SUSCEPTIBILITY OF SOME EGYPTIAN COTTON VARIETIES TO INFESTATION WITH SUCKING INSECTS .

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Abstract

Nine Egyptian cotton varieties were evaluated for their susceptibility to infestation with certain sucking insects under field conditions of north Delta during 1995 season. Weekly count of total number of insects per 25 seedlings or leaves chosen at random, showed that peak aphid populations on the different varieties occurred during the period from the 2nd week of July to the 3rd week of August. The highest numbers of aphids existed on cotton variety Giza 83, while Giza 70 harboured the least numbers.

On the other hand, cotton variety Giza 83 was the least infested variety with jassids and whiteflies, which showed highest affinity to varieties Giza 70 and Giza 85, respectively.

In most tested varieties, the total populations of the three sucking insects correlated positively with temperature, and relative humidity, while this correlation was negative with wind speed in all tested varieties. The combined effect of the three climatic factors was more pronounced on the populations on Giza 45 and Giza 80 than on other varieties since it was responsible for 86.8 and 80.33% of variability in the populations, respectively. On the other hand, the total populations were less affected by the three climatic factors collectively on Giza 76, Giza 83 and Giza 77, where it was responsible for 28.00, 21.75 and 19.80% of variability in the populations, respectively.

INTRODUCTION

Cotton plants are attacked by a wide range of sucking insect pests from the seedling stage until near maturity. Among the main sucking insect pests are aphids, whiteflies and jassids. In addition to sucking the plant sap, virus diseases transmitted by some of these insects may increase the severity of the injury and reduce the yield (Buttler *et al.*, 1986; Andrew and Kitten, 1989 and Harris *et al.*, 1992).

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

tain sucking insects which makes the lint sticky, resulting in difficulties in the ginning and spinning processes (Perkins, 1987 and Anonymous, 1989).

Chemical control of these insects is expensive and environmentally disruptive and largely ineffective. Therefore, it is strictly necessary to select resistant varieties as one of the simplest and useful tactics in integrated pest management programmes.

So, the population density of the above-mentioned sucking insects was evaluated on nine cotton varieties grown under field conditions of Sakha region, Kafr El-Sheikh Governorate, north Delta, as well as effect of some prevailing climatic factors on the population density.

MATERIALS AND METHODS

Nine Egyptian cotton varieties were selected for this study namely : Dandara, Giza 45, Giza 70, Giza 75, Giza 76, Giza 77, Giza 80, Giza 83 and Giza 85. This experiment was conducted in Sakha Research Station, Kafr El-Sheikh Governorate, north Delta, during 1995 season.

Plot size was 42 m2 (1/100 Feddan), with four replicates for each variety, arranged in complete randomized block design. Sowing date was 19 April, 1995 for all the varieties which were subjected to normal agricultural practices of irrigation and fertilization, but no insecticidal application.

Weekly counts of the total numbers of aphids, jassids and whiteflies were recorded on 25 seedlings/plot early in the cotton season, and on 25 leaves/plot later on, selected at random in each plot. Duncan's multiple range test (1955) at 5% level was used to reveal significance among the means of the insects on the involved varieties.

Records of temperture, relative humidity and wind speed during 1995 season were obtained from Meteorological Station at Sakha Research Station. Daily mean of these climatic factors during the week preceding the sampling date was used to calculate the simple correlation, partial regression and explained variance values according to Fisher (1950).

RESULTS AND DISCUSSION

The population density of certain sucking insects on different cotton varieties

Data summarized in Table 1 show the numbers of the three sucking insects on the nine cotton varieties during the inspection period. With regard to aphid species Aphis gossypii (Glov.), the population was low nearly on all the tested varieties and fluctuated during the sampling period recording almost two peaks of abundance during the period from the second week of July to the third week of August. Statistical analysis of data revealed that the highest numbers of aphids existed significantly on variety Giza 83 with a mean of 665.6 insects/25 seedlings or leaves, while Giza 70 harboured the least numbers with a mean of 52.6 insects/25 seedlings or leaves. These results agreed with the findings of Salem *et al.*, 1992 who reported that Giza 70 was infested by A.gossypii less than Dandara and Giza 81

Regarding whitefly, Bemisia tabaci (Genn.) the obtained results showed that the population began to appear in very low numbers after two weeks of sampling date. Then, the population increased gradually till the end of the growing season. Giza 85 was significantly the most susceptible variety to infestation with whitefly with a mean of 42.7 insects/25 seedlings or leaves. On the other hand, Giza 83, Giza 80 and Giza 75 were the least infested with a mean of 9.9, 13.1 and 12.2 insects, respectively. The other varieties can be arranged ascendingly by means of 15.9 , 19.9, 20.4, 23.4 and 24.8 for Giza 45, Giza 76, Dandara, Giza 70 and Giza 77, respectively. Opposite results were obtained by Khalafalla *et al.* (1992) who found that Giza 76 harboured numbers of whitefly, B. tabaci higher than Giza 77 during 1991 cotton season at Kafr El-Sheikh. This may be due to differences in the prevailing weather conditions and/or to other factors.

As for jassids, Empoasca spp. the population fluctuated in relatively moderate numbers on the tested varieties during the growing season. Statistical analysis revealed that Giza 83 exhibited the lowest number of jassids with a mean of 11.36 insects/25 seedlings or leaves, while the highest affinity to infestation occurred on variety Giza 70. These results were opposite to those of Abou-toor *et al.* (1989) who reported that Giza 76 attained the highest number of jassids followed by Giza 70 during 1987 and 1988 seasons at Kafr El-Sheikh. This may be attributed to differences in the prevailing climatic conditions or to other factors.

Generally, it was apparent that all the tested varieties exhibited higher numbers of aphids than jassids or whiteflies. These findings are in agreement with those

Table 1. Number of sucking insects per 25 seedlings or leaves on cotton varieties at Sakha region, during 1995 season.

Sampling date	*Aphis gossypii*									*Bemisia tabaci*									*Empoasca spp.*								
	G.75	G.80	G.83	G.76	G.77	G.85	G.45	Dand	G.70	G.75	G.80	G.83	G.76	G.77	G.85	G.45	Dand	G.70	G.75	G.80	G.83	G.76	G.77	G.85	G.45	Dand	G.70
May 16	10	25	40	0	0	0	25	10	5	0	0	0	0	0	0	0	0	0	11	13	5	9	8	5	15	12	12
30	20	30	60	40	10	0	0	0	0	0	0	0	0	0	0	0	0	0	23	15	13	15	17	12	23	15	24
June 15	23	25	40	138	38	5	0	0	0	5	0	0	1	0	3	4	3	0	27	18	23	25	23	15	32	27	33
26	15	78	23	580	23	3	0	5	0	15	0	0	3	0	0	0	0	0	42	40	43	41	38	33	54	44	45
July 3	55	213	515	838	90	43	88	93	25	0	3	3	0	3	8	3	7	0	13	0	17	12	18	27	22	35	13
11	98	258	2163	950	238	325	35	113	25	0	0	0	0	0	18	8	19	3	15	19	15	15	8	12	9	21	15
19	475	200	4125	1050	305	48	43	43	80	3	8	10	13	20	5	8	5	5	55	22	3	27	25	21	20	27	29
26	1095	703	718	163	135	198	65	73	30	0	3	3	4	5	10	3	0	2	3	3	0	5	0	7	16	5	123
August 2	1050	1000	175	58	53	63	75	58	13	10	0	4	17	23	45	13	15	31	13	8	4	22	14	13	8	13	22
9	768	805	110	515	205	273	128	330	130	58	5	34	10	43	83	40	28	88	9	3	3	27	8	22	23	15	35
16	438	775	260	663	288	1250	328	210	228	25	5	20	15	48	58	19	14	43	25	3	10	25	23	8	15	25	32
23	588	710	585	550	1075	425	95	285	115	10	20	0	5	10	21	20	11	44	35	35	0	9	25	10	54	15	55
30	313	538	290	33	15	40	8	45	60	20	45	50	25	90	307	95	73	71	11	21	23	24	16	3	17	25	38
Sept. 6	90	285	75	5	40	110	115	25	25	25	95	15	185	105	40	10	110	40	25	0	0	15	0	0	0	20	0
Total	5038	5645	9179	5583	2515	2783	1005	12.90	736	171	184	139	278	347	597	223	285	327	307	200	159	271	223	188	308	299	365
Mean	359.9	403.2	655.6	398.8	179.6	198.8	71.8	92.1	52.6	12.2	13.1	9.9	19.9	24.8	42.7	15.9	20.4	23.4	21.9	14.3	11.4	19.4	15.9	13.4	22.0	21.4	26.1
	c	b	a	b	d	d	ef	e	f	de	de	e	bc	b	a	cd	bc	b	b	f	h	d	e	g	b	c	a

of Khalafalla *et al.*, (1992) who reported that cotton aphid, *A. gossypii* was more abundant than the whitefly, *B.tabaci* on Giza 76, Giza 77 and Giza 88 cotton varieties during 1991 season.

From the forementioned results, it is clear that Giza 83 was the most susceptible variety to aphid infestation, whereas it was the least infested with both jassids and whiteflies This result may be due to the competition for the source of food and/or other factors.

Concerning the total count of the three sucking insects, Table 2, statistical analysis confirmed that Giza 83 harboured the highest numbers with a mean of 676.9 insects/25 seedings or leaves followed by Giza 80 and Giza 76 with means of 430. 6 and 438.1 insects. On the other hand, lowest populations were found on Giza 70, Giza 45 and Dandara without significant differences.

Table 2. Number of aphids, whiteflies and jassids collectively and its mean on different Egyptian cotton varieties under field conditions of Sakha region, Kafr El-Sheikh Governorate, north Delta during 1995 season.

Number	Variety								
	Giza 75	Giza 80	Giza 83	Giza 76	Giza 77	Giza 85	Giza 45	Dandara	Giza 70
Total	5516	6029	9477	6132	3085	3569	1536	1874	1428
Mean	393.9c	430.6b	676.9a	438.1b	220.3d	254.9d	109.7e	133.9e	102.1e

However, the differences in susceptibility of plant varieties to pest infestation may be due to morphological and/or biochemical characters of plants, since, biochemical factors, to a large extent, affect the behaviour and metabolic processes of the pest, while, morphological factors mostly influence the mechanisms of locomotion, feeding, ovipoistion, ingestion and digestion of the pest. Also, environmental factors are known to affect the ability of plants to resist pest attack. Thus, a variety that exhibits resistance in one locality or environment may be susceptible in another, since these factors influence fundamental physiological processes of the plant as well as the pest and these may interact to make plant resistant or non-resistant temporarily (Kumar, 1984) .

Effect of some climatic factors on the total population of the three sucking insect

The changes of insect population are commonly correlated with the corresponding changes in its physical environment. Therefore, the effect of some prevail-

ing climatic factors on the total populations of the considered insects was studied and the obtained results are depicted in Table 3.

Table 3. Statistical parameters for correlation between the total numbers of the three pests recorded on cotton varieties and the climatic factors separately.

Varities	Daily mean temperature		Daily mean relative humidity		Daily mean wind speed		% Explained variance
	Simple correlation	Partial Regression	Simple correlation	Partial Regression	Simple correlation	Partial Regression	
Giza 70	0.506	9.616	0.874**	15.359**	-0.420	-0.384	78.84
Dandara	0.545*	20.628	0.690**	12.520*	-0.420	0.118**	55.75
Giza 45	0.458	0.030**	0.921**	15.540**	-0.470	-8.940	86.80
Giza 85	0.417	17.855	0.857**	57.580**	-0.350	4.162	73.93
Giza 77	0.330	67.925	0.335	15.429	-0.097	54.082	19.80
Giza 76	0.391	158.226	0.127	1.021	-0.001	125.155	28.00
Giza 83	0.267	375.385	-0.213	-85.697	-0.042	151.631	21.75
Giza 80	0.589*	-13.925	0.532*	17.594	-0.866**	-192.340**	80.33
Giza 75	0.437	-38.586	0.150	-11.764	-0.516	-266.273**	70.69

Tabulated r at 1 % level = 0.661
Tabulated r at 1 % level = 0.532

Statistical analysis of the results showed a positive and insignificant relationship between daily mean temperature and the total populations of the three insects on all tested varieties except for Dandara and Giza 80 since, the relationship was positive and significant. This means that the temperature was within the optimal range for the populations activity of the insects on all varieties except for Dandara and Giza 80 where, the temperature was out of the optimal range for the activity of insects.

The results also revealed that the relative humidity was within the optimal range for insects activity on Giza 77, Giza 76, Giza 83 and Giza 75 since the effect was insignificant and positive. On the other side, a positive and highly significant effect was obtained on varieties Giza 70, Dandara, Giza 45 and Giza 85. This means that the relative humidity was out of the optimal range for the activity of these insects.

It is clear that, the populations were affected negatively insignificantly with wind speed on all the tested varieties except for Giza 80 where, the effect was highly significant. This means that the wind speed was within the optimal range for the activity of the insects on all the varieties with the exception of Giza 80. The above-mentioned results are in agreement with those of Khalafalla *et al.* (1992) who

reported that the population density of both aphids and whiteflies was affected positively by the relative humidity and negatively by the wind speed on cotton varieties, Giza 76, Giza 77 and Giza 80 during 1991 season. Also, Salem *et al.*, (1992) found that daily means of temperature and relative humidity affected A.gossypii infestation on Giza 70, Dandara and Giza 81 positively insignificantly while the daily mean of wind speed influenced it negatively insignificantly.

As for the combined effect of the three climatic factors on the total of the insect populations as percentage of explained variance, it is clear that the effect was more pronounced on the total populations for Giza 45 and Giza 80 than the other varieties since, it was 86.8 and 80.33%. On the other hand, the total populations were less affected by the three factors collectively on Giza 76, Giza 83 and Giza 77 where it was 28.00, 21.75 and 19.80%, respectively.

Finally, it can be concluded that the highest numbers of aphids existed on cotton variety Giza 83, while Giza 70 harboured the least numbers. On the other hand, Giza 83 was the least infested variety with jassids and whiteflies, which showed highest affinity to varieties Giza 70 and Giza 85, respectively. Also, the three considered climatic factors affected the populations of these insects on the tested varieties with different degrees. Thus, the gained results can encourage adopting breeding programmes to select cotton varieties which are less susceptible to pest infestation as an attempt to minimize the insecticidal use.

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حساسية بعض أصناف القطن المصرية للإصابة بالحشرات الثاقبة الماصة

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أجرى هذا البحث فى منطقة سخا – شمال الدلتا – لدراسة حساسية تسعة أصناف قطن مصريه للإصابة بالمن والذبابة البيضاء والجاسيد لموسم ١٩٩٥. وباستخدام التعداد الأسبوعى لهذه الحشرات على ٢٥ بادره أو ورقه .تبين أن ذروات الأصابة بحشرة المن حدثت فى الفترة من الأسبوع الثانى من يوليه وحتى الأسبوع الثالث من أغسطس على الأصناف المختلفة وكان أعلى تعداد للمن على الصنف جيزة ٨٣ بينما كان أقل تعداد على الصنف جيزة ٧٠ . ومن ناحية أخرى كان الصنف جيزة ٨٣ أقل إصابة بالجاسيد والذبابة البيضاء بينما كان الصنف جيزه ٧٠ أكثر اصابه بالجاسيد والصنف جيزة ٨٥ اكثر اصابه بالذبابة البيضاء. وكذلك أوضحت الدراسة وجود ارتباط موجب بين المجموع الكلى للحشرات الثلاثة وكل من الحرارة والرطوبة النسبية على معظم الاصناف بينما كان سالبا مع سرعة الرياح على جميع الأصناف المختبرة.

وكان التأثير المشترك للعوامل الجوية الثلاثة (الحرارة – الرطوبة النسبية – سرعة الرياح) أكثر وضوحا على المجموع الكلى للحشرات الثلاثة على الصنف جيزة ٤٥ ، و الصنف جيزة ٨١ حيث أنه أثر على التعداد الكلى لهذه الحشرات بنسبه ٨٦,٨٪ ، ٨٠,٣٣ ٪ على كلا الصنفين على الترتيب ، بينما أثر بنسبة ٢٨,٠٪ ، ٢١,٧٥٪ ، ١٩,٨٠٪ على الأصناف جيزة ٧٦ ، جيزة ٨٣ و جيزة ٧٧ على الترتيب.