

# Empirical study on Spider Diversity in NBRI (National Botanical Research Institute), Lucknow, Uttar Pradesh, India

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**Abstract:- Spiders are eight legged arthropods belonging to phylum Arthropoda, order Araneae and class Arachnida. The present study was carried out to investigate the diversity of spiders in the National Botanical Research Institute, Lucknow, Uttar Pradesh, India. NBRI is a botanical garden, spanning 65 acres in size located on the co-ordinates 26.8563° N and 80.9499° E. The study was conducted from January to April 2023. During the study a total of 25 Spider species were identified belonging to 20 genera & 8 families. Out of this, majority of spiders belong to family Araneidae which has 9 species (36%) followed by Salticidae which has 5 species (20%). The total number of species recorded here makes up around 13% of all the spider families discovered in India.**

**Keywords:** Araneae, Spider Diversity, Eight Legged Arthropods, NBRI, India.

## I. INTRODUCTION

Spiders are among the most prevalent predators that fall under the phylum Arthropoda, class Arachnida, and order Araneae (Kumar *et al.* 2017). Spiders employ specialized and sensitive setae on their legs to pick up scent, noises, vibrations, and air currents because they lack antennae (Hardy, Maggie, 2016). Spiders, unlike insects, have an endoskeleton in addition to their exoskeleton (Foelix, 2011, 1996). Numerous spider species exhibit strong sexual dimorphism (Reiskind, 1965). Without spiders, the food chain would be significantly impacted and the environment would become unbalanced. Additionally, because people believe spiders to be harmful, research into them has long been neglected. Spiders play a crucial role in preserving the dynamics of interactions between ecological units in a micro level food web. Due to their ease of identification and the ability to assess the effects of anthropogenic disturbance on natural ecosystems, spiders could be employed as biological indicators to monitor the health of an ecosystem. (Pearce, *et al.* 2006).

When it comes to mainstream documentation, research, and conservation, spiders have been marginalised. Their vast diversity and abundance in practically all microhabitats, foraging tactics, and the benefit of simple collection make it

possible to monitor them in the atmosphere (Uniyal *et al.* 2011). Prey density, which often depends on seasonal variation and vegetation structure and may change throughout the year, regulates spider diversity and abundance. Prey density availability impacts the diversity of spiders. Pocock gave the first in-depth description of Indian spiders and catalogued 216 spider species under 17 families. There are 46408 species of spiders, which are the most numerous, diversified, and largest group of invertebrates. Of these, 1685 spider species, representing 438 genera and 60 families, have been found in India. (Keswani *et al.* 2012) Some naturalists like Pocock, Tikader, and (Gajbe *et al.* 1992) have studied the Indian Araneae in detail in certain geographic areas.

Spiders generally have a range within the specific humidity and temperature preferences areas according to their “physiological tolerances” which make them ideal candidates for land conservation studies (Riechert, S.E. and Gillespie, R.G. 1986). Therefore, documenting spider diversity patterns in this ecosystem can provide important information to justify the conservation and management of this ecosystem.

## II. STUDY AREA

NBRI Botanical Garden, also known as the CSIR-National Botanical Research Institute, is located in Lucknow. It is a botanic garden located at 26.8563° N and 80.9499° E in Lucknow, Uttar Pradesh, India. The garden was renamed "Government Horticultural Garden" and "National Botanic Garden" in the years that followed. Spanning 65 acres in size, the garden contains more than 6000 significant plant species and variations that were gathered from various locations in India and overseas. It is a historic garden that was built in the year 1789. The garden of National Botanical Research Institute (NBRI) has been preserved to provide for the long-term use of plants with educational, recreational, taxonomic, decorative, horticultural, biological, and ecological purposes. It contains more than 6000 significant plant species and variations that were gathered from various locations in India and overseas. Every day, more than a thousand people go for morning walks. Meditation and relaxation are made possible by the peaceful environment created by the enormous Banyan tree.



Map 1: Satellite map of National Botanical Research Institute (NBRI), Lucknow

### III. MATERIALS AND METHODS

The study was conducted from January to April 2023, covering 2 seasons viz, winter and summer, in morning and afternoon from 8 A.M. to 10 A.M. and 3 P.M. to 5 P.M. To study the diversity of spiders line transect method was followed. Ocular observation was made during the study, spiders were photographed in live condition using Canon EOS 1300D, identified and then released to their natural habitat. All specimens were identified using the taxonomic keys for Indian spiders given by B.K. Tikader 1987, Platnick 2011, Biswas and other reliable sources.

### IV. RESULT AND DISCUSSION

During this study a total of 25 Spider species were identified belonging to 20 genera & 8 families (Table 1) Out of this, majority of spiders belong to family Araneidae 9 species (36%) followed by Salticidae 5 species (20%), Oxyopidae 4 species (16%), Pholcidae 2 species (8%), Tetragnathidae 2 species (8%), Sparassidae 1 species (4%), Lycosidae 1 species (4%) and Dictynidae 1 species (4%). The maximum abundance of species was recorded from family Araneidae (9 species) with 36% of total spider’s species and minimum abundance of species recorded from family Sparassidae (1 species), Lycosidae (1 species), Dictynidae (1 species) with 4% of spider species.

**Table 1: Total number of families, species and functional guild of Spider from NBRI, Lucknow**

S.N.	Guild	Family	No. of Species	Common Name	Zoological Name
1.	Orb weavers	Araenidae (Simon, 1895)	9	Signature spider	1. <i>Argiope anasuja</i>
				Garden cross spider	2. <i>Argiope pulchella</i>
				Cross orb weaver	3. <i>Araneus diadematus</i>
				Garden tent web spider	4. <i>Cyrtophora cicutrosa</i>
				Garden orb weaver	5. <i>Eriophora transmarina</i>
				Spiny-backed orb weaver	6. <i>Gasteracantha cancriformis</i>
				Bordered orb weaver	7. <i>Neoscona adianta</i>
				Spotted orb weaver	8. <i>Neoscona crucifera</i>
				Giant golden orb weaver	9. <i>Nephila pilipes</i>

2.	Space web builders	Dictynidae (Pickard 1871)	1	Diving bell spider	10. <i>Argyroneta aquatica</i>
3.	Ground runners	Lycosidae (Sundevall, 1833)	1	Thin legged wolf spider	11. <i>Pardos aamentata</i>
4.	Stalkers	Oxyopidae (Thorell, 1870)	4	Burma lynx spider	12. <i>Oxyopes birmanicus</i>
				Striped lynx spider	13. <i>Oxyopes javanus</i>
				Green lynx spider	14. <i>Peucezia viridans</i>
				Lynx spider	15. <i>Hamadruas sikkimensis</i>
5	Space web builders	Pholcidae (C. L. Koch, 1851)	2	Tailed cellar spider	16. <i>Crossopriza lyoni</i>
				Long bodied cellar spider	17. <i>Pholcus phalangiodes</i>
6	Stalkers	Salticidae (Blackwall, 1841)	5	Pantropic jumping spider	18. <i>Plexippus paykulli</i>
				Common housefly catcher	19. <i>Plexippus petersi</i>
				Two striped jumper	20. <i>Telamoina dimidiata</i>
				Heavy bodied jumper	21. <i>Hyllus semicupreus</i>
				Gray wall jumper	22. <i>Menemerus bivittatus</i>
7	Foliage runners	Sparassidae (Bertkau, 1872)	1	Cane spider	23. <i>Heteropoda venatoria</i>
8	Orb weavers	Tetragnathidae (Menge, 1866)	2	Decorative silver orb weaver	24. <i>Leucauge decorate</i>
				Pear shaped opadometa	25. <i>Leucauge fastigata</i>
<b>Total</b>		<b>8</b>	<b>25</b>		<b>25</b>

Table 2. Showing % of Araneae Families recorded in NBRI, Lucknow

S.N.	Family	No. of species	% of Araneae
1.	Araenidae	9	36%
2.	Dictynidae	1	4%
3.	Lycosidae	1	4%
4.	Oxyopidae	4	16%
5.	Pholcidae	2	8%
6.	Salticidae	5	20%
7.	Sparassidae	1	4%
8.	Tetragnathidae	2	8%
<b>Total</b>	<b>8</b>	<b>25</b>	<b>100%</b>

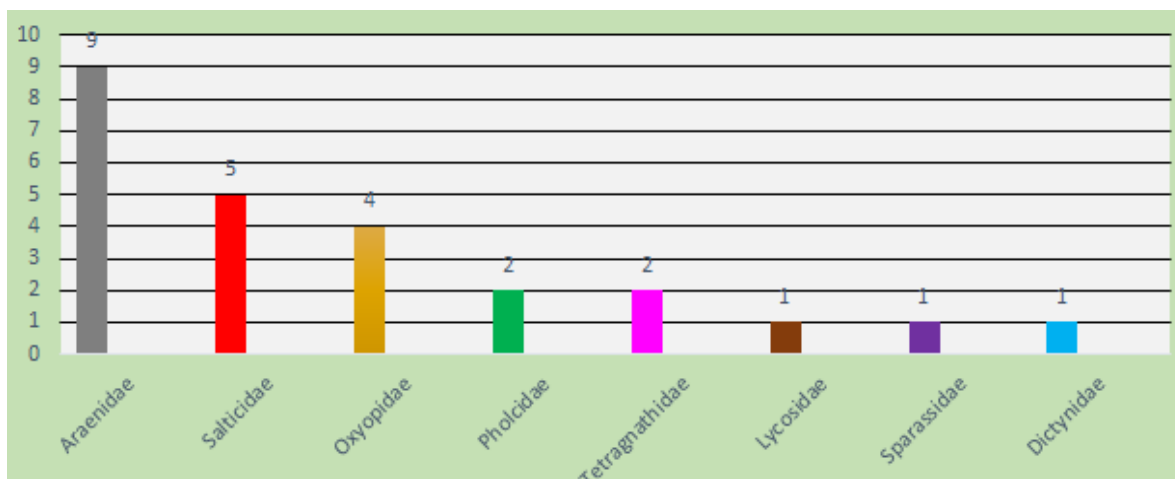
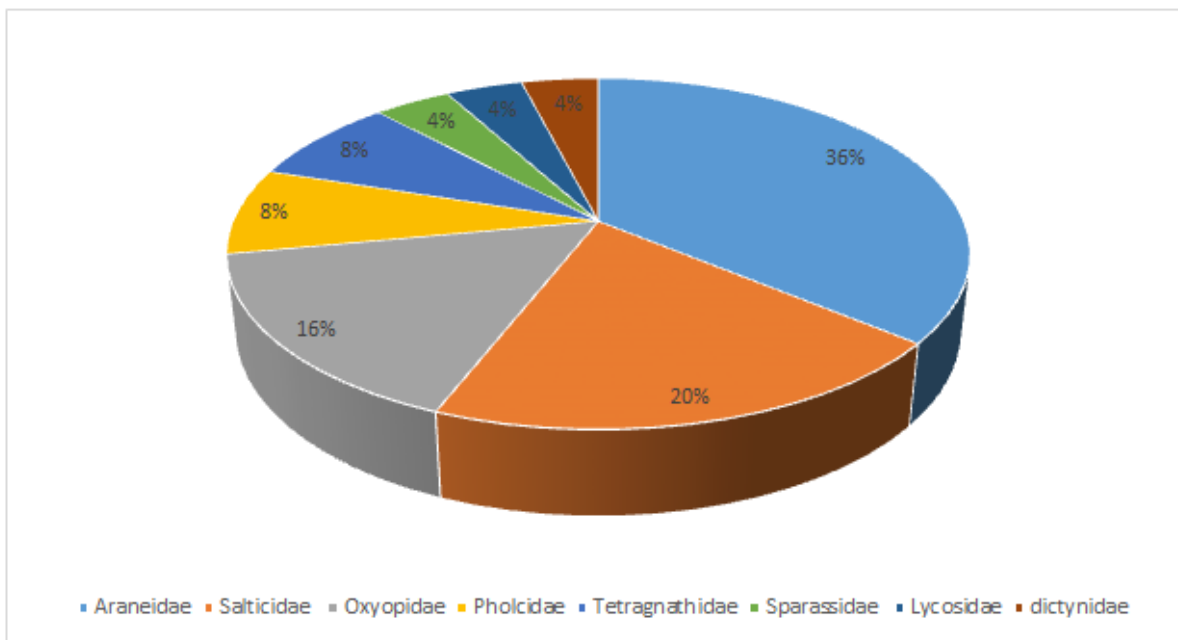
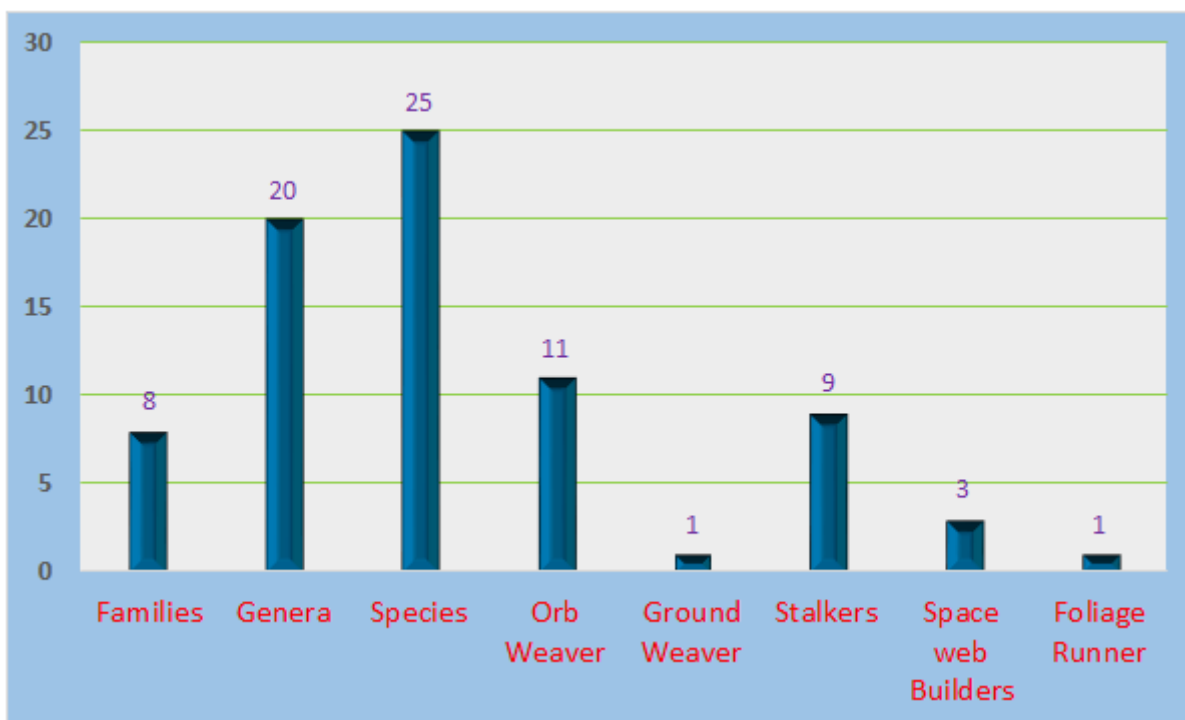


Fig 1: Bar graph showing number of species recorded under spider families in NBRI



**Fig 2: Pie chart showing family wise % composition of Spider species of NBRI**

The spiders of NBRI can be divided into 5 feeding guilds based on the foraging behaviour. They are the Orb weavers (11 species), Ground weavers (1 species), Stalkers (9 species), Space web builder (3 species), Foliage runner (1 species). The dominant guild was orb weaver with 11 species followed by stalkers with 9 species and the foliage runner was very scarce with 1 species.



**Fig 3: Bar graph showing overview of taxonomic status and feeding spider's species of NBRI, Lucknow**

There is no previous work in this area to compare the spider diversity. This indicates the need for further study in this area. Because of the intricate interaction of various climatic factors like rainfall, temperature, availability of water source nearby this area may hold many smaller but diverse environmental niches.

**V. CONCLUSION**

Studies on spiders in Uttar Pradesh are sparse and no checklist of spiders of this state has so far been prepared. Thus, this study provides baseline information about species diversity of one of the Research Institutes of U.P. The study will also be helpful to work for the conservation of the species and specify the hidden benefits in them. In this study

various threats to spiders were also identified which include habitat destruction, human encroachment for habitation, terrestrial and water pollution, excessive use of synthetic pesticides etc. Thus efforts can be laid to rear and conserve spiders and use them in various ways such as bio control agents, their webs and venom may be used for medical and research purposes. The study recommends for the conservation of habitat, pollution control, check on human activities for keeping the environment fit for natural growth of spiders including other flora and fauna. Organization of mass awareness programs for local people of the study area should be done to conserve the spider species.

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