ECOLOGICAL GUILD STRUCTURE FOR SPIDERS OF SEMI-ARID HABITAT

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ABSTRACT
A total of 1868 spiders belonging to 14 families, 36 genera and 52 species were recorded in the semi-arid habitat of Agra region. The guild structure was developed according to the habitat and behavior of each spider species. Two major category of community guild was developed. The maximum percentage of spiders found in the guild were: wandering spiders (32%) followed by the web builders (27%). Under the wandering spiders guild, the maximum number was observed from the group jumper and hunter (598 spiders) while in the web builders the most abundant were orb weavers (520 spiders) and the ground dwellers (391 spiders). A least number of funnel web builders were also recorded. A list on the basis of the different habitats of spiders was maintained in which the predominant spider families Araneidae, Salticidae, and Pholcidae were found on the plant Acacia arabica. The guild concept for semi-arid habitat is unknown; therefore, data generated can be used as a baseline information for northern Indian region.

Keywords: Guild structure, Semi-arid habitat, Agra, spiders.

INTRODUCTION
The guild structure concept was developed to study different ecological groups. The principle behind this structure is that species within the guilds are most likely competitors; therefore, guilds are suggested to form basis of community organization (Simberloff and Dayan, 1991). Community guilds are true guilds than the individual ones because the number of individuals can be observed under this category. Study on guild structure represents the functional diversity and also gives an idea about how ecosystem works and adapt to the changes (Petchey and Gaston 2006).

Agra region falls under semi-arid habitat (26°44'N 27°55'S and 77°26W78°32 E) in the southwest of the State of Uttar Pradesh and forms a part of upper Gangetic plains of North India. The climate is markedly periodic due to marked diurnal differences in temperature, high saturation deficit and moderately low rainfall. Mean annual temperature is about 23°C and annual precipitation is 760.4 mm (Singh and Islam, 2010). The ecology of semi-arid habitat in regard to the diversity and abundance of spiders is under survey (Anjali and Prakash, 2014a, b).

A total of 46,909 species and 4071 genera of spiders are known to the world (World Spider Catalog, 2017), of which 1687 species belonging to 438 genera and 60 families are reported from India (Keswani et al., 2012).

In this paper, we established the guild composition and community guild structure pattern for spiders from the northern Indian region specially focusing on semi-arid habitat.

MATERIAL AND METHODS
Spider Identification: Sampling was done by applying six different collection methods (hand collection, visual searching, beating limb, pit fall, sweeping net and transect method) on different sampling sites (Figure 1) (Anjali and Prakash, 2012, 2015). Identification was done by following different keys available on web and books: Platnick (2014), Pocock (1899), Sebastian and Peter (2009), Tikader (1987) and Siliwal (2005).
RESULTS

Guild is a group of individuals which is based on the behaviour and the habitat. We have developed the guild structure for the predominantly found spiders of this area. Figure 2 represents the total number of individuals recorded in different guilds. The maximum number was recorded from wandering spider guild (jumpers and hunters); followed by web builders. Figure 3 represents the distribution of percentage of spiders in various guilds. Highest percentage is among the jumpers and hunters (32 %), followed by orb weavers (27%).
DISCUSSION

The first category was wandering spiders with weak web building capacity and the second category was strong web builders. Wandering spiders includes Foliage runner, Ground dwellers and Jumpers and Hunters (Figure 4). In Foliage runners, the commonly found families recorded were Hersiliidae, Sparassidae and Eresidae with 8% of total spiders. Ground dwellers were recorded in large numbers from agricultural lands and flood plains around the Yamuna River. The percentage of Lycosidae and Selenopidae as a group was about 17%. The next guild was developed for Jumping and hunting type of spiders. The Jumper and Hunter guild stands with maximum number of spiders (32%) of the families Salticidae, Oxyopidae and Thomisidae. The high abundance of these families was because of the shrubs and plantation in this region (Table 1). Wandering spiders do not build webs to capture prey as they are active predators and either move about in search of prey, or sit and wait to ambush prey as it approaches. Most wandering spiders will build silken retreats in which they hide, molt, or lay their eggs. The next guild was web builders and we found that the Orb weaver with maximum number of spiders belonging to Araneidae followed by Tetragnathidae, Space web builders are known for making irregular webs, commonly found in human habitats. The total collection was 11% from Pholcidae, Therididae and Eresidae families. Family Agelenidae and Lycosidae in our study recorded as funnel web and wolf spiders with least number (5%). This guild method therefore also provides a tool to be used in identification of crop or plant system by emphasizing the particular habitat of spiders. By this study, ecological groups could be established based on the habitat and the behaviours of the spiders for this region.

![Figure 4 Ecological Guild Structure for spiders.](image-url)
Ecological guild structure for spiders of semi-arid habitat

Anjali & Sant Prakash

We have also observed that the spiders have species specific preference for vegetation for its habitat. We maintained a list of spider families, which are predominantly found on different plants. In our observation, we found that *Acacia arabica*, which is a predominant plant in this region was preferred by species of the families such as Araneidae, Salticidae and Pholcidae. On the other hand, on citrus plants, family Oxyopidae was abundant and on Neem and Eucalyptus plants, Hersiliidae and Salticidae were common (Table 1). The occurrence of these families on specific plants is because of the suitability of habitat for its survival as observed in Lynx spiders (Oxyopidae) which are attracted towards the flowering plants, where normally insects aggregate and are available to hunt; so the probability of occurrence is much higher on these plants.

**ACKNOWLEDGEMENTS**

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**REFERENCES**


**Table 1** Predominant spider families on commonly found plants in Agra.

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>English name</th>
<th>Common name</th>
<th>Commonly found spider families</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Acacia arabica</em></td>
<td>Gum tree</td>
<td>Babul</td>
<td>Araneidae, Salticidae, Pholcidae</td>
</tr>
<tr>
<td><em>Azadirachta indica</em></td>
<td>Margosa tree</td>
<td>Neem</td>
<td>Salticidae, Hersiliidae, Selenopidae</td>
</tr>
<tr>
<td><em>Ziziphus ammularia</em></td>
<td>Plum jar</td>
<td>Beri</td>
<td>Araneidae, Pholcidae</td>
</tr>
<tr>
<td><em>Ficus bengalansis</em></td>
<td>Bargad</td>
<td>Bargad</td>
<td>Salticidae, Hersiliidae</td>
</tr>
<tr>
<td><em>Ficus religiosa</em></td>
<td>Peepal</td>
<td>Pipal</td>
<td>Hersiliidae, Araneidae</td>
</tr>
<tr>
<td><em>Tamarindus indica</em></td>
<td>Imli</td>
<td>Imli</td>
<td>Salticidae, Oxyopidae</td>
</tr>
<tr>
<td><em>Mangifera indica</em></td>
<td>Mango</td>
<td>Aam</td>
<td>Salticidae, Oxyopidae</td>
</tr>
<tr>
<td><em>Psidium guajava</em></td>
<td>Guava</td>
<td>Amrud</td>
<td>Araneidae, Salticidae, Tetragonathida</td>
</tr>
<tr>
<td><em>Syzygium jambolana</em></td>
<td>Black berry</td>
<td>Jamun</td>
<td>Salticidae, Oxyopidae</td>
</tr>
<tr>
<td><em>Citrus species</em></td>
<td>Lemon</td>
<td>Nimbu</td>
<td>Salticidae, Oxyopidae</td>
</tr>
<tr>
<td><em>Aegle marmelos</em></td>
<td>wood apple</td>
<td>Bel</td>
<td>Salticidae, Oxyopidae, Araneidae</td>
</tr>
<tr>
<td><em>Carica papaya</em></td>
<td>Papaya</td>
<td>Papita</td>
<td>Oxyopidae, Thomisidae</td>
</tr>
<tr>
<td><em>Musa paradisiacal</em></td>
<td>Banana</td>
<td>Kela</td>
<td>Oxyopidae, Thomisidae</td>
</tr>
<tr>
<td><em>Eucalyptus hybrid</em></td>
<td>Eucalyptus</td>
<td>Eucalyptus</td>
<td>Salticidae, Hersiliidae</td>
</tr>
<tr>
<td><em>Cynodon dactylon</em></td>
<td>Dhoob</td>
<td>Bermuda</td>
<td>Salticidae, Oxyopidae, Lycosidae</td>
</tr>
<tr>
<td><em>Brassica sp.</em></td>
<td>Sarso</td>
<td>Sarso</td>
<td>Oxyopidae, Thomisidae</td>
</tr>
<tr>
<td><em>Saccharum officinarum</em></td>
<td>Sugar cane</td>
<td>Gunna</td>
<td>Salticidae, Oxyopidae, Lycosidae</td>
</tr>
</tbody>
</table>


