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ABUNDANCE OF CERTAIN INSECT PESTS AND ASSOCIATED PREDATORS IN COTTON FIELDS.

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ABSTRACT

The abundance of certain cotton insect pests and associated predators was studied on Giza 89 cotton variety under field conditions of Middle Delta during 2002 and 2003 seasons. Weekly count of total number of insects/100 seedling (or leaves or plants or bolls)chosen at random indicated that :

During early- to mid-season of 2002 and 2003, *Aphis gossypii* (Glover) showed one peak of abundance in first of May, while *Empoasca* spp. had one peak in late of May, 2002 and first of June 2003. *Thrips tabaci* (Lind.) had two peaks through May and June and it was the most abundant pest followed by *A. gossypii, Empoasca* spp. and *Bemisia tabaci* (Genn.). *Coccinella undecimpunctata* (L.) reached its highest abundance in may, while the rest predators peaked through June synchronizing with the higher numbers of aphids and thrips. The most abundant predator was *C. undecimpunctata*; while, *Chrysoperla carnea* (Steph.) was the least abundant one, *A. gossypii* positively correlated with *B. tabaci* and *T. tabaci*, while *Empoasca* spp. negatively correlated with *A. gossypii* and *B. tabaci*. Relative humidity affected *A. gossypii* and *B. tabaci* positively in 2002 and negatively in 2003, but the reverse correlation was observed with *Empoasca* spp., and *T. tabaci*. Temperature positively affected *Empoasca* spp., in the two early to mid- seasons, and *T. tabaci* in 2002 one only, but it negatively affected *A. gossypii* and *B. tabaci* in both seasons. *A. gossypii* and *B. tabaci* were more influenced by total predators than *Empoasca* spp. and *T. tabaci*.

During mid- to late-season of 2002 and 2003, *A. gossypii* showed one peak of abundance in late July and another peak in late August, while *B. tabaci* peaked twice through August and September. Also, *Empoasca* spp. reached their highest abundance through August, while the maximum abundance of *Pectinophora gossypiella* (Saund.) and *Earias insulana* (Boisd.) population were occurred in the end of both seasons. All insect pests except *P. gossypiella* were more abundant in 2002 season than the same insects in 2003. *B. tabaci* was the most abundant pest during 2002 season and *A. gossypii* during 2003 one, while *E. insulana* was the least abundant pest during the two seasons.

C. undecimpunctata peaked through August of 2002 and 2003 seasons; while, the rest predators mostly peaked through July and August of the two seasons. *Paederus alfierii* (Koch) was the most abundant predator, while *Orius* sp. and *C. carnea* were the least one through 2003. The correlation between all insect pests themselves were positive except *Empoasca* spp., which correlated negatively with *P. gossypiella* and *B. insulana* in the two seasons. Relative humidity affected *A. gossypii* and *P. gossypiella* positively in 2002 season, while *B. tabaci* and *Empoasca* spp. influenced by it positively in 2002 and 2003. On the other hand, *E. insulana* negatively correlated with it in the two seasons. Temperature affected *A. gossypii* and *B. tabaci* positively on 2003 and negatively in 2002, while the correlation was positively with *Empoasca* spp. and negatively with *P. gossypiella* and *E. insulana* in the two seasons. Total predators were more effective on *A. gossypii, B. tabaci* and *P. gossypiella* during 2003 season than 2002 one. While, these predators were more effective on *Empoasca* spp. and *E. insulana* during 2002 season than 2003 one. These findings have a great importance in cotton integrated pest management.

INTRODUCTION

Cotton, *Gossypium barbadense* Linn. is the most important economic crop in Egypt. The cotton agroecosystem is a complex and diverse one. There are about 1326 insect species found world wide on cotton (Hargreaves, 1948). In Arkansas, U.S.A., 600 predatory species of arthropod were found (Whitcomb and Bell, 1964). Cotton plants, however, liable to be attacked by a number of serious pests, but the majority of annual production loss is caused by a few key ones.

Numerous studies have been carried out on this subject in different places other than the target area of the present work (Hafez, 1960, Hassanein *et al.*, 1971; Ali *et al.*, 1975; Selim *et al.*, 1987; Singh and Butler, 1988; Singh and Lather, 1989; Kandil *et al.*, 1992; Abbas and El-Deeb, 1993; Ragab, 1999; Aref, 2000, Shawer, 2000.and Ragab, et al. 2004) However, a relatively little work is available in the literature concerning the population fluctuation of the most important cotton pests and their associated predators under Middle Delta, Gharbia governorate conditions.

The present work aimed to study the seasonal abundance of the most important insect pests infested cotton plants and their associated predators under field conditions of Middle Delta as well as the effect of temperature and relative humidity on the abundance of these pests.

MATERIALS AND METHODS

An experiment was conducted at the farm of Gemmeiza Agric. Res. Station (Middle Delta), Santa, Gharbia governorate, during two growing cotton seasons 2002 and 2003 to study the abundance of the most important economic pests attacking cotton plants and their associated predators.

The insect pests were; *A. gossypii*, *B. tabaci*, *Empoasca* spp., *T. tabaci*, *E. insulana* and *P. gossypiella*. The associated predators were;, *C. undecim-punctata*, *Scymnus* spp., *P. alfierii*, *Orius* spp., *C. carnea* and the true spiders.

Completely randomized block design (CRBD) with 4 replicates, each of 250 m^2 was adopted and planted with Giza-89 cotton variety on March 21 & 27 during 2002 and 2003 seasons, respectively. The normal agricultural practices were followed and no insecticidal treatments were applied during the whole experimental period.

For counting the number of aphid (nymphs and adults), whitefly (adults) and leafhopper (nymphs and adults) population, 25 cotton seedlings or leaves from each plot were taken weekly at random early in the morning at 7.0 a.m. from different levels of the plant (2, 1 and 2 leaves/plant from upper, middle and lower level, respectively). The upper and lower surfaces of the leaf were examined carefully (Hassanein *et al.*, 1971).

Sampling of thrips was carried out by carefully pulling out 25 cotton seedlings at random from each plot and was beaten quickly onto dark felt cloth. Then the nymphs and adults of thrips become entangled with the fibre of the cloth and were counted. After thinning of cotton hills, plant samples were inspected using the above mentioned technique without pulling out the plants.

When bolls formed, 25 bolls were picked weekly at random from each plot for determining the larval population density of spiny and pink bollworms. The bolls were dissected in the laboratory on the same day. For determining the population density of predator' (immature and adult), samples of 25 plant per plot were inspected by using direct observation count for each species.

The absolute number of the pests were transformed by using $\sqrt{x+1}$ to have a normal distribution of the population. A Complete Program (SAS) Institute (1999) and Thomas and Hills (1975) was used for calculating the simple correlation coefficient between the populations of the tested insect pests themselves and climatic factors or associated predators. Records of temp. and R.H. % were obtained from Meteorological Department at Gemmeiza Res. Station. Determination coefficients were also calculated to emphasize the relative importance of each factor.

RESULTS AND DISCUSSION

1- The population abundance of cotton insect pests and associated predators :

Data presented in Tables (1, 2, 3 & 4) show mean numbers of certain pests and their associated predators, respectively, occurring in Gemmeiza cotton fields during early to mid-season and mid to late- season of 2002 and 2003.

A- Insect pests :

1- The cotton aphid, *A. gossypii* :

During early to mid-season, data tabulated in Table (1) showed that the number of *A. gossypii* was 7.75 and 10.63 aphids/seedlings in the beginning of inspection on April 15 and 14 of 2002 and 2003 seasons, respectively. The population increased within 3-4 weeks to reach a maximum of 12.57 and 13.71 aphids/seedlings 1*st* and 2*nd* week of May 2002 and 2003, respectively. Then, the population decrease gradually till vanished completely during the last week of May 2002 and first week of June 2003, respectively. The mean number of *A.gossypii* recorded 6.34±1.33 and 8.2±1.38 insects seedling during the early to mid-season of 2002 and 2003, respectively.

Concerning mid to late-season, data obtained in Table (2) showed that the aphids reappeared on the first of July in both seasons with relatively low numbers which fluctuated to reveal two peaks of abundance. The first peak occurred on July 22 and 21 with numbers of 7.94 and 7.48 insects leave for 2002 and 2003 seasons, respectively. The second peak appeared on August 19 and 25 with number of 22.93 and 17.2 individuals leave during 2002 and 2003 seasons, respectively. The mean number recorded 15.5±1.95 and 10.9±1.27 aphids leave during mid to late - seasons of 2002 and 2003, respectively. These results were confirmed by Hassanein *et al.* (1995), Sewify *et al.* (1996), Kalafalla *et al.* (1997), and Salem (1998) who reported the peak of infestation with *A. gossypii* was obtained during August. Aphids were more abundant in the mid to late-season than early to mid-season.

2- The whitefly, *Bemisia tabaci* :

In the beginning of inspection of early mid-season, as shown in Table (1) the mean number of *B. tabaci* was 4.47 and 2.64 insect seedlings on April 15 and 14 of 2002 and 2003, respectively. The population fluctuated to reach 5.57 and 4.00 insects leave on April 22 and 28 of 2002 and 2003, respectively. Then the population decreased quickly and completely disappeared in the end of May in both seasons. Whitefly reappear on cotton plants at the end of June with means of 3.00 and 3.74 insect leave for 2002 and 2003 seasons, respectively.

Table (1): Early to mid-season population of certain insect pests occurred on cotton plants in Gemmeiza, Gharbia governorate during 2002 and 2003 seasons.

Mean numbers during :				
2002 season				
Date of inspection	*A. gossypii*	*B. tabaci*	*Empoasca* spp.	*T. tabaci*
15/4/2002	7.75	4.47	3.74	9.79
22/4	9.54	5.57	5.29	12.88
29/4	11.66	5.09	4.58	15.36
6/5	12.57	3.6	3.46	19.54
13/5	9.49	3.0	2.45	14.7
20/5	8.12	1.73	6.0	13.82
27/5	4.0	1.73	7.48	8.72
3/6	2.0	1.41	5.83	8.12
10/6	2.0	1.0	4.24	11.22
17/6	1.0	1.0	3.32	7.48
24/6	1.0	3.0	2.45	5.74
Total	89.1	31.6	48.8	127.4
Mean±SE*	6.3±1.33	2.9±0.48	4.4±0.48	11.6±1.83
2003 season				
14/4/2003	10.63	2.64	2.83	10.29
21/4	12.0	3.46	3.16	13.26
28/4	12.69	4.0	3.46	18.97
5/5	13.27	3.16	4.0	22.2
12/5	13.71	3.0	3.46	23.36
19/5	12.48	2.64	5.09	16.39
26/5	7.48	1.73	6.0	10.77
2/6	6.0	1.41	6.78	9.48
9/6	3.16	1.41	5.74	8.12
16/6	2.0	1.0	5.57	19.39
23/6	2.0	1.0	4.58	7.61
30/6	2.64	3.74	4.0	6.63
Total	98.1	29.2	54.7	166.5
Mean±SE	8.2±1.38	2.4±0.31	4.6±0.37	13.9±1.70

*SE : Standard error

Table (2): Mid to late-season population of certain insect pests occurred on cotton plants in Gemmeiza, Gharbia governorate, during 2002 and 2003 seasons.

Mean numbers during :					
2002 cotton					
Date of inspection	*A. gossypii*	*B. tabaci*	*Empoasca* spp.	*P. gossypiella* larvae/ boll	*E. insulana* larvae/ boll
1/7	2.65	4.0	2.65	0	0
8/7	2.83	3.0	3.16	0	0
15/7	4.24	6.4	5.39	0.02	0
22/7	7.94	8.89	7.75	0.06	0.01
29/7	6.86	10.3	6.0	0.12	0.02
5/8	10.77	12.08	6.56	0.17	0.04
12/8	13.82	15.84	8.89	0.29	0.03
19/8	22.93	15.26	9.7	0.52	0.01
26/8	20.83	22.72	7.87	0.74	0.06
2/9	22.61	23.32	6.56	0.86	0.05
9/9	18.6	23.08	5.29	0.96	0.08
16/9	18.06	20.4	4.9	1.1	0.11
23/9	17.03	19.72	4.0	1.28	0.12
30/9	11.22	18.05	3.16	1.39	0.17
Total	170.7	189.7	70.7	7.5	0.7
Mean±SE	15.5±1.95	17.2±1.89	6.4±0.58	0.54±0.13	0.05±0.02
2003 cotton					
7/7	4.0	4.58	4.24	0	0
14/7	4.24	4.0	4.58	0.02	0
21/7	7.48	6.0	5.83	0.07	0.01
28/7	7.0	7.74	7.81	0.18	0.02
4/8	6.16	8.72	6.7	0.25	0.01
11/8	11.22	9.74	6.16	0.37	0.03
18/8	13.19	10.0	7.14	0.54	0.04
25/8	17.2	13.26	8.54	0.73	0.03
1/9	16.0	11.66	6.55	0.78	0.06
8/9	15.03	14.69	6.24	0.85	0.05
15/9	14.31	15.49	4.58	0.98	0.7
22/9	13.41	12.96	3.0	1.14	0.10
29/9	12.24	10.9	3.0	1.42	0.13
Total	141.5	129.7	74.4	7.33	0.55
Mean±SE	10.9±1.27	10.0±1.02	5.7±0.47	0.56±0.13	0.04±0.02

As for mid to late-season (Table 2) the insects increased gradually to reach the first peak of abundance by means of 15.84 and 13.26 insects on 12 and 25 August of 2002 and 2003, respectively. The highest peak of abundance was achieved on 2 and 15 September with mean of 23.32 and 15.49 insects for 2002 and 2003 seasons, respectively. The mean number of

early to mid-season were lower than the mid to late-season, where they were 2.9±0.48 and 2.4±0.31 insects for 2002 and 2003 early to mid-season, and the corresponding numbers were 17.2±1.89 and 10.0±1.02 insects for mid- to late-season. These results are in harmony with those of Gerling *et al.* (1980), Hassanein *et al.* (1995), Kalafalla *et al* (1997), and Shawer *et al.* (2002).

3- The cotton leafhoppers, *Empoasca* spp. :

As shown in Table (1) the mean number of *Empoasca* spp. in the first inspection of the early to mid-season were 3.74 and 2.83 insects seedling on 15 and 17 April of 2002 and 2003 seasons, respectively. Then the population fluctuated to induced two peaks of abundance on 22 April (5.29 insects) and 27 May (7.48 insects) for 2002 season, and one peak in 2001 season with mean number of 6.78 insect.

Concerning mid to late-season (Table 2) the insect had two peaks of abundance for the two seasons with mean number of 7.75 (on July 22) and 9.7 (on August 19) insects for 2002 season and 7.81 insects (on July 28) and 8.54 insects (on August 25).

Empoasca spp. were more abundant in mid to late-season than early-to mid-season where the mean numbers were 4.4±0.48 and 4.6±0.37 insects/25 leaves in early to mid-season of 2002 and 2003, respectively; while the corresponding means were 6.4±0.58 and 5.7±0.47 insects during mid- to late-season. The present results are in accordance with those obtained by Hassanein *et al.* (1995) and Sewify *et al.* (1996) who found that the highest peak of *Empoasca* spp. occurred during July and August.

4- The onion thrips, *Thrips tabaci* :

As indicated in Table (1) the mean number were 9.79 and 10,29 insects three weeks after sowing date (the first inspection) for 2002 and 2003 early to mid-season, respectively. Numbers increased gradually to reach their first peak of abundance on 6 and 12 May by 19.54 and 23.36 insects/plant during 2002 and 2003, respectively. The second peak of abundance was occurred on 10 and 16 June by means of 11.22 and 19.39 individuals during 2002 and 2003 seasons, respectively. These results are in full agreement with those obtained by Hassanein *et al.* (1995) and Sewify *et al.* (1996) who found that cotton thrips had two peaks in the first of May and at the end of June or early July, and the first peak was much higher than the second one. It is observed that *T. tabaci* was more abundant during 2001 season than 2002 one.

5- The spiny bollworm, *Earias insulana* :

Table (2) shows that spiny bollworm started to infest the green cotton bolls in the end of July showing mean of 0.01 larva/boll during both seasons and reached its highest abundance in the last week of September for the two seasons. The infestation occurred on mid to late-season period by mean of 0.17 larvae/boll and 0.13 larvae/boll in the last week of September for 2002 and 2003 cotton season, respectively. Makkar and Kostandi (1995), Ragab (1999), Shawer (2000), Aref (2002) and El-Mezayyen (2003) recorded a serious infestation by *E. insulana* at the end of the growing season.

6- The pink bollworm, *Pectinophora gossypiella* (Saund.) :

Table (2) show that *P. gossypiella* achieved the highest abundance of 1.39 and 1.42 larvae/boll in the last week of September for 2002 and 2003 season, respectively. Close similarity was found between the present results and those of Katiyar (1982), Hassanein *et al.* (1995), Ragab (1999), Shawer (2000), Aref (2002) and Ragab, et al. (2004).

Table (3): Early to mid-season population of predators associated with certain insect pests occurred on cotton plants in Gemmeiza, Gharbia governorate, during 2002 and 2003 seasons.

Mean numbers during :						
2002 cotton						
Date of inspection	*C. undecim.*	*Scymnus* spp.	*Paederus alfierii*	*Orius* sp.	*C. carnea*	True spiders
15/4	6.1	2.2	3.2	1.7	1.7	2.2
22/4	6.8	2.8	3.5	3.0	2.0	2.6
29/4	8.1	3.3	4.0	3.5	2.0	2.6
6/5	8.7	3.7	4.8	4.0	2.2	3.2
13/5	9.1	3.6	3.7	4.5	2.8	3.0
20/5	10.4	4.5	3.6	3.9	2.4	4.6
27/5	8.2	4.2	4.2	4.1	4.1	5.7
3/6	6.8	5.1	7.1	4.8	7.5	7.3
10/6	6.0	5.9	6.6	5.1	5.6	7.9
17/6	4.0	7.5	9.3	6.0	4.2	9.2
24/6	5.7	8.4	11.0	4.9	3.2	8.8
Total	79.9	51.4	61.0	45.5	37.8	57.1
Mean±SE	7.3±0.54	4.7±0.57	5.5±0.78	4.1±0.33	3.4±0.54	5.2±0.81
2003 cotton						
14/4	5.1	3.2	2.6	2.2	3.6	2.0
21/4	5.8	3.6	3.3	2.6	3.2	1.4
28/4	6.8	2.6	3.6	3.0	2.6	1.7
5/5	7.9	2.2	4.5	3.5	2.4	1.4
12/5	10.5	2.8	5.1	2.4	1.4	3.3
19/5	9.8	4.0	4.2	3.2	2.4	4.0
26/5	9.2	3.5	5.5	2.6	2.2	3.9
2/6	8.6	5.1	4.9	4.0	2.0	5.7
9/6	8.1	6.3	6.6	5.6	3.0	6.8
16/6	6.1	7.9	5.4	4.5	3.3	8.0
23/6	4.6	8.9	7.4	4.0	6.3	8.7
29/6	2.9	7.5	9.2	5.5	4.0	6.0
Total	85.3	57.7	62.3	43.1	36.6	52.8
Mean±SE	7.1±0.66	4.8±0.66	5.2±0.51	3.6±0.31	3.1±0.37	4.4±0.75

Table (4): Mid to late-season population of predators associated with certain insect pests occurred on cotton plants in Gemmeiza, Gharbia governorate, during 2002 and 2003 seasons.

Mean numbers during :						
2002 cotton						
Date of inspection	*C. undecim.*	*Scymnus* spp.	*Paederus alfierii*	*Orius* sp.	*C. carnea*	True spiders
1/7	6.8	7.5	12.9	4.5	3.0	7.0
8/7	4.9	6.6	15.0	5.1	4.0	5.6
15/7	4.7	5.8	11.9	5.8	3.2	5.1
22/7	4.8	5.6	10.1	6.5	2.4	7.3
29/7	6.0	6.6	8.1	5.4	2.8	8.7
5/8	6.7	7.4	6.2	4.5	3.6	7.5
12/8	7.3	7.1	5.8	4.2	5.1	6.4
19/8	7.9	6.0	7.5	4.0	5.6	4.9
26/8	8.1	5.0	7.8	4.1	4.9	4.2
2/9	7.1	6.5	7.4	4.0	4.6	5.2
9/9	6.0	6.8	6.4	3.6	5.1	4.6
16/9	5.1	7.1	4.2	3.6	4.8	3.7
23/9	4.5	5.8	5.1	3.3	4.7	3.2
30/9	3.5	4.0	3.2	2.8	4.4	2.8
Total	67.0	67.4	72.0	46.1	48.0	58.6
Mean±SE	6.1±0.37	6.1±0.24	6.5±0.90	4.2±0.24	4.4±0.27	5.3±0.45
2003 cotton						
7/7	3.2	6.1	10.3	6.8	3.7	7.1
14/7	5.1	5.3	17.3	5.7	2.8	8.2
21/7	6.8	6.5	14.7	5.1	2.0	7.9
28/7	7.8	4.8	13.6	4.2	3.2	7.9
4/8	8.2	5.1	11.8	4.5	2.6	7.1
11/8	7.3	4.5	11.0	4.6	4.5	6.0
18/8	6.8	6.0	11.4	4.0	5.1	5.5
25/8	8.9	7.5	10.6	6.0	5.1	3.5
1/9	8.4	7.9	8.4	4.8	4.5	4.1
8/9	7.9	7.0	5.1	4.4	3.5	3.2
15/9	7.3	6.1	5.7	4.1	4.0	3.3
22/9	6.6	5.5	4.2	3.5	3.9	3.0
29/9	5.7	3.6	3.2	2.8	3.0	2.4
Total	90.0	75.8	127.3	60.5	47.9	69.2
Mean±SE	6.9±0.44	5.8±0.33	9.8±1.19	4.65±0.31	3.7±0.24	5.3±0.61

B- Predators :

During early to mid-season of 2002 (Table 3); *C. undecimpunctata* reached its only peak of abundance on May 20 (The mean was 10.4 insects) while *Scymnus* spp., *Paederus alfierii, Orius* sp., *C. carnea* and true spiders as shown in Table (3) have two peaks of abundance for each species. *Scymnus* spp. achieved the first peak (3.7 insects) on May 6 and the second

one (4.5 insects) on may 20. *P. alfierii* (4.8 & 7.1) on May 6 and on June 3. *Orius* sp. (4.5 & 6.0 insects) on May 13 and on June 17. *C. carnea* (2.8 & 7.5 insects) on May 13 and on June 3. While, true spiders (3.2 & 9.2 insects) on May 6 and on June 17. *C. undecimpunctata* was the most abundant predator (the mean was 7.3±0.52 insects) followed by *P. alfierii* (5.5±0.78), true spiders (5.2±0.81), *Scymnus* spp. (4.7±0.57), *Orius* sp. (4.1±0.33) and *C. carnea* (3.4±0.54), *C. undecimpunctata,* achieved its highest abundance in May, while the rest predators achieved their abundance through June.

Concerning early to mid-season of 2003 (Table, 3), *C. undecimpunctata* reached its highest abundance on May 12 by the mean of 10.5 insects seedling, while *Scymnus* spp., *P. alfierii, Orius* sp., *C. carnea* and true spiders reached their highest of abundance on June 23, June 9, June 9, June 23, and June 23 by means of 8.9, 6.6, 5.6, 6.3 and 8.7, respectively.

Also, *C. undecimpunctata* was the most abundant predator (with mean 7.1±0.66 insect) followed by *P. alfierii* (5.2±0.51 insect), *Scymnus* spp. (4.8±0.66 insect), true spiders (4.4±0.75 insect), *Orius* spp. (3.6±0.31 insect) and *C. carnea* (3.1±0.37 insect), respectively. *C. undecimpunctata* reached its highest abundance in May. While the rest predators achieved their highest abundance through June.

As for mid- to late-season (Table 4), *C. undecimpunctata* had one peak of abundance (the mean was 8.1 insects) on August 26 for 2002 season and twice peaks of 8.2 and 8.9 insects through August for 2003 season. *Scymnus* spp., *P. alfierii, Orius* sp., *C. carnea* and true spiders reached their highest peaks of abundance on August 5 (mean of 7.4 insects), July 8 (15.0 insects), July 22 (6.5 insects), August 19 (5.6 insects) and July 29 (8.7 spiders), respectively for 2002 season.

In 2003 season, the peaks of abundance for *Scymnus* spp., *P. alfierii, Orius* sp., *C. carnea* and true spiders were occurred on September 1, July 14, August 25, August 18 and July 14, respectively. *P. alfierii* was the most dominant predator (mean of 6.5±0.90 insects) followed by *C. undecimpunctata* (6.1±0.37 insects), *Scymnus* spp. (6.1±0.24 insects), true spiders (5.3±0.45 spiders), *C. carnea* (4.4±0.27 insects) and *Orius* sp. (4.2±0.24 insects), respectively in 2002. Similar trend of predator dominance was observed on the same period of 2001 season except *C. carnea* (3.7±0.24 insects) which was less abundant than *Orius* sp. (4.65±0.31 insects). These results are similar to a great extent with those obtained by Hafez (1960), Ali *et al* (1975), Ragab (1999) and Shawer (2000) and Aref (2002).

2- Relation between the abundance of insect pests in both 2002 and 2003 seasons :

During early to mid-season, Table (1); *A. gossypii, T. tabaci* and *Empoasca* sp. were more abundant in 2003 season than the same insects in 2002 one, while *B. tabaci* was relatively more abundant during 2002 season than 2003. *T. tabaci* was the most abundant pest (11.6 and 13.9 insects) followed by *A. gossypii* (6.3 and 8.2 aphids), *Empoasca* spp. (4.4 and 4.5 individuals) and *B. tabaci* (2.9 and 2.4 insects/25 seedlings) for 2002 and 2003 seasons, respectively.

Concerning mid- to late-season (Table 2), *A. gossypii, T. tabaci* and *Empoasca* sp. were more abundant during 2002 season than the same species during 2003 one. *E. insulana* was relatively more abundant during 2002 season (the mean was 0.05±0.02 larvae/boll) than in 2003 (mean of 0.04±0.02 larvae/boll). While, *P. gossypiella* was more abundant during 2001 (mean of 0.6±0.13 larvae/boll) than 2002 one (mean of 0.54±0.13 larvae/boll). *B. tabaci* was the most abundant pest (17.2±1.89 insects), followed by *A. gossypii* (15.5±1.92 insects), *Empoasca* spp. (6.4±0.58 insects), *P. gossypiella* (0.54±0.13 larvae/boll), and *E. insulana* (0.05±0.02 larvae) during 2002 season; while *A. gossypii* (10.9±1.27 insects) was the abundant pest followed by *B. tabaci* (10.0±1.02 insects), *Empoasca* spp. (5.7±0.47 insects), *P. gossypiella* (0.56±0.13 larvae) and *E. insulana* (0.04±0.02 larva during 2003 one. This indicate that the sucking pest became the most abundant pests in the cotton fields. So, it is very important to management these pests.

In early to mid-season, statistical analysis (Table 5) showed significant and positive correlation between *A. gossypii* and *B. tabaci* and negatively insignificant correlation between *A. gossypii* and *Empoasca* spp. during 2002 and 2003 seasons. *A. gossypii* Correlated positively and significant with *T. tabaci* in 2003 season and highly significant and positive with this pest in 2002 one. *B. tabaci* correlated with *Empoasca* spp. negatively insignificant in 2002 season and highly significant in 2003 season one.

In mid to late-season (Table 6) these results agree with those obtained by Salem (1998) and Nassef (2003). *A. gossypii* correlated with *B. tabaci* and *P. gossypiella* positively and significant in 2002 season and positive highly significant in 2003 one. *A. gossypii* correlated positively insignificant with *Empoasca* spp. in the two seasons, but significantly positive with *E. insulana* in 2003 season and insignificant in 2002 one. *B. tabaci* correlated positively insignificantly with *Empoasca* spp. and highly significant with *P. gossypiella* in 2002 and 2003 seasons. *B. tabaci* correlated with *E. insulana* significantly and positive in 2003 and highly significant in 2002 season. *Empoasca* spp. insignificantly and negative correlated with *P. gossypiella* and *E. insulana* in the two tested seasons.

P. gossypiella correlated positively highly significant with *E. insulana* also in the two tested seasons. These correlation have great importance in the management of those pests.

Table (5): Simple correlation between the densities of four sucking pests during early to mid-season of 2002 and 2003 seasons.

Seasons	*A. gossypii* and *B. tabaci*	*A. gossypii* & *Empoasca* spp,	*B. tabaci* and *Empoasca* spp,	*A. gossypii* and *T. tabaci*
2002 (1)	0.7209*	-0.0402	-0.1749	0.8966**
2003 (2)	0.65808*	-0.54111	-0.73874**	0.64621*

(1) Tabulated "r" value = 0.602 (5 %) = 0.734 (1 %), d.f. = 9
(2) Tabulated "r" value = 0.576 (5 %) = 0.707 (1 %), d.f. = 10
*** Significant**
**** Highly significant.**

3- Predators associated with pests and climatic factors relationships :

In 2002 and 2003 early to mid-season (Tables 1 & 3), *A. gossypii* and *T. tabaci* reached their highest abundance (12.57 & 13.71 aphids and 19.54 & 23.36 thrips, respectively) which coincided with the highest number of *C. undecimpunctata* (10.4 & 10.5 insects for 2002 & 2003, respectively) and the higher number of *Scymnus* spp., *P. alfierii, Orius* sp., *C. carnea* and true spiders. The highest number of *Empoasca* spp. (7.48 and 6.78 for late May 2002 and first June 2003, respectively) and the second peak of abundance of *T. tabaci* (11.22 and 19.39 insects in June 2002 and 2003, respectively), were synchronizing with *Scymnus* spp. (18.4 and 8.9 insects for 2002 and 2003), *P. alfierii* (7.1 & 6.6 insects for 2002 and 2003, respectively), *Orius* sp. (6.0 & 5.6 insects for 2002 and 2003, respectively), *C. carnea* (7.5 & 6.3 insects for 2002 and 2003, respectively), and true spiders (9.2 & 8.7 for 2002 and 2003, respectively).

The data presented In Table (7) indicated that *C. undecimpunctata* affected aphids and thrips positively and insignificant in 2003, but significant in 2002. *B. tabaci* correlated with *C. undecimpunctata* insignificantly positive in 2002 and negative in 2003. *C. undecimpunctata* correlated insignificantly and positive with *Empoasca* spp. in 2002 and 2003 seasons. *Scymnus* spp. affected aphids negatively and highly significant in the two seasons and affected *B. tabaci* negatively significant in 2003 and insignificant in 2002. *Scymnus* spp. influenced *Empoasca* spp. insignificant negatively in 2002 season and positively in 2003 one, while it correlated negatively with *T. tabaci* significantly in 2002 and insignificantly in 2003 season. *P. alfierii* correlated negatively with all the sucking insect pests except for *Empoasca* sp. which influenced positively and insignificant in 2003 but highly significant with *A. gossypii* in 2002 and 2003 seasons. *Orius* sp. negatively affected all insect pest (except *Empoasca* spp. in 2003), but significant for *A. gossypii* in 2002 season and highly significant in 2003 one. The relation between *C. carnea* and sucking insect pest was negatively significant for aphids and *B. tabaci* in 2002 season, highly significant and negative with *A. gossypii* in 2003 one. The rest correlations were insignificant and negative. True spiders affected *Empoasca* spp. positively and highly significant in 2003 season, negatively for rest pests, but highly significant for aphids (2002 and 2003), *B. tabaci* (2002 and 2003). *T. tabaci* (2002).

Temperature affected *Empoasca* spp. and *T. tabaci* positively highly significant for *Empoasca* spp. (2003) and insignificant for *T. tabaci* (2002 & 2003 seasons), and *Empoasca* spp. (2002 season).

Relative humidity influenced insignificantly all sucking insect pests, *A. gossypii* and *B. tabaci* positive in 2002 season and negative in 2003 one, but *Empoasca* spp. and *T. tabaci* negative in 2002 and positive in 2003.

The joint effect of total predators on *A. gossypii, B. tabaci, Empoasca* spp. and *T. tabaci* (Table 8) were 97.11 & 94.86, 92.09 & 94.28, 74.72 & 74.54 and 88.79 & 41.33 for 2002 and 2003 early to mid-season, respectively. It is clear that *A. gossypii* and *B. tabaci* are more influenced by total predator than *Empoasca* spp. and *T. tabaci*.

Table (6): Simple correltion between the densities of five pests during mid to late-season of 2002 and 2003.

Season	*A. gossypii* and *B. tabaci*	*A. gossypii* and *Empoasca* spp.	*A. gossypii* and *P. gossypiella*	*A. gossypii* and *B. insulana*	*B. tabaci* and *Empoasca* spp.	*B. tabaci* and *P. gossypiella*	*B. tabaci* and *B. insulana*	*Empoasca* spp. and *P. gossypiella*	*Empoasca* spp. and *B. insulana*	*P. gossypiella* and *B. insulana*
2002 (1)	0.9029*	0.5089	0.6573*	0.4185	0.2738	0.8242**	0.6790**	-0.1789	-0.3276	0.9250**
2003 (2)	0.9001**	0.1879	0.7722**	0.6109*	0.0597	0.8166**	0.6504*	-0.3558	-0.5158	0.9559**

(1) Tabulated r value = 0.532 (5 %), 0.661 (1 %), d.f. = 12
(2) Tabulated r value = 0.552 (5 %), 0.683 (1 %), d.f. = 11
* Significant
** : Highly significant

Table (7): Simple correlation between some pests, temperature, relative humidity and predators during early to mid-season of 2002 and 2003.

Variables	*A. gossypii*		*B. tabaci*		*Empoasca* spp.		*T. tabaci*	
	2002	2003	2002	2003	2002	2003	2002	2003
C. undecimpunctata	0.6601*	0.4822	0.1423	-0.1374	0.3308	0.3658	0.6807*	0.4888
Scymnus spp.	-0.7967**	-.9090**	-0.6215	-0.5813*	-0.2924	0.3837	-0.6131	-0.5386
Paederus alfierii	-0.7757**	-0.7480**	-0.4732	-0.2430	-0.3853	0.3201	-0.6453	-0.4698
Orius sp.	-0.6341*	-0.7872**	-0.7580**	-0.3100	-0.1789	0.4527	-0.3194	-0.4347
C. carnea	-0.7275*	-0.5845**	-0.7430*	-0.2697	0.2670	-0.1493	-0.4955	-0.5435
True spiders	-0.9268**	-0.9101**	-0.7715**	-0.7540**	0.0663	0.5996**	-0.7185**	-0.4463
Mean of temp.	-0.83374**	-0.58695*	-0.85411**	-0.6452*	0.08436	0.70796**	0.58068	-0.24088
Mean of R.H.	0.24557	-0.79398	0.770647	-0.27292	-0.138138	0.023103	-0.018894	0.011824

* Significant
** : Highly significant

Table (8): Direct and joint effect of six predators on the population of four sucking infesting cotton fields during early to mid-season of 2002 and 2003.

Variables	Coefficient of determination R^2							
	A. gossypii		*B. tabaci*		*Empoasca* spp.		*T. tabaci*	
	2002	2003	2002	2003	2002	2003	2002	2003
C. undecim.	43.15	23.63	1.89	1.85	11.82	13.50	45.60	24.45
Scymnus spp.	63.46	86.80	38.90	34.37	8.53	14.86	37.72	29.55
P. alfierii	59.99	55.94	21.80	6.15	15.27	10.28	41.78	21.91
Orius sp.	39.16	60.80	55.67	9.59	3.26	20.08	9.70	18.27
C. carnea	53.22	34.69	54.11	7.26	6.51	2.39	25.00	30.45
True spiders	85.65	82.83	59.72	57.92	0.51	36.26	51.37	20.34
Joint effect of the predators	97.11	94.86	92.09	94.28	74.72	74.54	88.79	41.33
Residuate factors	2.89	5.14	7.91	5.72	25.28	25.46	11.21	58.67

On the other hand, the predators were more effective on aphids and *T. tabaci* during 2002 season than 2003 one; while, these predators were more effective on *B. tabaci* during 2003 than 2002 season. The joint effect was the same during 2002 and 2003 season for *Empoasca* spp.

As for 2002, mid to late-season of 2003 (Tables 2 & 4) indicated that *A. gossypii* and *Empoasca* spp. first peak of abundance was on July 22 (7.94 and 7.75, respectively) and coincided with the high number of *Scymnus* spp., *P. alfierii, Orius* sp. and true spiders.

Also, the high number of *A. gossypii, B. tabaci, Empoasca* spp. through August and the first of September was accompanied by the high number of the same predators. Similar trend was observed in 2001 mid- to late-season.

It is noticed that the peak of some predators and the peak of some insect pest were not synchronized because the peaks of these predators may be correlated with another pests such as *Spodoptera* egg-masses and newly hatched larvae (El-Maghraby *et al.*, 1993).

As shown in Table (9), *C. undecimpunctata* affected *A. gossypii, B. tabaci* and *Empoasca* spp. positively in 2002 and 2003 season, but significant in the two seasons for *Empoasca* spp. and significant in 2003 only for *A. gossypii* and *E. tabaci. C. undecimpunctata* correlated with *P. gossypiella* and *E. insulana* insignificantly in the two seasons, but negatively in 2002 and positively in 2003 mid- to late one.

Scymnus spp. correlated insignificantly and negative with all insect pests during mid- to late-season, except for *A. gossypii, B. abaci* and *Empoasca* spp. which had the positive correlation for 2003 mid- to late-season.

P. alfierii affected negatively on all insect pests except for *Empoasca* spp. which influenced positively in 2003 mid- to late-season. These correlation was highly significant with *B. tabaci, P. gossypiella* and *E. insulana*, significant with *A. gossypii,* and insignificant with *Empoasca* spp. in the two seasons.

Table (9): Simple correlation between some pests, temperature, relative humidity and predators during mid to late-season of 2002 and 2003.

Variables	*A. gossypii*		*B. tabaci*		*Empoasca* spp.		*P. gossypiella* larvae		*E. insulana* larvae	
	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003
C. undecimpunctata	0.4614	0.60818*	0.2141	0.6051*	0.6486*	0.6773*	-0.2276	0.2559	-0.4151	0.0890
Scymnus spp.	-0.1991	0.4497	-0.2893	0.2883	-0.0151	0.4255	-0.4083	-0.0330	-0.3966	-0.2221
Paederus alfierii	-0.6522*	-0.63902*	-0.7959**	-0.7709**	-0.2070	0.4524	-0.7399**	-0.9018**	-0.7836**	0.8673**
Orius sp.	-0.6033*	-0.3680	-0.7022**	-0.493	0.2077	0.2886	-0.8677**	-0.6918*	-0.8136**	-0.7813**
C. carnea	0.8116**	0.6580*	0.7257**	0.4860	0.2922	0.3275	0.5805*	0.3057	-0.3733	0.1667
True spiders	-0.5050	-0.8621**	-0.5838*	-0.5548**	0.2414	0.2446	-0.8431**	-0.9561**	-0.7119**	-0.8458**
Mean of temp.	-0.0506	0.1087	-0.1812	0.0002	0.3846	0.4823	-0.3541	-0.2240	-0.2850	-0.3123
Mean of R.H.	0.1560	-0.5812	0.0450	0.5522*	0.3367	0.4363	0.0736	-0.7668**	-0.0014	-0.6997**

* Significant
** : Highly significant

Orius sp. affected *Empoasca* spp. positively and significant for the two seasons. *Orius* sp. affected *A. gossypii, B. tabaci, P. gossypiella* and *E. insulana* negatively significant for aphids in 2002 mid- to late season and insignificant in 2003 one, highly significant for whiteflies in mid- to late-season of 2002 and insignificant in 2003 one. Highly significant for *E. insulana* in the two seasons. *C. carnea* correlation positively and highly significant for aphids and *B. tabaci* in 2002 season, significant and positive for aphids in 2003 season and *P. gossypiella* in 2002 one, but the rest correlations were insignificant.

True spiders affected the pests negatively except for *Empoasca* spp. which influenced positively and insignificant, the correlation was highly significant with *P. gossypiella, E. insulana* in the two seasons, while it was highly significant with *A. gossypii* and *B. tabaci* in 2003 season one.

Temperature affected all pests insignificantly positive for *Empoasca* spp. in the two season, *A. gossypii* and *B. tabaci* in 2003 season. The rest correlations were negative.

Relative humidity affected the bollworms highly significantly and negative in 2003 season and insignificantly negative for *E. insulana* in 2002 significantly and negative for aphids in 2003 season, significantly and positive for *B. tabaci* in 2003. The rest correlations were positively and insignificant.

The joint effects of total predators (Table 10) on *A. gossypii, B. tabaci, Empoasca* spp., *P. gossypiella* and *E. insulana* were 86.87 & 98.73, 83.22 & 93.55, 95.86 & 85.58, 94.31 & 99.17 and 97.11 & 95.29. The predators were more effective on *A. gossypii, B. tabaci* and *P. gossypiella* during 2003 season than 2002 one. While, the predators were more effective on *Empoasca* spp. and *E. insulana* during 2002 than 2003 season.

Table (10): Direct and joint effect of six predators on the population of three sucking and bollworms pests infesting cotton fields during mid to late-season of 2002 and 2003.

Variables	Coefficient of determination R^2									
	A. gossypii		*B. tabaci*		*Empoasca* spp.		*P. gossypiella* larvae		*E. insulana* larvae	
	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003
C. undecim.	20.16	37.26	4.62	36.75	41.77	45.91	7.02	6.66	18.99	0.85
Scymnus spp.	3.97	20.08	8.39	8.28	0.02	18.04	23.23	0.13	21.02	5.11
P. alfierii	42.49	40.51	63.29	59.15	4.38	20.70	58.96	81.06	63.60	75.00
Orius sp.	36.57	13.59	49.76	24.24	4.14	7.95	69.47	47.81	62.59	61.14
C. carnea	65.23	44.86	52.14	24.72	8.10	10.91	39.56	9.94	18.75	3.15
True spiders	25.66	73.80	34.40	77.59	5.62	6.43	73.19	91.63	53.93	72.19
Joint effect	86.87	98.73	83.22	93.55	95.86	85.58	94.31	99.17	97.11	95.29
Residuate factors	13.13	1.27	16.78	6.45	3.14	14.42	5.69	0.83	2.89	4.71

REFERENCES

Abbas, M.S.T. and A.A. El-Deeb (1993). On the natural enemies of the major pests infesting cotton in Egypt. Egypt. J. Agric. Res., 71 (1) : 131-138.

Ali, A.M.; F.M. Khalil; M. Hafez and F. Abdel-Kawie (1975). Fluctuation of population density of certain predators in cotton and clover fields in Assiut Governorate. Agric. Res. Rev., 53 (1) : 47-52.

Aref, S. Abd El-Salam (2002). New approaches for controlling bolworms. Ph.D. THesis, Fac. Agric., Kafr El-Sheikh, Tanta Univ.

El-Heneidy, A.H.; M.S.T. Abbas and M.S.I. El-Dakroury (1979). Seasonal abundance of certain predators in untreated Egyptian clover and cotton fields in Fayoum Governorate, Egypt. Bull. Soc. ent. Egypte, 62 : 89-95.

El-Maghraby, M.M.A.; M.A. El-Tantawy; E.A.A. Gomaa and M.A. Nada (1993). Effect of pesticidal application during the early and late season on the abundance of certain predators associated with cotton plants. Zagazig J. Agric. Res., 26 (2A) : 727-737.

El-Mezayyen, G.A. (2003). Light and pheromone traps as monitoring techniques for three lepidopterous cotton pests in relation to the actual pest infestation in the Nile Delta, Egypt. Egypt. J. Appl. Sci., 18 (4B) : 612-623.

Gerling, D.U. Motro and R. Horowitz (1980). Dynamics of *Bemisia tabaci* (Gennadius) (Homoptera : Aleyrodidae) attacking cotton in the coastal plain of Israel. Bull. Ent. Res., 70 (2) : 213-219.

Hafez, M. (1960). The effect of some new insecticides on predators of cotton leafworm in cotton fields. Agric. Res. Rev., Cairo, 38 (1) : 47-79.

Hargreaves, H. (1948). List of Recorded Cotton Insects of the World. London Commonwealth Institute of Entomology.

Hassanein, M.H.; A.H. El-Sebae; F.M. Khalil and E.A. Mouftah (1971). Studies on *Aphis gossypii* and *A. craccivora* in the cotton fields in Upper Egypt. Bull. ent. Soc. Egypte, 55 : 163-169.

Hassanein, S.S.; M.E.M. Metwally; M.M. Helaly; W.M.H. Desuky and H.M.H. Al-Shannaf (1995). Relative abundance of some cotton pests and the simultaneous effect of certain weather factors on their activity in Zagazig region, Egypt. Zagazig J. Agric. Res., 11 (1) : 159-174.

Ibrahim, M.M. (1962). An indication of the effect of the wideaspread use of pesticides on the population of some predators in cotton fields. Bull. Soc. ent. Egypt, 46 : 317-323.

Khalafalla, E.M.E.; Salem, R.M. and Samira H. Mitri (1997). Susceptibility of some Egyptian cotton varieties to infestation with sucking insects. Egypt. J. Agric. Res., 75 (2) : 383-391.

Makkar, A.W. and S.N. Kostandy (1995). Relationship between spiny bollworm males attracted to pheromone traps and larval infestation in cotton bolls. Annals Agric. Sc., Moshtohor, 33 (4) : 1529-1538.

Mohamed, Zeinab .A. (1977). Ecological studies on cotton pests. M.Sc., Fac. of Agric., Zagazig Univ.

Nassef, M.A. and A. M. Nassef (2003).Interrelation between the population of sucking pests and their associated predators as affected by early – season insecticide treatments in cotton field. J. Agric. Res. Tanta, Univ., 29 (3): 464 – 474.

Nassef, M.A.; A.M. Hamid; Suzan, A. Bassiouny and N.M. Watson (1996). Correlation bewteen sucking pests infesting cotton plants and their associated natiral enemies. Egypt. J. Agric. Res., 74 (3) : 599-609.

Ragab, M.G.M. (1999). Ecological studies on cotton bollworms in Egypt. Ph.D. Thesis, Fac. Agric., Al-Azhar Univ.

Ragab, M. G.; Salem, A. Hoda and El-Shershaby, M.A. Mahasen (2004). Investigation of different sowing dates and different weather factors on the infestation of pink bollworm, Pictinophera gossypiella (Saunders). J. Egypt. Acad. Soc. Environ. Develop., (A-Entomology) Vol. 5, No. (1): 69 – 81.

Salem, R.M. (1998). Population density of some sucking pests infesting Giza-86 cotton variety in relation to associated predator under certain climatic factors at Kafr El-Sheikh. Alex. Sci. Exch., 19 (2) : 197-207.

SAS Institute (1999). SAS/STAT users guide, version 6. 4*th* ed. SAS Institute, Cary, NC.

Sewify, G.H. ; S.A. El-Arnaouty and M.H. Belal (1996). The effect of cotton late planting on population densities of sucking insects and their associated predators in Giza region. Egypt. Bull., Fac. Agric., Univ. Cairo, 47 : 665-676.

Shawer, M.B.M. Dalia (2000). Ecological studies on some insect pests attacking cotton plants. M.Sc. Thesis, Fac. Agric., Kafr El-Sheikh, Tanta Univ.

Shawir, M.S.; Attia A.M. Manal and Moustafa I. Fathia (2002). Some approaches for integrated pest management of whiteflies on coton. The First Conf. of the Central Agric. Pesticide Lab., 2-5 Sep., 2002.

Singh, J. and N.S. Butter (1988). Influence of climatic factors on the build-up of whitefly, *Bemisia tabaci* Genn. on cotton. Indian J. Entomol., 47 (3) : 459-460.

Singh, J.P. and B.P.S. Lather (1989). Monitoring of pink bollworm moths and larvae. Indian J. Plant Protection, 17 (2) : 199-204. (c.f. R.A.E., 79 (1), No. 720).

Thomas, M.L. and Hills, F.J. (1975). Statistical methods in agricultural research. UCD Book Store, Univ. of California, Davis, 95616.

Whitcomb, W.H. and K. Bell (1964). Predaceous insects, spiders and mites of Arkansas cotton field. Arkansas Agric. Exp. St. Bull., 690.

الوفرة العددية لبعض آفات القطن والمفترسات المصاحبة لها فى حقول القطن

محمد جمعة رجب

معهد بحوث وقاية النباتات - الدقى - القاهرة

تم دراسة الوفرة العددية لمنّ القطن والذبابة البيضاء ونطاط الأوراق والتربس ودودة اللوز الشوكية ودودة اللوز القرنفلية، والمفترسات المصاحبة لها مثل أبو العيد ذو الاحدى عشر نقطة والاسكيمنس والراوغة والأوريس وأسد المن والعناكب الحقيقية على صنف القطن جيزة ٨٩ المنزرع فى محطة البحوث الزراعية بالجميزة (وسط الدلتا) خلال موسمى ٢٠٠٢ و ٢٠٠٣. وأظهرت الدراسة النتائج التالية :

١- تواجد الحشرات من أول الموسم إلى وسط الموسم :

وجد أن منّ القطن له ذروة واحدة فى أول مايو فى خلال الموسمين، بينما كان لنطاطات الأوراق (الجاسيدز) ذروة واحدة فى نهاية مايو موسم ٢٠٠٢ وبداية يونيو موسم ٢٠٠٣. والتربس كان له ذروتين خلال مايو ويونيو وكان هو الأكثر من حيث الوفرة العددية يليه منّ القطن ثم نطاطات الأوراق ثم الذبابة البيضاء فى كلا الموسمين.

بالنسبة للمفترسات وجد أن أقصى تواجد لأبى العيد ذو الإحدى عشر نقطة فى مايو لكلا الموسمين، بينما كان أقصى تواجد لها المفترسات فى شهر يونيو خلال الموسمين متزامنا مع تزايد تعداد المنّ والتربس. كما وجد أن أبوالعيد كان أكثر سيادة خلال الموسمين بينما كان اسد المنّ على العكس أقل تعداداً.

وكان هناك ارتباطاً موجباً بين المنّ وكلاً من الذبابة البيضاء والتربس بينما كان الإرتباط بين الجاسيد وكلاً من المنّ والذبابة البيضاء سالباً خلال موسمى الدراسة. أثرت الرطوبة النسبية على كلٍ من المنّ والذبابة البيضاء تأثيرا موجبا فى موسم ٢٠٠٢ وسالبا فى ٢٠٠٣ وعلى العكس كانت العلاقة بين الرطوبة النسبية وكلاً من التربس والجاسيد ونطاطات الأوراق سالبة. ومن ناحية أخرى أثرت الحرارة تأيرا موجبا على نطاطات الأوراق فى كلا الموسمين، بينما كان تأثير الحرارة على التربس موجبا فى موسم ٢٠٠٢ فقط وكان سالباً على منّ القطن والذبابة البيضاء خلال الموسمين. وكانت الذبابة البيضاء ومنّ القطن أكثر تأثراً بالمفترسات عن نطاطات الأوراق والتربس خلال الموسمين.

٢- تواجد الحشرات من منتصف الموسم إلى نهايته :

وجد للمنّ ذروتان الأولى فى أواخر يوليو والأخرى فى نهاية أغسطس، بينما ظهر للذبابة البيضاء ذروتان خلال أغسطس وسبتمبر فى كلا الموسمين، و كان أقصى تعداد لنطاطات الأوراق فى شهر أغسطس خلال الموسمين. وجد أن تعداد يرقات ديدان الوز الشوكية والقرنفلية أقصى تعداد لها فى نهاية موسمى الدراسة ، وكان تعداد اليرقات أكثر وفرة فى موسم ٢٠٠٢ عن الموسم الأخر، وكانت الذبابة البيضاء أكثر وفرة يليها منّ القطن ثم نطاطات الأوراق ثم ديدان اللوز القرنفلية وأخيرا الشوكية فى موسم ٢٠٠٢، بينما كان منّ القطن أكثر وفرة يليه الذبابة البيضاء ثم نطاطات الأوراق ثميرقات القرنفلية وأخيرا الشوكية فى موسم ٢٠٠٣. وبالنسبة المفترسات، كان لأبوالعيد ذو الإحدى عشرة نقطة ذروة فى خلال شهر أغسطس فى موسمى الدراسة، بينما كانت ذروات باقى المفترسات خلال يوليو وأغسطس خلال موسمى ٢٠٠٢ و ٢٠٠٣. وكانت الحشرة الرواغة أكثر وفرة، بينما أسد المنّ وبق الأزهار (الأوريس) أقل تعدادا خلال موسمى الدراسة.

كان الارتباط موجبا بين كل الافات بعضهم البعض فيما عدا نطاطات الأوراق والذى ارتبط سلبياً مع دودة اللوز القرنفلية والشوكية خلال موسمى الدراسة. أثرت الرطوبة النسبية إيجابياً على كلاً من منّ القطن وديدان اللوز القرنفلية فى موسم ٢٠٠٢ فقط، بينما تأثرت كلٍ من الذبابة البيضاء ونطاطات الأوراق إيجابيا فى كلا الموسمين. ومن ناحية أخرى ارتبطت ديدان اللوز الشوكية سلبيا مع الرطوبة النسبية فى كلا الموسمين. أثرت درجة الحرارة إيجابيا على كل من منّ القطن والذبابة البيضاء موسم ٢٠٠٢ بينما كانت العلاقة موجبة بين درجة الحرارة ونطاطات الأوراق وسالبة بين درجة الحرارة وكلا من ديدان اللوز الشوكية والقرنفلية فى كلا الموسمين. وكانت المفترسات أكثر تأثيرا على كلٍ من منّ القطن والذبابة البيضاء ويرقات دودة اللوز القرنفلية فى موسم ٢٠٠٣ أكثر من موسم ٢٠٠٢. بينما كانت تلك المفترسات أكثر تأثيرا على كل من نطاطات الأوراق ويرقات دودة اللوز الشوكية فى موسم ٢٠٠٢ أكثر من موسم ٢٠٠٣. وهذه النتائج لها أهمية كبرى فى المكافحة المتكاملة لافات القطن الحشرية.