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Occurrence and population dynamics of the true spider and pests associated with wheat plants in Qalubiya and Beni–Suif Governorates

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Abstract:

Spiders associated with wheat plants were recorded in Qalubiya and Beni-Suef Governorates in Egypt, during the period from January to May 2016 and 2017 seasons. Results revealed the occurrence of fifteen spider species belonging to eleven families, namely, Agelenidae, Araneidae, Dictynidae, Filistatidae, Linyphiidae, Lycosidae, Cheracanthiidae, Philodromidae, Salticidae, Theridiidae and Uloboridae. Agelenidae, Araneidae, Dictynidae, Linyphiidae, Lycosidae, Salticidae and Theridiidaefamilies were the most dominant with frequency percentage of 100% on wheat in two Governorates. Population density of spider families in Qalubiya Governorate reached the highest peaks on wheat in early March by 42 and in early May 44 individuals during 2016, whereas, it has one peak in early March recorded 49 individuals during 2017. However, the population density of spider families in Beni-Suef have two peaks in early March by 48 and in early May 51 individuals during first year, while in the second year the peaks in mid February by 50 and in mid March recorded 53 individuals. The two spotted spider mite *Tetranychus urticae* Koch. (Acari : Tetranychidae) and *Aphis gossypii* Glover (Hemiptera: Aphididae) has one annul peak in March, while the *Frankliniella tritici* (Fitch) (Thysanoptera : Thripidae) have one annul peak on mid of May in the two Governorates. The results suggested that the true spider can play an important role for control pests on wheat plant in the two Governorates.

Introduction

Wheat (*Triticum aestivum* L.) is a convenient, nutritious and economical source of food. It provides about 20% world food calories and food for nearly 40% of the world's population. The cereal is grown on 23% global cultivated area is for great importance in bread, diet, pharmaceutics and other industry but also important product of international trade for worldwide market (Istvan, 2006). Aphids a serious pest of wheat and other field crops is an important sucking pest of various field crops, fruits and vegetables. Aphid attacks started in 1st week of January in all plots and increased with the vegetative growth of plant and reached at peak level in the 3rd week of March and after that its population started to decrease and population of bio-control agents was low at

start but maximum during the March when aphid population was at its peak level (Aheer *et al.*, 2008 and Ullah *et al.*, 2014)

Spiders may play an important role in controlling field populations of economic agricultural pests infesting some important drops. True spider sare world wide distributed and occupy many ecological environments thourough agroecosystems. Taxonomists documented about 117 families, 4128 genera and 48288 species(World Spider Catalog, 2019). The majority of spider species are polyphagous generalist predators (Pekár *et al.*, 2011).

Spiders are important mortality agents of horticultural/agricultural pests such as aphids, leafhoppers, planthoppers, fleahoppers, mites and other soft bodies insect like lepidopterous larvae as well as some flying insect (Khan and Misra, 2004). Several spider species from various families Araneidae, Dictynidae, Lycosidae, Cheracanthiidae, Salticidae, Thomisidae and Theridiidae have been commonly found associated with different crops, weeds, ornamental plants and fruit trees (Ghabbour*et al.*, 1999; Sallam, 2002; Habashy *et al.*, 2005; El-Gepaly *et al.*, 2018 and Abo-Zaed *et al.*, 2019).

Ecological parameters and taxonomic importance of different species of spiders from fruit gardens, cotton fields, citrus and guava fruit gardens were investigated by many researchers (EI-Hennawy, 1992; Sallam, 1996; Mohafez, 2004; Maqsood, 2011 and El-Gepaly *et al.*, 2018). The aim of the present work was to investigate the occurrence and population density of the spiders and pests associated with different pests infesting wheat crop in Qalubiya and Beni-Suif Governorates from early January to mid May during 2016-2017.

Materials and methods

A detailed study was conducted at Qaha Station, Plant Protection Research Institute, Qalubiya Governorate and Sids Station, Plant Protection Research Institute Beni-Suif Governorate on wheat crop during two successive years 2016 and 2017.

1. Collected spider:

Spiders were collected by two methods:

1.1. Plants shaking methods:

The spiders on wheat foliage were collected by shaking the plants on a cloth or a shake sheet. This method is referred as the drop cloth method. Then wheat plants were shocked over the shaking white cloth (1m*1m) biweekly during the period from early January to mid May.

1.2. Pitfall trap methods:

Samples of the soil spiders fauna were collected from the study are by pit-fall method described by Uetz and Unzicker (1976) and Southwood and Henderson (2000). Ten traps were distributed in the experimental wheat area (1/2 feddan). In this study, the number of spiders trapped in primarily depends on their location activity. The traps were used in each sampling date in different plots, according to (Habashy *et al.*, 2005). The spiders after then brought to the laboratory for identification. Samples were conducted biweekly during the surveying period. The surveyed spiders were kept in glass vials containing 75% ethyl alcohol and droplets of glycerin.

2. Identification of true spider:

Identification of adult females is depending on shape of eyes and epigyneal plate of female or on the palp in case of male (Sallam, 2002). Identification of specimens followed the descriptions of (Petrunkevitch, 1939; Kaston, 1978 and Jocqué and Dippenaar-Schoeman, 2007). Characteristers of obtained families, genera and species were presented. In some cases, identification was possible only to the genus level.

$$\text{Population density (P.D.)} = \frac{\text{No. of individuals of species}}{\text{No of sample containing this species}}$$

$$\text{Frequency of occurrence (F.O. \%)} = \frac{\text{No of sample containing a species} \times 100}{\text{No of collected sample}}$$

3. Population dynamics of pests:

Thirty leaves were collected from 10 wheat plants from January to mid May during two seasons 2016-2017. Samples were collected in a polyethylene bags and

transferred to laboratory. To kill insects, piece of cotton moistened with chloroform put in each sample and left for 15 minutes. The sample was emptied in Petri dish and cleaned from plant residues. Then it was examined under stereomicroscope to separate and count the major insect pests. This process was performed at weekly intervals thouroughout the entire period of investigation. Specimens were mounted for light microscopy according to the procedure detailed by Kosztarab and Kozár (1988). While the spider mite individuals were counted by direct examination under stereo–microscope andcleared in Nesbitt solution for about 15 minutes after that, mounted on microscope slides in Hoyer's medium was used to set most mites on the slides (Jeppson *et al.*, 1975).

4. Statistical analysis:

Data were subjected to the statistical analysis. Monthly average temperatures (°C) and average relative humidity (RH.%) prevailing in the area during the study were obtained from site http://www.wunderground.com**.** Simple correlation was used to correlate between weather factors and average monthly number of spider and pests by using SAS statistical software (SAS Institute, 2003).

Results and discussion

1. Occurrence and frequencies of spider families associated with wheat during 2016-2017 seasons at Qaha in Qalubiya Governorate:

The obtained data in Table (1) showed that, the collected spiders were 15 different spider species belonging to 15 genera under 11 different families. The families as shown in Table (1) were Agelenidae, Araneidae, Dictynidae, Filistatidae, Linyphiidae, Lycosidae, Cheracanthiidae, Philodromidae, Salticidae, Theridiidae and Uloboridae. The highest abundant families in this study were observed in family Salticidae, including thouree different species. The salticid spiders were; *Plexippus paykulli* (Audouin), *Memenorus* sp. and *Euophourys granulate* Denis. Two species of the family Theridiidae were *Theridion melanosticum* (Cambridge) and *Enophognatha deserta* Lerey and Amitai., two species of the family Lycosidae were *Lycosa* sp. and *Pardosa* sp., while the other families contain one species , Agelenidae (*Tegenaria* sp.), Araneidae (*Neoscona* sp.), Dictynidae (*Dictyna* sp.), Filistatidae (*Filistata* sp.), Linyphiidae (*Bathyphantes* sp.), Cheracanthiidae (*Cheiracanthium inclusum* (O.P.Cambridge)), Philodromidae (*Thanatus albini* Audouin) and Uloboridae (*Uloborus walckenacrius* Latreille).

As shown in Table (1), the frequency of occurrence of the collected families, Agelenidae, Araneidae, Dictynidae, Filistatidae, Linyphiidae, Lycosidae, Cheracanthiidae, Philodromidae, Salticidae, Theridiidae and Uloboridae were 100, 100, 100, 95, 100, 100, 95, 85, 100, 100 and 65, respectively on wheat at Qaha in Qalubiya Governorate. The total numbers of spider were 645 individuals at Qaha in Qalubiya Governorate during 2016-2017 seasons. The family Salticidae was the highest abundant population of wheat plants during the seasons 2016-2017 at Qaha region and recorded 137 spider individuals, followed by Lycosidae recorded 93 individuals while, the lowest number of spiders were recorded from family Uloboridae 14 spider individuals Table (1). The highest population density of spider on wheat plant on family Salticidae were 6.85 followed by Lycosidae and Philodromidae were 4.65 and 4.18, respectively.

Table (1): Occurrence and frequencies of spider families associated with wheat during 2016-2017 seasons at Qaha in Qalubiya Governorates

Families and species	Total individuals of species	Total No. of samples containing species	Population density (P.D.)	Frequency of occurrence (F.O. %)
Agelenidae Koch, 1837	48	20	2.40	100
Tegenaria sp.	48	20	2.40	100
Araneidae Simon 1895	44	20	2.20	100
Neoscona sp.	44	20	2.20	100
Dictynidae Cambridge, 1871	40	20	2.00	100
Dictyna sp.	40	20	2.00	100
Filistatidae Ausserer, 1867	41	19	2.16	95
Filistata sp.	41	19	2.16	95
Linyphiidae Blackvall, 1859	56	20	2.80	100
Bathyphantes sp.	56	20	2.80	100
Lycosidae Sundevall, 1833	93	20	4.65	100
Lycosa sp.	49	20	2.45	100
Pardosa sp.	44	20	2.20	100
CheracanthiidaeWagner, 1887	47	19	2.47	95
Cheiracanthium inclusum (O.P.Cambridge)	47	19	2.47	95
Philodromidae (Thorell, 1870)	71	17	4.18	85
Thanatus albini Audouin, 1826	71	17	4.18	85
Salticidae Blackwall, 1841	137	20	6.85	100
Plexippus paykulli (Audouin, 1826)	48	19	2.53	95
Memenorus sp.	48	20	2.40	100
Euophourys granulate Denis, 1947	41	20	2.05	100
Theridiidae Sundevall, 1833	54	20	2.70	100
Theridion melanosticum (Cambridge, 1876)	36	16	2.25	80
Enophognatha deserta Lerey& Amitai, 1981	18	14	1.29	70
Uloboridae Cambridge	14	13	1.08	65
Uloborus walckenacrius Latreille, 1806	14	13	1.08	65
Total number	645			

2. Occurrence and frequencies of spider families associated with wheat during 2016-2017 seasons at Sids in Beni-Suef Governorate:

The obtained data in Table (2) showed that; the collected spiders at Sids in Beni-Suef Governorate were 15 different spider species belonging to 15 genera under 11 different families similar in Qalubiya Governorate. The highest abundant families in this study were observed in family Salticidae, including thouree different species recorded 179 individuals followed by Lycosidae recorded 109 individuals, while the lowest number 25 individuals was recorded in the Uloboridae during 2016-2017 seasons.

As shown in Table (2), the frequency of occurrence of the collected families, Agelenidae, Araneidae, Dictynidae, Filistatidae, Linyphiidae, Lycosidae, Cheracanthiidae, Philodromidae, Salticidae, Theridiidae and Uloboridae were 100, 100, 100, 100, 100, 100, 95, 90, 95, 95 and 65, respectively on wheat plants at Sids in Beni-Suef Governorate. The highest population density of spider on wheat plant on family Salticidae were 9.26 followed by Lycosidae and Uloboridae were 5.45 and 1.92, respectively.

Table (2): Occurrence and frequencies of spider families associated with wheat during 2016-2017 seasons at Sids in Beni-Suef Governorate.

Families and species	Total individuals of species	Total No. of samples containing species	Population density (P.D.)	Frequency of occurrence (F.O. %)
Agelenidae Koch, 1837	61	20	3.05	100
Tegenaria sp.	61	20	3.05	100
Araneidae Simon 1895	55	20	2.75	100
Neoscona sp.	55	20	2.75	100
Dictynidae Cambridge, 1871	45	20	2.25	100
Dictyna sp.	45	20	2.25	100
Filistatidae Ausserer, 1867	46	20	2.30	100
Filistata sp.	46	20	2.30	100
Linyphiidae Blackvall, 1859	62	20	3.10	100
Bathyphantes sp.	62	20	3.10	100
Lycosidae Sundevall, 1833	109	20	5.45	100
Lycosa sp.	59	19	3.11	95
Pardosa sp.	50	20	2.50	100
CheracanthiidaeWagner, 1887	75	19	3.95	95
Cheiracanthium inclusum (O.P.Cambridge)	75	19	3.95	95
Philodromidae (Thorell, 1870)	52	18	2.89	90
Thanatus albini Audouin, 1826	52	18	2.89	90
Salticidae Blackwall, 1841	176	19	9.26	95
Plexippus paykulli (Audouin, 1826)	72	19	3.79	95
Memenorus sp.	58	19	3.05	95
Euophourys granulate Denis, 1947	46	20	2.30	100
Theridiidae Sundevall, 1833	48	19	2.53	95
Theridion melanosticum (Cambridge, 1876)	29	18	1.61	90
Enophognatha deserta Lerey& Amitai, 1981	19	15	1.27	75
Uloboridae Cambridge	25	13	1.92	65
Uloborus walckenacrius Latreille, 1806	25	13	1.92	65
Total number	754			

The obtained results are in harmony with that conducted by Ghabbour *et al*. (1999) who surveyed spiders in 18 different crops in Menoufiya Governorate, using pitfall traps, and recorded 10 spider families on winter crops, where Lycosidae was the dominant family constituting about 80% followed by Linyphiidae, Philodromidae, Gnaphosidae and Tetragnathidae. Also these results agree with finding by Ghabbour *et al.*, 1999; Sallam, 2002; Habashy *et al.*, 2005; El-Gepaly *et al.*, 2018 and Abo-Zaed *et al.*, 2019.

The present investigation was an attempt to explore the relation between temperature and relative humidity and the population dynamics of certain common true spiders associated with wheat plantations during the cultivated seasons, 2016 and 2017 in Qalubiya and Beni-Suef Governorates.

3. Population density of different spider families associated with wheat:

3.1. In Qalubiya Governorate:

The different recorded population density, temperature and relative humidity data were obtained from Tables (3 and 4), the total number of spiders were 294 and 351 individuals during the first and second year, respectively in Qalubiya Governorate.The highest abundance of the collected spider was for the members of family Salticidae at Qaha region (63 individuals), followed by family Lycosidae (41 individuals) and the lowest number of members of family Uloboridae (4 spider individuals). The population of spider individuals was recorded with low numbers in early January and gradually increased in numbers reached its peak in early March recorded 42 individuals at average temperature and relative humidity were 20.7°C and 53.4%, after that, the population fluctuated and peaked in early May recorded 44 individuals at average temperature and relative humidity were 26.8°C and 41.6% at Qaha in Qalubiya 2016 season Table (3) and Figure (1).

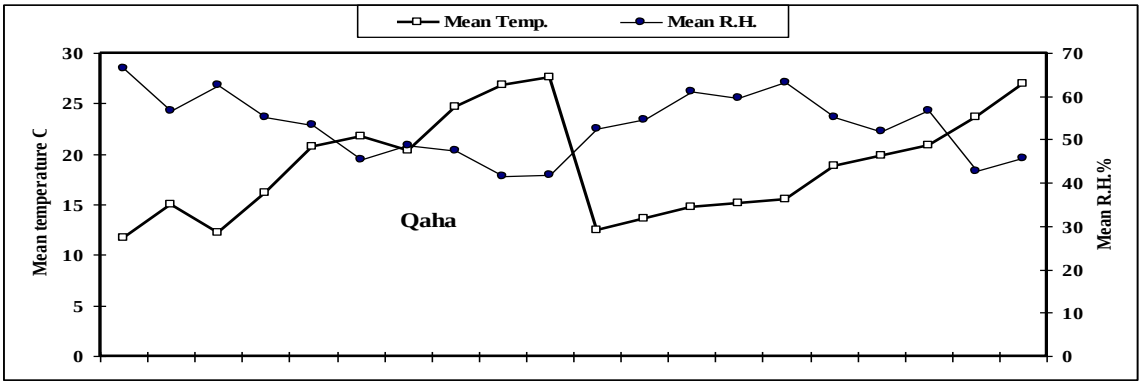
Similar results were observed in the second year 2017; members of the family Salticidae recorded the highest number were 74 individuals, while the lowest numbers were recorded in family Uloboridae 10 individuals. The population of spider individuals was recorded with low numbers in early January and gradually increased in numbers reached its peak in early March recorded 49 individuals at average temperature and relative humidity were 15.5 °C and 63.2 %, after that, the population gradually decreased till mid May (Table, 4). Statistical analysis present in the (Tables 3 and 4 and Figure, 1) showed that, the temperature was a significant positive correlation with the density of the population of spiders in the first year (0.66*), while non-significant negative correlation in the second year (-0.10). However, relative humidity had non-significant negative correlation with the spider population in the first year (-0.64) and positive in the second year (0.59).

Table (3):Population density of spider families associated with wheat during 2016 season at Qaha in Qalubiya Governorate.

Families	1/1	15/1	½	15/2	1/3	15/3	¼	15/4	1/5	15/5	Total
Agelenidae	2	2	2	2	3	3	4	2	2	2	**24**
Araneidae	2	1	3	3	4	4	3	2	1	1	**24**
Dictynidae	1	2	2	2	3	3	1	3	1	1	**19**
Filistatidae	2	3	2	2	3	4	2	1	2	1	**22**
Linyphiidae	3	3	2	3	4	4	2	2	3	3	**29**
Lycosidae	3	2	2	4	3	3	5	5	7	7	**41**
Cheracanthiidae	1	1	1	2	2	1	1	0	2	1	**12**
Philodromidae	0	0	4	4	7	1	0	1	5	3	**25**
Salticidae	3	4	5	4	9	7	5	2	12	12	**63**
Theridiidae	0	0	1	1	4	5	2	0	8	10	**31**
Uloboridae	1	1	0	0	0	0	0	0	1	1	**4**
Total	**18**	**19**	**24**	**27**	**42**	**35**	**25**	**18**	**44**	**42**	**294**
Mean Temp.	11.7	15.0	12.2	16.1	20.7	21.8	20.4	24.6	26.8	27.6	0.66*
Mean R.H.	66.3	56.6	62.7	55.1	53.4	45.5	48.5	47.6	41.6	41.7	-0.64

Table (4):Population density of spider families associated with wheat during 2017 season at Qaha in Qalubiya Governorate

Families	1/1	15/1	½	15/2	1/3	15/3	¼	15/4	1/5	15/5	Total
Agelenidae	1	1	2	2	4	4	3	3	2	2	**24**
Araneidae	1	1	2	2	2	3	4	3	1	1	**20**
Dictynidae	1	1	3	3	3	3	2	3	1	1	**21**
Filistatidae	2	2	2	2	2	2	3	3	0	1	**19**
Linyphiidae	1	1	2	3	5	5	3	3	3	1	**27**
Lycosidae	5	3	5	11	4	4	5	4	8	3	**52**
Cheracanthiidae	1	1	5	5	6	6	4	3	3	1	**35**
Philodromidae	1	2	8	3	13	10	1	2	3	3	**46**
Salticidae	3	4	5	8	8	8	17	13	5	3	**74**
Theridiidae	3	3	3	3	1	2	2	2	2	2	**23**
Uloboridae	1	1	1	1	1	0	1	2	1	1	**10**
Total	**20**	**20**	**38**	**43**	**49**	**47**	**45**	**41**	**29**	**19**	**351**
Mean Temp.	12.5	13.6	14.7	15.1	15.5	18.8	19.8	20.9	23.7	27.0	**-0.10**
Mean R.H.	52.4	54.6	61.2	59.5	63.2	55.2	52.0	56.7	42.6	45.7	**0.59**



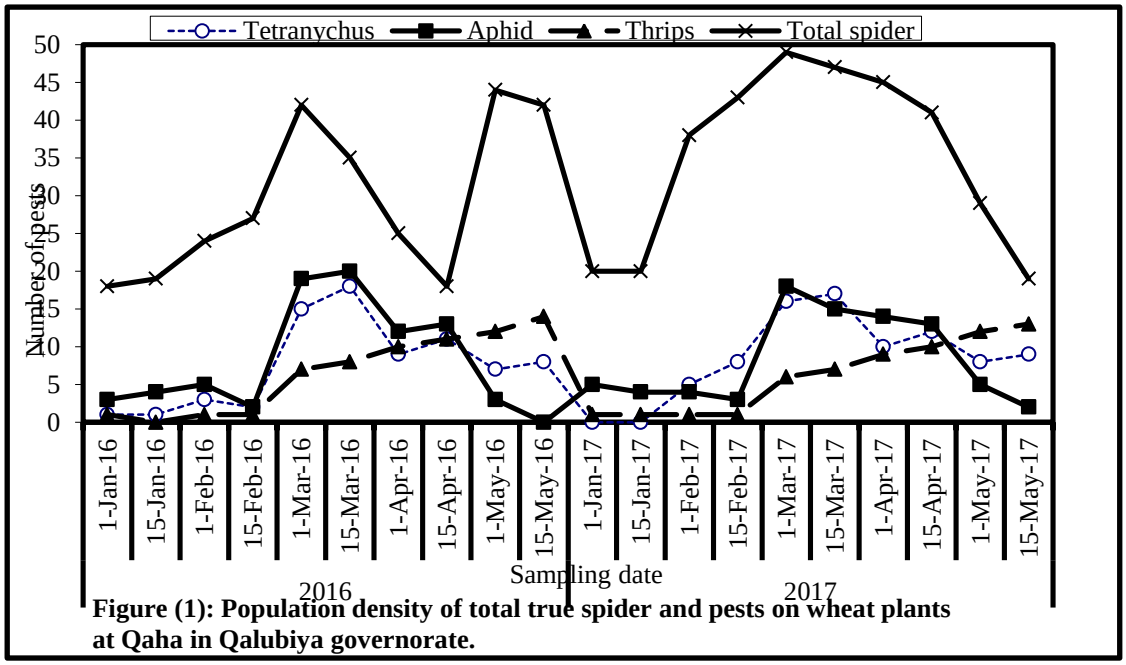


Figure (1): Population density of total true spider and pests on wheat plants at Qaha in Qalubiya governorate.

3.2. In Beni-Suef Governorate:

The results in Tables (5 and 6) and Figure (2) proved that, eleven spider families with annual total number of 349 and 405 individuals were collected from the wheat for 2016 and 2017, respectively (Tables, 5 and 6).

The highest abundance of the collected spider was for the members of family Salticidae at Sids region (89 individuals), and the lowest number of members of family Uloboridae (11 spider individuals). The population of spider individuals was recorded with low numbers in early January and gradually increased in numbers reached its peak in early March recorded 48 individuals at average temperature and relative humidity were 20.6°C and 51.6%, after that, the population fluctuated and peaked in early May recorded 51 individuals at average temperature and relative humidity were 26.9°C and 40.5% at Sids in Beni-Suef 2016 season (Table, 5 and Figure, 2).

The second year 2017; members of the family Salticidae recorded the highest number were 87 individuals, while the lowest numbers were recorded in family Uloboridae 14 individuals. The population of spider individuals was recorded with low numbers in early January and gradually increased in numbers reached its first peak in mid February recorded 50 individuals at average temperature and relative humidity were 15.1 °C and 58.2 %, whereas, the second peak was recorded in mid March was 53 individuals at average temperature and relative humidity were 18.9°C and 53.8% (Table, 6). Statistical analysis indicated that, the temperature was a highly significant positive correlation with the density of the population of spiders in the first year (0.77**), while non-significant negative correlation in the second year (-0.004). However, relative humidity had significant negative correlation with the spider population in the first year (-0.74*) and non-significant positive correlation in the second year (0.59)Tables (5 and 6) and Figure (2).

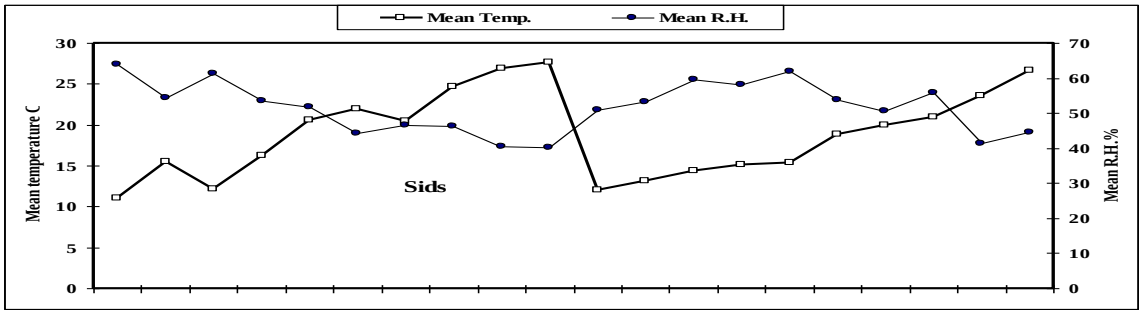
This result is accordance with Sallam (1996) and Hussein *et al.* (1998) observed that the five families Araneidae, Lycoside, Philodromidae, Salticidae and Theridiidae occurred in all the surveyed locations on citrus trees. Ghaobour *et al.* (1999) who found the shade of plants and the available humidity expressed as water requirement for each crop in addition to density of plants / acre directly affected abundance of activity density of soil fauna. Sallam (2002) who studied the influence of both temperature and the relative humidity on the population of the spiders in four locations in Egypt.

Table (5):Population density of spider families associated with wheat during 2016 season at Sids in Beni-Suef Governorate.

Families	1/1	15/1	½	15/2	1/3	15/3	¼	15/4	1/5	15/5	Total
Agelenidae	2	2	2	2	4	2	5	3	3	3	**28**
Araneidae	1	1	3	3	5	5	4	3	2	2	**29**
Dictynidae	1	1	1	1	4	4	1	4	2	2	**21**
Filistatidae	1	1	2	2	2	3	3	2	3	2	**21**
Linyphiidae	1	5	5	5	2	2	3	3	4	4	**34**
Lycosidae	3	4	1	3	5	5	5	7	6	6	**45**
Cheracanthiidae	2	2	0	1	10	5	1	1	6	4	**32**
Philodromidae	3	1	1	1	3	5	0	0	2	2	**18**
Salticidae	5	4	8	10	11	10	5	4	17	15	**89**
Theridiidae	1	1	3	2	2	3	2	1	3	3	**21**
Uloboridae	0	0	2	0	0	0	2	2	3	2	**11**
Total	**20**	**22**	**28**	**30**	**48**	**44**	**31**	**30**	**51**	**45**	**349**
Mean Temp.	11.0	15.5	12.2	16.3	20.6	22.0	20.5	24.7	26.9	27.6	**0.77****
Mean R.H.	64.0	54.4	61.4	53.6	51.9	44.2	46.5	46.3	40.5	40.3	**-0.74***

Table (6):Population density of spider families associated with wheat during 2017 season at Sids in Beni-Suef Governorate.

Families	1/1	15/1	1/2	15/2	1/3	15/3	1/4	15/4	1/5	15/5	Total
Agelenidae	2	2	3	3	6	5	4	2	3	3	**33**
Araneidae	2	2	3	2	3	4	2	5	2	1	**26**
Dictynidae	2	2	3	4	1	2	3	4	1	2	**24**
Filistatidae	3	2	2	3	2	4	2	4	1	2	**25**
Linyphiidae	2	1	2	2	6	5	5	3	1	1	**28**
Lycosidae	7	4	6	11	4	6	6	6	9	5	**64**
Cheracanthiidae	2	2	6	7	10	9	1	2	2	2	**43**
Philodromidae	2	1	8	4	3	4	2	3	2	5	**34**
Salticidae	4	6	7	8	7	8	21	18	4	4	**87**
Theridiidae	1	2	2	4	3	5	1	3	3	3	**27**
Uloboridae	1	2	2	2	1	1	0	0	3	2	**14**
Total	**28**	**26**	**44**	**50**	**46**	**53**	**49**	**48**	**31**	**30**	**405**
Mean Temp.	12.0	13.2	14.4	15.1	15.4	18.9	19.9	21.0	23.6	26.7	**-0.004**
Mean R.H.	51.0	53.1	59.6	58.2	61.8	53.8	50.6	55.9	41.3	44.5	**0.59**



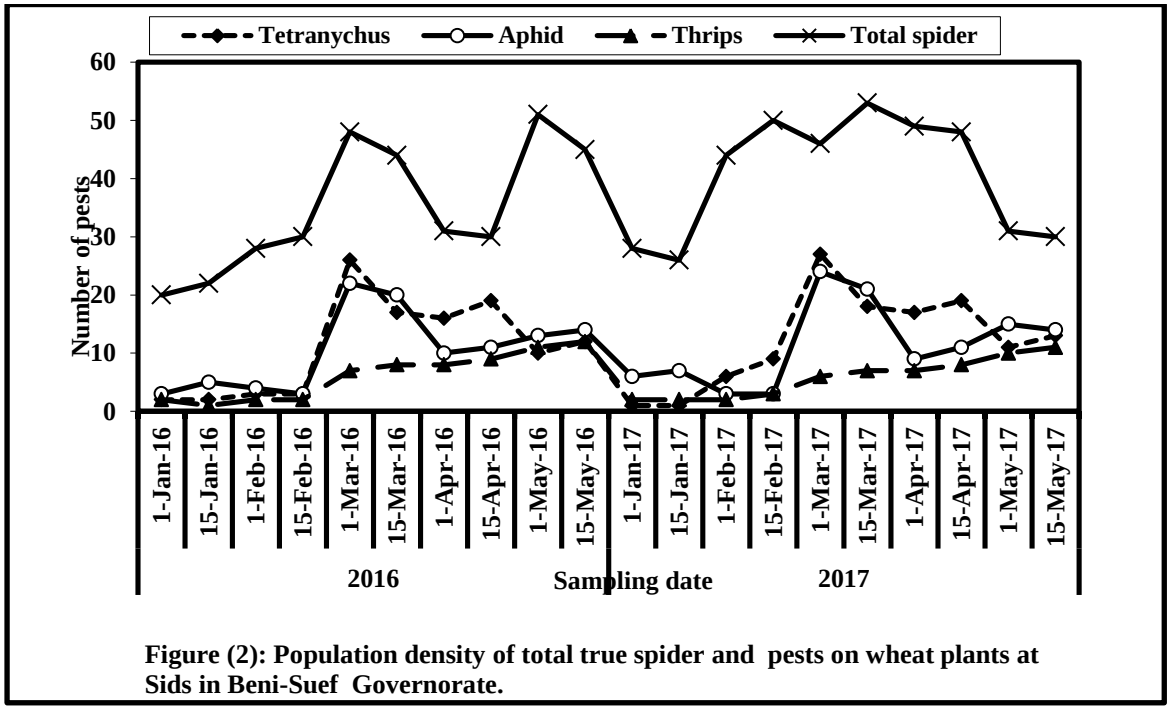


Figure (2): Population density of total true spider and pests on wheat plants at Sids in Beni-Suef Governorate.

4. Population density of mite and insect pests on wheat plants:

There are thouree pests were recorded on wheat in Qalubiya and Beni-Suef Governorates during two season 2016-2017: *T. urticae*, *A. gossypii* and *F.tritici.*

4.1. In Qalubiya Governorate:

As shown in Table (7) and Figure (1) indicated that, the incidence of *T. urticae* was available for two years 2016 and 2017. The mite occurrence was first observed during early January and came to peak in mid March recorded 18 and 17 individuals/ leaf during first and second season, respectively, after that the population decline till mid May (Figure,1).

Table (7):The correlation coefficient between temperatures, relative humidity, true spider and pest populations on wheat atQalubiya Governorate during 2016-2017.

Season	Pests	True spider	Mean Temperature	Mean RH
2016	***Tetranychus urticae***	**0.51**	**0.60**	**-0.64**
	Aphis gossypii	**0.12**	**0.17**	**-0.18**
	Frankliniella tritici	**0.59**	**0.95*** **	**-0.89*** **
2017	***Tetranychus urticae***	**0.74***	**0.40**	**0.14**
	Aphis gossypii	**0.74***	**-0.013**	**0.37**
	Frankliniella tritici	**0.03**	**0.95*** **	**-0.63**

The relationship between the true spider population and density of the tetranychid mite *T. urticae* was positively correlated (0.51 and 0.74*) during two successive years, respectively. The correlation analyses showed that mite occurrence had non-significant positive relationship with the average temperatures (0.60 and 0.40 in the two successive years. The relative humidity was non-significant negative correlated in the first year (-0.64) and non-significantly positively correlated (0.14) in the second year.

Data in Table (7) and Figure (1) indicated that, the population of *A. gossypii* was the first observed during early January in rear number and gradually increased in number and reach to a peak in mid March recorded 20 ind./ leaf in the first season, and in early March recorded 18 individuals/ leaf second season, after that the population decline till mid May. The relationship between the true spider population and density of the *A. gossypii* was positively correlated (0.12 and 0.74*) during two successive years, respectively. The correlation analyses showed that the population of Aphid had non-significant relationship with the average temperatures (0.17 and -0.013) in the two successive years, respectively. The relative humidity was non-significant negative correlated in the first year (-0.18) and non-significantly positively correlated (0.37) in the second year.

The aforementioned results in Table (7) and Figure (1) clarified that, the thripid insect *F. tritici* was recorded in fewer numbers in early January and gradually increased in number and reach its peak in mid May recorded 14 and 13 individuals/ leaf during the first and second seasons, respectively. The relationship between the true spider population and density of the *F. tritici* was positively correlated (0.59 and 0.03) during two successive years, respectively. The correlation analyses indicated that, the population of *F. tritici* had highly significant positive relationship with the temperatures (0.95*** and 0.95***) in the two successive years, respectively. While, the relative humidity had significant negative correlated in the first year (-0.89**) and non-significantly negatively correlated (-0.63) in the second year.

4.2. In Beni-Suef Governorate:

As shown in Table (8) and Figure (2), indicated that the population of *T. urticae* was first recorded in early January and reached a peak in early March recorded 26 and 27 individuals/ leaf during first and second season, respectively, after that the population decline till mid May (Fig.1). A similar trend was recorded on aphids, *A. gossypii* was the first observed during early January in rear number and gradually increased in number and reach to a peak in early March recorded 22 and 24 ind./ leaf in the first and second seasons, after that the population decline till mid May.The thrips, *F. tritici* was recorded in fewer numbers in early January and gradually increased in number and reach its peak in mid May recorded 12 and 11 Individual / leaf during the first and second seasons, respectively.

The relationship between the true spider population and density of *T. urticae, A. gossipii* and *F. tritici* was positively correlated during two successive years, respectively Table (8). These results indicated that the true spider can play an important role for control pests on wheat plant in the two Governorates.

These results agree with those of (Ibraheem *et al.*, 2007) who indicated that, highest mean thrips population (6.15/leaf) was recorded during 11/04/13 and 02/05/13 whereas, the minimum population of thourips (1.85/leaf) was recorded on 17/04/13.The two spotted spider mite recorded 3-4 peaks on the tested cultivars during the two seasons with highest peak of 26.0 mites/ leaf on Sakha 93 at early-April during the first season. During the second season, the highest peak of 7.0 mites/ leaf was recorded at the end of March on Gemiza 9.

Table (8):The correlation coefficient between temperatures, relative humidity, true spider and pest populations on wheat at Beni-Suef Governorate during 2016-2017.

Season	Pests	True spider	Mean Temperature	Mean RH
2016	***Tetranychus urticae***	0.62	0.62	-0.54
	Aphis gossypii	0.83**	0.66*	-0.63
	Frankliniella tritici	0.78**	0.94***	-0.89
2017	***Tetranychus urticae***	0.63	0.41	0.23
	Aphis gossypii	0.18	0.38	-0.07
	Frankliniella tritici	0.037	0.96***	-0.60

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