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by Susilawati .

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GROUND COVER PLANTS DIVERSITY IN MANDIANGIN HILL FOREST AREA WITH A SPECIAL PURPOSE OF SOUTH KALIMANTAN PROVINCE, INDONESIA

Susilawati*, **Rezekiah Arfa Agustina**, **Fithria Abdi**, **Hafizianor**, **Satriadi Trisnu**, **Rudy Gusti Seransyah**
Faculty of Forestry, University of Lambung Mangkurat, South Kalimantan, Indonesia
*E-mail: susilawati@ulm.ac.id

ABSTRACT
ULM's Special Purpose Forest Area (KHDTK) has an area of 1,617 ha. Areas included in the ULM KHDTK are Bukit Besar, Mandiangin Hill, Pamaton Hill, Pandamaran Hill, each of which has a different altitude. Ground cover plants diversity studies have been carried out at Mandiangin Hill within several elevations. The aims of this study were (1) to analyze the distribution and abundance of ground cover plants (2) to analyze the Important Value Index for ground cover plants and (3) to identify the diversity index of ground cover plants. The research method used is vegetation analysis through *purposive sampling* to get the Important Value Index (INP), the Species Diversity Index (*H'*), Evenness Index (*e*), Community Similarity Index (*IS*) and the effect of altitude on the number of species. The results showed that the highest INP value for ground cover plants from all altitudes was dominated by Rumput minyak (*Brachiaria humidicola)*, (*H')* score of the level of ground cover plants at all heights is moderate, the value (*e*) is almost evenly distributed, the value of (*IS*) is low, and the ANOVA test shows no significant difference between the effect of altitude on the number of species found in the study area.

KEY WORDS
Ground cover plants, altitude, species diversity.

The presence of ground cover plants in a forest ecosystem apart from being a source of biodiversity also plays a role in protecting soil and soil organisms, helping to create a microclimate on the forest floor, protecting soil from erosion and maintaining soil fertility. Ground cover plants has a large root system so that it produces dense clumps and is able to prevent soil erosion, as a soil protector from raindrops and surface runoff, also plays a role in increasing organic matter in the soil (as green manure and mulch) (Erna, 2017)

Ground cover plants is a plant consisting of ground cover plants other than tree rejuvenation, for example grass, herbs and shrubs or shrubs and ferns (Abrori, 2016). In addition to ecological functions, several levels of regeneration and ground cover plants have been identified as plants that can be used as food, medicinal plants and as an alternative energy source. But not infrequently also ground cover plants can act as weeds that inhibit the growth of tree rejuvenation. Santoso in Abrori 2016 stated that the diversity of regeneration and ground cover plants species is very high, causing the possibility that there are still many types of rejuvenation and other ground cover plants that have not been identified, so it is not clear what the diversity and community structure actually is.

The ULM KHDTK area is adjacent to the Sultan Adam Forest Park (Tahura). Mandiangin Hill is included in the KHDTK Area which has a height of approximately 275 meters above sea level. This hill still has quite extensive natural forest vegetation. The occurrence of a succession process in the ULM KHDTK Area caused a change in the composition of the existing vegetation in the area including Mandiangin Hill. The existence of tree shade, soil quality and environmental conditions formed were responded to by the presence of various species, including regeneration and ground cover plants, both shrubs, herbs and grasses. The problem that arises is how the distribution and abundance of ground cover plants species at different altitudes in the Bukit Mandiangin area. Specifically, it will be studied which types of ground cover plants can be present at different altitudes, how they are distributed and their abundance, important value index and diversity index. The distribution

and abundance of the ground cover plants level is important to study given their role in an ecosystem.

MATERIALS AND METHODS OF RESEARCH

This research was carried out for ± 3 months (June 2022 – August 2022) at Bukit Mandiangin KHDTK ULM Mandiangin Village, Karang Intan District, Banjar Regency, South Kalimantan which included research activities, data processing and research report writing. The tools used in this study are research location maps, GPS (*Global Positioning System*), *lightmeter, thermohygrometer*, raffia rope, tape measure, machete, white board, camera and laptop. The materials used in this study were ground cover vegetation at the study site. This study uses 2 types of data, namely primary and secondary. Primary data obtained from direct data collection in the field which is then recorded in *tallysheet* vegetation analysis.

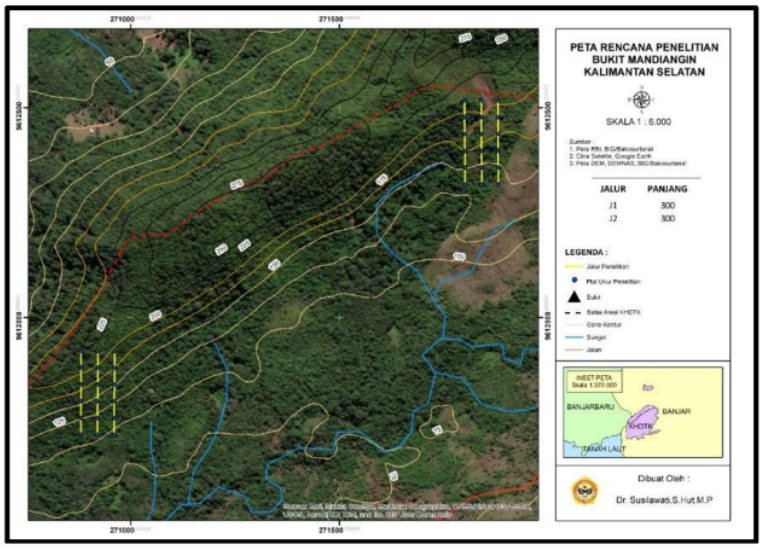

Figure 1 – Map of Research Locations

Data analysis and processing in this study included the calculation of important value index (INP), species diversity index (*H'*), evenness index (*and*), community similarity index (*IS*) and the ANOVA test so as to produce data that is quite complex about the ground cover plants at the study site.

RESULTS AND DISCUSSION

Based on the results of observations at the research location for the composition of the ground cover vegetation can be seen in Table 1. For ground cover plants, it was found that several species were able to be present at all altitude levels such as Ilalang (*Cylindrical orders*), Litu (*Climbing Lygodium*), Rumput minyak (*Brachiaria humidicola*) and Tratat (*Acroceras munroanum*). This high level of presence can occur because these species are able to grow and develop and adapt well to the environment in which they grow. According to Ewusie (1980) altitude is a factor that determines the accuracy of the location for habitat for a type of vegetation, where variations in topography and altitude can affect the nature and distribution of plant communities. There are at least two reasons for this clustering pattern to occur, one of which is related to the reproduction of seeds or fruit which tend to fall close to their parents and to soils that are close to their microclimatic conditions (Barbour *et al.,* 1987). According to Silvertown (1982) a safe and conducive habitat will greatly support the

existence of seeds of a species. According to Heriyanto & Garsetiasih (2005) some species have a wide tolerance range so that they can be found in several habitats. The natural regeneration ability of a plant also affects production and population growth.

Table 1 – Presence and Composition of Ground Cover Vegetation at All Altitudes

No	Type Name	Scientific name	Altitude Level		
			Low (125-150 masl	Moderate (150-175 masl)	High (175-200 masl)
1	Balik kadap	Spiraea cantoniensis	+	-	+
2	ilalang	Imperata cylindrica	+	+	+
3	Ilatung	Dypsis lutescens	+	-	-
4	Kanjar-kanjar	Eleusine indica	-	+	+
5	Karamunting	Melastoma candidum	-	-	+
6	Laladingan	Lophatherum gracile	-	-	+
7	Litu	Lygodium scandens	+	+	+
8	Mambap	Corylus avellana L	+	+	-
9	Paikat	Chasmanthium latifolium	+	+	-
10	Paku dandang	Pteridium aquilinum	+	-	+
11	Riu-riu	Lycopodiella cernua	-	+	+
12	Rumput balik kadap	-	+	-	-
13	Rumput minyak	Brachiaria humidicola	+	+	+
14	Rumput Tingkah	Falcaria vulgaris	-	+	-
15	Rumput tintah	Bromus sterilis	+	+	-
16	Tampukas	Alopecurus pratensis L	-	-	+
17	Tapus	Etlingera sp.	-	+	-
18	Tratat	Acroceras munroanum	+	+	+
	Total		11	11	11

Note: a) (+) = present in the plot; b) (-) = not present in the plot.

If the INP value of a type of vegetation is high, then that type greatly affects the stability of the ecosystem (Agustina, 2008). According to Soegianto (1994) the importance value index is a quantitative parameter that can be used to express the level of dominance (level of mastery) of species in a plant community. The IVI value of ground cover plants at lower elevations can be seen in Figure 1.

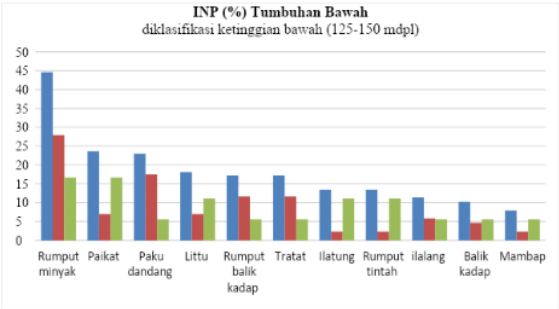

Figure 1 – Important Value Index of Ground Cover Plants at Lower Altitude

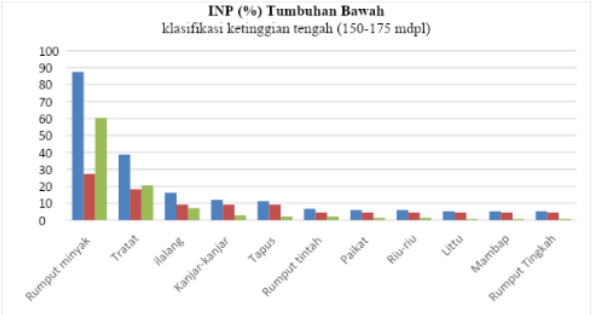

Figure 2 – Important Value Index of Ground Cover Plants at Middle Altitude

Rumput minyak (*Brachiaria humidicola*), Paikat, Paku dandang (*Pteridium aquilinum*), Litu (*Lygodium scandens*), Rumput balik kadap, Tratat (*Acroceras munroanum*), Rumput tintah, ialalang (*Imperata cylindrica*), Balik kadap, and Mambab. The highest INP value is the type of Rumput Minyak (*Brachiaria humidicola*) of 45% obtained from the sum of 27.9% KR and 17% FR. and the lowest INP value of this type, namely Mambab, is 8%. The difference in the INP value of Rumput minyak (Brachiaria humidicola) and Mambab is 37%. For INP ground cover plants at middle altitude (150-175 masl) can be seen in Figure 2.

Rumput minyak (*Brachiaria humidicola*), Tratat (*Acroceras munroanum*), ilalang (*Imperata cylindrica*), Kanjar-kanjar, Tapus Rumput tintah, Paikat, Riu-riu, Litu (*Lygodium scandens*), Mambab and Rumput tingkah. The type that has the highest INP value is still the same as the previous height, namely Rumput minyak (*Brachiaria humidicola*) of 88% and the lowest INP value, namely Rumput tingkah of 5%. The difference in INP value of Rumput minyak (*Brachiaria humidicola*) with Rumput tingkah of 8[illegible]. The INP value of the ground cover plants level at the upper altitude (175-200 masl) can be seen in Figure 3.

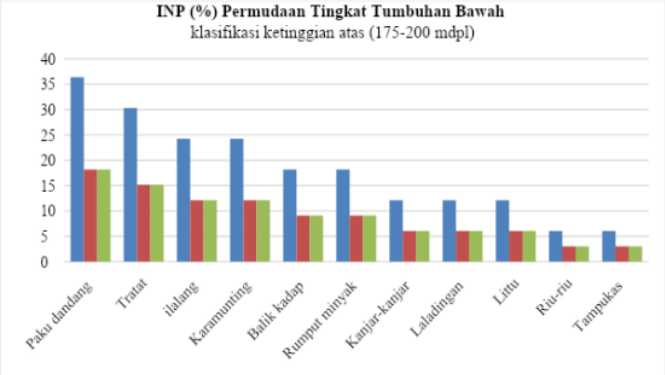

Figure 3 – Important Value Index of Ground Cover Plants at Upper Altitude

Paku dandang (*Pteridium aquilinum*), Tratat (*Acroceras munroanum*), ilalang (*Imperata cylindrica*), Karamunting (*Melastoma candidum*), Balik kadap, Rumput minyak (*Brachiaria humidicola*), Kanjar-kanjar, Laladingan (*Lophatherum gracile*), Litu (*Lygodium scandens*), Riu-riu, and Tampukas. The highest INP value is the type of Paku dandang (*Pteridium aquiline*) of 36% and the lowest INP value, namely the Tampukas type of 6%. The difference of INP value between the Paku dandang (*Pteridium aquiline*) and Tampukas is 30.

Species Diversity Index *(H')* the level of ground cover plants at all altitudes can be seen in Table 2.

Table 2 – Index of Diversity of Ground cover plants Species at All Altitudes

No	Growth Rate	Altitude (asl)	Total Types	*(H')*	Criteria
1	Ground plants	125-150	11	2,28	Moderate
		150-175	11	1,82	Moderate
		175-200	11	2,27	Moderate

Source: Processed primary data, 2022.

Based on Table 2 the value of the species diversity index (*H'*) ground cover plants at all heights if adjusted by *Shannon-Weiner* category about the index value (*H'*) which when the value is $1 < H' < 3$ then includes moderate criteria which can be interpreted as moderate diversity and moderate community stability or no certain species tend to dominate other types, because in that area the types of vegetation found are quite diverse or varied. Score (*H'*) can measure the maturity of a plant community. A plant community is said to be mature when it is more complex and more stable or of value $H' > 3$ which is high.

Species Evenness Index (*e*) the level of ground cover plants at all altitudes can be seen in Table 3.

Table 3 – Evenness Index of Ground cover plants Species at All Altitudes

No	Growth Rate	Altitude (asl)	Total Types	*(and)*	Criteria
1	Ground Plants	125-150	11	0,95	Almost evenly
		150-175	11	0,76	Almost evenly
		175-200	11	0,94	Almost evenly

Source: Processed Primary Data, 2022.

Based on Table 3 the value of the evenness index (*e)* According to Magurran (1988), the ground cover plants at all heights are almost evenly distributed. This high enough (*e*) score means that the plants found in the research location have a fairly good and fairly even distribution of species, so that the community balance tends to be quite stable, although what is good is if the value (*e)* the criteria are evenly distributed so that the balance of the community is really stable.

Community similarity index *(IS*) ground cover plants at all altitudes can be seen in Table 4.

Table 4 – Similarity Index Value (*IS*) Ground Plants at All Heights Places

Location 1	B	T	C (B-T)	IS	B	A	C (B-A)	IS	T	A	C (T-A)	IS
Ground plants	6	10	2	25.00	13	18	3	25.00	10	18	4	28.57
Location 2	B	T	C (B-T)	IS	B	A	C (B-A)	IS	T	A	C (T-A)	IS
Ground plants	12	10	4	36.36	12	14	3	23.08	10	14	2	16.67

Note: 1. B = Altitude 125-150 masl; 2. T = Altitude 150-175 masl; 3. A = Altitude 175-200 masl; 4. C (B-T/B-A/T-A) = The amount of the same type/vegetation; 5. IS = Similarity Index (%).

Based on Table 4 Similarity Index value (*IS*) is divided into 2 (two) locations. Calculation of (*IS)* highest in location 1 the level of ground cover plants, namely between T-A (altitude 150-175 masl with an altitude of 275-200 masl) of 28.57% and in location 2 (*IS)* the highest is between B-T (altitude 125-150 masl with an altitude of 150-175 masl) of 36.36%. According to Odum (1993) the value (*IS)* (%) ground cover plants in locations 1 and 2 is in the low category, except for the value (*IS*) the lower plant between B-T is of moderate value.

Table 5 – ANOVA Test of Ground cover plants Level at Locations 1 and 2

Lower Growth Level ANOVA T (Location 1)						
SK	Db	JK	KT	F count	F table (0.05)	Information
Treatment	2	0.78	0.39	0.17	3.68	*H0 is accepted*
Error	15	35.00	2.33			
Total	17	35.78				
Lower Growth Level ANOVA T (Location 2)						
SK	Db	JK	KT	F count	F table (0.05)	Information
Treatment	2	0.33	0.17	0.21	3.68	*H0 is accepted*
Error	15	11.67	0.78			
Total	17	12.00				

Hypothesis

- *H_0: Altitude has no significant effect on the number of species;*
- *H_1: Altitude has a significant effect on the number of species.*

Significance Level: 5%, α = 0.05.

Condition:

- *If the P value < than 0.05 then H_0 rejected and H_1 accepted (significant);*
- *If the P value > than 0.05 then H_0 accepted and H_1 rejected (not significant).*

The smaller the (*IS)* value for each combination of observation stations, the lower the level of similarity. Variations in environmental conditions, both physical and chemical, as well as interactions between species along the gradient of the study area, eventually resulted in vegetation being included in the low category. According to Sarmiento (1986) differences in altitude make a real difference in climate and ecological variations and plant growth. Relatively homogeneous microsite conditions will be occupied by individuals of the same

type, because these species naturally have developed mechanisms of adaptation and tolerance to their habitat (Barbour *et al.,* 1987).

The effect of altitude on the number of ground cover plants species was calculated using the ANOVA test design which can be seen in Table 5.

Based on Table 5 the effect of altitude on the number of species found for location 1 H_0 is rejected and H1 is accepted. The H_0 value is accepted, which means that the difference in altitude with an interval of 25 masl does not affect the number of individuals and does not need further testing. This can occur allegedly because the distance between the height intervals is too close so that it does not provide a significant difference in the number of individuals.

CONCLUSION

The presence of species for ground cover plants, some of which are able to be present at all heights such as the type of Ilalang (*Cylindrical orders*), Litu (*Climbing Lygodium*), Rumput minyak (*Brachiaria humidicola*) and Tratat (*Acroceras munroanum*). This is in line with the INP values of the types of rumput minyak and tratat which are indeed quite high, so that even though there is a difference in height, these species are still able to grow and maintain their existence. (2) Analysis of the distribution and abundance of species found for ground cover plants at lower, middle and upper elevations found the same number of species, namely 11 species. When viewed from the evenness index, the species value is almost even, which means that the distribution or distribution of species indicates that no species grows to dominate the plant community. (3) Analysis of the overall diversity of ground cover plants species is of moderate value, meaning that the species found are quite diverse or varied indicating that the community is quite stable.

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