

## Survey study of spiders from broad bean and sugar cane in Aswan governorate, Southern Egypt

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### Abstract

A study was carried out on spiders associated with broad bean and sugarcane in the Aswan governorate, Egypt, for two consecutive years (2021–2022). The number of spiders per month was estimated during the study period to track their distribution throughout the year. The data demonstrated that 19 families were deployed to the Aswan governorate over two consecutive years. The data noted that Family members of Philodromidae, Theridiidae, Lycosidae, Eutichuridae, Salticidae, and Scytodidae were found during the two years (2021–2022) in Kom Ombo and Draaw, where population density and frequency of occurrence are high relative to the overall number of individuals. The population density and frequency of family members belonging to Linyphiidae, Thomisidae, Gnaphosidae, Araneidae, and Filistatidae were moderate, whereas the families of other spiders had the lowest recorded numbers, densities, and frequency of occurrence.

**Keywords:** spiders, broad bean, sugarcane, Aswan governorate, Southern Egypt.

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## 1. Introduction

A list of Egyptian spiders was revised in reports that 405 species, 204 genera, and 41 families of spiders have been identified in Egypt. The list consists of the names of spider species, along with a map showing where they are distributed. There are multiple spider records in the regions of Aswan, Elephantine, Philae Island, Fatira (Kom Ombo), Wadi-Halfa, Nubia, and the Aswan Governorate, which are bordered by Sudan on the map (El-Hennawy, 2017). The order Araneae was ranked seventh in terms of global diversity, behind the five major insect orders (Hymenoptera, Lepidoptera, Coleoptera, Diptera, and Hemiptera), and Acari among the arachnids (Kevan, 1982). Arthropod research is important because arthropods make up a significant portion of biodiversity. Even though over a million species of arthropods have been described to date, this likely only accounts for a small portion of their overall diversity worldwide. Arthropods are a perfect source of data for the conservation management of the species mentioned or predicted because of their remarkable resource exploitation and widespread presence in nearly all ecosystems on Earth (Bell *et al.*, 2005; Gering *et al.*, 2003; McGuinness, 2001; Schmidt *et al.*, 2008). One of the most diverse groups on Earth is the spider family. Spiders stand out among these taxa because of their reliance on predation as a trophic strategy. However, the diversity of dietary strategies, particularly phytophagy and

parasitism, might account for the variety of mites and insects (Mitter *et al.*, 1988). The number of families will always fluctuate because of ongoing research, as new species are found every month and others are identified as synonyms. Consequently, it was impossible to accurately represent the current situation. The collection of araneid fauna from both localities at the District Kom Ombo and Daraw localities, Aswan Governorate, will provide us with useful information about their population dynamics. Broad beans and sugarcane are the most suitable crops for the Aswan Governorate climate. There are still many unidentified spider species in Egyptian agricultural fields. The main goal of this study was to describe the rained fauna in the broad bean and sugarcane fields.

## 2. Materials and methods

### 2.1 Study area

The study was conducted over two consecutive years, from June 2021 to May 2022, on sugarcane and broad beans in the botanical garden in Kom Ombo (Figure 1) and Draaw (Figure 2) localities of the Aswan governorate, Egypt.

### 2.2 Spider collection

Over the course of the study, the spider population was estimated at monthly intervals to determine their annual distribution. Three methods were used to randomly collect spiders from broad beans and sugarcane fields.



Figure (1): Map of Kom Ombo district, Aswan governorate, Egypt.

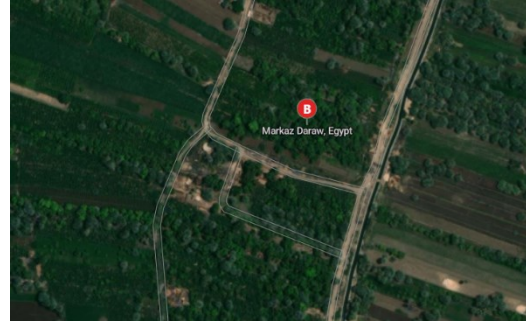


Figure (2): Map of Draaw district, Aswan governorate, Egypt.

### 2.2.1 Beat netting

Owing to the small number of branches, broad sugarcane bean fields were fitted for the beating method. I started by taking an umbrella-shaped plastic tray and shaping it outward from its corners. The tray was 12 inches square and rectangular. While holding the plants, place a tray underneath the branches with one hand and shake the branches with the other. After beating the plants that had been dropped into the tray until they flew, an appropriate number of spiders were collected.

### 2.2.2 Hand sorting

The spiders were carefully selected; the larger ones were stored in tubes, and the smaller ones were gathered with Gamel's hairbrush and placed in the  $1 \times 4$  cm plastic tubes. Samples were collected once a month for one hour, in the summer from 10 to 11 a.m., and in the winter from 11 to 12 a.m.

### 2.2.3 Pitfall traps

To gather ground spiders, 30 pitfall nets, each with a diameter of five centimetres

and a depth of ten centimetres, were positioned diagonally in each plot. These traps were submerged for a week beneath Earth's surface. Each bottle received three drops of 1% liquid detergent and 30 mL of 95% ethylene glycol to lower water tension.

### 2.3 Preservation

The lab received the collected spiders from each trapping session, cleaned them with alcohol, and stored them in a mixture of 70% alcohol and 20% glycerol. Locality, date of collection, and other relevant information were properly labeled. Using the literature that was available, spiders of all life phases that were gathered throughout sampling were totalled and identified down to the species level (Barrion and Litsinger, 1987; Prószyński, 2003; Prószyński, J. and Żochowska, 1981; Tikader, 1987; Tikader and Biswas, 1981; Tikader and Malhotra, 1980; World Spider Catalog, 2024). The collected samples were stored at the Laboratory of Agricultural Zoology and Nematology Department, Faculty of Agriculture, Al-Azhar University, Assiut,

Egypt.

## 2.4 Classification studies

Following their transfer to the laboratory, each sample was investigated and stored in a 10 cm diameter petri dish. A stereoscopic binocular microscope was used to examine all participants. Every specimen was stored separately in a sizable tube filled with 70% alcohol, and information about the host plant, locality, date of collection, and other details were written on the side of the tube (Kaston, 1978; Petrunkvitch, 1939).

## 2.5 Statistical analysis

Based on the location and types of fruit trees in the area, the population density and frequency of occurrence of various spider species were calculated using the following equations (Duncan, 1955):

$$\text{Population density (P.D.)} = \frac{\text{Overall number of species or family individuals}}{\text{Number of specimens having this family or species}}$$

$$\text{Frequency of occurrence (F.O.)\%} = \frac{\text{No. of samples having a species}}{\text{Total No. of gathered samples}} \times 100$$

## 3. Results and Discussion

### 3.1 In the Aswan governorate, the distribution and occurrence of true spider families are connected to sugarcane and broad bean fields

A total of 3486 specimens were collected between 2022 and 2021 (1893 from Kom Ombo and 1593 from Draaw), including a total of twenty-nine spider families (Table 1). In Kom Ombo and Draaw, two locations of the Aswan Governorate, true

spider samples were collected from broad beans and sugarcane, and the spiders were then processed to separate and identify them. All the gathered spiders belong to the suborder Labidognatha, which is made up of what is referred to as a true spider (Table 1) Nineteen families were identified as belonging to the suborder Labidognatha. These families include Dictynidae, Araneidae, Dysderidae, Eutichuridae, Filistatidae, Linyphiidae, Gnaphosidae, Lycosidae, Mimetidae, Oecobiidae, Philodromidae, Pholcidae, Salticidae, Scytodidae, Sparassidae, Thomisidae, Theridiidae, Titanoecidae, and Uloboridae. Their population densities and frequency of occurrence varied greatly depending on the location. In most surveys, Theridiidae, Eutichuridae, Philodromidae, Lycosidae, Salticidae, and Scytodidae were discovered at comparatively high population densities and frequencies (Table 1). The information in Table (1) shows that the family members Philodromidae, Theridiidae, Eutichuridae, Lycosidae, Salticidae, and Scytodidae were found in most of the spiders examined at the two locations (Kombo and Draaw), with a high number of individuals. 563, 471, 372, 280 and 263 individuals, While the density of the population and the frequency of occurrence (11.73 & 100%), (9.81 & 100%), (6.41 & 100%), (9.86 & 60.420%), (9.66 & 60.42%) and (10.52 & 52.08%) in the two years, respectively (2021-2022). Araneidae, Filistatidae, Thomisidae, Linyphiidae, and Gnaphosidae families were found in two localities, with

a moderately high total number of individuals (235, 211, 190, 160, and 113 individuals, respectively). The corresponding population densities and frequencies of occurrence were 6.35 & 75.00%, (5.70 & 77.08%), (4.42 & 89.58%), (3.10 & 81.25%) and (3.77 & 62.50%), respectively. In contrast, the population density (P.D.) and frequency of occurrence (F.O.%) of the other spider families were the lowest. Dictynidae, Uloboridae, Sparassidae,

Mimetidae, Pholcidae, Oecobiidae, Dysderidae, and Titanoecidae families were found in all localities with fewer total individuals, reaching average lower P.D. values of 68, 52, 44, 40, 37, 33, and 31 together with F.O. The average percentages were (1.88 & 33.33%), (1.72 & 66.67%), (1.89 & 75%), (1.79 & 60.42%), (2.59 & 35.42%), (2.11 & 39.58%), (1.74 & 39.58%), and (2.58 & 25%), consecutively.

Table (1): Abundance of spider families collected from broad bean and sugarcane (combined for two years) in Kom Ombo and Draaw, Aswan, Egypt.

| Family        | Overall individuals of families | Overall No. of samples comprising families | P. D. | F. O. % |
|---------------|---------------------------------|--------------------------------------------|-------|---------|
| Araneidae     | 160                             | 39                                         | 4.10  | 81.25   |
| Dictynidae    | 68                              | 36                                         | 1.89  | 75.00   |
| Dysderidae    | 33                              | 19                                         | 1.74  | 39.58   |
| Eutichuridae  | 372                             | 48                                         | 6.41  | 100.00  |
| Filistatidae  | 113                             | 30                                         | 3.77  | 62.50   |
| Gnaphosidae   | 190                             | 43                                         | 4.42  | 89.58   |
| Linyphiidae   | 235                             | 36                                         | 6.53  | 75.00   |
| Lycosidae     | 286                             | 29                                         | 9.86  | 60.42   |
| Mimetidae     | 40                              | 19                                         | 2.11  | 39.58   |
| Oecobiidae    | 37                              | 16                                         | 2.31  | 33.33   |
| Philodromidae | 563                             | 48                                         | 11.73 | 100.00  |
| Pholcidae     | 37                              | 17                                         | 2.18  | 35.42   |
| Salticidae    | 280                             | 29                                         | 9.66  | 60.42   |
| Scytodidae    | 263                             | 25                                         | 10.52 | 52.08   |
| Sparassidae   | 44                              | 17                                         | 2.59  | 35.42   |
| Theridiidae   | 471                             | 48                                         | 9.81  | 100.00  |
| Thomisidae    | 211                             | 37                                         | 5.70  | 77.08   |
| Titanoecidae  | 31                              | 12                                         | 2.58  | 25.00   |
| Uloboridae    | 52                              | 29                                         | 1.79  | 60.42   |

F.O. % = Frequency of occurrence, P.D. = Population density, Total No. of collected samples = 48.

*3.2 The population of spider families correlated with broad bean and sugarcane in the Kom Ombo locality, Aswan governorate, during two successive years, 2021 and 2022*

The distribution of spider families correlated with different fruit orchards and vegetables in Kom Ombo and Daraw in the Aswan governorate, Egypt is

presented in Table (2). In Kom Ombo, the spider families Lycosidae, Philodromidae, Salticidae, Eutichuridae, and Theridiidae were recorded at high (P.D.) averages of 280, 273, 267, 232, and 221, respectively, while members of families Gnaphosidae, Thomisidae, Linyphiidae, Araneidae, and Scytodidae were recorded as relatively moderate (P.D.) averages of 115, 104, 80, 65, and

35, respectively (Table 2). The remaining families appear in low numbers. Members of the families Theridiidae, Philodromidae, Salticidae, Lycosidae, and Eutichuridae had the highest F.O. (100%), as shown in Table (2). Also, the families' member Gnaphosidae, Araneidae, Thomisidae, Linyphiidae, Dictynidae and

Uloboridae were recorded in high (F.O.%) ranged between 95.83% and 70.83%, while the moderate number were observed with families Filistatidae, Scytodidae, Oecobiidae, Pholcidae, Dysderidae, Pisauridae and Mimetidae ranged between 58.33% and 20.83%, as shown in Table (2).

Table (2): Abundance of spider families collected from broad bean and sugarcane (combined for two years) in Kom Ombo, Aswan, Egypt.

| Family        | Overall individuals of families | Overall No. of samples comprising families | P. D. | F. O. % |
|---------------|---------------------------------|--------------------------------------------|-------|---------|
| Araneidae     | 65                              | 18                                         | 3.61  | 75.00   |
| Dictynidae    | 29                              | 16                                         | 1.81  | 66.67   |
| Dysderidae    | 20                              | 14                                         | 1.43  | 58.33   |
| Eutichuridae  | 232                             | 24                                         | 9.67  | 100.00  |
| Filistatidae  | 45                              | 13                                         | 3.46  | 54.17   |
| Gnaphosidae   | 115                             | 20                                         | 5.75  | 83.33   |
| Linyphiidae   | 80                              | 15                                         | 5.33  | 62.50   |
| Lycosidae     | 280                             | 24                                         | 11.67 | 100.00  |
| Mimetidae     | 13                              | 6                                          | 2.17  | 25.00   |
| Oecobiidae    | 36                              | 15                                         | 2.40  | 62.50   |
| Philodromidae | 273                             | 24                                         | 11.38 | 100.00  |
| Pholcidae     | 26                              | 10                                         | 2.60  | 41.67   |
| Salticidae    | 267                             | 24                                         | 11.13 | 100.00  |
| Scytodidae    | 35                              | 13                                         | 2.69  | 54.17   |
| Sparassidae   | 10                              | 5                                          | 2.00  | 20.83   |
| Theridiidae   | 221                             | 24                                         | 9.21  | 100.00  |
| Thomisidae    | 104                             | 17                                         | 6.12  | 70.83   |
| Titanoecidae  | 19                              | 8                                          | 2.38  | 33.33   |
| Uloboridae    | 23                              | 11                                         | 2.09  | 45.83   |

F.O. % = Frequency of occurrence, P.D. = Population density, Total No. of collected samples = 48.

### 3.3 opulation of spider families linked with citrus trees in the Draaw locality, Aswan governorate, during two successive years, 2021 and 2022

Data in Table (3) shows the spider of families, Pholcidae, Thomisidae, Sparassidae, Salticidae, Lycosidae and Araneidae were recorded in high (P.D.) averaged 290, 250, 228, 170, 155, and 95 respectively, while families of Linyphiidae, Gnaphosidae, Filistatidae, Philodromidae, and Theridiidae were recorded in

moderate (P.D.) as they averaged 86, 75, 50 and 34 respectively. The remaining families appear in low numbers. In contrast, members of the families Thomisidae, Eutichuridae, and Pholcidae achieved the highest (F.O.%) (100%), as shown in Table (3). Also, families of, Linyphiidae, Gnaphosidae Lycosidae, Araneidae, Uloboridae and Dictynidae were recorded in high (F.O.%) ranged between 95.83% and 62.50%, while the moderate families were Oecobiidae, Filistatidae, Scytodidae, and Dysderidae

ranged between 58.33% and 20.83% (Table 3). Our findings are consistent with those of Thaler and Zapparoli (1993), who identified

70 species in 18 families, the most common of which were Lycosidae, Gnaphosidae, Dysderidae, and Theridiidae.

Table (3): Abundance of spider families collected from broad bean and sugarcane (combined for two years) in Draaw, Aswan, Egypt.

| Family        | Overall individuals of families | Overall No. of samples comprising families | P. D. | F. O. % |
|---------------|---------------------------------|--------------------------------------------|-------|---------|
| Araneidae     | 95                              | 21                                         | 4.52  | 87.50   |
| Dictynidae    | 39                              | 20                                         | 1.95  | 83.33   |
| Dysderidae    | 13                              | 5                                          | 2.60  | 20.83   |
| Eutichuridae  | 140                             | 24                                         | 5.83  | 100.00  |
| Filistatidae  | 68                              | 17                                         | 4.00  | 70.83   |
| Gnaphosidae   | 75                              | 23                                         | 3.26  | 95.83   |
| Linyphiidae   | 86                              | 21                                         | 4.10  | 87.50   |
| Lycosidae     | 155                             | 21                                         | 7.38  | 87.50   |
| Mimetidae     | 6                               | 5                                          | 1.20  | 20.83   |
| Oecobiidae    | 27                              | 13                                         | 2.08  | 54.17   |
| Philodromidae | 50                              | 14                                         | 1.00  | 4.17    |
| Pholcidae     | 290                             | 24                                         | 12.08 | 100.00  |
| Salticidae    | 170                             | 15                                         | 1.57  | 60.17   |
| Scytodidae    | 13                              | 5                                          | 2.60  | 20.83   |
| Sparassidae   | 228                             | 12                                         | 19.00 | 50.00   |
| Theridiidae   | 34                              | 12                                         | 2.83  | 50.00   |
| Thomisidae    | 250                             | 24                                         | 10.42 | 100.00  |
| Titanoecidae  | 107                             | 20                                         | 5.35  | 83.33   |
| Uloboridae    | 12                              | 4                                          | 3.00  | 16.67   |

F.O. % = Frequency of occurrence, P.D. = Population density, Total No. of collected samples = 48.

The differences in temperature, moisture content, and fruit abundance between the two locations (Aswan governorate) may be the cause of the variation in population density (P.D.) and frequency of occurrence (F.O.) of spider families and species in all samples obtained. This is consistent with earlier data that other researchers have collected (Ahmed, 2012; Baert *et al.*, 1997; El-Erksousy, 2000; Mohafez, 2004; Rashwan, 2017; Sallam, 1996).

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