

Population Density of some Insect Pests Infesting Fallen Soft Dates and their Associated Natural Enemies in Giza Governorate, Egypt

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ABSTRACT

This study aimed to determine the population density and survey the insect pests infesting fallen dates fruits of soft cultivars (Zagloul, Samani and Amhat) in Giza Governorate, Egypt and associated natural enemies, parasitoid and predatory species during two successive seasons 2016/2017 & 2017/2018. Ten insect pests belongs to three insect orders (Lepidoptera, Coleoptera, and Homoptera) were recorded. Lepidopterous insects were, *Batrachedra amydraula* Meyrick (Fam.: Cosmptergidae), *Arenipses sabella* Hampson (Fam.: Pyralidae), *Ephestia calidella* Guenee (Fam. Pyralidae), *Ephestia cautella* Walker (Fam. Pyralidae), *Ectomyeloides ceratoniae* Zeller (Fam. Pyralidae) and *Stathmopoda auriferella* (Walker) (Fam. Stathmopodidae). Coleopterous pests were *Coccotrypes dactyliperda* (Fabricius) Fam. Scolytidae, *Carpophilus* spp. (Fam. Nitidulidae) and *Oryzaephilus surinamensis* Linnaeus (Fam. Silvanidae). The Homopterous insect was *Parlatoria blanchardi* Targioni (Fam. Diaspididae), one predatory species, *Labidura riparia* Pallas, (O.:Dermoptera: Fam.: Labiduridae) and one parasitoids species *bracon hebetor* (Say) (Hymenoptera: Braconidae) were found. Results showed that there was no significant difference between the numbers of insects in the two years of study or between the three tested cultivars. While there were significant differences between the inspection dates and between the recorded insect's species numbers. In addition, the results showed that the highest average number of the insect species were *Carpophilus* spp. followed by *E. calidella*, *P. blanchardi* and *E. cautella* respectively. Mean daily temperature & RH had a low and negative effect on insect population density, while there were differences between the insect pests numbers in different date of inspection. In addition, there was a significant difference between the insect pests numbers, which belongs to order Homoptera and each of (Lepidoptera and Coleoptera). Regarding infestation, percentage, there were significant differences between the averages infestation percentage for the three tested cultivars as well as between the two years of study. *Bracon hebetor* (Say) was the only recorded parasitoid during the period of study. Percentages of parasitism had no significant difference between the two years of the study, while it had a significant difference between the three date palm cultivars.

Keywords: Date palm pests, Population density, Survey, Predators, Parasitoids.

INTRODUCTION

Date palm has a great importance as a source of food and heritage symbols especially in the Arab world, which is characterized by the breadth of its area and diversity of its climate, which helped in the spread of date palms cultivation in many areas of it. Egypt occupies the first place for date production in the world since 2001 till now, accounting for 21.5% of the world's date production. The number of palm trees in Egypt reached about 16 million palm trees, of which 15 million producing female palm trees, or about 6.32% of the total cultivated area of fruit in Egypt, Egyptian Ministry of Agriculture (2015). Many pests affect all parts of the date palms, where these pests cause significant damage affecting the yield quantity and quality of the date fruits. Date fruits are severely infested by many insect species belonged to different orders. Lepidoptera is one of the most important orders, which contained many economic date fruits insect pests such as the greater date moth, *Arenipses sabella* Hampson (Pyralidae) which attacks unripe, ripe and fallen date fruits Imam, (2012). *A. sabella* was recorded in many farms of date palm at EL-Baharia Oases, Egypt, from March to June (Mikhael and Abul Fadl, 2011). Larvae of *A. Sabella* attack developing spathes and bore into heart leaves, fruit stalks, developing fruits and fruits all the year Kashif *et al.*, (2002) in Egypt and Cohen *et al.*, (2010) in Israel. Second serious insect is the lesser date moth, *Batrachedra amydraula* Meyrick (Cosmptergidae) which infests newly developed fruit spathes was also recorded in the New Valley Governorate (Sayed and Ali, 1995); AL-Arish, north Sinai (El-Sherif *et al.*, 1998); and Pakistan (Kakar *et al.*, 2010). Sayed and Temerak (1995) and Sayed (2000) recorded that *Cadra (Ephestia)* spp. infested palm dates fruits at Kharga Oasis, New Valley Governorate. Kashif *et al.* (2002) in Siwa and Hameed *et al.* (2011) in Iraq recorded Oases date moth, *Ephestia calidella* Guenee (Pyralidae) as a Serious pest at the end of the season. Also the almond moth (fig moth) *E. cautella* Walker (Pyralidae) was recorded in Siwa and the Governorate of New Valley in Egypt Kashif *et al.*, 2002;

Hameed *et al.*, 2011 in Iraq and Ben Jemaa *et al.*, 2012 in Tunisia. The larvae of *E. cautella* affect mature and semi-mature fallen date fruits as well as stored dates during storage. In addition, carob moth, *Ectomyeloides ceratoniae* Zeller (Pyralidae) is also one of the most dangerous pests of date fruits and it recorded on fallen date in Siwa Oasis, Egypt Kashif *et al.* (2002) and in USA Nay and Perring (2009). The second important date fruit insects order is Coleoptera. Date palm fruits are severely infested by many coleopterous insect species among which *Coccotrypes dactyliperda* (F.), *Carpophilus* spp. and *Oryzaephilus surinamensis* L., are serious pests of dates. The date-stone beetle *C. dactyliperda* was recorded as a new pest of immature dates in Iraq Al-Hafidh and Swair, (1981) and in different places of the World Hussain, 1990. In Egypt, Boraei, (1994) studied the biology, damage and food preference of *C. dactyliperda* as new serious pests of date palms at the northern regions of Egypt. Different species of genus *Carpophilus* was known as serious pests of many fruits as onion and apples (Ciampolini and Maiolini, 1991) and on dates (Al-Azawi *et al.*, 1984). The biology of the nitidulid beetle *Carpophilus* sp. investigated by Porter (1986) and Henckes (1992). Studies on the damage, life history and temperature effects on *Oryzaephilus surinamensis* infesting stored grains and dates reviewed by Obeng (1993) and Throne and Cline (1994). Date palm scale *Parlatoria blanchardi* from the third insect recorded order (Homoptera: Diaspididae) is a dangerous pest due to the damage it causes to date palm (*Phoenix dactylifera*). One of the main pest species threatening date palm orchards in oases of Arab countries is *Parlatoria blanchardi*, (Zaid *et al.* 1999; El-Shafie 2012). The present work aimed to survey the economic insect pests of fallen date fruits and their associated parasitoid and predatory species in Giza Governorate, Egypt.

MATERIALS AND METHODS

This work was carried out in the orchard of Research Station of the Agricultural Research Center as well as the Faculty of Agriculture, Cairo University, Giza Governorate.

Egypt during the two successive seasons (2016/2017 and 2017/2018).

Survey of insect pests and its associated natural enemies species.

The insect pests and its associated natural enemies found in the fallen dates under the three soft date palm trees cultivars (Zaghloul , Samani and Amhat) were exclusively covered from 22th June 2016 to 3^d July 2018. Samples of fallen dates were collected from under palm trees every two weeks at random 100 fruit for each cultivar. The date fruits are then examined externally and internally to record the numbers of infested dates as well as the number of insect pests present and determined which order and family its belongs to. After examining the collected fallen dates, each cultivar dates was placed in a 2-liter plastic jar, covered with muslin, attached with two layers of rubber band and incubated at 27±2°C for two weeks until the adult's stages of the insects.

Date fruits infestation percentage by insect pests

One hundred date fruits were collected randomly every two weeks from under palm tree of each of the three tested cultivars during the two years of study and infestation percentage were calculated.

Parasitism percentages

The parasitized larvae, which do not move well, are examined under the binoculars to verify the presence of exo-parasites, each larva placed individually in a 10 mL tube

covered with cotton until the adult parasite comes out. Each parasite was placed in a tube of 70 % Ethyl alcohol and glycerin for identification. Percentage of parasitism was calculated as numbers of parasitized larvae related to the total number of collected larvae.

Common predatory species, which found on date fruits at the Research Station of the Agricultural Research Center and the Faculty of Agriculture, Cairo University were observed and recorded.

The definition and classification of insects found in fallen dates, emerged pests, parasitoids, and predators was at the Department of Pests and Palm Diseases at the Central Laboratory of date palm trees of the Agricultural Research Center in Giza by Prof. Dr. Abd Rabou Eid Hussein Hassan, Plant Protection Dept., Fac. of Agric., Al-Azhar University, Cairo, Egypt.

Statistical analysis Obtained data of different variables were analyzed using Proc., ANOVA in SAS (SAS Institute 2006).

RESULTS AND DISCUSSION

1. Survey of insect pests infesting fallen soft date fruits at Giza Gov. during 2016-2018:

Data presented in Table (1&2) showed that ten fallen date insect pests belong to three insects orders (Coleoptera, Lepidoptera, and Homoptera) were recorded during the two-years of survey from June 2016 to July 2018.

Table 1. Number of Insect species collected from fallen date palm fruits in Giza Governorate during 2016 / 2017.

Inspection Date 2016/2017	Zaghloul			Samani			Amhat		
	Lep.	Col.	Hom.	Lep.	Col.	Hom.	Lep.	Col.	Hom.
22 June 2016	1			2			2		
6 July 2016	1	3	26						
20 July 2016				1	1	5			5
3 August 2016			3			20			
17 August 2016	4		8			19			130
31 August 2016						14			12
14 September 2016			12			4			4
28 September 2016			234						20
12 October 2016			28	6	18				15
26 October 2016	4	2		3	4				14
9 November 2016	28			15	10				13
23 November 2016	13	8		5	10	7	3		44
7 December 2016	83	8			24	3	18	3	19
21 December 2016	30	10		5	10	7			36
4 January 2017	17	33	3		18	4	4		55
18 January 2017	33	20			23	8			36
1 February 2017	18	11	7	4	7	7	3		
15 February 2017	27	6	9		23	7	7		3
1 March 2017	20	3			24	6	3	3	3
14 March 2017	7			3	11				
28 March 2017	3				5				
11 April 2017	3	3			4				
25 April 2017	3				4				
9 May 2017				12					11
23 May 2017									
6 June 2017									
20 June 2017				12					

Lep. = Lepidoptera Col. = Coleoptera Hom. = Homoptera

They could be arranged according to their first appearance in inspected fallen date fruits as follows: *Batrachedra amydraula* Meyer, the lesser date moth (Lepidoptera: Cosmopterigidae), *Coccytrypes dactyliperda* (Fabricius) (Coleoptera: Scolytidae), *Carpophilus* spp. (Coleoptera: Nitidulidae), date palm scale insect *Parlatoria blanchardi* (Homoptera: Diaspididae), *Oryzaephilus surinamensis* Linnaeus (Coleoptera: Silvanidae), the fig moth (almond moth) *Ephestia cautella* Walker (Lepidoptera: Pyralidae), *Ephestia calidella* Guenee the Oases date moth, (Lepidoptera: Pyralidae), carob moth, *Ectomyelois ceratoniae* Zell. (Lepidoptera: Pyralidae), *Stathmopoda auriferella* Walker (Lepidoptera: Heliodinidae) and finally date bunch moth (greater date moth), *Arenipses sabella* Hmp. (Lepidoptera: Pyralidae). Infestation with the mentioned insects started by *B. amydraula* which infesting newly shaped date fruits and resulted in fruit fall and decrease crop quantity while infestation by *Ephestia* spp., *E. ceratoniae* *S. auriferella*, and *A. sabella* happened after harvesting. Hussain, et al. (2016) recorded five Lepidopteran date palm fruit pests i.e., *Arenipses sabella* Hampson (Pyralidae), *Batrachedra*

amydraula Meyrick (Cosmopterigidae), *Ephestia cautella* Walker, *E. calidella* Guenee and *Ectomyelois ceratoniae* Zeller (Pyralidae), in his survey in Siwa Oasis, Egypt, during 2012 and 2013. Gharib and Hussain (2011) recorded eleven insect pests infesting Post-harvest residual dates under the date palm trees belonging to 10 families of three orders (Lepidoptera and Coleoptera) were recorded. The most dangerous pests of order Coleoptera and Lepidoptera were *O. surinamensis* and *E. calidella*. Kashif et al. (2002) and recorded six pest species; *A. sabella*, *B. amydraula*, *Virachola livia*, *E. cautella*, *E. calidella*, and *Ectomyelois ceratoniae* as palm fruit pests in Siwa Oasis during the years 1997-2000. *A. sabella* was the most dangerous one causing a great loss because the larvae ate the newly formed spathes underneath palm tree fibers and infested bunch stalks severely that broken under the heavy weight of full ripped date fruits (Cohen et al., 2010 and Imam, 2012). *E. cautella*, *E. calidella* and *E. ceratoniae* that recorded attacking date fruits in fields and stores are the most serious and destructive lepidopterous insect pests infesting date storage in , Oman, USA, Iraq and Tunisia (Nay and Perring, 2009; Hameed et al.,2011 and Ben Jemaa et al., 2012).

Table 2. Number of Insect species collected from fallen date palm fruits in Giza Governorate during 2017 / 2018.

Inspection Date	Zagloul			Samani			Amhat		
	Lep.	Col.	Hom.	Lep.	Col.	Hom.	Lep.	Col.	Hom.
2017/2018	<i>Batrachedra amydraula</i> <i>Ephestia calidella</i> <i>Ephestia cautella</i> <i>Ectomyelois ceratoniae</i> <i>Stathmopoda auriferella</i> <i>Arenipses sabella</i> <i>Coccytrypes dactyliperda</i> <i>Carpophilus</i> spp. <i>Oryzaephilus surinamensis</i>			<i>Parlatoria blanchardi</i> <i>Batrachedra amydraula</i> <i>Ephestia calidella</i> <i>Ephestia cautella</i> <i>Ectomyelois ceratoniae</i> <i>Stathmopoda auriferella</i> <i>Arenipses sabella</i> <i>Coccytrypes dactyliperda</i> <i>Carpophilus</i> spp. <i>Oryzaephilus surinamensis</i>			<i>Parlatoria blanchardi</i> <i>Batrachedra amydraula</i> <i>Ephestia calidella</i> <i>Ephestia cautella</i> <i>Ectomyelois ceratoniae</i> <i>Stathmopoda auriferella</i> <i>Arenipses sabella</i> <i>Coccytrypes dactyliperda</i> <i>Carpophilus</i> spp. <i>Oryzaephilus surinamensis</i>		
4 July 2017	2	4					1		11
18 July 2017		4		3			5		11
1 August 2017	1	2							76
15 August 2017	5	2	35	2	3	17	4	5	48
29 August 2017	1	22	29	3		19	13	42	26
12 September 2017		45	6			9	3	5	18
26 September 2017		38				29	8		12
10 October 2017		78		19		9			9
24 October 2017		7		6		56	8		27
7 November 2017	22	4	10	11	5	2	5	63	11
21 November 2017	33	3	2	23	13	8	4	29	10
5 December 2017	53	13	2	17	26	7	14	61	9
19 December 2017	47	8	4		13	5	11	57	3
2 January 2018	24	13	2		20	6	5		7
16 January 2018	32	21	5	33	25	9	5		8
30 January 2018	29	18	2	36	8	9	5	5	10
13 February 2018	23	14	5		26	9	2		11
27 February 2018	13	14	7	22	23	8	4	6	9
13 March 2018	17	5	2	13	13	1	2	3	6
27 March 2018				7	6	2			3
10 April 2018	5		11					16	2
24 April 2018	6	4	1				2		5
8 May 2018	2			4	3				1
22 May 2018									4
5 June 2018									2
19 June 2018		2							3
3 July 2018		4							2

Lep. = Lepidoptera Col. = Coleoptera Hom. = Homoptera

2-Survey of parasitoid species:

Only one species of insect parasitoids *Bracon hebetor* (Say) (Hymenoptera: Braconidae) was recorded emerging from the collected infested date fruits larvae in

the two inspection years. *Bracon hebetor* (Say) consider as a gregarious ecto-larval parasitoid of *E. cautella*, *E. calidella*, *E. ceratoniae*, and *A. sabella*. Hussain, et al. (2016) found in his study that *Bracon hebetor* (Say)

infesting fallen date fruits lepidopterous insect. In Egypt, Kashif *et al.* (2002) recorded *B. hebetor* as one of five parasitoid species which emerged from lepidopterous larvae that infesting fruit dates in Siwa Oasis from 1997-2000. Brower and Press (1990) In USA, recorded *B. hebetor* parasitized *E. cautella*. In Iraq, Al-Maliky and Al-Izzi (1986) found that, *B. hebetor* parasitized *E. ceratoniae*.

3 - Survey of predatory species:

Only one species of insect predators were recorded in the two inspection years and only on associated with the insects collected from fallen dates of cultivar Samani as an adult of *Labidura riparia* (O.:Dermaptera: Fam.: Labiduridae) Al Dhafer and Alayeid, (2014) recorded *Labidura riparia* with Robinson-type light traps placed in 16 date palm commercial orchards in the Al-Kharj region, Riyadh Province, Saudi Arabia, for 12 months from June 2007 to May 2008.

Data presented in Table (3) showed that, the effect of three factors (years, cultivars, insect pests species) on the number of insects collected from fallen dates from 2016 to 2018. Analyzed and compared data indicated that there was no significant difference between the numbers of insects in the two years of study or in the three tested cultivars. While there were significant differences between the recorded insect's species numbers. The results in Table (3) showed also that the highest averages insect pests species recorded on the fallen dates during the two years and the three tested date cultivars were the averages number of *Carpophilus spp. followed by E. calidella, P. blanchardi* and *E. cautella* respectively.

4. The effect of weather factors on the population density of insect pests species collected from fallen date fruits in Giza Gov. during 2016 - 2018:

The obtained results presented in Table (4) revealed that, the effect of weather factors (mean daily temperature &RH) and inspection dates on the population density of insect pest species collected from fallen dates from 2016 to 2018. The simple correlation coefficient (r) value between average temperature and insect population density of the fallen dates indicated non -significant negative correlation during the two tested years. The correlation coefficient between daily mean R.H.% and the insect population density

Table 4. the relation between insect pests population density, weather factors and inspection dates.

Years	Factor	Simple Correlation		Multiple regression							
		r	P	b	P	F	P	EV %			
1	Temp.	-0.34062	0.2334	-0.13476	0.2599	0.73	0.5055	11.67			
	RH	-0.05773	0.8446	0.01337	0.9307						
	Inspection dates	-	-	-	-				6.47	0.0104	66.01
	Combined	-	-	-	-				4.52	0.0296	73.86
2	Temp.	-0.35423	0.214	-0.07271	0.5431	4.95	0.0293	47.38			
	RH	0.67449	0.0081	0.19533	0.0207						
	Inspection dates	-	-	-	-				11.06	0.0016	76.84
	Combined	-	-	-	-				5.58	0.0166	77.71

r = simple correlation coefficient value b = Multiple regression coefficient value P = probability Level E.V.: Explained variance

5. Comparison between the insect pests numbers in the three tested orders from 2016 to 2018.

Results illustrated in Fig. (1) revealed that the total numbers of date fallen fruit insect pests belongs to the three insects orders (Lepidoptera, Coleoptera, and Homoptera) .In the first year of inspection 2016/2017 for order Lepidoptera were (417, 345 and 254) for cultivars (Zaglol, Samani, and Amhat) respectively, and they were (454, 457 and 241) for order Coleoptera of the same three Cultivars, while order Homoptera had (63,0 and 174) for the same cultivars also . In the second year, total Lepidopterous insect numbers were (452,352 and 301) for the three tested cultivars (Zaglol,

showed non -significant negative correlation during the first year (2016/2017), While there was a significant positive correlation in the second year (2017/2018).The effect of combination of (temperature, RH & inspection dates) on the insect pests population density during 2016 to 2018 was presented as explained variance (E.V. %) which was 11.67, 66.01 and 73.86 for (temp.&RH, inspection dates, and the three factors together) in 2016 / 2017. While the E.V. % was 47.38, 76.84 & 77.71 for (temp.&RH, inspection date, and the three factors together) in 2017/2018. It is possible to summarize the above that it was found during the two tested years of the examination that the factors of mean daily temperature &RH had a low and negative effect on insect population density, while the effect of inspection dates was strong, positive and high. The combined effect of temperature &RH was also low and negative, while when calculating the combined effect of the three factors together, it was found that it was highly significant and interpreted as the dates of the examination or the time factor is the one that shows the presence of the insect's host, which is fallen dates.

Table 3. Factorial Analysis for the significance of different studied factors.

Factors	Level	Mean	
Years	2016/2017	2.9012	a
	2017/2018	3.0802	a
P		0.677	
LSD		-	
Cultivars	Zagloul	3.4241	a
	Samani	2.8333	a
	Amhat	2.7148	a
P		0.351	
LSD		-	
Insects	<i>B. amydracula</i>	0.2222	d
	<i>E. calidella</i>	7.7284	b
	<i>E. cautella</i>	2.9383	c
	<i>E. ceratoniae</i>	1.7901	cd
	<i>S. auriferella</i>	0.1173	d
	<i>A. sabella</i>	0.0309	d
	<i>C. dactyliperda</i>	0.5494	d
	<i>Carpophilus spp.</i>	11.2963	a
	<i>O. surinamensis</i>	1.6049	cd
	<i>P. blanchardi</i>	3.6296	c
P		0.0001	
LSD		1.88	

Samani, and Ahmet) respectively, and they were (371,394 and 258) for Coleopterous insects, while Homopterous insects recorded (70, 44 and 238) for the same tested cultivars.

The recorded results presented in Table (5) showed that, the comparison between the insect's numbers in the three tested orders from 2016 to 2018. Data revealed that there was no significant difference between the mean numbers of insect pests found in fallen dates within the two studied years 2016/2017 &2017/2018 as well as between the three tested cultivars. While there was a significant difference between the three recorded orders (Lepidoptera, Coleoptera, and Homoptera) in insect pests numbers. There

were a significant differences between the insect pests numbers belongs to order Homoptera and the other two recorded orders (Lepidoptera and Coleoptera) while there was no significant difference between the insect pests numbers belongs to orders (Lepidoptera and Coleoptera).

Results in Table (6) explained the existence % of the three recorded orders and their insects. Data showed that the existence% was (44.96, 42.91 and 12.13 %) for orders (Coleoptera, Lepidoptera, and Homoptera) respectively .the most serious pest of coleopteran was *Carpophilus spp.* (37.76 %) followed by *O. surinamensis* (5.36%) and the most serious pest of Lepidoptera was *E. calidella* (25.83 %) followed by *E. cautella* (9.82%) while, only one pest of Homoptera *P. blanchardi* (12.13%). Gharib and Hussain (2011) mentioned that the existence (%) reached 51.0, 40.1 for the orders of Coleoptera and Lepidoptera respectively. The most dangerous pests of order Coleoptera and Lepidoptera were *O. surinamensis* (43.5) and *E. calidella* (39.4 %).

Table 5. Comparison between the insect pests numbers in the three tested orders from 2016 to 2018.

Factors	Level	Mean	
Years	2016/2017	9.848	a
	2017/2018	9.996	a
P value		0.934	
LSD		-	
Cultivars	ZAGLOL	11.278	a
	SAMANI	9.827	a
	AMHAT	8.66	a
P value		0.493	
LSD		-	
Orders	Lepidoptera	13.068	a
	Coleoptera	13.136	a
	Homoptera	3.562	b
P value		0.0001	
LSD		4.333	

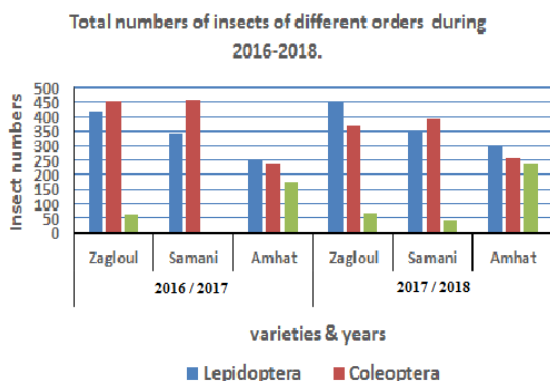


Fig. 1. Total numbers of insects of different orders during 2016-2018.

Table 6. The existence percentage (%) of insect pest species and their orders collected from fallen fruit dates during 2016 - 2018.

Orders	Insects	Total N. of Insect	Insect %	Order %
Lepidoptera	<i>B. amydraula</i>	38	0.78	
	<i>E. calidella</i>	1252	25.83	42.91
	<i>E. cautella</i>	476	9.82	
	<i>E. ceratonia</i>	290	5.98	
	<i>S. auriferella</i>	19	0.39	
	<i>A. sabella</i>	5	0.10	
Coleoptera	<i>C. dactyliperda</i>	89	1.84	
	<i>Carpophilus spp.</i>	1830	37.76	44.96
	<i>O. surinamensis</i>	260	5.36	
Homoptera	<i>P. blanchardi</i>	588	12.13	12.13
Grand total		4847	100	100.00

6. Infestation percentage of fallen date palm fruits by different insect pests from 2016 -2018.

Data illustrated in Fig. (2 & 3) showed that in the first year of inspection 2016/2017, the average infestation percentages were (24, 15 and 12 %) for the three tested cultivars (Zaghloul n Samani and Amhat) respectively. The infestation percentages were highest (81,45and 32%) in (7 Dec., 7 Dec. and 21 Dec. 2016) for the three tested cultivars (Zaghloul, Samani and Amhat) respectively. While they were the lowest (1, 2 and 1%) in 9 may 2017 for the three tested cultivars (Zaghloul , Samani and Amhat) respectively. In the second year of inspection 2017 / 2018, the average infestation percentages were relatively higher than in 2016/2017 recording (35, 20 and 16) for the three tested cultivars (Zaghloul n Samani and Amhat) respectively. The infestation percentages were highest (94, 51and 43%) in (15Aug. 2017, 5 Dec.2017 and (21 Nov.2017& 2 Jan. 2018)) for the three tested cultivars (Zaghloul n Samani and Amhat) respectively. While they were the lowest (1,2and 1%) in (24 Oct.2017, 42 April 2018 and 3 July 2018) for the three tested cultivars (Zaghloul , Samani and Amhat) respectively.

The obtained results presented in Table (7) cleared that, the significance between date palm cultivars and infestation percentage over two years 2016 to 2018. Data revealed that there were significant differences between the infestation percentages within the three tested cultivars as well as between the two years of study. It was found that there was a significant difference between the average infestation percentage of Zaghloul and other cultivars (Samani and Amhat), while there was a non-significant difference between the mean infestation percentage between the Samani and Amhat during the two years under study. The average infestation percentage over the two years of the three species were (24.48, 14.74 and 12.00) for Zaghloul, Samani, and Amhat for 2016 /2017, respectively, while the average infestation percentage were (34.85, 19.18 and 16.37) for Zaghloul, Samani and Amhat for 2017 /2018, respectively.

Table 7. Significance between date palm cultivars and infestation percentage over two years 2016 to 2018.

Years	2016/2017		2017/2018	
Zaghloul	24.481	a	34.852	a
Samani	14.741	b	19.963	b
Amhat	12	b	16.37	b
P		0.0002		0.0001
LSD		5.91		7.583

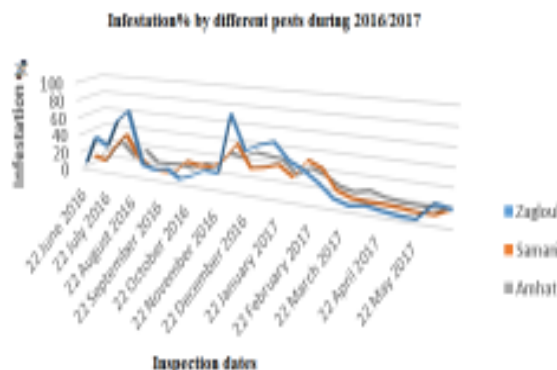


Fig. 2. Infestation percentage by different pests attacking fallen date palm fruits in Giza Gov. during 2016 /2017.

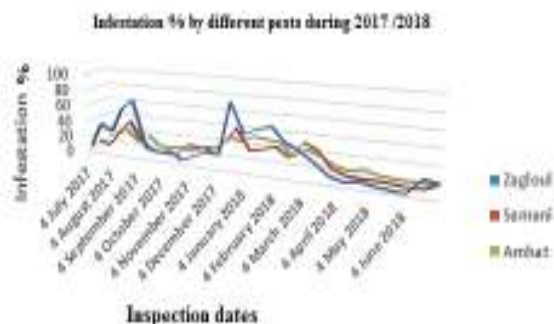


Fig. 3. Infestation percentage by different pests attacking fallen date palm fruits in Giza Gov. during 2017 /2018.

7. Parasitism percentage of Lepidopterous larvae by *Bracon hebetor* in fallen date palm fruits from 2016 - 2017.

Data illustrated in Fig. (4 & 5) indicated that there were comparatively two peaks of parasitism percentage mentioned in each year, in the first year of inspection 2016/2017 in Zagloul Cultivar the peaks were (9.89 , 11.32 and 13.39 %) at (7 Dec. 2016 ,4 Jan. 2017 and 1 Feb. 2017) and for Samani cultivars it was (20 ,16.67 %) at (23 Nov. 2016 and 1 Mar. 2017) while in Amhat Cultivar (16.67 & 20.69 %) at (7 Dec. 2016 &15 Feb. 2017). In the second year of inspection 2017 /2018, Zagloul peaks were (13.79 & 11.90 %) at (16 Jan. 2018 & 13 Feb. 2018)) and for Samani cultivars it were (16.13 ,12.50%) at (2 Jan. 2018 & 13 Mar. 2018) while in Amhat Cultivar (16.67 &8.16 %) at (21 Nov. 2017 &30 Jan.2018).

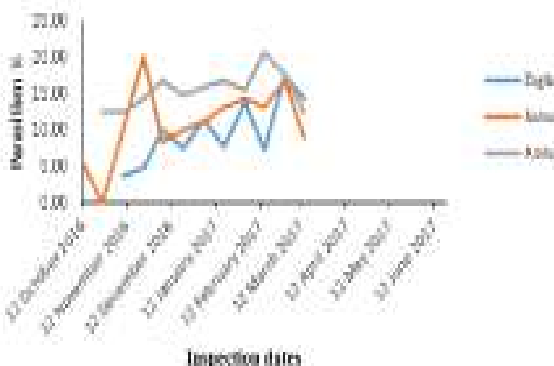


Fig. 4. Parasitism percentage by *Bracon hebetor* in collected larvae from fallen date palm fruits in Giza Gov. during 2016 /2017.

Results presented in Table (8) showed that, the relation between parasitism percentage of lepidopterous larvae by *Bracon hebetor* and date cultivars during the two tested years 2016 /2017 &2017/2018. Our data revealed that there was no significant difference between lepidopterous larval parasitism percentages in the two years of the study from 2016 to 2018, while there was a significant difference between parasitism percentages in the three date palm cultivars. The data showed that there was a significant difference between the parasitism percentages of the Zaghlol cultivar and the other two varieties (Samani and Amhat), while there was no significant difference between the parasitism percentages of the Samani and Amhat cultivars. In Egypt, Hussain, *et al.* (2016), Parasitoids, *Bracon hebetor* (Say), was recorded and it was active throughout the winter

and its Parasitism percentage on *E. calidella* reached 11.9 Gharib and Hussain (2011). Kashif *et al.* (2002) reported that there were two peaks of parasitism every year on the six inspected insect pests from 1997 to 2000. No parasitoids were recorded during the inspection period May to October during the 3 years of study.

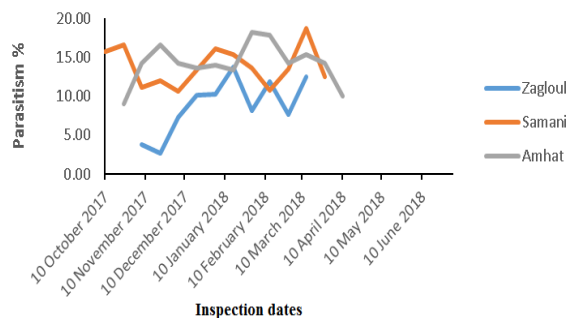


Fig. 5. Parasitism percentage by *Bracon hebetor* in collected larvae from fallen date palm fruits in Giza Gov. during 2017 /2018.

Table 8. The relation between Parasitism percentage by *Bracon hebetor* and date fruits cultivars during 2016 to 2018.

Factors	Level	Mean	
Years	2016/2017	9.471	a
	2017/2018	10.589	a
P value		0.3764	
LSD		-	
Cultivars	ZAGLOL	6.629	b
	SAMANI	11.121	a
	AMHAT	12.34	a
P value		0.0009	
LSD		3.063	

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الكثافة العددية لبعض الآفات التي تصيب البلح الرطب الساقط والإعداد الحيوية المرتبطة بها في محافظة الجيزة - مصر وائل كمال محمد الشافعي المعمل المركزي للنخيل - مركز البحوث الزراعية - الجيزة - مصر

هدفت هذه الدراسة لحصر وتحديد الكثافة العددية للحشرات التي تصيب البلح الرطب لأصناف (زغول، سماني وامهات) الساقط تحت النخيل بمحافظة الجيزة بمصر واعادتها الحيوية (طفيليات ومفترسات) خلال عامين متتاليين (2017/2016) و (2018/2017). تم تسجيل عشرة أنواع حشرية تتبع ثلاثة رتب حشرية وهي (حرشية، غمدية الاجنحة و متشابهة الاجنحة). وقد سجل من رتبة حرشية الاجنحة حشرات الحميرة (دودة البلح الصغرى)، دودة البلح الكبرى (ثاقية العراجين)، دودة بلح الواحات، دودة البلح العامري، دودة الخروب و دودة الثمار. كما سجل لرتبة غمدية الاجنحة حشرات خنفساء النوى، خنفساء الثمار الجافة وخنفساء السورينام. بينما سجل حشرة واحدة لرتبة متشابهة الاجنحة وهي حشرة النخيل القشرية البيضاء. وسجل مفترس حشري واحد وهو ابرة العجوز وطفيل حشري واحد وهو اليراقون الذي وجد مرتبطا بالحشرات المجمععة من البلح الساقط واطهرت النتائج أيضا انه لا يوجد فرق معنوي بين عدد الحشرات خلال عملي الدراسة ولا بين أصناف نخيل البلح الثلاثة المختبرة بينما وجد فروق معنوية بين اعداد الحشرات في مواعيد الفحص المختلفة. كما أظهرت النتائج ان اعلى متوسط لأعداد الحشرات المجمععة من البلح الساقط تحت الثلاث أصناف المختبرة خلال عملي الدراسة كان متوسط اعداد حشرات خنفساء الثمار الجافة يليها دودة بلح الواحات، حشرة النخيل القشرية البيضاء ودودة البلح العامري على التوالي. وقد وجد ان تأثير عملي متوسط درجات الحرارة والرطوبة النسبية اليومية ضعيف على تعداد الحشرات بينما كان تأثير مواعيد الفحص قوي. بالإضافة الى انه وجد فرق معنوي بين اعداد الحشرات المسجلة للثلاث رتب (حرشية، غمدية الاجنحة و متشابهة الاجنحة) حيث كان هناك فرق معنوي بين اعداد الحشرات التابعة لرتبة متشابهة الاجنحة والرتبتين الأخرتين. وقد أظهرت النتائج ان هناك فروق معنوية بين متوسطات نسب الإصابة بين الأصناف الثلاثة المختبرة وكذلك بين عملي الدراسة. وكان طفيل اليراقون هو الطفيل الحشري الوحيد الذي سجل خلال عملي الدراسة، ونسبة التطفل لم يوجد بها أي فروق معنوية بين عملي الدراسة بينما كان هناك فرق معنوي بين نسب التطفل بين أصناف البلح الثلاثة المختبرة.