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Analysis of Plant Vegetation in Sekipan Forest Tawangmangu District, Karanganyar District

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ABSTRACT

The purpose of this study was to determine the structure and composition of Vegetation structure and composition in Sekipan forest, Tawangmangu subdistrict, Karanganyar regency and to determine the tree species that dominate in the structure and composition of plant vegetation species in sekipan forest, Tawangmangu subdistrict, Karanganyar regency. This research is quantitative descriptive research. The population in this study was the vegetation in the skipan forest, Tawangmangu District, Karanganyar Regency, Central Java Province. The sample in this study is part of the area in the skipan forest, Tawangmangu District, Karanganyar Regency, Central Java Province. Method for sampling location using exploration. Data analisys using purpossive sampling. Sampling data collection for each observation using the plot sampling method. Data analysis techniques are calculated by calculating density, frequency, dominance, important value index, and diversity index. The results showed that the composition of plants in the Tawangmangu Karanganyar Sekipan Forest consisted of 52 plant species. *Leucaena leucocephala* has the highest density value with 110 trees/ha. The highest frequency was owned by the species *Pinus Mercusii* with 1.5%. The highest dominance is owned by *Pinus mercusii*, which is 70.95% and INP is 128.70%. A diversity index of 2.38617 indicates that diversity in sekipan forests is medium category.

1. INTRODUCTION

Biodiversity is the variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystem (Dickson, 2019). Biodiversity in the country of Indonesia is very high, which is found in forest and water resources, therefore Indonesia can be said to be a Mega Biodiversity Country. Biodiversity in Indonesia has been widely studied by experts. The results of various studies show that biodiversity in Indonesia consists of: lower plants commonly called herbs, shrubs, shrubs, saplings and trees. These types of plants are found in hilly areas and forests. These plants grow well with biotic and abiotic environmental factors that are suitable for these plants.

Plant diversity is spread throughout Indonesia. One of them is in the forest which forms a vegetation. Vegetation is a plant community that is included in the biotic component. Plants can occupy space in certain habitats according to the factors needed to grow and develop. These habitats are forests, hills, shrubs, grasslands, and so on. Vegetation in an area has a structure and composition that can be influenced by components in an ecosystem that interact with each other. Vegetation that can interact with various environments can grow well naturally in that area. Vegetation can also undergo drastic changes due to anthropogenic influences.

Vegetation is the aggregate of all the plants growing in an area and, as such, is the most conspicuous feature of most landscapes, already recognized by the early Greeks as a way of distinguishing one region from another. Vegetation involves populations of species of the local fl ora, which in turn involve different genetic, migration, historical or ecological elements. Vegetation is also composed of various plant forms and ecological plant types, reflecting various sizes, shapes and combinations. (Elgene, 2013). Vegetation is a collection of various types of plants that can live together in a certain area. In this togetherness of life, there are interactions that occur both among individual plants that make up the vegetation itself and with other organisms that live in the vegetation, so that vegetation is a living system that grows dynamically somewhere.

Vegetation analysis is a method for studying the composition of plant species in an area. In addition, it is also to study the form (structure) of vegetation and plant groups found. Large forest areas with diverse vegetation composition require detailed analysis, therefore the vegetation analysis activities are closely related to the sample. Detailed analysis of the relationship between vegetation and environment requires a detailed understanding of the environmental processes that influence vegetation, for example, knowledge of the processes the link rainfall to the availability of water to plants and of the physiological processes that govern its use by different species is essential (M.P. Austin, 2014). Vegetation analysis activities are carried out by determining various sample areas with a certain plot area (sample plot). Several selected sample plots can be used to represent the vegetation area. The selected sample plots must pay attention to three aspects, namely; the amount to be used, how to place the sample plots, and techniques for observing and analyzing data from the sample plots.

The purpose of this study was to determine the structure and composition of Vegetation structure and composition in Sekipan forest, Tawangmangu subdistrict, Karanganyar regency and to determine the tree species that dominate in the structure and composition of plant vegetation species in sekipan forest, Tawangmangu subdistrict, Karanganyar regency. A plant vegetation type describes the condition of the distribution of plant species in a certain area. Skipan forest vegetation consists of various kinds of plants. To find out the plants that make up the skipan forest vegetation, a study was carried out with the title "Analysis of Plant Vegetation in the Skipan Forest, Tawangmangu District, Karanganyar Regency".

2. MATERIALS AND METHODS

2.1. Method

This research is a type of exploratory research. The data is presented in a qualitative descriptive manner. Data collection techniques using exploration and inventory methods. Data is documented and identified by searching the literature review. The research was conducted in the area of the Skipan hill camp, Tawangmangu, Karanganyar, Central Java.

The population used in this study is the vegetation in the forest which is the skipan camping hill, Tawangmangu District, Karanganyar, Central Java. The sample used in this study is part of the skipan forest. Tawang Manggu District, Karanganyar Regency, Central Java Province. The areas used as samples are 8 plots divided by altitude as follows:

a. front area right and left (most west) near the entrance to the sikpan forest
b. forest center area left and right (north and south)
c. the central area of the forest on the left and right (north and south) with a slightly higher plain from the location b
d. the end of the forest with the highest plains of the skipan forest (easternmost) left and right (northern and southern parts.

2.2. Data analysis

Data analysis techniques can use parameters that are analyzed according to:

a. Density of a type (K)
K = Σ individual type/Area of example tile

b. Relative density of a type (KR)
KR = K of a type/K All types x 100 %

c. Frequency of a type (F)
F = Σ Sub− tile found of type/Σ All sub−example tiles

d. Relative frequency of a type (FR)
FR = F of a type/ F of all types x 100%

The plant frequency classes are:
Class A : 0 -20%
Class B : 21 - 40%
Class C : 41 - 60%
Class D : 61 - 80%
Class E : 81 – 100 %

e. Dominance of a type (D)
D = Base field area of a type/Example tile area
Base Area = π x (rod diameter/2)2

f. Relative dominance of a type (DR)
DR = D of a type/D of all types x 100%

g. Important Value Index (INP)
INP = KR + FR + DR

Information:
FR = Relative Frequency,
KR = Relative Density,
DR = Relative Domination

h. Diversity Index

$$H' = -\sum \left(\boldsymbol{ni/N} \right) \mathbf{ln}\left(\boldsymbol{ni/N} \right)$$

Information:
H' : Shannon-Wienner Diversity Index
Ni : the number of an individual type
N : total number of individuals of all species found

The definition of the formula above is as follows:
a. If the value of H'> 3 means that the diversity of species is high
b. b. If the value of H' 1 H' 3 means that the diversity of species is moderate
c. c. If the value of H',1 means that species diversity is low.

3. RESULTS AND DISCUSSION

3.1. Research result

From research activities that have been carried out in the Skipan Tawangmangu forest, Karanganyar regarding vegetation analysis, the results obtained are:

3.1.1. Plant data from the 10 plots used for analysis are presented in the following table

Table 1. Plant data with measurements of its diameter and area

Plot	Plant species	Tree diameter (m)	Tree diameter (m)	Radius (r) (meters)	Base Area (m)
1	*Pinus mercusii*	5.92	5.93	2.96	27.60
	Pinus mercusii	2.05	2.06	1.03	3.33
	Pinus mercusii	4.21	4.21	2.11	13.91
	Pinus mercusii	4.73	4.74	2.370	17.63
	Pinus mercusii	3.67	3.68	1.840	10.63
2	*Cyantheaceae*	7.22	7.23	3.615	41.03
	Leucaena leucocephala	3.7	3.7	1.850	10.75
	Dracaena angustifolia	0.95	0.95	0.475	0.71
	Dracaena angustifolia	0.95	0.95	0.475	0.71
	Dracaena angustifolia	0.85	0.85	.425	0.57
	Dracaena angustifolia	0.70	0.70	0.350	0.39
	Cajanus cajan	1.22	1.23	0.615	1.19
	Leucaena leucoephala	1.34	1.34	0.670	1.41
3	*Pinus mercusii*	6.20	6.20	3.100	30.18
	Pinus mercusii	5.85	5.85	2.925	26.86
	Pinus mercusii	8.40	8.40	4.200	55.39
	Pinus mercusii	5.35	5.35	2.675	22.47
	Coffea L.	2.75	2.75	1.375	5.94
	Coffea L.	1.42	1.41	0.705	1.56
	Coffea L.	1.20	1.20	0.600	1.13
4	*Acer neugunda L.*	1.45	1.45	0.73	1.65
	Leucaena leucocephala	3.85	3.85	1.93	11.63
	Leucaena	3.10	3.10	1.55	7.54

Plot	Plant species	Tree diameter (m)	Tree diameter (m)	Radius (r) (meters)	Base Area (m)
	leucocephala				
	Leucaena leucocephala	1.45	1.45	0.73	1.65
	Leucaena leucocephala	1.60	1.60	0.80	2.01
	Leucaena leucocephala	1.67	1.68	0.84	2.22
	Leucaena leucocephala	1.30	1.30	0.65	1.33
	Leucaena leucocephala	2.45	2.45	1.23	4.71
	Leucaena leucocephala	2.45	2.45	1.23	4.71
	Gnetum gnemon	4	4	2.00	12.56
5	*Pinus mercusii*	6.15	6.15	3.07	29.69
	Pinus mercusii	6.70	6.70	3.35	35.24
	Gnetum gnemon	6.80	6.80	3.40	36.29
6	*Pinus mercusii*	1.25	12.5	6.25	122.66
	Pinus mercusii	11.50	11.50	5.75	103.82
	Ruellia simplex	68.5	0.69	0.35	0.37
	Moringa oleifera	60.5	0.6	0.30	0.28
	Crassocepha lum crepidiodes	0.40	0.4	0.20	0.13
	Ageratum conyzoides	0.51	0.5	0.25	0.20
7	*Camellia sinensis*	1.39	1.39	0.69	1.52
	Camelia sinensis	3.9	3.9	1.95	11.94
	Schima walichii	1.66	1.67	0.84	2.19
8	*Pinus mercusii*	2.71	2.71	1.36	5.77
	Laucaena leucephala	6.20	6.21	3.10	30.27
	Pinus mercusii	3.91	3.92	1.96	12.06
9	*Citrus sp*	1.14	1.14	0.57	1.02
	Citrus sp	1.3	1.3	0.65	1.33
	Teotona grandis	1.2	1.2	0.60	1.13
10	*Terminalia catappa*	0.15	0.15	0.08	0.02
	Corydline fruticosa	0.32	0.32	0.16	0.08
	Corydline fructicosa	0.33	0.33	0.17	0.09
	Dypsis litescens	1.00	1.03	0.52	0.83

3.1.2. Data from analysis (important value index)

The results of the data on plant species in the research that have been obtained, then calculated the relative density and density, relative frequency and frequency, relative dominance and dominance as well as the IVI. The results of the calculation analysis are presented in table 2 below:

Table 2. Data from the analysis of density and relative density, relative frequency and frequency, relative dominance and dominance as well as plant important value index.

No	Spesies	K (ind/ha)	KR %	F	FR %	D (m2/ha)	DR %	INP %	H'
1	*Pinus mercusii*	15.00	28.85	1.5	28.85	0.4884	70.95	128.64	0.35861
2	*Cyantheaceae*	1.00	1.92	0.1	1.92	0.04103	5.97	9.87	0.07599
3	*Leucaena leucocephala*	11.00	21.15	1.1	21.15	0.07654	11.12	53.43	0.32859
4	*Dracaena angustifolia*	4.00	7.69	0.4	7.70	0.00226	0.33	15.71	0.1973
5	*Cajanus cajan*	1.00	1.92	0.1	1.92	0.00119	0.17	4.02	0.07599
6	*Coffea L.*	3.00	5.77	0.3	5.77	0.0085	1.23	12.77	0.16457
7	*Acer neugunda L.*	1.00	1.92	0.1	1.92	0.0016	0.23	4.08	0.07599
8	*Gnetum gnemon*	2.00	3.85	0.2	3.85	0.04885	7.10	14.79	0.12531
9	*Ruellia simplex*	1.00	1.92	0.1	1.92	0.00037	0.05	3.90	0.07599
10	*Moringa oleifera*	1.00	1.92	0.1	1.92	0.0002	0.03	3.88	0.07599
11	*Crassocephalum crepidiodes*	1.00	1.92	0.1	1.92	0.00012	0.02	3.86	0.07599
12	*Ageratum conyzoides*	1.00	1.92	0.1	1.92	0.00019	0.03	3.87	0.07599
13	*Camellia sinensis*	2.00	3.85	0.2	3.85	0.0134	1.95	9.64	0.12531
14	*Schima walichii*	1.00	1.92	0.1	1.92	0.00128	0.19	4.03	0.07599
15	*Citrus sp*	2.00	3.85	0.1	1.92	0.00234	0.34	6.11	0.12531
16	*Tecotona grandis*	1.00	1.92	0.2	3.85	0.00113	0.16	5.93	0.07599
17	*Terminalia catappa*	1.00	1.92	0.1	1.92	0.00001	0.00145	3.85	0.07599
18	*Corydline fruticosa*	2.00	3.85	0.2	3.85	0.00008	0.01	7.70	0.12531
19	*Dypsis litescens*	1.00	1.92	0.1	1.92	0.00091	0.13	3.98	0.07599
	Total	**52**	**100**	**5.2**	**100**	**0.69**	**100**	**300**	**2.38617**

3.1.3. Data of Coordinate Points from Plot 1-10

Table 3. The coordinate points of each plot

PLOT	COORDINATE POINT
plot 1	S07°40.364'E 111°08.842
plot 2	S07°40.344'E 111°08.834
plot 3	S07°40.363'E 111°08.853
plot 4	S07°40.124'E 111°08.631
plot 5	S07°40.404'E 111°08.879
plot 6	S07°40.438'E 111°08.734
plot 7	S07°40.477'E 111°08.884
plot 8	S07°40.368'E 111°08.795
plot 9	S07°40.385'E 111°08.790
plot 10	S07°40.366'E 111°08.775

3.2. Discussion

Vegetation is a group of plant communities that live in a particular area. the existence of plant vegetation in an area can have a positive effect on the balance of the ecosystem in a wider scope. Conversely, the absence of plant vegetation will have an impact on ecosystem imbalances so that it can be used as an illustration of ecosystem damage, including forest ecosystems (Latuhima, 2019). The plant vegetation is so wide and the variety of plant species makes it possible for researchers to carry out analysis.

The vegetation structure is divided into several groups. This grouping is based on growth form, size, crown shape, leaf function, and leaf texture and size. Based on the size, in plain view the vegetation can be seen from the height of the vegetation in question. Likewise, if it is based on the shape and size of the leaves, vegetation can be seen from the size, width, small, like needles, grass, and a combination of these forms. By feeling the sensation, you can immediately feel the structure of the leaves, whether they are hard, papery, or succulent. Finally, based on their covering capacity, vegetation has very diverse covering abilities. Very tall plants have a variable coverage area. However, even very tall plants have a horizontal cover with a large area. The closure can relatively be used as a cover, some are made to connect, and some are separated (Khambali, 2017).

Vegetation analysis is a method used to determine the distribution of various types of plant species found in a certain area. Vegetation analysis can facilitate information related to interactions between plants and also interactions with environmental factors. Vegetation analysis activities can be carried out by direct observation by making sample plots in the form of plots. This activity must be continued by observing the morphology, describing and identifying the vegetation found. In large forest conditions, vegetation analysis activities can be carried out by making sampling. The sampling was made to place the sample plots that we have provided as representative areas within the plant's habitat. The number of sample plots, the method of placing the sample plots and the vegetation analysis technique used need to be considered carefully so that the results are maximized. To carry out an analysis of a plant vegetation, the data that must be present is the type of plant, the diameter of the plant stem and the height of the plant. All of this data is needed to calculate the important value index of the forest community, which is then analyzed quantitatively and qualitatively to determine the distribution of biodiversity in an ecosystem.

In this research about Vegetation Analysis on Sekipan Hill, Tawangmangu. This vegetation analysis uses the plot method with a size of 10 m x 10 m. 10 plots were made with different altitudes. From the ten plots, 19 different plant species were found. Of the 19 species, the basal area was calculated as shown in table 4.1. Based on these calculations, the widest basal area is Pinus mercusii. This is because the number of Pinus mercusii is the most among other plants. So it seems to dominate the skipan forest vegetation.

Based on the entire plot size of 10 m x 10 m there are 52 species. The species Leucaena leucocephala has the highest density with 110 trees/ha. For the highest frequency belongs to the species Pinus mercusii with 1.5 %. This frequency is used as a parameter in plant vegetation which is used as the basis for the distribution of plant species at the species level in a studied habitat. This is in line with the statement in the Natural Resources and Environment Management Book (Damanik, 2018) which states the importance of analyzing vegetation in a habitat, namely to be able to find out the structure, abundance of species, distribution of vegetation in an ecosystem, and the relationship between the presence of plants and environmental factors environment.

Based on table 4.2, the species of each plant has been calculated, relative frequency and frequency, relative density and density, relative dominance and dominance as well as Important Value Index (INP). From the calculation results, the results are as shown in table 4.2, which shows that the most commonly found species is *Pinus mercusii* with a value of 70.95% and the least species found is *Terminalia catappa* with a value of 0.001%.

The highest Important Value Index or IVI in all plots measuring 10m x 10m was owned by Pinus mercusii with 128.639877% and the lowest Important Value Index or IVI was *Terminalia catappa*, which was 3.85%. So it can be seen that *Pinus mercusii* dominates the Tawangmangu Karanganyar sekipan forest. This is because the environmental conditions are very suitable for growth and development. The growth and development of a plant can be influenced by factors from within the plant itself and external factors, namely the habitat environment where the plant is located. Environmental factors that can be measured in the Skipan area at the time of the study were an altitude of 1244 masl, an air pressure of 872.3 hPa, and temperature of 25.7°C, and a humidity of 77%. The coordinate points in table 4.3 also affect the presence of species, causing one plant species to become dominant in a certain area according to the appropriate height.

4. CONCLUSIONS

The plant composition in the Tawangmangu Karanganyar Skipan Forest consists of 52 plant species. *Leucaena leucocephala* has the highest density value with 110 trees/ha. The highest frequency was owned by the species *Pinus Mercusii* with 1.5%. The highest dominance was owned by Pinus mercusii, namely 70.95% and the highest Importance Value Index or IVI was owned by the species *Pinus mercusii*, namely 128.70%.

The dominant plant species in the Tawangmangu Karanganyar Sekipan Forest is *Pinus mercusii*, which is 70.95% and INP is 128.70%. A diversity index of 2.38617 indicates that diversity in sekipan forests is medium category.

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