

## SUSCEPTIBILITY OF SOME EGYPTIAN COTTON VARIETIES TO WHITE FLY, *BEMISIA TABACI* (GENN.) INFESTATION

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(Manuscript received 21 June 2004)

### Abstract

Ten Egyptian cotton varieties were evaluated for their susceptibility to infestation with the whitefly, *B. tabaci* (Genn.) under field conditions at Sakha Agricultural Research Station during three successive seasons of 1997, 1998 and 1999. It was found that Giza 89 variety had the highest rate of adult infestation (729, 484 and 501.6 adults/9 leaves) as well as the immature stages (110.9, 130.9 and 156.9 individuals/9 in<sup>2</sup>) during 1997, 1998 and 1999 seasons, respectively. On the other hand, cotton variety Giza 45 was the least infested with means, of 177.0 and 304.2 adults/9 leaves during 1997 and 1999 seasons, respectively, while for season 1998, Giza 88 had the least infestation (157.2 adults/9 leaves). As for the immature stages, the least infestation level was found in case of variety Giza 45 (18.9, individuals/9 in<sup>2</sup>) for first and second seasons.

### INTRODUCTION

Cotton plants are attacked by a wide range of sucking insect pests from the seedling stage until near maturity, (Khalafalla *et al.*, 1997). The whitefly, *B. tabaci*, is considered to be one of them by causing most serious damage according to their honeydew excretion by the whitefly which makes the lint sticky, hindering easy ginning and spinning processes, (Perkins, 1987 and Anonymous, 1989).

Reliance on chemical control of the whitefly leads to insect resistant status, (Taher, 1994), therefore, it is strictly necessary to search for cotton resistant varieties as one of the simplest and useful tactics in the integrated pest management programmes.

### MATERIALS AND METHODS

Susceptibility of ten Egyptian cotton varieties namely, Giza 45, Giza 70, Giza 75, Giza 76, Giza 77, Giza 85, Giza 86, Giza 87, Giza 88 and Giza 89 was evaluated to *B. tabaci* (Genn.) infestation in the field at Sakha Agricultural Research Station during

season 1997. However, Giza 76 variety was excluded in season 1998 and Giza 75, 76 and 77 varieties were excluded in 1999 season.

The experimental area was divided into plots, each was 42 m<sup>2</sup> (1/100 feddan). Each variety was replicated 4 times in a completely randomized block design and received the common recommended agricultural practices. No chemical insecticidal applications were applied for controlling insect pests throughout the three successive seasons. Cotton plants were sown on March 15<sup>th</sup>, March 20<sup>th</sup> and April 5<sup>th</sup> for the three seasons, respectively. Evaluation the susceptibility of those Egyptian cotton varieties to whitefly infestation, *B. tabaci* was based on both the mean number of adults/leaf and the mean number of the two immature stages (nymphs and pupae)/square inch on the lower surface of the leaf.

**Inspection procedure:** Between 6 and 9 a.m. (Chakrovarthy *et al.*, 1985) numbers of all adults presented on the 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> leaves from the main stem (Naranjo and Flint, 1995) of 3 plants /plot, then, 36 leaves/sample for each variety were visually and directly investigated and the adult stages were counted weekly. For the immature stages, weekly sample consisted of 36 cotton leaves were taken from the 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> leaves on the main stem from the same plants. Leaves of each sample were kept in polyethylene bags and transferred to the laboratory for inspection. One square inch from every leaf was examined by using a binocular and the number of immature stages was counted. Data obtained were subjected to "F" test to detect significance, among varieties according to Fisher (1950).

## RESULTS AND DISCUSSION

### Season 1997:

**a. Adult stage:** Data recorded in Table 1 and illustrated in Figure 1 show the total number of adults and their mean numbers during the whole inspection period on the ten cotton varieties. Results indicated that the highest infestation level was found for Giza 89 which harboured settled a mean number of 729 adults/9 leaves, while the least infestation level was occurred on Giza 45 with a mean number of 177.0 adults/9 leaves. The other varieties can be arranged in a descending order as follows: Giza 77 (414), Giza 85 (348.4), Giza 76 (277.7), Giza 87 (272.2), Giza 70 (251.3), Giza 86 (244.7), Giza 75 (236) and Giza 88 (193.3) adults/9 leaves..

Statistical analysis of data exhibited significant differences among the ten varieties.

**b. Immature stages:** Data summarized in Table 2 and illustrated in Figure 2. clearly recorded the total number of immature stages of *B. tabaci*. Results revealed that the highest number of infestation occurred in case of variety Giza 89 with a mean number of 110.9 immature stages/9 in<sup>2</sup>. On the other hand the least infestation was recorded in case of Giza 45 with a mean number of 18.9 immature stages/9 in<sup>2</sup>. Other varieties could be arranged in a descending order as follows: Giza 85 (70.3), Giza 86 (56.6), Giza 75 (46.4), Giza 76 (36.3), Giza 70 (36.0), Giza 88 (27.2), Giza 77 (26.0) and Giza 87 (25.9) immature stages/9 square inches.

Table 1. Mean numbers of the whitefly, *Bemisia tabaci* (Genn.), adults per 9 leaves on 10 cotton varieties under field conditions at Sakha region (Kafr El-Sheikh Governorate) during 1997 season.

Variety	Date of inspection															Total	Mean
	Jun.		Jul.				Aug.				Sept.				Oct.		
	25	2	9	16	23	30	6	13	20	27	3	10	17	24	1		
Giza 45	0	22.5	36.0	58.5	72.0	83.3	119.3	175.5	528.8	731.3	452.3	175.5	101.3	81.0	18.0	2655.3	177.0 a
Giza 70	27.0	105.8	69.8	65.3	94.5	165.3	267.7	373.5	535.5	1064.3	622.3	173.3	90.0	81.0	33.7	3768.8	251.3 cd
Giza 75	42.8	45	60.7	49.5	78.8	121.5	180.0	198.0	785.3	909.0	621.0	218.3	130.5	54.0	45.0	3539.3	236.0 c
Giza 76	0	0	60.7	99.0	105.7	186.7	427.0	484.0	695.3	814.5	528.8	450.0	180.0	101.3	31.5	4165.0	277.7 e
Giza 77	0	0	87.7	99.0	108.3	272.3	490.0	828.0	846.0	1809.0	857.3	474.8	200.3	94.5	45.0	6212.2	414.0 g
Giza 85	36.8	48.7	73.0	81.3	148.5	178.0	270.3	295.3	415.3	735.0	1268.3	916.3	483.5	185.3	90.0	5225.5	348.4 f
Giza 86	0	0	51.0	80.0	88.0	137.7	407.7	640.7	752.3	784.0	453.8	165.0	55.3	43.5	11.5	3670.8	244.7 cd
Giza 87	0	0	53.3	81.8	109.5	225.3	296.5	725.0	856.5	1080.0	414.3	120.0	79.0	26.0	15.8	4083	272.2 d
Giza 88	38.3	54.0	91.5	98.3	107.7	136.7	354.3	433.8	487.5	586.5	326.3	96.0	46.5	32.8	8.8	2898.8	193.3 b
Giza 89	23.8	72.0	93.0	103.0	121.5	292.5	1127.7	1076.0	1672.3	1428.8	2062.5	1566.3	772.5	339.3	182.3	10933.5	729.0 h

Means followed by the same letter are not significantly different at 5% level by DMRT.

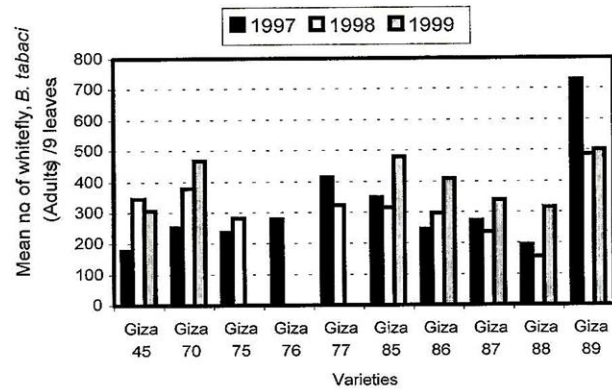


Figure 1. Infestation of some Egyptian cotton varieties with whitefly, *Bemisia tabaci* adults during 1997, 1998 and 1999 seasons at Sakha region, Kafr El-Sheikh Governorate.

**Season 1998:**

- a. **Adult stage:** Giza 89 received the highest mean number of adults per 9 leaves which reached 484.2 adults Table 3 and Figure 1. On the other hand, the least infestation was detected in case of Giza 88, with a mean of 157.2 adults per 9 leaves. Other varieties could be arranged in an ascending order as follows: Giza 70 (378.9), Giza 45 (345.6), Giza 77 (323.5), Giza 85 (314), Giza 86 (296.7), Giza 75 (280.3), and Giza 87 (236.8) adults per 9 leaves

Table 2. Mean numbers of the whitefly, *Bemisia tabaci*(Genn.) immature stages per 9 square inches on 10 cotton varieties under field conditions at Sakha region (Kafr El-Sheikh Governorate) during 1997 season.

Variety	Date of inspection											Total	Mean
	Jul.			Aug.			Sept.			Oct.			
	6	23	30	13	20	27	3	10	17	24	1		
Giza 45	0	16.5	33.8	33.3	17.8	51.5	36	8.8	7.3	2.8	0.5	208.3	18.90 a
Giza 70	0	9.0	26.5	29.3	34.8	72.8	36.8	111.5	51.5	20.8	3.5	396.5	36.0 c
Giza 75	0	20	33.3	30.8	91.8	120.5	94	84.3	24.8	9.0	1.5	510.0	46.4 d
Giza 76	0	29.3	85.5	72.	27	55.5	33.5	55.5	27.8	12.3	1.3	399.7	36.3 c
Giza 77	0	11.8	27.5	27.025	22.8	108.8	57.3	20.8	7.5	2.5	0	286.3	26.0 b
Giza 85	0	43.3	79.8	89.5	123.3	161	110.8	81.3	54.8	25.0	5.0	773.5	70.3 f
Giza 86	0	33.8	65.5	54.0	24.3	239	126.3	48.8	19.8	9.3	1.5	622.3	56.6 e
Giza 87	0	50.5	76.0	21.3	20.0	41.5	35.3	25.3	10.5	2.5	1.8	284.7	25.9 b
Giza 88	0	22.3	40.5	17.0	55.0	56.0	34.0	44.5	19.3	8.8	2.3	299.7	27.2 b
Giza 89	0	67.3	155.5	124.5	75.8	276.8	167.5	192.8	95.0	48.8	16.3	1220.3	110.9 g

Means followed by the same letter are not significantly different at 5% level by DMRT.

**b. Immature stages:** Table 4 and Figure 2 showed that the highest number of infestation occurred on variety Giza 89 with a mean of 130.9 immature stages/9 in<sup>2</sup>, while the least infestation was found in case of Giza 45 with a mean of 18.9 immature stages/9 in<sup>2</sup>. All tested cotton varieties differed significantly.

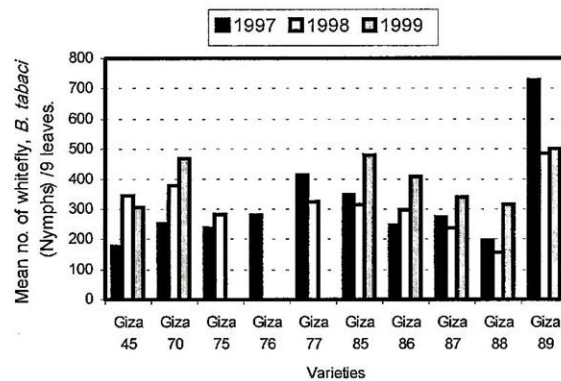


Figure 2. Infestation of some Egyptian cotton varieties with whitefly, *Bemisia tabaci* nymphs during 1997, 1998 and 1999 seasons at Sakha region, Kafr El-Sheikh Governorate.

Table 3. Mean numbers of the whitefly, *Bemisia tabaci* (Genn.) adults per 9 leaves on 9 cotton varieties under field conditions at Sakha region (Kafr El-Sheikh Governorate) during 1998 season.

Variety	Date of inspection																					Total	Mean
	Jun.			Jul.			Aug.			Sept.			Oct.										
	20	27	4	11	18	25	1	8	15	22	29	5		12	19	26	3						
Giza 45	29.3	42.7	56.2	92.2	101.3	123.7	164.2	207.0	348.7	740.2	1660.5	1010.2	504.0	211.5	157.2	81.0	5530.2	345.6 g					
Giza 70	18.0	58.5	65.2	159.7	209.2	225.0	342.0	459.0	553.5	670.5	1462.5	900.0	517.5	245.2	121.5	56.2	6063.3	378.9 h					
Giza 75	0	31.5	36	130.5	198.0	225.0	189.0	243.0	308.2	681.7	1019.2	787.7	288.0	166.5	126.0	56.2	4485.5	280.3 c					
Giza 77	24.8	63.0	40.5	108.0	166.5	204.7	227.2	301.5	506.2	661.5	1359.0	756.0	382.5	198.0	121.5	56.3	5177.2	323.5 f					
Giza 85	27.0	45.0	47.2	74.2	78.7	119.2	150.7	193.5	400.5	832.5	1575.0	420.0	632.2	254.2	114.7	60.8	5025.4	314.0 e					
Giza 86	0	13.5	45.0	58.5	54.0	74.3	146.2	299.2	614.2	729.0	1464.7	693.0	279.0	157.5	76.5	42.7	4747.3	296.7 d					
Giza 87	0	18.0	54.0	78.7	105.7	141.7	204.7	279.0	598.5	659.2	940.5	452.2	121.5	63.0	47.2	24.7	3788.6	236.8 b					
Giza 88	42.7	40.5	60.7	83.2	99.0	112.5	144.0	195.8	267.7	427.5	519.7	243.0	126.0	87.7	51.7	13.5	2515.2	157.2 a					
Giza 89	45.0	40.5	65.3	90.0	137.2	175.5	342.0	702.0	909.0	1032.7	1590.7	1091.2	762.7	375.7	272.2	114.7	7746.4	484.2 i					

Means followed by the same letter are not significantly different at 5% level by DMRT.



Table 4. Mean numbers of the whitefly, *Bemisia tabaci* (Genn.) immature stages per 9 square inches on 9 cotton varieties under field conditions at Sakha region (Kafr El-Sheikh Governorate) during 1998 season.

Variety	Date of inspection																		Total	Mean
	Jul.			Aug.						Sept.						Oct.				
	11	18	25	1	8	15	22	29	5	12	19	26	3							
Giza 45	0	6.2	19.3	39.5	27.5	21.2	61.5	37.0	14.3	7.7	3.5	5.2	2.7	245.6	18.9 a					
Giza 70	0	0	50.5	60.0	67.2	81.7	101.2	125.3	62.0	48.7	87.2	45.0	11.0	739.8	56.9 d					
Giza 75	0	10.7	53.0	57.5	69.5	77.2	99.7	114.5	60.7	93.0	102.5	32.0	8.5	778.8	59.9 e					
Giza 77	12.0	7.5	52.7	61.5	74.0	88.7	13.7	112.7	62.5	37.3	25.0	29.3	6.2	683.1	52.5 c					
Giza 85	0	32.7	132.0	151.3	170.5	114.7	176.7	189.5	135.0	65.3	76.5	37.7	4.2	1286.1	98.9 f					
Giza 86	0	9.0	59.3	68.3	85.5	95.8	115.5	139.3	37.3	44.0	41.0	11.8	0.8	707.6	54.4 d					
Giza 87	0	6.5	45.5	50.5	56.5	69.3	90.3	101.5	51.5	38.5	44.5	29.2	4.5	588.3	45.3 b					
Giza 88	10.3	32.3	60.3	93.3	89.8	81.8	107.0	128.5	69.5	37.3	40.3	11.8	2.0	764.2	58.8 de					
Giza 89	39.2	47.5	119.7	206.2	171.2	123.7	204.0	247.7	167.0	104.2	152.2	103.5	15.0	1701.1	130.9 g					

Means followed by the same letter are not significantly different at 5% level by DMRT.

**Season 1999:**

**a. Adult stage:** Table 5 and Figure 1 showed similar trend of the two previous seasons (1997 and 1998) as the highest infestation on variety Giza 89 revealed the significantly highest number of insects (501.6 individuals/9 leaves), while the lowest infestation level was observed for Giza 45 with a mean of 304.2 insects/9 leaves. Other varieties differed significantly and arranged in a descending order as follows:

Giza 85 (478.7), Giza 70 (467.8), Giza 86 (408.9), Giza 87 (339.7) and Giza 88 (314.4) adults/9 leaves.



Table 5. Mean numbers of the whitefly, *Bemisia tabaci* (Genn.) adult stage per 9 leaves on 7 cotton varieties under field conditions at Sakha region (Kafr El-Sheikh Governorate) during 1999 season.

Variety	Date of inspection																					Total	Mean
	Jul.							Aug.							Sept.			Oct.					
	2	9	16	23	30	6	13	20	27	3	10	17	24	1									
Giza 45	0	0	24.75	67.5	96.75	306.0	432.0	695.75	789.75	607.5	351.0	596.25	193.3	94.5	4259.25	304.2 a							
Giza 70	27.0	33.75	47.25	157.5	209.25	263.25	411.75	603.0	708.75	866.25	810.0	535.5	1588.5	288.0	6549.75	467.8 e							
Giza 85	15.0	37.5	79.5	234.0	451.5	666.0	838.5	937.5	1101.0	840.0	472.5	694.5	255.0	79.5	670.20	478.7 f							
Giza 86	12.0	15.0	70.5	87.0	231.0	321.0	594.0	615	678.0	799.5	706.5	1134.0	351.0	111.0	5725.5	408.9 d							
Giza 87	60.75	114.75	139.5	184.5	95.5	263.5	519.75	483.75	576.25	834.75	319.5	668.25	391.5	101.25	4755.5	339.7 c							
Giza 88	0	58.5	123.75	202.5	274.5	335.25	432.0	362.25	479.25	555.75	279.0	387.0	751.5	159.75	4401.0	314.4 b							
Giza 89	53.25	71.25	216.0	273.75	372.75	413.25	529.5	594.75	940.5	1248.75	382.5	982.5	822.0	121.5	7022.25	501.6 g							

Means followed by the same letter are not significantly different at 5% level by DMRT.

Table 6. Mean numbers of the whitefly, *Bemisia tabaci* (Genn.) immature stages per 9 inches on 7 cotton varieties under field conditions at Sakha region (Kafr El-Sheikh Governorate) during 1999 season.

Variety	Date of inspection													Total	Mean
	Jul.			Aug.				Sept.					1		
	30	6	13	20	27	3	10	17	24	1					
Giza 45	7.0	19.5	38.25	19.0	62.5	38.0	9.0	6.5	51.75	6.0	257.5	25.8 a			
Giza 70	0	9.5	23.25	32.5	48.25	39.5	70.5	43.75	69.75	11.75	348.8	34.9 bc			
Giza 85	0	34.72	106.25	90.0	103.25	146.75	121.75	72.75	76.25	15.75	767.5	76.8 e			
Giza 86	7.0	24.5	49.5	47.75	73.0	56.25	19.0	249.75	120.0	13.5	660.3	66.0 d			
Giza 87	29.25	49.25	79.5	92.25	112.0	85.0	58.75	40.25	10.5	7.0	563.8	56.4 cd			
Giza 88	0	15.25	23.5	30.75	78.25	68.0	48.5	36.75	12.5	6.5	320.0	32.0 ab			
Giza 89	23.25	60.0	95.5	104.75	647.0	374.5	169.5	57.5	32.25	4.75	1569.0	156.9 f			

Means followed by the same letter are not significantly different at 5% level by DMRT.

Table 7. Mean numbers of whitefly, *Bemisia tabaci* (Genn) adults and immature stages on 7 cotton varieties during three successive seasons. 1997, 1998 and 1999 under field conditions at Sakha region (Kafr El-Sheikh Governorate).

Variety	Adult stage					Immature stage				
	1997	1998	1999	Total	Mean	1997	1998	1999	Total	Mean
Giza 45	2655.3	5530.2	4259.3	12444.8	4148.3b	208.3	245.6	257.5	711.4	237.0 a
Giza 70	3768.8	6063.3	6549.75	16381.9	5461.0e	396.5	739.8	348.8	1485.1	459.0 d
Giza 85	5225.5	5025.4	6702.0	16953.0	5651.0f	773.5	1286.1	767.5	2827.1	942.4 f
Giza 86	3670.8	4747.5	5725.5	14143.6	4714.5d	622.3	707.6	660.3	1990.0	663.0 e
Giza 87	4083.0	3788.6	4755.5	12627.1	4209.0c	284.7	588.3	563.8	1436.8	479.0 bc
Giza 88	2898.8	2515.2	4401.0	981.5	3271.7a	299.7	764.2	320.0	1384.0	461 b
Giza 89	10933.5	7746.4	7022.2	25702.0	8567.4g	1220.3	1701.1	1569.0	4490.4	1497 g

Mean followed by the same letter are not significantly different at 5% level by DMRT

**b. Immature stages:** As for the susceptibility the tested of cotton varieties to infestation with immature stages of whitefly, *B. tabaci*, data presented in Table 6 and in Figure 2 showed that the highest infestation occurred on Giza 89 reaching a mean number of 156.9 individuals /9 in<sup>2</sup>, while the least infestation was on Giza 45 with a mean number of 25.8 individuals/9 in<sup>2</sup>. Means for other varieties ranged from 32.0 to 76.8 individuals /9 in<sup>2</sup>.

It could be concluded from the above mentioned results, that the highest susceptible variety was Giza 89 as the highest average numbers of adults and immature stages were gained on it and vice versa for Giza 45 Cotton variety, which represented the least susceptible cotton variety against whitefly, *B. tabaci* under Kafr El-Sheikh region (Table 7).

El-Dakroury (1979) mentioned that Giza 70 and Giza 45 cotton varieties were the highest susceptible to whitefly nymphs infestation. These which contradicted with those obtained in the present study, where Giza 45 was the least susceptible. Abou-Toor *et al.* (1989) studied the susceptibility of the Egyptian cotton varieties, Giza 45, Giza 70, Giza 75, Giza 76, Giza 77 and Giza 87 to whitefly infestation. They confirmed that the variety Giza 81 was more susceptible to whitefly nymphs than Giza 69 which harboured the lowest nymph populations. Khalafalla *et al.* (1993) proved that the variety Giza 76 was susceptible to the whitefly adults, *B. tabaci*, while Giza 77 showed the lowest population. Also, Khalafalla *et al.* (1997) stated that variety Giza 85 was significantly the most susceptible variety to infestation with whitefly adults, while Giza 75 was the least infested.

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### حساسية بعض أصناف القطن المصرى للإصابة بالذبابة البيضاء

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١ قسم الحشرات الاقتصادية - كلية الزراعة بكفر الشيخ - جامعة طنطا.

٢ معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى - الجيزة - مصر.

أجريت هذه الدراسة بمحطة البحوث الزراعية بسخا بمحافظة كفر الشيخ خلال الأعوام ١٩٩٧ ، ١٩٩٨ / ١٩٩٩. تم زراعة عشرة أصناف قطن وهى جيزة ٤٥ ، جيزة ٧٠ ، جيزة ٧٥ جيزة ٧٦ ، جيزة ٧٧ ، جيزة ٨٥ ، جيزة ٨٦ ، جيزة ٨٧ ، جيزة ٨٨ ، جيزة ٨٩ وذلك خلال الموسم الأول ١٩٩٧م. ثم ألغى للصف جيزة ٧٦ فى الموسم التالى والأصناف جيزة ٧٥ ، جيزة ٧٦ ، جيزة ٧٧ فى الموسم الثالث وتم عد الحشرات الكاملة بالعين المجردة على ٣٦ ورقة أسبوعياً لكل صنف على كل من سطحى الورقة العلوى والسفلى اعتباراً من الساعة السادسة حتى التاسعة صباحاً أما بالنسبة للأطوار غير الكاملة كانت تؤخذ الأوراق رقم ٦ ، ٧ ، ٨ من على الساق الرئيسية لثلاثة نباتات فى أربع مكررات وبالتالى يكون عدد الأوراق لكل صنف ٣٦ ورقة وتقل للمعمل مكبسة وتفحص تحت المجهر وتعد الأطوار غير الكاملة فى البوصة المربعة. وتم الحصول على النتائج التالية:

وجد أن الصنف جيزة ٨٩ كان أكثر الأصناف قابلية للإصابة خلال سنوات الدراسة الثلاث حيث كان متوسط تعداد الحشرات الكاملة للثلاث سنوات ٨٥٦٧,٤ حشرة/٩ أوراق. والأطوار غير الكاملة كانت النسبة ١٤٩٧ فرد/٩ بوصة مربعة .

كان الصنف جيزة ٨٨ هو أقل الأصناف قابلية للإصابة بالحشرات الكاملة حيث كان متوسط التعداد للثلاث سنوات ٣٢٧١,٧ حشرة/٩ أوراق فى حين وجد أن الصنف جيزة ٤٥ هو أقل الأصناف قابلية للإصابة بالأطوار غير الكاملة حيث كان متوسط التعداد ٢٣٧ فرد/٩ بوصة مربعة.