

Susceptibility of some Cucumber Plant Varieties to the Infestation by Certain Piercing Sucking Insects

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Abstract

These experiments were carried out at Menya AL- Qamh district, Sharkia governorate, during two growing seasons of 2016 and 2017 cucumber, *Cucumis sativus* plants. Varieties Sahim - El-prince and Beit alpha were planted to study their infestation with some pests aphid, leafhopper, mite, whitefly and thrips and the relationship between some chemical contents (Lipids , carbohydrate, protein and pH values) of the varieties and their infestation by *Aphis gossypii* (Glov.), *Empoasca decipiens* (Paoli) *Empoascya decedens* (Paoli), *Bemesia tabaci* (Genn.), *Tetranychus cucurbitacearum* (Sayeg), and *Thrips tabaci* (Lind). The obtained results showed that the susceptibility of cucumber varieties to pest infestation could be arranged descendingly according to the number of pests as follows: Beit alpha, El -prince and Sahim. Chemical analysis results indicated the increase in protein and carbohydrate contents caused on increased the mean number of some pests infested these varieties cucumber, while studied those increase of pH values led to decrease the mean number of pests and their rate of infestation.

Key words: Cucumber, varieties, pest infestation, chemical analysis .

Introduction

Aphids, leafhoppers, thrips, whitefly and mite are considered serious pests infesting cucumber plants. The plants are infested by the aforementioned pests which affect the yield as results of their direct feeding on plants. Several investigators recorded the role of homopterous insect species in transmitting the pathogens of plants diseases (El Gindy, 2002) and Al-Habshy, Aml (2018). who studied the life table data of *Aphis gossypii* on two cucumber varieties(c.v). developmental time of *A. gossypii* on Aramon cultivar was approximately 20% longer at all temperatures. Mortality of immature stage did not differ between two varieties. The intrinsic rate of increase on CV. Aramon was 15% smaller than CV. Sporu (Steenis and El – Khawass, 1995). Dawood 1999 estimated the average number of *B. tabaci* adults and immature stages on three cucumber varieties under field conditions of Beni-Sweif governorate, Egypt. For cucumber varieties, Sliberti hybrid was the least susceptible. Hafiz, 2002 indicated that *A. gossypii* had faster nymphal development on Tamra 761 variety, Rawa Fl-Rs and Fl- hybrid Beit alpha MR compared with Beit alpha MR, Beth alpha MR Fl-hybrid, Beth alpha MR and Hezara 480 varieties. The infestation of seven cucumber varieties by *T thapci* (nymph and adults) was as follows, the highest infestation rate was occurred on Ivor variety followed by Prince variety. When the lowest infestation occurred on Babylon and Al- Zaeim variety .Highest seasonal mean count of aphids was detected on leaves of El-Nems variety. While the lowest rates of infestation by aphids occurred on Thamin and Ivor. Super-Delila, Thamin and Prince varieties recorded higher infestation levels by

B. tabaci different stages. The highest infestation rate of *T. urticae* was occurred on Thamin and Prince Hanafy, 2004. Also, the same author reported that aphids increased by delaying the planting date on cucumber plants. Abd-ElSamed et al., (2018) investigated the susceptibility of different solanaceous plant varieties , egg plant, pepper, tomato to the infestation by certain piercing sucking pests.

The present study aimed to investigate susceptibility cucumber plants infestation with aphid, leafhopper, thrips, whitefly and mites during years 2016 and 2017 and the relationship between these pests aphid, leafhopper, thrips, whitefly and mites and chemical analyses

Materials and Methods

An area about 2100 m² was chosen to carry out this investigation at Menya Al-qamh district, Sharkia governorate, the experimental design was completed randomized plot with three replicates. Treatment was distributed as replicate each plot consisted four rows (4 meters long and 14 meters wide). Each replicate was divided into 18 lines; the space between hols were 25 - 30 cm. Planting date of the tested cucumber plants were during the first week of April , in 2016 and 2017 seasons, sampling were started when the age of the plants reached about 21-28 days and continued weekly intervals until 1st week of May. The normal agricultural practices were followed in due time and all plots were kept free of any insecticide treatment. The varieties of the three cucumber plants were (Beit alpha, El-prince and Sahim),

Plant samples

15 leaves per replicate representing different upper, middle and bottom parts were picked out randomly from each variety. These leaves were examined in the laboratory at the same day using a binocular microscope and the total number of existing of aphid, whitefly, Thrips and mite pests on both surfaces of the leaves were recorded.

Sweep net

30 cm diameter and 60 cm deep. Each sample consisted of 100 double strokes were taken from both diagonal directions of the experimental area. Each sample was kept in a tight closed paper bag and transferred to the laboratory for inspection by binocular microscope at the same day and the collected leafhoppers were killed by using killing jar cyanide, sorted into species and identified according to the work of **Hegab *et al.* (1989)**. Counts of captured leafhoppers were recorded for each sample.

Determination of total protein, carbohydrates contents and PH values. Samples were taken at random from each variety when there were peaks of pests and oven dried at 60°C till constant weight. The dried leaves cucumber varieties were finally ground and digested with a mixture of perchloric acid and nitric acid (2:1).

Determination of some chemical contents:

To determine total protein, carbohydrate contents and pH values, leaf samples were taken at random from each variety when there were peaks of pests and oven dried at 60°C until the constant weight. The dried leaves cucumber were finally ground and digested with a mixture of perchloric acid and nitric acid (2:1). Chemical analysis of the used cucumber varieties were carried out in central laboratory, Faculty of Agriculture, Benha University to determine the total lipids, carbohydrate contents, protein, and pH value

Determination of protein content

Total nitrogen in cucumber plants was estimated according to **Bremner and Mulvaney (1982)**. The crude protein content was obtained by multiplying the nitrogen content by the factor 6.25.

Determination of carbohydrate content

The total carbohydrates content in cucumber plants were determined calorimetrically using the anthrone reagent and the color intensity was measured at 240 mμ following the method described by **Dubois *et al.*, (1956)**.

Determination of pH value

PH value was estimated in the plant sap using pH meters.

Statistical Analysis

The chemical constituents of cucumber varieties at the infestation density of the aforementioned homopterous insects were statistically analyzed **Costat (2005)** The means were compared according to Duncan's multiple range test **Snedecor and Cochran (1981)**.

Results and Discussion

1- Susceptibility of different cucumber varieties on population density by certain piercing sucking pests infesting cucumber:

A) *Aphis gossypii*

As shown in Table (1) the differences between mean numbers of aphid on cucumber varieties during the two seasons were obviously high significant. The most susceptible variety was Beit alpha (2379.00 and 3113.33 insect/ plant sample) in the two seasons 2016-2017, respectively, while the least susceptible variety was Sahim that recorded total numbers of 323 and 834 insects/plant sample in 2016 and 2017 seasons, respectively.

B) *Empoasca decipiens*

As shown in Table (1) the differences between the mean numbers of *E. decipiens* on cucumber varieties during the two seasons proved to be statistical significant. The most susceptible variety was Beita alpha (350 and 380) insects/ sweep net in both seasons, respectively, while the least susceptible variety was Sahim which 301.33 and 260 recorded insects/sweep net in the net in both seasons, respectively.

C) *Empoasca decedens*

As shown in Table (1) the incidence of total number of the leafhopper *E. decedens* on cucumber varieties were greatly varied during the two seasons . The most susceptible variety was Beita alpha indicated (239 and 290) insects / sweep net) for *E. decedens* in both seasons , respectively. While the least susceptible variety was Sahim which 197and 164 recorded insects / sweep net in both seasons , respectively .

D) *Bemisia tabaci*

Data given in Table (1) showed that the differences between mean numbers of whitefly *B. tabaci* (immatures and adults) infested cucumber plant varieties during the two seasons. Sahim variety was the least susceptible host plant for immatures infestation showing 625 and 995 immatures / plant sample, while the variety Beit alpha appeared to be the most susceptible cucumber variety (2368 and 1227 immatures /sample) during the two seasons, respectively. The most susceptible variety was Beit-alpha 1359.33 and 814 adults /plant in both seasons,

respectively, while the least susceptible variety was Sahim recorded (508 and 786 adults / sample) for adults in both seasons, respectively.

E) *Tetranychus cucurbitacearum*

As shown in Table (1) the differences between mean numbers of mite infested cucumber plant varieties during the two seasons were obviously differed. The most susceptible variety was Beit alpha which 3283 and 3220 egg / sample recorded in the two seasons, respectively, while the least susceptible variety was Sahim that recorded mean numbers of 921 and 1233 egg /sample for eggs in 2016 and 2017 seasons, respectively, while the most susceptible variety was Beit alpha which 2266 and 2207 adult / sample recorded in the two seasons, respectively, while the least susceptible variety was Sahim that recorded mean numbers of 701 and 636 adult/ sample for adult in 2016 and 2017 seasons, respectively

F) *Thrips tabaci*

Data given in Table (1) showed the differences between mean numbers of *T. tabaci* infested cucumber plant varieties during the two seasons. Sahim variety was the least susceptible host plant for *T. tabaci* infestation showing 1320 and 1258 insects / sample. While the variety Beit alpha appeared to be the most susceptible cucumber variety (2082 and 2815) insects during the two seasons, respectively.

Generally, from the obtained results, Beit alpha variety was more susceptible to aphid, whitefly and leafhopper pests infestation, whereas Sahim variety was the least susceptible cultivar.

2- The influence of cucumber varieties on the yield

With respect to the influence of cucumber varieties on the yield, data presented in Table (1) showed that Sahim variety was the highest yield with 78.75 and 88.6 kg/plot in the two seasons, respectively. While, Beit alpha variety was the lowest yield with 44.87 and 51.56 kg/plot in the two seasons, respectively.

Hafiz (2002) indicated that *A. gossypii* had faster nymphal development on Tamra 761 variety, Rawa Fl-Rs and Fl- hybrid Beit alpha MR compared with Beit alpha MR, Beth alph MR Fl-hybrid, Beth alpha MR and Hezara 480 varieties. **Hanafy (2004)**

mentioned that, the infestation of the pests of seven cucumber varieties the highest infestation rate of *T. tabaci* was occurred on Ivor varieties. While the lowest rates of infestation by aphids occurred on Thamin and Ivor. The highest infestation rate of *T. urticae* was occurred on Thamin and Prince. Also, reported aphids increased by delaying the planting date on cucumber plants.

3) Relation between some chemical contents of cucumber varieties and population density of certain piercing sucking pests

Data given in Table (2) showed the effects of different chemical contents of cucumber varieties on the infestation by aphid, leafhopper, mite, whitefly and thrips during 2017 season.

Beita alpha variety recorded the mean numbers of *A. gossypii*, *E. decipiens*, *E. decedens*, *B. tabaci* (immatures), *B. tabaci* (adults), *T. cucurbitacearum* (egg), *T. cucurbitacearum* (adult) and *T. tabaci* of 3113.33, 380,290, 1227, 814, 3202, 2207 and 2815 pests/sample in years of 2017, respectively. Also, 5.02 total lipids, 17.7 % carbohydrate contents, 20.07 μ /m total protein and 3.65 pH on the other hand. Sahim variety recorded the mean numbers of *A. gossypii*, *E. decipiens*, *E. decedens*, *B. tabaci* (immatures), *B. tabaci* (adults), *T. cucurbitacearum* (egg), *T. cucurbitacearum* (adult) and *T. tabaci* of 834, 260, 164, 995, 786, 1233, 636 and 1258 pests/sample, respectively with 4.19 total lipids, 15.68 % carbohydrate contents, 17.11 μ /m total protein and 5.81 pH, during 2017 season.

Generally, from the obtained results indicated that the increasing of cucumber total protein and carbohydrate contents led to the increase of the mean number of pests infestation. But the increase in pH value, led to decrease the mean number of insects and mites on cucumber. Sahim varieties was the least susceptible to pests infestation and gave the highest yield **El – Gindy (2002); Hashem (2005) Youssef (2006); Al-Habshy et al., (2011); Hegab et al., (2014); Amer (2016) and Abd-Elsamed, et al.,(2018)** pointed out that the chemical constituents of some graminaceous, leguminous, solanaceous, cucurbitaceous and broad bean plants varieties were effective on the population density of aphid, leafhopper, thrips, whitefly and mites.

Table 1. Susceptibility of cucumber varieties to aphid, leafhopper, whitefly, thrips, and mite pests infestation during 2016 and 2017 seasons at Menya Elkamh, Sharkia governorate

Varieties	Aphid		leafhopper				<i>B. tabaci</i>				<i>T. cucurbitacearum</i>				<i>Thrips tabaci</i>		Yield kg/plot	
	<i>A. gossypii</i>		<i>E. decipiens</i>		<i>E. decedens</i>		Immature stages		Adult stages		egg		adult					
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
Beit alpha	2379 ^a	3113.33 ^a	350 ^a	380 ^a	239.0 ^a	290.0 ^a	2368.0 ^a	1227.0 ^a	1359.33 ^a	814.0 ^a	3283 ^a	3220 ^a	2266.0 ^a	2207 ^a	2082 ^a	2815 ^a	44.87	51.56
El-Prince	1549 ^b	926 ^b	330.6 ^b	270.13 ^b	208.7 ^b	189.2 ^b	1923 ^b	999.0 ^b	940 ^b	773.0 ^a	2845 ^b	2280 ^b	1128.33 ^b	1887.67 ^b	1970 ^a	2430 ^b	64.19	70.96
Sahim	323 ^c	834 ^b	301.33 ^{ab}	260.0 ^b	197.0 ^{ab}	164.0 ^c	625 ^c	995.0 ^b	508. ^c	786.0 ^a	921.0 ^c	1233 ^c	701.0 ^b	636 ^c	1320.33 ^b	1258 ^c	78.75	88.60
F	**	**	*	**	*	*	**	*	**	ns	**	**	*	**	**	**	**	**
L.S.D 0.05	122.95	669.71	68.05	116.686	54.221	61.22	190.31	175.35	295.89	142.122	252.74	245.19	971.5	272.24	152.43	283.17	11.819	6.46

Table 2. Effect of some chemical contents of three cucumber varieties on the percent of infestation of certain hemipterous and mite pests

Varieties	lipid	Carbohydrate	protein	p	ph	K	<i>A.</i>		<i>E.</i>	<i>B. tabaci</i>		<i>T. cucurbitacearum</i>		<i>T. tabaci</i>	Yield kg/plot
							<i>gossypii</i>	<i>decipiens.</i>		Immature stages	Adult stages	egg	adult		
							<i>decedens</i>								
Beit alpha	5.02 ^a	17.7 ^a	20.07 ^a	2.02 ^b	3.65 ^b	44.7 ^b	3113.33 ^a	380 ^a	290.0 ^a	1227.0 ^a	814.0 ^a	3220 ^a	2207 ^a	2815 ^a	51.56 ^c
El-Prince	4.52 ^a	14.5 ^b	21.8 ^a	1.75 ^b	4.833 ^b	42.1 ^c	926 ^b	270.13 ^b	189.2 ^b	999.0 ^b	773.0 ^a	2280 ^b	1887.67 ^b	2430 ^b	70.96 ^b
Sahim	4.19 ^a	15.68 ^b	17.113 ^a	4.41 ^a	5.81 ^a	54.3 ^a	834 ^b	260.0 ^b	164.0 ^c	995.0 ^b	786.0 ^a	1233 ^c	636 ^c	1258 ^c	88.6 ^a
F.	ns	*	**	*	**	**	**	**	*	*	ns	**	**	**	**
L.S.D.	1.997	1.997	2.245	1.98	0.785	1.99	669.71	116.686	61.22	175.35	142.122	245.19	272.24	283.17	6.46

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حساسية بعض أصناف نباتات الخيار للإصابة ببعض الآفات الثاقبة الماصة

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**معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقي - جيزة

أجريت هذه الدراسة في منطقة منيا القمح محافظة الشرقية على نباتات الخيار خلال 2016 و 2017 . على الأصناف (سهم والبرنس وبيتا الفا) وإصابتها ببعض حشرات من القطن ونشاطات الأوراق والذبابة البيضاء و الاكاروس والتريس وتأثير بعض المكونات الكيميائية (الدهون والكربوهيدرات و البروتين و قيمة pH) لبعض أصناف الخيار والإصابة بالحشرات. حيث وجد إصابة بحشرة من القطن *A. gossypii* ونشاطات الأوراق *E. decipiens* و *E. decedens* . الذبابة البيضاء *B. tabaci* (الاطوار الغير كاملة والحشرات الكاملة) والاكاروس ، *T. cucurbitacearum* وتريس البصل *T. tabaci* . أوضحت النتائج أن بيتا الفا أكثر أصناف الخيار حساسية وأن صنف سهم هو أقل الأصناف حساسية. نتائج التحليل الكيميائي اوضحت أنه كلما ازداد محتوى النبات من الدهون والكربوهيدرات والبروتين ازداد مستوى الإصابة بالآفات التي تم دراستها كما وجد أن الزيادة في قيمة pH يقابلها انخفاضاً في تعداد بعض الآفات.