Seasonal abundance of the most important insect pests of maize and their natural enemies in Egypt

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Abstract: The experiment was conducted to study the seasonal abundance of the most important insect pests of maize and its relation with natural enemies and weather factors in Assiut governorate during 2019 and 2020 seasons. The samples were examined from June to September to determine the population of Limothrips cerealium (Haliday, 1836), Rhopalosiphum maidis (Fitch, 1856) and Sesamia cretica Lederer, 1857 and its the associated predators. The population of L. cerealium recorded a peak in the 4th week of July 2019 and the 1st week of August 2020. The highest population of R. maidis occurred in 1st week of September at both seasons. The simple correlation and regression between L. cerealium population and three weather factors were insignificant in both seasons while S. cretica population were found to be significant with R.H%. The population of R. maidis in the 1st season was insignificant negative with temperatures but was significant in the 2nd season. The plant age was more effective than the weather factors on the population of the three insect pests. The common predators were Orius albidipennis (Reuter, 1884) and Scymnus interruptus (Goeze, 1777) which were highly significant with all three insect pests.

Keywords: insect population, climatic factors, Zea mays, predators

Introduction

Maize (Zea mays Linnaeus, 1753) (Poaceae) is an important crop in many developing countries for food and industrial cereal (Ande et al. 2008). In terms of world area and production, maize occupies the 3rd place after wheat and rice (FAOSTAT 2019). It belongs to class of cereals that cultivated under a wide range of environmental conditions (El-Gepaly 2007). Moreover, the economic importance of maize has been greatly increased since it is used for consumption of human and livestock’s; and as a source of industrial raw material for the production of bio products such as oil, alcohol, corn flakes, starch, fructose, etc.

In Egypt, the area cultivated with maize in 2013 reached about 840 336 hectares, which produced about 7 million tons of grain yield, with an average of 9.96 Ardabs/ hectares (Statistics yearbook, 2013). Even though the area cultivated with maize in Egypt is increasing year after another, the annual production of such strategic crop still covers only about 50% of its consumption needs.

The factors that limit maize production are diverse, some of the most important being insects. The corn plants are subjected to attack by several insect pests that cause a great damage to crop, which can lead to losses in yield and quality in case of high pest population levels (Bereś et al. 2013). The most economic harmful insects for maize are stem borers, aphids and thrips (Bereś et al. 2007). Limothrips cerealium (Haliday, 1836)
(Thysanoptera, Thripidae) is a polyphagous species which occurs worldwide. The economic damage of corn thrips infestation is caused by severe feeding activity of adults and nymphs on green plant tissues. In addition to, the thrips are virus vectors such as tospoviruses, and by sucking plant cells they facilitate the spread of bacterial and fungal diseases (Kucharczyk et al. 2011).

Corn leaf aphid *Rhopalosiphum maidis* (Homoptera, Aphididae) (Fitch, 1856), a polyphagous species of aphid known to attack more than 30 genera of the cereal crops in tropical and warm climates. Severe infestation of this aphid can cause serious yield losses of cereals through feeding damage, tassel cover by honeydew and viral infection (Blackman & Eastop 2000). In Egypt, it feeds on many gramineous weeds and cereals and is a serious pest of corn crops (Al-Eryan & El-Tabbakh 2004). The most important lepidopteran stem borers in Egypt is *Sesamia cretica* Lederer, 1857 (Lepidoptera, Noctuidae). This insect attacks maize and sorghum plants at ages less than 4–6 week old. The damage of the insect in young plants appears through its feeding on the whorl leaves that causes dead heart. On the other side, its feeding on the older plants causes longitudinal tunnels. Maize plants are broken below or above ear level, due to the infestations the grain yield subsequently is affected (Ezzeldin et al. 2009).

The damage due to insect pest complex depends upon their population trends in the field which, in turn, rely upon them dynamically of the physical factors of their immediate environment (Zulfiqar et al. 2010). A thorough understanding of the exact relationship between the change in environmental factors and those in the pest population may not only help anticipate the pest losses to the crop, but also help avoid them through some well-timed pest control measure (Aasman 2001). Abiotic factors like temperature and relative humidity play a vital role in the development of insect pests’ fluctuation.

Biological control is a component of an integrated pest management strategy. Where, it takes a part in the reduction of pest populations by natural enemies. Predators are mainly free-living species that consume a large number of preys during their lifetime (Pfannenstiel & Yeargan 2002, Musser et al. 2004).

The most important predators of maize pests in Egypt were *Coccinella undecimpunctata* (Linnaeus, 1758) (Coleoptera, Coccinellidae), *Chrysoperla carnea* (Stephens, 1836) Neuroptera, Chrysopidae), *Paederus alfieri* Fabricius, 1775 (Coleoptera, Staphylinidae) and *Syrphus corollae* Fabricius, 1794 (Diptera, Syrphidae) (Ibrahim et al. 1995, El-Wekeel 1997). The same authors showed significant relationships between *R. maidis* and *C. undecimpunctata*, *P. alfieri*, *Orius albidipennis* Reuter, 1884 (Heteroptera, Anthocoridae) and *Orius laevigatus* (Fieber, 1860). Similar relationships between *S. cretica* larvae and *C. undecimpunctata* and *Scymnus interruptus* (Goeze, 1777) (Coleoptera, Coccinellidae) were observed.

The present study aimed to investigate the effect of biotic and abiotic factors on the most important insect pests of maize during the two successive seasons: 2019 and 2020. In addition to survey of natural enemies associated with the insect pests in Egypt.

**Materials and methods**

**Experimental design**

The experiment was conducted at the farm of Agricultural Research Center, Assiut governorate during 2019 and 2020 seasons starting from 1st June until 15th September at two seasons. The experiment was laid out in randomized complete block design (RCBD) on single cross 10 variety of maize. An area of about 262.5 m² was divided into 4 plots, each measuring 21 X 3.0 meters separated by ridges and irrigation canals of suitable size. Every plot consisted of 30 rows 3 meters long
and 70 cm apart. Sowing was practiced during the 1st week of Jun in two seasons. All normal agricultural practices were performed without insecticide treatments.

**Plant samples**

The plots were investigated weekly for the presence of insects from June to September. Moreover, the data on the population of insect pests were collected by selecting plants/plot at random and by taking visual count of the insect pests when they had virtually vanished from the field. At all samples, the 10 plants in each plot were examined and count the following:

**Insect pests**

Maize thrips, aphid (nymphs and adults) and the number of pink stem borers larvae were recorded/plant in each sample was taken as the population index.

**Predators**

Direct counts of predators from ten randomly chosen plants / plot on the leaf surfaces or under the leaf sheath of corn plants were carried out weekly. Also, yellow sticky cards were placed in the field to attract the predators. Predators were collected and preserved for identification in tubes containing 70% ethyl alcohol. Their species were identified by Department of Taxonomy, Plant Protection Research Institute, Agricultural Res. Center, Giza, Egypt. The numbers of all stages of natural enemies were determined using the obtained data throughout the two successive seasons.

**Weather factors**

Daily meteorological data on minimum and maximum temperatures (D. Mn. T. and D. Mx. T.) in degree centigrade and relative humidity (D.R.H) (%) were recorded from the Agrometeorological station of the Ministry of Agriculture, Dokki, Giza throughout the two studied seasons.

**Statistical analyses**

Simple correlation (r), simple regression (b) and partial regression (P. reg.) were performed to study the effect of each of the three previously mentioned weather factors on the insect population. Also, explained variance (E.V. %) and (F value) of the combined effect of these factors were calculated. As well as, the relationship between the plant age and population of insect pests were detected. Running means ((a+b+c)/3) of obtained data was used in data analysis to reduce sampling errors over different counts. Obtained data was analyzed as simple and multiple polynomial models, using Proc REG in SAS (Statistics and graphics guide, 2003). Data was fitted to the polynomial model, where plant age was presented as third degree of polynomial (i.e. Age, Age^2 and Age^3). Weather factors (i.e. max, min temperatures were considered as linear ones). The multiple polynomial equation becomes:

\[ Y = a + b_1 T_{\text{max}} + b_2 T_{\text{min}} + b_3 \text{RH} + b_4 \text{Age} + b_5 \text{Age}^2 + b_6 \text{Age}^3 \]

where:

- \(a, b_1, b_2, b_3, b_4, b_5, b_6\) = mathematical constants
- \(T_{\text{max}}\) = maximum temperature
- \(T_{\text{min}}\) = minimum temperature
- \(\text{RH}\) = relative humidity
- \(\text{Age}\) = Plant age per week

**Results and discussion**

**Population fluctuations**

Presented data (Tables 1, 2; Figs. 1, 2) show the weekly population fluctuations of the major pests infesting the corn plants (*Limothrips cerealium*, *Rhopalosiphum maidis* and *Sesamia creatica*) and their relations to weather factors during 2019 and 2020 seasons.
Table 1. Population fluctuation densities, plant age, day maximum temperature, night minimum temperature and daily mean relative humidity of three insect pests infesting corn plants during 2019 season (DMxT – Day Maximum Temperature, NMnT – Night Minimum Temperature, DmRH – Daily mean Relative Humidity).

| Sampling date | Limothrips cerealium | Rhopalosiphum maidis | Sesamia cretica | Plant age [days] | Weather factors |
|---------------|----------------------|----------------------|-----------------|-----------------|-----------------|
|               |                      |                      |                 |                 | DMxT °C | NMnT °C | DmRH [%] |
| June          |                      |                      |                 |                 |         |         |         |
| 20            | 128                  | 0                    | 2               | 20              | 38      | 23      | 33      |
| 27            | 203                  | 0                    | 6               | 27              | 43      | 22      | 29      |
| July          |                      |                      |                 |                 |         |         |         |
| 4             | 246                  | 0                    | 11              | 34              | 39      | 22      | 38      |
| 11            | 266                  | 0                    | 8               | 41              | 38      | 22      | 42      |
| 18            | 231                  | 4                    | 13              | 48              | 41      | 23      | 31      |
| 25            | 311                  | 7                    | 5               | 55              | 40      | 24      | 43      |
| August        |                      |                      |                 |                 |         |         |         |
| 1             | 292                  | 13                   | 3               | 62              | 40      | 24      | 43      |
| 8             | 213                  | 19                   | 7               | 69              | 44      | 27      | 31      |
| 15            | 172                  | 11                   | 2               | 76              | 42      | 23      | 46      |
| 22            | 112                  | 38                   | 5               | 83              | 37      | 23      | 46      |
| 29            | 81                   | 111                  | 3               | 90              | 38      | 22      | 36      |
| September     |                      |                      |                 |                 |         |         |         |
| 5             | 52                   | 196                  | 1               | 97              | 39      | 22      | 35      |
| 12            | 28                   | 98                   | 0               | 104             | 40      | 24      | 43      |
| Total         | 2335                 | 497                  | 66              | --              | --      | --      | --      |

Table 2. Population fluctuation densities, plant age, day maximum temperature, night minimum temperature and daily mean relative humidity of three insect pests infesting corn plants during 2020 season (DMxT – Day Maximum Temperature, NMnT – Night Minimum Temperature, DmRH – Daily mean Relative Humidity).

| Sampling date | Limothrips cerealium | Rhopalosiphum maidis | Sesamia cretica | Plant age [days] | Weather factors |
|---------------|----------------------|----------------------|-----------------|-----------------|-----------------|
|               |                      |                      |                 |                 | DMxT °C | NMnT °C | DmRH [%] |
| June          |                      |                      |                 |                 |         |         |         |
| 20            | 78                   | 0                    | 4               | 20              | 43      | 24      | 34      |
| 27            | 100                  | 0                    | 7               | 27              | 43      | 25      | 30      |
| July          |                      |                      |                 |                 |         |         |         |
| 4             | 104                  | 0                    | 13              | 34              | 40      | 24      | 42      |
| 11            | 152                  | 1                    | 19              | 41              | 42      | 25      | 39      |
| 18            | 192                  | 3                    | 22              | 48              | 42      | 24      | 40      |
| 25            | 228                  | 7                    | 15              | 55              | 41      | 22      | 34      |
| August        |                      |                      |                 |                 |         |         |         |
| 1             | 331                  | 14                   | 9               | 62              | 41      | 24      | 38      |
| 8             | 249                  | 23                   | 7               | 69              | 42      | 26      | 33      |
| 15            | 187                  | 18                   | 3               | 76              | 42      | 25      | 43      |
| 22            | 173                  | 30                   | 2               | 83              | 37      | 23      | 46      |
| 29            | 123                  | 69                   | 3               | 90              | 38      | 22      | 36      |
| September     |                      |                      |                 |                 |         |         |         |
| 5             | 56                   | 91                   | 2               | 97              | 37      | 20      | 40      |
| 12            | 24                   | 43                   | 1               | 104             | 41      | 23      | 48      |
| Total         | 1997                 | 299                  | 107             | --              | --      | --      | --      |
At two seasons, the highest population density of aphid individuals occurred in 1st week of September with a total number 196 and 91 individuals/sample, respectively at D. Max. T. of 39°C and 37°C and D. Min. T. was 22°C and 20°C with 35% and 40% R.H. for the two seasons, respectively.

In general, the lowest population was reported by Bereš et al. (2013) who study the infestation. The population of *S. cretica* was higher in the second season (recording total number 107 insects) than in the first season (total number was 66 insects) (Table 1, 2).

Similar population fluctuations have been reported by Bereš et al. (2013) who study the...
Table 4. Correlation coefficient of the different predator species on the population density of three insect pests infesting maize plants at 2019 and 2020 seasons (r – simple correlation, ** – Highly Significant, * – Significant).

| Season | Predator                     | *L. cerealium* | *R. maidis* | *S. cretica* |
|--------|------------------------------|----------------|-------------|--------------|
|        |                              | r   | p-value     | r   | p-value   | r   | p-value   |
| 1st    | *Coccinella undecimpunctata* | 0.5785* | 0.0383       | -0.2009 | 0.5103   | 0.4888 | 0.096 |
|        | *Paederus alfieri*           | 0.1529 | 0.6178       | -0.3053 | 0.3104   | 0.1245 | 0.6852 |
|        | *Orius albidipennis*         | -0.3617 | 0.2246       | 0.4611  | 0.1128   | -0.3322 | 0.2676 |
|        | *Scymmus interruptus*        | 0.7499** | 0.0032       | -0.6902** | 0.009   | 0.7309** | 0.0045 |
|        | *Chrysoperia carnea*         | 0.2300 | 0.4495       | -0.1941 | 0.5251   | 0.2084 | 0.4944 |
| 2nd    | *Coccinella undecimpunctata* | 0.09411 | 0.7597      | 0.6767* | 0.0111   | -0.4931 | 0.0864 |
|        | *Paederus alfieri*           | 0.6065* | 0.0250       | 0.02176 | 0.9438   | -0.1120 | 0.7155 |
|        | *Orius albidipennis*         | 0.6043* | 0.0287       | 0.17091 | 0.5767   | -0.2413 | 0.4270 |
|        | *Scymmus interruptus*        | 0.4498 | 0.1230       | -0.5354* | 0.0593   | 0.7427** | 0.0036 |
|        | *Chrysoperia carnea*         | 0.6249* | 0.0224       | -0.2388 | 0.4319   | 0.4044 | 0.1704 |

different species of thrips on the sweet corn plants during three seasons. They showed that, one peak of population appear in 2nd week of May at 2008 season and the last week of May at 2009 and 2010 seasons. A similar observation that recorded in the present study they monitored a single population peak during the second half of July. In agreement with our results, Kurolí (2002) in Hungary found that the average number of aphids was 24.99 per corn plant. In Egypt, Farag et al. (1992) found that *S. cretica* had two periods of activity, during May and between 30th June and the first week of August, on maize. El-Gepaly 2007 in Egypt also, mentioned that the mean number of aphid were 69.95 and 156.57 aphids/plant at 2004 and 2005 seasons. At two seasons, the aphid appeared in the 2nd and 4th week of July, respectively. The mean numbers of aphids increased gradually reaching its peak of 231.67 and 143 insects/maize on 22nd August and 24th September at two seasons. Abd-El samed (2006) showed that the activity of *R. maidis*, *Rhopalosiphum padi* (Linnaeus, 1758) and *Aphis gossypii* Glover, 1877 have one peak on maize plants during summer plantation.

EL-Khayat et al. (2016) found that population of *R. maidis* were 1 640 and 1 250 individuals/sample, respectively and recorded one peak at the 2nd week of August in both seasons 2012 and 2013. El-Gepaly 2007 reported that the mean number of *S. cretica* larvae in maize was 1.88 and 1.55 larvae at seasons of 2004 and 2005, respectively. He found one peak/season. The peaks formed on August 29th (4.0 larvae/5 plants) and September 3rd (4.33 larvae/5 plants) at 2004 and 2005 seasons. Effect of climatic factors and plant age on the insect pests populations

- The corn thrips, *L. cerealium* (Haliday, 1836)

The values of both simple correlation (r) and partial regression (b) coefficient between *L. cerealium* population and maximum temperature or minimum temperature were positive and insignificant, while, relative humidity was negative and insignificant in both seasons (Table 3). The statistical analysis showed that the effect of plant age on population of thrips was the most effective factor during the two seasons. The explained variance (E.V.%) was 97.83% and 90.97%, respectively.

The combined effect of the climatic factors on the *L. cerealium* was insignificant and the
Fig. 1. Population fluctuations of *Limothrips cerealium*, *Rhopalosiphum maidis* and *Sesamia cretica* in relation to maximum and minimum temperatures and relative humidity during 2019 season.
Fig. 2. Population fluctuations of *Limothrips cerealium*, *Rhopalosiphum maidis* and *Sesamia cretica* in relation to maximum and minimum temperatures and relative humidity during 2020 season.
Fig. 3. Population density of natural enemies associated with insect pests on corn plants during 2019 and 2020 seasons.
E.V.% presented 10.58% & 19.88% during the two seasons, respectively. The effect of the plant age on the *L. cerealium* were highly significant and the E.V.% was 97.89% and 90.97%, respectively at two successive seasons. When adding the effect of plant age to the effect of weather factors on the *L. cerealium* led to increase the explained variance until reached to 98.76% at 2019 and 94.89% at 2020 (Table 3).

- The corn leaf aphid *Rhopalosiphum maidis* (Fitch, 1856)

Data presented in Table (3) showed that, there is an insignificant negative relationship between D. Mx. T. or D. Min. T. and population of *R. maidis* in 1st season but is significant negative in the 2nd season. While the relationship between R.H% and population of *R. maidis* was insignificant positive at two seasons. According to the third-degree equation, the plant age factor was the highly effect on the aphid population. The explained variance (E.V.%) was 86.36% and 88.73% in both seasons, respectively.

The combined effect of the climatic factors on the *R. maidis* was insignificant at 2019 season and it was significant at 2020 season. The explained variances (E.V.%) were 9.58% & 65.81% during the two seasons, respectively. On the other hand, at two seasons the combined effect of the climatic factors and plant age on the maize aphid were highly significant and the E.V.% was 96.41% and 97.27%, respectively (Table 3).

- The stem borer, *Sesamia cretica* Lederer, 1857

The correlation and regulation of larval population of *S. cretica* was found insignificant with maximum and minimum temperature but significant with R.H% during two seasons. The results showed that the effect of plant age on population of *S. cretica* was more effective than the three weather factors. The relationship between population and plant age was significantly high and the E.V.% was 86.34 and 93.14% at 2019 and 2020 seasons, respectively. (Table3)

The combined effect of the climatic factors was weak on the *S. cretica* population and insignificant during the two seasons. The
explained variance presented 10.58 \& 19.88\% during the two seasons, respectively. While, the explained variance of the combined effect of the climatic factors and plant age were higher than the explained variance of each separately factor. The combined explained variance reached to 95.08 at 2019 and 95.86 \% at 2020 season (Table 3).

The available literature provides relatively scarce information on the insect pests found on corn in the current study. Bereś et al. 2013 demonstrated a positive correlation between temperature and the number of adult Frankliniella tenuicornis (Uzel, 1895) (Thysanoptera, Thripidae) and Haplothrips aculeatus (Fabricius, 1803) (Thysanoptera, Thripidae) individuals on sweet corn during 2008 – 2010 years. Farag et al. (1992) showed that the populations of R. maidis were significantly affected by temperature and relative humidity, with relative humidity being the most important. El-Gepaly 2007 mentioned that All weather factors (D.Max.T., D.Min.T and R.H.\%) had almost insignificant correlation with R. maidis infestation at two seasons except D.Min.T showed significant at 2005 season.

Survey of natural enemies associated with insect pests

Data presented in figure (3) summarize the number of predator larvae and adults collected from maize plots planted at the two seasons 2019 and 2020. Five predaceous species were collected during the two seasons. These species included: three Coleopterous, i.e. Coccinella undecimpunctata (Coccinellidae) and Scymnus interruptus. (Coccinellidae) and Paederus alfieri (Staphylinidae), one Hemipterous, Orius albidipennis (Anthocoridae) and one Neuropteran, Chrysoperla carnea (Chrysopidae).

• Coccinella undecimpunctata (Linnaeus, 1758)

At the first season, C. undecimpunctata population appeared on the 3\textsuperscript{rd} week of June until the 1\textsuperscript{st} week of September. The highest population was recorded in 3\textsuperscript{rd} and 4\textsuperscript{th} weeks of July (6 individuals per 10 plants). At the second season, the predator appeared later than the first season, nearly 2 weeks. The population increase gradually and reach 11 individuals per 10 plants at the end of August. Generally, total number of C. undecimpunctata on the 2\textsuperscript{nd} season was higher than in the first season (55 and 47 individuals per season, respectively) (Fig. 3A).

• Scymnus interruptus (Goeze, 1777)

At both seasons, the S. interruptus appear from the 1\textsuperscript{st} week of investigation until the last week of August. The population peak of abundance was detected in the 4\textsuperscript{th} and 3\textsuperscript{rd} week of July throughout the two seasons, respectively. (Fig. 3 B). The total number of S. interruptus in the first season was double on the second season (56 and 28 individuals per season, respectively).

• Paederus alfieri Fabricius, 1775

The population of P. alfieri appeared on the 3\textsuperscript{rd} week in both June and July until the 2\textsuperscript{nd} and 1\textsuperscript{st} week of September at 2019 and 2020 season, respectively. The total number of P. alfieri was equal in both seasons (Fig. 3C).

• Orius albidipennis Reuter, 1884

Data in Figure 3 D summarized that the first appearance of O. albidipennis was recorded in 3\textsuperscript{rd} week of June (6 insects per 10 plants) in the 1\textsuperscript{st} season but it appeared one week late in the 2\textsuperscript{nd} season (2 insects per 10 plants). The population peak of abundance recorded in August, 22 in the first season (29 individuals per 10 plants) and August 15 in the second (22 individuals per 10 plants). The total number of O. albidipennis in the first season was higher than on the second season (154 and 103 individuals per 10 plants, respectively).

• Chrysoperla carnea (Stephens, 1836)

At both seasons, few numbers of C. carnea was found in all period of investigation. The
total number of this predator was 25 individuals at 2019 season and 29 at 2020 season (Fig. 3 E).

Generally, in figure 4 summarized that the population of predators was higher in 2019 season than 2020 season. On both seasons, the most common predators were *O. albidipennis* which recorded high number followed by *S. interruptus*. On other hand, *P. alfieri* was the least important predators on maize pests and recorded the lowest number.

**The correlation between population density of maize insect pests and its predators:**

Data in Table 4 present the correlation analysis between the population densities of the three insect pests and their predators on maize during 2019 and 2020 seasons. Significant positive correlation values were obtained between the total numbers of *C. undecimpunctata* predator and *L. cerealium* in 1st season (*r* = 0.5785) or *R. maidis* in 2nd season (*r* = 0.6767). All population densities of *P. alfieri*, *O. albidipennis* and *C. carnea* predators were positive significant with *L. cerealium* only on the second season. In addition, the relationships for the total number of *S. interruptus* predators were highly significant with all three insect pests on the 1st season but on the 2nd season, this relationship were highly significant with *S. cretica* (*r* = 0.7427) and only significant with *R. maidis* (*r* = -0.5354).

The above results were agreement with those obtained by Paulian (1999) who stated that the chrysopids played the key role in controlling aphids. Chrysopid occurrence in maize fields was permanent from mid June to mid September, not depending on aphid colony density. Daware *et al.* (2004) showed that no significant increase in *Chrysopa* population was observed in different intercropping systems of cotton, black gram, and soybean. Paulian (1999) found the coccinellids on maize from the beginning of July. They established later, only if plants were strongly colonized by aphids. Pfannenstiel & Yeargan (2002) found that the predation of coccinellid, *Coleomegilla maculata* De Geer, 1775 increased through the beginning of August and then declined on the last sampling date in sweet-corn. Tawfik *et al.* (1974) found that *Scymnus spp.* recorded two peaks, the first peak was on 27th August and the second on 1st October, while *Orius spp.* recorded one peak on 10th September. Helmy (2014) mentioned *Chrysoperla carnea* as a predator to *Hemiberlesia lataniae* (Signoret, 1869) (Hemiptera, Diaspididae) in the field to control this pest and gave a good reduction percentage. Also, El-Gepaly (2007) reported that, nine predaceous species were collected from corn fields during the two plantations of seasons 2004 and 2005. Results showed that the population density of the predators and its prey (*R. maidis*) was positively and significantly correlated over all planting dates and seasons. The most abundant predators were *Orius spp.*, *Scymnus spp* and *C. undecimpunctata* which significantly increased with the increase of their prey.

**Conclusion**

In the study years, the results demonstrated a positive correlation between whether factors and the number of *L. cerealium*, *R. maidis* and *S. cretica*. The plant age considered more effective than the weather factors on the population of the three insect pests. The value of explained variance increased when adding the effect of plant age to the effect of weather factors on the insect pests. Also, the results of the present study assure the presence the role of destructive predators in reducing the population of the maize insect in the ecosystem of corn fields of Assiut governorate, Egypt.

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