COMPOSITION OF MYCORRHIZA IN THE PLANTATION AREA OF LAMPAGEU UJONG PANCU, ACEH BESAR DISTRICT

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ABSTRACT

Desa Lampague Ujung Pancu di Kabupaten Aceh Besar memiliki perkebunan desa dengan berbagai jenis tanaman yang tumbuh subur. Hal ini dimungkinkan oleh akar tanaman yang kuat dan Fungi Mikoriza Arbuskula (FMA) yang membantu penyerapan unsur hara dari tanah. FMA berperan sebagai mikroba perombak yang membantu tanaman mendapatkan nutrisi yang dibutuhkan untuk tumbuh dengan baik. Sehingga perlu dilakukan kajian tentang keberadaan mikoriza yang ada di kawasan hutan lampague ujung pancu. Upaya Penelitian ini bertujuan untuk mengidentifikasi fungi mikoriza arbuskular pada Kawasan Perkebunan Desa Lampague Ujong Pancu Kabupaten Aceh Besar. Pengambilan sampel tanah dilakukan dengan metode *Line transek* dengan cara menarik garis sepanjang 100 meter, kemudian disetiap titik dibuat petak kuadrat dengan ukuran 20x10 meter dan dicari 1 jenis tanaman tinggi dalam setiap plot 20x10. Analisis tanah dan pengamatan spora dilakukan di Laboratorium Mikrobiologi. Hasil identifikasi menunjukkan bahwa terdapat 6 jenis mikoriza yaitu A*ccoulospora* sp*., Accouospora vofeata, Scutellospora* sp*., Sclerocytis* sp*., Gigaspora* sp*., Glomus deseticola*. Keberadaan Fungi Mikoriza Arbuskular (FMA) pada tanaman dipengaruhi oleh bentuk akar tanaman yang berupa akar tunggang atau akar serabut, tekstur akar, jenis akar dan kondisi lingkungan.

Keywords**:** Fungi Mikoriza Arbuskula, Komposisi, dan Kawasan Perkebunan Lampague

ABSTRACT

Lampague Ujung Pancu Village in Aceh Besar Regency boasts village plantations teeming with diverse plant life that thrives abundantly. This is facilitated by robust plant root systems and the presence of Arbuscular Mycorrhizal Fungi (AMF). AMF function as beneficial microbes, aiding plants in efficiently absorbing essential nutrients from the soil, ultimately contributing to their optimal growth, so it is necessary to study the presence of mycorrhizae in the Lampague Ujung Pancu forest area. This research effort aims to identify arbuscular mycorrhizal fungi in the Plantation Area of Lampague Ujong Pancu Village, Aceh Besar Regency. Soil sampling was carried out using the method of Line transect *by drawing a line 100 meters long, then at each point a square plot was made with a size of 20x10 meters and looking for 1 type of tall plant in each 20x10 plot. Soil analysis and spore observations were carried out in the Microbiology Laboratory. The identification results show that there are 6 types of mycorrhiza, namely A*ccoulospora, Accouospora vofeata, Scutellospora *sp.*, Sclerocytis *sp.*, Gigaspora *sp.*, and Glomus deseticola*. The existence of Arbuscular Mycorrhizal Fungi (AMF) in plants is influencedby the shape of the plant roots in the form of tap roots or fibrous roots, root texture, root type, and environmental conditions*.

***K**eywords**:** Arbuscular mycorrhizal fungi, composition, and Lampague Ujung Pancu Village*

A. PENDAHULUAN/INTRODUCTION

Gampong Lampageu, located in Peukan Bada District, Aceh Besar, Indonesia, is a coastal area situated approximately 10 km west of Banda Aceh. Geographically, this village directly faces Kuala Pancu (Pancu estuary), which opens into the Strait of Malacca and the Bay of Bengal. Gampong Lampageu lies at the western edge of Kuala Pancu, at the tip of Sumatra Island. This area features village plantations that are home to various types of plants. The healthy growth of these plants is influenced by root systems that optimize nutrient absorption, aided by arbuscular mycorrhizal fungi (Palupi et al., 2022).

Mycorrhizal fungi form a mutualistic symbiotic relationship with the roots of higher plants. In this symbiosis, the host plant provides photosynthates (carbohydrates) to the fungi, while the host benefits from additional nutrients that the fungi extract from the soil. Arbuscular mycorrhizal fungi (AMF) play a crucial role in nutrient cycling, improving soil structure, carbon transport within root systems, combating soil fertility degradation, protecting plants from diseases, and acting as agents of phytoremediation (Simamora et al., 2015).

Roots associated with mycorrhizae facilitate nutrient cycling. The long, fine hyphae can explore the soil to absorb water and macro- and micronutrients that roots cannot reach. The symbiosis of AMF with the host can enhance the host's resistance to root diseases. Hyphae also produce glomalin, which helps stabilize soil aggregation. AMF can assist in phytoremediation processes in areas contaminated with heavy metals (Purba & Prasetya, 2021).

Mycorrhizae are categorized based on the location of the fungi into two types: ectomycorrhiza (ECM) and endomycorrhiza (arbuscular mycorrhiza, or AM). Among these, AM fungi are the most common and widely distributed. Endomycorrhizal fungi have extensive relationships with agricultural, plantation, and forest plants, with estimates suggesting that over 93% associate with the roots of higher plants. According to INVAM (2012), endomycorrhizae belong to the order Glomeromycota and are divided into 10 families, further categorized into 19 types. Each of these 19 types of mycorrhizae exhibits different characteristics, properties, and levels of resistance and adaptability (Nuridayati et al., 2019).

AMF have a broad range of host associations, but the effectiveness varies among different host plants. Some specific AMF types exhibit a preference for certain host plants. The host plant species and environmental conditions significantly influence root colonizationlevels, spore quantity, and spore type diversity (Muryati et al., 2017). Therefore, it is essential to study the presence of mycorrhizae in the Lampageu Ujong Pancu forest area. This research aims to identify arbuscular mycorrhizal fungi in the plantation areas of Lampageu Ujong Pancu, Aceh Besar.

B. METODE PENELITIAN/RESEARCH METHOD

The research was conducted in the plantation area of Lampague Ujong Pancu Village, Aceh Besar District. Purification isolation was carried out in the Biology Laboratory of UIN Ar-Raniry Banda Aceh. The study took place in June 2023. The tools used in this research included transects, measuring tape, a trowel, scales, plastic bags, 1 kg milk cans, sieves, sample bottles, distilled water, 50% glycerol tubes, large dropper pipettes, centrifuges, and microscopes.

This study utilized the line transect method by drawing a line 100 meters long, and at each point, a square plot measuring 20x10 meters was created. One type of tall plant was identified in each 20x10 plot, and soil was excavated from beneath the tree, specifically near the plant's roots, using a trowel to a depth of 3 cm from the soil surface. The soil was then placed in a 1 kg milk can. The soil was transferred into plastic bags and weighed to determine its wet weight before being processed in the laboratory.

To identify Arbuscular Mycorrhizal Fungi (AMF), a wet sieving technique was employed: soil samples were placed in a tiered sieve and washed with running water until they broke down into smaller particles, allowing spores to be collected in the final sieve. The resulting sample was then placed in sample bottles and mixed with distilled water. Next, it was transferred into 50% glycerol tubes and mixed in a beaker. The mixture was then pipetted into the tubes, ensuring that the volume in each tube was equal for centrifugation. The samples were centrifuged for 5 minutes at a speed of 2,500 rpm. Finally, the samples were examined under a microscope, counted by distinguishing colors, and the spore samples were documented and identified basedon their morphological characteristics.

C. HASIL DAN PEMBAHASAN

The diversity of mycorrhizal fungal species in the Lampague Ujong Pancu plantation area of Aceh Besar is categorized as moderate. A total of six mycorrhizal fungal species were identified: Acaulospora, Acaulospora vofeata, Scutellospora sp., Sclerocystis sp., Gigaspora sp., and Glomus deserticola. The most dominant mycorrhiza in the Lampague Ujong Pancu plantation is Acaulospora, with a total of 13 species identified. In contrast, the least represented species are Acaulospora vofeata and Glomus deserticola.

Table 1. Mycorrhizal Species Found in the kawasn Desa Lam Pageu, Ujong Pancu, Kab. Aceh Besar.

No	Jenis	Stasiun					Jenis
		1	2	3	4	5	
1.	A*caulospora* sp.	13	2	0	4	0	19
2.	*Accouospora foveata*	1	0	0	3	0	4
3.	*Scutellospora* sp.	4	0	6	8	0	18
4.	*Sclerocytis* sp.	1	7	3	0	2	13
5.	*Gigaspora* sp.	3	4	2	0	7	16
6.	*Glomus deseticola*	1	0	0	0	3	4
Jumlah							**74**

Based on the table above, the descriptions of each mycorrhizal species observed are as follows:

***Acaulospora* sp.**

Klasifikasi

Kerajaan : Fungi

Divisi : Glomeromycota

Kelas : Glomeromycetes

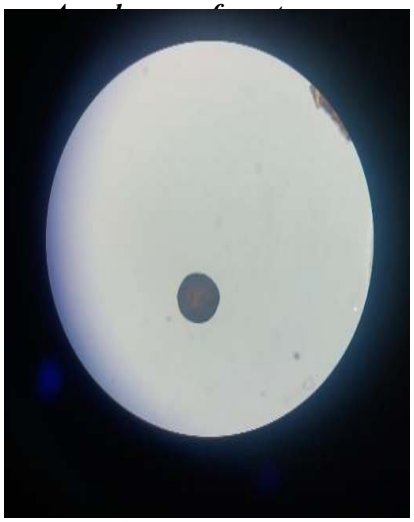
Ordo : Diversisporales

Family : Acaulosporaceae

Genus : Acaulospora

Acaulospora sp. is a genus of mycorrhizal fungi that belongs to the family Acaulosporaceae. This genus has several distinctive characteristics, including the presence of 2-3 spore walls, spores formed on the lateral side of the sporiferous saccule, a shape ranging from globose to elliptical, and coloration that can be hyaline, yellow, or yellowish-red. The spore size typically ranges from 100 to 400 µm (Ega Elman Miska et al., 2016).

1.

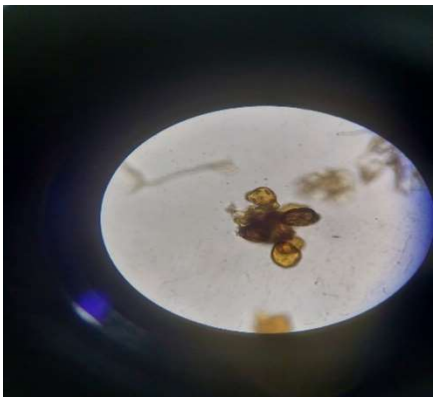


Klasifikasi

Domain : Eukariota
Kerajaan : Fungi
Divisi : Glomeromycota
Kelas : Glomeromtycetes
Ordo : Diversispolarales
Famili : Acaulosporaceae
Genus : Acaulospora
Spesies : Acaulospora foveate

Acaulospora foveata is a mycorrhizal species that belongs to the family Acaulosporaceae. It was found in the Lampague area of Ujong Pancu, Aceh Besar, with a total of 34 spores per 250 grams of soil. Acaulospora foveata is predominantly red in color, and its spores consist of three layers. The spores are globose to subglobose in shape and can sometimes be irregular. The size of the spores typically ranges from 240 to 360 μm.

Sclerocytes sp



Klasifikasi
Kerajaan : Fungi
Divisi : Glomeromycota
Kelas : Glomeromycetes
Ordo : Glomerales
Famili : Glomeraceae
Genus : Scclerocytis
Spesies : Sclorecytis sp

Sclerocystis sp. is a mycorrhizal species that belongs to the family Acaulosporaceae. It was found in the Lampague area of Ujong Pancu, Aceh Besar, with a total of 192 spores per 250 grams of soil. This type of spore is oval in shape, dark brown in color, and features a bulbous structure at the base of the hypha, which supports the spore.

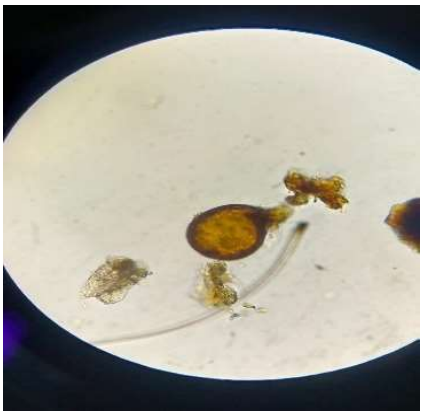
2. Scutellospora sp

Klasifikasi

Kingdom : Fungi
Divisi : Zygomicota
Kelas : Glomeromycetes
Ordo : Glomeromycota
Family : Gigasporaceae
Genus : Scutellospora
Spesies : Scutellospora sp.

Scutellospora sp. is a genus of mycorrhizal fungi that belongs to the family Gigasporaceae. This genus has several distinctive characteristics, including spores that may or may not have ornamentation, flexible spore walls, and spore structures that can be ovoid, obovoid, pyriform, or irregular. The process of spore formation in Scutellospora sp. is similar to that in the genus Gigaspora sp. The main difference between Gigaspora sp. and Scutellospora sp. is the presence of a germination shield in Scutellospora sp., from which hyphae emerge during germination (Ega Elman Miska et al., 2016).

***Gigaspora* sp.**

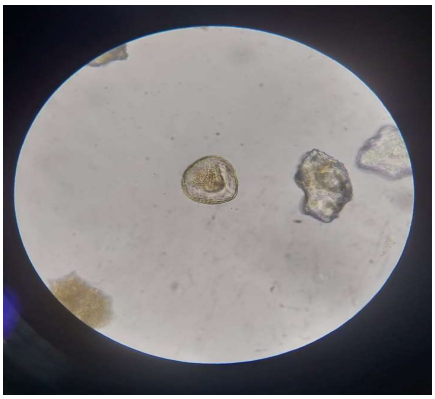


Klasifikasi

Domain: Eukariota
Kerajaan: Fungi
Divisi : Glomeromycota
Kelas : Glomeromycetes
Ordo : Diversisporales
Famili : Gigasporaceae
Genus : Gigaspora sp

Gigaspora sp. is a genus of mycorrhizal fungi that belongs to the family Gigasporaceae. This genus is characterized by several features, including the production of single spores in the soil, the absence of an inner spore wall layer, and the presence of a bulbous suspensor. The sporesare typically globose or sub-globose in shape, creamy to yellow in color, and range in size from 125 to 600 µm (Fajri & Susilo, 2023).

3. Glomus diserticola



Klasifikasi

Kerajaan : Fungi
Divisi : Glomeromycota
Kelas : Glomeromycetes
Ordo : Glomerales
Famili : Glomeraceae
Genus : Glomus
Spesies : Glomus diserticola

Glomus diserticola is a species of mycorrhiza belonging to the family Glomaceae. The species Glomus diserticola was found in the Lampageu area, Ujong Pancu, Pekan Bada District, Aceh Besar, with a quantity of 11/250 grams of soil. Based on its morphological characteristics, the spores of Glomus diserticola observed are globose, sub-globose, ovoid, or obovoid, with spore walls consisting of more than one layer, and they range in color from hyaline to yellow, reddish-brown, brown, and black.

D. Based on observations, it can be concluded that mycorrhiza can colonize and develop in a mutualistic symbiosis with plant roots, thereby enhancing plant growth and helping to suppress the development of certain soil pathogens. Mycorrhizal infection can improve plant growth and its ability to utilize nutrients, particularly phosphorus (P), calcium (Ca), nitrogen (N), copper (Cu), manganese (Mn), potassium (K), and magnesium (Mg). This is due to mycorrhizal colonization of plant roots, which expands the root absorption area through the growth of external hyphae along the root hairs (Octavianti & Ermavitalini, 2014).

E.

F. Factors influencing mycorrhizal abundance in the Lampageu Ujong Pancu plantation area of Aceh Besar include temperature, soil moisture, soil pH, light, nutrients, organic matter, and others. Light availability and nutrient levels, along with moderate nitrogen or phosphorus intensity, can increase carbohydrate levels in the roots, making plants more susceptible to mycorrhizal fungal infection. The highest degree of infection occurs in soils with low fertility. Highly active root systems are rarely infected by mycorrhiza. Conversely, when root growth declines, mycorrhizal infection increases. The close relationship between mycorrhiza and phosphorus availability for plants indicates a specific connection between mycorrhiza and soil phosphorus status. In temperate regions,

high soil phosphorus concentrations can lead to reduced mycorrhizal infection, possibly due to high internal phosphorus concentrations in host tissues (Rahmi, Dewi, 2017).

KESIMPULAN

The mycorrhizal species in the Lampageu Ujong Pancu Village, Aceh Besar District, are classified as moderate. A total of six species of mycorrhizal fungi were identified: Acaulospora, Acaulospora vofeata, Scutellospora sp., Sclerocystis sp., Gigaspora sp., and Glomus deseticola. Among these, Acaulospora was the most dominant with 19 species, while the least frequently found were Acaulospora vofeata and Glomus deseticola.

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