

INCIDENCE AND SEASONAL FLUCTUATION OF TRUE SPIDERS INHABITING DIFFERENT ORCHARD TREES AT SOHAG GOVERNORATE

Mohafez, M. A. M. ; T. M. M. Al-Akraa and M. A. M. El-Danasory
Agric. Zoology and Nematology Dept., Fac. of Agric., Al-Azhar Univ.

ABSTRACT

Survey and seasonal fluctuation of common true spiders inhabiting different orchard trees in Egypt were studied at two localities (Tahta and Temma) at Sohag Governorate from March 2004 to February 2006. Visual count and collection of spiders associated with orchard (Mango, Olive, Citrus, Guava and Grape) collected monthly. The survey revealed about 22 Genera and 25 spider species belonging to 17 families. Concerning of the seasonal fluctuated of the most predominant families' relation to Temperature and relative Humidity in two localities (Tahta and Temma) at Sohag Governorate. Population of spider families Lycosidae, Miturigidae, Theridiidae and Salticidae were found in all the months of two successive years. Each one from these families has two peaks, during seasons. The members of rest spider families found between moderate and lowest population during the successive years.

Keywords: true spiders Survey, population fluctuation.

INTRODUCTION

True spiders are the most abundant predatory groups in terrestrial ecosystems. They are feed on insects and some other arthropods. Therefore, it can play an important role in pest control, 40028 species of true spiders have been identified in the world. Many studies have been done on spider fauna, abundance and their role in pest control in citrus orchards in many countries. Spiders can inhabit all types of the habitats and ecosystems. Of the continents and from sea level to 5000 m elevations: (Foelix, 1982). The spiders are known to occupy nearly every terrestrial habitats, from the peaks of the highest mountain ranges to the depths of the largest caves and pot-holes, from down marsh to dry desert, any where in fact that can find other arthropods to provide them with meal. Some spend at last part of their lives running around on the surface of fresh water lakes and pond and survive below the surface of the water for short time, although only the true water spider, *Argyroneta*, has perfected this ability to the extent that it is able to live wholly aquatic. A few spiders live along the coastal strand line and some of them can tolerate emergent in salt water while the tide is in. Also many species of spiders have a fairly wide distribution both within and between the continents of the world, the majority tend to be found within a fairly restricted habitat because they are specifically adapted to live in that particular area. Spider adapted for living in a damp, marshy habitat, for example, would find it impossible to live in the hot, dry conditions met within desert. Such a habitat preference is well illustrated in very closely related jumping spiders of the genus *Salticus*. *Salticus scenicus* is the very common black and white zebra spider, found in both Europe and North America, normally on the outside of buildings and on stone walls around human habitation. Although it also occurs amongst rocks in more natural situation.

Whoever, most spiders' life in terrestrial ecosystems. Mostly, they dwell on the ground in gardens and fields or life on webs on vegetation. Spiders that live in continental ecosystems are defined as effective predators of insects and other arthropods. Spiders live together with insects in agriculture ecosystems. Ecological and fanatic investigation on spiders demonstrated that spiders can control insects and their larvae in terrestrial ecosystem (Riechart and Lockley 1984; Nyffeler and Benz, 1987; Malony *et al.*, 2003). Many studies have been performed on spider of serial (Luczak, 1975., Jones, 1976). True spiders are recorded in Cotton and Tobacco field and some orchard in Middleast (Bayram *et al.*, 2000; Ghavami, 2006).

In Egypt spiders are found to be predators on insects and mites, which cause damages for many agricultural crops. The predacious habits of spiders are beneficial in the control of different pests. In Egypt (Hussine 1999): studied the seasonal abundance and activity patterns of spider fauna in some vegetable fields in Menoufyia, Nile Delta. The peak activity (19ind/hr) and the highest diversity (9 species) were recorded in summer, while the lowest values (0.08) ind/hr and 3 species) were registered in winter. (Abdul-Ghafoor 1988) studied the monthly fluctuation of 12 spider species in rice field in Pakistan. The present work aimed to throw light on the incidence and seasonal fluctuation of true spiders inhabiting different orchard trees at Sohag Governorate.

MATERIALS AND METHODS

All investigation samples were collected from two localities at Sohag Governorate south part of Egypt. The diversity of planted habitats (in different habitats) including orchards trees in different localities. i.e. Tahta and Temma .Sample carried out monthly during the period from March 2004 to February 2006. As some spider specimens were collected by different method included umbrella (branch shaking), screening (silky trap) and bit fall traps. Samples were randomly collected from selected orchards ,i.e. . olive (*Olia europæa*), mango (*Mangifera indica*) and citrus (*Citrus sinensis*) trees, five trees were randomly selected and 5-10 branch of each tree were shaken five times for each sample. Olive trees branches were 120-150cm, mango trees branches were 50-200cm and citrus trees branches were 150-200cm long. For grape (*Vitis quadrangularis*), 50-80cm leaves were shaken over pice of cloth. For guava, used a screening method (silky trap) when make collection by shaken some branches (5-6) over screening cloth. Ground spiders were collected by hand within the area of a square meter around each tree selected for shaking.Specimens were individually kept in small plastic vials and transferred to the laboratory for counting and identification to family' level. Identification of genera and species was carried out by Mr. H.K. El-Hennawy (Egypt). Collected samples were examined in Petri-dish filled with 70% ethyl alcohol; each specimen was individually placed in glass vial (3×5cm) containing 70% ethyl alcohol and labeled with locality, habitat and date collection. specimens were presented in the collection on Faculty of Agriculture - Al-Azhar University.

RESULTS AND DISCUSSION

Samples of true spiders were collected from inhabiting orchards of (olive, mango, guava, citrus and grape) located in Tahta and Temma districts at Sohag Governorate (south part of Egypt), from March 2004 to February 2006, and processed for spiders isolation and identification well occurred. All collected spiders belonging to sub-order Labidogantha and this group includes the true spiders. Data presented in Table (1) showed the presence of twenty five spider species belonging to twenty two genera and seventeen families.

Data in Table (2) showed that the families, Lycosidae, Miturgidae, Theridiidae and Salticidae were represented in all localities. They were found in most surveyed localities with relative high number at Sohag Governorate, followed by Araneidae, Linyphiidae, Philodromidae and Gnaphosidae as a moderate population density. The other families were recorded in few surveyed localities with a low number population. The variation among the surveyed localities in relation to the number of collected spiders individuals and host plants were presented as follow:-

1-Tahta district:

- a- Mango, the dominant families were Lycosidae (genus *Lycorma*), Gnaphosidae (genus, *Zelotes* and *Setaphis*) and Theridiidae (genus *Theridion*).
- b- Olive, the dominant families were Lycosidae (genus *Lycorma*), Salticidae (genus *Plexippus* and *Thyene*) and family Araneidae (genus *Cyrtophora*).
- c- Citrus, the dominant families were Lycosidae (genus *Lycorma*), Theridiidae (genus *Khochioura* and *Theridion*) and Linyphiidae, (genus *Erigone* and *Prinerigone*).
- d- Guava, the dominant families were Salticidae (genus *Plexippus* and *Thyene*), Lycosidae (genus *Lycorma*) and Theridiidae (genus *Khochioura* and *Theridion*).
- e- Grape, the dominant families were Miturgidae (*Cheiracanthium*), Philodromidae, (genus *Thanatus* and *Philodromus*), Theridiidae (genus *Theridion*) and Salticidae (genus *Plexippus* and *Thyene*).

2- Temma district :-

- a- Mango, the dominant families were Lycosidae (genus *Lycorma*) Miturgidae (genus, *Cheiracanthium*).
- b- Olive, the dominant families were Salticidae (genus *Plexippus* and *Thyene*).
- c- Citrus, the dominant families were Lycosidae and Linyphiidae, (genus *Erigone* and *Prinerigone*).

Table (1):-Incidence of and indentified spiders, genera and species in two districts (Tahta and Temma) at Sohag Governorate.

Familles	Localities	Genus and species	Tahta					Temmass				
			mango	olive	citrus	guava	grape	mango	olive	citrus	guava	grape
Araneidae (Simon, 1895)		<i>Cyrtophora citricola</i>	6	4	1	8	5	4	4	1	3	5
Corinnidae (Cambridge, 1871)			0	2	0	5	0	4	0	4	0	6
Dictynidae (Cambridge, 1871)		<i>Dyctya sp.</i>	0	0	0	0	0	0	1	0	2	
Dysderidae Simon 1807		<i>Dysdera sp.</i>	0	1	0	0	0	3	0	0	0	0
Gnaphosidae Prosoch 1984		<i>Zelotes nilicola</i> <i>Trachyzelotes sp.</i> <i>Micaria sp.</i>	0	1	0	3	3	3	3	2	0	4
			0	1	0	1	1	2	0	1	0	5
			0	1	0	3	0	3	0	1	0	5
Hersiliidae Savigny1825		<i>Hersilia caudata</i>	3	2	0	0	0	1	2	0	0	0
Linyphiidae Black well , 1870		<i>Erigone dentipalpis</i> <i>Prinerigone</i> <i>vagans</i>	3	3	3	0	0	5	2	2	2	2
			2	2	1	0	0	3	1	1	1	1
Lycosidae Sundevall 1833		<i>Lycorma sp.</i>	6	3	6	2	6	4	4	6	2	6
Miturgidae Simon1885		<i>Cheiracanthium isiacum</i> <i>Cheiracanthium sp.</i>	7	8	4	3	6	5	2	2	2	4
			3	4	2	1	3	2	0	2	1	4
Oecobiidae Black well 1862		<i>Oecobius putus</i>	0	0	1	0	0	0	0	0	0	2
Philodromidae Thoral 1830		<i>Philodromus glaucinus</i> <i>Thanatus albini</i>	0	2	3	3	00	0	0	3	3	6
			0	1	2	3	0	0	3	2	9	
Pholcidae C.L. Koch,1850		<i>Pholicus sp.</i>	0	0	0	0	0	0	0	1	0	0
Pisauridae Simon, 1890			19	0	17	0	0	11	20	11	15	1
Salticidae Black well 1841		<i>Plexippus paykullii</i> <i>Thyene sp.</i>	5	4	3	1	3	1	4	1	3	6
			2	3	0	1	2	1	3	1	1	2
Theridiidae Sundevall 1833		<i>Khochioura aulicus</i> <i>Theridion. melanostictum</i> <i>Staatoda</i> <i>paykulliana</i>	1	3	2	2	6	2	0	5	5	5
			1	3	4	1	1	2	5	4	2	7
			1	2	2	6	2	1	0	0	0	3
Thomisidae Sundevall 1833		<i>Thomisus splnifer</i> <i>Syenema diana</i> <i>Thomisus sp</i>	1	0	3	0	4	0	0	1	0	3
			1	0	2	0	3	0	0	1	0	2
			1	0	2	0	4	0	0	1	0	2
Uloboridae Laterella 1805		<i>Uloborus walckenearius</i>	2	5	0	-	5	2	5	0	0	5

Table (2):- Incidence spider of families on different most plants orchard in (Tahta and Temma districts) at Sohag Governorate.

Localities Families	Number of individuals										Total	%
	Tahta					Temma						
	mango	olive	citrus	guava	grape	mango	olive	citrus	guava	grape		
Araneidae (Simon, 1895)	18	22	13	11	18	13	15	14	19	22	166	7.95
Corinnidae (Cambridge, 1871)	4	0	4	0	6	0	2	0	5	0	21	1.06
Dictynidae. Cambridge, 1871	0	0	5	0	5	0	0	3	0	4	17	0.81
Dysderidae Simon 1807	10	0	0	0	0	6	1	4	2	0	23	1.1
Gnaphosidae Prosoch 1984	25	21	18	0	29	0	17	2	13	20	145	6.95
Hersiliidae Savigny, 1825	3	5	0	0	0	7	5	0	0	0	20	0.95
Linyphiidae Blackwall, 1870.	18	17	23	7	8	23	14	29	5	6	150	7.19
Lycosidae Sundevall 1833	40	42	76	18	29	57	21	43	10	35	371	17.78
Miturgidae Simon, 1885.	60	18	18	7	41	43	23	14	10	36	310	14.86
Oecobiidae Blackwall, 1862.	0	0	0	0	5	0	0	2	0	0	7	0.33
Philodromidae Sundevall 1833	5	0	19	15	47	0	5	10	13	00	147	7.04
Pholcidae C. L. Koch, 1850	0	0	4	0	0	0	0	5	0	3	12	0.57
Pisauridae Simon, 1980.	11	20	11	15	1	19	0	17	0	0	92	4.41
Salticidae Black well 1841	16	23	9	22	36	22	43	14	14	16	217	10.4
Theridiidae Sundevall 1833	25	20	28	18	43	11	19	21	18	23	226	10.83
Thomisidae Sundevall 1833	5	0	9	0	18	5	0	13	3	27	80	3.83
Uloboridae Laterella 1805	7	19	0	0	14	5	15	1	0	21	82	3.93

Table (3): Seasonal fluctuation of the most predominant spider families on mango trees in relation to emperature degrees and relative humidity in two districts at Sohag Governorate.

Seasons	Months	Years	lycoseidae	Miturgidae	Therididae	Salticidae	Araneidae	Linyphiidae	Phidornidae	Gnaphosidae	T. of true spider family	Temperature °C	Relative humidity
Spring	March	2004	2	8	4	5	4	14	3	5	45	26.9	75
	April		4	11	8	8	11	12	4	6	64	30.6	84
	May		11	10	12	4	5	20	9	2	73	38.7	73
	Mean		5.66	9.66	8	5.66	6.66	15.33	5.33	4.33	62.3	32.6	77.3
Summer	June	2004	6	14	20	2	10	21	5	5	83	35.9	77
	July		20	15	23	14	12	9	16	6	115	38.3	87
	August		22	32	6	6	17	6	5	18	112	37.3	90
	Mean		16.66	22	16.33	7.33	13	12	8.66	9.66	103.33	37.16	84.6
Autumn	September	2004	23	4	7	27	11	2	1	4	79	35	90
	October		15	20	13	12	8	6	23	4	101	34.5	89
	November		17	9	6	9	2	2	15	5	55	25	91
	Mean		18.33	11	8.66	16	7	3.33	18.3	4.33	76.6	31.5	90
Winter	December	2006	13	12	10	5	2	0	1	5	48	22.1	92
	January		16	14	6	5	2	5	2	7	57	20.2	92
	February		20	14	14	5	0	2	2	4	61	23.3	90.9
	Mean		16.33	13.33	10	5	1.33	2.33	1.66	5.33	55.3	21.8	91.6
Spring	March	2006	21	6	1	3	5	8	3	2	49	25.6	90
	April		21	1	5	0	1	3	1	4	36	31.9	84
	May		19	12	10	8	2	3	3	1	58	35	93
	Mean		21.3	6.33	8.66	3.66	2.66	4.66	2.33	2.33	47.66	30.8	89
Summer	June	2006	23	14	13	16	5	4	6	10	91	38	72
	July		51	17	11	10	2	13	7	2	113	37.4	87
	August		29	18	13	11	14	8	7	2	102	36.6	89
	Mean		34.3	16.3	9.66	12.3	7	8.33	6.66	4.66	102	37.3	82.8
Autumn	September	2006	21	33	19	28	11	3	13	7	135	35.2	87
	October		14	18	5	18	11	4	9	7	86	31.4	87
	November		31	8	6	10	5	0	6	5	71	26	90
	Mean		22	19.3	9.33	18.6	9	2.33	9.33	6.33	97.33	30.8	86
Winter	December	2006	13	10	8	4	8	4	1	4	52	23.3	83
	January		10	3	3	2	7	0	3	4	32	21.3	78
	February		17	2	3	5	11	1	2	6	47	23.2	78.4
	Mean		13.3	5	4.66	3.66	8.66	1.66	2	4.33	43.66	22.6	79.7

d- Guava, the dominant families were Araneidae and Theridiidae (genus *Theridion* and *Khochioura*). These families had a wide population density on different hosts of orchard in the survey; while rarest families were Dysidridae, Corinnidae, Hersiliidae, Pholcidae and Oecobiidae, were found on some hosts in a few individual number inhabiting orchards in the two localities. Family Lycosidae and Miturgidae were the largest spider of individuals during the survey study when collected from citrus and mango trees with values (32.07 %) and (26.14 %) respectively. Angeli *et al...* (1996) recorded over 60 spider species representing 18 families in six apple and 2 pear orchards in Torrent, Italy.. Deltashev (1997) collected 61 spider species from 17 families at 10 sites along the Shabla-Exerets Lake in Bulgaria during 1992-1994. He reported that the most important and dominant families were Lycosidae (25.8%), Salticidae (12.9%) and Linyphiidae, Theridiidae and Gnaphosidae (all 9.7%).

In citrus orchards in the northern part of Iran but the spider species variety were more in the citrus orchard in another countries such as, in Italy 89 species of spiders belonged to 17 families. Ghavami, (2006) (2007).and Ghavami, (2008): Reported that, the families Lycosidae, Gnaphosidae and Theridiidae height population in the study area specimens were immature in the winter and spring and they were adult in the summer. The dominant species in all of study region was *Pardosa agrestis* (Wesring) In the present study, Fig (1) show the families Lycosidae, Miturgidae, Theridiidae, and Salticidae were the highest population and distribution in the two districts through successive years with values (17.7, 14.68, 10.83) and (10.4) respectively. Other families Araneidae, Linyphiidae and Philodromidae were moderate in population and little distribution in the study on the different hosts of orchards with values (7.95, 7.19) and (7.04) respectively. Fig (2) showed the lowest families Pisauridae, Uloboridae, Thomasidae, Dysderidae, Corinnidae, Hersiliidae, Pholcidae, Dictynidae and Oecobiidae were lowest in population collected in the very low population. in the study on the different hosts of orchards .

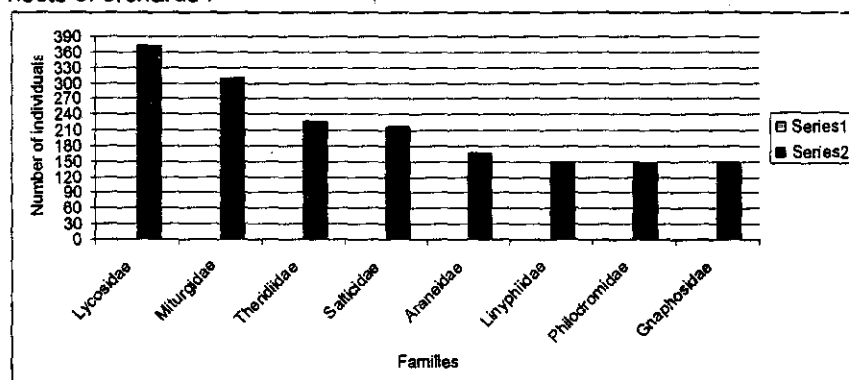


Fig (1): The highest and moderate numbers of spider families in habiting different orchards c during successive years March 2004-to February 2005 at Sohag Governorate.

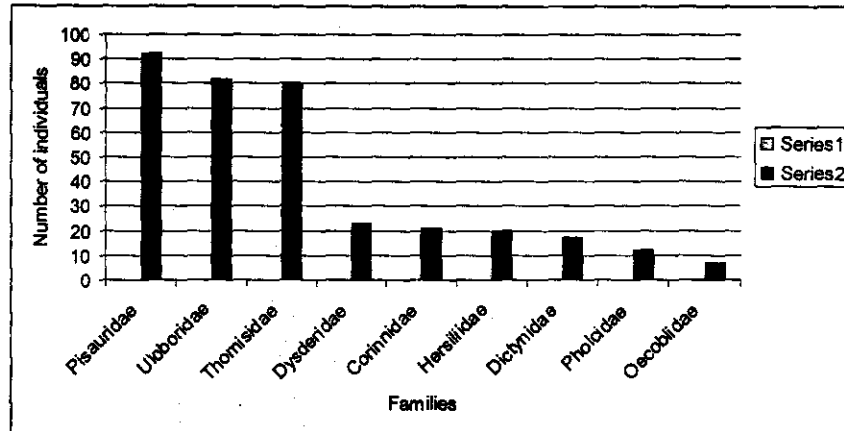


Fig (2): The lowest numbers of spider families in habiting different orchards c during successive years 2004- 2006 at Sohag Governorate.

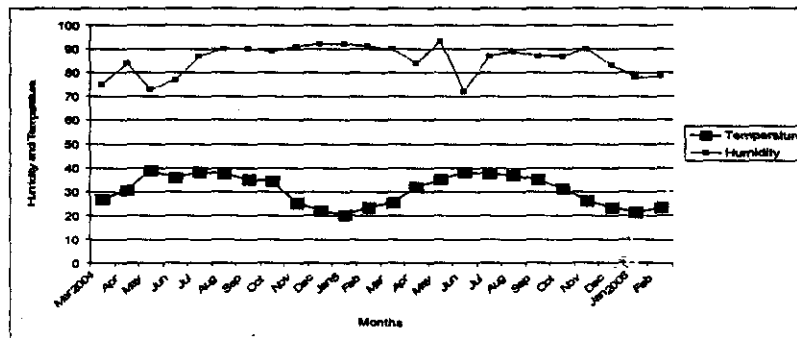


Fig (3): Temperature and relative humidity during two successive years from March 2003-February 2006 at Sohag Governorate.

The population fluctuation of spider individuals belonging to the most prevalent spider families on mango trees during two successive years from (March 2004 to February 2006), were studied at Sohag Governorate.

Data presented in (Table 3 and Fig 1) showed that:-

The population of spider families Lycosidae, Miturgidae, Theridiidae and Salticidae were found all over the two year months, with highest numbers fluctuation nearly to each other in relatively. However, the population numbers of family Lycosidae had two highest peaks in September 2004 and July 2006 with 23, 51 individuals, on mango trees respectively. Also the individuals of family Miturgidae started to increase gradually during Spring months of the first year to reach the first peak in early Summer season, (August 2004 with 32 individuals), then a sharp decline in spider population in late Summer, Autumn and Spring then started to increase gradually during Summer season, to reach peak in September 2005 with values (33)

individuals, after which the spider population increased rapidly to form the lowest peak in Winter season 2006, with values 5 individuals to which temperature and relative humidity with values 22.6°C, 79.7 R.H., respectively. The population members of family Theridiidae were fluctuated during the Spring to reach the first highest peak in mid Summer season (July 2004 with 23 individuals), then a sharp decline in spider population was occurred in Autumn (2005), Winter and Spring (2005) months with mean 10, 8.66 individuals, after which the spider population increased rapidly to reach their the second highest peak in early Autumn (September 2005 with 19 individuals). The members of family Salticidae fluctuated to increase from Spring (2004) to reach the relatively highest peak in early Autumn season (September 2004, with 27 individuals), while the second highest peak were appeared in first Autumn season (September 2005). The other families of Araneidae, Liniphiidae, Philodromidae and Gnaphosidae found as moderate population in spiders.

The population of family Araneidae were fluctuated during the Spring season (2004) to reach the first peak in late Summer (September 2004) with (17 individuals) then they started to decrease during (Autumn, Winter and Spring) then reach the second peak late (Summer 2005) (August) with (14 individuals). Family Lyniphiidae had to peak the first in Summer (June with (26 individuals) and the second peak reach mid Summer 2005 (August) with (13 individuals). Family Philodromidae and Gnaphosidae cross to peak in Summer (June and July 2004) with (21 and 16 individuals), the second peak for this family was in Autumn and Summer 2005 with (13 and 10 individuals) respectively. EL-Erksousy (2000), investigated the seasonal population fluctuations of the most prevalent families of the true spiders associated with the growing seasons of cotton during two successive seasons (1997-1998) in two different locations of El-Beheira and Beni-Suef Governorates. Mohafez (2000), studied the population dynamics 1997 to September 1999 at Sohag and El-Baliana at Sohag Governorate.

ACKNOWLEDGMENT

The author would like to thank Mr. Hisham El-Hennawy for helping through this study and identification.

REFERENCES

- Abdul-Ghafoor, G.A. (1988):- Population trend of spider in different months in a rice field faisalabad. Pak.J.Agric.Sciences 35:14.
- Angeli, G.; Forti, D. and Pesarini, C. (1996). Epigeic spiders (Araneae) in apple and pear orchards in Trentino. Redia, 79: 113-121.
- Bayram, A.; Varol, M.L. and Tozan, L.H. (2000):- The spider (Aranea) fauna of cotton field located in the west part of Turkey. Serct 6. 105-114 .
- Deltshev, C.D. (1997). Spiders (Araneae) from the coastal habitats of Shabla-Exerets Lake, Bulgaria (Black Sea Coast). Acta Zoologica Bulgarica, 49 : 58- 63.
- El-Erksousy, M.H.M. (2000): Studies on some true spiders in Egypt. Ph.D. Thesis, Fac. of Agric., Al-Azhar Univ., 132 pp.

- Foelix, R.F. (1982):- Biology of spiders Harvard University Press. Cambridge, MA. USA.
- Ghavami, (2006):- Abundance of spiders (Aranidea: Aranea) in Olive orchards in Northern part of Iran. Pakistan Journal of Biological Science, 9: 795-799.
- Ghavami, (2007):- Spiders fauna in Caspin coastal of Iran. Pakestan Journal of Biological Sciences. 10(5):682-691
- Ghavami, (2008):- Investigation fauna and density of population of spiders in the desert and pomegranate orchards in Tehran and semnan provinces. Pakestan Journal of Biological Sciences. 11 (5) 686:691.
- Hussine, A.M. (1999):- Seasonal abundance and daily activity pattern of spider fauna in some vegetable crops in Menoufyia Governorate, Egypt J.Agric. Res., 77(2): 677-689.
- Jones, M.G. (1976):- The arthropod fauna of a winter wheat field. Journal of Applied Ecology. 13:16-35.
- Luczak, J. (1975):- Studies on the group- field ecosystem. Part 1.10 spider communities of the group field. Polish Ecological Studies 1:93-110.
- Malony, D.; Drummond, F.A. and Alford, R. (2003):- Spider predation in agro-ecosystem: can spiders effectively control pest populations Technical Bulletin, Main agricultural and forest experiment station, P. 190.
- Mohafez, M. A. M. (2000). Studies on true spiders in Sohag Governorate. M.Sc. Thesis, Fac. of Agric., Al- Azhar Univ., 115 p.
- Nyffeler, M. and Benz, G. (1987):- Spider in natural pest control: areview. J. Api. Entomol. 103:321-339.
- Riechart, S.E. and Lockley, T. (1984):- Spiders as biological control against, Annual Review of Entomology. 29:299-320.

دراسة حصر وتذبذب التعداد لبعض عائلات العناكب على بعض أشجار الفاكهة خلال عامين متتاليين في بعض مراكز محافظة سوهاج.

محمد عبدالعال محمد محافظ ، طارق محمد مصطفى الأقصر و محمد عبدالعظيم محمد الدناصوري
كلية الزراعة - جامعة الأزهر - القاهرة.

أجريت هذه الدراسة بغرض حصر ودراسة تذبذب التعداد لبعض أنواع العناكب الموجودة في مركز (طهطا - طما) بمحافظة سوهاج في عامين متتاليين في الفترة من شهر مارس ٢٠٠٤ وحتى فبراير ٢٠٠٦ م .

تم جمع وملاحظة العناكب المرتبطة ببعض أشجار الفاكهة (المانجو، الزيتون، الموالح، الجوافة و العنب) وذلك بصفة شهرية.

دلت النتائج على وجود ١٧ عائلة تتضمن ٢٢ جنس و ٢٥ نوعا من العناكب الحقيقية وكانت هناك علاقة بين تذبذب تعداد أفراد العناكب وبين درجات الحرارة والرطوبة النسبية في موقعي الدراسة (طهطا - طما) بمحافظة سوهاج . وتشير النتائج إلى أن عائلات (Lycosidae, Miturgidae, Theridiidae) بالإضافة إلى عائلة (Salticidae) هي الأكثر تواجداً خلال فترة الدراسة وكان لكل من هذه العائلات ذروتين للتعداد خلال موسمي الدراسة في حين كانت باقي العائلات بين المتوسطة والقليلة التعداد خلال موسمي الدراسة.

قام بتحكيم البحث

أ.د / عمر عبد الحميد نصار
أ.د / مدحت محمد أحمد سيد

كلية الزراعة - جامعة المنصورة
كلية الزراعة - جامعة الأزهر