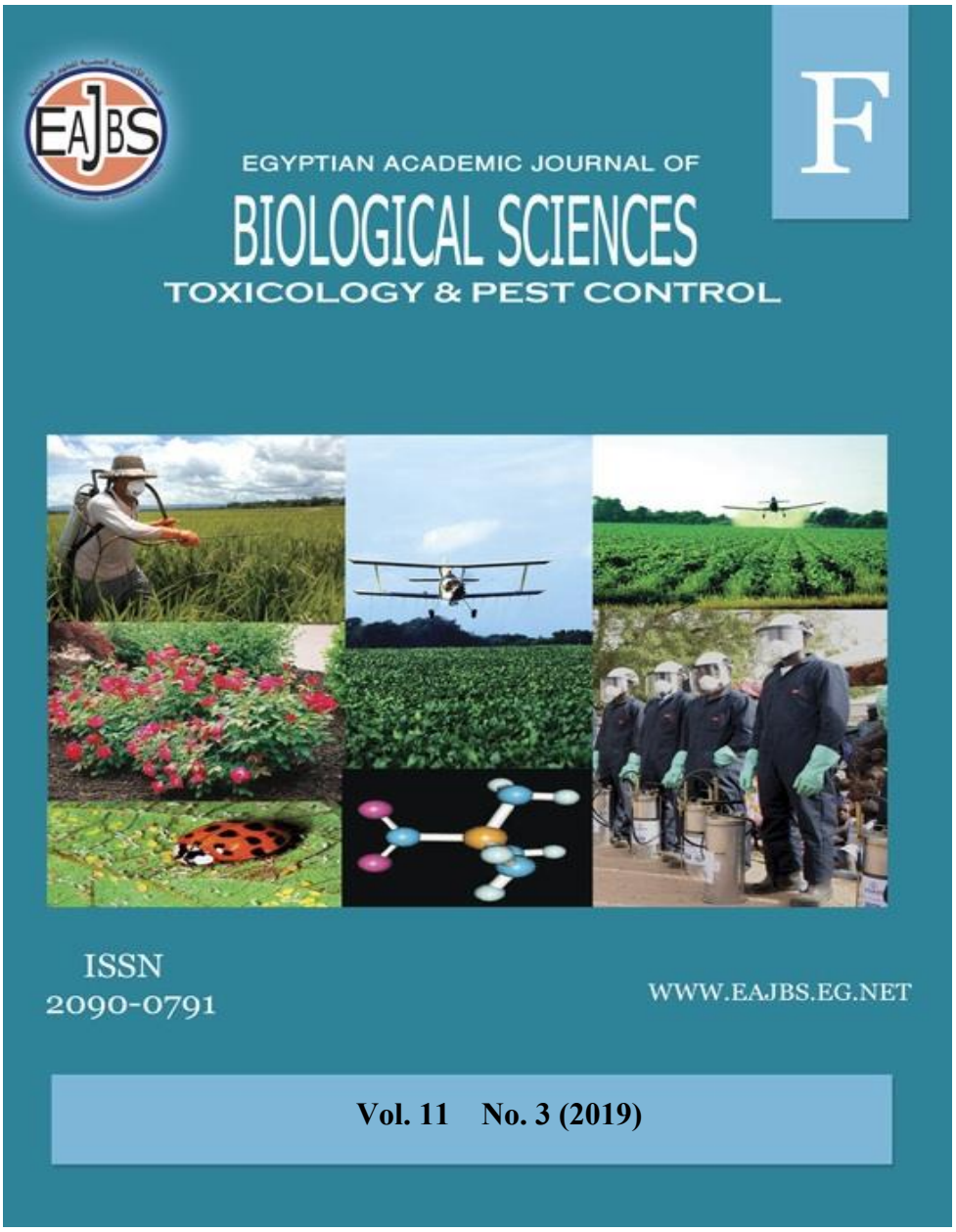

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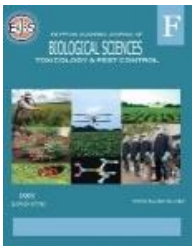
www.eajbs.eg.net

Egypt. Acad. J. Biolog. Sci., 11(3): 37-49 (2019)

Egyptian Academic Journal of Biological Sciences
F. Toxicology & Pest Control
ISSN: 2090 - 0791
http://eajbsf.journals.ekb.eg/



Field Studies on the Natural Role of the Predator *Chrysoperla carnea* (Steph.) Attacking Aphids in a Mixed Orchard Containing Pear and Plum Trees, with Evaluating the Possibility of Using Pheromone Traps against the Peach Fruit Fly, *Bactrocera zonata* (Saunders).

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ARTICLE INFO
Article History
Received:18 /9/2019
Accepted:15/10/2019

Keywords:
Pear, Plum, Aphids' species, *Bactrocera zonata*, Natural enemies, *Chrysoperla carnea*, Pheromone traps, Control.

ABSTRACT

The present study was carried out to record the population density of two aphids' species (the cotton aphid *Aphis gossypii* on pear trees and the mealy plum aphid *Hyalopterus pruni* on plum ones) and the green lacewing predator *Chrysoperla carnea*, which occurred in a mixed orchard containing both trees, during season 2019, in Qalubia Governorate. The obtained data showed that the occurrence of aphids' species on pear and plum trees covered the whole four months of study (March-June, 2019). Aphids' populations were the highest in their numbers, during the two months April and May 2019, on both the two trees species. The results indicated also that, the existence periods of aphids' individuals on both pear and plum trees were the same as those recorded in case of the predator *C. carnea*. A field experiment was performed by putting pheromone traps on plum trees (during the fruiting season from the second half of May to the first half of July, 2019). Highest total number of the peach fruit fly *Bactrocera zonata* males was recorded in pheromone traps during the first half of June, 2019 (when using one or two pheromone capsules on the same glued sheets, on the same plum tree). Generally, the lacewing predator *C. carnea* can be massed reared in the laboratory and released for controlling aphids on pear and plum trees and/or other fruit trees that are subjected to attack by the two aphids' species. Besides, the pheromone traps can be used against the peach fruit fly *B. zonata* on plum trees and/or fruit trees that suffer from pest attack. The uses of either *C. carnea* and/or pheromone traps can be applied with other available safe control methods, in the frame of Integrated Pest Management (I.P.M.) programs, for protecting man heath and the surrounding environment from pollution.

INTRODUCTION

The importance of cultivating fruit trees has extensively increased year after year in Egypt, due to their economic values. Therefore, great attention has been done to increase these areas and consequently fruit production. The two popular stone-fruit trees of family Rosaceae; pear (*Pyrus communis*) (Osman & Mahmoud, 2008) and plum (*Prunus domestica*) (Ismail *et al*., 1991), are widely successfully grown in many Egyptian Governorates. Both pear and plum trees are subjected to attack by many insect pests such as aphids and fruit flies. Aphids (Homoptera: Aphididae) mostly cause direct damage

through leaf deformation and shoot distortion, coupled with the effects of inoculated saliva and sap draining. Honeydew secretion lead to the development of sooty molt and also aphids' species acts as vectors of plant pathogens, therefore, transmitting many plant diseases (Robert & Bourdin, 2001). Pear trees were recorded to be attacked by the cotton aphid *Aphis gossypii* (Khan *et al*., 2017). While, plum trees are infested by the mealy plum aphid *Hyalopterus pruni* (Rakauskas, 1980). Moreover, fruit flies (Diptera: Tephritidae) are considered important agribusiness fruit cropping pests worldwide, due to the direct yield damage, the great ease of dispersal and adaptation to several hosts under different climatic conditions. In addition, to the cost involved in the implementation of control measures. Thus, they have world trade in agricultural production (FAO/IAEA, 2000). A major one of them is the peach fruit fly *Bactrocera zonata* (Saunders), where its larvae feed on the fruit flesh causing their destruction, and consequently leading annually to high loss in fruits production (Mahmoud, 2009; Hosni *et al*., 2011 and Ibrahim *et al*., 2014).

The use of chemical insecticides as the only way to control pests in fruits has caused environmental pollution and hygienic problems that represent a risk for both people and animals (Gallo, 2007). Besides, the disruption in the natural balance caused natural enemies (Attalah *et al*., 2009 and Ibrahim *et al.*, 2014). The need for reducing pesticide usage has provided an incentive for the development of cost effective`s alternatives to conventional chemical pesticides (El-Akhdar & Ouda, 2009).

The field of biological control has received much crucial worldwide and revealed a significant impact as a possible way of insect control (Sabbour & Abbas, 2007). It can mitigate crop yield loss and pest control costs in agricultural ecosystems (Landis *et al*., 2000) and also represents an important ecosystem service for agriculture (Losey & Vaughan, 2006). Now, it is considered as an essential component of Integrated Pest Management (I.P.M.) programs (El-Sahn & Gaber, 2012), and often recommended as the first defense line to face the menace of attacking economic pests (El-Zahi, 2012). However, many natural enemies such as predators (as one of the main components of biological control) play a noticeable natural role against different insects' pests in agriculture (El-Khawas, 2005), including their occurrence in many fruit orchards. As, biological control depends mainly on studying the natural role of biological agents (Hafez, 1994) and knowing the most efficient one for future uses against insects' pests. The green lacewing predator, *Chrysoperla carnea* (Steph.), (Neuroptera: Chrysopidae) represented one of the most predators, which is quite common in the agricultural ecosystems in most of the world countries and received great attention in the field of biological control (Atallah *et al*., 2009). The lacewing adults feed on pollen, nectar or honey (Abdel-Samad, 2011), while, predatory larvae (aphid lion) are polyphagous. Larvae feed upon a wide range of pest species such as; aphids, whiteflies, mealy bugs, scale insects, thrips, leafhoppers, psyllidae, psocides, lepidopterans and mites (Remoldi *et al*., 2008).

Moreover, implementation of sex pheromone traps was widely recent spread as a main complementary component of I.P.M. programs; for monitoring, forecasting and control decision making of various pests including fruit flies attacking fruit trees (El-Husseini *et al*., 2008).

Therefore, the present study was carried out to study the population fluctuations of two aphids' species, which occurred in a mixed orchard of pear and plum trees and their common associated lacewing predator *C. carnea* during season 2019, in Qalubia Governorate. Moreover, a field experiment was conducted a plum tree, including using sex pheromone traps (one and two pheromone capsules on the same tree); against the peach fruit fly *B. zonata*. Such ecological information is considered as one of the main

concepts that may help in planning IPM strategies against aphids and fruit flies on pear and plum as well as other fruit trees.

MATERIALS AND METHODS

The present study was carried out in a mixed orchard containing pear and plum trees (5 feddan), located in Shebein El-Kanater district (Qalubia Governorate), during the season, 2019. The different agricultural practices were conducted in the orchard, except the chemical insecticides uses. Biweekly samples of 15 pear trees (variety Balady, three-years-old) and 15 plum trees (variety Hollywood of five-years-old), were both selected to perform this study. A sample of 300 leaves was randomly investigated and collected for either pear or plum trees (5 branches/tree × 4 leaves/branch × 15 trees). The five branches represented the four main directions and the central core of each tree. Sampling started in 11/3/2019 and ended in 17/6/2019. The samples were used for surveying aphids' species (adults & nymphs), attacking pear and plum in the mixed orchard (of both two fruit trees). Their common associated lacewing predator *C. carnea* individuals (eggs, larvae & adults) were also recorded where they were directly counted in the experimental orchard.

The percentages of occurrence of both adults and nymphs of the aphids' species, attacking pear and plum trees, the mean total numbers of aphids' individuals for each tree, branch, and leaf, were also calculated according to the following equations:

$$\% \text{ of adults of aphids' species} = \frac{\text{Total no. of aphids' adults}}{\text{Total no. of aphids' individuals (For either pear or plum) for each sample}} \times 100$$

$$\% \text{ of nymphs of aphids' species} = \frac{\text{Total no. of nymphs}}{\text{Total no. of aphids' individuals (For either pear or plum) for each sample}} \times 100$$

$$\text{The mean total no. of aphids/one tree} = \frac{\text{Total no. of aphids' individuals}}{\text{Total no. of trees (For either pear or plum) for each sample}}$$

$$\text{The mean total no. of aphids/one branch} = \frac{\text{Total no. of aphids' individuals}}{\text{Total no. of branches (For either pear or plum) for each sample}}$$

$$\text{The mean total no. of aphids/one leaf} = \frac{\text{Total no. of aphids' individuals}}{\text{Total no. of leaves (For either pear or plum) for each sample}}$$

Moreover, at the period extended from 20/5/2019 to 1/7/2019, a field experiment was performed on plum trees, by using nine pheromone traps (type El-Matwiya) against the peach fruit fly *B. zonata* males. Pest fly males were attracted to the odor of pheromone capsules containing females' odors (that were put in the middle of the trap, one the same plum tree).

These traps were classified as; one pheromone trap/tree × 3 replicates × 2 treatments; including one or two pheromone capsule) + control (only two glued faces that

represent the trap without using any pheromone capsules). The pheromone capsule contains Methyl Eogenol 98%, of the chemical description 4-Allyl Veratrole1, 2-Dimethoxy-4-Allybenzene and the emperical formula was (C11 H14 O2). It was exported by YASHO INDUSTEISE PVT. LTD, INDIA and was imported by Agrin Serve. The total numbers of *B. zonata* males were directly weekly counted on both glued sides of the pheromone traps. These traps were changed every 3 weeks (with new glued traps sides, where they were changed only 2 times during the whole experiment (after 55 days from the beginning of their uses).

$$\text{The mean total no. of males/each trap} = \frac{\text{Total no. of counted } \textit{B. zonata} \text{ males}}{\text{Total no. of traps sample (3 replicates)}}$$

Obtained data were tabulated and statistically analyzed to calculate the means and the r-values (correlation coefficient) by using SPSS program version14.0. As, the weather factors including the means of temperatures and relative humidity were obtained from the Meteorological Station at A.R.C.

RESULTS

Population Density of Aphids' Species on Pear and Plum Tree:

The cotton aphid *Aphis gossypii* (Glov.), (Homoptera: Aphididae) was the only recorded aphid species attacking pear trees. While, the mealy plum aphid *Haylopterous pruni* (Geoff.) was the recorded one on plum trees, in a mixed orchard containing both trees. As shown in Table (1) and Fig.(1), the cotton aphid *A. gossypii* started to appear with high numbers (3957 individuals), during March 2019, then reached the maximum total numbers (8337 & 8226 individuals) during April and May, finally decreased to reach a low total number of 435 individuals in June, 2019. The corresponding mealy plum aphid *H. pruni* were; 705, 2292, 4815 and 689 (in all four months; March, April, May, and June 2019, respectively).

The adults of aphids had the highest occurrence during April (184 adults on pear trees) and (98 adults on plum trees) with percentages of occurrence (2.21 & 7.23 %), during April and March 2019, respectively. The highest occurrence of aphids nymphs (8153 & 4778 nymphs), was during April & May 2019, in case of pear and plum trees, respectively. The mean total numbers of aphids' individuals (adults & nymphs) were; 5238.75±1898.82, 87.00±35.66 & 5151.75±1869.05 for pear trees, respectively. As for plum trees, the corresponding recorded mean total numbers were; 2125.25±972.22, 48.50 ±18.77 & 2076.75±969.66, respectively. The maximum monthly total numbers of aphids individuals on one pear and plum tree were; 277.90 & 160.50 individuals (in the two months April & May 2019, respectively). The values in case of the maximum monthly mean total numbers of aphids' individuals on one branch were; 833.70& 481.50 (in the two months April & May 2019). Those recorded on one leaf were; 39.60 & 4.82 individuals (in the two months March & May 2019), for pear and plum trees, respectively.

The obtained results revealed that the total numbers of aphids' nymphs on both pear and plum trees were higher in their numbers than those of adults ones. Also, the mean total numbers per months of aphids' individuals (adults & nymphs) were higher on pear trees, in comparing with their numbers on plum trees. I.e., indicating the ability of pear trees to be more attacked by aphids than plum ones regardless the two aphids' species. The cotton aphid *A. gossypii* was recorded as a pest of pear by many authors such as;

Ismail *et al.* (1991) and Osman & Mahmoud (2008). The first authors found that the winged individuals were seen on the new leaves during March and April. While, the second authors demonstrated that, the dynamics of aphid population was initiated during the first decade of April to reach its peak in the second decade of May. However, the mealy plum aphid *H. pruni* was observed as one of the important aphid species infesting plum by Ali (2008). Moreover, Soliman (2008) indicated that the presence of different successive hosts in the same orchard or even near orchards helps the pest to reproduce easily and rapidly giving rise overpopulation.

Table (1): Monthly total numbers of the two aphids species' individuals, recorded in a mixed orchard containing pear and plum trees during the season, 2019 in Qalubia Governorate.

Months	Aphids' individuals						Weather factors	
	Adults		Nymphs		Total no.		Mean c°	Mean R.H.%
	Pear	Plum	Pear	Plum	Pear	Plum		
March, 2019	68 (1.72)*	51 (7.23)	3889 (98.28)	654 (92.77)	3957	705	17.74	51.68
April	184 (2.21)	98 (4.28)	8153 (97.79)	2194 (95.72)	8337	2292	20.23	45.33
May	83 (1.01)	37 (0.77)	8143 (98.99)	4778 (99.23)	8226	4815	27.48	37.66
June	13 (2.99)	8 (1.16)	422 (97.01)	681 (98.84)	435	689	30.03	48.40
Mean total no./ months	87.00 ± 35.66 (13 – 184)	48.50 ± 18.77 (8-98)	5151.75 ± 1869.05 (482 - 8153)	2076.75 ± 969.66 (654 - 4778)	5238.75 ± 1898.82 (435-8337)	2125.25 ± 972.22 (689 - 4185)	23.87c° (17.74 - 30.03)	45.77% (37.66 - 51.68%)

Months	Mean total no./ one tree		Mean total no./ one branch		Mean total no./ one leaf	
	Pear	Plum	Pear	Plum	Pear	Plum
March, 2019	131.90	23.50	395.70	70.50	39.60	0.71
April	277.90	76.50	833.70	229.20	8.34	2.29
May	274.20	160.50	822.60	481.50	8.23	4.82
June	14.50	22.97	87.00	68.90	0.44	0.69
Mean total no./ months	174.63 ± 63.28 (14.50-277.90)	70.87 ± 32.41 (22.97-160.50)	534.75 ± 180.75 (87.00-833.70)	212.53 ± 97.22 (68.90-481.50)	14.15 ± 8.68 (0.44-39.60)	2.13 ± 0.97 (0.69-4.82)

* = Percentages of occurrence.

Fig. (1): Infestation of pear leaves with the cotton aphid *A. gossypii* (A) and also the infestation of plum leaves with the mealy plum aphid *H. pruni* (B), in a mixed orchard containing the two aphids' species.

Population Density of The Lacewing, *C. carnea* Individuals:

As shown in Table (2) and Fig. (2), the period of *C. carnea* occurrence extended from March until June 2019, on both pear and plum trees. The highest monthly total numbers of this predator were during May 2019, for both pear and plum trees. They were 207 & 461 individuals, where they included; 90, 30 & 87 individuals (in case of pear trees) and 389, 40 & 44 individuals (in case of plum trees; as egg, larvae & adults, respectively). Results indicated that, the total number of *C. carnea* individuals on pear trees was (376 individuals), less than that recorded on plum trees (616 individuals). The mean total numbers of *C. carnea* individuals per month were; 94.00±44.66 & 154.00±105.29 individuals, for pear and plum trees, respectively. This may give a conclusion that the predator *C. carnea* preferred the mealy plum aphid attacking plum trees more than the cotton aphid *A. gossypii* on pear ones. Also, results revealed that the predator *C. carnea* tend to appear too late in the season when large aphid colonies have already developed. Whereas, damaged by aphids is the highest well before them in early spring on both pear and plum tree in the mixed orchard. In general, El-Batran and Fathy (1991) reported chrysopids as useful predators attacking aphids and could play a noticeable role in reducing aphid populations (Ibrahim *et al*., 1991). However, the period of the higher population of aphids on pear and plum trees were related to the occurrence with higher numbers of *C. carnea* individuals (during April & May 2019). Where the two previous months were recorded as the months of high activity of *C. carnea* against aphids' species.

Table (2): Monthly total numbers of *C. carnea* individuals (eggs, larvae, and adults), recorded in a mixed orchard containing pear and plum trees during season, 2019 in Qalubia Governorate.

Months	The lacewing predator *C. carnea*							
	Eggs		Larvae		Adults		Total no.	
	Pear	Plum	Pear	Plum	Pear	Plum	Pear	Plum
March, 2019	3	1	1	1	8	2	12	4
April	37	73	13	3	73	44	123	120
May	90	389	30	40	87	32	207	461
June	13	23	2	3	19	5	34	31
Total no./ Months	143 (3- 90)	486 (1- 389)	46 (1- 30)	47 (1- 40)	187 (8- 87)	83 (2- 44)	376 (12- 207)	616 (4- 461)
Mean total no./ months	35.75 ± 19.44	121.50 ± 90.43	11.50 ± 6.74	11.75 ± 9.43	46.75 ± 19.54	20.75 ± 10.27	94.00 ± 44.66	154.00 ± 105.29

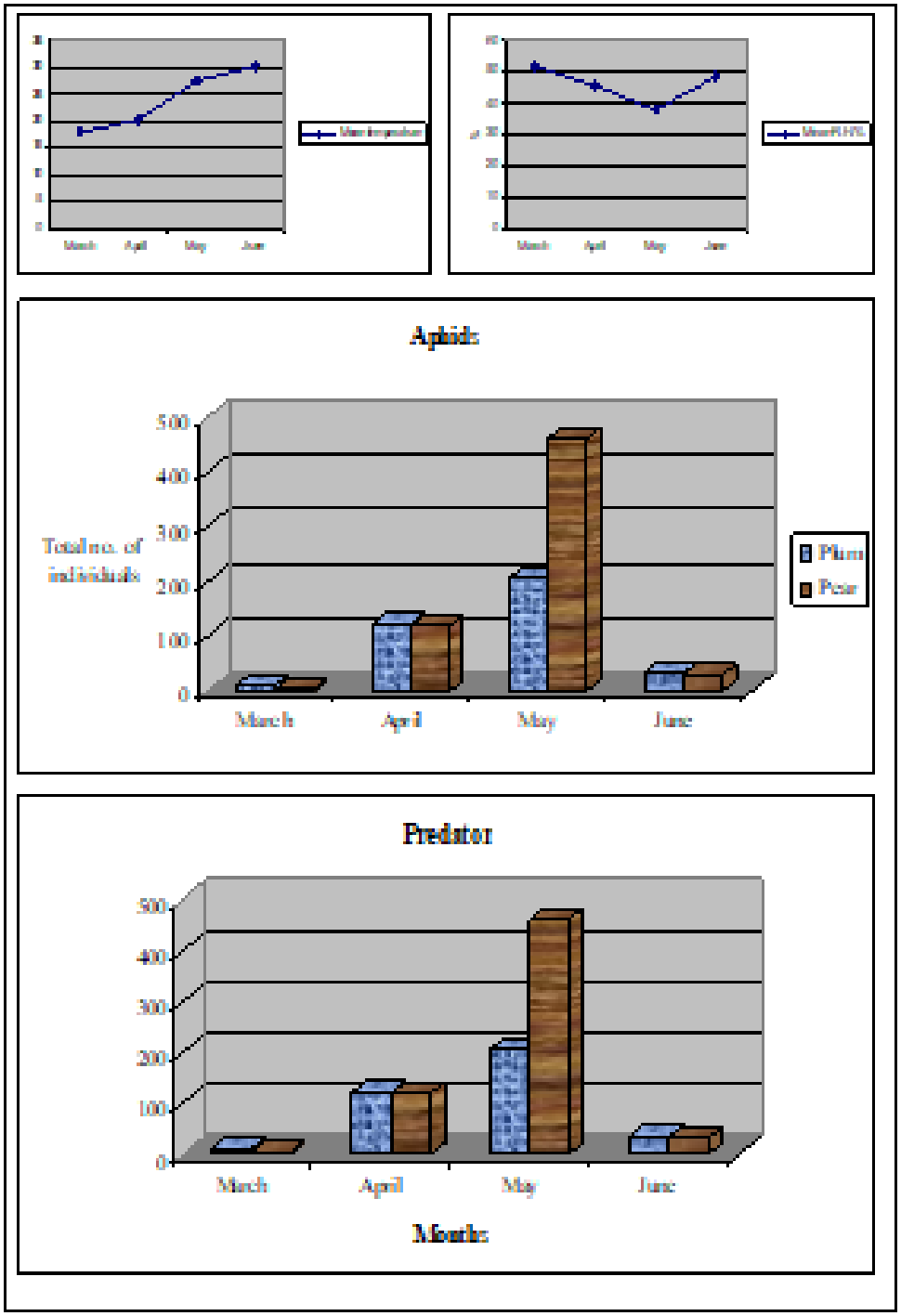

Fig. (2): The relationship that was recorded between the two aphids' species and the lacewing predator *C. carnea*, on both pear and plum trees in a mixed orchard during the season, 2019 in Qalubia Governorate.

Natural Ratios between Aphids' Species and the Predator, *C. carnea*:

Results in Table (3) demonstrated that the lowest monthly ratio (aphids: *C. carnea* individuals), was 94.55:1 (on pear trees, which was recorded during May 2019). While, that on plum trees was 52.09:1 (that was recorded during April, 2019). The general ratios per months were; 112.06:1 & 102.42:1, in case of pear and plum trees, respectively.

Many attempts were made to use *C. carnea* in the field of biological control (Nordlund & Marrison, 1992). However, *C. carnea* is taken as representative of

Chrysopidae to be used in the biocontrol programs. This predator is characterized by its high: expanded geographically distribution, compatibility to different system and searching ability (Azema & Mirabzadae, 2004). It seems to be a good candidate in I.P.M programs, as it is a voracious feeder (Balasubramani & Swamiappan, 1994). Moreover, it displays a relative broad range of acceptable preys (Hydron & Whitecomb, 1979), easy to be mass produced in the laboratory (El-Arnaouty, 1991 and Azema & Mirabzadae, 2004) and also it's tolerant ability to some groups of pesticides (Azema & Mirabzadae, 2004).

Table (3): Monthly ratios between aphids' species and the lacewing predator *C. carnea* individuals, recorded in a mixed orchard containing pear and plum trees during season, 2019 in Qalubia Governorate.

Months	Monthly ratio between (aphids' species : *C. carnea*)	
	Pear	Plum
March, 2019	494.63 : 1	352.50 : 1
April	114.21 : 1	52.09 : 1
May	94.55 : 1	150.47 : 1
June	22.89 : 1	137.80 : 1
General ratio (aphids' species : *C. carnea*)	112.06 : 1	102.42 : 1

Natural Relationship between Aphids & *C. carnea* and Weather Factors:

The relationships between the two aphids' species populations and the means of temperature and relative humidity were shown in Table (4). These r-values were; 0.108 & 0.671 for *A. gossypii* (on pear trees) and 0.264 & 0.974 for *H. pruni* (on plum trees). The corresponding data for *C. carnea* were; (0.279 & 0.978) and (0.120 & 0.359), in relation to means of temperatures and relative humidity, respectively.

Table (4): The calculation of the correlation coefficient (r-value) existed between many tested factors and the weather factors (means of temperatures & relative humidity).

Tested factors	Tested factors × means of temperature	Tested factors × means of relative humidity
The cotton aphid, *A. gossypii* (on pear trees)	0.108	0.671**
The mealy plum aphid, *H. pruni* (on plum trees)	0.264	0.974****
The lacewing predator, *C. carnea* (on pear trees)	0.279	0.978****
The lacewing predator, *C. carnea* (on plum trees)	0.120	0.359

- Significant (0.500-0.600) **Moderate significant (0.600-0.800) ***Highly significant (0.800-0.900) ****Very highly significant>0.900

Catching of the Peach Fruit Fly *B. zonata* Males by Using Pheromone Traps:

Obtained data recorded in Table (5) and Figs. (3&4) indicated that, the highest mean total number of the peach fruit fly *B. zonata* males per each pheromone trap (17.00 males/ one trap), was caught during the first half of June, in case of using only one pheromone capsule in each trap on the plum tree. Also, by using two pheromone capsules on the same pheromone trap (on the same plum tree), the highest mean total number of *B. zonata* males per each trap (42.33 males/ one pheromone trap), was also recorded during the first half of June. No *B. zonata* males were attracted to the control traps (which contain glue only on both sides of the trap, but without any pheromone

capsules). The mean total numbers of *B. zonata* males per month that were caught in pheromone traps containing one and two capsules were; 9.84±3.80 & 23.58±7.44 males, respectively. These results showed that using two pheromone capsules in the same trap were more effective in attracting the peach fruit fly *B. zonata* males than putting only on pheromone capsule in the trap. By increasing the numbers of traps used, the effectiveness against the pest will also increase. So, it will help to decrease the uses of harmful pesticides by using more safe control methods. The fertilization and mating processes with females of *B. zonata* will decrease; hence, less damage to plum fruits will be obtained and consequently safer fruit production. Many factors are affecting the efficiency of sex pheromone traps, such as; climatic factors, competition between adults females, trap placement, ageing of target individuals in pest population, trap design, pheromone substance ageing, average of pheromone resulting and interaction between sticky materials and pheromone substance (Mcnally & Barnes, 1981). The relatively low numbers of catching males in the pheromone traps may be due to the less ability of plum to attract female *B. zonata* for the egg-laying process. El-Husseini *et al.* (2008) demonstrated that, the recent strategies of I.P.M for controlling tephritid fruit flies in Egypt support the use of classical biological control including augmentation and preservation of their natural enemies, besides male-sterile technique and mating disruption by sex pheromones. As shown in Table (5), the R-values were; (0.779 & 0.664) and (0.730 & 0.203), in case of using one and two pheromone capsules, (in relation to means of temperatures and relative humidity), respectively.

Table (5): Mean total numbers o *B. zonata* males attracted to pheromone traps (with one and two pheromone capsules on the same trap, on one plum tree), in comparing with the control (which contains a sticky trap only without any pheromone capsules), during the fruiting period (May-June, 2019), in Qalubia Governorate.

Months	Mean total numbers of *B. zonata* males attracted to traps				
	Control trap (contains two sticky sheets' faces of the trap - without pheromone)	One pheromone capsule + two sticky sheets' faces of the trap.	Two pheromone capsules + two sticky sheets' faces of the trap.	Weather factors	
				Mean c°	Mean R.H.%
2nd half of May, 2019	0.00	15.67	24.33	28.70	35.59
1st half of June	0.00	17.00	42.33	29.86	47.79
2nd half of June	0.00	4.67	21.67	30.21	49.41
1st half of July	0.00	2.00	6.00	34.29	50.68
Mean total no. of *B. zonata* males / months	0.00 ♂♂ (no males were attracted to control trap)	9.84 ♂♂ ± 3.80 (2.00 –17.00)	23.58 ♂♂ ± 7.44 (6.00–42.33)	30.77c° (28.70 - 34.29)	45.87% (35.59 - 50.68%)

Statistical analysis: (the calculation of r-values)		
Tested factors	Tested factors × means of temperature	Tested factors × means of relative humidity
Mean total numbers of *B. zonata* males attracted to traps (containing one pheromone capsule on the trap), on one plum tree.	0.779**	0.644**
Mean total numbers of *B. zonata* males attracted to traps (containing two pheromone capsules on the trap), on one plum tree.	0.730**	0.203

- Significant (0.500-0.600) **Moderate significant (0.600-0.800) ***Highly significant (0.800-0.900) ****Very highly significant>0.900

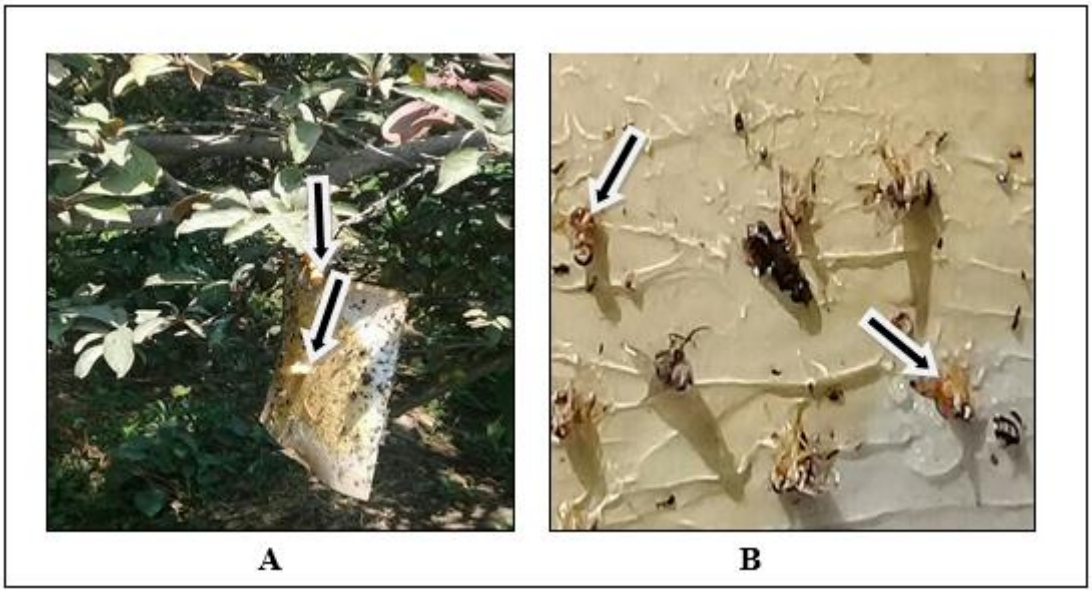

Fig. (3): The peach fruit fly *B. zonata* males (**B**), that were attracted to the pheromone trap (**A**) (that contain two pheromone capsules and was put on the plum tree), during the plum fruiting period (May-June, 2019), in Qalubia Governorate.

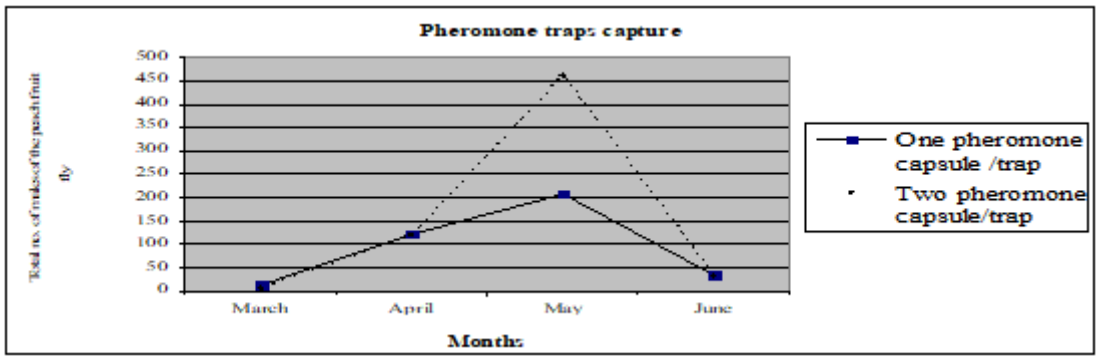

Fig. (4): A comparison between the mean total numbers of *B. zonata* males attracted to pheromone traps, with one and two pheromone capsules on the same trap (on one plum tree), during the fruiting period (May-June, 2019), in Qalubia Governorate.

In conclusion, obtained results indicated the important natural role of the lacewing predator *C. carnea* as a biocontrol agent against the cotton aphid *A. gossypii* (on pear trees) and the mealy plum aphid *H. pruni* (on plum trees). Magnifying the predator natural role becomes necessary for future releases of *C. carnea* predator against aphids on pear and plum trees and/or other related fruit orchards that suffer from aphids attack. Using such biocontrol agent must be included in I.P.M strategies against aphids. Moreover, using pheromone traps techniques for controlling insect pests, especially those attacking fruit trees is normally recommended for substituting the chemical control methods in order to avoid the hazards of direct insecticides application on the fruit trees.

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ARABIC SUMMARY

دراسات حقلية للدور الطبيعى لمفترس أسد المن *Chrysoperla carnea* (Steph.) المهاجم للمن فى حديقة مختلطة لأشجار الكمثرى والبرقوق ، مع تقدير الإمكانية لاستخدام مصائد فورمونية ضد ذبابة الخوخ *Bactrocera zonata* (Saunders).

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أجرى هذا العمل بغرض دراسة وتسجيل كثافة التعداد لنوعين من المن سجل تواجدهما خلال الدراسة في حديقة مختلطة منزرعة بأشجار الكمثرى والبرقوق هما : من القطن (the cotton aphid *Aphis gossypii*) على أشجار الكمثرى ومن البرقوق الصوفى (the mealy plum aphid *Hyalopterus pruni*) على أشجار البرقوق. وكذلك دراسة التواجد الموسمي لمفترس أسد المن *Chrysoperla carnea* Stephens (Neuroptera: Chrysopidae) , خلال موسم 2019 فى محافظة القليوبية.

أظهرت النتائج أن كلا نوعى المن (*A. gossypii* و *H. pruni*), قد تواجدا على أشجار الكمثرى والبرقوق خلال الشهور الأربعة للدراسة (فى الفترة من مارس- يونية 2019). حيث بلغ أعلى تعداد شهرى لنوعى المن خلال شهري أبريل ومايو2019 على كلا نوعى الأشجار فى الحديقة ، على التوالى. وقد سجل ايضاً تواجد أعلى تعداد شهرى لمفترس أسد المن *C. carnea* ، خلال شهر مايو 2019على كلاً من أشجار الكمثرى والبرقوق. وهذا يعنى مدى ارتباطه كعدو طبيعي للمن (related natural enemy) مع فترات تواجد أفراد المن المهاجم لكلا نوعى الأشجار فى الحديقة.

كما تم عمل تجربة حقلية بتعليق مصائد فورمونية (sex pheromones) لجذب ذكور ذبابة الخوخ *Bactrocera zonata* (Saund.) (Diptera: Tephritidae), على أشجار البرقوق (خلال موسم الإثمار فى خلال الفترة من النصف الثاني لشهر مايو- النصف الأول من شهر يولية 2019). حيث كان أعلى تعداد لذكور ذبابة الخوخ *B. zonata*، والتي تم اصطيادها فى المصائد الفورمونية خلال النصف الأول من شهر يونية 2019, وذلك عند تعليق مصيدة فورمونية واحدة تحتوى على كبسولة واحدة للفورومون فقط أو كبسولتين على نفس المصيدة (بتكثيف عدد كبسولات الفورومون عند التعليق على نفس شجرة البرقوق).

وإجمالاً ، يمكن إستخدام مفترس أسد المن *C. carnea* ، بتربيته وإكثاره كمياً فى المعمل ، ثم الاطلاق الحقلى لمكافحة كلا نوعى المن على أشجار الكمثرى والبرقوق ، أو الأشجار الأخرى للفاكهة التى تتعرض للإصابة بالمن. كما يمكن العمل ايضاً على دمج والتطبيق المكثف لإستخدام المصائد الفورمونية لمكافحة ذبابة الخوخ *B. zonata* على أشجار البرقوق أو الأشجار الأخرى للفاكهة التى تهاجم بنفس الآفة. وينبغى أن يكون هذا الإستخدام للمفترس *C. carnea* وكذلك المصائد الفورمونية بمفردهما أو معاً, في إطار منظومة المكافحة المتكاملة للآفات I.P.M (Integrated Pest Management)ضمن برامجها, جنباً إلى جنب مع باقى الوسائل الأخرى المتاحة والآمنة للمكافحة للحفاظ على صحة الإنسان والبيئه المحيطة به خالية من التلوث.