Journal of Biotechnology and Natural Science
Vol. 2, No. 2, December 2022, pp. 56-60
ISSN 2808-2508

# Species Diversity and Dominance of the Aranaemorphae Sub-Order in the 90-Day-Old Rice Generative Phase

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ARTICLE INFO

**Article history**
Received: December 1th 2022
Revised: December 7th 2022
Accepted: December 9th 2022

**Keywords**
Diversity
Dominance
Paddy
Pest
Spider

ABSTRACT

Spiders have an important role in ecosystems, in particular agricultural ecosystems. Spiders play the role of natural enemies capable of helping farmers by eating insect pests. The purpose of this study was to identify the type of Sub-Order Aranaemorphae and calculate the level of diversity and dominance of the type of Sub-Order Aranaemorphae in the generative phase of rice aged 90 days. The study was conducted in April-September 2022 in the rice field area of Tamanan Village. The determination of the research location was carried out using the purposive sampling method with the criteria of a rice field area of 2500 $m^2$ and the age of rice plants ranging from 90 days. Sampling was carried out on 9 plots with a plot size of 21 x 4 $m^2$ each. Sampling was carried out by hand picking and indirect methods with sweep nets, pitfall traps, and yellow pan traps. The species of Sub-Order Aranaemorphae found in this study were 12 species, namely Oxyopes sp., O. *lineatipes*, *O. javanus*, *Atypena formosana*, *Tetragnatha vermiformis*, *Pardosa* pseudoannulata, Lycosa sp., *L. pseudoannulata*, *Lycosa* sp. 1, *Araneus inustus*, *Clubiona* sp. and *Thomisus* Sp. The conclusion of this study were the diversity index value (H') of the Aranaemorphae Sub-Order obtained in this study was 2.133 with a moderate category, and the dominance index value (D) of the Aranaemorphae Sub-Order obtained was 0.1785 with a low category. The total number of spider individuals obtained was 173 individuals.



*How to Cite: Pertiwi, P.M.S. & Putra, I.L.I. 2022. Species Diversity and Dominance of the Aranaemorphae Sub-Order in the 90-Day-Old Rice Generative Phase. Journal of Biotechnology and Natural Science, 2(2), 50-54.*

## 1. Introduction

Species diversity is a community trait that shows the level of diversity of the types of organisms present in it (Siregar *et al*., 2014). Diversity can be said to be high when a community is composed of various types with almost the same abundance (Umar, 2013). One of the types of diversity present in nature is the diversity of arthropods. Arthropod diversity has an important role as a counterweight to ecosystems (Triyogo et al., 2019), especially in rice fields (Hendrival *et al*., 2011).

One of the main obstacles in rice cultivation is the presence of pest attacks that can cause a decrease in production (Herviyanti & Mulyani, 2016). The decline in production can be resolved through the presence of predatory arthropods (Dewi *et. al.*, 2019). Farmers in their activities do not know the role of natural predators in controlling rice pests, so they still use excessive pesticides that will kill pests as well as natural predators that should be friends of farmers.

According to Hendrival *et al*. (2017), predatory arthropods can prey on or eat other organisms in agroecosystems, especially insect pests, for their food needs. Predatory arthropods can be a group of spiders, insects, or centipedes. Spiders are the dominant predators in rice field ecosystems (Khodijah *et a*l., 2012). Spiders are able to feed on insect pests on rice plants, such as brown leafhoppers (*Nilaparvata lugens* Stall.) and white rice stem borers (*Scirpophaga innotata* Walker) (Hendrival et. al., 2011), which will reduce the occurrence of crop failure (Tahir et. al., 2011 ).

Research on the diversity of spider species (Sub-Order Aranaemorphae) in rice field ecosystems has been carried out in Padang, West Sumatra by Nasution (2016) with the results of 45 types of spiders. The most abundant type found in the study was *Thorell's Tetragnatha maxillosa* . A similar study was also conducted by Riska (2020) in Pemulutan District, South Sumatra. The results of the study found as many as 11 types, with the most abundant type being *Araneus inustus* L. Koch. Although there have been studies on the diversity of Aranaemorphae Sub-Order species in other locations, research on the diversity of Aranaemorphae Sub-Order species has never been carried out on rice fields in Tamanan Village, Banguntapan District, Bantul Regency, D.I. Yogyakarta.

The study was conducted on paddy fields that have 90 days of rice, where at the age of 90 days rice enters the generative phase (Yulina *et al*., 2020). According to Rizal *et al*. (2017), generally pest attacks, such as brown leafhoppers and white rice stem borers, occur in the generative phase of rice. So that the presence of these pests can trigger the presence of predatory arthropods (Vinothkumar, 2012), especially labalaba (Safriyani *et al*., 2019). In addition, this study can also be a database of spiders contained in the rice field araea and as an effort to use spiders in suppressing pest populations.

## 2. Methods

The study was conducted in April-September 2022 in the rice field area of Tamanan Village. The determination of the location of the study was carried out using the *purposive sampling* method with the criteria of the area of rice fields in the garden village of about 2500 $m^2$ and the age of rice plants ranging from 90 days. Sampling was carried out on 9 plots with a plot size of 21 x 4 m each. Sampling is carried out when the rice is about 90 days old. The use of rice age is 90 days because at that age arthropods that interact with rice plants begin to increase in population (Siregar, 2014). Sampling in this study was carried out by *hand picking*, namely catching directly using hands on each spider at the sampling location and indirect methods with traps, namely with *sweep nets*, *pitfall* traps and *yellow pan traps* ). The sampling process is carried out in the morning around 07.00 - 10.00 WIB and in the afternoon at 15.00 - 17.00 WIB (Effi & Siska, 2020).

The data analysis used in this study was using descriptive and inferesial analysis. A descriptive analysis is carried out to describe each of the types of spiders found. The calculation of the level of diversity of spider species is carried out with the value of the diversity index with the *Shannon-Wiener formula.* As for determining the presence or absence of species dominance, it is calculated using the Simpson dominance index.

## 3. Findings and Discussion

### 3.1. Types of Members of the sub-order Aranaemorphae found

Based on the results of studies that have been carried out, 12 species of Sub-order Aranaemorphae consisting of 7 different families (Table 1) were obtained. The family with the most common species of spiders is Lycosidae (4 types). While the spider families that are the least found members of the family are Clubionidae and Thomisidae 1 species each.

Table 1. Types of Spiders found in rice fields

| No | Family | Species names |
|---|---|---|
| 1 | Oxyopidae | *Oxyopes* sp. |
| | | *O. javanus* |
| | | *O. lineatipes* |
| 2 | Linyphiidae | *Atypena formosana* |
| 3 | Tetragnathidae | *Tetragnatha vermiformis* |
| 4 | Lycosidae | *Lycosa* sp. |

| | | |
|---|---|---|
| | | *L. pseudoannulata* |
| | | *Lycosa* sp. 1 |
| | | *Pardosa pseudoannulata* |
| 5 | Araneidae | *Araneus inustus* |
| 6 | Clubionidae | *Clubiona* sp. |
| 7 | Thomisidae | *Thomisus* sp. |

The results obtained in this study are in accordance with the theory of Hendrival *et al*., (2017) who said that the spider family usually found in rice fields consists of the families Araneidae, Lycosidae, Linyphiidae, Oxyopidae, Salticidae and Tetragnathidae. However, in this study no members of the Salticidae family were found. The results of research from Juan and Honsang (2019) also found the least number of species from the Salticidae family compared to other spider families in rice fields. This spider is a type of spider that does not make webs (Peng et *a* l., 2002), but only makes threads to protect its eggs from predators (Jacob et al., 2007). The factor that causes the non-discovery of members of the Salticidae Family in this study is because members of this family are usually found in residential areas (Argañaraz *et al*., 2017; Jasmi *et al*., 2021). According to Wettering and Umponstira (2014) spiders of the Salticidae family are important predators that control urban pest populations in residential areas, such as mosquitoes, flies, and ants.

The variety of spiders found in rice fields according to Thongphak *et a*l. (2012) can occur due to differences in vegetation, pesticide use, and the age of the selected rice. Vegetation acts as a provider of food sources, shelters, hiding places, and spawning places for labalaba (Isaac. 2015). The rice fields used in this study contained vegetation in the form of weeds and trees around the study area. According to Thamrin *et al*., (2013) some weeds are used by spiders as a place to lay eggs and catch prey. Weeds found in rice fields such as kelakai (*Stenochiaena palutris* Bedd.), bundung grass (*Scirpus grosus* L.), purun kudung grass (*Lepironea articulate* Retz.), teki grass (*Cyperus rotundus* Linn.), lempuyangan (*Panicum repens* L.), banta (*Leersia hexandra* Sw.), elephant grass (*Pennisetum purpureum* Mott.) and tambura ( *Ageratum conyzoides* L.). The weed is known to have been used by spiders as a place to nest and catch prey (Asikin, 2014). In addition, weeds and trees are also used by spiders as places to interact, such as laying eggs (Thamrin et al., 2013), hiding (Isaac, 2015), making webs (Juan & Honsang, 2019) and looking for prey (Sembodo, 2010).

### 3.2. Degree of diversity, number of individuals, dominance of the type of order Coleoptera

Based on the studies that have been carried out, a total number of spider individuals was obtained as many as 173 individuals. The type of spider with the highest number of individuals is *Pardosa pseudoannulata* with 42 individuals, while the least Clubiona sp. and *Thomisus* sp. each as many as 1 head. The diversity index value (H') of the Aranaemorphae Sub-order in the rice field area of Tamanan Village is 2.133, while the dominance index value (D) of the Aranaemorphae Sub-order is 0.17 (Table 2).

Table 2. H' and D values of spiders found in rice fields

| No. | Family | Species | H’ | D |
|---|---|---|---|---|
| 1 | Oxyopidae | *Oxyopes* sp | -0.18 | 0.0012 |
| | | *O. Javanus* | -0.33 | 0.0535 |
| | | *O. Lineatipes* | -0.32 | 0.0482 |
| 2 | Linyphiidae | *Atypena formosana* | -0.10 | 0.0003 |
| 3 | Tetragnathidae | *Tetragnatha vermiforis* | -0.18 | 0.0021 |
| 4 | Lycosidae | *Lycosa* sp. | -0.14 | 0.0021 |
| | | *L. Pseudoannulata* | -0.23 | 0.0108 |
| | | *Lycosa sp*. 1 | -0.12 | 0.0008 |
| | | *Pardosa pseudoannulata* | -0.32 | 0.0589 |
| 5 | Araneidae | *Araneus inustus* | -0.10 | 0.0003 |

| No. | Family | Species | H' | D |
|---|---|---|---|---|
| 6 | Clubionidae | *Clubiona* sp. | -0.06 | 0.0000 |
| 7 | Thomisidae | *Thomisus* sp. | -0.06 | 0.0000 |
| | | **Total** | -2.1326 | 0.1785 |

Based on Table 4 above, the index value of the diversity of species of the Aranaemorphae Sub-order in the rice field area of Tamanan Village is 2.133. This value indicates that the level of diversity of species of the Sub-order Aranaemorphae is classified as moderate (Arifin *et. al.*, 2017). The current category is interpreted that the rice field ecosystem used in this study is disturbed, where the disturbance is due to land function change which causes the presence of arthropods to be disturbed (Harto et al., 2021), one of which is spiders (Sulislawaty et al., 2021). The rice fields used as research sites are the habitat of spiders which then change their function into different fields. The existence of agricultural land conversion or housing development can disrupt the stability of the ecosystem (Harini, 2010), especially the constituent components of the ecosystem in it (Latumahina & Ismanto, 2010), such as the presence of spiders (Sulislawaty *et a*l., 2021). In addition, land conversion can also result in a decrease in the level of diversity of spider species (Kurniawati, 2018).

## 4. Conclusion

The types of sub-order Aranaemorphae found in this study are 12 types, namely O*xyopes lineatipes, Oxyopes javanus, Oxyopes* sp, A*typena formosana, Tetragnatha vermiformis, Pardosa* pseudoannulata, Lycosa pseudoannulata, Lycosa sp, *Lycosa* sp 1, *Araneus inustus*, *Clubiona* sp , and *Thomisus* sp.

The diversity index value (H') of the Aranaemorphae Sub-order obtained in this study was 2,133 with a moderate category, and the dominance index value (D) of the Aranaemorphae Sub-order obtained in this study was 0.1785 with a low category with a total number of individuals of 173 heads.

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