(ISSN: 0973-7049(P))

The Bioscan AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES 21(3): S.I (3), 828-834, 2026 www.thebioscan.co

Role of Spiders in Pest Management of Rice Field Region in Sindewahi, District Chandrapur (M.S.), India

P. R. Bhagade and U. S. Indurkar
Department of Zoology, Shri Dnyanesh Mahavidyalaya, Nawargaon, Maharashtra, India
Corresponding author email: priyabhagade710@gmail.com
DOI: https://doi.org/10.63001/tbs.2026.v21.i03.S.I(3).pp828-834

Keywords:

Spider diversity, Rice agroecosystem, Sindewahi, Natural pest controller, Integrated Pest Management (IPM).

Article Info
Received: 21.06.2026
Accepted: 28.7.2026
Published: 10-08-2026

Abstract

Spiders (Araneae) are key generalist predators in rice agroecosystems and can suppress major pests such as planthoppers, leaf folders, and stem borers. This study documents spider diversity, abundance, and pest-predation roles in rice fields of Sindewahi (Chandrapur, Maharashtra) during July 2025–December 2025. Sampling across the kharif season (July to October) and Rab season November, December recorded 188 individuals belonging to 7 families and 13 species. Araneidae was the most abundant family (89 individuals; 4 species), followed by Tetragnathidae (57 individuals; 4 species), with notable contributions from Oxyopidae (16), Lycosidae (12), Thomisidae (7), Scytodidae (6), and Salticidae (1). Dominant species included *Argiope aemula* (26), *Neoscona adianta* (25), *Nephila pilipes* (20), *Tetragnatha extensa* (19), *Leucauge argyra* (18), and *Oxyopes salticus* (16). Field observations indicated strong predatory associations: Araneidae and Tetragnathidae targeted gundhi bugs, leaf folders, planthoppers, and leafhoppers; Lycosids focused on planthoppers; oxyopids on stem borers and whorl maggots; salticids on caterpillars and flies; and scytodids on small soft-bodied nocturnal prey. The assemblage structure and prey spectrum align with other Indian rice ecosystems, supporting the integration of spider conservation (e.g., bund vegetation, reduced broad-spectrum sprays) into IPM programmes for Sindewahi.

Introduction

Spiders (Order: Araneae) represent one of the most diverse and ecologically significant groups of terrestrial arthropods, comprising over 50,000 described species globally (World Spider Catalog, 2023). They occupy a wide range of habitats, ranging from forests and grasslands to wetlands and intensively managed agroecosystems, exhibiting remarkable adaptability in predatory strategies such as web-building, ambushing, and active hunting (Foelix, 2011; Nyffeler & Birkhofer, 2017). As generalist predators, spiders exert substantial top-down control over insect populations, influencing both pest and non-pest species within agricultural landscapes (Marc *et al.*, 1999; Riechert & Lockley, 1984). Their predation not only reduces herbivore pressure on crops but also indirectly enhances plant health and productivity, underscoring their functional importance in maintaining ecosystem stability (Cardoso *et al.*, 2011; Nyffeler *et al.*, 2016).

In India, approximately 1,800 spider species distributed across 438 genera and 60 families have been documented, demonstrating considerable taxonomic richness (Keswani *et al.*, 2012). Despite this diversity, localized studies addressing spider assemblages in the agroecosystems of eastern Maharashtra, particularly in rice-growing regions such as Sindewahi in Chandrapur District, remain limited. Most regional research has historically focused on forested or urban habitats, leaving a knowledge gap regarding spider-mediated pest control in paddy fields and associated vegetation (Sundaram *et al*., 2016; Reddy & Rao, 2007). Documenting species composition and ecological roles in such landscapes is vital, as spiders serve both as bioindicators of environmental health and as an eco-friendly alternative to chemical pest management (Nyffeler & Birkhofer, 2017).

The Sindewahi region is predominantly agrarian, with rice (Oryza sativa) serving as the primary kharif crop. The structural complexity of paddy fields, including bunds, water channels, vegetation edges, and fallow patches, creates a mosaic of microhabitats supporting high spider diversity (Reddy & Rao, 2007; Padhye *et al*., 2015). Spiders exploit these microhabitats for foraging, shelter, and reproduction, which in turn enhances their efficiency as natural pest suppressors (Marc et al., 1999; Nyffeler *et al.,* 2016). Given the paucity of regional data, this study was undertaken to document family-wise abundance, species distribution, and specific pest-regulation functions of spiders in the rice fields of Sindewahi.

Materials and Methods

The study was conducted in the agrarian rice-farming landscape of the Sindewahi tehsil in Chandrapur District, Maharashtra (19.57°N, 79.18°E). Field surveys and sampling were carried out from July 2025 to December 2025, covering the primary active growth and harvesting phases of the paddy crop.

Multiple collection strategies including hand-picking, visual searches on foliage and bunds, and sweep-netting across paddy vegetation were utilized across different microhabitats such as crop canopies, waterlogged zones, and field margins (Barrion & Litsinger, 1995). Collected spider specimens were preserved in 70% ethanol, categorized, and identified down to family and species levels using standard taxonomic keys and reference guides (Barrion & Litsinger, 1995; Keswani *et al*., 2012).

Observations and Results

During the survey period from July to December 2025, a comprehensive collection yielded a total of 188 individual spiders distributed across 7 distinct families.

Table 1: Family-wise abundance and relative abundance of spiders in rice fields of Sindewahi (July–December 2025)

Family	Species (n)	Individuals	Relative abundance (%)
Araneidae	4	89	47.34
Tetragnathidae	4	57	30.32
Oxyopidae	1	16	8.51
Lycosidae	1	12	6.38
Thomisidae	1	7	3.72
Scytodidae	1	6	3.19

(ISSN: 0973-7049(P))

The Bioscan
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
21(3): S.I (3), 828-834, 2026 www.thebioscan.co

Salticidae	1	1	0.53
Total	13	188	100.00

Table 2: Species-wise abundance and relative abundance of spiders in rice fields of Sindewahi (July–December 2025)

Family	**Species**	**Individuals**	**Relative abundance (%)**
Araneidae	*Argiope aemula*	26	13.83
Araneidae	*Araneus ellipticus*	18	9.57
Araneidae	*Nephila pilipes*	20	10.64
Araneidae	*Neoscona adianta*	25	13.30
Lycosidae	*Lycosa pseudoannulata*	12	6.38
Oxyopidae	*Oxyopes salticus*	16	8.51
Salticidae	*Telamonia dimidiata*	1	0.53
Scytodidae	*Scytodes thoracica*	6	3.19
Tetragnathidae	*Leucauge argyra*	18	9.57
Tetragnathidae	*Leucauge venusta*	9	4.79
Tetragnathidae	*Tetragnatha extensa*	19	10.11
Tetragnathidae	*Tetragnatha montana*	11	5.85
Thomisidae	*Thomisus okinawensis*	7	3.72
Total		188	100.00

Taxonomic Composition and Pest Regulation Roles

1. Family Araneidae: Family Araneidae (Orb-weavers) exhibited the highest recorded abundance with 89 individuals (46.58% relative representation). Species such as *Argiope aemula* (26), *Araneus ellipticus* (18), *Nephila pilipes* (20), and *Neoscona adianta* (25) construct large vertical or horizontal webs across the crop canopy, effectively intercepting flying and jumping insect pests. They specialize in preying upon gundi bugs, leaf folders, and lepidopteran leaf feeders.

2. Family Tetragnathidae: Represented by 57 individuals across *Leucauge argyra* (18), *Leucauge venusta* (9), *Tetragnatha extensa* (19), and *Tetragnatha montana* (11). Inhabiting moist microhabitats close to waterlogged zones in paddy fields, long-jawed orb-weavers feed heavily on major economic rice pests, including brown planthoppers (BPH), green leafhoppers (GLH), and mirid bugs.

3. Family Oxyopidae: Accounted for 16 individuals of *Oxyopes salticus*. Lynx spiders are active, non-web-building hunters that patrol plant stems and leaves, playing a vital role in suppressing stem borers and whorl maggots within the rice canopy.

4. Family Lycosidae: Represented by 12 individuals of Lycosa pseudoannulata. As ground-dwelling and base-wandering hunters, they are widely recognized as premier biocontrol agents in paddy fields, specializing in preying upon planthoppers moving near the water-soil interface.

5. Family Thomisidae: Represented by 7 individuals of *Thomisus okinawensis*. These sit-and-wait ambush predators reside on flowers and upper foliage, preying broadly on various small visiting insects.

6. Family Scytodidae: Represented by 6 individuals of *Scytodes thoracica*. Specialized nocturnal hunters that capture prey by spitting sticky substance tracks, feeding on a wide variety of small, soft-bodied insects.

7. Family Salticidae: Represented by 1 individual of Telamonia dimidiata. Active daytime visual hunters that predate efficiently on caterpillars and small flies inhabiting upper vegetation layers.

Discussion

The present investigation revealed that the Sindewahi agroecosystem supports a diverse spider community (188 individuals across 7 families) representing both web-building and cursorial guilds. The dominance of Araneidae and Tetragnathidae indicates a balanced trophic structure and functional complementarity between web-dependent and active-hunting predators. Similar guild compositions have been reported in rice and agroecosystems across India and Southeast Asia, emphasizing the ecological universality of these families in pest regulation (Sebastian *et al*., 2005; Rajagopal *et al*., 2011).

For instance, Barrion and Litsinger (1995) documented diverse spider assemblages in South and Southeast Asian rice fields, where Tetragnatha and Neoscona served as dominant aerial predators. Although the Sindewahi assemblage shows specific localized richness, the dominance of Tetragnatha and Neoscona reflects analogous ecological patterns. In southern India, Sebastian *et al*. (2005) reported spider assemblages from Kerala's rice ecosystems, highlighting monsoon-associated rises in web-building populations a seasonal pattern mirrored in Sindewahi, where spider abundance peaked during kharif cultivation. Similarly, Rajagopal *et al*. (2011) demonstrated in Tamil Nadu that habitat complexity and organic farming significantly enhanced spider richness; the stable abundance recorded in Sindewahi likely reflects comparable microhabitat heterogeneity and limited pesticide exposure.

Several regional studies further corroborate these findings. Sankaran *et al*. (2005) observed seasonal variations of spiders during rice vegetative stages in Tamil Nadu, corresponding to our observations. Tambe *et al*. (2018) recorded spider communities in Maharashtra agroecosystems dominated by Araneidae, families also highly prevalent in Sindewahi. Seasonal population shifts similar to our study were described by Satpathy and Mishra (2011) in Odisha rice paddies, attributing fluctuations to prey availability. In northeastern India, Choudhury and Biswas (2010) reported Tetragnatha as dominant taxa in Assam paddy fields, consistent with Sindewahi's assemblage. Furthermore, the impact of agricultural management on spider diversity was highlighted by Rajeswari and

Jayakumar (2012), who found increased abundance in lower pesticide-input rice fields, aligning directly with Sindewahi's agrarian practices.

Landscape and crop-specific studies provide additional parallels. Ghosh and Saha (2019) observed seasonal succession in West Bengal paddy rotations, paralleling the seasonal turnover of dominant guilds seen in our study. Purkait and Saha (2016) highlighted the importance of bund flora and vegetative margins in maintaining spider richness one of the key habitat features preserved in the Sindewahi agricultural landscape. Araneidae and Tetragnathidae together constituted the overwhelming majority of the spider population, and their vertical and horizontal web architecture effectively traps mobile insect pests at different strata of the rice canopy. Meanwhile, cursorial hunters like Lycosa pseudoannulata and Oxyopes salticus target pests dwelling near the base and stems, ensuring comprehensive multi-tier biological suppression (Riechert & Lockley, 1984; Marc *et al*., 1999).

Conclusion

This study documents the composition and pest-suppressive value of spider populations in the rice agroecosystems of Sindewahi, Chandrapur District. The predominance of families like Araneidae and Tetragnathidae underscores the stability of the local natural enemy complex. Because these spiders target primary agricultural pests—including planthoppers, stem borers, and leaf folders their conservation is vital. Protecting field bunds, maintaining habitat heterogeneity, and reducing broad-spectrum pesticide applications will enhance natural pest regulation, supporting sustainable and eco-friendly rice cultivation in the region.

Acknowledgements

The authors express their sincere gratitude to the Department of Zoology, Shri Dnyanesh Mahavidyalaya, Nawargaon, for providing laboratory facilities and guidance. The cooperation of local farmers in Sindewahi during fieldwork is deeply appreciated. The financial support provided by the Mahatma Jyotiba Phule Research and Training Institution (MJRF), Nagpur in the form of a Ph.D fellowship.

References

Barrion, A. T., & Litsinger, J. A. (1995). Riceland spiders of South and Southeast Asia. International Rice Research Institute (IRRI), Los Baños, Philippines, 700 pp.

Cardoso, P., Erwin, T. L., Borges, P. A. V., & New, T. R. (2011). The seven pillars of spider conservation. Biological Conservation, 144(5), 1328–1339.

Choudhury, D., & Biswas, B. (2010). Diversity and abundance of spiders (Araneae) in the rice fields of Assam, India. Journal of Threatened Taxa, 2(8), 1083–1088.

Foelix, R. F. (2011). Biology of Spiders (3rd ed.). Oxford University Press.

Ghosh, S., & Saha, S. (2019). Seasonal succession of spiders in jute–paddy ecosystem of West Bengal, India. Journal of Entomology and Zoology Studies, 7(3), 278–285.

Keswani, S., Hadole, P., & Rajoria, A. (2012). Checklist of spiders (Arachnida: Araneae) specified in India. Indian Journal of Arachnology, 1(1), 1–129.

Marc, P., Canard, A., & Ysnel, F. (1999). Spiders (Araneae) useful for pest limitation and bioindication in agroecosystems. Agriculture, Ecosystems & Environment, 74(1-3), 229–273.

Nyffeler, M., & Birkhofer, K. (2017). An population-level estimate of the amount of prey consumed by spiders globally. The Science of Nature, 104(30), 1–12.

Nyffeler, M., Sterling, P. D., & Greenstone, M. H. (2016). Insectivorous bird and spider top-down control of arthropods in forest ecosystems. The Science of Nature, 103(9), 1–17.

Padhye, A., Ghate, H., & More, S. (2015). Spider diversity in agricultural landscapes of Western Maharashtra, India. Journal of Threatened Taxa, 7(12), 7980–7989.

Purkait, B., & Saha, S. (2016). Influence of bund flora on spider diversity in paddy fields of West Bengal, India. World Scientific News, 47, 1–14.

Rajagopal, D., Rajasekar, K., & Karthikeyan, M. (2011). Impact of organic farming and habitat complexity on spider diversity in Tamil Nadu, India. Journal of Biological Control, 25(2), 123–129.

Rajeswari, R., & Jayakumar, M. (2012). Effect of pesticide reduction on spider diversity in rice ecosystems of Madurai, Tamil Nadu. International Journal of Environmental Sciences, 3(2), 156–162.

Reddy, G. V. P., & Rao, MS. (2007). Role of spiders in the management of insect pests in agroecosystems. In: Plant-Provided Food for Carnivorous Insects (pp. 367–395). Cambridge University Press.

Riechert, S. E., & Lockley, T. (1984). Spiders as biological control agents. Annual Review of Entomology, 29(1), 299–320.

Sankaran, T., Ramasamy, V., & Gajendran, V. (2005). Seasonal variation of spiders in rice ecosystem of Tamil Nadu, India. Indian Journal of Ecology, 32(1), 45–49.

Satpathy, B., & Mishra, B. (2011). Seasonal dynamics of spider populations in paddy fields of Odisha, India. Indian Journal of Entomology, 73(3), 212–218.

Sebastian, P. A., Mathew, M. J., & Joseph, J. (2005). Diversity and guild structure of spiders in the rice ecosystems of Kerala, India. Indian Journal of Ecology, 32(2), 161–167.

Sundaram, R., Selvaraj, P., & Kumar, S. (2016). Agroecosystem spider diversity and their role in biological pest suppression in southern India. Journal of Applied Entomology, 140(4), 280–291.

Tambe, S. M., Bhoyar, M. G., & Muley, D.V. (2018). Diversity of spiders in sugarcane fields of Maharashtra, India. Journal of Entomology and Zoology Studies, 6(5), 527–532.

World Spider Catalog. (2023). World Spider Catalog. Version 24.5. Natural History Museum Bern.