

<http://www.pjbs.org>

PJBS

ISSN 1028-8880

**Pakistan
Journal of Biological Sciences**

ANSI*net*

Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Abundance of Spiders (Arachnida: Araneae) in Olive Orchards in Northern Part of Iran

Sahra Ghavami

Department of Agricultural Zoology Research, Plant Pests and Diseases Research Institute,
P.O. Box 1454, Tehran 19395, Iran

Abstract: The current study investigated spiders fauna and abundance of olive orchards in Guilan, Ghazvin, Golestan, Mazandaran and Zanjan provinces during 2002-2003. Valid spider keys identification used for species determination. Four species *Frontinellina fruntetorum* (C.L. Koch, 1981) (Linyphidae), *Thyene imperialis* (Rossi, 1846), *Salticus scenicus* (Clerk, 1757) (Salticidae) and *Thomisus onustus*, Walkenaer, 1806 (Thomisidae) of spider of the collection determined as dominant species. Uniform distribution and dominant spider species only recorded for *F. fruntetorum* in all provinces. Spiders abundance researches at three olive orchards in Guilan, Ghazvin and Zanjan provinces. Population abundance of spider recorded by stroking to 8 olive branches of 30 trees at 15 days interval witch onset from May to October. Among collected natural enemies fauna insects and spiders fauna 42.8% was belong to spider specimens and their population fluctuation was varied from 25.4 to 60.7% in month of May to October, respectively.

Key words: Spiders, olive, abundance, predator, biological control, Iran

INTRODUCTION

Spiders are one of the most abundant predatory groups in terrestrial ecosystems. They belonging to phylum arthropoda, class of arachnida and order of araneae. They are predator. They feed on insects and small arthropods. They prey by web, ambush and following. Therefore, they can to play important role in pests control. The current study has done in north part of Iran. Iran, comprising the south western part of Asia, consist of an area about 2700000 km². North part of Iran borders in the south of Caspian sea. Very little up to know has been known about the spider fauna of this huge area. Because, Spiders research is young in Iran. Mozaffarian *et al.* (2000) have researched about spiders fauna of rice fields in Guilan and Mazandaran (northern part of Iran). They recorded 27 species, can be mentioned. Spiders were one of the most abundant predator in this fields. The author investigated spiders fauna of Iran cotton fields in 2003-2004 and recorded 59 species, 41 genera and 20 Families, which in 28 species and 6 genera and 1 family of spiders were reported as the first record in Iran. The most abundant predators were spiders in this fields. 28 species recorded from cotton field in Golestan province (north of Iran) and one of the most population of identified species, had belonged to linyphidae family in cotton fields in this province. Also, author studied spiders fauna of citrus orchards in Guilan, Mazandaran and Golestan provinces (northern part of Iran) and recorded 43 species. The most abundant of spiders were from Linyphidae family. But, about olive

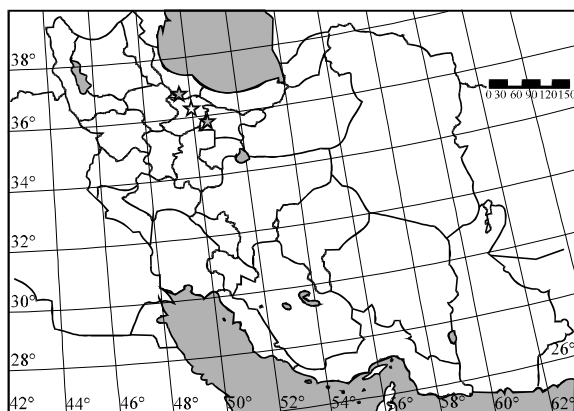
spiders no study carried out in Iran. Therefore, in this study, investigated spiders abundance in olive orchards in Guilan, Ghazvin and Zanjan provinces during 2003 and studied olive spiders fauna in Guilan, Ghazvin, Golestan, Mazandaran and Zanjan provinces during 2002-2003. The study area lies mainly in the olive orchards, dominated by orchards situated in plain. In addition to orchards located in height and forests were included in the investigating place.

Also, many researches about spiders fauna, abundance and their role in pests control had done in many countries. As (Nieuwenhuys, 1999) spiders were one of the most predator in the European and American olive orchards. The most spiders population in European and American olive orchards had belonged to Linyphidae family. (Morris *et al.*, 1999) spiders were second most abundant predator in olive orchards in Granada, Spain. The most abundant spider families were Salticidae and Philodromidae. *Philodromus* sp. was the most frequently caught species followed by *Salticus* sp., *Icius hamatus* and *Philodromus* sp. were the main spider predators of *P. oleae* consuming the eggs and larvae of the anthophagus generation. Thaler and Zapparoli (1993) olive spiders were studied by using pitfall traps in olive grove near Viterbo, central Italy. About 70 species were found belonging to 18 families with the predominant families being Linyphiidae, Lycosidae, Dysderidae, Gnaphosidae and Theridiidae. There was only one abundant species *Lepthyphantes tenuis* together with 4 scarcer species, including *Erigone dentipalpis*, *Meioneta rurestris* and *Pachygnatha degeeri*. Other species also

occurred in mid-Europe mainly in urban environments (*Dysdera crocata* and *Scytodes thoracica*) and at xerothermic sites (various species of Theridiidae, Gnaphosidae, Clubionidae, Thomisidae and Salticidae) (Lozano *et al.*, 2000). Over 900 predators collected during 1998 and 1999 from a Portuguese organic olive orchard were subjected to a serological bioassay for *Prays oleae* predation. The highest number of predators was tested positive during the phyllophagous and antophagous generations of *P. oleae*. Ants (Formicidae) were the most common predators, followed by species belonging to Coleoptera, Hemiptera and spiders (Araneae) (Graf and Nentwig, 2001). Spiders had the most population in olive orchards in Pnama. They were one of the most abundant predator. The one of Important spider species was *Eriophora fuliginosa* belonging to Araneidae family in these orchards. Spiders were the most abundant predator in olive orchards in Cumberland plain woodland (Byron and Green, 2000). Spiders, ants and redbugs had the highest population in olive orchards in Greene County, Mississippi (Viggiani, 1977). Spiders were one of the most abundant predators and they have important role in olive pests control in Italy (Triggiani and Naples, 1971) spiders were natural enemy of *P. unionalis* in Italy (Sacchetti, 1990), spiders are one of important of predators *Prays oleae* in Italy. They were reduced 60-80% of *P. oleae* population in these orchards.

MATERIALS AND METHODS

Study area: The study sites were: 1) Guilan, Roodbar, Ali Abad, about 60 km of Rasht, 15 and 30 of May, 15 and 30 of June, 15 and 30 of July, 15 and 30 of August, 15 and 30 of September and 15 and 30 of October 2003 (Fig. 1).



*Asterisks pink (Guilan), yellow (Zanjan) and green (Ghazvin) has shown site of study

Fig. 1: Site of investigation spiders abundant in olive orchards in Guilan, Ghazvin and Zanjan

2) Ghazvin, inferior Tarom, Loshan, about 70 km of Ghazvin, 16 of May and 1 of June, 16 and 1 of July, 16 of July and 1 of August, 16 of August and 1 of September, 16 of September and 1 of October and 15 of October 2003 (Fig. 1).

3) Zanjan, higher Tarom, about 100 km of Zanjan, 17 of may and 2 of Jun, 17 and 2 of July, 17 of July and 2 of August, 17 of August and 2 of September, 17 of September and 2 of October and 17 of October 2003 (Fig. 1).

Spider sampling: Spiders were sampled for fauna determination 16th times throughout spring, summer, autumn and winter during 2002-2003, from branches, ground, trunks, under stones and grasses by Steiner and Bajolini methods, buttle, aspirator, pitfall trap and pans and transferred to the laboratory. Sampling for abundance spiders were sampled 12th times of each region, during spring, summer and autumn during 2003, by selected 30 trees and stroked to eight branches of each trees every 15 days. Collected spiders transferred to the laboratory and counted. Valid spider keys identification (Anonymous, 2002; Barrion and Litsingerm, 1995; Borrer *et al.*, 1989; Kaston, 1970; Roberts, 1985) used for species determination.

RESULTS

In this study, spiders were classified in 48 species, 56 genera and 18 Families, which in 24 species and 10 genera of spiders were reported as the first record in Iran. Golestan province had the most species number.

Spiders were averagely contributed 42.8% to predators of olive pests (Araneae, Chrysopa and Coccinelid), while were increasing from May (25.4%) to October (60.7%) 2003 (Table 1). In total,

Table 1: Trends of spiders in olive orchards of Ghazvin, Zanjan and Guilan during May to October 2003

Month	No. of spiders	No. of predators	Spiders percentage to total predators
May	15	55	25.4
June	17	62	27.4
July	24	75	32
August	32	86	37.2
September	56	115	48.6
October	82	135	60.7
Total	226	528	42.8

Table 2: Total (Percentage) of four dominant spider species in olive orchards of Ghazvin, Zanjan and Guilan from May to October 2003

Month	<i>Frontinellina frotetorum</i>	<i>Thyene imperialis</i>	<i>Salticus scenicus</i>	<i>Thomisus ornatus</i>
May	33.33	26.66	2	13.33
June	35.29	33.33	24.52	11.76
July	41.66	25	16.66	12.5
August	56.25	21.87	12.5	9.38
September	62.5	17.85	10.71	9
October	82.56	7.3	6.9	4.87



Fig. 2: *Salticus scenicus* (Clerk, 1757) (Original figure, Ghavami *et al.*, 2003)



Fig. 3: *Thyene imperialis* (Rossi, 1846) (Original figure, Ghavami *et al.*, 2004)

Frontinellina fruntetorum (Linyphidae) Fig. 5, *Thyene imperialis* Fig. 3, *Salticus scenicus* (Salticidae) Fig. 2 and *Thomisus onustus* (Thomisidae) (Fig. 4), identified as dominant species. The population of *F. fruntetorum* was the most in all months between May to October (33.33, 35.29, 41.66, 56.25, 62.5 and 82.56%, respectively) and *T. onustus* the lowest (Table 2). The population of *T. imperialis* and *S. scenicus* was the most in Zanjan olive orchards. The most population of *T. onustus* was found in Ghazvin olive orchards. *F. fruntetorum* were found on all branches olive trees. They webbed on all of branches. The mostly population were found in down and middle of olive trees. *T. imperialis* were seen on middle and *S. scenicus* were showed on all high and middle branches of olive trees, especially on head of the tree. *T. onustus* were found on down and middle branches, especially on the point of branches.

F. fruntetorum (Linyphidae), *T. imperialis*, *S. scenicus* (Salticidae) and *T. onustus* (Thomisidae), were feeding on olive pests. *F. fruntetorum*, the mostly fed on *Euphyllura olivina*. Also, it fed on *Seissetia oleae*



Fig. 4: *Thomisus onustus*, Walkenaer, 1806 (Original figure, Ghavami *et al.*, 2003)



Fig. 5: *Frontinellina fruntetorum* (C.L. Koch, 1981) (Original figure, Ghavami, 2006)

and *Palpita unionalis*. *T. imperialis* and *S. scenicus* the mostly were feeding on *P. unionalis*. Also, they fed on *E. olivinae*, *T. onustus* the mostly fed on *S. oleae* and *E. olivinae* and fewer of *P. unionalis*. *F. fruntetorum* they fed on all life stage of *E. olivinae*. *T. imperialis* and *Salticus scenicus* fed on all instar larvae of *P. unionalis* by establishment in larvae niche (*P. unionalis* larvae (4 and 5 and prepupal instar) stick 2 or 3 leaf by webs and established for hibernation and prepupal to pupal) *P. unionalis* and fed it. The most feeding of *T. onustus* was on first instar nymph of *S. oleae*. Also, they fed of all instar nymph of *E. olivinae* and *P. unionalis*. The most population was found in Ghazvin olive orchard.

DISCUSSION

According to this study, Spiders and other predators had high population and activity in olive orchards in north of Iran. Spiders were averagely contributed 42.8% to predators (Chrysopa and Coccinellid) of olive pests. The lowest population of predators and spiders in olive orchards were in May (55, 25.4%) and June (62, 27.4%) and the most population were in September (115, 48.6%) and October (135, 60.7%). As, according to Nieuwenhuys (1999), Graf and Nentwig (2001), Viggiani (1977) and Byron and Green (2000) spiders were one of the most abundant predator in European and American, Pnama, Cumberland, Mississippi and Italy olive orchards, too. Also Morris *et al.* (1999) introduced spiders as the second most abundant predator in olive orchards in Granada, Spain.

Among 48 species had identified, *F. fruntetorum*, *T. imperialis*, *S. scenicus* and *T. onustus* had the most abundance and population in olive orchards.

F. fruntetorum had the highest population and abundance between other species in all of orchards. They had the most population in olive orchards in Zanjan province. The highest population of them were in October (82.56%) and the less population were in May (33.33%). As, according to Nieuwenhuys (1999) the most spiders population in European and American olive orchards had belonged to Linyphidae family. *F. fruntetorum* have seen in olive grove in Europe and USA. It was one of the most abundance species among other species belonging to Liniphidae family in these orchards.

T. imperialis were the most active spiders in all olive orchards. They move fast and had high diet from olive pests. The highest abundance and population of them were in Ghazvin and Zanjan provinces. They had the most population in June (33.33%) and the less in October (7.3%).

S. scenicus were with high activity and abundant in Guilan and Zanjan provinces. The lowest population of *S. scenicus* were in May (2%) and the most were in June (24.52) (Morris *et al.*, 1999) *Salticus* sp. had the most abundant in olive orchards in Granada, Spain, too.

T. onustus have high abundant and activity (diet from insects) in all olive orchards. The highest population of them were in May (13.33%) and the less population were in October (4.87%). As according to Thaler and Zapparoli (1993) Linyphiidae family had the highest population and species from Thomisidae and Salticidae families had high population in olive grove near Viterbo, central Italy, too.

According to current research, spiders were one of the most effective predator in pest control. Specially, they play important role in control of olive key pests (*Euphyllura olivina*, *Seissetia oleae* and *Palpita unionalis*) in olive orchards in north of Iran. As, *T. imperialis* and *S. scenicus* and *T. onustus*, fed from all of life stage *P. unionalis*. Viggiani (1977) introduced spiders as one of the effective predators for *P. unionalis* (one of the most important olive pests in north of Iran now). Triggiani and Naples (1971), presentation spiders one of natural enemies of *P. unionalis* in Italy, too.

Linyphid spiders Specially *F. fruntetorum* were the most effective predators *E. olivinae* and *S. oleae* in olive orchards of Iran. They able to control them with other natural enemies agents. Thaler and Zapparoli (1993) Linyphidae family spiders were one of the natural enemies of olive pests in olive grove in Italy.

In this study, determined spiders role in olive orchards. In more Iran Olive orchards don't used harmful

insecticide for natural enemies and used only Volk oil for pests control. Therefore, population of natural enemies, specially spiders are high and they can olive pests control.

ACKNOWLEDGMENT

I wish to thank to Mr A. Bahramishad for his field assistance.

REFERENCES

- Anonymous, 2002. A key of spiders of black forests, available in <http://research.Amnh.org/entomology/blackrock2/key.htm>.
- Byron, E. and Jr. Green, 2000. Green county history. [Hyyp//www.usgennet.org/usa/ms/county/green/byron.htm](http://www.usgennet.org/usa/ms/county/green/byron.htm).
- Borror, D.J., C.A. Triplehorn and N.F. Jonson, 1989. An Introduction to Study of Insects, Sanders College Publishing, pp: 875.
- Barrion, A.T. and J.A. Litsingerm, 1995. Riceland Spiders of South and Southeast Asia. Cab Intl., pp: 697.
- Byron, E. and Jr. Green, 2000. Green county history. [Hyyp//www.usgennet.org/usa/ms/county/green/byron.htm](http://www.usgennet.org/usa/ms/county/green/byron.htm).
- Graf, B. and W. Nentwig, 2001. Ontogenetic change in coloration and web bulding behavior in the tropical spider *Eriophora foliginea*. Arachnol. J., 29: 104-110.
- Ghavami, S., M. Mohammadi, Damghan, S. Ghannad Amooz, S. Soodi and S. Javadi, 2003. Investigation spider fauna in olive orchards in northern part of Iran. 16th Iranian Plant Protection Congress, 1: 463-464.
- Ghavami, S., M. Taghizadeh, G.A. Amin, Z. Karimian and M. Hossieni, 2004. Investigation spider fauna in cotton field of Iran. Plant Pests and Diseases Research Institute. Final Report Project, pp: 45.
- Ghavami, S., 2006. Investigation spider fauna in citrus orchards in northern part of Iran. Plant Pests and Diseases Research Institute Project, pp: 36.
- Kaston, B.J., 1970. How To Know Spiders. M.W.C. Brown Company Publishers, pp: 220.
- Lozano, C., T. Morris, M. Campos, J.A. Pereira, A. Bento, C. Vitagliano and G.P. Martelli, 2000. Detection by ELISA of predators of *Prays oleae* (Lepidoptera: Plutellidae) in a Portuguese olive orchard. Proceedings of the 4th International Symposium on Olive Growing, Valenzano, Italy, 25-30 September, Volume 2. Acta-Hortic., 586: 831-834.
- Morris, T., W.O.C. Symondson, N.A.C. Kidd and M. Campos, 1999. Spiders and their incidence on *Prays oleae* in olive plantations. Boletin de Sanidad Vegetal, Plagas, 25: 475-489.

- Mozaffarian, F., S. Tirgari and H.B. Asady, 2000. Investigations on the fauna of spiders in paddy fields in Mazandaran and Guilan provinces. *Appl. Entomol. Phytol.*, 13: 1-14.
- Nieuwenhuys, Ed., 1999. Sheet web spiders (Family: Linyphidae). <http://www.xs4all.nl/edniew/spiders/spidhome.htm>.
- Triggiani, O. and I. Naples, 1971. *Margaronia unionalis* Hb. (olive Pyralid). *Entomology*, 18: 29-47.
- Roberts, M.J., 1985. Spiders of Great Britain and Ireland. Hartley Books Essex, England, Vol. pp: 1: 229.
- Sacchetti, P., 1990. Observations on the activity and bioethology of the natural enemies of *Prays oleae* (Bern.) In Tuscany, Predators. *Redia*, 16: 243-259.
- Thaler, K. and M. Zapparoli, 1993. Epigenic spiders in an olive-groove in central Italy (Araneae) *Redia*, 8: 307-316.
- Viggiani, G., 1977. Biological and Integrated Control. Liguori Editore, Naples, Italy.