

SURVEY OF BORERS ATTACKING DECIDUOUS FRUIT TREES IN EGYPT WITH REFERENCE TO CERTAIN BIOLOGICAL AND ECOLOGICAL STUDIES

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Abstract

A survey was conducted on seven deciduous fruit trees (apple, apricot, fig, grapevine, peach, pear and plum) to detect the borers attacking these trees. Collected borers were 37 species which belong to seven families of two orders: Coleoptera (34 species) and lepidoptera (3 species).

Seasonal activity of *Agrilus lituratus* beetle occurred during the period from 4th week of May until 3rd week of August with one peak in the 1st week of July, while the activity period of *Ptosima undecim - maculata* extended from 1st week of March until last week of September recorded three peaks of population. However, two peaks of *Sphenoptera tappesi* beetle showed during its activity period extended from 4th week of April until 3rd week of September.

Relative susceptibility of different hosts by some borers indicated that high differences were detected between the percentages of infestation of each borer on different hosts.

Seasonal abundance and transformation of developmental stages of *Niphona picticornis* borer on fig trees exhibited that this insect has one generation yearly. larval duration average was 205 ± 75.67 days, while the prepupal and pupal durations recorded 9.4 ± 4.05 and 18 ± 4.78 days, respectively. The highest population percentages of prepupa and pupa recorded in September. The adults stay inside the branches between 63 to 168 days, while their longevity from 7-80 days. The highest population percentage of beetles inside host recorded in December, while the highest percentage of emerged beetles detected in January and March.

Sphenoptera trispinosa beetle has two peaks of population, while its parasite, *Cratocentrus* sp., has three peaks during the activity period extended from April to September. Monthly percentages of parasitism differ during successive months of activity, general percentages of parasitism were 29.4% and 29.6% in 1996 and 1997, respectively. Highest percentage of emerged parasites recorded from eastern direction and at 50-100 cm. height.

INTRODUCTION

In Egypt, deciduous fruit trees (apple, apricot, fig, grapevine, peach, pear and plum) occupy a major area within among the total cultivated area with fruit trees. Different parts of these trees are exposed to intense attack by various species of borers, causing a serious damage resulted in destructive of trees, reduce of area and minimize the crop.

Certain investigators had studied some borers infesting various fruit trees (Willcocks, 1924; El-Zoheiry, 1950; Nour, 1963, Shalaby, 1958, Alfiere, 1976, Mostafa, 1977, Moussa, 1977; Tadros, 1982; Girgis, 1987; Batt, 1989; Okil, 1991; Haggag 1991).

The current work was carried out to survey of borers infesting some deciduous fruit trees, add some new ecological contribution of some borers that not studied previously in Egypt, the effect of different hosts on relative susceptibility by some borers and the relation between stem fig borer, *Sphenoptera trispinosa* Klug and its chalcidid parasite.

MATERIALS AND METHODS

A. Survey of borers infesting some deciduous fruit trees

Periodical survey visits were made during two successive years 1996 and 1997 to ten regions i.e., Beheira, Gharbia, Menoufia, Qalubia, Giza, Fayoum, Beni-suef, El-Minia, North coast and North Sinai Governorates.

Cuttings of different deciduous fruit trees (apple, apricot, peach, pear, plum, fig and grapevine) were taken from infested orchards for examining and identification purposes. Infested cuttings of different hosts were placed in plastic containers separately, the emerged insects were collected and classified.

B. Comparative study of seasonal activity of three buprestid species on plum trees

Population fluctuation of *Agrilus lituratus*, *Ptosima undecim - maculata* and *Sphenoptera tappesi* were studied during one year of 1997. Infested plum trees of these buprestids were selected in plum orchard at kafr alaem (Berket el - saba district, Menoufia Governorate).

Thirty infested cuttings with borers (each of about 40 cm long and 2 cm diameter) were collected randomly every week during the period from early January 1997 to late December. Samples were placed in plastic containers covered with muslin cloth. Daily inspection was carried out until the first beetle of each borer had emerged, then the weekly number of emerged beetles was recorded and monthly numbers were estimated. Activity periods and peaks of each borer were determined.

C. Effect of different hosts on their relative susceptibility by some borers

The host plants as factor affecting the infestation by some borer were studied at kafer alaem (Berket el - Saba, Menoufia Governorate).

Numbers of infested trees by each borer at neighboring different orchards of apple, apricot, peach, pear and plum were recorded. The percentage of infestation was determined as follows:

$$\% \text{ infestation} = \frac{\text{No. of infested host trees by borer}}{\text{No. of total infested trees of all hosts (of the same borer)}} \times 100$$

D. study on some fig borers

1. Seasonal abundance and transformation of developmental stages of pomegranate stem borer, *Niphona picticornis* Muls, within fig trees

Thirty infested fig cuttings (each, 50 cm long and about 1.5 cm diameter) were collected monthly, these cuttings were longitudinally splited and the various stages of borer were collected, monthly realive abundance for each stage was estimated.

Thirty larvae were collected from infested trees during July were replanted in fig cuttings and examined daily. The different transformations of life stages were recorded and durations of these stages were calculated.

2. Relation between fig stem borer, *Sphenoptera trispinosa* klug, and its chalcidid parasite

Fourty stand of infested fig trees were randomly selected in fig orchard located at dar el-ramad. Fayoum Governorate, to study the directional and vertical population distribution of emerged parasites (chalcididae) from fig trees infesting

S. trispinosa larvae. The directional distribution was estimated at eight compass directions (east, northeast, north, northwest, west, southwest, south, southeast), while the vertical distribution was evaluated at adjusted heights of 50 cm., starting from ground level up to 300 cm. per tree.

Seasonal abundance for each of *S. trispinosa* beetle and its parasite was estimated, so the old exit holes were marked by coloured pen and the new exit holes were counted each two weeks. The effect of prevailing weather factors throughout the seasonal activity was studied.

Larvae of *S. trispinosa* were collected by splitting the infested fig cuttings. The full grown larvae were placed solitary in glass vials under laboratory conditions till adult parasites were emerged. Behaviour of parasite was observed and certain biological aspects was estimated.

Statistical analysis was worked out according to Fisher (1950).

RESULTS AND DISCUSSION

Survey study on the seven host plants, viz. apple, apricot, fig, grapevine, peach, pear and plum trees, revealed the presence of 37 species of borers belonging to two orders; Coleoptera and Lepidoptera.

The Coleopterous wood borers These include 34 species under 5 families, as follows:

1. Family Bostrychidae (8 species)

The bostrychid powder post beetles infesting deciduous fruit trees are recorded in Table 1. These are *Bostrychopsis reichei* Mars., *Enneadesmus forficula* Frm., *Enneadesmus obtusedentatus* Lesne., *Enneadesmus trispinosa* O1., *Phonapate frontalis* Fhr., *Scobicia chevrieri* villa., *Sinoxylon ceratoniae* L. and *Sinoxylon sudanicum* Lesne.

2. Family Buprestidae (10 species)

The flat-headed wood borers or metallic beetles attacking deciduous fruit trees are recorded in Table 2. These are *Agrilus lituratus* Klug., *Anthaxia congregata* Klug., *Capnodis Carponaria* Klug., *Chrysobothris dorsata* Fab., *Pseudocastalia aegyptiaca* Gmelin, *Ptosima undecim-maculata* Hbst., *Sphenoptera arabica* Gory.,

Table 1. Bostrychid powder post beetles, (Col.: Bostrychidae)

Ser. No.	Borer name	Host plants							No. of hosts
		Apple	Apri-cot	Fig	Grap-evine	Peach	Pear	Plum	
1	<i>Bostrychopsis reichei</i>						x		1
2	<i>Enneadesmus forficula</i>			x	x				2
3	<i>Enneadesmus obtusedentatus</i>			x	x				2
4	<i>Enneadesmus trispinosa</i>			x	x				2
5	<i>Phonapate frontalis</i>				x	x			2
6	<i>Scobicia chevrieri</i>			x					1
7	<i>Sinoxylon ceratoniae</i>			x					1
8	<i>Sinoxylon sudanicum</i>			x	x				2
Number of species		-	-	6	5	1	1	-	-

Table 2. Flat-Headed wood borers or Metallic beetles, (Col.: Buprestidae)

Ser. No.	Borer name	Host plants							No. of hosts
		Apple	Apri-cot	Fig	Grap-evine	Peach	Pear	Plum	
1	<i>Agrilus lituratus</i>					x		x	2
2	<i>Anthaxia congregata</i>		x	x		x	x	x	5
3	<i>Capnodis carponaria</i>					x			1
4	<i>Chrysobothris dorsata</i>	x	x	x		x	x		5
5	<i>Pseudocastalia aegyptiaca</i>		x			x			2
6	<i>Ptosima undecim-maculata</i>		x			x		x	3
7	<i>Sphenoptera arabica</i>			x		x			2
8	<i>Sphenoptera ardens</i>			x		x			2
9	<i>Sphenoptera tappesi</i>		x			x		x	3
10	<i>Sphenoptera trispinosa</i>			x		x		x	3
Number of species		1	5	5		10	2	5	-

Sphenoptera ardens Klug., *Sphenoptera tappesi* Mars. and *Sphenoptera trispinosa* Klug.

3. Family Cerambycidae (8 speies)

The round-headed wood borers or longicorn beetles which obtained from deciduous fruit trees are represented in Table 3. These borers are : *Batocera rufomaculata* De Geer, *Chlorophorus varius* Mull., *Hesperophanes griseus* F., *Macrotoma palmata* Fab., *Nathius brevipennis* Muls., *Niphona picticornis* Muls., *Stromatium fulvum* vill., and *Xystrocera globosa* Ol.

4. Family Curculionidae (2 species)

The Curculionid wood borers or weevils (snout beetles) infesting deciduous fruit trees are recorded in Table 4, i.e., *Mesites cupines* Boh. and *Rhyncolus cylindrus* Boh.

5. Family Scolytidae (6 species)

The scolytid borers attacking deciduous fruit trees are detected in Table 5. These include : pin - hole borers *Hypothenemus eruditus* west., *Hypothenemus erytherinae* Egg. and *Hypothenemns obscurus* Fab.), shot - hole borers (*Hypoborus ficus* Er. and *Scolytus amygdali* Guer.) and pear root borer (*Xyleborinus saxeseni* Ratz.).

The lepidopterous wood borers: The wood boring caterpillars infesting deciduous fruit trees are showed in Table 6; include 3 species belonging to 2 families i.e:

1. Family Cossidae (2 species)

Two species of this family were recorded: The solitary carpenter worm, (*Paropta paradoxa* H. and the leopard moth, *Zeuzera pyrina* L.

2. Family Sesiidae (one species)

The apple clearwing moth, *Synanthedon myopaeformis* Bork.

On the other hand, data recorded in Tables (1-6) indicated that the highest number of borers infesting deciduous fruit trees (20 species) recorded on fig trees followed by peach (15 species), plum (13 species), apple (12 species), apricot (11 species), pear (10 species), while the least number recorded on grapevine trees (7 species).

Table 3. Round-Headed wood borers or Longicorn beetles, (Col.: Cerambycidae)

Ser. No.	Borer name	Host plants							No. of hosts
		Apple	Apri-cot	Fig	Grap-evine	Peach	Pear	Plum	
1	<i>Batocera rufomaculata</i>			x					1
2	<i>Chlorophorus varius</i>	x	x	x	x	x	x	x	7
3	<i>Hesperophanes griseus</i>			x					1
4	<i>Macrotoma palmata</i>		x					x	2
5	<i>Nathius brevipennis</i>					x			1
6	<i>Niphona picticornis</i>			x					1
7	<i>Stromatium fulvum</i>			x					1
8	<i>Xystrocera globosa</i>		x						1
	Number of species	1	3	5	1	2	1	2	-

Table 4. Curculionid wood borers or snout weevils, (Col.: Buprestidae)

Ser. No.	Borer name	Host plants							No. of hosts
		Apple	Apri-cot	Fig	Grap-evine	Peach	Pear	Plum	
1	<i>Mesites cupines</i>	x					x	x	3
2	<i>Rhyncolus cylindrus</i>	x					x	x	3
	Number of species	2	-	-	-	-	2	2	-

Table 5. Pin-hole borers, shot-hole borers and root beetles, (ambrosia beetle), (Col.: Scolytidae).

Ser. No.	Borer name	Borer name							No. of hosts
		Apple	Apri-cot	Fig	Grap-evine	Peach	Pear	Plum	
1	<i>Hypoborus ficus</i>			x					1
2	<i>Hypothenemus eruditus</i>	x	x	x		x	x	x	6
3	<i>Hypothenemus erytherinae</i>	x		x					2
4	<i>Hypothenemus obscurus</i>	x							1
5	<i>Scolytus amygdali</i>	x	x			x	x	x	5
6	<i>Xyleborinus saxesni</i>	x	x				x	x	4
Number of species		5	3	3	-	2	3	3	-

Table 6. Wood boring caterpillars, (Lepidopterous borers).

Fam.	Ser. No.	Borer name	Host plants							No. of hosts
			Apple	Apri-cot	Fig	Grap-evine	Peach	Pear	Plum	
Cossidae	1	<i>Paropta paradoxa</i>	x		x	x			x	3
	2	<i>Zeuzera pyrina</i>	x							2
Sesiidae		<i>Synanthedon myopaeformis</i>	x						x	2
Number of species			3	-	1	1	-	1	1	-

Table 7. Relative susceptibility of different hosts by some borers as percentage of infestation.

No.	Borer name	Host plant				
		Apple	Apricot	Peach	Pear	Plum
1	<i>Hypothenemus eruditus</i>	28	3	13	37	19
2	<i>Scolytus amygdali</i>	19	19	21	8	33
3	<i>Chlorophorus varius</i>	8	18	35	13	26
4	<i>Chrysobothris dorsata</i>	15	39	20	26	
5	<i>Anthaxia congregata</i>		21	38	15	26
6	<i>Xyleborinus saxesni</i>	6	31		44	19
7	<i>Ptosima undecim-maculata</i>		38	4		58
8	<i>Spheoptera tappesi</i>	5		17		78
9	<i>Macrotoma palmata</i>		96			4
10	<i>Synanthedon myopaeformis</i>	99.5				0.5
11	<i>Zeuzera pyrina</i>	66			34	

Table 8. Monthly percentages of developmental stages of *N.picticornis* within fig trees and emerged beetles during the period from July 1996 to June 1997.

Month	Percentage of developmental stages				Percentage of emerged beetles
	Larva	Prepupa	Pupa	Adult	
Jul.	100	-	-	-	-
Aug.	93.5	6.5	-	-	-
Sep.	27.1	24.3	27.1	21.5	-
Oct.	15.4	7.7	7.7	69.2	-
Nov.	14.3	-	3.9	81.8	7
Dec.	14.3	-	-	85.7	13
Jan.	16.7	-	-	83.3	27
Feb.	22.2	-	-	77.8	18
Mar.	28.6	-	-	71.4	27
Apr.	33.3	-	-	66.7	8
May.	75.0	-	-	25.0	-
Jun.	100	-	-	-	-

Table 9. Durations of developmental stages of *N.picticornis* within fig trees and longevity of adult under laboratory conditions.

State	Larva	Pre-pupa	Pupa	Pupa	
				Within host	Out host
Range	110-330	7-20	13-27	63-168	7-80
Av.±S.e	205±75.67	9.4±4.05	18±4.78	108.29±27.86	27.75±19.64

Table 10. Relationship between the number of *S. trispinosa* beetles/tree and percentage of parasitism by *Cratocentrus* sp.

Level of infestation	No. of beetles / tree	Parasitism %
Light	5-6	29.9
Moderate	16-27	26.3
Heavy	27-38	24.6

Table 11. Monthly percentages of parasitism by *Cratocentrus* sp. parasite during 1996 and 1997 at Fayoum Governorate.

Year	Monthly percentages of parasitism						General parasitism %
	Apr.	May	Jun.	Jul.	Aug.	Sep.	
1996	52.6	43.9	22.2	24.2	27.4	23.8	29.4
1997	85.7	57.1	31.0	24.5	20.2	11.5	29.6

Table 12. Directional population distribution of emerged parasites (*Cratocentrus* sp.) from fig trees.

Directions	Number of parasites (%)	Groups
East (E)	27	a
Southeast (Se)	24	
Southwest (Sw)	13	
South (s)	12	b
Northeast (Ne)	12	
Northwest (Nw)	5	
North (N)	5	c
West (W)	2	
Chi-square value = 51.7		

Table 13. Vertical population distribution of emerged parasites (*Cratocentrus* sp.) from fig trees.

Heights (cm)	No. of parasites (%)	Groups
50-100	63	a
0-50	17	b
100-150	16	
150-200	4	c
200-250	-	
250-300	-	
Chi-square value = 108.3		

Moreover, Nour (1963) mentioned that *Lyctus africanus* Lesene infest the peach, while Batt (1989) found that *Hypoborus ficus* Er. infested the apple cuttings. Shalaby (1958) stated that *Enneadesmus obtusidentatus* Lesne beetle infests the peach, while Batt (1989) found that apple, apricot, peach and pear cuttings failed to attract any beetles of *Enneadesmus forficula* Frm. Also, Batt et al (1996) found that *B.rufomaculata* beetle infests the fig trees in North Sinai only.

Comparative study of seasonal activity of three buprestid species on plum trees

Data concerning the population densities of each *Agrilus lituratus* Klug., *Ptosima undecim - maculata* Hbst. and *Sphenoptera tappesi* Mars. beetles during 1997 are illustrated in fig. 1.

The occurrence of *A.lituratus* beetle lasted 12 weeks, beginning from 4th week of May until 3rd week of August, during this period the population density of beetles showed one peak of activity at the 1st week of July. Monthly and seasonal percentages of emerged beetles indicated that the main activity of this species was concentrated in the summer season and definitely active during the spring season.

The seasonal fluctuations in population density of *Pt undecim - maculata* beetles showed that the beetles started to emerge from the 1st week of March and continued until last week of September (28 weeks), recorded three peaks of emergence during the 1st week of June, the 2nd week of July and the 2nd week of August. The maximum percentage population occurred throughout the summer followed by the spring and the autumn, while no emerged beetles occurred during the winter, Fig 1.

Obtained results indicated that the initial occurrence of *Sph. tappesi* beetles took place at the 4th week of April, while the activity period extended until the 3rd week of September, recorded 20 weeks of emergence and 2 peaks of population; the first at the 2nd week of June and the second at the 3rd week of July. Data in Fig 1 showed that the numbers of emerged beetles reached their maximum during the summer, while the adults were impeded to emerge by the winter. Similar results were obtained by Kinawy (1981) and Batt (1991) on *Sphenoptera trispinosa* Klug infesting fig trees.

Effect of different hosts on relative susceptibility by some borers

Recorded data in Table 7 indicated that percentages of infestation by each borer are differed according to host type.

Highest percentages of infestation on apple trees were 99.5% and 66% for *Syn. myopaeformis* and *Z.pyrina*, respectively, while the least ones were 8%, 15%, 6% and 5% recorded by *Chl.varius*, *Chr. dorsata*, *X.saxesni* and *Sph. tappesi*, respectively. On the apricot trees, highest percentages of infestation were 39% and 96% for *Chr.dorsata* and *M.palmata*, respectively, while least percentage was restricted *H.eruditus* (3%). Concerning peach trees, found that *Chl. varius* and *A. congregata* had highest percentages (35% and 38%, respectively), while *Pt.undecim - maculata* gave the least percentage (4%). Pear trees were more attacked by *H.eruditus* (37%) and *X.saxesni* (44 %), while least infestation were 8%, 15% and 34% recorded by *S.amygdali*, *A.congregata* and *Z.pyrina*. Estimated infestation on plum trees showed that highest percentages were 33%, 58% and 78% recorded by *S.amygdali*, *Pt.undecim-maculata* and *Sph.tappesi*, respectively, while the least ones were 4% and 0.5% for *M.palmata* and *Syn.myopaeformis*, respectively.

Previous results indicated that high differences were detected between percentages of infestation of each borer on different hosts. This variation may be due to the different sorts of host plants. Similar results were obtained by Svihra and Volney (1983), who stated that *Scolytus multistriatus* Marsh females demonstrated more distinct preference to English and Siberian elm than Chinese one either in attacking bolts or in establishing their egg - galleries. Also, Batt (1989) found that plum was the most preferable host for *Scolytus amygdali*, while pear was the least infestation of this borer.

Study on some fig borers

1. Seasonal abundance and transformation of development stages of pomegranate stem borer, *N.picticornis*, within fig trees.

Data in Table 8 represent monthly percentages of various developmental stages of *N.picticornis* within fig branches and emerged beetles during the period from July 1996 and June 1997.

Larvae were abundant throughout the year, the highest percentage (100%) was recorded during June and July, while the least percentage was obtained on November and December. The highest percentages of prepupae (24.2%) and pupae (27.1%) observed on September, while the least percentages of prepupae (6.5%)

and pupae (3.9%) recorded during August and November, respectively. The adults were abundant within host throughout the period from September to May, the highest percentage (85.7%) was moliced on December, while the least one (21.5%) obtained during September. Highest percentage of emerged beetles (27%) recorded during January and March, while the least percentage (7%) observed on November.

Durations of developmental stages of *N.picticornis* and longevity of adult are given in Table 9. The larval, prepupal and pupal durations were 110-330 days (205 ± 75.67 , average), 7-20 days (9.4 ± 4.05 days, average) and 13-27 days (18 ± 4.78 days, average), respectively. Adult duration within fig branches varied from 63 to 168 days with an average of 108.29 ± 27.86 days, while the adult longevity out host varied from 7 - 80 days with an average of 27.75 ± 19.69 days.

Previous results exhibited that pomegranate stem borer, *N.picticornis* has one generation yearly on Fig trees.

Relation between *Sphenoptera trispinosa* borer and its parasite

Behaviour of *S.trispinosa* parasite, *cratocentrus* sp.

Cratocentrus sp. parasite (Family Chalcididae) is a solitary internal parasite of *S.trispinosa* larvae.

The parasite turns about over the bark to find the infested fig branch with *S.trispinosa* and select a spot to insert the ovipositor through the bark into larval tunnel. The eggs are laid singly in the larvae; one egg only for each larva, and development is completed before the pupal stage is attained.

Full grown larvae of *S.trispinosa* bore pupal chamber in the outer xylem, they transform to prepupae, where lasted 16-35 days, with an average of 25.8 ± 2.5 days, until the puparium of parasite is formed, the perfect pupal stage is not attained by host larvae. One parasite adult emerges from a single parasitized larva of *S.trispinosa*.

After pupation and transformation to adult stage, the parasites escape by gnawing circular exit hole (ranged 2-3 mm, with an average of 2.4 ± 0.46 mm) through the bark. Pupal duration lasted 23-30 days with an average of 26 ± 1.55 days, whereas longevity of parasite ranged between 3 to 17 days, with an average of 8.4 ± 2.36 days.

Seasonal abundance

Sphenoptera trispinosa beetle

The beetles of *S.trispinosa* started to emerge from 1st and 2nd. half of April 1996 and 1997, respectively. The activity period of this insect extended until last September recorded two peaks; the first peak observed in 1st. half of June 1996 and 1st half of July 1997, while the second appeared in the 2nd. half of July 1996 and 2nd half of August 1997, fig 2. Batt (1991) found that the population percentages of beetles exhibited that maximum abundance of *S.trispinosa* beetles occurred during July.

Significant positive correlation was obtained between the max. temp. and number of emerged beetles during 1996 and 1997 ($r = 0.773$ and 0.667), the same trend seemed with min. temp. ($r = 0.684$ and 0.709 in 1996 and 1997, respectively), while the correlation between R.H. and number of emerged beetles was insignificant in both years ($r = -0.273$ and 0.108).

Cratocentrus sp. parasite

The first appearance of adult parasite occurred in the 1st half of April 1996 and 1997. Parasite emergence continued until 1st half of September of two years. Three peaks were observed during the period activity of parasite, the first peak occurred in 2 nd. half of may 1996 and 1997, the second peak observed in the 2 nd half of June 1996 and the 1st half of July 1996, while the third peak appeared in the 1st half of August 1996 and 1997, Fig 2.

The correlation between the max. temp. and number of emerged parasites was positive and significant ($r = 0.620$) in 1996, while it was insignificant ($r = 0.446$) in 1997. Insignificant correlation ($r = 0.319$) appeared between min temp. and number of emerged parasites in 1996, while the correlation was significantly positive ($r = 0.525$) in 1997. On the other hand, R.H. gave negative significant correlation ($r = 0.591$) with the number of emerged parasites in 1996 and insignificant correlation ($r = -0.218$) in 1997.

Percentage of parasitism.

Under field conditions, the obtained results from tested infested fig trees indicated that the percentage of parasitism by chalcidid parasite varied from 0 up to 62.5% per tree. General percentage of parasitism varied from 18.3% to 24.9%. Re-

relationship between the number of *S.trispinosa* beetles tree and percentage of parasitism by *cratocentrus* sp., Table 10, revealed that the percentage of parasitism in heavy infestation was comparatively lower than that of light infestation.

Monthly percentages of parasitism, Table 11, differ during successive months of activity. Highest percentages were 52.6% and 85.7% found in April 1996 and 1997, respectively, while lower percentages were 22.20% recorded in June 1996 and 11.5 and 11.5% observed in September 1997. On the other hand, the monthly general percentages of parasitism were 29.4% and 29.6% in 1996 and 1997, respectively.

Vertical and directional distribution of *S.trispinosa* parasite

Directional distribution of parasites are given in Table 12. Highest percentage of emerged parasites (27%) recorded from eastern direction, while the lowest one (2%) emerged from western direction. Highly significant between the percentages number of parasites were obtained, (chi-square value = 51.7).

According to statistical analysis, the percentages could be grouped into three groups, as follows:

- a) E. (27%) and S.e (24%).
- b) S.w (13%), S. (12%), N.e (12%), N.w (5%) and N. (5%).
- c) N.w (5%), N. (5%) and W. (2%).

Batt (1991) found that 30% of *S.trispinosa* beetles emerged from east, while 3% only emerged from northwest direction.

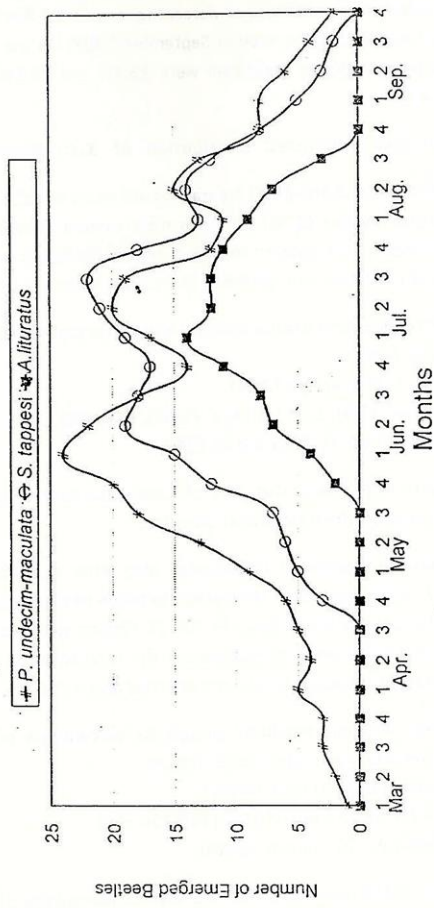
Vertical distribution of parasites also differ at different heights of trees, Table 13. Highly significant differences between percentages of emerged parasites were obtained, (chi-square value = 108.3). Highest percentages (63%) recorded at 50-100 cm. height and the least percentage (4%) recorded at 150-200 cm height, while no emerged parasites had been recorded above 200 cm. height.

Three different significant groups for percentages of emerged parasites at different heights were obtained, as follows:

- a) 63% (at 50-100 cm height)
- b) 17% (0-50 cm) and 16% (100-150 cm)
- c) 4% (at 150-200 cm. height).

Batt (1991) recorded that the highest percentage of *S.trispinosa* emerged

Fig.1. Weekly number of *Ptosima undecim-maculata*, *Sphenoptera tappesi* and *Agrilus lituratus* beetles emerged from plum branches during 1997 year.



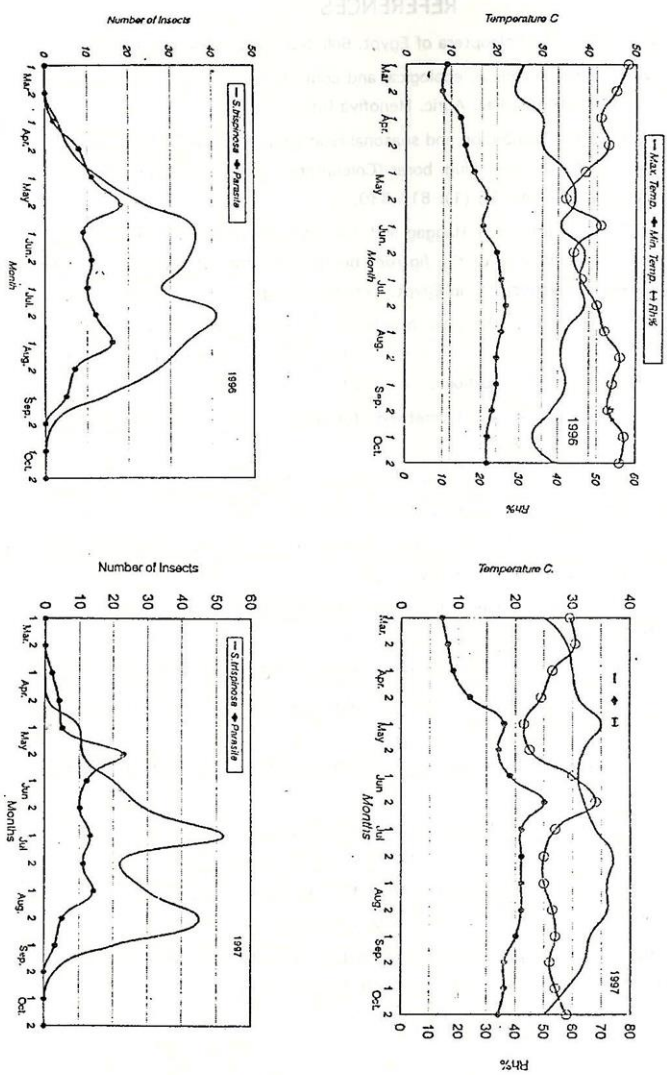


Fig. 2. Half monthly numbers of emerged *S. trispinosa* beetles and their parasite from fig trees during 1996 and 1997 at Fayoum Governorate.

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حصن للناخرات التي تهاجم اشجار الفاكهه متساقطه الاوراق في مصر مع اجراء بعض الدراسات البيولوجيه والايكولوجيه عليها

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تعتبر أشجار التفاح والمشمش والتين والعنب والخوخ والكمثري والبرقوق من أهم أشجار الفاكهه متساقطة الأوراق في مصر. أجريت دراسات لحصن الناخرات التي تصيب هذه الاشجار، حيث أوضحت عن وجود ٢٧ نوعاً من الحشرات تتبع ٧ فصائل من رتبتي غمديه الاجنحه وحرشفيه الاجنحه.

تمتد فتره النشاط الموسمي لخنفساء *Agrius lituratus* من الاسبوع الرابع من مايو حتي الاسبوع الثالث من أغسطس وتظهر فيه قمه واحدة لتعداد الحشرات في الاسبوع الأول من يوليو، بينما تمتد فتره نشاط خنفساء *Ptosima undecim-maculata* من الاسبوع الاول من مارس حتي الاسبوع الاخير من سبتمبر مسجله ثلاث قمم لنشاط هذه الحشره في حين وجدت قمتين لخنفساء *Sphenoptera tappesi* خلال فتره نشاطها الممتد من الاسبوع الرابع من إبريل حتي الاسبوع الثالث من سبتمبر.

وجدت اختلافات كبيره بين النسب المئوية للإصابة لكل ناخر علي العوائل المختلفه (التفاح - المشمش - الخوخ - الكمثري - البرقوق).

- أظهرت الوفرة الموسميّه وتحولات أطوار النمو لخنفساء *Niphona picticornis* أن لهذه الحشره جيل واحد سنويًا، وكان متوسط الفتره اليرقيه ٢٠٥ يوما، بينما كان طول فتره ما قبل العذراء ٩ أيام والعذراء ١٨ يوما. هذا وقد وجد أن أعلى نسبة تعداد لكل من طوري ما قبل العذراء والعذراء خلال شهر سبتمبر، أما الحشره الكامله فانها تظل داخل افرع التين ما بين ٢٦ - ١٦٨ يوما قبل خروجها، بينما تعيش فتره تتراوح بين ٧ - ٨٠ يوما بعد خروجها. كما وجد أن أعلى وفرة لهذه الخنفساء داخل العائل كانت خلال ديسمبر، بينما سجلت أعلى نسبة مئوية لتعداد الخنفساء الخارجه خلال شهري يناير ومارس.

وجد أن خنفساء *Sphenoptera trispinosa* لها قمتين من التعداد للحشره الكامله في حين ظهر لطفيل يرقات هذه الخنفساء ثلاثه قمم خلال فتره النشاط الممتدة من إبريل وحتى سبتمبر. وقد وجد أن النسبة المئوية للطفيل تختلف خلال أشهر النشاط المختلفه، حيث كانت النسبه العامه للطفيل ٢٩,٤٪ / ٢٩,٦٪ خلال ١٩٩٦، ١٩٩٧ علي التوالي.

وسجلت أعلى نسبة لخروج الطفيل في الاتجاه الشرقي كما خرجت اعلي أعداد له عند ارتفاع ٥٠ - ١٠٠ سم من سطح الارض.