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MAJOR TRUE SPIDERS (ARANEAE) AND THEIR PREDATORY EFFECTS ON DOMINANT APHID SPECIES IN ALFALFA AGROECOSYSTEM AT WESTERN SAUDI ARABIA

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ABSTRACT

The weekly intensive survey showed that two major aphid species, are widely prevalent in the alfalfa agroecosystem including the black alfalfa aphid *Macrosiphum* sp. and the spotted alfalfa aphid *Therioaphis trifolii* (Monell). A rich fauna of true spiders (Araneae) was also recorded as foliage-dwelling spiders that belong to 6 major families. Three major predominant spider families arranged by their percentage presence included Philodromidae (24.09%), Thomisidae (21.09%), Salticidae (16.58%). However, other less predominant families included Zodariidae (4.68%) Gnaphosidae (4.22%), Theridiidae (3.80%), Lycosidae (3.01%). Araneidae (2.51%), Cithaeronidae (0.40%), Agelenidae (0.88%), Pholcidae (0.38%) and Clubionidae (0.33%). A linear correlation existed between the total numbers of spider complex and the total number of the spotted alfalfa aphid showed an appreciable synchrony with the population of the highly prevalent host (prey) throughout the year.

Key words: *alfalfa agroecosystem, aphid species, foliage-dwelling spiders.*

1. INTRODUCTION

Alfalfa forage crop *Medicago sativa* L., locally called Al-Barseem Al-Hijazi, is considered an indispensible component and a principal common denominator of most Saudi agroecosystem since it has been grown in scattered valleys and oases since hundreds of years ago. Currently the Kingdom of Saudi Arabia has been embarking on sophisticated technology of attaining ambitious goals of maintaining its own food security. Many farms are currently mushrooming in deserts, including extensive agricultural farms, huge livestock and sophisticated poultry farms were established in addition to widening and creating new high technological oases in such hostile semi-arid and desert domains. In all these enclaves and oases, alfalfa crop is being a unifying factor of these fragile agroecosystems with the objective of sustaining prodigious amounts of food and feed needed for all types of these tended crops and animals.

Alfalfa crop with its continued greenery is depicted as a retreat and a refuge for a multitude number of pests and their natural enemies (Faragalla *et al.*, 1985, Faragalla and Al-Ghamdi, 1999). Moreover, the currently intensive crop studies have generated valuable information relating its phenology with pests and their natural enemies as reported earlier by many workers. (Whitcomb *et al.*, 1963, Turnbull, 1973, Hatley and Macmahon, 1980, Dean *et al.*, 1982, Doane and Dondale, 1979, Leigh and Hunter, 1969, Lesar and Unzicker 1978, Riechert and Lockley 1984). Furthermore, indigenous and naturally occurring predators and parasitoids playing vital role in suppressing, major insects within the premises of the alfalfa agroecosystem, have been documented (Taher and Faragalla, 1990, Riechert and Bishop, 1990, Nyffeler *et al.* 1987, 1992, Nashnosh and Salama, 1993; Riechert and Lawrence, 1997).

The potential role of true spiders as possible regulatory agents of alfalfa insect pests and as an effective imperative in their suppression has been addressed by many workers (Wheeler, 1973, Yeargan and Dondale, 1974, Culin and Rust, 1980; Plagens, 1983, 1986, Faragalla *et al.*, 1985, Fred *et al.*, 1987). Many workers have been involved in studies with the goals of evaluating their practical application concerning their use and utilization in sustaining effective environment for maximum use of these natural enemies and

subsequently in the reduction of injurious pest populations (Howell and Pienkowsli, 1971, Watson *et al.*, 1975, Culin and Rust, 1980; Ekbom, 1994).

The objectives of this study were to determine major true spider families (Araneae) which constantly dwell in the foliage of alfalfa agroecosystem and evaluate their predatory suppressive role on major aphid population densities.

2. MATERIALS AND METHODS

To achieve the goals of the present study, an intensive field data collection was conducted during the years 1999/2000 within the premises of the Research Farm that belong to the College of Meterology, Environment and Arid Land Agriculture of King Abdulaziz University which is located at Hada Al-Sham 130 km north east the city of Jeddah. The field tests were conducted there because this valley represents the type of agriculture the "valley system" that prevails in western Saudi Arabia and to the scarce field investigations on major aphid populations and the predominant foliage-dwelling true spiders in the alfalfa agroecosystem.

The alfalfa crop was grown as a forage crop separately in a solid field in an area of about eight donums (one donum= $1000m^2$) and the central pivot system of irrigation was used as a sole system for sprinkling and delivering water to the crop. The crop schedule for irrigation was twice weekly and no insecticides were applied to control the pest species within the crop. Data collection were carried out weekly from an area of a sampling universe approximately 7.5 donums or 0.75 ha well within the crop area by using sweeping nets. Each net is made up of fine muslin having 38 cm diameter with a 100cm long handle and contains tiny holes and openings with 0.02 mm diameter. The same sweep net was used for both major aphid species and the true spiders. Data collection was perfoffi1ed weekly by taking 100 double sweeps (4x25) by walking diagonally across the alfalfa field. The recovered collection was secured in 100 ml glass jars each containing about 150 ml of 70% ethyl alcohol as a killing and a preserving agent. Then glass jars were taken to the lab for further investigations and categorization to their respective orders and families. The population density of dominant aphid species and their

major true spider predators were compiled to give their annual fluctuation dynamics.

The above method of sampling using the same sweeping nets was conducted once every two weeks throughout the year to determine the population density of dominant aphid species and their true spider predators.

Statistical Methods

A simple linear correlation and standard deviation (±SD) were used to show the variation in population density of major aphid species, the weekly variation and standard deviation, and linear correlation of both total number of aphids and their true spider predators.

3. RESULTS AND DISCUSSION

The intensive weekly survey has yielded an appreciable amount of data which showed that the major aphid species prevalent throughout the year as foliage-dwellers in alfalfa agroecosystem were *Macrosiphium* sp. and *Therioaphis trifolii* (Monell) (Table 1) Moreover, the population density of both species represented as average number ± standard deviation per week is shown in (Table 2).

Data recovered from field surveys showed that a rich fauna of foliage-dwelling true spiders is prevalent throughout the year and the spider complex was made of twelve spider families including Zodariidae, Salticidae, Thomisidae, Philodromidae, Araneidae, Lycosidae, Theridiidae, Gnaphosidae, Clubionidae, Pholcidae, Cithoeronidae and Agelenidae. Moreover the dominant families were Philodromidae, (42.09%), Thomisidae (21.09%) and Salticidae (16.58%) of the total spider family complex (Table 3,4) and the weekly population density of the three dominant families represented as average number ± standard deviation per week in the alfalfa agroecosystem is shown (Table 4, Fig.1). However the rest of the spider complex was represented by low percentages (Table 5) and low total population density throughout the year (Fig.2). It is evidently clear that members of the family Philodromidae was the most predominant among all other families since their activity was observed all the year round exhibiting five activity peaks, the highest occurred during May while the others were present during March, October, December and

Table (1): Weekly variation in the population density of major aphid species in alfalfa agroecosystem Hada Al-Sham, Western Saudi Arabia, 1999-2000.

Species	Mar.				Apr.				May				Jun.			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Macrosiphum sp.	200	111	551	300	139	146	515	435	700	1005	626	562	944	950	1062	1060
Therioaphis trifolii	220	267	414	265	260	350	77	42	97	227	186	177	409	200	341	390

Species	Jul.				Aug.				Sep.				Oct.			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Macrosiphum sp.	1632	222	274	274	638	640	2432	4265	800	810	97	99	415	490	133	103
Therioaphis trifolii	373	51	50	51	120	122	551	260	170	174	8	10	67	110	32	48

Species	Nov.				Dec.				Jan.				Feb.			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Macrosiphum sp.	134	152	167	392	413	308	130	145	310	329	912	760	2357	2029	2026	2060
Therioaphis trifolii	65	68	74	153	242	132	175	367	199	228	232	230	645	336	334	224

Table (2): Weekly population density of major aphid species represented as average number ± standard deviation (±SD) for each week in alfalfa agroecosystem, Hada Al-Sham, Western Saudi Arabia, 1999-2000.

Species	Mar.	Apr.	May	Jun.
Macrosiphum. sp	290.50±164.59	308.75±194.75	723.25±65.87	1004.00±65.87
Therioaphis trifolii	291.50±84.50	182.25±147.12	171.75±54.38	312.50±87.43

Species	Jul.	Aug.	Sep.	Oct.
Macrosiphum. sp	600.50±688.10	1993.75±1734.10	451.50±408.21	285.25±195.92
Therioaphis trifolii	131.00±161.33	263.25±202.72	90.50±94.12	64.25±33.68

Species	Nov.	Dec.	Jan.	Feb.
Macrosiphum. sp	221025±121.25	249.00±135.83	577.75±304.68	2118.00±160.07
Therioaphis trifolii	90.00±42.06	229.00±102.53	222.25±15.58	384.75±181.22

Table (3) : Weekly variation in the population density of foliage-dwe1ling of home spiders in alfalfa agroecosystem Hada Al-Sham valley, western Saudi Arabia, 1999-2000.

Family	Mar.				Apr.				May				Jun.				Jul.				Aug.			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Philodromidae	40	6	30	13	8	17	16	15	55	65	40	26	25	28	29	23	6	9	9	10	6	17	18	22
Thomisidae	22	3	19	11	4	9	9	8	25	45	22	14	12	12	19	7	3	5	6	5	3	6	6	10
Salticidae	13	2	15	6	2	11	8	6	18	34	18	17	8	16	18	4	1	3	5	5	3	3	4	6
Araneidae	1	2	6	2	1	3	1	0	2	1	00	3	1	4	4	2	1	0	1	2	1	2	2	0
Gnaphosidae	8	2	3	3	2	4	2	6	2	2	4	1	2	4	6	4	1	1	2	2	1	1	1	0
Clubionidae	1	00	1	1	00	00	00	00	00	00	00	00	00	1	1	00	00	00	00	00	00	00	00	00
Theridiidae	1	1	5	3	2	4	1	6	3	1	2	1	1	5	5	4	2	2	1	00	2	00	00	00
Zodariidae	6	2	3	3	3	3	2	2	1	1	1	00	2	6	8	6	2	2	1	2	2	2	1	00
Agelenidae	4	00	00	1	00	1	00	1	00	00	00	00	00	2	4	00	00	00	00	00	1	1	00	00
Cithaeronidae	1	00	00	00	00	00	00	00	00	00	00	00	00	1	00	00	00	00	00	00	1	1	2	00
Lycosidae	3	1	5	3	1	4	2	1	1	1	1	00	1	4	5	00	2	00	1	00	2	2	3	1
Pholcidae	00	00	1	1	00	1	00	00	00	00	00	00	00	1	1	00	00	00	00	00	00	1	00	00
Total	**100**	**19**	**86**	**49**	**23**	**57**	**41**	**40**	**107**	**145**	**88**	**62**	**47**	**84**	**90**	**50**	**18**	**22**	**26**	**27**	**20**	**36**	**37**	**39**

Family	Sep.				Oct.				Nov.				Dec.				Jan.				Feb.			
	1	2	3	4	1	2	3	4	1	2	3	4	i	2	3	4	1	2	3	4	1	2	3	4
Philodromidae	22	27	11	11	21	44	25	15	14	15	14	18	22	17	11	28	21	22	24	8	21	19	14	33
Thomisidae	8	13	3	4	5	18	8	8	7	8	9	9	12	8	8	18	11	10	9	5	10	11	6	12
Salticidae	8	3	2	2	4	8	7	2	4	6	5	7	10	7	8	14	13	9	9	2	12	9	5	15
Araneidae	1	0	0	1	2	2	1	0	1	00	00	00	00	00	1	00	1	3	2	00	1	00	00	2
Gnaphosidae	0	0	1	1	1	2	4	1	00	00	1	2	00	3	3	3	2	2	2	00	2	00	3	4
Clubionidae	00	00	00	00	1	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	1	1
Theridiidae	00	1	1	1	2	6	5	1	00	1	00	1	00	1	2	1	2	4	3	00	2	2	2	1
Zodariidae	00	00	2	00	4	6	10	4	00	00	00	1	00	1	2	1	2	3	4	1	2	2	4	2
Agelenidae	00	00	00	00	1	2	1	00	00	00	00	00	00	00	1	00	00	00	00	00	00	00	1	00
Cithaeronidae	00	00	00	00	1	2	00	00	00	00	00	00	00	00	00	1	00	00	00	00	00	00	1	00
Lycosidae	1	00	00	00	1	4	3	2	00	00	00	1	00	2	1	4	0	2	3	00	1	00	2	00
Pholcidae	00	00	00	00	00	00	1	1	00	00	00	00	00	00	00	00	00	00	00	00	00	00	1	00
Total	**40**	**44**	**20**	**22**	**44**	**94**	**65**	**29**	**26**	**30**	**30**	**39**	**44**	**39**	**37**	**70**	**53**	**55**	**56**	**16**	**51**	**41**	**40**	**70**

Table (4): Weekly population of dominant foliage-dwelling true spiders represented as average number ± standard deviation per week in alfalfa agroecosystem Hada Al-Sham valley, western Saudi Arabia, 1999-2000.

Family	Mar.	Apr.	May	Jun.	Jul.	Aug.
Philodromidae	22.25±15.54	14.00±4.8	46.50±17.09	26.25±2.75	8.50±1.73	15.75±6.84
Thomisidae	13.75±8.53	7.50±2.38	26.50±13.17	12.50±40.93	4.75±1.25	6.25±2.87
Salticidae	9.00±6.05	6.75. ±3.77	21.75±8.18	11.50±6.60	3.50±1.91	4.00±1.41

Family	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.
Philodromidae	17.75±8.05	26.25±12.52	15.25±1.89	19.50±7.23	18.75±7.57	12.25±8.34
Thomisidae	7.00±4.54	9.75±5.67	8.25±0.95	11.50±4.72	8.75±2.63	9.75±2.563
Salticidae	3.75±2.87	5.25±2.75	5.50±1.29	9.75±3.09	8.25±4.57	10.25±4.27

Table (5): Total and percentage of major foliage dwellers true spiders in alfalfa agroecosystem, Hada Al-Sham, western Saudi Arabia, 1999-2000.

Family	Clubionidae	Pholcidae	Agelenidae	Cithaeronidae	Araneidae	Lycosidae
Total/ year	8	9	21	11	60	72
%	0.33%	0.38%	0.88%	0.46%	2.51%	3.01%

Family	Theridiidae	Gnaphosidae	Zodariidae	Salticidae	Thomisidae	Philodromidae
Total/ year	91	101	112	397	505	1008
%	3.80%	4.22%	4.68%	16.58%	21.09%	42.09%

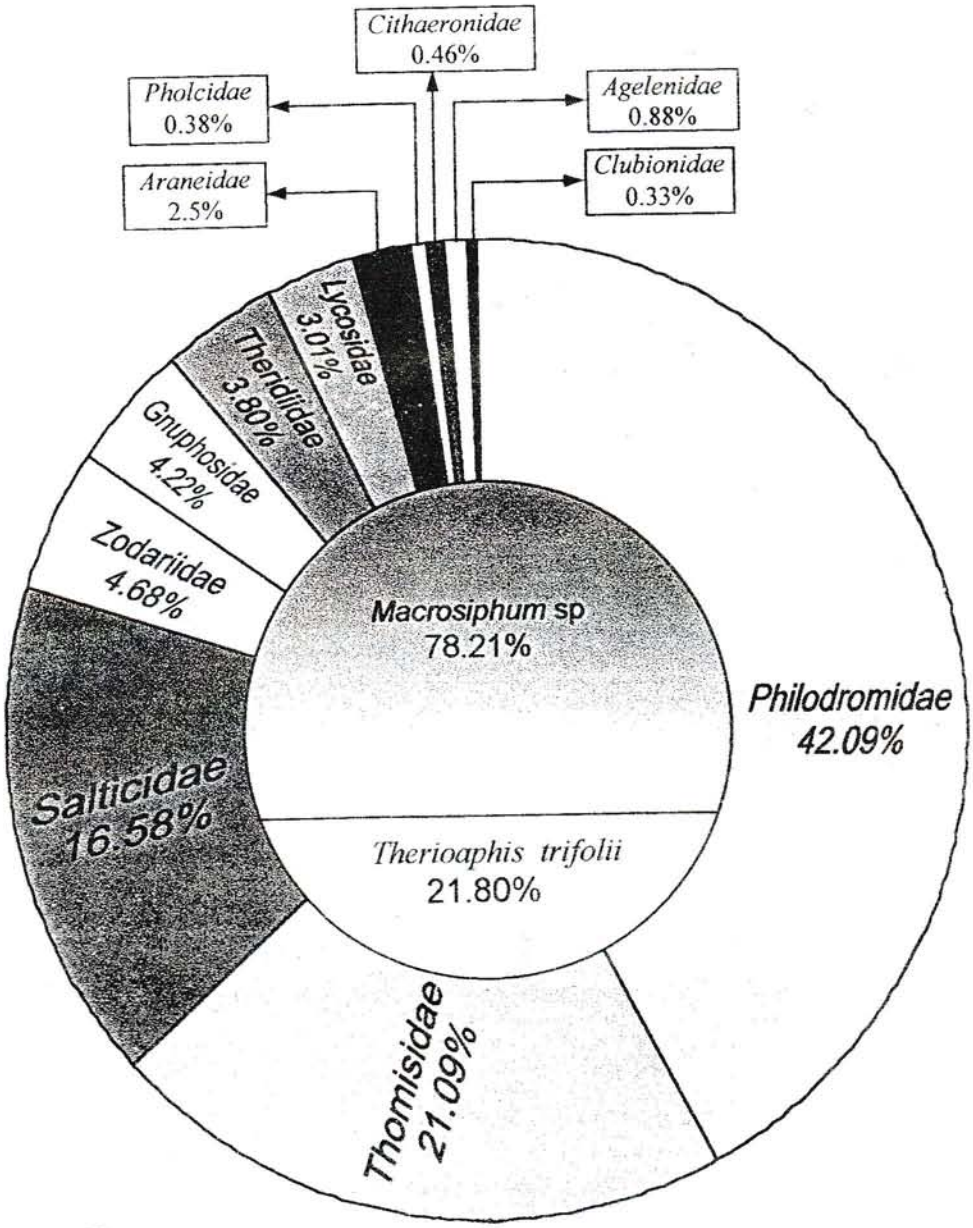

Fig. (1): Percentage variation of the foliage-dwelling true spiders complex and their major aphid preys in alfalfa agroecosystem, Hada Al-Sham valley, western Saudi Arabia, 1999-2000.

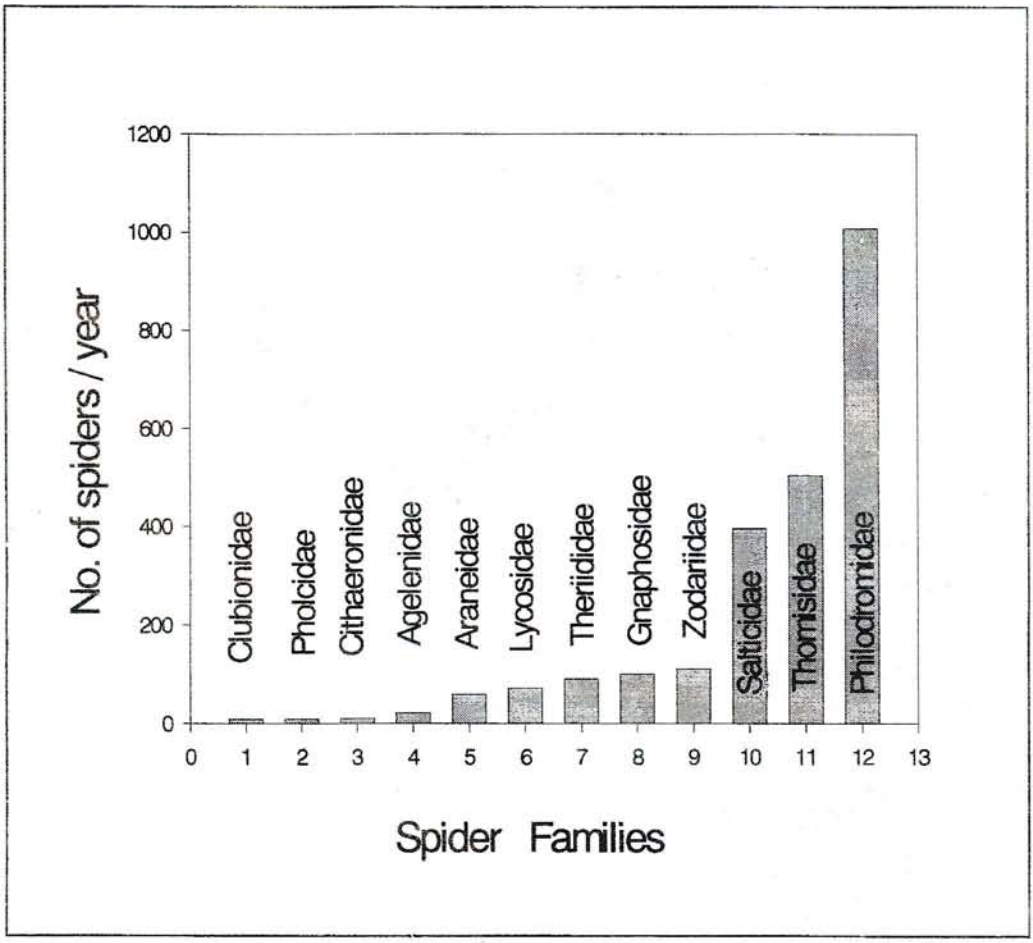

Figure (2): Population of foliage-dwellers true spider families in alfalfa agroecosystem, Hada Al-Sham valley, western Saudi Arabia, 1999-2000.

February. The Thomisid family showed three activity peaks during March, May and December, whereas members of family Salticidae has only two peaks during May and December (Fig. 3). Moreover and based on recorded data and the frequent recovery of spiders from the intensive weekly field surveys, it is clear that the dominant families in the order of their frequent presence reported as (most frequent, more frequent and frequent) based on their numbers showed the following order Philodromidae, Thomisidae and Salticidae (Table 6). The linear correlation between the total numbers of the spider complex and the total number of the spotted alfalfa aphid, *T. trifolii* showed that the spider complex as a group has an appreciable synchrony with the population of its prey throughout the year where they have high population peaks with those of their prey, *T. trifolii* (Table 7).

More future in-depth and extensive studies will be needed to generate deep insights about this natural enemy complex, its speciation and nomenclature, to determine its specific role and give more information about suggested candidates to be used in the future IPM programs in the alfalfa agroecosystem.

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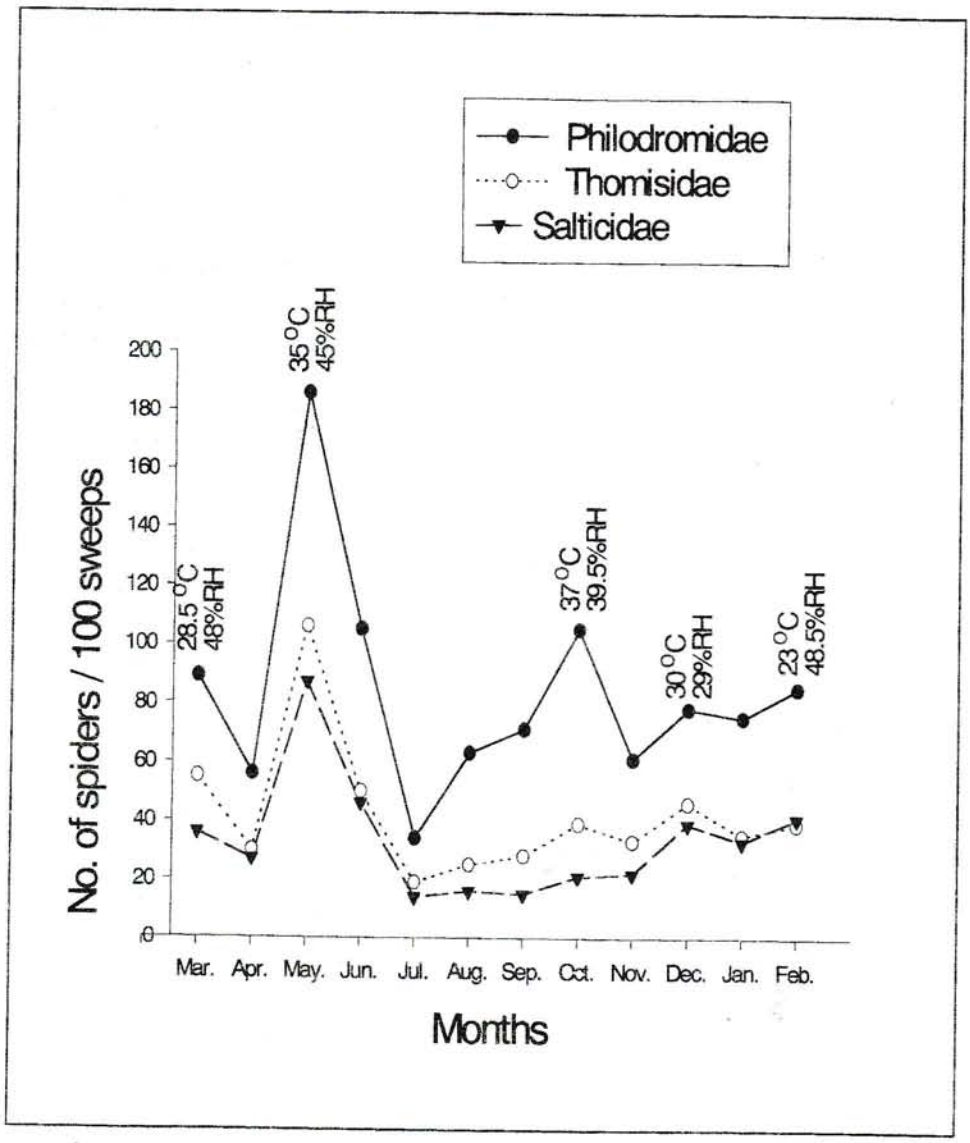

Figs. (3): Monthly fluctuation of the major foliage-dwellers true spider families in alfalfa agroecosystem, Hada Al-Sham valley, western Saudi Arabia, 1999-2000.

Table (6): Variation in numbers of foliage-dwellers true spiders in alfalfa agroecosystem, Hada Al-Sham valley, western Saudi Arabia, 1999-2000.

Range	Family	Status
0-200	Clubionidae	Less Freqaence
	Pholcidae	
	Cithaeronidae	
	Agelenidae	
	Araneidae	
	Lycosidae	
	Theridiidae	
	Gnaphosidae	
	Zodariidae	
201-400	Salticidae	Frequence
401-600	Thomisidae	More Frequence
601-	Philodromidae	Most Frequence

Table (7): Linear regression of the monthly numbers of the foliagedwellers true spiders complex in relation to total numbers of spotted alfalfa aphid *T. trifolii* in alfalfa agroecosystem, Hada Al-Sham valley, western Saudi Arabia, 1999-2000.

Dependent Variable	Parameter	Estimate	Standard Error	t-vallue	P. Value
Spiders	β_0	75.815	59.936	10265	0.238
Complex	β_1	0.139	0.0635	2.182	0.057

4.REFERENCES

Culin J.D. and Rust R.W. (1980). Comparison of the ground surface and foliage-dwelling spiders common in soybean habitat. Environ Entomol. 9: 577-582.

Dean D.A., Sterling W.L. and Homer N.V. (1982). Spiders feeding on pests in Texas cotton fields, J. Archno 10: 251-260.

Doane J. F. and Dondale C.D., (1979). Seasonal capture of spiders (Araneae) in a wheat field and its grassy borders in central Saskatchewan. Can. Entomol, lll : 439-445.

Ekbom B. (1994). Arthropod predators of the pea aphid, *Acythosiphon pisum* Harr, (Homoptera: Aphididae) in peas (*Pisum sativum* L) clover (*Trifolium pratense*) and alfalfa (*Medicago sativa*). J. of Applied Entomol. 117(5): 469-476.

Faragalla A.A. and Al-Ghamdi K.M. (1999). Abundance of foliage-dwelling predaceous and parasitic arthropods (Insecta and Araneida) in alfalfa agroecosystem, western Saudi Arabia. Egyptian Journal of Biological Pest Control. 9(1): 11-15.

Faragalla A.A., Moussa A.M., Badawi A.I. and Ibrahim A.A. (1985). Partial list of beneficial insect species of two localities in the central region of Saudi Arabia. Tropical pest Manag. 6: 139-143.

Fred W., Showers W.B. and Edwards G.G. (1987). Insecticide tolerance of ground and foliage-dwelling spiders (Araneae) in European corn borer (Lepidoptera: Pyralidae) action sites. Environ. Entomol. 16: 779-785.

Hatley C.L. and Macmahon J.A. (1980). Spider community organization: seasonal variation and the role of vegetation architecture. Environ. Entomol. 9: 62-69.

Howell J.O. and Pienkowski R.L. (1971). Spider populations in alfalfa, with notes on spider prey and effect of harvest. J. Econ. Entomol. 64: 8-163.

Leigh T.F. and Hunter R.E. (1969). Predaceous spiders in California cotton. Calif. Agric. 23: 4-5.

Lesar C.D. and Unzicker J.D. (1978). Soybean spider species composition, population densities and vertical distribution, III Nat His. Surv. Biol Notes, 107.

Nashnosh I. And Salama, A.K.A. (1993). A study on the abundance of some predator and spider populations in alfalfa (*Medicago sativa* L.) field in El-jedieda region, Tripoli, Libya. Arab J. Plant Protection, 11(2),82-85.

Nyffeler M., Dean D.A., and Sterling W.L. (1987). Predation by green lynx spiders, *Peucetia viridans* H (Araneae: Oxyopidae), inhabiting cotton and wooly cotton plant in East Texas. Environ. Entomol. 16: 355-359.

Nyffeller M., Dean D.A. and Sterling, W.L. (1992). Diet, feeding specialization and predatory role of two lynx spiders, *Oxyopes salticus* H and *Peucetia viridans* H (Araneae: Oxyyopidae), in Texas cotton agroecosystem. Environ. Entomol. 21(6), 1457-1465.

Plagens M.J. (1983). Population of *Misumenops* (Araneidae, Thomisidae) in two Arizona cotton fields. Environ. Entomol. 12: 572-575.

Plagens M.P. (1986). Aerial dispersal of spiders (Araneae) in Florida cornfield ecosystems. Ibid. 15: 1225-1233.

Riechert S.E. and Bishop L. (1990). Prey control by an assemblage of generalist predators: Spiders in a garden test system. Ecology, 71(4),726-736.

Riechert S.E. and Lawtence, K. (1997). Test for predation effects of single versus multiple species of generalist predators:

Riechert S.E. and Lockley T.C. (1984). Spiders as biological control agents. Ann. Rev. Entomol., 29,299-320.

Taher M.O. and Faragalla, A.A. (1990). A pictorial key of some families of true spiders (Araneomorphae) recovered in Western Region of Saudi Arabia. J.K.A.A. U (2), 63- 78.

Turnbull A.L. (1973). Ecology of the true spiders (Araneomorphae). Ann. Rev. Entamol., 18, 305-348.

Watson T.F., Moore, L. and Ware G.W. (1975). Practical insect pest management- A self- instruction manual. W.H. Freeman and Company. Reading, England. 196p.

Wheeler A.G. Jr. (1973). Studies on the arthropod fauna of alfalfa. V. spiders (Araneidae). Can. Entomol. 105: 32-425. .

Whitcomb W.H., Exline H. and Hite, M. (1963). Comparison of spider populations of ground stratum in Arkansas: pasture and adjacent cultivated field. Ark. Acad. Proc., 17,1-6

Yeargan K.V. and Dondale C.D. (1974). The spider fauna of alfalfa fields in northern California. Ann. Entomol Soc. Am. 67: 681-682.

العناكب الحقيقية السائدة والمفترسة على حشرات المنّ الرئيسية في النظام البيئي الزراعي للبرسيم الحجازي بالمنطقة الغربية من المملكة العربية السعودية

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ملخص

أوضح الحصر الأسبوعي المكثف عن وجود نوعين سائدين من حشرات المنّ في النظام البيئي الزراعي للبرسيم الحجازي وهما *Macrosiphum* sp. و *Therioaphis trifolii*.تم من ناحية أخرى حصر اعداد عنكبوتية غزيرة مـــن العناكب الحقيقية القاطنة للمجموع الخضري للبرسيم تمثلت في إثنتا عشر عائلـــة وهي:

Philodromidae (42-09%), *Thomisidae* (21.09%), *Salticidae* (16.58%) *Zodariidae* (4.68%), *Gnaphosidae* (4.22%), *Theridiidae* (3.80%), *Lycosidae* (3.01%), *Araneidae* (2.51%), *Cithaeronidae* (0.40%), *Agelenidae* (0.88%), *Pholcidae* (0.38%) and *Clubionidae* (0.33%).

اتضّح عند استخدام التحليل الإحصائي بتطبيق معامل الارتباط فيمـــا بيـــن المجموع الكلي لمعقد هذه العناكب الحقيقية مع حشرات المنّ السائدة اتضح أن لهذه العناكب إرتباط معنوي جيد مع حشرات المنّ من النوع *T.trifolii* حيث يتضح أن هناك توافقية جيدة فيما بين مجتمعات معقد هذه العناكب وهذا النوع من حشـــرات المنّ السائدة.

المجلة العلمية لكلية الزراعة – جامعة القاهرة -المجلد (٥٥) العدد الثانى (إبريل ٢٠٠٣): ٣٣١-٣٤٦ .