SUSCEPTIBILITY OF THREE SOYBEAN VARIETIES TO INFESTATION BY CERTAIN SUCKING INSECTS UNDER FIELD CONDITIONS OF KAFR EL SHEIKH GOVERNORATE EGYPT

EL-KHOULY A.S.[1], R.M. SALEM[2], M.M. METWALLY[1], H.A. HELAL[1] AND A.B. EL-MEZAIEN[2]

1 Faculty of Agriculture, Al-Azhar University, Cairo, Egypt.

2 Plant Protection Research Institute, Agricultural Research Centre, Dokki, Egypt.

(Manuscript received 31 March, 1997)

Abstract

Three varieties of soybean namely, Cutter, Crawford and Clark were tested for infestation by certain sucking insects; *Aphis* spp, *Empoasca* spp., *Thrips tabaci* (L.) and *Bemisia tabaci* (Genn.) in an attempt to seek for less susceptible varieties to these insect pests. Also, the effect of some climatic factors (temperature, relative humidity and wind velocity) on these insects was determined. The study was carried out at Sakha Agric. Res. Station Farm during 1993 season. The results indicated that the three tested varieties received high populations of aphids, low ones of thrips and relatively moderate numbers of jassids and whiteflies. Variety Clark harboured, significantly, the highest number of the considered insects, while Crawford received the lowest number. The three climatic factors correlated insignificantly with *T.tabaci*, but positively with temperature and negatively with relative humidity and wind velocity in all tested varieties. Temperature, relative humidity and wind velocity jointly affected, by 0.4913, 0.4852 and 0.4265 of variability, thrips populations on Crawford, Cutter and Clark, respectively. Total of *Aphis* spp., *Empoasca* spp. and *B.tabaci* correlated insignificantly and negative with the three climatic factors. Temperature, relative humidity and wind velocity collectively influenced by 0.8264, 0.8140 and 0.8235 of variability, the total populations of these insects on Crawford, Cutter and Clark, respectively.

Thus, Crawford variety could be recommended to be cultivated at Kafr El-Sheikh Governorate since it was relatively less susceptible to the sucking insects infestation as an agricultural method in the integrat-

INTRODUCTION

Recently, soybean, *Glycine max* (L.) has become the most important leguminous crop in Egypt as a source of protein and fat, in addition to several vitamins and some essential elements. In the field, soybean is subjected to attack by different injurious insect pests, among which are the sucking insects; *T.tabaci, Empoasca* spp., *B.tabaci* and aphids (El-Kifl *et al.*, 1974; Hamed, 1977; Shaheen, 1977; Awadalla *et*

al., 1991). These sucking insects cause serious injury to the plants by sucking plant juices, secrete honeydew on which a sooty mold grows or by acting as vectors of several important soybean viruses (Goodman and Nene, 1976; Ross, 1977; Granada, 1979). The insecticidal control of these insects causes environmental pollution, serious harmful side effects to human, domestic animals, the natural enemies and resistance of pests to many pesticides. Thus, there is a tendency toward insect pest management to emphasize the alternative non-chemical methods of control (Dent, 1991).

The present study aims to : 1. evaluate the susceptibility of three soybean varieties to infestation by the above mentioned sucking insects, 2. investigate the effect of temperature, relative humidity and wind velocity on these insects in the field.

MATERIALS AND METHODS

The present experiment was conducted during 1993 season at the Experimental Farm of Sakha Agric. Res. Station. The experimental area was divided into plots, each of 42 m2. The varieties involved in this study were Cutter, Crawford and Clark. The three varieties were planted in mid-May, 1993 in complete randomized blocks with four replicates for each variety. The regular agricultural practices were followed without any insecticidal treatments throughout the growing season of soybean.

To monitor the population of aphids, weekly samples of ten plants of each variety from each replicate were taken at random and the total number of aphids (nymphs and adults) was counted and recorded. For assessment of the population of *B.tabaci* (nymph), *T.tabaci* and *Empoasca* spp. (all forms), ten leaves were weekly picked up from each replicate at random from the three leavels of the plant and the numbers of each insect species were counted on the whole leaves. To reveal significance between the mean number of each insect on the three tested varieties, Duncan's multiple range test (1955) at 5% level was used. Daily mean temperature, relative humidity and wind velocity during the inspection period were obtained from the Meteorological Department at Sakha Research Station. Daily means of these climatic factors during the preceding week of sampling date was used to calculate the determination coefficient (R2) according to Fisher (1950) for these insects at different climatic factors.

RESULTS AND DISCUSSION

1. Susceptibility of three soybean varieties to infestation by sucking insects

Data presented in Table 1 show the numbers of sucking insects and their means during the inspection period on the three soybean varieties. Generally, the obtained results indicated that the three varieties harboured high populations of aphids, low ones of thrips, and relatively a moderate numbers of jassids and whiteflies. As for aphids, *Aphis* spp., the initial infestation began to appear on 2nd August with means of 10, 15 and 20 aphids/10 plants for Crawford, Cutter and Clark varieties, respectively. The population increased sharply to reach its peak on 6th September with respective means of 2856, 3064 and 3224. The populations then decreased gradually until the end of the season. Crawford significantly harboured the lowest number of aphids (659.82/10 plants), while Clark harboured the highest one (762.76). Cutter harboured 707.59/10 plants.

Regarding jassids, *Empoasca spp.*, the population appeared one week after whitefly appearance. The population peaked twice, the first occurred on 26th July with means of 40, 48.5 and 61 insects/10 leaves for Crawford, Cutter and Clark, respectively. The population fluctuated to reach the second peak which took place on 30th August with respective means of 101, 118.5 and 135 jassids/10 leaves. Then the population declined gradually till the end of the season. Clark was significantly the highest infested variety with jassids (61.18/10 leaves), while Crawford was the lowestt infested one (40.74/10 leaves). Cutter had 50.43/10 leaves.

The thrips, *T.tabaci*, infestation occurred early in the season on 14th June with means of 32, 38 and 45 insects/10 leaves, then the population increased gradually to reach its peak on 5th July with means of 89, 114 and 135 insects/10 leaves for Crawford, Cutter and Clark, respectively. After that date the population decreased and completely disappeared by 26th July in all tested varieties.

Considering whitefly, *B.tabaci*, the initial infestation started in large numbers; 100, 109 and 102 numphs/10 leaves for Crawford, Cutter and Clark, respectively. The population increased gradually to reach its first peak on 2nd August with respective means of 211, 220 and 234 nymphs/10 leaves. After that date, the population fluctuated forming the second peak by 16th August with means of 191, 203 and 223. Whitefly population decreased gradually on Clark variety till the end of the season, while it reached a third peak of 194 and 202 nymphs/10 leaves (on 30th

Table 1. *Mean numbers of certain sucking insects on three soybean varieties under field conditions at Sakha region, Kafr El-Sheikh Governorate during 1993 season.

Sampling date	*Aphis spp.*			*Empoasca spp*			*Thrips tabaci*			*Bemisia tabaci*		
	Craw-ford	Cutter	Clark	Craw-ford	Cutter	Clark	Craw-ford	Cutter	Clark	Craw-ford	Cutter	Clark
June 7	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	32	38	45	0	0	0
21	0	0	0	0	0	0	59	67.5	73.5	0	0	0
28	0	0	0	0	0	0	87	103	106	0	0	0
Jul. 5	0	0	0	0	0	0	89	114	135	0	0	0
12	0	0	0	0	0	0	71.5	83	86	100	109	102
19	0	0	0	20	21	25	26	35	42	124	127	137
26	0	0	0	40	48.5	61	0	0	0	158.5	159	170
Aug. 2	10	15	20	38.5	43.85	58	0	0	0	211	220	234
9	149	184	222	60	71.5	89	0	0	0	182	191	211
16	224.5	261	295	38	90	93	0	0	0	191	203	223
23	272.5	335	370	95.5	105	130	0	0	0	183	193	210
30	1556	1646	1789	101	118.5	135	0	0	0	194	202	186
Sept. 6	2856	3064	3224	89	98	120.5	0	0	0	120	120	166
13	2651	2867	2999	81.5	97	113	0	0	0	90	103	129
20	1911	1985	2170	69	87	111.5	0	0	0	113.5	126.5	113
27	1587	1672	1878	60	77	104	0	0	0	122	141	100
Total	11217	12029	12967	692.5	857.3	1040	364.5	440	487.5	1789	1894.5	1981
Mean	659.82c	707.59b	762.76a	40.74c	50.43b	61.18a	21.44c	25.91b	28.67a	105.23c	111.44b	116.52a

August) on Crawford and Cutter, respectively. Crawford significantly received the lowest numbers of whitefly nymphs (105.23/10 leaves), while Cutter harboured 111.44/10 leaves. On the other hand, Clark variety was the highest infested one (116.52/10 leaves). Generally, it is of interest that variety Clark harboured significantly the highest numbers of the considered insects, while Crawford received the lowest ones. The obtained results were in agreement with the findings of Hoda and Doss (1984) who found the Clark variety was susceptible to whitefly, while Crawford was harbouring the lowest insect populations. Also, Hamed (1977) and Bachately (1984) found that Clark variety was the most favourable host to *B.tabaci*. Metwally (1989) found that Clark variety received the highest population of *A.craccivora*, while Crawford had a moderate level of infestation.

Metcalf and William (1975) explained the reasons of plant resistance to insects and mentioned that this phenomenon generally attributes to certain morphological and biochemical characteristics of plants which affect the behaviour and/or the metabolism of insects. Robbins and Daugherty (1969) found that glabrous varieties of soybean had both the highest numbers of leafhoppers and highest ovipositional rates, while the dense pubescent varieties had the lowest numbers and lowest incidence of ovipostion.

2. Effect of some climatic factors on the population density of *T.tabaci*

The results in Table 2 indicate that the population of *T.tabaci* infested the three tested soybean varieties in the period from 7th June until 19th July was not affected significantly by temperature, relative humidity and wind velocity. Mean temperature correlated positively and insignificant with thrips while, relative humidity and wind velocity correlated negatively and insignificant with this insect. The three considered factors jointly affected, by 0.4913, 0.4852 and 0.4265 of variability, thrips population on Crawford, Cutter and Clark, respectively.

3. Effect of some climatic factors on the total population densities of *Aphis spp.*, *Empoasca* spp. and *B.tabaci*

Data presented in Table 3 show that the total populations of aphids, jassids and whiteflies infested Crawford, Cutter and Clark varieties in the coincident period starting from 2nd August through 27th September was affected highly significant and negative by wind velocity (B=-2705. 6087, -2848.2910 and -3031.3707) and significantly and negative by temperature (B=-795.8967, -848.5497 and

Table 2. Simple correlation (r), regression coefficient (B) and determination coefficient (R2) between some climatic factors and population density of *T.tabaci*, infesting three soybean varieties during 1993 season.

Varieties	Climatic factors	(r)	(B)	(R2)
Crawford	Mean temperature (°C)	0.5559	-4.8044	0.4913
	Mean relative humidity (%)	-0.4367	-6.5580	
	Mean wind velocity (km/h)	-0.4978	-16.0181	
Cutter	Mean temperature (°C)	0.5459	-7.2231	0.4852
	Mean relative humidity (%)	-0.4279	-7.9794	
	Mean wind velocity (km/h)	-0.4991	-19.8804	
Clark	Mean temperature (°C)	0.5057	-8.7095	0.4265
	Mean relative humidity (%)	-0.4062	-8.4465	
	Mean wind velocity (km/h)	-0.4625	-20.7300	

Table 3. Simple correlation (r), regression coefficient (B) and determination coefficient (R2) between some climatic factors and the total populations of *Aphis spp., Empoasca spp. and B.tabaci* infesting three soybean varieties during 1993 season.

Varieties	Climatic factors	(r)	(B)	(R2)
Crawford	Mean temperature (°C)	-0.0270	-795.8967*	0.8264
	Mean relative humidity (%)	-0.2184	-110.6643*	
	Mean wind velocity (km/h)	-0.5653	-2705.6087**	
Cutter	Mean temperature (°C)	-0.0332	-848.5497*	0.8140
	Mean relative humidity (%)	-0.2129	-115.0125	
	Mean wind velocity (km/h)	-0.5592	-2848.2910**	
Clark	Mean temperature (°C)	-0.0353	-906.6599*	0.8235
	Mean relative humidity (%)	-0.2128	-121.8674	
	Mean wind velocity (km/h)	-0.56620	-3031.3707**	

* = Significant, ** = Highly significant.

906.6599) on Crawford, Cutter and Clark, respectively. On the other hand, relative humidity influenced the total populations of these insects insignificantly and negative on Cutter and Clark varieties (B=-115.0125 and -121.8674) and significantly and negative on Crawford variety (B=-110.6643). Total populations of these sucking insects correlated insignificantly and negative with the three climatic factors. The three climatic factors collectively affected by 0.8264, 0.8140 and 0.8235 of variability, the total populations of aphids, jassids and whiteflies on Crawford, Cutter and Clark, respectively.

From the obtained results, it could be concluded that Clark variety seemed to be the most susceptible to infestation by the mentioned sucking insects while, Crawford looked less susceptible. Also, the climatic factors can play a serious role on population densities of sucking insects. Such results could encourage developing breeding programmes to produce new varieties less susceptible to insect infestation in an attempt to minimize chemical control and pesticide hazards.

REFERENCES

1 . Awadalla, S.S., A.A.S. El-Zanan and R.M. Salem. 1991. Studies on injurious insects infesting soybean plants and the efficiency of certain chemicals against these pests at Kafr El-Sheikh, Egypt. J. Agric. Soc. Mansoura Univ. 16 (2) : 420-429.

2 . Bachatly, M.A. 1984. Ecological and biological studies on soybean pests. M. Sc. Thesis, Fac. of Agric., Zagazig Univ .

3 . Dent, D. 1991. Insect pest management. C.A.B. International., P. 212.

4 . Duncan, D.B. 1955. Multiple range and multiple F tests. Biometrics. 11: 1-42.

5 . El-Kifl, A.H., A.E.A. Wafa, M.A. Assem and A.A. Metwally. 1974. List of insects, mites and pests associated with leguminous crops in Egypt. Bull. Soc. ent. Egypte, 58 : 297-302.

6 . Fisher, R.A. 1950. Statistical methods for research workers. 11-Rev. Ed. Oliver and Boyd, London.

7. Goodman, R.M. and Y.L. Nene. 1976. Virus diseases of soybean. PP. 91-96 in R.M. Goodman, ed. Expanding the use of soybean. Proc. of a Conference for Asia and Oceania. Univ. of Illinois, College of Agriculture, INTSOY Ser. 10. 261 P.

8. Granada, G.A. 1979. Machismo disease of soybean: 1-Symptomatology and transmission. Plant Dis. Rep. 63 : 47-50.

9. Hamed, M.A.A. 1977. Survey of insect on soybean. M.Sc. Thesis, Fac. of Agric. Al-Azhar Univ., Cairo.

10. Hoda, F.M. and S.A. Doss. 1984. Studies on the susceptibility of soybean to major pests infestation. Agric Res. Rev. 62 (1) : 79-85.

11. Metcalf, R.L. and L.H. William. 1975. Introduction to insect pest management. New York, P. 103.

12. Metwally, S.A.G. 1989. Ecological studies on some insect pests infesting certain legume crops in Qualyobia Governorate. Ph. D. Thesis, Fac. of Agric., Cairo Univ.

13. Robbins, J.C. and D.M. Daugherty. 1969. Incidence and oviposition of potato leafhopper on soybeans of different pubescent types. Proc. N. Cent. Br. Entomol. Soc. Amer. 24 : 35-36.

14. Ross, J.P. 1977. Effect of aphid-transmitted soybean mosaic virus on yield of closely related resistant and susceptible soybean lines. Crop Sci. 17 : 869-872.

15. Shaheen, A.H. 1977. Survey of pests attacking soybean plants in Egypt with some ecological notes. Agric. Res. Rev. 55 (1) : 59-65.

مدى قابلية ثلاثة اصناف من فول الصويا للإصابة ببعض الحشرات الثاقبة الماصة تحت الظروف الحقلية بمحافظة كفر الشيخ

عبد المنعم سليمان الخولى١ ، رمضان محمد بهى الدين سالم٢ ، منير محمد متولى١ ، هلال احمد هلال١ ، الأنصارى بلتاجى المزين٢

١ كلية الزراعة – جامعة الازهر – القاهرة .

٢ معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقى .

اختبرت مدى قابلية ثلاثة اصناف من فول الصويا : كتر وكروافورد وكلارك للإصابة بالمن والجاسيد والذبابة البيضاء والتربس كمحاولة للبحث عن اصناف اقل قابلية للإصابة بتلك الحشرات وكذا تحديد تأثير كل من درجات الحرارة والرطوبة النسبية وسرعة الرياح على هذه الحشرات. وقد إجريت هذه الدراسة بمزرعة محطة البحوث الزراعية بسخا – كفر الشيخ فى الموسم الزراعى ١٩٩٣م

أوضحت النتائج ان الثلاثة اصناف المختبرة أصيبت بتعداد عالى للمن وتعداد اقل للتربس وتعداد متوسط للجاسيد والذبابة البيضاء – ولقد أوى الصنف "كلارك" أعلى تعدادا معنويا نتلك الحشرات موضع الدراسة بينما اصيب صنف كراوفورد بأقل تعداد لهذه الحشرات. أوضحت الدراسة أن هناك ارتباط بسيط غير معنوى بين الثلاث عوامل الجوية والتربس، كان هذا الارتباط موجبا مع الحرارة وسالبا مع الرطوبة النسبية وسرعة الرياح. أثرت الثلاث عوامل الجوية مجتمعة بحوالى ٠,٤٩١٣ ، ٠,٤٨٥٢ ، ٠,٤٢٦٥ على تعداد التربس الذى يصيب الصنف كراوفورد والصنف كتر والصنف كلارك على التوالى .

كما أوضحت الدراسة ان هناك ارتباط بسيط سالب وغير معنوى بين الثلاث عوامل الجوية المختبرة ومجموع كل من المن والجاسيد والذبابة البيضاء. أثرت الثلاث عوامل الجوية المختبرة على مجموع كل من المن والجاسيد والذبابة البيضاء بحوالى ٠,٨٢٦٤ ، ٠,٨١٤٠ ، ٠,٨٢٣٥ على الصنف كراوفورد والصنف كتر والصنف كلارك على التوالى.

وتشجع نتائج هذة الدراسة على تطوير برامج لانتاج واكثار اصناف اقل حساسية للاصابة بالافات كوسيلة لتقليل استخدام المبيدات الكيماوية واضرارها.