

SENSITIVITY OF FOUR CUCUMBER CULTIVARS TO SOME PIERCING SAP SUCKING PESTS INFESTATION AND THEIR IMPACT ON YIELD

GHALLAB, MONA M., NADIA H. HABASHI, AIDA K. F. ISKANDAR
AND MARGUERITE A. RIZK

Plant Protection Research Institute, A. R. C. Dokki, Giza

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Abstract

Experiment was carried out at Biahmo, Fayoum Governorate, during 2009 season. Four cucumber varieties (*Cucumis sativus* L.), Xena, Sweet crunch, Nemsse and Zaeim were selected to study their sensitivity to four piercing sap sucking pests infestation {the spider mite, *Tetranychus arabicus* Attiah, the whitefly, *Bemisia tabaci* (Gennadius), the thrips, *Thrips tabaci* Lindquist and the aphid, *Aphis gossypii* Glover} and their associated predator, the pirate bug, *Orius* sp. under field condition, all treatments were applied 4 times. Data revealed that Nemsse cultivar harbored the highest infestation of spider mites, with mean numbers of 77.8 individuals / 40 plants, followed insignificantly by Sweet crunch cultivar (52.5 individuals / 40 leaves), while Xena cultivar recorded the lowest infestation (18.9 individuals / 40 leaves). On the contrary *Thrips* sp. recorded the highest infestation in Xena cultivar with mean numbers of 205.4 individuals / 40 leaves. No significant difference in the average number was found between the different CULTIVARS for the whitefly population. Zaeim variety was more susceptible to the aphid infestation than the other varieties with a significant difference in the average number comparing to Sweet crunch and Nemsse CULTIVARS. The highest total cucumber fruit yield was obtained by Xena cultivar, followed by Zaeim, Sweet crunch then Nemsse CULTIVARS, respectively. They recorded 18.65, 16, 15.9 and 14.2 tons / feddan, respectively.

Key words: Aphid, cucumber, *Orius* sp., piercing sap sucking pests, spider mite, *Thrips* sp., whitefly, yield.

INTRODUCTION

Vegetables are very important commodity, most vegetables have a high economical value, and as a source of nutritive food especially vitamins and minerals. Piercing sucking pests (spider mite, aphids, whitefly, leafhoppers and trips) are widely spread attacking a wide variety of agricultural crops and causing considerable damage, either directly by sucking plant juice or indirectly as vector transmitting plant diseases. (Carter1990).

The two spotted spider mite is considered one of the important pests during summer plantation causing various degrees of damage and lately yield losses (Faris *et al.*, 2004). Trips and whiteflies are not less in their seriousness than spider mite.

One of the mainstays of integrated pest management is the use of crop varieties that are resistant or tolerant to insect pests and diseases. A resistant variety may be less preferred by the insect pest, adversely affect its normal development and survival or the plant may tolerate the damage without an economic loss in yield or quality (Hoffmann and Frodsham 1993)

Many new varieties are being introduced by seed companies each year, therefore, variety evaluation is essential in order to recommend these varieties to the industry in Egypt. In particular, varieties that have local adaptability and market acceptance, together with higher yields improved fresh quality and better pest tolerance are needed.

From this point of view, this is an attempt to evaluate four cucumber varieties for some piercing sap sucking pest's infestation under the same environmental conditions.

MATERIALS AND METHODS

The relative susceptibility of four cucumber CULTIVARS to some piercing sucking pests (the spider mite, *Tetranychus arabicus* Attiah, the whitefly nymph, *Bemisia tabaci*, Thrips *tabaci* and *Aphis gossypii*) was evaluated. Seeds of different CULTIVARS (Xena, Sweet crunch, Nemsse and Zaeim) were planted on March 6th, 2009. An area of about 700 m² was divided into 16 equal plots comprised the four CULTIVARS of cucumber of 4 replicates each. The experiment was designed in a complete plot design. Each plot with 8 ridges 6 m. length and 0.50m apart and thinned to 2 plants in the row to give a plant population of 18.000 plants / feddan. All plots received the normally recommended agricultural practices of land preparation, thinning irrigation, and mechanical weed control and kept free from any insecticidal application.

Sampling procedure

Samples of 10 leaves/ cultivar were randomly picked weekly, placed directly into paper bags and transferred to the laboratory for examination. The pests and the associated predator were recorded, after a month of planting for eight weeks.

Crop Yield

Fruits of 10 plants / cultivar were picked and weighted from 11 to 25 May. The hand-pick trial was harvested 8 times during the season.

Statistical analysis:

The analysis of variance was adopted and the L.S.D values were used to determine the significance between means of CULTIVARS.

RESULTS AND DISCUSSION

Population abundance of piercing sucking pests in different CULTIVARS

Data presented in Table (1) show weekly counts of total and mean numbers of spider mite (movable stages & eggs), thrips (adults and nymphs), whitefly (nymphs & eggs) and aphids (adults and nymphs) on forty cucumber leaves in each cultivar.

A - Spider mite, *Tetranychus arabicus* Attiah

As illustrated in Fig (1), the population dynamic of spider mite exhibited two peaks, the first peak was observed in the end of April (150.75 individuals/ 40 leaves) and the second was in the mid of May (402.25 individuals/ 40 leaves), so the numbers increased until the end of the season.

This result was in agreement to Sallam *et. al.* (2009), they recorded the highest population of spider mites occurred on cucumber plant was in April and May, while June was the month which showed the highest level of abundance of the spider mites before ending the season.

Among the different CULTIVARS, Xena recorded the lowest attraction of spider mite with mean number (18.9 individuals/ 40 leaves) which was significant than Nemsse cultivar (77.8 individuals/ 40 leaves) and insignificance with Sweet crunch & Zaeim where their mean numbers 34.3& 52.5 individuals/ 40 leaves, respectively.

B- Whitefly, *Bemisia tabaci* (Gennadieu)

Whitefly nymphs started to appear with very few numbers at the beginning of April, Fig (1) (0.25 individuals) and then sharply increased to reach the peak (323.75 individuals/ 40 leaves) on April 26th and then decreased in May and sharply increased by the end of the season reach (285.5 individuals). The same result was obtained by Habashi *et al.* (2007).

According to the different varieties, the cultivar Sweet crunch showed the greatest attraction of whitefly population followed by cultivar Xena with mean average of (59 & 48.9 individuals/ 40 leaves), while cultivar Zaeim showed the lowest mean number (22.9 individuals/ 40 leaves).

No significant differences between means of different CULTIVARS were observed, whereas the number of the whitefly eggs was appeared in great numbers in Zaeim cultivar with significant difference comparing to the other CULTIVARS.

Eggs of spider mite and whitefly

Data in Table (1) and Fig. (2) showed the total numbers of eggs deposited by *Tetranychus arabicus* and *Bemisia tabaci* on leaves of cucumber CULTIVARS, Xena, Sweet crunch, Nemsse and Zaeim. The number of eggs laid per females of spider mite and whitefly on different cucumber CULTIVARS were significantly different.

In case of *Tetranychus arabicus*, eggs started to appear in low number at the beginning of April and then increased to reach its high level at the end of May.

The highest number of eggs was recorded on Nemsse cultivar, of mean number 141 eggs, followed by Sweet crunch, (111.6 eggs) and the lowest mean number of eggs was recorded on Xena cultivar, 48.6 eggs. The statistical analysis proved that there were significant differences between means of Xena and Nemsse and insignificant to the other CULTIVARS.

In case of *Bemisia tabaci*, a few numbers of eggs was observed in beginning of April then a sharp increase start in mid of April reach a peak at the end of April and first May and then begin to decrease again.

The lowest number of eggs was observed on Zaeim cultivar followed by Sweet crunch and then Xena cultivar by the mean number 6.6, 9.2 and 14.9 eggs, respectively, with a significant difference comparing to Nemsse cultivar which recorded the highest infestation by whitefly eggs by the mean number 23.6 eggs.

It could be concluded from these finding that Nemsse is susceptible to pest infestations while Xena and Zaeim were somewhat resistant.

Ullah *et al.* (2005) evaluated that the number of eggs laid by female *Tetranychus arabicus* on a particular cucumber accession could be an index of acceptance of the host for oviposition and the amount of nutrients or secondary metabolites provided by the host.

C- Thrips, *Thrips tabaci* Lindquist

The population dynamic of trips showed two active periods, Fig (1), the first peak on 6 April, and the second peak on 26 April with total numbers 1008.5 and 1647.25 individuals/ 40 leaves, respectively. These findings are in full agreement with Habashi *et al.* (2007) and Ebaid & Mansour (2006)

The statistical analysis proved that there were Significant differences were detected between Nemsse cultivar and the other CULTIVARS, Sweet crunch and Xena, while there is insignificant with Zaeim.

D- Aphid, *Aphis gossypii* Glover

The aphid started to appear with few number 0, 4 individuals/ 40 leaves and then their numbers increased to reach a peak with total numbers 49 individuals/ 40 leaves on May 25th.

These results are similar to data obtained by Habashi *et al.* (2007), in which the population of aphids observed in mid April in few numbers and increased to reach its peak in the third week of May.

Also, these results are in harmony with those recorded by Whitney (1999) and Griffen (2010) who indicated that aphids are considered to be very serious minor pest that attack cucurbits, particularly melons and cucumbers.

Among the different CULTIVARS, Sweet crunch recorded the lowest attraction of aphid pests with mean number (0.63 individuals/ 40 leaves) which was significant than Nemsse cultivar (9.7 individuals/ 40 leaves) and insignificance with Xena & Zaeim where their mean numbers 4.13& 3.75 individuals/ 40 leaves, respectively.

Hafiz *et al.* (1997) proved that cucumber varieties had significant effect on aphid development and reproduction

Population abundance of the pirate bug, *Orius* sp.

Data presented in table (2), show the weekly total numbers of the predator, *Orius* sp. from different CULTIVARS throughout the period from April, 6th until May, 25th

The predator was counted during the study with the highest record observed in Zaeim and Xena CULTIVARS with total number (24 & 12 individuals), respectively. In Zaeim periods of activity started from the first inspection and extend to the last inspection with a peak on May 4th and 11th (6 individuals / 40 leaves).

Kappers *et al.* (2010) interpreted those differences in the attraction of predator by various accessions correlated to differences in the individual chemical profiles of these accessions.

Regarding to L. S. D values, there is a significant differences between Zaeim cultivar and the other three CULTIVARS (Xena, Nemsse and Sweet crunch). The lower total numbers of predators /40 plants in Sweet crunch (6 individuals), while the higher total numbers of predators /40 plants was (24 individuals) in Zaeim cultivar in 2009 season.

Fig.(4) show the total number of the four piercing sucking pests and the predator *Orius* sp. on the four cucumber CULTIVARS.

Resistant varieties are first line of defense in cases where pesticides cannot be used or other alternative controls are not available.

There are different varieties of cucumber which grow in different ways, the suitable varieties must be chosen for the proper country.

Effect of four cucumber varieties on the resultant yield

Data recorded in Table (3), show the means of cucumber yield produced by different varieties cultivated in March 2009. The highest total cucumber fruit yield was obtained by Xena cultivar, followed by Zaeim, Sweet crunch then Nemsse CULTIVARS, respectively. They recorded 18.65, 16.0, 15.9 and 14.2 tons / feddan, respectively.

Mean of harvested cucumber fruit yield per ten plants proved that there is a significant difference between Xena cultivar and the other three CULTIVARS.

Yield differences were attributed to varietals differences and potentials because all varieties were planted under the same conditions.

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حساسية أربعة أصناف من نباتات الخيار للإصابة ببعض الآفات الثاقبة الماصة وتأثيرها على المحصول الناتج

منى محمد أحمد غلاب، ونادية حنا حبشى، وعائدة خليل إسكندر،
ومارجريت عدلي رزق

مركز البحوث الزراعية ، معهد بحوث وقاية النباتات، الجيزة

يعتبر الخيار من أهم محاصيل الحقل القرعية ذات العائد الإقتصادي حيث يزرع في الحقل المفتوح وفي الصوب البلاستيكية والتي إزدادت المساحة المنزرعة به في السنوات الأخيرة وذلك من أجل الأستهلاك المحلي والتصدير. يصاب الخيار بالعديد من الآفات مثل العنكبوت الأحمر (الأكاروس)، والذبابة البيضاء، والترس، والمن، وتسبب هذه الآفات خسائر تؤثر على جودة المحصول. نظراً للضرر الذي تسببه هذه الآفات على محصول الخيار تم دراسة مدى قابلية أربعة أصناف من الخيار: زينة، وسويت كرانش، والنمس، والزعيم للإصابة بالآفات وأطوارها المختلفة، بيض، وحوريات، والطور الكامل للآفات المذكورة سابقاً وكذلك الأعداء الحيوية المصاحبة لهم وكذلك تم تقدير المحصول الناتج من هذه الأصناف.

أجريت التجربة بعزبة سنورس بالفيوم وذلك في عروة خيار على مساحة 700 متر مربع خلال الفترة 6 من شهر مارس حتى نهاية شهر مايو 2009. قسمت المساحة إلى 16 حوض خصصت لأربعة أصناف، ولكل منها أربعة مكررات وزعت عشوائياً، وكانت النتائج التالية:

العنكبوت الأحمر (الأكاروس):

تبدأ الأطوار المختلفة للآفة (بيض وحوريات وأطوار كاملة) في الظهور بأعداد قليلة في أوائل شهر أبريل ثم تزداد تدريجياً حتى نهاية المحصول في آخر شهر مايو؛ وأوضحت النتائج أن الصنف النمس كان أعلى الأصناف إصابة ببيض وأطوار هذه الآفة حيث بلغ متوسط تعداد البيض 141 بيضة و 77.8 فرد/ 40 ورقة من أطوار الآفة في حين إحتل الصنفين سويت كرانش، والزعيم درجة متوسطة للإصابة بالآفة وأطوارها حيث أصيبت أوراقهما ب 111.6 و 94.8 بيضة و 52.5، و 34.31 فرد/ 40 ورقة على التوالي؛ بينما كان الصنف زينة أقل الأصناف معنوية من حيث الإصابة حيث بلغ 48.6 بيضة و 18.9 فرد/ 40 ورقة.

الذبابة البيضاء:

ظهرت حوريات الذبابة البيضاء على أصناف أوراق الخيار المختلفة بأعداد متفاوتة في منتصف شهر أبريل وإزدادت تدريجياً حتى بلغ أعلى تعدها في نهاية شهر أبريل ثم بدأ يتناقص ثم تزايد مرة أخرى في نهاية شهر مايو

أظهرت الأصناف سويت كرانش وزينة أعلى إصابة حيث كان متوسط أعداد الذبابة البيضاء 59، و48.9 حورية/40 ورقة بينما كان الصنف النمس أقل إصابة 22.9 حورية/40 ورقة.

التربس:

تواجد التربس بأعداد كبيرة منذ بداية الفحص في بداية شهر أبريل على الأصناف زينة، وسويت كرانش، والنمس بينما تأخر ظهوره على صنف الزعيم. أظهرت متوسط الأعداد الأصناف زينة وسويت كرانش 205.4، 194.5 حورية / 40 ورقة تقريباً لتكون أعلى إصابة بينما أظهر صنف الزعيم أقل إصابة 65.5 حورية / 40 ورقة

المن :

بدأ المن في الظهور في منتصف شهر أبريل و إزداد تعداده تدريجياً حتى أول شهر مايو واستمر حتى منتصف الشهر ثم بدأ يتناقص كان الصنفين سويت كرانش والنمس أكثر الأصناف مقاومة للإصابة بالمن (0.75 ، و1 فرد/ 40 ورقة) بينما كان صنف الزعيم أكثر الأصناف حساسية للإصابة بالمن (3 فرد/ 40 ورقة).

المفترس، بقعة ال Orius :

تعتبر هذه الحشرة ذات أهمية كبيرة في مجال مكافحة الحيوية حيث أنها سريعة الحركة ولها أهمية في مكافحة العديد من الآفات.

تواجد المفترس مصاحب للآفات المذكورة سابقاً على أصناف الخيار المختلفة وكان أكثر تعداد له في منتصف شهر أبريل وأول شهر مايو. كما أظهرت النتائج أنه يوجد فرق معنوي للمفترس بين صنف الزعيم و الأصناف الأخرى.

المحصول:

أظهرت النتائج أن الصنفين زينة والزعيم كانا أقل الأصناف إصابة بالعنكبوت الأحمر وكانا أكثر الأصناف إنتاجاً حيث بلغ وزن متوسط الثمار الناتج لهما 18.65 و16.00 طن / فدان على التوالي خلال الموسم تلاهما الصنف سويت كرانش حيث بلغ متوسط انتاجه 15.9 طن / فدان؛ أما صنف النمس كان أكثر الأصناف قابلية للإصابة بالآفات حيث أعطى أقل إنتاج 14.2 طن / فدان خلال الموسم.