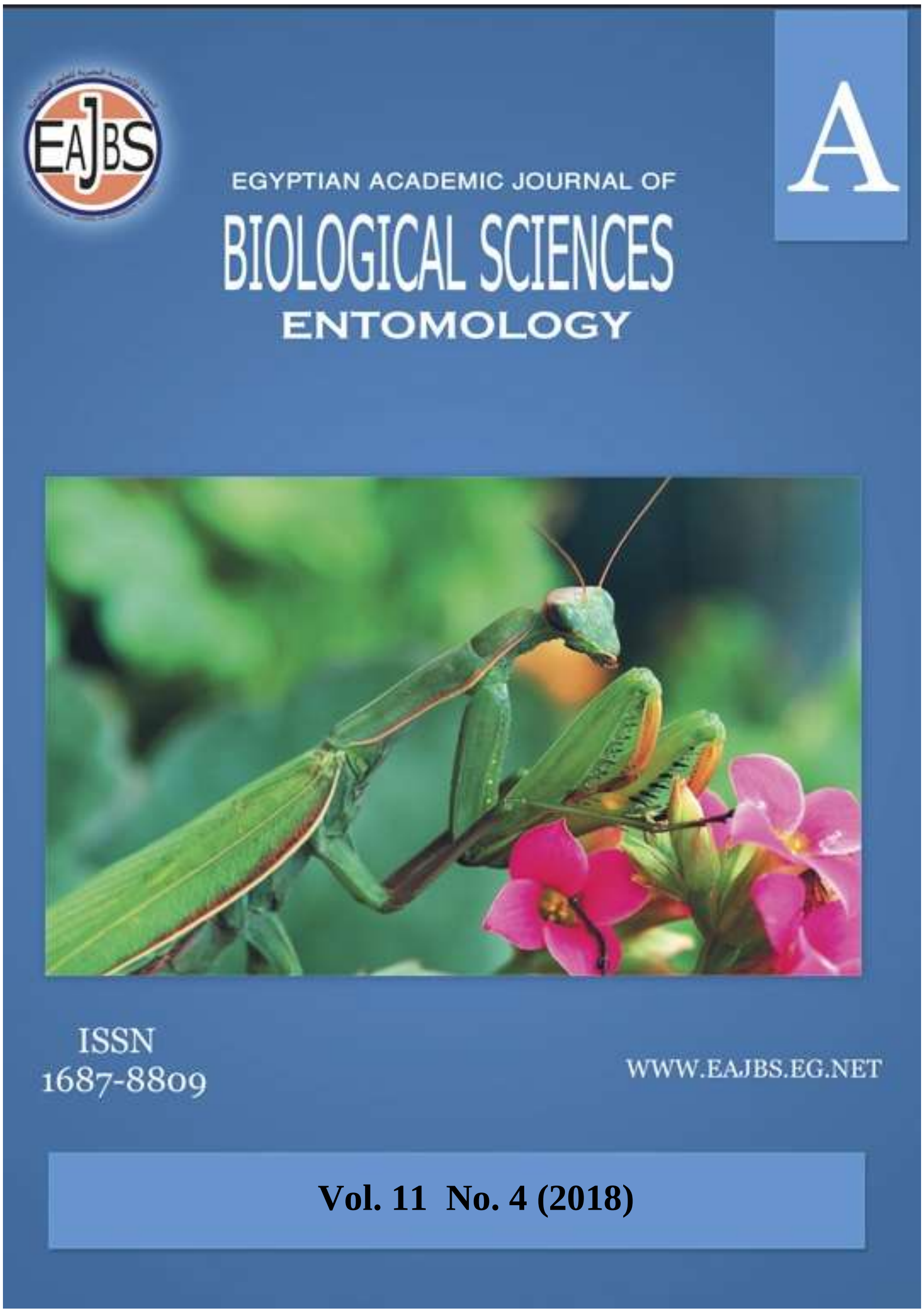

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Impact of Biotic and Abiotic Factors on the Population Dynamics of *Bemisia tabaci* (Genn.) and *Tetranychus urticae* (Koch) Infested Tomato Plant *Lycopersicon esculentum* L. at kafr El sheikh Governorate

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ABSTRACT

Impact of abiotic (minimum–maximum temperatures and relative humidity) and biotic factors (*Coccinella undecimpunctata*, *Syrphus corollae* , *Amblyseius swirskii*, *Nesidiocoris tenuis* and *Chrysoperla carnea*) on the population dynamics of *Bemisia tabaci* (Genn.) and *Tetranchys urticae* (Koch) infesting tomato plant *Lycopersicon esculentum L*. at kafr El sheikh governorate, Egypt were studied on spring plantation of 2016 &2017 seasons. The analysis of variance revealed significant variation among dates of observations, lines and in their interaction for *B. tabaci* (Genn.), *T. urticae* (Koch) and their natural enemies. The mean number of *B. tabaci* and *T. urticae* during the first season was higher than that was recorded during the second season. The percentage of explained variance **(E.V.)** of abiotic and biotic altogether in the population densities of *B. tabaci* and *T. urticae* in the first season was stronger percentage values than second as (62% - 86%) and (94% - 77%) for eggs and nymphs of *B. tabaci* while (84% _ 77%) and (84% - 98%) and for eggs and movable stages of *T. urticae* during spring of plantation 2016 &2017 seasons, respectively.

INTRODUCTION

Tomato *Solanum lycopersicum* Milles is the 3rd most economically important vegetable crop after potato and onion. FAO classified Egypt as the 5th country around the world (China, USA, India, Turkey and Egypt, respectively) (FAO, 2008) and the second around the Mediterranean countries in production and exportation of tomato. Tomato is a dietary source of vitamins especially A and C, minerals and fibres, which are important for human nutrition and health. Also, tomatoes are the richest source of lycopene, a phytochemical that protects cell from oxidants that have been linked to human cancer (Giovannuci, 1999 and Mutanen *et al.*, 2011).). Tomatoes are hosts of wide varieties of pests, between 100 and 200 species are reported to attack tomatoes worldwide (Lange and Bronson, 1981) such as Leafminer pests;

Tuta absoluta (Meyrick) *Phthotimaea operculella* (Zeller) and *Liriomyza Trifolii* (Burgess), sap sucking pests; *Bemsia tabaci* Genn., *Aphis gossypii* Glov., *Myzus persicae* (Sulzer) *Pseudococcus solenopsis* Tinsley, *Tetranychus urticae* Koch and *Aculops lycopersici* Massee and army worms; *Helicovepra zea* (Bod), *Agrotis ipsilon* (Haf) and *spodoptera littoralis* (Biosd). All these pests attack all tomato plant parts causing directly reduction in growth or death feeding or indirectly by transmission of many vectoring diseases Shaheen (1977) Gravena (1984) Kirk *et al*. (1993) Obopile *et al.* (2008) Harizanova *et al (*2009) Erler *et al.* (2010) Pokle and Abhishek (2016).

The level of infestation depends on the temperature and weather, and thus varies from year to year. It also depends on the plant species and cultivar in question (Kielkiewicz and Tomczyk, 1987; Labanowska, 1992 and Skorupska, 2004).

This study aimed to evaluate the population fluctuation of certain pests infesting tomato plant *Lycopersicon esculentum L*. and the combined effects of principle abiotic & biotic factors on the population dynamics of these pests.

MATERIALS AND METHODS

Experiments were carried out on tomato plants at Mahalet Abo- Ali village, Desok, Kafr El-sheikh governorate during two successive years of plantations (2016 and 2017) of tomato plants. Alissa variety (genotype) was cultivated in spring plantation. Inspection was started 15 days after plantation of tomato seedlings. Sample content 10 leaves from three levels of plants (lower, mid and upper) (50 leaflets/replicate); four replicates were found. Samples were taken early in morning between 8 and 10 a.m. and transferred to the laboratory in plastic bags, the upper and lower surface of the leaflets were extremely examined by the aid of stereomicroscope in the same day for examination and identify the collected pests and natural enemies.

To study the effect of abiotic factor (Maximum temperature, Minimum temp. and Mean relative humidity) and biotic factors (natural enemies) on population dynamics of these pests, the simple correlation (r) and the partial regression (b) were calculated between each of the above mentioned factors (Xs) and the weekly mean numbers of these pests.

RESULTS AND DISCUSSION

Population Fluctuations of Certain Pests Infesting Tomato Plant *Lycopersicon Esculentum L.* :

Spring Plantation of 2016&2017 Season:

1. *Bemisia tabaci* (Genn.):

The infestation of tomato plants with *B. tabaci* was expressed as the number of eggs laid, number of nymphs and pupae/leaf, recorded at weekly intervals, applying the plant sample counting technique. Population density in the first season 2016 was higher than that recorded in the second season 2017 with general mean numbers 15.78 and 9.39/ leaf, respectively. Tables (1&2)

Eggs:

The data in Table 1 showed mean number of *B. tabaci* eggs on tomato plants during the first season was higher than that was recorded during the second season with mean numbers 4.71 and 3.11 eggs /leaf for the first and second season, respectively (2016&2017).

1st season 2016:

Table 1 revealed that the population density of *B. tabaci* eggs was appeared with fewer mean number on 3rd week of March after that fluctuated to increase gradually and recorded two peaks on 2nd and 4th week of May with mean numbers of population density 11.4 and 20.1 eggs / leaf, respectively. Data in Table, (5) showed insignificant positive effects to maximum & minimum temperature, *C. undecimpunctata, S. corollae, Amblyseius swirskii* and *N. tenuis* on the seasonal fluctuations of *B. tabaci* eggs whereas, “r” values were 0.43, 0.47, 0.36, 0.27, 0.36 and 0.43, respectively. The mean percentage of relative humidity had significant negative effect whereas, “r” value was -0.63. The combined effect of these factors as a group (E.V.) showed responsible of 62% on the population dynamics of *B. tabaci* eggs.

2nd season 2017:

Table 2 showed that the population density of *B. tabaci* eggs started to appear in few mean numbers during first four inspections at end of March then increased gradually to record two peaks on 2nd and 4th week of May with mean numbers of population density 9 and 12.2 eggs/ leaf for the two peaks, respectively. Data in Table, (5) showed insignificant positive effects to max. & min. temp., R. H. and *S. corollae* whereas, “r” values were 0.54, 0.50, 0.44 and 0.39, respectively. The mean of *C. undecimpunctata* had significant positive effect whereas; “r” value was 0.60. The mean of *Amblyseius swirskii* and *N. tenuis* had significant negative effect on the seasonal fluctuations of *B. tabaci* eggs whereas, “r” values were -0.75 and -0.69, respectively. The combined effect of these factors as a group (E.V.) showed responsible of 86% on the population dynamics of *B. tabaci* eggs.

Nymphs:

Data in Table, 1&2 showed that the mean number of *B. tabaci* nymphs on tomato plants during the first season was higher than that was recorded during the second season with general mean numbers 6.95 and 4.11 nymphs / leaf for the first and second season, respectively.

1st season 2016:

The population density of *B. tabaci* nymph was absent in first five inspections during March and appeared with fewer mean number in the 1st week of April then fluctuated to increase gradually and recorded a higher number on 1st week of June with mean number 20.3 nymph / leaf. Data in Table, (5) showed significant positive effects to maximum & minimum temperature, *C. undecimpunctata, N. tenuis* and *C. carnea* on the seasonal fluctuations of *B. tabaci* nymphs whereas, “r” values were 0.79, 0.74, 0.60, 0.62 and 0.69, respectively. The mean percentage of relative humidity had significant negative effect, whereas “r” value was -0.62. Partial regression analysis illustrated insignificant positive relation between *S. corollae* and *Amblyseius swirskii B. tabaci* nymphs whereas, “r” values were 0.24 and 0.36, respectively. The combined effect of these factors as a group (E.V.) showed responsible of 94% on the population dynamics of *B. tabaci* nymphs.

2nd season 2017:

The population density of *B. tabaci* nymphs absent during first seven inspections then increased gradually to recorded highest peak on 1st week June with mean numbers of population density 14.8 nymph/ leaf for the two peaks, respectively. Data in Table, (5) the partial regression analysis demonstrated insignificant positive effect of weather factors (max. & min. temp. and R. H.). *C. undecimpunctata*, whereas “r” value were 0.24, 0.47, 0.48 and 0.31, respectively and insignificant negative effect of *S. corollae* and *Amblyseius swirskii* whereas, “r” value -0.01 and -0.54, respectively. The results showed that *N. tenuis* and *C. carnea* had significant negative effect (r= -0.64 and -0.60, respectively) on the B. tabaci nymphs. The combined effect of these factors as a group (E.V.) showed responsible of 77% on the population dynamics of *B. tabaci* nymphs.

Also the results close to the results of Ahmed (1990) who reported that, the initial occurrence of *B. tabaci* took place on July 12th on *H. sabdariffa* during 1986-1987, population increases gradually reaching a light peak on September 6th. Insect population still low until the end of September, then increased rapidly to reach its peak on October 18th. Afterward the population declined gradually until the end of the season on December. The accordance with results of Lin *et al.* (2002) also indicated the population of *Bemisia tabaci* increased continually and up to a peak at around August, then gradually decreased. Also these results are in agreement with those obtained by EI-Sayed *et al.* (1991) who indicated that bean leaves showed high rate of infestation with *B. tabaci* immature stages in all plantations (early summer, summer and winter). They also mentioned that periods of high infestation rates were in August and September for summer plantation, October and November for winter plantation and July and August for the early summer plantation. Meena, *et al.* (2013) revealed that the whitefly, *Bemisia tabaci* (Genn.) appeared in the third week of July and continue up to fourth week of November. The population increased gradually and touched its peak with mean population of 6.9 whiteflies / 3leaves /plant in first week of September during 2006-07 while, the population of whitefly touched its peak with 6.7 whiteflies 3 leaves /plant in the second week of September during 2007-08. Thereafter, the population decline gradually and reached up to 1.1 and 1.2 whiteflies/3 leaves /plant. The findings confirmed with the results obtained by Shanab and Awad-Allah (1982) who reported that the whitefly on tomato appeared in May and reached to its peak during July to October. He also reported that the higher temperature declined the pest incidence, whereas scattered rain and high relative humidity favoured the population build up. However Farman *et al*. (2004) observed that the whitefly infestation started on brinjal in mid of May and reached to its peak in July. While, Bharadia and Patel (2005) reported maximum population of whitefly in the 4th week of October. This might be due to variable climatic conditions of that particular region and time of cultivation that particular crop. Lal and Pillai (1982) mentioned that, the correlation between *B. tabaci* population and max. temp. was positive and significant correlation, it increased with the increase of max. temp

Tetranychus urticae Koch.

Table (1): Weekly mean numbers of *Bemisia tabaci* during spring plantation / leaf, its associated natural enemies and ecological factors at kafr El sheikh governorate in 2016 season

Date			**Weather factors**			**Natural enemies**				
	egg	**nymph**	**Max. Temp.**	**Min. Temp.**	**R.H.%**	***Coccinella undecimpunctata***	***Syrphus corolla***	***Amblyseius swirskii***	***Nesidiocoris tenuis***	***Chrysoperla carnea***
03/03/2016	0	0	22.71	12.43	68.72	0	0	0	0	0
10/03/2016	0	0	22.25	10.88	62.857	0	0	0	0	0
17/03/2016	0	0	22.59	12.62	61.59	0	2	0	0	0
24/03/2016	0.5	0	22.95	12.56	59.28	0	5	0	0	1
31/03/2016	0.6	0	22.52	12.72	58.73	0	9	0	0	5
07/04/2016	0.4	2.7	26.1	14.43	59.86	0	9	0	0	7
14/04/2016	0.3	2.1	25.61	15.7	61.06	1	15	0	1	6
21/04/2016	0.1	1.1	26.42	13.04	60.13	3	7	1	3	8
28/04/2016	1.2	5.3	26.94	16.05	59.26	9	13	3	9	5
05/05/2016	0.8	7.2	27.29	16.57	57.43	11	15	6	8	10
12/05/2016	11.4	11.9	25.97	17.38	56.29	15	25	5	6	11
19/05/2016	8.5	15.6	28.17	18.68	52.02	19	9	3	12	13
26/05/2016	20.1	18.4	28.06	18.62	51.93	20	6	7	15	17
02/06/2016	16	20.3	35.5	20.5	54.57	23	2	6	20	11
09/06/2016	10.5	19.6	32.95	21.45	53.14	29	1	2	11	9
General	70.6	104.2				130	118	33	85	103
Mean	4.22	6.95				8.66	7.89	2.2	5.67	6.86

Table (2): Weekly mean numbers of *Bemisia tabaci* during spring plantation / leaf, its associated natural enemies and ecological factors at kafr El sheikh governorate in 2017 season

Date			Weather factors			Natural enemies				
	egg	Nymph	Max. Temp.	Min. Temp.	R.H.%	*Coccinella undecimpunctata*	*Syrphus corolla*	*Amblyseius swirskii*	*Nesidiocoris tenuis*	*Chrysoperla carnea*
02/03/2017	0	0	21.29	11.57	69.43	0	0	0	0	0
09/03/2017	0	0	21.57	11.71	56.57	0	0	0	0	0
16/03/2017	0	0	20.14	12.86	54.57	0	4	0	0	0
23/03/2017	0	0	20.08	13.39	56.1	0	2	0	0	0
30/03/2017	0.3	0	20.87	13.45	57.56	0	7	0	0	1
06/04/2017	0.6	0	22	13.57	63	0	10	0	0	1
13/04/2017	1.1	0	22	15	60.43	0	12	0	0	2
20/04/2017	1.4	1.6	23.5	14.87	57.8	5	9	0	4	5
27/04/2017	0.3	1.2	23.9	15.12	55.14	8	16	1	7	3
04/05/2017	3.6	2	25.57	16.14	54.4	14	17	2	9	7
11/05/2017	9	6.6	28.4	17.14	56.3	20	21	3	3	8
18/05/2017	5.7	7.9	28.5	18.5	56.3	22	7	6	10	10
25/05/2017	12.2	13.4	27.8	18.5	55.7	19	1	10	15	15
01/06/2017	10	14.8	29.2	20.7	51.7	30	0	9	12	9
08/06/2017	2.5	14.2	31.6	20.5	50.7	34	0	5	6	7
General	46.7	61.7				152	106	36	66	68
Mean	3.11	4.11				10.13	7.06	2.4	4.4	4.53

2.Tetranychus urticae Koch.

The infestation of tomato plants with *T. urticae* was expressed as the number of eggs laid and movable stage (immature and adult)/leaf recorded at weekly intervals. The result showed that, the seasonal general mean number of *T. urticae* on tomato plants during the first season 2016 higher than the second season 2017 season 2.28 and 1.88, respectively and with mean numbers of 0.67 eggs &1.61 movable stage / leaf and 0.59 eggs &1.3 movable stage / leaf for season 2016&2017, respectively. Table (3&4)

Eggs:

1st season 2016:

Data in Table, (3) indicated that, the mean number of *T. urticae* eggs was absent in the first seven inspections. It increased above to record 0.3 eggs / plant on 3rd week of April. Then, the mean increased gradually by the time at the end of the season to record two peaks on 2nd week of May and1st week of June with mean numbers of population density 2 and 2.2 / leaf, respectively.Data in Table, (6) cleared that max. & min temp., *C. undecimpunctata* and *Amblyseius swirskii* had highly significant positive effects on seasonal fluctuation of *T. Urticae* eggs whereas, “r” values were 0.75, 0.85, 0.89 and 0.77, respectively. The mean percentage of R.H. had significant negative effect whereas, "r" value was - 0.77. The percentage of explained variances (E.V.) for the three selected ecological factors and *C. undecimpunctata* & *Amblyseius swirskii* was 84 % effect on the dynamics of *T. urticae* eggs.

The 2nd season 2017:

Table (4) indicated that, the individuals of *T. urticae* eggs not appeared in six inspections. The mean numbers of *T. urticae* began to appear 2nd week of April and recorded two peaks on 2nd week of May and 1st week of June with mean numbers of population density 1.2 and 2.5 / leaf, respectively. Data in Table, (6) cleared that the mean percentage of Min. Temp., RH and *C. undecimpunctata* had significant negative effect whereas, “r” values were -0.63, -0.75 and -0.60, respectively, but *A. californicus* had significant positive effect (r=0.75). The results showed that the max. temp. had insignificant positive effect whereas, “r” value was (-0.50). The combined effect (E.V.) of these factors on *T. urticae* eggs showed that these factors were responsible as a group for 77% effect.

Table (3): Weekly mean numbers of *Tetranychus urticae* during spring plantation / leaf, its associated natural enemies and some ecological factors at kafr El sheikh governorate in 2016 season

Inspection Dates	stages		Weather factors			Natural enemies	
	egg	Movable stages	Max. Temp.	Min. Temp.	R.H.%	*Coccinella undecimpunctata*	*Amblyseius swirskii*
03/03/2016	0	0	22.71	12.43	68.72	0	0
10/03/2016	0	0	22.25	10.88	62.857	0	0
17/03/2016	0	0.3	22.59	12.62	61.59	0	0
24/03/2016	0	0.8	22.95	12.56	59.28	0	0
31/03/2016	0	0.1	22.52	12.72	58.73	0	0
07/04/2016	0	0	26.1	14.43	59.86	0	0
14/04/2016	8.2	13.6	25.61	15.7	61.06	1	0
21/04/2016	5.7	9.3	26.42	13.04	60.13	3	1
28/04/2016	6.3	5.9	26.94	16.05	59.26	9	3
05/05/2016	8.9	12.5	27.29	16.57	57.43	11	6
12/05/2016	12.7	16.1	25.97	17.38	56.29	15	5
19/05/2016	13.6	18.6	28.17	18.68	52.02	19	3
26/05/2016	60.4	40.3	28.06	18.62	51.93	20	7
02/06/2016	30.8	73.1	35.5	20.5	54.57	23	6
09/06/2016	29.2	60.3	32.95	21.45	53.14	29	2
General	175.8	250.9				130	33
Mean	11.72	16.73				8.66	2.2

Movable stages:

The population densities of *T. urticae* movable stages were higher abundance but not much in the first season 2016 than that recorded in the second season 2017 with general mean1.61 and 1.3/ leaf, respectively. Data in Table, (3&4) indicated that, the individuals of *T. urticae* movable stages not appeared in six inspections in both season 2016&2017. In the season 2016 & 2017, the population had two peaks in the 2nd week of May and 1stweek of June, respectively with mean number 4.8& 6.7 and 2.8&5.1/ leaf, respectively.

1st season 2016:

Data in Table (6) indicated that significant negative effect for R.H. on the seasonal fluctuations of *T. urticae* movable stages whereas, "r" value was -0.68. The results showed highly significant positive effects for max. & min. temp., *C. undecimpunctata* and *A. californicus* on the seasonal fluctuations of *T. urticae* movable stages, whereas "r" values were 0.85, 0.86, 0.89 and 0.68, respectively. The combined effect (E.V.) of these factors on *T. urticae* movable stages showed that these factors were responsible as a group for 84% effects on the population dynamics of *T. urticae* .

Table (4): Weekly mean numbers of ***Tetranychus urticae*** during **spring plantation** / leaf, its associated natural enemies and some ecological factors at kafr El sheikh governorate in **2017** season

Inspection Dates	stages		Weather factors			Natural enemies	
	egg	Movable stages	Max. Temp.	Min. Temp.	R.H.%	*Coccinella undecimpunctata*	*Amblyseius swirskii*
02/03/2017	0	0	21.29	11.57	69.43	0	0
09/03/2017	0	0	21.57	11.71	56.57	0	0
16/03/2017	0	0	20.14	12.86	54.57	0	0
23/03/2017	0	0	20.08	13.39	56.1	0	0
30/03/2017	0	0	20.87	13.45	57.56	0	0
06/04/2017	0	0	22	13.57	63	0	0
13/04/2017	0.1	0.2	22	15	60.43	0	0
20/04/2017	0.4	0.5	23.5	14.87	57.8	5	0
27/04/2017	0.4	0.7	23.9	15.12	55.14	8	1
04/05/2017	0.6	1.2	25.57	16.14	54.4	14	2
11/05/2017	1.2	2.8	28.4	17.14	56.3	20	3
18/05/2017	1	2	28.5	18.5	56.3	22	6
25/05/2017	0.8	2.5	27.8	18.5	55.7	19	10
01/06/2017	2.5	5.1	29.2	20.7	51.7	30	9
08/06/2017	1.8	4.5	31.6	20.5	50.7	34	5
General	8.8	19.5				152	36
Mean	0.59	1.3				10.13	2.4

Table (5): Simple correlation and partial regression values of the three main weather factors and biotic factors on *B. tabaci* and corresponding percentage of explained variance on tomato spring plantation at kafr El sheikh governorate during **2016 and 2017 seasons.**

Pests stage	Variables	2016					2017				
		Correlation		Regression coefficient		E.V%	Correlation		Regression coefficient		E.V%
		r	p	b	P		r	P	B	P	
***B .tabaci* (Egg)**	**Max. Temp.**	0.43	0.10	0.33	0.33	62%	0.54	0.03	-3.24	0.32	86%
	Min. Temp.	0.47	0.07	1.25	1.25		0.50	0.05	-1.95	0.46	
	RH%	-0.63	0.01	-1.11	-1.11		0.44	0.09	-3.43	0.04	
	C. undecimpunctata	0.36	0.18	-0.82	-0.82		0.60	0.03	-0.41	0.23	
	S. Corollae	0.27	0.32	-0.003	-0.003		0.39	0.14	0.03	0.93	
	A. Californicus	0.36	0.17	0.06	0.06		-0.75	0.001	-0.57	0.04	
	N. Tenuis	0.43	0.1	0.20	0.20		-0.69	0.004	-1.82	0.02	
***B .tabaci* (Nymph)**	**Max. Temp.**	0.79	0.0005	2.02	0.01	94%	0.24	0.38	1.99	0.90	77%
	Min. Temp.	0.74	0.002	-0.02	0.98		0.47	0.07	-6.32	0.64	
	RH%	-0.62	0.01	0.05	0.89		0.48	0.06	-25.21	0.03	
	C. undecimpunctata	0.60	0.01	-0.18	0.56		0.31			0.21	
	S. Corollae	0.24	0.37	0.27	0.18			0.26	-2.24	0.09	
	A. californicus	0.36	0.18	-1.89	0.06		-0.01	0.95	-4.46	0.24	
	N. Tenuis	0.62	0.02	-0.09	0.84		-0.54	0.03	-1.57	0.17	
	C. Carnea	0.69	0.004	0.99	0.02		-0.64	0.02	-5.24	0.07	

2nd season 2017:

The results revealed that max. & min. temp., R.H. and *C. undecimpunctata* had significant negative effects on seasonal fluctuation of movable stages of *T. urticae* whereas "r" values were -0.85, -0.64, -0.61 and -0.60, respectively. The partial regression analysis demonstrated a highly significant positive effect of *A. californicus* on *T. urticae* population (r. = 0.94). The E.V. percentage recorded 98%. Table, (6)

The effectiveness of weather factors and the predators on the population density of sucking pests on different crops have been studied by several researchers (Ali and Rizk, 1980; Liu, 1993; Koleva *et al.*, 1996; Abou-Elhagag and Abdel-Hafez, 1998). In addition, Dent (1991) reported that environmental conditions at any location influence the seasonal phenology of pest numbers, the number of generations and the level of pest abundance.

These regard was in agreement with Hollingsworth and Berry (1982) mentioned that, population of *T. urticae* Koch declined abruptly on peppermint after reaching a peak density during late June. Yasin (1997) added that there were many different factors effect on the population density of phytophagous mites other than, (predaceous mites and environmental conditions) factors. Ghallab (2001) found that the population of *T. urticae* was a significant increase between April and June. Shereef *et al.* (1980) recorded that temperature but not humidity was positively and significantly correlated with pest mite numbers. Results not agreement Atef and Wael (2013) recorded that the percentage of explained variance of abiotic factors (minimum–maximum temperatures and relative humidity) and biotic factors (predators and parasitism percentages) altogether in the population densities of *B. tabaci* and *T. urticae* in the second season were the greater percentage values as 63.2%, and 68.3%, respectively, compared to the first season (45.5% and 69.8% respectively), but the disagreement from , date of plantation which different from governorate to others and different position so differences climatic factors.

Table (6): Simple correlation and partial regression values of the three main weather factors and biotic factors on *T.urticae* and corresponding percentage of explained variance on tomato spring plantation at kafr El sheikh governorate during 2016 and 2017 seasons.

s stage	Variables	2016					2017				
		elation		coefficient		E.V%	Correlation		coefficient		E.V%
T.urticae (Egg)	Max. Temp.	0.75	0.001	-0.01	0.78	84%	0.50	0.054	3.24	0.72	77%
	Min. Temp.	0.85	<.0001	0.01	0.91		-0.63	0.010	5.07	0.43	
	RH%	-0.77	0.0007	0.007	0.87		-0.75	0.001	-4.44	0.03	
	C. undecimpunctata	0.89	<.0001	0.05	0.15		-0.56	0.027	-0.54	0.31	
	A. californicus	0.77	0.0006	0.07	0.29		0.75	0.001	0.76	0.27	
able stagesh)	Max. Temp.	0.85	<.0001	0.18	0.35	84%	-0.85	<.0001	-12.16	0.01	98%
	Min. Temp.	0.86	<.0001	-0.08	0.82		-0.64	0.009	4.44	0.13	
	RH%	-0.68	0.005	0.08	0.51		-0.61	0.015	-3.27	0.002	
	C. undecimpunctata	0.89	<.0001	0.18	0.11		-0.60	0.016	0.03	0.88	
	A. californicus	0.68	0.004	0.06	0.74		0.94	<.0001	1.13	0.003	

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