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**Murali S**
Scientist - B, CSB, RSRS, Jammu - 181101, J & K, India

**Jalali SK**
Principal Scientist, NBAIR, Bengaluru - 560024, Karnataka, India

**Shylesha AN**
Principal Scientist, NBAIR, Bengaluru - 560024, Karnataka, India

**Shivalinga Swamy TM**
Principal Scientist, NBAIR, Bengaluru - 560024, Karnataka, India

**Gandhi Gracy R**
Scientist, NBAIR, Bengaluru - 560024, Karnataka, India

**Correspondence**
**Murali S**
Scientist - B, CSB, RSRS, Jammu - 181101, J & K, India

# Predatory spider fauna in Brinjal crop their abundance and composition

**Murali S, Jalali SK, Shylesha AN, Shivalinga Swamy TM and Gandhi Gracy R**

**Abstract**
The population of total predatory fauna of spiders occurring in brinjal crop at sprayed and unsprayed areas study has been conducted. The results revealed that, average number of spiders recorded was highest in unsprayed area, *i.e.*, Attur Farm, 3.20, while at Chikkaballapur and Doddaballapur the average spiders recorded were 1.79 and 2.01 per 10 plants, respectively during *Kharif* season. Similar, results were observed during *Rabi* and summer season also under both sprayed and unsprayed areas. The maximum relative abundance of *Peucetia viridana* was most frequently recorded which about 12 percent of the spider population was and next most abundant species was *Oxyopes birmanicus* (8.20%) in *Kharif* season, *Oxyopes rukuminiae* (8.33%) in *Rabi* season and *O. birmanicus* (9.01%) in summer season in unsprayed (Attur Farm) area. In sprayed areas, *viz.*, Chikkaballapur and Doddaballapur *P. viridana* and *O. birmanicus* were recorded as two most abundant species constituting 12.0 to 16.9 percent of the population, in addition during *Rabi* season; *O. assamensis* was also recorded as an important species.

**Keywords:** Brinjal, Sprayed areas, Unsprayed area, Spiders, Seasons, Relative abundance, Species composition

## 1. Introduction
Brinjal, *Solanum melongena* L., is one of the three most important vegetables in many South Asian countries like India, Bangladesh, Nepal and Sri Lanka accounting for almost 50 percent of the world`s area under cultivation [1]. In the brinjal field, various arthropod species both pests and natural enemies prevail from seedling to harvesting stage. Reports revealed that, 28 species of insect pests under seven different insect orders from the brinjal ecosystem [2] while 53 species of insect pests of brinjal has been reported [3].

Arthropods are important components of ecosystems occupying vital positions in food webs, dynamics of populations and communities. They play various roles in ecosystems acting as herbivores, predators, decomposers, parasitoids and pollinators [4]. Added advantage is that they can be sampled quickly and reliably using various survey methods [5]. Thus, arthropods are often used as biological indicators of ecosystem integrity [6] and could be used reliably to infer ecosystem function and habitat condition [7-]. Population ecologists discussed diversity of arthropods in two aspects, species richness (*i.e*. the number of species in a set of samples) and equitability e.g., the number of individuals of each species in a sample [9]. Although, several researchers published reports on pest of brinjal elsewhere however, information about total arthropods community in the brinjal agroecosystem is limited. So, our objective was to observe the arthropod biodiversity in the brinjal agroecosystem.

## 2. Material and Methods
The documentation of natural enemy diversity was carried out in two systems, one unsprayed for which crop was raised at research farm of NBAIR, Bengaluru, at their Yelahanka Campus, Attur Farm and another at sprayed situation at farmers field at Doddaballapur and Chikkaballapur. The crop was raised/ observed from June, 2013 to June, 2014, for one year. At NBAIR research farm, plot was prepared by ploughing and cross-ploughing followed by laddering. All the plots were prepared with proper proportions of manure and fertilizers. The plot size was prepared 8 × 8 m having 75 × 60 cm plant spacing as control plot. The variety which we have used for experimentation was MAHYCO-11 throughout the year. For comparison from control plot, farmer fields were selected at Doddaballapur and Chikkaballapur districts.

At farmers' field, the crop stage selected was 35 days after transplanting of the crop and plot size was 8 × 8 m was selected irrespective of the plant spacing and variety grown by the farmers. The counting of predatory diversity, individuals were counted by using absolute methods like visual searching method by recording on plants as well as collection of various stages of predators. After collection, specimens were identified with the help of specialists. The sampling was done once in 10 days in both unsprayed and sprayed fields, thus 36 observations were recorded in a year. The relative abundance of the dominant species of spiders was worked out by using the following formula after pooling all the data and expressed in percentage.

$$\text{Relative abundance of species A} = \frac{\text{Number of species}}{\text{Total number of species in the crop}} \times 100$$

## 3. Results

### 3.1 Diversity of Predatory spiders occurring in brinjal crop

The results of the present investigation revealed that totally 32 species of spiders were found to occur in the brinjal crop (Table 1), among them the family wise species composition was as follows: Araneidae (10 species), Oxyopidae (7 species), Salticidae (4 species), Tetragnathidae (2 species), Thomisidae (2 species), Sparassidae (1 species), Eutichuridae (1 species), Pisauridae (1 species), Theridiidae (1 species), Miturgidae (1 species), Eresidae (1 species), Lycosidae (1 species). Among the 32 species, only sixteen dominant species were considered for computing the species composition under unsprayed conditions, *i.e.,* Bengaluru (Attur Farm) (Table 2). The sixteen species which were relatively more abundant than the others were *Oxyopes birmanicus, Oxyopes shweta, Oxyopes javanus, Oxyopes assamensis, Oxyopes rukminiae, Peucetia viridana, Carrhotus viduus, Chalcotropis pennata, Thomisus projectus, Cheiracanthium melanostomum, Pardosa pseudoannulata, Argiope anasuja, Argiope pulchella, Cyclosa hexatuberculata, Araneus mitificus* and *Cheiracanthium danieli* and in sprayed conditions, *i.e.,* Chikkaballapur and Doddaballapur area, among the 32 species, only nine dominant species were considered for computing the species composition *viz., Oxyopes birmanicus, Oxyopes javanus, Oxyopes assamensis, Peucetia viridana, Carrhotus viduus, Thomisus projectus, Cheiracanthium melanostomum, Argiope pulchella* and *Araneus mitificus* (Table 3 & 4). By observing the faunal composition of spiders highest number of species was recorded under unsprayed condition compared to the sprayed conditions.

### 3.2 Relative abundance of different predatory spiders fauna in brinjal crop

At Bengaluru (Attur Farm) during *Kharif* season, number of spiders recorded species-wise were *Peucetia viridana* (6.92 spiders/10 plants), followed by *Oxyopes birmanicus* (4.58 spiders/10 plants), *Oxyopes javanus, Oxyopes assamensis* (4.17 spiders/10 plants), *Carrhotus viduus* (3.50 spiders/10 plants), *Thomisus projectus* (3.42 spiders/10 plants) and minimum number of spiders recorded was in case of *Cheiracanthium danieli* and other species of spiders (2.00 spiders/10 plants) (Table 5). Among the various spider species recorded, the maximum relative abundance was in case of as *Peucetia viridana* (12.37%), followed by *Oxyopes birmanicus* (8.20%), *Oxyopes javanus, Oxyopes assamensis* (7.45%), *Carrhotus viduus* (6.26%), *Thomisus projectus* (6.11%) and lowest species composition was observed in case of *Cheiracanthium danieli*, while for other spider species, the composition recorded was 3.58 percent (Table 5).

Similarly, during *Rabi* season, *Peucetia viridana* was the most abundant species recorded (2.83 spiders/10 plants), which constituted 12.32 percent of the species, other important species based on their abundance were *Oxyopes rukminiae* (1.92 spiders/10 plants), *Oxyopes birmanicus, Oxyopes assamensis* (1.50 spiders/10 plants), *Argiope anasuja* (1.42 spiders/10 plants) and least number recorded was for *Argiope pulchella* (0.75 spiders/10 plants) (Table 5). The species composition was as follows: *Oxyopes rukminiae* (8.33%), *Oxyopes birmanicus, Oxyopes assamensis* (6.52%), *Argiope anasuja* (6.16%) and *Argiope pulchella* (3.26%) in that decreasing order (Table 5).

Maximum number of spider species were recorded during the summer season *Peucetia viridana* which was the most abundant species, with a mean population of 4.50 spiders/10 plants, followed by *Oxyopes assamensis* (3.75 spiders/10 plants), *Oxyopes birmanicus* (3.25 spiders/10 plants), *Oxyopes javanus* (2.83 spiders/10 plants), *Oxyopes shweta* (2.58 spiders/10 plants), *Oxyopes rukminiae* (2.25 spiders/10 plants), *Carrhotus viduus* (2.17 spiders/10 plants) and *Argiope pulchella* (1.08 spiders/10 plants) in that decreasing order (Table 5). Among the spider species maximum relative abundance was recorded in case of *Peucetia viridana* (12.47%), followed by *Oxyopes assamensis* (10.39%), *Oxyopes birmanicus* (9.01%), *Oxyopes javanus* (7.85%), *Oxyopes shweta* (7.16%), *Oxyopes rukminiae* (6.24%), *Carrhotus viduus* (6.00%) and the lowest species composition was recorded in case of *Argiope pulchella* (3.0%) (Table 5).

At Chikkaballapur during *Kharif* season**,** maximum number of spider species recorded were *Peucetia viridana* and *Oxyopes birmanicus* (2.25 spiders/10 plants), followed by *Thomisus projectus* (1.92 spiders/10 plants), *Oxyopes javanus, Oxyopes assamensis, Carrhotus viduus* (1.83 spiders/10 plants) and minimum spider number was recorded in case of *Argiope pulchella* and other species (1.42 spiders/10 plants) (Table 6). Among the different spider species, maximum relative abundance was recorded in case of *Peucetia viridana* and *Oxyopes birmanicus* (12.56%), followed by *Thomisus projectus* (10.70%), *Oxyopes javanus, Oxyopes assamensis, Carrhotus viduus* (10.23%), *Argiope pulchella* and other spiders (7.91%) in that decreasing order (Table 6).

Similarly during *Rabi* season, maximum number of spider species were recorded in case of *Oxyopes assamensis* (2.00 spiders/10 plants), *Oxyopes birmanicus* (1.92 spiders/10 plants), *Peucetia viridana* (1.83 spiders/10 plants), *Oxyopes javanus, Carrhotus viduus* (1.67 spiders/10 plants)and *Argiope pulchella* followed by other spider species(1.00 spiders/10 plants) each in decreasing order (Table 6). Among the spiders species maximum relative abundance was recorded in case of *Oxyopes assamensis* (13.11%), *Oxyopes birmanicus* (12.57%), *Peucetia viridana* (12.02%), *Oxyopes javanus, Carrhotus viduus* (10.93%) while *Argiope pulchella* and other spiders had the lowest species composition (6.56%) (Table 6).

During summer season of 2013-14, maximum number of spider species recorded were *Peucetia viridana, Oxyopes birmanicus* (1.92 spiders/10 plants), other species recorded in significant numbers were *Oxyopes javanus* and *Carrhotus viduus* (1.67 spiders/10 plants) and least number was recorded in the species *Argiope pulchella* (1.25 spiders/10 plants) (Table 6). Among the spiders species maximum relative

abundance was recorded in case of *Peucetia viridana* and *Oxyopes birmanicus* (12.30%), while *Oxyopes javanus* and *Carrhotus viduus* constituted 10.70 percent each and *Argiope pulchella*, constituted 8.02 percent which was the least (Table 6). At Doddaballapur during *Kharif* season, maximum number of spider species recorded was in case of *Oxyopes birmanicus* (2.58 spiders/10 plants) while the other important species were *Peucetia viridana* (2.25 spiders/10 plants), *Oxyopes javanus, Cheiracanthium melanostomum,* other species of spiders (2.08 spiders/10 plants), however, *Araneus mitificus* was the least recorded species (1.42 spiders/10 plants) (Table 7). *Oxyopes birmanicus* constituted 12.86 percent of the total species composition, while *Peucetia viridana* constituted (11.20%), *Oxyopes javanus* and *Cheiracanthium melanostomum* constituted 10.37 percent each and *Araneus mitificus* constituted 7.05 percent, which was least among all the species recorded during the season (Table 7).

Similarly, during *Rabi* season, maximum number of spider species recorded were *Oxyopes birmanicus* and *Oxyopes assamensis* (2.00 spiders/10 plants), followed by *Peucetia viridana* (1.50 spiders/10 plants), *Oxyopes javanus* (1.25 spiders/10 plants) (Table 7). The highest relative abundance was recorded for *Oxyopes birmanicus* and *Oxyopes assamensis* (16.90%), followed by *Peucetia viridana* (12.68%) and *Oxyopes javanus* (10.56%) (Table 7).

Maximum number of spider species recorded during summer season were *Peucetia viridana* (2.17 spiders/10 plants), this was followed by *Oxyopes javanus* (1.92 spiders/10 plants), *Oxyopes birmanicus* (1.83 spiders/10 plants), *Oxyopes assamensis, Argiope pulchella,* other spiders (1.75 spiders/10 plants and *Araneus mitificus* which was the least recorded species, with its mean population being (1.33 spiders/10 plants) (Table 7). Among the spider species maximum relative abundance was recorded in case of *Peucetia viridana* (12.75%), followed by *Oxyopes javanus* (11.27%), *Oxyopes birmanicus* (10.78%), *Oxyopes assamensis, Argiope pulchella,* other species of spiders (10.29%) and the lowest species composition was recorded in case of *Araneus mitificus* (7.84%) (Table 7).

**Table 1:** Predatory spider fauna recorded during the investigation at both unsprayed and sprayed areas during 2013-14

| Sl. No. | Species | Family |
|---|---|---|
| 1 | *Oxyopes assamensis* Tikader, 1969 | Oxyopidae Thorell, 1870 (Lynx spiders) |
| 2 | *Oxyopesbirmanicus* Thorell, 1887 | |
| 3 | *Oxyopes javanus* Thorell, 1887 | |
| 4 | *Oxyopes lineatipes* CL Koch, 1847 | |
| 5 | *Oxyopes rukminiae* Gajbe 1999 | |
| 6 | *Oxyopes shweta* Tikader, 1970 | |
| 7 | *Peucetia viridana* Stoliczka, 1869 | |
| 8 | *Olios* sp. | Sparassidae Bertkau, 1872 (Giant crab spiders) |
| 9 | *Carrhotus viduus* C. L. Koch, 1846 | Salticidae Blackwall, 1841 (Jumping spiders) |
| 10 | *Chalcotropis pennata* Simon, 1902 | |
| 11 | *Evarcha* sp. | |
| 12 | *Hasarius adansoni* Audouin, 1826 | |
| 13 | *Araneus mitificus* Simon, 1886 | Araneidae Simon, 1895 |
| 14 | *Araneus* sp. | |
| 15 | *Argiope anasuja* Thorell,1887 | |
| 16 | *Argiope pulchella* Thorell,1881 | |
| 17 | *Cyclosa hexatuberculata* Tikader,1982 | |
| 18 | *Cyrtophora citricola* Forsskål, 1775 | |
| 19 | *Eriowixia* sp. | |
| 20 | *Neoscona achine* Simon, 1906 | |
| 21 | *Neoscona mukerjei* Tikader, 1980 | |
| 22 | *Neoscona* sp. | |
| 23 | *Striglopus* sp. | Thomisidae Sundevall, 1833 |
| 24 | *Thomisus projectus* Tikader, 1960 | |
| 25 | *Cheiracanthium melanostomum* Thorell, 1895 | Eutichuridae Lehtinen, 1967 |
| 26 | *Perenethis* sp. | Pisauridae Simon, 1890 |
| 27 | *Chrysso* sp. | Theridiidae Sundevall, 1833 |
| 28 | *Cheiracanthium danieli* Tikader, 1975 | Miturgidae Simon, 1885 |
| 29 | *Stegodyphus* sp. | Eresidae CL Koch, 1851 |
| 30 | *Pardosa pseudoannulata* Bösenberg & Strand, 1906 | Lycosidae Sundevall, 1833 |
| 31 | *Leucauge decorata* Blackwall,1864 | Tetragnathidae Menge, 1866 |
| 32 | *Tetragnatha* sp. | |

**Table 2:** Predatory spider fauna recorded during the investigation and their status at unsprayed - Attur Farm area

| Sl. No. | Family | Species | Status of spiders |
|---|---|---|---|
| 1 | Oxyopidae (Thorell, 1870) (Lynx spiders) (6) | *Oxyopes birmanicus* (Thorell, 1887) | Major |
| 2 | | *Oxyopes shweta* (Tikader, 1970) | Major |
| 3 | | *Oxyopes javanus* (Thorell, 1887) | Major |
| 4 | | *Oxyopes assamensis* (Tikader, 1969) | Major |
| 5 | | *Oxyopes rukminiae* (Gajbe, 1999) | Major |
| 6 | | *Peucetia viridana* (Stoliczka, 1869) | Major |
| 7 | Salticidae (Blackwall,1841) (Jumping spiders) (3) | *Carrhotus viduus* (C. L. Koch, 1846) | Major |
| 8 | | *Hasarius adansoni* (Audouin, 1826) | Minor |
| 9 | | *Chalcotropis pennata* (Simon, 1902) | Major |
| 10 | Pisauridae(Simon, 1890) (1) | *Perenethis* sp. | Minor |
| 11 | Sparassidae (Bertkau, 1872) (1) | *Olios* sp. | Minor |
| 12 | Thomisidae (Sundevall, 1833) (2) | *Thomisus projectus* (Tikader, 1960) | Major |
| 13 | | *Striglopus* sp. | Minor |
| 14 | Eutichuridae (Lehtinen, 1967) (1) | *Cheiracanthium melanostomum* (Thorell, 1895) | Major |
| 15 | Lycosidae (Sundevall, 1833) (1) | *Pardosa pseudoannulata* (Bösenberg & Strand, 1906) | Major |
| 16 | Araneidae (Simon, 1895) (10) | *Argiope anasuja* (Thorell, 1887) | Major |
| 17 | | *Argiope pulchella* (Thorell, 1881) | Major |
| 18 | | *Cyclosa hexatuberculata* (Tikader, 1982) | Major |
| 19 | | *Neoscona mukerjei* (Tikader, 1980) | Minor |
| 20 | | *Araneus* sp. | Minor |
| 21 | | *Neoscona achine* (Simon, 1906) | Minor |
| 22 | | *Cyrtophora citricola* (Forsskål, 1775) | Minor |
| 23 | | *Araneus mitificus* (Simon, 1886) | Major |
| 24 | | *Neoscona* sp. | Minor |
| 25 | | *Eriowixia* sp. | Minor |
| 26 | Miturgidae (Simon, 1885) (1) | *Cheiracanthium danieli* (Tikader, 1975) | Major |
| 27 | Eresidae (Koch, 1851) (1) | *Stegodyphus* sp. | Minor |
| 28 | Theridiidae (Sundevall, 1833) (1) | *Chrysso* sp. | Minor |
| 29 | Tetragnathidae (Menge, 1866) (2) | *Leucauge decorata* (Blackwall, 1864) | Minor |
| 30 | | *Tetragnatha* sp. | Minor |

**Note:** Major= > 1.00 spider per plant per observation
Minor= < 1.00 spider per plant per observation

**Table 3:** Predatory spider fauna recorded during the investigation and their status at sprayed - Chikkaballapur area

| Sl. No. | Family | Species | Status of spiders |
|---|---|---|---|
| 1 | Oxyopidae (Thorell, 1870) (Lynx spiders) (4)* | *Oxyopes birmanicus* (Thorell, 1887) | Major |
| 2 | | *Oxyopes javanus* (Thorell, 1887) | Major |
| 3 | | *Oxyopes assamensis* (Tikader, 1969) | Major |
| 4 | | *Peucetia viridana* (Stoliczka, 1869) | Major |
| 5 | Salticidae (Blackwall,1841) (Jumping spiders) (2)* | *Carrhotus viduus* (C. L. Koch, 1846) | Major |
| 6 | | *Hasarius adansoni* (Audouin, 1826) | Minor |
| 7 | Thomisidae (Sundevall, 1833) (1)* | *Thomisus projectus* (Tikader, 1960) | Major |
| 8 | Eutichuridae (Lehtinen, 1967) (1)* | *Cheiracanthium melanostomum* (Thorell, 1895) | Major |
| 9 | Araneidae (Simon, 1895) (4)* | *Argiope pulchella* (Thorell, 1881) | Major |
| 10 | | *Araneus mitificus* (Simon, 1886) | Major |
| 11 | | *Neoscona mukerjei* (Tikader, 1980) | Minor |
| 12 | | *Araneus* sp. | Minor |
| 13 | Tetragnathidae (Menge, 1866) (1)* | *Leucauge decorata* (Blackwall, 1864) | Minor |

**Note:** Major= > 1.00 spider per plant per observation
Minor= < 1.00 spider per plant per observation
*Values in parentheses are total number of species in that group

**Table 4:** Predatory spider fauna recorded during the investigation and their status at sprayed - Doddaballapur area

| Sl. No. | Family | Species | Status of spiders |
|---|---|---|---|
| 1 | Oxyopidae (Thorell, 1870) (Lynx spiders) (4)* | *Oxyopes birmanicus* (Thorell, 1887) | Major |
| 2 | | *Oxyopes javanus* (Thorell, 1887) | Major |
| 3 | | *Oxyopes assamensis* (Tikader, 1969) | Major |
| 4 | | *Peucetia viridana* (Stoliczka, 1869) | Major |
| 5 | Salticidae (Blackwall,1841) (Jumping spiders) (3)* | *Carrhotus viduus* (C. L. Koch, 1846) | Major |
| 6 | | *Hasarius adansoni* (Audouin, 1826) | Minor |
| 7 | | *Evarcha* sp. | Minor |
| 8 | Thomisidae (Sundevall, 1833) (1)* | *Thomisus projectus* (Tikader, 1960) | Major |
| 9 | Eutichuridae (Lehtinen, 1967) (1)* | *Cheiracanthium melanostomum* (Thorell, 1895) | Major |
| 10 | Araneidae (Simon, 1895) (4)* | *Argiope pulchella* (Thorell, 1881) | Major |
| 11 | | *Araneus mitificus* (Simon, 1886) | Major |
| 12 | | *Neoscona mukerjei* (Tikader, 1980) | Minor |
| 13 | | *Araneus* sp. | Minor |
| 14 | Tetragnathidae (Menge, 1866) (1)* | *Leucauge decorata* (Blackwall, 1864) | Minor |
| 15 | Pisauridae (Simon, 1890) (1)* | *Perenethis* sp. | Minor |

**Note:** Major= > 1.00 spider per plant per observation
Minor= < 1.00 spider per plant per observation
*Values in parentheses are total number of species in that group

**Table 5:** Relative abundance of different predatory spiders in unsprayed area of brinjal crop at Attur Farm

| Spider species | *Kharif* | | | *Rabi* | | | Summer | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Mean± SD | % species composition | Total | Mean± SD | % species composition | Total | Mean± SD | % species composition |
| *Araneus mitificus* | 39.00 | 3.25±1.48 | 5.81 | 14.00 | 1.17±0.72 | 5.07 | 14.00 | 1.17±0.83 | 3.23 |
| *Argiope anasuja* | 28.00 | 2.33±0.78 | 4.17 | 17.00 | 1.42±0.79 | 6.16 | 18.00 | 1.50±0.52 | 4.16 |
| *Argiope pulchella* | 37.00 | 3.08±1.31 | 5.51 | 9.00 | 0.75±0.87 | 3.26 | 13.00 | 1.08±0.67 | 3.00 |
| *Carrhotus viduus* | 42.00 | 3.50±0.90 | 6.26 | 15.00 | 1.25±0.45 | 5.43 | 26.00 | 2.17±1.64 | 6.00 |
| *Chalcotropis pennata* | 31.00 | 2.58±1.24 | 4.62 | 13.00 | 1.08±0.79 | 4.71 | 15.00 | 1.25±0.75 | 3.46 |
| *Cheiracanthium danieli* | 24.00 | 2.00±0.95 | 3.58 | 11.00 | 0.92±1.00 | 3.99 | 15.00 | 1.25±0.62 | 3.46 |
| *Cheiracanthium melanostomum* | 39.00 | 3.25±0.97 | 5.81 | 12.00 | 1.00±0.60 | 4.35 | 20.00 | 1.67±1.15 | 4.62 |
| *Cyclosa hexatuberculata* | 31.00 | 2.58±1.08 | 4.62 | 13.00 | 1.08±0.51 | 4.71 | 22.00 | 1.83±1.34 | 5.08 |
| *Oxyopes assamensis* | 50.00 | 4.17±1.03 | 7.45 | 18.00 | 1.50±0.67 | 6.52 | 45.00 | 3.75±1.22 | 10.39 |
| *Oxyopes birmanicus* | 55.00 | 4.58±1.62 | 8.20 | 18.00 | 1.50±0.80 | 6.52 | 39.00 | 3.25±1.22 | 9.01 |
| *Oxyopes javanus* | 50.00 | 4.17±1.27 | 7.45 | 13.00 | 1.08±0.79 | 4.71 | 34.00 | 2.83±0.72 | 7.85 |
| *Oxyopes rukminiae* | 30.00 | 2.50±0.90 | 4.47 | 23.00 | 1.92±0.67 | 8.33 | 27.00 | 2.25±0.87 | 6.24 |
| *Oxyopes shweta* | 39.00 | 3.25±1.48 | 5.81 | 16.00 | 1.33±1.15 | 5.80 | 31.00 | 2.58±1.31 | 7.16 |
| *Pardosa pseudoannulata* | 28.00 | 2.33±0.89 | 4.17 | 12.00 | 1.00±0.85 | 4.35 | 22.00 | 1.83±0.94 | 5.08 |
| *Peucetia viridana* | 83.00 | 6.92±1.56 | 12.37 | 34.00 | 2.83±1.27 | 12.32 | 54.00 | 4.50±2.71 | 12.47 |
| *Thomisus projectus* | 41.00 | 3.42±1.24 | 6.11 | 14.00 | 1.17±0.83 | 5.07 | 22.00 | 1.83±0.83 | 5.08 |
| Others | 24.00 | 2.00±0.95 | 3.58 | 24.00 | 2.00±0.95 | 8.70 | 16.00 | 1.33±0.89 | 3.70 |
| Total | 671.00 | 55.92±4.50 | 100.00 | 276.00 | 23.00±4.22 | 100.00 | 433.00 | 36.08±4.34 | 100.00 |

**Table 6:** Relative abundance of different predatory spiders in sprayed area of brinjal crop at Chikkaballapur

| Spider species | *Kharif* | | | *Rabi* | | | Summer | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Mean± SD | % species composition | Total | Mean± SD | % species composition | Total | Mean± SD | % species composition |
| *Araneus mitificus* | 19.00 | 1.58±1.08 | 8.84 | 16.00 | 1.33±0.78 | 8.74 | 16.00 | 1.33±0.49 | 8.56 |
| *Argiope pulchella* | 17.00 | 1.42±0.90 | 7.91 | 12.00 | 1.00±0.43 | 6.56 | 15.00 | 1.25±0.45 | 8.02 |
| *Carrhotus viduus* | 22.00 | 1.83±0.94 | 10.23 | 20.00 | 1.67±1.07 | 10.93 | 20.00 | 1.67±0.49 | 10.70 |
| *Cheiracanthium melanostomum* | 19.00 | 1.58±1.16 | 8.84 | 16.00 | 1.33±0.78 | 8.74 | 17.00 | 1.42±0.67 | 9.09 |
| *Oxyopes assamensis* | 22.00 | 1.83±1.27 | 10.23 | 24.00 | 2.00±0.60 | 13.11 | 18.00 | 1.50±1.17 | 9.63 |
| *Oxyopes birmanicus* | 27.00 | 2.25±0.97 | 12.56 | 23.00 | 1.92±0.29 | 12.57 | 23.00 | 1.92±1.08 | 12.30 |
| *Oxyopes javanus* | 22.00 | 1.83±1.47 | 10.23 | 20.00 | 1.67±1.07 | 10.93 | 20.00 | 1.67±0.89 | 10.70 |
| *Peucetia viridana* | 27.00 | 2.25±1.54 | 12.56 | 22.00 | 1.83±1.11 | 12.02 | 23.00 | 1.92±0.79 | 12.30 |
| *Thomisus projectus* | 23.00 | 1.92±1.16 | 10.70 | 18.00 | 1.50±1.24 | 9.84 | 18.00 | 1.50±1.00 | 9.63 |
| Others | 17.00 | 1.42±0.79 | 7.91 | 12.00 | 1.00±0.43 | 6.56 | 17.00 | 1.42±0.67 | 9.09 |
| Total | 215.00 | 17.92±7.75 | 100.00 | 183.00 | 15.25±2.63 | 100.00 | 187.00 | 15.58±3.55 | 100.00 |

**Table 7:** Relative abundance of different predatory spiders in sprayed area of brinjal crop at Doddaballapur

| Spider species | *Kharif* | | | *Rabi* | | | Summer | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Mean± SD | % species composition | Total | Mean± SD | % species composition | Total | Mean± SD | % species composition |
| *Araneus mitificus* | 17.00 | 1.42±0.67 | 7.05 | 12.00 | 1.00±0.85 | 8.45 | 16.00 | 1.33±0.49 | 7.84 |
| *Argiope pulchella* | 21.00 | 1.75±1.14 | 8.71 | 12.00 | 1.00±0.74 | 8.45 | 21.00 | 1.75±1.22 | 10.29 |
| *Carrhotus viduus* | 23.00 | 1.92±0.51 | 9.54 | 12.00 | 1.00±0.43 | 8.45 | 20.00 | 1.67±0.49 | 9.80 |
| *Cheiracanthium melanostomum* | 25.00 | 2.08±1.31 | 10.37 | 10.00 | 0.83±0.58 | 7.04 | 16.00 | 1.33±0.49 | 7.84 |
| *Oxyopes assamensis* | 24.00 | 2.00±0.74 | 9.96 | 24.00 | 2.00±0.43 | 16.90 | 21.00 | 1.75±1.14 | 10.29 |
| *Oxyopes birmanicus* | 31.00 | 2.58±1.62 | 12.86 | 24.00 | 2.00±0.60 | 16.90 | 22.00 | 1.83±1.03 | 10.78 |
| *Oxyopes javanus* | 25.00 | 2.08±0.79 | 10.37 | 15.00 | 1.25±0.62 | 10.56 | 23.00 | 1.92±0.79 | 11.27 |
| *Peucetia viridana* | 27.00 | 2.25±1.06 | 11.20 | 18.00 | 1.50±1.24 | 12.68 | 26.00 | 2.17±1.47 | 12.75 |
| *Thomisus projectus* | 23.00 | 1.92±1.31 | 9.54 | 8.00 | 0.67±0.65 | 5.63 | 18.00 | 1.50±0.80 | 8.82 |
| Others | 25.00 | 2.08±1.62 | 10.37 | 7.00 | 0.58±0.67 | 4.93 | 21.00 | 1.75±1.22 | 10.29 |
| Total | 241.00 | 20.08±3.90 | 100.00 | 142.00 | 11.83±2.04 | 100.00 | 204.00 | 17.00±5.53 | 100.00 |

## 4. Discussion

The results of the plant dwelling predaceous and other insects in the present study suggest that ants, spiders and coleopterans are the most important predators on brinjal crop. The present findings closely agree with the findings, who observed 28 species of insect pests under seven different insect orders and coleopteran and ants as major predaceous insects [2], while 53 species of insect pests of brinjal were reported [3]. Assessment of parasitoid community is one of the key steps of understanding pest dynamics. Successful biological control program requires detailed studies on biology and behaviour of the host and their natural enemies, interaction among hosts, natural enemies and environment. Although, several researchers published reports on pest of brinjal elsewhere however, information about total arthropods community in the brinjal agro-ecosystem is limited. So, our objective was to observe the arthropod biodiversity in the brinjal agro-ecosystem both under unsprayed and sprayed conditions.

It is well documented that spiders serve as buffer that limit the exponential growth of pest populations in different crops because of their predatory potential [10-13]. In a study on the differential species composition under unsprayed and sprayed is in variance to the findings wherein the population of spiders did not show significant difference between areas, while the mean value of spider populations in Nangoor (pesticide free) was higher than Moongilthottam (frequently pesticide used area) and on number of spider species [14, 15]. Assemblage of spiders is more effective at reducing prey densities than single species of spider [16, 17]. This indicates that use of insecticides decreases the density of spiders, which is in accordance with the present work. This result was confirms the earlier report [18, 15]. Observations stated that web weaving spiders may be transported by the wind to the surrounding area during spraying of insecticides [19], while also stated population of spiders was reduced in sprayed fields [20].

## 5. Conclusions

The present study clearly shows that spider's diversity was favorably supported by brinjal crop. Brinjal may be planted as border crop or intercrop in agricultural crop cultivation. Results revealed that maximum number of spiders was observed in unsprayed areas compared to sprayed areas. This may be useful to conserve predatory ladybird beetles in agroecosystem, which may lead to natural biological control and reduction of the use of chemical pesticides.

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