

VERTICAL DISTRIBUTION OF *Bemisia tabaci* (Genn.) IMMATURES AND THEIR PARASITOIDS ON UNSPRAYED AND SPRAYED COTTON PLANTS

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ABSTRACT

Field study of the vertical distribution of the cotton whitefly *Bemisia tabaci* (Genn.) immatures and their larval and pupal parasitoids was carried out at Sakha Agricultural Research Station, Kafr El-Sheikh Governorate, Egypt during 2000 and 2001 cotton seasons. The results revealed that the highest numbers of *B. tabaci* eggs and larvae were found on the upper level of the cotton plant during August in both seasons in the treated and untreated fields. The overall means of eggs and larvae on upper level were 166, 67, 496.2, 65.0/160 in² in 2000 and 121.8, 37, 683 and 168.8/160 in² in 2001 on untreated and treated cotton plants, respectively. They represented 59.1, 23.8, 82 and 10.7% in 2000, and 72.5, 22.1, 79.4 and 19.6% in 2001 of the total immatures on upper level on untreated and treated cotton plants, respectively. For pupae, the highest numbers were found on middle and lower levels during August and September. The overall means of pupae on middle and lower levels represented 67.1, 89.8, 39.2, 67.2% in 2000, and 73.4, 75.1, 57 and 71.6% in 2001 of the total immatures on untreated and treated cotton plants, respectively. Two parasitoid species, *Eretmocerus mundus* Mercet. and *Encarsia lutea* (Mas.) were recorded on larvae and pupae of the pest. Percents of parasitism were lower in the treated field compared with the untreated one and were higher on *B. tabaci* pupae than on larvae in both fields. Highest rates of parasitism on larvae and pupae were recorded during August and September on the upper level of the untreated cotton plants, and on the middle level on treated ones. The overall means of parasitism on upper level on untreated plants were 16.4 and 23%, while they were 6.4 and 15.6% on treated one on middle in 2000 and 2001, respectively. The total parasitism percentages on untreated and treated cotton were 5 and 13% in 2000, and 12.7 and 18.3%, in 2001 respectively.

Key words: *Bemisia tabaci*, vertical distribution, parasitism, *Eretmocerus mundus*, *Encarsia lutea*.

INTRODUCTION

The cotton whitefly, *Bemisia tabaci* (Genn.) (Homoptera: Aleyrodidae) a polyphagous insect, has become an increasingly serious pest of cotton and other crops not only in Egypt but also in many parts of the world.

In the last two decades, the control of *B. tabaci* was based exclusively on conventional insecticides which in many cases did not result in comprehensive control because of presence of the adults and immatures on the underside of the leaves and, the ability of *B. tabaci* to develop a rapid resistance to most classes of existing insecticides exacerbated the situation (Horowitz and Shaaya 1994). In addition, continued use of insecticides caused a negative impact on natural enemies and the environment (Butler *et al.*, 1989, Sundaramurty, 1992, Horowitz and Shaaya, 1994 and Mesbah, 1999).

This study aimed to shed light upon the vertical distribution of *B. tabaci* immature stages and their larval and pupal parasitoids on cotton plants; sprayed with insecticide and unsprayed.

MATERIALS AND METHODS

This research was carried out at Sakha Agricultural Research Station at Kafr El-Sheikh Governorate during two successive cotton seasons; 2000 and 2001. A cotton field of an area of two feddans was divided into two equal parts; the first was kept insecticide-free and the second was subjected to treatments of recommended insecticides.

In 2000 season, katabron (Curacron & Atabron), cyfluthrin (Baythroid), esfenvalerate (Sumi-alpha) and thiodicarb (Larvin) were sprayed on 28 June, 13 July, 1 August and 16 August, respectively.

In 2001 season, katabron, chlorpyrifos (Dursban), katabron and thiodicarb were sprayed on 22 July, 7 August, 14 August and 21 August, respectively.

Vertical distribution of *B. tabaci* immature stages:

Twenty random cotton plants were chosen at a diagonal transect of each untreated and treated experimental fields to count the population density of *B. tabaci* immatures (eggs, larvae and pupae) weekly. Samples were taken by picking three leaves from each plant, representing three levels (upper, middle and lower). The leaves were put into plastic bags and transferred to the laboratory for counting existing immatures. By the aid of a binocular stereomicroscope, numbers of the whitefly immatures were counted for each level in an area of 2 in² per leaf in the center of lower surface of the leaf.

Vertical distribution of *B. tabaci* parasitoids:

Percentages of parasitism were estimated weekly by confining infested leaves from each plant level in Petri dishes (7.5 cm diameter) until the emergence of parasitoids or whitefly adults. Parasitism was estimated according to the following formula:

$$\text{Parasitism (\%)} = \frac{\text{No. of emerged parasitoids}}{\text{Total no. of } B. \text{ tabaci larvae or pupae}} \times 100$$

Statistical analysis:

Obtained data were subjected to analysis of variance (ANOVA), and the means were compared using Duncan's Multiple Range test.

RESULTS AND DISCUSSION

Vertical distribution of *B. tabaci* immatures:

Total numbers of *B. tabaci* immatures/40 in² on each cotton plant level during the two seasons of the study were summarized in Tables 1 and 2. Generally, *B. tabaci* immatures occurred on untreated and treated cotton plants from July with very few numbers, peaked during August and decreased through September and October.

B. tabaci eggs:

Data presented in Tables 1 and 2 show that eggs of *B. tabaci* started to show up in August in 2000 and in July in 2001. Total numbers of eggs

were always higher on the treated cotton than on the untreated ones. Highest total numbers of eggs (1854 and 1131 eggs/160 in²) were counted on the upper level of the treated cotton plants during August in 2000 and 2001, respectively. Such peaks represented 75.1 and 85.7% of the total immature stages of the pest in the two seasons. The respective numbers of eggs (in August) on untreated cotton plants were 370 and 380/160 in² and representing 63.7 and 87.4% of the total immatures on upper level during the two seasons, respectively. Highest total numbers of eggs were found on the upper level of the plants, while the lowest were recorded on the lower level of the plants and no eggs were found during October on all plant levels.

Percentages of the overall means of *B. tabaci* eggs on the three levels of untreated cotton plants (upper, middle and lower), reached 59.1, 4.3 and 0% in the first season, and 72.5, 12.4 and 2.9% in the second season, respectively. Corresponding values in the treated cotton were 82, 25.4 and 3.7% in 2000 and 79.4, 13.7 and 8.6% in, 2001.

Statistical analysis revealed highly significant differences in numbers of eggs among the three levels in both untreated ($F = 40.50^{**}$ in 2000 and 14.32^{**} in 2001) and treated ($F = 101.91^{**}$ in 2000 and 69.86^{**} in 2001) cotton.

These results are in agreement with those of Abdel-Baky (2000) who stated that the majority of *B. argentifolii* eggs were found on the newly formed leaves of cotton followed by upper-middle and middle leaves.

B. tabaci larvae:

Data presented in Tables 1 and 2 show that: total numbers of larvae were higher on the treated cotton plants than those on the untreated ones, except on the upper level during August 2000. Highest total numbers of *B. tabaci* larvae were counted in August 2000 (186/160 in²) in untreated cotton and August 2001 (606/160 in²) in treated cotton. Lowest total numbers of larvae were found during October on the three levels of both treated and untreated plants.

Percentages of the overall means of larvae on the three levels of untreated cotton plants (upper, middle and lower), were 23.8, 28.8 and 10.7% of total immatures, in 2000 and 22.1, 14.2 and 22% in 2001. The respective values in the treated cotton were 10.7, 35.4 and 29.1% in 2000 and 19.6, 29.3 and 19.8% in 2001.

It was noticed that the middle level harboured the highest numbers of *B. tabaci* larvae compared to the other two levels.

Statistical analysis of data of untreated cotton revealed highly significant differences ($F = 26.87^{**}$) between lower level and each of the upper and middle ones in 2000, and between upper level and each of middle and lower ones ($F = 32.47^{**}$), in 2001. No significant difference was detected between upper and middle level in 2000 or between middle and lower in 2001. In case of treated cotton there were highly significant differences ($F = 28.85^{**}$) among the three levels in 2000 and high significant difference ($F=238.37$) between the upper and middle or lower levels in 2001.

***B. tabaci* pupae:**

Data presented in Tables 1 and 2 show that pupae of *B. tabaci* were not found during July in the two seasons on the upper level of cotton plants, while they were recorded on the other levels. Number of pupae reached a peak of 178/160 in² in August 2000 (in untreated cotton) and a peak of 191/160 in² in September 2001 (in treated cotton).

Statistical analysis of data on untreated cotton indicated that highly significant differences between pupal numbers on three levels ($F = 36.51^{**}$) in 2000, while in 2001, these differences were high only between upper and middle levels ($F = 10.64^{**}$). In case of treated cotton plants, the differences were insignificant among the three levels ($F = 5.01^{ns}$) in 2000, while they were highly significant between upper and middle levels ($F = 26.29^{**}$) in 2001.

The percentages of overall mean numbers of *B. tabaci* pupae on the three plant levels; upper, middle and lower, on untreated cotton represented 17.1, 67.1 and 89.8% of total immatures in season 2000 and 5.4, 73.4 and 75.1% in season 2001. The respective values in the treated plants were 7.3, 39.2 and 67.2% in season 2000 and 1, 57 and 71.6% in season 2001.

Obtained results disagree with those of Ohnesorge *et al.* (1980) who stated that the final-instar larvae of *B. tabaci* were found to occur only on the oldest cotton leaves and agree with those of Abdel-Baky (2000) who found that the percentage of *B. argentifolii* nymphs distributed on cotton plants were 35.33, 28.54, 26.93 and 9.20% on lower, middle-lower, middle and top, respectively.

Although the obtained results show that the total immature stages of *B. tabaci* on treated cotton plants are higher than those on untreated ones, statistical analysis revealed that the differences were insignificant. Despite the reduction in infestation on untreated cotton plants during September and October, the infestation continued high on treated ones. This may be due to the high numbers of eggs laid after completing insecticide applications against the cotton bollworms. In this regard, Butler *et al.* (1986) recorded that the insecticides in cotton induced higher population of *B. tabaci*, while there were marked reduction of *B. tabaci* in the absence of insecticide applications.

Sundaramurthy (1992) stated that the prime causes for the upsurge of whitefly in cotton system were the elimination of natural enemies as a result of insecticide applications and increasing fecundity due to availability of life-supporting chemicals in host plants followed by frequent application of insecticides.

Gerling and Mayer (1995) and El-Adl *et al.* (1998) reported that *B. tabaci* population increased after heavy application of insecticides, which are used to control cotton leafworm and bollworms.

Vertical distribution of *Bemisia tabaci* parasitoids:

Two hymenopterous parasitoids, *Eretmocerus mundus* Merc. and *Encarsia lutea* (Mas.) were the two parasitoid species emerged from *B. tabaci* larvae and pupae during the two seasons of the study; 2000 and 2001. Hafez *et al.* (1979), El-Adl *et al.* (1998) and Mesbah (1999) recorded the same two parasitoids species as the most important parasitoids of *B. tabaci* larvae and pupae, in Egypt.

Percentages of parasitism on *B. tabaci* larvae and pupae on each of the cotton plant levels during the two seasons of the study are summarized in tables 3 and 4. No parasitism was recorded during July on both the treated and untreated cotton plants. Percentages of parasitism on *B. tabaci* pupae were usually higher than those found on larvae on both treated and untreated cotton plants.

On untreated cotton plants:

As shown in Tables 3 and 4 the percentages of parasitism ranged 2.1-60% on larvae

Table (1): Vertical distribution of *Bemisia tabaci* (Genn.) immature stages on unsprayed and sprayed cotton plants at Kafr El-Sheikh region during 2000 season.

Month	Untreated and treated plants		Total monthly no. /160 in ² (indicated by plant levels).											
			Upper				Middle				Lower			
			Eggs	Larvae	Pupae	Total	Eggs	Larvae	Pupae	Total	Eggs	Larvae	Pupae	Total
July	Untreated.	No.	0	0	1	1	1	7	15	23	0	3	7	10
		%	0	0	100	10	4.3	30.4	5.3	100	0	30.0	70.0	100
	Treated	No.	0	0	0	0	0	4	6	10	1	1	11	13
		%	0	0	0	0	0	40.0	60.0	100	7.7	7.7	84.6	100
August	Untreated.	No.	370	186	25	581	17	104	178	299	0	0	27	27
		%	63.7	32.0	4.3	100	5.7	34.8	59.5	100	0	0	100	100
	Treated	No.	1131	147	42	1320	102	37	55	174	3	5	74	82
		%	85.7	11.1	3.2	100	58.6	21.3	29.1	100	3.7	6.1	90.2	100
Sept.	Untreated.	No.	284	42	120	446	0	6	82	88	0	0	1	1
		%	63.7	9.4	26.9	100	0	6.8	93.2	100	0	0	100	100
	Treated	No.	820	108	122	1050	113	221	161	495	14	120	191	325
		%	78.1	10.3	11.6	100	22.8	44.7	32.5	100	4.3	36.9	58.8	100
Oct.	Untreated.	No.	10	40	46	96	0	0	0	0	0	0	0	0
		%	10.4	41.7	47.9	100	0	0	0	0	0	0	0	0
	Treated	No.	34	5	12	51	0	38	130	168	0	18	56	74
		%	66.7	9.8	23.5	100	0	22.6	77.4	100	0	24.03	75.7	100
Overall mean	Untreated.	No.	166.0	67.0	48.0	281	4.05	29.3	68.8	102.6	0	1.0	8.8	9.8
		%	59.1	23.8	17.1	100	4.3	28.8	67.1	100	0	10.2	9.8	100
	Treated	No.	496.2	65.0	44.0	605.2	53.8	75.0	83.0	211.8	4.5	36.0	83.0	123.5
		%	82.0	10.7	7.3	100	25.4	35.4	39.2	100	3.7	29.1	67.2	100

Table (2): Vertical distribution of *Bemisia tabaci* (Genn.) immature stages on unsprayed and sprayed cotton plants at Kafr El-Sheikh region during 2001 season.

Month	Untreated and treated plants		Total monthly no. /160 in ² (indicated by plant levels).											
			Upper				Middle				Lower			
			Eggs	Larvae	Pupae	Total	Eggs	Larvae	Pupae	Total	Eggs	Larvae	Pupae	Total
July	Untreated.	No.	3	10	0	13	2	10	19	31	2	4	14	20
		%	23.1	76.9	0	100	6.5	32.3	61.2	100	10.0	20.0	70.0	100
	Treated	No.	20	8	0	28	12	16	25	53	4	7	16	27
		%	71.4	28.6	0	100	22.6	30.2	47.2	100	14.8	58.9	59.3	100
August	Untreated.	No.	380	94	11	485	16	3	72	91	0	10	33	43
		%	78.4	19.4	2.2	100	17.6	3.3	79.1	100	0	25.3	76.7	100
	Treated	No.	1854	606	8	2468	18	54	68	140	0	1	17	18
		%	75.1	24.6	0.3	100	12.9	38.6	48.5	100	0	5.6	94.4	100
Sept.	Untreated.	No.	105	41	14	160	0	9	20	29	0	1	5	6
		%	65.6	25.6	8.8	100	0	31.0	69.0	100	0	16.7	83.3	100
	Treated	No.	858	57	23	938	5	5	52	62	0	1	6	7
		%	91.5	6.1	2.4	100	8.8	5.8	83.8	100	0	14.3	85.7	100
Oct.	Untreated.	No.	0	3	13	16	0	0	2	2	0	0	0	0
		%	0	18.8	81.2	100	0	0	100	100	0	0	0	0
	Treated	No.	0	4	3	7	0	0	1	1	0	0	1	1
		%	0	57.1	42.9	100	0	0	100	100	0	0	100	100
Overall mean	Untreated.	No.	121.8	37.0	9.2	168	4.8	5.5	28.3	38.6	0.5	3.8	13.0	17.3
		%	72.5	22.1	7.6	100	12.4	14.2	73.4	100	2.9	22.0	75.1	100
	Treated	No.	683.0	168.8	8.5	860.3	8.85	18.8	36.5	64.1	1.0	2.3	8.3	11.6
		%	79.4	19.6	1.0	100	13.7	29.3	57.0	100	8.6	19.8	71.6	100

Table (3): Percentages of parasitism on *Bemisia tabaci* (Genn.) larvae and pupae on unsprayed and sprayed cotton plants at Kafr El-Sheikh region during 2000.

Month	Level	Untreated cotton							Treated cotton						
		Larval parasitism %			Pupal parasitism %				Larval parasitism %			Pupal parasitism %			
		<i>Er. mundus</i>	<i>En. lutea</i>	Total	<i>Er. mundus</i>	<i>En. lutea</i>	Total	Average* of larvae & pupae	<i>Er. mundus</i>	<i>En. lutea</i>	Total	<i>Er. mundus</i>	<i>En. lutea</i>	Total	Average* of larvae & pupae
July	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lower	0	0	0	0	0	0	0	0	0	0	0	0	0	0
August	Upper	5.5	5.5	11.0	22	0	22	16.2	2.4	0	2.4	0	3.6	3.6	2.9
	Middle	2.3	0	2.3	2.2	1.3	3.5	3.3	0	0	0	8	2	10	6.8
	Lower	0	0	0	0	1.6	1.6	1.2	0	0	0	0	0	0	0
Sept.	Upper	2.8	5.6	8.4	30.7	7.1	37.8	25.5	0	2.8	2.8	4.1	0	4.1	3.5
	Middle	0	0	0	4.0	14.0	18.0	8.6	4.0	1.1	5.1	8.0	0	8.0	6.2
	Lower	0	0	0	4.7	1.0	5.7	5.7	4.7	1.0	5.7	5.3	3.5	8.8	6.7
Oct.	Upper	40.0	20.0	60.0	50.0	0	50.0	58.3	0	0	0	10.0	0	10.0	10.0
	Middle	0	0	0	0	0	0	0	0	0	0	7.7	0	7.7	7.7
	Lower	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Overall mean	Upper	6.1	6.1	12.2	30.0	4.4	34.4	16.4	0.9	1.7	2.6	3.6	0.9	4.5	3.6
	Middle	2.1	0	2.1	2.5	3.5	6.0	5.1	3.5	1.0	4.5	8.0	0.6	8.6	6.4
	Lower	0	0	0	0	1.6	1.6	1.2	4.9	0.8	5.7	2.0	2.0	4.7	4.4

* Overall mean was calculated on the basis of total numbers of larvae or pupae and parasitoids throughout the experimental period.

Table (4): Percentages of parasitism on *Bemisia tabaci* (Genn.) larvae and pupae on unsprayed and sprayed cotton plants at Kafr El-Sheikh region during 2001.

Month	Level	Untreated cotton							Treated cotton						
		Larval parasitism %			Pupal parasitism %				Larval parasitism %			Pupal parasitism %			
		<i>Er. mundus</i>	<i>En. lutea</i>	Total	<i>Er. mundus</i>	<i>En. lutea</i>	Total	Average* of larvae & pupae	<i>Er. mundus</i>	<i>En. lutea</i>	Total	<i>Er. mundus</i>	<i>En. lutea</i>	Total	Average* of larvae & pupae
July	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lower	0	0	0	0	0	0	0	0	0	0	0	0	0	0
August	Upper	4.0	14.0	18.0	87.5	12.5	100	29.3	6.0	0.8	6.8	6.9	13.1	20.0	14.0
	Middle	3.9	0	3.9	20.5	0	20.5	14.3	13.6	1.7	15.3	16.8	0	16.8	16.3
	Lower	0.0	10.0	10.0	12.2	0	12.2	12.0	0	0	0	7.0	2.3	9.3	9.3
Sept.	Upper	11.3	1.8	13.1	36.7	20.0	56.7	22.1	5.3	2.3	7.6	6.5	3.2	9.7	8.0
	Middle	0	0	0	4.0	16.0	20.0	17.2	15.4	3.8	19.2	13.2	0	13.2	14.4
	Lower	0	0	0	0	11.1	11.1	11.1	0	0	0	3.3	0	3.3	3.3
Oct.	Upper	0	0	0	0	5.3	5.3	5.3	0	0	0	3.3	0	3.3	3.3
	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lower	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Overall mean	Upper	9.1	5.5	14.6	33.3	14.1	47.4	23.0	5.7	1.5	7.2	6.5	11.1	17.6	11.7
	Middle	3.3	0	3.3	14.5	5.8	20.3	15.2	14.1	2.4	16.5	15.2	0.0	15.2	15.6
	Lower	10	0	10	8.5	0	8.5	8.8	0	0	0	5.5	1.4	6.9	12.7

* Overall mean was calculated on the basis of total numbers of larvae or pupae and parasitoids throughout the experimental period.

and 1.6-50% on pupae in season 2000, while they ranged 3.3-13.1 on larvae and 5.3-100% on pupae in season 2001. Highest parasitism rates; 60% on larvae and 50% on pupae were found late during October in season 2000 (on the upper level, of plants). In season 2001, highest rates; 18 and 100% on larvae and pupae, respectively, were recorded during August (also on the upper level).

The overall means of the percentages of parasitism by the two parasitoid species on upper, middle and lower levels of the plants were 12.2, 2.1 and 0 on larvae and 34.4, 6 and 1.6% on pupae in season 2000. The respective rates in 2001 were 14.6, 3.3 and 10% on larvae and 47.4, 20.3 and 8.5% on pupae.

On treated cotton plants:

Percentages of parasitism ranged 2.4-5.7% on larvae and 3.6-10% on pupae in season 2000, while they ranged 6.8-19.2% on larvae and 3.3-20% on pupae in season 2001. Highest parasitism (5.7% on larvae and 10% on pupae) were recorded during September and October 2000, respectively on the treated cotton plants. In season 2001, highest rates (19.2% on larvae and 20% on pupae) were found during September and August, respectively.

The overall means on treated cotton plants in season 2000 on upper, middle and lower levels were 2.6, 4.5 and 5.7% on larvae and 4.5, 8.6 and 4% on pupae, respectively. The respective values in 2001 were 7.2, 16.5 and 0 on larvae and 17.6, 15.2 and 6.9% on pupae.

Statistical analysis showed that significant differences between rates of parasitism on untreated and treated cotton, and no significant differences on different levels of plants in both untreated and treated cotton plants during the two seasons.

Data in Tables 3 and 4 obviously showed that the highest rates of parasitism on untreated cotton were recorded on the upper level, while the lowest were always on the lower level in the two seasons. In contrast on treated cotton plants the highest rates of parasitism were recorded mostly on the lower and middle levels, while the lowest rates was recorded mostly on upper level. This may be due to the extending infestation on treated cotton plants through September and October and increasing larvae and pupae numbers, especially on middle and lower level, when no insecticides were applied from the third week of August or as direct effect of insecticide applications on the parasitoids on upper level or by the two reasons together.

In this regard, Heather *et al.* (1994) found that the fourth larval instar of *B. tabaci* on the top surface was more often parasitized than the four instars on the bottom surface of cotton plants.

The total parasitism on untreated cotton was 13 and 18.3% in 2000 and 2001, respectively, while on treated one was 5 and 12.7% in 2000 and 2001, respectively. It was also noticed that average percentage of parasitism was less on the treated cotton plants compared with untreated ones. This fact is expected because of the harm effect of insecticides on the natural enemies of *B. tabaci*.

Data in Tables (3 and 4) also shown that the parasitoid species *Er. mundus* was superior to *E. lutea* in both the treated and untreated cotton plants.

Such results are in agreement with those of Hafez *et al.* (1979) who stated that *Eretmocerus mundus* Mercet was one of the factor reducing population densities of *B. tabaci*, in Egypt.

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الملخص العربي

التوزيع الرأسى للأطوار الغير كاملة لذبابة القطن البيضاء *Bemisia tabaci* (Genn.) وطفيلياتها على نباتات القطن المعاملة بالمبيدات والغير معاملة

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أجريت هذه الدراسة الحقلية لدراسة التوزيع الرأسى للأطوار الغير كاملة لذبابة القطن البيضاء *Bemisia tabaci* (Genn.) وكذلك لطفيليات يرقات وعدادى تلك الآفة وذلك بالمزرعة البحثية بمحطة البحوث الزراعية بسخا - محافظة كفر الشيخ خلال موسمى ٢٠٠٠ ، ٢٠٠١م.

بالنسبة للأطوار الغير كاملة أظهرت النتائج أن أعلى تعداد للبيض واليرقات وجد على المستوى العلوى فى كلا الحقلين المعامل بالمبيدات والغير معامل ، وكان المتوسط العام لتعداد اليرقات والبيض على المستوى العلوى هو ١٦٦ ، ٦٧ ، ٤٩٦،٤ ، ٦٥ لكل ١٦٠ بوصة مربعة فى موسم ٢٠٠٠م و ١٢١،٨ ، ٣٧ ، ٦٨٣ ، ١٦٨،٨/بوصة مربعة فى موسم ٢٠٠١م فى القطن الغير معامل والمعامل على التوالى ، وقد مثلت هذه الأعداد بنسبة ١٠،٨ ، ٨٢ ، ٢٣،٨ ، ٥٩،١% من المجموع الكلى للأطوار الغير كاملة على المستوى العلوى فى موسم ٢٠٠٠م و ٧٢،٧ ، ٢٢،١ ، ٧٩،٤ ، ١٩،٦% على التوالى موسم ٢٠٠١م. وبالنسبة للعدادى فكان أعلى معدل لتواجدها على المستوى الوسطى والأسفل خلال أغسطس وسبتمبر وكانت النسبة المئوية للمتوسط العام للعدادى على المستوى الوسطى والأسفل هى ٦٧،١ ، ٨٩،٨ ، ٣٩،٢ ، ٦٧،٢% فى موسم ٢٠٠٠م ، بينما فى موسم ٢٠٠١م كانت ٧٣،٤ ، ٧٥،١ ، ٥٧ ، ٧١،٦% من مجموع الأطوار الغير كاملة على تلك المستويات فى القطن الغير معامل والمعامل بالمبيدات على التوالى.

بالنسبة للتطفل فقد سجل نوعين من الطفيليات على كل من يرقات وعدادى الآفة وهما *Encorsia lutea* (Mas.)، *Eretmocerus mundus* Mercet وكانت نسبة التطفل منخفضة بصفة عامة فى القطن المعامل مقارنة بالقطن الغير معامل كما كانت نسبة التطفل على العذارى أعلى منها على اليرقات فى كلا الحقلين المعامل والغير معامل. وقد سجل أعلى معدل للتطفل على اليرقات وعدادى خلال شهر أغسطس وسبتمبر.

أعلى معدل للتطفل فى القطن الغير معامل سجل على المستوى العلوى بينما فى القطن المعامل كان على المستوى الوسطى.

المتوسط العام للتطفل فى القطن الغير معامل على المستوى العلوى هو ١٦،٤ ، ٢٣% بينما فى المعامل على المستوى الوسطى هو ٦،٤ ، ١٥،٦ وذلك خلال موسمى ٢٠٠٠ ، ٢٠٠١م على التوالى.

أما النسبة الكلية للتطفل فى القطن الغير معامل والمعامل بالمبيدات موسم ٢٠٠٠ هى ١٣،٥% و فى موسم ٢٠٠١ كانت ١٢،٧ و ١٨،٣% على التوالى.