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INCIDENCE AND SEASONAL ABUNDANCE OF PHYTOPHAGOUS AND PREDATORY MITES INHABITING SOYBEAN PLANTS IN RELATION TO SOME WEATHER FACTORS AT KAFR EL-SHEIKH

Magouz, R. I. E.[1]; M. H. Mowafi[2] and A. M. El-Shennawy[1]

1- Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza

2- Agricultural Zoology and Nematology Department, Faculty of Agriculture Al-Azhar-University

ABSTRACT

Field experiments were carried out to survey the mite species inhabiting soybean fields at Kafr El-Sheikh during three successive seasons; 2002, 2003 and 2004 as well as the seasonal abundance of the phytophagous mite and its relation to the predatory species and some weather factors (temperature and relative humidity).

The obtained results indicated existence 11 species of mites on soybean plants represented three groups; phytophagous, predatory and miscellaneous. *Tetranychus urticae* Koch (Family: Tetranychidae) was the only species belonging to the phytophagous mites. Seven species of the predatory mites were found in two families; stigmaeidae and phytoseiidae. *Stigmaeus* sp.; *Agistemus vulgaris* ((Soliman and Gomaa), *Agistemus exertus* (Gonzales) and *Stigmaeus rattus* (Gomaa and Rakha) were belonged to family stigmaeidae while *Phytoseius finitimus* (Ribaga), *Amblyseius swirskii* (Athias-Henriot) and *Amblyseius cucumeris* (Oudemans) were belonged to family phytoseiidae. *Stigmaeus* sp., *Agistemus vulgaris* formed a great portion of the population (34.62% and 30.77%, respectively), while *Phytoseius finitimus* and *Amblyseius cucumeris* composed the lowest portion by 3.85% each. Three species of miscellaneous mites belonging to two families were surveyed. *Tyrophagus putrecentiae* (Schrank) and *Rhizoglyphus robini* (Claparede) were belonged to family Acaridae, while *Tarsonemus meyerus* (Soliman and Kandeel) was belonged to family Tarsonimidae and every species represented 33.3% of the total population. Also, the results cleared that the population of *T. urticae* started to appear on soybean plants earlier than the predatory mites during the three study seasons. The highest population of *T. urticae* took place during July synchronizing with no or low numbers of predatory mites. Also, soybean plants significantly harbored the highest population of *T. urticae* during season of 2004 followed by season of 2002 and 2003.

The predatory mites and the two weather factors (temperature and relative humidity) affected insignificantly the population of *T. urticae* in the three study seasons. The combined effect of three factors on the population of *T. urticae* was more pronounced in season 2003, while lowest effect was found during season of 2004.

INTRODUCTION

Soybean, *Glycine max* (L.) is one of the most important legume crops all over the world, as it shares with about 30% of the total world production of edible oil and more than 60% of the world production of high protein meal. A great number of mite species (phytophagous or predatory) are found inhabiting soybean plants during the growing of the crop (Abraham and Kuroli, 2003).

The phytophagous mites are of the main pests infesting soybean plants causing a great damage and loss in yield (Taha *et al.,* 1995) as the injured plants mature early, produce smaller and wrinkled seeds (Poe, 1980). On the other side, the predatory mites are of the most important agents in suppressing the population of phytophagous mites in soybean fields (Yasin, 1997).

However, a survey of mites species on the crop may be carried out to study the distribution and abundance of these pests. Consequently, it can identify species of relatively high abundance and may show up seasonal patterns of occurrence. Also, the aim of a survey is to locate and map geographical distribution of any pest species (Dent, 1991).

So, this work was carried out to throw light on the incidence of mite species and seasonal abundance of the phytophagous and predatory mite species inhabiting soybean in relation to weather factors during three successive seasons at Kafr El-Sheikh.

MATERIALS AND METHODS

The experiment were carried out at Sakha Agriculture Research Station during three successive seasons; 2002, 2003 and 2004. An area of about ¼ feddan was chosen and divided into four plots. The soybean variety Giza 82 was sown on 5 May, 16 June and 26 June for 2002, 2003 and 2004 seasons, respectively. The normal agricultural practices were conduced without any pesticidal treatments throughout the growing season.

1.Incidence of mites species inhabiting soybean plants:

Infested soybean leaves with mites were collected from the three levels of the plants (lower, middle, and upper) and placed in paper bags, then tightly closed and transferred to laboratory. The mites were collected using a fine brush (0) and cleared with Nesbitt's solution. The individuals then, were mounted in a drop of Hoyer's medium on glass slides, gently heated to stretch them and to get rid of the air bubbles. Necessary taxonomical and ecological information were written on labels fixed on both ends of slides. Later, specimens were identified and classified into different groups and species by aid of Prof. Dr. Abdel-Sattar Mohamed Metwaly, Professor of Acarology of Agriculture Zoology and Nematology Dept., Faculty of Agriculture, Al-Azhar University. Terminology of identification was done according to the key of Krantz (1970) and Zaher (1986).

2.Seasonal abundance of phytopathougs and predatory mites on soybean:

Weekly samples of 10 leaflets were collected at random from every plot. The collected leaflets were kept in paper bags and transferred to the laboratory to count the motile stages of both phytophagous and predatory mites by the aid of binocular microscope.

3. Relationship between phytophagous mites and both predatory mites and some weather factors:

The daily records of temperature and relative humidity during the three study seasons (2002, 2003 and 2004) were obtained from the

Metrological Department at Sakha Agric. Res. Station. Weekly means of the two climatic factors were calculated during the week proceeding the sample dates. Weekly numbers of phytophagous, predatory mites and the corresponding weekly means of temperature and relative humidity were used to calculated the regression coefficient between predatory mites, the climatic factors and the population density of phytophagous mites in addition to its combined effect on the population of phytophagous mites according to Fisher (1950).

RESULTS AND DISCUSSION

1. Incidence of mites species inhabiting soybean plants:

The data in Table (1) indicated 11 species of mites on soybean plants representing three groups; phytophagous, predatory and miscellanceous mites. Only one species of phytophagous mites; *Tetranychus urticae* Koch (family: Tetranychidae) was found.

Seven species of predatory mites were existed in two families; Stigmaeidae and Phytoseiidae. *Stigmaeus* sp., *Agistemus vulgaris* (Soliman and Gomaa). *Agistemus exertus* (Gonzales) and *Stigmaeus rattus* (Gomaa and Rakha) were belonged to family Stigmaeidae while *Phytoseius finitimus* (Ribaga), *Amblyseius swirskii* (Athias-Henriot) and *Amblyseius cucumeris* (Oudemans) were belonged to family Phytoseiidae. *Stigmaeus* sp. and *Agistemus vulgaris* were the most dominant species of predatory mites forming a great portion o the population (34.623% and 30.77%, respectively), while *Phytoseius finitimus* and *Amblyseius cucumeris* composed the lowest portion by 3.85% each. The remained species could be arranged in a descending order as follows: *Agistemus exertus* (11.54%), *Stigmaeus rattus* (7.69%) and *Amblyseius swirskii* (7.69%).

Three species of miscellaneous mites belonging to two families were surveyed. *Tyrophagous putirescentiae* (Schrank) and *Rhizoglyphus robini* (Claparede) were belonged to family Acaridae, while only one species; *Tarsonemus meyerus* (Soliman and Kandeel) was belonged to family Tarsonimidae and every species was represented by 33.3% of the total population.

However, many investigators surveyed mites species on soybean plants. Yasin (1997) surveyed one family of phytophagous mite (Tetranychidae) and three families of predaceous mites (Phytoseiidae, Stigmaeidae and Tydeidae) on soybean plants at Menofia and Fayoum governorates. Abraham and Kuroli (2003) reported that *T. urticae* was the dominant mite species on soybean. Also, Ahmed, Malakah (2004) surveyed eight species of predatory mites on soybean plants belonging to five families (Phytoseiidae, Stigmaeidae, Laelapidae, Asicade and Tydeidae). She also surveyed two species of phytophagous mites (*T. urticae* and *T. cucurbitacearum*) belonged to family Tetranychidae.

Table (1): Mites species surveyed on soybean plants at Kafr El-Sheikh governorate during 2002 season.

Phytophagous mites			Predatory mites			Miscellanceous mites		
Family	**Species**	**%**	**Family**	**Species**	**%**	**Family**	**Species**	**%**
Tetranychidae	Tetranychus urticae	100	Stigmaeidae	*Stigmaeous* sp. *Agistemus vulgaris* *Agistemus exertus* *Stigmaeus rattus*	34.62 30.77 11.54 7.69	Acaridae	*Tyrophagus putrescentiae* *Rhizoglyphus robini*	33.33 33.33
			Phytoseiidae	*Amblyseius swirskii* *Phytoseius finitimus* *Amblyseius cucumeris*	7.69 3.85 3.85	Tarsonimidae	*Tarsonemus meyerus*	33.33

2. Seasonal abundance of *Tetranychus urticae* Koch and the predatory mites on soybean plants:

From the previous results, it was observed that *T. urticae* was the only species of phytophagous mites on soybean plants. So, its seasonal abundance and the associated predatory mites were determined throughout three growing seasons (2002, 2003 and 2004) Table (2).

During season of 2002, the population of *T. urticae* started with relatively high numbers (21.25 individuals/10 leaflets) on 13th July. The maximum number (38.13 individuals/10 leaflets) was recorded in the last week of July. The high number continued till the first week of August. After that, the population suddenly declined and fluctuated up and down till the end of the season. As for the predatory mites, the population began to appear with low number (0.13 individuals/10 leaflets) on 13th July and continued to fluctuate till 11th August. Then, the population rapidly increased till the end of the season recording the maximum population (9.13 individuals/10 leaflets) on 8th September.

In season of 2003 the results indicated that *T. urticae* population started to appear in the last week of June by 5.81 individuals/10 leaflets. Then, the population increased gradually recording its maximum number (31.94 individuals/10 leaflets) on 11th July and the relatively high number continued till the end of this month. Thereafter, the population suddenly decreased in the first week of August with a mean of 0.13 individuals and completely disappeared on 8th August. Then, the population started to appear again in low numbers on 14th August and increased gradually recording high number of 15.38 individuals at the end of season. The predatory mites began to appear at the end of July with low number (0.25 individuals/10 leaflets) and increased gradually reaching the highest number (7.69 individuals) in the first week of September.

Concerning season of 2004, the data revealed that the *T. urticae* started with high number (83.97 individuals/10 leaflets) in the fist week of July and recorded its peak on 11th July with a mean of 116.66 individuals/10

leaflets. Then, the population declined and completely disappeared on 8th August. The population began again to appear with low number in mid August and fluctuated till the end of the season. The predatory mites did not existed till 8th August, and started to appear in low number (0.31 individuals/10 leaflets) in mid August, then increased gradually to reach its maximum number (7.57 individuals/10 leaflets) on 12th September. Based on the seasonal mean, the results in Table (2) indicated that the highest number of *T. urticae* existed during seasons of 2004 (20.06 individuals) followed by season 2002 (12.45 individual), while the lowest population (9.47 individuals) was recorded during season 2003. From the mentioned results, it is obvious that the highest population of *T. urticae* took place during July synchronizing with no or low numbers of associated predatory mites. Also, the decline of population during August and September was coincided with an increase of the predatory mites. This results confirmed that the predatory mites play an important role in suppressing the phytophagous mites in soybean fields. These results agreed with the findings of Younes, Ahlam *et al.* (2001); Amer (2003); Ahmed, Alyat (2005) who found that the population of phytophagous mites recorded the highest number on soybean plants during July. Also, Ahmed, Malakah (2004) and Ahmed, Alyat (2005) reported that the predatceous mites recorded a peak of abundance on soybean plants during late August and September at Kafr El-Sheikh.

Table (2): Mean number of *Tetranychus urticae* Koch and predatory mites/10 leaflets of soybean plants during 2002, 2003 and 2004 season at Kafr El-Sheikh Governorate.

Inspection date	Season of 2002		Inspection date	Season of 2003		Inspection date	Season of 2004	
	T. urticae	Predatory mites		*T. urticae*	Predatory mites		*T. urticae*	Predatory mites
13/7	21.25	0.13	26/6	5.81	0.0	4/7	83.97	0.0
20/7	26.63	0.69	3/7	10.44	0.0	11/7	116.66	0.0
28/7	38.13	0.38	11/7	31.94	0.0	18/7	83.61	0.0
4/8	23.25	0.56	18/7	20.44	0.0	25/7	23.25	0.0
11/8	3.13	0.31	25/7	21.63	0.25	1/8	019	0.6
18/8	2.75	5.13	1/8	0.13	1.25	8/8	0.0	0.0
25/8	1.63	4.56	8/8	0.0	1.75	15/8	0.91	0.31
1/9	3.81	3.88	14/8	0.88	2.75	22/8	0.35	0.63
8/9	4.63	9.13	21/8	0.56	3.56	29/8	0.19	0.74
15/9	7.10	8.53	29/8	1.0	5.38	5/9	0.47	4.0
22/9	10.25	3.56	5/9	5.38	7.69	12/9	2.0	7.57
29/9	6.81	9.31	12/9	15.38	3.88	19/9	1.10	2.47
Seasonal mean	12.45	3.83	-	9.47	2.21	-	26.06	1.31

LSD at 5% between *Tetranychus urticae* throughout the three season, 2002, 2003 and 2004 was 5.982

LSD at 5% between predatory mites throughout the three season, 2002, 2003 and 2004 was 0.688

3. Relationship between *T. urticae* and each of predatory mites and some weather factors:

Data presented in Table (3) reveal the relationship between the population density of *T. urticae* and both the associated predatory mites and

the two weather factors (temperature and relative humidity) in soybean field during seasons; 2002, 2003 and 2004 at Kafr El-Sheikh Governorate. The relationship was insignificant and negative during the three tested seasons except relative humidity relationship in 2004 season, as it was positive. This means that each of temperature and relative humidity was within the optimal range for *T. urtiace* activity. The results cleared that the combined effect (expressed as a percentage of explained variance) of the predatory mites and the two weather factors on the population of *T. urticae* was more pronounced in season 2003 (42.2%) followed by season 2002 (38.6%) while, the lowest effect was found during season 2004 (19.4%). This means that there are many other unconsidered factors affecting the population of *T. urticae*.

These results agreed with the findings of Gamieh and El-Basuony (2001) who found a negative correlation between the population of predatory mites and the moving stages of spider mites in soybean fields. Ahmed Alyat (2005) found insignificant correlation between phytophagous mites and each of temperature and relative humidity on soybean plants during 2001 and 2002 seasons at Kafr El-Sheikh. Also, Magouz *et al.* (2006) found that the population density of phytophagous mites was insignificantly affected by the prevailing temperature and relative humidity in soybean fields during 2003 and 2004 seasons at Kafr El-Sheikh.

Table (3): Regression coefficient (b) and explained variance (%EV) between the population density of *Tetranychus urticae* and temperature, relative humidity and predatory mites on soybean plants during 2002, 2003 and 2004 season at Kafr El-Sheikh Governorate.

Factor	Season 2002		Season 2003		Seasons 2004	
	(b)	% EV	(b)	% EV	(b)	% EV
Temperature	-0.351		-2.013		-7.300	
Relative humidity	-0.884	38.60	-2.310	42.20	4.051	19.40
Predatory mites	-2.566		-2.144		-9.796	

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حصر لأنواع الآكاروسات والتذبذب الموسمى للأكاروسات النباتية والمفترسة على نباتات فول الصويا بكفرالشيخ

رفعت إبراهيم السيد معجوز[١] ، مصطفى حلمى موافى[٢] و أحمد محمود الشناوى[١]
١- معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى - الجيزه
٢- قسم الحيوان الزراعى والنيماتودا - كلية الزراعة - جامعة الأزهر

أجريت التجارب الحقلية في كفر الشيخ وذلك لحصر أنواع الأكاروسات في حقول فول الصويا خلال ثلاث مواسم متتالية ٢٠٠٢ ، ٢٠٠٣ ، ٢٠٠٤ بالإضافة إلى دراسة التذبذب الموسمي للأكاروس النباتى وعلاقته بأنوع الأكاروسات المفترسة وبعض العوامل الجوية (درجه الحرارة والرطوبة النسبية).

وقد أوضحت النتائج وجود ١١ نوع من الأكاروسات على نباتات فول الصويا تابعه لثلاثه مجاميع هى الأكاروسات النباتية ، الأكاروسات المفترسة ، الأكاروسات المتنوعة التغذية.

وقد وجد من الحصر وجود نوع واحد فقط من الأكاروسات النباتية هو العنكبوت الأحمر العادى *Tetranychus urticae* يتبع عائله *Tetranychidae* ، سبعة أنواع من الأكاروسات المفترسه تتبع عائلتين هما: *Stigmaeidae & Phytoseiidae* الانواع *Stigmaeus* sp., *Agistemus* exertus, *Agistemus vulgaris*, *Stigmaeus rattus* تتبع عائلة *Stigmaeidae* بينما الأنواع *Amblyseius swirskii, Phytoseius funitimus, Amblyseius cucumers* تتبع عائلة *Phytoseiidae* كما وجد من الحصر أن الأنواع *Agistemus vulgaris, Stigmaeus* sp. كانت اكثر الأنواع تعدادا حيث بلغت نسبتها٣٤,٦٢%، ٣٠,٧٧% علي التوالى ، بينما كانت الأنواع *phytoseius finitinus, Anblyseius cucumeris* أقلهم تعدادا وبلغت نسب كل منهما ٣,٨٥%. كما تم حصر ثلاثة أنواع من الأكاروسات المتنوعة التغذية تتبع عائلتين. النوعين *Tyrophagus putrescentiae, Rhizoglyphus robini* يتبعان عائله *Acaridae* بينما وجد نوع واحد فقط هو *Tarsonemus* meyerus يتبع عائلة *Tarsonimidae* وكانت نسبة تعداد كل نوع منهما ٣٣,٣%.

أيضا أظهرت النتائج أن العنكبوت الأحمر *T. urticae* بدأ فى الظهور مبكرا على نباتات فول الصويا بدرجة أكبر من الأكاروسات المفترسة خلال مواسم الدراسة وأن أقصى تعداد للأكاروس *T. urticae* كان خلال شهر يوليو والذى تزامن مع انخفاض فى التعداد أو عدم وجود أفراد من الأكاروسات المفترسة كما اوضح التحليل الاحصائى ان تعداد العنكبوت الاحمر كان اعلى بدرجة معنوية خلال موسم ٢٠٠٤ يليه موسم ٢٠٠٢، ٢٠٠٣ كما أظهرت النتائج أن تأثير الأكاروسات المفترسة والعوامل الجوية (درجة الحرارة ، الرطوبة النسبية) على تعداد الأكاروس *T. urticae* كان غير معنوى فى مواسم الدراسة الثلاثة وأن التأثير المشترك لهذه العوامل الثلاثة على تعداد الأكاروس *T. urticae* كان أكثر وضوحا فى موسم ٢٠٠٣ بينما كان أقل تأثيرا خلال موسم ٢٠٠٤.