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Investigation of Abundance and Determination of Dominant Species of Spider Species in Iranian Cotton Fields

¹Sahra Ghavami, ²Gholam Ali Amin ³Masood Taghizadeh and ⁴Zakaria Karimian
¹Iranian Research Institute of Plant Protection, Agriculture Zoology Research Department,
Araneology Research Laboratory, Tehran, Iran
²Agriculture Center of Fars, Iran
³Agriculture Center of Ardebil, Iran
⁴Cotton Research Institute, Iran

Abstract: In the present study, density of abundance of spiders explored and dominant species determined in the cotton major fields i.e., Ardebil, Fars, Golestan and Tehran provinces in 2003-2004. Through regular weekly, specimens collected by shaking bushes and they were carried out for the further study to the Araneae laboratory. A total of 632 specimens were classified in 76 species, 59 genera belonged to 19 families. Twenty seven species and 15 genera of them were new records for spider's fauna of Iran. The collected spiders counted and frequency of each species and dominant species determined. The following species *Thanatus formicinus* (Clerck), *Cheiracanthium pennyi* (O.P. Cambridge), *Aulonia albimana* (Walckenaer), *Neoscona adianta* (Walckenaer) were dominant species in Tehran, Ardebil, Fars and Golestan cotton fields, respectively.

Key words: Spiders, abundance, dominant species, cotton fields, Tehran, Golestan, Fars, Ardebil, Iran

INTRODUCTION

To date, 35,000 species of spiders have been identified in the world and a total of 244 species of spiders are known in Iran (Ghavami, 2006a). Most of investigations on spiders are in agricultural ecosystems in Iran. For instance, some researches were performed on the spider fauna and abundance of rice fields (Ghavami, 2004, 2007a), olive orchards (Ghavami, 2006d; Ghavami *et al.*, 2007c), Rose fields (Ghavami and Nematollahi, 2006) citrus orchards (Ghavami, 2006b, c) and cotton fields (Ghavami *et al.*, 2007d; Ghavami, 2007b).

The present study is accomplished for the first time in Iran but in many countries have been done many studies about them. Such as, in cotton field in South-eastern Queensland, the spider species *Cheiracanthium mordax* L. Koch (Diversum L. Koch), *Archaearanea veruculata* (Urquhart) and *Lycosa* sp. were equally distributed in the outer, middle and inner portions. However, *A. veruculata* was more abundant in the western side of the field late in the season, apparently in response to a more favorable habitat. In sampling, the variance was greater than the mean and over dispersion was apparent. *C. mordax* and *A. veruculata* were most abundant in the top and one-third of plants and

Oxyopes mundulus L. Koch was evenly distributed over plants. Among crop spacing's, most spiders of 4 species preferred the highest density (12 plants/m) (Bishop, 1981). *Thanatus formicinus* had high population in Tando jam cotton fields. It was one of the most effective of spider species on pests control in these fields (Rad *et al.*, 2002). *O. salticus* was dominant species in Massachusetts cotton fields. This species were 58% of collected spider species (Bradwell and Averill, 1997). *Philodromus cespitum* was one of the most abundance predators of cotton pests in Chinese cotton fields (Liu and Niu, 1981). *O. salticus* was dominant species in Texas cotton fields (Dean *et al.*, 1982). *C. erraticum* and *C. pennyi* had high population in German cotton fields (Wolf, 1990).

The aims of the present study were investigation density of spider's population and determination dominant spider species in the Ardebil Golestan, Fars and Tehran provinces during 2003-2004.

MATERIALS AND METHODS

In order to establish the spider abundance of the major cotton fields (Ardebil, Golestan, Fars and Tehran), spider specimens were collected every week in spring, summer and autumn during 2003-2004. Localities of

collections were Aghdam, Oltan, Majidabad and Moghan in Ardebil province and Filestan, Goltapeh, Pakdasht, Pishva, Taghi Abad, Jafar Abad, Ghasem Abad, Gharchak and Varamin in Tehran province, Estahbanat, Darab, Fasa, Jahrom and Neyriz in Fars province and Gonbad, Bailar, Hivehchi, Ghareghaj, Kordkooy and Hashemabad in Golestan province.

Spiders were collected by choose 40 bushes of each cotton fields and shaking them. The collected spiders counted and determined rate of frequency of each species and dominant species (Rad *et al.*, 2002; Bradwell and Averill, 1997). The keys of Anonymous (2002), Barrion and Litsinger (1995), Borrer *et al.* (1989), Kaston (1970) and Roberts (1985), were used for the species classification.

RESULTS AND DISCUSSION

In the present study, quantity of frequency and dominant species of spiders inspected in Iranian major cotton fields during 2003-2004. The examinations executed in cotton fields of 4 provinces, i.e., Ardebil, Golestan, Fars and Tehran. A total of 632 specimens were classified in 76 species, 59 genera belonged to 19 families. Twenty seven species and 15 genera of them were new records for spider's fauna of Iran. The abundance of spiders considered weekly for 7 months (June to December) in each year, too (Table 1).

The dominant spider species determined in Ardebil cotton fields by weekly sampling. *Cheiracanthium pennyi*

O.P. Cambridge, 1873 had the most population in these fields. This species assigned as a dominant species in Ardebil cotton fields. The frequency percent of that in June to December were 5, 5, 10, 15, 30, 25 and 10 in 2003 and 8, 12, 12, 16, 28, 20 and 4 in 2004 (Table 2, 3).

According to the results, spiders had the highest population in the Ardebil cotton fields. The highest population of *C. pennyi* (dominant species) and *X. cristatus* were in August, September and October. These species had synchronized with the highest population of cotton pest's in these times. The fewest population of them were in May and June. The highest population of the other spider species were in July, August and September and the fewest population were in June and December.

The dominant spider species in Fars cotton fields assigned by weekly sampling. *Aulonia albimana* (Walckenaer, 1805) had the most population in these fields and it determined as a dominant species in Fars cotton fields. The frequency percent of it was included 5, 5, 10, 15, 35, 15, 10 and 5 in May to December in 2003 and 5.71, 8.57, 11.42, 14.28, 25.71, 17.14, 11.41 and 5.71 in May to December in 2004. *Arctosa* sp., *Drassodes* sp. and *Xysticus* sp. had high population after *A. albimana* in these fields (Table 4, 5).

As per the results, the highest population of *A. albimana*, *Drassodes* sp., *Arctosa* sp. and *Xysticus* sp. were in July to October. These times had contemporary with the highest population of pests in cotton fields. The fewest population of that were in May and June. The

Table 1: Quantity of population percent of spider's species in Iranian cotton fields during 2003-2004

Scientific names	Ardebil		Fars		Golestan		Tehran	
	First year	Second year	First year	Second year	First year	Second year	First year	Second year
Agelenidae								
<i>Agelena labyrinthica</i>					2.03	1.89		
<i>Cicurina</i> sp.					0.40	0.63		
Araneidae								
<i>Agalenakea redii</i> (Scopoli, 1763)					1.21	0.94		
<i>Araneus</i> sp.					1.21	0.94		
<i>Argiope lobata</i> (Pallas, 1772)	3.20	6.62						
<i>Argiope bruennichi</i> (Scopoli, 1772)					1.21	0.63		
<i>Hyposisinga sanguinea</i> (C.L.Koch, 1845)					0.81	0.31		
<i>Hyposisinga albovitata</i> (Westring, 1851)								
<i>Neoscona adianta</i> (Walckenaer, 1802)	4.00	5.29			12.19	14.24		
<i>Mongora acalypha</i> (Walckenaer, 1802)					1.21	1.58		
<i>Singa</i> sp.					4.06	3.79		
Clubionidae								
<i>Clubiona neglecta</i> (O.P. Cambridge, 1862)	4.00	1.98			0.40	0.31		
<i>Clubiona</i> sp.							2.43	2.89
Dictynidae								
<i>Argenna patula</i> (Simon, 1874)					0.81	0.63	2.43	1.08
<i>Dictyna</i> sp.					2.03	1.58		
Eresidae								
<i>Eresus</i> sp.							1.46	0.36
Gnaphosidae								
<i>Drassodes</i> sp.	4.00	3.31	10.89	12.26				
<i>Gnaphosa</i> sp.			2.56	3.30				
<i>Haplodrassus</i> sp.			4.48	3.77				
<i>Micaria</i> sp.			2.56	1.88			0.48	1.08
<i>Zelotes</i> sp.			1.28	1.94				
Hahniidae								
<i>Artistea</i> sp.			0.64	0.47				

Table 1: Continued

Scientific names	Ardebil		Fars		Golestan		Tehran	
	First year	Second year	First year	Second year	First year	Second year	First year	Second year
Linyphiidae								
<i>Linyphia</i> sp.								
<i>Leptyphantis zimmermani</i> (Bertkau, 1890)							0.97	0.72
<i>Microlinyphia</i> sp.							5.85	6.15
Lycosidae								
<i>Pardosa amentata</i> (Clerck, 1757)	1.60	1.98						
<i>Pardosa agrestis</i> (Westring, 1861)	3.20	1.32	5.12	5.18			6.34	5.07
<i>Pardosa</i> sp.								
<i>Alopecosa pulverulenta</i> (Clerck, 1757)			3.84	3.30				
<i>Arctosa</i> sp.			8.33	8.01				
<i>Ailonia albimana</i> (Walckenaer, 1805)			12.82	16.50				
<i>Hogna</i> sp.	0.80	1.32						
Metidae								
<i>Zygiella x-notata</i> (Clerck, 1757)					1.21	1.58		
Miturgidae								
<i>Cheiracanthium erraticum</i> (Walckenaer, 1802)*	6.40	6.62			10.16	11.39	20.48	19.92
<i>Cheiracanthium pennyi</i> (O.P. Cambridge, 1873)	16.00	16.55			6.09	6.64		
<i>Cheiracanthium mildeji</i> (L. Koch, 1864)			7.31	6.88			7.31	6.88
<i>Cheiracanthium</i> sp.								
Oecobidae								
<i>Oecobius</i> sp.								
Oxyopidae								
<i>Oxyopes salticus</i> (Hentz, 1802)	4.00	6.62					17.07	17.02
<i>Feucetia</i> sp.			1.92	1.80				
Philodromidae								
<i>Philodromus cespitum</i> (Walckenaer, 1802)		5.29					7.80	10.14
<i>Philodromus</i> sp.	8.00	5.29						
<i>Tibellus oblongus</i> (Walckenaer, 1802)	1.60	3.31					0.48	0.72
Pisauridae								
<i>Pisaura mirabilis</i> (Clerck, 1757)								
Salticidae								
<i>Bisnor</i> sp.								
<i>Euphrys frontalis</i> (Walckenaer, 1802)	1.60	1.98	0.64	0.42				
<i>Euphrys</i> sp.	0.80	1.32						
<i>Evarcha</i> sp.			2.56	1.43				
<i>Heliophanus cupreus</i> (Walckenaer, 1802)								
<i>Heliophanus flavipes</i> (Hahn, 1831)								
<i>Heliophanus</i> sp.	3.82	3.31	3.84	3.30				
<i>Pellenes</i> sp.			0.64	0.94				
<i>Phelegra</i> sp.			1.28	0.94				
<i>Philasius</i> sp.	0.80	0.66						
<i>Salticus scenicus</i> (Clerck, 1957)								
<i>Thyene imperialis</i> (Rossi, 1846)	9.60	9.93	5.76	6.13			8.29	7.60
Sparassidae								
<i>Micrommata virescens</i> (Clerck, 1757)								
							0.97	1.08
Tetragnathidae								
<i>Tetragnatha montana</i> (Simon, 1874)								
<i>Tetragnatha javana</i> (Thorell, 1890)								
<i>Tetragnatha exiensa</i> (Linnaeus, 1785)								
Theridiidae								
<i>Steatoda paykullina</i> (Fabricius, 1775)	2.40	1.32	2.56	3.38				
<i>Theridion impressum</i> L. Koch, 1881	2.40	2.64						
<i>Enoplognatha</i> sp.	0.80	0.66						
Thomisidae								
<i>Dixa dorsata</i> (Fabricius, 1777)								
<i>Ozyptilla</i> sp.			1.28	0.94				
<i>Misumenia vatica</i> (Clerck, 1757)	4.00	1.98					4.87	3.98
<i>Misumenops</i> sp.								
<i>Monaesis aciculatus</i> (Simon, 1903)	1.60	0.66						
<i>Synaema globosum</i> (Fabricius, 1775)			1.92	1.43				
<i>Temarius</i> sp.								
<i>Tharatus striatus</i> (Clerck, 1757)							14.87	22.72
<i>Tharatus</i> sp.								
<i>Tharatus striatus</i> (C.L. Koch, 1845)			1.28	1.41			1.46	1.44
<i>Thomisus onustus</i> (Walckenaer, 1806)	4.00	3.31	3.2	2.35			3.90	5.07
<i>Thomisus</i> sp.								
<i>Xysticus cristatus</i> (Clerck, 1757)	12.00	11.93	4.48	4.24			2.43	3.26
<i>Xysticus lanius</i> (C.L. Koch, 1824)			2.56	2.83				
<i>Xysticus luctuosus</i> (Blackwall, 1836)			0.64	0.47				
<i>Xysticus</i> sp.			7.05	7.07				

highest population of the other species was in July and August and the fewest population was in May and June.

The dominant spider species in Golestan cotton fields ordained by the weekly sampling. *Neoscona*

adianta (Walckenaer, 1802) had the highest population in these fields and it assigned as a dominant species in Golestan cotton fields. The frequency percent of it was 23.33, 33.33, 16.66, 13.33, 6.66, 3.33 and 3.33 in May to December in 2003 and 20, 33.33, 17.77, 15.55, 6.66, 4.44 and

Table 2: Monthly dispersion spider's species in Ardebil cotton fields in 2003

Scientific names	May		June		July		August		September		October		November	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
<i>Argiope lobata</i>			1	25.00	2	50.00	1	25.00						
<i>Neoscona adianta</i>	1	20.00	2	40.00	2	40.00								
<i>Cheiracanthium errathicum</i>					2	25.00	4	50.00	2	25.00				
<i>Cheiracanthium pennyi</i>	1	5.00	1	5.00	2	10.00	3	15.00	6	30.00	6	25	2	10.00
<i>Clubiona</i> sp.			3	60.00	2	40.00								
<i>Drassodes</i> sp.			1	20.00	2	40.00	2	40.00						
<i>Pardosa amenata</i>			2	100.00										
<i>Pardosa agrestis</i>	1	25.00	2	50.00	1	25.00								
<i>Hogna</i> sp.			1	100.00										
<i>Oxyopes salticus</i>							2	40.00	3	60.00				
<i>Philodromus</i> sp.				1.00	10	3.00	30	4.00	40	2.00	20			
<i>Tibellus oblongus</i>					1	50.00	1	50.00						
<i>Bianor</i> sp.			1	50.00	1	50.00								
<i>Euphrys</i> sp.					1	50.00	1	50.00						
<i>Heliophanus</i> sp.			1	25.00	2	50.00	1	25.00						
<i>Philasaeus</i> sp.							1	100.00						
<i>Thyene imperialis</i>			1	8.33	2	16.66	4	33.33	3	25.00	2			
<i>Steatoda paykulliana</i>						33.33		66.66						
<i>Theridion impressum</i>							2	66.66	1	33.33				
<i>Enoplognatha</i> sp.							1	100.00						
<i>Misumenz vatia</i>					1	20.00	3	60.00	1	20.00				
<i>Monaesis aciculatus</i>							1	50.00	1	50.00				
<i>Thomisus orastus</i>					1	20.00	2	40.00	2	20.00				
<i>Xysticus cristatus</i>	1	6.66	1	6.66	2	13.33	3	20.00	4	36.66	3	20	1	6.66

Table 3: Monthly dispersion spider's species in Ardebil cotton fields in 2004

Scientific names	May		June		July		August		September		October		November	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
<i>Argiope lobata</i>	1	10.00	2	20.00	5	50.00	2	20.00						
<i>Neoscona adianta</i>	1	12.50	4	50.00	2	25.00	1	12.50						
<i>Cheiracanthium errathicum</i>					1	10.00	5	50.00	3	30.00	1	10		
<i>Cheiracanthium pennyi</i>	2	8.00	3	12.00	3	12.00	4	16.00	7	28.00	5	20	1	4.00
<i>Clubiona</i> sp.			2	66.66	1	33.33								
<i>Drassodes</i> sp.			2	40.00	2	40.00	1	20.00						
<i>Pardosa amenata</i>	1	33.33	2	66.66										
<i>Pardosa agrestis</i>	1	50.00	1	50.00										
<i>Hogna</i> sp.			1	50.00	1	50.00								
<i>Oxyopes salticus</i>					1	10.00	3	30.00	4	40.00	2	20		
<i>Philodromus</i> sp.					1	12.50	2	25.00	3	37.50	2	25		
<i>Tibellus oblongus</i>					1	20.00	2	40.00	2	40.00				
<i>Bianor</i> sp.			1	33.33	2	66.66								
<i>Euphrys</i> sp.					1	50.00	1	50.00						
<i>Heliophanus</i> sp.			1	20.00	3	60.00	1	20.00						
<i>Xysticus cristatus</i>	1	6.45	1	6.66	2	13.33	3	20.00	4	36.66	3	20	1	6.66

Table 4: Monthly dispersion spider's species in Fars cotton fields in 2003

Scientific names	May		June		July		August		September		October		November	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
<i>Drassodes</i> sp.			2	11.76	3	17.64	5	29.41	4	23.52	2	11.76	1	5.88
<i>Gnaphosa</i> sp.			1	25.00	2	50.00	1	25.00						
<i>Haplodrassus</i> sp.			1	12.50	3	37.50	2	25.00	1	12.50				
<i>Micaria</i> sp.					2	50.00	2	50.00						
<i>Zelotes</i> sp.					1	50.00	1	50.00						
<i>Arctoseja</i> sp.							1	100.00						
<i>Peucezia</i> sp.							1	33.33	2	66.66				
<i>Tharatus striatus</i>							1	50.00	1	50.00				
<i>Alopecosa pulvidentata</i>	1	16.66	2	33.33	3	50.00	1	16.66						
<i>Arctosa</i> sp.	1	7.69	2	15.38	4	30.76	3	23.07	2	15.28	1	7.69		
<i>Aulonia albimana</i>	1	5.00	1	5.00	2	10.00	3	15.00	7	35.00	3	15.00	2	10.00
<i>Oxyopes salticus</i>					2	28.57	3	42.85	2	28.57				
<i>Euphrys frontalis</i>					1	100.00								
<i>Evarcha</i> sp.			1	25.00	1	25.00	1	50.00						
<i>Heliophanus cupreus</i>					1	16.66	3	50.00						
<i>Pellenes</i> sp.									1	100.00				
<i>Phelegra</i> sp.									1	50.00	1	50.00		
<i>Thyene imperialis</i>					2	22.22	3	33.33	2	22.22	1	11.11		
<i>Steatoda paykulliana</i>							1	33.33	2	66.66				
<i>Dioea dorsata</i>									1	50.00	1	50.00		
<i>Oxyptila</i> sp.									1	50.00	1	50.00		
<i>Synaema globosum</i>					1	33.33	2	66.66						
<i>Thomisus orastus</i>			1	20.00	1	20.00	2	40.00	1	20.00				
<i>Xysticus cristatus</i>			1	14.28	2	28.57	3	42.87	1	14.28				
<i>Xysticus lanius</i>					1	25.00	2	50.00	1	25.00				
<i>Xysticus luctuosus</i>				%		%		%	1	10.00%	0	%		%
<i>Xysticus</i> sp.					1	9.09	2	18.18	3	27.27	2	18.18	2	18.18

Table 5: Monthly dispersion spider's species in Fars cotton fields in 2004

Scientific names	May		June		July		August		September		October		November	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
<i>Drassodes</i> sp.			2	11.76	3	17.64	5	29.41	4	23.52	2	11.76	1	5.88
<i>Gnaphosa</i> sp.			1	25.00	2	50.00	1	25.00						
<i>Haplodrassus</i> sp.			1	12.50	3	37.50	2	25.00	1	12.50				
<i>Micaria</i> sp.					2	50.00	2	50.00						
<i>Zelotes</i> sp.					2	100.00								
<i>Artistea</i> sp.									1	100.00				
<i>Peucetia</i> sp.					1	25.00	1	25.00	2	50.00				
<i>Thanatus striatus</i>					1	33.33	2	66.66						
<i>Alopecosa pulvenilentia</i>	1	14.28	3	42.85	2	28.57	1	14.28						
<i>Arctosa</i> sp.	2	11.76	2	11.76	5	29.41	4	23.52	3	17.64	1	5.88		
<i>Aulonia albimana</i>	2	5.71	3	8.57	4	11.42	5	14.28	9	25.71	6	17.14	4	11.42
<i>Oxyopes salticus</i>					2	22.22	4	44.44	3	33.33				
<i>Euphrys frontalis</i>					1	100.00								
<i>Evarcha</i> sp.					1	33.33	2	66.66						
<i>Heliophanus cupreus</i>							2	28.57	3	42.85	2	28.57	1	14.28
<i>Pellenes</i> sp.									1	50.00	1	50.00		
<i>Phelegra</i> sp.									1	50.00	1	50.00		
<i>Thyene imperialis</i>			1	7.69	2	15.38	5	38.48	3	23.07	2	15.38		
<i>Steatoda paykullina</i>			2	28.57	2	28.57	3	42.85						
<i>Diaea dorsata</i>							1	50.00	1	50.00				
<i>Oxyptila</i> sp.									1	50.00	1	50.00		
<i>Synaema globosum</i>					1	33.33	2	66.66						
<i>Thomisus onastus</i>			1	20.00	1	20.00	2	40.00	1	20.00				
<i>Xysticus cristatus</i>			1	11.11	3	33.33	3	33.33	2	22.22				
<i>Xysticus lanio</i>					1	16.66	3	50.00	2	23.33				
<i>Xysticus luctus</i>									1	100.00				
<i>Xysticus</i> sp.					1	16.66	3	50.00	2	33.33	4	26.66	1	6.66

Table 6: Monthly dispersion spider's species in Golestan cotton fields in 2003

Scientific names	June		July		August		September		October		November		December	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
<i>Agelena labyrinthica</i>	1	20.00	2	40.00	2	40.00								
<i>Cicurina</i> sp.					1	100.00								
<i>Agalentea redii</i>			1	33.33	2	66.66								
<i>Argiope bruennichi</i>	1	33.33	2	66.66										
<i>Araneus</i> sp.			1	33.33	2	66.66								
<i>Hyposinga sanguinea</i>			1	50.00	1	50.00								
<i>Mangora acalypha</i>			1	33.33	2	66.66								
<i>Neoscona adianta</i>	7	23.33	10	33.33	5	16.66	4	13.33	2	6.66	1	3.33	1	3.33
<i>Singa</i> sp.	1	10.00	3	30.00	4	40.00	2	20.00						
<i>Zygiella x-notata</i>			1	33.33	2	66.66								
<i>Cheiracanthium erraticum</i>	1	4.00	2	8.00	4	16.00	9	36.00	6	13.33	2	4.44	1	2.22
<i>Cheiracanthium pennyi</i>	1	6.66	1	6.66	2	13.33	5	33.33	4	26.66	1	6.66	1	6.66
<i>Clubiona neglecta</i>							1	100.00						
<i>Dictyna</i> sp.			1	20.00	2	40.00	2	40.00						
<i>Argera patula</i>			1	50.00	1	50.00								
<i>Oxyopes salticus</i>					2	25.00	3	37.50	2	25.00	1	12.50		
<i>Philodromus cespitum</i>	2	25.00	4	50.00	2	25.00								
<i>Tibellus oblongus</i>			1	20.00	2	40.00	2	40.00						
<i>Euphrys</i> sp.			1	20.00	3	60.00	1	20.00						
<i>Heliophanus flavipes</i>			2	33.33	3	50.00	1	16.66						
<i>Thyene imperialis</i>	1	5.00	1	5.00	4	20.00	5	25.00	4	20.00	3	15.00	2	10.00
<i>Tetragnatha montana</i>			1	14.28	2	28.57	3	42.85	1	14.28				
<i>Tetragnatha javana</i>							2	50.00	2	50.00				
<i>Tetragnatha extensa</i>					2	25.00	4	50.00	2	25.00				
<i>Steatoda paykullina</i>					1	14.28	3	42.85	2	28.57	1	14.28		
<i>Theridion impressum</i>	1	11.11	2	22.22	4	44.44	2	22.22						
<i>Theridion</i> sp.	1	5.55	2	11.11	3	16.55	5	27.77	4	22.22	2	11.11	1	5.55
<i>Misumena vatia</i>			1	20.00	2	40.00	2	40.00						
<i>Synaema globosum</i>	1	12.50	2	25.00	3	37.50	2	25.00						
<i>Thanatus formicivus</i>					1	14.20	2	28.57	3	42.85	1	14.28		
<i>Thanatus striatus</i>							2	50.00	2	50.00				
<i>Thomisus onastus</i>			1	10.00	2	20.00	5	50.00	2	20.00				
<i>Xysticus lanio</i>					1	100.00								
<i>Xysticus luctus</i>			1	33.33	2	66.66								

2.22 in May to December in 2004. *C. erraticum* (Walckenaer, 1802) and *Theridion* sp. had high population in these fields after *Neoscona adianta* (Table 6, 7).

According to the results, the highest population of dominant species (*N. adianta*) and other spider species in Golestan cotton fields were in June to August. These times had concurrent with the highest population of pests

in cotton fields. The fewest population was in November and December. The highest population of the other species was in August to October and the fewest population of them was in December.

The dominant spider species in Tehran cotton fields considered by weekly sampling. *Thanatus formicivus* (Clerck, 1757) had the highest population in these fields and assigned as a dominant species in Tehran cotton

Table 7: Monthly dispersion spider's species in Golestan cotton fields in 2004

Scientific names	June		July		August		September		October		November		December	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
<i>Agelena labyrinthica</i>	1	20.00	2	40.00	2	40.00								
<i>Cicurina</i> sp.			1	50.00	1	50.00								
<i>Agalentea redii</i>			1	33.33	2	66.66								
<i>Argiope bruennichi</i>	1	33.33	2	66.66										
<i>Araneus</i> sp.			1	33.33	2	66.66								
<i>Hypsosinga sanguinea</i>					1	100.00								
<i>Mangora acalypha</i>	1	20.00	2	40.00	2	40.00								
<i>Neoscona adianta</i>	9	20.00	15	33.33	8	17.77	7.0	15.55	3	6.66	2.0	4.44	1	22/2
<i>Singa</i> sp.	1	8.33	4	33.33	5	41.66	2.0	16.66						
<i>Zygiella x-notata</i>			1	33.33	2	66.66								
<i>Cheiracanthium erraticum</i>	2	5.55	4	11.11	5	13.88	11.0	30.55	8	22.22	4.0	11.11	2	55/5
<i>Cheiracanthium pennyi</i>	1	4.76	2	9.52	3	14.27	7.0	33.33	5	23.80	2.0	9.52	1	76/4
<i>Clubiona neglecta</i>							1.0	100.00						
<i>Dictyna</i> sp.			1	20.00	3	60.00	1.0	20.00						
<i>Argona patula</i>			1	50.00	1	50.00								
<i>Oxyopes salticus</i>				2.00	25	3.00	37.5	2.00	25	1.00	12.5			
<i>Philodromus cespitum</i>	2	18.18	5	45.45	2	18.18	1.0	9.09						
<i>Tibellus oblongus</i>			2	25.00	3	37.50	2.0	25.00	1	12.50				
<i>Euphyra</i> sp.			2	40.00	2	40.00	1.0	20.00						
<i>Helicophanus flavipes</i>			1	25.00	2	50.00	1.0	25.00						
<i>Thyene imperialis</i>	2	7.40	3	11.11	4	14.81	7.0	25.92	6	22.22	3.0	11.11	2	40/7
<i>Tetragnatha montana</i>			1	12.50	3	37.50	3.0	37.50	1	12.50				
<i>Tetragnatha javana</i>					3	30.00	4.0	40.00	3	50.00	1.0	16.66		
<i>Tetragnatha extensa</i>			1	10.00	3	30.00	2.0	20.00	2	20.00				
<i>Steatoda paykulliana</i>					1	14.28	2.0	28.57	3	42.85	1.0	14.28		
<i>Theridion impressum</i>	1	7.69	3	23.07	6	46.15	2.0	15.38	1	7.69				
<i>Theridion</i> sp.	1	4.76	2	9.52	4	19.04	6.0	28.57	5	23.80	2.0	9.52	1	76/4
<i>Misumena vatia</i>			1	25.00	2	50.00	1.0	25.00						
<i>Synaema globosum</i>	2	20.00	3	30.00	3	30.00	2.0	20.00						
<i>Tharatus striatus</i>					1	12.50	2.0	25.00	3	37.50	2.0	25.00		
<i>Tharatus striatus</i>							2.0	50.00	2	50.00				
<i>Thomisus onastus</i>			1	14.28	1	14.28	3.0	42.85	2	28.57				
<i>Xysticus lanio</i>					1	50.00	1.0	50.00						
<i>Xysticus luctuosus</i>			2	50.00	2	50.00								

Table 8: Monthly dispersion spider's species in Tehran cotton fields in 2003

Scientific names	June		July		August		September		October		November		December	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
<i>Cheiracanthium erraticum</i>	2	4.76	2	4.76	4	9.52	7	16.66	14	33.33	8	19.04	5	11.9
<i>Cheiracanthium mildei</i>			1	66.66	2	13.33	4	26.66	5	33.33	3	20.00		
<i>Clubiona</i> sp.			1	20.00	3	60.00	1	20.00						
<i>Argona patula</i>			3	60.00	2	40.00								
<i>Eresus</i> sp.			1	33.33	2	66.66								
<i>Micaria</i> sp.					1	100.00								
<i>Leptyphantes zimmermanni</i>			1	50.00	1	50.00								
<i>Microlyphyra</i> sp.	1	8.33	2	16.66	4	33.33	3	25.00	2	16.66				
<i>Pardosa agrestis</i>	1	7.69	3	23.07	5	38.46	3	23.07	1	7.69				
<i>Philodromus cespitum</i>			1	6.25	3	18.75	6	37.50	3	18.75	2	12.50	1	6.25
<i>Tibellus oblongus</i>							1	100.00						
<i>Oxyopes salticus</i>	2	5.71	3	8.57	5	14.28	12	34.28	7	20.00	3	8.57	2	5.71
<i>Thyene imperialis</i>	1	5.88	2	11.76	3	17.64	6	35.29	3	17.64	1	5.88	1	5.88
<i>Micrommata virecers</i>			1	50.00	1	50.00								
<i>Misumena vatia</i>					1	10.00	3	30.00	4	40.00	2	20.00		
<i>Tharatus striatus</i>					1	9.09	2	18.18	5	45.45	2	18.18		
<i>Tharatus striatus</i>							1	33.33	2	66.66				
<i>Thomisus onastus</i>					2	25.00	4	50.00	2	25.00				
<i>Xysticus cristatus</i>					2	40.00	3	60.00						

fields. The frequency percent of it was in May to December and were included 1.66, 2.11, 5.33, 7.22, 13.45, 7.12 and 3.44 in 2003 and 2.03, 7.45, 10.23, 15.65, 8.38 and 5.34 in 2004, respectively. *C. erraticum*, *Oxyopes salticus* (Hentx, 1802), *Philodromus cespitum* (Walckenaer, 1802) and *Thyene imperialis* (Rossi, 1846) had high population in these cotton fields after *T. formicinus* (Table 8, 9).

As per results, the highest population of *T. formicinus* (dominant species) and *C. erraticum*, *Oxyopes salticus* (Hentx, 1802), *Philodromus cespitum* (Walckenaer, 1802) and *Thyene imperialis* (Rossi, 1846) in Tehran cotton fields were in September to November.

These times had synchronized with the highest population of pests in cotton fields. The fewest population of spider species was in July, August and December. The highest population of the other species was in August and September and the fewest population was in December.

According to the results, *O. salticus* had high population in Tehran cotton fields. Also, it was in Ardebil cotton fields. This species was one of the dominant species in Texas and Massachusetts cotton fields too (Dean *et al.*, 1982; Bradwell and Averill, 1997). *T. formicinus* was dominant species in Tehran province. It was in Golestan cotton fields, too. This

Table 9: Monthly dispersion spider's species in Tehran cotton fields in 2004

Scientific names	June		July		August		September		October		November		December	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
<i>Cheiracanthium erraticum</i>	2	3.63	4	7.27	9.00	16.36	12.00	21.81	15.00	27.27	8.00	54.14	5	9.09
<i>Cheiracanthium mildei</i>			1	5.26	3.00	15.78	5.00	26.31	7.00	36.84	3.00	15.78		
<i>Clubiona</i> sp.					2.00	25.00	4.00	50.00	2.00	25.00				
<i>Argemina patula</i>					1.00	33.33		66.66						
<i>Eresus</i> sp.			1	100.00										
<i>Micaria</i> sp.			1	33.33	2.00	66.66								
<i>Leptyphantes zimmermanni</i>			1	50.00	10.00	50.00								
<i>Microlygyptha</i> sp.	2	11.76	3	17.64	5.00	29.41	4.00	23.52	2.00	11.76	1.00	5.88		
<i>Pardosa agrestis</i>	1	7.14	4	28.57	5.00	35.71	3.00	21.42	1.00	7.14				
<i>Philodromus cespitum</i>	1	3.57	3	10.71	5.00	17.85	8.00	28.57	5.00	17.85	4.00	14.00	2	7.14
<i>Tibellus oblongus</i>					1.00	50.00	1.00	50.00						
<i>Oxyopes salticus</i>	3	6.38	5	10.63	8.00	17.02	14.00	29.78	8.00	17.02	5.00	10.63	4	82.50
<i>Thyene imperialis</i>	2	9.52	2	9.52	4.00	19.04	7.00	33.33	3.00	14.28	2.00	9.52	1	4.76
<i>Micrommata virescens</i>			1	33.33	2.00	66.66								
<i>Misumena vatia</i>				2.00	18.18	3.00	27.27	4.00	36.36	2.00	18.18			
<i>Tharatus striatus</i>					2.00	13.33	3.00	20.00	7.00	46.66	2.00	13.33	1	6.66
<i>Tharatus striatus</i>							2.00	50.00	2.00	50.00				
<i>Thomisus onustus</i>			2	14.28	3.00	21.42	5.00	35.71	2.00	14.28	2.00	14.28		
<i>Xysticus cristatus</i>					2.00	22.22	4.00	44.44	2.00	22.22	1.00	11.11		

species was one the most abundance spider species in Tando Jam cotton fields (Rad *et al.*, 2002). *P. cespitum* had high population in Tehran cotton fields. It was in Ardebil cotton fields, too. Also, it had high frequency in Chinese cotton fields (Liu and Niu, 1981).

According to the results, spiders and cotton pest's were appearance in the same time and when the pest population was height spider's population were height, too. Spiders, specially the dominant spider species had an important role in reduce of cotton pest's population.

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