EVALUATION OF SOME SOYBEAN VARIETIES TO NATURAL INFESTATION WITH WHITEFLY *BEMISIA TABACI* (GENN.) AND SPIDER MITE *TETRANYCHUS URTICAE* (KOCH.) IN UPPER EGYPT

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Abstract

Six soybean varieties namely, Giza111, Giza35, Giza21, Giza82, Clark and Crawford were tested for infestation with cotton whitefly *Bemisia tabaci* (Genn.) and spider mite *Tetranychus urticae* (Koch.) in Shandweel Research Station, Sohag Governorate during two successive seasons, 1999 and 2000. The seasonal abundance of the whitefly was moderately low during July, then reached its peak during August and the population decreased to the lowest level in September in the two successive seasons. The same trend was noticed for the spider mite. Statistical analysis showed that there were significant differences between the soybean varieties and the infestation with the two pests.

Soybean varieties can be arranged for their susceptibility to infestation with whiteflies as follows; Giza35 and Crawford as susceptible ones, while G.111, G.21, G.82 and Clark were low resistant. In case of the spider mite, however, Giza 21 and Crawford were susceptible, while G.111, G.35, G.82 and Clark were low resistant.

INTRODUCTION

Soybean, *Glycine max* L. is one of the most important leguminous crop allover the world. Its seeds contain high nutritional value containing about 30 – 40 % protein and 15 – 20 % oil and occupied an intermediate position among oil seed crops. Soybean is subjected to attack by some phytophagous pests.

Concerning insects, Azab *et al.* (1970) recorded the two sucking insects; the whitefly *Bemisia tabaci* (Genn.) and *Empoasca decipiens* (Paoli) as chief insects attacking plants in different localities of Egypt. In the same year, Ammar et al. studied the population densities of *E.decipiens* (Paoli) and *Balcutha hortensis* (Lindb.) at Giza. Also, Shaheen (1979) and El-Khouly (1996) investigated the seasonal abundance of certain

sucking insects on soybean plants in Egypt.

Regarding the spider mites infestations, Ratcliffe *et al.* (1960) indicated soybean yield reduction as a result of pest damage, especially spider mites at Maryland. Zaher *et al.*(1980) and Mohammed Abd El-Hafeaz (1981) studied the susceptibility of some soybean varieties to infestation with spider mite *T. urticae* (Koch.) .

The aim of this investigation is to study the seasonal abundance of the two major pests; the whitefly, *B. tabaci* (Genn.) and the spider mite, *T. urticae* (Koch.) on soybean plants at Shandweel Research Station, Sohag , Upper Egypt as well as the degree of susceptibility of six plant varieties.

MATERIALS AND METHODS

The experiment was carried out throughout two successive growing seasons, 1999 and 2000. Soybean seeds were sown on May, 20th. And 23rd. for the 1st. and 2nd. Year , respectively at Shandweel Research Station, Sohag Governorate.

The tested varieties were Giza 111, 35, 21, 82, Clark and Crawford were sown in a complete randomized block design with three replicates. The plot size was $42m^2$. The regular agricultural practices were followed without any chemical control throughout the growing seasons.

To determine the number of whiteflies and spider mites, ten leaves were picked up from each variety, randomly, at weekly intervals, from three plant levels during July, August and September. Leaf samples were sent to the laboratory for counting the immature stages of the whitefly and spider mite individuals.

The soybean varieties were divided into groups according to their sensitivity to infestation with the spider mite or the whitefly according to Chiang and Talekar, (1980). The number of whitefly and spider mite less than X- 2SD were considered to be highly resistant (HR); between X- 1SD to X – 2SD were moderately resistant (MR); between X and X- 1SD were low resistant (LR); between X and X+ 2SD were susceptible (S) and more than X+ 2SD were highly susceptible (HS). On the other hand, statistical analysis were carried out owing to Fisher, (1950).

RESULTS AND DISCUSSIONS

1. Seasonal abundance of whitefly *B. tabaci* (Genn.) on six soybean varieties

Data presented in table 1 show that the numbers of whitefly differed between the varieties, i.e. the varieties G.111, G.35, G.21, G.82 & Crawford received 45,54.15, 46.35, 30.35, 36.1 & 132.3 immature stages per leaf during July, 1999, respectively. However, during August, numbers of insects increased to 96.58, 183.45, 62.33, 159.73, 173.83 & 327.45 per ten leaves, while in September, sharply decreased to 18.03, 19.27, 27.33, 5.0 & 60.53 per ten leaves, respectively.

The same trend was noticed regarding the immature stages on the second season 2000, where in July, numbers were 11.1, 15.9, 9.5, 13.77, 13.8 & 24.33 per ten leaves, respectively, Table 2. In August, immature stages number increased to reach its maximum as 39.9, 66.16, 36.14, 60.86, 62.82 & 112.2 per ten leaves. In September, however, numbers declined to its lowest figures.

Data in Table 5 showed that there is a significant difference between the mean numbers of immature stages of whiteflies in the six soybean varieties during the 1st. growing season, 1999. While in the 2nd. one, there was a significant difference between all the tested varieties except G.82 and Clark. These results are in agreement with those of El-Sayed *et al.*, 1991 who mentioned that bean leaves showed high rates of infestation with whiteflies especially in the summer and winter plantations and also added that July and August received higher infestation rates for the early summer plantations. The same results were obtained by Shaheen, 1979 who recorded heavy infestation with *B. tabaci* on soybean plants during April – July and could retard the plant growth during Autumn plantations. Also, Abd El-Hamied, 2000 stated that cotton whitefly was more abundant in Beni-Suef followed by Fayoum and Menoufia Governorates.

Heather, 2000 stated that there were some plant factors that cause the plants to be not preferred by whiteflies. Smooth-leafed cotton and soybean varieties were less favoured by the *Bemisia* females for oviposition. On the other hand, the hairy leafed ones and that glossy (less waxy) crucifers, such as Broccoli and Collard were less

acceptable for oviposition than varieties with a normal wax layer.

The soybean varieties can be, however, divided into two groups, Table 6 regarding sensitivity according to Chaing and Talekar, 1980 that G.35 and Crawford were susceptible (S) to whitefly infestation, while G.111, G.21, G.82 and Clark varieties were low resistant (LR) to the whiteflies.

2. Seasonal abundance of *Tetranychus urticae* (Koch.) on six soybean varieties

Data in Table 3 exhibit that the *T. urticae* numbers appeared during the 3rd. week of July, 1999 and continued till September, 15th. . The mean numbers of *T. urticae* per leaf of soybean varieties G.111, G.21, G.82, Clark and Crawford were 18.2, 12.0, 9.5, 5.0 and 65 individuals / 10 leaves in July. The population was highly increased in August with monthly average of 1442.9, 1568.9, 2207.9, 1199.2, 1281.5 and 610.3 on the aforementioned varieties, respectively. The numbers of *T. urticae* disappeared completely on all varieties, except for Crawford in July (12.7) individuals / 10 leaves in September 15th. . The mean numbers in September, however, were 8.1, 26.9, 4.9, 7.0 & 28.8 individuals / 10 leaves, respectively.

During the second season, 2000, average numbers of *T. urticae* on soybean varieties G.111, G.35, G.21, G.82, Clark and Crawford during July were 21.9, 11.7, 15.0, 9.3, 6.3 and 79.7 individuals / 10 leaves. On the other hand, the peak of the population was recorded in August and averaging 1491.1, 1720.8, 1837.0. 4846.1, 1326.6 and 674.4 individuals / 10 leaves. The numbers then decreased sharply to 10.0, 0.0, 23.2, 0.0, 0.0 and 29.7 individuals / 10 leaves.

Statistical analysis showed that there was a significant difference between all the soybean tested varieties during the two growing seasons, Table 5.

These results are, however, in agreement with those of Zaher et al., 1980 who had first found that Clark variety was highly susceptible to *T. urticae* , also with Ratcliffe *et al.*, 1960 where they observed that the spider mites occurred in mid August.

The results are in partial agreement with Melton and Connell, 1965 where they found that soybean plants were infested with *Tetranychus atlanticus* lately in June. Our

findings are in quite proportional with those of Hoda and Doss, 1984 who tested eight varieties of soybean to the spider mite *Tetranychus cucurbitacerum* and showed significant differences in susceptibility and Clark and Crawford varieties were the most heavily infested varieties.

Chris Difonzo, 1998 found that the drier areas in the field were more susceptible to *T. urticae* infestation and damage, being capable for increasing in numbers to the point that affecting yield components especially under dry conditions and on sandy soil types where water stress is an issue.

Two groups of sensitivity of soybean varieties regarding infestation with spider mites in this experiment according to Chaing and Talker, are as follows: G.21 and Crawford were susceptible (S) while G.111, G.35, G.82 and Clark were low resistant (LR) to spider mite infestation, Table 6.

Table 1. Seasonal abundance of *Bemisia tabaci* on six soybean varieties during 1999 season in Upper Egypt

Inspection date		No. / 10 leaves of the varieties					
		G.111	G.35	G.21	G.82	Clark	Crawford
July	22	74	86.3	25.7	26.7	56.2	98.3
	29	16	22	67	34	16	34
Mean		45	54.15	46.35	30.35	36.1	132.3
August	3	59.3	119.3	65.3	140.3	128.3	146.3
	10	163	146	128	214	367	600.5
	17	84	310	42	192.6	120	339
	25	80	158	14	92	80	224
Mean		96.58	183.45	62.33	159.73	173.83	327.45
September	1	15	57	82	15	0	123
	8	23.3	0	6	0	0	41
	15	15.8	0	0	0	0	17.6
Mean		18.03	19	27.33	5	0	60.53

Table 2. Seasonal abundance of *Bemisia tabaci* on six soybean varieties during 2000 season in Upper Egypt

Inspection date		No. / 10 leaves of the varieties					
		G.111	G.35	G.21	G.82	Clark	Crawford
July	13	7.4	10.8	0	9.4	11.1	11
	20	22.6	28.9	7.2	14.9	20.3	53
	27	3.3	8	21.3	17	10	9
Mean		11.1	15.9	9.5	13.77	13.8	24.33
August	3	18.8	57.8	22.8	68.2	63.9	81.1
	10	114	70.5	58.9	87.5	170.5	204.9
	17	38.1	108	14	110.5	53.7	162
	24	24.6	77.5	5	32	26	107
	31	4	17	80	6.1	0	6
Mean		39.9	66.16	36.14	60.86	62.82	112.2
September	7	7	0	10.6	0	0	12
	14	0	0	0	0	0	9.6
Mean		3.5	0	5.3	0	0	10.8

Table 3. Seasonal abundance of *Tetranychus urticae* on six soybean varieties during 1999 season in Upper Egypt

Inspection date		No. / 10 leaves of the varieties					
		G.111	G.35	G.21	G.82	Clark	Crawford
July	22	23.3	0	11	0	0	0
	29	13.5	17.3	13	19	10	130
Mean		18.2	8.7	12	9.5	5	65
August	3	47.3	71.3	55.7	74.3	131.3	173.3
	10	117.1	396.2	836	3009	3828.7	939
	17	4245.1	4732	7014	14559.3	1110	1117
	25	308	1076	926	254	56	212
Mean		1442.9	1568.9	2207.9	1199.2	1281.5	610.3
September	1	16.3	0	45	14.7	21	51
	8	8	0	35.6	0	0	22.7
	15	0	0	0	0	0	12.7
Mean		8.1	0	26.9	4.9	7	28.8

Table 4. Seasonal abundance of *Tetranychus urticae* on six soybean varieties during 2000 season in Upper Egypt

Inspection date		No. / 10 leaves of the varieties					
		G.111	G.35	G.21	G.82	Clark	Crawford
July	13	11.3	0	3	0	0	0
	20	32.3	8.7	20	0	0	0
	27	22	26.3	22	28	19	239
Mean		21.9	11.7	15	9.3	6.3	79.7
August	3	59.3	83.3	67.7	86.3	243.3	282
	10	1038	458.7	900	3762.7	4558	929.3
	17	5910	5974	7084.3	19995.6	1730.6	1773.5
	24	420	2088	1076	359.3	68	324
	31	28.3	0	57	26.7	33	63
Mean		1491.1	1720.8	1837	4846.1	1326.6	674.4
September	7	20	0	46.3	0	0	34.7
	14	0	0	0	0	0	24.7
Mean		10	0	23.2	0	0	29.7

Table 5. Mean number of whitefly, *Bemisia tabaci* and spider mite, *Tetranychus urticae* on different soybean varieties during two successive seasons

Varieties	*B. tabaci*		*T. urtica*	
	1999	2000	1999	2000
G. 111	28.1b	79.9b	648.0d	837.9d
G.35	99.9e	126.2d	699.2e	959.9e
G. 21	47.4a	73.3a	992.9f	1030.7f
G. 82	79.4c	115.2c	536.7b	695.4b
Clark	85.3d	118.5c	573.0c	739.1c
Crawford	180.4f	218.5e	295.3a	4078a
L. S. D.	1.91	3.35	7.8	4.4

Table 6. Sensitivity of soybean varieties to infestation with white fly, *Bemisia tabaci* and red spider mite, *Tetranychus urticae* through two successive seasons

Varieties	*B. tabaci*	Sensitivity	*T. urtica*	Sensitivity
G. 111	69	LR	742.95	LR
G.35	113.05	S	829.55	LR
G. 21	60.35	LR	1011.8	S
G. 82	97.3	LR	616.05	LR
Clark	101.9	LR	656.05	LR
Crawford	199.45	S	2186.65	S
	X=106.84 SD= 49.65		X=1007.18 SD=594.78	

S= susceptible

LR= low resistant

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تقييم بعض أصناف فول الصويا للإصابة بالذبابة البيضاء *Bemisia tabaci* (Genn.) والعنكبوت الأحمر *Tetranychus urticae* Koch. فى مصر العليا

فرغل أحمد على سلمان وعبد الواحد محمد محمد أحمد
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معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقى – الجيزة .

تم دراسة الإصابة الطبيعية فى الحقل بآفتى الذبابة البيضاء والعنكبوت الأحمر فى محطة البحوث الزراعية بجزيرة شندويل محافظة سوهاج خلال موسمين متتاليين ١٩٩٩-٢٠٠٠ وكانت الأصناف موضوع الدراسة هى جيزة ١١١ وجيزة ٣٥ وجيزة ٢١ وجيزة ٨٢ وكلارك وكراوفورد ولقد أظهرت الدراسة أن الذبابة البيضاء كان تعدادها متوسط خلال شهر يوليو وتصل إلى أقصى تعداد لها خلال شهر أغسطس وأقلها خلال شهر سبتمبر فى كلا الموسمين .

كذلك كان الإتجاه نفسه مع العنكبوت الأحمر خلال الموسمين. ولقد أظهر التحليل الإحصائى أن هناك فروقا معنوية بين أصناف فول الصويا فى الإصابة بالذبابة البيضاء وكذلك العنكبوت الأحمر وكان ترتيب الأصناف من حيث حساسيتها للإصابة بالذبابة البيضاء كالتالى :

جيزة ٣٥ وكراوفورد حساسين للإصابة، بينما كان باقى الأصناف جيزة ١١١ وجيزة ٢١ وجيزة ٨٢ وكلارك منخفض المقاومة، أما بخصوص العنكبوت الأحمر فكان الصنفان جيزة ٢١ وكراوفورد حساسين للإصابة، بينما باقى الأصناف جيزة ١١١ وجيزة ٣٥ وجيزة ٨٢ وكلارك منخفضة المقاومة.