

## SURVEY OF PREDATORS ASSOCIATED WITH MAJOR INSECT PESTS ON OKRA PLANTS, IN QALUBIA GOVERNORATE.

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### ABSTRACT

This study was conducted to survey the major piercing sucking insect pests and their associated predators during summer crop of okra plants in the two successive seasons, 2003 and 2004, in Qalubia Governorate. The maximum total numbers of *Aphis gossypii* individuals were recorded during the last and third week of August, 2003 and 2004, respectively. The maximum numbers of *Bemisia tabaci* individuals were counted with their maximum numbers in the second week of August, 2003 and 2004. The jassids, *Empoasca* spp. individuals were peaked in the third week of September, 2003 and in the last week of August, 2004. *A. gossypii* was the most abundant pest species, followed by *B. tabaci* and *Empoasca* spp. Ants and *Chrysoperla carnea* were the most abundant predators, associated with the major insect pests attacking okra plants. Generally, the present study showed that, the natural role of the biocontrol agents in okra fields must be enhanced and developed. Also, it revealed that, the three predators; *C. carnea*, *Scymnus* spp. and *Coccinella undecimpunctata*, could have a promising role when planning Integrated Pest Management (I.P.M.) strategies, with other safe methods, to protect the surrounding environment from pollution.

Keywords : Okra, Pests, Predators, *Chrysoperla carnea*, Population dynamics.

### INTRODUCTION

The importance of cultivating vegetables has extensively increased year after year, due to their economic value. Egyptian farmers prefer cultivation of such crops which represent one of the main sources of their income. Okra (*Hibiscus esculentus*) is one of the most favorite vegetable crops, that its green and dry pods are locally consumed for their high quality of nutrients. Okra plants are subjected to attack by several insect pest species, causing considerable damage and consequently affecting the quantity and quality of the yield (Jaydeb *et al.*, 1999).

Many natural enemies such as predators play a noticeable role against different insect pests. So, workers in biological control fields have diverted their attention to encourage this role by maintaining proper habitats to attain their efficiency (Hafez, 1994). Protecting these beneficial agents from the undesirable uses of harmful insecticides is very necessary. The excessive use of these insecticides, particularly those of long residual effects, has disrupted the natural balance existed between pests and their natural enemies (Amer and Marei, 2001).

The present study was carried out to study the population fluctuations of abundant piercing sucking insect pests and their associated predators, in the summer crop of okra in 2003 and 2004. Such ecological information is

considered as one of the main concepts for planning I.P.M. strategies in okra as well as other vegetable crops.

## **MATERIAL AND METHODS**

The study was carried out in summer crop of okra fields in Qalubia Governorate, during 2003 and 2004. An area of one feddan was chosen in Kafer- Hamza region (an area of widely cultivated okra), for recording the major piercing sucking insect pests attacking okra plants. This area received all the normal recommended agricultural practices throughout the period of investigation, except chemical insecticides. Weekly samples of 200 leaves (50 plants x4 leaves / plant), were examined at random. Examination started when the plants were 14 days old (at the second week of April) and ended in the last week of September (at pods collection time).

Direct counts (in the field) of the cotton aphid, *Aphis gossypii* (adults and nymphs), the whitefly, *Bemisia tabaci* (adults) and the jassids, *Empoasca* spp. (adults and nymphs), were carefully done early in the morning on both surfaces of plant leaves. At the same time, the most common predators observed associated with the previous major pests were identified and counted. Then, the infested leaves were picked, kept in paper bags and transferred to the laboratory for further examination and actual counts of *B. tabaci* nymphs, by the aid of a stereomicroscope. Obtained data were statistically analyzed according to procedures outlined by Snedecor and Cochran (1980). The correlation coefficient (*r*) and the least significant differences (L.S.D.) test was run to compare the means at 0.05 levels, using SAS program (SAS Institute, 1994). Moreover, the weather factors including the means of temperature and relative humidity, were obtained from the Meteorological station at A.R.C.

## **RESULTS AND DISCUSSION**

### **Survey of major piercing sucking insect pests.**

The aphid, *Aphis gossypii* (Glov.) (Homoptera: Aphididae), was the only recorded aphid species attacking okra plants, during the two seasons, 2003 and 2004. The winged adults of *A. gossypii* (alate form), firstly appeared on okra plants after 14 days from planting (on the 2<sup>nd</sup> week of April). After that, wingless individuals started to appear during the 3<sup>rd</sup> week of April. Aphid population (winged and wingless individuals) increased gradually until reaching their maximum number of 1485 individuals /200 leaves, during the last week of August, 2003 (at 29.1 C° and 64.0 % R.H.). In 2004 season, the corresponding maximum number was 1383 individuals / 200 leaves, during the 3<sup>rd</sup> week of August (at 27.7 C° and 55.5 % R.H.). Then, aphid population decreased until the end of the season in the last week of September, 2003(the total number was 127 individuals) and September, 2004 (91 individuals/200 leaves). The mean total numbers of aphid individuals per season were 570.76 (127-1485) and 525.72 (91-1383) individuals / 200 leaves, seasons, 2003 and 2004, respectively (Tables,1 and

2). Al-Eryan *et al.* (2001) showed that, *A. gossypii* attacked summer crop of okra plants, where aphid infestation started in July and reached its maximum peak in late August.

Data in Tables (1 and 2) reveal that, the infestation by the whitefly, *Bemisia tabaci* (Genn.) (Homoptera : Aleyrodidae) , was found on okra plants after 30 and 44 days from planting , in 2003 and 2004, respectively. Many authors reported *B. tabaci* as a pest of okra plants (Kumar & Moorthy, 2000; Praveen & Dhandapani, 2001 and Yin *et al.*, 2002). Adults and nymphs were recorded all over the season in both years.

**Table (1) :Total numbers of the piercing sucking insect pests attacking okra plants during season, 2003, in Qalubia Governorate.**

Dates of inspection	No. of major piercing sucking insect pests			Total no. of sucking pests	Mean total no. of sucking pests / leaf	Weather factors	
	<i>A. gossypii</i>	<i>B. tabaci</i>	<i>Empoasca</i> spp.			Mean C°	Mean R.H. %
10/4/2003	182	0	0	182	0.91	17.9	64.0
17/4	491	0	0	491	2.46	21.0	51.0
24/4	534	4	0	538	2.69	24.2	54.0
1/5	879	11	1	891	4.46	20.3	59.0
8/5	857	24	11	892	4.46	23.7	58.0
15/5	868	25	19	912	4.56	25.2	53.0
22/5	572	36	14	622	3.11	26.2	58.0
29/5	349	130	25	504	2.52	31.2	41.0
5/6	370	149	33	552	2.76	26.6	58.0
12/6	288	110	49	447	2.24	25.6	56.0
19/6	460	126	59	645	3.23	28.0	59.0
26/6	221	246	45	512	2.56	27.5	58.0
3/7	170	327	33	530	2.65	29.1	58.0
10/7	176	345	27	548	2.74	25.5	67.0
17/7	211	195	24	430	2.15	26.6	70.0
24/7	439	198	13	650	3.25	28.2	67.0
31/7	851	197	25	1073	5.37	27.1	65.0
7/8	463	233	21	717	3.59	28.1	71.0
14/8	662	349	25	1036	5.18	28.7	72.0
21/8	1410	96	27	1533	7.67	29.1	66.0
28/8	1485	86	31	1602	8.01	29.1	64.0
4/9	1075	39	43	1157	5.79	29.0	63.0
11/9	672	50	116	838	4.19	30.5	60.0
18/9	457	17	226	700	3.50	29.6	61.0
25/9	127	13	168	308	1.54	27.3	58.0
Mean season	570.76 (127 - 1485)	120.24 (0-349)	41.40 (0-226)	732.40 (182- 1602)	3.66 (0.91-8.01)	26.6 (17.9-31.2)	60.4 (41.0-72.0)

Pest populations reached the maximum numbers of 349 and 235 individuals / 200 leaves (at 28.7 & 28.3 C° and 72.0 & 56.5 % R.H., respectively), in the 2<sup>nd</sup> week of August, 2003 and 2004, respectively. The mean total numbers of *B. tabaci* individuals per season were 120.24 (0-349) and 70.28 (0-235) individuals, respectively.

**Table (2): Total numbers of the piercing sucking insect pests attacking okra plants during season, 2004, in Qalubia Governorate.**

Dates of inspection	No. of major piercing sucking insect pests			Total no. of sucking pests	Mean total no. of sucking pests / leaf	Weather factors	
	A. <i>gossypii</i>	B. <i>tabaci</i>	<i>Empoasca</i> spp.			Mean C°	Mean R.H. %
8/4/2004	144	0	0	144	0.72	18.2	62.0
15/4	574	0	0	574	2.87	21.0	64.0
22/4	625	0	0	625	3.13	20.0	59.0
29/4	509	0	0	509	2.55	21.9	64.0
6/5	667	1	0	668	3.34	29.0	42.0
13/5	795	3	0	798	3.99	25.7	54.0
20/5	785	8	0	793	3.97	23.8	63.0
27/5	490	22	3	515	2.58	27.6	56.0
3/6	463	63	11	537	2.69	28.4	60.0
10/6	348	95	17	460	2.30	26.2	64.0
17/6	417	114	23	554	2.77	28.8	64.0
24/6	215	123	27	365	1.83	27.6	62.0
1/7	122	118	38	278	1.39	29.0	59.0
8/7	137	127	41	305	1.53	29.5	65.0
15/7	197	166	18	381	1.91	29.4	56.0
22/7	384	103	16	503	2.52	29.1	56.0
29/7	752	110	21	883	4.42	29.5	56.0
5/8	596	214	17	827	4.14	30.0	56.5
12/8	729	235	55	1019	5.10	28.3	56.5
19/8	1383	81	63	1527	7.64	27.7	55.5
26/8	1272	34	75	1381	6.91	29.2	54.0
2/9	734	42	44	820	4.10	28.2	56.0
9/9	433	75	32	540	2.70	28.3	58.0
16/9	281	18	41	340	1.70	24.8	56.0
23/9	91	5	73	169	0.85	28.2	56.0
Mean season	525.72 (91-1383)	70.28 (0-235)	24.60 (0-75)	620.60 (144-1527)	3.11 (0.72-6.91)	26.8 (18.2-30.0)	58.2 (42.0-65.0)

The jassids, *Empoasca* spp. (Homoptera : Cicadellidae), were also observed attacking okra plants during the two seasons. The same observation was shown by Sreelatha & Divadar (1997); Jaydeb *et al.* (1999) and Kiranmai *et al.* (2002). The maximum total numbers of these pest species were 226 and 75 individuals / 200 leaves , which were counted during the 3<sup>rd</sup> week of September, 2003(at 29.6 C° and 61.0 % R. H. ) and the last week of August, 2004(at 29.2 C° and 54.0 % R. H.), respectively. Their mean total numbers per season were 41.40 (0-226) and 24.60 (0-75) individuals, respectively (Tables, 1 and 2).

In general, *A. gossypii* individuals were the highest in their numbers compared to the other two pests (*B. tabaci* and *Empoasca* spp.). Their mean percentages of occurrence to each others in the two seasons collectively were 81.32, 13.87 and 4.81 % , respectively (Table, 3). The highest total numbers of the all species were 1602 individuals (in the last week of August, 2003) and 1527 individuals/200 leaves (in the 3<sup>rd</sup> week of August, 2004).

#### Survey of predators.

Data involving the field observations of the most common predators found associated with major insect pests on okra plants , are shown in Tables (4 and 5). These predatory species belong to 5 orders and 6 families,

including ; ants (Hymenoptera : Formicidae), *Chrysoperla carnea* (Steph.) (Neuroptera : Chrysopidae), *Coccinella undecimpunctata* L. (Coleoptera : Coccinellidae), *Onius* sp. (Hemiptera: Anthocoridae), *Paederus affierii* Koch. (Coleoptera : Staphylinidae), *Scymnus* spp. (Coleoptera : Coccinellidae) and *Syrphus* sp. (Diptera: Syrphidae). True spiders (unidentified species) were also recorded during the study.

**Table (3) : Percentages of occurrence of the mean piercing sucking insect pests, to each others, on okra plants during the two seasons, 2003 and 2004, in Qalubia Governorate.**

Pest species	Percentages of occurrence		Mean percentage / 2 seasons			
	2003	2004				
<i>A. gossypii</i>	77.93(14269)	84.71 (13143)	81.32 (13706.0)			
<i>B. tabaci</i>	16.42 (3006)	11.33 (1757)	13.87 (2381.5)			
<i>Empoasca</i> spp.	5.65 (1035)	3.96 (615)	4.81 (825.0)			
Total	100.00 % (18310)	100.00 % (15515)	100.00 %			
<b>Statistical analysis between 2003 and 2004 seasons (compared means)</b>						
<i>A. gossypii</i>	2003	2377.83A	2004	2191.00B	L.S.D.0.05	178.20
<i>B. tabaci</i>		501.17A		292.67B		18.16
<i>Empoasca</i> spp.		172.83A		103.17B		13.07

• Total no. of individuals. Means of the same letter are not significantly different.

The period of predators occurrence extended all over the season in both years. The maximum total numbers of these predators were recorded during the 3<sup>rd</sup> week of June, 2003(220 individuals) and June, 2004 (144 individuals). The total numbers of predators per season were 2358 (9-220) and 1927 (7-144) individuals, in 2003 and 2004, respectively (Tables, 4 and 5).

Ants were found on okra plants all over the season from the 2<sup>nd</sup> week of April until the last week of September. The highest total numbers of these species were counted during the last week of July, 2003 (125 individuals) and July, 2004 (68 individuals).

*C. undecimpunctata* was recorded during the 2<sup>nd</sup> week of April, until the 3<sup>rd</sup> week of July, 2003 and from the 2<sup>nd</sup> week of April until the 2<sup>nd</sup> week of July, 2004. The highest total numbers of this species were found during the 3<sup>rd</sup> week of June, 2003 (45 individuals) and the last week of April, 2004 (56 individuals), as indicated in Tables (4 and 5). Coccinellids have been widely known as useful predators attacking aphids and have been credited with regulating field populations of some species of aphids (Grevstad and Klepetka, 1992).

*P. affierii* was detected during the last week of May until the 2<sup>nd</sup> week of July, 2003 and during the 3<sup>rd</sup> week of April & the 2<sup>nd</sup> week of May and from the last week of May until the 3<sup>rd</sup> week of July, 2004. The highest total numbers of *P. affierii* individuals were counted during the 3<sup>rd</sup> week of June, 2003 and 2004 (11 and 3 individuals, respectively).

Regarding the predator *C. carnea* (Tables, 4 & 5 and Fig., 1) , it occurred on okra plants during the last week of April until the 2<sup>nd</sup> week of September, 2003 and from the last week of April until the 3<sup>rd</sup> week of

September, 2004 The maximum total numbers of *C. carnea* individuals were counted during the 2<sup>nd</sup> week of June, 2003 and the 2<sup>nd</sup> week of July, 2004 (where, the total numbers were 84 and 68 individuals, respectively). El-Batran and Fathy (1991) reported chrysopids as useful predators attacking aphids. Also, Praveen and Dhandapani (2001) surveyed the predator *C. carnea* on okra plants.

The occurrence period of the predators *Scymnus* spp. extended from the last week of April until the 3<sup>rd</sup> week of September, 2003, and from the 3<sup>rd</sup> week of April until the last week of September, 2004. The maximum total numbers of these predators were recorded in the last week of June, 2003 (53 individuals) and during the 2<sup>nd</sup> week of August, 2004 (68 individuals) (Tables, 4 and 5).

The predator *Orius* sp. was found on, from the 2<sup>nd</sup> week of May until the 2<sup>nd</sup> week of June, the last week of June and in the 2<sup>nd</sup> week of July, 2003. In the second season, predator occurred during the 2<sup>nd</sup> and 3<sup>rd</sup> week of May and from the 1<sup>st</sup> week until the last week of June. The maximum total numbers of *Orius* sp. individuals were counted during the 1<sup>st</sup> and 3<sup>rd</sup> of June, 2003 and 2004 (5 and 7 individuals, respectively). Shamsan (1995) demonstrated that, the two predators *O. albidipennis* and *O. laevigatus* were among the active predators of aphids. Also, *Orius* spp. were reported as promising predators on many host plants infested with aphids (Salem *et al.*, 1999).

The periods of occurrence of *Syrphus* sp. were during May, in the 3<sup>rd</sup> week of July and from the 2<sup>nd</sup> week until the last week of August, 2003. In season 2004, this species was recorded during the 2<sup>nd</sup> week of April until the 1<sup>st</sup> week of May, during the 3<sup>rd</sup> and last week of May and during the 2<sup>nd</sup> and 3<sup>rd</sup> week of June, 2004. The maximum total numbers of *Syrphus* sp. individuals were counted during the 2<sup>nd</sup> week of August, 2003 (5 individuals) and during the 3<sup>rd</sup> and last week of May, 2004 (3 individuals).

True spiders (unidentified species), were recorded all over the season, during the period extended from the 2<sup>nd</sup> week of April until the last week of September, 2003 and 2004. The maximum total numbers of these predators were counted during the 3<sup>rd</sup> week of June, 2003 (43 individuals) and during the 1<sup>st</sup> week of September, 2004 (22 individuals).

From Tables (1,2,4&5) and Fig. (2), it could be mentioned that, the predators occurrence was synchronized with that of the major insect pests recorded, especially *A. gossypii*. The ratio between such insect pests and predators were 7.77 :1 (in season, 2003) and 8.05 : 1 (in season,2004). The general ratio of the two seasons together was 7.89:1 (Table,6). El-Heneidy and Abdel-Samad (2001) stated that, it is important to recognize both positive and negative interactions that occur between the two primary components of a management system, plant cultivars and natural enemies, when developing Integrated Pest Management systems.

The mean total numbers per leaf were 3.66 (0.91-8.01) and 3.11 (0.72-6.91) individuals, respectively (Tables, 1 and 2). Statistical analysis of obtained data showed significant differences between the mean total numbers of individuals of the three piercing sucking insect pests, for the two seasons together. The L.S.D.0.05 value was 6.63 (Table,6). Also, significant

differences were found between the total numbers of these three pests in comparing the two studied seasons (Table, 3).

**Table (4) : Total numbers of the common predators recorded on okra plants during season, 2003, in Qalubia Governorate.**

Dates of inspection	The common predators								Total no. of predators
	<i>C.carnea</i> (E,L)	<i>C. undecimpunctata</i> (A,E,L)	<i>Scymnus</i> spp. (L,A)	<i>Syrphus</i> sp. (L)	<i>P. alfieri</i> (A)	<i>Orius</i> sp. (A)	Ants	True spiders	
10/4/2003	0	1	0	0	0	0	7	1	9
17/4	0	14	0	0	0	0	10	1	25
24/4	2	12	1	0	0	0	13	2	30
1/5	4	13	4	1	0	0	36	5	63
8/5	13	17	6	0	0	1	23	21	81
15/5	65	21	12	1	0	1	11	32	143
22/5	14	24	17	3	0	1	12	17	88
29/5	28	32	22	0	1	3	4	9	99
5/6	42	13	43	0	4	5	9	17	133
12/6	84	31	14	0	7	1	16	33	186
19/6	79	45	23	0	11	0	19	43	220
26/6	81	17	53	0	8	2	21	19	201
3/7	22	6	8	0	1	0	22	5	64
10/7	27	5	13	0	2	2	53	12	114
17/7	11	1	4	1	0	0	62	7	86
24/7	8	0	11	0	0	0	79	2	100
31/7	2	0	7	0	0	0	125	4	138
7/8	3	0	21	0	0	0	72	7	103
14/8	6	0	28	2	0	0	28	9	73
21/8	4	0	21	5	0	0	12	11	53
28/8	1	0	16	2	0	0	43	12	74
4/9	1	0	23	2	0	0	80	16	122
11/9	4	0	25	0	0	0	47	12	88
18/9	0	0	4	0	0	0	32	1	37
25/9	0	0	0	0	0	0	27	1	28
Total/season	501 (0-84)	252 (0-45)	376 (0-53)	17 (0-5)	34 (0-11)	16 (0-5)	863 (4-125)	299 (1-43)	2358 (9-220)

\*A= adults , L= larvae , E= eggs.

However, the two predators, ants and *C. carnea* had the highest total numbers of individuals among other recorded predators. The percentages of occurrence of the different predators, in 2003 and 2004 were as follows : ants (36.60&21.22%), *C. carnea* (21.25 & 24.39%), *C. undecimpunctata* (10.69&16.81%), *Orius* sp. (0.67 & 0.78%), *P. alfieri* (1.44 & 0.47 %), *Scymnus* spp. (15.95 & 23.51 %), *Syrphus* sp. (0.72 & 0.73%) and true spiders (12.68 & 12.09 %) (Table,6). However, the mean total numbers of the common observed predators ; ants, *C. carnea*, *C. undecimpunctata*, *Orius* sp., *P. alfieri*, *Scymnus* spp., *Syrphus* sp. and true spiders

Table (5) : Total numbers of the common predators recorded on okra plants during season, 2004, in Qalubia Governorate.

Dates of inspection	The common predators								Total no. of predators
	<i>C. carnea</i> (E,L)	<i>C. undecimpunctata</i> (A,E,L)	<i>Scymnus</i> spp. (L,A)	<i>Syrphus</i> sp. (L)	<i>P. affierii</i> (A)	<i>Orius</i> sp. (A)	Ants	True spiders	
8/4/2004	0	4	0	0	0	0	1	2	7
15/4	0	33	2	1	0	0	3	2	41
22/4	1	24	4	2	1	0	4	1	37
29/4	2	56	7	2	0	0	2	3	72
6/5	2	44	10	1	0	0	4	8	69
13/5	4	39	22	0	1	1	17	11	95
20/5	12	16	45	3	0	1	37	16	130
27/5	20	17	23	3	1	0	5	10	79
3/6	33	8	12	0	2	1	4	10	70
10/6	51	18	23	1	1	3	6	17	120
17/6	67	26	11	1	3	7	8	21	144
24/6	64	13	16	0	0	2	11	14	120
1/7	43	4	5	0	0	0	12	10	74
8/7	68	5	7	0	0	0	16	6	102
15/7	36	0	3	0	0	0	20	4	63
22/7	19	0	6	0	0	0	44	3	69
29/7	14	0	16	0	0	0	68	8	106
5/8	11	0	43	0	0	0	35	9	98
12/8	9	0	68	0	0	0	17	3	97
19/8	4	0	45	0	0	0	9	6	64
26/8	4	8	34	0	0	0	12	14	72
2/9	3	6	28	0	0	0	31	22	90
9/9	1	3	14	0	0	0	11	16	45
16/9	2	0	7	0	0	0	8	10	27
23/9	0	0	2	0	0	0	27	7	36
Total/season	470 (0-68)	324 (0-56)	453 (0-68)	14 (0-3)	9 (0-3)	15 (0-7)	409 (1-68)	233 (1-22)	1927 (7-144)

\*A= adults , L= larvae , E= eggs.

Table (6) : The mean total numbers of major piercing sucking insect pests, common predators and the ratio between them on okra plants, during the two seasons, 2003 and 2004, in Qalubia Governorate.

Pests		Predators					Ratio between sucking pests and predators
Pest species	Mean total no. of individuals /2 seasons	Predatory species	Mean total no. of the two seasons	% predators occurrence to each others			
				2003	2004	% per 2 seasons	
A. gossypii	548.24 ± 31.85 A	Ants	25.44 ± 12.84 A	36.60	21.22	28.91	Ratio for season, 2003 7 77:1
		<i>C. carnea</i>	19.42 ± 0.88 B	21.25	24.39	22.82	
		<i>C. undecimpunctata</i>	11.52 ± 2.04 D	10.69	16.81	13.75	
B. tabaci	95.26 ± 35.33 B	<i>Orius</i> sp.	0.62 ± 0.03 G	0.67	0.78	0.73	Ratio for season, 2004 8.05:1
		<i>P. affierii</i>	0.86 ± 0.71 F	1.44	0.47	0.95	
Empoasca spp.	33.00 ± 11.88 C	<i>Scymnus</i> spp.	16.58 ± 2.18 C	15.95	23.51	19.73	General ratio for the two seasons 7.89:1
		<i>Syrphus</i> sp.	0.62 ± 0.09 G	0.72	0.73	0.72	
		True spiders	10.64 ± 1.87 E	12.68	12.09	12.39	
L.S.D. 0.05	6.63	L.S.D. 0.05	0.16	Total			
				100.00 %	100.00 %	100.00 %	

Note : means of the same letter are not significantly different.



were ;  $25.44 \pm 12.84$ ,  $19.42 \pm 0.88$ ,  $11.52 \pm 2.04$ ,  $0.62 \pm 0.03$ ,  $0.86 \pm 0.71$ ,  $16.58 \pm 2.18$ ,  $0.62 \pm 0.09$  and  $10.64 \pm 1.87$  individuals, in 2003 and 2004 together, respectively (Table,6).

The relationships between *A. gossypii* populations and means of temperature and relative humidity were shown in Table (7). The r- values were 0.2793 & 0.1396 (for means of temperature) and 0.2931 & 0.6051 (for means of relative humidity), in 2003 and 2004, respectively.

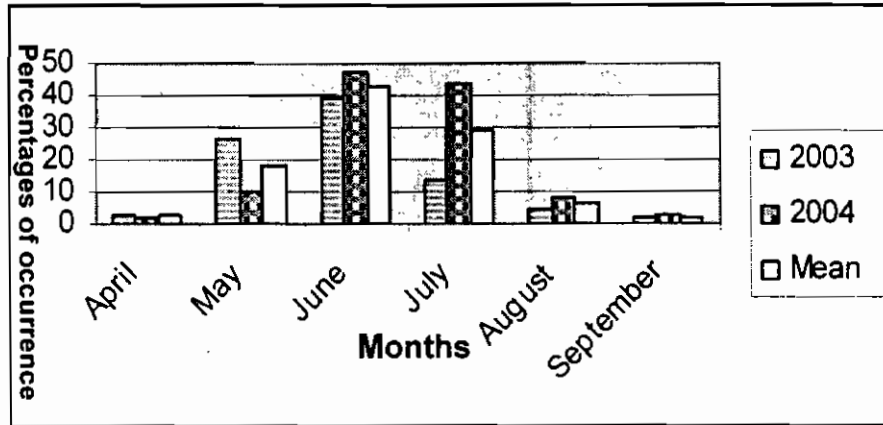


Fig. (1): Monthly percentages of occurrence of *C. carnea* among other predators on okra plants, during , seasons 2003 and 2004, at Qalubia Governorate.

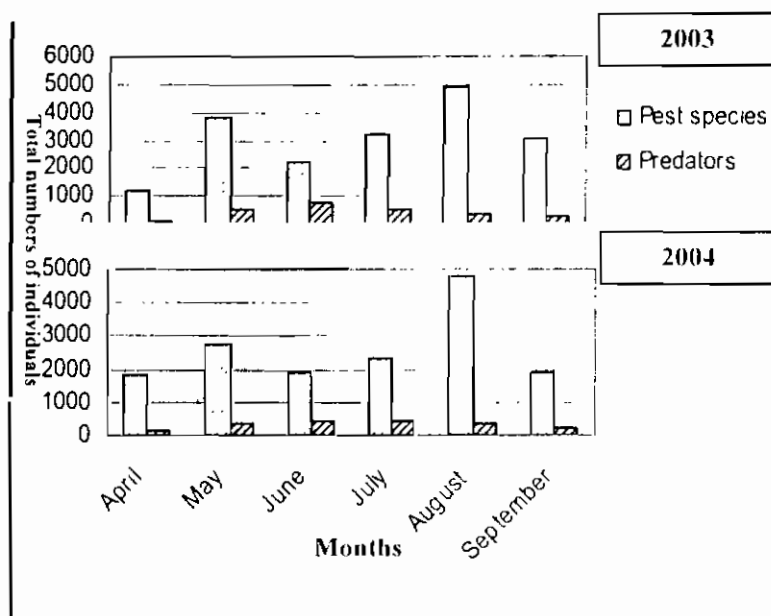


Fig. (2): Monthly total numbers of major piercing sucking insect pests and their common associated predators on okra plants, during the two seasons,2003 and 2004, in Qalubia Governorate.

The relationships between *B. tabaci* populations and means of temperature and relative humidity were shown in Table (7). The r – values were 0.4698 & 0.7043 (for means of temperature) and 0.7071 & 0.0548 (for means of relative humidity), in 2003 and 2004, respectively.

The relationships between *Empoasca* spp. populations and means of temperature and relative humidity were shown in Table (7). The r – values were 0.6386 & 0.7267 (for means of temperature) and 0.1086 & 0.3183 (for means of relative humidity), in 2003 and 2004, respectively.

**Table (7) : Correlation coefficient (r) between weather factors (means of temperature and relative humidity) and means of *A. gossypii*, *B. tabaci* and *Empoasca* spp. and their common predators.**

Tested factors		Tested factors x means of temperature		Tested factors x means of relative humidity	
		2003	2004	2003	2004
<i>A. gossypii</i>	r- value	0.2793	0.1396	0.2931	0.6051
	Equation	Y=116.42 x -861.89	Y= 41.492 x + 1076.40	Y= 65.321 x- 1730.60	Y= -167.26x + 11919.00
<i>B. tabaci</i>	r- value	0.4698	0.7043	0.7071	0.0548
	Equation	Y= 75 x - 1479.00	Y= 57.165 x- 1242.00	Y= 60.564 x- 3154.00	Y= -0.4398 x+ 318.42
<i>Empoasca</i> spp.	r- value	0.6386	0.7267	0.1086	0.3183
	Equation	Y=42.008x-936.50	Y= 19.691 x- 426.20	Y= 3.8376 x- 59.10	Y= -8.0233 x + 569.19
predators	r- value	0.4117	0.6199	0.0412	0.0600
	Equation	Y=32.026x-452.28	Y=22.073x- 271.48	Y=-1.7194x +496.76	Y=-1.9818x +436.44

The relationships between predators population and means of temperature and relative humidity were shown in Table (7). The r-values were 0.4117& 0.6199 (for means of temperature) and 0.0412 & 0.0600 (for means of relative humidity).

In conclusion, obtained results indicate the important natural role of the predators as biocontrol agents against major insect pests, especially *A. gossypii* on okra plants. Magnifying the natural role became necessary for future releases of most common predators such as *C. carnea*, *C. undecimpunctata* and *Scymnus* spp. in okra and other fields, that are attacked by piercing sucking pests, especially *A. gossypii*. Using such biocontrol agents must be included in Integrated Pest Management (I.P.M.) strategies against these major pests.

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حصر المفترسات المصاحبة للآفات الحشرية الهامة على نباتات الباميا، في محافظة القليوبية.

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أجريت هذه الدراسة بغرض حصر الآفات الثاقبة الماصة الهامة والمفترسات المصاحبة لتلك الآفات خلال العروة الصيفية لنباتات الباميا، خلال الموسمين المتتاليين ٢٠٠٣، ٢٠٠٤، في محافظة القليوبية.

بلغ أعلى تعداد لمن القطن (*Aphis gossypii*) خلال الأسبوع الأخير والثالث من شهر أغسطس ٢٠٠٣، ٢٠٠٤ لموسمي الدراسة، على التوالي. بينما كان أعلى تعداد للذبابة البيضاء (*Bemisia tabaci*) خلال الأسبوع الثاني من شهر أغسطس ٢٠٠٣، ٢٠٠٤ لموسمي الدراسة. ووصل أعلى تعداد للجاسيدات (*Empoasca spp.*) في الأسبوع الثالث من شهر سبتمبر ٢٠٠٣ للموسم الأول، والأسبوع الأخير من أغسطس ٢٠٠٤ للموسم الثاني. وقد كان من القطن هو الأكثر تواجدا من الآفات الثاقبة الماصة، يليه الذبابة البيضاء والجاسيدات. سجل أعلى تواجد للنمل وأسد المن بالمقارنة بباقي أنواع المفترسات الأخرى المسجلة، حيث وجدت تلك المفترسات مرتبطة بفترة تواجد الآفات الحشرية الرئيسية على نباتات الباميا. وعلى ذلك يجب تشجيع الدور الطبيعي للأعداء الحيوية في حقول الباميا باستمرار وتمية هذا الدور. وكذلك يمكن التربية لكمية لمفترسات أسد المن والسكنس وأبو العيد (نقطة معملية)، ثم الإطلاق الحقل في حقول الباميا والحقول الأخرى التي تُهاجم بالآفات الثاقبة الماصة الهامة وخصوصا المن كافة رئيسية، في إطار منظومة تطبيق استراتيجية مكافحة المتكاملة للآفات، مع باقي الطرق الأخرى الأمانة لحماية للإنسان و حفاظا على البيئة المحيطة به من التلوث.