International Journal of Scientific Research in Science, Engineering and Technology

Print ISSN - 2395-1990
Online ISSN : 2394-4099

OPEN ACCESS

Available Online at : www.ijsrset.com
doi : https://doi.org/10.32628/IJSRSET2310521

Composition and Diversity of Swamp Plants In Lawa District, Southeast Sulawesi

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ARTICLEINFO

Article History :

Accepted: 07 Sep 2023
Published: 20 Sep 2023

Publication Issue :
Volume 10, Issue 5
September-October-2023
Page Number :
83-88

ABSTRACT

This research aims to determine the composition and diversity of seasonal swamp plants in Kasiono Oe, Lawa District, West Muna Regency, Southeast Sulawesi, and analyze environmental factors that influence the growth of Kasiono Oe swamp plants. This research is descriptive-quantitative research carried out at 5 stations in the swamp area, namely Station I (Lianoghule River flow), station II (Mata River flow), station III (Soni River flow), station IV (near settlements) and Station V (near plantations). Location determination uses the path and grid method with a width of 20x20 (for the tree phase) and the line method (for the seedling, sapling, and pole phase), installing transects 50 m long with a length of 100 m. The results of the research showed that the composition of plant species found in Station I was found to be 4 plant species totaling 115 individuals, Station II 9 species totaling 71 individuals, Station III 5 plant species totaling 49 individuals, station IV 5 species totaling 61 individuals and station IV 8 species totaling 109 individuals. The diversity index for the tree stratum was 1.03, the pole stratum 0.63, the sapling stratum 1.3, and the seedling stratum for Station II 1.09 and Station V 1.01. The highest uniformity index for the tree stratum was 0.943, and the lowest was 0.918. For the pole stratum, it was 0.91; the highest for the sapling stratum was 0.97. The lowest was 0.81, the highest for the seedling stratum was 0.99, and the lowest was 0.81.

Keywords : Plant species composition, diversity, Seasonal freshwater swamps

I. INTRODUCTION

Wetlands are areas where the land is saturated with permanent (settled) or seasonal water, for example, swamps, mangroves, brackish areas, flood areas, flooded forests, and other similar areas. This is a type of wetland that is included in the group consisting of lakes, ponds, rivers, waterfalls, freshwater swamps, seasonal lakes, ponds, and salt marshes on land [1],[2],[3]. The Kasiono Oe Freshwater Swamp is one of the swamps in Lawa District, West Muna. The freshwater swamp area of Kasiono Oe is located in Lapadaku Village, which has an area of approximately 396 m^2 during the dry season. Still, during the rainy season, the area of the swamp increases with increasing rainfall.

The freshwater swamp of Kasiono Oe has its own charm for research because there are 5 springs flowing throughout the swamp and various types of plants. Based on initial observations, the freshwater swamp area has a diverse plant composition structure, and in this area, the growth of trees, poles, and saplings is not dense. The condition of the Kasiono Oe Seasonal Freshwater Swamp plants has a slow growth rate because the growth of tree species at the seedling level, saplings, and poles is lacking and cannot survive due to environmental conditions that are less supportive for plant growth. This area is also used as a livestock grazing area.

Factors that influence plant growth may be environmental factors that do not support growth, such as water pH, turbidity, depth, light intensity, and temperature [4],[5],[6]. Another factor that can influence the growth of freshwater swamp plants is that they are always wet [7],[8]. Based on the description above, it is necessary to conduct research that discusses the composition and diversity of plants in the seasonal freshwater swamp wetland of Kasio Oe, located in Lawa District, West Muna Regency, Southeast Sulawesi.

II. METHODS AND MATERIAL

2.1 Time and place

The research was carried out in August-November 2022 at the Kasiono Oe wetland area, Lapadaku Village, Lawa District, West Muna Regency, Southeast Sulawesi, and continued at the Ecology and Taxonomy Laboratory, Faculty of Mathematics and Natural Sciences, Halu Oleo University, Kendari as the location plant identification and data analysis.

2.2 Tools and Materials

The tools used in this research are GPS, digital camera, pH meter, DO meter, Secchi disk, thermometer, hygrometer, lux meter, roll meter, scale stick, machete, identification book, and writing tools—materials used in this research: 70% alcohol, newsprint, insulation.

2.3 Research procedure

Determining Research Locations

The data and sample collection location was the Kasiono Oe seasonal freshwater swamp in Lawa District, West Muna Regency, Southeast Sulawesi. Based on the initial survey, the research location was determined as a station, namely, Station I, located in the Lianoghule River flow area with coordinates (122^{0}33'42.10''E-04^{0}52'17.41'S). Station II is located in the river flow area with coordinates (122^{0}33'34.51''E 04^{0}52'11.78''S), Station III is in the Soni River flow area with coordinates (122^{0}33'50.54''E-04^{0}52'25.10''S, Station IV is located near the Settlement with coordinates (122^{0}33'30.99''E-04^{0}52'26.86''S) and Station V is located close to the plantation with coordinates (122^{0}33'42.97''E-04^{0}52'28.83''S).

2.4 Sampling

Sampling used the strip method and the checkered line method. The path method is a method used to calculate tree types or tree strata, while the plotted line method is used to calculate sapling, poles, and seedling strata. The area of the measuring plot for each growth level is 2mx2m (seedling level, namely from

germination to a height of 1.5 m), 5m x 5m (sapling level, namely the growth level reaching a height of 1.5 m with a stem diameter of less than from 10 cm), 10 m x 10 m (pole or small tree level, namely the growth level of young trees with a trunk diameter of 10-19cm) and 20mx20m (tree level, namely the level of trees with a trunk diameter of more than 20cm).

2.5 Environmental Parameter Measurement

Air temperature

To measure temperature, use a thermometer in the research area. Water temperature is measured by holding a thermometer for around ±15 minutes and then recording the scale results.

Light intensity

Light intensity is measured with a lux meter. The part of the light sensor that is sensitive to light is directed at the reflection of the incoming light, and then the scale results are recorded.

Humidity

Air humidity is measured with a hygrometer; measurements are made by holding the hygrometer for approximately ±15 minutes, recording the scale results.

Depth

It is measuring depth using a scale stick. The procedure for measuring depth is that the scale stick is inserted into the water vertically until it touches the bottom of the water, then look at the height of the water on the stick, which is still visible above the water's surface.

Water pH

To measure the pH of water, you can measure the pH value using a pH meter.

Turbidity

It is measuring the turbidity of swamp water using a Secchi disk. The Secchi disk is inserted into the water until it disappears from view and is raised slowly until the level where the Secchi disk is visible.

2.6 Plant Identification

Determining the types of freshwater swamp plants in Kasiono Oe found at the research location was then done by identifying the types of swamp plants by referring to the book Flora of Java and literature studies (Google Lens).

2.7 Data analysis

The formula used in analyzing the findings is Summed Dominance Ratio (SDR), the total sum of relative density, relative frequency, relative dominance, and relative weight divided by four.

III.RESULTS AND DISCUSSION

3.1 Analysis of Location and Environmental Factors

Data collection in this research used 5 stations. Station I is located in the Lianoghule River flow area with coordinates (122^{0}33'42.10''E-04^{0}52'17.41''S) in this area which residents often use to take wood or cut longkida wood, which is used as plantation fences. The environmental conditions at Station I have murky and mossy water, and the types of plants that survive in this area are very limited. The measurement of environmental factors can be seen in Table 1.

Table 1. Average results of factor measurements environment at Station I-V

Parameters to be measured	Observation time		
	Morning	Afternoon	Dusk
Light intensity (Lux)	89.26	114.04	77.32
Temperature (^{0}C)	33.82	40.38	34.4
Humidity (%)	24	27.6	23.2
Ph	5.48	5.94	5.48
Turbidity (cm)	6.26	6.98	5.6

Source: Analysis Results, 2022

Station II is located in the Mata River flow area with coordinates (122^{0}33'34.51''BT-04^{0}52'11.78''LS) where the activities carried out are not much different from Station I. Residents often use this area to pick up wood for fences, and when At low tide, this area is often used to release livestock such as cows and horses. Station III in the Soni River flow area with coordinates (122^{0}33'50.54''BT-04^{0}52'25.10''LS,) is often used by

children as a place to play and fish. Station IV is located near the Settlement with coordinates (122⁰33'30.99''E-04⁰52'26.86''S) in this area, which is also used as a fishing spot, and Station V is located near the plantation (122⁰33'42.97''E– 04⁰52'28.83''S).

Low light intensity due to too dense shade for types that require light [9]. It can be seen that the higher the light entering the swamp area, the higher the intensity of the reflected light. This can be seen in the highest average value, namely during the day. The average air temperature in the morning is 33,82⁰C, in the afternoon 40,38⁰C, and the afternoon 34,36⁰C. So, the highest air temperature is during the day with a value of 40,38⁰C. The air temperature is higher during the day compared to the morning and evening because the intensity of the reflected sun is higher during the day. Meanwhile, the air temperature is relatively low in the morning and evening because the light entering the swamp area is less intense.

Air temperature is the heat of the air caused by the sun's heat [10]. The results of water pH measurements in the morning were 5.48, in the afternoon 5.94, and the evening 5.48. Measuring the pH of the water in the Kasiono Oe seasonal swamp has an acidic pH because a water pH below 7 is said to be acidic, and a value of 7 is normal, and above a value of 7 is said to be alkaline. Kasiono Oe Seasonal swamp water has a high level of turbidity because the water is dark in color, and at the bottom of the water, there is a lot of moss and leaves and even fallen tree trunks, which become humus, which results in dark colored water.

3.2 Plant Species Composition

The results of research at the locations found at Station I were that 4 species of plants were found, totaling 115. Station II found 9 species totaling 71. Station III found 5 species of plants totaling 49. Station IV found 5 species of plants totaling 61 and Station V found 8 species of plants totaling 109 At each research station, the types of plants that are often found are Nymphaea pubescent, Nymphaea Alba for seedling level and tree level, Nauclea orientalis and Syzygium malaccense.

The population has a typical growth pattern, namely exponential and sigmoid. Exponentially, the increase in population density occurs rapidly and then stops suddenly due to environmental factors[11]. Sigmoid pattern initially increases in density slowly, then continues quickly, and then gradually becomes slow again due to environmental factors [12].

3.3 Plant Species Composition

The results of research at the locations found at Station I were 115 4 plant species found, 71 9 species were found at Station II, 49 5 plant species were found at Station III, 61 5 plant species were found at Station IV, and 8 plant species were found at Station V. 109. At each research station, the types of plants often found are Nymphaea pubescens, Nymphaea Alba for seedling level and tree level, Nauclea orientalis, and Syzygium malaccense.

Populations experience growth with a characteristic pattern, which can be described as rapid growth at first and then slowing down suddenly due to environmental influences. Apart from that, there is also a sigmoid growth pattern where growth initially occurs slowly, then increases significantly, and finally slows down again due to the influence of environmental factors [13].

3.4 Plant Vegetation Structure

Vegetation structure results from spatial arrangement by the constituent components of stands and life forms, stratification, and vegetation cover, which are described through the conditions of diameter, height, distribution in space, canopy diversity, and continuity of species [14]. Based on the results of the research carried out, the values for density (K), frequency (F), dominance (D), importance value index (INP), diversity index (H'), and uniformity index (e) were obtained. Environmental factors greatly influencing vegetation include altitude, air humidity, air temperature, and light intensity [15]. These environmental factors influence the distribution of plant types and their growth [16].

The highest Importance Value Index (INP) was found in the Nauclea orientalis species. The Importance Value Index (INP) shows the role of the species in an area. The type that has the largest INP means it has the most important role in that area. The type that has the highest importance value index (INP) among other types is called the dominant type. The uniformity index at each research station has a value of 0.721-0.943, and which is said to be in the medium group. The higher the uniformity value (e), the more stable the species diversity. Based on the plant species diversity index, the highest level of Tihang is found at Station III, with a value of 0.63.

The Shanom-Wiener diversity index for Kasiono Oe Seasonal Swamp plants can be seen at 4.3 at Station II 1.30, Station III 0.67, Station IV 0.56, and Station V 1.35 while at Station I 0. The high diversity index is found at stations II and V. Types of plants used: The most commonly found plant species are Syzygium malaccense and Nauclea orientalis.

The uniformity value for each Station can still be moderate because it is in the range of 0.57. The higher the e value, the more stable the species diversity. Another factor that causes the number of plant species found in swamp areas to decrease is due to environmental factors such as light intensity and dry swamp water during the dry season so that plants found in swamp areas die because they cannot survive in dry conditions. Plants that are only able to survive in dry conditions, apart from water plants in general, are the Ceiba petandra plant type, this type of plant is often found along the Kasiono Oe swamp area, but those that are found only at the level of trees for their saplings are not found in the Rawa area.

The vegetation structure of seedling-level plants or the understory of seasonal water swamps in Kasiono Oe, the types of vegetation at each research station are diverse. At stations I, II, and IV, there are plant types whose types have not been identified. Based on the Shanom-Wiener diversity index, the highest plant species diversity index is found at stations II and V, 1.09 and 1.01, while the other stations have a diversity below one or less than one, where based on the Shanom-Wiener index, if the plant diversity is less than one, it is categorized as Very low diversity.

The high or low diversity index of a plant community depends on the number of species and the number of individuals of each type (richness) of the species [17],[18]. Species diversity can be used to express community structure, namely the ability of a community to maintain itself and remain stable despite disturbances to its components [19],[20]. One of the factors is the lack of plant vegetation at the seedling level because in this swamp area, there is a lack of sunlight, and in the swamp area, there are many animals, such as cows, that roam the swamp area, so the swamp plants at stake and tihang level cannot survive.

IV.CONCLUSION

The composition of the plant species found consisted of Nauclea Orientalis, Ceiba petandra, Anacardium occidentale, Syzygium malaccense, Gliriciasepium, Hibiscus tiliaceus, Nymphea alba, Asclepias curassavica, Eupatorium odoratum, Nymphaea pubescens and Sp1. The diversity of plants found in the Kasiono Oe Seasonal Freshwater Swamp, the diversity index is classified as moderate and even very low based on the criteria for plant species diversity, namely <1 very low diversity, 1<greater than 1.5 low diversity, 2.0 medium diversity, and >2.0 high diversity. For tree strata, the diversity index was found at station III, namely 1.03. The poles level was found at station III 0.63. The sapling level was found at station II 1.3, and Station V 1.35, and for the seedling level it was found at station II 1.09 and Station V 1.01.

Environmental factors that influence the growth or diversity of plant species are light intensity, humidity, air temperature, turbidity, depth, and pH of the water. The environmental factor that most influences plant growth in this swamp area is light intensity because the intensity of light entering the

swamp area is relatively low, causing little plant growth.

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Cite this article as :

Sitti Wirdhana Ahmad, Indrawati, Nurul Azizah, Ida Usman1, Damhuri, Lili Darlian, La Ode Muh. Munadi, "Composition and Diversity of Swamp Plants In Lawa District, Southeast Sulawesi ", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 10 Issue 5, pp. 83-88, September-October 2023. Available at doi : https://doi.org/10.32628/IJSRSET2310521
Journal URL : https://ijsrset.com/IJSRSET2310521