MICRO CLIMATE ASSESSMENT OF MEDICINAL PLANT HABITAT FOR THE FIRST STEP OF DOMESTICATION

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ABSTRACT

*Indonesia is known as a storehouse of medicinal plants (herbal) called live laboratory, but unfortunately 78% of medicinal plants were taken directly from the forest. The cultivation of medicinal plants until present day is only 20%. In order to prevent the extinction and commercialization of medicinal plants it is essential to develop the cultivation of medicinal plants either exstitu The process of domestication of wild plants into crops by planting in the new habitat. The preparation of planting of medicinal plants need to attent the technical aspects, especially the abiotic environment such as; temperature, humidity, and light intensity. Based on that, as an the first initial step in order domestication of some medicinal plants of Malinau and Harakit in South Kalimantan, it is necessary to do a study on the microclimate them, so that later can be developed elsewhere, with the micro-climatic conditions can be created like in their natural habitat. the results showed herbs grown at an altitude of 132-223 m above sea level, has a micro climate is very variable, temperature of 28-41°C, humidity 53-89%, and light intensity 1-100%. Manggarsih (**Parameria laevigata** (Juss.) Moldenke) is located on the highest point (oil palm plantations), with high temperatures, low humidity and high light intensity, while kayu sisil (Litsea sp) and bayuan (**Coptosapelta tomentosa** Korth.) near the riverbank, with altitude low temperature and low light intensity and high humidity. Meanwhile pikajar (Schizaea digitata (L) Sw.) and pasak bumi (**Eurycoma longifolia**) with a wider spread of habitat, with an interval of temperature, humidity and light intensity were great. Tambar bisa (**Clausena excavata** Burm.f.) can be found at the site of lowest to highest, but humidity should be high and low light intensity. Akar waring (**Coptosapelta tomentosa** Valeton ex K.Heyne) was found in oil palm plantations, rubber plantations until secondary forests.*

Keywords: Medicinal plants, domestication, microclimate

INTRODUCTION

Indonesia is known as a storehouse of medicinal plants (herbal) earning the nickname of live laboratory. In the area of Indonesia tropical rainforest there are 30,000 species of plants, more than 8,000 species of medicinal plants, and 800-1200 species have been used by the people for traditional or herbal medicine (Department of Health, 2009). In the region of South Kalimantan, based on results of RISTOJA 2012 and 2015 there are 60 species of medicinal plant used by the people of Dayak Bukit Ethnic in Malinau Sub-District, Hulu Sungai Selatan District and 111 species by the people of Harakit Ethnic, Piani Sub-District, Tapin District. Most of species about 82% was obtained from the forest, and there had been no attempt

ISSN: 2223-9944, e ISSN: 2223-9553

cultivation (Hamidah et al, 2012; Arifin et al 2015). Dhar et al (2000) said that only 20% of medicinal plant cultivated, reflecting the lower of research study and development of medicinal plants endemic. This fact is very unfortunate given the utilization actually showed an increase as with the trend of people to back to nature. According to the WHO 65% of the population of developed countries use herbal medicines (Aspan, 2004; Department of Health, 2006; Pujiasmanto, 2009).

Most of medicinal plant was dependency source from the forest and still many original plant utilization conventionally, requiring the role of experts cultivation (Radji, 2005) and the need to develop cultivation techniques either in situ or ex situ. Saparinto & Susiana (2016) said that the research policy direction for medicinal plant is still be mined from nature and its request a high enough, one of them is domestication. Domestication is the process of wild plants into crops by planting in the new habitat. Dephut (2004) stated that cultivation of medicinal plant, one of them must be attent to the technical aspects, the environmental aspects especially abiotis aspects, such as; temperature, humidity and light intensity.

Based on this background as a first step of domestication of medicinal plants, it is necessary to first be reviewed microclimate native habitat of seven species found in the region Malinau Sub-District and Haraki Sub-District in South Kalimantan where most widely used by people round this areas in herb treatment. The purpose of this study was to determine Characteristic native habitat, especially microclimate of seven species of medicinal plant frequently used by the people of Dayak Bukit Ethnic in Malinau and Harakit Ethnic in Harakit. The benefits of this research is to determine cultivation techniques of medicinal plants as insitu or eksitu, to create a nursery in the home screen (screenhouse) that can be controlled and managed micro climate according to the the needs of each species, and it can be made manual seeding for each species according to their natural habitat based on their original microclimate.

RESEARCH METHODS

The location of this research is the discovery of the natural habitat of seven species consist of *P. laevigata (*Juss.) Moldenke, *S. digitata* (L) *Sw*., *Litsea* sp, *C. tomentosa* Korth., *C. excavata* Burm.f., *E. longifolia* and *C. tomentosa* Valeton ex K.Heyne, which is located in the District and Sub-District Malinau Piani, South Kalimantan. Research period was for seven months, starting from preparation, site survey and data collection, data analysis and reporting research. The method used is purposive sampling, where medicinal plants were found. The parameters observed were: temperature, humidity and light intensity, while the additional data and information were the coordinates where the discovery of medicinal plant, altitude and description of the habitat where the discovery of medicinal plant. The data obtained were tabulated and analyzed.

RESULT

Microclimate research results from seven medicinal plant species derived from forests in Malinau District and Harakit District, South Kalimantan Province, where the discovery of medicinal plants, can be seen in Table 1.

The results showed that the micro-climatic conditions native habitat are very varied natural habitatof medicinal plant start from low and high depending on the plant type. Temperature ranges from 28-41 °C, humidity ranging between 54%-89% and the light intensity of 1.05-100%. Medicinal plants were found at altitude between 132-223 m asl, and the habitat of medicinal plants were ranging from the riverbank to the rubber and oil palm plantations.

ISSN: 2223-9944, e ISSN: 2223-9553

Table 1. Habitat where the discovery of medicinal plants

No	Botanical Name	Altitude (m asl)	Habitat
1	*Parameria polyneura* Hook.f	223	In Malinau Village - Oil palm plantations area - Need high light intensity
2	*Schizaea digitata* (L) *Sw.*	214	In Malinau Village - Humid and covered area - Need high light intensity
		164-170	In Harakit Village
3	*Litsea* sp.	132-136	on riverbank
4	*Coptosapelta tomentosa* Korth	132-165	on riverbank
5	*Clausena excavate* Burm.f.	200	around riverbank
		160-161	on riverbank
6	*Eurycoma longifolia* Jack	200-223	In secondary forest
		164-170	In secondary forest
7	*Coptosapelta tomentosa* Valeton ex K.Heyne	197-228	in oil palm plantations, rubber plantations until secondary forests

Table 2. Microclimate where found medicinal plants

No	Botanical Name	Temperature (°C)	Humidity (%)	Light intensity (%)
1	*Parameria polyneura* Hook.f	41	54-60	100
2	*Schizaea digitata* (L) *Sw.*	37	60	14,25
		28 - 36	56-89	2,1-27
3	*Litsea* sp.	29- 31	77-85	1,05-4,651
4	*Coptosapelta tomentosa* Korth			4,15
		29-30	73-86	1,28-4,57
5	*Clausena excavate* Burm.f.	30	78-83	2,56-4,10
		29	83-89	0-1,81
6	*Eurycoma longifolia jack*	30 - 41	53-83	3,91
		28 - 36	56-89	2,10-27,6
7	*Coptosapelta tomentosa* Valeton ex K.Heyne	30-33	69-83	15-13,9

Parameria polyneura Hook.f is used by women of ethnic Dayak Amandit, including family Apocynaceae and generally grows wild in the area is quite open. This is consistent with the results of research, where the results showed that the microclimate of the original habitat manggarsih is a very high intensity (even up to 100%), with the highest temperature (41°C) than the temperature of habitat of medicinal plant was more and humidity lowest (54-60%). Place the discovery of *P. laevigata (*Juss.) Moldenke located at the highest altitude of 223 asl and an open space on the land of palm oil that gets full sun (high light intensity). The results of this study indicate that, *P. laevigata (*Juss.) Moldenke can be developed on lands open, especially empty area that no vegetation.

Litsea sp., *C. tomentosa* Korth. and *C. excavata* Burm.f. is the type that grow in the opposite *P. laevigata (*Juss.) Moldenke. Microclimate native habitat place this plant, located on the conditions of temperature and light intensity is low and humidity is high, and usually are in the low places around and the river bank. Microclimate research results of the three types of

ISSN: 2223-9944, e ISSN: 2223-9553

the show that the temperature ranges between 29-31°C, 73-89% humidity and light intensity from 1.28 to 4.57%.

Schizaea digitata (Linn.) Sw.) and *Eurycoma longifolia* Jack) is a medicinal plant species that can be found in secondary forest with altitude ranging from low to high, and where the temperature and humidity ranging from low to high, so also the light intensity from low to high. This means that both the medicinal plant can be spread on a wider habitats. At *E. longifolia* native habitat, temperatures range between 28-41°C, 56-89% humidity and light intensity ranges from 2.1-27.6%. Microclimate and altitude habitat of *E. longifolia* is similar to the microclimate and the altitude of habitat of *S. digitata* (L) *Sw*., which indicates the temperature ranges from 28-37°C, 56-89% of humidity and light intensity ranges from 2.1-27.0%. *E. longifolia* is found in a place with a height of 164-223 m asl, at an altitude of *S. digitata* (L) *Sw*.from 164-214 m dpl. Kartikawati et al. (2014), said that based on his research, *E. longifolia* found in Ambawang Protected Forest, West Kalimantan, is at a location with an altitude of 320-402 m asl, the average temperature of 25.6 °C, humidity of 73.6%, and the intensity light of 4.5%. If we compare the results of the research, temperature, humidity and light intensity research results is included in the range of research Kartikawati et al. (2014), except height of the place, which *E. longifolia* are found in this study locations (South Kalimantan) that are in a lower place. This suggests that the *E. longifolia* can be found at high altitude or lowest 164 m above sea level and the highest 402 m asl. This is consistent with the opinion of Mardisiswojo and Harsono (1968) in Heriyanto, et al (2006) which stated that the *E. longifolia* is a wild plant that is widely available in Sumatra and Kalimantan in the lowlands to an altitude of 500 m asl. Based on the research results, the light intensity of the *E. longifolia* shows range is quite large, ranging from 2.1 -27.6%. Heriyanto et al (2006) said that at the seedling stage, *E. longifolia* are often found in groups under a forest canopy. The young plants disliked direct light is too much, but need direct light since mature plant. The results of this research provide hope that the *E. longifolia* could be developed in agroforestry with other plants.

C. tomentosa Valeton ex K.Heyne, discovered from secondary forest to oil palm plantations with temperatures ranging between 30-33°C, 69-89% humidity and light intensity ranges from 13.9 to 15%. The results of this research can not be compared with other studies, given the identification of the plant is not yet done.

DISCUSSION

Research and studies habitat microclimate native medicinal plants need to be implemented first so that the cultivation of medicinal plants in the area ekstitu later be managed, the micro-climate will affect the quality of plant growth. Ashari (1995) states that the intensity of light, associated with plant photosynthesis. Environmental temperature increased resulting high plant respiration, the impact in net photosynthesis (biomass) stored in plant tissues a little (Dwidjoseputro, 1996).

Plants need specific conditions to be able to grow and develop properly. Abiotic factors is important role in the survival of plant life. Humidity and air temperature is a component of micro-climates affecting the growth and realizing the optimal environmental conditions for the plant. The increased growth if the temperature increases and humidity decreases (Noorhadi, S., 2003). Temperature affects the growth process, plants are able to grow at temperatures between 28-33 °C (Soerianegara & Indrawan, 2005). Humidity related to the temperature, the lower the temperature will generally increase the humidity. Transpiration effect on the air humidity, the lower the humidity, the higher transpiration. Low temperatures affect the average evaporation of water and root growth. Low soil temperatures reduce the rate of evaporation of water by roots. Plants are able to live in a specific temperature range

ISSN: 2223-9944, e ISSN: 2223-9553

according to the ability of physiology. Soil temperature effect on root growth and water conditions in the soil (Syafei, 1990). Temperature of the soil is affected by air temperature, intensity of sunlight that enters the soil, and the water in the soil (Kartasapoetra, 2006). Abiotic factors of light used by plants for photosynthesis. The better the process of photosynthesis, the better the growth (Vitello & Nurunnajah, 2012). Based on the adaptation to light, there are plants that need full light, and does not need the full light (Tjitrosomo, 1985).

Most of medicinal in the research areas could grow with temperature range of 28-36oC and humidity range of 53-83%. Normally medicinal plants need shading for growing up and only *P. polyneura* Hook.f. could grow in open area without shading. Temperature and moisture could also influence the amount of organic matter and nitrogen in soil (Brady, 1995). Normally soil organic carbon and nitrogen pool are determined by temperature and moisture which vary of topographic (e.g. radiation, slope, aspect) and geochemical (e.g. age, parent rocks) factors in additions to elevation in the mountains (Koerner, 2003; Yimer et. al., 2006).

CONCLUSION

Most of Medicinal plant species grow at an altitude of 132-223 m dpl, has a very varied micro-climates, the temperature ranges from 41ºC to 28ºC, humidity 53% - 89%, and light intensity of 1.05% - 100%. *P. laevigata* (Juss) Moldenke is located on the highest point (oil palm plantations), with high temperatures, low humidity and high light intensity, while *Litsea* sp. and *C. tomentosa* Korth. around the riverbank, with altitude low temperature and low light intensity and high humidity. *S. digitata* (L) Sw. and *E. longifolia* is medicinal plant with a wider spread of habitat, with an interval of temperature, humidity and light intensity were great. *C. excavate* Burm. f. was found at the site of lowest to highest, but humidity should be high and low light intensity.

Cultivation eksitu to *P. laevigata* (Juss) Moldenke should be done in the land with open area, otherwise the kayu sisil laki and *C. tomentosa* Korth. should be carried out on lands that are closed or places with low light intensity. *S. digitata* (L) Sw. and *E. longifolia* can be cultivated in a bigger place. However consideration of other factors, such as soil type and altitude of the place.

ACKNOWLEDGEMENTS

The authors would like to thank:

1. Head of Central Research & Development of Medicinal Plants and Traditional Medicines in Tawangmangu and staff, the trust given to the research team to do the research of medicinal plants in particular regarding medicinal plants cultivation techniques that originated from the Territory HSS & Tapin South Kalimantan.
2. Chairman of the LPPM Unlam for its support of this research,
3. Dean, the Faculty of Forestry Unlam, on administration of a permit for the research team to conduct this research.
4. Staff Laboratory of Silviculture Faculty of Forestry Unlam, for support on this research.
5. Mr Riswan as Batra and traditional leaders on ethnic Dayak Bukit in District Malinau HSS, and Mr. PaMung as Batra and traditional leaders on Ethnic Harakit Tapin and the the whole community for the support and assistance information and medicinal plants used in this research.

ISSN: 2223-9944, e ISSN: 2223-9553

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ISSN: 2223-9944, e ISSN: 2223-9553