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STUDY OF SPIDER FAUNA FROM THE COTTON FIELDS OF VITALA VILLAGE NEAR WARDHA RIVER PULGAON, INDIA

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ABSTRACT: Spiders are one of the dominant predatory groups found in agro-ecosystems in India. They have special adaptations towards a predatory way of life. Their distensible abdomens enable them to consume large amounts of food in relatively short periods of time, while their rate of predation may greatly increase during short periods when plentiful supply of food is available. They have an exceeding high resistance to starvation, which enables them to survive and maintain normal reproduction during periods of low prey availability. This is accomplished by an ability to decrease their metabolic rate. During their life which varies from 9 months to 25 years, all instars feed voraciously as predators. Most spiders are polyphagous and feed on a variety of prey but some are specialists. Predation is not limited to adults only but includes the egg and larval or nymphal stages as well. They can achieve equilibrium in pest control, after which their own numbers are suppressed by their territoriality and cannibalism.

The population densities and species abundance of spider communities in agricultural fields can be as high as in natural ecosystems. Spiders are important predators of pests on cotton, rice, apple, banana, citrus, soybean, and various other crops and plantations. The use of spiders as biological control agents depends mainly on the conservation and increases in numbers through the use of agricultural practices such as selective spraying rather than on mass rearing and release. The extent, to which spiders can contribute to agricultural pest control, is however limited by the disruptive effect of insecticide applications. The selective use of pesticides to prevent elimination of natural enemies; restricting insecticide usage during crucial periods in the life cycle of the pest; limiting spray application to midday when spiders are less active and shelter; application of pesticides as spot treatments to permit spiders to recolonize in treated areas immediately are important to conserve the predator spiders.

Key words: - Spiders, Cotton field, Diversity, Wardha River..

INTRODUCTION :

In a faunistical investigation in the Indian cotton fields, the most abundant species were belonged to Clubionidae, Lycosidae, Theridiidae, Thomisidae, Heteropodidae, Araneidae, Oxyopidae and Filistatidae families too. The most population of spiders was in September and October. They were one of the important predators in these fields and they play an important role in cotton pest's control.

Before attempting to assess the role of spiders in suppressing pest populations in a given agricultural situation, there must be available sufficient information on their taxonomic diversity and abundance habitat preferences in space and time, hunting strategy, body size of species, predators and prey items and the rate of their consumption, and reproduction. Information on these aspects is essential for the formulations of ecological concepts and conclusions (Berry, 1970; Horner & Starks, 1972).

Because of their high abundance and predominantly insectivorous feeding habits, spiders are suspected to play an important predatory role in agroecosystems, woodlands, and other terrestrial ecosystems (Nyffeler and Benz, 1987; Nyffeler, 2000a,b). They are one of the major groups of generalist predators that are needed in the development of efficient, sustainable, low-input agricultural systems (Ekschmitt et al., 1997).

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be as high as in natural ecosystems. Spiders are important predators of pests on cotton, rice, apple, banana, citrus, soybean, and various other crops and plantations. The use of spiders as biological control agents depends mainly on the conservation and increases in numbers through the use of agricultural practices such as selective spraying rather than on mass rearing and release. The extent, to which spiders can contribute to agricultural pest control, is however limited by the disruptive effect of insecticide applications. The selective use of pesticides to prevent elimination of natural enemies; restricting insecticide usage during crucial periods in the life cycle of the pest; limiting spray application to midday when spiders are less active and shelter; application of pesticides as spot treatments to permit spiders to recolonize in treated areas immediately are important to conserve the predator spiders. They are of economic value to farmers because of their ability to suppress pest abundance and do not damage plants in agro-ecosystem. Special features of predatory behavior, such as mortality of non-consumed pests in spider webs and wasteful killing or partial consumption of prey by hunting spiders also contribute to the biocontrol potential of spiders. They make a worthwhile contribution to pest control. However, their role in pest control and crop protection has not been utilized properly in India.

MATERIALS AND METHODS:

Study Area:

In the district Wardha, a village Pulgaon is located at 20°43′34″N to 78°19′01″E at an elevation of 935 ft. A village Pulgaon is well associated with many small villages with dry deciduous forest area. A Pulgaon is well known for the Wardha River which passes through the Pulgaon village and provide suitable environment for the cotton based agricultural field.

Study Period, sampling and identification

The current study was carried out for a period of eight months from August 2018 to March 2019. Sampling was conducted in six months at the randomly selected cotton field.

Spiders were collected by various methods like insect nets, pitfall trap, visual searching, beating, sweeping, and stroking sticks. Sampling was done in each month by plotting the quadrates method i.e. (1sq. m × 1sq.). Attempts were made to carefully scan the leaf litter surface, tree bark, foliage (Including the under – surface of leaves when traces of webs were found) twigs, and branches of the vegetation (up to 1.5m height) along the transect. Specimens from each quadrate were preserved in 75% alcohol in the field and observed under a stereozoom microscope in the laboratory.

METHODOLOGY:

To document spider diversity of agriculture ecosystem:

Well established sampling protocols for spider collection will be adopted in different selected sampling plots. The detailed descriptions of the collection techniques are as follows.

1) Pitfall Trapping -- Pitfalls will be used to trap the ground dwelling spiders. The pitfall traps consists of a 9 cm wide by 10 cm deep plastic jar, one-third filled with 30% ethyl acetate and a few drops of liquid soap/detergent. The pitfall traps will be left open for a period of one week, as this allows maintaining the spider specimens in good condition before processing in the laboratory for their identification.

2) Visual Observation – This method of sampling is used to collect the spiders by visual observation.

3) Ground Hand Collecting – Ground Hand collection involves the collection of spider samples from ground to knee level. This method of sampling is used to collect the spiders, which are found to be visible in the ground, litter, in broken logs, rocks etc.

4) Aerial Hand Collecting – Aerial Hand collection involves the collection of spiders samples from knee level to arm length level. This method accesses web-building and free-living spiders on the foliage and stems of living or dead shrubs, high herbs, tree trunks etc.

5) By visual observation of small webs

6) Preservation and Identification of specimens - Collected adult mature specimens will be photographed, analyzed and then will be transferred to 70% alcohol. All adult specimens will be identified at family, genus and species level. Species will be distinguished by examination of external genitalia. Sexes will be matched by colour pattern and somatic features. Identification will be done on the basis of morphometric characters of various body parts.

RESULTS AND DISCUSSION :

Collected data representing 11 families, 35 genera and 72 species were recorded from agricultural lands adjoining to the Wardha river. Family Araneidae and Thomisidae forms the dominant group (Table 1). i.e. 17 species in both families with 8 and 6 genera respectively. The large number of Thomisidae and Araneidae species found in this region is due to the availability of flowering plants with the deep vegetation at the border of agricultural and forest area. The Saltisidae represent 12 species and 7 genera. Lycosidae and Tetragnathidae also found in decreasing species number which is due to their specific habitation. The analysis of guild structure (Uetz, et al.,1999) revealed six feeding guilds i.e. orb web weavers, Foliage hunters, Sheet web weavers, Ground runners, Stalkers and Ambushers (Table 1). Orb web weavers and Ambushers constituted the dominant feeding guild representing 33% and 22% of the total collection respectively. Stalkers and ground runners represent 20% and 17% respectively.

This study brought out the fact that agricultural fields adjoin to the forest has the potential to maintain the richness of spider diversity in the agricultural fields. This rich diversity of spiders indicate useful indicator for the species richness related to agro-ecosystem (Noss, 1990).

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Table 1. Total number of families, genera and species of spiders with their guild and habitat collected from agriculture lands of Pulgaon, Maharashtra-India.

SR. NO.	FAMILY	NUMBER OF GENERA	NUMBER OF SPECIES	GUILD	HABITAT
1	Aranaidae	08	17	Orb web weavers	Tropical forest, foliage, dry forests, ground.
2	Clubionidae	01	02	Foliage hunters	Under stones
3	Eresidae	01	02	Sheet web weaver	Tree trunk
4	Gnaphosidae	03	03	Ground runners	Stones
5	Hersiliidae	01	01	Foliage hunters	Under stones
6	Lycosidae	04	06	Ground runners	Dunes
7	Miturgidae	01	01	Foliage hunters	Foliage
8	Oxyopidae	1	6	Stalkers	Grass land
9	Saltisidae	7	12	Stalkers	Tropical forest
10	Tetragnathidae	2	5	Orb web weavers	Low
11	Thomisidae	6	17	Ambushers	Forest grass, flowering plant

Table 2. Checklist of spiders collected from agriculture lands of Pulgaon, Maharashtra-India.

Family	Genus/ Species
Araneidae	*Aranus mitifica*- male
	Aranus cucurbitinus- female
	Argiope pradhani-female
	Argiope aemula -Female
	Cyclosa hexatubulata- female
	Cyclosa mooduesis- female
	Cyclosa spirifera -Female
	Cyclosa insulana -Male
	Cryptophora citricola-female
	Leucange decorate-female
	Neoscona theis-female
	Neoscona excelsus-male
	Neoscona mukergai-male
	Neoscona rumpfi- Female
	Neoscona nautica –Male
	Poltys nagpurensis -Tikader *Female*
	Zygeilla indica- female
Clubionidae	*Clubiona drassodes* Cambridge male
	Clubiona tikaderi female
	Callilepis rukminiae female
Eresidae	*Stegodyphus sangivani*-female
	Stegodyphus mirandus- Pocock Female
Gnaphosidae	*Gnaphosa pauriensis* Tikader female
	Megamyrmecion ashae Tikader female
	Zelotes chandosiensis Tikader female
	Zelotes mandlaensis Tikader female
Hersiliidae	*Hersilia savignyi*-female

Fig.1. Guild structure of spiders collected from ecotone area of Pulgaon, Maharashtra-India.