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HERBAL SPECIES DIVERSITY IN PUTROE ALOEH TOURISM AREA, JEUMPA DISTRICT, SOUTHWEST ACEH REGENCY

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ABSTRAK

Kehadiran vegetasi pada suatu daerah akan memberikan dampak positif bagi keseimbangan ekosistem dalam skala yang lebih luas. Herba berperan penting dalam mempertahankan kondisi vegetasi dan dalam proses siklus hara untuk pertumbuhan tumbuhan dalam suatu kawasan. Penelitian bertujuan untuk mengetahui komposisi vegetasi, nilai penting dan keanekaragaman spesies (Ĥ) herba di Kawasan Wisata Putroe Aloeh Kecamatan Jeumpa Kabupaten Aceh Barat Daya. Metode yang digunakan yaitu metode observasi dengan penentuan stasiun secara subjektif dan plot menggunakan metode kuadrat. Stasiun penelitian sebanyak 7 stasiun meliputi; tepi sungai sisi kiri bagian hilir, tepi sungai sisi kanan bagian hilir, tepi sungai sisi kiri bagian tengah, tepi sungai sisi kanan bagian tengah, tepi sungai sisi kiri bagian hulu, tepi sungai sisi kanan bagian hulu dan hutan sekitar. Setiap stasiun diletakkan 10 plot kudrat berukuran 2 x 2 m. Parameter yang diamati meliputi; kerapatan mutlak (KM) spesies, frekuensi mutlak (FM) spesies, dan dominansi mutlak (DM) spesies. Analisis data meliputi Nilai Penting (NP) spesies dan Indeks Keanekaragaman Spesies (Ĥ). Berdasarkan hasil penelitian diketahui 50 spesies herba yang terdiri dari 26 familia. Familia yang mendominasi yaitu Asteraceae (20%). Spesies yang memiliki nilai penting dengan kategori tertinggi yaitu *Selaginella doederleinii* (NP = 48,48), sedangkan spesies yang memiliki nilai penting dalam kategori terendah yaitu *Emilia sonchifolia* dan *Cyperus strigosus* (NP = 0,16). Indeks keanekaragaman spesies herba di lokasi penelitian dalam kategori sedang (Ĥ= 2,43).

Kata Kunci: Herba, Vegetasi, Nilai Penting Spesies, Keanekaragaman Spesies, Kawasan Wisata

ABSTRACT

The presence of vegetation in an area will positively impact the balance of the ecosystem on a broader scale. Herbs play an important role in maintaining vegetation conditions and cycling of plant growth in an area. The study aimed to determine the composition of vegetation, important values , and diversity index (Ĥ) of herbs in the Putroe Aloeh Tourism Area, Jeumpa District, and Southwest Aceh Regency. The method used is the observation method with the subjective determination of stations and plots using the quadratic method. Research stations as many as seven include; the downstreams left side of the river, the downstream right side of the river, the left middle side of the river, the middle right side, of the river the upstream left side of the river, the upstream right side of the river, and the surrounding forest. Each station is placed in 10 square plots measuring 2 x 2 m. Parameters observed include; absolute density (KM) of species, absolute frequency (FM) of species, and absolute dominance (DM) of species. Data analysis included the Important Value (IV) of species' Important Value (IV) y Index (Ĥ). Based on the research results, it is known that there are 50 herb species consisting of 26 families. The dominating family is Asteraceae (20%). The species with the highest category of importance value was *Selaginella doederleinii* (IV = 48.48), while the species with the lowest category were *Emilia sonchifolia* and *Cyperus strigosus* (IV = 0.16). The diversity index of herbaceous species at the study site was medium (Ĥ= 2.43).

Keywords: Vegetation, Species Important Values, Species Diversity, Tourism Areas.

INTRODUCTION

Indonesia is located in the tropics because its forests are tropical forest types. Tropical forests are strongly influenced by climatic and edaphic factors that affect the growth and composition of various species of community plants. Putroe Aloeh is one of popular tourism area in Southwest Aceh District that have not been investigate the diversity of herbs. The characteristic of a community in an environment is diversity. The entire plant community in ecology is called vegetation [1]. Vegetation is classified based on dominant species or life forms, physical habitats, or functions with broader characteristics. Vegetation is the whole plant that lives together in a place [2].

The presence of vegetation in an area has positively impacted the balance of the ecosystem on a wider a broader scale. The diversity of vegetation forms the strata of trees, shrubs, herbs, mosses, etc. One way to preserve the ecosystem is to maintain the condition of the vegetation, one of which is herbaceous vegetation [3].

Herbaceous vegetation is one of the vegetation that makes up the forest which is much smaller in size when compared to shrubs or trees. Herbaceous vegetation also functions as a wealth of germplasm; for example, the preservation of wild animals as ecosystem components are influenced by the presence and diversity of undergrowth as a place to live and a source of food [4].

Herbaceous plants have a crucial role in an area, herbs; protect the soil from rain falling onto the soil surface, improve the composition or structure of the earth with the ground's help of its roots, have strong competitiveness and high adaptation to the surrounding plants so they can grow in an empty place. Herbs also essential to the annual nutrient cycle, namely, the herb litter that is returned to the soil contains high levels of nutrients, which play a role in adding soil organic matter so that it can prevent erosion [5].

Vegetation analysis requires species data to determine the important value of the constituent communities of a place. Through vegetation analysis, quantitative information is obtained about the structure and composition of a plant community [6].

Information about herbaceous species at the study site has never been disclosed or recorded. Therefore, it is necessary to do research.

METHOD

This research was conducted in the Putroe Aloeh Tourism Area, Jeumpa District, and Southwest Aceh District. This research was conducted from February 2022 to August 2022. The tools and materials used included; a tape measure, wooden stakes, a camera, a hygrometer, a soil meter, a plastic bag, 70% alcohol, a set of plant collection tools, an observation sheet, label paper, raffia rope, scissors, and stationery.

Station Determination

The determination of the research stations was carried out using a purposive sampling technique so that the selected stations representing the riverbanks and surrounding forest were determined based on the characteristics of the environmental baseline for each station based on height, near/far from water sources, and light intensity. There are 7 (seven) research stations, including; the downstreams left side of the river, the downstream right side of the river, the left middle side of the river, the middle right side, of the river the upstream left side of the river, the upstream right side of the river, and the surrounding forest.

Sampling

Plot placement was carried out using the quadratic method at each observation station sampled by 10 square plots so that a total of 70 (seventy) samples were sampled with a square size of 2m x 2m. 70 (seventy) square size of 2m x 2m

Sample Identification

The herbs found in each plot were recorded with the species names the taxonomists gave, then the number of species was counted and documented. Meanwhile, herbal species whose scientific names are unknown are taken as samples, then preserved using 70% alcohol, and put in plastic bags for further identification using the Flora identification book for Schools in Indonesia [7] and identification applications (PlantNet and Google Lens).

Data analysis

The research data begins by calculating the absolute density, frequency, and dominance. The relative density, relative frequency, and relative dominance are calculated using the formula [8] as follows:

$$\text{Absolute Density} = \frac{\text{total number of the species}}{\text{wide of the plot}}$$

$$\text{Relative Density} = \frac{\text{the absolute density of the species}}{\text{total density of all species}} \times 100\%$$

$$\text{Absolute Frequency} = \frac{\text{the number of squares occupied by species}}{\text{the number of sample plot}}$$

$$\text{Relative Frequency} = \frac{\text{the absolute frequency of the species}}{\text{total frequency of all species}} \times 100\%$$

$$\text{Absolute Dominance} = \frac{\text{total species cover area}}{\text{total plot area}}$$

$$\text{Relative Dominance} = \frac{\text{absolute dominance of the species}}{\text{the dominance of all the species}} \times 100\%$$

Density, frequency and dominance data were then analyzed to

determine the importance of the species using the formula [9] as follows:

$$IV = KR + FR + DR$$

Information:

IV = Important Value

KR = Relative Density FR = Relative Frequency DR = Relative Dominance.

For the meaning of IV to be interpreted, it is necessary to determine the categories, namely High (T), Moderate (S), and Low (R), with a description of the formula [10] as follows:

$$IV = \frac{\text{Higest Value} + \text{Lower Value}}{3}$$

To determine variations in species composition or diversity index, the Shannon-Wiener index ($\hat{H}$) equation is used [11]

$$\hat{H} = -\sum (pi)\,(\ln.\ pi)$$

Information:

$\hat{H}$ = Diversity index
ni = The number of important values of the 1st species
N = Total of the important values of all species in the community
pi = ni/N, the ratio between the important values of each type with the total important values of all types.
ln = natural logarithm (natural number)

So that the meaning of the Shannon-Whiener species diversity index ($\hat{H}$) can be interpreted, criteria are used [10]. Where if the value of $\hat{H} \leq 1$ category is very low if $\hat{H} \geq$ 1-2 categories are low if $\hat{H} \geq$ 2-3 categories are moderate, if $\hat{H} \geq$ 3-4 categories are high, and if $\hat{H} \geq 4$ categories are very high.

RESULTS AND DISCUSSION

The research results obtained 50 herb species consisting of 26 families. Vegetation composition, important value, and species diversity index at the study site are presented in Table 1

Table 1. Species Composition, Importance Value and Diversity Index

No	Region Name	Spescies	Familia	IV	$\hat{H}$
1	Rumput Israel	*Asytasia gangetica* (L.) T. Anderson.	Acanthaceae	36,74	1,17
2	Cakar ayam	*Selaginella doederleinii* Hieron	Selaginellaceae	48,48	1,61
3	Rumput keranjang	*Oplismenus hirtellus* (L.) P. Beauv.	Asparagaceae	6,73	0,50
4	Sirih cina	*Peperomia pellucida* (L.)	Piperaceae	1,01	0,09

No	Region Name	Spescies	Familia	IV	Ĥ
		Kunth.			
5	Pecut kuda	*Stachytarpheta jamaicensis* (L.) Vahl.	Verbenaceae	15,90	0,95
6	Sintrong	*Crassocephalum crepidioides* Benth.	Asteraceae	14,12	0,71
7	Sembung rambat	*Mikania micrantha* Kunth.	Asteraceae	5,87	0,48
8	Bandotan	*Ageratum conyzoides* L.	Asteraceae	5,65	0,43
9	Jotang kuda	*Synedrella nodiflora* (L.) Gaertn.	Asteraceae	2,08	0,15
10	Ketul	*Bidens pilosa* L.	Asteraceae	3,32	0,28
11	Kenikir	*Cosmos sulphureus* Cav.	Asteraceae	0,27	0,03
12	Tempuh wiyang	*Emilia sonchifolia* (L.) DC.	Asteraceae	0,16	0,02
13	Bunga jopan	*Clibadium surinamense* L.	Asteraceae	0,65	0,06
14	Daun ungu	*Praxelis clematidea* (Griseb.)	Asteraceae	12,01	0,77
15.	Kirinyuh	*Euphatorium odoratrum* L.	Asteraceae	4,46	0,32
16	Jintan	*Plectranthus amboinicus* Lour.	Lamiaceae	5,89	0,39
17	Rimangi	*Plectranthus monostacyus* P. Beauv.	Lamiaceae	1,88	0,14
18	Kenop	*Hyptis capitata* Jacq.	Lamiaceae	0,63	0,06
19	Jukut pendul	*Kyllinga nemoralisn* J.R. Forst	Cyperaceae	8,23	0,63
20	Rumput Teki	*Cyperus rotundus* L.	Cyperaceae	2,41	0,22
21	Rumput kacang palsu	*Cyperus strigosus* L.	Cyperaceae	0,16	0,02
22	Rumput pait	*Axonopus compressus* Sw. Beauv.	Poaceae	4,96	0,40
23	Rumput kerbau	*Paspalum conjugatum* P.J.Bergius.	Poaceae	11,59	0,50
24	Alang-alang	*Imperata cylindrica* (L.) P.Beauv.	Poaceae	5,79	0,36
25	Bayam pasir	*Cyathula prostata* L.	Amaranthaceae	0,55	0,06
26	Keladi	*Philodendron* sp.	Araceae	6,62	0,52
27	Keladi dwiwarna	*Caladium bicolor* (Aiton) Vent.	Araceae	0,34	0,04
28	Keladi tikus	*Typhonium flagelliforme* (Lodd.) Blume.	Araceae	0,17	0,02
29	Peace lily	*Spathiphyllum bandlum* Schott.	Araceae	0,51	0,07
30	Pisang	*Musa* sp.	Musaceae	1,60	0,15
31	Putri malu	*Mimosa pudica* L.	Fabaceae	4,95	0,32
32	Daun picah	*Desmodium gangeticum* (L.) DC.	Fabaceae	0,19	0,02
33	Bunga mata kucing	*Legazpia polygonoides* (Benth.) T. Yamaz	Linderniaceae	15,46	0,62

No	Region Name	Spescies	Familia	IV	Ĥ
34	Anggrek payung	*Nervilia aragoana* Gaudich.	Orchidaceae	2,69	0,26
35	Bunga pukul delapan	*Turnera ulmifolia* L.	Turneraceae	3,89	0,33
36	Rumput bunga putih	*Spermacoce ocymoides* Burm.f.	Rubiaceae	4,90	0,41
37	Rumput Edrastima	*Edrastima uniflora* L.	Rubiaceae	2,80	0,22
38	Rumput mutiara	*Hedyotis diffusa* Willd.	Rubiaceae	0,56	0,06
39	Ophiorriza	*Ophiorriza pumila* L.	Rubiaceae	6,95	0,50
40	Kingkilaban	*Mussaenda frondosa* L.	Rubiaceae	4,49	0,35
41	Meniran	*Phyllanthus urinaria* L.	Euphorbiaceae	5,42	0,47
42	Akar slemang	*Merremia umbellata* (L.) Hallier f.	Convolvulaceae	0,76	0,09
43	Daun balsem	*Polygala paniculata* L.	Polygalaceae	12,81	0,78
44	Daun katemas	*Euphorbia heterophylla* L.	Euphorbiaceae	15,03	0,58
45	Sacatrapo	*Caperonia pallustris* L.	Euphorbiaceae	1,38	0,11
46	Cocor bebek	*Kalanchoe pinnata* (Lam.) Pers.	Crassullaceae	1,57	0,12
47	Garaman	*Oxalis carniculata* L.	Oxalidaceae	2,93	0,26
48	Temu kunci	*Boesenbergia rotunda* (L.) Mansf.	Zingiberaceae	1,39	0,15
49	Daun bungkus	*Smilax zeylanica* L.	Smilacaceae	1,36	0,13
50	Sidagori	*Sida rhombifolia* L.	Malvaceae	1,65	0,13
		Total		**300**	**2.43**

Based on Table 1, it is known that the IV of each herb species at the study site is different, so it can be grouped based on the following criteria; High (T), Medium (S), and Low (R). However, from the results of the IV calculation, there are only species in the High and Low categories. In contrast, for the Moderate category, there are no species that have a range of important values in the category. Species with the high IV category were *Selaginella doederleinii* (IV= 48.48), while species with the lowest IV were *Emilia sonchifolia* and *Cyperus strigosus* which both had (IV= 0.16). The grouping is based on a formula [10] namely, herb species that have a range of IV≥32.42 are categorized as high, IV≥ 16.21-32.42 classified as medium, and IV ≤ 16.21 are categorized as low.

The presence of *Selaginella doederleinii* species was found at all research station points. The existence of dominant species is influenced by several factors, including competition between existing plants, in this case, related to the climate and minerals needed; if the environment and mineral required are met then these species will have superior competitiveness compared to plants. Others will be found with more numbers or a high spread [12].

Ecologically, the value of vegetation is determined by the function of the dominant species, which results from the interaction of the components in the ecosystem. Dominant (ruling) species in a dominant plant community are of the highest importance in the ecosystem concerned [13].

The importance value of plant species in a community is one of the parameters indicating the role of these plant species in a community. If a species has a high importance value, then the species plays a crucial role in the community. The higher the value means the more important the role and the better the adjust community's adjustment and utilization of energy resources *Laginella doederleinii* forms dense stands which can out with high IV reflect these increased' high ability to adapt to the existing environment and ese species to adapt to different existing environment and can compete with other types [14].

This is due to the nature or character of the Selaginellaceae family, which can grow in various climates and soil types and is easily found in areas with sufficient humidity, moderate and shaded sunlight, on cliffs, river banks, and sites with flat surfaces. Environmental conditions in the Putroe Aloeh Tourism Area, Jeumpa District, are presented in Table 2.

Table 2. Environmental Conditions of Research Locations

No	Location	Air Temperature (℃)	Humidity (%)	Humidity Land (%)	pH Land	Intensity Light (Cd)
1	Station I	28.85	73.5	75	6,6	900
2	Station II	28.55	73.5	75	6,6	1020
3	Station III	28,25	76.5	77	6,5	1030
4	Station IV	27.95	76.5	77	6,5	1030

No	Location	Air Temperature (℃)	Humidity (%)	Humidity Land (%)	pH Land	Intensity Light (Cd)
5	Station V	27.85	78.5	78	6,3	1050
6	Station VI	27.65	78.5	78	6,3	1050
7	Station VII	26.85	80.0	70	6,8	600
Average		27.99±0.6	76.71±2.3	76±2.6	6.5±0.2	954.29±152.4

Based on Table 2, it is known that the environmental conditions in the Putroe Aloeh Tourism Area have high levels of temperature and humidity and are very suitable for the habitat of *Selaginella* species because the place is a river area or close to a water source, *Selaginella* is a plant that requires much water for growth and its reproduction so that these plants are found living in damp areas such as springs, mountain slopes, rivers and damp cliffs [15].

Environmental conditions with sufficient humidity and lots of water can speed up the reproduction process and the growth rate of *Selaginella doederlenii* species which causes the high importance of this species in research locations. The species with a high IV in plant ecology are known as notable (exclusive) in terms of quantitative values for frequency, density, and dominance [10].

Meanwhile, the lowest IV was *Emilia sonchifolia* and *Cyperus strigosus*, where both had (IV = 0.16). A low importance value indicates that the species has the least amount in all study stations. *Emilia sonchifolia* and *Cyperus strigosus* are members of the families Asteraceae and Cyperaceae, where the families Asteraceae and Cyperaceae are families that are easy to grow and spread in various places, especially in dry areas; this causes a lack of distribution of species in the seven research stations, the number of species found is small, the mastery of small species or the lack of dominance these two species have in the study area.

Differences in the dominance of a species in certain areas, according to other research, can also be caused by environmental conditions related to competition between different species. Even though the living requirements of a plant have been fulfilled, if it does

not have high competitiveness and is unable to compete, then the strongest species will suppress the growth rate of other species so that the losing species become less adaptive, which then causes a low reproduction rate and density [16].

The presence and distribution of high species will affect a community's diversity index. The diversity index is a quantitative measure (count) that reflects how many the number of species in a set (community).

A plant community's high or low diversity index depends on the number of species and individuals of each type (species richness). Species diversity can be used to express community structure [17]. Diversity index data for all stations is presented in Table 3.

Table 3. Herb Species Diversity Index at all Stations

No	Station	Number of Species	Species Diversity Index (Ĥ)
1.	I	14	1.90
2.	II	19	2.09
3.	III	24	2.62
4.	IV	23	2.80
5.	V	25	2.84
6.	VI	25	3.02
7.	VII	13	1.77
Average			2.43 (moderate)

The diversity of herb species found was in the moderate category. The differences in species at each research station were minimal. Thus herb species that lived at all research stations were relatively the same in terms of species and the number of species. The environmental conditions of each station will affect the species diversity index at that station.

Herbs at riverside stations or near water sources have a higher number of species and individuals than herbs found at surrounding forest stations due to environmental factors that influence them. Station VI is the station that has the highest species diversity index compared to other stations; this is due to the large number of species and the number of individuals found at this station, as well as environmental conditions that strongly support the growth of herbaceous plants.

Station VII is the research location with the lowest diversity index of the other six stations; when viewed from the number of species where at this location, only 13 species were found. The number of species found at station VII is the least among the other stations. The higher a place is usually

associated with an increase in openness, wind speed, air humidity, and a decrease in temperature, resulting in a more homogeneous community [5].

This causes fewer ground cover plants to be found in closed stands because these stands are located higher than open stands and are also due to the large amount of tree shade which makes it difficult for light to enter for the process of photosynthesis and reproduction of herbaceous plants.

The surrounding forest stations produce the fewest species because the air humidity in this area is very high, so the transpiration rate is low, and the absorption of nutrients is also common; as a result, the availability of nutrients for herb growth is reduced, so that their growth will also be stunted. Then, the intensity of sunlight in this place is also low because the shade is tightly closed by the big trees around the forest, so the photosynthesis and reproduction process could improve. This is under the statement that the greater the level of shade (the lower the intensity of light received by the plants), the lower the air temperature and the higher the air humidity [18].

CONCLUSION

Research results in the Putroe Aloeh Tourism Area, Jeumpa District, and Southwest Aceh District found 50 herb species from 26 families. The importance value of the highest species category was *Selaginella doederleinii* (IV = 48.48), while the species with the lowest category of IV were *Emilia sonchifolia* and *Cyperus strigosus* (IV = 0.16). The level of diversity of herbaceous species is in the moderate category ($\hat{H}$= 2.43).

SUGGESTION

We hope this research can be developed further by conducting further research on the analysis of other herbaceous vegetation on different vegetation so that data can be obtained at various locations and compared.

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