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Factors Affecting The Population Density of The Two-Spotted Spider Mite,Tetranychus Urticae Koch on Cucumber Plants in Sohag Governorate.

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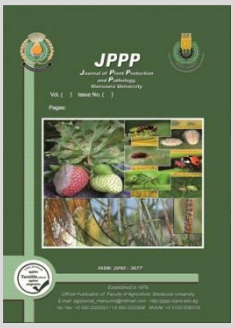

ABSTRACT

The population abundance of the two-spotted spider mite, Tetranychus urticae that infest cucumber plants in upper-Egypt was investigated during spring plantations of 2015 and 2016 season. Data showed that the population of the spider mite population varied in its density during the entire season of both seasons with a peak number occurrence the end of season (May 30), when plant age was 90 day-old when temperature and relative humidity were in moderate levels. Also, this study revealed that the cucumber plants highly impacted by the pest in addition to the few number of predators were observed during these seasons. The abiotic factors, e.g. temperature, relative humidity, and the plant age, more likely to induce the infestation than the biotic factors (predators). Accordingly, further studies are needed to examine the factors affecting the population of this pest. This study may be useful for determining the timing of the control program for T. urticae that infest cucumber plants during spring plantations.

Keywords: Tetranychus urticae, cucumber plants, spring plantations, temperature, relative humidity.

INTRODUCTION

Cucumber, Cucumis sativus L is one of the most delicious vegetable crop in Egypt. This crop is used for local consumption and export. The total cucumber production in Egypt was about 488.723 tons (FAO, 2019).

Cucumber plants are liable to be infested by many phytophagous pests (e.g., the cotton aphid, Aphis gossypii (Glover); the whitefly, Bemisia tabaci (Genn.), the onion thrips; Thrips tabaci (L.), and the two-spotted spider mite, Tetranychus urticae Koch (Karaman *et al* ., 2007; Ghallab *et al* ., 2011 and Shalaby *et al* ., 2013) . Tetranychus urticae is one of the most serious pests that infest a wide range of plants worldwide, about 1200 plant species (Abdel Rahman & Fouly , 2001 and Zhang, 2003) . In Egypt, T. urticae considers one of the most significant pest attacking the different parts of cucumber plants (vegetative, flowering and fruiting). The ecology of T. urticae has been studied by Abou El-Saad and Embarak (2009); Shalaby *et al* . (2013); Abou El-Saad (2015) and Abo-El maged *et al* . (2020). The relation between predators and phytophagous pests on cucurbit plants in different plantation times has been also studied by many investigations (El-Maghraby *et al* ., 1994 ; Amor, 2008 and Gameel, 2013). The use of chemical control on the mite pests on cucumber plants is inefficient due to the behavior of its motile stages in escaping by using the surfaces of the abnormal leaves as a shelter. Therefore, cultural control is recommended to regulate mite pest population. The planting data in linkage with the weather factors is among the which main effect that could affect on the pest enumeration (Leite *et al* ., 2003 and Abo - El maged *et al* ., 2020) .Therefore , the current study was conducted to examine the impact of weather factors, plant age and plant height levels on the population density of the mite pest on cucumber plants during spring plantation.

MATERIALS AND METHODS

The present study was conducted at the experimental farm of the Faculty of Agriculture (Al-Kawamil city), Sohag University during two successive spring seasons of 2015 and 2016. An area of about quarter feddan (1050 m²) was spilt into 100 plots (each was 3 × 3.5m). The spring plantations were cultivated on March 1 of both years. Normal agricul

tural practices free from pesticides treatment were followed. Sampling started two weeks after planting data, and continued fortnightly until harvest. Nine cucumber leaves from five randomized chosen plots of different sides with three replicates at three plant levels (top, middle and bottom) were taken fortnightly leaves were put in tightly closed paper bags labeled with necessary informations, then translocated into the laboratory for examination by using stereoscopic binocular microscope of 40-100 times magnification force. The number of Tetranychus urticae motile stages were counted and recorded. Temperature (°C), (max. and min.) and relative humidity (%) max and min were obtained from the meteorological station of the experimental farm of the Faculty of Agriculture , Sohag University .

Simple correlation co-efficient (r) was calculated in order to study the effect of weather factors , plant age and plant levels on the population density of the two-spotted spider mite, Tetranychus urticae motile stages on cucumber plants during the spring planations of both years (2015 and 2016).

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RESULTS AND DISCUSSION

In general , the current study showed that the number of days from the date of cucumber planting to harvest took about 90 days in spring plantations during the two studied years (2015 and 2016) in Al-Kawamil city , Sohag Governorate . The population fluctuations of T. urticae motile stages are given in Table (1).

The first occurrence of the pest was recorded in March 16th , when age of the plant was 16 day-old. The mite density begin with relatively high abundance 96.70 individuals / 9 plant leaves (2015) and 120.96 individuals / 9 leaves (2016) , and increased gradually by the end of the month (March 30) and recorded 123.9 individuals (2015) and 132.9 individuals.(2016) , when max. and min. Temperature and relative humidity were 25 , 14 °C ; 38, 22 %R.H. (2015) and 25, 11 °C and 55 , 15 % R.H. (2016).

Then, the numbers of the pest were fluctuated until the end of spring season (May 30) in both years, with an average number of 280.9 individuals / 9 plant leaves at max. and min. temperature of 32 and 19 °C ; 36 and 15 % R.H. (2015 season).In 2016 season , the number was 286.8 individuals / 9 plant leaves at 35 and 19 °C; 45 and 10 % R.H. (Table 1) .

Table 1. Population fluctuations of *T. urticae* motile stages on cucumber plant in spring plantations of 2015 and 2016 seasons

Sampling date		Mean No. of mites /9leaves	Temperature (°C)		Relative humidity (%)	
			Max.	Min.	Max.	Min
2015	March 15	96.7	25	12	50	18
	March 30	123.9	25	14	38	22
	April 15	150.65	24	11	45	13
	April 30	171.4	36	21	42	8
	May 15	201.7	35	18	34	7
	May30	280.9	32	19	36	15
2016	March 15	120.96	23	11	48	19
	March 30	132.9	25	11	55	15
	April 15	149.1	32	16	35	11
	April 30	174.5	35	17	24	6
	May 15	211.2	43	26	12	4
	May30	286.8	35	19	45	10

Data in Table (2) showed the correlations (r) between the pest population recovered from the three plant levels of cucumber in spring plantations of 2015 and 2016 seasons with Temperature and relative humidity (max. and min.). Highly significant positive correlations were recorded between the pest population on the three plant levels (top , middle ,bottom) and temperature (max. and min.), where r =0.974 , 0.974 , 0.972 , 0.980, 0.980 , 0.980 during spring plantations of 2015 season , respectively . Whereas the relationship with R.H.% ,were highly significant negative with max. R.H. (r = -0.94 , -0.94, -0.94) on the three plant levels ,and negative significant ones with min. R.H. (-0.77, -0.77, -0.76) on the three plant levels of spring plantations 2016 season, respectively. The same trend of results was also found with few differences in 2016 spring season.

Table 2. Simple correlation coefficients (r) between number of *T. urticae* (motile stages) on three cucumber plant levels and the temperature , relative humidity in spring plantations of 2015 and 2016 seasons

factors	No. of mite /9 leaves					
	2015			2016		
	Top leaves	Middle leaves	Bottom leaves	Top leaves	Middle leaves	Bottom leaves
Max. Temp	0.974**	0.974**	0.972**	0.926**	0.924**	0.918**
Min. Temp	0.980**	0.980**	0.980**	0.978**	0.977**	0.974**
Max R.H	-0.940**	-0.940**	-0.940**	-0.753**	-0.748*	-0.739*
Min R.H	-0.770*	-0.770*	-0.760*	-0.815**	-0.812**	-0.803**

*** Correlation is highly significant at the 0.05 level .**
**** Correlation is significant at the 0.01 level .**

In general, the population of T. urticae was very high on cucumber plant in spring season, probably because the weather conditions during spring plantations, since temperature was relatively low during spring as compared with that of summer. The current findings are in agreement with those obtained by Karimi *et al*. (2006); Abdel El-Wahed and El-Halawany (2012); Riahi *et al* .(2013); and Abo-Elmaged *et al*. (2020). Also, the current results are in consistence with those obtained by Abou El-Saad and Emberak (2009), who found that T. urticae had only one peak on cucumber plants during the third week of April. On the other side, Shalaby *et al*. (2013) noted that the population of T. urticae on cucumber plants was higher in the earlier plantations than the later one.

From this study, it can be concluded that the two-spotted spider mite, T. urticae is a very serious pest that infest Egyptian cucumber plants. Our results revealed that the pest started to attack younger plants (15 day-old). Abiotic factors, for example, temperature and relative humidity, as well as plant age, may contribute in reducing infestation more than other biotic factors (predators). Accordingly, further studies are needed to investigate other factors that might affect the population of this pest. It is recommended to control weeds before planting both in and around the fields as they are the main source of infestation, and we can benefit from this study by determining the timing of the control program for the two-spotted spider mite infesting cucumber plantsduring this period.

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العوامل المؤثرة على كثافة تعداد اكاروس العنكبوت الاحمر ذو البقعتين على نباتات الخيار بمحافظة سوهاج

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تمت دراسة الوفرة العددية لاكاروس العنكبوت الأحمر ذو البقعتين، Tetranychus urticaeالذي يصيب نباتات الخيار في صعيد مصر خلال مزارع الربيع لموسم 2015 و 2016. أظهرت النتائج المتحصل عليها أن كثافة العنكبوت قد تذبذبت في كثافتها خلال الموسم بأكمله من كلتا السنتين المدروستين مع حدوث ذروة في نهاية الموسم (30 مايو) ، عندما كان عمر النبات 90 يومًا عندما كانت درجة الحرارة والرطوبة النسبية في مستويات معتدلة.كما أظهرت الدراسة الحالية أن نباتات الخيار تأثرت بشدة بالآفة بالإضافة إلى قلة عدد المفترسات التي لوحظت خلال هذا الموسم. من المحتمل أن تلعب درجة الحرارة والرطوبة النسبية ، بالإضافة إلى عمر النبات ، دورًا مهمًا في الإصابة بخلاف العوامل الحيوية (الحيوانات المفترسة) ، وبالتالي يلزم إجراء مزيد من الدراسات لإعداد وتأكيد العوامل الرئيسية التي تؤثر على مجتمع هذه الآفة. هذه الدراسة مفيدة لتحديد توقيت برنامج المكافحة لعثة العنكبوت ثنائية النقط Tetranychus urticae التي تصيب نباتات الخيار خلال مزارع الربيع.