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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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**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 melt 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 (Atallah 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:

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

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

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

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

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

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 Eugenol 98%, of the chemical description 4-Allyl Veratrole1, 2-
Dimethoxy-4-Alllylbenzene and the empirical 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).

\[
\text{Total no. of counted B. zonata males} = \frac{\text{Obtained data were tabulated and statistically analyzed to calculate the means and the } r\text{-values (correlation coefficient) by using SPSS program version 14.0. As, the weather factors including the means of temperatures and relative humidity were obtained from the Meteorological Station at A.R.C.}}
\]

**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;
Field Studies on the Natural Role of the Predator

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 \(H. \text{pruni}\) 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.

<table>
<thead>
<tr>
<th>Months</th>
<th>Aphids' individuals</th>
<th>Weather factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adults</td>
<td>Nymphs</td>
</tr>
<tr>
<td></td>
<td>Pear</td>
<td>Plum</td>
</tr>
<tr>
<td>March, 2019</td>
<td>68 (1.72)</td>
<td>51 (7.23)</td>
</tr>
<tr>
<td>April</td>
<td>184 (2.21)</td>
<td>98 (4.28)</td>
</tr>
<tr>
<td>May</td>
<td>83 (1.01)</td>
<td>57 (0.77)</td>
</tr>
<tr>
<td>June</td>
<td>13 (2.99)</td>
<td>8 (1.16)</td>
</tr>
<tr>
<td>Mean total no./months</td>
<td>87.00 ± 35.66</td>
<td>48.50 ± 18.77</td>
</tr>
<tr>
<td>Months</td>
<td>Mean total no./ one tree</td>
<td>Mean total no./ one branch</td>
</tr>
<tr>
<td></td>
<td>Pear</td>
<td>Plum</td>
</tr>
<tr>
<td>March, 2019</td>
<td>131.90</td>
<td>23.50</td>
</tr>
<tr>
<td>April</td>
<td>277.90</td>
<td>76.50</td>
</tr>
<tr>
<td>May</td>
<td>274.20</td>
<td>160.50</td>
</tr>
<tr>
<td>June</td>
<td>14.50</td>
<td>22.97</td>
</tr>
<tr>
<td>Mean total no./months</td>
<td>174.63 ± 63.28</td>
<td>70.87 ± 32.41</td>
</tr>
</tbody>
</table>

*= 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.

<table>
<thead>
<tr>
<th>Months</th>
<th>The lacewing predator <em>C. carnea</em></th>
<th>Total no.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Eggs</td>
<td>Larvae</td>
</tr>
<tr>
<td></td>
<td>Pear</td>
<td>Plum</td>
</tr>
<tr>
<td>March, 2019</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>April</td>
<td>37</td>
<td>73</td>
</tr>
<tr>
<td>May</td>
<td>90</td>
<td>389</td>
</tr>
<tr>
<td>June</td>
<td>13</td>
<td>23</td>
</tr>
<tr>
<td>Total no. Months</td>
<td>143 (3-90)</td>
<td>486 (1-389)</td>
</tr>
<tr>
<td>Mean total no. months</td>
<td>35.75</td>
<td>121.50</td>
</tr>
</tbody>
</table>

(±) LOD
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.

<table>
<thead>
<tr>
<th>Months</th>
<th>Monthly ratio between (aphids' species : <em>C. carnea</em>)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pear</td>
</tr>
<tr>
<td>March, 2019</td>
<td>494.63 : 1</td>
</tr>
<tr>
<td>April</td>
<td>114.21 : 1</td>
</tr>
<tr>
<td>May</td>
<td>94.55 : 1</td>
</tr>
<tr>
<td>June</td>
<td>22.89 : 1</td>
</tr>
<tr>
<td><strong>General ratio (aphids' species : <em>C. carnea</em>)</strong></td>
<td>112.06 : 1</td>
</tr>
</tbody>
</table>

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).

<table>
<thead>
<tr>
<th>Test factors</th>
<th><em>r</em> values of temperature</th>
<th><em>r</em> values of relative humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The cotton aphid, <em>A. gossypii</em> (on pear trees)</strong></td>
<td>0.108</td>
<td>0.671***</td>
</tr>
<tr>
<td><strong>The mealy plum aphid, <em>H. pruni</em> (on plum trees)</strong></td>
<td>0.264</td>
<td>0.974****</td>
</tr>
<tr>
<td><strong>The lacewing predator, <em>C. carnea</em> (on pear trees)</strong></td>
<td>0.279</td>
<td>0.978****</td>
</tr>
<tr>
<td><strong>The lacewing predator, <em>C. carnea</em> (on plum trees)</strong></td>
<td>0.120</td>
<td>0.359</td>
</tr>
</tbody>
</table>

• 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 of *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.

<table>
<thead>
<tr>
<th>Months</th>
<th>Mean total numbers of <em>B. zonata</em> males attracted to traps</th>
<th>Weather factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control trap (contains two sticky sheets' faces of the trap - without pheromone)</td>
<td>One pheromone capsule + two sticky sheets' faces of the trap</td>
</tr>
<tr>
<td>2nd half of May, 2019</td>
<td>0.00</td>
<td>13.67</td>
</tr>
<tr>
<td>1st half of June</td>
<td>0.00</td>
<td>17.00</td>
</tr>
<tr>
<td>2nd half of June</td>
<td>0.00</td>
<td>4.67</td>
</tr>
<tr>
<td>1st half of July</td>
<td>0.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Mean total no. of <em>B. zonata</em> males (months)</td>
<td>0.00</td>
<td>9.84±3.80</td>
</tr>
<tr>
<td>(no males were attracted to control trap)</td>
<td>(2.00-17.00)</td>
<td>(6.00-42.33)</td>
</tr>
</tbody>
</table>

Statistical analysis: (the calculation of r-values)

<table>
<thead>
<tr>
<th>Tested factors</th>
<th>Tested factors × means of temperature</th>
<th>Tested factors × means of relative humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean total numbers of <em>B. zonata</em> males attracted to traps (containing one pheromone capsule on the trap), on one plum tree</td>
<td>0.779**</td>
<td>0.644**</td>
</tr>
<tr>
<td>Mean total numbers of <em>B. zonata</em> males attracted to traps (containing two pheromone capsules on the trap), on one plum tree</td>
<td>0.730**</td>
<td>0.203</td>
</tr>
</tbody>
</table>

• 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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Field Studies on the Natural Role of the Predator


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Field Studies on the Natural Role of the Predator

ARABIC SUMMARY

دراسات حقلية للدور الطبيعي لمفترس أسد المن المهاجم للمن في حديقة Chrysoperla carnea (Steph.) مختلطة لأشجار الكمنثى والبرقوق، مع تقدير الإمكانية لاستخدام مصائد فومورية ضد ذبابة الخوخ Bactrocera zonata (Saunders).

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أجري هذا العمل بغرض دراسة وتسجيل كثافة التعداد لنوعين من المن سجلت نشأتهما خلال الدراسة في حديقة (the cotton aphid Aphis gossypii) ومفترس أسد المن (the mealy plum aphid Hyalopterus pruni) من القطاع الكرمى ومن البرقوق الصوفي (Neuroptera: Chrysopidae).


كما تم عمل تجربة حقلية لتعظيم مصائد فومورية (sex pheromones) لجذب ذكور ذبابة الخوخ (Diptera: Tephritidae) Bactrocera zonata (Saund.) في خلال الفترة من النصف الثاني لشهر مايو - النصف الأول من شهر يوليو 2019). حيث كان أعلى عدد ذكور ذبابة الخوخ (B. zonata) في المصيدة النورمائية خلال النصف الأول من شهر يونية 2019. وذلك عند تشغيل المصيدة النورمائية واحدة تحتوى على كبسولة واحدة للفومون فقط أو كبسولتين على نفس المصيدة (بتكثيف عدد كبسولات الفومون عند التعظيم على نفس شجرة البرقوق).

وإجمالاً، يمكن استخدام مفترس أسد المن C. carnea، كعدي وعكسي، وعكسي كعدي في المعمل، ثم الإطلاق الحديقي لمكافحة كل نوعى المن على أشجار الكمثرى والبرقوق، أو الأشجار الأخرى الهاجمة التي تتعرض للإصابة بالمن. كما يمكن العمل أيضا على دمج التدريب المكثف لإستخدام المصائد الفومورية لمكافحة ذبابة الخوخ على أشجار البرقوق أو الأشجار الأخرى الهاجمة التي تتهامس نفسها الأفان. ويمكن أن يكون هذا الاستخدام للأسد المن C. carnea، وكذلك المصائد الفومورية، بمجرد ما تفعلا في إطار منظومة المكافحة المتكاملة للأفام، ضمن برنامجا جرياً إلى جنب مع باقي الوسائل الأخرى المتاحة (Integrated Pest Management) I.P.M والأمنة للمكافحة للحفاظ على صحة الإنسان والبيئة المحيطة به حاليا من التلوث.

I.P.M.