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SUSCEPTIBILITY OF CERTAIN CULTIVATED CUCUMBER VARIETIES TO SUCKING PESTS AND ASSOCIATED NATURAL ENEMIES IN SADAT REGION, MENOFIA GOVERNORATE

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ABSTRACT: ***Field experiment was carried out at Sadat City, Menofia Governorate, Egypt during 2007 and 2008 successive seasons to study the population density of different sucking pests and their associated natural enemies on five cucumber varieties (Madena, Perins, Hoy land, Marmer–rs, and Beit-alpha hybrid) under field conditions. The results revealed that, the Beit-alpha hybrid was the highest infested variety with sucking pests in this study, but the Perins varity was the least one harbored sucking pests. Also, the numbers of predacious mites, insects and spiders were high on a Beita-alpha hybrid and the least populations were observed on Perins Varity. From obtained results, it was noticed that the highest number of hairs / cm2 was recorded on Perins varity (1289 hairs) as compared with Marmer–rs, the lowest one which nontains 1176.25 hair/ cm2.The lowest moisture content was found in the Madena variety leaf (35.31 %) as compared with other examined cucumber varities around (52 % approximately). However, the current study cleared that the concentrations of components (N, Po4, K, Ca, Mg, Fe, Zn, Cu, Mn, Br. and Mo.) in leaves were highly significant differed with the different varities. The Beita-alpha hybrid was shown highly concentrations of all tested elements, but the lowest concentrations of the elements were noticed in the leaves of Perins varity. There was a positive correlation between the tested sucking pests (whitefly, jassids, aphids and mites) and the different concentrations of all elements in the study cucumber varities. According to Duncan's multiple test, cucumber varieties could be arranged according to their susceptible to pest infestation as Beit-alpha hybrid > Marmar.rs > Hoyland hybrid > Perins > Madena.***

Key words: ***Cucumber – Sucking pests- Associated Natural Enemis,***

INTRODUCTION

Vegetable varieties differ in their susceptibility to insect pests and this response is called host plant resistance (HPR). Resistance can be expressed as tolerance, non-preference, or antibiosis. Extensive variety trials are needed to understand the HPR of vegetables. Most variety selection is done emphasizing other factors like appearance, taste, and production volume. HPR status of many of our modern varieties is simply not known well.

Recently, transgenic plants have been developed for field crops and some vegetables including tomatoes, potatoes, and corn. Transgenic plants have their genetic material altered and dramatic results can be achieved when genes for resistance to insects are incorporated.

In Egypt, cucurbitaceous vegetable plants represents a daily food meal. Cucumber, Cucmis sativus L. is one of the most important vegetables crops as its fruits have high nutritional value, proteins, carbohydrates, fats, vitamins, calcium, phosphorus contain and many essential amino acids (Tomezyk and Kiekiewiez, 2001). Cucumber is subject with some serious insect and mite pests. The most destructive pests are cucumber beetles, aphids, and spider mites. The whitefly Bemisia tabaci (Genn.) (Homoptera: Aleyrodidae) is a destructive insect pests on cucurbits (El-Mersawy, 1987). The role of the predacous mites in suppressing the population of cucumber pests has been reported by many investigators (Rasmy et al., 1990; Kilany 1997, Farrag et al., 1998, Kiekiewicz et al., 2006 and Abou-Tayesh et al., 2007.The association of several morphological traits with resistance to insects and diseases have been reviwed (Sikka et al., 1966). In general, the chemical control of pests creates several problems i.e. environmental pollution, destruction of beneficial organisms and pest resistance to many pesticides. In addition, chemicals may be determined to humans and other animals. An alternative strategy for controlling the sucking pests is the identification and development of cucumber cultivars resistant to these pests feeding damage. Development of effective management strategies for the pest requires an understanding of the mechanisms of internal plant components involved in plant selection. Identification of cucumber varital resistance to the insect pest is essential for varital enhancements and cultivar development. Therefore, it is necessary to select tolerant or resistant crop varieties as one of the simplest and useful tactics in the integrated pest management programs. The breeding of improved cucumber cultivars with some levels of heritable resistance to pests while having desirable yield is essential. The present work aims to evaluate the susceptibility of certain common cucumber varieties during the two successive seasons 2007 and 2008 to infestation with certain sucking pests (insects and mites) in Menoufia Governorate (Sadat City) as well as associated natural enemies.

MATERIALS AND METHODS

Five cucumber varieties (Madena, Perins, Hoyland hybrid, Marmar.rs, and Beit-alpha hybrid) were evaluated for their susceptibility to infestation with different sucking pests in Sadat City, Menofia Governorate during 2007 and 2008 cultivated seasons. Experimental plots were arranged in a complete randomized design with 4 replicates. All agricultural practices were carried out as usual, and no insect control measures were applied.

Seasonal abundance

Sampling took place as soon as the newly growth appeared (one week after sowing) (16th Aug. 2007 and 20th Aug. 2008). Samples consist of 50 leaves were randomly taken from terminal, middle and basal plant regions. In laboratory, one square inch from every leaf was examined and the number of insects and mites was counted. Samples were taken 10 days interval till the end of planting stages (7th Dec. 2007 and 13th Dec. 2008. Counting of aphids took place in the field on the same day of sampling with the aid of 20 x lens. Both surfaces of the leaf were inspected for the presence of aphid species forms and stages. Mites were counted only on the lower surface of the leaves.

The examination of samples was carried out as follows:

Aphid, Aphis craccivora (Koch), and Jassid, Empoasca decipiens Paoli, samples of 10 leaflets were directly investigated early in the morning. The number of immature stages (nymphs and adults) was counted and recorded.

Whitefly, Bemisia tabaci (Genn), samples of ten leaflets were inspected early in the morning from each replicates. The number of immature stages (larvae and pupae) was counted and recorded using the aid of a stereomicroscope.

Two-spotted spider mite, Tetranychus urticae Koch, samples of 10 leaflets were inspected early in the morning. The number of larvae, nymphs and adults were counted and recorded using the aid of a stereomicroscope.

The beneficial insects were collected in the same period of collecting the previous insects using the D-Vack suction machine. Also, the spiders on foliage were collected by shaking the plants on a cloth or a shake sheet. This method is referred as the drop cloth method. Ten cucumber plants were shacked over the shaking white cloth (1 m x 1 m) twice monthly during the surveying period. The surveyed spiders were kept in glass vials containing 75 % ethyl alcohol and few droplets of glycerin.

Leaf components were evaluated using technique described by Piper (1950).

Statistical analysis

The data as mean number of collected species by different methods were subjected to statistical analysis of variance (ANOVA).

RESULTS AND DISCUSSION

Population densities of sucking pests (whitefly, aphid, leaf miner and spider mites) and other associated predators (mites, insects and spiders) on cucumber varieties at Sadat City, during 2007 and 2008

In this study five cucumber varieties were used to estimate the population of different sucking pests and their associated natural enemies on leaves at Sadat City, Menofia Governorate. As shown in Table (1) the obtained data indicated that their were very highly significant differences between the

population of all pests and natural enemies with the different tested varities, where the varity Beit-alpha hybrid was the most one harbored both sucking pests and the natural enemies during the two examined seasons 2007 and 2008. On the other hand, Perins was the least varity containing sucking pests and associated predators. Considering whitefly, jassid, aphids, leaf miner, and spider mites as harmful pests during 2007 season, the population of them on Beit-alpha hybrid varity recorded 212, 80.25, 98.5, 67.75, and 95.64 individuals / 10 leaves, respectively. These numbers clearly decreased significantly to 95.0, 28.5, 33, 29.25 and 55.75 individuals on Perins variety, respectively. However, in 2008 season, the population of the previously mentioned pests inhabiting Beit-alpha hybrid, the numbers of different collected species were 209.0, 88.25, 111.5, 69.7 and 99.0, while these numbers were 103.0, 29.0, 37.0, 31.15 and 58.75 individuals / 10 leaves on Perins variety, respectively. Based on the population development of the predacous species which appeared from the mid of October and continued till the harvesting time, Table (1) showed also that there were highly significant differences among the different populations on different tested cucumber varities.The predacous mites included, Pronematus ubiquitus McGregor and P. rykei Meyer and Rodriguez (Tydeidae), Amblyseius badryi Yousef and El-Brolossy, Phytoseius plumifer (Canestrini & Fanzago), and Typhlodromus pyri Scheuten (Phytoseiidae), and Agistemus exsertus Gonzales (Stigmaeidae) were the most abundant predacous mites followed by the predacous insects Paederus alfierii Koch (Staphylinidae), Coccinella undecimpunctata Linnaeus, Coccinella sp., Cydonia vicina nioltica Muls (Coccinellidae) and Chrysoperla carnea Stephens (Chrysopidae), while the true spiders come in the least order included Argiope trifasciata Forskal (Araneidae), Cheiracanthium sp., (Miturgidae), Thanatus albini (Audouin) and Eurgopis sp. (Theridiidae).The highest level of abundant for these predacous species were 31.25, 30.55 and 21.12 individuals on Beit-alpha hybrid during 2007 changed to 36.55, 33.50 and 29.10 individuals during 2008 season on the same cucumber varity for the predacous mites, insects and spiders, respectively, Table (1). The study conducted by Kiekiewicz et al., (2006) indicated that the occurrence of insect and mite pests and their natural enemies in genetically modified cucumber plants expressing the thaumatin II gene was studied under field conditions in Poland. The density of sucking herbivores (both insects and mites) differed depending on the cucumber line. The densities of cotton aphid (Aphis gossypii) and the two spotted spider mite, T. urticae were also lower in the transgenic lines than in the non-transgenic lines. Diversity, seasonal abundance and diurnal-nocturnal of spider population associated with 8 vegetable crops were studied, Hussein (1999). He concluded that the high population density of spiders in August seems to be a result of combination of 3 factors: the dense vegetation, high temperature and naturally high relative humidity.

Table (1) :

The correlation between the population density of sucking pests and each of the leaf hair density and moisture content ratios

Various morpho-physical and chemical plants factors viz., moisture content, hair density and length, thickness of leaf lamina, total minerals, nitrogen, phosphorus, potassium, magnesium, ferrous, manganese, zinc, crude fiber, carbohydrate and fat contents in the leaves are affected on the kind and number of pests and their natural enemies. The results in Table (2) revealed negatively significant correlation between the population densities of each collected whiteflies, Jassids, aphids and mites and both the number of leaf hairs / one cm2 cucumber and the leaf moisture contents %.

Sikka et al., (1966) evaluated the degree of jassid resistance against hairiness of different varieties of cotton on leaves leaves and the relative importance of different aspects of hairiness. Total partial and multiple correlation coefficients were determined and it was found that degree of jassid resistance has definite correlation with the pilosity of the plant. On the relative importance of three characteristics of hairiness studied, length of hair seemed to be of prime importance, closely followed by density of hair on the lamina whereas hair on the mid rib does not seem to play any important part in imparting resistance to this pest. However, combination of hair length with high density of hair on the lamina may be the best index of selection in breeding for resistance to jassid attack.

Table (2): The correlation between the population density of sucking pests and each of the leaf hair density and moisture content ratios

Varity	No. of leaf hairs / one cm2	Leaf moisture contents %
Madena	1231	35.31
Perins	1289	52.60
Hoyland hybrid	1203.75	52.06
Marmar-rs	1176.25	52.36
Beit-alpha hybrid	1089.75	51.16
Correlation coefficient values		
Whitefly	- 0.9636	-0.4713
Jassids	-0.9045	-0.6525
Aphids	-0.9841	-0.5631
Spider mites	-0.9648	-0.4875

The relationship between leaf components of cucumber varities with sucking pests

As shown in Table (3), the different components of cucumber leaf were differed according to the cucumber varity. The obtained data cleared that all different leaf components were highly significant between the different element

Table (3)

concentrations. The Beit-alpha hybrid varity was shown highly concentrations of all tested elements N, Po4, K, Ca, Mg, Fe, Zn, Cu, Mn, Br. and Mo. On the other hand the lowest concentrations of the previously mentioned elements were noticed in the leaves of Perins varity. However, the statistical analysis of obtained data showed that the there was a positive correlation between the tested sucking pests (whitefly, Jassids, aphids and mites) and the different concentrations of all elements in the study cucumber varities and these results may indicated that the highest population of sucking pests and the natural enemies may be attributed to these high concentrations of all tested elements. Some vegetable varieties are unattractive or resistant to certain pests. Planting resistant varieties adapted to area can dramatically reduce the need for insecticides. For example, the sweet corn variety 'Seneca Sentry' is resistant to corn earworms and is adapted to central Texas, Jackman (1999). In this variety, the leaves that wrap around the corn ear tip are much tighter around the silk than in more susceptible varieties. Unfortunately, the pest resistance status of only a few vegetable varieties is known. Generally, there were noticeable differences between the different tested cucumber cultivars with respect to their susceptibility to infestation with whiteflies, aphids, leaf miners and spider mites. Dawood (1999) noticed that cucumber Sliberti hybrid was the least susceptible varity to B. tabaci followed by Sweet krransh than Alegi was being the most susceptible. According to Duncan's multiple test, cucumber cultivars could be arranged according to their susceptible to pest infestation as Beit-alpha hybrid > Marmar.rs > Hoyland hybrid > Perins > Madena. It could be concluded that the select adapted cultivars of cucumber with resistance to different sucking pests must be taken in consideration

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حساسية بعض اصناف الخيار للاصابة بالافات الماصة والاعداء الطبيعية المصاحبة لها فى منطقة السادات –محافظة المنوفية

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الملخص العربي

اجريت دراسة حقلية فى منطقة السادات بمحافظة المنوفية لدراسة حساسية خمسة اصناف مختلفة من الخيار للاصابة بالافات الماصة وايضا تواجد الاعداء الطبيعية المصاحبة لها. وكانت هذه الاصناف مدينا – برنس – هوى لاند – مرمر ار اس – وهجين بيت– الفا . ومن الدراسة اتضح ان الصنف هجين بيت الفا كان اكثر الاصناف حساسية لتواجد كل الافات الماصة وايضا الاعداء الحيوية المصاحبة لها من اكاروسات وحشرات وعناكب حقيقة واظهرت الدراسة ان اكبر عدد من الشعيرات الموجودة على الاوراق كانت على الصنف برنس (١٢٨٩ شعرة) مقارنة بالصنف مرمر ار اس حيث وجدت ١١٧٦.٢٥ شعرة / سم٢ مقارنة بباقى الاصناف التى كانت تتراوح اعداد الشعيرات بها حوالى ٥٢ شعرة / سم٢– كما وجد من الدراسة ايضا ان اقل نسبة رطوبة فى الورقة مسجلة فى اوراق الصنف مدينا (٣٥.٣١ %) مقارنة بباقى الاصناف التى كانت تتراوح النسبة بها حول ٥٢ % – كما تشير الدراسة ان مكونات الورقة فى كل صنف من اصناف الخيار المختبرة اختلفت فيما بينها اختلافا واضحا حيث كانت نسبة العناصر المختبرة (N و,Po4 و K و Ca و Mg و Fe و Zn, Cu, Mn و Br. و Mo.)أعلى بصورة واضحة فى الصنف بيت الفا واقلها كانت فى أوراق الصنف برنس وهذا ما يرجح ان هذا هو السبب فى زيادة أعداد الآفات وبالتالى زيادة أعداد الأعداء الطبيعية المرتبطة بها على جميع الاصناف المختبرة كما اتضح من الدراسة انه كانت هناك ارتباطا بصورة موجبة بين وجود الافات والمفترسات على الأصناف المختبرة وتركيز العناصر الموجود فى الاوراق. ويمكن ترتيب الاصناف المختلفة تبعا لتواجد الافات الضارة والاعداء الطبيعية كالاتى : بيت الفا هيبرد > مرمرار اس > هوى لاند هيبرد > برنس > مدينا.

Table (1): Population densities of sucking pests and other associated predators on cucumber varities at Sadat City, during 2007 and 2008

Varity	Mean numbers of individuals / 10 leaves							
	Sucking pests					Predators		
	Whitefly *B. tabaci*	Jassids *Empoasca* spp.	Aphids *Aphis* spp.	Leaf miners *Liriomyza* spp.	Spider mite *Tetranychus urticae*	Mites	Insects/ 10 plant	Spiders/ 10 plants
2007								
Madena	133.25^{b}	37.5^{b}	52.0^{b}	30.5^{ab}	61.5^{ab}	18.64^{a}	14.23^{a}	10.0^{a}
Perins	95.00^{a}	28.5^{a}	33.0^{a}	29.25^{a}	55.75^{a}	19.64^{a}	16.21^{b}	11.28^{ab}
Hoyland hybrid	139.50^{b}	64.75^{c}	69.5^{c}	32.75^{ab}	65.24^{ab}	18.90^{a}	20.10^{b}	13.25b
Marmar.rs	187.75^{c}	75.5^{d}	77.75^{c}	42.0^{b}	77.68^{b}	25.64^{b}	22.59^{b}	15.96^{b}
Beit-alpha hybrid	212.0^{c}	80.25^{d}	98.5^{d}	67.75^{c}	95.64^{c}	31.25^{c}	30.55^{c}	26.12^{c}
2008								
Madena	125.25^{b}	41.5^{b}	46.0^{b}	29.5^{ab}	59.5^{ab}	16.64^{a}	16.20^{a}	9.20^{a}
Perins	103.00^{a}	29.0^{a}	37.0^{a}	31.15^{a}	58.75^{a}	18.64^{a}	18.0^{b}	12.11^{ab}
Hoyland hybrid	152.50^{b}	70.5^{c}	66.5^{c}	34.75^{ab}	66.5^{ab}	19.0^{a}	22.18^{b}	14.1^{b}
Marmar.rs	200.75^{c}	79.5^{d}	82.75^{c}	47.0^{b}	79.55^{b}	27.1^{b}	235^{b}	15.0^{b}
Beit-alpha hybrid	209.0^{c}	88.25^{d}	111.5^{d}	69.7^{c}	99.0^{c}	36.55^{c}	33.50^{c}	29.10^{c}

*** Means followed by a common letter are not significantly different at 5 % level**

Table (3): The relationship between the leaf components (nitrogen, phosphorus, potassium, calcium and other trace elements) and infestation of cucumber varieties with different sucking pests.

Varity	Concentration during the different growing stages (vegetative, flowering and fruiting)										
	N ppm	Po4 ppm	K %	Ca %	Mg %	Fe ppm	Zn ppm	Cu ppm	Mn ppm	Br ppm	Mo ppm
Madena	17133.33	9363.66	12.5	1.5	0.5	113	41.66	6	102	43.33	1.66
Perins	16983.33	9256.66	11.75	1.16	0.46	100.66	41	6	102.33	48.33	1.5
Hoyland hybrid	18883.33	9476.66	13.75	1.66	0.53	115.66	46	7.33	104.33	53.66	2
Marmar.rs	19133.33	9501.66	14.83	2.25	0.6	116.83	47.33	7.66	106	55.83	2.25
Beit-alpha hybrid	19600	9533.33	15.5	2.33	0.66	117.66	49.66	8.33	108	56.33	2.58
Correlation coefficient values											
Whiteflies	0.8805	0.9099	0.9711	0.9892	0.9896	0.8384	0.9275	0.9071	0.9302	0.7281	0.8971
Jassids	0.9911	0.9746	0.9851	0.9451	0.9289	0.8543	0.9848	0.9776	0.9361	0.8934	0.9652
Aphids	0.9462	0.9639	0.9822	0.9485	0.9719	0.8786	733	0.9581	0.94206	0.7830	0.9652
Mites	0.9167	0.9245	0.9644	0.9847	0.9648	0.8651	0.9125	0.9264	0.9842	0.9624	0.9864