



RESEARCH ARTICLE

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Diversity of Arthropods in Peanut Plants (*Arachis hypogaea* L) Administered Using Organic Fertilizer in Dry Land

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Abstract

This study aimed to determine the diversity of arthropods on peanut plants (*Arachis hypogaea* L.) grown on land treated with organic fertilizer. The research was conducted from July to December 2024 at Jalan Sukarela KM 7, Palembang City. Data collection for arthropods in the plant canopy was performed through direct observation, involving the counting and identification of arthropods visible on the surfaces of leaves and stems, without the use of nets. For soil surface observations, the pitfall trap method was employed. The observation parameters included the identification of arthropod types and the calculation of the diversity index at both the canopy and soil surface levels of the plants. Arthropods found in the peanut plant canopy belonged to 5 orders and 10 families, while those on the soil surface comprised 7 orders and 9 families. The diversity index in the plant canopy was 2.12, categorised as medium, whereas on the soil surface, it was 1.57, classified as low.

Keywords: Arthropods, Organic Fertilizer, Peanuts

1. Introduction

Peanuts (*Arachis hypogaea* L.) are a legume crop with excellent nutritional value. They contain protein, carbohydrates, and vitamins, making them highly suitable for human consumption. Peanuts serve as a fundamental ingredient in various food products and can also be used as animal feed, resulting in a growing demand for them. To meet the increasing demand for peanuts for both food and feed, efforts must focus on enhancing the productivity of peanut-growing areas. Peanut cultivation can be practised in diverse agroecosystems, including rice paddies, tidal flats, drylands, and soils with acidic pH levels. However, cultivating peanuts in these varied environments presents potential challenges. Therefore, site-specific technological recommendations are essential, tailored to each agroecosystem. These should include guidelines for land preparation, selection of suitable varieties, crop management practices such as fertilization, integrated pest management (IPM) addressing pests, diseases, and weeds, as well as harvesting and post-harvest handling (Sundari, 2023)

One of the challenges in peanut cultivation is the

infestation by plant pests, which can significantly reduce agricultural productivity. Farmers often have limited knowledge of ecosystem balance, particularly regarding the role of natural enemies. Generally, all arthropods found on plants are considered harmful pests. However, not all arthropods are destructive; some serve as natural enemies, such as predators and parasitoids. The presence of these predators can help reduce pest populations that damage the plants. Moreover, pest control efforts targeting peanut plants frequently result in errors and inaccuracies. Therefore, pest diagnosis in peanut crops must be conducted quickly and accurately, as these pests can spread rapidly and infest entire fields. According to research by Putra et al. (2021), pests found in peanut plants include leaf rollers, armyworms, wireworms, and leaf beetles. Pest identification is necessary to determine the appropriate control method for early prevention of pest attacks on peanut plants. Healthy and fertile soil conditions can make plants healthy because the nutrient content in the soil is fulfilled, allowing the plants to be more resistant to OPT attacks, in this case, plant pests.

Adding organic fertilizer can improve soil conditions

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physically, chemically, and biologically, thereby enhancing the growth and yield of peanut plants. Organic fertilizer is derived from organic waste such as plant, animal, or human remains. Organic fertilisers are categorised into two groups based on their form and structure: solid organic fertilisers and liquid organic fertilisers. Manure plays a crucial role as a food source for soil organisms, thereby increasing the number of soil organisms, which in turn loosens the soil and enhances crop production. (Juarsah, 2016). Peanut plants fed with manure showed better growth, but no significant differences were observed compared to plants fed with SP-36 fertiliser in several parameters (Astuti *et al.*, 2022). In research (Marlina *et al.*, 2015), providing sufficient amounts of chicken manure fertiliser improves the physical, chemical, and biological properties of the soil, including enhancing soil physical properties and improving its structure. Improving structuring can lead to better root development due to the creation of a crumbly and loose soil environment. This process enables deeper and more extensive root development, facilitating better nutrient and water absorption by plants, which in turn enhances plant productivity. Therefore, this study aims to determine what arthropods are found in the crown and soil surface of peanut plants that are applied using organic fertilizer on dry land. This research aimed to determine the diversity of arthropods found in the canopy and soil surface of peanut plants that are treated with organic fertiliser on dry land.

2. Material and Methods

This research was conducted on a farmer's land on Jl. Sukarela KM 7, Palembang City. With coordinate points 2.9317° S, 104.7294° E (2°55'54.19" S, 104°43'45.71" E). The altitude above sea level is 8 meters. The research period is from July to December 2024. The materials used were Garuda variety peanut seeds and organic chicken manure fertiliser (comprising chicken manure, EM-4, brown sugar, and water). At the same time, the tools used were hoes, meters, sprayers, sickles, raffia ropes, scales, plastic, *hand sprayers* and watering cans. The research began with the manufacture of an organic chicken manure

fertiliser, composed of bran, EM4, brown sugar, and water (10:1), which was incubated for 21 days. Furthermore, fertilizer application was carried out 1 week before planting. Peanut planting with a plot area of 2 x 1 m was conducted in 36 plots. The distance between replications was 1 m, and the distance between plots was 0.5 m. Furthermore, observations were carried out in the 2nd week after planting, with subsequent weekly observations for a total of 4 weeks, examining all arthropods both in the canopy and on the ground surface. The data collection method for observations in the plant canopy was carried out through direct observation, where arthropods were counted and identified on the surface of leaves and stems without the use of nets. Observations on the ground surface employed the pitfall trap method. Arthropods that walk on the ground surface will fall into a trap container planted flush with the ground. (Southwood & Henderson, 2000).

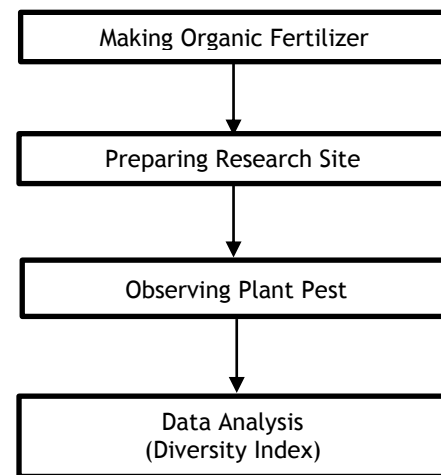


Figure 1. Research flowchart

3. Results and Discussion

3.1. Results

Based on the results of research on peanut plants using organic fertilizer, several arthropod insects were found in the plant crown and on the soil surface (Tables 1 and 2).

Table 1. Types and populations of arthropods in the canopy of peanut plants.

Taxonomy Insect			Role	Amount
Order	Family	Species		
Araneida	Tetragnathidae	<i>Caleosoma octomaculatum</i>	Predator	5
Orthoptera	Acrididae	<i>Valanga nigricornis</i>	Pest	12
	Tettigoniidae	<i>Phyllium bioculatum</i>	Pest	6
	Tettigoniidae	<i>Gampsocleis burgers</i>	Pest	8
	Staphylinidae	<i>Paederus fucipes</i>	Predator	5
Coleoptera	Chrysomelidae	<i>Phyllotreta cruciferous</i>	Pest	15
Diptera	Dolichopodidae	<i>Condylostylus siphio</i>	Pest	3
Lepidoptera	Sphingidae	<i>Theretra oldenlandiae</i>	Pest	1
	Erebidae	<i>Pyrrharctia Isabella</i>	Pest	1
Hemiptera	Coreidae	<i>Anasa tristis</i>	Pest	20
Hymenoptera	Formicidae	<i>Odontoponera transversa</i>	Predator	6

Source: (Hickman *et al.*, 2018)

Table 2. Types and populations of arthropods on the soil surface of peanut plants.

Taxonomy Insect			Role	Amount
Order	Family	Species		
Coleoptera	Staphylinidae	Paederus fucipes	Predator	3
	Chrysomelidae	Phyllotreta cruciferous	Pest	27
Araneae	Oxyopidae	Oxyopes matiensis	Predator	122
Hymenoptera	Formicidae	Solenopsis invicta	Predator	108
	Formicidae	Lasius Nigeria	Predator	63
Polydesmida	Xystodesmidae	Harpaphe Haydeniana	Pest	4
Lepidoptera	Sphingidae	Theretra oldenlandiae	Pest	2
	Erebidae	Pyrrharctia Isabella	Pest	4
Mecoptera	Panorpidae	Panorpa communis	Pest	9
Spirobolide	Pachybolidae	Trigoniulus corallinus	Pest	5

The grouping of arthropod roles by family is illustrated in Figures 1 and 2. In Figure 1, the plant canopy contains 7 families of arthropods, while the presence of predators consists of 3 families in the canopy of peanut plants treated with organic fertiliser. In Table 2, the plant canopy contains 6 families of arthropods, while the presence of predators consists of 2 families.

Amount Arthropod Families and Roles in Peanut Plant Canopies Applied with Organic Fertilizer

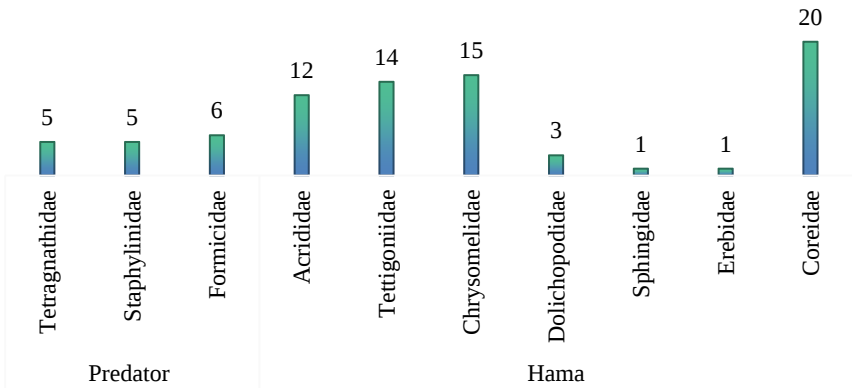


Figure 2. The role of crown insect species in peanut plants applied with organic fertiliser

Number of Families and Role of Arthropods on the Soil Surface of Peanut Plants Applied with Organic Fertilizer

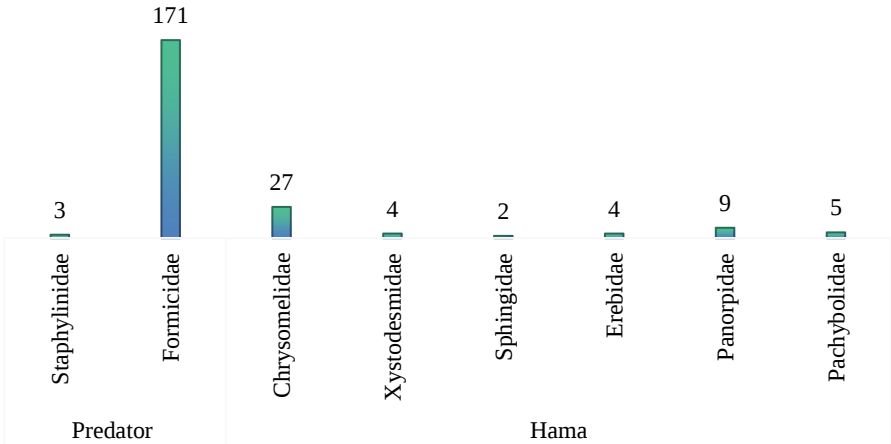


Figure 3. The role of ground surface insect species in peanut plants treated with organic fertiliser.

The results of the study indicate that the application of organic fertiliser can affect the arthropod community active

in the canopy and on the ground surface of peanut plants. The value of the diversity index in the canopy of peanut plants is 2.11, while on the ground surface, it is 1.57 (Table 3-4 and Appendix 1). Based on the diversity index, it shows that the diversity of insects in the canopy of caisim plants treated with organic fertiliser has a medium level of

diversity, while on the ground surface, it has a low level of diversity. According to Barbour et al., (1987), the criteria for the value of the species diversity index based on Shannon-Wiener, as follows: if $H' < 1$ is categorized as very low, $H' > 1-2$ is low category, $H' > 2-3$ is medium category, $H' > 3-4$ is high category, and if $H' > 4$ is very high category.

Table 3. Characteristics of the arthropod insect species community in the peanut plant canopy

Characteristics Community	Arthropods Title Plant
Amount Individual	82
Index Diversity	2.12
Index Domination	0.24
Index Equality	0.88

Table 4. Characteristics of the arthropod insect species community on the ground surface of peanut plants

Characteristics Community	Arthropods Ground level
Amount Individual	347
Index Diversity	1.57
Index Domination	0.35
Index Equality	0.33

3.2. Discussion

Based on results analysis fertility land on land test before treatment Research shows that soil pH (H_2O) = 5.3 (acidic) with a content of Nitrogen (N), ppm 0.10 (included in low), C-organic% 1.13 (low), Potassium (K), cmol/kg 0.08 (categorized as very low) From results analysis land place study own content nutrient Which low And react sour.

Based on the research results table, several arthropod insects were found in the plant canopy and on the soil surface. The types and populations of arthropods found in the plant canopy include 7 orders, where some arthropods act as pests and also as predators (natural enemies). The insect pests found in the research area consist of only 8 pest species, namely those from the families Acrididae, Tettigonidae, Chrysomelidae, Dolichopodidae, Sphingidae, Erebididae, and Coreidae. 3 families that act as predators include the Tetragnathidae, Staphylinidae, and Formicidae families. Of the pest groups that attack peanut plants, some are not significant pests. According to Susanti et al (2003), the dominant pests that attack peanut plantations in tidal land are leaf-destroying pests such as armyworms (*Spodoptera litura* F.), aphids (*Aphis craccivora*), leaf-mining caterpillars (*Aproaerema modicella*), and inchworms (*Chrysodeixis calsites*), as well as stem borers (*Melanogromyza phaseoli*).

In this study, the arthropods that most frequently attack peanut plants in the canopy are pests from the Hemiptera, Coleoptera, and Orthoptera orders. These types of pests attack the leaves of the plant. Hemiptera is a sucking pest group that can cause the leaves of the plant to turn yellow and some to curl. Coleoptera is a chewing pest, so the symptoms of the attack cause holes in the leaves of the plant. Orthoptera is a group of grasshoppers that eat parts of the leaves. According to Kalshoven (1981), as cited in

Hill (2008), peanut plants are often attacked by pests from the Hemiptera, Coleoptera, and Hymenoptera orders. From the Hemiptera order, the aphid group is a significant pest because it sucks the sap from young shoots and can also act as a vector for viruses in peanut plants.

Pests from the order Coleoptera that are often encountered include leaf beetles (*Epilachna virgintioctopunctata*), which cause skeletonising symptoms on leaves, and blister beetles (*Mylabris* sp.), which can damage flowers so that they can reduce pod formation (Kalshoven, 1981; Pracaya, 2008). Meanwhile, from the order Orthoptera, several species of grasshoppers, such as *Oxya chinensis* and *Valanga nigricornis*, often damage young leaves and stems. Heavy attacks can cause bald plants, reducing photosynthesis and crop yields. Even under certain conditions, the migratory locust (*Locusta migratoria*) can cause mass damage (Kalshoven, 1981; Hill, 2008). Taxonomically, the Hemiptera, Coleoptera, and Diptera groups are categorised as Insects, which are included in the Arthropoda phylum, with the main characteristics of having a segmented body, a chitin exoskeleton, and various mouthparts according to their feeding type (Kalshoven, 1981; Hill, 2008).

Based on the results, the study shows that from a total of 82 individuals, arthropods observed on the peanut land acquired an index of diversity (H') of 2.12. This value indicates a level of diversity that is currently high, so that community arthropods on land are considered sufficiently diverse. The index value dominance (D) of 0.24 indicates a very dominant species population, whereas the index evenness (J) of 0.88 signifies a relatively even distribution of individuals among species. From the results of these parameters applied to the agroecosystem, it is in a stable condition, with community arthropods maintaining diversity without domination by a single type. According to

a study by Jasil Yulistiawati and Kisey (2021), the index diversity (H') of arthropods in peanut land reached 3.61 on local land varieties. The value of the arthropod diversity at the site is of great importance. This finding is attributed to the presence of various environmental factors, including the diversity and intensity of land management, as well as the treatment used, which can also impact the diversity index.

The ecosystem in the research area remains relatively stable, as evidenced by the presence of arthropods acting as predators. Crop rotation, or alternating cultivated crops, can break the pest cycle, resulting in very few insect pests in the area. Furthermore, the use of organic fertilisers can affect the presence of arthropods on plants.

Arthropods found on the soil surface belong to seven orders, including both harmful insects (pests) and beneficial insects that serve as natural enemies (predators). These seven orders, present on the soil surface of peanut plants, comprise ten arthropod families: Staphylinidae, Chrysomelidae, Oxyopidae, Formicidae, Xystodesmidae, Sphingidae, Erebididae, Panorpidae, and Pachybolidae.

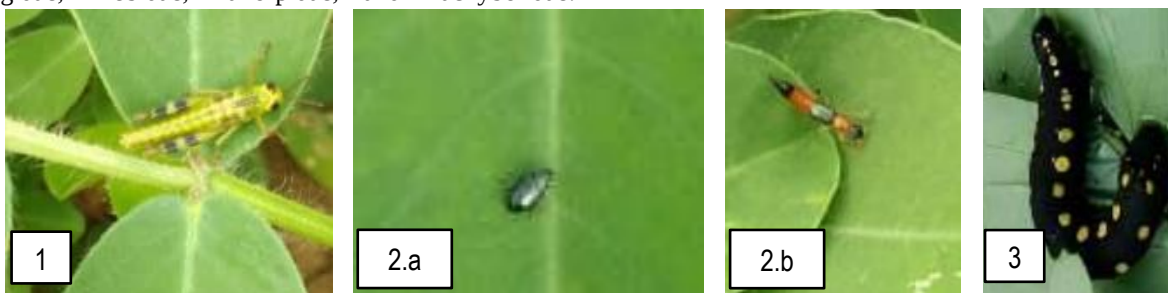


Figure 4. Arthropods found on the canopy of peanut plants. (1), Order Orthoptera (2 .a.2.b), Order Coleoptera (3), Order Lepidoptera

4. Conclusion

Based on the study results, the arthropods found in the canopy and on the ground surface of peanut plants exhibit significant variation. In the canopy, arthropods belong to 7 orders and 11 families, with the highest population observed in the species *Anasa tristis*, comprising 20 individuals that act as pests. On the ground surface, arthropods represent 7 orders, 10 families, and numerous species, with the highest population found in the species *Oxyopes matiensis*, totalling 122 individuals that function as predators. The arthropod diversity index in the canopy is 2.11, indicating medium diversity, while on the ground surface, it is 1.57, classified as low diversity. Additionally,

Among all arthropods on the soil surface, the Oxyopidae family has the highest number of individuals, with 122 specimens acting as predators. The presence of these natural enemies can reduce the pest population in the study area. According to Untung (2006), predatory insects are those that prey on other insects, while Agung (2014) states that predatory insects play a crucial role in maintaining ecosystem balance and serve as biological control agents or natural enemies of insect pests.

The diversity index in the peanut canopy is 2.11, which falls within the medium category. On the ground surface of the peanut plant, the arthropod diversity index is 1.57, classified as low. According to Utami et al. (2023), environmental suitability, food availability, the presence of predators, and ecological functions within ecosystems are key factors determining the presence of terrestrial insects. A high arthropod population indicates greater diversity, as well as a reduced reliance on chemical pesticides (Hossain, 2015).

the research provides the latest quantitative data on pest density in peanut plants, highlighting variations in pest populations across different locations. This information can serve as a foundation for integrated pest management (IPM) strategies and as a practical reference for farmers and researchers.

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