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CAN SPIDERS BE THE BIOLOGICAL CONTROL MEASURE: A SURVEY THROUGH ORANGE AND COTTON FIELDS

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ABSTRACT

Spiders from cotton & orange fields were sampled to observe and compare their abundance in varied agricultural crop products, during June 2011 to May 2012. From cotton fields 70 species from 29 genera belonged to 7 families were identified. From orange fields 64 species belonging to 32 genera under 13 families were identified, total 37 species were commonly recorded. The spider population was in abundance in both the fields, species richness and diversity was high during August to October.

Spiders are ubiquitous predators in terrestrial ecosystem and generalist feeders mainly attack on insects and other arthropods. They not only prey on one stage of the prey but eggs, larvae, pupae and moths are fed on. Irrespective of agricultural products it has been observed that most of the spiders are common to orange and cotton fields. Due to variation in vegetation the insect fauna may vary but the abundance and diversity of spiders in any agro-ecosystem indicates that spiders feed on all most all types of insects and keeping the insect population under control naturally.

KEYWORDS: Agricultural product, Spider, Cotton field, Orange fields, Predators and Pest

Order Araneae is a large group of animals, which are commonly known as spiders. Spiders are among the earliest animals to live on land. They probably evolved about 400 million years ago from thick- waisted Arachnids ancestors. More than 44,906 species of spiders have been identified in the world (Platnick, 2014). They have special adaptations towards a predatory way of life. They feed on insects/pests and some other arthropods. Therefore, they can play important roles in pests control. Their distensible abdomen enables them to consume large amounts of food in relatively short period of time, while their rate of predation may greatly increase during short periods when plentiful supply of food is available.

Vidarbha, a part of Maharashtra is famous for orange and cotton production. Geologically the nature of agricultural field in this region is black cotton soil. Most of the crop products are cultivated in the same soil. There are some diseases that always damage the orange and cotton crop plants, for example Citrus cancer, the disease caused by bacteria carried by small insects. Red cotton bugs, mite pests and many other larval forms damages the cotton crop. To control the pests farmers usually go for pesticides, but these pesticides are mostly not species specific and therefore also kills non-harmful insects or arthropods, continuous use of pesticides may increase the resistance of pests, and their accumulation in environment also causes harm to human beings. Therefore it is necessary to aware the farmers and encourage them for the use of natural insecticides like spiders.

Some researchers have investigated abundance of spider fauna in rice fields, citrus orchards and olive orchards. Very little is known about the spider fauna of cotton and orange fields in Vidarbha, Maharashtra. However, some natural pests controlling agents found in orange and cotton fields, spider is one of the commonest amongst them. As the spiders attack these insect pests and therefore can be used in integrated pest management (IPM) program.

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The main aim of present study was to investigate, identify and compare the spider fauna from orange and cotton fields in Vidarbha (Maharashtra). Conservation and augmentation of spiders in orange and cotton fields is a simple method for pests control. Farmers must regard spiders as one of their best friend in combating harmful pests.

MATERIAL AND METHOD

In order to establish the spider fauna of the orange and cotton fields, spider specimens were collected every week during June 2011 to May 2012. Collection of spiders was done as per need to identify; repetition of collection of specimens was avoided. The specimens were preserved in 70% alcohol, labeled and identified according to Biswas (1984 b), Gajbe (1995, 2008), Tikader (1962; 1973; 1982), Tikader and Biswas (1984), Zabka (1989).

OBSERVATIONS AND RESULTS

During the survey, 690 specimens were collected from cotton fields, 70 species from 29 genera belonging to 07 families were identified. Among the specimens 392 individuals were adult (56.81%) and 298 individuals were immature (43.19%). Female/male ratio was approximately 5:1 (Table 1). The most abundant species are from the family Salticidae (19) followed by species from family Araneidae (18).

737 specimens were collected from orange fields. 63 species genera belonging to 13 families were identified. Among the specimens 482 individuals were adult (65.40%) and 255 individuals were immature (34.60%). Female/male ratio was **7:1** (Table 1). The most abundant species are from the family Salticidae (17) and Araneidae (13) each.

It has been observed that in all 37 species commonly belonged to both fields; the species belonging to family Araneidae, Salticidae, Lycosidae and Thomocidae are more commonly recorded in both the fields. Indicating that in both the habitat these spiders can grow very well in spite of vegetation. While spiders belonging to Eresidae, Miturgidae, Philodromodae, Theridiidae, Tetragnathidae and Uloboridae are restricted to orange fields only. Insect fauna of both the fields was diverse, basically depending on vegetation structure. But, as spiders can feed on all most all type of insects they help in regulating insect pests under control in fields.

The Araneids mostly built orb webs with varying diameters ranges up to two meters in diameter. Many of them construct their webs in evening and distract it in the morning, it has been observed that large number of insects get trapped in. Social spiders webs are unkempt but occupy large area, comparatively large number of insects and larvae are observed trapped in the webs. Gnaphosids and Salticids though do not construct the webs but are active in trapping insects and other small arthropod on ground. Oxiopids, Thomisids were observed around the flowers catching the insects.

Many of the spiders from family Salticidae were recorded throughout the year; however abundance of rest of spiders were observed depending on availability of food as well as seasonal variations. During rainy season with the flourishing of seasonal flora and high availability of insects and other arthropods abundance and diversity of spiders was at its pick.

Table 1: List of spiders from Orange and Cotton fields

Spiders from Cotton field	Spiders from Orange field
1. FAMILY:- ARANEIDAE	**1. FAMILY:- ARANEIDAE**
1) *Araneus mitifica* (Simon) Female	1) *Araneus mitifica* (Simon) Female
2) *Argiope aemula* (Walckenaer). Female	2) *Argiope* sp. Female. Male.
3) *Argiope* sp. Male and Female	3) *Cyclosa bifida* (Doleschall). Female
4) *Chorizopes khanjanes* Tikader. Female.	4) *Cyclosa insulana* (Costa). Female
5) *Cyclosa bifida* (Doleschall). Female.	5) Cyc*losa moonduensis* Tikader. Female
6) *Cyclosa hexatuberculata* Female.	6) *Cyclosa simoni* sp. Male.
7) *Cyclosa insulana* (Costa). Male.	7) *Cyclosa* sp. Male.
8) *Cyclosa moonduensis* Tikader. Female.	8) *Neoscona bengalensis* Tikader and Bal. F.
9) *Cyclosa neilensis* Tikader. Female.	9) *Neoscona mukerjei* Tikader. Female
10) *Cyclosa simoni* sp. Male.	10) *Neoscona shillongensis* Female. Male.
11) *Cyrtophora species* Female.	11) *Neoscona theis* Female.
12) *Neoscona bengalensis* Tikader and Bal. F.	12) *Neoscona sp*. Female.
13) *Neoscona mukerjei* Tikader. Female	13) *Zygiella indica* Tikader and Bal. F Male.
14) *Neoscona nautica* (L. Koch). Female.	
15) *Neoscona sinhagadensis* (Tikader). Female.	
16) Neoscona sinhagadensis (Tikader). Male.	
17) *Neoscona theis* (Walckenaer, 1842). F M.	
18) *Zygiella indica* Tikader & Bal. Female.	
2. FAMILY:- CLUBIONIDAE	**2. FAMILY:- CLUBIONIDAE**
19) *Clubiona filicata* Cambridge. Female.	14) *Clubiona terrestris* Male.
20) *Clubiona nicobarensis* Female.	15) *Clubiona* sp. Female.
21) *Oedignatha sp* Female	
	3. FAMILY: - ERESIDAE
	16) *Stegodyphus sarasinorum* Female
	17) *Stegodyphus* sp. Female Male.
3. FAMILY: - GNAPHOSIDAE	**4. FAMILY: - GNAPHOSIDAE**
22) *Gnaphosa kailana* Tikader. Female.	18) *Gnaphosa poonaensis* Tikader. Female
23) *Gnaphosa poonaensis* Tikader. Female.	19) *Gnaphosa kailana* Tikader. Female.
24) *Zelotes choubeyi* Tikader and Gajbe. F.	20) *Zelotes kusumae* Female.
25) *Zelotes kusumae* Female	
26) *Zelotes poonaensis* Tikader and Gajbe. M.	
4. FAMILY: - LYCOSIDAE	**5. FAMILY: LYCOSIDAE**
27) Evippa shivajii sp. nov. Female.	21) *Hippasa agelenoides* (Simon). Female.
28) *Hippasa agelenoides* (Simon). Female.	22) *Hippasa lycosina* Pocock. Female.

29) *Hippasa loundesi* Gravely. Female.	23) *Hippasa pisaurina* Pocock. Male.
30) *Hippasa lycosina* Pocock. Female.	24) *Lycosa poonaensis* Female.
31) *Hippasa partita* (Cambridge). Female.	25) *Lycosa shillongensis* Female.
32) *Hippasa pisaurina* Pocock. Male.	26) *Lycosa* species Female.
33) *Lycosa poonaensis* Female.	27) *Pardosa annandalei* (Gravely). Female.
34) *Lycosa shillongensis* Female.	28) *Pardosa minutus* Tikader and Malhotra. F.
35) *Pardosa annandalei* (Gravely). Female.	
36) *Pardosa birmanica* Simon. Female.	
37) *Pardosa minutus* Tikader and Malhotra. F.	
	6. FAMILY: - MITURGIDAE
	29) *Chiracanthium* sp. Female
5. FAMILY :- OXYOPIDAE	**7. FAMILY :- OXYOPIDAE**
38) *Oxyopes burmenicus* (Thorell). Female.	30) *Oxyopes burmenicus* (Thorell) Female.
39) *Oxyopes chittrae* Tikader. Female.	31) *Oxyopes chittrae* Tikader. Female.
40) *Oxyopes jabalpurensis* Gajbe & Gajbe. F.	32) *Oxyopes jabalpurensis* Gajbe &Gajbe. F.
41) *Oxyopes pankaji* Gajbe and Gajbe. Female.	33) *Oxyopes pankaji* Gajbe and Gajbe. Female
42) *Oxyopes pawani* Gajbe. Male.	34) *Oxyopes pawani* Gajbe. Female and Male.
43) *Oxyopes shweta* Tikader. Female.	35) *Oxyopes sp*. Male.
44) *Peucetia latikae* Tikader. Female.	36) *Peucetia jabalpurensis* Gajbe & Gajbe. F.
45) Peucetia jabalpurensis Gajbe & Gajbe. F.	
46) *Peucetia viridana* Pocock, 1900. Male &F.	
	8. FAMILY: - PHILODROMIDAE
	37) *Philodromous* sp. Female
	38) *Thanatus sp.* Female
6. FAMILY :- SALTICIDAE	**9. FAMILY :- SALTICIDAE**
47) *Euophrys chiriatapuensis* Tikader. Female.	39) *Euophrys chiriatapuensis* Tikader. Female.
48) *Marpissa andamanensis* Female.	40) *Euophrys* sp. Female.
49) *Marpissa anusuae* Tikader and Biswas F.	41) *Euryattus* species female
50) *Marpissa bengalensis* Tikader. Female.	42) *Marpissa andamanensis* Female.
51) *Marpissa decorata* Tikader. Female.	43) *Marpissa bengalensis* Tikader. Female.
52) *Marpissa dhakuriensis* Tikader. Female.	44) *Marpissa decorata* Tikader. Female.
53) *Marpissa kalapani* Female.	45) *Marpissa dhakuriensis* Tikader. Female.
54) *Marpissa mandali* sp. Female.	46) *Menamerus* sp. Female
55) *Myrmarachnae orientales* Tikader. Male.	47) *Myrmarachnae poonaensis* Tikader. F.
56) *Myrmarachnae poonaensis* Tikader. F.	48) *Myrmarachnae* sp. Female
57) *Phidippus bengalensis* Tikader. Female.	49) *Phidippus bengalensis* Female
58) *Phidippus bhimrakshiti* Female.	50) *Phidippus indicus* Tikader. Female.
59) *Phidippus indicus* Tikader. Female.	51) *Phidippus sp*. Female.

60) *Phidippus yashodharae* Male.	52) *Plexippus paykullii* Female.
61) *Phlegra dhakuriensis* Tikader. Female.	53) *Plexippus* sp. Male.
62) *Plexippus paykullii* Female.	54) *Rhene khandalensis* Female.
63) *Rhene sanghrakshiti* Female.	55) *Telamonia dimidiata* (Simon) Female.
64) *Rhene khandalensis* Female.	
65) *Telamonia dimidiata* (Simon) Female.	
	MILY: - TETRAGNATHIDAE
	56) *Leucage decorata* Female
	1. FAMILY:- THERIDIIDAE
	57) *Theridion sp.* Female
7. FAMILY: - THOMOSIDAE	**12. FAMILY: - THOMOSIDAE**
66) *Misumena decorata* Female.	58) *Misumena decorata* Female.
67) *Synaema decorata* Tikader. Female.	59) *Synaema decorata* Tikader. Female.
68) *Thomisus andamanensis* Female.	60) *Thomisus andamanensis* Female.
69) *Thomisus dhakuriensis* Tikader. Female.	61) *Thomisus dhakuriensis* Tikader. Female.
70) *Xysticus minutes* Tikader. Female.	62) *Xysticus minutes* Tikader. Female.
	13.FAMILY: - ULOBORIDAE
	63) *Uloborus* sp. Female Male

Table 2: Total number of families and species of spiders with their habitat

Sr. No	Family	Common Name	No. of Species		Common spiders
			Orange field	Cotton field	
1	Araneidae	Orb web spider	13	18	09
2	Clubionidae	Sac/leaf rolling spider	02	03	--
3	Eresidae	Social spider	02	--	--
4	Gnaphosidae	Ground spider	03	05	02
5	Lycosidae	Wolf spider	08	11	06
6	Miturgidae	Dark sac spider	01	--	--
7	Oxyopidae	Lynx spider	07	09	06
8	Philodromidae	Elongated crab spider	02	--	--
9	Salticidae	Jumping spider	17	19	11
10	Tetragnathidae	Long jawed spiders	01	--	--
11	Theridiidae	Cobweb spider	01	--	--
12	Thomisidae	Crab/flower spider	05	05	05
13	Uloboridae	Hackled web spider	01	--	--

CONCLUSION

Irrespective of agriculture crop products it has been observed that most of the spiders are common to orange and cotton fields. Due to variation in vegetation the insect fauna may vary but the abundance and diversity of spiders in any agro-ecosystem indicates that spiders feed on all most all types of insects and help to keep the insect population under control naturally.

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