Zagazig J. Agric. Res., Vol. 47 No. (3) 2020 719-733

Plant Protection and Pathology Research

http:/www.journals.zu.edu.eg/journalDisplay.aspx?Journalld=1&queryType=Master

APHIDOPHAGOUS INSECTS OF THE MEALY PLUM APHID *Hyalopterus pruni* (GEOFFROY) IN APRICOT AT SHARKIA GOVERNORATE, EGYPT

Shehta A.M. Ali*

Plant Prot. Res. Inst., ARC, Dokki, Giza, Egypt

Received: 29/04/2020 ; Accepted: 09/06/2020

ABSTRACT: The present investigation was carried out at El-Khattara District, Sharkia Governorate, Egypt during 2017 and 2018 seasons to evaluate the population density of the aphidophagous insects of the mealy plum aphid *Hyalopterus pruni* in apricot. Two parasitoid species belonging to *Aphidius colemani* Viereck and *Aphidius picipes* (Nees) and eight predator species, namly: *Chrysoperla carnea* Steph., *Chrysopa septempunctata,* Waesmael, *Ccoccinella septempunctata, Coccinella undecimpunctata* L., *Aphidoletes aphidimyza* Rond., *Syrphus corollae* F., *Cydonia vicinia nilotica* Muls. and *Scymnus interruptus* Goeze were recorded. *C. undecimpunctata* came in first rank (16.75 and 17.74%) followed by *C. carnea* (14.85 and 17.16%) followed by *C. septempunctata* (12.61 and 14.96%) then *Cydonia vicinia nilotica* (12.26 and 12.76%), while *Ch. septempunctata, S. corollae, Scymnus interruptus* and *A. aphidimyza* were represented by (11.92 and 11.87%), (11.40 and 9.53%), (10.71 and 9.53%), (9.50 and 6.45%), from the total number of aphid predators during 2017 and 2018 seasons, respectively. The highest percentage of parasitism by the two parasitoids were recorded on the first and last week of May (37.20 and 50.00%) during 2017 season, while in the second season (2018) were recorded in the first week of both May and June (43.28 and 62.01%) respectively, with an average percentage of parasitism 27.12 and 35.98% during the two successive seasons, respectively. Statistical analysis showed that temperature and relative humidity were significant with some insects and insignificant with the other. In general, the parasitoid *A. colemani* and the predator *C. undecimpunctata,* could be mass reared and released for controlling *H. pruni* on apricot trees include integrated pest management programs and crop management against *H. pruni* to save the environment from pollution.

Key words: Contribution in the quality, quantity of the resulting crop.

INTRODUCTION

Aphid species are among the most injurious pests attacking fruit trees, damage caused by aphids is mainly due to feeding on the plant- sap causing direct injury to the trees (**Ismail *et al.*, 1991; Ibrahim, 1994; Ali, 2008; El-Maghraby *et al*., 2008; El-Gantiry *et al.*, 2009; Lozier *et al.* 2009; Saleh and Ali, 2012; Saleh *et al,* 2013; Youssif *et al.*, 2014**).

Apricot trees are by far one of the most important fruit crops in Egypt. They are widely cultivated in Qalubia Governorate, where their fruit represent one of the most important sources of farmers income. This fruit possesses highly nutritional quality, because of its contents of sugars, proteins and vitamins, especially vitamin "A". Besides, it represents one of the best sources of mineral salts including, Phosphorous, Potassium and Calcium. The apricot fruit trees are liable to attack by the mealy plum aphid *H. pruni* (**El- Kady *et al.*, 1970**). In Egypt this aphid has been recognized as a pest of stone fruit trees (*Prunus* spp.), causing considerable damage by sucking the juice and resulting in loss of the yield (**Ibrahim and Afifi, 1994; Abul-Fadi *et al.* 2005**).

Use insecticides in controlling aphids, leads to many problems not only increasing resistant strains of aphids to these chemical substances,

* **Corresponding author: Tel.:** +201008638802
E-mail address: Dr.shehta@yahoo.com

but also in induction of pollution to man and beneficial insects (**El- Maghraby, 1993; Saleh *et al.*, 2013; Ali *et al.* 2020**).

Hyalopterus pruni (Geoffroy) is one of the important insect pests of apricot and peach in Egypt and in the world (**Abul-Fadi *et al.*, 2005; Ali, 2008; Baldacchino *et al.*, 2010; Saleh *et al.*, 2013; Youssif *et al.*, 2014**). Recently, the attention has been focused up on the integrated pest control approach that, appears as an assential aim for sound future of agriculture. The first goal of this approach depends extensively on minimizing the use of chemical pesticides, for avoiding their indiscriminate usage (**Abd El-Salam, 2000; El-Khawas *et al.*, 2003; El-Maghraby *et al.*, 2008; Saleh *et al.*, 2013**).

Little information are known on the natural relationship between *H. pruni* infestation and its natural enemies especially, aphidophagous insects on apricot trees, in the newly reclaimed sandy area. For this reason, this work was conducted to shed light on the population dynamics of aphid *H. pruni,* surveying the most common natural enemies found associated with the previous aphid species, during the period of aphid existence. Such ecological information will undoubtedly help in planning integrated control programs and apricot management against *H. pruni*.

MATERIALS AND METHODS

Estimation the Role Aphidophagous Insects of *Hyalopterus pruni* Population in the Field

This work was carried out at El-Khattara district, Sharkia Governorate, Egypt during 2017 and 2018 seasons. An area of a faddan (4200m^2) was selected. This area received all normal recommended agricultural practices, except absence of any chemical insecticidal treatment. Sampling started in the first week of March. Inspections continued till the 2nd and 3rd week of June during 2017 and 2018 seasons. Weekly sampling of 60 infesting leaves (12 leaves from 5 trees) were randomly, respectively for apricot trees. Collected, kept in paper bag and transferred to the laboratory. The numbers of *Hyalopterus pruni* (nymphs and adults) were recorded for each sample. Meanwhile, the numbers of predators associated with aphid were also recorded. To estimate parasitism rates, mealy plum aphid individuals were fed in the laboratory on their host plant and kept in Petri-dishes until formation of mummies. The mummies were isolated and kept in small glass tubes until emergence of adult parasitoids. Adult emerged from mummies, were classified, counted and their percentages were also calculated. Emerged parasitoids were mounted and identified at the Biological Control Department, ARC, Giza, Egypt. Percentage of parasitism was calculated as weekly means according to **Ferrell and Stufkens (1990)**.

$$\text{Percentage of Parasitism} = \frac{A+B}{A+B+C}\times 100$$

Where:

A= Number of mummified aphids counted at the date of inspection

B= Number of mummified host appeared during the laboratory rearing

C= Number of unparasitized aphids

Effect of Certain Climatic Factors (Maximum, Minimum Temperature and Mean Relative Humidity) on the Population Density of Mealy plum Aphid and Associated Aphidophagous Insects on Apricot at El-Khattara District

For clearing the effect of certain weather factors such as temperature and atmospheric relative humidity on the population density of the studied aphid and their aphidophagous, the daily records of both maximum, minimum temperature and mean relative humidity throughout the two seasons (2017 and 2018) were provided by the Meteorological Central Laboratory for Agricultural Climate, Agricultural Research center, Dokki, Giza, during the whole period of the study, to show the effect of factors as well as their total effect on insects population density, the values of simple correlation coefficient (r), partial regression coefficient (P) and total explained variance (EV%) were calculated using CoSTAT Software Microcomputer Program (**CoSTAT, 2005**).

RESULTS AND DISCUSSION

Survey of Aphid Infesting Apricot and Aphidophagous Insects in El-Khattara District

Results presented in Table 1 show that only the mealy plum aphid *Hyalopterus pruni* (Geoffroy) infested leaves of apricot during two successive seasons of 2017 and 2018 in newly reclaimed sandy area of El-Khattara District, Sharkia Governorate. The total number of *H. pruni* was higher during 2018 season (14688 individuals) than in the first season 2017 (12120 individuals). These results are in agreement with those of **Abul-Fadi *et al.* (2005) and Youssif *et al.* (2014)**.

Two groups of aphidophagous insects associated with *H. pruni* on apricot trees were recorded as follows:

Predators associated with *H. pruni* infested apricot trees

Neuropterous insects

Chrysoperla carnea (Steph.) *Chrysopa septempunctata* Wesmael (Chrysopidae)

Coleopterous insects

Coccinella septempunctata L., *Coccinella undecimpunctata* L., *Cydonia vicina nilotica* and *Scymnus interruptus* (Coccinellidae)

Dipterous insects

Aphidoletes aphidimyza (Rond.) (Cecidomyiidae)

Syrphus corollae (Syrphidae)

Results in Table 1 show that *C. undecimpunctata* came in first rank (16.75%), followed by *C. carnea* (14.85%) then *C. septempunctata* (12.61%) then *Cydonia vicinia nilotica* constituted about 12.26% while *Ch. septempunctata, S. corollae, Scymnus interruptus* and *A. aphidimyza* were represented by 11.92, 11.40, 10.71 and 9.50%, respectively, in the first season (2017).

In the second season (2018), the same trend was observed where *C.undecimpunctata* came in first rank (17.74%) followed by *Ch. carnea* (17.16%) then *C. septempunctata* (14.96%), while *Cydonia vicinia nilotica, Ch. septempunctata, S. interruptus, S. corollae* and *A. aphidimyza* were represented by 12.76, 11.87, 9.53, 9.53 and 6.45% from the total number of aphid predators, respectively (Table 1).

Table 1. Total collected numbers (A) and occurrence percentage (B) of *Hyalopterus pruni* on apricot and associated predators and parasitoids during 2017 and 2018 seasons

Insect species	2017		2018	
Insect pest	**A**	**B**	**A**	**B**
Hyalopterus pruni	**12120**	**100**	**14688**	**100**
Insect predators:				
Chrysoperla carnea	86	14.85	117	17.16
Chrysopa septempunctata	69	11.92	81	11.87
Coccinella septempunctata	73	12.61	102	14.96
Coccinella undecimpunctata	97	16.75	121	17.74
Cydonia vicinia nilotica	71	12.26	87	12.76
Scymnus interruptus	62	10.71	65	9.53
Aphidoletes aphidimyza	55	9.50	44	6.45
Syrphus corollae	66	11.40	65	9.53
Total	**579**	**100**	**682**	**100**
Insect parasitoids:				
Aphidius colemani	1653	65.21	3208	70.24
Aphidius picipes	882	34.79	1359	29.76
Total	**2535**	**100**	**4567**	**100**

Parasitoids of *H. pruni* on apricot

Results in Table 1 show that two primary parasitoid species, *Aphidius colemani* (Viereck) and *Aphidius picipes* (Nees) were recorded, the primary parasitoid *A. colemani* was the most dominant species with mean relative densities 65.21 and 70.24% followed by *Aphidius picipes* 34.79 and 29.76% during 2017 and 2018 seasons, respectively.

Population Density of *H. pruni* on Apricot Trees

Results in Fig. 1 show the population of *H. pruni* was appeared in the 2nd week of march by 90 individuals/sample, two peaks of population activity were recorded on the first week of April 1340 individuals/ 60 leaves at mean temp. 19.3°C and 62.0% RH, the second peak of activity 2620 individuals/ sample on the first week of May at mean temp. 22.3°C and 53.9% RH, in the first season 2017. In the second season 2018 (Fig. 3), the infestation started in the 2nd week of March by 75 individuals/ sample and increased to record two peaks of population activity in the 1st week of April and May by 1415 and 2715 individuals/ sample at mean 21.8°C and 56.6% RH as well as 24.5°C and 68.3% RH, respectively.

From the aforementioned results, it could be concluded that, the *H. pruni* was observed with its highest population during April and early May, it appears that, the active period of this aphid species under investigation occurred during the period from March until May. Therefore, this period represents a critical period, for Integrated Pest Management (IPM) programs to protect apricot trees from aphid attacks. **El-Kady *et al.* (1970)** showed that, *H. pruni* is the most injurious aphid species on peach and apricot as well as on reed weed. **Ibrahim and Afifi (1994)** reported two peaks of infestation of *H. pruni* occurred on both peach and reed plants, the first was during March and the second one was during July on peach trees and August on reed plants. They added that, *H. pruni* existed allover the year on reed plants and only during the nine months from February to October on peach trees. The population density of *H. pruni* on apricot and peach trees also reported by others (**Abul-Fadi *et al.*, 2005, Adil and Muhammed, 2008, Ali, 2008, Saleh *et al.*, 2013 and Youssif *et al.*, 2014**).

Population Density of Predators on *H. pruni* Infested Apricot Trees

Chrysoperla carnea

Fig. 2 show that *C. carnea* individuals were appeared in the 3rd week of March by two individuals/sample, and increased gradually to record two peaks by 14 and 16 individuals/ sample at means (20.3°C and 59.2% RH as well as 21.3°C and 53.9% RH) in the 2nd week of April and first week of May, respectively and decreased untile the 4th week of May during the first season 2017. While in the second season were appeared in the 2nd week of March, 8 individuals / sample, and recorded two peaks by 18 and 14 individuals/sample at means (21.8°C and 56.6% RH as well as 23.5°C and 52.0% RH) in the first and 4th week of April, respectively (Fig. 4).

Chrysopa septempunctata

The population of activity to this predator recorded two peaks in the 2nd week of April and in the first week of May during two seasons with (12 and 15 individuals at means 20.3°C and 59.2% RH as well as 21.3°C and 53.9% RH) and (14 and 13 individuals/sample) at means 22.7°C and 57.4% RH as well as 24.5°C and 68.3% RH) during 2017 and 2018 seasons (Figs. 2 and 4), respectively.

Coccinella septempunctata

As seen from Fig. 2, two peaks of activity were recorded on the first week of both April and May by 9 and 14 individuals/sample at means 19.5°C and 62.0% RH as well as 21.3 and 53.9% RH during first season (2017). In the second season (2018), two peaks of population activity were recorded on the same time by 16 and 18 individuals/sample at mean of 21.8°C and 56.6% RH as well as 24.5°C and 68.3% RH, respectively (Fig. 4).

Coccinella undecimpunctata

In the first season (2017) as shown in Fig. 2, two peaks of activity were recorded on the 2nd week of April and first week of May by 15 and 20 individuals/sample at means 20.3°C and 59.2% RH as well as 21.3°C and 53.9% RH, respectively. In The second season 2018 (Fig. 4) two peaks of population activity were recorded on the first week of both April and May by 19 and 17 individuals/sample at means 21.8°C and 56.6% RH as well as 24.5°C and 68.3% RH, respectively.

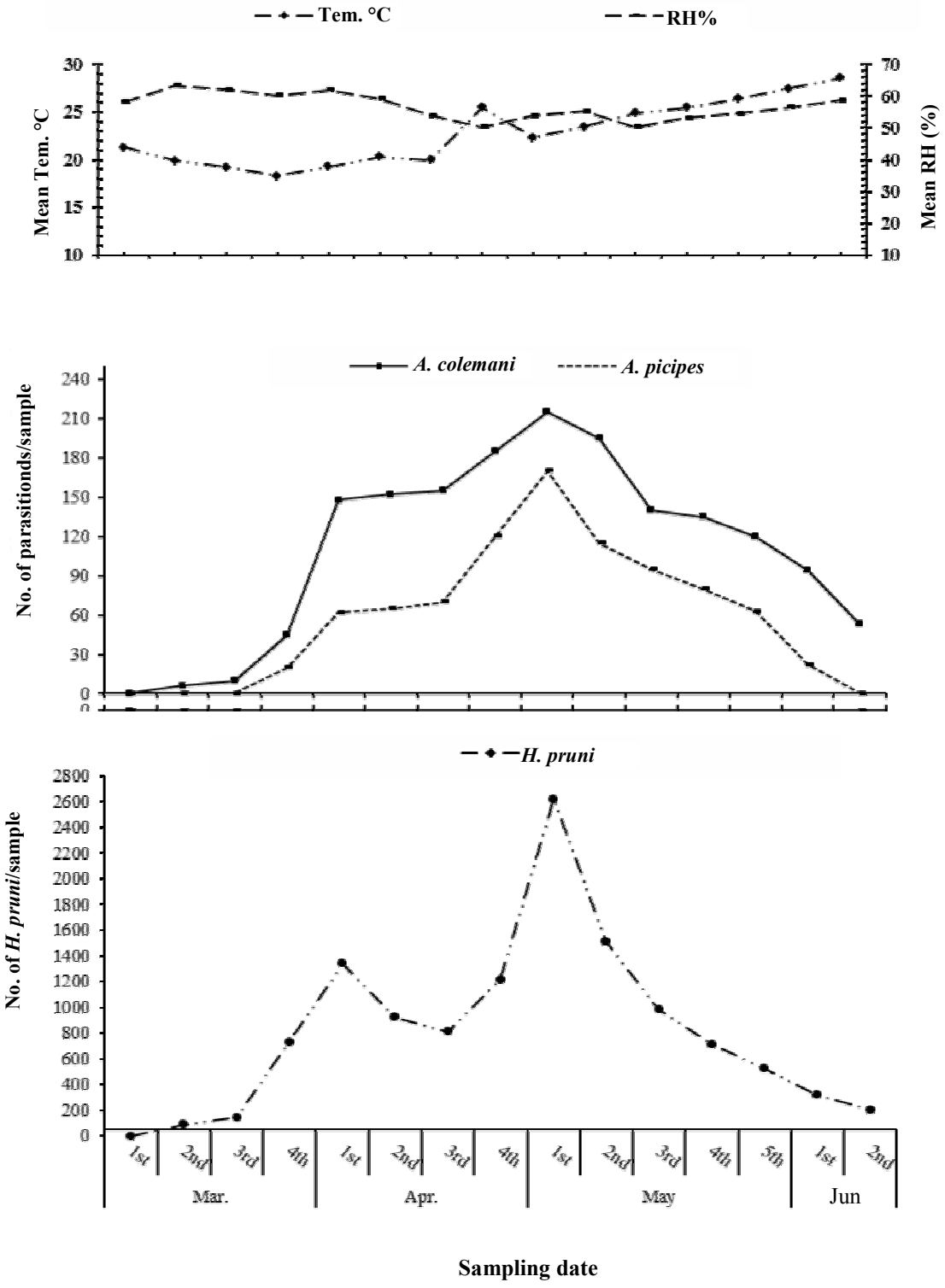

Fig. 1. Weekly total number of aphid (*Hyalopterus pruni*) infesting apricot trees and associated parasitoids during 2017 season at El-Khattara Distirct, Sharkia Governorate, Egypt

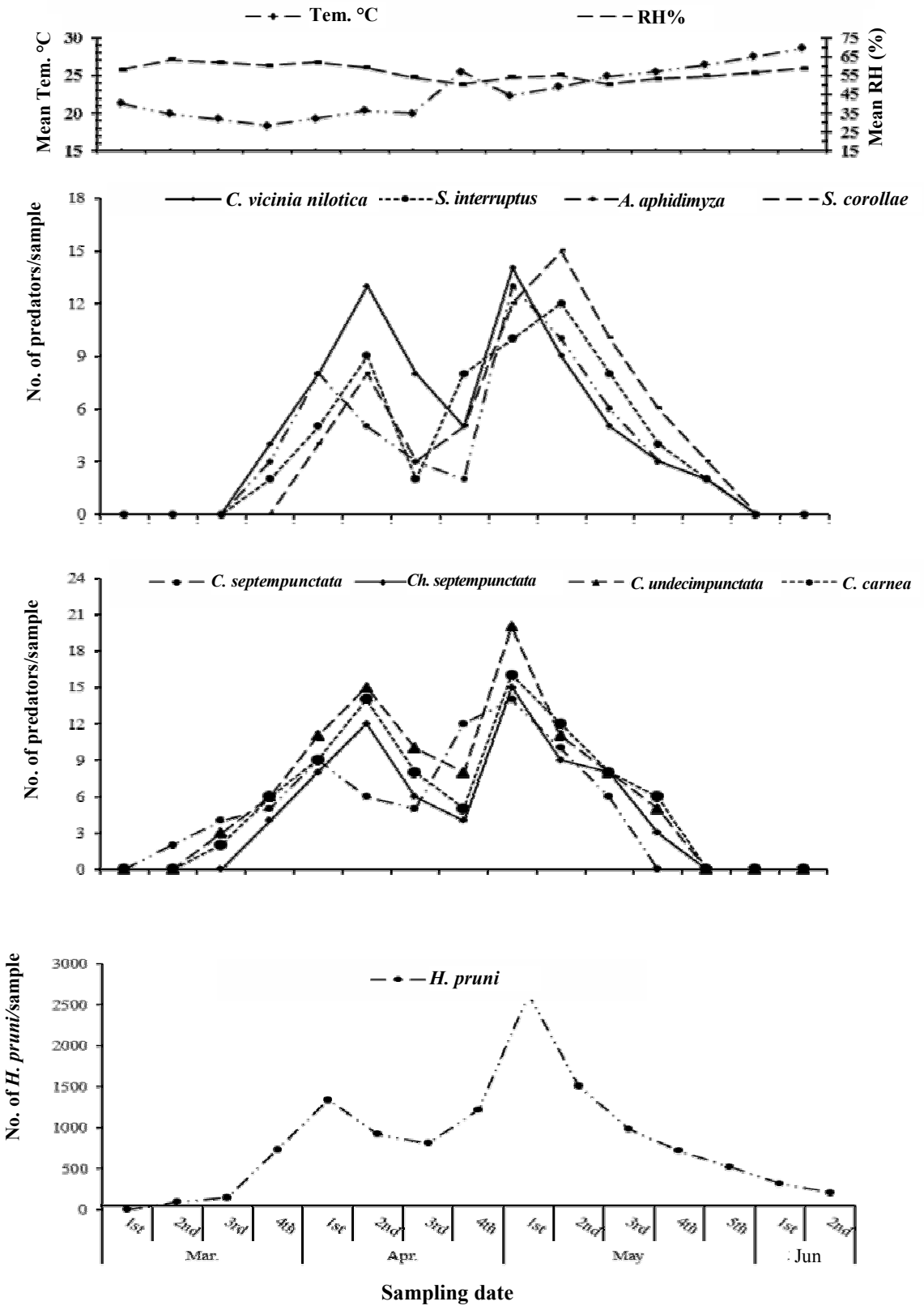

Fig. 2. Weekly total number of aphid (*Hyalopterus pruni*) infesting apricot trees and associated predators during 2017 season at El-Khattara Distirct, Sharkia Governorate, Egypt

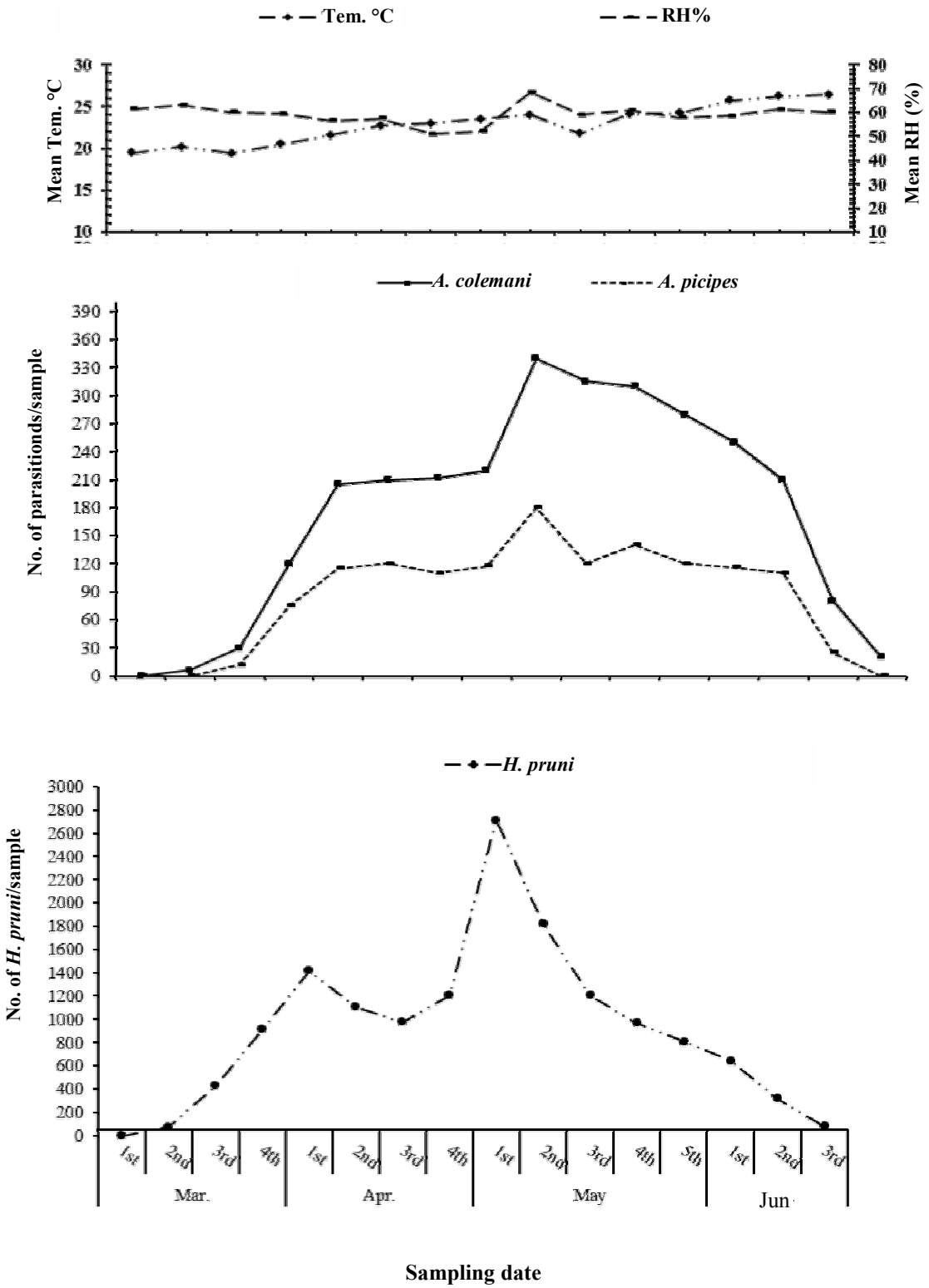

Fig. 3. Weekly total number of aphid (*Hyalopterus pruni*) infesting apricot trees and associated parasitoids during 2018 season at El-Khattara Distirct, Sharkia Governorate, Egypt

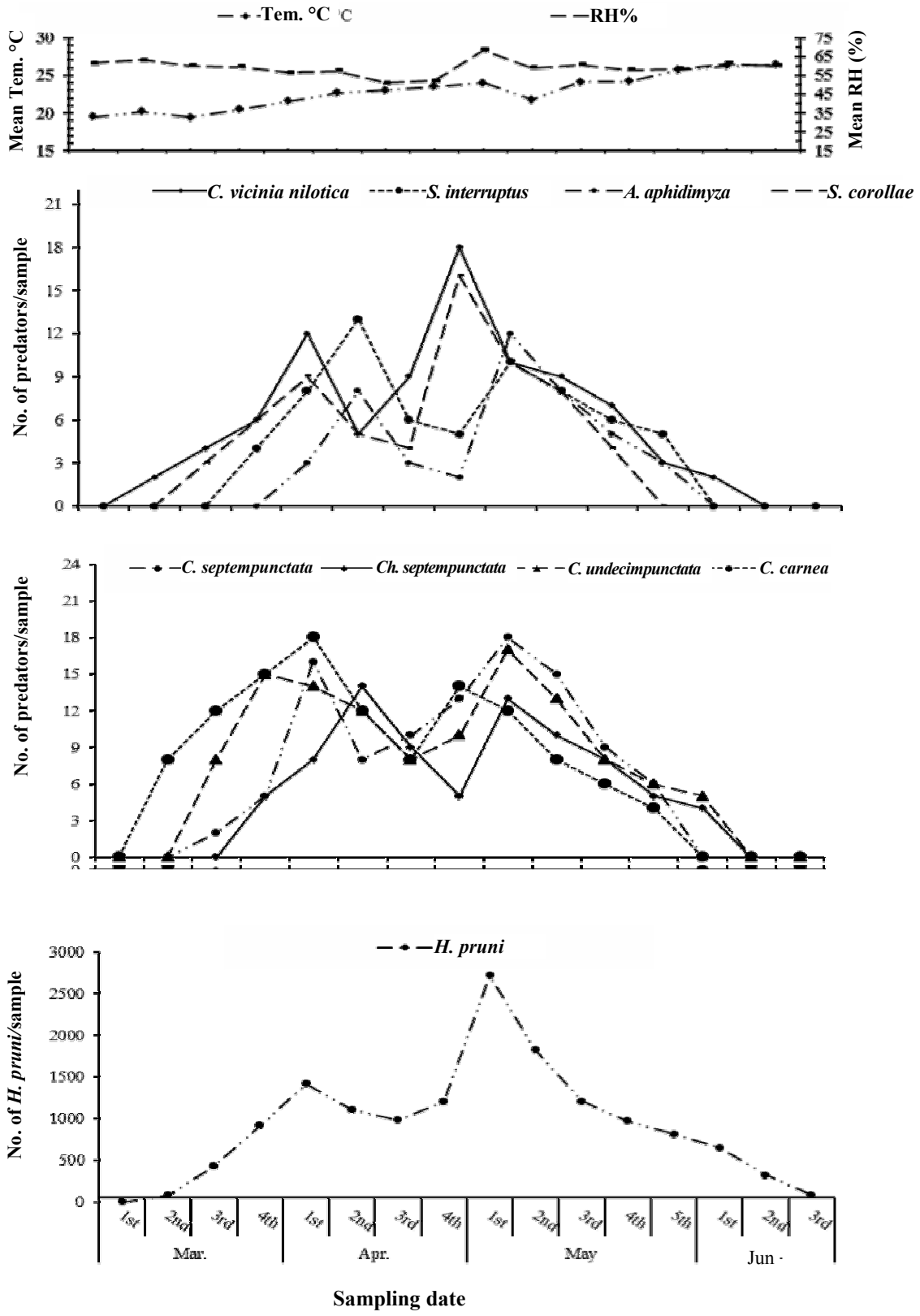

Fig. 4. Weekly total number of aphid (*Hyalopterus pruni*) infesting apricot trees and associated predators during 2018 season at El-Khattara Distirct, Sharkia Governorate, Egypt

Cydonia vicina nilotica

As seen from Fig. 2, two peaks of activity were recorded during 2017 season on the 2nd week of April and first week of May by 13 and 14 individuals/ sample for each means 20.3°C and 59.2% RH as well as 21.3°C and 53.9% RH, respectively. Also two peaks of activity were recorded in the second season (2018), on the first and the 4th week of April by 12 and 18 individuals/sample at means 21.8°C and 56.6% RH as well as 23.5°C and 52.0% RH, respectively (Fig. 4).

Scymnus interruptus

In the first season 2017 (Fig. 2) two peaks of activity were recorded by 9 and 12 individuals/ sample, on the 2nd week of both April and May, at means 20.3°C and 59.2% RH as well as 23.5 and 55.2% R.H., respectively. While in the second season two peaks were recorded on the 2nd week of April and first week of May by 13 and 10 individuals/ sample at means 22.7°C and 57.4% RH as well as 24.5 and 68.3% RH, respectively (Fig. 4).

Aphidoletes aphidimyza

Results in Fig. 2 show that two peaks of activity were recorded on the first week of both April and May, with values 8 and 13 individuals/ sample at means 19.5°C and 62% as well as RH 21.3°C and 53.9% RH, respectively during 2017 season. In the second season (Fig. 4), two peaks of population activity were observed on the 2nd week of April and first week of May by 8 and 12 individuals/ sample at means 22.7°C and 57.4% RH as well as 24.5°C and 68.3% RH, respectively.

Syrphus corollae

In the first season (2017) as shown in Fig. 2, two peaks of activity were recorded on the 2nd week of both April and May by 8 and 15 individuals/sample at means 20.3°C and 59.2% RH as well as 23.5°C and 55.2% RH, respectively. In the second season 2018 (Fig. 4), two peaks of population activity were observed on the first and 4th week of April by 9 and 16 individuals/ sample at means 21.8°C and 56.6% RH as well as 23.5°C and 52.0% RH, respectively.

Total aphid predators

Fig. 2 show the number of common predators associated with *H. pruni* on apricot trees. The insect predators belonged to three insect orders: Neuroptera, Coleoptera and Diptera, and four families namly: Chrysopidae, Coccinellidae, Syrphidae and Cecidomyiidae. The total number of insect predators were first appear by two individuals / sample in the second week of March and increased gradually to record two peaks of population density 82 and 114 individuals / sample in the 2nd week of April and first week of May, respectively. Then, their numbers declined towards the end of the first season. In second season (2018) it appeared by 3 individuals/ sample in the 3rd week of March and increased to record two peaks of population density (93 and 1020 individuals/ sample) during first week of both April and May, respectively (Fig. 4).

Abul-Fadi *et al.* (2005) found that most common predators recorded associated with *H. pruni* on apricot trees. Several predaceous species belonging to four orders namely: Neuroptera, Coleoptera, Hemiptera and Diptera during the period of study, 2017 and 2018 seasons. Also, **Adil and Muhammed (2008)**, showed that mealy plum aphid, *H. pruni* was recorded on apricot trees, were associated with 8 species of predators, 5 of them from family Coccinellidae and order Coleoptera, they were: *Scymnus syriacus* (Muls.), *S. apetzi* (Muls.), *Synharmonia couglubata* L. and 2 species of order Diptera, one species, *Metasyrphus corollae* F. from family Syrphidae, the other species, *Phaenobremia aphidovora* Rubs. from family Cecidomyiidae; and *Chrysoperla carnea* Steph. From family Chrysopidae and order Neuroptera.

Saleh *et al.* (2013) studied the seasonal activity of the parasitoids and predators associated with the mealy aphid *Hyalopterus pruni* population

and found six predator species, *Chrysoperla carnea, C. undecimpunctata, Aphidoletes aphidimyza, Syrphus corollae, Cydonia vicinia nilotica* and *Scymnus interruptus* on peach trees.

Rate of parasitization

Table 1 show that two primary parasitoid species *Aphidius colemani* Vier. and *Aphidius picipes* (Nees) were recorded, the percentages of parasitism ranged from 8.89% and 50.00% during the first season and from 16.00% and 62.01% during the second season (Table 3). In the first season (2017), the percentage of parasitism started by 8.89% in the second week of March, it increased to record two peaks by 37.20% and 50.0% in the first and 5th week of May, respectively. In the second season (2018), the percentage of parasitism started by 16.0% in the second season of March, and it increased to record two peaks of 43.28% and 62.01% in the first week of both May and June, respectively.

Total means of parasitism rate of *A. colemani* and *A. picipes* together were 27.12% and 35.98% during 2017 and 2018, respectively. The primary parasitoid *A. colemani* was the most dominant species with mean relative density (68.47% and 67.43%) during the two seasons, respectively. Meanwhile, the mean relative densities of primary parasitoid *A. picipes* were 24.87% and 26.33% during 2017 and 2018 seasons Table (2 and 3), respectively.

The present results are agree with those of **Abul-Fadi *et al.* (2005), Adil and Muhammed (2008), Ali (2008) and Saleh *et al.* (2013)**.

Combined effects of meterological factors on the mealy plum aphid and associated aphidophagous insects

The effect of maximum temperature, minimum temperature and mean relative humidity on the aphids and their associated aphidophagous insects were estimated by calculating the multiple partial regression analysis.

Results in Table 4 explain variance by the three meterological factors and show that the considered factors have played a conspicuous role in activity of aphid species and aphidophagous insects during the aforementioned investigated seasons. These results ensure that the tested metrological factors play a great role in regulating the population density and seasonal abundance of aphids and their associated aphidophagous insects. These results are in agreement with those of **El-Maghraby (1993), El-Maghraby *et al*. (1994), El-Maghraby *et al.* (2008), El-Gantiry *et al.* (2009), Saleh *et al.* (2013), Shoukry *et al.* (2018) and El-Falogy (2020)**.

Results in Table 5 show the values of the correlation coefficient of relation between predators and the population density of *H. pruni* during the two successive seasons. The predators *Ch. carnea, Ch. septempunctata, C. septempunctata* and *C. undecimpunctata* showed highly positive significant correlation (0.6808** and 0.3207**), (0.8814** and 0.8384**), (0.8737** and 0.8970**) and (0.8952** and 0.8396**) during 2017 and 2018 seasons, respectively. Also the correlation coefficient of relation between other predators and *H. pruni* were *cydoina vicina nilotica*, *S. interruptus, A. aphidimyaz and S. corollae* showed highly positive significant correlation (0.8575** and 0.6785**), (0.83727** and 0.7880**), (0.9352** and 0.8696**) and (0.7987** and 0.6991**) during 2017 and 2018 seasons, respectively.

In case of the parasitoids *Aphidius colemani* and *A. picipes* showed highly positive significant correlation (0.7914**and 0.9285**) and (0.9142** and 0.8716**) during 2017 and 2018 seasons, respectively.

Table 2. Percentage of parasitism on *H. pruni* on apricot during 2017 season at El-Khattara District, Sharkia Governorate, Egypt

Sampling dates		No. of aphid	No. of parasitoid aphid			Total parasitism (%)	Emerged parasitoids				Total	Weather factors	
			A	B	Total		*Aphidius colemani*		*Aphidius picipes*			Mean °C	Mean RH
							No.	RD%	No.	RD%			
Mar.	1st	0	0	0	0	0	0	0	0	0	0	21.3	58.2
	2nd	90	0	8	8	8.89	6	100	0	0	6	19.9	63.2
	3rd	145	10	6	16	11.03	10	100	0	0	10	19.5	62.1
	4th	732	60	35	95	12.98	45	69.23	20	30.77	65	18.3	60.3
Apr.	1st	1340	130	115	245	18.28	148	70.48	62	29.52	210	19.5	62.0
	2nd	920	140	120	260	28.26	152	70.05	65	29.95	217	20.3	59.2
	3rd	810	150	85	235	29.01	155	68.89	70	31.11	225	20.3	53.9
	4th	1215	315	137	452	31.03	185	60.66	120	39.34	305	25.5	50.3
May	1st	2620	240	220	460	37.20	215	55.84	170	44.16	385	21.3	53.9
	2nd	1510	205	195	400	26.49	195	62.90	115	37.10	310	23.5	55.2
	3rd	980	185	120	305	31.12	140	59.57	95	40.43	235	24.9	50.3
	4th	715	130	118	248	34.69	135	62.79	80	37.21	215	25.5	53.2
	5th	520	140	120	260	50.00	120	65.57	63	34.43	183	26.4	54.5
Jun.	1st	318	80	75	155	48.74	94	81.03	22	18.97	116	27.5	56.4
	2nd	205	60	20	80	39.02	53	100.00	0	0	53	28.6	58.6
Mean		808.00	123.0	91.60	214.6	27.12	110.2	68.47	58.8	24.87	169.0		
Total		12120	1845	1374	3219		1653		882		2535		

A = Number of mummified aphids counted at the date of inspection RD = Relative density

B = Number of mummified host appeared during the laboratory rearing

Table 3. Percentage of parasitism on *H. pruni* on apricot during 2018 season at El-Khattara District, Sharkia Governorate, Egypt

Sampling dates		No. of aphids	No. of parasitoid aphid			Total parasitism (%)	Emerged parasitoids				Total	Weather factors	
			A	B	Total		*Aphidius colemani*		*Aphidius picipes*			Mean °C	Mean RH
							No.	RD%	No.	RD%			
Mar.	1st	0	0	0	0	0	0	0	0	0	0	19.5	61.5
	2nd	75	0	12	12	16.00	6	100	0	0	6	20.2	63.0
	3rd	430	62	33	95	22.09	30	71.43	12	28.57	42	19.9	60.2
	4th	915	140	80	220	24.04	120	61.54	75	38.46	195	20.5	59.4
Apr.	1st	1415	240	180	420	29.68	205	64.06	115	35.94	320	21.8	56.6
	2nd	1105	220	185	405	36.65	210	63.64	120	36.36	330	22.7	57.4
	3rd	980	205	170	375	38.27	212	65.84	110	34.16	322	23.0	51.0
	4th	1205	320	190	510	42.32	220	65.28	117	34.72	337	23.5	52.0
May	1st	2715	760	415	1175	43.28	340	65.38	180	34.62	520	24.5	68.3
	2nd	1820	330	210	540	29.67	315	72.41	120	27.59	435	21.8	59.0
	3rd	1205	305	200	505	41.91	310	68.89	140	31.11	450	24.1	60.7
	4th	970	290	190	480	49.48	280	70.00	120	30.00	400	24.2	58.0
	5th	810	265	185	450	55.55	250	68.49	115	31.51	365	25.7	58.5
Jun.	1st	645	230	170	400	62.01	210	65.63	110	34.37	320	26.3	61.3
	2nd	318	120	30	150	47.17	80	76.19	25	23.81	105	26.4	60.1
	3rd	80	20	10	30	37.50	20	100	0	0	20	28.9	59.2
Mean		918.00	219.19	141.25	360.44	35.98	175.5	67.42	84.94	26.33	260.44		
Total		14688	3507	2260	5767		2808		1359		4167		

A = Number of mummified aphids counted at the date of inspection RD = Relative density

B = Number of mummified host appeared during the laboratory rearing

Table 4. Simple correlation coefficient values between temperature, relative humidity and the total number of *H. pruni* and some predators and parasitoids in El-Sharkia Governorate during 2017/ 18 seasons

	Aphid	Predators									parasitoids	
Weather factors	*Hyalopterus pruni*	*Chrysoperla carnea*	*Ch. septempunctata*	*C. septempunctata*	*C. undecimpun ctata*	*Cydonia vicina nilloticae*	*S.interruptus*	*A. aphidimyza*	*S. corollae*	Total insect predators	*A. colemani*	*A. picipes*
Cor (r ±S.E)	-0.1277± 0.2750	-0.3343± 0.2613	-0.3170±0.2630	-0.2744± 0.2667	-0.3606± 0.2586	-0.3084± 0.2638	0.0177± 0.2773	-0.2207± 0.2705	0.0769± 0.2765	0.2399± 0.2692	0.3148± 0.2632	0.1206± 0.2753
Max.°C Slope (b)	-7.4206± 32.3062	-0.2450± 33.1113	-0.2569±32.8888	-0.2329± 32.8403	-0.2316± 33.2044	-0.2580± 32.9279	0.0167± 31.6373	-0.2180± 32.5061	0.0623± 31.4321	0.0260± 32.7115	0.0167± 30.0128	0.0092± 31.1642
P	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Corr (r ±S.E)	-0.1179± 0.2754	-0.3525± 0.2595	-0.2821±0.2660	-0.3521± 0.2595	-0.3672± 0.2579	-0.3435± 0.2604	-0.0753± 0.2765	-0.1891± 0.2723	0.0153± 0.2773	-0.2690± 0.2671	0.2036± 0.2715	0.0666± 0.2767
Min.°C Slope (b)	-4.9619± 14.3275	-0.1871± 14.9998	-0.1656±14.6888	-0.2165±14.9805	-0.1708± 15.0316	-0.2082± 14.9122	-0.0514± 14.1394	-0.1353± 14.4229	0.0090± 13.8870	-0.0211± 14.7431	0.0078± 13.1329	0.0036± 13.7093
P	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Corr (r ±S.E)	-0.4149± 0.2523	-0.2509± 0.2684	-0.2687±0.2671	-0.2643± 0.2674	-0.2562± 0.2680	-0.2485± 0.2686	-0.4869± 0.2422	-0.2702± 0.2670	-0.5268± 0.2357	-0.3388± 0.2609	-0.7108± 0.1950	-0.7038± 0.1970
Mean R.H. Slope (b)	-0.0025± 58.7975	-0.1924± 57.8632	-0.2279±57.8083	-0.2348± 57.9030	-0.1722± 57.8738	0.2175± 57.7899	-0.4801± 58.7447	-0.2793± 57.7841	-0.4468± 58.7261	-0.0384± 58.2451	-0.0396± 60.7617	0.0563± 60.0722
P	NS	NS	NS	NS	NS	NS	NS	NS	*	NS	**	**
E.V	73.44	58.32	57.64	63.19	65.28	59.86	57.21	54.87	54.70	63.66	67.90	85.85
						season 2018						
Corr (r ±SE)	0.0551± 0.2668	-0.4783± 0.2346	-0.0528±0.2668	-0.1017± 0.2658	-0.2831± 0.2563	-0.1289± 0.2650	-0.1171± 0.2654	0.0025± 0.2672	-0.1327± 0.2648	-0.2045± 0.2616	0.2653± 0.2576	0.2376± 0.2595
Max. °C Sslope (b)	3.1445± 31.0800	-0.3125± 33.6544	-0.0435±31.5893	-0.0628± 31.7692	-0.1902± 32.7479	-0.1002± 31.9136	-0.1106± 31.8181	0.0027± 31.3611	-0.1120± 31.8238	-0.0222± 32.3191	0.0059± 30.1832	0.0164± 29.9726
P	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Corr (r ±SE)	-0.1005± 0.2659	-0.6122± 0.2113	-0.1482±0.2643	-0.2669± 0.2575	-0.3430± 0.2510	-0.4375± 0.2403	-0.1716± 0.2632	--0.0386± 0.2670	-0.3669± 0.2486	-0.3613± 0.2492	0.0530± 0.2668	0.0003± 0.2672
Min. °C Slope (b)	2.2220± 15.4415	-0.1552± 16.3728	-0.0474±15.4776	-0.0639± 15.6451	-0.0894± 15.8859	-0.1319± 15.9548	-0.0628± 15.4929	-0.0161± 15.2820	-0.1201± 15.7257	-0.01528± 15.8889	4.5874± 15.1455	9.8884± 15.2366
P	NS	*	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Corr (r ±SE)	0.1295± 0.2650	-0.1899± 0.2623	-0.1031±0.2658	-0.1407± 0.2646	-0.0665± 0.2666	-0.4199± 0.2425	-0.1254± 0.2651	0.2370± 0.2596	-0.0267± 0.2574	-0.1707± 0.2633	0.2932± 0.2555	-0.0843± 0.2664
Mean R.H. Slope (b)	7.3906± 58.4590	-0.1243± 60.0464	-0.0851±59.5687	-0.0869± 59.6920	-0.0447± 59.4620	-0.3267± 60.9139	-0.1186± 59.6193	0.2562± 58.4327	-0.2264± 60.0572	-0.0186± 59.9319	0.0065± 57.8256	-0.0058± 59.6335
P	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
E.V	21.68	54.31	7.12	22.70	29.27	51.15	7.47	13.36	34.34	28.70	35.92	17.52

NS.: Not significant * Significant ** Highly significant

Table 5. Correlation coefficient between *H. pruni* and some predators and parasitoids in El-Sharkia District during 2017 and 2018 seasons

Species	Natural enemies	2017			2018		
		Corr(r) ± S.E.	Slop (b)	P	Corr(r) ± S.E.	Slop (b)	P
H. pruni	*Ch. carnea*	0.8608 ± 0.1411	108.6349 ± 185.1595	**	0.5207 ± 0.2281	59.7218 ± 481.2836	*
	Ch. septmpunctata	0.8814 ± 0.1309	123.0183 ± 242.1155	**	0.8384 ± 0.1456	121.3650 ± 303.5895	**
	C. septempunctata	0.8737 ± 0.1348	127.7274 ± 186.3929	**	0.8970 ± 0.1181	97.1660 ± 298.5662	**
	C. undecimpunctata	0.8952 ± 0.1235	99.0007 ± 167.7951	**	0.8396 ± 0.1451	98.9943 ± 200.2906	**
	C. vicina niloticae	0.8575 ± 0.1426	123.5275 ± 223.3029	**	0.6785 ± 0.1963	92.5244 ± 414.8982	**
	S. interruptus	0.8327 ± 0.1535	135.1361 ± 249.4372	**	0.7880 ± 0.1645	130.5467 ± 387.6539	**
	A. aphidimyza	0.9352 ± 0.0981	159.0659 ± 224.7580	**	0.8696 ± 0.1319	164.8212 ± 464.7415	**
	S.corollae	0.7987 ± 0.1668	111.4840 ± 317.4703	**	0.6991 ± 0.1910	103.5589 ± 497.2919	**
	Total insect predator	0.9253 ± 0.1051	17.2915 ± 140.5452	**	0.8629 ± 0.1350	16.5076 ± 214.3621	**
	A.colemani	0.7914 ± 0.1695	7.2689 ± 74.8059	**	0.9285 ± 0.0992	3.6307 ± 190.0334	**
	A.picipes	0.9142 ± 0.1123	12.0407 ± 100.0033	**	0.8716 ± 0.1309	10.570 ± 19.5272	**

NS= Not significant *Significant **Highly Significant

REFERENCES

Abd El-Salam, S. A. (2000). Field evaluation of some native safe materials against *Aphis gosspii* (Glover) and *Bemisia tabaci* (Genn.) infesting cotton plants. Bull. Ent. Soc. Egypt, Econ. Ser., 27 (1): 1-6.

Abul-Fadi, H.A.A., M.A.M. Khawas and Salwa, S. M. Abdel- Samad (2005). Natural enemies associated with mealy plum aphid *Hyalopterus pruni* (Geoff.), (Homoptera: Aphididae) infested apricot trees, at Qalubia Governorate. J. Agric. Sci., Ain Shams Univ., Cairo, 13 (2): 521- 535.

Adil, H. A. and S. H. Muhammed (2008). Seasonal abundance of mealy plum aphid, *Hyalopterus pruni* (Geoffroy) and its natural enemies on some stone fruit trees in Erbil city, Kurdistan region, Iraq. Egypt. J. Bio. Pest. Cont., 18 (1): 249- 256.

Ali, Sh.A.M. (2008). Relationship between aphids and aphidophagous insects in El-khattara district. Ph.D. thesis, Fac. Agric., Zagazig Univ., Egypt.

Ali, Sh.A.M., A.A.A. Saleh and F.M. Saleh (2020). Bioefficacy of plant extracts and entomopathogenic fungi *(Trichoderma album)* in controlling *Myzus persicae* and *Bemisia tabaci*. Plant Archives, 20 (1): 1450-1459.

Baldacchino, F., M.R. Tabilio, A. Letardi and P. Santarcangelo (2010). Evaluation of a lure efficiency towards green lacewings in organic apricot orchard. Acta Hort., 862: 461- 464.

CoSTAT (2005). Computer Program. Version 6.311, Copyright (C) Coltart Software 798 Lighthouse Ave. PMB 320. Monterey, CA, 93940, USA.

El-Falogy, M.S.A. (2020). Biological control of some sucking pests. M. Sc. Thesis, Sci., Fac. Zagazig Univ., 130.

El-Gantiry, A.M., M.M.A. El- Maghraby, M.M. El-Zohairy and Sh.A.M. Ali (2009). Aphids and their associated aphidophagous insects on pear and mango trees in newly reclaimed sandy area in Egypt. Egypt J. Agric. Res., 87 (5): 1273- 1293.

El-Kady, E.A., M.S. Hassan and A.A. Attia (1970). Studies on the life- cycle of *Hyalopterus pruni* (Geoffroy), in Egypt. Bull. Soc. Ent. Egypt, 54: 579- 582.

El-Khawas, M.A.M., R.M.Y. Helal, H.A.S. Abd El-Gawad and M.M. Metwally (2003). Effects of different field treatments against sap sucking pests infesting sunflower, sesame and soybean. Bull. Ent. Soc. Egypt, Econ. Ser., 29: 83- 101.

El-Maghraby, M.M.A. (1993). Seasonal abundance of the cruciferous aphid *Brevicoryne brassicae* L. (Homoptera, Aphididae) in relation to the primary and hyperparasitoids on cauliflower in Zagazig region, Egypt. J. Agric. Res. 20 (5): 1627- 1639.

El-Maghraby, M.M.A., M.M. El-Zohairy and S.S. Hassanein (1994). Relationship between insect predators and pests associated with different varieties of squash and cucumber cultivated in the newly reclaimed sandy area of El- Khattara district, Egypt. Zagazig J. Agric. Res., 21 (3B): 969- 975.

El-Maghraby, M.M.A., M.M. El-Zohairy, A.M. El-Gantiry and Sh.A.M. Ali (2008). Survey and seasonal abundance of aphids infesting leaves of apple and peach trees and associated aphidophagous insects in El-Khattara District, Sharkia Governorate, Egypt. Zagazig J. Agric. Res., 35 (3): 637- 662.

Ferrell, J.A. and M.W. Stufkens (1990). The impact of *Aphidius rhopalosiph* (Hymenoptera: Aphidiidae) on population of the rose grain aphid *Metopolophium dirhodium* (Homoptera: Aphididae) on cereals in cankrbury. Newzeland. Bull. Entomol. Res., 80: 377- 383.

Ibrahim, A.M.A. (1994). Aphids and their parasitoids on apple trees at Giza region. Egypt. J. Biol. Pest Cont., 4 (1): 35- 43.

Ibrahim, A.M.A. and A.I. Afifi (1994). *Aphidius colemani* Viereck and *Aphidius picipes* (Nees) as parasitoids on the mealy aphid *Hyalopterus pruni* (Geoffroy) on peach in Egypt. J. Biol. Pest Cont., 4 (1): 45- 56.

Ismail, I.I.I., S. El-Nagar and A.A. Attia (1991). The aphid fauna of fruit trees in Egypt. J. Agric. Res., 69 (1): 235- 243.

Lozier, J.D., G.K. Roderick and N.J. Mills (2009). Molecular markers reveal strong geographic, but not host associated, genetic differentiation in *Aphidius transcaspicus,* a parasitoid of the aphid genus *Hyalopterus* Bull. Ento. Res., 99 (1): 83- 96.

Saleh, A.A.A. and SH.A.M. Ali (2012). Biological aspects of two predators as affected by feeding on two aphid species *Aphis gossypii* Glover and *Hyalopterus pruni* (Geoffroy) under laboratory conditions. Egypt. J. Agric. Res., 90 (4): 1531- 1542.

Saleh, A.A.A., Sh.A.M. Ali and N.E. Mohamed (2013). Natural enemies attacking the mealy aphid *Hyalopterus pruni* (Geoffroy) in peach orchard at Ismailia Governorate, Egypt. Egypt J. Agric. Res., 91 (1): 75- 93.

Shoukry, I.F., S.E. Ahmed, Sh.A.M. Ali and D.K.A. Barakat (2018). Susceptibility of certain potato varieties to the infestation with aphids and white fly *Bemisia tabaci* Genn. in newly reclaimed sandy areas at El-Khattara district, Sharkia Governorate, Egypt. 13th Int. Environ. Conf., Fac. Sci., Zagazig Univ., 129- 143.

Youssif, M.A.I., A.H. El-Heneidy, M.M.A. El-Maghraby, M.M.M. El-Zohairy and K.A.A. Hammad (2014). *Chrysemosa jeanneli* (Navas, 1914). (Neuroptera: Chrysopidae), a new Lacewing species recorded in Egypt. Egyptian J. Bio. Pest Cont., 24 (2): 529- 530.

مقتاتات المن الحشرية لمن البرقوق الدقيقى (*Hyalopterus pruni* (Geoffroy فى المشمش بمحافظة الشرقية- مصر

شحتة على محمد على

معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقى – الجيزة – مصر

أجريت هذه الدراسة بمنطقة الخطارة، محافظة الشرقية، مصر وذلك خلال موسمى ٢٠١٧، ٢٠١٨ لتقدير الكثافة العددية لمقتاتات مْنّ البرقوق الدقيقى (*Hyalopterus pruni* (Geoffroy، سجل نوعان من الطفيليات هما *Aphidius colemani* Viereck and *A. picipes* (Nees)، وتم تسجيل ثمانية أنواع من المفترسات هى *Chrysoperla carnea* Steph., *Chrysopa* s*eptempunctata* Waesmael, *Coccinella septempunctata* L., *C. undecimpunctata* L., *Aphidoletes aphidimyza* Rond., *Syrphus corollae* F., *Cydonia vicinia nilotica* Muls. and *Scymnus interruptus* Goeze. ولقد أحتل المركز الأول المفترس أبو العيد ذو الإحدى عشر نقطة بمقدار (١٦,٧٥، ١٧,٧٤%) يليه أسد المْنّ الأخضر (١٤,٨٥، ١٧,٧٤%) متبوعا بأسد المْنّ ذو السبع نقاط (١٢,٦١، ١٤,٩٦%) ثم أبو العيد السمنى (١٢,٢٦، ١٢,٧٦%) بينما سجل أسد المْنّ ذو السبع نقاط وذباب السرفس وأبو العيد الاسكمنس والأفيدوليتس النسب التالية (١١,٩٢، ١١,٨٧%)، (١١,٤٠، ٩,٥٣%)، (١٠,٧١، ٩,٥٣%)، (٩,٥٠، ٦,٤٥%) من مجموع تعداد مفترسات مْنّ البرقوق الدقيقى خلال موسمى الدراسة ٢٠١٧، ٢٠١٨ على التوالى ووجد أيضا أن أعلى نسب للتطفل بالطفيليين *A.colemani* ، *A. picipes* قد سجلت خلال الأسبوع الأول والأخير من شهر مايو (٣٧,٢٠، ٥٠ %) خلال موسم ٢٠١٧ بينما فى الموسم الثانى ٢٠١٨ سجلت خلال الأسبوع الأول من شهري مايو ويونيه (٤٣,٢٨، ٦٢,٠١%) على التوالى، بمتوسط نسب تطفل ٢٧,١٢، ٣٥,٩٨% خلال موسمى الدراسة على التوالى، وخلصت نتائج التحليل الإحصائي أن لدرجة الحرارة والرطوبة النسبية تأثير معنوي على بعض الحشرات وتأثير غير معنوي على البعض الآخر، ولذلك فانه يمكن تربية الطفيل *A. colemani* والمفترس *C. undecimpunctata* معمليا وكذلك الإطلاق الحقلى لمكافحة من البرقوق الدقيقى على أشجار المشمش ضمن برامج المكافحة المتكاملة لهذه الآفة، حفاظا على البيئة من التلوث وإسهاما فى جودة وكمية المحصول الناتج.

المحكمـــــون:

١- د. علـــي عبـدالعـزيـز الشيخ رئيس قسم الحشرات الاقتصادية المتفرغ– معهد بحوث وقاية النباتات بالشرقية.

٢- أ.د. محمد مصطفى أحمد المغربي أستاذ الحشرات الاقتصادية المتفرغ– كلية الزراعة – جامعة الزقازيق.