

EFFECT OF PLANTING DATES AND SPACES ON THE INFESTATION OF CUCUMBER VARIETIES WITH TWO-SPOTTED SPIDER MITE, *TETRANYCHUS URTICAE* KOCH

Mona A. Mohamed, M.R. El-Aassar and A.A. Mourad

Plant Protection Research Institute, ARC, Dokki, Giza, Egypt

Received: Mar. 23 , 2017

Accepted: Apr. 23 , 2017

ABSTRACT: Field experiments were conducted to study the effectiveness of three cucumber planting dates (March, 15th; April, 15th and May, 15th), three planting spaces (20, 30 and 40 cm) between cucumber seeds and three varieties of cucumber (Al-Zaeim, El-Nemse and Prince) on the population densities of *Tetranychus urticae* Koch during 2015 and 2016 seasons. The results indicated that, the three variables (planting dates, spaces and varieties) had pronounced effects on the numbers of *T. urticae* movable stages on cucumber plants. The population density of *T. urticae* movable stages was affected significantly by the tested planting date, the earliest planting date (March, 15th) harboured the lowest population of *T. urticae* movable stages (6.62 and 4.78 individuals/inch²) in the two seasons, respectively. Cucumber plants cultivated at the longest planting space (40 cm) infested by the lowest rate of *T. urticae* movable stages (6.22 and 4.42 individuals/inch²) in the two seasons, respectively. The tested cucumber varieties showed significant differences in the infestation rates by *T. urticae* movable stages. Al-Zaeim variety was the least infested by *T. urticae* movable stages (9.27 and 6.12 individuals/inch²) for the two seasons, respectively. The results revealed that the lowest seasonal mean of infestation was 1.08 and 0.36 individuals/inch² during the two tested seasons, respectively on cucumber plant (Al-Zaeim variety) sown at the largest space (40 cm) during earliest planting date (March, 15th). While the highest infestation levels (37.03 and 35.33 individuals/inch² in the two seasons, respectively) occurred on cucumber plants (Prince variety) planted at the closest planting space (20 cm) during last planting date (May, 15th).

Key words: *T. Urticae*, *Cucumis sativus*, two –spotted spider mite, population

INTRODUCTION

Cucurbits represent an important part of vegetable production and are considered very important in agricultural crops in Egypt. They are cultivated in wide areas either old lands or newly reclaimed lands.

Cucumber, *Cucumis sativus* L. is one of the most important cucurbitaceous vegetable crops in Egypt, as it cultivated under different environmental conditions, open fields and greenhouses for local consumption and exportation.

The two –spotted spider mite, *Tetranychus urticae* Koch (Acari: Tetranychidae) is a major economic pest attacking several kinds of vegetables especially cucumber. *T. urticae* is considering serious economic pest, they

have ability to produce webs on the host plants that coating them with a shiny dust which reduces the plant photosynthetic abilities. Its damage results from the sucking of plant juices with its piercing-sucking mouth parts, causing bronzed and off-coloured poorly coloured fruit are produced. It affects the quantity and the size of fruits and also reduces their quality (Faris *et al*, 2004). The planting seasons and plant varieties play an important role in the change of the population density levels of pests attacking the plants. So, the planting date and crop varieties can be an effective pest management tactics because it results in a synchrony between the pest and crop (Albuquerque, 1993; Hoffmann and Frodsham, 1993). Numerous issues had studied on the effect of planting dates and

the infestation of *T. urticae* on different crops as Ghalab *et al.* (2011), El Saeidy *et al.* (2012) and Maklad *et al.* (2012) and Shalan (2016).

The present study was carried out to shed light on the effectiveness of planting dates, planting spaces and varieties on the population density of *Tetranychus urticae* movable stages on cucumber plants during two successive seasons, 2015 and 2016.

MATERIAL AND METHODS

Field experiments were carried out throughout two successive seasons (2015 and 2016) during summer plantation in Moshtohor locality, Qaliobia governorate.

These experiments were cultivated with three different cucumber varieties, *Cucumis sativus* L. (Al-Zaeim, El-Nemse and Prince) in three planting dates (March, 15th, April, 15th and May, 15th). Seeds of each planting date were sown in three consecutive planting spaces (20, 30 and 40 cm between hills on row). The experimental area was about 0.375 feddan and was planted in three replicates. The experimental plots were laid out in a randomized complete block design with split-plot treatments. Main plots were planting dates and subplots were planting space. Normal agriculture practices were followed except for keeping the whole area free from any pesticides. Sampling started after 15 days of sowing and continued weekly for 12 weeks. Weekly samples of cucumber leaves (30 leaves/plot) were randomly picked up from different levels of plant, and then kept in tightly closed paper bags to be transferred to the laboratory for inspection by the aid of a stereomicroscope and the number of *T. urticae* movable stages /inch² from the middle of the leaf lower surface were counted.

Analysis of variance for each experiment was conducted by F-test using SAS program computer (SAS institute, 2003).

RESULTS AND DISCUSSION

1- Effect of planting dates:

Data in Table (1) showed that the effect of planting dates on the population density of *T. urticae* movable stages during two successive seasons of 2015 and 2016 regardless the effect of planting spaces and cucumber varieties. There were significant differences between the number of the pest on the plant throughout the different planting dates of 2015 and 2016 seasons.

The obtained data showed that, during 2015 season, the infestation by *T. urticae* movable stages were heavier as the planting date was delayed, the heaviest infestation rates were recorded in the latest date (May, 15th), as the seasonal mean counts were 19.37 individuals/inch². These counts were higher than recorded from intermediate planting date (April, 15th) 11.57 individuals/inch². The slightest means of infestation by *T. urticae* movable stages were recorded on plants of the earliest planting date March, 15th being 6.62 individuals/inch². Data showed in the same table that the population of *T. urticae* movable stages on cucumber plants in the second season of study 2016, nearly the same trend of results was observed where the plants of the third planting dates (May, 15th) showed higher infestation levels compared to the plants of the other planting dates recording 17.59 individuals /inch².

The population of *T. urticae* movable stages increased by delaying the planting date. The first planting date (March, 15th) cucumber leaves harboured the lowest seasonal mean count of *T. urticae* 4.78 individuals/inch². On the contrary, the latest date (May, 15th) record the highest population 17.59 individuals/inch². Sowing on (April, 15th) led to intermediate infestation as a leaf harboured mean of 8.67 individuals/inch².

Effect of planting dates and spaces on the infestation of cucumber varieties

Table (1): Effect of planting dates on the population of *Tetranychus urticae* movable stages on cucumber plants during 2015 and 2016 seasons at Qaliobia governorate.

Planting date	Mean no. of movable stages/inch ² /season		
	2015	2016	Grand mean
March, 15 th	6.62c	4.78c	5.70
April, 15 th	11.57b	8.67b	10.12
May, 15 th	19.37a	17.59a	18.48
L.S.D. at 0.05	2.47	1.56	-

Means followed by the same letter in each column are not significantly different at 0.05 level.

The general two seasons mean counts of *T. urticae* movable stages on leaves of cucumber plants from the three planting dates confirmed that the earliest planting date (March, 15th) could be considered the best treatment, as it harboured the lowest population of 5.70 individuals/inch² of leaf.

Regardless the effect of planting spaces and cucumber varieties, it could be observed that, the cucumber plants cultivated in the late planting date harboured relatively higher number of *T. urticae* movable stages. Meanwhile, the plants of the early planting date harboured relatively lower numbers of the pest. Varieties of seasonal plantation can control pests, most of which show some seasonal frequency, either by crop avoiding the egg-laying period of the pest or by allowing the plants to have aged to resistant stage by the time of the pest increasing (Van Emden, 1977).

The results agree with Farrag *et al.* (1982), Ali *et al.* (1986), Miqdadi (1989), Rizk *et al.* (1990), Metwally *et al.* (1994), Wnuk and Wiech (1996), Hanafy (2004), Emam *et al.* (2006), Sayed and Gameel (2008), El-Khayat *et al.* (2010) and Mohamed (2011), as they reported that the infestation rate of *T. urticae* increased by delaying planting date. Also, Shalan (2016) studied the effect of planting dates and the *T. urticae* infestation on cucumber variety

(Medina variety). He found that *T. urticae* increased with the early planting ,August 1st.

2- Effect of planting spaces:

Data in Table (2) showed that the rate of infestation by *T. urticae* movable stages increased by decreasing planting space in the two investigated seasons regardless the effect of planting dates and varieties. The highest mean numbers of *T. urticae* movable stages 21.03 and 17.04 individuals/inch² were recorded on cucumber plants planted at the shortest space (20 cm between hills) in the two seasons, respectively. On the other extreme, the lowest level of infestation with *T. urticae* movable stages on cucumber plants occurred on the plants sown at the longest space (40 cm), recording 6.22 and 4.42 individuals/inch² for the two seasons, respectively.

For the planting space (30 cm) between plants, an intermediate infestation was recorded, as the whole seasonal mean numbers were 10.31 and 9.59 individuals /inch² in the two seasons, respectively.

The general mean counts of *T. urticae* movable stages for the two seasons together indicated that the closest planting space (20 cm) associated with the heaviest infestation rate 19.04 individuals/inch², while cucumber plants in the largest space (40 cm) infested by the lowest rate of *T. urticae* 5.32 individuals /inch².

Effect of planting dates and spaces on the infestation of cucumber varieties

Table (2): Effect of planting space on the population of *Tetranychus urticae* movable stages on cucumber plants during 2015 and 2016 seasons at Qaliobia governorate.

Planting space	Mean no. of movable stages /inch ² /season		
	2015	2016	Grand mean
20 cm	21.03a	17.04a	19.04
30 cm	10.31b	9.59b	9.95
40 cm	6.22c	4.42c	5.32
L.S.D. at 0.05	2.70	1.23	-

Means followed by the same letter in each column are not significantly different at 0.05 level.

Obtained results are agreement with those recorded by Wnuk and Wiech (1996), Abd El-Malak and Salem (2002) and Emam *et al.* (2006), as they recorded that the largest sowing space harboured significantly the lowest seasonal mean number of pests.

3- Effect of cucumber varieties:

Data in Table (3) show that the differences in infestation rates by *T. urticae* movable stages to the tested cucumber varieties during 2015 and 2016 seasons, regardless the effect of planting dates and spaces. There were significant differences between the tested cucumber varieties in the infestation rates by *T. urticae* movable stages. The obtained data on *T. urticae* movable stages abundance throughout 2015 and 2016 seasons, clearly show higher infestation rates occurred on Prince variety which was infested by 16.03 and 14.50 individuals/inch² for the two seasons, respectively. El-Nemse variety was less infested, as they harboured 12.25 and 10.42 individuals /inch² for the two seasons, respectively. While, Al-Zaeim variety was the least infested showing a seasonal mean 9.27 and 6.12 individuals /inch² for the two seasons, respectively.

The general mean counts of *T. urticae* movable stages for the two seasons together indicated that the studied varieties may categorized to three groups, the high

infestation by *T. urticae* movable stages, which represented by Prince variety (15.27 individuals /inch²), the moderately infestation rate contributed with El-Nemse variety (11.34 individuals /inch²) and low infested variety, which observed in Al-Zaeim (7.70 individuals /inch²). These results are in agreement with that obtained by Ahmed (1994), Hanafy (2004), Gameel and Abd El-Gaid (2007), Amro (2008) and El-Lakwah *et al.* (2010).

4- The interaction effects of planting dates, planting spaces and cucumber varieties on the population density of *T. urticae* movable stages infesting cucumber plants:

Data in Tables (4 and 5) clearly showed that the effect of the three variables on the population density of *T. urticae* movable stages during seasons, 2015 and 2016. Data in Table (4) indicate that, the highest population densities of the pest were recorded on (Prince variety) 37.03, 19.05 and 15.72 individuals /inch² with the planting date (May, 15th) and spaces (20, 30 and 40 cm), respectively. While, the lowest numbers of the pest were recorded on (Al-Zaeim variety) 7.82, 3.14 and 1.08 individuals /inch² during the planting date (March, 15th) and spaces (20, 30 and 40 cm), respectively.

Effect of planting dates and spaces on the infestation of cucumber varieties

Table (3): Effect of cucumber varieties on infestation rates by *Tetranychus urticae* movable stages during 2015 and 2016 seasons at Qalibia governorate.

Variety	Mean no. of movable stages /inch ²		
	2015 season	2016 season	Grand mean
Al-Zaeim	9.27c	6.12c	7.70
EI-Nemse	12.25b	10.42b	11.34
Prince	16.03a	14.50a	15.27
L.S.D. at 0.05	2.11	2.05	-

Means followed by the same letter in each column are not significantly different at 0.05 level.

Table (4): Combined effect of planting dates, spaces and cucumber varieties on the population density of *Tetranychus urticae* movable stages /inch² infesting cucumber plants during 2015 season at Qalibia governorate.

Planting date	Mean no. of movable stages /inch ² /season									Aver.
	Al-Zaeim			EI-Nemse			Prince			
	20cm	30cm	40cm	20cm	30cm	40cm	20cm	30cm	40cm	
Mar., 15 th	7.82	3.14	1.08	10.56	6.04	3.10	13.22	9.15	5.44	6.62
Apr., 15 th	16.35	6.27	3.15	19.12	9.32	5.23	24.15	11.34	9.20	11.57
May, 15 th	27.76	12.79	5.10	33.26	15.69	7.96	37.03	19.05	15.72	19.37
Total	51.93	22.20	9.33	62.94	31.05	16.29	74.40	39.54	30.36	37.56
Average	17.31	7.40	3.11	20.98	10.35	5.43	24.80	13.18	10.12	
	9.27			12.25			16.03			12.52

L.S.D. at 0.05 = 1.05

Table (5): Combined effect of planting dates, spaces and cucumber varieties on the population density of *Tetranychus urticae* movable stages /inch² infesting cucumber plants during 2016 season at Qalibia governorate

Planting date	Mean no. of movable stages /inch ² /season									Aver.
	Al-Zaeim			EI-Nemse			Prince			
	20cm	30cm	40cm	20 cm	30cm	40cm	20cm	30cm	40cm	
Mar., 15 th	5.55	2.13	0.36	7.65	3.10	1.23	12.72	6.15	4.11	4.78
Apr., 15 th	9.11	4.22	1.70	15.33	6.83	3.16	20.56	10.67	6.43	8.67
May, 15 th	18.46	9.67	3.88	28.62	19.50	8.36	35.33	24.01	10.52	17.59
Total	33.12	16.02	5.94	51.60	29.43	12.75	68.61	40.83	21.06	31.04
Average	11.04	5.34	1.98	17.20	9.81	4.25	22.87	13.61	7.02	
	6.12			10.42			14.50			10.35

L.S.D. at 0.05 = 1.20

Effect of planting dates and spaces on the infestation of cucumber varieties

In the second season, 2016, data in Table (5) clearly indicated that, the same trend of results was observed. The highest infestation rate was recorded on leaf samples picked from cucumber plants (Prince variety) planted at the shortest space (20 cm) during the planting date (May, 15th), as they infested by 35.33 individuals /inch² followed by plants cultivated with the same variety and distance in the planting date (April, 15th) with mean number of 20.56 individuals /inch². The lowest seasonal mean count 0.36 individuals /inch² was counted on cucumber plants (Al-Zaeim variety) sown at the longest space (40 cm) during the earliest planting date (March, 15th). Highest infestation levels generally occurred on cucumber plants (Prince variety) planted at the shortest planting space (20 cm) during last planting date (May, 15th) than the other tested treatments. In general, the rate of infestation by *T. urticae* movable stages on cucumber plants varied according to planting dates, spaces and varieties in the two investigated seasons.

REFERENCES

- Abd El-Malak, V. S. G. and A. A. Salem (2002). Influence of planting spaces and hybrid on the population of six arthropods attacking sweet potato plant. *Annals Agric. Moshtohor*, 40 (3): 1797-1806.
- Ahmed, M.A. (1994). Differences in susceptibility of six cucumber cultivars to infestation by *Aphis gossypii* Glov., *Tetranychus urticae* and *Bemisia tabaci* as correlated to protein and amino acid contents of leaves. *Ann. Agric. Sci. Moshtohor*, 32 (4): 2189-2194.
- Albuquerque, G. S. (1993). Planting time as a tactic to manage the small rice stink bug, *Oebalus poecilus* (Hemiptera : Pentatomidae) in Rio Grande do Sul, Brazil-Crop Protection, 12 : 627-630.
- Ali, A.A., I.A. Razoki and A.S. Rajeb (1986). Influence of planting date and crop variety on infestation with some spring cucurbit pests. *Allnta JUAI-Nabati*, 5(2): 37-52.
- Amro, M. A. R. M. (2008). Population fluctuation of certain arthropod pests inhabiting selected cucurbit varieties and their resistance status to the main sap sucking pests. *Egypt. J. Agric. Res.*, 86 (2): 697-709.
- El-Khayat, E.F., F.A. El-Lakwah, G.H.H. Rady, Mona M.A. Ghallab and B.S. Wahba (2010). Impact of planting dates on infestation of cowpea plants with some pests. *Egypt. J. Agric. Res.*, 88(4): 1107-1120.
- El-Lakwah, F. A., E. F. El-Khayat, G. H. H. Rady, Mona M. A. Ghallab and B. S. Wahba (2010). Impact of varieties on infestation of common bean plants with pests. *Egypt. J. Agric. Res.*, 88 (4): 1121-1140.
- El-Saeidy, E.M.A., A.M.M. Abou-Zaid and A.M.H. Maklad (2012). Evaluation of the susceptibility of two kidney bean cultivars to the infestation of the two-spotted spider mite and some sap-sucking insects and their relations with some abiotic factors. *Journal of Applied Science Research*, 8(11): 5543-5543.
- Emam, A. K., M. F. A. H. Hegab and M. A. M. Tantawy (2006). Effect of planting space and date on the population densities of certain insect pests infesting sweetpea plants at Qalyobia Governorate. *Ann. Agric. Sci.*, Moshtohor, 44 (1): 299-308.
- Faris, F.S., Nadia H. Habashy and Iskandar, Aida K.F. (2004). Relation-ship between infestation with different stages of the spider mite, *Tetranychus urticae* Koch on fifteen tomato varieties and plant age with special reference to vegetative and yield physical characters. *J. Agric. Sci. Mansoura Univ.*, 29(6):3567-3579.
- Farrag, A.M.I., M.L. Wahba and M.A. Abdel-Hafez (1982). Effect of planting date on the population fluctuation of *Tetranychus urticae* on some cucurbitaceous plants at

Effect of planting dates and spaces on the infestation of cucumber varieties

- Qaluobia province. Agric. Res. Rev., 60(1): 107-116.
- Gameel, S.M.M. and M. A. Abdel-Gaid (2007). Relative susceptibility of three cucurbit vegetables to the infestation *Epilachna chrysomelina* F. (Coleoptera: Coccinellidae) at the New Valley- Egypt. The 1st International Conference on Desert Cultivation, 27-29 March, Minia Univ., 85-90.
- Ghallab, M.M., N.H. Habashi, A.K.F. Iskandar and M.A. Rizke (2011). Sensitivity of four cucumber cultivars to some piercing sap sucking pests infestation and their impact on yield. Egyptian J. of Agric. Res., 89 (4): 1363-1371.
- Hanafy, A. R. I. (2004). Studied on the most important cucumber pests in the open field and suitable control programs. Ph. D. Thesis., Fac. Agric. Moshtohor, Zagazig Univ., 279 pp.
- Hoffmann, M.P. and A.C. Frodsham (1993). Natural enemies of vegetable insect pests. Integrated Pest Management Cooperative Extension, Cornell Univ., Ithaca, NY.63 pp.
- Maklad, A. M. H., S.M. Abolmaaty, M.K. Hassanein and N. Y. Abd El-Ghafar (2012). Impact of Type of Greenhouse Cover Sheets on Certain Major Cucumber Pests under Protected Cultivation. New York Science Journal, 5(7): 19-24.
- Metwally, E.M., S.S.M. Hassanein and A.F.E. Afsa (1994). Effect of planting date on the population abundance of certain leaf pests infesting some vegetable crops at Gemmeza region, Egypt. Egypt. J. of Agric. Res., 72(4):977-988.
- Miqdadi, G.H.M. (1989). Studies on insect pests, mites and fungal diseases on cucumber grown under plastic houses in the central Jordan. Amman (Jordan), 63 p.
- Mohamed M. A. (2011): Effect of planting dates on infestation with certain pests and yield parameters of squash plants. Egypt. J. Agric. Res., 89(4): 1353-1362.
- Rizk, G. A., E. A. Mofteh, G. A. Karaman and A. A. Abdel-Naby (1990). Effectiveness of different planting dates on the population density of some sucking pests attacking soybean plants in Minia region. Assiut J. Agric. Sci., 21 (3): 141-151.
- SAS Institute (2003). SAS version 9.1. SAS Institute Inc, Cary, NC, USA.
- Sayed, A.A. and S. M.M. Gameel (2008). Effect of some vegetable cucurbit crops and seasonal plantation on the population densities of *Epilachna chrysomelina* F. (Coleoptera: Coccinellidae), at the new valley- Egypt. Egyptian J. Agric. Res., 86 (3): 1053-1060.
- Shalan, H.S. (2016). Effect of planting dates on infestation with certain pests and yield of cucumber plants during fall plantation in Giza governorate. Egypt. Acad. J. Biolog. Sci., 9(2): 23-31.
- Van Emden, H, F. (1977): Pest control and its ecology, Publisher Ltd, London 59 pp.
- Wnuk, A. and K. Wiech (1996). The effect of spacing, date of sowing and intercropping on the occurrence of pea pests. Roczniki, Nauk. Rolniczych, Seria E., Ochrona Roslin, 25(1/2): 9-14.

تأثير مواعيد ومسافات الزراعة على إصابة أصناف نباتات الخيار بالعنكبوت الأحمر ذو البقعتين

***Tetranychus urticae* Koch**

منى عبد الحميد محمد ، مسعود رشاد الأعصر، عبد الرؤوف أحمد محمد مراد

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

الملخص العربي

أجريت هذه الدراسة لمعرفة تأثير كل من : مواعيد الزراعة (15 مارس ، 15 أبريل ، 15 مايو) وثلاث مسافات للزراعة (20، 30، 40 سم بين الجور علي الخط) وثلاث أصناف للخيار (الزعيم، النمى، برنس) علي الكثافة العددية للعنكبوت الأحمر ذو البقعتين خلال موسمي 2015 و2016 في منطقة مشتهر بمحافظة القليوبية وذلك عن طريق الفحص الميكروسكوبي للاوراق .

أوضحت النتائج أن الثلاث عوامل المختبرة لها تأثير في تحديد درجة الإصابة بالعنكبوت الأحمر. كما أظهرت نتائج الدراسة أن الكثافة العددية للعنكبوت الأحمر قد تأثر معنوياً بكل من مواعيد ومسافات الزراعة والأصناف المختبرة منفصلين كلا منه علي حدي وكذلك بالتأثير المشترك لكل من العوامل الثلاث مجتمعين. حيث أظهرت النتائج أن زراعة نباتات الخيار في الميعاد المبكر (15 مارس) أدي الي إصابتها بأقل عدد معنوي للعنكبوت الأحمر (6,62 ، 4,78 فرد/بوصة مربعة) للموسمين علي التوالي. وكذلك أثرت مسافات الزراعة تأثير معنوي علي إصابة نباتات الخيار بالعنكبوت الأحمر حيث سجل أقل تعداد (6,22، 4,42 فرد/بوصة مربعة) للموسمين علي التوالي علي نباتات الخيار المنزرعة علي مسافة 40 سم. كما أظهرت النتائج أن صنف الزعيم كان أفضل الأصناف حيث كان الأقل في مستوي الإصابة بالعنكبوت الأحمر (9,27، 6,12 فرد/بوصة مربعة) للموسمين علي التوالي.

ثبت من دراسة التأثير المشترك بين مواعيد ومسافات الزراعة والأصناف أن العنكبوت الأحمر قد تأثر بكل من الثلاث عوامل مجتمعين حيث سجل أقل تعداد معنوي للعنكبوت الأحمر في صنف الزعيم من نباتات الخيار المنزرعة علي أكبر مسافة (40 سم) في الميعاد الأول (15 مارس) وهو (1,08، 0,36 فرد/بوصة مربعة) للموسمين علي التوالي، بينما سجل صنف برنس من نباتات الخيار المنزرعة علي أقل مسافة (20 سم) في الميعاد الأخير (15 مايو) أعلي تعداد معنوي للعنكبوت الأحمر (37,03، 35,33 فرد/بوصة مربعة) للموسمين علي التوالي.

