed in plum orchards in Egypt. However, eleven species were first recorded in Egypt. The

dominating pests were the woodborers, the leaf and flower eaters, the fruit worms and flies and the sucking and scale insects.

On the other hand, literature recorded in Egypt more than 9 species belonging to 4 families and 2 order in plum orchards (Table, 2-appendex). These pests were the fruit worm *Anastrepha oblique* (Diptera: Tephritidae) and the woodborers *Agrilus lituratus*, *Ptosima undecimmaculata*, *Sphenoptera tappesi* and *Sphenoptera trispinosa* (Buprestidae), *Macrotoma palmata* and *Chlorophorus varius* (Cerambycidae), *Scolytus amygdali*, and *Xyleborinus saxeseni* (Scalytidae) of Order Coleoptera.

Survey results demonstrated that, the most abundant insect pests in plum orchards were the woodborers. The wasp beetle *Chlorophorus varius* (Coleoptera: Cerambycidae) and the plum borer *Ptosima undecimmaculata* (Coleoptera: Buprestidae) caused serious damage to the stem and branches, whereas the shot hole bark beetle *Scolytus amygdali* (Coleoptera: Scalytidae) attacked the stem, branches and twigs. The peach twigs borer *Anarisa lineatella* (Lepidoptera: Gelechiidae) seriously infested the twigs and fruits of plum trees. The other woodborers, *Sphenoptera trispinosa*, *Chrysobothris dorsata* (Coleoptera: Buprestidae), and *Macrotoma palmata* (Coleoptera: Cerambycidae) were of less importance and abundance. Larvae of woodborers spent all their life span inside the wood of trees all the year round, whereas, adults were active during spring, summer, and / or autumn according to the insect species and the weather factors affecting the adult activity (Tadros et al., 2006). On the other hand, *Chrysobothris dorsata* borer was reported for the first time in Egypt.

These results agree with the records on *Chlorophorus varius* (Tadros, 1994 b), *Macrotoma palmata* (Tadros et al., 1993), *Ptosima undecimmaculata*, *Sphenoptera trispinosa* (Batt, 1999), *Scolytus amygdali* (Tadros, 1994 a) on stem and branches. In addition to *Anarisa lineatella*, plum fruits were attacked by the med fruit fly *Ceratitidis capitata* (Diptera: Tephritidae) during spring and summer and caused economic damage to fruit production. In some years infestation was of less importance in plum orchards owing to the relatively thick leathery surface of the fruits. Moreover, *Carpophilus hemipterus* (Coleoptera: Nitidulidae) and *Drosophila melanogaster* (Diptera: Tephritidae) infested over ripening and fallen plum fruits. Mostly, adults of the scarabaeid hairy chaefer *Tropinota squalida* (Coleoptera: Scarabaeidae) attacked the flowers of plum trees and caused neglectable damage but during some years a noticeable damage was noticed.

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Table 1. Major (M) and minor (m) insect pests status (S) attacking plum trees in Egypt with the damage plant parts and activity period (winter: W; spring: Sp; summer: Su; autumn: A). (R: root; St: stem; Br: branches; Sh: shoot; T: twig; Bu: bud; L: leaf; Fl: flower; Fr: fruit).

No.	Scientific name	Order	Family	S	Damaged plant parts	Activity period			
						W	Sp	Su	A
1	<i>Thrips major</i> **	Thysanoptera	Thripidae	M	Bu, L, Fl, Fr		*	*	
2	<i>Empoasca decedens</i> **	Hemiptera: Homoptera	Cicadellidae	m	L		*	*	
3	<i>Bemesia tabaci</i> **	Hemiptera: Homoptera	Aleyrodidae	m	L		*	*	
4	<i>Aphis gossypii</i> **	Hemiptera: Homoptera	Aphididae	M	Tw, L, Fl, Fr		*		
5	<i>Myzus persicae</i> **	Hemiptera: Homoptera	Aphididae	M	Tw, L, Fl, Fr		*		
6	<i>Parlatoria oleae</i> **	Hemiptera: Homoptera	Coccidae	M	Br, Tw, L, Fr		*	*	*
7	<i>Aonidiella orientali</i> **s	Hemiptera: Homoptera	Diaspididae	M	Br, Tw, L, Fr		*	*	*
8	<i>Anarisa lineatella</i>	Lepidoptera	Gelechiidae	M	Tw, Fr	*	*	*	*
9	<i>Tropinota squalida</i>	Coleoptera	Scarabaeidae	M	Fl	*	*		
10	<i>Ptosima undecimmaculata</i>	Coleoptera	Buprestidae	M	St, Br	*	*	*	*
11	<i>Sphenoptera trispinosa</i>	Coleoptera	Buprestidae	M	St, Br	*	*	*	*
12	<i>Chrysobothris dorsata</i> **	Coleoptera	Buprestidae	m	St, Br	*	*	*	*
13	<i>Macrotoma palmata</i>	Coleoptera	Cerambycidae	m	St, Br	*	*	*	*
14	<i>Chlorophorus varius</i>	Coleoptera	Cerambycidae	M	St, Br	*	*	*	*
15	<i>Scolytus amygdali</i>	Coleoptera	Scolytidae	M	St, Br, Tw, Bu	*	*	*	*
16	<i>Carpophilus hemipterus</i> **	Coleoptera	Nitidulidae	m	Fr		*	*	
17	<i>Ceratitis capitata</i> **	Diptera	Tephritidae	M	Fr		*	*	
18	<i>Drosophila melanogaste</i> **	Diptera	Tephritidae	m	Fr			*	

** First record.

Table 2. List of major (M) and minor (m) insects attacking plum trees together with status (S), activity period (A. P.), damage plant parts (P. P.) and number of annual generations (G) as revealed in different countries (C) from literature in Egypt (E) and other countries (O). (R: root; St: stem; Br: branches; Sh: shoot; Tw: twig; Bu: bud; L: leaf; Fl: flower; Fr: fruit)

No	Scientific name	C	S	A. P.	P. P.	G
I. Order: Thysanoptera						
i. Family: Thripidae						
1	<i>Frankliniella occidentalis</i>	O	M	Jun.-Oct.	Bu, L, Fl, Fr	5-7
2	<i>Thrips imaginis</i>	O	M	Jun.-Oct	Bu, L, Fl, Fr	5-7
3	<i>Thrips australis</i>	O	m	Jun.-Oct	Bu, L, Fl, Fr	5-7
4	<i>Thrips tabaci</i>	O	M	Jun.-Oct	Bu, L, Fl, Fr	5-7
II. Order: Hemiptera: Heteroptera						
i. Family: Cicadellidae						
5	<i>Zyginella pulchra</i>	O	M	Jun.-Oct	Br, L	>3
6	<i>Erythroneura spp.</i>	O	M	Jun.-Oct	Br, L	>3
ii. Family: Aphididae						
7	<i>Hyalopterus pruni</i>	O	M	Jun.-Oct	Tw, Bu, L, Fl, Fr	many
8	<i>Brachycaudus helichrysi</i>	O	M	Jun.-Oct	Tw, Bu, L, Fl, Fr	many
9	<i>Pterochloroides persicae</i>	O	M	Jun.-Oct	Tw, Bu, L, Fl, Fr	many
10	<i>Phorodon humuli</i>	O	M	Jun.-Oct	Tw, Bu, L, Fl, Fr	many
iii. Family: Pseudococcidae						
11	<i>Pseudococcus affinis</i>	O	M	Apr.-Nov.	R, St, Fr	5
12	<i>Pseudococcus longispinus</i>	O	M	Apr.-Nov.	St, Br, Tw	1
13	<i>Pseudococcus marilimus</i>	O	M	Apr.-Nov.	St, Br, Tw	1
iv. Family: Coccidae						
14	<i>Coccus hesperidum</i>	O	M	Apr.-Nov.	St, Br, Tw	1
15	<i>Aspidiotus nerii</i>	O	m	Apr.-Nov.	St, Br, Tw	1
16	<i>Sphaerolecanium prunastri</i>	O	M	Apr.-Nov.	St, Br, Tw	1
v. Family: Diaspididae						
17	<i>Diaspidiotus ancylus</i>	O	m	Apr.-Nov.	St, Br, Tw	1
18	<i>Quadraspidiotus [Diaspidiotus] perniciosus</i>	O	M	Apr.-Dec.	Fr, Br, Tw	3

Table 2. Cont.

No	Scientific name	C	S	A. P.	P. P.	G
19	<i>Quadraspidiotus ostreaeformis</i> [Diaspidiotus]	O	M	Apr.-Dec.	Fr, Br, Tw	3
20	<i>Lepidosaphes ulmi</i>	O	M	Apr.-Dec.	Fr, Br, Tw	3
21	<i>Chlidaspis asiatica</i>	O	M	Apr.-Dec.	Fr, Br, Tw	3
IV. Order: Lepidoptera						
i. Family: Zygaenidae						
22	<i>Illiberis rotundata</i>	O	M	Jul.-Aug.	Tw	1
ii. Family: Lymantriidae						
23	<i>Euproctis chrysorrhoea</i>	O	m	Jun.-Sep.	L	2
iii. Family: Noctuidae						
24	<i>Lacanobia subjuncta</i>	O	M	Jun.-Sep.	L	1
iv. Family: Gelechiidae						
25	<i>Anarsia lineatella</i>	O	M	Jun.-Sep.	Tw, Fr	2
v. Family: Pyralidae						
26	<i>Euzophera semifuneralis</i>	O	M	May-Nov.	St, Br	2-3
27	<i>Cryptoblabes gnidiella</i>	O	m	Jul.-Sep.	Fr	3
vi. Family: Tortricida						
28	<i>Archips rosana</i> [Archips rosanus]	O	M	Summer	Fr	1-2
29	<i>Choristoneura diversana</i>	O	M	Summer	Fr	1-2
30	<i>Hedya dimidioalba</i>	O	m	Summer	Fr	1-2
31	<i>Spilonota ocellana</i>	O	M	Summer	Fr	1-2
32	<i>Pandemis heparana</i>	O	m	Summer	Fr	1-2
33	<i>Laspeyresia</i> [Cydia] <i>funebrana</i>	O	M	Summer	Fr	1-2
34	<i>Grapholita lobarzewskii</i>	O	M	Summer	Fr	1-2
35	<i>Cydia</i> [Grapholita] <i>molesta</i>	O	M	Summer	Tw, Fr	1-2
36	<i>Grapholita</i> [Cydia] <i>dimorpha</i>	O	M	Summer	Fr	1-2
37	<i>Adoxophyes orana</i>	O	M	Summer	Fr	1-2
V. Order: Coleoptera						
i. Family: Buprestidae						
38	<i>Agrilus lituratus</i>	E	M	May-Aug.	St, Br	1
39	<i>Ptosima undecimmaculata</i>	E	M	Mar.-Sep.	St, Br	1
40	<i>Sphenoptera tappesi</i>	E	M	Apr.-Sep.	St, Br	1
41	<i>Sphenoptera trispinosa</i>	E	M	Apr.-Sep.	St, Br	1
42	<i>Anthaxia candens</i>	O	m	May-Sep.	St, Br	1
43	<i>Sphenoptera laferti</i>	O	M	May.-Sep.	St, Br	1

Table 2. Cont.

No	Scientific name	C	S	A. P.	P. P.	G
44	<i>Capnodis tenebrionis</i>	O	M	Spring & Summer	St, Br	1
45	<i>Hyalopterus pruni</i>	O	M	Summer	St, Br	1
46	<i>Brachycaudus helichrysi</i>	O	M	Summer	St, Br	1
47	<i>Agrilus populneus</i>	O	m	Summer	St, Br	1
48	<i>Phaenops formaneki</i>	O	m	Summer	St, Br	1
49	<i>Salpingus aeneus</i>	O	m	Summer	St, Br	1
50	<i>Ampedus cardinalis</i>	O	m	Summer	St, Br	1
51	<i>Priobium carpini</i>	O	m	Summer	St, Br	1
52	<i>Gnathoncus nidorum</i>	O	m	Summer	St, Br	1
ii. Family: Cerambycidae						
53	<i>Macrotoma palmata</i>	E	M	Jun.-Sep.	St, Br	1 per 3 yrs
54	<i>Chlorophonus varius</i>	E	M	May-Oct.	St, Br	1
55	<i>Anoplophora nobilis</i>	O	m	Jun.-Sep.	St, Br	1
56	<i>Anoplophora glabripennis</i>	O	M	Jun.-Sep.	St, Br	1
iii. Family: Scolytidae						
57	<i>Scolytus amygdali</i>	E	M	Feb.-Dec.	St, Br, Tw	5
		O	M	Apr.-Oct.	St, Br, Tw	4
58	<i>Scolytus mediterraneus</i> [S. rugulosus]	O	m	Mar.-Oct.	St, Br, Tw	4
59	<i>Xyleborinus saxeseni</i>	E	m	Whole year	R	<5
iv. Family: Nitidulidae						
60	<i>Carpophilus hemipterus</i>	O	m	Jun.-Sep.	Fr	1
61	<i>Carpophilus mutilatus</i>	O	m	Jun.-Sep.	Fr	1
62	<i>Carpophilus davidsoni</i>	O	m	Jun.-Sep.	Fr	1
v. Family: Curculionidae						
63	<i>Conotrachelus nenuphar</i>	O	m	Jun.-Sep.	Fr, L	1
64	<i>Anthonomus bituberculatus</i>	O	m	Apr.-Oct.	Fr	1
VI. Order: Hymenoptera						
i. Family: Formicidae						
65	<i>Formica aerata</i>	O	M	Jul.-Oct.	Fr	1
i. Family: Tenthredinidae						
66	<i>Hoplocampa sp.</i>	O	M	Jul.-Oct.	Fr	1
67	<i>Hoplocampa flava</i>	O	M	Jul.-Oct.	Fr	1
68	<i>Hoplocampa minuta</i>	O	M	Jul.-Oct.	Fr	1
69	<i>Euura sp.</i>	O	M	Jul.-Oct.	Fr	1
No	Scientific name	C	S	A. P.	P. P.	G
VII. Order: Diptera						
i. Family: Cecidomyiidae						
70	<i>Putoniella pruni</i>	O	M	Jul.-Sep.	Fr	3-4
71	<i>Putoniella gracilis</i>	O	M	Jul.-Sep.	Fr	3-4
ii. Family: Tephritidae						

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72	<i>Bactrocera dorsalis</i>	O	M	Jul.-Aug.	Fr	3-4
73	<i>Rhagoletis completa</i>	O	M	Jul.-Sep.	Fr	3-4
74	<i>Rhagoletis pomonella</i>	O	m	Jul.-Sep.	Fr	3-4
75	<i>Anastrepha suspensa</i>	O	M	Jul.-Sep.	Fr	3-4
76	<i>Anastrepha obliqua</i>	O	M	Jul.-Sep.	Fr	4
77	<i>Ceratitis capitata</i>	E	M	Jul.-Aug.	Fr	3
		O	M	Jul.-Sep.	Fr	3-4
78	<i>Nearctic[Chymomyza] amoema</i>	O	m	Jul.-Sep.	Fr	3-4

According to the survey study, the fruit fly *Ceratitis capitata*, the flower eater *Tropinota squalida*, the fruit rotting *Carpophilus hemipterus* and *Drosophila melanogaster* were recorded for the time in Egypt.

Different parts of plum trees were infested with the Thripid *Thrips major* (Thysanoptera: Thripidae), the Cicadellid *Empoasca decedens* (Hemiptera-Homoptera: Cicadellidae), the Aleyrodid *Bemesia tabaci* (Hemiptera- Homoptera: Aleyrodidae), aphids *Aphis gossypii*, and *Myzus persicae* (Hemiptera- Homoptera: Aphididae), the scale *Parlatoria oleae* (Hemiptera- Homoptera: Coccidae) and *Aonidiella orientalis* (Hemiptera- Homoptera: Diaspididae). Branches, twigs, leaves, and fruits are attacked by the scale during spring, summer, and / or autumn. Aphids infested twigs, leaves, flowers, and fruits during spring. However, the Aleyrodid and the Cicadellid attacked plum leaves during spring and summer. Moreover, buds, leaves, flowers, and fruits are attacked by the Thripid during spring and summer.

According to the present survey, *Thrips major*, *Empoasca decedens*, *Bemesia tabaci*, *Aphis gossypii*, and *Myzus persicae*, *Parlatoria oleae*, and *Aonidiella orientalis* were recorded for the first time in Egypt.

The available and most recent literature (Table, 2-appendex) concluded that plum orchards could be subjected to 78 insect species belonging to 23 families and 7 orders in the countries of the world, including Egypt (several authors such as Tadros *et al.*, 1993; Aluja and Birke, 1993; Tadros, 1994 a; Tadros, 1994 b; Hartfield *et al.*, 1997; Khajuria and Sharma, 1998; Batt, 1999; Pluciennik *et al.*, 1999; Shang *et al.*, 2000; Ben Yehuda *et al.*, 2000; Hai *et al.*, 2000; Leskey *et al.*, 2001; Polesny and Avilla, 2001; Arnaoudov *et al.*, 2002; Milne and Walter, 2003; and Tadros *et al.*, 2006). Among these species, 54 insects were serious pests and 24 insects were of minor importance.

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(٣) حصر الآفات الحشرية آفات أشجار الفاكهة ذات النواة الحجرية في حدائق البرقوق

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تم إجراء حصر للآفات الحشرية التي تصيب أشجار البرقوق في مصر، خلال ثلاث سنوات متعاقبة (٢٠٠٠ - ٢٠٠٢). أجريت الدراسة في مناطق بيئية مختلفة في غرب وشرق ووسط الدلتا وشمال وجنوب الوادي. وقد تم فحص وتسجيل الآفات المتواجدة في فصول السنة الأربعة، ومدى أهميتها الاقتصادية (آفة أو حشرة)، والأجزاء النباتية المصابة. تم تسجيل أكثر من ١٨ نوعا حشرياً، تتبع ١٣ عائلة، من ٦ رتب في حدائق البرقوق، منها إحدى عشر نوعاً سجلت للمرة الأولى. وكانت الآفات السائدة هي حفارات الأشجار، حيث تسبب أضراراً للسوق والأفرع (حفار ساق الخوخ ذو القرون الطويلة *Chlorophorus varius*، وحفار ساق البرقوق *Ptosima undecimmaculata*)، والسوق والأفرع واللباليب (خنافس قلف الحلويات *Scolytus amygdali*)، واللباليب (الأنارسيا *Anarsia lineatella*). أيضاً تسبب الحفارات ذات القرون القصيرة (*Sphenoptera trispinosa*)، وحفار ساق السنط *Macrotoma palmata* والخنافس (*Xyleborinus saxeseni*) أضراراً ولكن بدرجة أقل. تسبب ذبابة الفاكهة *Ceratitis capitata* والأنارسيا *A. lineatella* أضراراً شديدة للثمار. أحياناً تهاجم حشرات جعل الورد الزغبى *Tropinota squalida* الأزهار. أما خنافس الثمار *Carpophilus hemipterus* وذبابة الدروسوفيليا *Drosophila melanogaster* فتهاجم الثمار في مرحلة ما بعد النضج والثمار المتساقطة على الأرض. تتأثر أجزاء مختلفة من الأشجار بالإصابة بالتربس *Thrips major*، والجاسيد *Empoasca decedens*، والمن المختلفة *Aphis gossypii* و *Myzus persicae*، والذبابة البيضاء *Bemisia tabaci*، والحشرات القشرية *Parlatoria oleae* و *Aonidiella orientalis*.