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Research Article

Inventory of herbs plants at three different locations in forest education of Mulawarman University, Samarinda, East Kalimantan, Indonesia

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Abstract

Many plants have the potential to be medicinal from the herbaceous group. Herbaceous plants have short, small steam and have a wet trunk because they contain many water and non-woody. This research aims to inventory species of herbaceous plants that can be medicinal plants and other uses in three different locations. The results showed that 12 species were found in the slope area, 340 individuals. The highest number of SDRn of 29.26% was *Nephrolepis biserrata* (SW.) Schott. In the ramp, the area has been found of 11 species of herbaceous, 215 individuals. The highest number of SDRn of 34.81% was *Phrynium pubinerve* Blume. In a hill, area has been found 16 species of herbaceous, 542 individuals. The highest number of SDRn of 38.72% was *Phrynium pubinerve* Blume. Dominance index (C) in three locations research was 0.26, 0.23 and 0.31. Similarity index (ISs) in three locations was 60.87% (slope-ramp: high), 59.26% (slope-hill: medium) and 57.14% (ramp-hill: medium). There were 11 species as medicinal plants, 17 species as ornamental plants, and 2 species as crafts.

Introduction

Indonesia is located in the tropics because it is a form of tropical forest. Tropical forests are highly heterogeneous, forests whose shapes are strongly influenced by environment and building factors that affect growth and the composition of different types of plant communities, as well as the existence of a plant or plant group (Soemarwoto et al., 1992). The potential of a large number of medicinal plants in natural forests utilized by various ethnicities (Diana & Matius, 2017) and many of these plants come from herbaceous groups (Hidayah et al. 2017). Part of the herbaceous is lianas which are an important part of tropical forests, and a very common manifestation of these forests (Ghazoul & Sheil, 2010) and they have many beneficial effects upon the forest, for example: they minimize the growth of trees, suppress and change gap phase regeneration

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(Diana & Andani, 2020). As stated by Ghazoul & Sheil (2010), herbaceous plants have short, small water vapor and have a moist and non-woody trunk. In a community with the same organism, herbaceous plants can spread rapidly in different environments such as damp, dry land, rocks, and shade or open space. The important factors influencing the disparity are light; other factors are caused by competition from root. Light resist species frequently tend to be particularly involved and grow in communities, while non-light resistant species are generally solitary in remote locations. Unfortunately, the information related to the presence of herbs on different tofography is still very limited. Furthermore, it is also possible to find most of the herbaceous plants usually found in the open area in limited amounts in the shade, although not in the darkest part of the forests. Therefore, the research related to the presence of herbs on different tophography is necessary. The aim of this research is to inventory herbaceous plant species in three different locations and provide information on the usability of botanical plants, particularly as a literature study based on medicinal plants.

Materials and methods

This research was conducted in Forest Education of Mulawarman University in Samarinda, East Kalimantan. Sampling was done by transect method with three topography types, i.e., slope, ramp, and hill. The methods sampling was purposive sampling, each topography made 100 meters transect with a plot of 5 x 5 meters by turns in the slope, ramp, and hill area. Tools used meter 50 meters, a machete, a compass, writing tools, cameras, GPS, thermo hygrometer, light meter, survey ribbons, a laptop, and a calculator. The materials used are location map research, tally sheet, and herbaceous identifications guidebook.

Analysis of the data

Data obtained are species and total species of herbaceous plants and analyzed summed dominance ratio, dominance index and similarity index.

Summed Dominance Ratio (SDRn)

Summed Dominance Ratio is a comparison of important value index of vegetation with the parameters used. On calculation of SDR uses two parameters, among others the relative abundance and frequency parameters are relative. For more details can be seen in the following formula (Wijana, 2014).

$$SDRn\ (\%) = INP/n$$

Description :
SDRn = Summed Dominance Ratio
INP = Important Value Index
n = Observation variable

Dominance Index (C)

Dominance index can be calculated with the following formula.

$$C = \Sigma(ni/N)^2$$

Description :
C = Dominance Index
ni = Number of species for individuals-i
N = Number of all species for individuals

Dominant index criteria:
$0 < C < 0.5$ = No species dominates
$0.5 > C > 1$ = There are species that dominate

Similarity Index

Similarity index can be calculated with the following formula

$$SI\ (\%) = \frac{2C}{A+B} \times 100$$

Description :
SI = Similarity Index
A = Number of species on location A
B = Number of species on location B
C = Number the same of species on second locations

Similarity Index criteria:
1 – 30 % = Low category
31 – 60 % = Medium category
61 – 91 % = High category
>91 % = Very high category

Percentage of use of herb species

From the data obtained will be calculated the percentage of uses of types of herbs based on usability (medicinal plants, ornamental plants and craft plants) with the following approach formula.

$$\text{Usability percentage (\%)} = \frac{\Sigma \text{ usability value}}{\Sigma \text{ total usability value}} \times 100$$

Results and discussion

Types of herbs that are found on the location of research

The research results showed that some herbaceous plants can be found in all locations, but some species only found in two locations or only in one location. All species herbaceous plant can be seen in Table 1.

Table 1. Herbaceous plants in research locations

No	Species	Family	Slope		Ramp		Hill		Total	
			N	SDRn	N	SDRn	N	SDRn	N	SDRn
1	*Phrynium pubinerve*	Marantaceae	2	1.43	84	34.81	237	38.72	323	74.96
2	*Molineria latifolia*	Hypoxidaceae	55	14.91	29	8.13	40	13.80	124	36.84
3	*Calathea concinna*	Marantaceae	15	6.75	30	11.14	71	10.98	116	28.87
4	*Asystasia gangetica*	Acanthaceae	114	23.58	-	-	-	-	114	23.58
5	*Nephrolepis biserrata*	Araceae	114	29.26	-	-	-	-	114	29.26
6	*Hornstedtia conica*	Zingiberaceae	19	9.61	6	6.95	47	14.57	72	31.13
7	*Scleria oblata*	Cyperaceae	5	4.14	41	19.26	2	1.78	48	25.18
8	*Amischotolype griffithii*	Commelinaceae	3	2.71	-	-	21	3.89	24	6.60
9	*Leptaspis urceolata*	Poaceae	-	-	-	-	18	5.90	18	5.90
10	*Stachyphrynium repens*	Marantaceae	4	1.72	11	8.11	-	-	15	9.83
11	*Ottochloa nodosa*	Poaceae	-	-	10	3.71	1	0.89	11	4.60
12	*Alocasia longiloba*	Araceae	3	2.71	1	3.01	3	1.89	7	7.61
13	*Cheilocostus speciosus*	Costaceae	2	1.43	-	-	5	2.12	7	3.55
14	*Dicranopteris linearis*	Gleicheniaceae	4	1.72	-	-	-	-	4	1.72
15	*Haplopteris malayensis*	Vittariaceae	-	-	1	1.62	1	0.89	2	2.52
16	*Solanum* sp.	Solanaceae	-	-	-	-	2	1.00	2	1.00
17	*Adiatum* sp.	Pteridaceae	-	-	-	-	1	0.89	1	0.89
18	*Asplenium nidus*	Apleniaceae	-	-	-	-	1	0.89	1	0.89
19	*Blechum occidentale*	Blechnaceae	-	-	1	1.62	-	-	1	1.62
20	*Davallia lorrainii*	Davalliaceae	-	-	-	-	1	0.89	1	0.89
21	*Homalomena occulta*	Araceae	-	-	1	1.62	-	-	1	1.62
22	*Tacca chantrieri*	Dioscoreaceae	-	-	-	-	1	0.89	1	0.89
	Total		340	100	215	100	452	100	1,007	300

Description: N = Number individuals SDRn = Summed Dominance Ratio

Herbaceous plants in research locations have been found of 22 species with 1,007 individuals from 17 families on the three locations research. The research on Phrynium pubinerve Blume's location most widely found as many as 323 individuals, *Molineria latifolia* (Dryand ex W. T. Aiton) Herb. ex Kurz as much as 124 individuals and types of *Calathea concinna* (W. Bull) K. Schum as much as 116 individuals. The kind of the least discovered, i.e., *Adiantum* sp., *Asplenium nidus* L., *Blechnum occindentale* L., *Davallia lorrainii* Hance, *Homalomena occulta* (Lour.) Schott, *Solanum* sp. and *Tacca chantrieri* with is only one individual in each species. *Phrynium pubinerve* Blume found in hill topography were 327 individuals with SDRn value 3.72. Moreover, *P. pubinerve* also found wildly in the tropical forest, wetlands around the swamp or river, and roadside (Wakur et al., 2014). There were 55 individuals of *Molineria latifolia* found in slope topography with a value SDRn 14.91. According to Syabana et al. (2015), *Molineria latifolia* can be found widely in tropical forests dan humid areas. Furthermore, 71 individuals of *Calathea concinn*a with SDRn value 10.98 and 47 individuals with SDRn value 14.57 of *Hornstedtia conica* found in hill topography. These species can be found widely in tropical forests and open areas (Indrianti, 2014; Anaputra et al., 2015) and can be found wildly in tropical rain forests from the lowlands to the highlands (Siregar & Pasaribu, 2008). In ramp, topography was found 41 individuals with SDRn value 19.26 of *Scleria oblata.* This species' presence is likely due to the plot on-ramps' topography is an open plot area. *S. oblata* can be found in direct light exposure (Wibisono & Azham, 2017).

Dominance index

Dominance of species in the sampling area concentrated in some species so that the dominance index can be found. Dominance index can be seen in Figure 1.

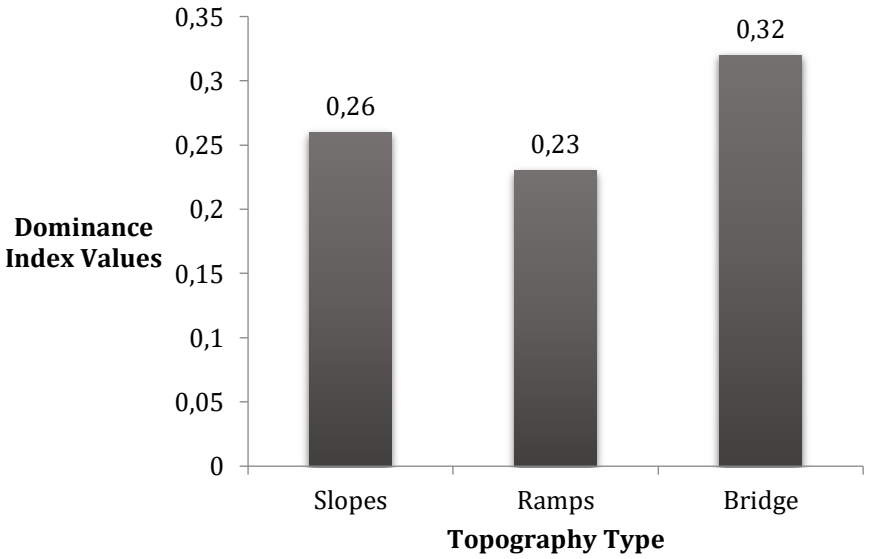

Figure 1. Dominance index in three topography types

The highest dominance index value in hill area was 0.32, classified into medium dominance index criteria. The other, in the slopes of dominance index value of 0.26 and the ramps dominance index value of 0.23, both classified into low criteria.

Similarity index

The similarity index values in the three topography can be seen in Figure 2.

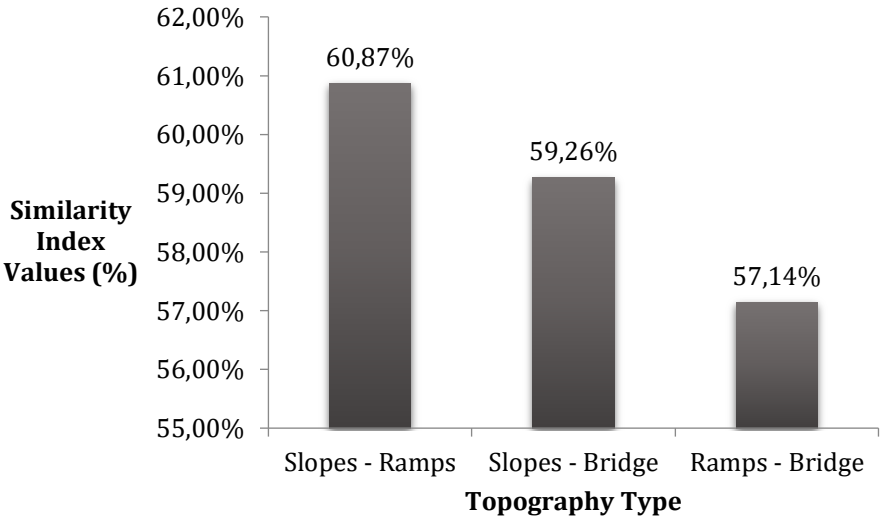

Figure 2. Similarity index in three topography types

The highest similarity index value is 60.87%, in slope topography, classified into high similarity index criteria. The other, in the slopes with bridge area of 59.26% whereas in ramps with bridge area of 57.14%, both classified into medium similarity index criteria.

Percentage of different types of herbs based in usability

Percentage of the type of herbacous plants based on usability. Herbaceous plants distributions based on it's usability can be seen in Figure 3.

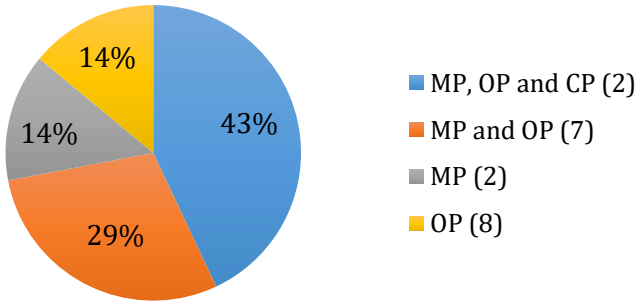

Figure 3. Percentage of the type of herbacous plants based on usability, Medicine Plants (MP), Ornamental Plants OP), Craft Plants (CP)

Two species of herbaceous plants can be used as a medicine, ornamental plants, and crafts, i.e., *Dicranopteris linearis* (Burm. f.) Underw. and *Molineria latifolia* (Dryand ex W. T. Aiton) Herb. ex Kurz. The two species have a 43 percent usability percentage. According to Indrianti (2014) and Anaputra et al. (2015), herbaceous plants can be used for various purposes of life because herbaceous plants whose size is relatively small have the opportunity to get more living space, thus allowing the lives of more in species diversity. There were seven species of herbaceous plants, can be used as medicine and ornamental plants, i.e., *Asplenium nidus* L., *Asystasia gangetica* (L.) T. Anderson, Cheilocostus speciosus (J. Koenig) C. D. Specht, *Homalomena occulta* (Lour.) Schott, *Hornstedtia connica* Ridl., *Stachyphrynium repens* and *Tacca chantrieri* Andre. Most of the medicinal plants are herbaceous groups (Mukti et al. 2016) and some of these plants are cultivated by people who live around the forest as ornamental plants (Purnawan, 2016). The seven species

have a 29 percent usability percentage. The two species of herbaceous plants which have a 14 percent usability percentage can be used as medications, i.e., *Phrynium pubinerve* Blume and *Scleria oblata* S. T. Blake ex J. Kern. The eight species of herbaceous plant can be used as ornamental plants, i.e., *Adiantum* sp., *Alocasia longiloba* Miq., *Amischotolype griffithii* (C. B. Clarke) I. M. Turner, *Blechnum occidentale* L., *Calathea concinna* (W. Bull) K. Schum, *Davallia lorrainii* Hance, *Nephrolepis biserrata (*SW.) Schott and *Solanum sp.* The eight species have a percentage of usability of 14%. Herbaceous plants list that has medicinals (Table 2), as ornamental (Table 3), and as craft (Table 4).

Table 2. Herbaceous plants list that has medicinals

No	Species	Medicinials	Reference
1	*Asplenium nidus* L.	Hair fertilizer, fever medicine, contraceptive medicine, sedative and depurative	Hartini (2006), Wibisono and Azham (2017)
2	*Asystasia gangetica* (L.) T. Anderson	Rheumatism, asthma, dry cough medicine, indigestion, diabetes, hypertension, snakebite, stomach ache, relieve stiff muscles, wounds, limps magnifier	Indriati (2014), Wahyuningtas (2017)
3	*Cheilocostus spesiosus* (J. Koenig) C. D. Specht	Antidote and itching medication	Royyani & Rahayu (2010), Karmilasari (2011), Wahyuningtas (2017), Wibisono and Azham (2017)
4	*Dicranopteris linearis* (Burm. f.) Underw	Asthma, cough, bruises, burns, fever medicine and sprain	Kinho et al. (2009), Supriati et al. (2012), Nurhaida et al. (2015), Hartini and Sahroni (2016), Kurniawati et al. (2018), Naibaho (2018)
5	*Homalomena occulta* (Lour.) Schott	Wind breaker, strengthen tendons and bones	Dalimartha (2003), Wahyuningtas (2017)
6	*Hornstedtia conica* Ridl	Aromatic and ringworm	Siregar and Pasaribu (2008), Indriati (2014), Pratiwi et al. (2015)
7	*Molineria latifolia* (Dryand ex W. T. Aiton) Herb. ex Kurz	Skin disease, asthma, bronchitis, jaundice and diarrhea	Irshad et al (2006), Syabana et al. (2015), Gusmalawati and Mayasari (2017), Kurniawati et al. (2018)
8	*Phrynium pubinerve* Blume	Antidote and wounds	Kinho et al. (2009), Wakur et al. (2013), Nurrani (2013)
9	*Scleria oblata* S. T. Blake ex J. Kern	Cough medicine, menstrual pain and ulcer	Noorcahyati and Arifin (2015), Wibisono and Azham (2017)
10	*Stachyphrynium repens* (Korn.) Suksathan & Borchs	Wound medicine	Noorcahyati (2012), Wibisono and Azham (2017)
11	*Tacca chantrieri* Andre	Antidote, menstrual pain, fever medicine and inflammation	Sulaiman (2015), Putri (2017)

Herbaceous plants that has ornamental use list can be seen Table 3.

Table 3. Herbaceous plants that has ornamental use list

No	Latin Name	Ornamental	Reference
1	*Adiatum* sp.	Leaf	Soerotaroeno (2009), Lestari (2015)
2	*Alocasia longiloba* Miq.	Leaf	Soerotaroena (2009), Lestari (2015)
3	*Amischotolype griffithii* (C. B. Clarke) I. M. Turner	Leaf, flower	Lestari (2015)
4	*Asplenium nidus* L.	Leaf	Kinho (2009), Soerotaroena (2009), Lestari (2015)
5	*Asystasia gangetica* (L.) T. Anderson	Leaf, flower	Soerotaroena (2009), Lestari (2015)
6	*Blechnum occidentale* L.	Leaf	Soerotaroena (2009), Hartini and Sahroni (2016)
7	*Calathea concinna* (W. Bull) K. Schum	Leaf	Soerotaroena (2009), Lestari (2015)
8	*Cheilocostus speciosus* (J. Koenig) C. D. Specht	Leaf, flower, stem	Soerotaroena (2009), Lestari (2015)
9	*Davallia lorrainii* Hance	Leaf	Soerotaroena (2009), Irshad et al. (2006)
10	*Dicranopteris linearis* (Burm. f.) Underw	Leaf, stem	Hasibuan et al. (2016), Supriati et al. (2017)
11	*Homalomena occulta* (Lour.) Schott	Leaf	Lestari (2015), Mukti et al. (2016)
12	*Hornstedtia conica* Ridl.	Leaf	Siregar & Pasaribu (2008), Suriyanto et al. (2015)
13	*Molineria latifolia* (Dryand ex W. T. Aiton) Herb. ex Kurz	Leaf, flower	Irshad et al. (2006)
14	*Nephrolepis biserrata* (Sw.) Schott	Leaf	Soerotaroena (2009), Lestari (2015)
15	*Solanum* sp.	Daun, fruit	Soerotaroena (2009), Suriyanto et al. (2015)
16	*Stachyphrynium repens* (Korn.) Suksathan & Borchs	Leaf, flower, fruit	Soerotaroena (2009), Wibisono and Azham (2017)
17	*Tacca chantrieri* Andre	Leaf, flower	Soerotaroena (2009), Suriyanto et al. (2015)

Herbaceous plants that has handicrafts use list can be seen Table 4.

Table 4. Herbaceous plants that has handicrafts use list

No	Species	Craft	Reference
1	*Dicranopteris linearis* (Burm. f.) Underw	Caps, bracelet and fishing nets	Atmoko et al. (2016), Irshad et al. (2006)
2	*Molineria latifolia* (Dryand ex W. T. Anton) Herb. ex Kurz	Weaving and fishing nets	Hartini and Sahroni (2016), Supriati et al. (2017)

Conclusion

The present research indicated that the dominant index (C) was 0.26 (slope), 0.23 (ramp) and 0.31 (hill) in three different locations of research. The number of plant species in these three locations, however, varies. There were 11 species as medicinal plants, 17 species as ornamental plants, and 2 species as crafts.

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Author declaration

Authors declare that there is no conflict of interest. YHM (Post Graduate Student) conducted field experiments, wrote the draft, data analysis and references. S (Lecturer of Biology) advised about the field experiment technique and revised the draft. RD (Associate Professor of Forest Ecology) conceived the idea and supervised the experiment and wrote the concept, discussion and conducted manuscript proofreading before submission. All authors read and approved the final version of the manuscript.

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