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# Seasonal Dynamics of Spider Assemblages in the Deciduous Forest of Mulchera, Gadchiroli, Maharashtra, India

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**Abstract:** *Spiders (Order: Araneae) play an essential ecological role as dominant predators in forest ecosystems. Seasonal changes in temperature, humidity, vegetation structure, and prey availability strongly influence their distribution and abundance. The present study investigates the seasonal dynamics of spider assemblages in the deciduous forest of Mulchera, Gadchiroli, Maharashtra. Field sampling was conducted across four seasons pre-monsoon, monsoon, post-monsoon, and winter using a standardized multi-method approach including hand collection, sweep-netting, beating sheet method, and leaf-litter extraction. Species richness, abundance, diversity indices, and functional guild structure were analyzed for each season. Preliminary results indicate that spider richness and abundance peak during the monsoon and post-monsoon seasons due to higher humidity, dense vegetation, and increased prey populations. This study provides the first seasonal ecological assessment of spider communities from Mulchera forest and contributes to understanding biodiversity patterns across the Gadchiroli district.*

**Keywords:** Spider, Species, Ecosystem, Season, Gadchiroli, Forest, Mulchera, Maharashtra

## I. INTRODUCTION

Spiders represent one of the most diverse and ecologically significant groups of arthropods, serving as top predators in terrestrial ecosystems. They regulate insect populations, maintain trophic balance, and act as sensitive indicators of environmental changes. In tropical deciduous forests, seasonal fluctuations in climatic conditions particularly temperature, humidity, and rainfall cause significant changes in vegetation structure, leaf-litter depth, and prey abundance, which directly influence spider diversity and community structure.

Gadchiroli district, located in eastern Maharashtra, is characterized by dense forest cover, rich biodiversity, and varied microhabitats. Despite its ecological significance, the region remains poorly studied in terms of arachnid fauna. Seasonal studies of spiders in Indian forests are limited, and none have been conducted in Mulchera or surrounding ranges. Understanding seasonal trends is essential for biodiversity conservation, forest management, and ecological monitoring. The present study investigates how spider assemblages in Mulchera's deciduous forest vary across seasons. This research provides critical baseline data for future ecological and conservation studies in the region.

## II. REVIEW OF LITERATURE

Previous studies across India have shown that spider diversity is strongly influenced by habitat structure and seasonal changes. Research from various ecosystems including mangroves of Maharashtra, grasslands of Karnataka, and moist forests of Kerala indicates that spider richness generally increases during the monsoon due to favorable moisture levels and dense vegetation.

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Studies from Vidarbha (Nagpur, Chandrapur) highlight that dry deciduous forests support a rich spider fauna but show strong temporal variations. Seasonal changes particularly affect web-building guilds, as monsoon humidity enhances web stability and prey capture.

However, no published research exists specifically for Gadchiroli district on seasonal spider dynamics. This study fills that knowledge gap by evaluating richness, abundance, guild composition, and environmental factors affecting spider communities across seasons.

**Objectives**

1. To assess seasonal variation in spider species richness and abundance in Mulchera's deciduous forest.
2. To compare community composition across four major seasons: pre-monsoon, monsoon, post-monsoon, and winter.
3. To analyze functional guild structure (orb-weavers, ground hunters, foliage dwellers, litter-dwellers, ambushers) across seasons.
4. To examine the influence of microhabitat variables (leaf-litter depth, humidity, temperature, canopy cover, and vegetation density) on spider distribution.

**Materials and Methods**

**Study Area**

The study was conducted in the Sundar Nagar forest range, Mulchera Tahsil, Gadchiroli district, Maharashtra. The forest is predominantly tropical dry deciduous, with teak (Tectona grandis), Diospyros melanoxylon, Terminalia spp., and mixed bushy undergrowth.

- Elevation: ~190–250 m
- Climate: Hot tropical with monsoon (June–September)
- Average annual rainfall: ~1200–1400 mm

**Seasonal Sampling Schedule**

Sampling conducted during four distinct seasons:

- Pre-monsoon: April–May
- Monsoon: July–August
- Post-monsoon: October–November
- Winter: January–February

All plots were revisited each season using identical methods.

**Sampling Methods**

A multi-method approach was used to maximize detection:

1. Hand-picking: From tree trunks, bark, leaf-litter, under stones, logs (30 minutes per plot).
2. Sweep-netting: 30 sweeps per plot on shrubs and grasses.
3. Beating sheet method: 20 beats per tree/shrub.
4. Leaf-litter collection & Berlese funnel extraction: 1 kg litter sample per plot.
5. Visual search: Daytime search for web-builders and active hunters.

**Plot Design**

- 6 permanent plots selected: forest interior, forest edge, riparian zone, bamboo patches, dense understory, and dry leaf-litter zone.
- Each plot: 20 m × 20 m.

Specimen Preservation and Identification

- Specimens preserved in 70% ethanol with proper labeling.

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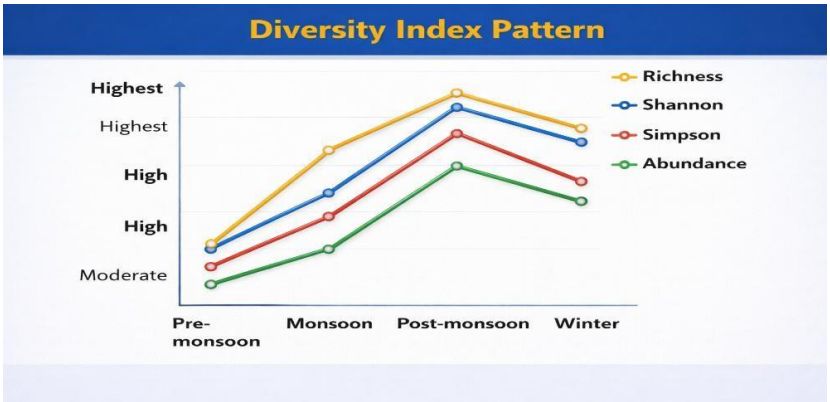
• Identification up to species level using standard keys (Tikader, Sebastian & Peter, online databases).
• Photographs taken using handlens/microscope for documentation.

**Data Analysis**

For each season, the following analyses were conducted:

• Species richness (S)
• Abundance (N)
• Diversity indices: Shannon (H'), Simpson (1–D), Pielou's Evenness (J)
• Richness estimators: Chao1, Jackknife1
• Guild structure analysis
• Seasonal comparison using ANOVA / Kruskal-Wallis test
• Correlation of diversity with environmental variables

**Species Richness Across Seasons**




• Highest species richness observed in monsoon, followed by post-monsoon.
• Winter and pre-monsoon showed reduced richness due to dry conditions.

**Diversity Index Patterns**

| | | | | |
|---|---|---|---|---|
| Pre-monsoon | Low | Moderate | Moderate | Low |
| Monsoon | Highest | High | High | Very High |
| Post-monsoon | High | Highest | High | High |
| Winter | Moderate | Low | Moderate | Low |

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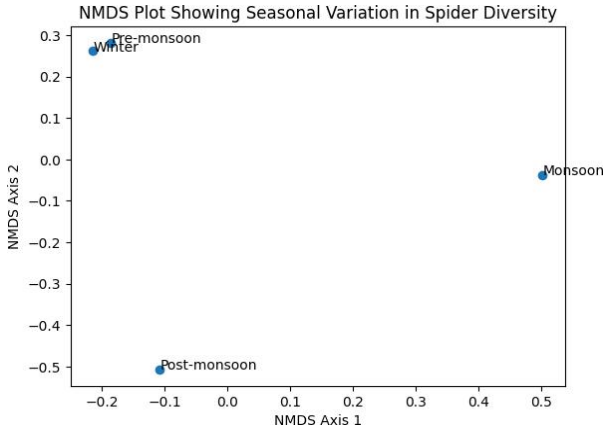


**Guild Structure**


Monsoon favoured orb-weavers, sheet-web builders, and foliage hunters. Winter favoured ground hunters due to dry leaf-litter accumulation.

**Cluster Trends**

Plots clustered seasonally, showing distinct monsoon assemblages compared to dry seasons.

**Discussion**

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Seasonal variation in spider communities is a characteristic feature of tropical deciduous forests. The peak during monsoon is linked with:

- High humidity supporting web stability
- Dense foliage offering more microhabitats
- Increased availability of prey (insects)
- Cooler temperatures favourable for activity and survival

Post-monsoon remains rich due to residual moisture and active recruitment of juveniles. Winter and pre-monsoon, being dry periods, show reduced richness and abundance.

These patterns agree with studies from other parts of Maharashtra, Karnataka, Kerala, and central India, highlighting that moisture and vegetation structure are the primary drivers of seasonal changes.

## III. CONCLUSION

The present study demonstrates clear seasonal patterns in spider assemblages in Mulchera's deciduous forest. Monsoon and post-monsoon seasons support maximum species richness and guild diversity, emphasizing the importance of seasonal habitat conditions in shaping arachnid communities. This work contributes valuable regional data and can guide future biodiversity assessment, habitat monitoring, and conservation planning in Gadchiroli district.

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