

EFFECT OF SOME ENVIRONMENTAL FACTORS ON SEASONAL ABUNDANCE OF SOME COTTON PESTS AT SHARKIA GOVERNORATE, EGYPT

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Abstract

The present work was carried out to study the effect of both temperature and relative humidity on the two spotted spider mite, *Tetranychus urticae* Koch, *Aphis gossypii* and *Thrips tabaci* (Lind) which infesting cotton, *Gossypium hirsutum* L. at three districts, Abo Kabeer, Belbais and Diarb Nigm in Sharkia Governorate, during the two seasons 2005 & 2006. The obtained data could be summarized as follows:

1. In both seasons, the population of *Tetranychus urticae* showed two peaks at three districts, recording a highly infestation on the crop at Belbais than that at Abo Kabeer and Diarb Nigm.
2. In both seasons the population of *T. tabaci* has a one peak at three districts recording 2 highly infestation on the crop at Belbais than the other two districts.
3. The Aphid *Aphis gossypii* recorded two peaks in both the growing seasons at three districts, showing a highly infestation on the crop at Belbais and Diarb-Nigm than that at Abo-Kabeer.
4. Statistical analysis of the obtained data introduced significant and highly significant correlation coefficient between the population of the two pests *T. urticae* and *Thrips tabaci* and both climatic factors and no significant correlation between the population and mean relative humidity except a significant negative correlation between *Thrips tabaci* during both seasons at Belbais and *T. urticae* during second season at it district.
5. No significant correlation coefficient between the population of the *Aphis gossypii* and both climatic factors, except a significant negative difference between *A. gossypii* with maximum temperature at the second season at Diarb Nigm.

INTRODUCTION

The future of cotton industry in Egypt depends on the competitiveness in the world market and its profitability to produce those demands compasses.

Arthropod predators of insects, mites and the spiders are considered the elements, for minimizing the population of different pests therefore its necessary to follow up the status of different sucking pests during the growing season to gain more information concerning the population trend of these pests and their natural enemies which play an important role in biological control of certain sucking pests attacking cotton plants and will be useful for an enlightened integrated control. It has long

recognized that plants and their pests are greatly influenced by climate and modified by weather.

Luo and Shen (1985) conducted a computer model which simulates the population dynamics of *Aphis gossypii* on cotton. Al-Faisal and Kardou (1986) showed that *Thrips tabaci* had population peaks in early may and at the end of June. Broza (1986) found that, there was an outbreak of the aphid *Aphis gossypii* in cotton field in Israel at the end of 1983 and throughout the 1984 season.

Ecological studies and weather factors of sucking pests of cotton plants at present were investigated Layton *et al.* (2001), Taha *et al.* (2001), Sirjani and Arbabi (2005) and El-Naggar and B. Jehan (2006). Thus the present authors thought to study different sucking pests inhabiting that crop.

The present work aims to carried these population fluctuation of the main sucking pests infesting cotton during the two seasons 2005-06 at Abo-Kabeer, Belbais and Diarb Nigm districts, Sharkia Governorate, The effect of temperature and relative humidity on the main sucking pests were subjected to this study.

MATERIALS AND METHODS

1. Experiment design

An experiment was carried out on cotton, *Gossypium hirsutum* L. at three certain districts, Abo Kabeer, Belbais and Dirab Nigm in Sharkia Governorate, during the two successive seasons 2005-06 to study the effect of temperature and relative humidity on *Tetranychus urticae* Koch, aphids *Aphis gossypii* and *Thrips tabaci* (Lind) on the population fluctuation of three latent pests. The experimental area was chosen and divided into three plots. Each plot equals 1/8 fedden (21×25 in.2). The border width was 60 cm between plots. The field was planted with cotton on March 1st during both seasons. Normal agricultural practices were followed and no pesticidal treatments were applied during the whole experimental period.

2. Population fluctuation of the latent pests

Sample is randomly collected from diagonals of the inner cotton area of each experimental plot. For counting latent pests, 50 leaves were sampled for tonight intervals from each plot through different levels of the plant. The upper and lower surfaces of the leaf were examined carefully (Hassanein *et al.*, 1971).

The obtained data were statistically analyzed according to computer program Costat (2005) to show the influences of temperature and relative humidity on population density of the tested pests, and using the simple correlation between the latent pests as affected by temperature and relative humidity. Also, the correlation between the latent pests was tested.

RESULTS AND DISCUSSION

Data presented in Table (1-3) show the population fluctuation of the main sucking pests infesting cotton, simple correlation between them with temperature and relative humidity (Table 4) show the correlation coefficient between the main sucking pests at the three districts Abo-Kabeer, Belbais and Diarb Nigm, Sharkia Governorate, during the two successive seasons 2005-06.

Population fluctuation studies

Relationships of population fluctuation of *Tetranychus urticae* Koch on cotton shown at the three localities (Abo- Kabeer, Belbais and Diarb- Nigm) influenced with temperature and relative humidity fluctuation during the periods of 2005 and 2006.

Population Density of *Tetranychus urticae*

I. Abo- Kabeer.

1. First season 2005

The mite species, *T. urticae* appeared for the first time on mid April, 2005 with a mean number of about 32.66 mites/leaf (Table 1, Fig. 1). The mean density increased gradually, showing the first peak in mid May. The maximum number was 134.66 mites / leaf. The mean density declined, reaching 22.33 mites/leaf at mid June, then the population increased, reaching its second peak at First July, after that decreased to reach 6.0 individual/leaf at mid September.

2. Second season 2006

The mite species, *T. urticae* appeared for the first time on mid April 2006 with a mean number of about 37.33 mites/leaf (Table 1, Fig. 4). The mean density increased gradually, showing the first peak in mid May, 2006. The maximum value was 115.33 mites/leaf. The mean density decreased gradually to 27.66 mites/leaf on mid June, and then the population increased, reaching its second peak at mid July, after that decreased to reach 7.0 individual/leaf at mid September.

I. Belbais

1. First season 2005

The mite species, *T. urticae* appeared for the first time on mid April 2005 with a mean number of about 77.3 mites/leaf (Table 1, Fig. 1). The mean density increased gradually, reaching the maximum peak 147.66 individual/leaf on mid May. The mean density declined abruptly to 19.66 mites/leaf on 15 June, and then it dropped to 5.66 mites/leaf at the end of the season (mid September).

2. Second season 2006

The mite species, *T. urticae* appeared for the first time on mid April, 2006 with a mean number of about 77.33 mites/ leaf (Table 1, Fig. 4). The mean density increased quickly, reaching the maximum number 147.0 mites/leaf on mid May, then declined abruptly to 24.0 mites/leaf in mid June, 2006 and being increased to reach the maximum second peak at mid July, 2006 reaching 6.0 individual / leaf. The number decreased slowly till (mid September) the end of the season.

I. Diarb –Nigm**1. First season 2005**

The mite species, *T. urticae* appeared for the first time on mid April, 2005 with a mean number of about 32.0 mites/leaf (Table 1, Fig. 1). The mean density increased gradually showing its peak, reaching the maximum value of 84.66 mites/leaf on mid May, 2005. The mean density decreased gradually to 16.33 mites/leaf on First July, and then the population increased, reaching its second peak at mid July, after that decreased to reach 5.66 individual/leaf September.

2. Second season 2006

The mite species, *T. urticae* appeared for the first time on first April, 2006 with a mean number of about 60.66 mites/leaf (Table 1, Fig.4). The mean density increased gradually, reaching a mean number of about 97.0 mites / leaf at mid May 2006 showing the first peak. The mean density declined abruptly to first June, then the population increased, reaching its second peak at mid July, after that decreased to reach 4.66 individual/leaf at mid September.

Relationship of population fluctuation of *Thrips tabaci* on cotton sown at the three localities (Abo- Kabeer, Belbais and Diarb-Nigm) influenced with temperature and relative humidity fluctuation during the periods of 2005 and 2006.

Population Density of *Thrips tabaci***I. Abo-Kabeer****1. First season 2005**

T. tabaci appeared for the first time on mid April, 2005 with a mean number 12.66 individual/leaf (Table2, Fig.2). The mean density increased quickly, reaching the maximum number 41.33 individual / leaf on first May 2005, then the mean density declined gradually to zero at the end of the season at mid September.

2. Second season 2006

T. tabaci appeared for the first time on mid April, 2006 with a mean number of about 64.33 individual/leaf (Table2, Fig.5). The mean density increased gradually, reaching the maximum peak recording individual/leaf on first May, 2006. The mean density declined gradually to zero at the end of the season at mid September.

I. Belbais**1. First season 2005**

The *T. tabaci* appeared for the first time on mid April, 2005, with a mean reaching the maximum value of 87.33 individual/leaf (Table2, Fig.2). The mean density decreased gradually to zero at mid August, then the mean density increased till the end of the season at mid September to reach 1.0 individual / leaf.

2. Second season 2006

The *T. tabaci* appeared for the first time on mid April, 2006 with a mean number of about 29.66 individual/ leaf (Table 2, Fig. 5). The mean density increased gradually forming a peak recording 47.0 individual/leaf at first May, then declined to reach 2.0 individual/leaf at mid July, 2006. The mean numbers increased to reach 3.66

individual/leaf at first August, then declined to 1.33 individual/leaf at the end of the season.

I. Diarb-Nigm

1. First season 2005

The population *T. tabaci* appeared for the first time on mid May, 2005 with a mean number of about 22.33 individual/leaf (Table 2, Fig. 2). The mean density increased quickly showing its peak, reaching the maximum number 86.0 individual/leaf on first May, 2005 After wards the mean density declined abruptly to reach 24.0 individual/leaf at mid May, then declined to zero at the end of the season.

2. Second season 2006

The population of *T. tabaci* appeared for the first time on mid April, 2006, with a mean reaching the maximum number 87.66 individual/leaf (Table 2, Fig. 5). The mean density declined abruptly to reach 21.33 individual/ leaf at mid May, the declined, reaching zero before the end and the end of the season at 1 and 15 September.

Relationships of population fluctuation of *Aphis gossypii* on cotton sown at the three localities (Abo-Kabeer, Belbais and Diarb-Nigm) influenced with temperature and relative humidity fluctuaton during the periods of 2005 and 2006.

Population Density of *Aphis gossypii*

I. Abo-Kabeer

1. First season 2005

The population density of *A. gossypii* appeared for the first time on mid April, 2005 with a mean number of about 24.33 individual/leaf (Table 3, Fig. 3). The mean density decreased slowly till mid June. After wards the mean density increased quickly, reaching the maximum value of 82.0 individual/leaf on mid July then declined abruptly to reach 47.0 individual/leaf on first August, 2005 and being increased to reach the maximum peak at mid August to record 53.0 individual / leaf. After that the number decreased abruptly till at the end of the season.

2. Second season 2006

The population *A. gossypii* appeared for the first time on mid April with a mean number of about 13.66 individual/leaf (Table 3, Fig. 6). The mean density increased gradually till on first May, then the mean decreased gradually to first June. After wards the mean density increased quickly forming a peak recording 104.0 individual/leaf at mid July then declined to reach 36.0 individual/ leaf at first August, 2006. The mean density increased gradually forming the second and the maximum peak at mid August, 2006 by 68.0 individual/leaf, then declined to 6.0 individual/leaf at the end of the season.

I. Belbais.

1. First season 2005

The mean density *A. gossypii* appeared for the first time on mid April, 2005 with a mean number of about 53.66 individual/ leaf (Table 3, Fig. 3). The mean density increased gradually forming its peak at first May recording 62.0 individual/leaf after

wards the mean density declined to 15.66 individual/leaf at first July, 2005 then the mean density increased quickly forming the second and the maximum peak at mid August recording 88.0 individual/leaf. After wards, the mean density declined gradually to 6.0 individual/leaf at the end of the season at mid September.

2. Second season 2006

The individual *A. gossypii* appeared for the first time on mid April, 2006 with a mean number of about 31.66 individual/ leaf (Table 3, Fig. 6). The mean density increased gradually, reaching the maximum value of 72.33 individual/leaf on mid May, then declined abruptly to 24.66 individual/leaf on first June, 2006 and being increased to reach the maximum peak at mid July recording 95.0 individual/leaf. After that the number declined abruptly to reach 34.33 individual/leaf on first August, then increased abruptly, reaching its maximum peak at mid August, recording 68.33 individual/leaf. After wards, the mean density declined abruptly to 5.33 individual/leaf at the end of the season.

I. Diarb-Nigm

1. First season 2005

The mean *A. gossypii* appeared for the first time on mid April, 2005 with a mean number of about 47.0 individual/leaf (Table 3, Fig.3). The mean density increased abruptly, reaching a mean number of about 69.66 individual/ leaf at first May, 2005 showing the first peak. After wards, the mean density declined abruptly reaching 39.66 individual/leaf at mid June, then the population decreased gradually to reach 22.0 individual/leaf at mid July. After wards, the mean density increased, reaching its second peak at first August. After that decreased to reach 9.0 individual/leaf at the end of the season on mid September.

2. Second season 2006

Individuals of *A. gossypii* appeared for the first time on mid April, 2006 with a mean number of about 73.66 individual/leaf (Table 3, Fig. 6). The mean density increased gradually but declined at first July, 2006 to reach about 22.33 individual/leaf, then the mean increased abruptly forming a peak recording 92.0 individual/leaf at mid July, the declined to reach 28.66 individual/leaf at first August, 2006. The mean numbers increased gradually forming the second and the maximum peak at mid August recording 42.33 individual/ leaf. The mean density decreased at the end of the season (mid September 2006) recording 8.33 individual / leaf.

Statistical analysis

The statistical analysis of correlation (Table 4) cleared that in the three localities where a significant negative correlation between *Tetranychus urticae* population infesting cotton in Abo-Kabeer and minimum temperature during the two seasons ($r = -0.682$), (-0.618), respectively. While the correlation was highly significant negative with maximum temperature during the second season ($r = -0.750$). The correlation was insignificant with mean relative humidity during the two seasons. The combined effect was 64.256 % and 75.420 % for both seasons, respectively.

There were highly significant negative correlation between *Tetranychus urticae* population infesting cotton in Belbais and minimum temperature during the first season ($r = -0.808$). Also there were significant negative correlation between the mite population and both maximum temperature ($r = -0.710$) and minimum temperature ($r = -0.695$) and the mean relative humidity ($r = -0.674$) during the second season. The combined effect was 71.527 % and 67.529 % for both seasons, respectively.

In the same trend, there were a significant negative correlation between *Tetranychus urticae* population infesting cotton in Diarb Nigm and minimum temperature during both seasons where $r = -0.680$ and -0.690 , respectively. Also, there was a highly significant negative correlation with maximum temperature during the second season ($r = -0.787$) while it was insignificant with other factor. The combined effect was 56.317 % and 64.895 % for both seasons, respectively.

The statistical analysis of correlation cleared that there were highly significant negative correlation between *Thrips tabaci* population infesting cotton in Abo-Kabeer and minimum temperature during both seasons where ($r = -0.775$) and ($r = -0.915$), respectively. Also, there were highly significant also negative correlation with maximum temperature during the second season ($r = -0.922$). The correlation was insignificant with relative humidity. The combined effect for both temperature and relative humidity was 68.224 % and 93.014 % for both seasons, respectively.

The data presented in Table (4) showed that the statistical analysis of correlation were highly significant negative correlation between *Thrips tabaci* population infesting cotton in Belbais and the maximum and minimum temperature during both seasons ($r = -0.886$) $r = -0.883$) and ($r = -0.955$), $r = -0.888$), respectively while the correlation was significant negative the two seasons. The combined effect was 87.082 and 95.395 for both seasons, respectively.

The same trend were found in Diarb Nigm between *Thrips tabaci* population infesting cotton and the minimum temperature during the first season ($r = -0.639$). The correlation was highly significant negative between *Thrips* population and both maximum and minimum temperature ($r = -0.838$) and ($r = -0.902$), respectively for both seasons, respectively. The combined effect was 46.249 % and 90.561 % for both seasons, respectively.

The statistical analysis of correlation cleared that there were in significant correlation between *Aphis gossypii* population infesting cotton in Abo-Kabeer and Belbais, also in Diarb Nigm there was significant negative between *Aphis gossypii* population and maximum temperature during second season. The combined effect was 12.642 % and 38.317 % for both seasons, respectively (Table 4).

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تأثير بعض العوامل البيئية على التذبذب الموسمي لبعض آفات القطن في محافظة الشرقية

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أجرى البحث لدراسة تأثير كل من الحرارة والرطوبة النسبية على الآفات (العنكبوت الأحمر والمن والترس) التي تصيب القطن في المناطق ابو كبير - بلبيس وديرب نجم، محافظة الشرقية، خلال الموسمين ٢٠٠٥ و ٢٠٠٦.

وتتلخص النتائج المتحصل عليها على النحو التالي:

- ١- كان لتعداد العنكبوت الاحمر قمتين في عامي الدراسة في الثلاث مناطق بالإضافة الى أن النوع اظهر أعلى إصابة على المحصول في بلبيس عن تلك في أبو كبير وديرب نجم خلال موسمي الدراسة وكانت منطقة ديرب نجم الأقل إصابة.
- ٢- كان لتعداد الترس قمة واحدة في عامي الدراسة في الثلاث مناطق وكانت في بداية الموسم بالإضافة الى أن النوع اظهر أعلى إصابة على المحصول في منطقتي ديرب نجم وبلبيس.
- ٣- كان لتعداد المن قمتين في عامي الدراسة في الثلاث مناطق بالإضافة الى أن النوع اظهر أعلى إصابة على المحصول في منطقة أبو كبير خلال الموسم الثاني.
- ٤- أوضح التحليل الاحصائي للنتائج المتحصل عليها وجود معنوية ومعنوية جدا لكل من الحرارة والرطوبة بالنسبة للعنكبوت الاحمر والترس، وغير معنوية بالنسبة للمن ماعدا الموسم الثاني في منطقة ديرب نجم حيث كانت معنوية بين المن والحرارة .

