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SEASONAL ABUNDANCE OF WHITEFLY *Bimisia tababci* (Gennadius) ON COTTON IN RELATION TO THE ASSOCIATED PREDATORS AND SOME WEATHER FACTORS AT KAFR EL-SHEIKH GOVERNORATE

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ABSTRACT

Field experiments were conducted at farm of Sakha Agricultural Research Station, Kafr El-Sheikh Governorate during 2005, 2006 and 2007 cotton growing seasons to study the population abundance of *Bimisia tabaci* (Genn.) on cotton in relation to common associated predators (*Coccinella* spp., *Scymnus* spp., *Chrysoperla carnea, Syrphus corellae, Orius* spp. and true spiders) and some prevailing weather factors (temperature, relative humidity and wind speed).

Concerning the associated predators, their total population fluctuated and recorded three peaks of abundance during, August and September (2005 season) and four peaks during 2006 and 2007 seasons.

The combined effect of weekly mean of total predators, daily mean temperature, relative humidity and wind speed was responsible for 81.44, 82.19 and 95.42% of change in the population of whitefly *B. tabaci* in 2005, 2006 and 2007 cotton growing seasons, respectively.

Results obtained could be summarized in the following points:

- Four peaks of abundance were observed for *B. tabaci* (Genn.) during the period of study from May to September for each season.
- Maximum number of *B. tabaci* took place during July and August for three tested seasons with a mean of 628, 890 and 4188 individual/50 cotton leaves and 3954, 3920 individual/50 cotton leaves (2007 season), respectively.

INTRODUCTION

Recently, the piercing – sucking insects are considered of the most serious insect pest that attack cotton plants under the Egyptian environmental conditions. Among of these insects, whitefly, *Bemisia tabaci* (Genn.) is an important pest causes damage not only by sucking plant fluids (Phloem sap.) which can result in yield reduction but also transmitting viral diseases (Chen, 1996). The whitefly, *B. tabaci* has become resistant to most classes of insecticides, currently registered for control (Prabhaker *et al.*, 1985). However, the integrated management of this insect on cotton should take into account all factors that may have a negative effect on the population growth. The natural enemies and climatic conditions are the most important factors affecting the population dynamics of this insect (Gadfrey and Rosenheim, 1996). The interaction between insects and their natural enemies are essential ecological processes that contribute to the regulation of insect population. Also, the environmental conditions at any location influence the level of insect generations (Dent, 1991). Therefore, this was carried out to evaluate the population density of *B. tabaci* on cotton plants as influenced by common associated predators and some weather factors during 2005 to 2007 cotton growing seasons.

MATERIALS AND METHODS

The experiment was carried out at the farm of Sakha Agricultural Research Station, Kafr El-Sheikh Governorate during three growing seasons from 2005 to 2007. An area of about one feddan was divided into four equal plots, the cotton variety of Giza86 was planted during the second week of April in all seasons. The natural agricultural practices were followed by and no insecticidal treatments were applied during the whole experimental period. Weekly samples of fifty cotton leaves representing the three levels of the plant were taken early in the morning within an imaginary zigzag line in tested. The numbers of whitefly (adults and associated common predators) species were carefully counted directly in the field on the two leaf surface. The same samples were taken into the laboratory to count the immature stages of whitefly using a hand lens. The considered predatory species were, *Coccinella* spp. (adults and larvae) *Scymnus* spp. (adults and larvae), *Chrysoperla carnea* Steph. (larvae), *Syrphus corellae*, *Orius* spp. and true spiders. The daily records of temperature, relative humidity and wind speed through the experimental period were obtained from the Meteorological Department at Sakha Research Station. The weekly mean of three climatic factors as well as total predators were calculated to determine the simple correlation between them and the population of whitefly using Computer Program (MREQ2)

RESULTS AND DISCUSSION

Data presented in Tables (1-3) showed the following points:

The population of all immatures and adult of whitefly was appeared on June 21st , June 5th within 2005 and 2006 cotton season while appeared on June 2nd during 2007 cotton season, respectively.

The abundance of whitefly adult and immature stages increased gradually to reach a maximum level on August 30th (4188 individuals/50 cotton leaves) during 2005, 4142 individuals/50 cotton leaves on July 31st during 2006 and 3954 individuals/50 cotton leaves on July 28th during 2007 cotton season.

The population abundance of whitefly was in general, much more higher during 2005 cotton seasons than that during both other seasons.

Concerning the number of *B. tabaci* peaks, the data showed that four peaks were quite observed during 2005 cotton-season. The first peak occurred on June 28th estimating by 185 individuals/50 cotton leaves. The second peak was on August 2nd estimating by 890 individuals/50 cotton leaves. The third peak was observed on August 30th counting 4188 individuals/50 cotton leaves and while the fourth peak was recorded on September 20th (3180 individuals/50 cotton leaves).

In 2006 cotton season, four peaks were observed on July 5th, July 31st, August 21st and September 11 estimating by (2356, 4142, 5644 and 1226 individuals/50 cotton leaves) with regards to the number of peaks recorded

during 2007 cotton-season, four peaks were observed on July 14, July 28, August 11 and September 8 with a mean of 3304, 3954, 3920 and 3810 individuals/ 50 cotton leaves.

From the current results, it could concluded these following statements:

The population fluctuations of the immature and adult stages of whitefly showed four district peaks in each growing season. The population abundance of all stages of *B. tabaci* was, in general, higher during 2005 than those recorded through 2006 and 2007 growing seasons. These results coincide with many investigators, Luo *et al.* (1989) studied the population dynamic of *B. tabaci* in cotton fields in Shanghai, China. The pest appeared in cotton fields form early July. Three regular population peaks were observed in August-September. Moreover, El-Mezayyen and Abou Attia (1996) reported that the highest population of *B. tabaci* coincided with the highest peak predators during July and August. In addition, Nassef *et al.* (1996a) reported that two distinct peaks of whitefly were observed during August and September. Moreover, Nassef *et al.* 1996b) mentioned that the population of whitefly fluctuated recording 2-4 generations during a period extending from April to September in both seasons; 1990 and 1991, respectively. Also, Kejian *et al.* (2002) showed that during the growing cotton-season, the population of *B. tabaci* increased continuously until it reached its maximum peak on August 22nd, then the population decreased gradually.

Kejian *et al.* (2008) studied the population fluctuations of *B. tabaci* in commercial cotton fields during the summers of 2003 through 2005 in China. They found that the abundance of *Bemisia tabaci* was found to increase rapidly in late July and reached its first peak in mid-August then followed by the second peak in early September. Whitefly, population subsequently declined slowly to attain a plateau after mid September.

Population dynamics of associated predators:

The population dynamics of predators namely, *Coccinella* spp.; *Scymnus* spp., *Chrysoperla carnea*; *Syrphus corallae*; *Orius spp.* and True spiders were surveyed weekly and the data are presented in Table (1-3).

***1. Coccinella* spp.:**

Data presented in Tables (1-3) showed that the population of *Coccinella* spp. started to appear on May 25. Two peaks were recorded. The first peak was occurred on July 19th, showing a mean of 70 beetles/50 cotton leaves. The second peak occurred on September 20 with mean of 100 beetles/50 leaves within 2005 cotton season.

The results also showed that in spite of the total of population density of *Coccinella* spp. is relatively more abundant during 2006 cotton season (828) than 2005 and 2007 (741 and 561 beetles), but only two peaks were recorded on July 31st and September 18th with mean of (164 and 108 beetles/50 cotton leaves, respectively, while, in 2007 cotton season two peaks appeared on July 7th and September 1 with mean of (60 and 132 beetles/50 leaves), respectively.

Table (1): Weekly mean number of cotton plants whitefly *Bemisia tabaci* and associated predators and some weather factors on cotton fields during the season 2005 at Kafr El-Sheikh Governorate.

Date of sampling	Number of predators per 50 cotton leaves						Total number of predator	No. of *B. tabaci* per/50 cotton leaves			Weather factors			
	Coccinella spp.	*Scymnus* L + A	*C. carnea*	*Syrphus corellae*	*Orius* spp.	True spider		A	IMM	Total	Temp. max.	Temp. Min.	R.H %	W.S m/min
24/5/2005	10	6	0	0	0	8	24	0	0	0	29.1	11.5	58.1	112.3
31/5/2005	6	10	0	10	6	14	46	0	0	0	31.8	13.2	56.9	111.1
7/6/2005	12	12	0	22	10	14	70	0	0	0	30.3	14.3	60.9	123.0
14/6/2005	8	26	0	34	8	20	96	0	0	0	32.0	15.5	54.4	110.0
21/6/2005	18	32	4	12	32	10	108	92	50	142	30.8	16.8	60.9	89.8
28/6/2005	16	47	2	10	26	10	111	142	43	185	30.7	17.5	72.0	121.6
5/7/2005	19	48	10	16	22	12	127	115	31	146	32.5	17.4	61.2	105.4
12/7/2005	56	56	4	64	0	32	212	66	46	112	31.6	18.3	68.9	108.0
19/7/2005	70	60	10	24	0	38	202	180	135	315	32.7	18.7	71.0	92.6
26/7/2005	64	46	18	29	0	14	171	378	250	628	32.5	18.9	71.8	99.1
2/8/2005	62	18	18	28	14	32	172	605	285	890	33.9	19.8	74.2	95.0
9/8/2005	30	22	32	14	12	58	168	595	225	820	33.4	20.0	72.3	86.9
16/8/2005	10	34	26	14	8	44	136	773	520	1293	33.6	20.9	75.9	83.1
23/8/2005	18	12	46	6	10	18	110	2557	1150	3707	33.8	21.1	73.1	83.6
30/8/2005	40	56	48	14	12	30	200	2575	1613	4188	34.1	20.1	73.3	77.6
6/9/2005	72	64	102	12	16	36	302	2163	855	3018	33.0	19.4	71.7	87.6
13/9/2005	70	58	110	18	24	48	328	2245	625	2870	32.7	18.9	73.1	75.0
20/9/2005	100	50	168	0	56	52	426	2140	1040	3180	31.8	19.2	72.0	86.1
27/9/2005	34	44	92	0	20	32	222	1982	538	2520	31.4	16.1	69.2	82.4
4/10/2005	26	34	48	0	25	34	167	1675	105	1780	32.9	18.9	71.9	71.0
Total number of insects	741	735	738	327	301	556	3368	18283	7511	25794				

L = larvae A = adult

Table (2): Weekly mean number of cotton plants whitefly *Bemisia tabaci* and associated predators and some weather factors on cotton fields during the season 2006 at Kafr El-Sheikh Governorate.

Date of sampling	Number of predators per 50 cotton leaves						Total number of predator	No. of *B. tabaci* per/50 cotton leaves			Weather factors			
	Coccinella spp. L + A	*Scymnus* spp. L + A	*C. carnea* L	*Syrphus corollae* L+A	*Orius* spp.	True spider A		A	IMM	Total	Temp. max.	Temp. Min.	R.H %	W.S m/sec
8/5/2006	0	0	0	0	0	10	10	0	0	0	28.1	10.5	62.0	1.6
15/5/2006	0	0	0	0	0	8	8	0	0	0	27.9	10.4	65.0	1.26
22/5/2006	0	0	0	14	0	12	26	0	0	0	28.5	10.4	69.5	1.17
29/5/2006	0	0	0	6	0	14	20	0	0	0	34.3	15.6	66.4	1.20
5/6/2006	0	0	4	10	0	16	30	64	22	86	34.3	17.2	57.9	1.41
12/6/2006	2	0	0	18	4	18	42	72	52	124	30.4	14.9	59.1	1.48
19/6/2006	0	0	2	14	4	6	26	291	113	404	79.3	15.7	63.2	1.60
26/6/2006	2	0	6	4	2	12	26	623	445	1068	32.9	18.6	66.2	0.97
5/7/2006	8	4	14	28	16	18	88	1438	918	2356	33.3	19.8	728.8	1.00
10/7/2006	10	8	22	30	41	22	96	1156	790	1946	31.5	17.9	71.6	1.03
17/7/2006	74	6	22	34	6	34	176	1770	1360	3130	32.3	18.9	74.0	0.87
24/7/2006	82	28	26	54	4	56	250	2205	1115	3320	31.6	16.8	73.6	0.94
31/7/2006	164	66	30	36	10	24	330	2234	1906	4140	32.6	17.4	75.0	0.88
7/8/2006	80	100	62	36	12	22	312	1170	870	2040	32.9	18.6	78.9	0.80
14/8/2006	58	64	74	6	4	18	224	1252	602	1854	33.1	18.3	78.7	0.83
21/8/2006	50	34	52	4	10	76	220	3631	2013	5644	35.1	20.7	78.7	0.69
28/8/2006	34	14	62	2	10	40	162	887	709	1596	35.3	19.7	76.6	0.71
4/9/2006	24	16	30	4	8	14	96	642	420	1062	31.6	17.6	70.9	0.96
11/9/2006	46	68	72	10	6	36	238	708	518	1226	33.6	16.7	71.6	0.86
18/9/2006	108	102	44	18	4	46	322	509	415	924	32.7	16.6	69.7	1.00
25/9/2006	86	100	94	10	34	50	374	581	389	970	32.6	16.7	69.1	0.79
Total number of insects	828	610	616	338	138	552	3082	19233	12658	31891				

L = larvae **A = adult**

Table (3): Weekly mean number of cotton plants whitefly *Bemisia tabaci* and associated predators and some weather factors on cotton fields during the season 2007 at Kafr El-Sheikh Governorate.

Date of sampling	Number of predators per 50 cotton leaves						Total number of predator	No. of *B. tabaci*/50 cotton leaves			Weather factors			
	Coccinella spp. L + A	*Scymnus* spp. L	*C. carnea* L	*Syrphus corollae* L+A	*Orius* spp.	True spider		A	IMM	Total	Temp. max.	Temp. Min.	R.H %	W.S m/sec
12/5/2007	2	0	0	0	0	0	2	0	0	0	28.85	11.64	62.43	1.37
19/5/2007	3	0	0	0	0	9	12	0	0	0	31.50	11.85	68.43	1.20
26/5/2007	0	0	0	0	0	6	6	0	0	0	29.93	13.93	65.28	1.50
2/6/2007	0	0	0	12	4	10	26	45	39	84	31.43	15.0	65.21	1.57
9/6/2007	0	0	0	18	10	8	36	63	51	114	31.48	14.64	72.21	1.00
16/6/2007	0	0	0	26	4	12	42	302	172	474	31.50	15.28	65.85	1.31
23/6/2007	8	4	2	10	8	6	38	663	507	1170	33.78	17.57	71.21	1.35
30/6/2007	4	10	6	16	26	12	74	920	860	1780	36.35	19.14	67.50	1.16
7/7/2007	60	14	10	26	14	16	140	1406	1054	2460	32.43	16.78	68.14	1.28
14/7/2007	38	12	18	36	10	14	128	1581	1723	3304	33.71	17.78	74.57	1.05
21/7/2007	12	28	18	44	14	2	118	1568	962	2530	33.70	17.57	71.78	1.00
28/7/2007	28	44	22	24	8	28	154	2604	1350	3954	35.57	18.71	67.93	0.90
4/8/2007	4	46	26	4	4	38	122	1993	1187	3180	3.92	19.14	70.71	1.02
11/8/2007	8	54	62	4	0	46	174	2090	1830	3920	33.07	17.0	67.21	1.10
18/8/2007	4	68	76	10	6	32	196	1759	1561	3320	33.28	17.71	71.0	0.90
25/8/2007	90	56	42	16	4	30	238	1800	980	2780	34.57	17.71	73.71	0.77
1/9/2007	132	44	64	34	16	30	320	2410	1250	3660	34.35	17.92	72.11	0.80
8/9/2007	52	38	32	14	4	60	200	2175	1635	3810	33.07	16.85	67.57	0.96
15/9/2007	26	84	66	6	6	16	204	918	832	1750	30.57	13.28	60.5	0.99
22/9/2007	50	40	88	4	2	22	206	590	590	1180	31.78	13.50	62.14	0.91
29/9/2007	40	32	34	2	6	28	142	413	177	590	30.50	12.78	66.14	1.00
Total number of insects	561	574	566	306	146	425	2578	23300	16760	40060				

L = larvae A = adult

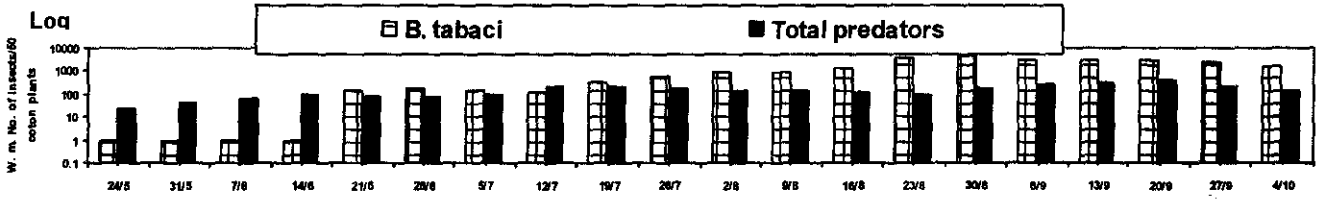

Fig. (1): Weekly mean numbers of *Bemisia tabaci* and total predators on 50 cotton leaves (untreated) during 2005 at Kafr El-Sheikh governorate.

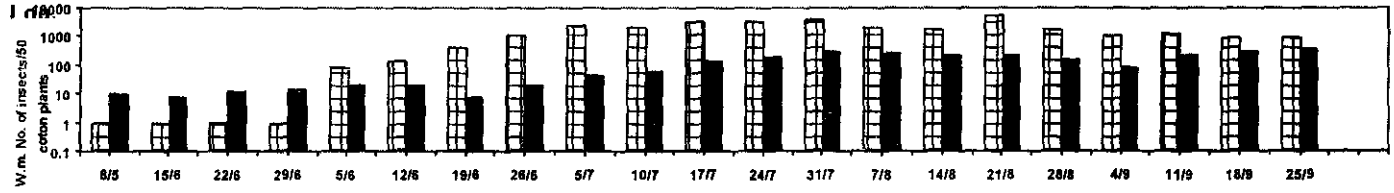

Fig. (2): Weekly mean numbers of *Bemisia tabaci* and total predators on 50 cotton leaves (untreated) during 2006 at Kafr El-Sheikh governorate.

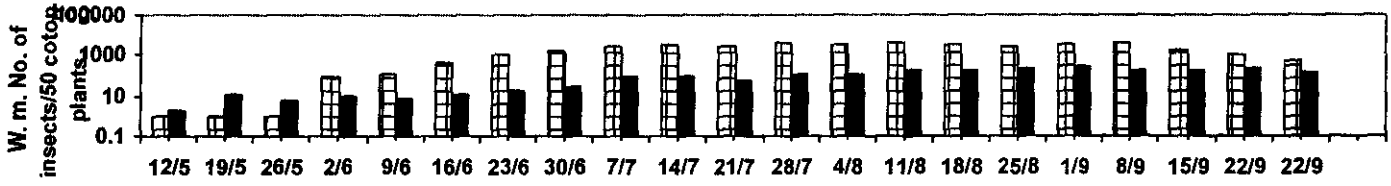

Fig. (3): Weekly mean numbers of *Bemisia tabaci* and total predators on 50 cotton leaves (untreated) during 2007 at Kafr El-Sheikh governorate.

2. *Scymnus* spp.:

With regard to the population dynamics of lady beetles, *Scymnus* spp., three peeks were recoded in all seasons (Table 1-3). In the first cotton season the data revealed that the first peak was occurred on July 19th (60 beetles/50 leaves). The second peak was observed on August 16th (34 beetles/50 cotton leaves) while, the third peak occurred on September 6th (64 beetles/50 cotton leaves). In the second cotton-season, the lady beetles bird fluctuated recording three peaks on July 10 (8 beetles/50 cotton leaves). The second peak appeared on August 7th (100 beetles/50 cotton leaves), while the third peak showed on September 18 (102 beetles/50 cotton leaves).

In the third cotton-season the three sharp peaks were appeared on July 7 August 18 and September 15th with mean of (14, 68 and 84 beetles/50 cotton leaves).

The data also revealed that the average numbers of *Scymnus* spp. were higher during 2005 and 2006 cotton seasons compared with 2007 cotton season.

3. *Chrysoperla carnea*:

Data presented in Tables (1-3) showed that the population dynamics of *C. carne* appeared within the second half of June during 2005 and 2007 cotton seasons recording two peaks in each cotton-season. The first peak was occurred on August 9th, representing 32 individuals/50 cotton leaves whereas the second peak was noticed on September 20th recording 168 individuals/50 leaves during 2005 cotton season. While, in 2007 season the first peak was occurred in August 18th representing 76 individuals/50 leaves and the second peak sharped on September 22nd recording 88 individuals/50 leaves.

As for 2006 cotton-season the first peak was appeared on August 14th representing 74 individuals/50 leaves and the second peak was occurred on September 11th recorded (72) individuals/50 cotton leaves. while, this insect appeared on June 1st. With regard to the population size of *C. carnea* during three seasons, one can noticed that the recorded total population was relatively in high numbers during 2005 and 2006 cotton seasons (738 and 616 individuals/50 leaves) then dropped drastically to 566 individuals/50 leaves during 2007 cotton season.

4. *Syrphus corollae:*

The results in Tables (1-3) showed that the population dynamics of *S. corollae* on cotton was generally recorded at 10% as percent ratio of total predators. The predator population recorded three peaks during the period of study in 2005. the first peak was observed on June 14 recorded 34 individuals/50 leaves the second peak observed on July 12 was 64 predator/50 leaves and the third peak appeared on July 26 recorded 29 predator/50 leaves.

In 2006 cotton season the first peak observed on June 12 and the second peak showed on July 24 while third peak showed on September 18 with counts (18, 54 and 18 predator/50 leaves), respectively.

In 2007 cotton season three peaks occurred on (June 16, July 21 and September 1) with records (26, 44 and 34 predators/50 leaves).

5. *Orius* spp.

Data in Tables (1-3) revealed that the population of the predator *Orius* spp. was fluctuating at moderate numbers on cotton plantation was slightly higher during 2005 cotton season than that of 2006 and 2007 cotton season (301, 138 and 146 individuals/50 leaves. This predator was considered a very low of the number compared with the six predators.

6. True spiders:

The population dynamics of the true spider are studied under cotton field conditions through three successive seasons, 2005, 2006 and 2007 and the data are presented in Tables (1-3).

It is quit clear that the population of the true spiders appeared almost on May in three seasons and continuous to the end of season.

Concerning 2005 cotton season, the population dynamics of the true spiders recorded 4 peaks, the first on June 14th, the second on July 19th, the third on August 9 and the fourth on September 20th represented by (20, 38, 58 and 52 spiders/50 leaves).

Regarding 2006 cotton-season, the population fluctuation of the true spiders confirm the presence of 4 peaks. The first on June 12th, the second on July 24th, the third on August 21st and the fourth on September 25th. The numbers recorded (18, 56, 76 and 50 spiders/50 leaves).

Regarding 2007 cotton-season, the population density of the true spider's recorded 4 peaks on (June 16th, August 11th, Sept. 8th and Sept. 29th, with mean value of (12, 46, 60 and 28 spiders/50 leaves.

Effect of biotic and abiotic factors on population density of whitefly (*Bemisia tabaci*)

The effect of predators and weather factors on population density of whitefly *B. tabaci* was studied under field conditions during three successive cotton seasons at Kafr El-Sheikh governorate. The data were analysed and presented in Table (4). The simple correlation coefficients between predators and whitefly were negatively significant and the values determined were -0.566*, -0.537 and -0.499* in three seasons. Correlation equal with whitefly which calculated (0.741**, 0.582** and 0.702**), with the effect of max. temperature. The effect of min-temp. on the population fluctuation of whitefly (*B. tabaci*) were not significant. The correlation was wind speed and population dynamics of whitefly were insignificant and at optimal range, while predators were significant and above the optimal range of population activity. The maximum temperature, relative humidity (R.H.) had significant and positive effect during 2006 and 2007 while in 2005 insignificant that means that mean temperature and R.H. were below the optimal range of activity

Abeer *et al.* (1999), in Pakistan, reported that the data were recorded from 25 leaves each from three different un-sprayed plots. Spider, and black ants showed a positive and significant correlation with whitefly population with 2 values 0.548 and 0.483, respectively. The correlation between *Chrysopa* spp. and whitefly populations was non-significant. The coefficient of determination values (R_2) were 0.002, 0.300 and 0.333 for *Chrysopa*, spider and black ants, respectively. In addition, Kejian *et al.* (2008), in Northern China, found that a total of natural enemy species were discovered in association with *B. tabaci* in cotton fields including dominant species such as

Chrysopa spp. and *Orius similes* Zheng. Solangi *et al.* (2008) studied the appearance and abundance of different insect predators against sucking insect pests of cotton under field conditions. The correlation coefficient (r = 0.563) showed a positive relationship between insect predators and sucking insect pest (whitefly) population. The increase in sucking insect population also exhibited an increase in predator population in observed days and trend line shows increase predator population with sucking insect pest (whitefly) population during the growth stages of cotton crop.

Table (4): Simple and multiple correlations of biotic and abiotic factors with the population density of whitefly (*Bemisia tabaci*) during 2005 to 2007 cotton seasons at Kafr El-Sheikh governorate.

Year	Pest	Total predators	Temp. Max.	Temp. Min	R.H.	Wind speed	Combined effect (E.V)
2005	Whitefly	-0.566*	0.741**	0.189	0.391	-0.277	81.44
2006		-0.537*	0.582**	-0.186	0.606*	-0.302	82.19
2007		-0.499*	0.702**	0.281	0.550*	-0.289	95.24

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الوفرة الموسمية للذبابة البيضاء في حقول القطن وعلاقتها بالمفترسات المصاحبة لها وبعض العوامل الجوية بمحافظة كفرالشيخ

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أجريت هذه الدراسة بمزرعة البحوث الزراعية بسخا ، محافظة كفرالشيخ خلال مواسم ٢٠٠٥ ، ٢٠٠٦ ، ٢٠٠٧ بحقول القطن الغير معاملة بالمبيدات وذلك لتقدير الوفرة الموسمية لعشائر الذبابة البيضاء على نبات القطن وعلاقتها بالمفترسات المصاحبة والشائعة وكذلك بعض العوامل الجوية (الحرارة ، الرطوبة النسبية ، سرعة الرياح).

وأظهرت النتائج المتحصل عليها خلال سنوات الدراسة وجود أربعة أجيال لحشرة الذبابة للمواسم الثلاثة مسجلة أعلى تعداد لها خلال شهرى يوليو وأعطى فى الموسم الأول (٢٠٠٥) بمتوسطات ٦٢٨ ، ٨٩٠ ، ٤١٨٠ فرد/٥٠ ورقة. وكذا ٣٣٢٠ ، ٤١٤٠ ، ٥٦٤٤ فرد/٥٠ ورقة فى موسم ٢٠٠٦ أما فى موسم ٢٠٠٧ ، ٣٩٥٤ ، ٣٩٢٠ فرد/٥٠ ورقة. أما بالنسبة للمفترسات الشائعة فقد أوضحت النتائج ظهور ست مفترسات وهى ابو العيد بأنواعه ، الاسكمنس ، اسد المن الأخضر ، ذبابة السيرفس ، بقة الأزهار (الأوريس) و العناكب الحقيقة المفترسة مسجلة ثلاثة أجيال خلال شهرى أغسطس سبتمبر لموسم ٢٠٠٥ ، وأربعة أجيال خلال فترة الدراسة ٢٠٠٦ ، ٢٠٠٧ على التوالى.

كما أظهرت النتائج من خلال التحليل الأحصائى وجود علاقة معنوية موجبة بين المفترسات والذبابة البيضاء وذلك خلال موسم ٢٠٠٥ وكانت ٠,٥٦٦ وفى موسم ٢٠٠٦ كانت العلاقة أيضا معنوية بـــ ٠,٥٣٧ وفى موسم ٢٠٠٧ كانت العلاقة بين المفترسات والذبابة البيضاء معنوية موجبة ٠,٤٩٩.

كما أظهرت النتائج وجود علاقة عالية المعنوية وموجبة بين درجات الحرارة العظمى والذبابة فكانت (٠,٧٤١ ــ ٠,٥٨٢ ــ ٠,٧٠٢) خلال الأعوام الثلاث ٢٠٠٥ ، ٢٠٠٦ ، ٢٠٠٧ على التوالى. بينما كانت العلاقة غير معنوية بين كل من الذبابة البيضاء ودرجة الحرارة الصغرى وسرعة الرياح ، بينما المفترسات والذبابة البيضاء كانت العلاقة معنوية وموجبة وذات فاعلية بينها وبين درجة الحرارة العظمى ونسبة الرطوبة خلال موسمى ٢٠٠٦ ، ٢٠٠٧ وكانت ٠,٦٠٦ ، ٠,٥٥٠ على التوالى بينما كانت العلاقة غير معنوية خلال موسم ٢٠٠٥ فكانت ٠,٣٩١ أما بالنسبة لسرعة الرياح فكانت العلاقة غير معنوية سالبة لكل من الذبابة والمفترسات.

كان التأثير المشترك للمفترسات والعوامل الجوية واضحا على الذبابة البيضاء خصوصا فى موسم ٢٠٠٧ والنتائج المتحصل عليها من هذه الدراسة ذات أهمية كبيرة فى تطوير برامج المكافحة المتكاملة لهذه الحشرة فى حقول القطن.

قام بتحكيم البحث

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