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Prajapati JN
Department of Agricultural Entomology, N.M.C.A, NAU, Navsari, Gujarat, India

Patel SR
Assistant Professor, Department of Agricultural Entomology, N.M.C.A, NAU, Navsari, Gujarat, India

Surani PM
Department of Agricultural Entomology, N.M.C.A, NAU, Navsari, Gujarat, India

Radadia GG
Professor & Head, Department of Agricultural Entomology, N.M.C.A, NAU, Navsari, Gujarat, India

Correspondence
Prajapati JN
Department of Agricultural Entomology, N.M.C.A, NAU, Navsari, Gujarat, India

Agrobiont spiders (Araneae) from Five Ecosystems of Navsari Agricultural University, Navsari, Gujarat, India

Prajapati JN, Patel SR, Surani PM and Radadia GG

Abstract
A study on biodiversity of agrobiont spiders was carried out at N. M. College of Agriculture, Navsari Agricultural University (NAU) campus, Navsari, Gujarat, India. A total 48 species of agrobiont spiders were recorded belonging to 34 genera and 12 families from different ecosystems *i.e.*, paddy, sugarcane, maize, mango and banana. Araneidae was found to be dominant family followed by Salticidae and Oxyopidae. Maximum diversity of spider was recorded from paddy fields followed by maize, sugarcane, banana and mango.

Keywords: Agrobiont spiders, Agricultural University, 48 species

Introduction
Spiders are generalist predator, which can act against a broader range of insect pests. The population densities and species abundance of spider communities in agricultural fields can be as high as in natural ecosystems (Turnbull, 1973; Riechert, 1981 and Tanaka, 1989) [16, 7, 10]. Worldwide 45,557 spider species described (Uniyal *et al.*, 2011) [17] and are estimated to number 60,000-170,000 species (Coddington and Levi, 1991) [2]. In numbers, 1686 species of 438 genera belongs to 60 families are recorded from India (Keswani *et al.*, 2012) [3]. Total 415 species belong to 169 genera of 40 families are recorded from Gujarat state (Yadav *et al.*, 2017) [18]. Spiders are divided into two principal groups of forages: "Web-weavers" that spin a catching web and "Hunters" that seize prey without the use of a web (Nyffeler *et al.*, 1994) [5]. Spiders are considered to be of economic value to farmers as they play valuable role in pest management by consuming large number of prey in the agriculture fields without any damage to crops. Therefore, there is a great need to know their diversity which will gives us exact picture of spiders.

Materials and Methods
Study site: A study on biodiversity of agrobiont spiders was carried out at Department of Agricultural Entomology, N. M. College of Agriculture, Navsari Agricultural University, Navsari (Gujarat) during January 2017 to December 2017. Navsari is situated at coastal region of western India. Geographically, it is situated at 20˚57' N latitude and 72˚54' E longitude with an altitude of 11.98 meters above the mean sea level.

Collection and preservation of spiders: The spider collection was carried out from the different ecosystems *i.e.* Paddy, Sugarcane, Maize, Banana and Mango. The spiders were collected at fortnightly interval from various ecosystem with an intention to find out different species of spiders in different ecosystem. Spiders were collected by sweep netting or picking them with hand and leading them into plastic tube (2.30 cm radius × 9.00 cm height). All the collected specimens were preserved in 70 per cent ethyl alcohol in specimen tube with proper labeling, indicating locality, date and name of collector.

Identification of spiders: Preserved specimens were identified under a stereoscopic dissecting microscope. It was made with the help of Tikader (1977, 1980, 1982, 1987) [11-15], Tikader and Biswas (1981) [16] and Sebastian and Peter (2009). The taxonomy and nomenclature followed as per the world spider catalogue by Platnick (2014) [6] for confirming the identification.

Apart from that few specimens were sent to Prof. Ramesh Thumar, Assistant Professor, Department of Zoology, B. P. Baria Science College, Navsari, Gujarat for confirmation of specimens.

Results and Discussion

A total 48 species of agrobiont spider belonging to 34 genera and 12 different families were recorded from the five major agro-ecosystems namely paddy, sugarcane, maize, mango and banana of NAU campus, Navsari (Table 2). Amongst these, 33.33 per cent species belongs to family Araneidae, 29.17 per cent from Salticidae, 8.33 per cent species belongs to family Oxyopidae, 6.25 per cent species belongs to family Clubionidae, 4.17 per cent species belongs to Tetragnathidae, Sparassidae as well as Theridiidae of each, whereas remaining 2.08 per cent species from Thomisidae, Uloboridae, Lycosidae, Hersiliidae and Scytodidae of each (Table 1). Ambily and Antony (2016) [1] reported total 40 species of spiders belonging to 14 families from Kerala. Further, More (2015) [4] from Maharashtra also recorded Araneidae as one of the most dominant family, thus closely support the present findings. The maximum family diversity of spiders was observed in paddy (9 families) followed by maize, sugarcane (8 families each), banana and mango (6 families each) whereas the maximum generic diversity of spiders was recorded from paddy fields (19 genera) followed by sugarcane, banana (18 genera each), maize (17 genera) and mango (10 genera). Also the maximum species diversity of spiders was recorded from paddy fields (33 species) followed by maize (26 species), sugarcane (25 species), banana (24 species) and mango (13 species) (Figure 1). Solanki and Kumar (2015) [9] recorded 67 spider species from agricultural field in Panchmahal district of Gujarat closely support the present findings. The variation in species of spiders might be due to diverse kind of habitat, vegetation, food availability and agricultural practices.

Conclusion

Total 48 species of agrobiont spiders were recorded belonging to 34 genera and 12 families from different ecosystems *i.e.*, paddy, sugarcane, maize, mango and banana of NAU campus, Navsari, Gujarat, India.

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Table 1: Species distribution of agrobiont spiders of different families in NAU campus

Sr. No.	Family	Genera	No. of Species	% Species
1.	Araneidae	7	16	33.33
2.	Salticidae	14	14	29.17
3.	Oxyopidae	1	4	8.33
4.	Clubionidae	2	3	6.25
5.	Tetragnathidae	1	2	4.17
6.	Sparassidae	2	2	4.17
7.	Theridiidae	2	2	4.17
8.	Thomisidae	1	1	2.08
9.	Uloboridae	1	1	2.08
10.	Lycosidae	1	1	2.08
11.	Hersiliidae	1	1	2.08
12.	Scytodidae	1	1	2.08
Total		34	48	100

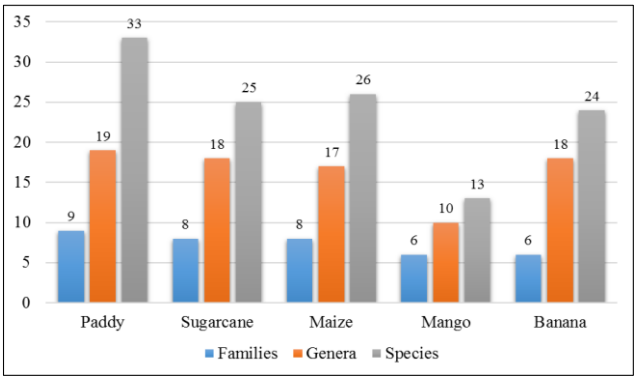

Fig 1: Total number of families, genera and species composition of spiders sampled from five major agroecosystems

Table 2: List of spiders collected from five major agro-ecosystems of NAU campus

Sr. No.	Spider species	Ecosystems				
		Paddy	Sugarcane	Maize	Mango	Banana
I. Family: Araneidae						
1.	*Argiope anasuja* (Thorell, 1887)	P	P	P	A	P
2.	*Argiope pulchella* (Thorell, 1881)	P	A	P	A	P
3.	*Argiope* sp.	P	A	A	A	P
4.	*Argiope aemula* (Walckenaer, 1841)	P	A	A	A	A
5.	*Neoscona mukerjei* (Tikader, 1980)	P	P	P	P	P
6.	*Neoscona theisi* (Walckenaer, 1842)	P	P	P	P	P
7.	*Neoscona bengalensis* (Tikader & Bal, 1981)	P	A	A	P	P
8.	*Neoscona vigilans* (Blackwall, 1865)	P	P	A	A	A
9.	*Neoscona* sp.1	P	P	P	A	A
10.	*Neoscona* sp.2	P	A	P	P	A
11.	*Pasilobus* sp.	P	P	A	A	A
12.	*Cyclosa confraga* (Thorell, 1892)	P	A	P	P	P
13.	*Cyclosa* sp.	P	A	P	A	A
14.	*Cyrtophora cicatrosa* (Stoliczka, 1869)	P	P	A	A	P
15.	*Eriovixia* sp.	A	A	A	P	P
16.	*Larinia* sp.	P	P	P	A	A
II. Family: Salticidae						
17.	*Carrhotus viduus* (Koch, C. L., 1846)	P	P	P	P	P

Sr. No.	Spider species	Ecosystems				
		Paddy	Sugarcane	Maize	Mango	Banana
18.	*Epeus indicus* (Proszynski, 1992)	A	A	P	A	A
19.	*Plexippus paykulli* (Audouin, 1826)	A	A	A	P	P
20.	*Phintella vittata* (Koch, C. L., 1846)	A	P	P	A	P
21.	*Chrysilla volupe* (Karsch, 1879)	P	P	P	A	P
22.	Unknown sp.1	A	A	A	A	P
23.	*Pristobaeus* sp.	A	P	A	A	P
24.	*Evarcha falcate* (Clerck, 1757)	A	P	A	A	A
25.	Unknown sp.2	P	P	A	A	A
26.	*Cosmophasis* sp.	A	A	A	A	P
27.	*Telamonia dimidiata* (Simon, 1899)	A	P	P	A	A
28.	*Menemerus bivittatus* (Dufour, 1831)	A	A	A	P	P
29.	*Siler* sp.	A	A	P	A	A
30.	*Rhene* sp.	P	A	A	A	A
III. Family: Oxyopidae						
31.	*Oxyopes javanus* (Thorell, 1887)	P	P	P	P	P
32.	*Oxyopes sunandae* (Tikader, 1970)	P	P	P	A	A
33.	*Oxyopes* sp.	P	P	P	A	P
34.	*Oxyopes birmanicus* (Thorell, 1887)	P	P	P	A	A
IV. Family: Clubionidae						
35.	*Clubiona* sp.	P	P	P	A	P
36.	*Clubiona drassodes* (Cambridge, O. P., 1874)	P	P	P	A	P
37.	*Cheiracanthium punctorium* (Villers, 1789)	P	A	A	A	P
V. Family: Tetragnathidae						
38.	*Tetragnatha mandibulata* (Walckenaer, 1842)	P	A	A	A	A
39.	*Tetragnatha* sp.	P	A	A	A	A
VI. Family: Sparassidae						
40.	*Heteropoda venatoria* (Linnaeus, 1767)	P	P	P	A	A
41.	*Olios* sp.	P	A	P	A	A
VII. Family: Theridiidae						
42.	*Theridion* sp.	A	P	P	A	A
43.	*Steatoda* sp.	A	A	A	P	P
VIII. Family: Thomisidae						
44.	*Thomisus* sp.	P	P	P	A	A
IX. Family: Uloboridae						
45.	*Uloborus plumipes* (Lucas, 1846)	A	A	A	P	P
X. Family: Lycosidae						
46.	*Lycosa* sp.	P	A	A	A	A
XI. Family: Hersiliidae						
47.	*Hersilia savignyi* (Lucas, 1836)	A	A	A	P	A
XII. Family: Scytodidae						
48.	*Scytodes thoricica* (Latreille, 1802)	P	P	P	A	A
	Total	33	25	26	13	24

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