The potency of medicinal plants in production forest of Bantaeng, South Sulawesi

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Abstract. Herbs can contribute not only to ecological function, but also to being a source of food, energy, and medicinal ingredients. This study is to identify and discover the potential of medicinal plants. The study took a site at the Production Forest of Eremerasa, Bantaeng regency. The sampling was performed systematically random by considering land use units. Data collection of medicinal plant species was performed using vegetation analysis methods. Determination of the observation plot followed the land use unit map. The observation was carried out using a 20x20 m plot with an amount of 13 plots applied. The study covered 0.008125 Ha area, successfully identified 14 herb species. The obtained data indicate the moderate biodiversity of plants. Whereas, only 4 herb species are often used by the community around the production forest, namely Ageratum conyzoides, Bryophyllum pinnatum, L. camara, and Melastoma malabathricum, while the 10 remaining species are very rarely to utilize.

1. Introduction
Indonesia bears very complex biodiversity that includes the rich of medicinal plants [1]. Therefore, Indonesia becomes the best herbal medicine country in the world. Natural medicine is very dependent on medicinal plants [2]. Some conducted studies estimated 130 species of plants containing medicinal properties that are potentially useful for various diseases are grown in Tropical Forests of Indonesia [3].

Medicinal plants are being an option for common to overcome certain diseases since it is considered safe, not causing any side effects and dependence effects even if consumed in high doses. The utilization of medicinal plants is increasing with the global issue of "back to nature". Treatment using traditional medicines derived from plants is a long-standing cultural heritage which is now a potential and being a basic capital to be developed [4,5]. Currently throughout the world, traditional pharmacopoeia are being developed because they have an important role in the discovery of new molecules of therapeutic interests [4].

There are many plant species in the forest ranging from trees, wild plants, undergrowth (herbaceous plants) and ornamental plants. Herbs are plants that are spread in individual or solitary forms in a variety of habitat conditions such as moist and runny soil, dry soil, rocky rocks and habitats with dense
shade [6]. Herbaceous plants can contribute not only to ecological function, but also to being a source of food, energy, and medicinal ingredients [7].

A study by Benekdita, et al (2018) [8] found that the most widely used habitus after the tree is the herb that poses 28.5%. The utilization of herbs for traditional medicine is already performed by communities around the IUPPHK-HTI area in Mempawah regency.

Production forest in Eremerasa, Bantaeng regency is one of the Production Forest areas with high biodiversity potential. This study is important as it tries to collect data and information as well to discover potential plant species as the medicinal plants. Thus, this study aims to identify and discover the potential of medicinal plants at the herb level.

2. Materials and methods

2.1. Location
The study took a site at the Production Forest of Eremerasa, Bantaeng regency. The study spent 3 months duration to implement, started from December 2018 to February 2019.

2.2. Materials
The study used a map of the site, raffia ropes, “tay” sheets, tape measure, compass, machete, camera, GPS, and stationery.

2.3. Research methods
The sampling was performed systematically random by considering land use units. Data collection on medicinal plant species was performed using vegetation analysis methods. Determination of the observation plot followed the land use unit map. The observation was carried out using a 20x20 m plot with an amount of 13 plots applied.

2.4. Research procedures
a. Conduct a site survey to obtain a general picture of the medicinal plants' habitat, request guidance of an experienced resident to help to indicate medicinal plants.
b. Determine the observation plots, place anywhere could find medicinal plants.
c. Identify all vegetation species and the number of individual herbaceous plants. The species of medicinal plants could be recognized by informal interviews with field guides, medicinal plant users, local midwives, trained traditional healers and literature studies.
d. If unknown species found, sufficiently cut organs of the plants (leaves, flowers or fruit) for further identification. Preserve using methylated spirit for being wet herbarium.
Figure 1. Illustration of data collection method for vegetation analysis. A. Observation plot of tree (20mx50m), tree with a diameter >20 cm; B. Observation plot pole (10m x 10m), tree with a diameter of 10-20 cm; C. Observation plot sapling (5m x 5m), a young-like tree with a high 1.5 m and diameter <10 cm; D. Observation plot of seedling/herbaceous plant (2m x 2m), a seedling with a high no more than 1.5 m [9].

2.5. Data analysis
Species diversity is calculated using the Shannon-Wiener index ($H'$) formula. The Shannon-Wiener diversity index ($H'$) is widely used in community ecology [10].

$$H' = -\sum p_i \ln p_i$$

Where:
- $H'$ = Shannon-Wiener Diversity Index
- $p_i$ = Proportion of species importance value found in species $i$
- $\ln$ = natural logarithm
- $n_i$ = Number of individuals of type
- $N$ = Total number of individuals of all types

Based on Shannon-Wiener's species diversity index, it is defined as follows:
- a. A value of $H' > 3$ indicates that the diversity of species in a plot is high.
- b. A value of $1 > H' > 3$ indicates that the diversity of species in a plot is moderate.
- c. A value of $H' < 1$ indicates that the diversity of species in a plot is low.

3. Results and discussion

3.1. Identification of herb plant species
The observations successfully identified 14 families of medicinal plants, spreading out in 13 sampling plots. The identification recorded the species of medicinal plants. The plants are:
- Leguminosae family, namely Quickstick (Gliricidia sepium);
- Crassulaceae family, namely Air Plant (Bryophyllum pinnatum);
- Verbenaceae family, namely Blue Snake Tree (Stachytarpheta jamaicensis);
- Melastomales Family, namely Malabar Melastoma (Melastoma malabathricum);
- Family Piperaceae, namely Pepper Elder (Peperomia pellucida);
- Euphorbiaceae Family, namely Indian Acalypha (Acalypha indica);
- Family Phorbiaceae, namely Stonebreaker (Phyllanthus sp.);
- Family Verbenaceae, namely Common Lantana (L. camara);
- Family Solanaceae, namely Black Nightshade (Solanum nigrum);
- Family Cycadaceae, namely Queen Sago Palm (Cycas rumphii);
- Family Acanthaceae, namely Red Snakeweed (Stachytarpheta mutabilis);
- Family Asteraceae, namely Billygoat-weed (Ageratum conyzoides);
- Family Asterales, namely Fireweed (Crassocephalum crepidoideus);
- Family Rosaceae, namely Bramble (Rubus reflexus);
- Family Fabaceae, namely Sleepy Plant (Mimosa pudica).

Based on the interviews with the locals, out of fourteen (14) species of medicinal plants, only 4 species are often utilized for medicinal plants. The plants are Ageratum conyzoides, Bryophyllum pinnatum, L. camara, and Melastoma malabathricum; while the rest 10 species are rarely utilized.

3.2. Diversity Index of plants
Species diversity is a level characteristic to state the number of plant species present in a community. The observations identified 14 plants included in the herbaceous plant in 13 sampling plots with an area of 0.008125 Ha (table 1).
Table 1. Herbaceous plants diversity index.

| Species                      | Plot area (ha) | Pi   | Ln Pi | H'  |
|------------------------------|----------------|------|-------|-----|
| Billygoat-weed (*Ageratum conyzoides*) | 0.008125       | 0.24 | -1.42 | 0.34|
| Acalypha (*Acalypha indica*) | 0.008125       | 0.04 | -3.16 | 0.13|
| Air Plant (*Bryophyllum pinnatum*) | 0.008125       | 0.01 | -4.34 | 0.06|
| Fireweed (*Crassocephalum crepidioides*) | 0.008125       | 0.03 | -3.53 | 0.10|
| Queen Sago Palm (*Cycas rumphii*) | 0.008125       | 0.12 | -2.14 | 0.25|
| Common Lantana (*L. camara*) | 0.008125       | 0.07 | -2.64 | 0.19|
| Malabar Melastome (*Melastoma malabathricum*) | 0.008125       | 0.10 | -2.29 | 0.23|
| Sleepy Plant (*Mimosa pudica*) | 0.008125       | 0.09 | -2.39 | 0.22|
| Pepper Elder (*Peperomia pellucida*) | 0.008125       | 0.06 | -2.89 | 0.16|
| Stonebreaker (*Phyllanthus sp*) | 0.008125       | 0.04 | -3.24 | 0.13|
| Bramble (*Rubus reflexus*) | 0.008125       | 0.03 | -3.42 | 0.11|
| Black Nightshade (*Solanum nigrum*) | 0.008125       | 0.01 | -4.34 | 0.06|
| Blue Snake Tree (*Stachytarpheta jamaicensis*) | 0.008125       | 0.12 | -2.09 | 0.26|
| Red Snakeweed (*Stachytarpheta mutabilis*) | 0.008125       | 0.03 | -3.53 | 0.10|
| **Total**                    | **1.00**       | **-41.44** | **2.34** |

The calculation of the diversity index obtained a value of 2.34. The value indicates that species diversity is moderate. The result is in accordance with Ludwing & Reynold (1988), state that if the value of the Shannon-Wiener species diversity index is $1 \leq H' \leq 3$, the diversity of species in a plot is moderate.

The moderate value diversity index reveals potential medicinal plants in the Production Forests of the Pa'bumbungan, Bantaeng Regency are still relatively small. The moderate value indicates that, in the location, the complexity level of the herbaceous plants is relatively moderate, which means the occurring interaction is not so high and the ability to deal with disturbances is relatively moderate. Ernikawati (2017) stated that the non-seedling phase species could be triggered by several factors that become obstacles. One of the factors is environmental disturbance by humans.

4. Conclusions
1) The diversity of herbaceous plant species found in the production forests of Pa'bumbungan district, Bantaeng regency consists of 14 families and 14 species.
2) There are only 4 species are often utilized by locals around the Production Forest area, namely *Ageratum conyzoides*, *Bryophyllum pinnatum*, *L. camara*, and *Melastoma malabathricum*, while the rest 10 species are very rarely utilized.
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