Al-Azhar J. Agric. Res., Vol. 36
PP., 99-109 (Dec), 2002

POPULATION DYNAMICS AND RELATIVE SUSCEPTIBILITY OF CUCUMBER AND TOMATO VARIETIES TO *BEMISIA TABACI* (GENN.) UNDER GLASSHOUSE CONDITION

Hafez S. F. M.

Plant Protection Department, Fac. Agric. Al-Azhar University.
Nasr City, Cairo, Egypt.

ABSTRACT: The population dynamics and the relative susceptibility to the white fly *Bemisia tabaci* (Genn.) on cucumber and tomato varieties were studied under the glasshouse condition, at faculty of agriculture, Al-Azhar University, for one successive season in 2001-2002 year. Data obtained cleared that *Bemisia tabaci* nymphs showed two peaks on cucumber plants and one peak on tomato plants. Cucumber peaks occurred in 17th of March and 21st of April while tomato peak occurred in 31st of March.

Data also revealed that the cucumber varieties differed in infestation by *Bemisia tabaci*. The variety Sakata harbored higher mean numbers of nymphs followed by Hybrid select and Beta alfa varieties.

Tomato varieties showed a significant difference between each of "Castle rock" and "Broad star" and "Super murmond" varieties in their infestation by the insect pest. Cucumber varieties mounted a higher mean numbers than tomato varieties under glasshouse conditions.

INTRODUCTION

The white fly *Bemisia tabaci* (Genn.) is one of the main pests under glasshouse. In Egypt. Azab et al., (1971) recorded it on at least 172 host plant species belonging to different families.

Some host plants are more suitable for rearing and reproduction of *B. tabaci* than other hosts and higher numbers of the insect pest attract to crops as vegetable marrow, cucumber, eggplant and bean followed by soyabean, cotton, okra and tomato (El-Sayed. 1989), further more, *B. tabaci* establish as a key pest of various winter, spring and summer crops in different governorates in Egypt.

Numerous investigations were achieved to study population dynamics, host range and food preference (Avidov 1956, Azab et al. 1971, El- Helaly et al. 1971, Boxtel et al., 1978, Merendock and Lanteren 1978, Gerling et al. 1980, El-Sayed, 1981 and Salem, 1993).

The host plants under glasshouse are very expensive because of its sensitivity to infestation and a high cost of cultivation, in addition the white fly *B. tabaci* sucking the plant sap and transmitting virus diseases to many crops (Costa, 1976), particularly the vegetable crops under glasshouses conditions. The substantial success of the biological control not realize against the main pests of the greenhouses under climatic conditions of the Mediterranean area (Van lanteren and Woets 1988), and the natural enemies were not effective in these conditions (Vet et al. 1980). A more detail study on this pest under glasshouse conditions is needed. Therefore this paper achieved to clear the susceptibility of certain cucumber and tomato varieties to the white fly *B. tabaci* insects as a new trend to select varieties resistant or tolerant to the pest studying of population dynamics of this pest as well as to obtain the differences within each of cucumber and tomato varieties separately, and between cucumber and tomato varieties.

MATERIAL AND METHODS

The experiment of this investigation was conducted under the research glasshouse of the plant protection department, faculty of agriculture, Al-Azhar University. The glasshouse area was about ($33x8.5x2.5m^3$).The selected varieties of cucumber (*Cucumis sativa L.*) and three another varieties of tomato (*Lycopersicum esculentum L.*) in the end of December by seedlings of each variety from all tested varieties.

The selected varieties of cucumber (*Cucumis sativa L.*) were Sakata, Beta alfa and Hybrid select whereas the tested varieties of tomato were castle rock, Broad star and Super murmond.

Seedlings of each varieties were planted in the end of December. Each was planted in one line, thus, the six cucumber and tomato varieties were planted on 6 lines in the glasshouse area.

Successive samples were taken weekly (after the planting date by six weeks and continued for 16 weeks from the first week of February to the 3rd week of May). Sample of 10 leaves were picked up randomly from each line (variety) and transferred to the laboratory in the same day for inspection. The actual and mean numbers of nymphs/leaf were determined to study the population dynamic of the insect pest.

To study the relative susceptibility of cucumber and tomato varieties to the infestation with *B. tabaci* under glasshouse condition, the mean numbers of nymphs/leaf were statistically analyzed by applying the analysis of variance (ANOVA) and the least significant difference (LSD) at probability level of 0.05.

RESULTS AND DISCUSSON

1- population dynamic of Bemisia tabaci on cucumber and tomato varieties:

Data obtained in (Table 1 & 2) cleared that the infestation of *B. tabaci* on both cucumber and tomato started from the 2nd week of February and continued until the 2nd week of May.

On cucumber, nymphs occurred on leaves in relatively few number during the 2nd week of February (22.3), then fluctuated until reached its first peak of 116.8 insects/leaf during the 3rd week of March. This peak was followed by a decline in population throughout the next 3 weeks, and thereafter an increase in nymphal numbers occurred till forming the second peak of 106.8 insects/leaf in the 3rd week of April. Another decrease in nymphs population was observed throughout the following inspection dates.

Activity curves of cucumber varieties shown in Fig. (1) revealed that *B. tabaci* nymphs had two activity peaks on leaves of Sakata variety which took place during 2nd week of March (65.6/leaf) and 3rd week of April (73.2/leaf), respectively. Also, two nymphal peaks were recorded on Beta alfa variety that determined during the 3rd week of March and the 4th week of April in which the population of nymphs reached 49.6 and 56.6/leaf, respectively.

As for Hybrid select variety, only one peak of nymphs prevalence was determined during the 2nd week of April in which the infestation reached its climax (78.1/leaf).

As shown in Table (2), the occurrence *B. tabaci* nymphs on tomato started also from the 2nd week of February till the 2nd week of May. However, one peak of nymphs prevalence was determined in which the infestation reached its climax in thelast week of March.

Results graphically illustrated in Fig. (2) clearly indicated that nymphs stated to show up on tomato varieties in low numbers, then, the mean numbers of nymphs/leaf increased with some fluctuations towards the only one peak that took place during the last week of March in both Castle rock (20.7) and Super murmond (12.3) varieties whereas this peak was detected during the 2nd week of April in case of Broad star variety (20.5).

2- *Susceptibility of the six cucumber and tomato varieties to infestation with B.tabaci*

It is evident from the results obtained in Table (1&2) that the mean population densities of nymphs/leaf were - in general - higher on cucumber than tomato.

On the other hand, on cucumber varieties, Sakata variety was heavily infested by nymphs (655.4) followed by Hybrid select (285.6) then Beta alfa (273.3). As for tomato varieties, Super murmond showed low infestation (65.4) followed by Broad star (111.7) then Castle rock (155.6).

To obtian reliable information about the relative susceptibility of the six cucumber and tomato varieties, the average number of nymphs were used as indicated in Tables 1&2 which showed that the differences between the mean numbers of *B. tabaci* nymphs/leaf on each cucumber and tomato varieties were significant (F=10.67 for cucumber varieties and 8.77 for tomato varieties).

Thus, the least significant different (LSD) at probability level 0.05 was calculated as shown in the same Tables.

According to LSD 0.05 value in Table 1 (= 2.99), cucumber varieties could be arranged in descending orders as follows: Sakata variety was the most susceptible variety to infestation with *B. tabaci* where it harbored the highest population of nymphs (40.96) followed by both Hybrid select and Beta alfa varieties which considered as on group (the average numbers were 17.85 and 17.08, respectively).

(Table: 1): Weekly mean no. of *Bemisia tabaci* insects / one plant leaf on Cucumber varieties in 2001-2002 tested season.

Varieties	Cucumber varieties			Total	Mean
Date	Sakata	Beta alfa	Hybrid select		
2-2-2002	0	0	0	0	0
9-2-2002	18.7	1.3	2.3	22.3	7.43
17-2-2002	39.6	6.4	1.5	47.5	15.83
24-2-2002	44.1	5.2	1.7	51.0	17.00
3-3-2002	36.7	7.6	4.7	49.0	16.33
10-3-2002	65.6	42.3	4.1	112.0	37.33
17-3-2002	62.0	49.6	5.2	116.8	38.93
24-3-2002	70.5	22.0	11.6	104.1	34.70
31-3-2002	67.2	8.0	26.8	102.0	34.00
7-4-2002	32.3	12.1	29.2	73.6	24.53
14-4-2002	36.5	13.2	78.1	127.8	42.56
21-4-2002	73.2	30.0	57.6	160.8	53.60
28-4-2002	61.2	56.6	36.9	154.7	51.56
4-5-2002	42.2	16.6	22.7	81.5	27.16
11-5-2002	5.6	2.4	3.2	11.2	3.73
18-5-2002	0	0	0	0	0
Total	655.4	273.3	285.6		
Mean	40.96^{a}	17.08^{b}	17.85^{b}		

F value for variety = 10.67 P. = .000
L.S.D. (0.05) = 2.99
Means followed by the same letter in the same row are not significantly different.

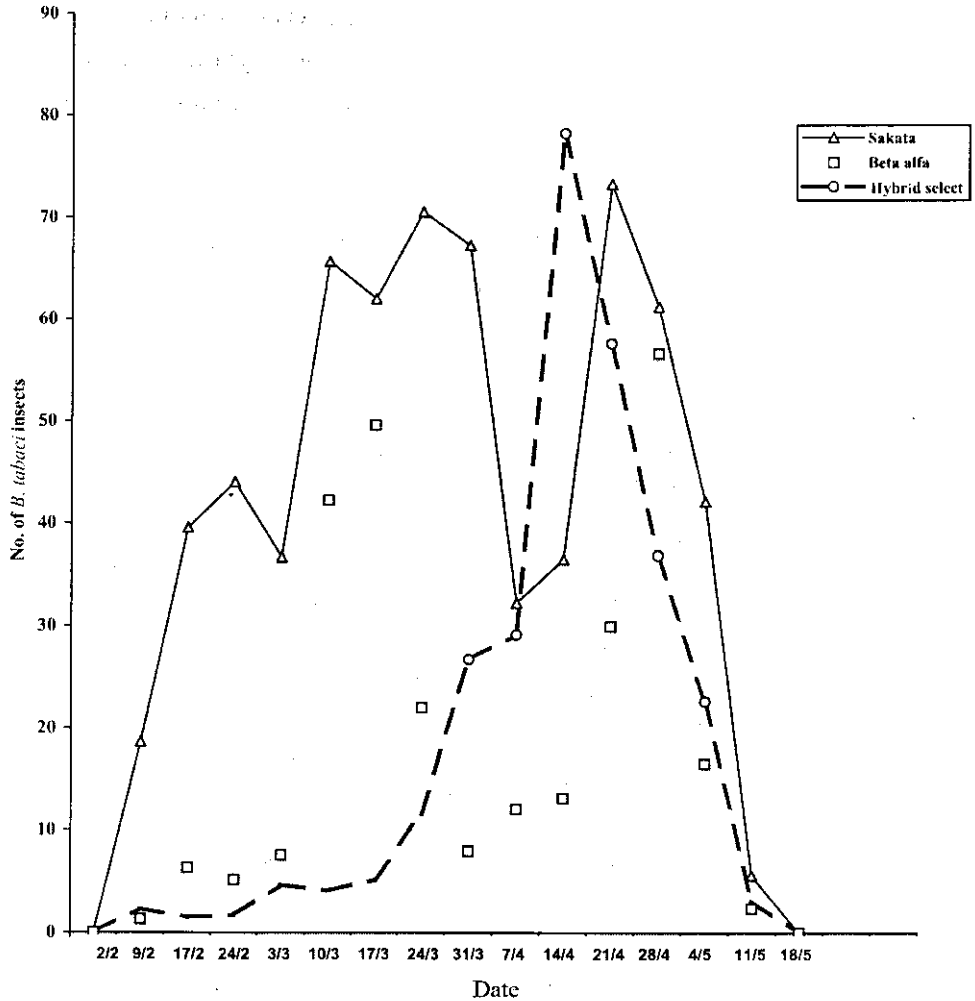

Fig. (1): Weekly mean no. of B. tabaci insects /one plant leaf on Cucumber varieties in 2001-2002 tested season.

(Table: 2): Weekly mean no. of *Bemisia tabaci* insects / one plant leaf on tomato varieties in 2001-2002 tested season.

Varieties	Tomato varieties				
Date	Castle rock	Broad star	Super murmond	Total	Mean
2-2-2002	0	0	0	0	0
9-2-2002	0.3	2.5	0.5	3.3	1.10
17-2-2002	2.5	4.1	10.0	16.6	5.53
24-2-2002	6.9	0.6	0.5	8.0	2.88
3-3-2002	12.0	1.3	2.9	16.2	5.40
10-3-2002	16.0	4.5	3.2	23.7	7.90
17-3-2002	12.8	16.9	8.3	38.0	12.66
24-3-2002	15.2	11.6	5.6	32.4	10.80
31-3-2002	20.7	19.5	12.3	52.5	17.50
7-4-2002	18.3	19.0	10.7	48.0	16.00
14-4-2002	17.6	20.5	4.0	42.1	14.03
21-4-2002	14.2	8.5	3.2	25.9	8.63
28-4-2002	13.2	2.3	3.6	19.1	6.36
4-5-2002	4.7	0.4	0.6	5.7	1.9
11-5-2002	1.2	0	0	1.2	0.4
18-5-2002	0	0	0	0	0
Total	155.6	111.7	65.4		
Mean	9.72 [a]	6.98 [a]	4.08 [b]		

F value for variety = 8.77 P.= .000
L.S.D. (0.05) = 0.68
Means followed by the same letter in the same row are not significantly different.

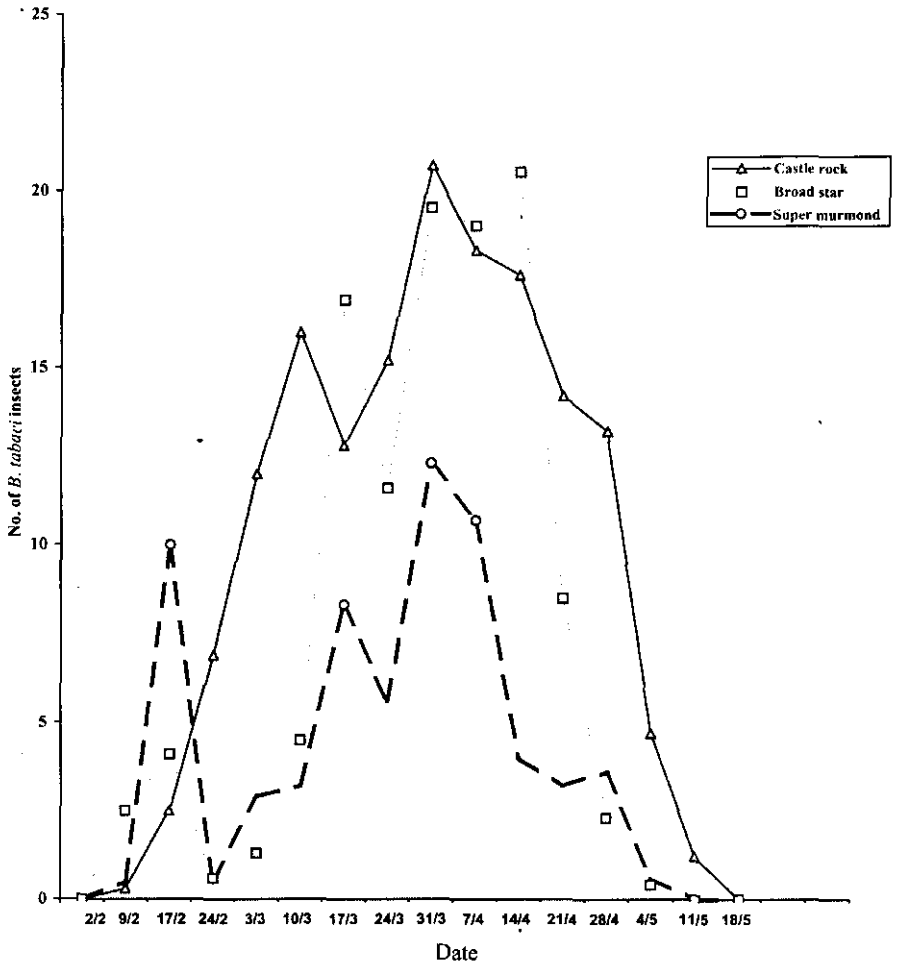

Fig. (2): Weekly mean no. of B. tabaci insects /one plant leaf on tomato varieties in 2001-2002 tested season.

In case of tomato varieties (LSD = 0.68), it could be concluded that among the tested 3 varieties, Super murmond was the least susceptible variety to infestation with this pests (4.08 nymphs/leaf) and is recommended for planting. On the other hand, Castle rock variety was the most susceptible cultivars (9.72 nymphs/leaf). Broad star variety showed an intermediate susceptibility to infestation (6.98).

Boxtel *et al.*, (1978) found a similar sequence for *Trialeurodes vaporariorum* adult deposited 364 eggs/female on eggplant, 158 eggs/female on cucumber, 47 eggs/female on tomato and 23 eggs/female on paprika. Merendok and Lanteren (1978) indicated that eggplant was the best for *Trialeurodes vaporariorum* followed by cucumber, tomato then paprika.

REFERENCES

Avidov, Z. (1956): Bionomics of the tobacco white fly, *Bemisia tabaci* (Genn.) in Israel. Katvim 7 (1) : 25-41. (c.F.R.A.E., A 46 : 418-419).

Azab, A. K., M. M. Megahed and H. D. El-Mirsawy (1971): on the biology of *Bemisia tabaci* (Genn.) (Hemiptera-Homoptera : Aleyrodidae). Bull. Ent. Egypt, 55: 305-315.

Boxtel, W. Van, J. Woets and J. Van Lanteren (1978): Determination of host plant quality of eggplant (*Solanum melongena* L.). cucumber (*Cucumis sativas* L.), tomato (*Lycopersicum esculentum* L.) for the greenhouse white fly *Trialeurodes vaporaiorum* (Westwood). (Homoptera: Aleyrodidae). Proc. Int. Symp. On crop protection, Med. Fac. Land. Gent., 43 : 397-408.

Costa, A. S. (1976): White flies transmitted plant diseases. Ann. Rev. Phytopathology, 14 : 429-449.

El-Helaly, M. S., A. Y. El-Shazli and F. H. Gayar (1971): Biological studies on *Bemisia tabaci* (Genn.) (Homoptera : Aleyrodidae) in Egypt. Z. Ang. Ent., 69 : 48-55.

El-Sayed, A. M. (1981): Ecological and Control studies on the white fly *Bemisia tabaci* (Genn.) and its natural enemies in Egypt. Ph.D. Thesis, Fac. Agric., Moshtohor, Zagazig Univ.

El-Sayed, A. M. (1989): Influence of host plant on some biological aspects of *Bemisia tabaci* (Genn.) (Homoptera: Aleyrodidae). Proc. 1st. Int. Conf. Econ. Ent. Vol. I, (241).

Gerling, D., U. Motro and R. Horowitz (1980): Dynamic of Bemisia tabaci (Genn.) attacking cotton in the coastal plain of Israel. Bull. Ent. Res., 70: 213-219.

Merendok, S. Van der and J. C. Van Lanteren (1978): Determination of mortality of greenhouse white fly, (*Trialeurodes vaporaiorum* west.) (Homoptera: Aleyrodidae) eggs, larvae and pupae on four host plant species; eggplant (*Solanum melongena* L.), cucumber (*Cucumis sativas* L.), tomato (*Lycopersicum annum* L.) and paprika (*Capsicum annum* L.) Proc. Int. Symp. on crop protection, Med. Fac. Land. Rijksuniv. Gent., 43 (2) : 421-429.

Salem, M. (1993): Distribution pattern of infestation and control of whitefly *Bemisia tabaci* (Genn.) . on cucumber plants in the greenhouses Ann. Of Agric. Sciense, 38 (2) : 783-792.

Van Lanteren, J. C. and J. Woets (1988): Biological and integrated pest control in greenhouse, Ann. Rev. Entomol. 33 : 239-269.

Vet, L. E. M.; J. C. Van Lanteren and J. Woets (1980): The parasite host relation between *Encarsia formosa* (Hymenoptera: Aphelinidae) and *Trialeurodes vaporariorum* (Homoptera : Aleyrodidae). IX. A review of the biological control of the greenhouse white fly with suggestion for future research. Z. Angew, Entomol. 90: 26-51.

Al -Azhar J. Agric. Res., Vol. 36, 99 - 109 (December), 2002

دراسة تذبذب المجموع وحساسية بعض أصناف الخيار والطماطم لحشرة *Bemisia tabaci* تحت ظروف الصوبة

شريف حافظ

قسم وقاية النبات _ كلية الزراعة _ جامعة الأزهر

تم دراسة تذبذب التعداد وحساسية بعض أصناف الخيار والطماطم لذبابة القطن البيضاء تحت ظروف الصوبة ، في كلية الزراعة – جامعة الأزهر. لمدة موسم واحد (٢٠٠١-٢٠٠٢) . من النتائج المتحصل عليها وجد أن الذبابة البيضاء لها قمتي منحنى على محصول الخيار في كل من السابع عشر من مارس والواحد والعشرين من أبريل على التوالي وقمة منحنى واحدة على الطماطم في الواحد والثلاثين من مارس .

ولقد أوضحت النتائج أن أصناف الخيار اختلفت معنويا في إصابتها بالآفة ، وكان الصنف "ساكاتا" مصاباً بمتوسط من الحشرات أعلى من الصنفين اللاحقين له وهما "هيبردسلكت" و "بيتا ألفا".

من ناحية أخرى ، فلقد أظهرت النتائج وجود اختلافات معنوية بين أصناف الطماطم "كاسل روك" و "برودستار" و "سوبر مورموند" ، أظهرت النتائج أيضاً أن أصناف الخيار قد تعرضت للإصابة بشدة عن أصناف الطماطم تحت ظروف الصوبة.