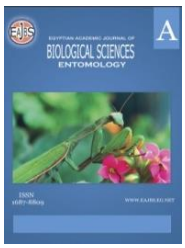
Citation: *Egypt. Acad. J. Biolog. Sci. (A. Entomology) Vol. 14(1) pp.271-286 (2021)*
DOI: 10.21608/EAJBSA.2021.162946

Egypt. Acad. J. Biolog. Sci., 14(1):271-286(2021)

Egyptian Academic Journal of Biological Sciences
A. Entomology

ISSN 1687- 8809
http://eajbsa.journals.ekb.eg/



Studies on The Possibility of Using the Three Biological Control Agents; The Predator *Ccoccinella undecimpunctata* L., the Predator, *Hippodamia convergens* Guer. and the Aphid Parasitoid, *Diaeretiellarapae* (M'Intosh), Against the Legume Aphid, *Aphis craccivora* Koch.

Ali, M. A. M.
Biological Control Research Department, Plant Protection Research Institute, Agriculture Research Center.
E. mail :**abonoraba@gmail.com**

ARTICLE INFO

Article History
Received:6/2/2021
Accepted:30/3/2021
Keywords:
Faba bean plants, The legume aphid, *Aphis craccivora,* Biolo gical control, Predators, *Ccoccinella undecimpunctata*, *Hippodamia convergens*, *Diaeretiella rapae*, Predatorś, and parasitoid releases.

ABSTRACT

In Egypt, the faba bean plants (*Vicia faba*L.) is considered as one of the most important field crops that are continuously and extensively grown year after year, representing a popular local feeding and market crop for the Egyptian people. This crop is subjected to attack by the legume aphid, *Aphis craccivora* Koch. (Homoptera: Aphididae), which cause obvious damage to the resulted faba bean crop.The obtained results indicated that the faba bean plants that were cultivated in the greenhouses of the two tested released cases of the ladybird beetles ; *Ccoccinella undecimpunctata* L. and *Hippodamia convergens* Guer. (Coleoptera: Coccinellidae) when were compared with that case of the unreleased control 1 were as follows: for the unreleased control 1, the mean total number of the legume aphid, *A. craccivora* individuals per the period of experiment 1 was 2360.92±419.77(100-5189) individuals. While, in there leased case of the ladybird beetle *C. undecimpunctata*, the corresponding mean total number of the legume aphid, *A. craccivora* individuals per the period of the experiment was 715.30±235.30 (100-2861) individuals and the percentage of the reduction in the total number of the aphid individuals per the period of the experiment was 69.70%.But, for the released caseof the ladybird beetle, *H. convergens*,the mean total number of the legume aphid, *A. craccivora* individuals per the period of the experiment was 933.00±247.47 (100-2975) individuals and the percentage of the reduction in the total number of the aphid individuals per the period of the experiment was 60.48%.However, in experiment 2, the mean total number of the legume aphid *A. Craccivora* individuals in the aphid parasitoid, *Diaeretiella rapae* (M'Intosh) (Hymenoptera: Braconidae) releasing case was 1380.76±248.84 (100-2711) individuals, in comparing with the unreleased control 2 cases (1672.79±313.10 (100-3582)). The total number of the mummies of the aphid parasitoid, *D. rapae* increased at the end of the experiment in the release case of the aphid parasitoid, *D. rapae*. This indicated that the *D. rapae* adults' parasitoids were emerged from the parasitized aphid mummies and began to parasitize newly aphid individuals and thus the total number of the aphid mummies were increased at the end of season (successful parasitism of the aphid parasitoid, *D. rapae* has occurred). Therefore, the obtained results revealed the important role of the two predators (the ladybird beetles; *C. undecimpunctata* & *H. convergens*) and also the aphid parasitoid, *D. rapae*, as three effective biocontrol agents (representing a major component of the biological control techniques) against the legume aphid, *A. craccivora*on the faba bean plants. As a result, they can be released in the faba bean fields and/or other related fields that suffer from the pest attack. They must be included in the Integrated Pest Management (I.P.M.) strategies, for decreasing the undesirable effects of using the chemical control methods.

INTRODUCTION

In Egypt, the faba bean plants (*Vicia faba*L.) are considered as one of the most important field crops that are continuously and extensively grown year after year, representing a popular local feeding and marketing crop for the Egyptian people. As, this crop constitutes and provides a major rich source of protein for humans (Ali, 2014). However, its plants are subjected to attack by many serious agricultural pests which reduces their quality and quantity such as; the legume aphid, *Aphis craccivora* Koch**.** (Homoptera: Aphididae) (Gaber *et al.,* 2015). This aphid species induces much severe damage to the faba bean plants by causing obvious economic losses in the yield and the quality of the resulted crops, where, these losses depend on the time and the intensity of the aphid infestation (Bishara *et al*., 1984). Aphids are polyphagus pests' species of the field crops especially family leguminosae and have ahigh reproductive capability and a rapid buildup of their population in a short time. In general, Srivastava *et al*. (2010) and Stanković *et al.* (2015) showed that the damage caused by their infestation includes sucking the plant sap by their piercing-sucking mouthparts, with the transmission of many of the viral diseases from the infected plants to the healthy ones. Moreover, aphids secrete honeydew, which prevents the photosynthesis process resulting in the wilt and the death of the agricultural plants and serves as a medium for developing the sooty mold fungi (Salman *et al.,* 2014).

Although the chemical control might provide satisfactory results in the pests' control, itis also responsible for the occurrence of the residual chemical problems and can interfere with the biological control methods of these pests (Gameel, 2004). As, their use for controlling the insects' pests has caused many environmental pollutions and many hygienic problems, that represent a risk for both people and the animals (Nicolas *et al.,* 2012). For example, some of the commonly used insecticides were found to not only decrease the aphid outbreak but also will be responsible for removing the aphid predatory species and allowing the aphid population to dramatically increase. Generally, the repeated application of the chemical insecticides in the field and in the greenhouse often favors unwanted effects such as pesticide resistance, the elimination of non-target species, the pest resurgence, and secondary pest outbreaks (Foster *et al.,* 2010). Their effects were led to the occurrence of the disruption in the natural balance that existed between these pests and the common natural enemies (Ibrahim *et al.,* 2014), such as the bees and the other pollinators, the insect parasitoids and the predators (Maghraby, 2012). The need of reducing pesticide usage has provided the need for the development of many of the effectives' alternatives to conventional chemical pesticides (El-Akhadar&Ouda, 2009).The field of the biological control techniques has received much crucial worldwide and revealed the presence of a significant impact as a possible safe and acceptable way in the insect's control programs (Bellows, 2001) and now, it is considered as the main factor of the integrated control programs (Machar &Drobilová, 2012). Therefore, this situation has directed the producers' attention to the biological control agents, especially the predators and the parasitoids, which are shown as effective and environmentally friendly management tools for insect pests control in the protected environments (Wan Yang *et al.,* 2014), where in the present time it has gained great attention with extensively developed and encouraged (Saranya *et al.,* 2010).Many natural enemies such as predators (as one of the main components of the biological control agents) play a noticeable natural role against the different insects' pests in the view of agriculture (El-Khawas, 2005). The predators that belong to the family Coccinellidae (Coleoptera) are characterized by their feeding during both the larval and the adult stages (Shalaby *et al.,* 2008), representing one of the most important insect families which have the potential to be used in the biological control in the agriculture as well as in the forestry (Evans, 2010), having a high foraging performance and high reproductive

efficacy (Rakhshan & Equbal, 2015). However, the aphidophagous ladybird beetles are considered as important cosmopolitan predators of the aphids' species in the agricultural crops (Omkar & Pervez, 2000) and have been receiving attention as biological control agents due to some of their characteristics, such as the ability to feed on a wide range of preys, to be very voracious and to have a rapid numeric response (Dixon, 2000). Therefore, the legume aphid, *A. craccivora*c on stitute one of the essential preys for the majority of Coccinellidae predators (Saharaoui *et al.*, 2001), where both of the adult and the larval stages of many coccinellid species feed on the aphids' species (Waldbauer, 1988). Of these predators, the ladybird beetle,*Coccinella undecimpunctata* L. (Coleoptera: Coccinellidae) was recorded as an effective biocontrol agent against many insects' pests and was considered as an interesting potential control agent in the context of Integrated Pest Management (I.P.M.) (Cabral *et al.*, 2011 and Arif *et al.*, 2017), representing one of the commonly observed predators in the faba bean fields (Ali *et al.*, 2013).Also, the ladybird beetle, *Hippodamia convergens* Guer. (Coleoptera: Coccinellidae) was recorded as an effective biocontrol agent against many insects' pests and was considered as an interesting potential control agent in the context of Integrated Pest Management (I.P.M.) (Bahy El-Din, 2014).Moreover, the insects' parasitoids constitute the main component of the biological control applications such as; the parasitoid *Diaeretiella rapae* (M'Intosh) (Hymenoptera: Braconidae), which is recorded as an important primary parasitoid of a wide range of the aphids' species in the world including Egypt, that was found to parasitize the legume aphid, *A. craccivora* (Saleh &Gatwary, 2007 and Ali, 2014).So, the present work was carried out to study the effect of releasing the adults of the two coccinellid ladybird beetles, *C. undecimpunctata* & *H. convergens* and the aphid parasitoid, *D. rapae*on the faba bean plants for controlling the legume aphid, *A. craccivora*, in Giza Governorate. Such experimental information is considered as one of the main concepts that may help in planning I.P.M strategies against the legume aphid, *A. craccivora* on the faba bean plants or other plants that are subjected to attack by the insect pest species, side by side with the other applied safe control methods, to decrease the environmental pollution.

MATERIALS AND METHODS

The present study was carried out in the experimentally designed greenhouses located in the Biological Control Research Department, Agricultural Research Centre (Giza Governorate), where the faba bean seeds (variety Maryout 1) were cultivated in the third week of November, 2020, while the period for carrying out the first and the second experiments were extended from the second & third weeks of January, 2021 till the second &weeks of February 2021, in the first and the second experiments, respectively. Five experimental cases were used for the two experiments, for studying the release of three biocontrol agents; the adults of the two coccinellid ladybird beetles, *C. undecimpunctata* &*H. convergens* and the aphid parasitoid, *D. rapae*, against the legume aphid, *A. craccivora* attacking the faba bean plants, in comparing with two unreleased control cases 1 and 2 (with no biocontrol agents release).

1-The Experimentally Designed Greenhouses:

The following steps were followed for carrying out the experiments in this study:

a-The five greenhouses cases that were used in all experiments representing 5.95m^2, each experimental case contains three replicates (i.e., each replicate was 1.19 m^2 =1.70m×0.70m). Where each replicate was represented by three double rows that were planted with 78 faba bean plants (=26 faba bean plants/one double row×3 double rows).

b-For the released case of the two biological control agents; *C. undecimpunctata* and *H. convergens,* in comparing with the unreleased control 1, they contain 234 plants (=3

cases×78 faba bean plants/one case). While, in the case of the released case of the aphid parasitoid *D. rapae,* in comparison with the unreleased control 2,it contains 156 faba bean plants (=2 cases ×78 faba bean plants/one case). So, the total cultivated faba bean plants for all five cases used were 390 plants (=5 cases×78 faba bean plants/ treatment) for all five tested cases.

c- The distances were equal (12.5cm) between the faba bean plants and the rows, while, the distance between the external limit from each side and the faba bean plants was 10 cm.

d-However, the investigated cases received all the recommended agricultural practices in these experimental greenhouses throughout the periods of the two experiments 1 &2; except the use of the chemical insecticides which were entirely avoided.

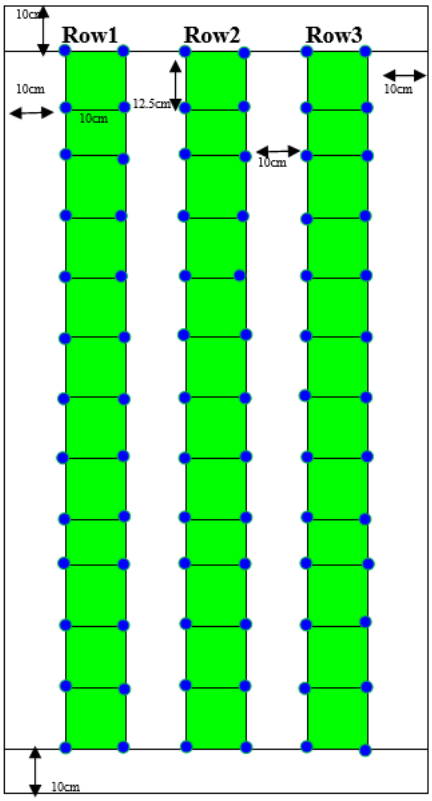


Fig. 1: The design of each of the experimental cases that were used for carrying out the study.

2-The Rearing Technique and Infestation of The Faba Bean Plants in The Greenhouses Cases by The Legume Aphid, *A. craccivora*:

The legume aphid, *A. craccivora* was reared in the laboratory on the faba bean plants, according to the technique previously shownby Bahy El-Din (2006).These laboratory aphid species were used for two purposes; the first one was for mass raring the three biocontrol agents (the two ladybird beetles; *C. undecimpunctata* & *H. convergens* and the aphid parasitoid, *D. rapae*) in the laboratory and the second one was for putting a suitable total primary number of 100 individuals on the faba bean plants as a laboratory infestation in all of the five experimental tested cases.

3- The Rearing and The Releasing of The Two ladybird Biological Control Beetles; *C. undecimpunctata* and *H. convergens* Adults on The Faba Bean Plants in The Experimental Greenhouses, That Were Infested by The Legume Aphid, *A. craccivora:*

1-The two coccinellids predators were collected from the faba bean and the clover fields and were mass-reared in the laboratory (at25±5C°&60±5%), on the legume aphid, *A. craccivora*, according to the technique previously shown by Bahy El-Din (2006).

2-For the experimental purpose, a total number of 25 pairs of each ladybird predatory species (i.e., 50 males and females adults were put in two cups each one cup was 4.5×5.5cm for each of the predatory species). The release of the two predatory ladybird beetles was made only one time on17/1/2021,according to the degree of the legume aphid, *A. craccivora* recorded infestation along with experiment 1.

4- The Rearing and The Release of the Aphid Parasitoid, *D. rapae*on the Faba Bean Plants in The Experimental Greenhouses That Were Infested by The Legume Aphid, *A. craccivora*:

1- The aphid parasitoid, *D. rapae* was collected from the parasitized cabbage aphid, *Brevicoryne brassicae* (L.) (Homoptera: Aphididae), from the cabbage fields and was mass-reared in the laboratory (at25±5C°&60±5%), on the legume aphid, *A. craccivora*, according to the technique previously shown by Abdel-Samad (2002).

2- A total number of 100 fresh formed mummies of the aphid parasitoid, *D. rapae* were put only one time in 24/12/2021, on the faba bean plants for the emergence of the adults' parasitoids of the aphid parasitoid, *D. rapae* for controlling the legume aphid, *A. craccivora*.

Fig. 2: The infestation of the faba bean plants by the legume aphid, *A. craccivora* under the greenhouse experimental cases located in Giza Governorate.

Fig. 3: The release of the two common predatory ladybird beetles against the legume aphid, *A. craccivora.*

1= The releasing the adults of the coccinellid ladybird beetle, *C. undecimpunctata* (11 spots).

2=The releasing the adults of the coccinellid ladybird beetle, *H. convergens*(13 spots).

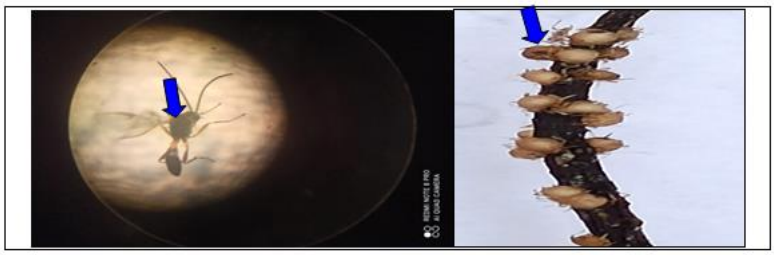


Fig. 4: The release of the aphid parasitoid,*D. rapae* against the legume aphid, *A. craccivora*.

A= The adult aphid parasitoid, *D. rapae*.

B= The aphid mummies of the released aphid parasitoid, *D. rapae* with the parasitoid emerging hole.

5- Sampling and the Obtained Data Calculations:

a- Sampling was done early in the morning on the faba bean plants during the period that was extended from the second & third weeks of January 2021 till the second &weeks of February 2021, in the first and the second experiments, respectively.

b- In the first experiment of releasing the two-ladybird beetle; *C. undecimpunctata* and *H. convergens*, random regular samples of 10 faba bean plants were carefully examined from each replicate (i.e., 30 faba bean plants were examined=10plants/one replicate×3replicates). A total number of 90 faba bean plants were examined in everyday of sampling for the three studied cases; the unreleased control 1 case (30 plants), the released case of the ladybird beetle, *C. undecimpunctata* (30 plants) and the released case of the ladybird beetle, *H. convergens* (30 plants). The total numbers of the legume aphid, *A. craccivora* individuals of the three tested cases were recorded and counted throughout the whole period of the faba bean plants sampling. The two released cases of the two common biocontrol agents (the two the ladybird beetle, *C. undecimpunctata &H. convergens*) were compared to the case of the unreleased control 1(no predators' release). The percentages of the reduction in the legume aphid, *A. craccivora* individuals' population in the two released cases were calculated and recorded in comparison with the unreleased control 1 case. These percentages of the reduction in the legume aphid, *A. craccivora* individuals' population was calculated according to the following equation:

$$\% \text{ Reduction in the mean total numbers of the legume aphid, } A. \text{ craccivora} = 100 - \frac{\text{Total no. of the legume aphid, } A. \text{ craccivora in either the released case either of the two ladybird beetles; } C. \text{ undecimpunctata \& } H. \text{ convergens}}{\text{Total no. of the faba bean aphid, } A. \text{ craccivora in the unreleased control cases either 1 or 2 (no predators' release)}} \times 100$$

c- In the second experiment of releasing the aphid parasitoid,*D. rapae* against the legume aphid, *A. craccivora*, a total number of 60 faba bean plants were carefully examined in everyday of sampling for the two studied cases; the unreleased control 2 cases (30plants) and the released control case of the aphid parasitoid, *D. rapae* (30 plants). The total numbers of the legume aphid, *A. craccivora* individuals of the two tested cases were recorded and counted. Also,the total numbers of the formed mummies of the aphid parasitoid, *D. rapae*in the released case of the aphid parasitoid, *D. rapae* were recorded and counted throughout the whole period of the faba bean plants sampling, as an indicator for the successful occurrence of the parasitism by the aphid parasitoid,*D. rapae*. The release case of the aphid parasitoid, *D. rapae*was compared to the case of the unreleased control 2 (no parasitoids release).

6- Statistical Analysis and The Weather Factors Correlation Relationships of The Obtained Data:

a-The obtained data were carefully tabulated and statistically analyzed to calculate the means and the R-values (the correlation coefficient) by using SPSS program version (15.0.).

b-The weather factors including the means of temperatures and the means of the relative humidity were obtained from the Meteorological Station at A.R.C., to find out the correlation relationships with the obtained data in this study.

RESULTS AND DISCUSSION

Data presented in Tables (1 &2) and Fig. (7), showed the effect of releasing the adults of the two coccinellid ladybird beetles; *C. undecimpunctata* &*H. convergens* and the aphid parasitoid, *D. rapae* on the faba bean plants for controlling the legume aphid, *A. craccivora,*in the greenhouses cases located in Giza Governorate.

1- The First Experiment of Releasing the Two Coccinellids Ladybird Beetles; *C. undecimpunctata* &*H. convergens* predators against the Legume Aphid, *A. craccivora* Individuals:

For the population density of the legume aphid, *A. craccivora* individuals in the unreleased control 1 case, as shown in Table (1) and Fig. (7), during the period of experiment 1, the legume aphid, *A. craccivora* individuals had a number of 100 individuals in 10/1/2021 (at means of the temperature of 17.10C˚&the relative humidity of 45.40%). They reached a maximum total number of 5189 individuals in 21/1/2021 (at 13.30C˚&57.90R.H. %). Finally, there was a total number of 1423 individuals in 7/2/2021 (at 17.50C˚&68.30R.H. %). The mean total number of the legume aphid, *A. craccivora* individuals per the period of experiment 1 was 2360.92±419.77(100-5189)individuals. However, the legume aphid, *A. craccivora* was recorded as a pest of the faba bean plants by many authors such as Mahmoud *et al.* (2015) and Abd El-Wareth (2016).

For the adults' predators of the ladybird beetle, *C. undecimpunctata* case, as shown in Table (1) and Fig. (7), during the period of experiment 1, the legume aphid, *A. craccivora* individuals had a number of 100 individuals in 10/1/2021 (at means of the temperature of 17.10C˚& the relative humidity of 45.40%). They reached a maximum total number of 2861 individuals in 17/1/2021 (at 16.30C˚&46.20R.H. %). Finally, there was a total number of 101 individuals in 7/2/2021 (at 17.50C˚&68.30R.H. %). The mean total number of the legume aphid, *A. craccivora* individuals per the period of experiment 1 was 715.30±235.30 (100-2861) individuals. The percentage of the reduction in the total number of aphid individuals per the period of the experiment was 69.70%. While, as shown in Table (1) and Fig. (7), for the adults' predators of the ladybird beetle, *H. convergens* case**,** during the period of experiment 1, the legume aphid, *A. craccivora* individuals had a number of 100 individuals in 10/1/2021 (at means of the temperature of 17.10C˚& the relative humidity of 45.40%). They reached a maximum total number of 2975individuals in 17/1/2021 (at 16.30C˚&46.20R.H. %). Finally, there was a total number of 227 individuals in 7/2/2021 (at 17.50C˚&68.30R.H. %). The mean total number of the legume aphid, *A. craccivora* individuals per the period of experiment 1 was 933.00±247.47 (100-2975) individuals. The percentage of the reduction in the total number of aphid individuals per the period of experiment 1 was 60.48%.

Many investigators such as; Benrey& Lamp (1994) showed that, in agricultural systems, the use of the natural enemy complexes, as opposed to a single enemy strategy, has been a controversial issue in the management and the biological control of pests. The aphidophagous ladybird beetles have been receiving attention as biological control agents due to some of their characteristics, such as the ability to feed on a wide range of prey, bevery voracious and having a rapid numeric response (Dixon, 2000). The predators that belong to the family Coccinellidae comprise one of the most active groups of the predatory species that gained the interest of many investigators as an important group of the predators in the field of the biological control of insects' pests attacking the different crop plants (Bahy El-Din, 2006). In addition, Rakhshan and Equbal (2015) stated that the coccinellid beetles due to their high foraging performance, immense predatory potential, and high reproductive efficacy, possess the potential to be effectively employed in biological control programs. The prey consumption increased with an increase in the number of the prey insects supplied as food (Watagodakumbura &Ahangama, 2001). The ladybird beetles are very popular cosmopolitan insects, most of which feed on aphids, mealy bugs, scale insects, whiteflies, thrips, leafhoppers, mites, or other small soft-bodied insects (Singh *et al.*, 2009). Fore example, the ladybird beetle, *C. undecimpunctata* is a euriphagous predator, which prefers to feed on aphids (Cabral *et al.,* 2011 and Ali *et al.,* 2013). Moreover, the ladybird beetle, *H. covergens* was recorded as a predator of aphids by El-Heneidy *et al.* (2008) and

Bahy El-Din (2014). Where, the legume aphid, *A. craccivora* constitutes the essential prey for the majority of the family Coccinellidae (Saharaoui *et al.,* 2001). In addition, Saranya *et al.* (2010) stated that, by taking into consideration the adverse effect of insecticides, pest management through biological control is encouraged by using predators, parasitoids and pathogens.

Table 1: Mean total numbers of the legume aphid, *A. craccivora* individuals that were recorded one the faba bean plants, in comparing; the unreleased control 1 (no predator release), with those recorded after releasing the two ladybird beetles, *C. undecimpunctata* and *H. convergens* against the pest, in Giza Governorate.

No.	Dates of sampling	The case of the ladybird beetle, *C. undecimpunctata*	The case of the ladybird beetle, *H. convergens*	The case of the unreleased control 1	The weather factors	
					Mean temperature (C°)	Mean R.H.%
1	10/1/2021	100	100	100	17.10	45.40
2	12/1	421	448	645	18.30	39.30
3	14/1	1103	1154	1327	19.90	34.20
4	17/1	2861	2975	3253	16.30	46.20
5	19/1	2060	2415	4043	17.70	55.00
6	21/1	891	1430	5189	13.30	57.90
7	24/1	609	1191	4329	14.90	65.30
8	26/1	349	696	3180	16.20	56.40
9	28/1	285	431	1678	15.30	47.50
10	31/1	218	403	1862	16.80	36.10
11	2/2	167	370	1970	20.30	37.50
12	4/2	134	289	1693	18.90	65.50
13	7/2	101	227	1423	17.50	68.30
Total (Range)		9299 (100-2861)	12129 (100-2975)	30692 (100-5189)	17.12C° (13.30-20.30C°)	50.35% (34.20-68.30%)
Mean ± S.E.		715.30±235.30	933.00±247.47	2360.92±419.77		
% Reduction in the total no. of the aphid individuals		69.70%	60.48%			

- Statistical analysis of the obtained data in Table (1) revealed that:
- There was no significant correlation between the total numbers of the aphid individuals in the case of the unreleased control 1 and the total numbers of the aphid individuals in the released one of the ladybird beetle *C. undecimpunctata* (the r-value was=0.479).
- There was a moderately significant correlation between the total numbers of the aphid individuals in the unreleased control case 1 and the total numbers of the aphid individuals in the released one of the ladybird beetle *H convergens* (the r-value was=0.647**).

There was a very highly significant correlation between the total numbers of the aphid individuals in the released one of the ladybird beetle *C. undecimpunctata* and the total numbers of the aphid individuals in the released one of the ladybird beetle *H convergens* (the r-value was=0.978****).

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

Fig. 5: The newly laid eggs and the formed larvae of the ladybird predatory beetles that were recorded after the release of these two common predatory species (*C. undecimpunctata* and *H. convergens*) against the legume aphid, *A. craccivora*.

Statistical analysis of the obtained data in Table (1) revealed that:
a-There was no significant correlation between the total numbers of the aphid individuals in the case of the unreleased control 1 and the total numbers of the aphid individuals in the released one of the ladybird beetle *C. undecimpunctata* (the r-value was=0.479).
b-There was a moderately significant correlation between the total numbers of the aphid individuals in the unreleased control case 1 and the total numbers of the aphid individuals in the released one of the ladybird beetle *H convergens* (the r-value was=0.647**).
c-There was a very highly significant correlation between the total numbers of the aphid individuals in the released case of the ladybird beetle *C. undecimpunctata* and the total numbers of the aphid individuals in the released one of the ladybird beetle *H convergens* (the r-value was=0.978****).

2- The Second Experiment of The Releasing of The Aphid Parasitoid, *D. rapae* against the Legume Aphid, *A. craccivora* Individuals:

For the population density of the legume aphid, *A. craccivora* individuals in the unreleased control 2 case, as shown in Table (2) and Fig. (7), during the period of experiment 2, the legume aphid, *A. craccivora* individuals had a number of 100 individuals in 21/1/2021 (at means of the temperature of 13.30C˚&the relative humidity of 57.90%). They reached a maximum total number of 3582 individuals in 14/2/2021 (at 15.50C˚&69.50R.H. %). Finally, there was a total number of 1894individuals in 18/2/2021 (at 12.20C˚&64.80R.H. %). The mean total number of the legume aphid, *A. craccivora* individuals per the period of experiment 2 was 1672.79±313.10 (100-3582) individuals.

For the aphid parasitoid, *D. rapae* case, as shown in Table (2) and Fig. (7), during the period of experiment 2, the legume aphid, *A. craccivora* individuals had a number of 100 individuals in 21/1/2021 (at means of the temperature of 13.30C˚&the relative humidity of 57.90%). They reached a maximum total number of 2711 individuals in 14/2/2021 (at 15.50C˚&69.50R.H. %). Finally, there was a total number of 1634 individuals in 18/2/2021 (at 12.20C˚&64.80R.H. %). The mean total number of the legume aphid, *A. craccivora* individuals per the period of experiment 2 was 1380.76±248.84 (100-2711) individuals.The total number of the mummies of the aphid parasitoid, *D. rapae* increased at the end of experiment2 in the release case of the aphid parasitoid, *D. rapae*. This indicated that the *D. rapae* adults' parasitoids were emerged from the parasitized aphid mummies and began to parasitize newly aphid individuals and thus the total number of the aphid mummies were increased at the end of season (successful parasitism of the aphid parasitoid, *D. rapae* has occurred). However, the aphid parasitoid,*D. rapae*was recorded in association with the field. The population of the legume aphid, *A. craccivora* infesting the faba bean plants (Ragab *et al.,* 2002; Saleh &Gatwary, 2007andAli, 2014),which is an important primary parasitoid of a wide range of the aphids' species in the world.

Statistical analysis of the obtained data in Table (2) revealed that:
1-There was a very highly significant correlation between the total numbers of the aphid individuals in the case of the unreleased control 2 and the total numbers of the aphid individuals in the case of the released aphid parasitoid, *D. rapae* (the r-value was=0.989****).
2-There was a moderately significant correlation between the total numbers of the aphid mummies of the aphid parasitoid, *D. rapae* and the total numbers of the aphid individuals in the case of the unreleased control 2 (the r-value was=0.741**).

Table 2: Mean total numbers of the legume aphid, *A. craccivora* individuals that were recorded per one the faba bean plants, in comparing; the unreleased control 2 (no predator release), with those recorded after releasing the aphid parasitoid, *D. rapae* against the pest, in Giza Governorate.

No.	Dates of sampling	The area of the parasitoid, *D. rapae*				Total no. of the aphid individuals in the unreleased control area 2	The weather factors	
		Total no. of the aphid individuals	Total no. of the aphid mummies	% formation of the aphid mummies	Total no. of increased mummies		Mean temperature(C°)	Mean R.H.%
1	21/1/2021	100	0	0.00	0	100	13.30	57.90
2	24/1	124	0	0.00	0	137	14.90	65.30
3	26/1	317	0	0.00	0	365	16.20	56.40
4	28/1	635	0	0.00	0	692	15.30	47.50
5	31/1	721	0	0.00	0	871	16.80	36.10
6	2/2	1667	0	0.00	0	1940	20.30	37.50
7	4/2	1704	100	5.86	0	2076	18.90	65.50
8	7/2	1759	105	5.96	5	2184	17.50	68.30
9	9/2	1858	131	7.05	31	2479	22.50	43.90
10	11/2	2425	257	10.59	157	3061	16.90	61.50
11	14/2	2711	346	12.76	246	3582	15.50	69.50
12	16/2	2295	362	15.77	262	2364	12.60	69.30
13	18/2	1634	387	23.68	287	1894	12.20	64.80
Total (Range) Mean ± S.E.		17950 (100-2711) 1380.76±248.84	1688 (0-387) 129.84±42.78	Mean % 6.28% (0-00-23.68%)	988 (0-287) 76.00±32.23	21745 (100-3582) 1672.79±313.10	16.37C° (12.20-22.50 C°)	57.19% (36.10-69.50%)

- Statistical analysis of the obtained data in Table (2) revealed that:
- There was a very highly significant correlation between the total numbers of the aphid individuals in the case of the unreleased control 2 and the total numbers of the aphid individuals in the case of the released aphid parasitoid, *D. rapae* (the r-value was=0.989****).
- There was a moderately significant correlation between the total numbers of the aphid mummies of the aphid parasitoid, D. *rapae* and the total numbers of the aphid individuals in the case of the unreleased control 2 (the r-value was=0.741**).

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

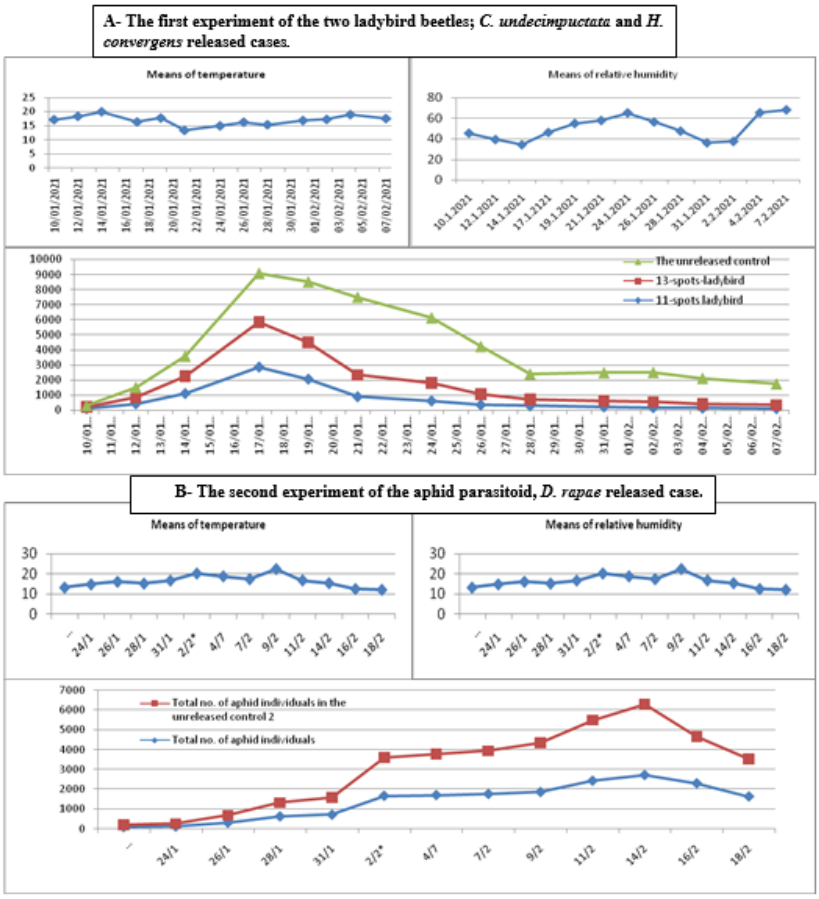


Fig. 7: The mean total numbers of the legume aphid, *A. craccivora* individuals that were recorded in the different experimental areas cultivated with the faba bean plants, in the greenhouses located in Giza Governorate.

5- The Relationships That Existed Between Many Tested Factors and The Weather Factors Concerning the Means of Temperatures and The Relative Humidity, In the Greenhouses Located in Giza Governorate:

Data obtained in Table (4) showed the correlation relationships (r-values) that were occurred between the mean total numbers of the legume aphid, *A. craccivora* individuals in the unreleased control 1 case, the mean total numbers the mean total numbers of the legume aphid, *A. craccivora* individuals in the released area of the aphid parasitoid, *D. rapae*, with the means of the temperatures and the relative humidity, in the greenhouses located in Giza Governorate.

Table 3: The correlation relationships(r-values) that were occurred between the mean total numbers of the legume aphid, *A. craccivora* individuals in the unreleased control 1 case, in the released cases of the two ladybird beetles; *C. undecimpunctata*, *H. convergens*,in the unreleased *control* 2 case and in the released case of the aphid parasitoid, *D. rapae*, with the means of the temperatures and the means of the relative humidity, in the greenhouses cases located in Giza Governorate.

No.	The tested factors	The weather factors	
		The means of the temperatures (C°)	The means of the relative humidity (R.H. %)
1	-The mean total numbers of the legume aphid, *A. craccivora* individuals in the unreleased control 1 case.	-0.608**	0.435
2	-The released case of the ladybird beetle, *C. undecimpunctata*.	-0.119	-0.079
3	-The released case of the ladybird beetle, *H. convergens*.	-0.242	0.034
4	-The mean total numbers of the legume aphid, *A. craccivora* individuals in the unreleased control 2 case.	0.276	0.284
5	-The released case of the aphid parasitoid, *D. rapae*.	0.208	0.526*
6	-The total numbers of the aphid mummies in the released case 2 of the aphid parasitoid, *D. rapae*.	-0.359	0.581*

- Statistical analysis of the obtained data in Table (3) revealed that:
- There was a negative moderate significant correlation between the mean total numbers of the legume aphid, *A. craccivora* individuals in the unreleased control 1case and the means of temperatures (C°) (the r-value was= -0.608**).
- There was no significant correlation between the mean total numbers of the legume aphid, *A. craccivora* individuals in the unreleased control 1case and the means of the relative humidity (R.H. %) (the r-value was=-0.435).
-There was no significant correlation between the released case of the ladybird beetle, *C. undecimpunctata* and the means of temperatures (C°) (the r-value was= -0.119).
-There was no significant correlation between the released case of the ladybird beetle, *C. undecimpunctata* and the means of the relative humidity (R.H. %) (the r-value was= -0.079).
-There was no significant correlation between the released case of the ladybird beetle, *H. convergens* and the means of temperatures (C°) (the r-value was= -0.242).
-There was no significant correlation between the released case of the ladybird beetle, *H. convergens* and the means of the relative humidity (R.H. %) (the r-value was= -0.034).
-There was no significant correlation between the mean total numbers of the legume aphid, *A. craccivora* individuals in the released case of the aphid parasitoid, *D. rapae* and the means of temperatures (C°) (the r-value was=0.208).
-There was a significant correlation between the mean total numbers of the legume aphid, *A. craccivora* individuals in the released case of the aphid parasitoid, *D. rapae* and the means of the relative humidity (R.H. %) (the r-value was=0.526*).
-There was no significant correlation between the mean total numbers of the aphid mummies in the released case of the aphid parasitoid, *D. rapae* case and the means of temperatures (C°) (the r-value was=-0.359).
-There was a significant correlation between the mean total numbers of the aphid mummies in the released case of the aphid parasitoid, *D. rapae* and the means of the relative humidity (R.H. %) (the r-value was=0.581*).

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

Statistical analysis of the obtained data in Table (3) revealed that:

1-There was a negative moderate significant correlation between the mean total numbers of the legume aphid, *A. craccivora* individuals in the unreleased control case 1 and the means of temperatures (C°) (the r-value was=-0.608**).

2-There was no significant correlation between the mean total numbers of the legume aphid, *A. craccivora* individuals in the unreleased control 1 case and the means of the relative humidity (R.H. %) (the r-value was=-0.435).
3-There was no significant correlation between the released case of the ladybird beetle, *C. undecimpunctata* and the means of temperatures (C°) (the r-value was=-0.119).
4-There was no significant correlation between the released case of the ladybird beetle, *C. undecimpunctata* and the means of the relative humidity (R.H. %) (the r-value was=-0.079).
5-There was no significant correlation between the released area of the ladybird beetle, *H. convergens* and the means of temperatures (C°) (the r-value was=-0.242).
6-There was no significant correlation between the released case of the ladybird beetle, *H. convergens* and the means of the relative humidity (R.H. %) (the r-value was= -0.034).
7-There was no significant correlation between the mean total numbers of the legume aphid, *A. craccivora* individuals in the released case of the aphid parasitoid, *D. rapae* and the means of temperatures (C°) (the r-value was=0.208).
8-There was a significant correlation between the mean total numbers of the legume aphid, *A. craccivora* individuals in the released case of the aphid parasitoid, *D. rapae* and the means of the relative humidity (R.H. %) (the r-value was=0.526*).
9-There was no significant correlation between the mean total numbers of the aphid mummies in the released case of the aphid parasitoid, *D. rapae* and the means of temperatures (C°) (the r-value was= -0.359).
10-There was a significant correlation between the mean total numbers of the aphid mummies in the released case of the aphid parasitoid, *D. rapae* and the means of the relative humidity (R.H. %) (the r-value was=0.581*).

CONCLUSION

1-The percentage of the reduction in the total number of the aphid individuals per the period of experiment 1 was 69.70%, in case of the released case of the ladybird beetle, *C. undecimpunctata*, in comparing with the unreleased control 1 case. While, the percentage of the reduction in the total number of the aphid individuals per the period of experiment1 was 60.48%, in case of the released case of the ladybird beetle, *H. convergens*, in comparing with the unreleased control 1 case.
3-The total number of mummies of the aphid parasitoid *D. rapae* increased at the end of experiment2 in the released case of the parasitoid, *D. rapae*. This indicated that the *D. rapae* adults' parasitoids were emerged from the parasitized aphid mummies and began to parasitize newly aphid individuals and thus the total number of the aphid mummies were increased at the end of season (successful parasitism of the aphid parasitoid, *D. rapae* has occurred).
4-The obtained results indicated the important role of releasing the two predators ladybird beetles;*C. undecimpunctata* &*H. convergens* and also the aphid parasitoid, *D. rapae*,as three biocontrol agents against the legume aphid, *A. craccivora* on the faba bean plants and/or the other related plants that suffer from pest attack. Using such biocontrol agents must be included in I.P.M. strategies, for substituting the chemical control methods in order to avoid the hazards of the direct insecticide application.
5-Statistical analysis of the obtained data concerning the correlation relationships (r-values), that were occurred between the mean total numbers of the legume aphid, *A. craccivora* individuals in the unreleased control case 1, the mean total numbers of the legume aphid, *A. craccivora* individuals in the released area of the two ladybird beetles, *C. undecimpunctata* &*H. convergens*, the mean total numbers of the legume aphid, *A. craccivora* individuals in the unreleased control case 2, the mean total numbers of the legume aphid, *A. craccivora* individuals in the released area of the aphid parasitoid, *D.*

rapae, with the means of the temperatures and the relative humidity, in the greenhouses cases located in Giza Governorate, revealed the following:

1-There was a negative moderate significant correlation between the mean total numbers of the legume aphid, *A. craccivora* individuals in the unreleased control case 1 and the means of temperatures (C◦) (the r-value was=-0.608**).

2-There was no significant correlation between the mean total numbers of the legume aphid, *A. craccivora* individuals in the unreleased control 1 case and the means of the relative humidity (R.H. %) (the r-value was=-0.435).

3-There was no significant correlation between the released case of the ladybird beetle, *C. undecimpunctata* and the means of temperatures (C◦) (the r-value was=-0.119).

4-There was no significant correlation between the released case of the ladybird beetle, *C. undecimpunctata* and the means of the relative humidity (R.H. %) (the r-value was=-0.079).

5-There was no significant correlation between the released area of the ladybird beetle, *H. convergens* and the means of temperatures (C◦) (the r-value was=-0.242).

6-There was no significant correlation between the released case of the ladybird beetle, *H. convergens* and the means of the relative humidity (R.H. %) (the r-value was= -0.034).

7-There was no significant correlation between the mean total numbers of the legume aphid, *A. craccivora* individuals in the released case of the aphid parasitoid, *D. rapae* and the means of temperatures (C°) (the r-value was=0.208).

8-There was a significant correlation between the mean total numbers of the legume aphid, *A. craccivora* individuals in the released case of the aphid parasitoid, *D. rapae* and the means of the relative humidity (R.H. %) (the r-valuewas=0.526*).

9-There was no significant correlation between the mean total numbers of the aphid mummies in the released case of the aphid parasitoid, *D. rapae* and the means of temperatures (C°) (the r-value was= -0.359).

10-There was a significant correlation between the mean total numbers of the aphid mummies in the released case of the aphid parasitoid, *D. rapae* and the means of the relative humidity (R.H. %) (the r-value was=0.581*).

REFERENCES

Abd El-Samad, S. S. M. (2002). Bioagents for controlling aphids in wheat field to minimize pesticide population. *Ph.D. Thesis, Faculty of Agriculture, Ain Shams University, Egypt*, pp.129.

Abd El-Wareth, H. M. (2016). Feeding sequence of *Aphis craccivora* Koch. by different levels of infestation density on different parts of faba bean under laboratory condition. *Egyptian Academic Journal of Biological Sciences A, Entomology,*9(2):69-75.

Ali, S. H. A. M. (2014).Parasitism percentages on *Aphis craccivora* Koch. On faba bean and cowpea plants in newly reclaimed land in Egypt. *Egyptian Journal of Agriculture Research, 92(3)*

Ali, S.H. A.M.; Saleh, A.A. and Mohamed, N. E. (2013). *Aphis craccivora* Koch. and predators on faba bean and cowpea in newly reclaimed areas in Egypt. *Egyptian Journal of Agriculture Research*, 91(4).

Arif, A.; Memon, S. A.; Mastoi, A. H.; Narejo, M. N.;Afza, A. M.and Ahmed, S. (2017). Biology and feeding potential of ladybird beetle (*Coccinella septempunctata*) against different species of aphids. *Science. International. (Lahore),* 29(6):1261-1263.

Bahy El-Din, I. A. E. (2006). Studies on the biology and feeding capacity of some

coccinellid species. *M. Sc. Thesis, Thesis, Faculty of Agriculture, Moshtohor Benha University, Egypt,* pp.158.

Bellows, T.S. (2001). Restoring population balance through natural enemy introductions. *Biological Control,* 21:199-205.

Benrey, B. and Lamp, W. O. (1994). Biological control in the management of plant hopper population. Pages519–550 in R. F. Denno and T. J. Perfect, editors. *Plant hoppers: their ecology and management.*

Bishara, S.I.; Fam, E.Z.; Attia, A.A. and El-Hariry,M. A. (1984). Yield losses of faba bean due to aphid attack. *FABIS Newsletter,* 10: 16-18

Cabral S.; Soares, A.O. and Garcia,P. (2011). Voracity of *Coccinella undecimpunctata*, effects of insecticides when foraging in a prey/plant system. *Journal Pest Science,*84 :373–379.

Dixon, A. F. G. (2000). Insect predator–prey dynamics: ladybirds and biological control. *Cambridge University Press, Cambridge, MA.*

El-Akhadar, E. A. and Ouda, S. M. (2009). Pathogenicity of different fungal isolates to the adult stage of the Mediterranean fruit fly *Ceratitis capitata* (Wiedmann). *Egyptian Journal of Biological Pest Control*, 19(1):5-10.

El-Khawas, M.A.M.(2005). Survey of predators associated with major insect pests on okra plants, in Qalubia Governorate. *Journal Agriculture Science Mansoura University,* 30(2):1105-1116.

Evans, E. W.(2010). Dynamics and impact of *Coccinella septempunctata* as an invasive ladybird beetle inNorth America. *IOBC/wprs Bulletin*, 58:31-37.

Foster, S.P.; Gorman, K. and Denholm,I. (2010). English field samples of *Thrips tabaci* show strong and ubiqui-tous resistance to Deltamethrin. *Pest Management Science,* 66:861–864.

Gaber, A. S. ; Abd-Ella, A. A.; Abou-Elhagag, G. H. and Abdel-Rahman, Y. A. (2015). Field efficiency and selectivity effects of selected insecticides on cotton aphid, *Aphis gossypii* Glover (Homoptera: Aphididae) and its predators. *Journal of Phytopathology and Pest Management,* 2(1):22-35.

Gameel, S. M. M. (2004). Eco-Biological studies on the black melon bug, *Coridius* (*Aspongopus*) *viduatus* F. (Hemiptera: Pentatomidae) in the New Valley. *Ph.D. Thesis, Faculty of Agriculture,* Assiut *University*, 209pp.

Ibrahim, A. A.; Soliman, N. A.; Shams El-Deen, M. M.; Ramadan, N. F. and Farag, S. R. (2014). Susceptibility of the peach fruit fly, *Bactrocera zonata* (Saunders) and the Mediterranean fruit fly *Ceratitis capitata* (Wiedmann) adults to the entomopathogenic fungi; *Metarhizum anisopiae* (Met.) and *Beauveria bassiana* (Bals.). *Egyptian Journal of Biological Pest Control*, 24(2):491-495.

Machar, I. and Drobilová, L. (2012). Ochranapřírody a krajiny v Česke Republice: vybranéaktuálníproblémy a možnostijejichřešení. 1. *Vyd. Olomouc: Univerzita Palackého v Olomouci, 2 sv. ISBN*: 978-80-244-3041-6.

Maghraby, H.M.M. (2012). Studies on the parasitoid, *Diaeretiella rapae* on some aphid species in Sharkia Governorate.*M. Sc. Thesis, Thesis, Faculty of Agriculture, Moshtohor Benha University, Egypt,* pp. 222.

Mahmoud, M. A.; El-Khawass, K. A.; Hammad, S.A. and Ali, M. I. (2015). Susceptibility of three faba bean cultivars to field infestation with legume aphid *Aphis craccivora* Koch. (Homoptera: Aphididae).*International Journal of Environment,* 4:116-120.

Nian-Wan Yang, A.; Lian-Sheng Zang, A.B.Su, W.; Jian-Ying Guo, A.; Hong-Xing Xu, C.; Fan Zhang, C. and Fang-Hao, W.,(2014). Biological pest management by predators and parasitoids in the greenhouse vegetables in China. *Biological*

Control, 68 92–102

Nicolas, D.; Thielemans, T.;Herbener, M. and Rosemeyer, V. (2012). The use of a mix of parasitoids to control all aphid species on protected vegetable crops. Integrated control in protected crops, Mediterranean climate. *IOBC-WPRS Bulletin,* 80:261–266.

Omkar and Pervez, A. (2000). Biodiversity in predaceous coccinellids (Coleoptera: Coccinellidae) in India- A review. *Journal of Aphidology,* 14: 41-66.

Rakhshan, M. D. and Equbal, A. (2015). Predatory efficiency of *Cheilomenes sexmaculata* (Fabricius) (Coleoptera:Coccinellidae) against *Aphis craccivora* Koch. on various hostplants of family Fabaceae. *European Scientific Journal June edition,* 11(18).

Saharaoui, L.; Gourreau, J. M. and Perti, G. I. (2001): Biological parameters of some aphidophgous coccinellids in Algeria (Coleoptera: Coccinellidae). *Bulletin de la Society Zoologique de France,*126 (4):351-373.

Saleh; A. A. A. and Gatwary; W. G. T. (2007). Seasonal abundance of the oleander aphid *Aphis nerii* Boyer De Fonscolombe (Homoptera, Aphididae) in relation to the primary and hyperparasitoid on dafla in Egypt. *Journal of Product and Development*, 12(2):709-730.

Salman, A.M.A.; El-Harery, M.A. and El-Solimany, E.A. (2014).Effects of Population Densities of *Aphis craccivora* Koch. on Predatory Efficiency of *Cuccinelli septempunctata* L., *Coccinella undecimpunctata L.*and *Chrysoperla carnea* Stephens. Larvae under Laboratory Conditions. *Middle East Journal of Agriculture Research,* 3(1):116-122.

Saranya, S. R.;Ushakumari, S. J. and Babu M. P. (2010). Efficacy of different entomopathogenic fungi against cowpea aphid, *Aphis craccivora* (Koch.). *Journal of Biopesticides,* 3(1):138–142.

Shalaby, F.F.; El-Heneidy, A.H.; Hafez, A.A. and Bahy El-Din,I. A. (2008). Seasonal abundances of common *Coccinella* species in some economic field crops in Egypt. *Egyptian Journal of Agriculture Research,* 86(1):303-317.

Singh, K. I.;Singh,C. H.; Singh,M. P. and Gupta,M. K. (2009). Predation efficiency of five coccinellid beetles on *Aphis craccivora* Koch infesting cowpea. *Journal of Biological Control*, 23(1):49-52.

Srivastava, M.; Gupta, U.P. and Sinha,A. (2010). Viral diseases of leguminous crops. *Journal of Science. Research*, 54:135-152.

Stanković, S.; Milošević, M. I. and Žikić, V. (2015). Potential candidates for biological control of the black bean aphid *Aphis fabae* in Serbia. *Biologica Nyssana*, 6(1):49-54.

Ragab, M.E.;Abou El-Naga, A.A.; Ghanim,A.A. and Saleh, A.A. (2002). Effect of host aphid species, temperature and food supple on some biological characteristics of the two aphid parasitoids, *Diaeretialla rapae* (M'Intosh) and *Aphidius* sp. (Hymenoptera: Aphidiidae). *Journal of Agriculture Science Mansoura University,* 27(7):4997-5002.

Waldbaur, G. (1988): The birder's Bug Book. *HavardUniversity Press, Cambridage, Massachusetts*.

Watagodakumbura, H.M.N.M. and Ahangama,D. (2001). Predatory action of coccinellid, *Cheilomenes sexmaculata* Fab. on bean aphid, *Aphis craccivora* Koch. *Tropical Agricultural Research,* 13:435-438.

ARABIC SUMMARY

دراسات على إمكانية استخدام ثلاثة كائنات مكافحة حيوية: المفترس أبو العيد ذو الإحدى عشر نقطة. وأبو العيد ذو الثلاثة عشرة نقطة. وطفيل المن ضد من البقوليات

محمد أحمد محمد على
قسم بحوث المكافحة الحيوية – معهد بحوث وقاية النباتات – مركز البحوث الزراعية.

يعتبر الفول البلدي من أهم المحاصيل الحقلية التي تزرع باستمرار وعلى نطاق واسع عامًا بعد عام في مصر، حيث يمثل الغذاء المحبب والشائع والأكثرتسويقًا للشعب المصري. ويتعرض هذا المحصول للإصابة بمن البقوليات (Homoptera: Aphididae) the legume aphid, *Aphis craccivora* Koch، مما يتسبب عنه حدوث ضرر واضح لمحصول الفول الناتج. وقد أشارت النتائج المتحصل عليها في هذه الدراسة، أن نباتات الفول التي تم زراعتها في الصوب الزراعية في التجربة الأولى في حالتي الإطلاق المختبرة الخاصة بالمفترسين: أبو العيد ذو الإحدى عشر نقطة *Coccinella undecimpunctata* L. وأبو العبد ذو الثلاثة عشرة نقطة *Hippodamia convergens* Geur.(Coleoptera: Coccinellidae) عند مقارنتها مع الحالة الأولى التي لم يتم فيها أي إطلاق للمفترسات (كنترول 1) كانت على النحو التالي: كان متوسط العدد الإجمالي لمن البقوليات *A. craccivora* خلال فترة التجربة 2360.92 ± 419.77 (100-5189) فردًا.بينما، في الحالة التي تم إطلاق أبي العيد ذو الإحدى عشر نقطة *C. undecimpunctata* فيها، كان متوسط العدد الإجمالي لمن البقوليات the legume aphid, *A. craccivora* 715.30 ± 235.30 (100-2861) فردًا خلال فترة التجربة والنسبة المئوية للخفض في التعداد الإجمالي للمن خلال فترة التجربة بلغت 69.70٪.ولكن في حالة إطلاق أبى العبد ذو الثلاثة عشرة نقطة *H.convergens*، كان متوسط العدد الإجمالي لمن البقوليات, *A. craccivora* the legume aphid في فترة التجربة 933.00 ± 247.47 (100-2975) فردًا والنسبة المئوية للخفض في التعداد الإجمالي للمن خلال فترة التجربة بلغت 60.48٪.وفى التجربة الثانية في هذه الدراسة، كان متوسط العدد الإجمالي لمن البقوليات, *A. craccivora* the legume aphid في حالة إطلاق طفيل المن *Diaeretiella rapae* (M'Intosh)(Hymenoptera: Braconidae) هو 1380.76 ± 248.84 (100-2711) فردًا ، مقارنته مع الحالة الثانية التي لم يتم فيها أي إطلاق للطفيل (كنترول 2) (1672.79 ± 313.10 (100-3582) فردًا).

لذلك، أوضحت النتائج التي تم الحصول عليها مدى عن الدور المهم للمفترسين أبى العيد ذو الإحدى عشر نقطة *C. undecimpunctata* وأبو العيد ذو الثلاثة عشرة نقطة *H. convergens* ، وكذلك طفيل المن *D. rapae* ، كعوامل فعالة في المكافحة الحيوية ، (تمثل عنصرًا رئيسيًا في تقنيات المكافحة البيولوجية) ضد من البقوليات the legume aphid, *A. craccivora*، على نباتات الفول. ولذا ، يمكن العمل على إطلاقها في حقول الفول أو المحاصيل الأخرى ذات الصلة والتي تهاجم بهذه الآفة ، كما يجب العمل على تضمينها في استراتيجيات الإدارة المتكاملة للآفات (I.P. M.) ، لتقليل الآثار الناجمة عن استخدام طرق المكافحة الكيميائية.