

## SUSCEPTIBILITY OF SOME COTTON VARIETIES TO INFESTATION WITH SUCKING INSECTS AND THE MAIN ASSOCIATED PREDATORS AND PARASITOIDS AT KAFR EL-SHEIKH REGION

EL-MEZAYYEN, G. A., A. M. NASSEF, H. M. MANSOUR AND M. M. METWALLY

Plant Prot. Res. Inst., Sakha Agric. Res. Station, A R C, Egypt

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### Abstract

The study was conducted at Sakha Agricultural Research Station, Kafr El-Sheikh Governorate, north Delta during 2004 and 2005 seasons. Results showed that the highest numbers of aphids existed on cotton variety Giza 85, while Giza 89 and Giza 70 harboured the least numbers. On the other hand, Giza 45 and Giza 89 were the least infested varieties with whiteflies and jassids which showed the highest affinity to varieties Giza 89 and Giza 86, respectively.

Results indicated that Giza 85 harboured the highest number of predators with a mean of 2.44 individuals/leaf while Giza 89 had the lowest number with a mean of 0.32 indiv./leaf. The third peak of predators was correlated with the first peak of both *A. gossypii* and *E. lybica* on July 28<sup>th</sup> on Giza 85 and Giza 45. Also, the fifth peak of predators coincided with the corresponding highest peak of *B. tabaci* on September 1<sup>st</sup> on Giza 45 and Giza 85. Results showed five parasitoid species belonging to family aphidiidae attacking *A. gossypii* which amounted 7.08% parasitism emerged from aphid mummies. Also, three peaks of five parasitoids were recorded on July 28<sup>th</sup> (10.94% parasitism), August 25<sup>th</sup> (15.69% parasitism) and September 29<sup>th</sup> (17.95% parasitism) and coincided with the first and second peaks of *A. gossypii* on the tested cotton varieties. *Diaeretiella rapae* (McIntosh) parasitoid came the first as amounted 2.25% parasitism followed by *Trioxys* sp. (1.93%), *Aphidius* sp. (1.85%), *Ephedrus* sp. (0.56%) and then *Paron* sp. (0.48%).

### INTRODUCTION

Cotton plants are subjected to attack by a wide range of insect pests throughout growing stages until near maturity. Among the main insect pests are aphid, *Aphis gossypii* Glover; whitefly, *Bemisia tabaci* (Genn.); jassids, *Empoasca lybica* (De Berg) and green stink bug, *Nezara viridula* (L.). In addition to sucking the sap of plant tissues, virus diseases, transmitted by some of sucking insects, may increase the severity of the injury and reduce the yield (Buttler *et al.*, 1986; Andrews & Kitten, 1989 and Harris *et al.*, 1992).

The most serious damage to cotton is a result of honeydew excreted by

certain sucking insects which makes the lint sticky, resulting in difficulties in the ginning and spinning process (Perkins, 1987; Anonymous, 1989 and Shower, 2000).

Chemical control of these insects is expensive and environmentally disruptive and largely ineffective. Therefore, it is strictly necessary to select resistant varieties are one of the simplest and useful tactics in integrated pest management programmes. Certain beneficial arthropods are associated with these pests in the agroecosystem which will be of value to reduce the pest infestation in integrated pest management.

## MATERIALS AND METHODS

Six Egyptian cotton varieties were selected for this study namely: Giza 45, Giza 70 and Giza 88 (extra long staple), Giza 85, Giza 86 and Giza 89 (long staple). This experiment was conducted at Sakha Agricultural Research Station, Kafr El-Sheikh Governorate, north Delta during 2004 and 2005 seasons.

Plot size measured 42 m<sup>2</sup> (1/100 feddan) with four replicates for each variety, arranged in a complete randomized block design. Therefore, the experimental field contained 24 plots. Cotton was sown on March 25<sup>th</sup>, 2004 and on March 30<sup>th</sup>, 2005, adopting the normal agricultural practices of irrigation and fertilization: Regime of insecticide application for controlling cotton leafworm and bollworms, was conducted according to the recommendation of Ministry of Agriculture and Land Reclamation. The used insecticides were: Dursban (chlorpyrifos) 48% E.C. at a rate of 1 liter/feddan, Atabron 5% E.C. (IGRs) at a rate of 400 ml/fed., sumialpha (esfenvalerate) 5% E.C at a rate of 600 ml/fed., Curacron (profenofos) 72% E.C. at a rate of 750 ml/fed.

### 1. Count of piercing sucking insects and associated predators

Weekly counts of the total numbers of *A. gossypii*, *B. tabaci* (adults), *E. lybica*, *N. viridula* and associated predators were recorded on 20 leaves/variety represented the lower, medium and upper levels of plant, selected at random in each plot. Duncan's multiple range test (DMRT) (1955) at 5% level was used to reveal significance among the means of the insects attacking the considered varieties.

### 2. Parasitism on cotton aphid, *A. gossypii*

Weekly samples of aphid were collected from untreated cotton plants (1/2 feddan), counted on 20 leaves and kept into petri dishes in the laboratory. The petri dishes were daily observed and the formed aphid mummies were collected, counted and kept into vials till the emergence of adult parasitoids. The emerging parasitoids were identified by Dr. Ahmed S. Hendawy, Biological Control Research Department, Sakha Agricultural Research Station, Agricultural Research Center. Thus, percentage of

parasitism and population fluctuations were recorded.

## RESULTS AND DISCUSSION

### I. Susceptibility of some cotton varieties to piercing sucking insects infestation

Data in Table (1) show the numbers of the four sucking insects on five Egyptian cotton varieties during 2004 and 2005 seasons. Statistical analysis revealed that the highest numbers of aphids were existed significantly on variety Giza 85 with means of 7.76 & 4.14 insects/ leaf while Giza 89 and 70 harboured the least numbers with means of 2.42 & 1.23 and 3.80 & 1.82 insects/leaf in both seasons, respectively. These results agreed with the findings of Abdallah (1979), Salem *et al.* (1992) and Khalafalla *et al.* (1997) who reported that Giza 70 was less infested by *A. gossypii* than the other tested varieties.

Table 1. Mean number of piercing sucking insects per cotton leaf on some cotton varieties during 2004 and 2005 seasons at Kafr El-Sheikh region.

Insects	Variety				
	Giza 45	Giza 70	Giza 85	Giza 86	Giza 89
pests					
	2004 season				
<i>A. gossypii</i>	5.24 ab	3.80 a	7.76 b	4.29 a	2.42 a
<i>B. tabaci</i>	27.69 a	27.87 a	54.41 ab	49.82 ab	58.44 b
<i>E. lybica</i>	1.41 a	1.17 ab	1.12 ab	1.95 c	0.87 a
<i>N. viridula</i>	0.07 a	0.10 a	0.09 a	0.03 a	0.08 a
Total mean	34.41 a	32.94 a	63.38 b	56.10 b	61.81 b
	2005 season				
<i>A. gossypii</i>	4.08 a	1.85 a	4.14 b	1.62 a	1.23 a
<i>B. tabaci</i>	28.50 a	29.16 a	47.17 bc	40.96 ab	59.15 c
<i>E. lybica</i>	2.38 a	1.86 a	1.51 a	2.46 a	1.31 a
<i>N. viridula</i>	0.08 a	0.04 a	0.06 a	0.02 a	0.07 a
Total mean	35.04 a	32.88 a	52.88 b	45.07 b	61.76 b

Means with the same letter in the same year are not significantly different at  $P < 0.05$  by DMRT.

Regarding whitefly, *B. tabaci*, Giza 89 and Giza 85 were significantly the most susceptible varieties to infestation with means of 58.44 & 59.15 and 54.41 & 47.17 insects/leaf in both seasons, respectively. On the other hand, Giza 45 and Giza 70 were the least infested with means of 27.69 & 28.50 and 27.87 & 29.16 insects/leaf in both seasons, respectively. Results agree with those of Khalafalla *et al.* (1997) who found that Giza 85 was the most susceptible variety to infestation with whitefly at Kafr

El-Sheikh region while opposite results were obtained by Abdallah (1979) who reported that Giza 45 and Giza 70 were highly susceptible varieties with whitefly, this may be due to differences in the prevailing weather conditions and/or to other factors.

As for jassid, *E. lybica*, statistical analysis revealed that Giza 89 harboured the lowest number of jassids with means of 0.87 and 1.31 insects/leaf followed by Giza 85 and Giza 70, while the highest affinity to infestation occurred on Giza 86 in both seasons.

With regard to green stink bug, *N. viridula*, statistical analysis revealed no significant differences among the tested cotton varieties in both seasons (Table 1).

From the aforementioned results, it is clear that Giza 89 was the most susceptible variety to whitefly infestation, whereas it was the least infested with both aphids and jassids. This result may be due to the competition for the source of food and/or other factors.

Concerning the total count of the four sucking insects (Table 2), statistical analysis confirmed that Giza 89 harboured the highest numbers with means of 61.61 and 61.76 insects/leaf followed by Giza 85, Giza 86 with means of 63.38 & 52.80 and 56.10 & 45.07 insects/leaf in both seasons, respectively. On the other hand, the lowest populations were found on Giza 70 and Giza 45 without significant differences. These results are in agreement with those of Khalafalla *et al.* (1997) who found that Giza 70 and Giza 45 harboured the lowest populations of the total three sucking insects at Kafr El-Sheikh region.

Table 2. Total numbers of aphids, whiteflies, Jassids and green stink bugs and means on different Egyptian cotton varieties under field conditions of Sakha region, Kafr El-Sheikh Governorate, North Delta.

Season	Number	Variety				
		Giza 45	Giza 70	Giza 85	Giza 86	Giza 89
2004	Total	620.07	592.81	1140.87	1009.87	112.66
	Mean	34.45 a	32.93 a	63.38 b	56.10 b	61.61 b
2005	Total	630.85	591.91	951.80	811.25	1111.60
	Mean	35.05 a	32.88 a	52.8 b	45.07 b	61.76 b

Means with the same letter in the same year are not significantly different at  $P < 0.05$  by DMRT.

## II. Relationship between piercing sucking insects and beneficial arthropods:

The results in Table (3) show mean numbers of main predators on four cotton varieties in 2005 season. Giza 85 harboured the highest number of predators with a

mean of 2.44 individuals/leaf while Giza 89 had the lowest number with a mean of 0.32 indiv./leaf. The third peak of predators was recorded on July 28<sup>th</sup> on Giza 85 and Giza 45 (4.54 & 3.60 indiv./leaf, respectively) which correlated with the first peak of each of *A. gossypii* and *E. lybica* (12.25 & 13.75 indiv./leaf, respectively). The fourth peak of predators was recorded on August 11<sup>th</sup> of Giza 85 (5.69 indiv./leaf) coincided with the first peak of *E. lybica* (7.65 indiv./leaf). The fifth peak of predators found on September 1<sup>st</sup> on Giza 45 and Giza 85 (4.5 & 6.84 indiv./leaf, respectively) coincided with the corresponding highest peak of *B. tabaci* (112.75 & 201.30 indiv./leaf, respectively). Results confirm those of El-Mezayyen and Abou-Attia (1996) who found that the largest generation of each *Chrysoperla carnea* (Steph), *Coccinella undecimpunctata* (Rich), *Paederus alfieri* (Koch), and *Scymnus* spp. were coincided with largest ones of their pests such as *A. gossypii*, *B. tabaci* and *E. lybica* during July, August and September at Kafr El-Sheikh region. In this respect, Abo-Sholooa (2001) indicate that *C. carnea*, *C. undecimpunctata*, *P. alfieri*, *Orius* spp. and *Scymnus* spp. were correlated with aphid, Jassids, whitefly and bollworms.

### III. Parasitism on cotton aphid, *Aphis gossypii* Glover

Data in Table (4) present population fluctuations of five parasitoid species attacking *A. gossypii* and their percentages of parasitism in 2005 season. Generally, the five parasitoid species amounted 7.08% parasitism emerged from *A. gossypii* mummies. Also three peaks of the five parasitoids were recorded on July 28<sup>th</sup> (10.94% parasitism), August 25<sup>th</sup> (15.69% parasitism) and September 29<sup>th</sup> (17.95% parasitism) and coincided with first and second peaks of this aphid on the tested cotton varieties in 2005 season. Five parasitoid species, belonging to aphidiidae, were detected. *D. rapae* came first as amounted 2.25% parasitism followed by *Trioxys* sp. (1.93%), *Aphidius* sp. (1.85%), *Ephedrus* sp. (0.56%) and then *Paron* sp. (0.48%). Similar results were obtained by Salem (2002) who reported that *A. gossypii* was parasitized by *Aphelinus* sp. (0.51% parasitism) and *Alloxysta* sp. (1.09%) while *D. rapae* parasitized on *Aphis craccivora* (Koch.) at a rate of 4.73%. Also, she indicated that the numbers of *Alloxysta* sp. parasitoid were higher by late August and early September at Kafr El-Sheikh region. Selim *et al.* (1987) and Ferrari and Burgio (1994) reported that *A. gossypii* was parasitized by *Aphidius colomani* (Vitseck) and *Aphidius lysiphlobus* in Egypt and Italy, respectively.

Table 3. Mean numbers of main predators\* per one leaf of cotton varieties in 2005 season.

Inspection date	Varieties			
	Giza 45	Giza 85	Giza 88	Giza 89
2/6	0.12	0.42	0.15	0.42
9/6	0.65	1.02	0.54	0.47
16/6	0.47	0.56	0.21	0.16
23/6	0.90	1.41	0.75	1.25
30/6	0.45	1.12	0.26	0.38
7/7	0.70	2.20	0.64	0.23
14/7	0.85	0.54	0.80	0.25
21/7	0.42	0.15	0.37	0.18
28/7	3.60	4.54	5.08	0.15
4/8	2.10	1.75	1.80	0.10
11/8	2.05	5.69	1.62	0.04
18/8	3.20	3.27	2.50	0.16
25/8	2.30	4.05	2.50	0.22
1/9	4.50	6.84	3.83	0.46
8/9	2.90	4.85	3.04	0.47
15/9	1.20	3.24	1.74	0.40
22/9	0.55	1.95	0.99	0.30
29/9	0.0	0.32	0.0	0.14
Total	26.96	43.92	26.82	5.78
Mean	1.50 a	2.44 a	1.49 a	0.32 b

Predators were calculated as a total number included: *Chrysoperla carnea*, *Coccinella undecimpunctata*, *Orius* sp., *Paederus alfieri*, *Scymnus* spp. and true spiders, since each species was low/variety.

Means with the same letter are not significantly different at  $P < 0.05$  by DMRT

Table 4. Parasitoid species attacking cotton aphids, *Aphis gossypii* Glover and their percentages of parasitism during 2005 season at Kafr El-Sheikh region.

Inspection date	A. <i>gossypii</i>	Parasitoid species										Total	
		<i>Diaeretiella rapae</i> (M'Intosh)		<i>Trioxys</i> sp.		<i>Aphidius</i> sp.		<i>Ephedrus</i> sp.		<i>Praon</i> sp.		No.	%
		No.	%	No.	%	No.	%	No.	%	No.	%		
2/6	29	0	0	0	0	0	0	0	0	0	0	0	0
9/6	27	0	0	0	0	0	0	0	0	0	0	0	0
16/6	38	0	0	0	0	0	0	0	0	0	0	0	0
23/6	49	0	0	0	0	0	0	0	0	0	0	0	0
30/6	69	2	2.99	0	0	0	0	0	0	0	0	2	2.99
7/7	57	0	0	0	0	0	0	2	3.51	0	0	2	3.51
19/7	51	1	1.96	0	0	0	0	1	1.96	0	0	2	3.92
21/7	48	0	0	0	0	0	0	1	2.08	0	0	1	2.08
28/7	64	3	4.69	0	0	1	1.56	3	4.69	0	0	7	10.94
4/8	51	0	0	0	0	2	3.92	0	0	0	0	2	2.92
11/8	48	0	0	0	0	3	6.25	0	0	0	0	3	6.25
18/8	64	0	0	0	0	5	7.81	0	0	0	0	5	7.81
25/8	51	0	0	1	1.96	7	13.73	0	0	0	0	8	15.69
1/9	42	0	0	2	4.76	1	2.38	0	0	0	0	3	7.14
8/9	33	0	0	3	9.10	0	0	0	0	0	0	3	9.10
15/9	38	0	0	2	5.26	0	0	0	0	0	0	2	5.26
22/9	46	0	0	4	8.70	2	4.35	0	0	2	4.35	8	17.40
29/9	78	0	0	9	11.5	2	2.56	0	0	3	3.85	14	17.95
6/10	121	6	4.96	3	4	0	0	0	0	1	0.83	10	8.27
13/10	108	8	7.41	0	2.48	0	0	0	0	0	0	8	7.41
20/10	79	5	6.33	0	0	0	0	0	0	0	0	5	6.33
27/10	51	3	5.88	0	0	0	0	0	0	0	0	3	5.88
					0								
Total	1242	28		24		23		7		6		88	
Parasitism %			2.25		1.93		1.85		0.56		0.48		7.08

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## حساسية بعض أصناف القطن للاصابة بالحشرات الثاقبة الماصة وأهم المفترسات والطفيليات المصاحبة لها في منطقة كفر الشيخ

جمال على المزين ، على ممدوح ناصف، حمدى أحمد متولى منصور ، ممدوح محمد متولى

معهد بحوث وقاية النباتات محطة البحوث الزراعية بسخا مركز البحوث الزراعية

أجرى هذا البحث بمزرعة محطة البحوث الزراعية بسخا - كفرالشيخ - شمال الدلتا خلال موسمي ٢٠٠٤م ، ٢٠٠٥م. أوضحت النتائج أن أعلى تعداد للمن على الصنف جيزة ٨٥ بينما كان أقل تعداد على الصنف جيزة ٨٩ وجيزة ٧٠ وكان الصنف جيزة ٤٥ وجيزة ٨٩ أقل اصابة بالذبابة البيضاء والجاسيد على الترتيب بينما كان الصنف جيزة ٨٩ أكثر اصابة بالذبابة والصنف جيزة ٨٦ أكثر اصابة بالجاسيد.

أوضحت النتائج أيضا ان الصنف جيزة ٨٥ احتوى على أكبر تعداد من المفترسات بمتوسط ٢,٤٤ فرد لكل ورقة بينما كان أقل تعداد على الصنف جيزة ٨٩ بمتوسط ٠,٣٢ وفرد لكل ورقة ومن ناحية أخرى تزامنت الذروة الثالثة للمفترسات والتي سجلت في ٢٨ يوليو على الصنف جيزة ٨٥ وجيزة ٤٥ مع الذروة الأولى لكل من المن والجاسيد كذلك تزامنت الذروة الخامسة للمفترسات والتي وجدت في ١ سبتمبر على الصنف جيزة ٤٥ وجيزة ٨٥ مع أعلى ذروة للذبابة البيضاء.

بينت النتائج أيضا انه يتطفل على حشرة من القطن *Aphis gossypii* Glover خمسة أنواع من الطفيليات تنتمي لعائلة *Aphidiidae* حيث مثلت نسبة تطفلها معا على المن ٧,٠٨% ، كما سجلت ثلاث ذروات للطفيليات الخمسة معا في ٢٨ يوليو بنسبة تطفل ١٠,٩٤% وفي ٢٥ اغسطس بنسبة تطفل ١٥,٦٩% وفي ٢٩ سبتمبر بنسبة تطفل ١٧,٩٥% حيث تزامنت مع الذروة الأولى والثانية للمن *A. gossypii* ومن ناحية أخرى جاء الطفيل (*Diaeretiella rapae* (Mc'Intosh) فى المرتبة الأولى بنسبة تطفل ٢,٢٥% ثم تلاة الطفيل *Trioxys* sp. (١,٩٣%) ثم الطفيل *Aphidius* sp. (١,٨٥%) ثم الطفيل *Ephedrus* sp. (٠,٥٦%) واخيرا الطفيل *Praon* sp. (٠,٤٨%).