

Spider Diversity in Agriculture Fields of Chengalpattu District (Gandhi Nagar)

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Abstract—The present study was conducted to assess spider diversity in agricultural fields of Chengalpattu district during the months of November and December. Agricultural ecosystems in this region include crops such as paddy, groundnut, cotton, and vegetable fields, which provide suitable habitats for a variety of spider species. Field observations were carried out through regular visual search and direct sampling methods to document spider species, their abundance, and distribution patterns. The study aimed to understand species composition and evaluate the ecological role of spiders within the agroecosystem.

The results indicated that agricultural fields in Chengalpattu district support diverse spider communities belonging to different functional groups, including web-building and hunting spiders. Higher spider activity was observed in fields with diverse vegetation and minimal chemical disturbance. The presence of spiders contributes significantly to natural pest control by reducing populations of crop-damaging insects. Therefore, the study highlights the importance of conserving spider diversity for sustainable agriculture and ecological stability in the region

I. INTRODUCTION

Spiders are one of the most abundant and diverse groups of arthropods found in agricultural fields. They belong to the class Arachnida and order Araneida. Agricultural ecosystems provide suitable habitats for many spider species due to the availability of prey insects, vegetation cover, and micro-climatic conditions. Spider diversity refers to the variety and abundance of different spider species present in crop fields. Due to their predatory nature, spiders play an important role in regulating pest populations and maintaining ecological balance in agro-ecosystems (Riechert & Lockley, 1984; Nyffeler & Sunderland, 2003).

In agriculture fields, spiders play a crucial role as natural biological control agents. They are generalist predators that feed on a wide range of insect pests such as aphids, leafhoppers, caterpillars, flies, and beetles. By reducing pest populations, spiders help in maintaining ecological balance and reduce the dependency on chemical pesticides (Marc & Canard, 1997). Spiders are carnivorous to eat various disease spreading pest, like trips; at the time of movements the pests the pest come in the contact of spider traps it will be not escape so, the spider attack and kill and eat it. Through these feeding behaviors, spiders significantly contribute to pest suppression in agro-ecosystems (Symondson, Sunderland & Greenstone, 2002).

A sustainable ecosystem is essential for maintaining ecological balance in nature. Conservation of spiders is highly important, and systematic surveys are necessary to understand spider diversity within a given region. Studying spider diversity plays a vital role in biodiversity conservation because spiders contribute significantly to natural pest control and support ecosystem stability (Foelix, 2011). As effective predators in agricultural landscapes, spiders ultimately benefit farmers by reducing pest populations and minimizing the need for chemical pesticides, thereby promoting sustainable agro-ecosystems.

Agriculture And Biodiversity

Agriculture is one of the most widespread human activities on Earth and plays a crucial role in sustaining the growing human population. Agricultural ecosystems, also known as agroecosystems, are managed habitats in which crops, livestock, soil organisms, insects, birds, and microorganisms interact with one another and microorganisms interact with one another and with the physical environment. Unlike natural ecosystems, agroecosystems are frequently

disturbed by human activities such as ploughing, irrigation, fertilizer application, and pesticide use. Despite these disturbances, agricultural fields support a considerable level of biodiversity, which is essential for maintaining ecosystem stability, productivity, and long-term sustainability (Algeri, M.A. 1999; Swift *et al.*, 1996). Biodiversity in agroecosystems enhances ecological services such as nutrient cycling, pollination, and biological pest control, thereby contributing to sustainable agricultural production (Tillman *et al.*, 2002; Tscharntke *et al.*, 2005).

Biodiversity in agricultural landscapes includes plants, insects, arthropods, microorganisms, birds, and small mammals. Among these, arthropods constitute a major portion of animal diversity and perform vital ecological functions such as pollination, decomposition, nutrient cycling, and biological control of pests. Predatory arthropods are especially important because they help regulate populations of herbivorous insects that damage crops. Understanding the diversity and ecological roles of these organisms is essential for developing sustainable agricultural practices.

Spider Diversity in Agricultural Fields

Agricultural fields provide a mosaic of habitats that support a wide range of spider species. Crop type, cropping pattern, vegetation structure, soil conditions, and the surrounding landscape significantly influence spider diversity and abundance. Fields with diverse crops, intercropping systems, and the presence of weeds or hedgerows generally support higher spider diversity compared to monoculture systems (Rypstra *et al.*, 1999; Schmidt *et al.*, 2005). Habitat heterogeneity and landscape complexity enhance the availability of prey and shelter, thereby promoting greater abundance and diversity of spiders in agroecosystems (Tscharntke *et al.*, 2012). Spider diversity in agricultural fields is not uniform throughout the year. Seasonal changes in temperature, rainfall, crop growth stages, and farming activities affect spider populations. For example, spider abundance often increases during the vegetative and flowering stages of crops due to the availability of prey and shelter. Harvesting and pesticide application can reduce spider populations temporarily, but they may recolonize fields from nearby refuges.

Spiders play a crucial ecological role in pest control within agricultural ecosystems by acting as natural

predators of many crop-damaging insects (Symondson *et al.*, 2002). They feed on a wide variety of pests such as aphids, leafhoppers, planthoppers, caterpillars, beetles, flies, and moths. Because spiders are generalist predators, they do not depend on a single prey species and can regulate multiple pest populations simultaneously.

Spiders As Bio Indicators

Spiders are considered useful bio indicators of environmental quality and habitat disturbance (Clausen, 1986; Marc *et al.*, 1999). Changes in spider species composition, abundance, and diversity can reflect alterations in land use, vegetation structure, and pollution levels. In agricultural landscapes, spider diversity can indicate the ecological health of the agroecosystem (Pearce & Venire, 2006). High spider diversity generally suggests a stable and well-structured habitat with minimal chemical disturbance, whereas low diversity and the dominance of a few tolerant species may indicate intensive farming practices and environmental stress (Cardoso *et al.*, 2011). Therefore, studying spider diversity provides valuable information for assessing the sustainability of agricultural systems.

Spiders are also useful bio indicators in agroecosystems because they are sensitive to chemical inputs such as insecticides and fertilizers (Marc *et al.*, 1999). A decline in spider populations often indicates excessive pesticide use, which disrupts natural biological control. Since spiders occupy higher trophic levels, they accumulate the effects of environmental stress over time, making them valuable for monitoring long-term ecological changes. In addition, spiders are relatively easy to sample, widely distributed, and taxonomically diverse, which increases their usefulness as bio indicators. Changes in spider community structure can provide early warning signs of environmental degradation (Pearce & Venire, 2006). Thus, studying spider diversity helps researchers evaluate ecosystem stability, monitor environmental pollution, and promote sustainable agricultural practices.

II. MATERIAL AND METHODS

Study Area and Study Period

The present study was carried out in agricultural fields of Gandhi Nagar village, located in Chengalpattu

District, Tamil Nadu, India. The study area consists of crop fields with natural vegetation and associated insect fauna, providing suitable habitats for spiders. The region experiences a tropical climate, which supports diverse arthropod populations.

The agricultural fields selected for the study are managed under traditional farming practices with periodic irrigation. These fields provide suitable habitats for spiders due to the presence of crop vegetation, weeds, insect prey, and minimal disturbance in certain areas. The study area was chosen for its accessibility and representation of typical agricultural ecosystems in Chengalpattu district.

Study Period

The study was carried out for a period of 1-4 months covering different crop growth stages. Weekly 5 days watching for agriculture lands. Observations were made during morning (5.00–7.00 AM) and evening (4.00–6.00 PM) hours when spider activity is high.

The survey was carried out during the cropping season, with regular field visits made during morning and evening hours, when spider activity was high.

The study was conducted during the months of November and December January. Regular field observations were made during this period to record the diversity and abundance of spider species present in the agricultural fields.

Spider diversity was studied using visual searching and photographic documentation methods. Spiders were observed on crop plants, leaves, stems, flowers, soil surface, field margins, and nearby vegetation. No chemicals were used during the study.

Sample Collection

Spider samples were collected through direct visual observation and photographic documentation in the agricultural fields of Gandhi Nagar village, Chengalpattu District, Tamil Nadu. Field visits were conducted during morning and evening hours when spider activity was maximum. Spiders were searched on crop plants, leaves, stems, flowers, soil surface, field bunds, weeds, and nearby vegetation.

Spiders were not physically collected or harmed. Each spider encountered was considered a sample and was photographed using a mobile phone camera without disturbing its natural habitat. Clear images showing

body shape, color patterns, and web structure were taken to aid identification.

Sample Collection (Revised)

Spider samples were recorded through visual observation and photographic documentation from agricultural fields of Gandhi Nagar village, Essur, Manaappakam, and Arasur in Chengalpattu District. Field visits were conducted during morning and evening hours when spider activity was maximum. Spiders were observed on crop plants, leaves, stems, flowers, soil surface, field bunds, and nearby vegetation.

During the present study, spiders were regularly observed on different agricultural and horticultural plants such as paddy (*Oryza sativa*), cotton (*Gossypier sp.*), groundnut (*Arches hypogea*), watermelon (*Citrullus landaus*), and sampangi flower (*Jasmine samba*). In paddy fields, spiders were commonly found on leaf blades, leaf sheaths, and between tillers, where they actively preyed on small insects such as leafhoppers and plant hoppers.

Cotton plants supported a high diversity of spiders, especially foliage-dwelling and jumping spiders, which were observed on leaves, buds, and flowers due to the rich availability of insect pests. Groundnut fields showed moderate spider abundance, with spiders mainly found near the soil surface and among creeping branches, acting as important predators of ground-dwelling insects. In watermelon plants, spiders were frequently noticed on vines, tendrils, and flowers, where web-building spiders captured flying insects, while hunting spiders actively searched for prey. Sampangi flower plants harbored spiders on flower buds, leaves, and branches, where they remained hidden and played a significant role in controlling flower-visiting insects. Overall, these observations indicate that different crop plants provide suitable microhabitats for various spider groups, contributing significantly to natural pest control and maintaining ecological balance in agricultural fields.

Materials Used

- Digital mobile phone / camera for photography
- Field notebook for recording observations
- Hand lens (optional)
- Reference books and research articles for spider identification.

Family: Araneidae (Orb-weaver spider)

S. No	Spices Name	Common Name	Genus Name
1	<i>Araneus diadematus</i>	Cross orb-weaver	Araneus
2	<i>Argiope anasuja</i>	Signature spider	Argiope
3	<i>Leucauge argyrobapta</i>	Orchard orb weaver	Leucauge
4	<i>Micrathena virescens</i>	Spiny orb weave	Micrathen
5	<i>Araniella cucurbitin</i>	Cucumber green spider	Araniell
6	<i>Neoscona theis</i>	Garden orb weave	Neoscon
7	<i>Argiope auranti</i>	Yellow garden spide	Argiop
8	<i>Argiope sp</i>	St. Andrew's Cross Spider	Argiop
9	<i>Leucauge argyrobapt</i>	Orchard orb weave	Leucaug
10	<i>Argiope brunennichi</i>	Grass spider	Argiope

Family: Thomisidae (Crab Spiders)

S.No	Spices Name	Common name	Genus
1	<i>Thomisus viridulus</i>	Green crab spider	Thomisus
2	<i>Thomisus projectus</i>	Crab spider	Thomisus
3	<i>Oxytate virens</i>	Green running carb spider	Oxytate

Family: Oxyopidae (lynx spider)

S.No	Spices Name	Common name	Genus name
1	<i>Oxyopes javanus</i>	Lynx Spider	Oxyopes
2	<i>Peucetia viridana</i>	Green Lynx Spider	Peucetia
3	<i>Oxyopes salticus</i>	Striped Lynx Spider	Oxyopes
4	<i>Oxyopes lineatus</i>	Lynx Spider	Oxyopes

Family: Salticidae (Jumping spider)

S.No	Spices Name	Common name	Genus name
1	<i>Plexippus paykulli</i>	Pantropical Jumping Spider	Plexippus
2	<i>Maratus volans</i>	Peacock Spider	Maratus
3	<i>Neoscona theisi</i>	Garden Orb-weaver	Neoscona

Family: Trechaleidae (long legged water spider)

S.No	Spices Name	Common name	Genus Name
1	<i>Trechleae sp.</i>	Cinnamon Water Spider	Trechale

Family: Sparassidae (Huntsman spider)

S.No	Spices name	Common name	Genus Name
1	<i>Micrathena virescens</i>	Spiny Orb-weaver	Micrathena

Family: Tetragnathidae

S.No	Spices Name	Common Name	Genus Name
1	<i>Tetragnatha</i>	Long Jawed orb weaver	Tetragnatha
2	<i>Tetragnatha Javana</i>	Long Jawed orb weaver	Tetragnatha

Family: Araneidae

S. No	Spices Name	Common name	Genus Name
1	<i>Argiope brunennichi</i>	Garden orb weaver	Argiope
2	<i>Argiope aetherea</i>	Grass spider	Argiope

Family: Agelenidae

S. No	Spices Name	Common Name	Genus Name
1	<i>Ageloneopsis</i>	Grass spider	Ageloneopsis

III. DISCUSSION

The present study revealed that agricultural fields support a considerable diversity of spider fauna. Spiders were found to be one of the dominant

predatory arthropods in the study area. The occurrence of multiple families indicates that agroecosystems provide suitable habitat conditions such as vegetation structure, prey availability, and microclimatic stability for spider survival and reproduction.

In this study, families such as Araneidae, Salticidae, Lycosidae, Thomisidae, and Oxyopidae were recorded as common groups in the agricultural fields. These findings are consistent with previous studies conducted in Indian agroecosystems, where web-building spiders like Araneidae and active hunters like Salticidae and Lycosidae were reported as dominant groups. The dominance of Salticidae may be attributed to their active hunting behavior and adaptability to various crop environments.

The presence of web-building spiders suggests that crop plants provide adequate support for web construction, while ground-dwelling spiders such as Lycosidae indicate the importance of soil and litter layers in maintaining spider diversity. This shows that both vertical and horizontal habitat structures influence spider distribution in agricultural fields.

Seasonal variation also plays an important role in spider abundance. Higher diversity and population density are often observed during crop growth stages when prey insects are abundant. In contrast, heavy pesticide application may negatively affect spider populations by reducing prey availability and directly causing mortality. Therefore, reduced chemical usage and adoption of integrated pest management practices can help conserve spider diversity.

Spiders act as natural biological control agents by feeding on a wide range of insect pests. Their presence in agricultural ecosystems contributes to ecological balance and reduces dependence on synthetic pesticides. Thus, maintaining spider diversity is essential for sustainable agriculture. Overall, the findings highlight the ecological importance of spiders in agricultural landscapes. Conservation of these natural predators through habitat management and eco-friendly farming practices can enhance biological pest control and promote long-term agricultural sustainability.

IV. CONCLUSIONS:

The present study on spider diversity in agricultural fields of Chengalpattu district (Kandhi Nagar, Mamappakkam and Arasur areas) revealed that the

agricultural ecosystems of this region support a considerable diversity of spider fauna. Major crop fields such as paddy, cotton, groundnut, watermelon and sampangi flower fields harbored different spider families including Araneidae, Salticidae, Lycosidae, Oxyopidae, Tetragnathidae. Both web-building and hunting spiders were actively involved in controlling insect pests, thereby contributing significantly to natural biological control and maintaining ecological balance within the agro-ecosystem. The diversity and abundance of spiders varied depending on crop type, vegetation complexity, seasonal variation and farming practices followed in the study area.

REFERENCE

- [1] S. E. Riechert and T. Lockley, "Spiders as biological control agents," *Annual Review of Entomology*, vol. 29, pp. 299–320, 1984.
- [2] M. Nyffeler and K. D. Sunderland, "Composition, abundance and pest control potential of spider communities in agricultural systems: A review," *Agriculture, Ecosystems & Environment*, vol. 95, no. 2–3, pp. 579–612, 2003.
- [3] P. Marc and A. Canard, "Maintaining spider biodiversity in agroecosystems as a tool in pest control," *Agriculture, Ecosystems & Environment*, vol. 62, no. 2–3, pp. 229–235, 1997.
- [4] W. O. C. Symondson, K. D. Sunderland, and M. H. Greenstone, "Can generalist predators be effective biological control agents?" *Annual Review of Entomology*, vol. 47, pp. 561–594, 2002.
- [5] R. F. Foelix, *Biology of Spiders*, 3rd ed. Oxford, U.K.: Oxford University Press, 2011.
- [6] P. Cardoso, S. Pekár, R. Jocqué, and J. A. Coddington, "Global patterns of guild composition and functional diversity of spiders," *PLoS ONE*, vol. 6, no. 6, p. e21710, 2011.
- [7] M. A. Altieri, "The ecological role of biodiversity in agroecosystems," *Agriculture, Ecosystems & Environment*, vol. 74, no. 1–3, pp. 19–31, 1999.
- [8] M. J. Swift, A. M. N. Izac, and M. van Noordwijk, "Biodiversity and ecosystem services in agricultural landscapes," *Agriculture, Ecosystems & Environment*, vol. 57, no. 2–3, pp. 191–204, 1996.
- [9] D. Tilman, K. G. Cassman, P. A. Matson, R.

Naylor, and S. Polasky, “Agricultural sustainability and intensive production practices,” *Nature*, vol. 418, pp. 671–677, 2002.

- [10] T. Tschardtke, A. M. Klein, A. Kruess, I. Steffan-Dewenter, and C. Thies, “Landscape perspectives on agricultural intensification and biodiversity – ecosystem service management,” *Ecology Letters*, vol. 8, no. 8, pp. 857–874, 2005.
- [11] L. Rypstra, P. E. Carter, R. A. Balfour, and S. D. Marshall, “Architectural features of agricultural habitats and their influence on the spider community,” *Journal of Arachnology*, vol. 27, no. 1, pp. 371–377, 1999.
- [12] M. H. Schmidt, I. Schweitzer, C. Thies, and T. Tschardtke, “Differential effects of landscape and management on diversity and density of ground-dwelling farmland spiders,” *Journal of Applied Ecology*, vol. 42, no. 2, pp. 281–287, 2005.
- [13] H. S. Clausen, “The use of spiders (Araneae) as ecological indicators,” *Bulletin of the British Arachnological Society*, vol. 7, pp. 83–86, 1986.
- [14] P. Marc, A. Canard, and F. Ysnel, “Spiders (Araneae) useful for pest limitation and bioindication,” *Agriculture, Ecosystems & Environment*, vol. 74, no. 1–3, pp. 229–273, 1999.
- [15] J. L. Pearce and L. A. Venier, “The use of ground beetles (Coleoptera: Carabidae) and spiders (Araneae) as bioindicators of sustainable forest management,” *Ecological Indicators*, vol. 6, no. 4, pp. 780–793, 2006.



Neoscona ukerjei



Neosconathisi

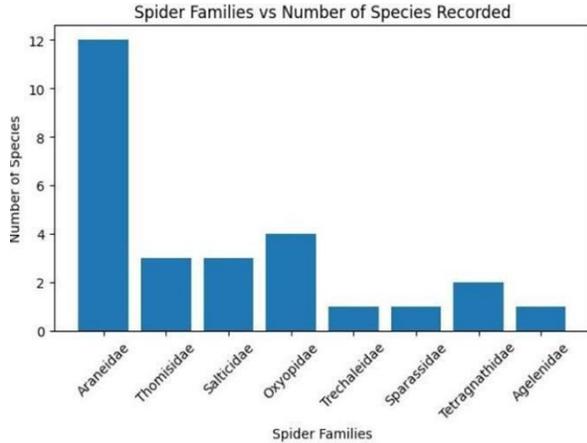


Cheiracanthium inclusum



Peucetia viridans

SPIDER FAMILIES' VS NUMBERS OF SPECIES





Araniella cucurbitina



Oxyopes Javanus



Neoscona muckerjei



Coleosoma ffordanum



Turmeric (haldi)



Ageloneopsis



Peucetia viridans



Argiopebrunnennichi



Peucetiaviridans



Maratusvelans



Oxyopesalticus



Plexippus



Argiopeaetherea



Peucetiaviridana



Peucetia viridans



Thomisusprojectus



Neoscona theisi



Argiopeaemula



Tetragnatha mandibulata



Argiopeanasuja



Cheriracanthiuminclusim