EAJBS

A

EGYPTIAN ACADEMIC JOURNAL OF

BIOLOGICAL SCIENCES

ENTOMOLOGY

ISSN
1687-8809

WWW.EAJBS.EG.NET

Vol. 10 No. 7 (2017)

Egyptian Academic Journal of Biological Sciences is the official English language journal of the Egyptian Society for Biological Sciences, Department of Entomology, Faculty of Sciences Ain Shams University.

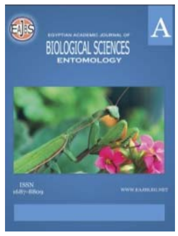
Entomology Journal publishes original research papers and reviews from any entomological discipline or from directly allied fields in ecology, behavioral biology, physiology, biochemistry, development, genetics, systematics, morphology, evolution, control of insects, arachnids, and general entomology.

www.eajbs.eg.net

Egypt. Acad. J. Biolog. Sci., 10(7): 117–125 (2017)

Egyptian Academic Journal of Biological Sciences
A. Entomology

ISSN 1687- 8809
www.eajbs.eg.net



Response of Some Cotton Varieties to Infestation of two Spotted Spider Mite, *Tetranychus urticae* Koch (Acari: Tetranychidae) and the Predator, *Euseius scutalis* (Athias-Henriot) El-Badry (Acari: Phytoseiidae) in Relation with Its Chemical Composition

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ARTICLE INFO
Article History
Received: 12/10/2017
Accepted: 12/11/2017

Keywords:
cotton verities
chemical composition
Tetranychus urticae
Amblyseius gossipi

ABSTRACT

Field studies were carried out to evaluate seven cotton varieties i.e. Giza 86, Giza 87, Giza 88, Giza 92, Giza 93, Giza 94 and Giza 96 for their liability to two spotted red mite, *Tetranychus urticae* Koch infestation and its associated predacious phytoseiidae mite, *Euseius scutalis* (Athias-Henriot) during 2014 and 2015 cotton growing seasons at two different Governorates; Sharkia and Kafr El Sheikh. Giza 86 was the most susceptible variety in Kafr El Sheikh during the two successive seasons, while in Sharkia Governorate, Giza 92 and Giza 96 were the most response to *T. urticae* infestation during 2014 and 2015 seasons, respectively. Results showed the populations of phytoseiidae, *E. scutalis*v aried according to the tested varieties and growing seasons. G. 94 proved the highest significant yield in Kafr El Sheikh during the two successive seasons, recording 7.57±0.47 and 13.07±1.20 kintar during 2014 and 2015 seasons, respectively. While recorded in Sharkia (7.86±0.25 and11.60±0.20) in both 2014 and 2015 seasons. Moreover, temperature and humidity played a key role in the infestation abundance of *T. urticae* in tested cotton varieties. A positive relationship was found between mite infestation and both nitrogen and protein contents in tested cotton leaves. The varieties Giza 96 and Giza 86 recorded the highest significant amounts of both total protein and nitrogen manifested the highest significant infestation of mites in both Sharkia and Kafr El Sheikh, respectively.

INTRODUCTION

Cotton is a crucial cash crop for millions of farmers worldwide in many developing economies. In Egypt, cotton is an important source of textile manufacturing. Egyptian cotton has prevailed as one of Egypt's biggest competitive advantages with an established reputation of being the best cotton in the world, its fineness, strength and superior characteristics, have positioned Egyptian cotton products as the world's finest. Pedigree selection method has become the most common plant breeding procedure, most of Egyptian cotton varieties were produced by this method Pesek and Baker (1970).

Pest control is a major concern in the total production cost of cotton in Egypt, the application of pesticides against the bollworm complex, is the main cause of red spider mite becoming an economically important pest of cotton, possibly because such pesticides may have a lethal effect on red spider mite enemies (Readshaw, 1975). Population growth rates largely determine the pest status of spider mites Janssen and Sabelis (1992), temperature and relative humidity strongly affects population growth. *Tetranychus urticae* Koch is an extremely polyphagous pest that has been reported from more than 900 host species and is described as a serious pest of at least 150 economically important plants has been considered as a major pest in many cotton growing areas of Egypt, this may be due to high reproductive potential and short generation time. Two spotted spider mite was first described by Koch in 1836 (Mondal and Ara 2006).

The feeding damage of spider mites, concentrated primarily on the lower surface of the leaves by using a piercing-sucking process and feeds on plant juices. Because the chloroplasts in leaves are gradually destroyed as the population of feeding mites increases, causes leaf yellowing as well as blistering and deformation of tissue. Under heavy infestation, severe defoliation occurs and leaves become entirely gray, curly, turn brown, and drop off. This declines the photosynthesis, stomata close and transpiration decreases, leading to reduced production (Brandenburg and Kennedy, 1987). Loss of leaves causes shedding of small bolls and may prevent the lint from developing properly in large bolls (Davidson and Lyon, 1979). The damage caused by mites to a cotton crop depends on timing and intensity of the infestation with respect to the crop growth stage, the presence of predators able to suppress infestation, temperature, and other factors Wilson *et al*., (1981).

T. urticae Infestations are most serious in hot and dry conditions because they multiply very fast and able to destroy plants within a short period of time. The rapid developmental rate, short generation time and high net reproductive rate of *T. urticae* allows them to achieve damaging population levels very quickly when growth conditions are good, resulting in an equally rapid decline of host plant quality (Wermelinger *et al.,* 1991).

The present study was initiated to determine preliminary whether levels of infestation varied with cotton variety under certain weather factors and if content levels of nitrogen and proteins in different cotton verities grown in field increased two spotted spider mite numbers. For this purpose, numbers of *Tetranychus* and associated predator, *Euseius scutalis* (Athias-Henriot) El-Badry (Acari: Phytoseiidae) were counted on cotton leaves and correlated to the content of nitrogen and protein

MATERIALS AND METHODS

Seven tested cotton varieties (*Gossypium barbadense* L.) were provided by the Cotton Research Institute where raised during the growing seasons 2014 and 2015 at Sakha Experimental Station, Kafr El Sheikh Governorate and Abu-Kebir, Sharkia Governorate, Agricultural Research Center, Egypt (Table 1). Each variety was sown in twelve rows of 8 m length, 0.65 m width for each (about 62 m^2 for replicate). Each hill was thinned to two plants per hill replicated three times for each variety in completely randomized design. All other normal agronomic practices were followed for growing the cotton crop including the protocol program of cotton pests control basically leaf and bollworms established by Agriculture Ministry. Two rows were subjected to take leaf samples from along the experiment period. At maturity stage, the yield of the middle three rows of each plot were harvested to determine for studying lint cotton yield measured as average weight of lint yield in Kentar/feddan**.**

Leaf samples were taken weekly started from June to August, a total of 25 randomly leaves at three levels of plant were taken for each, cotton leaves of different varieties were sealed in paper bags and transferred to the laboratory for examination using stereo binocular. All alive mobile stages of *Tetranychus urticae* and predators were recorded per leaf while other species of mites and predators have been neglected due to their very few numbers.

Table 1: List of the tested seven cotton genotypes and related information.

No	Genotype	Abbrev-iation	Pedigree	Category	Current position	Region	Year of release
1	Giza 86	G. 86	Giza75 x Giza81	Long stable	Commercial variety	Egypt	1995
2	Giza 87	G. 87	(Giza77 xGiza45)A	Extra long stable	Variety	Egypt	1998
3	Giza 88	G. 88	(Giza77 xGiza45)B	Extra long stable	Commercial variety	Egypt	1997
4	Giza 92	G. 92	[Giza84x (Giza74 x Giza 68)]	Extra long stable	Variety	Egypt	2009
5	Giza 93	G. 93	G. 77 x Pima S6	Extra long stable	Variety	Egypt	2013
6	Giza 94	G. 94	Australian 10229 x Giza 86)	Long stable	Commercial variety	Egypt	2016
7	Giza 96	G. 96	[G.84x (G.70 x G.51b)] S62	Extra long stable	Variety	Egypt	2017

Phytochemical analysis of cotton leaf varieties:

Leaf samples of the seven cotton varieties were picked up during the vegetation period, cleaned and washed with distilled water. The leaves were evenly spread on a tray, covered with cotton sheets to keep off dust and insects, turned occasionally and left to dry at room temperature in appropriate air flow until the samples drying then leaves were grinded. Total protein and nitrogen were estimated according to the methods of Bradford (1976); Sadasivam and Manickam (1991), respectively.

Statistical analysis:

The statistical analysis of simple correlation, partial and multiple regression between *T. urticae* or predator numbers as dependent variable and each of mean temperature and relative humidity (RH%) as dependent variables were computed to understand the effect of tested factors on tested animals population; Also, analysis of variance was carried out to determine the differences significance between mean numbers of *T. urticae* and associated predator, *E. scutalis*on (Athias-Henriot) cotton varieties. Statistical analysis was computed using the software package Costat® Statistical Software (2005) a product of Cohort Software, Monterey, California, USA. Duncan's multiple range test (1955) and Little and Hills (1975).

RESULTS AND DISCUSSION

Response of different cotton varieties to *T. urticae* infestation:

Data presented in Table (2) indicate that the tested cotton varieties significantly differed in their susceptibility to *T. urticae* infestation according to the mean population of movable mite stages and its associated predator *E. scutalis* (Athias-Henriot) through 2014 and 2015 seasons in two different Governorates, Sharkia and Kafr El Sheikh on samples represented each variety. At Sharkia Governorate, both G. 92 and G. 96 were the most highly significant response to *T. urticae* infestation recorded 23.16±7.71 and 26.75±7.24 developmental mite stages during the two successive seasons 2014 and 2015, respectively. While G. 88 and G. 94 were the most tolerant ones that gave the lowest significant difference in *T. urticae* mean population recorded 9.08±2.58 and 3.66±1.46 during both tested seasons, respectively.

At Kafr El Sheikh Governorate, In general, during the second season, the infestation occurred in few populations as compared to the first season. In the season 2014, the infestation ranged between the highest significant number 32.41±8.66 for G. 86 and the lowest significant one 23.16±6.10 for G. 94. The same trend was obtained in the respect of the effect of temperature and relative humidity on predator.

Table 2: Lint yield, *T. urticae* and *E. scutalis*numbers of different tested cotton varieties in both Governorates at 2014 and 2015 seasons.

Genotypes	2014 season						2015 season					
	Sharkia			Kafr El Sheikh			Sharkia			Kafr El Sheikh		
	T. urticae	*A. gossipi*	Yield	*T. urticae*	*A. gossipi*	Yield	*T. urticae*	*A. gossipi*	Yield	*T. urticae*	*A. gossipi*	Yield
G. 86	20.00± 7.41**b**	10.41± 3.11**a**	7.17± 0.21**a**	32.41± 8.66**a**	14.58± 3.49**b**	7.54± 0.43**a**	12.91± 3.78**d**	8.08± 3.20**bc**	9.05± 0.89**bc**	27.83± 8.26**a**	17.66± 3.57**a**	7.93± 0.98**c**
G. 87	9.58± 3.46**d**	11.91± 3.66**a**	5.14± 0.45**c**	24.50± 6.77**b**	16.16± 2.77**b**	6.17± 0.18**b**	18.33± 5.69**c**	6.58± 2.04**c**	8.16± 0.56**bc**	4.41± 0.94**d**	13.58± 4.90**d**	8.55± 0.72**bc**
G. 88	9.08± 2.58**d**	7.91± 2.20**b**	5.30± 0.10**c**	27.66± 7.16**ab**	12.41± 2.97**cd**	4.44± 0.55**c**	24.66± 7.46**ab**	8.50± 2.77**b**	7.26± 0.85**c**	3.00± 1.01**d**	12.75± 4.03**d**	10.08± 0.53**bc**
G. 92	23.16± 7.71**a**	7.58± 2.56**b**	6.93± 0.33**ab**	27.66± 8.51**ab**	1.08± 0.38**e**	6.33± 0.51**b**	20.75± 3.70**bc**	10.33± 4.17**a**	10.23± 0.98**ab**	6.25± 1.77**c**	12.33± 4.27**c**	9.83± 0.78**bc**
G. 93	21.41± 6.30**ab**	7.25± 2.13**b**	5.96± 0.54**bc**	27.58± 8.50**ab**	17.83± 3.53**a**	5.27± 0.16**bc**	25.16± 7.00**ab**	7.58± 2.78**bc**	7.30± 0.45**c**	3.58± 1.71**d**	10.00± 3.14**d**	10.71± 0.61**ab**
G. 94	20.08± 8.35**b**	10.75± 4.05**a**	7.86± 0.25**a**	23.16± 6.10**b**	14.00± 3.26**bc**	7.57± 0.47**a**	3.66± 1.46**e**	8.50± 3.09**b**	11.60± 0.20**a**	21.08± 5.90**b**	14.66± 4.01**b**	13.07± 1.20**a**
G. 96	14.33± 4.63**c**	5.41± 1.04**c**	7.73± 0.21**a**	26.33± 8.43**b**	12.25± 2.81**d**	6.41± 0.15**ab**	26.75± 7.24**a**	8.25± 2.40**bc**	9.30± 0.49**bc**	3.16± 1.27**d**	7.50± 2.13**d**	9.69± 1.21**bc**
P	**≤0.00**	**≤0.00**	**≤0.00**	**≤0.05**	**≤0.01**	**≤0.00**	**≤0.00**	**≤0.00**	**≤0.00**	**≤0.01**	**≤0.01**	**≤0.05**
$LSD_{0.05}$	**2.09**	**1.75**	**1.02**	**4.90**	**1.72**	**1.18**	**4.86**	**1.75**	**2.08**	**1.75**	**1.75**	**2.74**

Data expressed as Mean ± S. E.

***= P≤ 0.01

Mean under each variety having different letters in the same column denote a significant different (P≤ 0.05).

Effect of the different cotton varieties to the associated predator, *A. gossipi*:

Based on the mean numbers of predator *E. scutalisit (Athias-Henriot) (Athias-Henriot) (Athias-Henriot)* (Athias-Henriot) was apparent that all the tested varieties exhibited higher numbers in Kafr El Sheikh than Sharkia at the two tested seasons with the exception of G.92 through 2014 season, Table (2). Both G. 87 and G. 92 recorded the highest significant numbers during 2014 season (11.91±3.66) and 2015 (10.33±4.17) season, respectively; while the lowest mean populations occurred on the different cotton varieties were 5.41±1.04 and 3.66±1.46 recorded with G. 96 and G. 94 during both 2014 and 2015 seasons, respectively at Sharkia. In contrast, at Kafr El Sheikh Governorate, G. 93 and G. 86 gave the highest significant increase in the predator populations 17.83±3.53 in 2014 and 17.66±3.57 in 2015, respectively, Table (2). On the other hand, the lowest mean numbers of the predator were 1.08±0.38/leaf and 7.50±2.13/leaf recorded with G. 92 and G. 96 through 2014 and 2015 seasons, respectively.

Determination of the yield:

The lint yields of each cotton variety were estimated at the end of each tested season in both Governorates measured as kintar, G. 94 proved the highest significant yield in Kafr El Sheikh during the two successive seasons, recording 7.57±0.47 and 13.07±1.20 kintar during 2014 and 2015 seasons, respectively. While recorded in

Sharkia (7.86±0.25 and11.60±0.20) in both 2014 and 2015 seasons, Table (2). Generally, the cotton yield in 2015 season was higher than in 2014 season for all tested cotton varieties in both Governorates. The lowest significant lint yields were 5.14±0.45 and 7.26±0.85 kintar for G. 87 and G.88 at Sharkia Governorate in 2014 and 2015, respectively, whereas at Kafr El Sheikh, G. 88 and G. 86 gave the lowest significant reduction in the yield (4.44±0.55 and 7.93±0.98, respectively).

Effect of certain weather factors on the mean populations of *T. urticae* and *E. scutalis*at Kafr El Sheikh Governorate:

The results of partial regression in Table (3) cleared that there were negative partial regression coefficient on all cotton varieties were -7.81, -5.59, -6.08, -6.58, -8.16, -8.11 and -8.20 recorded with G. 86, G. 94, G. 87, G. 88, G. 92, G. 93 and G. 96 cotton varieties during 2014 season; while 2015 season recorded negative and highly significant on four cotton varieties -6.01, -4.76, -0.41 and -1.12 for G. 86, G. 94, G. 93 and G. 96, respectively; while recorded negative and non significant were -0.44 and -0.84 with G. 87 and G.92 during 2015 season except G. 88 gave positive and insignificant effect.

Table 3: Simple correlation, partial and multiple regression values for the numbers of *T. urticae* and associated predator *E. scutalis*on different cotton varieties and tested climatic factors at Kafr El Sheikh Governorate during 2014 and 2015 seasons.

Seasons	Weather factors	Parameters		Cotton genotypes													
				G. 86		G. 87		G. 88		G. 92		G. 93		G. 94		G. 96	
				T. urticae	predator	*T. urticae*	predator	*T. urticae*	predator	*T. urticae*	predator	*T. urticae*	predator	*T. urticae*	predator	*T. urticae*	predator
2014	Mean Temp.	Partial Reg.	b	-7.81	2.62	-6.08	2.16	-6.58	2.38	-8.16	2.37	-8.11	2.35	-5.59	2.58	-8.20	1.83
			p	<0.00	<0.02	<0.00	<0.01	<0.00	<0.01	<0.00	<0.03	<0.00	<0.04	<0.00	<0.01	<0.00	NS
		Simple Corr.	r	-0.5245	0.6685	-0.6458	0.7156	0.1661	0.7212	-0.6229	0.6129	-0.5466	0.0972	-0.7010	0.7007	-0.5928	0.5930
			p	NS	<0.01	<0.02	<0.08	NS	<0.08	0.03	<0.03	NS	NS	<0.01	<0.01	0.04	<0.04
	RH%	Partial Reg.	b	0.04	-0.01	0.05	-0.003	0.05	-0.007	0.06	-0.01	0.06	-0.004	0.04	-0.01	0.04	-0.004
			p	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		Simple Corr.	r	0.3159	0.3388	0.3172	0.4188	0.7736	0.2215	0.2157	0.0701	0.2772	-0.1336	0.1242	0.3760	0.2459	0.1209
			p	NS	NS	NS	NS	0.00	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Multiple Reg.		Ev%	66.90	46.67	70.00	51.57	71.08	53.29	76.44	40.42	75.99	37.53	70.02	51.60	51.60	35.64
			p	<0.00	NS	<0.00	<0.03	<0.00	<0.03	<0.00	NS	<0.00	NS	<0.00	<0.03	<0.03	NS
2015	Mean Temp.	Partial Reg.	b	-6.01	2.35	-0.44	2.47	0.01	2.41	-0.84	2.14	-0.41	1.84	-4.76	5.15	-1.12	1.43
			p	<0.00	<0.02	NS	NS	NS	<0.03	NS	NS	<0.00	<0.04	<0.00	NS	<0.00	<0.01
		Simple Corr.	r	-0.0323	0.6881	-0.4794	0.5695	-0.5836	0.6599	0.0385	0.5618	0.4348	0.6871	0.0853	0.7151	0.7151	0.7109
			p	NS	<0.01	NS	NS	0.04	<0.01	NS	NS	NS	<0.01	NS	<0.00	0.00	<0.00
	RH%	Partial Reg.	b	2.57	-0.43	0.01	-1.78	0.72	-1.38	0.73	-1.44	-0.12	-0.91	1.96	3.39	-0.19	-0.39
			p	NS	NS	NS	NS	<0.02	NS	NS	NS	NS	NS	NS	NS	NS	NS
		Simple Corr.	r	0.1691	-0.2224	-0.2185	-0.4274	-0.6577	-0.4223	-0.4276	-0.4020	-0.3298	-0.4352	0.1765	-0.3851	-0.1868	-0.2861
			p	NS	NS	NS	NS	0.01	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Multiple Reg.		Ev%	70.77	48.64	23.62	44.02	45.73	53.82	44.79	41.54	69.27	48.47	68.53	37.08	37.08	53.58
			p	<0.00	<0.05	NS	NS	NS	<0.03	NS	NS	<0.00	NS	<0.00	NS	NS	<0.03

Mean under each variety having different letters in the same column denote a significant different ($p \leq 0.05$).

***= $P \leq 0.01$NS= Non Significant. b= Partial regression. r= Correlation. EV= Explained Variance.

The results of partial regression on *T. urticae* showed the positive insignificant partial regression coefficient on all cotton varieties of Kafr El Sheikh during 2014 and 2015 seasons except with G. 88, b=0.72 positive significant and on G. 93 and G. 96 gave negative insignificant effect, b= -0.12 & -0.19 during 2015 season.

In case of simple correlation between mite population and temperature showed negative correlation coefficients on all cotton varieties during 2014 except on G. 88 gave positive correlation coefficient; while 2015 season data showed negative simple correlation with three cotton genotypes; G. 86, G. 87 and G. 88) and positive simple correlation coefficient with four cotton genotypes; G. 94, G. 92, G. 93 and G. 96. On the other hand, simple correlation between temperature and population and relative humidity cleared the positive insignificant coefficient on all studied cotton genotypes during 2014 season; while in 2015 season, results showed negative insignificant correlation coefficient with all cotton varieties except G. 86 and G. 94.

Statistical analysis of multiple regression as combined effect of temperature and RH % on mite population on cotton varieties at Kafr El Sheikh Governorate, EV % ranged between 66.90 for G. 86, to 77.88 for G. 96 during 2014 season; while in 2015 ranged between 23.62 for G. 87 and 77.88 for G. 96.

Effect of certain weather factors on the mean populations of *T. urticae* and *E. scutalis*at Sharkia Governorate:

Data in Table (4) showed the results of partial regression with temperature on *T. urticae,* there were negative partial regression coefficients on all varieties except G. 88 that gave positive non-significant difference, 0.36. Highly significant differences were obtained in G. 94, G. 87 and G. 92 recorded -8.29, -3.12 and -6.08, respectively in 2014 season. Reversely, four varieties showed positive insignificant of partial regression coefficient were 0.04, 0.54, 3.31 and 4.96 with G. 94, G. 92, G. 93 and G. 96 except G. 96 gave positive highly significant during 2015, respectively; three varieties showed negative insignificant were – 0.27, - 0.60 and – 2.57 recorded with G. 86, G. 87 and G. 88, respectively.

Positive insignificant partial regression coefficients were recorded in all tested varieties during 2014 season and in some varieties in 2015 season; G. 86, G. 94 and G. 87. As for simple correlation between mite population and temperature, there were negative correlation coefficients on all cotton varieties during 2014 except G. 88 which gave positive value r=0.2121; whereas in 2015 season, G. 86, G87 and G. 88 recorded the negative correlation, the other varieties gave positive simple correlation, Table (4).

Table 4: Simple correlation, partial and multiple regression values for the numbers of *T. urticae* and associated predator *E. scutalis*on different cotton varieties and tested climatic factors at Sharkia Governorate during 2014 and 2015 seasons.

Seasons	Weather factors	Parameters		Cotton genotypes													
				G. 86		G. 87		G. 88		G. 92		G. 93		G. 94		G. 96	
				T. urticae	predator	*T. urticae*	predator	*T. urticae*	predator	*T. urticae*	predator	*T. urticae*	predator	*T. urticae*	predator	*T. urticae*	predator
2014	Mean Temp.	Partial Reg.	b	-3.76	0.97	-3.12	1.90	0.36	1.34	-6.08	1.15	-5.02	0.77	-8.29	1.05	-3.95	0.03
			p	NS	NS	<0.03	NS	NS	NS	<0.04	NS	NS	NS	<0.01	NS	NS	NS
		Simple Corr.	r	-0.2287	0.3351	-0.6458	0.5027	0.2121	0.5160	-0.6230	0.3966	-0.5466	0.3064	-0.7010	0.2746	-0.5864	0.1308
			p	NS	NS	<0.02	NS	NS	NS	<0.03	NS	NS	NS	<0.01	NS	<0.04	NS
	RH%	Partial Reg.	b	1.93	0.77	0.018	1.04	0.67	0.34	0.56	0.39	0.67	0.19	0.71	0.80	0.50	0.27
			p	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		Simple Corr.	r	0.1770	0.3911	-0.1515	0.4864	0.3616	0.3443	-0.1214	0.3011	-0.0580	0.2006	-0.1340	0.3122	-0.0700	0.3325
			p	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Multiple Reg.		Ev%	12.35	20.09	42.12	36.86	14.06	30.05	39.57	19.01	31.52	10.51	50.17	13.07	13.07	11.11
			p	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	<0.04	NS	NS	NS
2015	Mean Temp.	Partial Reg.	b	-0.27	1.46	-0.60	1.02	-2.57	2.10	0.54	1.04	3.31	1.82	0.04	1.70	4.96	1.09
			p	NS	<0.04	NS	<0.02	NS	<0.00	NS	NS	NS	<0.00	NS	<0.02	<0.00	NS
		Simple Corr.	r	-0.0323	0.6625	-0.0410	0.7063	-0.5836	0.8860	0.0390	0.3200	0.4349	0.8230	0.0852	0.7046	0.7151	0.6280
			p	NS	<0.01	NS	<0.01	<0.04	<0.00	NS	NS	NS	<0.00	NS	<0.01	<0.00	<0.02
	RH%	Partial Reg.	b	0.48	0.70	1.01	0.40	-2.57	-0.29	-1.15	0.13	-2.28	0.09	0.15	0.19	-2.05	0.37
			p	NS	NS	NS	NS	<0.04	NS	NS	NS	NS	NS	NS	NS	NS	NS
		Simple Corr.	r	0.1691	0.5057	0.1986	0.4819	-0.6578	0.1157	-0.4280	0.1380	0.3300	0.2900	0.1765	0.2968	-0.1868	0.4016
			p	NS	NS	NS	NS	<0.02	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Multiple Reg.		Ev%	3.61	54.37	5.03	58.03	59.82	80.81	21.30	10.44	42.00	68.00	3.23	50.49	68.58	44.52
			p	NS	<0.03	NS	<0.02	<0.01	<0.00	NS	NS	NS	<0.00	NS	<0.04	<0.00	NS

Mean under each variety having different letters in the same column denote a significant different (P≤ 0.05).

***= P≤ 0.01 NS= Non Significant. b= Partial regression. r= Correlation. EV= Explained Variance.

The simple correlation between *Tetranychus* population and R.H% showed negative insignificant correlation on all tested varieties through 2014 with the exception of G. 86 (r=0.177) and G. 88 r= 0.3616. During 2015 season, all the varieties gave positive insignificant values except G. 88, 92 and G. 96, Table (4). Data of statistical analysis of multiple regression as combined effect of temperature and R.H% on mite population on cotton varieties at Sharkia Governorate showed the EV% were ranged between 12.35 for G. 86 to 50.17 for G. 94 in 2014 season; while in 2015 season ranged between 3.23 for G. 94 to 68.58 for G. 96, Table (4).

Relationship between mite population and chemical contents of cotton leaves:

Total protein and nitrogen were estimated in cotton leaves during 2015 cotton growing season, data cleared that the total protein and nitrogen contents were higher in plants grown in Kafr El Sheikh Governorate than which grown in Sharkia with the exception of G. 96 and G. 94 in only total protein, Table (5).

In respect of Sharkia, G. 96 recorded the highest significant contents in both total protein and nitrogen (896.00±23.86 and 142.10±4.52 mg/gm dry weight, respectively), whereas G. 88 recorded the lowest significant values (277.00±9.07 and 46.70±2.26 mg/gm dry weight, respectively. On contrary in Kafr El Sheikh, the values of total protein and nitrogen contents ranged between the highest values 875.67±24.66 and 149.00±3.84 mg/gm dry weight for G. 86; while the lowest values were 412.34±7.53 and 70.24±1.61 mg/gm dry weight for G. 88, respectively. The varieties G. 96 and G. 86 recorded the highest significant amounts of both total protein and nitrogen, manifested the highest significant infestation of mites in both Sharkia and Kafr El sheikh, respectively. Thus positive relationship was observed between mites infestation and both total protein and nitrogen contents in cotton leaves (Tables 2 & 5).

Table 5: Chemical constituents of tested cotton varieties.

Genotypes	Total proteins				Nitrogen			
	Sharkia	**Kafr El Sheikh**	**P**	**$LSD_{0.05}$**	**Sharkia**	**Kafr El Sheikh**	**P**	**$LSD_{0.05}$**
G. 86	784.00± 12.22**b**	875.67± 24.66**a**	**≤0.05**	76.41	126.8± 2.41**b**	149.00± 3.84**a**	**≤0.0**1	12.60
G. 87	277.00± 8.62**f**	460.67± 7.31**e**	**≤0.0**1	31.38	50.5± 1.68**e**	74.34± 1.39**e**	**≤0.0**1	6.06
G. 88	277.00± 9.07**f**	412.34± 7.53**f**	**≤0.0**1	32.74	46.7± 2.26**e**	70.24± 1.61**e**	**≤0.0**1	7.71
G. 92	334.00± 12.22**e**	501.34± 4.09**d**	**≤0.0**1	54.55	55.00± 2.50**e**	82.80± 1.17**d**	**≤0.0**1	7.67
G. 93	435.00± 13.05**d**	437.34± 8.97**ef**	NS	43.96	67.86± 2.90**d**	70.97± 1.41**e**	NS	8.98
G. 94	561.00± 11.59**c**	553.67± 9.13**c**	NS	40.97	82.33± 2.70**c**	88.87± 0.98**c**	NS	7.98
G. 96	896.00± 23.86**a**	600.34± 10.20**b**	**≤0.0**1	72.05	142.10± 4.52**a**	98.20± 1.55**b**	**≤0.0**1	13.29
P	**≤0.0**1	**≤0.0**1			**≤0.0**1	**≤0.0**1		
$LSD_{0.05}$	41.80	36.31			8.60	5.86		

Data expressed as Mean ± S. E.***= P≤ 0.01 NS= Non Significant.
Mean under each variety having different letters in the same column denote a significant different (P≤ 0.05).

The effect of tested cotton varieties on *T. urticae* and its associated predator populations varied depending on the growing regions (Sharkia and Kafr El Sheikh) or climatic variations in studied seasons (2014 and 2015). Generally, G. 86 was the most susceptibility variety in Kafr El Sheikh during the two tested seasons, while G. 92 and G. 96 were the most susceptible ones during 2014 and 2015 seasons, respectively. Similar results were obtained by Taha *et al.,* (2014) when tested different cotton varieties through two cultivated seasons. They found the cotton variety G. 90 was the most susceptible to *T. urticae* infestation during 2010 and 2011 seasons. Also, El-Sanady *et al.*, (2008) studied the susceptibility of *T. urticae* on different soybean varieties. On contrary, Wilson (1993) reported that, *T. urticae* populations were unaffected by cotton varieties in Australia. In addition, Taha *et al.,* (2014) recorded that, the population of phytosiidae differed according to the different sampling dates on the seven tested cotton varieties in Beni Suef Governorate. Host plant species strongly influenced the performance of the behavior of the predators on *T. urticae* (Rott and Ponsonby, 2000). In our study, temperature and humidity play a key role in the infestation abundance of *T. urticae* in tested cotton varieties, that is may be due to the relation between temperature, humidity and the development of *T. urticae*. Praslicka and Huszar (2004) reported that, the higher the temperature, the faster the development of the mite on different host plants. Also, population density of *T. urticae* on host plants is usually highly variable and mostly depends on the environmental conditions (temperature and humidity) (Maula and Khan, 2016).

Positive relationship was found between mite infestation and both nitrogen and protein contents in cotton leaves. Mead *et al.* (2010) reached the same conclusion when tested different maize varieties against *T. urticae*. Moreover, Ahmed (1994) suggested that resistance may be attributed to low protein and amino acid contents of leaves, that provided less nutritive diet for *T. urticae*. Hanna *et al.* (1982) nearly explained such relation when recorded nitrogen levels in leaf tissues are positively correlated to rates of mite development and fecundity. The relationship between nitrogen contents and reproduction of *T. urticae* population were recorded by Maia and Busoli (1992) when observed a reduction in the duration of pre-oviposition period and increase in oviposition period as the nitrogen contents increased. Generally, the nitrogen deficiency caused a reduction in the reproduction rate of *T. urticae*.

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ARABIC SUMMARY

استجابة بعض أصناف القطن للإصابة بالعنكبوت الأحمر ذو البقعتين و المفترس الأكاروسى أمبليسيس جوسيبيى وعلاقتها بمحتواها الكيميائى

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أجريت دراسات حقلية لدراسة استجابة سبعة أصناف من القطن هى جيزة ٨٦ و جيزة ٨٧ و جيزة ٨٨ و جيزة ٩٢ و جيزة ٩٣ و جيزة ٩٤ و جيزة ٩٦ لقابليتها للإصابة بالعنكبوت الأحمر ذو البقعتين و كذلك تواجد مفترس أمبليسيس جوسيبياى المصاحب خلال موسمى ٢٠١٤ و ٢٠١٥ فى محافظتى الشرقية و كفر الشيخ. صنف جيزة ٨٦ هو أكثر الأصناف حساسية للإصابة فى محافظة كفر الشيخ خلال موسمى الدراسة، بينما فى محافظة الشرقية كان الصنف جيزة ٩٢ و جيزة ٩٦ هما الأكثر حساسية للإصابة بالأكاروس خلال موسمى الدراسة ٢٠١٤ و ٢٠١٥ على الترتيب، أظهرت النتائج تباين تعداد المفترس على الأصناف المختلفة فى الموسمين. حقق الصنف جيزة ٩٤ أعلى كمية محصول فى محافظة كفر الشيخ فى موسمى الدراسة مسجلا 7.57±.47 قنطار للفدان فى موسم ٢٠١٤ و 13.07±1.2 قنطار فى موسم ٢٠١٥ بينما فى محافظة الشرقية سجل٧.٨٦±٠.٢٥ و ١١.٦٠±٠.٢٠ قنطار للفدان قى موسمى الدراسة. لعبت الظروف الجوية و بالأخص الحرارة و الرطوبة دورا هاما فى تحديد كثافة الاصابة بالأكاروس على أصناف القطن المختلفة و سجلت علاقة طردية بين مستويات الاصابة بالأكاروس و المحتوى الكيميائى لأوراق القطن لكلا من البروتين الكلى و النيتروجين و سجل الصنفان جيزة ٨٦ و جيزة ٩٦ أعلى محتوى معنوى من البروتين الكلى و النيتروجين و كذلك تحقيقهم أعلى نسب اصابة بالأكاروس فى محافظتى الدراسة كفر الشيخ و الشرقية.