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## SUMMARY

### **I- Ecological studies :**

#### **I-1- Survey of predatory insects associated with cotton pests :**

The predatory insects found associated with the injurious insects attacking cotton in Mansoura region during 2003 and 2004 seasons were six species namely, *C. undecimpunctata*, *C. carnea*, *P. alfierii*, *S. syriacus*, *O. albidipennis* and *M. corollae*. The density of *C. undecimpunctata* was gradually increased in the 1<sup>st</sup> week of May and peaked in the 3<sup>rd</sup> week of July then decreased gradually until the end of the season during 2003 season, while in the second season, it peaked in the 2<sup>nd</sup> week of June.

*Chrysoperla carnea* increased gradually till peaked around the last week of May then decreased until the end of the two successive seasons (2003 and 2004).

#### **I-2- Survey of predatory insects associated with corn pests :-**

The most abundant species of the predatory insects which associated with corn pests were *P. alfierii*, *O. albidipennis* and *S. syriacus*. *P. alfierii* had three sharp peaks in the 1<sup>st</sup> week of July, the 3<sup>rd</sup> week of August and the mid-October during 2003 season. The same trend was occurred in the second season (2004).

*Orius albidipennis* had three peaks during the two successive seasons on the last week of June, the 1<sup>st</sup> week of August and the mid-September then decreased until the end of the season .

### **I-3- Survey of predatory insects associated with tomato pests :-**

The predatory insects found associated with the injurious insects attacking tomato plants in Mansoura region during the two successive seasons 2003/2004 and 2004/2005 were *C. undecimpunctata*, *C. carnea*, *S. syriacus* and *P. alfierii*. All these predators increased gradually till reached their peaks then decreased again until the end of seasons .

*Coccinella undecimpunctata* had three peaks in the 1<sup>st</sup> week of November, the mid of December and the last week of December then decreased until the end of the season during 2003/2004 season, while during 2004/2005 season, it had two peaks in the mid of December and the last week of December then decreased gradually until the end of the season.

### **I-4- Survey of predatory insects associated with potato pests :-**

The most abundant species of the predatory insects which associated with potato pests were *C. undecimpunctata*, *C. carnea*, *S. syriacus* and *P. alfierii* during the two successive seasons 2003/2004 and 2004/2005 seasons in Mansoura region.

*Coccinella undecimpunctata* had two peaks in 2003/2004 season in the mid of December and the last week of December . While it had three peaks during 2004/2005 season in the 3<sup>rd</sup> week of November, the mid of December and the last week of December then decreased gradually until the end of the season .

*Chrysoperla carnea* increased gradually till peaked in the 3<sup>rd</sup> week of December then decreased gradually until the end of the two successive seasons of 2003/2004 and 2004/2005 .

## **Activity of *Bemisia argentifolii* parasitoids under field conditions :**

### **I- On cotton plants :**

The highest parasitism percentage by *E. aegypticus* was occurred during August (21.0%), while the highest parasitism by *E. lutea* was occurred during July (67.0%) during 2003 season after that the parasitism by each of the two parasitoids decreased until the end of season.

During the second season (2004), the maximum parasitism percentage by *E. aegypticus* was occurred during June and July, while it occurred during November by parasitism with *E. lutea*.

### **II- On maize plants :**

The highest parasitism by *E. aegypticus* was occurred during July during the first season 2003, while it was occurred during October in the second season 2004.

Data also presented that parasitism percentage by both parasitoids was low during the second season than in the first season.

### **III- On tomato plants:**

There were a lot of *B. argentifolii* nymphs and pupae but without any parasitism during October in the two successive seasons (2003/2004 and 2004/2005). The first present of parasitoids was occurred during November in the two successive seasons.

The maximum parasitism percentage by *E. aegypticus* was occurred during January, 2004 in the first season and during December in the second season.

#### **IV- On potato plants :**

The first appearance of parasitism by *E. aegypticus* was occurred during November in the first season and during December in the second season.

The first appearance of *E. lutea* was occurred during December, 2003 in the first season and during November, 2004 in the second season.

#### **Survey of true spiders :**

##### **1- In cotton fields :**

Cotton plants which were surveyed from August to December during two years indicated that family Saltcidae was the most abundant one and *P. paykulli* (Audouin) was the most abundant species . Family Lycosidae which collected by using pitfall traps was the second in abundant and presented by *L. ferox* (Lucas).

##### **2- In maize fields :**

Similar trend of true spider species presence in cotton fields were obtained in maize fields . Family Salticidae was the most abundant one with most numbers presented by *P. paykulli*. The spider *C. jovium* contributed the second most abundant (Family : Clubionidae).

##### **3- In tomato fields :**

The results indicated that family Titanoenocidae was the most abundant one. Family Lycosidae was collected by using pitfall traps was the second abundant and followed

by philodromidae. Few individuals of families Gnaphosidae, Mituregidae, Theridiidae and Salticidae were collected in the two seasons.

#### **4- In potato fields :**

The results indicated that family Lycosidae was collected by using pitfall traps was the most numerous followed by family Philodromidae, while few individuals were collected from families Araneidae and Dictynidae during the two seasons of study.

### **Biological studies of the parasitoid, *Eretmocerus aegypticus* Evans & Abd-Rabou (Hymenoptera: Aphelinidae) :**

#### **1- Incubation period:**

The incubation period of *E. aegypticus* ranged from 3 to 4 and from 3 to 4 with a mean of  $3.2 \pm 0.7$  and  $3.6 \pm 0.5$  for female and male, respectively at  $27 \pm 2^\circ\text{C}$  and  $60 \pm 5$  R.H.% .

#### **2- Duration of immature stages of *E. aegypticus* female:**

The larvae of *E. aegypticus* passes through three instars. Total larval period ranged from 5 to 8 days with a means of  $6.7 \pm 0.9$ . The prepupa and pupa lasted one day and from 4 to 5 with a means of  $1.0 \pm 0.0$  and  $4.5 \pm 0.5$  days, respectively. The total developmental period of the parasitoid lasted from 13 to 18 days with a mean of  $15.4 \pm 1.1$  days under the constant conditions of  $27 \pm 2^\circ\text{C}$  and  $60 \pm 5$  R.H.% .

#### **3- Duration of immature stages of *E. aegypticus* male:**

Total larval period ranged from 5 to 7 days with a mean of  $5.8 \pm 0.5$ . The prepupa and pupa lasted one day and from 2 to 3 with a means of  $1.0 \pm 0.0$  and



2.3±0.5 days, respectively. The total developmental period of the parasitoid lasted from 12 to 15 days with a mean of 12.9±0.9 days under the constant conditions of 27±2°C and 60±5 R.H.% .

#### **4- Longevity :**

Longevity of female parasitoid ranged from 8 to 14 days. The mean was 10.7±1.8 days, while that of male parasitoid ranged from 7 to 11 days with mean of 8.6±1.4 days, under controlled conditions 27±2°C and 60± 5 R.H.%).

#### **5- Fecundity :**

The total numbers of eggs per female ranged from 20 to 49 with the mean of 35.2±8.2 eggs. under controlled conditions 27±2 °C and 60± 5 R.H.% .

### **Biological studies of *Nurscia albomaculata* :**

#### **Incubation period :**

The incubation period of *N. albomaculata* on female under controlled conditions (25±2°C and 50-60% R.H.) ranged from 7 to 10 days with a mean of 8.4±1.4 days but with male ranged from 8.0±0.12 with a mean of 8.8±1.8 days .

#### **Duration of female spiderlings of *N. albomaculata* :**

The nymph of *N. albomaculata* passes through six spiderlings each one fed on essential stage of *S. littoralis*. The first and second spiderling of *N. albomaculata* fed on the first instar of *S. littoralis*, whereas the third spiderling of *N. albomaculata* fed on the third instar of *S. littoralis*. The fourth spiderling of *N. albomaculata* fed on the third instar of *S. littoralis*. The fifth and sixth spiderling of *N. albomaculata* fed

on the same stage of *S. littoralis* (the fourth instar). The average duration of total development period was  $94.57 \pm 6.83$  days .

#### **Duration of male spiderlings of *N. albomaculata* :**

Results indicated that the male nymph of *N. albomaculata* fed on the same trend of female on the same stages of *S. littoralis*. The average of duration of the total developmental period was  $83.9 \pm 4.7$  days.

Female spiderling consumed an average of  $4.1 \pm 0.9$ ,  $9.2 \pm 0.95$ ,  $14.1 \pm 1.07$ ,  $34.2 \pm 1.6$ ,  $92.4 \pm 6.6$  and  $192.9 \pm 20.6$  larvae during each stage, respectively. In addition, male spiderlings consumed  $4.4 \pm 0.5$ ,  $8.4 \pm 1.0$ ,  $25.1 \pm 3.2$ ,  $36.7 \pm 1.1$ ,  $42.2 \pm 2.1$  and  $89.4 \pm 5.4$  larvae, respectively .

#### **Release of *Phytoseiulus macropilis* on potato plants :**

In general, when the predatory mite, *P. macropilis* was released on potato plants which infested with the two-spotted spider mite, the pest population decreased in a positive relation with the level predator release (two or five or ten individuals / pot) .

Population of *T. urticae* (on the release pot) generally remained at nearly its initial level for about 24 days after predator release, then population rapidly decreased until the end of the experiment to reach 20, 3 and 3 individuals / pot in the release rate of 2, 5 and 10 predator / pot, respectively.

In the check pots, the pest population gradually increased to reach its highest level in the last inspection (1270 individuals / pot).

The *T. urticae* reduction reached about 90% after 20, 28 and 28 days when the predator at release rate of two, five and ten individuals / pot, respectively. The

maximum pest reductions were 100, 100 and 98 at the end of the experiment in November 14 at the previous predator rates, respectively.

According to data analysis there were non-significant variations within the different rates of release (two, five and ten predator individuals / pot), but there were significant variations between all the different rates of releases and check treatments.

### **Release of *T. evanescens* on cotton plants :**

#### **1- Population dynamic of pink bollworm, *Pectinophora gossypiella* :**

The numbers of male of PBW per trap per 3 days during the period extending from June, 10 till September, 31 during the first season (2004) and from June, 4 till September, 19 during the second season (2005).

The PBW moths exhibited two sharp peaks during the two successive seasons. The average captured males during July ranged between 10-82 and 15-48 moths / 3 days in first and second locations, respectively. Whereas, the average captured males ranged between 15-123 and 36-72 moths / 3 days in first and second locations, respectively during the second season (2005).

#### **2- Population density of *P. gossypiella* in *T. evanescens* release plots**

The numbers of male moths of PBW in egg parasitoid as well as check plots before and after release of *T. evanescens* (male / trap / 3 days) during the two successive seasons.

#### **Before release of *T. evanescens* :**

Average number of PBW males in the first location plots in the first season recorded 18.66 and 26.66 males / trap / 3 days in both treatments and check plots, respectively. Whereas, as the average numbers in the second location recorded 23.83 & 26.33 males / trap / 3 days in treatment and control units, respectively.

**After release of *Tichogramma* :**

Average numbers in Belqas in the first season recorded 16.83 and 30.56 males / trap / 3 days in treatment and check plots, while the average numbers in El-Senbellaween recorded 18.4 and 31.0 males / trap / 3 days in treatment and check plots, respectively.

In the second season, the average number in Belqas recorded 23.22 and 51.8 males / trap / 3 days in treatment and check plots , whereas these recorded 27.9 and 47.6 males / trap / 3 days in treatment and check plots, respectively.

**Reduction percentage in boll infestation :**

The reduction in boll infestation was reached 21% and 34% by releasing 20000 parasitoids / fed. in Belqas and El-Senbellaween, respectively during 2004 season. Whereas, the percentage of reduction in the second season (2005) was reached 36% and 35% by releasing the same rate of release of the parasitoid.

## CONCLUSIONS

**The following presents the conclusions of the current investigation :**

1. The predatory insects found associated with the injurious insects attacking cotton in Mansoura region during 2003 and 2004 seasons were six species namely, *C. undecimpunctata*, *C. carnea*, *P. alfierii*, *S. syriacus*., *O. albidipennis* and *M. corollae* .
2. The most abundant species of the predatory insects which associated with corn pests were *P. alfierii*, *Orius albidipennis* and *S. syriacus*.
3. The predatory insects found associated with the injurious insects attacking tomato plants in Mansoura region during the two successive seasons 2003/2004 and 2004/2005 were *C. undecimpunctata*, *C. carnea*, *S. syriacus* and *P. alfierii*.
4. The most abundant species of the predatory insects which associated with potato pests were *C. undecimpunctata*, *C. carnea*, *S. syriacus* and *P. alfierii* during the two successive seasons 2003/2004 and 2004/2005 seasons in Mansoura region.
5. On cotton plants the highest parasitism percentage by *E. aegypticus* was occurred during August (21.0%), while the highest parasitism by *E. lutea* was occurred during July (67.0%) during 2003 season .
6. The parasitism by *E. aegypticus* was high during July during the first season 2003, while it was occurred during October in the second season 2004 on maize plants.
7. The maximum parasitism percentage by *E. aegypticus* was occurred in tomato during January, 2004 in the first season and during December in the second season.

8. On potato the first appearance of parasitism by *E. aegypticus* was occurred during November in the first season and during December in the second season.
9. Cotton and maize plants which were surveyed during two years indicated that family Saltcidae was the most abundant one .
10. In tomato fieldes the results indicated that family Titanoenocidae was the most abundant one .
11. Family Lycosidae was collected from potato fieldes by using pitfall traps was the most numerous followed by family Philodromidae .
12. The larvae of *E. aegypticus* passes through three instars. The total developmental period of the parasitoid lasted from 13 to 18 days with a mean of  $15.4 \pm 1.1$  days under the constant conditions of  $27 \pm 2^{\circ}\text{C}$  and  $60 \pm 5$  R.H.% .
13. Longevity of female parasitoid ranged from 8 to 14 days. The mean was  $10.7 \pm 1.8$  days, while that of male parasitoid ranged from 7 to 11days with mean of  $8.6 \pm 1.4$  days, under controlled conditions  $27 \pm 2^{\circ}\text{C}$  and  $60 \pm 5$  R.H.%).
14. The true spider, *N. albomaculata* passes through six spiderlings each one fed on essential stage of *S. littoralis*.
15. Both male and female of *N. albomaculata* fed on the same stages of *S. littoralis*. Thus *N. albomaculata* a promise to use in biological control program against *S. littoralis* in different field crops.
16. *P. macropilis* a successive candidate to use with rate of ten individuals / pot because the reduction percentage of *T. urticae* reached 90% after 20 days of release.
17. By using the release of *T. evanescens* the reduction in boll infestation was reached 21% and 34% by releasing 20000 parasitoids / fed. in Belqas and El-Senbellaween, respectively during 2004 season.