ECOLOGICAL AND BIOLOGICAL STUDIES ON APHIDS INFESTING SOME STONE FRUIT TREES GROWN IN DELTA-EGYPT

BY

KHALED MOHAMED SAYED AHMED

B. Sc. Higher Institute for Agriculture Co-operation- Ministry of Higher Education, 1999.

THESIS
Submitted in Partial Fulfillment of
The Requirements for the Degree

Of

MASTER OF SCIENCES

In

AGRICULTURAL SCIENCES
(Entomology)

Department Of Plant Protection
Faculty Of Agriculture
Benha University Egypt

2022

ECOLOGICAL AND BIOLOGICAL STUDIES ON APHIDS INFESTING SOME STONE FRUIT TREES GROWN IN DELTA-EGYPT

By

KHALED MOHAMED SAYED AHMED

B. Sc. Higher Institute for Agriculture Co-operation- Ministry of Higher Education, 1999.

THESIS

Submitted in Partial Fulfillment of the
Requirements for the Degree
Of
Master of Sciences
In
AGRICULTURAL SCIENCES
(Entomology)

Department of Plant Protection
Faculty of Agriculture
Benha University Egypt

Under the Supervision Committee:

1. Prof. Dr. Ahmed Abd El-Ghaffar Darwish .....
Emeritus Professor of Economic Entomology, Plant Protection Department, Fac. of Agric. Benha Univ.

2. Prof. Dr. Nabwy Ahmed Ali .....
Emeritus Professor of Pomology, Horticulture Department, Fac. of Agric. Benha Univ.

3. Prof. Dr. Gouda Mohamed El-Dafrawi .....
Emeritus Professor of Economic Entomology, Head Researcher. Plant protection Research Institute. Agricultural Research Center.

4. Dr. Amira Mohmamed El-Shewy .....
Associate Professor of Economic Entomology, Plant Protection Department, Fac. of Agric. Benha Univ.

2022

APPROVAL SHEET

ECOLOGICAL AND BIOLOGICAL STUDIES ON APHIDS INFESTING SOME STONE FRUIT TREES GROWN IN DELTA-EGYPT

By

KHALED MOHAMED SAYED AHMED

B. Sc. Higher Institute for Agriculture Co-operation- Ministry of Higher Education, 1999.

THESIS

Submitted in Partial Fulfillment of the Requirements for the Degree

Of

Master of Sciences

In

AGRICULTURAL SCIENCES

(Entomology)

1-Prof. Dr. Ahmed Abd El-Ghaffar Darwish: .....
Emeritus Professor of Economic Entomology, Plant Protection Department, Fac. of Agric. Benha Univ.

2-Prof. Dr. Mohamed Kamal El-Din El-Ansari: .....
Emeritus Professor of Economic Entomology, Plant Protection Department Faculty of Agriculture Al-Azhar University

3-Prof. Dr. Adel Abd El-Hamed Hafez: .....
Emeritus Professor of Economic Entomology, Faculty of Agriculture, Benha University.

4-Prof. Dr. Gouda Mohamed El-Dafrawi: .....
Emeritus Professor of Economic Entomology, Head Researcher. Plant Protection Research Institute. Agriculture Research Center.

5-Dr. Amira Mohmamed El-Shewy: .....
Associate Professor of Economic Entomology Plant Protection Department, Fac. of Agric. Benha Univ.

Date of Examination: 7 / 11 /2022

Vice Dean of Post Graduate Studies and Researches	Dean
Prof. Dr /Mohamed Hassan Refaat	Prof. Dr/ Mahmoud El-Zaabalawy El- Badawy

ABSTRACT

This study was conducted in Qalyubia governorate, one of the delta governorates in Egypt, over two successive seasons 2020 and 2021, to studying the survey and population dynamics of aphid species and associated predators on peach, apricot and plum trees. Also, study the effect of constant temperatures (20 – 25 – 30 °C) on some biological aspects of *Hyalopterus pruni* Geof. in the laboratories of the Plant Protection Research Institute in Dokki, Giza Governorate. The obtaind results revealed that thier were two aphid species (*Hyalopterus pruni and Myzus persicae*) infested tested trees associateal with 7 predator species i.e, *Coccinella undecimpunctata* L.*; Coccinella septempunctata* L.; *Cydonia vicina nilotica* Muls.*; Cydonia vicina isis Chrysoperla carnea* Stephens*; Syrphus corollae, and Aphidoletes aphidimyza*. The mealy plum aphid was the dominat aphid species found infested the three tested trees. The highest mean number (1958.3 individuals / sample) of *H. pruni* was recorded on apricot at 2nd week of May during the first season of 2021. The results of biological aspects of the mealy plum aphid under the three tested constant temperatures of 20, 25 and 30 °C reared on apricot seedlings revealed that: the developmental threshold temperature was greater for the nonlinear model than for the linear model. The greatest proportional survivorship of nymphs recorded at 25 ºC., mean daily fecundity was lowest at 30 ºC and highest at 20 ºC. The adult longevity decreased with temperatures decreasing. The population growth rates were estimated as fecundity and development time of tested individuals and were the highest at 20ºC.

ACKNOWLEDGEMENT

First of all, ultimate thanks are due to Allah the God of all Organisms, who without his aid this work could not be done.

The writer express deep thanks gratitude to **Prof. Dr. Ahmed Abd El-Ghaffar Darwish**, Professor of Economic Entomology, Department of Plant Protection, Faculty of Agriculture, Benha University, for their valuable supervision, fruitful advises and encouragement were indispensable throughout the investigation and preparation of this dissertation, representation of the obtained results and for the revision of this manuscript.

Thanks are also due to **Prof. Dr. Nabwy A. Ali**, Professor of Fruits, Department of Horticulture, Faculty of Agriculture, Benha University, for their valuable supervision, throughout the investigation period of this work.

My great thanks are due to **Dr. Gouda M. M. EL-Defrawi,** Professor of Economic Entomology, Department of Piercing-sucking insects, Plant Protection Research Institute, for his beneficial supervision and his generous help.

Thanks are also due to **Dr. Amira M. Al-Shewy**, Associate Professor of Economic Entomology, Department of Plant Protection, Faculty of Agriculture, Benha University, for her partial supervision, throughout the experimental part of this work.

I feel indebted also to all staff members of the **Plant Protection Department**, Faculty of Agriculture, Benha University, for their assistance and helping offered throughout investigation period.

Thanks are also due to **Prof. Dr. Mohamed M. Ibrahiem,** Professor of Economic Entomology, head of piercing-sucking insects research department, Plant Protection Research Institute, ARC, for his help in the statistical analysis part of the present work.

Thanks are also due to all staff members of Piercing & Sucking Insects Research Department, Plant Protection Research Institute, for their fruitful cooperation.

Special thanks to my father, mother and family for their patience and sincere assistance during the course of this work.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

I- INTRODUCTION

Stone fruit trees (peaches, apricots, and plums) are among the most important popular fruit crop in Egypt. It is grown on a large scale area in the Delta governorates, especially Qalyubia Governorate. The fruits of these trees are considered one of the most important income crops sources for farmers. This fruit has a high nutritional quality due to the components whereas it contains sugars, proteins and vitamins. The stone trees found attacked with many insect pests and the aphid species are considered among the most important pests of various trees in the world **(Ibrahim and Afifi 1994 and Ismail *et al.* 1991)**. The mealy plum aphid, *Hyalopterus pruni* (Geoff.) presented one of the most important pests that infested stone trees, **(El-Kady *et al.* 1970)**. In Egypt, this aphid species has been recognized as a pest of quarantined fruit trees (*Prunus spp*.).

Geographic distribution: *Hyalopterus pruni* (Geoff.) has been reported frequently in many parts of the world, especially in the northern temperate zone. It has reported in Africa (Federation of South Africa), Australia, Belgium, Canada, China, Denmark, Egypt, England, France, Germany, India, Ireland, Italy, Japan, Java, Latvia, Morocco, New Zealand, Norway, Palestine, Peru, Portugal, Russia, Scotland, Slavonia, Sweden, and Switzerland. In the United States, this species was first reported from the vicinity from Carmel, California, in 1881. ,**(Smith, 1937)**. The aphids infestation causes serious damage either directly by sucking plant sap or indirectly by the effect of honey dew secreted by these insects, which help on the growth of aerobic mold fungi and the result is the loss of the yield **Ibrahim and Afifi, 1994**. In addition, the aphids considered as a carrier of the plum pox virus.

Recently, an emphasis has been placed on integrated pest management, an approach that appears as a primary goal of a healthy future of agriculture. The first objective relies heavily on the objective of this approach to reduce the use of chemical pesticides to avoid their indiscriminate use **(Abdel -Salam, 2000, and El-Khawas *et al*. 2003)**. The field biological control is one of the main components of modern control strategies, depends mainly on studying the natural role of biological agents and continuous knowledge of the most efficient natural enemies for future use against insect pests. The common natural enemies associated with earlier aphid infestation are found during the existence of aphids. This environmental information will assist in planning IPM programs against aphids, *H. pruni* on plum, apricot and peaches. The research also aims to study the Effect of constant temperatures on some life features and population growth rates of *H. pruni*.

II. REVIEW OF LITERATURES

1. Aphid fauna on stone fruit trees (Apricot, Peach, and Plum).

Regarding to the literature concerning the survey of different aphid species infesting three stone fruit trees belonging to family Rosaccae, genus Prunus, i.e., Peaches (*Prunus persica*), Plums (*Prunus americana*) and Apricots (*Prunus armeniaca*), plants under investigation in different localities in Egypt, **Table (1) .**

Several out hers in different countries of the world were inspected stone fruit trees on potentially important piercing-sucking insect pests on it. Available literature indicated that aphids collected periodically during the trees active season. That were identified and classified according to the main and alternative host plants attacked and their feeding habits (**Cammell** and **Way, 1983**).

Leslie (1936) stated that, *Hyalopterus pruni* Geoff., has been reported frequently in many parts of the world: South Africa, Australia, Belgium, Canada, China, Denmark, Egypt, England, France, Germany, India, Ireland, Italy, Japan, Java, Latvia, Morocco, New Zealand, Norway, Palestine, Peru, Portugal, Russia, Scotland, Slavonia, Sweden, and Switzerland.

Przemysław (2004) recorded five aphid species infested *Prunus* spp., in Poland. The aphid species were *H. pruni* (Geof.), *Brachycaudus cardui, (*L.), *B. helichrysi* (Kalten.), *Phorodon humuli* (Schrank.) and *Rhopalosiphum nymphaeae* (L.). These species were coughed by suction traps yearly and considered an important group among a number of insect pests infesting plum trees and being primary hosts. The insects caused once immediately damages by not only plant sap suction, but also by transmitting viruses to plants.

Lucă *et al.* (2007) reported that the main aphid species on plum trees in Europe, Asia and northern Africa was the plum mealy aphid, *H. pruni*. The main host plant of *H. pruni* was the plum trees or other species belonging to the Prunus genera, while the secondary hosts were belonging to graminaceae species.

Vucetic *et al.* (2010) In Serbia, surveyed many species of aphids attacking stone fruit trees, but only seven of them are of economic importance. They also studied basic morphological characters, infestation symptoms, host plants, biology, geographical distribution, and viral vector activities for the most important species included *H. pruni* and *Brachycaudus helichrysi* that causes damage on plums, *Myzus cerasi* on cherries, *Myzus persicae, Myzus varians, H. pruni, Brachycaudus persicae* and *Brachycaudus schwartzi* on peach trees.

Birol, *et al.* (2013) recorded seven species of aphid: *H. pruni* (Geoffroy); *Pterochloroides persicae* (Cholod.); *Myzus persicae* (Sulzer); *Brachycaudus helichrysi* (Kaltenbach); *Brachycaudus amygdalinus* (Schouteden); *Rhopalosiphum nymphaeae* (Linnaeus) and *Myzus cerasi* (Fabricius) infested and caused considerable damage to almonds, apricots, nectarine, peaches, sweet cherries and sour cherries as vectors of Plum Pox Virus (PLV) in the fields.

Pasqualini and Scannavini (2015) in Italy, mentioned that the green peach aphid, *M. persicae* is a common pest of stone fruits (primary host), but it is a very serious problem on vegetable crops (secondary hosts), because the summer generation could be vectors of several important virus diseases (more than an hundred) on many vegetable crops.

Table (1). The recorded aphid species on apricot, peach, and plums trees in different locations in Egypt.

Host	Aphid Species	Locality	References
1. Apricot	*Hyalopterus pruni* (Geoffroy, 1762)	Egypt	El-Kady *et al*. (1970)
		Egypt	Ismail *et al.* (1991)
		El-Arish	Abul-Fadl (2005)
		Qalubia Gov.	Ahmed *et al.* (2007)
		El-Khattara-Sharkia	Youssif *et al.* (2014)
		El- Behera	Askar and El-Hussieni (2015)
		El-Khattara-Sharkia	Shehta (2020)
	Pterochloroides persicae (Cholod.)	El-Arish	Ahmed *et al.* (2007)
2. Peach	*Hyalopterus pruni* (Geoffroy, 1762)	Egypt	El-Kady *et al*. (1970)
		Egypt	Ismail *et al.* (1991)
		Egypt	Ibrahim and Amal (1993)
		Egypt	Ibrahim *et al.* (1994)
		El-Arish	Ahmed *et al.* (2007)
		Egypt	Saleh *et al.* (2012)
		Ismailia	Saleh *et al.* (2013)
	Brachycaudus schwartzi	El-Arish	Ahmed *et al.* (2007)
	Myzus persicae (Sulzer, 1776)		
	Pterochloroides persicae (Cholodkovsky, 1899)	El-Arish	Ahmed *et al*. (2007)
3. Plum	*Hyalopterus pruni* (Geoffroy)	El- Behera	Askar and El-Hussieni (2015)
	Pterochloroides persicae (Cholodkovsky, 1899)	El-Arish	Ahmed *et al.* (2007)

2. Population fluctuations of stone fruit aphid species on apricot, peach, and plum trees.

Smith (1937) in England studied geographically separated populations of aphids affected stone fruit growth and production may differ with respect to the influence of temperature on development and population growth.

Hille Ris Lamber (1950) studied population abundance of *Myzus* (Nectarosiphon) *persicae* (Sulzer), *Brachycaudus helichrysi* (Kaltenbach) and *H. pruni* (Geoffroy). He found that the *H. pruni* was the most abundant species of aphids in *Prunus spp*. Which known as a vector of plum pox virus (PPV), infected stone fruit plants.

In Tunis **Jrad (1997)** studied the seasonal abundance of *H. pruni* on peach and assessment infestation levels on almond trees. They indicated that the infestation levels were differed from study season to another. Almond trees harbored infestation often started in mid-February, reached a peak at the beginning of April and then declined and disappeared by the end of May, the main responsible factors of this decline proved by the gradual decreasing of aptera fecundity and alatoid migration flights. On the other hand, the fundatrix nymph survival and reproductive potential expression of aptera were mainly influenced by the phenology and vigour of host plant. On peach trees, infestation was delyed to the beginning of May and could be continued to the end of summer. The decline of population could be associated with premature leaf fallen and unfavorable environmental conditions (high summer temperature), that led to high level aphid mortality.

Aphids on apricot trees:

Zaklad and Skierniewice (1970) in Poland studied the seasonal population of *H. pruni* Geof. on apricot trees. They reported that the population size dramaticely reduced by the activity of different insect predator species

Abul-Fadl, *et al.* (2005) in Egypt, studied the population dynamics of the mealy plum aphid, its parasitoids and predators on apricot trees. They mentioned that the occurrence of *H. pruni* on apricot trees lasted 5 months (from February to June, every year). The seasonal mean numbers of aphid were 1.78 and 2.83 individuals /leaf. The maximum numbers of *H. pruni* were recorded during the 2nd week of April, 2003 and 2004; there were no aphid individuals showed during the period extended from July to September, during the two studied seasons.

Öztürk *et al.* (2007) in Turkey, stated that the population of the mealy plum aphid, *H. pruni* started to appear on apricots in the first half of March (temperature prevailing was above 12° C and the relative humidity was 40.3-62.6 %). Mealy plum aphid populations progressively increased from the second half of May, reached its highest level in June. However, towards the end of June, there was a rapid decline in population, and from early July, has been decreased and began to migration toward the reeds (*Phragmites spp.*) due to the influence of natural enemies activities, low humidity and high temperature. Since the second half of July, it has been determined that the average number of individuals per leaf has reached zero population, however, it has been observed that some individuals (0.3 individuals /leaf), and does not migrate in August and September and continue to feed on apricots.

Amin and Mohamed (2008) recorded that the mealy plum aphid, *H. pruni* was present on apricot trees from the last week of March in low numbers, and then decreased during May on peach trees, it is registered at mid-April with relatively low numbers, and then the numbers began decreases until it reached maximum mean numbers per leaf at first week of June.

Aphids on peach trees:

Basky (1982) in Hungary, assessed the population of *Myzus persicae* Sulz., and *Hyalopterus amygdali*, on peach trees as commonly main host plant. The aphid *H. amygdale*., proved more important in peach orchards because it produces more generations during the vegetation period, and dense colonies prevailed in May and June. During summer months, each of *H. amygdali* and *H. pruni* are prevailing on peach trees (while the latter species lives on plums) that migrates from the main host (peaches) to the reeds (*Phragmites sp.*). Large colonies of both species occurred in July and August.

Mohamad and Al-Mallah (1990) in Iraq, noticed a few number of mealy plum aphids, *H. pruni* on plum, peach, cherry and apricot during the 1st week of March, and the populations reached a peak by the 3rd week of April, then declined gradually and disappeared completely by the 2nd week of June. The apricot trees were the most susceptible to aphid infestation. A significant relation between aphid populations and temperature was recorded, but the relationship with relative humidity was not significant.

Ismail *et al.* (1991) recorded main populations of mealy plum aphid, *H. pruni* on peach and apricot trees started from February until September in the successive three growing season of 1979, 1980 and 1981, and considered a main pest in Egypt.

Fontanari *et al.* (1993) in Trento, Italy, stated that the prevalence of aphids are *Myzus cerasi* on cherries, *M. persicae* and *M. varians* on peach trees.

Niccoli and Fagnani (1994) recorded that the aphids *H. pruni* totally absent in orchards at the highest altitude, but *Myzus varians* appear to have been responsible for the most severe attacks in orchards at medium altitude.

Serdar and Yokomi, (2002) found that *Brachycaudus schwartzi* were harbored both peach and nectarine (*Prunus persica*) trees, during summer months

Barbagallo *et al.* (2007) stated that peach trees (*Prunus persica*) and nectarine (*P. persica*) are main hosts for *Myzus persicae,* that undoubtedly the most frequent and injurious pest.

El-Heneidy *et al*. (2008) studied population dynamics of *Pterochloroides persicae*, and *Brachycaudus schwartzi* (Borner) and associated natural enemies harbored peach trees at Rafah, North Sinai Governorate, Egypt. The obtained results indicated that the occurrence period of *P. persicae* was extended from February until April, and recorded highest peaking the 3rd week of March. While, *B. schwartzi*, occurred from early February until late May with highest peak at the 3rd week of March and the 4th week of April during 2005 and 2006 seasons, respectively. Seven species of parasitoids, 3 species as primary parasitoids and 5 hyper-parasitoid species were surveyed with the aphids on the peach trees.

Aphids on plum trees:

Dicker (1979) stated that the main destructive insect pests on plum trees in the UK are three specis of aphids; *Brachycaudus helichrysi* Kalt., *Phorodon humuli* (Schr.) and *H. pruni* Geof. That causing direct damage to the plum trees, and also it is a main vector for plum pox (Sharka) virus, which considered a dangerous viral disease that affects plums, and ornamental plums.

Strażyński (2004) Identified 5 species of aphids as major insect pests of plum trees in Poland; *H. pruni Brachycaudus cardui* L., *B. helichrysi* (Kaltenbach), *Phorodon humuli* (Schrank) and *Rhopalosiphum nymphaeae* (L.). Aphids started migration activity, harbored plum trees at the beginning of autumn causing severe injury to crop yields.

Lucă *et al.* (2007) stated that the *H. pruni* was the most important insect pests on plum orchard in Europe, Asia and northern Africa. This species caused fruit damages of the plum orchard in different sites of Mediterranean regions. They also found that the main host plants were fruit trees species belonging to the prunus genera and the alternative or secondary hosts were graminaceae species.

3. Natural enemies associated with aphid species on stone fruit trees:

Regarding to the literature concerning the survey of different aphidophagous predator species associated with aphids on the three stone fruit trees: apricot, peach and plum plants under investigation recorded as shown in, **Table (2).**

Zaklad and Skierniewice (1970) in Poland, found that *H. pruni* on fruit trees, had attacked by 7 aphidophagous predator species being: *Syrphus balteatus* (Deg.), *S. vitripennis* Mg., *Lasiophthicus (Scaevd) pyrastri* (L.), *Sphaero-phoria scripta* (L.), *Phaenobremia aphidivora* (Rübs.), *Adalia bipunctata* (L.) and *Coccinella septempunctata* L., and also by 3 insect parasitism by *Praon volucre* (Hal.), *Ephedrus* sp. and *Aphidius* sp.

Remaudiere and Leclant (1971) classified the predator and parasites that attacking aphids *M. persicae* (Sulz.) and *H. pruni* Geof. on peach trees. They recorded six species of syrphids observed prevailing, that the most abundant one being *Syrphus* (*Epistrophe*) *balteatus* (Deg.) and *S. vitripennis* Mg. They noticed also the population of syrphid in the orchards appeared to be maintained at a steady level by the arrival of immigrant aphids. Spiders exerted considerable control at the end of winter by preying on the newly hatched aphid fundatrices. The aphids were attacked from time to time by the fungi *Entomophthora aphidis* and *E. planchoniana.*

Babrikova (1981) in Bulgaria, conducted studies on the morphological, biological and ecological characteristics of mealy plum aphid, *H. pruni* and associated predatory, *Chrysopa abbreviata* Curt. He found both larvae and adults of *C. abbreviata* feed on alive aphids and other arthropods. He was also found that a pair of *C. abbreviata*

larvae could consume up to 426 individuals of *H. rosae* (L.), and up to 299 individuals from *Myzus cerasi* (F.).

Basky (1982) in Hungary, recorded 12 species of insect predators, belonging to four different orders, attacking mealy plum aphid, *Hyalopterus sp.,* colonies that infested peach, plum trees and reed plants. Syrphid flies were observed as the most abundant predacious insect, synchronized densities of populations with high abundant aphid numbers prevailing. The second most commonly insect predators being *Episyrphus balteatus* Deg., and *Metasyrphus corollae* Fabr., which formed colonies of aphids on reeds as well. The proportion of Coccinellid predator was lower abundant in each host plants than that of meat flies. The most famous parasite wasp is *Praon volucre* Haliday which found on each tested hosts. Five types of parasitoieds were bred from the colonies of *Hyalopterus,* four types from plums and two types from reeds harbored aphids.

Fontanari *et al.* (1993) inspected the population abundance of fruit aphids and associated natural enemies prevailing in cherry, peach, and apple orchards. They found that the Coccinellids, especially *Adalia bipunctat, Syrphid Episyrphus* balteatus and *Chrysoperla* carnea have been observed prevailing. Only one parasitoids species that reported on these aphids was the braconid *Ephedrus persicae.*

Niccoli and Fagnani (1994) found that Syrphid and Coccinellid predators were the most potential and numerous natural enemies attacking both, *Hyalopterus pruni* and *Myzus varians* aphid specices.

Semyanov (1996) found that several types of Coccinellids existed in orchards being: *Adalia bipunctata, Coccinella septempunctata, Calvia quattuor-decimguttata, Coccinella quinquepunctata, Propylea quatuordecimpunctata, Stethorus punctillum,* and *Coccinula quatuordecimpustulata. Adalia. bipunctata*

was the most numerous species and played an important role in limiting the populations of both, *H. pruni* and *Brachycaudus helichrysi* on plum trees.

Abul-Fadl *et al.* (2005) in Egypt, recorded 4 parasitoids species, *Aphidius matricariae* Hal., *Lysiphylbus sp.*, and 2 species of *Alloxysta spp*., attacking *H. pruni*. Also eight predator species were recorded being, *Coccinella septempunctata* L.; *Adalia decempunctata* L; *Hippodamia variegata* (Goeze.) (Coleoptera: Coccinellidae); *Episyrphus balteatus* (De Geer); *Eupeodes* (Metasyrphus) *corollae* (Fabricius); *Ischiodon scutellaris* (Fabricius); (Diptera: Syriphidae), *Leucopis annulipes* (Zetterstedt) (Diptera: Chamaemyiidae) and *Chrysoperla carnea* (Stephens,) (Neuroptera: Chrysopidae). The maximum monthly occurrence of these predatory species was during April, 2003 (146 individuals) and April, 2004 (581 individuals), respectively. The predator *Chrysoperla carnea* had the highest percentages of occurrence among other recorded predatory species.

El-Khawas *et al.* (2003) surveyed four species of parasitoids; *Aphidius matricariae* Hal., *Lysiphylbus sp*., and 2 species of *Alloxysta* spp. recorded during this period, that attacking *H. pruni*. These parasitoid species were found in synchronizing with the population activity of the meal plum aphid. Also they reported that predacious the insects; *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 found associated with aphid on tested host. The predator *Chrysoperla septempunctata* L. had the highest percentages of occurrence among other recording predatory species. They concluded that the parasitoid *A. matricariae* and the predatory *C. septempunctata*, could be mass

reared and released for controlling *H. pruni* on apricot trees with other available safe control methods that developed in best Integrated Pest Management (IPM) programs against mealy plum aphid.

Xin-geng and Russell (2006) stated that the insect parasitoid, *Aphidius transcaspicus* Telenga, was a main parasitoid of mealy plum *aphid H. pruni* Geof.; and *Myzus persicae* (Sulzer) in Mediterranean regions, on plums.

Ali *et al.* (2008) recoded that the aphidophagous predators associated with fruit tree aphids (*Brachycaudus helichrysi* Kaltenbach; *H. pruni* Geof.; *M. persicae* Sulz. and *Pterochloroides persicae* Cholodk., on peach trees were: *Coccinella septempunctata* Linnaeus; *Adalia bipunctata* L.; *A. decempunctata* L.; *Oenopia conglobata* L.; *Hippodamia variegata* Goeze; *Episyrphus balteatus* De Geer; *Eupeodes corollae* Fabricius; *Ischiodon scutellaris* Fabricius; *Scaeva pyrastri* L., *Leucopis annulipes* Zetterstedt, and *Chrysoperla carnea* Stephens. Also, 5 parasitoids being, *Aphidius colemani* Viereck; *Aphidius matricariae* Haliday; *Aphidius transcaspicus* Telenga; *Diaeretiella rapae* McIntosh, and *Ephedrus persicae* Froggatt.

Amin and Mohamed (2008) identified 9 species of natural enemies attacks mealy plum aphid included one parasitoid species, *Aphidius* sp., and 8 species of predatory, 5 from family Coccinellidae-Coleoptera; being *Scymnus syriacus*, *Scymnus apetzi*, *Synharmonia conglubata* [*Oenopia conglobata*], *Synharmonia ancina* and *Coccinella septempunctata*; and 2 species from order Diptera, *Metasyrphus corollae* (Syrphidae), *Phaenobremia aphidovora* [*Aphidoletes aphidimyza*] (Cecidomyiidae); and *Chrysoperla carnea* (Chrysopidae-Neuroptera).

El-Heneidy *et al.* (2008) sorted seven species of predators attacking aphids, *Pterochloroides persicae* chol. and *Brachycaudus*

schwartzi (Borner) harbored peach trees in Egypt, also identified 3 species as primary parasitoids and 5 hyper-parasitoid species associated with the aphids on the peach trees. There were insignificant correlation coefficients between the total numbers either, *P. persicae* and *B. schwartzi* associated with their natural enemies prevailing on peach trees.

Daniel and Mills (2010) concluded that, predation may have reduced the rate at which mealy plum aphid *H. pruni* populations increased early in the season and rebounded from mid-season declines, but was not sufficient to prevent high aphid densities.

Ahmadabadi *et al.* (2011) reported that the *Aphidius transcaspicus* was the most abundant species of parasitic aphids, with close association with *Hyalopterus spp. A. transcaspicus* and showed good control ability on *H. pruni* Geof. on plum and apricot trees. So it could be used as a biological control agent against mealy plum aphids.

Askar *et al.* (2013) in Egypt, stated that presence of natural enemies associated with the colonies of *H. pruni* prevailing on weeds grown within fruit trees were: hymenoptera parasites, *Aphidius smatrecariae* and *Aphelinus albipodus* on different *Hyalopterus sp*., besides several predatory insects are *Coccinella undecempanctata, Syrphus* larvae, *Chrysoperla carnea* larvae, and certain individuals of *Orius sp*. grown up.

Ben Halima *et al.* (2013) in Tunisia recorded different species of *Hyalopterus* in cultivated *Prunus sp.,* and *Phragmites sp.* Parasitic organisms found associated were represented by the hymenopteraus parasite, *Aphidius transcaspicus*, and ectoparasitic mite belonging to the Trombidiid family and an insect pathogen fungus belonging to the order Entomopthorales. The sperm insects have been recorded on *Hyalopterus sp.* They are the predatory fly by *Aphidoletes aphidimyza*,

Episyrphus balteatus and *Sphaerophoria scripta,* beside one lacewing, *Chrysoperla carnea*; silver fly, *Leucopis sp.* and four predacious beetles *Coccinella algerica*, *Hippodamia variegata, Oenopia doublieri,* and *Scymnus apetzi* were prevailing.

El-Basha *et al.* (2013) in Egypt, studied the population abundant of a mealy plum aphid, *H. pruni* and associated predators on apricot trees grown in Ismailia Governorate, Egypt. They stated that this insect species was the most injurious pest attacking apricots and as well as, others stone fruit trees in the gardens common incidence particularly, owing to favourable weather conditions. The predators identified were: *Coccinella undecimpunctata, Coccinella septempunctata, Chrysoperla carnea, Syrphus corolla,* and *Orius albidipennis,* the data also, showed a complete synchronization between aphid abundance and their associated predators during this study.

Youssif *et al.* (2014) In Egypt, recorded that the predator *Wesmaelius navasi* Andreu, was found on apricot and peach trees associated with the mealy plum aphid, *H. pruni* Geof. during the 2010 and 2011 summer season. This predatory species, confirmed identification by the Natural History Museum in London, UK.

Aparicio *et al.* (2019) surveyed parasitoid and hyperparasitoids of aphids, *M. persicae* Sulz. and *H. spp.*, that the most harmful aphid species to peach trees. They identified 11 species of parasitoids from *M. persicae,* and found that the *Aphidius matricariae* (Haliday) was the most abundant parasitoid while parasitoids were collected from *Hyalopterus spp.,* i.e, *Aphidius transcaspicus* Telenga and *Paron volucre* (Haliday).

Shehta (2020) in Egypt, recorded certain species of aphidophagous insects associated with the mealy plum aphid *H. pruni*

on apricot trees. Two parasitoid species belonging to Braconidae: *Aphidius colemani* Viereck and *Aphidius picipes* (Nees). More over 8 different species of predators were also recognized on apricot plants as follows: *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.

El-Kady, *et al*. (1970) in Egypt, studied population of *H. pruni* on apricot and peach trees within an area in which *Phragmites communis* was grown. They observed aphid, *H. pruni* on the reed plants and migrants between the reeds and the fruit trees during January, while it was start migrate to the fruit trees in September when they return back to the reeds.

Table (2): The recorded predator species associated with fruit trees aphid species.

Predator family	Predator species	Host	References
Coccinelldae (Coleoptera)	*ladybird beetles* *Coccinella septempunctata* *Coccinella undecimpunctata* *Cydonia vicina nilotica*	*H. pruni* on apricot trees.	Abul-Fadl *et al.* (2005) Shehta (2020)
	Scymnus interruptus	*H. pruni* on apricot trees.	Abul-Fadl *et al*. (2005)- Shehta (2020)
Chrysopidae (Neuroptera)	*Chrysoperla septempunctata* L *Chrysoperla carnea* *Chrysopa septempunctata*	*H. pruni* on apricot trees.	Abul-Fadl *et al*. (2005)- Shehta (2020) Shehta (2020)
Anthocoridae (Hemiptera)	*Orius sp.*	*H. pruni* on apricot trees.	Abul-Fadl *et al*. (2005)
(Diptera: Syrphidae)	*Syrphus corolla*	*H. pruni* on apricot trees.	Abul-Fadl et al. (2005) Shehta (2020)
(Diptera: Cecidomyidae)	*Phaenobremia sp.*	*H. pruni* on apricot trees.	Abul-Fadl *et al*. (2005)
Cecidomyiidae	*Aphidoletes aphidimyza*	*H. pruni* on apricot trees.	Shehta (2020)
	Coccinella septempunctata *Syrphus corolla* *Chrysoperla carnea* *Orius sp.*	*H. pruni* the weed, *Arundo donax*, L.	Askar *et al.* (2013)
(Neuroptera: Hemerobiidae)	*Wesmaelius navasi*	*H. pruni* on apricot trees.	Youssif *et al.* (2014)
	Chrysoperla carnea Steph., *Coccinella undecimpunctata* L. *Aphidoletes aphidimyza* Rond., *Syrphus corollae* F. *Cydonia vicinia nilotica* Muls. *Scymnus interruptus* Goeze.	*H. pruni* on peach trees.	SALEH and Ali. (2012)

Zaklad and **Skierniewrce (1970)** in Poland, migration to the summer food plants, mainly *Phragmites communis* [*Phragmites australis*] occurred over a long period, but migrants were most numerous in late June and July. They were unable to survive on plum, and so did not cause infestation within an orchard. Plum was re-infested in autumn by the return of gynoparae and males from the summer food plants. The gynoparae gave rise to oviparae, the first of which were detected in August, the first eggs were noted in mid-September. The oviparae laid an average of 3.1 eggs each (with a maximum of 5).

Tamaki (1975) in America observed that the green peach aphid *M. persicae* populations declined after mid-May on peach trees, also on the same time another population of this aphid species increased on the weeds *Chenopodium album* and *Amarantus retroflexus* on the floor of the orchard. The same previously mentioned weed aphid hosts inspected 1-6 miles away from peach orchards showed substantially small populations of *M. persicae*. However, a survey in the fruit-growing area showed that apple orchards in proximity to peach orchards had as high populations of *M. persicae* on the same weeds as in peach orchards.

Annis, *et al.* (1981) stated that monitored the populations density of *Myzus persicae* (Sulz.) on the floor (weeds) of peach orchards as hosts aphids grown naturally and also on the bank of a drainage ditch, they indicated that the green peach aphid populations at all sites peaked in spring and declined in summer.

Mohamad and Al-Mallah (1990) stated that, mealy plum aphids migrated to the secondary host *Phragmites communis*, from June to early November, then after the sexual forms returned to stone-

fruit trees for mating and oviposition around the buds and in bark crevices.

Mook and Wiegers (1999) studied mealy plum aphid, *Hyalopterus pruni* migration to its secondary host namely common reed in late spring and early summer. They were noticed that reed fields were known to be more heavily infested by *H. pruni*, at the edges compared to the centre, as the migrants are attracted to the colour of the reed. There is also evidence that reeds growing at wet sites are more heavily infested than at dry sites at different habitats. Aphid existence early in the season (June) of a higher infestation at the edges than in the centre of the field, density of winged aphids in this early period was higher in wet than in dry habitats, which may have been a result of a preference of the settling migrants for reed standing in water.

Megahed (2000) in Egypt concluded that the total numbers of surveyed aphids on weed plants was greatly higher aboutly three times than that recorded on economic crops.

Manachini and Cinanni (2004) found that *Myzus persicae* had a dissimilar development on the different stone crop species and it was preferred to grow and lives on *Z. elegans, Taraxacum officinale, C. cyanus* and *Achillea millefolium*. On contrary *Linum rubrum, Lupinus polyphyllus* and *Trifolium spp*., were not suitable hosts of *Myzus persicae*.

4. Biological studies on the mealy plum aphid, *H. Pruni* :

Earlier biological studies were carried out on the mealy plum aphid, *H. pruni* on different host plants by **Davidson (1919)** who studied life history details and habits of the mealy plum aphids.

Zaklad and Skierniewice (1970), indicated that the *H. pruni* Development was holocyclic, and there were 6-16 generations a year. Fecundity was highest in the fundatrices and in the fundatrigeniae of

the first generation, the females depositing 102-120 (with maximum 172) nymphs each. Temperatures of 30 °C and over had an adverse effect on development.

Mohamad and Al-Mallah (1990) in Iraq, studied complete biological characters of mealy plum aphids, *Hyalopterus pruni* on greengage, plum, peach, cherry and apricot trees. They refer also, that overwintering aphids took place in the egg stage and a significant positive correlation between temperature and percentage egg hatchability was found significant; and the effects of temperature and relative humidity on egg mortality were not significant.

Lactin, *et al*. (1995) reported that temperature influences both aphid development, mortality and life history.

Serdar and Raymond (2002) studied biological characters of *Brachycaudus schwartzi* (Borner) on peach and nectarine (*Prunus persica*) trees. The shortest developmental time was 6. 9 d. at 25 °C. and the longest was 19. 9 d. at 15 °C. Adult longevity was 38.5 d. at 15 °C and the highest offspring was 46.4 nymphs per female at 20 °C. The intrinsic rate of increase (r_m) rose sharply from 15 °C (0.109 nymphs /d) to a maximum at 25 °C (r_m 0.286), and then fell sharply at 27.5 °C with high mortality at 30 °C and above. The lower threshold for development was 10.04 °C.

Łucă, *et al.* (2005) studied the biological cycle of the plum mealy aphid, *H. pruni* on plum trees and reported that the first generation has completed it development, function the climatic conditions in 7 to 11 days. There has been phased 8-9 generations of winged and wingless form, untill September and even October.

Ozg¨okc and Atlıhan (2005) investigated development, survival, reproduction rate, and population growth parameters of the

mealy plum aphid *H. pruni*, on four apricot cultivars (Tyrinte, Sakıt, Colomer, and Bebeco) under field conditions. The fastest development time (first instar to adult lasted 9.4 days), highest daily reproduction rate (2.6 offspring /aphid /day), and highest total fecundity (48.1 offspring /aphid) were obtained on c.v., Tyrinte. The intrinsic rate of increase, agood indicator of the growth potential of a population of aphid individuals fed on c.v., Tyrinte was significantly greater than that of individuals fed on c.v., Colomer and Bebeco. While mean generation times (To) of populations on different cultivars were close to each other, the net reproductive rate was the highest (29.45 offspring /aphid /generation) on c.v., Tyrinte and the population doubling time on Tyrinte was18.7 %, 25.2 % and 26.3 % faster than those of individuals on other cultivars tested. The results obtained in this study indicated that c.v., Tyrinte appeared to be the most susceptible to the mealy plum aphid among the cultivars tested.

In California, the population parameters of the mealy plum aphid, *H. pruni* on prune trees were measured at five constants temperatures on potted prune trees by **Latham and Mills (2011).** They indicated that development rates increased with temperature up to an optimum. The relationship between development rate and temperature was described by linear and nonlinear models. Developmental threshold temperature was greater for the nonlinear model than for the linear model. Thermal requirement for development and maximum lethal temperature determined by these models were similar to those for other aphids. The greatest proportional survivorship of nymphs occurred at 26 °C. Mean daily fecundity was lowest at 14 degrees C and highest at 22 °C. Adult longevity decreased with temperature. Population growth rates for *H. pruni* were estimated from measurements of fecundity and development time and were highest at

22 °C. This is the first study to document the temperature dependence of the life history parameters for *H. pruni* and the first to generate a degree-day model for the prediction of phenological events.

Mohamed *et al.* (2015) observed that the development rates of aphids increased with temperature up to an optimum. The relationship between development rate and temperature was described by linear and nonline models. Developmental threshold based temperature temperature was greater for the nonlinear model than for the linear model. Thermal requirement for development and maximum lethal temperature determined by the models were similar to those for other aphids. The greatest proportional survivorship of nymphs occurred at 26 °C. Mean daily fecundity was lowest at 14 °C and highest at 22 °C. Adult longevity decreased with temperature. Population growth rates for *H. pruni* were estimated from measurements of fecundity and development time and were highest at 22 °C.

III- MATERIALS AND METHODS

These experiments were carried out in the stone fruit orchards at Toukh district, Qalyubia Governorate, and in laboratory of Piercing-Sucking research department PPRI-ARC, during the two successive seasons of 2020 and 2021, on the aphid species infested stone fruit trees (apricot, peach and plum) and alternative hosts (weed and wild plants). The following studies were conducted:

1-Ecological studies:

1.1-Survey and population density of aphid species and their associated natural enemies:

The samples of infested leaves and other plant parts of fruit stone trees peach, apricot, plum and some alternative hosts were collected from the orchards of stone fruit at Toukh district, Qalyubia Governorate during the two successive seasons of 2020 and 2021.

1.1. a-Sampling technique:

The samples of 10 leaves in three replicates were collected every week randomly from the four cardinal directions (10 leaves/ direction) of tested stone fruit trees just after vegetative puds emergence until the end of trees activity seasons (total sample size 120 leaves) that throughout the two study seasons at the its season the sampling period extended from 15/2/2020 to 30/7/2020, while during the second one the sampling period was extended from 10/2/2021 to 30/7/2021.

As well as the samples of 10 leaves in three replicats of *Phragmites australis* L. (Fam: poaceae- Gromineae) as alternative host (which grown naturally outer the ridges of fruit stone orchards)

The collected weekly samples were put in paper bags titly closed, transferred to laboratory of piercing-sucking research department PPRI-ARS for inspection and the insect species were

sorted, identified and the numbers of each species were recorded the method of plant sampling described by **(Megahed, *et al.*, 1979).**

1.1. b. Identification of the insects that have been examined:

The collected aphid were separately and kept in vials containing 70% ethyl alcohol and glycerol drops and then transferred to the laboratory of the sucking insects research department PPRI, Dokki, Cairo, Agricultural Research Center. Giza, Egypt.

Identification purposes as described by **Habib and Al-Qadi (1961).** Two types of aphids have been confirmed of the mealy plum aphid (*Hyalopterus pruni*) and of the green peach aphid (*Myzus persicae*) While the most common related predators in orchards were four of the order Coleoptera: the family Coccinellidae, being the eleven-patched ladybird beetle, *Coccinella undecimpunctata* L.; Seven-spotted lady beetle, *Coccinella septempunctata* L.; *Cedonia Vicina nilotica* molasses and *Cydonia vicina isis* Cr., one of the order Neuroptera: the common name as green lace, Fam., Chrysopidae, *Chrysoperla carnea* Stephens; Two of the order Diptera: Fam., Syrphidae: *Syrphus corollae*, and Fam Cecidomyiidae: *Aphidoletes aphidimyza.*

1.1. c-Statistical analysis:

The obtained data were subjected to scheme of statistical analysis using software statistical analysis program costat as follows:

The significance of relation between the mean numbers of plum aphids, *H. pruni* recorded on the samples of cardinal directions was compared as analysis of variance as **Fisher (1950).**

The correlation and regression Coefficients were computed between *H. pruni* weekly mean numbers (alate and aptra forms) infested the three tested stone fruit trees species during the two study seasons and each of mean, minimum, maximum temperature and

relative humidity. The daily and weekly mean values of temperature and relative humidity were obtained from central laboratory of climate.

As well as the correlation and regression coefficients were calculated between the weekly mean numbers of aphids and total mean of predators.

2- Biological Studies:

The experiment was carried out at the laboratory of piercing-sucking insects research department, PPRI, ARC, Dokki, Giza Egypt.

2. a-Rearing Technique:

The mealy plum aphid, *H. pruni* individuals were collected from apricot orchard located at ' Qalyubia Governorate and left for mass rearing. on apricot (*P. armeniaca*) seedlings (2 yr old, about 1-m. height) grown in 30 cm diameter plastic pots kept inside insect breeding cages. The apricot seedlings were artificially infested by only one viviparous female, the infested seedlings were kept under laboratory conditions (20, 25 and 30 °C, 60 ± 5 % R.H. and a 16-8 hr. day light-dark length). To obtain individuals under uniform genetically conditions, aptera viviparous female of *H. pruni* were collected randomly from the stock culture. After three successive generations of mealy plum aphid rearing, the newly born nymphs of the 3rd generation were used for the experimental purposes.

2. b-Biological studies: To study the effects of temperature regimes on life history, apricots (*Prunus armeniaca*) plants was used in this investigation as food supply. The three constant temperature of 20, 25 and 30 °C., were selected to investigate their effects on the biological characters of the mealy plum aphid, *H. pruni* inside the incubator of controlled day length (16:8 hr. light: dark cycle).

12 replicates were used per each temperature degree treatment, the nymphs were inserted in cages and (stayed reared for 3 generations) clip leaf cage described by **Mac Gillivary and Anderson (1957).** Experiments were carried out on exterior leaves of apricot trees, 0.75– cm above the ground **Ozgokc and Atlıhan (2005)**. The insects were checked every 12 hours and when necessary the insects were gently touched by means of a fine smooth camel's hair brush to withdraw their proboscis, and then the insects carefully transferred by means of hair brush moistened with water to the fresh apricot leaves with their clip leaf cages. Observations were made daily every 24 hr., on deposited newly born until the adult established and each aphid caged was checked daily under stereoscopic microscope and their survival recorded at the constant temperatures. When the immature nymphs become adults, they were observed daily for reproduction and survival, all new-born nymphs were removed from each aphid cliped on cage after counting and these observations continued until the mature aphid died at tested constant temperature regimes. Developmental times for each nymphal instars, duration of adult pre-parturition, parturition and post-parturition periods, lifetime fecundity and average daily reproduction were calculated.

2. c-Data analyses and statistics: The obtained data were subjected to statistical analysis. Data gained in the study are presented as means with standard error values (mean ± SE). The significance of differences between nymphal development times, adult life cycle length, fecundity, and daily reproduction at the three constant temperatures were analyzed using ANOVA and the means comparisons were determined by Least Significant Differences (LSD at 0.05%) The effects of different temperatures on the biology of *H. pruni* were assessed by constructing a life table, using age-specific survival rates and fecundity for each age

interval (x) per day. The intrinsic rate of increase r_m was also calculated adapting **Birch (1948)**. Statistical significance was estimated at $p < 0.05$. Statistical Analysis were done using (ILCYM) software **Tonnang *et al*. (2013).**

iv. RESULTS AND DISCUSSION

1.Survey studies:

1.a-Survey and incidence of aphids species infested stone fruit trees and alternative hosts:

The results in **Tables (3-7) and Figs. (1-4)** reveal that the three stone fruit trees being: apricots (*Prunus armeniaca*); peaches (*Prunus persica*), and plums (*Prunus americana*), found harbored two aphid species, throughout the examination periods of 2020 and 2021 growing seasons, at Qalyubia Delta Egypt. The two surveyed aphid species were the dominant one, mealy plum aphid, *Hyalopterus pruni* (Geoff.) And few scattered numbers of green peach aphid, *Myzus persicae* Sulzer, occurred on apricot, peach and plum trees. While the wild plant, common reed *Phragmites australis* witch existed between and around tree orchards, found infested by the mealy plum aphids *H. pruni* only. The present data found in harmony with that of **Leslie and Smith (1936)** who stated that mealy plum aphid, *H. pruni* has been reported frequently in many parts of the world, especially in the northern temperate zone: Africa, Australia, Belgium, Canada, China, Denmark, Egypt, England, France, Germany, India, Ireland, Italy, Japan, Java, Latvia, Morocco, New Zealand, Norway, Palestine, Peru, Portugal, Russia, Scotland, Slavonia, Sweden, and Switzerland. In the same trend, **Ali *et al.* (2008)** in Turkey recorded 4 species of aphid infesting peach trees, including Brachycaudus helichsi, *H. pruni*; *M. persicae*, and *Pterochloroides persicae* Cholodkovsky, (Hemiptera: Aphididae).

The mealy plum aphid *H. pruni* was occurred on both of the three tested stone fruit trees hosts throughout the periods extended from the 2nd week of March to the 2nd week of July at the study areas during

the two investigation successive seasons of 2020 and 2021 with highest mean numbers of 1970.32 and 2568.32 individual. /10 leaves recorded on Apricot trees during 2020 and 2021 seasons, respectively. The lowest mean numbers of 104.18 and 160.13 individual. /10 leaves were recorded on plum trees during 2020 and 2021 seasons**,** respectively, **tables (3&4).** So, the Apricot trees were found the most favorable to *H. pruni* than the other two tested hosts.

Table (3). Monthly mean numbers of mealy plum aphid, *H. pruni* infesting apricot, peach and plum trees (per 10 leaves) at Qalyubia Province, Delta Egypt during 2020 growing season.

Sampling date (Month)	Mean no. of aphids /10 leaves								
	Apricot			Peach			Plum		
	Ala.	Apt.	Tot.	Ala.	Apt.	Tot.	Ala.	Apt.	Tot.
February	0	0	0	1.0	0	1.0	0	0	0
March	9.0	16.8	25.8	13.7	108.2	121.9	0	0	0
April	13.5	1270.3	1283.8	6.0	1452.3	1458.3	1.2	1.3	2.5
May	3,0	6355.4	6358.4	0	5852.5	5852.5	17.3	268.2	285.5
June	40.6	2108.5	2149.1	17.2	1700.7	1717.9	12.0	115.7	127.7
July	12.2	22.3	34.5	2.0	0	2.0	1.0	0	1.0
August	0	0	0	0	0	0	0	0	0
Mean	15.7	1954.6	1970.3	6.7	1518.9	1525.6	7.9	96.3	104.2

Ala. = winged aphid; Apt. = wingless aphid; Tot. = Total numbers of aphids

Table (4). Monthly mean numbers of mealy plum aphid, *H. pruni* infesting apricot, peach and plum trees (per 10 leaves) at Qalyubia Province, Delta Egypt during 2021 growing season.

Sampling date (Month)	Mean no. of aphids /10 leaves								
	Apricot			Peach			Plum		
	Ala.	Apt.	Tot.	Ala.	Apt.	Tot.	Ala.	Apt.	Tot.
February	0	0	0	1.0	0	1.0	0	0	0
March	20.5	95.4	115.9	17.4	458.9	476.3	0	0	0
April	9.7	2364.3	2374.0	2.1	1861.6	1863.7	10.5	38.2	48.7
May	3.4	7071.6	7075.0	5.7	5606.8	5612.5	5.6	373.9	379.5
June	38.6	3136.8	3175.4	42.2	1751.5	1793.7	19.2	192.1	211.3
July	4.2	97.1	101.3	18.5	36.2	54.7	1.0	0	1.0
August	0	0	0	0	0	0	0	0	0
Mean	76.4	2491.9	2568.3	14.5	1539.8	1554.3	9.1	151.1	160.1

Ala. = winged aphid; Apt. = wingless aphid; Tot. = Total numbers of aphids

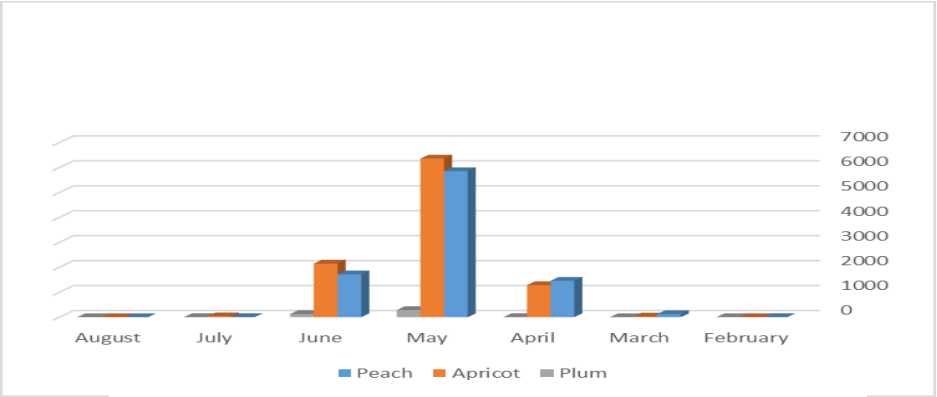


Fig. (1). Monthly mean numbers of *H. plum* infesting apricot, plum and peach trees (per 10 leaves) at Qalyubia province Delta-Egypt, 2020

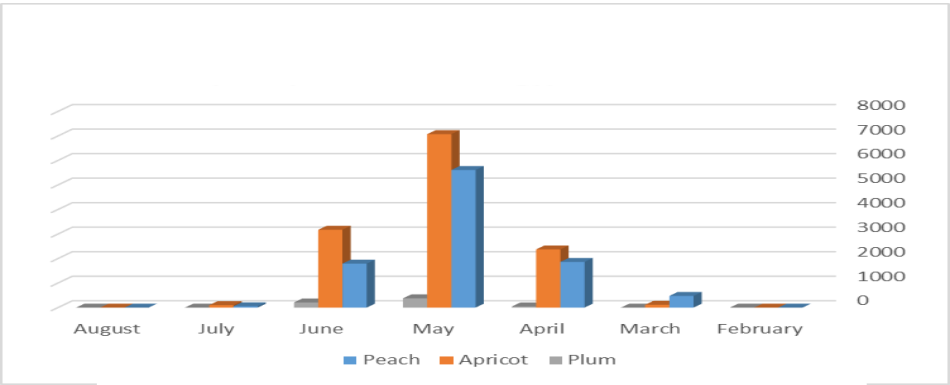


Fig. (2). Monthly mean numbers of *H. plum* infesting apricot, plum and peach trees (per 10 leaves) at Qalyubia province Delta-Egypt, 2021 Season.

The obtaind results in tables (5&6) show the total numbers of green peach aphid *M. persicae* on the three tested hosts which ranged 1-11 individ. /10 leaves on apricot and plum trees during 2020 season, while during 2021season it ranged 4-17 individ. /10 leaves on plum and apricot trees. As previous results of *H. pruni* and *M. persicae*, the plum aphid was the most dominant species than green peach aphid attacking the stone fruit trees under investigated areas during the study periods.

Table (5). Monthly mean numbers of green peach aphid, *M. persicae* infesting apricot, peach and plum trees (per 10 leaves) at Qalyubia Province, Delta Egypt during 2020 growing season.

Sampling date (Month)	Mean no. of aphids /10 leaves								
	Apricot			Peach			Plum		
	Ala.	Apt.	Tot.	Ala.	Apt.	Tot.	Ala.	Apt.	Tot.
February	0	0	0	2	0	2	2	0	2
March	1	0	1	3	0	3	0	0	0
April	0	0	0	0	0	0	0	0	0
May	0	0	0	0	0	0	0	0	0
June	0	0	0	0	0	0	0	0	0
July	0	0	0	0	0	0	0	0	0
August	0	0	0	2	0	2	2	7	9
Mean	1	0	1	7	0	7	4	7	11

Ala. = winged aphid; Apt. = wingless aphid; Tot. = Total numbers of aphids

Table (6). Monthly mean numbers of green peach aphid, *M. persicae* infesting apricot, peach and plum trees (per 10 leaves) at Qalyubia Province, Delta Egypt during 2021 growing season.

Sampling date (Month)	Mean no. of aphids /10 leaves								
	Apricot			Peach			Plum		
	Ala.	Apt.	Tot.	Ala.	Apt.	Tot.	Ala.	Apt.	Tot.
February	2	5	7	2	0	2	0	0	0
March	2	7	9	2	0	2	0	0	0
April	0	0	0	0	0	0	0	0	0
May	0	0	0	0	0	0	0	0	0
June	0	0	0	0	0	0	0	0	0
July	1	0	1	0	0	0	1	3	4
August	0	0	0	0	0	0	0	0	0
Total	5	12	17	4	0	4	1	3	4

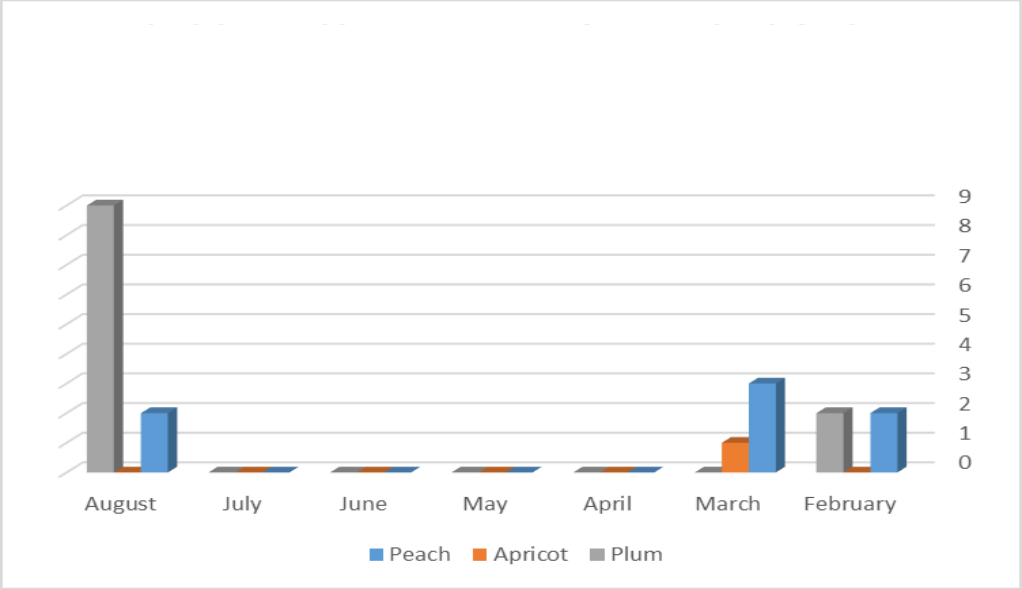


Fig. (3). Monthly mean numbers of M. persicae infesting apricot, plum and peach trees (per 10 leaves) at Qalyubia province Delta-Egypt, 2020 Season.

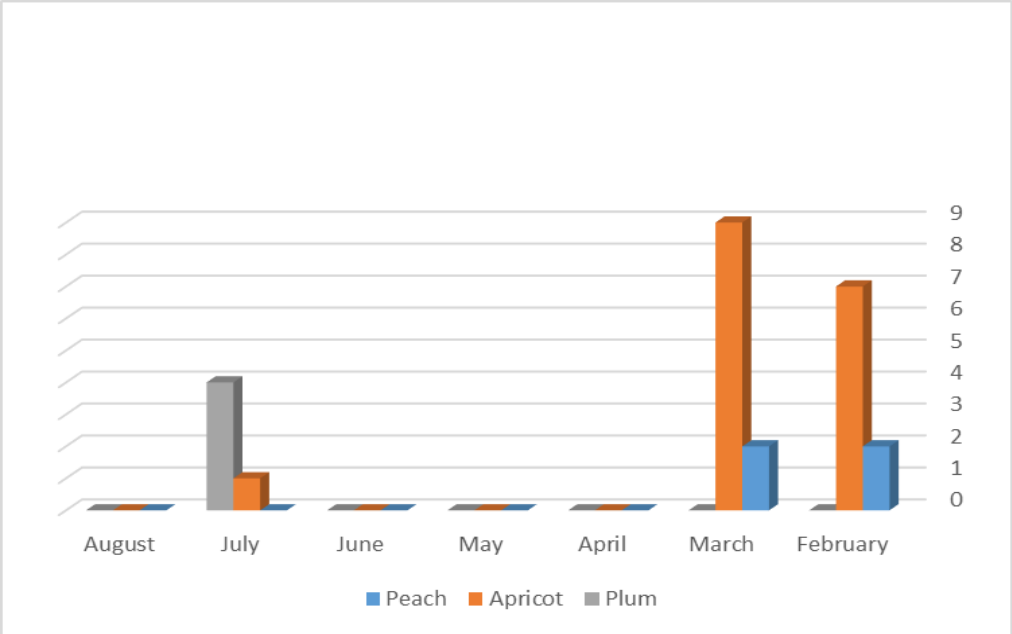


Fig. (4). Monthly mean numbers of M. persicae infesting apricot, plum and peach trees (per 10 leaves) at Qalyubia province Delta-Egypt, 2021 Season.

The population of mealy plum aphid was fluctuated widely throughout the different months of tested seasons and reached its maximum during May, in the two successive investigated seasons of 2020 and 2021; by means number of 6358.4, 5852.5 and 285.5 individ/ 10 leaves and of 7075.0, 5612.5 and 379.5 individ. /10 leaves of apricot, peach and plum throughout the two consecutive seasons of 2020 and 2021, respectively (Tables, 3-4). The prevailing climatic factors as the monthly means maximum, minimum, and mean temperatures in that time were (34.17°, 19.41°, & 26.73° C) and (33.99°, 20.07° & 27.03° C) and relative humidity values were (46.21 %) and (46.54 %) during the two successive seasons, respectively (table, 7). These conditions seem to be the optimal for the aphid species survival on the tested hosts.

Table (7). Monthly mean of prevailing weather conditions of Qalyubia GOV., Delta Egypt during 2020 and 2021 seasons.

Month	2020 season					2021 season			
	Temperature °C			R.H. %		Temperature °C			R.H. %
	Daily Max.	Daily Min.	Daily Avg.			Daily Max.	Daily Min.	Daily Avg.	
February	20.53	10.63	15.13	63.97		21.58	10.04	15.68	62.12
March	24.12	12.05	17.73	57.71		24.89	12.59	18.53	57.98
April	28.07	15.16	21.46	50.69		28.39	14.23	21.13	47.87
May	34.17	19.41	26.73	46.21		33.99	20.07	27.03	46.54
June	35.08	21.43	27.74	37.97		34.89	22.34	28.22	36.83
July	36.89	23.86	29.58	38.73		37.24	25.16	30.73	38.07
Mean	29.81	17.09	23.06	47.55		30.41	17.49	23.73	45.74

Similar results gained in different localities that occurred all over the whole growing seasons of the three stone fruit trees, apricot, peach and plum trees; **El-Kady *et al*. (1970), Ismail *et al.* (1991), Abul-Fadl (2005), Youssif *et al.* (2014), and Shehta (2020)** also, that of different countries of the world as well as in Egypt; in Tunisia (**Ben Halima *et al.* (2013)***;*** in Turkey (**Birol *et al*. (2013).**

Generally, as the obtained data in **Tables (3&4)** based on our observations during the present work, it is now clear that the mealy plum aphid, *H. pruni* could be only considered be a key pest of apricot, peach, and plum trees in Egypt, while *M. persicae* is patchy **(Tables, 5&6)**. We have seen that the former aphid species can build up to large colonies on all growth stages of the three stone fruit trees, and this species under experimental conditions, can significantly be reduce plant vigor's and fruit quality.

1. b-Survey of aphidophagous predators associated with aphid species on stone fruit trees:

The results of survey reveal that seven predator insects were found associated with aphid species infested tested stone fruit trees i.e, *Coccinella undecimpunctata* L.; *Coccinella septempunctata* L.; *Cydonia vicina nilotica* Muls.; *Cydonia vicina isis* Cr.; *Chrysoperla carnea* Stephens; *Syrphus corollae,* and *Aphidoletes aphidimyza.*

The obtaind results found in agree with those of **Polesny *et al.* (1996).** Who found predaceous predators that attacking *H. pruni* and *Brachycaudus helichrysi* on the apricot and plum orchards were: *Adalia bipunctata, Coccinella septempunctata, Calvia quattuordecimguttata, Coccinella quinquepunctata, Propylea quatuordecimpunctata, A. bipustulatus, Stethorus punctillum,* and *Coccinula quatuordecimpustulata. A. bipunctata* was the most numerous species

and played an important role in limiting the populations of both *H. pruni* and *B. helichrysi* on the orchid's trees. **Niccoli and Fagnani (1994)** found that Syrphid and Coccinellid predators were the most potential and numerous natural enemies attacking both, *H. pruni* and *Myzus varians* on apricot, peach, and plum trees. **Abul-Fadl, *et. al.* (2005)** in Egypt**;** Also**, El-Khawas *et al.* (2003),** found that, the occurrence of *H. pruni* on apricot trees in Egypt, covered five months (from February to June) accompanied by 8 species of predacious insects were: *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.* **Fontanari *et al.* (1993)** in Italy, found that the aphid species, *Myzus cerasi* on cherries and *M. persicae* and *M. varians* on peaches, were associated with some natural enemies; Coccinellids, especially *Adalia bipunctata.* Other predators such as *Syrphid Episyrphus* balteatus and *Chrysoperla carnea* have been observed prevailing. While, only one parasitoid species that reported on these aphids was the braconid *Ephedrus persicae*. In the same trend, **Remaudiere and Leclant (1971)** assessed the predators and parasites attacking aphids *Myzus persicae* (Sulz.) and *H. pruni* Geof. on peach trees. They recorded six species of Syrphids observed prevailing, that the most abundant one being *Syrphus* (*Epistrophe*) *balteatus* (Deg.) and *S. vitripennis* Mg. They noticed also the population of Syrphid in the orchards appeared to be maintained at a steady level by the arrival of immigrant aphids. Spiders exerted considerable control at the end of winter by preying on the newly hatched aphid fundatrices. The aphids were attacked from time to time by the fungi *Entomophthora aphidis* and *E. planchoniana.*

2- Population density of the mealy plum aphid, *Hyalopterus Pruni* (Geoff.) and their associated predators in the orchards of apricot, peach and plum trees.

The present survey proved the mealy plum aphid, *H. pruni* is the main injurious pest of the different stone fruit trees at the different sites of Egypt and as well as worldwide exhibited by **Dicker (1979)**; **Mohamad and Al-Mallah (1990); Abul-Fadl *et al*. (2005); Lucă *et al.* (2007)**.

This investigation was conducted at Qalyubia Governorate, Delta-Egypt in order to obtain precise information about the population dynamics of the mealy plum aphid, *H. pruni*, and its associated aphidophagous predators on three stone fruit trees being apricot (*Prunus armeniaca*); plum (*Prunus americana*) and peach (*Prunus persica*), crops.

2.1. On apricot trees:

2.1. (1). Spatial distribution of *H. Pruni* on apricot trees:

The obtained results of horizontal distribution pattern of *H. pruni*, in **Tables** (**8&9)** and illustrated in **Fig. (5)** clear that, the infestation level of aphids in the first season 2020 on apricot tree was relatively higher within Western and Northern direction than Eastern and Southern ones of the trees with slight significant differences in their aphid numbers ($F = 4.77^{*}$. $LSD_{0.05} = 17.13$ and in 2021 $F = 4.64^{*}$. $LSD_{0.05} = 16.64$). The general mean numbers of aphids were 443.58, 442.12, 415.90 and 410.82 individuals / sample during the 2020 season and 563.4, 579.31, 545.16 and 545.2 individuals / sample during 2021 season at the four cardinal directions of Western, Northern, Eastern, and Southern, respectively.

Table (8) Weekly mean numbers of the mealy plum aphid, *H. pruni* on different directions of the apricot trees canopy at Qalyubia Governorate, during 2020 season**.**

Inspection Date	Cardinal directions				
	North	South	East	West	Total
Feb. 2nd w.,	0	0	0	0	0
3rd w.,	0	0	0	0	0
4th w.,	0	0	0	0	0
March 1st w.,	0	0	0	0	0
2nd w.,	3.0	1.0	1.0	3.0	8.0
3rd w.,	4.1	3.75	2.5	4.58	35.2
4th w.,	18.3	14.17	9.58	17.95	60
April 1st w.,	66.1	52.0	60.7	59.6	238.4
2nd w.,	197.6	187.7	180.1	177.8	743.2
3rd w.,	415.0	409.8	411.0	421.0	1656.8
4th w.,	635.3	612.5	579.6	669.4	2496.8
May 1st w.,	1145.8	1005.0	1132.7	1149.7	4433.2
2nd w.,	1812.0	1708.6	1744.4	1801.8	7066.8
3rd w.,	1808.6	1686.0	1740.1	1882.1	7116.8
4th w.,	1698.8	1643.7	1704.3	1770.0	6816.8
June 1st w.,	933.3	800.1	733.3	833.3	3300
2nd w.,	916.6	833.3	783.3	900	3433.2
3rd w.,	354.0	340.0	343.4	355.8	1393.2
4th w.,	121.7	116.6	110.0	121.7	470.0
July 1st w.,	33.4	31.6	26.6	30.0	121.6
2nd w.,	5.2	3.25	3.25	4.7	16.4
3rd w.,	0	0	0	0	0
4th w.,	0	0	0	0	0
Mean	442.12	410.82	415.90	443.58	1713,3

L.S.D 0.05 % =16.64

Table (9) Weekly mean numbers of the mealy plum aphid, *H. pruni* on different directions of the apricot trees canopy at Qalyubia Governorate, during 2021 season.

Inspection Date	Cardinal directions				
	North	South	East	West	Total
Feb. 2nd w.,	0	0	0	0	0
3rd w.,	0	0	0	0	0
4th w.,	0	0	0	0	0
March 1st w.,	0	0	0	0	0
2nd w.,	5.6	3.0	3.4	3.6	15.6
3rd w.,	33.2	27.1	30.0	31.67	121.97
4th w.,	99.2	66.67	76.5	84.0	326.37
April 1st w.,	263.3	234.4	257.3	265.0	1020
2nd w.,	500.0	426.1	432.5	451.0	1809.6
3rd w.,	717.0	700.0	665.1	650.0	2732.1
4th w.,	1035	932.1	966.2	1000.0	3933.3
May 1st w.,	2012.0	1832.4	1933.3	1989.1	7766.8
2nd w.,	1967.0	2000.0	1832.8	2033.4	7833.2
3rd w.,	1934.0	1867.4	1831.5	1832.3	7465.2
4th w.,	1367.0	1233.7	1300.0	1332.5	5233.2
June 1st w.,	1100.0	1034.0	1000.0	1049.3	4183.3
2nd w.,	1365.5	1350.1	1333.4	1400.0	5449.0
3rd w.,	566.4	500.0	533.5	500.1	2100.0
4th w.,	250.0	236.7	243.3	238.5	968.5
July 1st w.,	109.1	97.6	100.0	98.5	405.2
2nd w.,	0	0	0	0	0
3rd w.,	0	0	0	0	0
4th w.,	0	0	0	0	0
Mean	579.31	545.27	545.16	563.43	2233.1

L.S.D 0.05 % =16.89

The twigs at Western and Northern directions of apricot trees canopy found harbored the higher aphid population than that of Eastern and Southern parts. The results of statistical analysis showed significant differences between aphid mean numbers within different trees directions. The mean numbers at tested directions Northern, Western, Eastern and Southern during the two successive seasons of 2020 and 2021, could be arranged in a descending order as follows: 510.72, 478.5, 480.53, and 503.43 aphid individ. / sample of apricot leaves collected from different directions, respectively.

The differences between the seasonal grand means of the aphid numbers were significant (F = 4.71 LSD 0.05 = 16.89). That exhibited two separated groups for dispersal of mealy plum aphid within apricot trees canopy directions. Accordingly, it could be stated that Northern, and Western directions being the higher preferred aphid landing (510.72 & 503.43 insects / sample) than on the Eastern and Southern directions (480.53 & 478.5 insects / sample). Accordingly, it could be stated that preferred apricot tree leaves for mealy plum aphid; *H. pruni* landing was discovered at Northern, and Western direction as shown in **Fig. (5**)

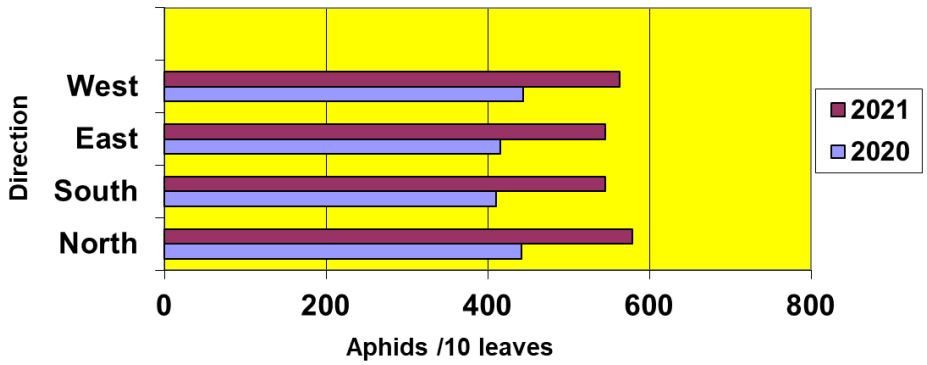


Fig. (5) Relative abundance of *Hyalopterus pruni* distributed within cardinal directions of apricot trees, Qalyubia, 2020 and 2021 seasons.

It could be mentioning that: As the apricot buds begin to open at the end of winter and early spring, the nymphs of mealy plum aphids started to attract and feed on the newly growth leaves; the aphids reproduce rapidly and their numbers reach a peak on the tested hosts (apricot, peach and plums) during late spring to early summer. Winged aphids develop and migrate away from the main stone fruit hosts to infest new trees or bush in beginning and late summer, sometimes leading to new infestation on apricot host and other hosts. The aphids spend the winter season on herbaceous plants. In the end of autumn winged aphids are again produced alate adults which fly back to the primary host's trees to viviparidae. The alate adults being to disperse widely when they migrate to winter hosts (grasses and reeds). The leaves of main hosts which emerge during June-July can be remains suitable to aphid feeding throughout the whole summer season.

Aphids excrete a sugary substance, known as honeydew that makes the foliage, fruits sticky and can attract ants. Also, a black sooty

mould often grows on the honeydew, which reduces the amount of sunlight reaching the leaves and can spoil the appearance of the fruit.

2.1. (2). Population density of *H. pruni* on apricot trees:

The population density of mealy plum aphid, *H. pruni* (Geoff.) alate and aptera forms found attacking apricot trees were estimated weekly once apricot tree leaves emergence (**tables 10&11,** and illustrated in **Figs. 6&7).** The weekly means of daily maximum, minimum temperature and of relative humidity percentages one week earlier before counts in this locality (Al-Qalyubia Province) during the two successive seasons of 2020 and 2021.

Regarding the seasonal average of *H. pruni*, the population was more abundant during 2021 than on 2020 season, by seasonal average being 558.21 and 428.33 individuals / leaf, respectively.

The mealy plum aphid, had one main seasonal activity period in both tested seasons, from the 2nd week of March to the 2nd week of July. Aphids on apricot trees progressively activity until reached maximum mean number of 1779.2 individ. / sample at 3rd week of May, 2020 (at 28.18 °C and 40.7 % R.H.) and in the 2nd week of May, 2021by 1958.3 individ. / sample (at 26.32 °C. and 45.01 RH%).

The results indicated that the population was reached maximum peak (1779.2 and 1958.3individ. / sample) expressing by means nearly 10 weeks after aphid initial set up plants with curled leaves noticed and succulence of leaves, coupled with optimum weather conditions temperature and relative humidity as 28.18- 26.32 °C and 40.7-45.01 R.H%), (Fig., 6 & 7).

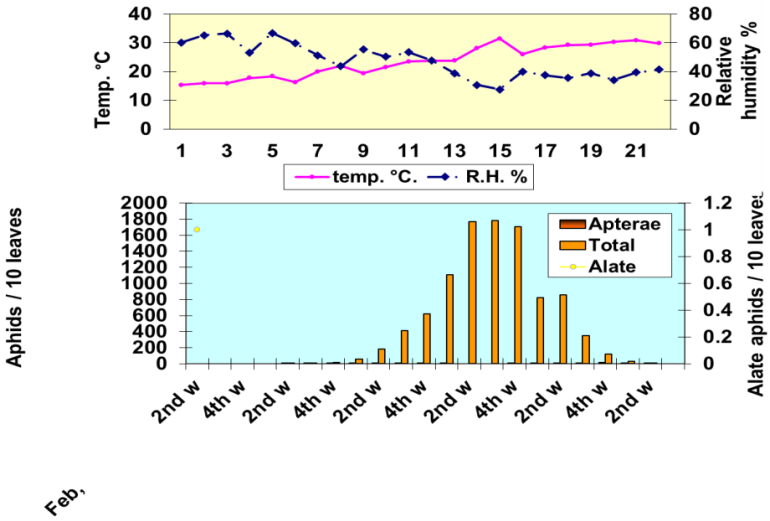


Fig. (6). Weekly mean numbers of different forms of *H. pruni* /10 leaves of apricot with corresponding weekly means temperature and relative humidity one week before at Qalyubia, Governorate during 2020 season.

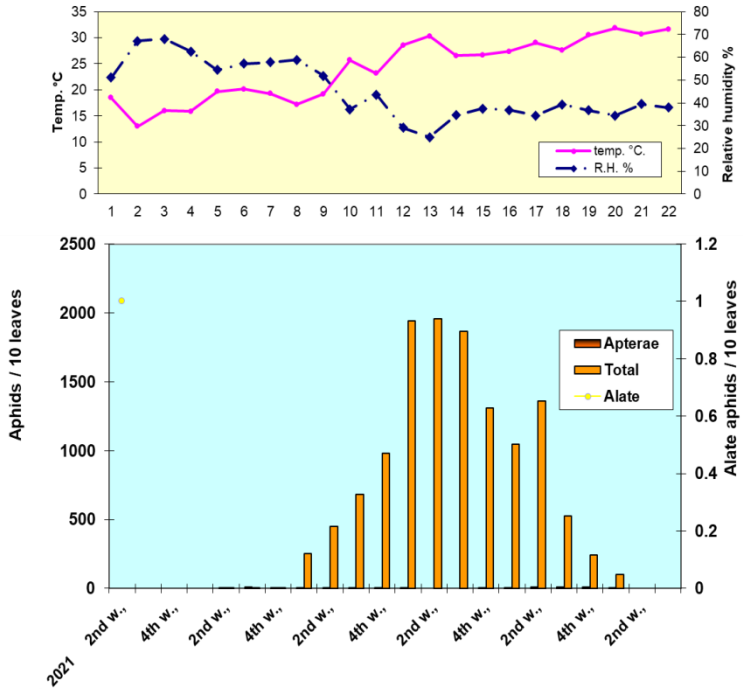


Fig. (7). Weekly mean numbers of different forms of *H. pruni* /10 leaves of apricot with corresponding weekly means temperature and relative humidity one week before at Qalyubia, Governorate during 2021 season.

Table (10) Weekly mean numbers of the mealy plum aphid *H. pruni* /10 leaves of apricot at Qalyubia Governorate, during 2020 season.

Inspection Weeks	Aphid numbers			Weather factors*			
	Alate	Apter.	Total	Temp. °C			R.H. %
				Max.	Mini.	Mean	
2nd. w., February	0	0	0	20.35	10.25	15.3	60.22
3rd. w.,	0	0	0	20.83	10.91	15.87	65.21
4th. w.,	0	0	0	20.4	10.73	15.87	66.48
1st. w., March	0	0	0	24.59	10.84	17.72	53.1
2nd. w.,	2.0	0	2.0	23.49	13.17	18.33	66.79
3rd. w.,	3.0	5.8	8.8	22.06	10.49	16.28	59.61
4th. w.,	4.0	11.0	15.0	26.35	13.71	20.03	51.36
1st. w., April	4.6	55.0	59.6	29.23	14.57	21.9	53.66
2nd. w.,	3.6	182.2	185.8	24.66	14.22	19.44	55.37
3rd. w.,	3.1	411.1	414.2	27.63	15.52	21.58	50.32
4th. w.,	2.2	622.0	624.2	30.73	16.30	23.52	53.42
1st. w., May	1.0	1107.3	1108.3	30.29	17.16	23.73	47.72
2nd. w.,	0	1766.7	1766.7	31.34	16.18	23.76	48.91
3rd. w.,	0	1779.2	1779.2	35.31	21.05	28.18	40.7
4th. w.,	2.0	1702.2	1704.2	39.73	23.24	31.5	47.51
1st. w., June	5.0	820.0	825.0	32.36	19.71	26.04	40.05
2nd. w.,	7.2	851.1	858.3	35.49	21.27	28.38	47.54
3rd. w.,	10.1	338.2	348.3	36.97	21.54	29.26	45.46
4th. w.,	18.3	99.2	117.5	35.49	23.19	29.34	48.85
1st. w., July	10.2	20.2	30.4	37.48	23.09	30.29	44.18
2nd. w.,	2.0	2.1	4.1	37.38	24.41	30.9	49.49
3rd. w.,	0	0	0	35.85	23.76	29.81	41.4
4th. w.,	0	0	0	36.84	24.17	30.51	49.85
Mean	3.1	425.23	428.33	30.21	17.37	23.81	51.62

* one week earlier

Table (11) Weekly mean numbers of the mealy plum aphid. *H. pruni* /10 leave apricot at Qalyubia Governorate, during 2021 season.

Inspection Weeks	Aphid numbers			Weather factors*			
	Alate	Apter.	Total	Temp. °C			
				Max.	Mini.	Mean	R.H.%
2nd. w., February	0	0	0	24.69	12.27	18.48	51.12
3rd. w.,	0	0	0	18.33	7.65	12.99	67.16
4th. w.,	0	0	0	21.74	10.19	15.97	68.09
1st. w., March	0	0	0	21.96	9.79	15.88	62.5
2nd. w.,	3.9	0	3.9	25.96	13.35	19.66	54.48
3rd. w.,	10.2	20.2	1.0	26.6	13.71	20.16	57.15
4th. w.,	6.4	75.2	2.0	25.04	13.53	19.29	57.81
1st. w., April	5.1	249.9	255.0	23.88	10.49	17.19	58.89
2nd. w.,	2.6	452.4	450.0	25.54	12.91	19.23	51.84
3rd. w.,	1.2	682.1	683.3	34.24	17.14	25.69	47.19
4th. w.,	1.0	982.3	983.3	29.90	16.37	23.14	43.56
1st. w., May	1.2	1940.5	1941.7	36.89	20.28	28.59	49.09
2nd. w.,	0	1958.3	1958.3	32.69	19.95	26.32	45.01
3rd. w.,	0	1866.7	1866.3	33.58	19.51	26.55	44.54
4th. w.,	2.2	1306.1	1308.3	32.78	20.54	26.66	47.53
1st. w., June	6.5	1039.3	1045.8	33.39	21.39	27.39	36.93
2nd. w.,	12.4	1350.1	1362.5	35.72	22.27	29	34.36
3rd. w.,	11.6	513.4	525.0	33.63	21.59	27.61	39.35
4th. w.,	8.1	234.0	242.1	36.83	24.10	30.47	36.67
1st. w., July	4.2	97.1	101.3	38.78	24.84	31.81	34.42
2nd. w.,	0	0	0	36.59	24.84	30.72	39.4
3rd. w.,	0	0	0	36.94	26.31	31.63	37.88
4th. w.,	0	0	0	36.64	24.65	30.65	40.57
Mean	3.160	550.31	553.3	30.54	17.72	24.13	48.07

Our findings are in agreement with those of **Abul-Fadl *et al.* (2005)** in Egypt who mentioned that the greatest population of aphids occurred due to the vegetative stage of the apricot trees.

In the same trend, **ÖZTÜRK, *et al.* (2007)** determined that *H. pruni* nymphs in apricots first started to be seen in the first half of March at 12 ° C and the relative humidity of 40.3-62.6%. In addition, it was determined that the *H. pruni* population progressively increased from the second half of May and reached the highest level in June. However, towards the end of June, there was a rapid decrease in pest density, and from July, the density of *H. pruni* has decreased due to migration to the reeds (*Phragmites spp.*), influence of natural enemies, low humidity and high temperature. Since, the second half of July, the average number of aphids has decreased to zero, some individuals do not migrate in August or September and continue to feed on apricots.

2.1. (2). a. Alate form:

Data included in **Tables (10&11) and Figs. (6&7)**, indicated that the first winged individuals of *H. pruni* immigrants from early summer fruit trees and wild (weed and grasses) plants landed on apricot plants almost during the 2nd Week of March in both investigated seasons. In 2020 season, alate forms had two main periods of activity: from 2nd week of March to 1st week of May (lasted 9 weeks nearby) and 4th week of May to 2nd week of July. The maximum count of winged forms was recorded during the 1st week of April and the last week of June 2020 (4.6 and 18.3 individuals /10 leaves, respectively); where the prevailing weather conditions being (21.9 ° C & 53.66 % R.H., and 29.34 ° C & 48.5 % R.H., in the two intervals, respectively).

In 2021 season, alate forms occupied two main intervals of activity periods also: from 2nd week of March – 1st week of May 2021

with a maximum number during the 3rd week of March (10.2 insects /10 leaves, when the prevailing weather conditions was 20.16 °C and 57.15 % R.H.), and the second from 4th week of May – 1st week of July 2021, with a peak number at the 2nd week of June 2021 being (12.4 aphids /leaf, where climatic conditions being 29.0° C and 34.36 % R.H.)**.**

Alate forms of this species observed decrease in numbers at two distinct periods, the first extended from 2nd week of April to 1st week of May and the second was recorded in the end of vegetative season at the 1st week of July 2020 on ward, whereas during 2021season extended from 4th week of March to 1st week of May and the second one from the end of vegetative season in the 3rd week of June to 1st week of July 2021. The main factures caused aphid reduction in numbers as it advanced to physiological maturity of leaves and due to these natural control agents (mortality factors), also decreased as affected by environmental unfavorable conditions. It showed that there was a direct relation of weather conditions with that of aphid activities in summer fruit trees in general **(Öztürk, *et al.* (2007).**

2.1. (2).b. Apterae form:

Regard abundance and distribution of aptera forms (wingless) of *H. pruni* set up apricot trees, **Tables (10-11) and Fig. (6-7) s**hows that mealy plum aphid, *H. pruni* aptera had one main activity period in both investigated seasons of 2020 and 2021, in 2020 season, initiated from 3rd week of March to 2nd of July, and in the second successes season from 3rd week of March to 1st week of July 2021. The maximum numbers of wingless forms were detected at the 3rd week of May 2020, and in the 2nd week of May 2021, being (1779.2 and 1958.3 insects /10 leaves, in the two successive seasons, respectively); where the

prevailing weather conditions being (28.18 °C and 40.07 % R.H.), and (26.32 °C and 45.01 % R.H.) in the two seasons, respectively.

The consolidated in population of mealy plum aphid apterous form during the two successive growing seasons 2020 and 2021 illustrated in (**Figs. 6&7**) indicated that their was reached peaks (1779.2 and 1958.3 individuals /10 leaves) on 3rd and 2nd week of May, where vegetative growth and succulence of leaves coupled with favorable conditions mainly mean temperature was 28.18 and 26.32 °C, respectively.

From the aforementioned results, it could be concluded that mealy plum aphid, *H. pruni* found to be more abundant early and could be considered as a key pest on apricot plants. *H. pruni* found to be a pest active on apricot plants and attacked plants during summer months at early – mid, March during vegetative growth period extended from mid-July where plants in flowering and fruit ripening stages**.** These results are in agreement with the findings of certain authors such as: **Mohamad and Al-Mallah (1990)** in Iraq who mentioned that, a few aphids, *H. pruni* were occurred on the greengage, plum, peach, cherry and apricot the trees during the 1st week of March, and the population reached a peak by the 3rd week of April, then declined gradually and disappeared completely by the 2nd week of June. **Abul-Fadl *et al.* (2005)** in Egypt, they noted that the occurrence of *H. pruni* on apricot trees lasted 5 months (from February to June, every year). The maximum numbers of *H. pruni* were recorded during the 2nd week of April. There were no aphid individuals showed during the period extended from July to September.

2.1. (3). Population density of predator species associated with mealy plum aphid, *H. pruni* on apricot trees:

In the course of the ecological studies concerning the population dynamics of mealy plum aphid, *H. pruni* infested apricot trees, 7 predaceous insects found associated with this aphid species (**Tables 12&13 and Figs. 8&9**). The predacious insects inhabited on the apricot leaves are belong to three insect orders; of which four from order Coleoptera: family Coccinellidae, being the eleven-spotted ladybird beetle, *Coccinella undecimpunctata* L.; seven spotted lady beetle, *Coccinella septempunctata* L.; *Cydonia vicina nilotica* Muls. and *Cydonia vicina isis* Cr., one from order Neuroptera: common name as green lacewing, Fam., Chrysopidae, *Chrysoperla carnea* Stephens; two from order Diptera: Fam., Syrphidae: *Syrphus corollae,* and Fam Cecidomyiidae: *Aphidoletes aphidimyza*.

The population density of investigated predator species were recorded as weekly mean numbers/ 10 apricot leaves. Such predaceous species were relatively more abundant during the second season (66.22 insects /10 leaves) than the first one (47.26 insects /10 leaves). These predacious insects prevail in one main activity period; from 4th week of March to the 1st week of July 2020 and 2021 growing seasons. Maximum counts of aphidophagous predators occurred by the 3rd Week of May 2021, and in the 2nd week of May 2021 (by seasonal means of 257 and 246 insects /70 leaves, respectively.

Table (12): Weekly mean numbers of predator species associated with *H. pruni* apricot trees at Qalyubia Governorate, during 2020 season.

Inspection Date		Predator species							
		C. undc.	*C. sept.*	*C. vicinia Nilotica*	*C. vicinia var*	*Ch. carnea*	*Sy. corollae*	*A. aphidimyza*	Total
Feb, 2020	2nd w.,	0	0	0	0	0	0	0	0
	3rd w.,	0	0	0	0	0	0	0	0
	4th w.,	0	0	0	0	0	0	0	0
March, 2020	1st w.,	0	0	0	0	0	0	0	0
	2nd w.,	0	0	0	0	0	0	0	0
	3rd w.,	0	0	0	0	0	0	0	0
	4th w.,	1	0	0	0	1	0	0	2
April, 2020	1st w.,	4	1	1	1	0	0	0	7
	2nd w.,	6	2	2	1	2	0	0	13
	3rd w.,	6	1	2	0	2	0	0	11
	4th w.,	8	2	1	1	1	10	4	27
May, 2020	1st w.,	10	3	3	1	5	40	35	97
	2nd w.,	18	7	3	3	4	95	80	210
	3rd w.,	20	6	4	2	5	115	105	257
	4th w.,	16	5	3	1	2	108	95	230
June, 2020	1st w.,	9	4	2	2	1	70	35	123
	2nd w.,	5	1	1	1	1	30	25	64
	3rd w.,	1	1	0	0	0	18	10	30
	4th w.,	1	1	1	0	0	10	0	13
July, 2020	1st w.,	2	1	0	0	0	0	0	3
	2nd w.,	0	0	0	0	0	0	0	0
	3rd w.,	0	0	0	0	0	0	0	0
	4th w.,	0	0	0	0	0	0	0	0
Mean		4.65	1.52	1.0	0.57	1.04	21.56	16.91	47.26

Table (13): Weekly mean numbers of predator species associated with *H. pruni*, on apricot trees at Qalyubia Governorate, during 2021 season**.**

Inspection Date		Predator species							
		C. undc.	*C. sept.*	*C. vicinia Nilotica*	*C. vicinia var*	*Ch. carnea*	*Sy. corollae*	*A. aphidimyza*	Total
Feb, 2021	2nd w.,	0	0	0	0	0	0	0	0
	3rd w.,	0	0	0	0	0	0	0	0
	4th w.,	0	0	0	0	0	0	0	0
March, 2021	1st w.,	0	0	0	0	0	0	0	0
	2nd w.,	0	0	0	0	0	0	0	0
	3rd w.,	0	0	0	0	0	0	0	0
	4th w.,	0	1	0	0	1	0	0	2
April, 2021	1st w.,	4	2	1	1	3	0	0	11
	2nd w.,	6	3	2	1	2	14	20	48
	3rd w.,	6	2	2	1	1	28	33	73
	4th w.,	9	4	0	0	3	45	60	121
May, 2021	1st w.,	11	5	1	1	4	98	114	234
	2nd w.,	10	6	2	2	2	102	122	246
	3rd w.,	7	3	1	2	2	85	120	220
	4th w.,	7	4	2	0	0	76	90	179
June, 2021	1st w.,	4	1	1	0	0	50	65	121
	2nd w.,	0	0	0	0	0	55	60	115
	3rd w.,	0	0	0	0	0	30	38	68
	4th w.,	0	0	0	0	0	22	28	50
July, 2021	1st w.,	2	0	0	0	0	15	18	35
	2nd w.,	0	0	0	0	0	0	0	0
	3rd w.,	0	0	0	0	0	0	0	0
	4th w.,	0	0	0	0	0	0	0	0
Mean		2.87	1.35	0.52	0.35	0.78	26.95	33.39	66.21

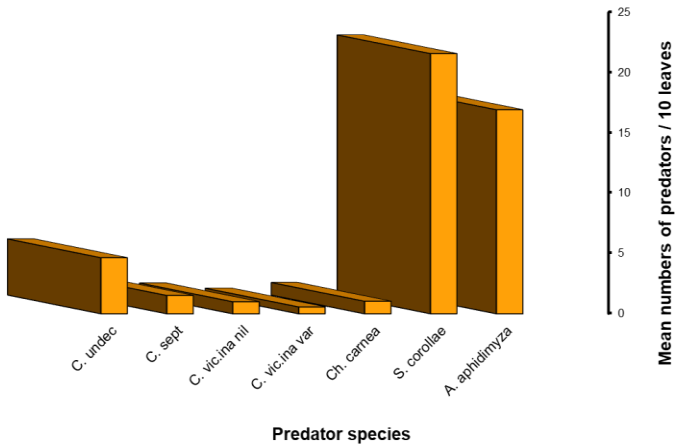


Fig.(8). Seasonal mean numbers of different insect predators associated with mealy plum aphid, *H. pruni* /10 leaves apricot plants at Qalyubia, Governorate during 2020 growing season.

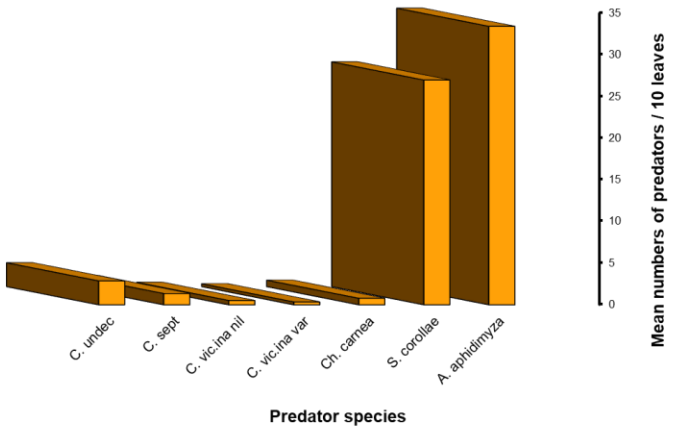


Fig.(9). Seasonal mean numbers of different insect predators associated with mealy plum aphid, *H. pruni* 10 /leaves apricot plants at Qalyubia, Governorate during 2021 growing season.

2.1. (3) a. The ladybird beetles, *Coccinella undecimpunctata* L., *C. Septeumpunctata* L., *Cydonia vicina nilotica* Muls. and *Cydonia vicina isis* Cr.

As clearly shown in **Tables** (**12&13) and Figs (8&9),** the seasonal fluctuation in the population densities of the four ladybird beetles *Coccinella undecimpunctata*; *C. septempunctata.; Cydonia vicina nilotica* Muls. and *Cydonia vicina isis* Cr. indicate convenient active during 2020 than 2021 season. The general seasonal mean numbers were 4.65, 1.52, 1.0 and 0.57 for the four predator species in 2020 season; while during 2021 being 2.87, 1.35, 0.52 and 0.35 insects /10 apricot leaves, respectively.

2.1. (3).b: The green lacewing, *Chrysoprela carnea* Steph.

The concerning data (**Tables 12&13 and Figs. 8&9)** showed that this *Chrysoprela* species was at the same limited active for ten weeks on apricot plants in both 2020 and 2021. The seasonal mean numbers were 1.04 and 0.78 insects /10 leaves. This species had one main period of seasonal abundance in 2020, and 2021, initiated in the 4th week of March to the 2nd week of June, 2020; and from 4th week of March to 3rd week of May, 2021. The weekly mean numbers reached their maximum numbers on the 3rd week of May 2020 and 1st week of May 2021, being 5.0 and 4.0 individuals /10 leaves, during the two growing apricot seasons, respectively. During 2020 and 2021, this species displayed for 10 weeks only during the main aphid infested infestation period. These results found in agree with those of **Abul-Fadl, *et al.* (2005)** who stated that the predatory *Chrysoperla carnea Steph.* And *C. septempunctata* had the highest occurrence percentages than other recorded predatory species.

2.1. (3) c. Dipteran predators.

With regards to seasonal abundance of the predaceous Dipteran insects: *Syrphus corollae* and *Aphidoletes aphidimyza* that prey mealy plum aphid on apricot trees, data in **Tables (12&13) and Figs. (8&9**), show that these syrphid and Cecidomyiid flies were found to be active from the 4th week of April (10 & 4 insects) to the fourth and third week of June, 2020 (10 & 10 insects /10 leaves), for the two predaceous insects, respectively. In 2021 season, these Syrphid and Cecidomyiid insects were active as predatory from 2nd week of April (14 & 20 insect) to 1st week of July (15 & 18 insects /10 leaves) for the two predator, respectively. The seasonal mean counts were (21.56 &16.91) and (26.95 &33.39) individuals /10 leaves, for the two predacious species in the first and second season, respectively. Weekly mean numbers of this predaceous species recorded one activity period extended from the 4th week of April to 3rd week of June, 2020; while in the second season 2021 it tooks from 2nd week of April to 1st week of July, reached their maxima during 3rd week of May (115 & 105 insects) and 2nd week of May (102 & 122 insects), the two dipterous insects in 2020 and 2021 growing season, respectively.

Generally, it could be concluded that the seven predator species; *Coccinella undecimpunctata, C. septempunctata, Cydonia vicina nilotica* Muls. *Cydonia vicina* isis., *Chrysoprela carnea*, Syrphus *corollae*, and *Aphidoletes aphidimyza* had 1-2 activity periods throughout the study seasons. Also mealy plum aphid, *H. pruni* had one main period of seasonal activity on apricot trees grown at Qalyubia district. Both aphids and predator species were more active during 2020 and 2021, both synchronized that seeme to be coinciding with each other. These results are in agreement with the findings obtained by **Abul-Fadl, *et al.* (2005)** in Egypt**; Zaklad and Skierniewice, (1970)**

in Poland who found that *H. pruni* had attacked by 7 aphidophagous predator species being: *Syrphus balteatus* (Deg.), *S. vitripennis* Mg., *Lasiophthicus pyrastri* (L.), *Sphaero-phoria scripta* (L.), *Phaenobremia aphidivora* (Rübs.), *Adalia bipunctata* (L.) and *Coccinella septempunctata* L.**.**

El-Khawas *et al.* (2003), found that, the *H. pruni* on apricot trees accompanied by 8 species of predacious insects were: *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. The total numbers of predatory species per season were 407 and 1082 individuals, in the two studied seasons, 2003 and 2004, respectively. The maximum monthly occurrence of these predatory species was during April.

2.1. (4). Effects of some climatic factors on the population density of the mealy plum aphid, *H. pruni* on apricot trees:

The simultaneous effects of some ecological factors (biotic and abiotic) infelouncing population density of mealy plum aphid, *H. pruni* infesting apricot trees, was determined throughout the growing seasons of 2020 and 2021. The obtained results are summarized in **Tables (14&15)**.

2.1. (4) a. Effect of Temperature:

In the present work temperature represented as weekly mean of maximum, minimum and temperature average. In order to investigate the effects of three temperature regimes on mealy plum aphid forms population (alate, apterae and total forms) on apricot trees, the obtained data were analyzed statisticaly (**Tables 14&15).**

The *H. pruni* alate mean numbers on apricot trees under field conditions were positively correlated with maximum and minimum, temperature, and exhibited statistically significant for both 2020 and 2021 seasons, being (0.3508, 0.2798 & 0.4937) and (0.3946, 0.3081 & 0.4665), for correlated between aptera form and each mean, maximum and minimum temperature, and being (0.3540, 0.2830 & 0.4069) and (0.3954, 0.3090 & 0.4672), for correlated between total alate and aptera forms and each mean, maximum and minimum temperature, respectively.

The simple regression formula was adopted to show the unit effect of each factor (e.g., maximum and minimum temperature) on the corresponding population density of mealy plum aphid (alate, aptera and total numbers) being (0.4921, 0.0032 & 0.032) (0.44488, 0.0023 & 0.0023) and (0.5403, 0.0041 & 0.042) in 2020; while (0.1877, 0.0034 & 0.0034) (0.0046, 0.0026 & 0.0026) and (0.1708, 0.0042 & 0.042) in 2021. The calculated values of regression coefficient "b" and constant values (A) are given in **Tables (14&15)** for both tested seasons.

From these results it can be concluded that the weekly mean numbers of *H. pruni* on apricot plants markedly varied according to temperature factor and unit of change. Thus, the increase or decrease in temperature was affected on the mealy plum aphid population *H. pruni*, as reveled for winged by (0.5403 & 0.1708); aptera by (0.0041 & 0.0041), and total counts of mealy plum aphid by (0.0042 & 0.0042), respectively, could be resulted due to a change in the weekly mean maximum, minimum and average temperature by 1 ºC.

2.1. (4) b. Effect of relative humidity:

Significant negative correlated between R.H. % and each alate, aptera and total forms of *H. pruni* exhibited in both 2020 and 2021 growing seasons (r = -0.3553, -0.5445 & -0.5477) and (r = -0.0723, -0.6703 & -0.6710) except insignifiact and also negative correlation between the same climatic factor R.H. % and alate form *H. pruni* in the second season (r = -0.0723) occurred in 2021 season **Tables (14&15).** The regression coefficient "b" values were (-0.9266, -0.0103 & -0.0103) and (-0.2213, -0.0120 & -0.0120) for alate, aptera and total numbers of mealy plum aphid in the first and second season, respectively.

From these results it can be concluded that the weekly mean numbers of *H. pruni* on apricot plants markedly decrease with the increase of relative humidity percentages as confirmed in both tested seasons. These results are in agreement with similar results obtained in Egypt**, by Mohamad and Al-Mallah (1990)** in Iraq found, during a period of 1985-86, significant relation between aphid *H. pruni* populations and temperature was proved, but the relationship with relative humidity was not significant.

2.1. (4) c. Effect of Insect Predators:

The activity of seven insect predators i.e., *Coccinella undecimpunctata* L.*; Coccinella septempunctata* L.*; Cydonia vicina nilotica* Muls.*; Cydonia vicina* isis Cr.*; Chrysoperla carnea* Stephens; *Syrphus corollae*, and *Aphidoletes aphidimyza*., that totally represent the biotic factor showed negative and insignificant effect on the population density of winged form of mealy apricot aphid, *H. pruni* on apricot plants throughout 2020 and 2021; but significant (P = > 0.01)

and negative effects on the wingless and total forms of mealy plum aphid during both tested seasons Tables (14&15). Fore-mentioned predators were totally negatively effects and highly significant (r= - 0.9670 & - 0.9851) and (r= - 0.9672 & - 0.9855); both P = >0.01) on abundance of total and aptera forms of the mealy apricot aphid during 2020 and 2021; and also negative effects but non-significant on alate form in the first and second season 2020 and 2021, where r value being -0.1666 and – 0.0589), respectively. As given in s 11, and 12. The correlation coefficient "r" values were (- 0.9870 and - 0.9851; P = >0.01) for the effects of total insect predators on total numbers of mealy plum aphid in the first and second season, respectively. The present results obtained were agreement with **Polesny *et al.* (1996)** who found that predaceous predators that attacking *H. pruni* and *Brachycaudus helichrysi* on the apricot and plum orchards were*: Adalia bipunctata, Coccinella septempunctata, Calvia quattuordecimguttata, Coccinella quinquepunctata, Propylea quatuordecimpunctata, A. bipustulatus, Stethorus punctillum,* and *Coccinula quatuordecimpustulata*. *A. bipunctata* was the most numerous species and played an important role in limiting the populations of both *H. pruni* and *B. helichrysi* on the orchid's trees.

2.1. (4) d. Combined effects of meteorological factors and predators:

The two seasons combined effects estimated as explained variance (E.V. %) for the three ecological factors (weekly mean temperature; and relative humidity) and bio-agent predators on total aphid populations of aphids infesting apricot plants are estimated were (56.0 %, 37.1 % and 95.77 %), respectively. Obtained results resulted positive significant regression coefficient were obtained for the relationship between temperature and the progress in population

density of mealy plum aphids in both 2020 and 2021 seasons and subsequent on development life stages.

From the above mentioned discussion, it could be concluded that the direct and joint effect of the bio-agent predators coordinated with the influence of weekly average maximum, and minimum temperatures and mean percentage of relative humidity showed precise effects, as a group on the population densities of *H. pruni* harbored apricot during summer months. These simultaneous effects were more confirmed in both tested seasons. The predator population was significantly correlated with that of its preys. The same results were reported by **Abul-Fadl*, et al.* (2005).**

In conclusion, the correlation between the population of the mealy plum aphids on one hand and the population of their associated predators on the other hand was negative. This means that whenever increases the number of aphidophagous predators within apricot fields parallel decrease in the abundance of corresponding aphids that noticed. These results agree with those obtained by **Zaklad and Skierniewice (1970)** in Poland, they found the population size of *H. pruni* dramatically reduced by the activity of insect different predator species.

Table (14). Simple correlation and regression coefficient values between main weather factors (abiotic and predators (biotic) on the weekly mean numbers of different forms of *H. pruni* on apricot trees at Qalyubia Governorate during 2020 growing season.

Tested factors	Aphid density	Correlation Coefficient (r)	*P*	Regression coefficient (b	Intercept (A)
Mean temperature	Alate form	0.3887	>0.01	0.4921	22.13
	Aptera form	0.3508	>0.01	0.0032	22.44
	Total numbers	0.3540	>0.01	0.0032	22.42
Minimum temperature	Alate form	0.3931	>0.01	0.4488	15.84
	Aptera form	0.2798	>0.05	0.0023	16.39
	Total numbers	0.2830	>0.05	0.0023	16.37
Maximum Temperature	Alate form	0.3806	>0.01.	0.5403	28.37
	Aptera form	0.4037	>0.001	0.0041	28.45
	Total numbers	0.4069	>0.001	0.0042	28.42
% R.H	Alate form	-0.3553	>0.01	-0.9266	49.99
	Aptera form	-0.5445	>0.001	-0.0103	51.20
	Total numbers	-0.5477	>0.001	-0.0103	51.26
Predators	Alate form	-0.1666	N.S.	-3.0054	7.49
	Aptera form	-0.9672	>0.001	-0.1262	6.35
	Total numbers	-0.9670	>0.001	-0.1263	6.83

Table (15). Simple correlation and regression coefficient values between main weather factors (abiotic and predators (biotic) on the weekly mean numbers of different forms of *H. pruni* on apricot trees at Qalyubia Governorate during 2021 growing season.

Tested factors	Aphid density	Correlation Coefficient (r)	*P*	Regression coefficient (b	Intercept (A)
Mean Temperature	Alate form	0.1274	N.S.	0.1877	23.68
	Aptera form	0.3946	>0.05	0.0034	22.43
	Total numbers	0.3954	>0.01	0.0034	22.41
Minimum Temperature	Alate form	0.1439	N.S.	0.2046	17.13
	Aptera form	0.3081	>0.05	0.0026	16.40
	Total numbers	0.3090	>0.05	0.0026	16.38
Maximum Temperature	Alate form	0.1100	N.S.	0.1708	30.23
	Aptera form	0.4665	>0.01	0.0042	28.45
	Total numbers	0.4672	>0.01	0.0042	28.44
% R.H	Alate form	-0.0723	N.S.	-0.2213	45.76
	Aptera form	-0.6705	>0.001	-0.0120	51.66
	Total numbers	-0.6710	>0.001	-0.0120	51.71
Predators	Alate form	-0.0589	N.S.	-1.2153	7.25
	Aptera form	-0.9855	>0.001	-0.1184	0.52
	Total numbers	-0.9851	>0.001	-0.1183	0.15

2.2. On peach trees:

2.2. (1). Spatial distribution of *H. pruni* Geof.:

The data presented in **Tables (16&17)** and **Fig. (10)** demonstrated that the abundance of mealy plum aphids per 10 leaves sustained peach plants that aphid infestation distributed on the four cardinal directions North, South, East, and West were varied significantly recorded during 2020 and 2021, growing seasons, respectively (F= 3.1 >0.05 and 6.51 >0.01).

Data also indicated that *H. pruni* infestation level on peach tree was relatively higher within Northern and Western sides than Eastern and Southern of the trees with slight significant differences in their aphid numbers (LSD 0.05 = 33.75 and 22.45) in the two seasons, respectively. Mean number of aphids on 10 leaves, during the whole growing season were: 420.60; 412.74; 383.52 and 375.56 individual/sample during 2020 season at directions Northern, Western, Eastern and Southern of the peach trees, respectively. The same result was proved, during second season of 2021, Trees at the Northern and Western sides of the peach field harbored the higher counts of aphid infestation than on Eastern and Southern sides and statistically showed highly significant differences between aphid infestation abundance within different field directions (F = 6.51, *P* <0.01). The seasonal average numbers at those directions could be arranged in a descending order as follows: 463.40; 426.02; 408.90 and402.09 individuals /sample10 during 2021 season at Northern, Western, Southern, and Eastern direction of trees, respectively.

The difference between the season grand means of the aphid numbers was significant (F= 4.75, and LSD 0.05= 33.75 at 5 %) probability that could separate into two groups for dispersal of mealy

plum aphid among peach trees. Accordingly, it could be stated that Northern and Western directions being the higher preferred aphid landing than on the Eastern and Southern direction. The grand seasonal means of aphids sustained peach field at Northern, Western, Southern and Eastern directions being 442.0, 419.38, 392.23 and 392.81 individuals/sample, respectively. Accordingly, it could be stated that preferred peach tree plants for mealy plum aphid landing was observed on North-West direction as shown in **Fig. 10**.

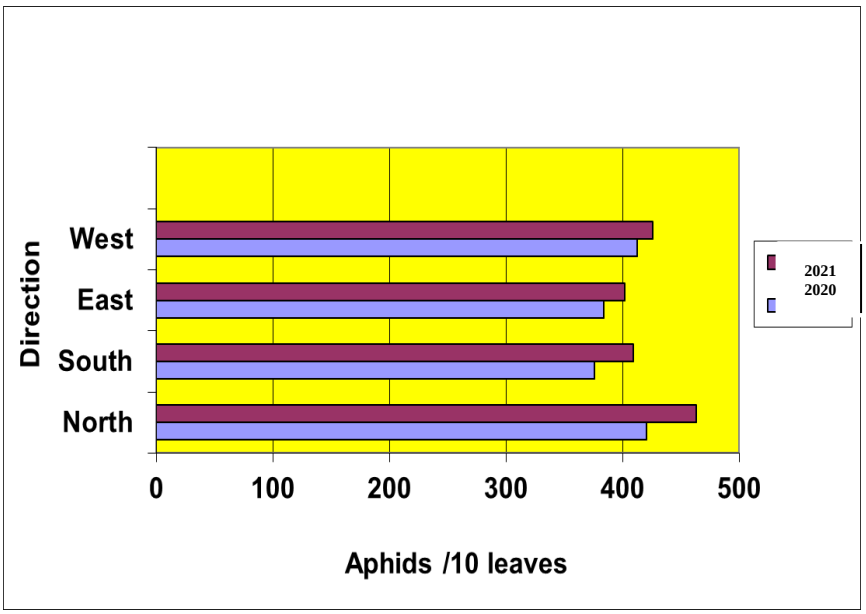


Fig. (10). Relative abundance of *Hyalopterus pruni* distributed within cardinal direcions of peach trees, Qalyubia, 2020 and 2021 seasons.

Table (16). Weekly mean numbers of the mealy plum aphid. *Hyalopterus pruni*, per 10 peach leaves at different directions of the orchard (Qalyubia Governorate, during 2020 season).

Inspection Date	Cardinal directions				
	North	South	East	West	Total
Feb, 2020 2nd w.,	0.0	0.0	0.0	0.0	0.0
3rd w.,	0..0	0.0	0.0	0.0	0.0
4th w.,	2.0	0.0	0.0	2.0	4.0
March, 20201st w.,	4.1	2.8	2.9	3.0	12.8
2nd w.,	21.4	16.3	18.4	19.5	75.6
3rd w.,	33.3	29.9	25.3	28.1	116.7
4th w.,	80.2	68.7	68.5	77.0	294.4
April, 2020 1st w.,	131.3	117.1	120.9	120.7	490.0
2nd w.,	268.9	261.7	270.3	259.1	1060.0
3rd w.,	498.6	432.4	390.6	395.0	1716.6
4th w.,	652.1	634.6	635.0	644.7	2566.4
May, 2020 1st w.,	1100.3	1070.8	1061.7	1067.2	4300.0
2nd w.,	1978.8	1463.1	1457.6	1900.5	6800.0
3rd w.,	1750.9	1470.4	1688.7	1800.0	6710.0
4th w.,	1405.3	1366.5	1394.5	1433.7	5600.0
June, 2020 1st w.,	777.8	765.2	770.1	786.9	3100.0
2nd w.,	668.1	655.5	659.6	670.0	2653.2
3rd w.,	204.0	188.1	176.0	198.7	766.8
4th w.,	93.9	93.8	78.9	85.0	351.6
July, 2020 1st w.,	3.0	1.0	2.0	2.0	8.0
2nd w.,	0.0	0.0	0.0	0.0	0.0
3rd w.,	0.0	0.0	0.0	0.0	0.0
4th w.,	0.0	0.0	0.0	0.0	0.0
Mean	420.60	375.56	383.52	412.74	1592.44

Table (17). Weekly mean numbers of the mealy plum aphid. *Hyalopterus pruni*, per 10 peach leaves at different directions of the orchard (Qalyubia Governorate, during 2021 season).

Inspection Date	Cardinal directions				
	North	South	East	West	Total
Feb, 2020 2nd w.,	0	0	0	0	0
3rd w.,	0	0	0	0	0
4th w.,	2.0	1.0	0	1.0	4.0
March, 20201st w.,	7.7	6.7	8.3	10.0	32.7
2nd w.,	83.3	66.6	76.7	70.0	296.7
3rd w.,	200.2	166.7	176.87	196.66	740.4
4th w.,	216.6	201.0	203.1	210.0	830.8
April, 2020 1st w.,	283.4	266.4	270.5	267.0	1087.3
2nd w.,	466.6	333.4	366.7	400.0	1566.7
3rd w.,	516.7	466.5	500.2	483.33	1966.7
4th w.,	770.7	720.5	674.4	667.5	2833.1
May, 2020 1st w.,	1666.7	1333.5	1400.0	1500.0	5900.2
2nd w.,	1750.0	1666.6	1633.5	1700.0	6750.1
3rd w.,	1533.5	1532.9	1366.7	1400.0	5833.1
4th w.,	1066.9	965.5	934.5	1000.0	3966.9
June, 2020 1st w.,	950.0	766.7	732.0	835.0	3283.7
2nd w.,	650.0	465.5	501.1	616.7	2233.3
3rd w.,	334.0	315.9	266.6	300.0	1216.6
4th w.,	125.0	100.0	107.0	109.3	441.3
July, 2020 1st w.,	35.0	29.5	30.0	32.1	126.6
2nd w.,	0	0	0	0	0
3rd w.,	0	0	0	0	0
4th w.,	0	0	0	0	0
Mean	463.40	408.90	402,09	426.02	1700.4

From above mentioned discussion, it could be concluded that the highest number of *H. pruni* was mostly accumulated at the North area of field summer peach crop. These results may be attributed to the wind direction which below from North to East-West direction and drift aphid population towards the opposite direction in Southern. **Mohamad and Al-Mallah (1990)** in Iraq, noticed a few number of mealy plum aphids, *H. pruni* on plum, peach, cherry and apricot during the 1st week of March, and the populations reached a peak by the 3rd week of April, then declined gradually and disappeared completely by the 2nd week of June. The apricot trees were the most susceptible to aphid infestation. **Ismail *et al.* (1991)** recorded main populations of mealy plum aphid, *H. pruni* on peach and apricot trees started from February until September in the successive three growing season of 1979, 1980 and 1981, and considered a main pest in Egypt. **Fontanari *et al.* (1993)** in Trento, Italy, stated that the prevalence of aphids are *Myzus cerasi* on cherries and *M. persicae* and *M. varians* on peach trees. **Niccoli and Fagnani (1994)** recorded that the aphids *H. pruni* totally absent in orchards at the highest altitude, but *Myzus varians* appear to have been responsible for the most severe attacks in orchards at medium altitude.

2.2. (2). Population density of *H. pruni* on peach trees:

The population density of mealy plum aphid, *H. pruni* Geoff., include winged and wingless forms harboring peach trees were estimated weekly early season during February and data collected are tabulated in **Tables (18&19) and Figs. (11&12)** record of main weather environmental factors mainly corresponding weekly means of daily maximum and daily minimum temperature and percentage of relative humidity one week earlier before counts in this locality (Al-

Qalyubia Province) during both 2020 and 2021 seasons are also included.

Regarding the seasonal average of *H. pruni*, the population was more abundant during 2021, by seasonal average being 425.25 individual / leaf than, on 2020 season 398.11 individual / leaf.

The mealy plum aphid, had one main seasonal activity period in both tested seasons, from the 4th week of February to the 1st week of July, 2020. While during 2021 season, this species started attack peach in the 4th week of February and extended infestation up to the 3rd week of July 2021. Aphids on peach trees progressively activity until reached maximum mean numbers individuals/sample at 2nd week of May, 2020 (23.76 °C and 48.91 % R.H.) and also in the 2nd week of May, 2021 (26.32 °C., and 45.01 % R.H.) being 1700.0 and 1687.5 individuals / sample, in the two tested season, respectively.

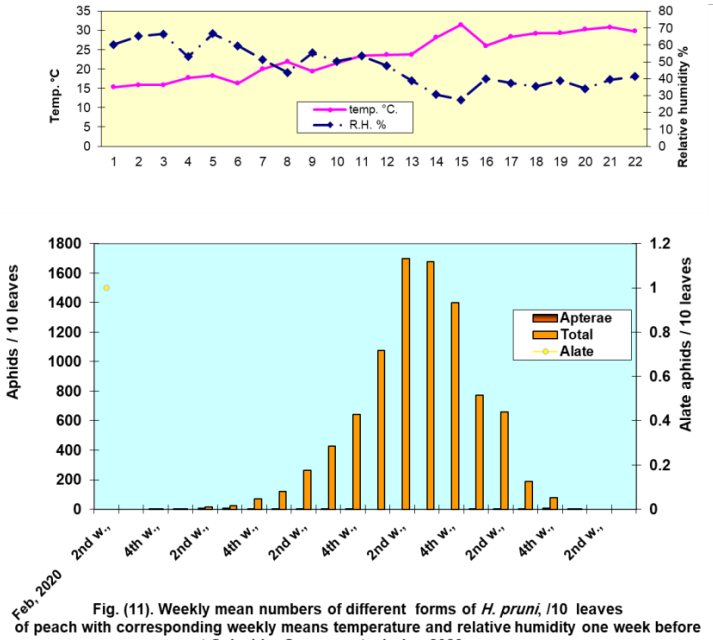


Fig. (11). Weekly mean numbers of different forms of *H. pruni*, /10 leaves of peach with corresponding weekly means temperature and relative humidity one week before at Qalyubia, Governorate during 2020 season.

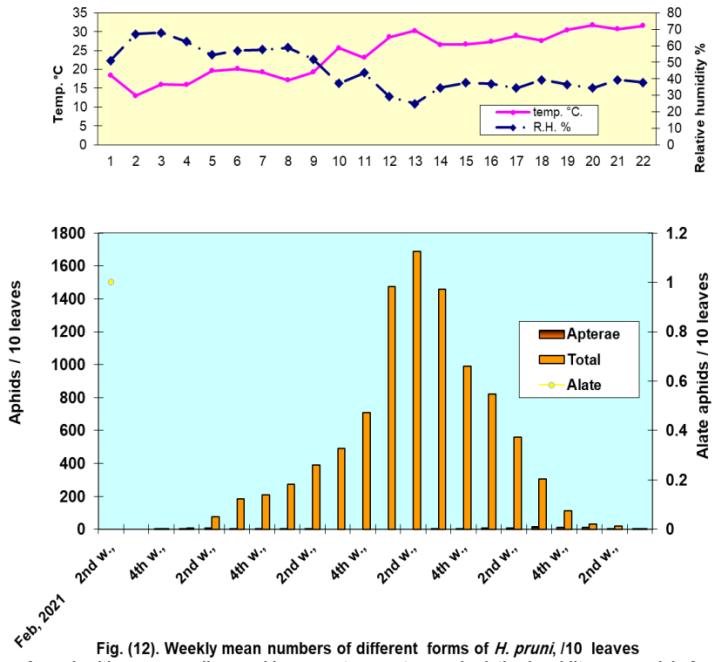


Fig. (12). Weekly mean numbers of different forms of *H. pruni*, /10 leaves of peach with corresponding weekly means temperature and relative humidity one week before at Qalyubia, Governorate during 2021 season.

Table (18). Weekly mean numbers of the mealy plum aphid. *H. pruni*, infested peach trees at Qalyubia Governorate, during 2020 season.

Inspection weeks	Aphid numbers			Weather factors*			
	Alate	Apter.	Total	Temp. °C			R.H.%
				Max.	Mini.	Mean	
2nd. w., February	0.0	0.0	0.0	20.35	10.25	15.3	60.22
3rd. w.,	0.0	0.0	0.0	20.83	10.91	15.87	65.21
4th. w.,	1.0	0.0	1.0	20.4	10.73	15.87	66.48
1st. w., March	3.2	0.0	3.2	24.59	10.84	17.72	53.1
2nd. w.,	5.2	18.9	13.7	23.49	13.17	18.33	66.79
3rd. w.,	5.0	29.17	24.2	22.06	10.49	16.28	59.61
4th. w.,	3.3	73.6	70.3	26.35	13.71	20.03	51.36
1st. w., April	2.5	122.5	120.0	29.23	14.57	21.9	53.66
2nd. w.,	1.5	265.0	263.5	24.66	14.22	19.44	55.37
3rd. w.,	1.0	429.2	428.2	27.63	15.52	21.58	50.32
4th. w.,	1.0	641.6	640.6	30.73	16.30	23.52	53.42
1st. w., May	0.0	1075.0	1075.0	30.29	17.16	23.73	47.72
2nd. w.,	0.0	1700.0	1700.0	31.34	16.18	23.76	48.91
3rd. w.,	0.0	1677.5	1677.5	35.31	21.05	28.18	40.7
4th. w.,	0.0	1400.0	1400.0	39.73	23.24	31.49	47.51
1st. w., June	2.0	775.0	773.0	32.36	19.71	26.04	40.05
2nd. w.,	3.1	663.3	660.2	35.49	21.27	28.38	47.54
3rd. w.,	3.5	191.7	188.2	36.97	21.54	29.26	45.46
4th. w.,	8.6	87.9	79.3	35.49	23.19	29.34	48.85
1st. w., July	2.0	0.0	2.0	37.48	23.09	30.29	44.18
2nd. w.,	0.0	0.0	0.0	37.38	24.41	30.9	49.49
3rd. w.,	0.0	0.0	0.0	35.85	23.76	29.81	41.4
4th. w.,	0.0	0.0	0.0	36.84	24.17	30.51	49.85
Mean	1.87	396.24	398.11	30.21	17.37	23.81	51.62

* one week earlier

Table (19). Weekly mean numbers of the mealy plum aphid. *H. pruni*, infested peach trees at Qalyubia Governorate, during 2021 season.

Inspection Weeks	Aphid numbers			Weather factors*			
	Alate	Apter.	Total	Temp. °C			R.H. %
				Max.	Mini.	Mean	
2nd. w., February	0.0	0.0	0.0	24.69	12.27	18.48	51.12
3rd. w.,	0.0	0.0	0.0	18.33	7.65	12.99	67.16
4th. w.,	1.0	0.0	1.0	21.74	10.19	15.97	68.09
1st. w., March	3.5	5.5	9.0	21.96	9.79	15.88	62.5
2nd. w.,	6.2	68.0	74.2	25.96	13.35	19.66	54.48
3rd. w.,	5.3	180.1	185.4	26.6	13.71	20.16	57.15
4th. w.,	2.4	205.3	207.7	25.04	13.53	19.29	57.81
1st. w., April	1.0	271.0	272.0	23.88	10.49	17.19	58.89
2nd. w.,	1.1	390.6	391.7	25.54	12.91	19.23	51.84
3rd. w.,	0.0	491.7	491.7	34.24	17.14	25.69	47.19
4th. w.,	0.0	708.3	708.3	29.90	16.37	23.14	43.56
1st. w., May	0.0	1475.0	1475.0	36.89	20.28	28.59	49.09
2nd. w.,	0.0	1687.5	1687.5	32.69	19.95	26.32	45.01
3rd. w.,	1.2	1457.1	1458.3	33.58	19.51	26.55	44.54
4th. w.,	4.5	987.2	991.7	32.78	20.54	26.66	47.53
1st. w., June	8.6	812.2	820.8	33.39	21.39	27.39	36.93
2nd. w.,	9.2	549.1	558.3	35.72	22.27	29	34.36
3rd. w.,	14.1	290.1	304.2	33.63	21.59	27.61	39.35
4th. w.,	10.3	100.1	110.4	36.83	24.10	30.47	36.67
1st. w., July	11.5	20.2	31.7	38.78	24.84	31.81	34.42
2nd. w.,	5.0	16.0	21.0	36.59	24.84	30.72	39.4
3rd. w.,	2.0	0.0	2.0	36.94	26.31	31.63	37.88
4th. w.,	0.0	0.0	0.0	36.64	24.65	30.65	40.57
Mean	**3.78**	**422.3**	**425.25**	**30.54**	**17.72**	**24.13**	**48.07**

* one week earlier

These results indicated that the population was reached maximum numbers (1700.0 and 1687.5 individuals/sample) expressing by means nearly 11 weeks after aphid initial infested plants coupled with optimum weather conditions temperature and relative humidity **(**23.76-26.32 °C and 48.91-45.01 % R.H.), **(Figs. 11&12). Serdar and Yokomi. (2002)** found that *Brachycaudus schwartzi* was harbored both peach and nectarine (*Prunus persica*) trees, during summer months. **Also, El-Heneidy *et al.* (2008)** studied population dynamics of *Pterochloroides persicae*, and *Brachycaudus schwartzi* (Borner) and associated natural enemies harbored peach trees at Rafah, North Sinai Governorate, Egypt. The obtained results indicated that the occurrence period of *P. persicae* was extended from February until April, and recorded highest peaking at the 3rd week of March. While, *B. schwartzi*, occurred from early February until late May with highest peak at the 3rd week of March and the 4th week of April during 2005 and 2006 seasons, respectively. Seven species of parasitoids, 3 species as primary parasitoids and 5 hyper-parasitoid species were surveyed with the aphids on the peach trees.

2.2. (2).a. Alate forms:

Data included in **Tables (18&19) and Figs. (11&12**) Alatoids *H. pruni* flight and infest peach plants almost during the 4th week of February in both investigated seasons. In 2020 season, alate forms had two main periods of activity: the 4th week of February to 4th week of April (lasted 9 weeks) and 1st week of June to 1st week of July. The maximum count of winged forms was recorded during the 2nd week of March and the last week of June 2020 (5.2 and 8.6 individuals /10 leaves, respectively); where the prevailing weather conditions being (18.33 ° C & 66.79 % R.H., and 29.34 °C & 48.85 % R.H., in the two

intervals, respectively). In 2021 season, alate forms noticed also two main intervals of activity periods: 4th week of February, to 2nd week of April 2021 with a maximum number during the 2nd week of March (6.2 individuals /10 leaves, when the prevailing weather conditions was 19.66 °C and 54.48 % R.H.), and 3rd week of May – 3rd week of July 2021, with a peak numbers date the 3rd week of June 2021 being (14.1 aphids /10 leaves, where climatic conditions being 27.61° C and 39.35 % R.H.).

Alate form of this species observed reached zero in numbers at two distinct periods through the two tested seasons, first period extended from 1st week of May to last week of the same month in May and the second one recorded in the end of crop vegetative season in the 2nd week of July 2020 on ward, while during 2021, from 3rd week of April to 2nd week of May and the second one recorded in the end of crop vegetative season in the 4th week of July to end of growing season of 2021. The main factors caused aphid reduction in numbers as it advanced to physiological maturity of leaves and due to these natural control agents (mortality factors), also decreased as affected by environmental unfavorable conditions. It showed that there was a direct relation of weather conditions with that of aphid activities in the end summer growth fruit trees in general**.**

2.2. (2). b.Aptera form:

Presented data in **Tables (18&19) and Figs. (11&12**) **s**how that mealy plum aphid, *H. pruni* aptera form had one main periods of seasonal activity in both investigated seasons 2020 and 2021.

In the first season 2020, initiated from 2nd week of March to 4th of June, and in the second successes season from 1st week of March to 2nd week of July 2021, The maximum number of wingless form were

detected in the 2nd week of May 2020, and 2021, being (1700 and 1687.5 individuals /10 leaves, in the two successive seasons, respectively); where the prevailing weather conditions being (18.33 °C and 66.79 % R.H.), and (19.66 °C and 54.48 % R.H.) in the two seasons, respectively.

The consolidated in population of mealy plum aphid apterous form during two successive growing seasons 2020 and 2021 illustrated in (Fig., 11 & 12) indicated that their was reached peaks (1700 and 1687.5 insects /10 leaves) on 2nd week of May, in both tested seasons synchronized with favorable conditions mainly mean temperature was 23.76 °C and 26.32 °C in the two successive season, respectively.

From the aforementioned results, it could be concluded that mealy plum aphid, *H. pruni* found to be more abundant early during vegetative growth stage and could be considered as a key pest on peach plants. Mealy plum aphids can become established on peaches. The aphids feed initially on the shoot tips, which can cause growth stunting and malformation at the tips of young trees. On older trees, fruit set may be reduced in subsequent years if populations are high. Aphid honeydew production can cause sooty mold problems on fruit. Green peach aphid is a more serious problem on nectarines which lack "fuzz" on the fruit's surface. When the colonies of aphids are large, they can greatly reduce plant vitality or even kill the plant through mechanical injury. This is especially true in a nursery situation. Feeding aphids also produce honeydew, a sticky substance that is potentially damaging. As aphids feed, honeydew is excreted and accumulates on the leaves and developing fruits. Honeydew can serve as a substrate for bacteria, yeast, and filamentous fungal growth which reduce plant vigor.

2.2. (3). Predator species associated with mealy plum aphid, *H. pruni* Geoff. On peach trees:

Field observation on peach trees attacked by mealy plum aphid, *H. plum* that surveyed also seven aphidophagous predators associated with this aphid species and data collected are given in **Tables (20&21) and Figs. (13&14)**. Identification of the different species of the predacious insects found on the peach leaves are belong to three insect orders; Coleoptera: family Coccinellidae, were eleven-spotted ladybird beetle, *Coccinella undecimpunctata* L.; seven spotted lady beetle, *Coccinella septempunctata* L.; *Cydonia vicina nilotica* Muls. and *Cydonia vicina isis* Cr.; Neuroptera: Fam., Chrysopidae, *Chrysoperla carnea* Stephens; and Diptera: Fam., Syrphidae: *Syrphus corollae*, and Fam: Cecidomyiidae: *Aphidoletes aphidimyza*.. The Seasonal fluctuation in the population densities for these predator species was sorted and recorded weekly by mean numbers on 10 peach leaves. Such predaceous species were relatively more abundant during the second season 54.13 insects /10 leaves than the first season 42.6 insects /10 leaves. These predacious insects prevailed in one main activity period; 2nd week of March to the 4th week of June 2020 and from 2nd week of March to 1st week of July 2021. These predacious insects reached maximum counts during the 2nd week of May 2020 and 2021 seasons being (199 and 246 insects /70 leaves, respectively.

Table (20). Weekly mean numbers of predator species associated with *H. pruni*, / 10 leaves on peach trees at Qalyubia Governorate, during 2020 season.

Inspection Date		Predator species						
	C. undc.	*C. sept.*	*C. vicinia Nilotica*	*C. vicinia Var*	*Ch. Carnea*	*Sy. corollae*	*A. aphidimyza*	Total
Feb, 2020 2nd w.,	0	0	0	0	0	0	0	0
3rd w.,	0	0	0	0	0	0	0	0
4th w.,	0	0	0	0	0	0	0	0
March, 2020 1st w.,	0	0	0	0	0	0	0	0
2nd w.,	5	2	0	1	0	0	0	8
3rd w.,	5	3	0	0	2	0	0	10
4th w.,	6	2	0	2	2	0	0	12
April, 2020 1st w.,	4	2	1	2	4	0	0	13
2nd w.,	7	5	2	2	2	0	0	18
3rd w.,	5	2	1	1	1	0	0	10
4th w.,	8	2	2	0	0	25	6	43
May, 2020 1st w.,	9	3	3	1	0	70	30	116
2nd w.,	12	7	0	0	10	100	70	199
3rd w.,	10	2	0	0	2	110	65	189
4th w.,	7	3	0	0	0	80	50	140
June, 2020 1st w.,	3	2	0	0	2	55	30	92
2nd w.,	1	0	0	0	0	50	35	86
3rd w.,	1	0	0	0	0	20	15	36
4th w.,	2	0	0	0	0	8	0	10
July, 2020 1st w.,	0	0	0	0	0	0	0	0
2nd w.,	0	0	0	0	0	0	0	0
3rd w.,	0	0	0	0	0	0	0	0
4th w.,	0	0	0	0	0	0	0	0
Mean	3.69	1.52	0.39	0.3	1.08	22.5	13.0	42.69

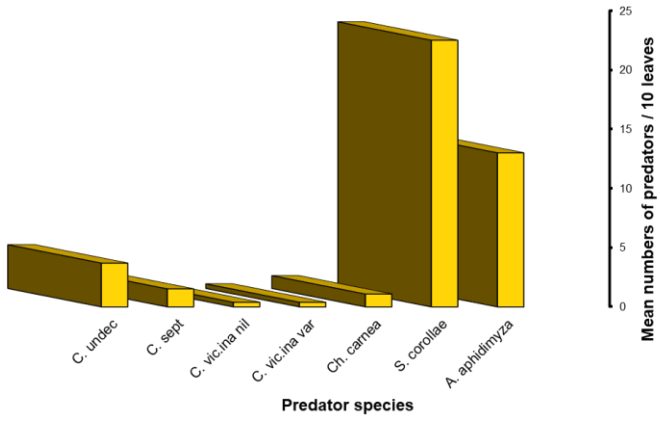


Fig.(13). Seasonal mean numbers of different insect predators associated with mealy plum aphid, *H. pruni* 10 leaves peach trees at Qalyubia, Governorate during 2020 growing season.

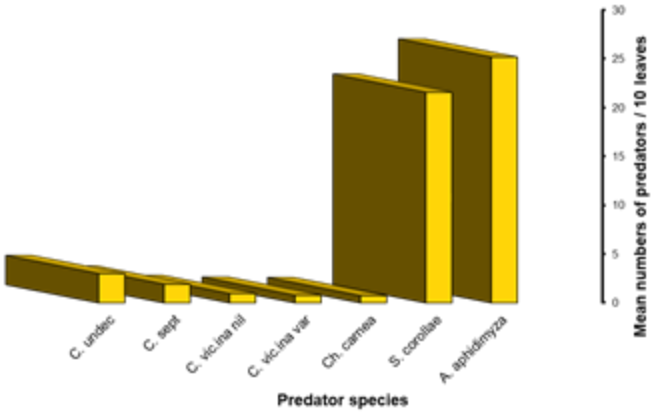


Fig.(14). Seasonal mean numbers of different insect predators associated with mealy plum aphid, *H. pruni* 10 leaves peach trees at Qalyubia, Governorate during 2021 growing season.

Table (21). Weekly mean numbers of predator species associated with *H. pruni*, /10 leaves on peach trees at Qalyubia Governorate, during 2021 season.

Inspection Date	Predator species							
	C. undc.	*C. sept.*	*C. vicinia Nilotica*	*C. vicinia var*	*Ch. Carnea*	*Sy. Corolla*	*A. aphidimyza*	Total
Feb, 2021 2nd w.,	0	0	0	0	0	0	0	0
3rd w.,	0	0	0	0	0	0	0	0
4th w.,	0	0	0	0	0	0	0	0
March, 2021 1st w.,	0	0	0	0	0	0	0	0
2nd w.,	2	1	1	1	2	0	0	7
3rd w.,	3	3	1	0	3	0	0	10
4th w.,	7	2	2	2	1	0	0	14
April, 2021 1st w.,	6	3	1	1	2	0	0	13
2nd w.,	6	5	2	2	2	6	10	33
3rd w.,	5	5	1	1	3	10	18	43
4th w.,	5	3	2	1	1	30	45	87
May, 2021 1st w.,	9	6	2	2	0	80	96	195
2nd w.,	11	3	3	1	0	108	120	246
3rd w.,	7	5	3	2	0	85	105	207
4th w.,	4	4	2	2	1	65	70	148
June, 2021 1st w.,	4	3	1	2	2	45	50	107
2nd w.,	0	1	1	1	0	40	40	83
3rd w.,	0	0	0	0	0	12	15	27
4th w.,	0	0	0	0	0	8	10	18
July, 2021 1st w.,	0	0	0	0	0	7	0	7
2nd w.,	0	0	0	0	0	0	0	0
3rd w.,	0	0	0	0	0	0	0	0
4th w.,	0	0	0	0	0	0	0	0
Mean	3.00	1.91	0.97	0.78	0.74	21.56	25.17	54.13

2.2. (3).a. The ladybird beetles:

Tables (20&21) and Figs. (13&14) refer the seasonal fluctuation in the population densities of the four ladybird beetles *Coccinella undecimpunctata*; *C. septempunctata.; Cydonia vicina nilotica* Muls. and *Cydonia vicina isis* Cr. Our result indicates that coccinellid beetles were almost the same convenient active during 2020 and 2021 season. The seasonal mean numbers were 3.69; 1.52; 0.39 and 0.3 insects for the four predator species in 2020 season; while during 2021 being 3.00; 1.91; 09 and 0.78 insects /10 peach leaves, respectively.

2.2. (3)b. The green lacewings

Data included in **Tables (20&21) and Figs. (13&14)** show the seasonal abundance of the common green lacewing, *Chrysoperla carnea* that attack mealy plum aphid on peach trees that predaceous insect was at the same limited active for ten weeks on peach plants in both 2020 and 2021. The seasonal mean numbers were; 1.08 and 0.74 insects /10 leaves. This species had one main period of seasonal activity both in 2020, and 2021, initiated in the 3rd week of March to the 1st week of June, 2020; and from 2nd week of March to 1st week of June, 2021. The weekly mean numbers reached their maximum numbers on the 2nd week of May 2020 and the 3rd week of April 2021, being 10.0 and 3.0 individuals /10 leaves, during two growing season, respectively. During 2020 and 2021, this species displayed for 8-9 weeks existing only during the main aphid infestation on peach trees.

2.2. (3) c. Dipteran predators:

With regards to seasonal abundance of the predaceous Dipteran insects: *Syrphus corollae* and *Aphidoletes aphidimyza,* that prey mealy plum aphid on peach trees, data in **Tables (20&21) and Figs. (13&14)**

showed that these syrphid and Cecidomyiid flies were found to be active from the 3rd week of April both 2020 and 2021 (25.0 & 6 insects /10 leaves) and from the second week of April 2020 and 2021 being (6 & 10 insects /10 leaves), for two predaceous insect, respectively. Weekly mean numbers of this predaceous species recorded one activity period recorded on the 3rd week of April to 4th and 3rd week of June, 2020, for the species. While in the second season 2021, it took place from 2nd week of April to 1st week of July, and 4th week of June 2021, these insects reached their maxima during 2nd and 1st week of May 2020 (110 & 70 insects) and 2nd week of May 2021 (108 & 120 insects), for the two dipterous insects, respectively.

From the above mentioned data, it could be concluded that the seven predator species; *Coccinella undecimpunctata, C. septempunctata, Cydonia vicina nilotica* Muls., *Cydonia vicina* isis., *Chrysoprela carnea, Syrphus corollae,* and *Aphidoletes aphidimyza* had one period of seasonal activity. Also mealy plum aphid, *H. pruni* had one main period of seasonal activity on peach trees grown at Qalyubia district. Both aphids and predators species were more active during 2020 and 2021, both synchronized that seem to be coinciding with each other.

2.2. (4). Effects of some ecological factors on the population density of the mealy plum aphid, *H. pruni* (Geoff.) on peach trees:

The simultaneous effects of some ecological factors (biotic and abiotic) on the fluctuation in the population density of mealy plum aphid, *H. pruni* infesting peach trees, was determined throughout the growing seasons of 2020 and 2021. The obtained results are summarized in **Tables (22&23)**.

2.2. (4) a. Effect of temperature:

The relationship between the abundance of alate form of *H. pruni* on peach trees under field conditions was negative correlated with mean, maximum, and minimum weekly temperatures and statistically non-significant in 2020 and significant in 2021, being (-0.0779, -0.0707 & -0.0802) and (0.3771. 0.4209 & 0.3301) in 2020 and 2021 seasons, respectively.

The relationship between aptera and total form of mealy plum aphid and each of weekly mean temperature, maximum and minimum were positively correlated and statistically significant for both 2020 and 2021 seasons, being (0.3019, 0.3547 & 0.2325) and (0.3287, 0.4057 & 0.2381), for correlated between aptera form and each mean, maximum and minimum temperature, and being (0.3021, 0.3549 & 0.2326) and (0.3324, 0.4090 & 0.2419), for correlated between total alate and aptera forms and each mean, maximum and minimum temperature, respectively.

The simple regression formula was adopted to show the unit effect of each factor (e.g., maximum and minimum temperature) on the corresponding population density of mealy plum aphid (alate, aptera and total numbers) being (0.2288, 0.0040 & 0.040) (0.4835, 0.0048 & 0.0049) for maximum temperature in the two tested seasons 2020 and 2021, respectively, while minimum temperature affects by (-0.1621, 0.0021 & 0.0021) and (0.5643, 0.0026 & 0.0026) in 2020 and 2021, respectively. The calculated values of regression coefficient “b” and constant values (A) are given in **Tables (22&23)** for both tested seasons.

From these results it can be concluded that the weekly mean numbers of *H. pruni* on peach plants markedly varied according to

temperature factor and unit of change. Thus, the increase or decrease in temperature was affected on the mealy plum aphid population, as revealed for winged by (-0.1981 & 0.5238); aptera by (0.0030 & 0.0037), and total counts of mealy plum aphid by (0.0030 & 0.0038), respectively, could be resulted due to a change in the weekly mean maximum, minimum, and average temperature by 1 ºC.

2.2. (4) b. Effect of relative humidity:

Data presented in **Tables (22&23)** indicate significant negative correlated between R.H. % and each alate, aptera and total forms of *H. pruni* exhibited in both 2020 and 2021 growing seasons (r = -0.1074, -0.5021 & -0.5024) and (r = -0.2434, -0.6120 & -0.6150), respectively (Table, 26&27). The regression coefficient "b" values were (-0.5627, -0.0104 & -0.0104) and (-0.7027, -0.0144 & -0.0145) for alate, aptera and total numbers of mealy plum aphid in the first and second season, respectively.

Mohamad and Al-Mallah (1990) in Iraq, found significant relation between aphid *H. pruni* populations and temperature was recorded, but the relationship with relative humidity was not significant. Aphids migrated to the secondary host *Phragmites communis* [*P. australis*] from June to early November, then the sexual forms returned to stone-fruit trees for mating and oviposition around the buds and in bark crevices.

2.2. (4).c. Effect of insect predators:

The activity of seven insect predators i.e., *Coccinella undecimpunctata* L.; *Coccinella septempunctata* L.; *Cydonia vicina nilotica* Muls.; *Cydonia vicina isis* Cr.; *Chrysoperla carnea* Stephens; *Syrphus corollae*, and *Aphidoletes aphidimyza*, that totally represent the biotic factor showed negative and significant effect on the population

density of winged form of mealy plum aphid, *H. pruni* on peach trees throughout 2020, but insignificant effect in 2021; while significant (*P* = > 0.01) and negative effects on the wingless and total forms of mealy plum aphid during both tested seasons 2020 and 2021 **Tables** (**21&22**). Seven aphidophagous predators mentioned before were totally negatively effects and highly significant (r= - 0.9817 & - 0.9907) and (r= - 0.9815 & - 0.9905); both *P* = >0.01) on abundance of total and aptera forms of the mealy plum aphid during 2020 and 2021; and also negative effects but non-significant on alate form in the second season 2021, where r value being -0.3022 and –0.1787), in the two tested seasons, respectively.

The simple regression formula was applied to show the unit effect of the seven aphidophagous predators on the corresponding weekly mean number of alate, aptera and total mealy plum aphids inhabited on peach trees. The regression coefficient "b" values were (-8.5307, -0.1093 & -0.1095) and (-3.1534, -0.1423 & -0.1426) for alate, aptera and total *H. pruni* throughout the two consecutive seasons, respectively.

From the practical point of view, it can be concluded that the increase in aphid population exhibited an increase in predator population during growth stages of the crop. Both population densities of the seven arthropod predators and mealy plum aphid. *H. pruni*, when found together on peach tree fields were interrelationship with each other and both of them sometimes significantly affects on the abundance of the each other under natural field conditions. The prey (mealy plum aphid) population was significantly negative correlated with that of its predators. The same results were reported by **Shehta (2020).**

In conclusion, the correlation between the population of the mealy plum aphid on one hand and the population of their associated predators on the other hand was negative. This means that whenever increases the number of aphidophagous predators within peach fields parallel effects caused significant decrease in the abundance of corresponding aphids that exhibited in our results. These results agree with those obtained by: **Zaklad and Skierniewice. (1970)** who found that the activity of arthropod predators: *Coccinella undecimpunctata, C. septempunctata, Chrysoperlla carnea, Syrphus spp., Phaenobremia aphidivora,* and *Scymnus spp.,* had a great role in suppressing *H. pruni* population on peach trees fields.

2.2. (4).d. Combined effects of meteorological factors and predators:

The combined effects estimated as explained variance (E.V. %) for the three ecological factors (weekly mean temperature; and relative humidity) and bio-agent (predators) on total aphid populations of aphids infesting peach plants are estimated were (22.43 %, 55.87 % and 97.2 %), respectively.

Positive or negative significant regression coefficient were obtained for the relationship between the progress in population density of mealy plum aphids in both 2020 and 2021 seasons parallel with status ecological and biological factors affect on development life stages.

From the above mentioned discussion, it could be stated that the direct and joint effect of the bio-agent predators coordinated with the influence of weekly average temperature both maximum, and minimum and mean percentage of relative humidity showed precise effects, as a group on the population densities of *H. pruni* harbored peach trees

during summer months. These simultaneous effects were more confirmed in both tested seasons**.**

Table (22) Simple correlation and regression coefficient values between main weather factors (abiotic) and predators (biotic) on the weekly mean numbers of different forms of *H. pruni* on peach trees at Qalyubia Governorate during 2020 growing season**.**

Tested factors	Aphid density	Correlation Coefficient (r)	*P*	Regression coefficient (b)	Intercept (A)
Mean Temperature	Alate form	-0.0779	N.S.	-0.1981	24.18
	Aptera form	0.3019	>0.05	0.0030	22.60
	Total number	0.3021	>0.05	0.0030	22.60
Minimum Temperature	Alate form	-0.0707	N.S.	-0.1621	17.67
	Aptera form	0.2325	>0.05	0.0021	16.53
	Total number	0.2326	>0.05	0.0021	16.53
Maximum Temperature	Alate form	-0.0802	N.S.	-0.2288	30.64
	Aptera form	0.3547	>0.05	0.0040	28.63
	Total number	0.3549	>0.05	0.0040	28.62
% R.H	Alate form	-0.1074	N.S.	-0.5627	45.79
	Aptera form	-0.5021	>0.001	-0.0104	50.95
	Total number	-0.5024	>0.001	-0.0104	50.98
Predators	Alate form	-0.3022	>0.05	-8.5307	58.61
	Aptera form	-0.9815	>0.001	-0.1093	0.63
	Total number	-0.9817	>0.001	-0.1095	0.90

Table (23) Simple correlation and regression coefficient values between main weather factors (abiotic) and predators (biotic) on the weekly mean numbers of different forms of *H. pruni* on peach trees at Qalyubia Governorate during 2021 growing season.

Tested factors	Aphid density	Correlation Coefficient (r)	*P*	Regression coefficient (b	Intercept (A)
Mean Temperature	Alate form	0.3771	>0.05.	0.5238	22.33
	Aptera form	0.3287	>0.05	0.0037	22.74
	Total number	0.3324	>0.05	0.0038	22.70
Minimum Temperature	Alate form	0.4209	>0.01	0.5643	15.68
	Aptera form	0.2381	>0.05	0.0026	16.71
	Total number	0.2419	>0.05	0.0026	16.68
Maximum Temperature	Alate form	0.3301	>0.05	0.4835	28.97
	Aptera form	0.4057	>0.05	0.0048	28.75
	Total number	0.4090	>0.05	0.0049	28.71
% R.H	Alate form	-0.2434	N.S.	-0.7027	47.68
	Aptera form	-0.6120	>0.01	-0.0144	51.10
	Total number	-0.6150	>0.01	-0.0145	51.20
Predators	Alate form	-0.1787	N.S.	-3.1534	66.04
	Aptera form	-0.9905	>0.001	-0.1423	-5.98
	Total number	-0.9907	>0.001	-0.1426	-6.63

2.3. On plum trees:

2.3. (1). Spatial distribution of *H. Pruni* Geof. on plum trees:

Activity of mealy plum aphid, *H. Pruni* Geof., and infestation quantity distribution patterns, within plum trees under climatic conditions of fields at Qalyubia Egypt are presented in **Tables (24&25) and Fig. (15).** In the first season 2020, the infestation level of aphid on plum trees was relatively higher within Northern and Western directions than on Southern and Eastern directions of the trees with slight significant differences in their aphid numbers (F = 2.66. LSD 0.05 = 55.32). Mean numbers of aphids per sample during the two seasons were 21.53, 20.23, 15.61 and 15.06 individual/sample during 2020 season, at directions Northern, Western, Eastern and Southern of the plum trees, respectively. The same trend was proven, during the second season of 2021, being: 30.77; 28.23; 26.36 and 25.72, aphids /sample of plum trees at directions Northern, Western, Eastern and Southern, respectively.

Table (24). Weekly mean numbers of the mealy plum aphid. *Hyalopterus pruni*, per 10 leaves plum trees at different directions of the orchard (Qalyubia Governorate, during 2020 season).

Inspection Date	Cardinal directions				
	North	South	East	West	Total
Feb, 2020 2nd w.,	0	0	0	0	0
3rd w.,	0	0	0	0	0
4th w.,	0	0	0	0	0
March, 20201st w.,	0	0	0	0	0
2nd w.,	0	0	0	0	0
3rd w.,	0	0	0	0	0
4th w.,	0	0	0	0	0
April, 2020 1st w.,	0	0	0	0	0
2nd w.,	0	0	0	0	0
3rd w.,	0	0	0	0	0
4th w.,	2.0	3.0	0	5.0	10.0
May, 2020 1st w.,	33.3	18.3	23.3	30	105.2
2nd w.,	100.0	66.6	70.0	93.4	330.0
3rd w.,	110.0	76.6	73.4	100.0	360.0
4th w.,	103.3	66.6	76.6	100.3	346.8
June, 2020 1st w.,	83.3	63.3	66.6	76.8	290.0
2nd w.,	36.6	33.3	33.4	38.3	141.6
3rd w.,	16.6	15.0	11.6	15.2	58.4
4th w.,	8.1	3.9	3.3	5.5	20.8
July, 2020 1st w.,	2.0	0	1.0	1.0	4.0
2nd w.,	0	0	0	0	0
3rd w.,	0	0	0	0	0
4th w.,	0	0	0	0	0
Mean	21.53	15.06	15.61	20.23	72.46

Table (25). Weekly mean numbers of the mealy plum aphid. *Hyalopterus pruni*, per 10 leaves plum trees at different directions of the orchard (Qalyubia Governorate, during 2021 season).

Inspection Date	Cardinal directions				
	North	South	East	West	Total
Feb, 2020 2nd w.,	0	0	0	0	0
3rd w.,	0	0	0	0	0
4th w.,	0	0	0	0	0
March, 20201st w.,	0	0	0	0	0
2nd w.,	0	0	0	0	0
3rd w.,	0	0	0	0	0
4th w.,	0	0	0	0	0
April, 2020 1st w.,	1.5	1.0	0	1.5	4.0
2nd w.,	2.0	1.0	0	1.0	4.0
3rd w.,	16.5	10.1	11.67	10.0	48.27
4th w.,	32.67	35.0	33.3	31.7	132.67
May, 2020 1st w.,	66.5	66.8	56.67	73.3	263.27
2nd w.,	100.0	76.7	73.2	83.3	333.2
3rd w.,	125.0	100.0	116.67	120.0	461.67
4th w.,	120.3	110.0	113.3	116.4	460.0
June, 2020 1st w.,	75.0	63.3	64.0	69.3	271.6
2nd w.,	100.0	70.0	76.67	83.4	330.07
3rd w.,	37.3	33.4	35.0	36.7	142.4
4th w.,	30.0	23.3	25.0	21.7	100
July, 2020 1st w.,	1.0	1.0	1.0	1.0	4.0
2nd w.,	0	0	0	0	0
3rd w.,	0	0	0	0	0
4th w.,	0	0	0	0	0
Mean	30.77	25.72	26.36	28.23	111.09

The difference between the seasonal grand means of the aphid numbers was significant (F = 2.75. and LSD 0.05= 42.83). The seasonal average numbers at those directions could be arranged in a descending order as follows: 26.15; 24.23; 20.98 and 20.39 individuals/sample at Northern, Western, Eastern and Southern directions, respectively.

Accordingly, it could be stated that preferred plum trees leaves for mealy plum aphid, *H. pruni* landing was discovered at Northern and Western directions as shown in **Fig. 15**.

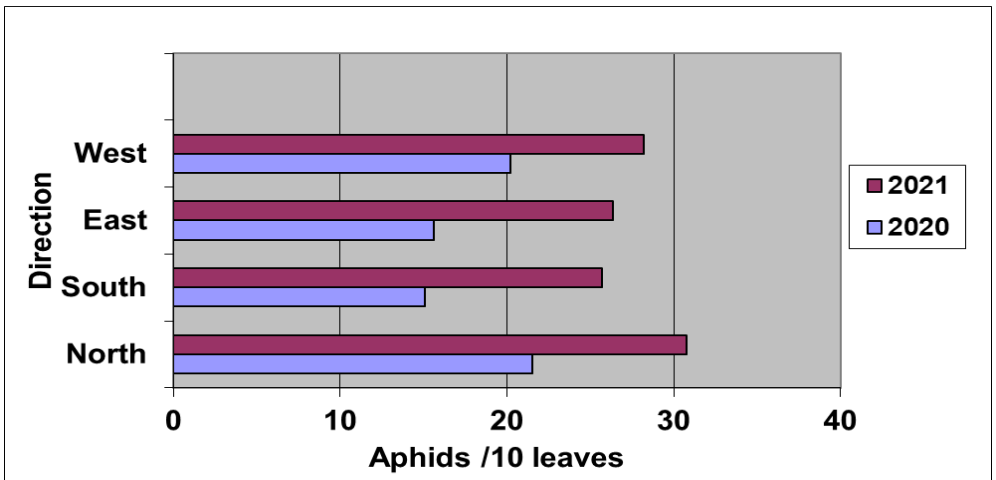


Fig. (15). Relative abundance of *Hyalopterus pruni* distributed within cardinal directions of plum trees, Qalyubia, 2020 and 2021 seasons.

In general, data conserned *H. pruni* on apricot, peach and plum trees exihibted that Northern and Western sides of the field harbored the higher numbers of mealy plum aphid infestation than on Eastern and Southern sides along two successive growing seasons 2020 and 2021.

From the above mentioned discussion, it could be resulted that *H. pruni* found to be a pest on plum plants and attacked plants during mid-summer months exact April every year. Different stages of this species had one peak of seasonal abundance, was exusting early in April extended July every season.

2.3. (2). Population density of *H. pruni* on plum trees:

Results obtained for seasonal fluctuation in the population density of mealy plum aphid, *H. pruni* Geof. Both alate and aptera morphs attacking plum trees were estimated weekly once leaves emergence are presented in **Tables (26&27) and Figs. (16&17).** Records of corresponding weekly means of daily maximum and daily minimum temperature and percentage of relative humidity one week earlier before counts in this locality (Al-Qalyubia Province) during 2020 and 2021 successive investigated seasons are also included.

Our results obvious indicates that this insect species was more abundant size during 2021 than 2020 season, by seasonal mean numbers 27.83 and 18.12 insects per 10 leaves, respectively. This insect (winged plus wingless form) had one main seasonal activity in both tested seasons, from the 4th week of April to the 1st week of July, 2020. Whereas during 2021 season, start attack plum trees in the 1st week of April extended infestation to the 1st week of July 2021. Aphids on plum trees progressively activity until reached maximum counts by mean numbers 90 and 115.4 insects per 10 leaves recorded in the 3rd week of May, 2020 (28.18 °C and 40.7 % R,H.) and in 2021 season (26.55° C and 44.54 % R,H.), respectively.

Table (26) Weekly mean numbers of the mealy plum aphid. *H. pruni*, per 10 leaves plum trees at Qalyubia Governorate, during 2020 season.

Inspection Date	Aphid numbers			Weather factors *			
	Alate	Apte.	Total	Temp. ℃			R.H. %
				Max. ℃	Min. ℃	Mean ℃	
Feb, 2020 2nd w.,	0	0	0	20.35	10.25	15.3	60.22
3rd w.,	0	0	0	20.83	10.91	15.87	65.21
4th w.,	0	0	0	20.4	10.73	15.87	66.48
March, 2020 1st w.,	0	0	0	24.59	10.84	17.72	53.1
2nd w.,	0	0	0	23.49	13.17	18.33	66.79
3rd w.,	0	0	0	22.06	10.49	16.28	59.61
4th w.,	0	0	0	26.35	13.71	20.03	51.36
April, 2020 1st w.,	0	0	0	29.23	14.57	21.9	53.66
2nd w.,	0	0	0	24.66	14.22	19.44	55.37
3rd w.,	0	0	0	27.63	15.52	21.58	50.32
4th w.,	1.2	1.3	2.5	30.73	16.30	23.52	53.42
May, 2020 1st w.,	4.2	22.1	26.3	30.29	17.16	23.73	47.72
2nd w.,	5.5	77.0	82.5	31.34	16.18	23.76	48.91
3rd w.,	6.0	84.0	90.0	35.31	21.05	28.18	40.7
4th w.,	1.6	85.1	86.7	39.73	23.24	31.49	47.51
June, 2020 1st w.,	1.0	71.5	72.5	32.36	19.71	26.04	40.05
2nd w.,	4.3	31.1	35.4	35.49	21.27	28.38	47.54
3rd w.,	4.5	10.1	14.6	36.97	21.54	29.26	45.46
4th w.,	2.2	3.0	5.2	35.49	23.19	29.34	48.85
July, 2020 1st w.,	1.0	0	1.0	37.48	23.09	30.29	44.18
2nd w.,	0	0	0	37.38	24.41	30.9	49.49
3rd w.,	0	0	0	35.85	23.76	29.81	41.4
4th w.,	0	0	0	36.84	24.17	30.51	49.85
Mean	1.4	16.8	18.12	30.21	17.37	23.81	51.62

* one week earlier

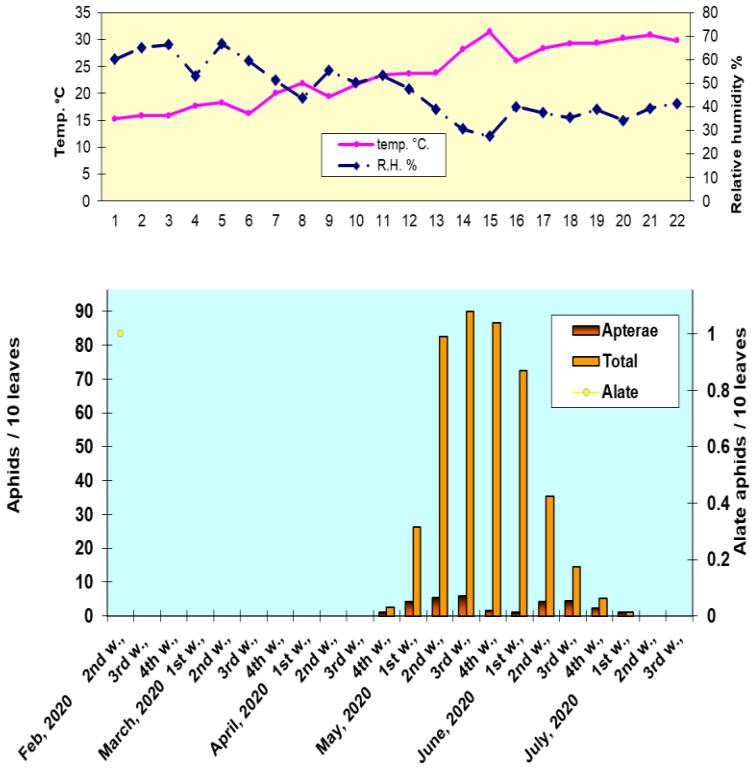


Fig. (16). Weekly mean numbers of different forms of *H. pruni* /10 leaves of plum with corresponding weekly means temperature and relative humidity one week before at Qalyubia, Governorate during 2020 season.

Table (27) Weekly mean numbers of the mealy plum aphid. *H. pruni*, per 10 leaves plums at Qalyubia Governorate, during 2021 season.

Inspection date	Aphid numbers			Weather factors *			
				Temp. °C			R.H. %
	Alate	Apte.	Total	Max. °C	Min. °C	Mean °C	
Feb, 2021 2nd w.,	0	0	0	24.69	12.27	18.48	51.12
3rd w.,	0	0	0	18.33	7.65	12.99	67.16
4th w.,	0	0	0	21.74	10.19	15.97	68.09
March, 2021 1st w.,	0	0	0	21.96	9.79	15.88	62.5
2nd w.,	0	0	0	25.96	13.35	19.66	54.48
3rd w.,	0	0	0	26.6	13.71	20.16	57.15
4th w.,	0	0	0	25.04	13.53	19.29	57.81
April, 2021 1st w.,	1.0	0	1.0	23.88	10.49	17.19	58.89
2nd w.,	1.0	0	1.0	25.54	12.91	19.23	51.84
3rd w.,	4.1	8.0	12.1	34.24	17.14	25.69	47.19
4th w.,	4.4	30.2	34.6	29.90	16.37	23.14	43.56
May, 2021 1st w.,	2.1	63.7	65.8	36.89	20.28	28.59	49.09
2nd w.,	1.3	82	83.3	32.69	19.95	26.32	45.01
3rd w.,	1.2	114.2	115.4	33.58	19.51	26.55	44.54
4th w.,	1.0	114.0	115.0	32.78	20.54	26.66	47.53
June, 2021 1st w.,	3.6	64.6	67.9	33.39	21.39	27.39	36.93
2nd w.,	4.1	78.4	82.5	35.72	22.27	29	34.36
3rd w.,	5.5	30.1	35.6	33.63	21.59	27.61	39.35
4th w.,	6.0	19.0	25.0	36.83	24.10	30.47	36.67
July, 2021 1st w.,	1.0	0	1.0	38.78	24.84	31.81	34.42
2nd w.,	0	0	0	36.59	24.84	30.72	39.4
3rd w.,	0	0	0	36.94	26.31	31.63	37.88
4th w.,	0	0	0	36.64	24.65	30.65	40.57
Mean	1.6	26.3	27.8	30.54	17.72	24.13	48.07

* one week earlier

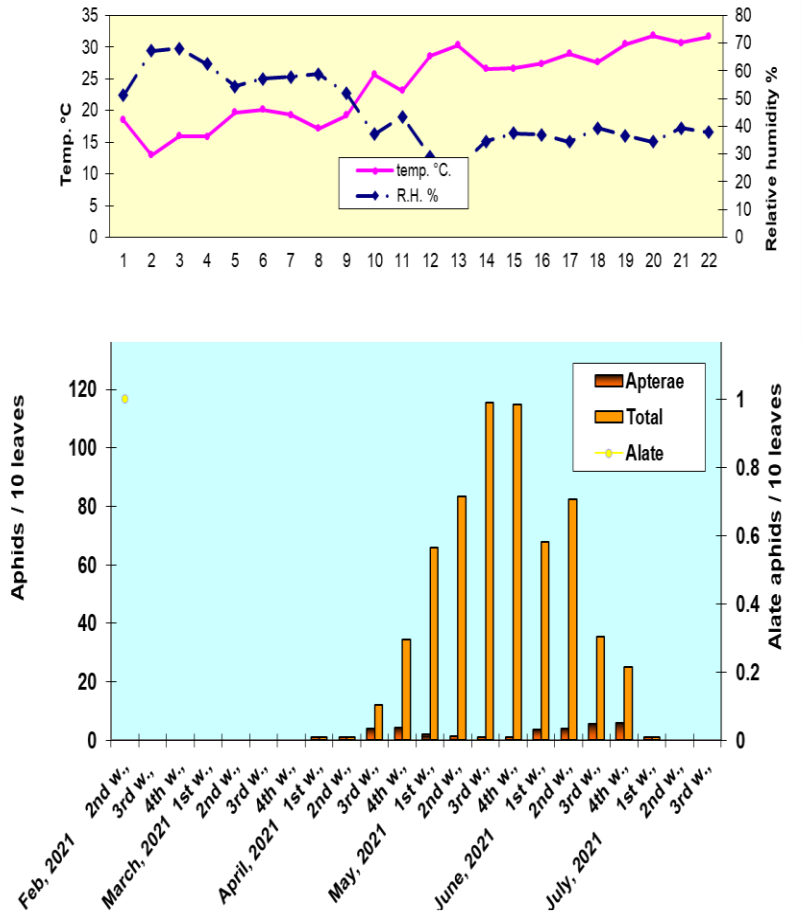


Fig. (17). Weekly mean numbers of different forms of *H. pruni* /10 leaves of plum with corresponding weekly means temperature and relative humidity one week before at Qalyubia, Governorate during 2021 season.

The results are consistent with **Baskey, (1982)** in Hungary, who explained that dense colonies of *Hyalopterus pruni* predominate in May and June. On the plum it migrates from the main host to the reeds (*Phragmites sp*.) where large colonies form in July and August.

2.3.(2).a. Alate form:

Data in **Tables (26&27) and Figs. (16&17**) indicate that the first winged *H. pruni* immigrants from early summer fruit trees and wild grasses landed on plum plant leaves late during the last week of April 2020 and 1st week of the same month. In both 2020 and 2021 investigation seasons, winged form of this insect species fluctuated widely between higher abundance and down up by phase characteristic one main period of activity: 4th week of April to 1st week of July, 2020 (lasted 10 weeks attack plant) and 1st week of April to 1st week of July (sustained 13 weeks infestation). Population density of this species reached their maximum counts of alate form during the 3rd. week of May 2020 and 4th week of June 2021 (6.0 & 6.0 individuals /10 leaves) obtained in the two seasons; where the prevailing weather conditions being (28.18° & 30.47° C and 40.7 & 36.67 % R.H.) in the two seasons, respectively.

Mealy plum aphids disappeared nearly at the end of crop season of plum production in 2nd week of July 2020 and 2021, as it advanced to physiological maturity of leaves and as affected by environmental unfavorable temperature.

2.3.(2).b. Apterae form:

Regard abundance and distribution of aptera form of *H. pruni* feed on plum trees, data presented in **Tables (26&27) and Figs. (12 &13)** shows that aptera (wingless) form of mealy plum aphid, *H. pruni* being more abundant during 2021 than on 2020 season, by the seasonal mean counts being 26.27 and 16.75 insects per 10 leaves, respectively. This insect had one main seasonal activity in both tested seasons, from the 4th week of April to the 4th week of June, 2020. While during 2021 season, start attack plum trees in the 3rd week of April and extended

attack 9 weeks to vanished about in the 4th week of June 2021. Aphids infestation abundance fluctuated on plum trees, and their activity reached maximum by mean numbers 85.1 and 114.2 insects per 10 leaves that recorded in the 4th and 3rd week of May, 2020 (31.49° C and 47.51 % R,H.) and in 2021 (26.55° C and 44.54 % R,H.), respectively.

The consolidated in aptera form population of mealy plum aphid observed (Fig., 16) could be indicated that it was reached maximum by (90 and 115.4 individuals /10 leaves) on 3rd week of May, both 2020 and 2021 seasons with synchronized vegetative growth and succulence of leaves coupled with favorable conditions mainly mean temperature and relative humidity being (28.18° C & 40.7% R.H, in 2020 and 26.55° C & 44.54 % R.H, in 2021).

From the aforementioned results, it could be concluded that mealy plum aphid, *H. pruni* found to be more abundant early during vegetative growth stage and could be considered as a key pest on plum plants. Mealy plum aphids can become established on plum trees. The aphids feed initially on the shoot tips, which can cause growth stunting and malformation at the tips of young trees. On older trees, fruit set may be reduced in subsequent years if populations are high. Aphid honeydew production can cause sooty mold problems on fruit. When the colonies of aphids are large, they can greatly reduce plant vitality or even kill the plant through mechanical injury. This is especially true in a nursery situation. Feeding aphids also produce honeydew, a sticky substance that is potentially damaging. As aphids feed, honeydew is excreted and accumulates on the leaves and developing fruits. Honeydew can serve as a substrate for bacteria, yeast, and filamentous fungal growth which reduce plant vigor.

2.3. (3). Predator species associated with mealy plum aphid, *H. pruni* Geoff. on plum orchard:

In the present study, mealy plum aphid *H. pruni* found to infest plum plants associated with the same 7 pre-mentioned predaceous insect aphids except in 2020 season two predatory species *Cydonia vicina nilotica* Muls, and *Chrysoperla carnea* disappeared all season round, as shown in **Tables (28&29) and Figs. (18&19).** The predacious insects inhabited plum plants related aphids are: *Coccinella undecimpunctata* L.; *Coccinella septempunctata* L.*; Chrysoperla carnea Stephens; Cydonia vicina nilotica* Muls.*; Cydonia vicina isis* Cr.*; Chrysoperla carnea* Stephens*; Syrphus corollae,* and *Aphidoletes aphidimyza.*

The Seasonal fluctuation in the population densities for these predaceous species was recorded weekly by mean counts on 10 plum leaves. Such predaceous species were relatively more abundant during the second season (5.043 insects /10 leaves) than on the first season (3.74 insects /10 leaves).

Table (28) Weekly mean numbers of predator species associated with the mealy plum aphid. *H. pruni*, on 10 plum leaves at Qalyubia Governorate, during 2020 season.

Inspection Date	Predator species							
	C. undc.	*C. sept.*	*C. vicinia nilotica*	*C. vicinia var*	*C. carnea*	*S. corolla*	*A. aphidimyza*	Total
Feb, 2020 2nd w.,	0	0	0	0	0	0	0	0
3rd w.,	0	0	0	0	0	0	0	0
4th w.,	0	0	0	0	0	0	0	0
March, 2020 1st w.,	0	0	0	0	0	0	0	0
2nd w.,	0	0	0	0	0	0	0	0
3rd w.,	0	0	0	0	0	0	0	0
4th w.,	0	0	0	0	0	0	0	0
April, 2020 1st w.,	0	0	0	0	0	0	0	0
2nd w.,	0	0	0	0	0	0	0	0
3rd w.,	0	0	0	0	0	0	0	0
4th w.,	0	0	0	0	0	0	0	0
May, 2020 1st w.,	1	1	0	0	0	0	0	2
2nd w.,	1	2	0	0	0	0	0	3
3rd w.,	3	2	1	0	0	10	7	23
4th w.,	5	0	0	0	0	12	8	25
June, 2020 1st w.,	2	2	1	0	0	12	6	23
2nd w.,	1	0	1	0	0	4	2	8
3rd w.,	0	0	0	0	0	2	0	2
4th w.,	0	0	0	0	0	0	0	0
July, 2020 1st w.,	0	0	0	0	0	0	0	0
2nd w.,	0	0	0	0	0	0	0	0
3rd w.,	0	0	0	0	0	0	0	0
4th w.,	0	0	0	0	0	0	0	0
Mean	0.57	0.30	0.13	0.0	0.0	1.74	1.0	3.74

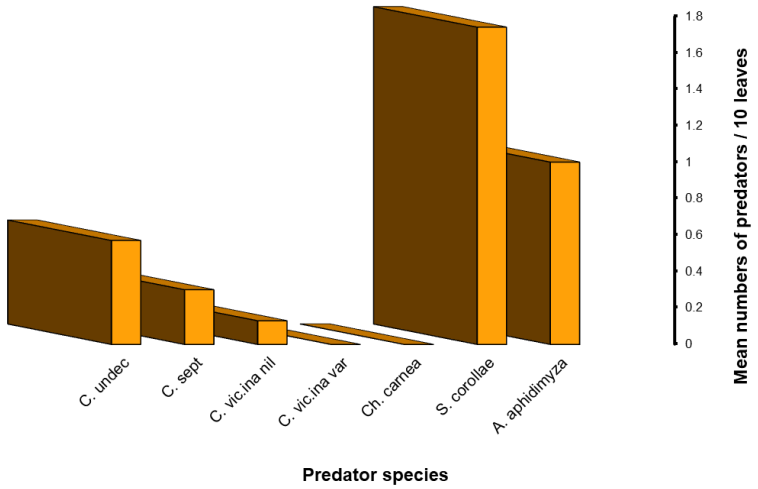


Fig.(18). Seasonal mean numbers of different insect predators associated with mealy plum aphid, *H. pruni* /10 leaves of plum plants at Qalyubia, Governorate during 2020 growing season.

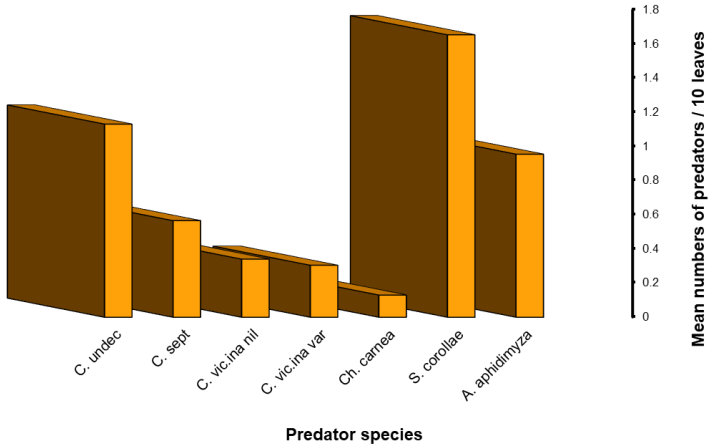


Fig.(19). Seasonal mean numbers of different insect predators associated with mealy plum aphid, *H. pruni* /10 leaves of plum plants at Qalyubia, Governorate during 2021 growing season.

Table (29) Weekly mean numbers of predator species associated with the mealy plum aphid. *H. pruni*, on 10 plum leaves at Qalyubia Governorate, during 2021 season.

Inspection Date	Predator species							
	C. undc.	*C. sept.*	*C. vicinia nilotica*	*C. vicinia var*	*C. carnea*	*S. corolla*	*A. aphidimyza*	**Total**
Feb, 2021 2nd w.,	0	0	0	0	0	0	0	0
3rd w.,	0	0	0	0	0	0	0	0
4th w.,	0	0	0	0	0	0	0	0
March, 2021 1st w.,	0	0	0	0	0	0	0	0
2nd w.,	0	0	0	0	0	0	0	0
3rd w.,	0	0	0	0	0	0	0	0
4th w.,	0	0	0	0	0	0	0	0
April, 2021 1st w.,	0	0	0	0	0	0	0	0
2nd w.,	0	0	0	0	0	0	0	0
3rd w.,	1	0	0	0	0	0	0	1
4th w.,	1	1	0	0	0	0	0	2
May, 2021 1st w.,	2	1	1	0	0	0	0`	4
2nd w.,	4	2	1	0	0	4	1	12
3rd w.,	7	1	1	2	1	8	5	25
4th w.,	6	4	2	1	1	10	6	30
June, 2021 1st w.,	4	4	1	2	1	5	2	19
2nd w.,	1	0	2	2	0	5	3	13
3rd w.,	0	0	0	0	0	4	4	8
4th w.,	0	0	0	0	0	2	0	2
July, 2021 1st w.,	0	0	0	0	0	0	0	0
2nd w.,	0	0	0	0	0	0	0	0
3rd w.,	0	0	0	0	0	0	0	0
4th w.,	0	0	0	0	0	0	0	0
Mean	1.13	0.57	0.34	0.30	0.13	1.65	0.95	5.04

2.3. (3) a. The ladybird beetles, *Coccinella undecimpunctata* L., *C. Septeumpunctata* L., *Cydonia vicina nilotica* Muls. and *Cydonia vicina isis* Cr.

Tables (28&29) and Figs. (18&19), indicates the seasonal fluctuation in the population densities of the four ladybird beetles *Coccinella undecimpunctata; C. septempunctata.; Cydonia vicina nilotica* Muls. and *Cydonia vicina isis* Cr. Data also indicates, the four coccinellid beetles were more convenient active during 2020 than 2021 season. The seasonal mean numbers of the four predator species recorded in 2020 season were 0.57, 0.30, 0.13 and 0.0; while during 2021 season being 1.13, 0.565, 0.34 and 0.304 insects /10 leaves, respectively.

2.3. (3) b. The green lacewing, *Chrysoprela carnea* Steph.

Concerning the seasonal abundance of the common green lacewing, *Chrysoperla carnea*, data included in **Tables (28&29) and Fig. (20)** Show that this Chrysopa was disappeared from related aphids during 2020 season, while its found attack mealy plum aphid associated 3 weeks only on plum plants during 2021. The seasonal mean numbers were 0.040 and 0.130 insects /10 leaves. This species foundation being accidental during 2021 for three weeks from 3rd week of May to 1st week of June 2021, recorded few numbers not exceeded sufficient as bio-agents on plum trees.

2.3. (3)c. Dipteran predators.

As for two Dipterans insects: *Syrphus corollae* and *Aphidoletes aphidimyza* that prey mealy plum aphid on plum trees, data concerning population dynamics presented in **Tables (28&29) and Figs. (18&19)**, show that these Syrphid and Cecidomyiid flies were found to be active attaks 4-5 weeks aphids on plum trees, from the 3rd week of May

(maximum 12 & 8 insects /10 leaves) to the third week of June, 2020, for the two predaceous insect, respectively. In 2021 season, these Syrphid and Cecidomyiid insects were active fairly as predatory for 7 and 6 weeks from 2nd. week of May to 4th and 3rd weeks of June 2021 reached maximum in 4th week of May 2021 (maximum counts being 10 & 6 insects /10 leaves, recorded in 4th week of May 2021) for the two predacious species in the first and second season, respectively.

Weekly mean numbers of this predaceous species recorded one activity period recorded on the 3rd week of May to 3rd week of June, 2020; while in the second season 2021 it took place from 2nd week of May to 4th week of June 2021, stayed 5-7 weeks on plum trees associated with mealy plum aphid.

From the above mentioned data, it could be concluded that the seven predator species; *Coccinella undecimpunctata, C. septempunctata, Cydonia vicina nilotica., Cydonia vicina isis., Chrysoprela carnea, Syrphus corollae,* and *Aphidoletes aphidimyza* had one period of seasonal activity on apricot, peach and plum plants. Also mealy plum aphid, *H. pruni* had one main period of seasonal activity on the same Prubus species (apricot, peach and plum trees) grown at Qalyubia district. Both aphids and predator species were more active during 2021 than on 2020 season, and both aphid and predators synchronized in existence benefit that seemed to be coinciding with each other. These results are in agreement with the findings obtained in Egypt by **Shehta (2020)**.

2.3. (4) Effects of some ecological factors on the population density of the mealy plum aphid, *H. pruni* on plum trees:

Results are summarized in **Tables (30&31**) refer the simultaneous effects of some ecological factors (biotic and abiotic) on

the fluctuation in the population density of mealy plum aphid, *H. pruni* infesting plum trees throughout the growing seasons of 2020 and 2021.

2.3. (4).a. Effect of temperature:

In the present work temperature represented by three means, i.e., weekly mean maximum; weekly mean minimum and weekly average temperature, to investigate the effects of three temperature regimes on mealy plum aphid population (alate, aptera and total morphs) densities on plum plants, data analyzed and obtained results of statistical analysis are given in **Tables (30&31).**

The relationship between the abundance of alate morph of *H. pruni* on plum plants under field conditions was positively correlated with maximum, minimum, and weekly mean temperatures and statistically significant in both 2020.and 2021, this relationship being with population of alate, aptera and total.

Mealy plum aphids on plum trees and significant correlation with weekly mean of temperature. The correlation coefficient values were (0.4080, 0.3667 and 0.3770) and (0.3965, 0.4001 and 0.4131), for weekly mean temperature effects on alate, aptera and total numbers of mealy plum aphids in the two experimental seasons 2020 and 2021, respectively.

Alate and aptera *H. pruni* population found on plum plants under field conditions was positively correlated with maximum, minimum, and weekly mean temperature and statistically exhibited significantly ("r" value respectively being (0.4080, 0.3667 & 0.3770) in 2020 and (0.3963, 0.4001 & 0.4131) in 2021 for alate, aptera and total numbers of aphids and exhibited significantly correlated with mean temperature **(Tables 30&31)**.

The simple regression coefficient value was applied to show the unit effect of each factor (e.g., maximum and minimum Temperature) on the corresponding population density of mealy plum aphids (alate, aptera and total numbers). The calculated values of regression coefficient "b" being (1.1374, 0.0679 & 0.0669) and (1.1934, 0.0612 & 0.0621) and constant values (A) are given in **Tables (30&31)** for both tested seasons.

From these results it can be concluded that the weekly mean numbers of *H. pruni* on plum plants markedly varied according to temperature factor and unit of change. Thus, the increase or decrease in temperature was affected on the mealy plum aphid population H. pruni, as reveled for winged by (1.1374 & 1.1934), for aptera (0.0679 & 0.0612) and total numbers being (0.0669 & 0.0621) aphid individuals increase in 2020 and 2021, respectively, could result due to a change in the weekly mean temperature by 1 ºC.

2.3. (4) b. Effect of relative humidity:

Significant negative correlation between R.H. % and alate, aptera and total morphs of *H. pruni* exhibited in both 2020 and 2021 seasons, where ('r' < 0.05) being (-0.5550, -0.5759 & -0.5866) and (-0.4849, -0.6107 & -0.6246) as shown in **(Tables 30&31).**

The regression coefficient "b" values were (0.171, 0.001 and 0.001) and (0.185, 0.001 and 0.001) for alate, aptera and total numbers of mealy plum aphid in the first and second season, respectively.

From these results it can be concluded that the weekly mean numbers of *H. pruni* on plum plants markedly increase with the increase of relative humidity percentages as confirmed in both tested seasons.

2.3. (4) c. Effect of insect predators:

The activity of seven insect predators i.e., *Coccinella undecimpunctata* L.*; Coccinella septempunctata* L.*; Chrysoperla carnea* Stephens; *Cydonia vicina nilotica* Muls.*; Cydonia vicina isis* Cr.*; Chrysoperla carnea* Stephens*; Syrphus corollae,* and *Aphidoletes aphidimyza,* that totally represent the biotic factor show negative and significant effect on the population density of winged and wingless morphs of mealy plum aphid, *H. pruni* on plum plants throughout 2020 and 2021; but insignificant (P = > 0.05) and negative effects on the winged form of mealy plum aphids during the second season 2021. Fore-mentioned predators were totally negative effects and highly significant (r= - 0.8740; P = >0.01 and 0.3599, P >0.05) on abundance of aptera and alate morphs of the mealy plum aphid during 2020 and 2021 seasons, respectively and also negative effects, where r values being (-0.2222 and – 0.0180), during two tested seasons, respectively as given in Tables 11, and 12. The correlation coefficient "r" values were (P = >0.01) and (P = > 0.05) for the effects of total insect predators on total numbers of mealy plum aphid in the first and second season, respectively.

The simple regression coefficient values was applied to show the unit effect of four aphidophagous predators on the corresponding weekly mean number of mealy plum aphids existed on plum orchard. The regression coefficient "b" values were (-1.44, - 0.2 & - 0.29) and (-0.0, - 1.16 & -1.08) for alate, aptera and total *H. pruni* throughout the two consecutive seasons, respectively.

From the practical point of view, it can be concluded that the increase in aphid population exhibited an increase in predator

population during growth stages of the crop. Both population densities of the seven aphidophagous insects and mealy plum aphid, when exist together on plum trees where were interrelationship with each other and both of them sometimes significantly effects on the abundance of the other under natural field conditions. The predator population was significantly correlated with that of its preys.

In conclusion, the correlation between the population of the mealy plum aphids on one hand and the population of their associated predators on the other hand was negative. This means that whenever increases the number of aphidophagous predators within apricot, peach and plum fields parallel decrease in the abundance of corresponding aphids that noticed.

2.3.(4)d. Combined effects of meteorological factors and predators:

The combined effects estimated as explained variance (E.V. %) for the three ecological factors (weekly means maximum temperature; minimum temperature; relative humidity) and predators on aphid populations infesting plum trees are given in **Tables (30&31).** Positive significant regression coefficient were obtained for the relationship between the progress in population density of mealy plum aphids in both 2020 and 2021 season parallel with plant developing in growth (in days). The partial regression was 0.474 and 0.218 in the two successive seasons, respectively. Negative correlation and statistically significant between maximum and minimum temperature one week before counts and the corresponding population density of mealy plum aphid infesting plum trees in both 2020 and 2021 seasons, while, insignificant correlation was found between *H. pruni* infested plum and relative humidity. In 2020, this climatic factor i.e., maximum temperature showed also negative regression but insignificant effects on population

density of the same insect pest attacking the same host plants. The joint effect of the three considered ecological factors and plant aged (biotic and abiotic) as explained variation (%), value differ greatly for *H. pruni* infested plum trees during 2020 and 2021seasons, respectively.

Table (30). Simple correlation and regression coefficient values between main weather factors (abiotic) and predators (biotic) on the weekly mean numbers of different forms of *H. pruni* on plum trees at Qalyubia Governorate during 2020-growing season.

Tested factors	**Aphid density**	**Correlation Coefficient (r)**	***P***	**Regression coefficient (b**	**Intercept (A)**
Mean Temperature	Alate form	0.4080	>0.05	1.1374	22.25
	Aptera form	0.3667	>0.05	0.0679	22.67
	Total number	0.3770	>0.05	0.0669	22.59
Minimum Temperature	Alate form	0.3489	>0.05	0.8768	16.17
	Aptera form	0.3102	>0.05	0.0518	16.50
	Total number	0.3191	>0.05	0.0510	16.44
Maximum Temperature	Alate form	0.4504	>0.01	1.4075	28.28
	Aptera form	0.4072	>0.01	0.0846	28.79
	Total number	0.4184	>0.05	0.0832	28.70
% R.H	Alate form	-0.5550	>0.01	-3.1867	51.20
	Aptera form	-0.5759	>0.01	-0.2197	50.51
	Total number	-0.5866	>0.01	-0.2143	50.72
Predators	Alate form	0.4198	>0.05	1.6774	1.44
	Aptera form	0.8851	>0.001	0.2350	-0.20
	Total number	0.8740	>0.001	0.2222	-0.29

Table (31). Simple correlation and regression coefficient values between main weather factors (abiotic) and predators (biotic) on the weekly mean numbers of different forms of *H. pruni* on plum trees at Qalyubia Governorate during 2021 growing season.

Tested factors	Aphid density	Correlation Coefficient (r)	*P*	Regression coefficient (b	Intercept (A)
Mean Temperature	Alate form	0.3965	>0.05	1.1934	22.42
	Aptera form	0.4001	>0.05	0.0612	22.70
	Total number	0.4131	>0.05	0.0621	22.58
Minimum Temperature	Alate form	0.3612	>0.05	1.0494	16.16
	Aptera form	0.3573	>0.05	0.0527	16.43
	Total number	0.3692	>0.05	0.0536	16.32
Maximum Temperature	Alate form	0.4215	>0.05	1.3378	28.69
	Aptera form	0.4319	>0.05	0.0696	28.97
	Total number	0.4456	>0.05	0.0706	28.83
% R.H	Alate form	-0.4849	>0.01	-3.0335	49.81
	Aptera form	-0.6107	>0.01	-0.1941	50.12
	Total number	-0.6246	>0.01	-0.1952	50.46
Predators	Alate form	0.067	N.S.	1.0000	0.00
	Aptera form	0.3156	>0.05	0.0160	1.16
	Total number	0.3599	>0.05	0.0180	1.08

From the above mentioned discussion, it could be concluded that the direct and joint effect of the plant age and coordinated with the influence of weekly average maximum, minimum and mean percentage of relative humidity showed precise effects, as a group on the population densities of *H. pruni* harbored plum during winter months. These simultaneous effects were more confirmed in both tested seasons.

3. Biological studies:

Effect of temperature on the biological aspects and life table parameters of the mealy plum aphid, *Hyalopterus pruni* Geoffroy. on apricot seedlings

The results presented in **Tables (32&35)** and **Figs. (20a-e and 21).** showed that the duration periods of different *H. pruni* instars reared on apricot cv. Amar variety, were affected by the different tested temperatures (20, 25 and 30 °C).

3.1- Development and survival:

3.1. a- Developmental time: Data in **Table (32)** clear that the developmental times for the nymphal instars of *H. pruni* reared at the tested temperatures of 20, 25 and 30 °C. were decreased significantly with the increase in temperature ($P < 0.05$). At the tested degrees developmental time was the elapsed for the first, second, third and fourth nymphal instars feed on apricot leaves recorded: 4.44 ± 0.72, 2.44 ± 0.53. 2.67 ± 0.5 & 1.78 ± 0.44 days at 20 °C; 3.5 ± 0.53, 1.88 ± 0.35, 1.38 ± 0.52 &1.25 ± 0.46 days at 25 °C, and 2.29 ± 0.49, 1.29 ± 0.49, 1.0 ± 0.14 & 1.0 ± 0.0 days at 30 °C, respectively.

Statistical analysis of the data showed that the longest time for complete development of the nymphal stage was recorded at the temperature of 20 °C (11.33 ± 0.71 days); mean while the shortest period noticed at 30 °C, being 5.58 ± 1.00 days.

The time required for complete development of *H. pruni*, was decreased with temperature increasing from 20 to 30 °C with shortest time being observed at the latter. The optimum developmental time of *H. pruni* was at 25 °C. these results found in harmony with **Serdar and Raymond (2002)** who recorded that the shortest developmental time of *B. Shwartzi* on peach trees was 6. 9 d. at 25 °C and the longest was 19.

9 d. at 15 °C. However, **Latham and Mills (2011)** showed that the rates of *H. pruni* evolution increased roughly linear with the temperature reaching a maximum at 26°C before declining at higher temperatures.

Table (32) Developmental times (days) and developmental rates (1/d) of *H. pruni* nymphal stages at various temperatures (20-25-30 °C) on Apricot leaves.

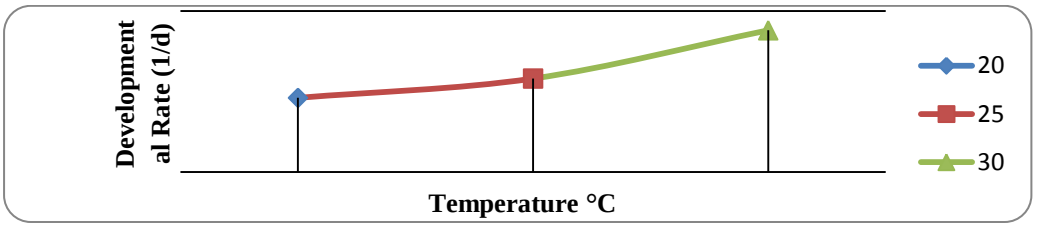
Parameters	Temp. °C	1st. Instar	2nd. Instar	3rd. Instar	4th. Instar	Total nymphal stage
Developmental Time (Day± SE)	**20**	4.44b ± 0.72	2.44c ± 0.53	2.67c ± 0.5	1.78b ± 0.44	11.33c ± 0.71
	25	3.5ab ± 0.53	1.88b ± 0.35	1.38a ± 0.52	1.25a ± 0.46	8b ± 0.53
	30	2.29a ± 0.49	1.29a ± 0.49	1a ± 0.14	1a ± 0	5.58a ± 1.0
LSD (0.05)	**-**	1.37	0.44	0.74	0.46	2.16
Developmental Rate (1/d)	**20**	0.23	0.41	0.37	0.62	0.088
	25	0.29	0.53	0.72	0.8	0.125
	30	0.44	0.78	1	1	0.179

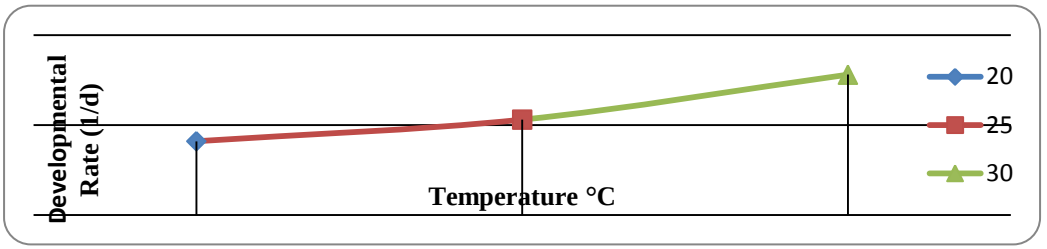
3.1.b-Developmental rates:

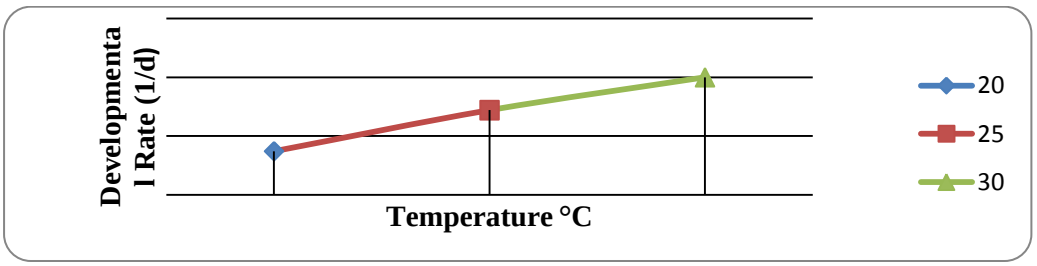
The developmental rates of all instars and total immature stage of mealy plum aphid, *H. pruni* from birth to adult increased linearly with temperatures from 20° up to 25 °C, then after word reached maximum at 30 °C., **(Table 32 and Figs. 20a-e)**. Although the increasing rates of all the developmental rates parella at 25 and 30 °C slowed slightly toward upper, they were still the maximum

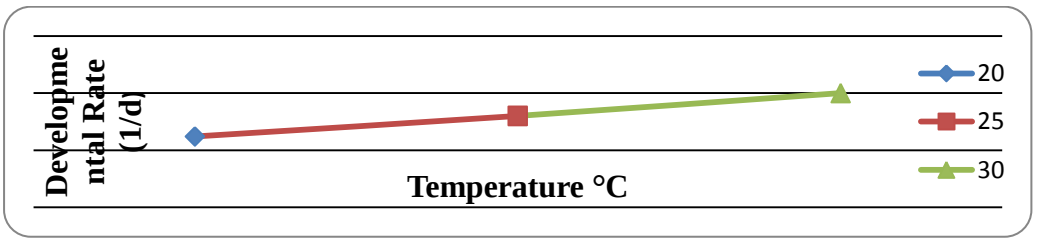
development rates **(Figs. 20a-e),** In the same trend, **Serdar and Raymond (2002)** stated that developmental rate for *B. schwartzi* (Borner) was differed on peach and nectarine (*Prunus persica*) trees in Canada being (r_m 0.286) and for Queen crest peach (r_m 0.283), therefore, these cultivars could be selected as the host plant for the rearing aphid colony. **Mohamed *et al.* (2015)** in Algeria, observed that the development rates *H. pruni* increased with temperature up to an optimum 27 °C. The relationship between development rate and temperature was described by linear and nonlinear models. Developmental threshold based temperature was greater for the nonlinear model than for the linear model.

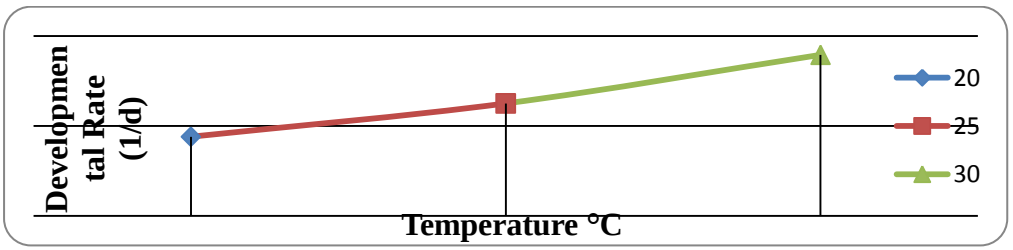
The results of linear regression analysis for nymphal developmental rates and temperatures within the range of 20–30 °C are shown in **(Table 33).** The estimated lower developmental thresholds were 1.01, 3.24, 1.13, 1.05 °C and 1.12 °C for the first through fourth instars and total immature stage, respectively.











Figs. (20a-e) Observed development rates for nymphal stage of *H. pruni* on apricot leaves within the range of 20–30 °C, and curves fit to these data by a nonlinear regression.

According to **Campbell *et al.* (1974)** methodology estimates of developmental times in degree-days, decreased from 47.29 DD for first instars to 22.82 DD for fourth instars and the total immature development required 127.54 DD above 1.12 °C (**Table 33**). The degree-Day model fit the data well, and adequately predicted the development rates (**Table 33 and Figs. 20a-e**).

Table (33) Liner regression analysis for expressing developmental rates of *Hyalopterus pruni* immature instars reared on apricot leaves at temperature range of 20-30 °C.

Developmental Periods	Regression Values				
	1st. Instar	**2nd. Instar**	**3rd. Instar**	**4th. Instar**	**Nymphal stage**
Simple Correlation "r"	0.971	0.982	0.998	0.999	0.999
R^2	0.942	0.965	0.995	0.997	0.999
Intercept A	-0.213	-0.341	-0.864	-0.308	-0.069
Regression B	0.021	0.037	0.063	0.044	0.0078
Developmental Time in DD	47.29	27.37	15.988	22.821	127.54
Low Developmental Threshold (°C)	1.01	3.24	1.13	1.05	1.12

The present data in **Table (34)** indicate that survivorship rate (%) for immature stage was differed significantly within three constant temperatures on apricots. Higher temperature degree at 30 °C had

detrimental effects on the survivorship of immature stage. The highest mortality occurred between 25 and 30 °C, being 33.7 and 42.4 % respectively; when mealy plum aphids feed on leaves of apricot, whereas the lowest mortality percentages were recorded at 20 °C, being 25.3 % mortality of nymphs of *H. pruni* under our investigation increased with temperature and all the nymphs died at 35 °C, therefore did not included in our data. **Serdar and Raymond (2002)** indicated that the lower threshold for *B. schwartzi* development was 10.04 °C. Also, the data indicate that *B. schwartzi* does better performance on peach or nectarine at cooler temperatures and that early season peach or nectarine varieties and may be susceptible to damage by this aphid. The same result was detected in *H. pruni* by **Özgökçe and Atlihan (2005),** and other aphid species by **Asin and Pons (2001)** for corn aphids.

Generally, aphids reared at the highest tested temperature of 30°C had a detrimental effect on the survivorship of *H. pruni* immature stages; where, it decreased developmental time of nymphs on apricot leaves from 11.33 to 5.58 days, so it developed fastest and had a minimum survival rate about 57.6 %. These result agree with those of **Latham and Mills (2011)** who recorded greatest proportional survivorship of *H. pruni* nymphs on prune trees occurred at 26 °C. Mean daily fecundity was lowest at 14 °C and highest at 22 °C.

Table (34) Life table parameters of *Hyalopterus pruni* Geoff. on apricot leaves at temperature range of 20-30 °C.

Parameter	**20 °C**	**25 °C**	**30 °C**
Survival rate To Maturity %	74.7	66.3	57.6
Mortality % in nymphal stage	25.3	33.7	42.4
Time To 50% maturity (Days)	36.83	24.88	14.5
Mean generation time (Days)	20.11	14.63	10.36
Net reproductive rate (R_o) Female	14.92	16.25	9.69
Intrinsic rate of increase (r_m)	0.134	0.191	0.219
Finite rate of increase (exp. $_{rm)}$	1.144	1.21	1.25
Generation doubling time (Days)*	5.17	3.63	3.17

*Generation Doubling Time (Days)= Ln (2)/r_m.

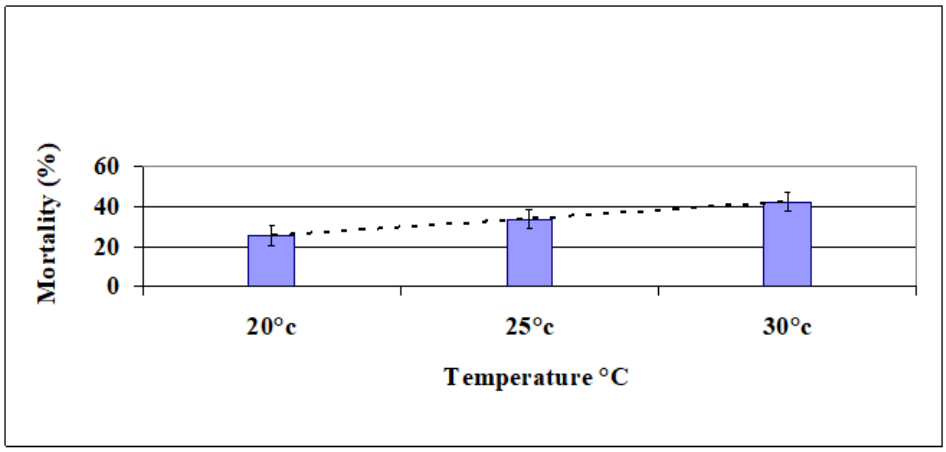


Fig. (21). Effect of constant temperature on mortality percentage occurred in nymphal stage of H. pruni within the temperature range of 20-30 °C.

3.2- Adult longevity and reproduction:

Female adult longevity as pre- parturition, parturition and post-parturition periods was investigated under the three constant temperatures of 20, 25 and 30 °C, **Table (35).** The statistical analysis of the data revealed that the temperature had a highly significant effect on duration of the adult stage, where the longest durations of the adult stages occurred at 20 °C, (24.89 ± 1.62 days.) and the shortest duration occurred at 30 °C, (10.29 ± 2.29 days).

The obtained result, indicate that different periods of the adult duration decreases with the increase in temperature regime **(Table 35).** the pre- parturition period was ranged 3 ± 1.1 days at 20 °C, to 1.0 ± 0,23 days at 30 °C. The mean parturition period that preduced new born ranged 12.78 ± 1.79 days at 20 °C, to 6.57 ± 1.99 days at 30 °C., and the post-reproductive period ranged from 9.11 ± 1.62 days at 20 °C to 2.71 ± 0.76 days at 30 °C.

The obtained results are found in contrast with that of **Serdar and Raymond (2002)** who recorded that the adult longevity of *B. schwartzi* on peach trees was 38.5 d. at 15 °C and the highest offspring was 46.4 nymphs per female at 20 °C; while it found agreed with **Latham and Mills (2011)** who stated that the adult longevity of *H. pruni* on prune trees decreased with temperature increasing.

Also data indicated that temperature regimes affected significantly on female longevity, total life-span and on their fecundity as shown in **(Table 35).** The mean insect period of viviparous females of mealy plum aphids was varied from 16.29 ± 1.5 days at 30 °C to 36.22 ± 1.79 days at 20 °C. The average nymph production of *H. pruni* female (offspring per female) reached a maximum of 24.25± 3.88 and 19.89± 2.76 nymphs per female at 25 and 20 °C, respectively. While,

the lower rates 16.71 ± 5.22 nymphs per female produced at 30 °C. when feed on apricot leaves, respectively under temperature within 20–30 °C, also data obtained exhibited that viviparous female *H. pruni* longevity and fecundity were both statistically significant affected by temperature (LSD at 0.05 being 8.14 and 2.88, respectively).

Table (35) Female specific data of the life cycle at three temperetures.

Mean duration's ± S.E (day)	**Temperature (°C)**			**LSD (0.05)**
	20	**25**	**30**	
Pre-parturition	3.0c ± 1.1	1.38b ± 0.52	1.0a ± 0.23	0.48
parturition	12.78b ± 1.79	11.38b ± 1.51	6.57a ± 1.99	2.45
Post-parturition	9.11c ± 1.62	6.13b ± 2.23	2.71a ± 0.76	2.44
generation time	14.33b ± 0.71	9.38a ± 0.74	7.0a ± 1	2.57
Adult stage	24.89c ± 1.62	18.88b ± 3.14	10.29a ± 2.29	4.17
Life span	36.22 ± 1.79	26.88 ± 3.36	16.29 ± 1.5	8.14
fecundity rate (progeny/female)	19.89 ± 2.76	24.25 ± 3.88	16.71 ± 5.22	2.88

Means within the same row sharing the same letter are not significantly different at 0.05 Prob., Duncan multiple range test.

Longevity of mealy plum aphid female was 36.22 ± 0.1.79 days at 20 °C, but significantly declined at 30 °C (16.29 ± 1.5 days). The highest value of adult fecundity was about 24.25± 3.88 offspring per female at 25 °C. The lower progeny borne being 19.89 ± 2.76 and 16.71 ± 5.22 nymphs per female at 20 and 30 °C, respectively **(Table 35).** At 35 °C, only few nymphs of *H. pruni* less than four individuals survived, but all adults died before reached reproductive phase with very low numbers not exceeded than one individuals.

Adult fecundity was also adversely affected by the three temperature regimes of 20, 25 and 30 °C, where the reproduction rates were 1.56 ± 0.15; 2.13 ± 0.2 and 2.57 ± 0.37 nymphs /mother/day, for the three tested temperature respectively. **Zaklad and Skierniewice (1970)**. Mentioned that mealy plum aphid, *H. pruni* development was holocyclic, and there were 6-16 generations a year. Fecundity was highest in the fundatrices of the first generation, the females depositing 102-120 (with maximum 172) nymphs each.

v- SUMMARY

Stone fruit trees (peach, apricot, and peach) are among the most important and popular fruit crops in Egypt. It is widely cultivated in the Delta governorates, especially Qalyubia Governorate. This fruit is characterized by high nutritional quality because it contains sugars, proteins and vitamins. As a result of the climatic changes that have recently led to the emergence of many new key pests on Stone-core fruit trees which negatively affected the yield of these trees. Aphids are considered one of the most important pests of various crops in the world in addition to being one of the most harmful pests that affect these fruit trees group.

These experiments were carried out in the stone fruit orchards at Toukh district, Qalyubia Governorate and in laboratory of piercing-sucking research department PPRI-ARC, during the two successive seasons of 2020 and 2021. On the aphid species infested stone fruit trees (apricot, peach and plum) and alternative hosts (weeds and wild plants). The following studies were conducted:

1.Survey studies:

1.a-Survey of aphids species infest stone fruit trees and alternative hosts:

The three stone fruit trees being: apricots (*Prunus armeniaca*); peaches (*Prunus persica*), and plums (*Prunus americana*), found harbored two aphid species, throughout the examination periods. The two surveyed aphid species were: the dominant one, mealy plum aphid, *H. pruni* Geof. and few scattered numbers of green peach aphid, *M. persicae* Sulz., occurred on apricot, peach and plum trees. In while the wild plant, common reed *Phragmites australis* wtich existed between

and around trees orchards, Found infested by the mealy plum aphids *H. pruni* only.

The mealy plum aphid *H. pruni* was occurred on both of the three tested stone fruit trees hosts throughout the periods extended from the 2nd week of march to the 2nd week of July at the study areas during the two investigated successive seasons of 2020 and 2021 with highest seasonal mean numbers of 1970.32 and 2568.32 individ. /10 leaves recorded on Apricot trees which considered as the most favorable host to *H. pruni* during the two seasons, respectively. The total numbers of green peach aphid *M. persicae* on the three tested hosts which recorded relatively high range of 4-17 individ. /10 leaves during 2021season on plum and apricot trees. As previous results, the mealy plum aphid was the most dominant species than green peach aphid attacking the stone fruit trees under investigated areas during the study periods.

1. b-survey of aphidophagous predators associated with aphid species on the three tested stone fruit trees:

The results of survey of aphidophagous predators on the three tested stone fruit trees revealed that there were seven predator insects found associated with aphids specises infested tested stone fruit trees, i.e, *Coccinella undecimpunctata* L.*; Coccinella septempunctata* L.*; Cydonia vicina nilotica* Muls.*; Cydonia vicina isis* Cr.*; Chrysoperla carnea* Stephens; *Syrphus corollae,* and *Aphidoletes aphidimyza.*

2. Population density of the mealy plum aphid, *Hyalopterus Pruni* Geof., and its associated predators in the orchards of the tested host trees.

The population of mealy plum aphid was fluctuated widely throughout the tested seasons and reached its maxima numbers during May, in the two investigated seasons of 2020 and 2021; by means

number of 6358.4, 5852.5 and 285.5 insects/ 10 leaves and of 7075.0, 5612.5 and 379.5 insects/ 10 leaves of apricot, peach and plum throughout the two successive seasons, respectively. Also, the population distribution on the original directions of the trees of each the three hosts was studied throughout the investigation seasons and the results on the three hosts can be concluded as follows:

2.1. On apricot trees:

2.1. (1). Distribution of *H. pruni* population:

The obtained results of horizontal distribution patterns of *H. pruni*, cleared that; in 2020 season, the twigs at Western and Northern directions of apricot trees canopy found harbored the higher aphid population than that of Eastern and Southern parts with slight significant differences between aphid mean numbers within different trees directions. The general mean numbers of aphids were 443.58, 442.12, 415.90 and 410.82 individ. /sample during the 2020 season. 563.4, 579.31, 545.16 and 545.2 individ. /sample during 2021 season at the four cardinal directions of Western, Northern, Eastern and Southern respectively. The mean numbers at tested directions Northern, Western, Eastern and Southern during the two successive seasons of 2020 and 2021, could be arranged in a descending order as follows: 510.72, 478.5, 480.53, and 503.43 aphid individ. /sample to the four directions, respectively.

2.1. (2). Population density of *H. pruni* on apricot trees:

The population density of mealy plum aphid, *H. pruni* alate and aptera forms found attacking apricot trees were estimated weekly once apricot tree leaves emergence. The weekly means of daily maximum, minimum temperature and of relative humidity percentages of the experiment locality during the two study seasons are also included

Regarding the seasonal average of *H. pruni*, the population was more abundant during 2021 than on 2020 season, by seasonal average being 558.21 and 428.33 individuals / 10 leaves, respectively.

The mealy plum aphid had one main seasonal activity period in both tested seasons, from the 2nd week of March to the 2nd week of July. Aphids on apricot trees progressively activity until reached maximum mean number of 1779.2 individ. / sample at 3rd week of May, 2020 (at 28.18 °C and 40.7 % R.H.) and in the 2nd week of May, 2021by 1958.3 individ. / sample at (26.32 °C and 45.01 R.H %).

2.1. (3). Population density of predator species associated with mealy plum aphid, *H. pruni* on apricot trees

The obtained results cleared that such predaceous species were relatively more abundant during the second season with seasonal total number of 66.22 insects /10 leaves) than the first one of 47.26 insects /10 leaves. These predacious insects prevail in one main activity period extended from 4th week of March to the 1st week of July 2020 and 2021 growing seasons. The Maximum counts of aphidophagous predator occurred at the 3rd Week of May 2021, and in the 2nd week of May 2021 by seasonal means of 257.0 and 246.0 insects /70 leaves, respectively.

2.1. (3) a. The ladybird beetles, *Coccinella undecimpunctata* L., *C. Septeumpunctata* L., *Cydonia vicina nilotica* Muls. and *Cydonia vicina isis* Cr.:

The seasonal fluctuation in the population densities of the four ladybird beetles *Coccinella undecimpunctata*; *C. septempunctata.; Cydonia vicina nilotica* Muls. and *Cydonia vicina isis* Cr. indicate convenient active during 2020 than 2021 season. The general seasonal

mean numbers were 4.65, 1.52, 1.0 and 0.57 for the four predator species in 2020 season; while during 2021 being 2.87, 1.35, 0.52 and 0.35 insects /10 apricot leaves, respectively.

2.1. (3) b. The green lacewing, *Chrysoprela carnea* Steph.:

The green lacewing ***Ch. carnea*** was at the same limited active for ten weeks on apricot trees in both 2020 and 2021 seasons with seasonal mean numbers of 1.04 and 0.78 insects /10 leaves, respectively. This predator had one main occurrence period in 2020, and 2021, initiated from the 4th week of March to the 2nd week of June, 2020; and from 4th week of March to 3rd week of May, 2021. The weekly mean numbers reached their maximum numbers on the 3rd week of May 2020 and 1st week of May 2021, being 5.0 and 4.0 individuals /10 leaves, during the two growing apricot seasons, respectively. During 2020 and 2021, this species displayed for 10 weeks only during the main aphid infested infestation period

2.1. (3) c. Dipteran predators.

The two predaceous Dipteran insects: *Syrphus corollae* and *Aphidoletes aphidimyza* flies were found to be active from the 4th week of April (10 & 4 insects) to the fourth and third week of June, 2020 (10 & 10 insects /10 leaves), respectively. In 2021 season, these Syrphid and Cecidomyiid insects were active from 2nd week of April (14 & 20 insect) to 1st week of July (15 & 18 insects /10 leaves) for the two predators, respectively. The seasonal mean counts of 21.56 &16.91 and 26.95 &33.39) individuals /10 leaves were recorded for the two predacious species in the first and second season, respectively. The Weekly mean numbers of this predaceous species reached their maxima during 3rd week of May (115 & 105 insects) and 2nd week of

May (102 & 122 insects), for the two dipterous insects in 2020 and 2021 growing season, respectively.

Generally, it could be concluded that the seven predator species; *Coccinella undecimpunctata, C. septempunctata*, *Cydonia vicina nilotica* Muls*.*, *Cydonia vicina isis.*, *Chrysoprela carnea*, *Syrphus corollae*, and *Aphidoletes aphidimyza* had 1-2 activity periods throughout the study seasons seemed to be coinciding with mealy plum aphid, *H. pruni* seasonal activity period on apricot trees during 2020 and 2021.

2.1. (4). Effects of some climatic factors on the population density of the mealy plum aphid, *H. pruni* on apricot trees:

As the obtained results it could be concluded that the weekly mean numbers of *H. pruni* on apricot plants markedly varied according to temperature change. As regression coefficient reveled for winged by (b= 0.5403 & 0.1708); apterae by (b= 0.0041 & 0.0041), and total counts of mealy plum aphid by (b= 0.0042 & 0.0042), respectively, could be resulted due to a change in the weekly mean maximum, minimum, and average temperature by 1 ºC.

2.1. (4) b. Effect of relative humidity:

The results cleared that the weekly mean numbers of *H. pruni* on apricot plants markedly decrease with the increase of relative humidity percentages as confirmed in both tested seasons. The regression coefficient "b" values were (-0.9266, -0.0103 & -0.0103) and (-0.2213, -0.0120 & -0.0120) for alate, aptera and total numbers of mealy plum aphid in the first and second season, respectively.

5.2.1.(4)c. Effect of Insect Predators:

The biotic factor showed negative and insignificant effect on the population density of winged individuals of mealy plum aphid, *H. pruni* on apricot trees throughout 2020 and 2021; but significant (P = > 0.01) and negative effects on the wingless and total means of the two mealy plum aphid forms during both tested seasons.

2.1. (4) d. Combined effects of meteorological and Predators

The direct and joint effect of the bio-agent predators coordinated with the influence of weekly average of tested climatic factors showed precise effects, as a group on the population densities of *H. pruni* harbored apricot during summer months. These simultaneous effects were more confirmed in both tested seasons. The predator population was significantly correlated with that of its preys**.** The two seasons combined effects estimated as explained variance (E.V. %) for the three ecological factors (weekly mean temperature; and relative humidity) and bio-agent predators on total aphid populations of aphids infesting apricot plants are estimated were (56.0 %, 37.1 % and 95.77 %), respectively.

2.2. Peach trees:

2.2. (1). Distribution of *H. pruni* on peach trees :

The aphid infestation distributed on the North, South, East, and West directions of peach trees were varied significantly during 2020 and 2021, growing seasons. The highest number of *H. pruni* was mostly accumulated at the Northern parts of peach trees. These results may be attributed to the wind direction which below from North to East-West direction and drift aphid population towards the opposite direction in Southern. The seasonal average numbers at the four directions could be arranged in a descending order as follows: 420.6;

412.74; 383.52 and 375.56 individ. /sample during 2020 season at Northern, Western, Eastern and Southern, direction, of trees respectively. 463.40; 426.02; 408.90 and 402.09 individ. /sample during 2021 season at Northern, Western, Southern, and Eastern direction, of trees respectively.

2.2. (2). Population density of *H. pruni* on peach trees:

The mealy plum aphid, had one main seasonal activity period in both tested seasons extended from the 4th week of February to the 1st week of July, 2020. While during 2021 season, this species started attack peach in the 4th week of February and extended infestation up to the 3rd., week of July 2021. Aphids on peach trees progressively activity until reached maximum mean numbers at 2nd week of May, 2020 and also in the 2nd week of May, 2021 being 1700.0 and 1687.5 individuals/sample, in the two tested season, respectively; with optimum weather conditions temperature and relative humidity **(**23.76-26.32 °C and 48.91-45.01 % R.H.)**.**

2.2. (3).Predator species associated with mealy plum aphid, *H. pruni* on peach trees:

Such predaceous species were relatively more abundant during the second season (54.13 ± 4.74 insects /10 leaves) than the first season (42.6 ± 4.18 insects /10 leaves). These predacious insects prevailed in one main activity period; from 2nd week of March to the 4th week of June 2020 and from 2nd week of March to 1st week of July 2021. The maximum total counts of predacious insects were recorded during the 2nd week of May 2020 and 2021 seasons being 199 and 246 insects /70 leaves, respectively.

2.2. (3) a. The ladybird beetles:

The seasonal population fluctuation of the four ladybird beetles *Coccinella undecimpunctata*; *C. septempunctata.; Cydonia vicina nilotica* Muls. and *Cydonia vicina isis* indicated that coccinellid beetles were almost the same convenient active during 2020 and 2021 season. The seasonal mean numbers of 3.69; 1.52; 0.39 and 0.3 insects were recorded during 2020 season; while during 2021 being 3.00; 1.91; 09 ± and 0.78 insects /10 peach leaves, respectively.

2.2. (3)b. The green lacewings

The seasonal mean numbers of the common green lacewing, *Chrysoperla carnea* during both of 2020 and 2021 seasons were; 1.08 and 0.74 insects /10 leaves; occupied one activity period initiated from the 3rd week of March to the 1st week of June, 2020; and from 2nd week of March to 1st week of June, 2021. The maximum weekly mean numbers recorded at the 2nd week of May 2020 and the 3rd week of April 2021 with 10.0 and 3.0 individuals /10 leaves, during the two growing season, respectively.

2.2. (3) c. Dipteran predators:

The obtained results of seasonal abundance of the Dipteran predaceous insects: *Syrphus corollae* and *Aphidoletes aphidimyza* showed that the flies were recorded one activity period recorded on the 3rd week of April to 4th and 3rd week of June, 2020, for the two species; while in 2021 season, the periods extended from 2nd week of April to 1st week of July, and 4th week of June 2021, with maxima at 2nd and 1st week of May 2020 (110 & 70 insects) and 2nd week of May 2021 (108 & 120 insects), for the two dipterous insects, respectively.

2.2.(4). Effects of some ecological factors on the population density of *H. pruni* Geoff. on teach Trees:

The relationship between the abundance of alate form of *H. pruni* on peach trees under field conditions showed insignificant negative correlation with each of temperatures weekly mean of maximum, minimum and its mean during 2020 and negative significant in 2021.

The relationship between aptera mean numbers and the total of the two forms of mealy plum aphid correlated with each of weekly mean temperature, maximum and minimum were positive and significant.

Also, it can be concluded that the weekly mean numbers *of H. pruni* on peach plants markedly varied according to temperature changing. Thus, the increase or decrease in temperature was affected mealy plum aphid population, as reveled for winged by (b=-0.1981 & 0.5238); aptera by (b= 0.0030 & 0.0037), and total counts of mealy plum aphid by (b= 0.0030 & 0.0038), respectively.

2.2.(4)b. Effect of relative humidity:

The obtained data indicates significant negative correlation between R.H. % and each alate, aptera and total forms of *H. pruni* exhibited in both 2020 and 2021 growing. The regression coefficient "b" values were (-0.5627, -0.0104 & -0.0104) and (-0.7027, -0.0144 & -0.0145) for alate, aptera and total numbers of mealy plum aphid in the first and second season, respectively.

2.2. (4).c. Effect of insect predators:

The relationship between Predators mean numbers and winged aphids mean numbers showed negative and significant effect on peach trees throughout 2020, but resulted insignificant effect in 2021; in case of wingless and total forms of aphids, significant (P = > 0.01) and negative effects were noticed during both tested seasons 2020 and 2021

2.2. (4).d. Combined effects of meteorological factors and predators:

Positive or negative significant regression coefficient were obtained for the relationship between the progress in population density of mealy plum aphids in both 2020 and 2021 seasons parallel with status of ecological and biological factors effect on development life stages. Also, it could be stated that the direct and joint effect of the bio-agent predators coordinated with the influence of weekly average temperature both maximum and minimum and mean percentage of relative humidity showed precise effects, as a group on the population densities of *H. pruni* harbored peach trees.

2.3. On plum trees:

2.3. (1). Distribution of *H. Pruni* aphids on plum trees:

In the first season of 2020, the infestation level of aphids was relatively higher within Northern and Western directions of plum trees than on Southern and Eastern directions with slight significant differences between aphid mean numbers. The mean numbers of aphids per sample were 21.53, 20.23, 15.61 and 15.06 individ. /sample during 2020 season, at the four cardinal directions of the plum trees, respectively. The same trend was proven, during the second season of 2021, being 30.77; 28.23; 26.36 and 25.72, aphids /sample on the vegetative parts at the four directions of plum trees, respectively.

2.3. (2).Population density of *H. pruni* on plum trees:

It could be concluded that *H. pruni* found attacked plum trees during mid-summer months exact April every year and had one peak of numbers existing early in April. Also, the results revealed that the aphids was more abundant during 2021 than 2020 season, by seasonal mean numbers of 27.83 and 18.12 insects / 10 leaves, respectively. The

total mean of winged plus wingless individuals had one main seasonal activity in both tested seasons, extended from the 4th week of April to the 1st week of July, 2020. Whereas during 2021 season, start attack plum trees in the 1st week of April extended to the 1st week of July 2021. The aphid maximum mean numbers of 90 and 115.4 insects/ 10 leaves were recorded in the 3rd week of May, 2020-2021 respectively.

2.3. (3). Predator Species Associated with *H. pruni* on plum trees:

The predacious insects inhabited plum trees Associated with aphids were *Coccinella undecimpunctata* L.; *Coccinella septempunctata* L.*; Chrysoperla carnea* Stephens*; Cydonia vicina nilotica* Muls*.; Cydonia vicina isis* Cr.*; Chrysoperla carnea* Stephens; *Syrphus corollae,* and *Aphidoletes aphidimyza.*

2.3. (3) a. The ladybird beetles:

The ladybird beetles, *Coccinella undecimpunctata* L., *C. Septeumpunctata* L., *Cydonia vicina nilotica* Muls. and *Cydonia vicina isis* the obtained results of such predaceous species were relatively more abundant during 2021 season (5.043 insects /10 leaves) than that of 2020 season (3.74 insects /10 leaves). The seasonal mean numbers of the four predator species recorded in 2020 season were 0.57, 0.30, 0.13 and 0.0; while during 2021 season being 1.13, 0.565, 0.34 and 0.304 insects /10 leaves, respectively.

2.3. (3)b. The green lacewing, *Chrysoprela carnea* Steph.:

The get data of *Chrysoprela carnea* Showed that the predator found attack mealy plum aphid throughout 3 weeks only on plum plants during 2021, with seasonal mean numbers were 0.040 and 0.130 insects /10 leaves. This species foundation being accidental throughout three weeks extended from 3rd week of May to 1st week of June 2021,

recorded few numbers not exceeded sufficient as bio-agents on plum trees.

2.3. (3) c. Dipteran predators.

As for two Dipterans insects: *Syrphus corollae* and *Aphidoletes aphidimyza* flies were found to be active attacks aphids for 4-5 weeks aphids on plum trees, extended from the 3rd week of May (maximum 12 & 8 insects /10 leaves) to the third and second week of June, 2020, for the two predaceous insect, respectively. In 2021 season, the two predators were active fairly for 7 and 6 weeks from presented from 2nd week of May to 4th and 3rd weeks of June 2021 reached maximum in 4th week of May 2021 being 10 & 6 insects /10 leaves, recorded at 4th week of May 2021 for the two predacious species in the first and second season, respectively.

2.3. (4) Effects of some ecological factors on the population density of the mealy plum aphid, *H. pruni* on plum trees:

2.3. (4) a. Effect of temperature:

The mean numbers of *H. pruni* alate insects on plum trees under field conditions had significant positive correlation with maximum, minimum, and weekly mean temperatures in both 2020.and 2021as same as for aptera and total of the two forms of mealy plum aphids on plum trees. Also, the weekly mean numbers of *H. pruni* on plum plants markedly varied according to temperature changes; where the regression coefficient between the mealy plum aphid mean numbers and as reveled for winged by (b= 1.1374 & 1.1934), for aptera (b= 0.0679 & 0.0612) and total numbers being (b= 0.0669 & 0.0621) during 2020 and 2021seasons, respectively.

2.3. (4) b. Effect of relative humidity:

Significant negative correlation between R.H. % and alate, aptera and total morphs of *H. pruni* were exhibited in both 2020 and 2021 seasons. Also**,** the regression coefficient "b" values (-3.1867, -0.2197 and -0.2143) and (-3.0335, -0.1941 and -0.1952) were resulted for alate, aptera and total numbers of mealy plum aphid in the first and second season, respectively; that mean the population of aphids was influenced significantly by R.H% changing.

2.3. (4) c. Effect of insect predators:

The effect of predators on aphids population showed negative and significant relation each on the winged and wingless insects of mealy plum aphid, *H. pruni* on plum trees throughout 2020 and 2021; except that on the winged aphids, where it was insignificant and negative during 2021season.

2.3. (4).d. Combined effects of meteorological and predators factors on *H. pruni*:

Positive significant regression coefficient were obtained for the relationship between the progress in population density of mealy plum aphids in both 2020 and 2021 seasons parallel with each of meteorological and predators values changing, The partial regression was 0.474 and 0.218 in the two successive seasons, respectively. Negative significant correlation was noticed between maximum and minimum temperature and the corresponding population density of mealy plum aphid infesting plum trees in both 2020 and 2021 seasons, while, insignificant correlation was found between *H. pruni* infested plum and relative humidity. In 2020 the maximum temperature showed also negative regression but insignificant effects on population density of the same insect pest attacking the same host plants. The joint effect of the three considered ecological factors and predators (biotic and

abiotic) as explained variance (%), value differ greatly for *H. pruni* infested plum trees recorded 67.8 and 67.43 % of changes in the aphid populations during 2020 and 2021 seasons, respectively. These results pointed out that the three selected factors were responsible, as a group, the significance of variance ratio were 4.085 (P = >0.01), in 2020 and 5.490 (P = >0.004), in 2021 season.

3. Biological Studies:

3. 1. The Effects of constant temperature on the biological and life table aspects of mealy plum aphid, *Hyalopterus pruni* Geof, on apricot seedlings:

The obtained results of the constant temperature effects on the biological and life table aspects of mealy plum aphid, *H. pruni* reared on Apricot (Amar variety) Seedlings revealed that duration periods of different *H. pruni* instars were affected by the different tested temperature degrees (20, 25 and 30 °C) under 60 % relative humidity and 16 hours of illumination period. Mealy plum aphid nymphs has 4 ages which were influenced by the temperature variation. The survival rate to maturity was 75% - 67% - 58% at temperatures of 20 - 25 - 30 degrees Celsius, respectively. The life span of adults averages of 24.89 - 18.88 - 10.29 days were detected at 20, 25 and 30 °C, respectively, while the averages of fertility rates of 19.89 - 24.25 - 16.71 offspring/ Female were observed at 20, 25 and 30 °C tempera, respectively. The duration averages of the generation of 20.11 - 14.63 - 10.36 days were computed at 20, 25 and 30 °C, respectively. The net reproduction rate / female was the largest at 25 °C, where it reached 16.25, and the natural rate of increase increases with the increase in temperature, as it

increased from 0.134 at of 20 °C until it reached 0.219 at 30 °C. The absolute rate of increase was 1.14 - 1.21 - 1.25 at a temperature of 20 - 25 - 30 °C, respectively. The time to doubling the generation was 5.17 – 3.63 – 3.17 days at 20-25-30°C. From the above, it can be said that the temperature of 25 °C is considered the optimum temperature for the life and reproduction of the mealy plum insect on apricot trees.

References

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

Abul-Fadl1, H.A.A; M.A.M. El-Khawas and S.M. Salwa Abdel-Samad1 (2005). Natural enemies associated with mealy plum aphid *Hyalopterus Pruni* (Geoff.), (Homoptera: Aphididae) infested apricot trees, at Qalubia Governorate. Arab Univ. J. Agric. Sci., Ain Shams Univ., Cairo, 13(2): 521-535.

Ahmadabadi, N. J.; Karimi, J.; Awal, M. M. and E. Rakhshani, (2011). Morphological and molecular methods in identification of *Aphidius transcaspicus* Telenga (Hym: Braconidae: Aphidiinae) parasitoid of *Hyalopterus spp.* (Hom: Aphididae) with additional data on aphidiinae phylogeny. Journal of the Entomological Research Society; 2011. 13(2):91-103. 32 ref.

Ahmed, S. A.; M. G. A., EL-Deeb and A. H. EL-Heneidy (2007). Survey of abundant aphid species on economic crops and wild plants in North Sinai Governorat, Egypt. Agricultural Research Journal, Suez Canal University. V. 7, No. 3, 129-132.

Ali, G.; Z. Yoldaş and N. Madanlar (2008). Studies on the aphids (Hemiptera: Aphididae) and their natural enemies on peach orchards in İzmir. Türk. Entomol. Derg., 34 (3): 399-408.

Amin, A. H. and Muhammed, S. H. (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: Egyptian J. of Biological Pest Control Vol.18 No.1.249-256.

Annis, B.; Tamaki, G. and Berry, R. E. (1981). Seasonal occurrence of wild secondary hosts of the green peach aphid, *Myzus persicae* (Sulzer), in agricultural systems in the Yakima Valley. Environmental Entomology;. 10(3):307-312.

Aparicio, Y.; R. Gabarra; J. Riudavets; P. Stary; Z. Tomanovic; K. Kocic; J. Pujade Villar; M. Ferrer Suay; V. Cuesta Porta and J. Arno (2019). Hymenoptera complex associated with *Myzus persicae* and *Hyalopterus spp*. in peach orchards in northeastern Spain and prospects for biological control of aphids. J. Insects; 10(4): 109-122.

Asin, L. and X. Pons. (2001). Effect of high temperature on the growth and reproduction of corn aphids (Homoptera: Aphididae) and implications for their population dynamics on the Northeastern Iberian Peninsula. Environ. Entomol. 30:1127–1134.

Askar, S. I. and M. M. El-Hussieni (2015). Biological aspects of the aphid parasitoid *Aphelinus albipodus* (Hayat & Fatima) (Hymenoptera: Aphelinidae) Parasitizing mealy plum aphid *Hyalopterus pruni* (Geoffroy) (Homoptera, Aphidoidea). – Egypt. J. of Biol., Pest Control, 25(3): 619-623.

Askar, S.I.; M.A. El-Aw and Kh. A.A. Draz. (2013). Population density of the mealy plum aphid, *Hyalopterus Pruni* (Geoffroy), (Hemiptera: Aphididae) and its natural enemies on the weed, *Arundo donax*, L. at El-Beheira Governorate J. Agric. & Env. Sci. Dam. Univ, Egypt Vol.12 (2) 93-106.

Babrikova, T. (1981). Some morphological-bioecological characteristics of *Chrysopa abbreviata* Curtis (Chrysopidae, Neuroptera). [Bulgarian]. Gradinarska i Lozarska Nauka;. 18(2):28-34.

Barbagallo1, G. Cocuzza1, P. Cravedi2, and S. Komazaki, (2007). IPM case studies: Deciduous fruit trees. Dipartimento di Scienze e Tecnologie Fitosanitarie, University of Catania, Italy;29:(655-659).

Basky, (1982). Predators and parasites of *Hyalopterus pruni* and *Hyalopterus amygdali* populations living on peach, plum and reed phytopathologica academiae scientiarum Hungaricae, Vol. 17(3- 4), pp. 311- 316.

Ben Halima, K.; M. Mdellel; L. Karboul and S. Zouari (2013). Natural enemies of *Hyalopterus pruni* species complex in Tunisia. Tunisian Journal of Plant Protection, 8: 119-126.

Birch, L.C. (1948). The intrinsic rate of natural increase of an insect population, J. Anim. Ecol., 17: 15-26.

Cammell, M.E. and M.J. Way (1983). Aphid pests in the faba bean (*Vicia faba* L.) a basis for improvement Butterworths. Edt. P.D. Hebblethwaite, NDA, Dip. Agric. London ISBNO-408-10695-6.

Campbell, A; B. D. Frazer; N. Gilbert; A. P. Gutierrez and M. Mackauer, (1974). Temperature requirements of some aphids and their parasites. Journal of Applied Ecology, 11, 431–438. 10.2307/2402197.

Daniel, R. L. and N.J. Mills (2010). Quantifying aphid predation: the mealy plum aphid *Hyalopterus pruni* in California as a case study. J. of App. Eco., 47, 200–208.

Davidson W. M. (1919). Life history and habits of the mealy plum aphis. U. S. Dept. Agr. Bul. 774:1-16.

Dicker, G. H. L (1979). Plum aphids. Leaflet, Ministry of Agriculture, Fisheries and Food; (641):6 pp.

El-Basha, N.A.; A.A. Sarhan; N.S. Mandour and D.S. Abd El-Motaal. (2013). Population fluctuations of aphid and their insect predators on four different crops at Ismailia Government. J. of Applied Plant Protection. Suez Canal University,Vol. (1): 7-16.

El-Heneidy, A.H; S.A. Ahmed and M.G.A. El-Deeb (2008). Monitoring aphids' population and their associated parasitoid and predatory species on peach trees in North Sinai, Egypt. Egypt. J. Agric. Res, 86(1).

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. Met-wally (2003). Effects of different field treatments against sap sucking pests infesting sunflower, sesame and soybean. Bull. ent. Soc. Egypt, Econ. Ser., 29: 83-101.

Fisher, R.A. (1950). Statistical Tables for biological agriculture and medical research. Oliver and Boyd, Engin. Burgh. London.

Fontanari, M.; M. Sacco and V. Girolami (1993). Influence of ants on aphids and their predators in orchards. [Italian]. Informatore Fitopatologico. 43(4): 47-55.

Habib, A. and E.A. El-Kady (1961). The Aphididae of Egypt. Bull. Soc. Ent. Egypte, 45: 1- 137.

Hafez, A.A. (1994). Increasing the role of biological agents against cereal aphids infesting wheat in Qalubia Governorate. Egypt. J. Biol. Pest Control, 4(2): 57-71.

Hille Ris Lambers, G. (1950). On mounting Aphids and other softskinned insects. Ent. Ber 13:55–58.

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.

Ibrahim A. M. A. and I. A. Amal (1993) Population dynamics of the mealy plum aphid *Hyalopterus pruni* (Geoff.) and its associated parasitoids on peach. Egypt J. Biol. Pest Control 3(2):207–212.

Ismail, I. I.; S. El-Nagar and A.A. Attia (1991). The aphid fauna of fruit trees in Egypt. African Journal of Agricultural Sciences, Vol. 13 (1-2), pp.1-7 .

Jrad D. Drid (1997). Sur la dynamique des populations de *Hyalopterus pruni* Geoffroy (Horn., Aphididae) dans la region de Tunis. J. Appl. Ent. 121, 373-382.

Lactin, D.J., N.J. Holliday; D.L. Johnson and R. Craigen (1995). Improved rate model of temperature-dependent development by arthropods. Environ. Entomol. 24: 6–75.

Latham, D.R. and N.J. Mills (2011). Effects of temperature on the life history parameters and population growth rates of *Hyalopterus Pruni* (Hemiptera: Aphididae). J. of Econ. Entom., 104(6): 1864-1869.

Leslie M. Smith (1936). Biology of the mealy plum aphid, *Hyalopterus pruni* Geoff. A Journal of Agricultural Science Published by the California Agricultural Experiment Station VOL. 10 No.7. 170-171.

Łucă, O.; I.Mitrea and C. Stan (2005). The biological cycle of plum mealy aphid (*Hyalopterus Pruni* Geoffr.) on the Climatic Conditions From S.D. Banu Mărăcine, Cn, 63/2007-Bulletin Usamv Craiova.

Mac Gillivary, M.E. and G.E. Anderson (1957). Three useful insect cages. The candian entomologist, 89: 43-46.

Manachini, B. and L. Cinanni, (2004). First indications on the development of *Myzus persicae* (Sulzer) (Rhynchota Aphididae) on different herbaceous species. Bollettino di Zoologia Agraria e di Bachicoltura; 36(2):241-250

Megahed, H.E.A. (2000). Studies on aphids. Ph. D. Thesis. Fac. Agric., Zagazig Univ., Sharquia Egypt. 229 pp.346-357.

Megahed, M.M.; S. Elnagar and A.H. Amin (1979). Seasonal abundance of certain aphid species on wild plants in Giza, Egypt. Bull. Soc. ent. Egypt.

Mohamad, M. A. and N.M. Al-Mallah (1990). Preliminary field observations on the ecology and biology of the apricot leaf aphid, *Hyalopterus Pruni* G. (Homoptera: Aphididae) in Mosul Region - Iraq. [Arabic]. Arab Journal of Plant Protection;. 8(1): 1-5.

Mohamed El Fodhil, A. 1.; B. D. Mitiche; D. Petit and Z. Djazouli (2015). Temporal variations in the life-cycles of aphids (Sternorrhyncha: Aphididae) and their coccinellid predators. Eur. J. Entomol. 112. (@): 000–000, 2015 doi: 10.14411/eje.2015.000 ISSN 1210-5759 (print), 1802-8829 (online)

Mook Jaap, H. W. (1999). Distribution of the aphid *Hyalopterus pruni* (Geoffr.) within and between habitats of common reed *Phragmites australis* (Cav.) Trin. ex Steudel as a result of migration and population growth. Limnologica, Volume 29, Issue 1, Pages 64-70.

Niccoli, A. and F. Fagnani (1994). Observations of the progress of *Myzus varians* (Davidson) infestation in peach -orchards in Tuscany. [Italian]. Redia;. 77(1): 175-187.

Ozgokc, M.S.; F.I. and R.Atlihan (2005). Biological features and life table parameters of the mealy plum aphid *Hyalopterus pruni* on different apricot Cultivars. Entomology Phytoparasitica, 33(1): 1-7.

Ozturk, N.; C. Uysal, and M. Ulusoy (2007). Population change of plum mealy aphid (*Hyalopterus pruni* (Geoffroy) (Homoptera: Aphididae) in Mut (Mersin) apricot orchards Plant Protection Bulletin 47(1-4): 1-12.

Pasqualini, E. and M. Scannavini, (2015) Spirotetramat to control *Myzus persicae* (Sulzer) on peach in Emilia-Romagna (Italy). Acta Horticulturae; (1084):375-382.

Przemysław, S. (2004). First infestation level and population growth dynamics of aphids inhabiting plum trees. Aphids and other Hemipterous Insęcts, vol.10: 111-117.

Remaudiere, G. and F. Leclant, (1971). The complex of natural enemies of peach aphids in the Middle Rhone Valley. Entomophaga; 16(3):255-267.

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.

Semyanov, V.P. (1996). Lady beetles (Coleoptera, Coccinell-idae) of Leningrad region orchards (fauna, biology and their role in pest population dynamics). Bulletin OILB/SROP; 19(4): 208-211.

Serdar, S. and R. Yokomi (2002). Effect of temperature and host on development of *Brachycaudus schwartzi* (Homoptera: Aphididae). Ann. Entomol. Soc. Am. 95(5): 597-602.

Shehta, A.M.A. (2020). Aphidophagous Insects of the mealy plum aphid, *Hyalopterus Pruni* (Geoffr.) in apricot at Sharkia Governorate, Egypt. Zagazig J. Agric. Res., Vol. 47 (3): 719-733.

Smith, L.M. (1937). Growth, reprodction, feeding and wing development of the mealy plum aphid, *H. pruni* on peach and apricot in relation to climatic factors. J.Agri. Res. Vol. 54, No. 5, pp. 345-364.

Strażyński, P. (2004). First infestation level and population growth dynamics of aphids inhabiting plum trees chance for

monitoring Aphids and Other Hemipterous Insects, vol.10: 111-117.

Tamaki, G. (1975). Weeds in orchards as important alternate sources of green peach aphids in late spring. Environmental. Ent.; 4(6):958-960.

Tonnang, E.Z.H.; H. Juarez,; P. Carhuapoma; J.C. Gonzales; D. Mendoza; M. Sporleder; R. Simon and J. Kroschel, (2013). Insect life cycle modeling. A software package for developing temperature-based insect phenology models with applications for local, regional and global analysis of insect populations and mapping. International Potato Center (CIP), Lima, 193 pp

Vucetic, A.; P.O. Obradovic and D. Vukasinovic (2010). Aphids (Aphididae: Hemiptera) of stone fruit trees. *Biljni Lekar* (Plant Doctor); 38(4/5): 347-354.

Xin-geng W. and H. Russell (2006). Potential host range of the newly introduced aphid parasitoid *Aphidius transcaspicus* (Hymenoptera: Braconidae) in Hawaii. Hawaiian Entomol. Soc., 38:81–86.

Youssif, M.A.; S.A. El-Arnaouty; M. El-Maghraby; M. El-Zohairy and K.A. Hammad (2014). Scientific note: First record of the predatory species *Wesmaelius navasi* (Andreu, 1911) (Neuroptera: Hemerobiidae) in Egypt. Egyptian J. of Biological Pest Control; 24(2): 531-532.

Zaklad, O. and R. Skierniewice (1970). The biology of the mealy plum aphid, *Hyalopterus Pruni* (Geoff.) (Homoptera, Aphidodea). Polskie Pismo Entomologiczne, Vol. 40 (2) PP., 287-328.

الملخص العربي

تعتبر أشجار الفاكهة ذات النواة الحجرية (الخوخ والمشمش والبرقوق) من أهم محاصيل الفاكهة وأكثرها شعبية في مصر. حيث تزرع على نطاق واسع في محافظات الدلتا وخاصة محافظة القليوبية. تتميز هذه الفاكهة بقيمة غذائية عالية لاحتوائها على السكريات والبروتينات والفيتامينات. ونتيجة للتغيرات المناخية التي أدت مؤخرًا إلى ظهور العديد من الآفات الرئيسية الجديدة على أشجار الفاكهة ذات النواة الحجرية والتي أثرت سلبًا على محصول هذه الأشجار. وتعتبر حشرات المنْ من أهم هذه الآفات ضرراً التي تصيب مجموعة الأشجار المثمرة.

أجريت هذه التجارب في بساتين الفاكهة ذات النواة الحجرية بمركز طوخ بمحافظة القليوبية وفي معمل بحوث الحشرات الثاقبة الماصة في معهد بحوث وقاية النباتات مركز البحوث الزراعية خلال موسمي ٢٠٢٠ و ٢٠٢١ المتتاليين وقد أجريت الدراسات التالية:

اولا: دراسات الحصر:

١-حصر أنواع حشرات المنْ التي تصيب أشجار الفاكهة ذات النواة الحجرية والعوائل البديلة لها:

تم الحصر علي ثلاث أنواع من الأشجار المثمرة ذات النواة الحجرية وهي: المشمش (*Prunus armeniaca*) والخوخ (*Prunus persica*) ، والبرقوق (*Prunus americana*) ، ووجد انها تؤوي نوعين من حشرات المنْ ، خلال فترات الفحص لعامي ٢٠٢٠ و ٢٠٢١. وكان النوعان اللذان تم حصرهما هما ، منْ البرقوق الدقيقي وهو النوع السائد ، (*Hyalopterus pruni* Geoffroy) وبعض الأعداد المتناثرة من حشرات منْ الخوخ الأخضر (*Myzus persicae* Sulzer)، في حين أن النبات البري (الهيش) (*Phragmites australis*) الذي كان موجودًا بين بساتين الأشجار وحولها ، تم حصر نوع واحد فقط وهو حشرات منْ البرقوق الدقيقي *Hyalopterus pruni*.

تم العثور على حشرة منْ البرقوق الدقيقي *H. pruni* على كل من أشجار الفاكهة الحجرية الثلاثة المختبرة خلال الفترات الممتدة من الأسبوع الثاني من مارس إلى الأسبوع

الثاني من يوليو في منطقة الدراسة خلال موسمي ٢٠٢٠ و ٢٠٢١ مع أعلى متوسط موسمي للتعداد ١٩٧٠.٣٢ و ٢٥٦٨.٣٢ فرد/ ١٠ أوراق تم تسجيلها على أشجار المشمش خلال موسمي ٢٠٢٠ و ٢٠٢١ على التوالي. وكان أدنى متوسط موسمي للتعداد هو ١٠٤.١٨ و ١٦٠.١٣ فردًا / ١٠ أوراق على أشجار البرقوق خلال موسمي ٢٠٢٠ و ٢٠٢١ على التوالي ، لذلك تعتبر أشجار المشمش هي الأكثر ملاءمة للإصابة بحشرات منْ البرقوق الدقيقي *H. pruni* مقارنة بالعوائل الأخرى المختبرة.

تراوح إجمالي تعداد حشرة منْ الخوخ الأخضر *M. persicae* على العوائل الثلاثة المختبرة ما بين ١-١١ فردًا / ١٠ أوراق على أشجار المشمش والبرقوق خلال موسم ٢٠٢٠ ، بينما تراوحت خلال موسم ٢٠٢١ من ٤ إلى ١٧ فرد/ ١٠ أوراق على اشجار البرقوق والمشمش. وكانت حشرات منْ البرقوق الدقيقي هي النوع السائد التي تهاجم أشجار الفاكهة ذات النواة الحجرية تحت مناطق الدراسة خلال فترات الدراسة.

٢- حصر أنواع المفترسات الحشرية المصاحبة لأنواع المنْ على أشجار الفاكهة ذات النواة الحجرية:

كشفت نتائج الحصر عن وجود سبع أنواع من الحشرات المفترسة مرتبطة بأنواع حشرات المنْ علي أشجار الفاكهة المختبرة وهي ابو العيد إحدى عشر نقطة *Coccinella undecimpunctata* L ؛ابو العيد سبع نقط *Coccinella septempunctata* L ؛ابو العيد السمنى *Cydonia vicina nilotica* Muls ابو العيد الأسود *Cydonia vicina isis* ؛اسد المنْ *Chrysoperla carnea* ؛ ذبابة السيرفس *Syrphus corollae* ، و ذبابة الأفيدوليتس *Aphidoletes aphidimyza*.

ثانيا: الكثافة العددية وتوزيع الإصابة لحشرات منْ البرقوق الدقيقي ، *Hyalopterus pruni* Geoff و المفترسات الحشرية المرتبطة بها علي أشجار المشمش والخوخ والبرقوق:

أوضحت النتائج ان أعداد حشرة منْ البرقوق الدقيقي تقلبت بشكل كبير خلال موسمي الدراسة ٢٠٢٠ و ٢٠٢١ ووصلت للحد الأقصى خلال شهر مايو بتعداد ٦٣٥٨.٤ و

٥٨٥٢.٥ و ٢٨٥.٥ حشرة / ١٠ أوراق و ٧٠٧٥.٠ و ٥٦١٢.٥ و ٣٧٩.٥ حشرة / ١٠ أوراق من اشجار المشمش والخوخ والبرقوق، على التوالي. أيضًا ، تم دراسة توزيع الاصابة علي الاجزاء النباتية في الاتجاهات الأصلية لأشجار كل من العوائل الثلاثة خلال موسمي الدراسة ويمكن تلخيص النتائج على النحو التالي:

أ- **<u>على أشجار المشمش:</u>**

(١) توزيع الاصابة:

توضح النتائج أن مستوى الإصابة بحشرات المنْ *H. pruni* ، في الموسم الأول ٢٠٢٠ كان أعلى نسبيًا علي الاجزاء النباتية في الاتجاه الغربي والشمالي ٤٤٣,٥٨و٤٤٢,١٢ فرد/عينة عنه في الإتجاه الشرقي والجنوبي ٤١٥,٩و٤١٠,٨٢ فرد.

بينما كانت متوسطات التعداد في الموسم الثاني ٥٦٣.٤ و ٥٧٩.٣١ و ٥٤٥.١٦ و ٥٤٥.٢ فرد في الإتجاهات الأساسية الأربعة الغربية والشمالية والشرقية والجنوبية على التوالي.

أظهرت نتائج التحليل الإحصائي وجود فروق معنوية بين متوسط أعداد المن في الإتجاهات المختلفة للأشجار. ويمكن ترتيب المتوسطات للإتجاهات الشمالية والغربية والشرقية والجنوبية خلال الموسمين المتعاقبين لعامي ٢٠٢٠ و ٢٠٢١ بترتيب تنازلي على النحو التالي: ٥١٠.٧٢ ،٥٠٣,٤٣ ، ٤٨٠.٥٣ ، ٤٧٨,٥ فرد من الاتجاهات الاربعة على التوالي.

وبناءً على ذلك ، يمكن الإشارة إلى أن الإتجاهين الشمالي والغربي هو الأكثر تفضيلاً عند هبوط المنْ علي الأشجار عند بداية الإصابة مقارنة بالإتجاهين الشرقي والجنوبي.

(٢) الكثافة العددية لحشرات *H. pruni* على أشجار المشمش:

فيما يتعلق بالمتوسط الموسمي لحشرات المنْ *H. pruni* ، كان التعداد أكثر وفرة خلال عام ٢٠٢١ مما كان عليه في موسم ٢٠٢٠ ، حيث بلغ المتوسط الموسمي ٥٥٣.٣ و ٤٢٨.٣٣ فردًا للموسمين على التوالي.

كان لحشرات منْ البرقوق الدقيقي فترة نشاط موسمية رئيسية في كلا الموسمين ،امتدتا من الأسبوع الثاني من مارس إلى الأسبوع الثاني من يوليو حيث تنشط حشرات المن على أشجار المشمش بشكل تدريجي حتى وصلت إلى الحد الأقصى لمتوسط التعداد ١٧٧٩.٢ فردًا. في الأسبوع الثالث من مايو ٢٠٢٠ وفي الأسبوع الثاني من مايو ٢٠٢١ وصلت الي ١٩٥٨.٣ فرد.

(٣) الكثافة العددية للمفترسات المصاحبة لحشرة منْ البرقوق الدقيقي علي أشجار المشمش :

سجلت أنواع المفترسات التي تم حصرها وفرة موسمية خلال الموسم الثاني (٦٦.٢٢ حشرة / ١٠ أوراق) مقارنة بالموسم الأول (٤٧.٢٦ حشرة / ١٠ أوراق). ونشطت هذه الحشرات المفترسة في فترة نشاط رئيسية واحدة ؛ امتدت من الأسبوع الرابع من مارس إلى الأسبوع الأول من يوليو خلال ٢٠٢٠ و ٢٠٢١. وتم تسجيل اقصي تعداد من اجمالي المفترسات في الأسبوع الثالث من مايو ٢٠٢٠ ، وفي الأسبوع الثاني من مايو ٢٠٢١ حيث كانت ٢٥٧.٠ و ٢٤٦.٠ حشرة ، على التوالي.

- خنافس أبو العيد المفترسة.

تشيرالنتائج خلال عام ٢٠٢٠ ان نشاط الاربع مفترسات من ابو العيد كان أعلى مقارنة بموسم ٢٠٢١. حيث سجل المتوسط العام للأعداد الموسمية ٤.٦٥ و ١.٥٢ و ١.٠ و ٠.٥٧ لأنواع المفترسات الأربعة في موسم ٢٠٢٠ ؛ بينما خلال عام ٢٠٢١ كانت ٢.٨٧ و ١.٣٥ و ٠.٥٢ و ٠.٣٥ حشرة / ١٠ على التوالي.

- المفترس اسد المن .***Chrysoprela carnea*** **Steph** :

كان لهذا المفترس نشاط محدود لمدة ١٠ اسابيع علي أشجار المشمش للموسمين ٢٠٢٠-٢٠٢١بمتوسط الأعداد الموسمية ١.٠٤ و ٠.٧٨ حشرة / ١٠ أوراق على التوالي. ، بدأت من الأسبوع الرابع من مارس إلى الأسبوع الثاني من يونيو ٢٠٢٠ ؛ ومن الأسبوع الرابع من مارس إلى الأسبوع الثالث من مايو ٢٠٢١. وصل متوسط الأعداد الأسبوعية إلى الحد الأقصى في الأسبوع الثالث من مايو ٢٠٢٠ والأسبوع الأول من مايو ٢٠٢١ ، وهو ٥.٠ و ٤.٠ أفراد / ١٠ أوراق على التوالي .

- **الحشرات ثنائية الاجنحة المفترسة** ذبابة السرفيس والافيدوليتس :

كانت فترة النشاط لهذه المفترسات من الاسبوع الرابع من أبريل (١٠ و ٤ حشرات) إلى الأسبوع الرابع والثالث من يونيو ٢٠٢٠ (١٠ و ١٠ حشرات / ١٠ أوراق) ، على التوالى. وفي موسم ٢٠٢١ ، كانت هذه الحشرات نشطة من الأسبوع الثاني من أبريل (١٤ و ٢٠ حشرة) إلى الأسبوع الأول من يوليو (١٥ و ١٨ حشرة / ١٠ أوراق) للمفترسين على التوالي. تم تسجيل متوسط الأعداد الموسمية ٢١.٥٦ و ١٦.٩١ و ٢٦.٩٥ و ٣٣.٣٩) فرد / ١٠ أوراق للنوعين المفترسين في الموسم الأول والثاني على التوالي. وبلغ متوسط الأعداد الأسبوعية لهذه الأنواع المفترسة ذروتها خلال الأسبوع الثالث من شهر مايو (١١٥ و ١٠٥ حشرة) والأسبوع الثاني من مايو (١٠٢ و ١٢٢ حشرة) للمفترسين في موسم النمو ٢٠٢٠ و ٢٠٢١ على التوالي.

(٤). تأثيرات بعض العوامل المناخية على الكثافة العددية لمنْ البرقوق الدقيقي *H. pruni* على أشجار المشمش:

- **تأثير درجة الحرارة :**

اوضحت نتائج التحليل الاحصائي لمعامل الارتباط ان درجات الحرارة الصغري والعظمي والمتوسط بينهم قد أعطت ارتباطى موجبآ معنويآ مع الأفراد الغير مجنحة والمجموع (المجنح والغير مجنح) موسمي ٢٠٢٠ و ٢٠٢١وارتباط موجب غير معنوي مع الأفراد المجنحة في موسم ٢٠٢١ .

كما اوضحت نتائج معامل الانحدار أن متوسط الأعداد الأسبوعية لحشرات منْ البرقوق الدقيقي على نباتات المشمش تختلف بشكل ملحوظ وفقًا للتغير في درجة الحرارة حيث كان معامل الانحدار في حالة الافراد المجنحة أعلي (٠.٤٩٢١ & ٠.١٨٧٧) مما كان في حالة الغير مجنحة (٠.٠٠٣٢ & ٠.٠٠٣٤) ، وإجمالي أعداد الشكلين (٠.٠٠٣٢ & ٠.٠٠٣٤) موسمي ٢٠٢٠ و٢٠٢١على التوالي.

- **تأثير الرطوبة النسبية:**

اوضحت نتائج التحليل الأحصائي ان هناك علاقة ارتباط غير معنوية سالبة بين الرطوبة النسبية والمتوسطات الاسبوعية لأعداد المنْ في موسمي ٢٠٢٠ و ٢٠٢١ مع الأفراد المجنحة وعلاقة معنوية سالبة مع الغير مجنحة والمجموع للنمطين بينما كان معامل الانحدار (-٠,٩٢٦٦،-٠,٠١٠٣،-٠,٠١٠٣) علي التوالي موسم٢٠٢٠ وكان في ٢٠٢١ (-٠,٢٢١٣،-٠,٠١٢٠،-٠,٠١٢٠) علي التوالي.

من هذه النتائج يمكن أن نستنتج أن متوسط الأعداد الأسبوعية من *H. pruni* على نبات المشمش ينخفض بشكل ملحوظ مع زيادة نسب الرطوبة النسبية كما هو مؤكد في كلا الموسمين.

- تأثير الحشرات المفترسة:

من خلال التحليل الاحصائي تبين ان العلاقة بين المفترسات السبعة كعامل حيوي مؤثر علي اعداد منْ البرقوق الدقيقي ذات ارتباط سالب وغير معنوي مع الأفراد المجنحة ولكنه سالب ايضا ولكن معنوي مع الأفراد غير المجنحة والمجموع الكلي للشكلين خلال موسمي الدراسة.

واوضحت نتائج معامل الانحدار تاثير العوامل المختبرة علي الانماط المختلفة لحشرات المن (-٣,٠٠٥٤،-٠,١٢٦٢،-٠,١٢٦٣) علي التوالي موسم ٢٠٢٠. وفي ٢٠٢١ كانت (-١,٢١٥٣،-٠,١١٨٤،-٠,١١٨٣) علي التوالي.

- التأثير المشترك للعوامل الجوية والمفترسات معآ:

كان تعداد المفترسات الحشرية مرتبطًا ارتباطًا وثيقًا بفرائسها. تم تقدير التأثيرات المشتركة خلال للموسمين (E.V.٪) للعوامل البيئية الثلاثة والحشرات المفترسة على إجمالي اعداد المنْ التي تغزو نبات المشمش وقدرت (٥٦.٠٪ ، ٣٧.١٪) و ٩٥.٧٧٪) على التوالي.

<u>ب- علي أشجار الخوخ:</u>

(١). توزيع الاصابة:

تفاوت انتشار حشرات المنْ الموزعة على الاتجاهات الشمالية والجنوبية والشرقية والغربية لأشجار الخوخ بشكل كبير خلال مواسم النمو ٢٠٢٠ و ٢٠٢١. وتم تسجيل اعلى متوسط لتعداد من *H. pruni* على الأجزاء في الجهة الشمالية من أشجار الخوخ.

النتائج التي تم الحصول عليها ، توضح أن مستوى إصابة حشرات المنْ في الجهات الاربعة خلال الموسم الأول ٢٠٢٠ كان ٤١٢,٧٤،٣٨٣,٥٢،٣٧٥,٥٦،٤٢٠,٦فرد علي التوالي.

بينما كانت خلال الموسم الثاني ٢٠٢١ أعلي نسبيآ وكان ٤٦٣,٤، ٤٢٦,٠٢،٤٠٢,٠٩،٤٠٨,٩ فرد في الاتجاهات الأساسية الأربعة على التوالي. وكانت الفروق بين المتوسطات لأعداد المنْ معنويا . وبناءً على ذلك ، يمكن الإشارة إلى أن الاتجاهين الشمالي والغربي هو الأكثر تفضيلاً عند هبوط المنْ مقارنة بالاتجاهين الشرقي والجنوبي.

(٢) الكثافة العددية لحشرات *H. pruni* على أشجار الخوخ:

اوضحت النتائج ان المتوسط الموسمي لحشرات *H. pruni* أعلى خلال عام ٢٠٢١ مما كان عليه في موسم ٢٠٢٠ ، حيث بلغ المتوسط الموسمي ٤٢٥.٢٥ و ٣٩٨.١١ فردًا على التوالي.

كان لحشرة منْ البرقوق الدقيقي فترة نشاط موسمي رئيسية في كلا الموسمين المختبرين امتدت من الأسبوع الرابع من فبراير إلى الأسبوع الأول من يوليو ٢٠٢٠. بينما خلال موسم ٢٠٢١ ، بدأ هذا النوع في إصابة أشجار الخوخ في الأسبوع الرابع من فبراير وامتد انتشاره حتى الأسبوع الثالث من شهر يوليو من عام ٢٠٢١. زادت أعداد حشرات المنْ على أشجار الخوخ تدريجيًا حتى وصلت إلى الحد الأقصى في الأسبوع الثاني من مايو ٢٠٢٠ وأيضًا في الأسبوع الثاني من مايو ، ٢٠٢١ بمتوسطات ١٧٠٠.٠ و ١٦٨٧.٥ فردًا في الموسمين، على التوالي .

(٣) الكثافة العددية للمفترسات الحشرية المصاحبة لحشرة منْ البرقوق الدقيقي علي أشجار الخوخ:

سجلت المفترسات المرتبطة بمنْ البرقوق الدقيقي ، *H. pruni* على أشجار الخوخ اعلى وفرة نسبيًا خلال الموسم الثاني (٥٤.١٣ حشرة / ١٠ أوراق) مقارنة بالموسم الأول (٤٢.٦ حشرة / ١٠ أوراق). تواجدت هذه الحشرات المفترسة في فترة نشاط رئيسية واحدة من الأسبوع الثاني من مارس إلى الأسبوع الرابع من يونيو ٢٠٢٠ ومن الأسبوع الثاني من مارس إلى الأسبوع الأول من يوليو ٢٠٢١. ووصلت الي الحد الأقصى لإجمالي أعداد الحشرات المفترسة خلال الأسبوع الثاني من مايو ٢٠٢٠ وموسم

٢٠٢١ وهو ١٩٩ و ٢٤٦ حشرة على التوالي.

- **مفترسات أبو العيد . :**

تشيرالنتائج إلى انه خلال عام ٢٠٢٠ كان نشاط الاربع مفترسات من ابو العيد مناسب مقارنة بموسم ٢٠٢١. كان المتوسط العام للأعداد الموسمية ٣.٦٩ و ١.٥٢ و ٠.٣٩ و ٠.٣ لأنواع المفترسات الأربعة في موسم ٢٠٢٠ ؛ بينما خلال عام ٢٠٢١ كانت ٣.٠ و ١.٩١ و ٠.٩٧ و ٠.٧٨ حشرة / ١٠ أوراق خوخ على التوالي.

- **مفترس أسد المن .*Chrysoprela carnea* Steph :**

كان لهذا المفترس نشاط محدود لمدة ١٠ اسابيع علي أشجار الخوخ للموسمين ٢٠٢٠-٢٠٢١بمتوسط تعداد موسمي ١.٠٤ و ٠.٧٨ حشرة / ١٠ أوراق على التوالي. ، احتلت فترة نشاط واحدة بدأت من الأسبوع الثالث من مارس إلى الأسبوع الأول من يونيو ٢٠٢٠ ؛ ومن الأسبوع الثاني من مارس إلى الأسبوع الأول من يونيو ٢٠٢١. تم تسجيل متوسط الأرقام الأسبوعية القصوى في الأسبوع الثاني من مايو ٢٠٢٠ والأسبوع الثالث من أبريل ٢٠٢١ مع ١٠.٠ و ٣.٠ أفراد / ١٠ أوراق على التوالي .

-**الحشرات ثنائية الاجنحة المفترسة** ذبابة السرفيس والافيدوليتس:

سجلت هذه المفترسات فترة نشاط واحدة مسجلة من الاسبوع الرابع من أبريل (٢٥ و ٦ حشرات) إلى الأسبوع الرابع والثالث من يونيو ٢٠٢٠ (٨ و ١٥ حشرات / ١٠ أوراق) ، على التوالى. وفي موسم ٢٠٢١ ، كانت هذه الحشرات نشطة من الأسبوع الثاني من أبريل (٦ و

١٠ حشرة) إلى الأسبوع الأول من يوليووالرابع من يونيو (٧ و ١٠ حشرة / ١٠ أوراق) للمفترسين على التوالي. تم تسجيل متوسط الأعداد الموسمية ٢٢.٥ و ١٣.٠ و ٢١.٥٦ و ٢٥.١٧) فرد / ١٠ أوراق للنوعين المفترسين في الموسم الأول والثاني على التوالي. وبلغ متوسط الأعداد الأسبوعية لهذه الأنواع المفترسة ذروتها خلال الأسبوع الثالث من شهر مايو والثاني (١١٠ و ٧٠ حشرة) والأسبوع الثاني من مايو (١٠٨ و ١٢٠ حشرة) للمفترسين في موسم النمو ٢٠٢٠ و ٢٠٢١ على التوالي.

(٤). تأثيرات بعض العوامل المناخية والحيوية على الكثافة العددية لمنْ البرقوق الدقيقي ، *H. pruni* على أشجار الخوخ:

- تأثير درجة الحرارة :

ارتبط تعداد حشرات المنْ مع متوسط درجات الحرارة والحرارة الصغري والعظمي ارتباطآ موجبآ معنويآ مع الأفراد الغير مجنحة والمجموع (المجنح والغير مجنح) وارتباط سالب غير معنوي مع الأفراد المجنحة في موسم٢٠٢٠ .ولكن في موسم ٢٠٢١ كانت العلاقة معنوية موجبة بين درجات الحرارة مع الأفراد المجنحة والأفراد الغير مجنحة والمجموع.

واوضحت نتائج معامل الانحدار أن متوسط الأعداد الأسبوعية من *H. pruni* على أشجار المشمش تختلف بشكل ملحوظ وفقًا لتغير درجة الحرارة. وهكذا ، فإن الزيادة أو النقصان في درجة الحرارة قد أثرت على أفراد منْ البرقوق الدقيقي *H. pruni* المجنحة (-٠,١٩٨١& ٠.٥٢٣٨) ؛ والغير مجنح (٠.٠٠٣٠ & ٠.٠٠٣٧) ، وإجمالي عددهما (٠.٠٠٣٠ & ٠.٠٠٣٨) على التوالي ، نتيجة لتغير المتوسط الأسبوعي لدرجات الحرارة العظمى والصغرى والمتوسط بمقدار ١ درجة مئوية.

- تأثير الرطوبة النسبية:

اوضحت نتائج التحليل الأحصائي ان هناك علاقة غيرمعنوية سالبة بين الرطوبة النسبية والمتوسطات الاسبوعية لأعداد المنْ في موسمي ٢٠٢٠ و ٢٠٢١ مع الأفراد المجنحة وعلاقة معنوية سالبة مع الغير مجنحة والمجموع .

- تأثير الحشرات المفترسة:

من خلال التحليل الاحصائي تبين ان العلاقة بين المفترسات السبعة كعامل حيوي مؤثر علي أعداد منْ البرقوق الدقيقي أظهرت تأثيرًا سلبيًا ومعنويًا على أشجار الخوخ طوال عام ٢٠٢٠ ، لكنها لم تسفر عن تأثير معنوي في عام ٢٠٢١ ؛ لوحظت تأثيرات معنوية وسلبية خلال موسمي الدراسة٢٠٢٠ و ٢٠٢١ في حالة مجموع النمطين والافراد الغير مجنحة من حشرات المنْ.

- التأثير المشترك للعوامل الجوية والمفترسات معآ:

تم الحصول على معامل انحدار معنوي موجبآ أو سالبآ للعلاقة بين الزيادة في الكثافة العددية لمن البرقوق الدقيقي في موسمي ٢٠٢٠ و ٢٠٢١ بالتوازي مع حالة تأثير العوامل البيئية والبيولوجية على تطور هذا التعداد. كما يمكن الإشارة إلى أن التأثير المباشر والمشترك للمفترسات مع تأثير متوسط درجة الحرارة الأسبوعية والرطوبة النسبية كان معنويا

ج-علي أشجار البرقوق:

توزيع الاصابة:

في الموسم الأول عام ٢٠٢٠ ، كان مستوى الإصابة بحشرات المنْ أعلى نسبيًا في الاتجاهين الشمالي والغربي لأشجار البرقوق منه في الاتجاهين الشرقي و الجنوبي مع وجود فروق معنوية طفيفة بين متوسط أعداد المنْ. وكان متوسط عدد حشرات المن ٢١.٥٣ و ٢٠.٢٣ و ١٥.٦١ و ١٥.٠٦ فرد خلال موسم ٢٠٢٠ ، في الاتجاهات الأساسية الأربعة لأشجار البرقوق ، على التوالي. بينما خلال الموسم الثاني من عام ٢٠٢١ ، كان متوسط عدد الحشرات وهو ٣٠.٧٧ ؛ ٢٨.٢٣ ؛ ٢٦.٣٦ و ٢٥.٧٢ فرد على الأجزاء الخضرية في الاتجاهات الأربعة لأشجار البرقوق ، على التوالي.

(٢). الكثافة العددية لحشرات *H. pruni* على أشجار البرقوق:

أوضحت النتائج أن حشرات المنْ كانت أكثر وفرة خلال موسم ٢٠٢١ عن موسم ٢٠٢٠ ، بمتوسط موسمي للأعداد ٢٧.٨٣ و ١٨.١٢ حشرة / ١٠ أوراق على التوالي كان لحشرات منْ البرقوق الدقيقي فترة نشاط موسمي رئيسية في كلا الموسمين المختبرين ، امتدت

من الأسبوع الرابع من ابريل إلى الأسبوع من يوليوحيث تنشط حشرات المن على أشجار البرقوق بشكل تدريجي حتى وصلت إلى الحد الأقصى لمتوسط التعداد ٩٠ فردًا. في الأسبوع الثالث من مايو ٢٠٢٠ (عند ٢٨.١٨ درجة مئوية و ٤٠.٧٪ الرطوبة النسبية) وفي الأسبوع الثاني من ابريل الي الاسبوع الاول من يوليو ٢٠٢١ وصلت فى الاسبوع الثالث من مايوالي ١١٥,٤ فرد عند (٢٦.٥٥ درجة مئوية و ٤٤.٥٤٪ الرطوبة النسبية).

(٣) الكثافة العددية للمفترسات المصاحبة لحشرة منْ البرقوق الدقيقي علي أشجار البرقوق

اوضحت نتائج تعداد الأنواع المفترسة انها كانت أكثر وفرة نسبيًا خلال الموسم الثاني (٥.٠٤ حشرة / ١٠ أوراق) مقارنة بالموسم الأول (٣.٧٤ حشرة / ١٠ أوراق). وتواجدت هذه الحشرات المفترسة في فترة نشاط رئيسية واحدة ؛ كانت من الأسبوع الاول من مايو إلى الأسبوع الثالث من يونيو ٢٠٢٠ ومن الاسبوع الثالث من ابريل الي الاسبوع الرابع من يونيو ٢٠٢١ مواسم النمو. تم تسجيل العدد الأقصى من المفترسات في الأسبوع الرابع من مايو ٢٠٢٠ ، وفي الأسبوع الرابع من مايو ٢٠٢١ حيث كانت ٢٥.٠ و ٣٠.٠ حشرة ، على التوالي.

-مفترسات أبو العيد :

تشير النتائج التي تم الحصول عليها لهذه الأنواع المفترسة ان أعلى وفرة نسبيًا كانت خلال موسم ٢٠٢١ مقارنة بموسم ٢٠٢٠ حيث بلغ متوسط الأعداد الموسمية للأنواع المفترسة الأربعة المسجلة في موسم ٢٠٢٠ كانت ٠.٥٧ و ٠.٣٠ و ٠.١٣ و ٠.٠٠. بينما خلال موسم ٢٠٢١ كانت ١.١٣ و ٠.٥٦٥ و ٠.٣٤ و ٠.٣٠٤حشرات / ١٠ أوراق على التوالي.

- **مفترس أسد المنْ .*Chrysoprela carnea* Steph :**

كان لهذا المفترس نشاط محدود لمدة ٣ اسابيع فقط علي أشجار البرقوق للموسم ٢٠٢١بمتوسط الأعداد الموسمية ٠,١٣ فرد / ١٠ أوراق. ، بدأت من الأسبوع الثالث من مايو إلى الأسبوع الاول من يونيو ٢٠٢١ ؛ خلال فترة نمو البرقوق.

- **الحشرات ثنائية الاجنحة المفترسة** ذبابة السرفيس والافيدوليتس:

اوضحت النتائج ان هذه المفترسات هاجمت حشرات المنْ النشطة لمدة ٤-٥ أسابيع على أشجار البرقوق ، ممتدة من الأسبوع الثالث من شهر مايو (بحد أقصى ١٢ و ٨ حشرات / ١٠ أوراق) حتى الأسبوع الثالث و الأسبوع الثاني من شهر يونيو ٢٠٢٠ للحشرة المفترسة على التوالي. في موسم ٢٠٢١ ، كان المفترسان نشيطان إلى حد ما لمدة ٧ و ٦ أسابيع من الأسبوع الثاني من مايو إلى الأسبوع الرابع والثالث من يونيو ٢٠٢١ ووصل الحد الأقصى في الأسبوع الرابع من مايو ٢٠٢١ إلى ١٠ و ٦ حشرات / ١٠ أوراق للنوعين المفترسين في الموسم الأول والثاني على التوالي.

(٤). تأثيرات بعض العوامل المناخية والحيوية على الكثافة العددية لمنْ البرقوق الدقيقي ، *H. pruni* على أشجار البرقوق:

- تأثير درجة الحرارة :

اظهرت النتائج ان لمتوسط أعداد حشرات *H. pruni* المجنحة على أشجار البرقوق تحت الظروف الحقلية ارتباط إيجابي معنوي مع درجات الحرارة القصوى والصغرى والمتوسط الأسبوعي في كل من ٢٠٢٠ و ٢٠٢١ كما هو الحال بالنسبة للغير مجنحة وإجمالي نمطي منْ البرقوق الدقيقي على البرقوق.

واوضحت النتائج كذلك ان متوسط الأعداد الأسبوعية لحشرات المنْ *H. pruni* على أشجار البرقوق يختلف بشكل ملحوظ وفقًا للتغيرات في درجات الحرارة ؛ حيث أن معامل الانحدار بين متوسط أعداد المنْ المجنحة (١,١٣٧٤،١,١٩٣٤) و الغير مجنحة (٠,٠٦٧٩،٠,٠٦١٢) والأعداد الإجمالية للنمطين (٠,٦٦٩،٠,٦٢١) خلال موسمي ٢٠٢٠ و ٢٠٢١ ، على التوالى.

- تأثير الرطوبة النسبية:

اوضحت نتائج التحليل الأحصائي ان هناك علاقة ارتباط سلبي معنوي بين نسبة الرطوبة النسبية و الأفراد المجنحة و الغير مجنحة والمجموع الكلي لـ *H. pruni* في موسمي ٢٠٢٠ و ٢٠٢١. كما تم الحصول على قيم معامل الانحدار (-٣,١٨٦٧ ،-٠,٢١٩٧ ، -

٠,٢١٤٣٠) و (-٣,٠٣٣٥ ، -٠,١٩٤١ ، -٠,١٩٥٢) على التوالي. هذا يعني أن عدد حشرات المنْ قد تأثر بشكل كبير بتغير نسبة الرطوبة النسبية.

- تأثير المفترسات الحشرية:

أظهر تأثير المفترسات على حشرات المنْ علاقة موجبة ومعنوية لكل منها على الحشرات المجنحة وغير المجنحة والمجموع لمنْ البرقوق الدقيقي *H. pruni* على أشجار البرقوق خلال عام ٢٠٢٠ بينما كان التأثير موجب ومعنوي مع الأفراد الغير مجنحة والمجموع خلال موسم ٢٠٢١.

- التأثير المشترك للعوامل الجوية والمفترسات معآ:

تم الحصول على معامل الانحدار الموجب للعلاقة بين الزيادة في الكثافة العددية لحشرات منْ البرقوق الدقيقي في كل من موسمي ٢٠٢٠ و ٢٠٢١ بالتوازي مع تغير قيم الأرصاد الجوية والمفترسات الحشرية ، ولوحظ ارتباط معنوي سلبي بين درجة الحرارة العظمى والصغرى والكثافة العددية المقابلة لأشجار منْ البرقوق الدقيقي في كل من موسمي ٢٠٢٠ و ٢٠٢١ ، بينما وجد ارتباط غير معنوي بين البرقوق المصاب بـ *H. pruni* والرطوبة النسبية. في عام ٢٠٢٠ ، أظهرت درجة الحرارة القصوى أيضًا انحدارًا سلبيًا ولكن تأثيرات غير معنوية على الكثافة العددية لنفس الآفة الحشرية التي تهاجم نفس العائل. التأثير المشترك للعوامل البيئية الثلاثة المدروسة والمفترسات (الحيوية وغير الحيوية). أشارت هذه النتائج إلى أن العوامل الثلاثة المختارة كانت مسؤولة ، كمجموعة ، كانت دلالة نسبة التباين ٤.٠٨٥ (P (0.01 =>، في عام ٢٠٢٠ و ٥.٤٩٠ P => 0.004)، في موسم ٢٠٢١.

ثالثا- الدراسات البيولوجية:

- تأثير درجات الحرارة الثابتة على الظواهر البيولوجية وجدول الحياة لحشرة منْ البرقوق الدقيقي ، *Hyalopterus pruni* Geoffroy على شتلات المشمش:

أجريت الدراسة في معمل قسم بحوث الحشرات الثاقبة الماصة بمعهد بحوث وقاية النباتات بالدقي بمحافظة الجيزة خلال موسم ٢٠٢١ حيث تم دراسة تأثير ثلاث درجات حرارة (٢٠ -

٢٥ – ٣٠ درجة مئوية). ورطوبة نسبية ٦٠٪. و ١٦ ساعة إضاءة على بيولوجية منْ البرقوق الدقيقي عند تغذيته على أوراق أشجار المشمش.وتم الحصول على النتائج التالية:

* حشرة منْ البرقوق الدقيقي لها ٤ أعمار لطور الحورية. يتناسب طول هذه المراحل عكسياً مع درجة الحرارة.

* كان معدل البقاء على قيد الحياة حتى النضج ٧٥٪ – ٦٧٪ – ٥٨٪ في درجات حرارة ٢٠ – ٢٥ – ٣٠ درجة مئوية على التوالي.

* كان متوسط طول العمر للحشرات الكاملة ٢٤.٨٩ – ١٨.٨٨ – ١٠.٢٩ يوم عند درجات حرارة ٢٠–٢٥–٣٠ درجة مئوية على التوالي ، بينما كان متوسط معدل الخصوبة المسجل ١٩.٨٩ – ٢٤.٢٥ – ١٦.٧١ حورية/ أنثى عند درجات حرارة ٢٠–٢٥–٣٠ درجة. مئوية ، على التوالي.

* كان متوسط مدة الجيل١٤.٣٣ –٩.٣٨– ٧.٠ يوم عند درجات حرارة ٢٠ – ٢٥ – ٣٠ درجة مئوية على التوالي.

* كان معدل التكاثر الصافي للإناث هو الأكبر عند ٢٥ درجة مئوية حيث بلغ ١٦.٢٥ حورية و معدل الزيادة الطبيعي يزيد مع زيادة درجة الحرارة حيث ارتفع من ٠.١٣٤ حورية عند درجة حرارة ٢٠ درجة مئوية حتى وصل إلى ٠.٢١٩ يوم عند درجة حرارة ٣٠ درجة مئوية. بينما كان معدل الزيادة المطلق كان ١.١٤ – ١.٢١ – ١.٢٥ يوم عند درجة حرارة ٢٠ – ٢٥ – ٣٠ درجة مئوية على التوالي.

* كان الوقت اللازم لمضاعفة الجيل ٥.١٧ – ٣.٦٣ – ٣.١٧ يومًا عند ٢٠–٢٥–٣٠ درجة مئوية.

مما سبق ، يمكن القول أن درجة الحرارة ٢٥ درجة مئوية تعتبر هي درجة الحرارة المثلى لحياة وتكاثر حشرة منْ البرقوق الدقيقي على أشجار المشمش.

دراسات بيئية وبيولوجية على حشرات المنْ التي تصيب بعض أشجار الفواكه ذات النواة الحجرية فى دلتا مصر

رسالة مقدمة من

خالد محمد سيد أحمد جادالحق

بكالوريوس فى العلوم الزراعية شعبة عامة معهد الدراسات التعاونية الزراعية 1999

أستكمال شعبة وقاية نبات كلية الزراعة بمشتهر جامعة بنها 2017

للحصول على درجة الماجستير فى العلوم الزراعية

(تخصص الحشرات)

قسم وقاية النبات

جامعة بنها
كلية الزراعة بمشتهر
إدارة الدراسات والبحوث

تمت مناقشة الرسالة وإجازتها من الأساتذة :

1-أ.د.أحمد عبدالغفار درويش.....

أستاذ علم الحشرات المتفرغ – قسم وقاية النبات – كلية الزراعة – جامعة بنها.

2-أ.د.محمد كمال الدين الأنصاري .....

أستاذ علم الحشرات المتفرغ – قسم وقاية النبات– كلية الزراعة جامعة الأزهر.

3-أ.د.عادل عبد الحميد حافظ.....

أستاذ علم الحشرات المتفرغ –قسم وقاية النبات–كلية الزراعة – جامعة بنها.

4-أ.د.جودة محمد الدفراوي.....

رئيس بحوث متفرغ– معهد بحوث وقاية النباتات – مركز البحوث الزراعية.

5-د.أميرة محمد الشيوى.....

استاذ مساعد علم الحشرات– قسم وقاية النبات – كلية الزراعة – جامعة بنها.

تاريخ المناقشة:2022/11/7

وكيل الكلية للدراسات العليا والبحوث
أ.د/ محمد حسن رفعت

عميد الكلية
أ.د/ محمود الزعبلاوى البدوى

دراسات بيئية وبيولوجية على حشرات المنْ التي تصيب بعض أشجار الفواكه ذات النواة الحجرية فى دلتا مصر

رسالة مقدمة من

خالد محمد سيد أحمد جادالحق

بكالوريوس فى العلوم الزراعية شعبة عامة معهد الدراسات التعاونية الزراعية 1999

أستكمال شعبة وقاية نبات كلية الزراعة بمشتهر جامعة بنها

2017

للحصول على درجة الماجيستر فى العلوم الزراعية

(تخصص الحشرات)

من قسم وقاية النبات

لجنة الاشراف العلمى:

أ.د.أحمد عبدالغفار درويش.....

أستاذ علم الحشرات المتفرغ – قسم وقاية النبات – كلية الزراعة – جامعة بنها

أ.د.نبوى أحمد على.....

أستاذ الفاكهة المتفرغ – قسم البساتين – كلية الزراعة – جامعة بنها

أ.د.جودة محمد الدفراوي.....

رئيس بحوث متفرغ– معهد بحوث وقاية النباتات – مركز البحوث الزراعية.

د.أميرة محمد الشيوى.....

استاذ مساعد علم الحشرات – قسم وقاية النبات – كلية الزراعة – جامعة بنها

كلية الزراعة بمشتهر جامعة بنها

2022

دراسات بيئية وبيولوجية على حشرات المنْ التي تصيب بعض أشجار الفواكه ذات النواة الحجرية فى دلتا مصر

رسالة مقدمة من

خالد محمد سيد أحمد جادالحق

بكالوريوس فى العلوم الزراعية شعبة عامة معهد الدراسات التعاونية الزراعية 1999

أستكمال شعبة وقاية نبات كلية الزراعة بمشتهر جامعة بنها 2017

للحصول على درجة الماجستير فى العلوم الزراعية

(تخصص الحشرات)

قسم وقاية النبات

كلية الزراعة

جامعة بنها

2022