



Medicinal plants in Inamberi Research Station of Manokwari and their conservation status

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Abstract. Papua is well-known for its medicinal plants. However, several of them are not well documented yet. Numerous efforts have recently been addressed to record medicinal plants in different parts of Papua. This study aimed to identify medicinal plants in the Inamberi Research Station of Manokwari, West Papua Province. All plant species grown in the research station were listed and documented. The method used in this study was the observation method with survey techniques. Literature reviews were performed to identify the medicinal plants that were generally used by the local people of Papua. The conservation status of medicinal plants was derived from the IUCN red list website. The total medicinal plants grown in the research station were about 43 species, dominated by Euphorbiaceae and Moraceae families. Trees were the dominant medicinal plants. Medicinal plants in the research station can treat various diseases and some of them can cure more than one disease. Local people of Papua generally utilize leaves as medicinal plants. The utilization of medicinal plants was simple: boiling and drinking, directly eating it, chewing and attaching it to the wounds, and rubbing it on the skin. The conservation status of medicinal plants was categorized as low risk. However, concern should be given to *Pterocarpus indicus* that has been categorized by IUCN as an Endangered species. Ex situ and in situ conservation are required to protect this species.

Keyword: Euphorbiaceae, Inamberi Research Station, Medicinal plants, Moraceae, Papua.

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1 Introduction

Papua, the easternmost part of Indonesia, is rich in biodiversity. The island is inhabited by about 20.000 plants, 602 birds, 125 mammals, and 223 reptiles, many of which are considered endemic [1]. Papua is also home to about 250 tribal communities that have different languages, dialects, and ecological knowledge [2]. These communities have a strong connection with forests and have heavily relied on them. For local communities, forests are sources of food, wood, water, and medicine [3].

One of the most important forest commodities for local communities is medicinal plants (generally used by local people as medicine to cure some diseases). The local people of Papua have utilized medicinal plants for generations. Even though modern medicines have been widely available, some people in Papua are still relied on traditional medicine due to the limited access to public health services [4] – [5]. The utilization of medicinal plants in Papua generally varies among tribes, locations, and cultures.

To date, there is a shift from chemical medicine to herbal medicine or traditional medicine (back to nature). To support this trend, the Indonesian Ministry of Health has performed research on medicinal plants and jamu (*Riset Tumbuhan Obat dan Jamu, RISTOJA*) to collect data and information about medicinal plants and their utilization in different regions of Indonesia. This project is expected to provide the foundation for developing the database of Indonesian medicinal plants that can be used by the next generation to develop community health based on natural resources [6].

Papua is known to be one of the primary sources of medicinal plants in Indonesia, where some of those, such as *Myrmecodia* sp. and *Pandanus conoideus*, have been widely recognized and utilized in other parts of Indonesia [7]. However, numerous medicinal plants from Papua haven't been well documented. In recent years, some efforts have been addressed to collect data and information regarding medicinal plants in Papua. However, numerous studies are still needed to support these efforts [8]. The Inamberi Research Station was developed for research purposes. Until now, information regarding the potency of the research station to provide medicinal plants is not yet available. This study aimed to list medicinal plants in the Inamberi Research Station of Manokwari. This study also aimed to identify the conservation status of medicinal plants in the Inamberi Research Station.

2 Methods

2.1. Study Sites

This study was conducted in the Inamberi Research Station of Manokwari. The research station was established by the Environmental and Forestry Research and Development Institute of

Manokwari in 1986 as a gene pool, seed source, and research facility [9]. In the early period, the research station was secondary forests dominated by *Macaranga* sp., *Pometia* sp., and shrubs. Between 1992 and 1997, about 11 tree species were introduced to increase the number of tree species diversity in the research station [10]. Some areas were left for natural succession [10].

The size of the Inamberi Research Station is about 3 ha. The research station is located at an altitude of 60 m above sea level. The research station is located administratively in Susweni Village, Manokwari, West Papua Province, behind the main office of the Environmental and Forestry Research and Development Institute of Manokwari (Figure 1). Geographically, the research station is located between 00°51'26.63" S and 134°05'50.63" E. According to the classification of Schmidt and Fergusson, the climate is classified as Type A, with annual rainfall is about 2,391 mm [9]. The topography of Inamberi Research Station is relatively flat to undulating, and the soil type is classified as Reddish Podzolic [10].

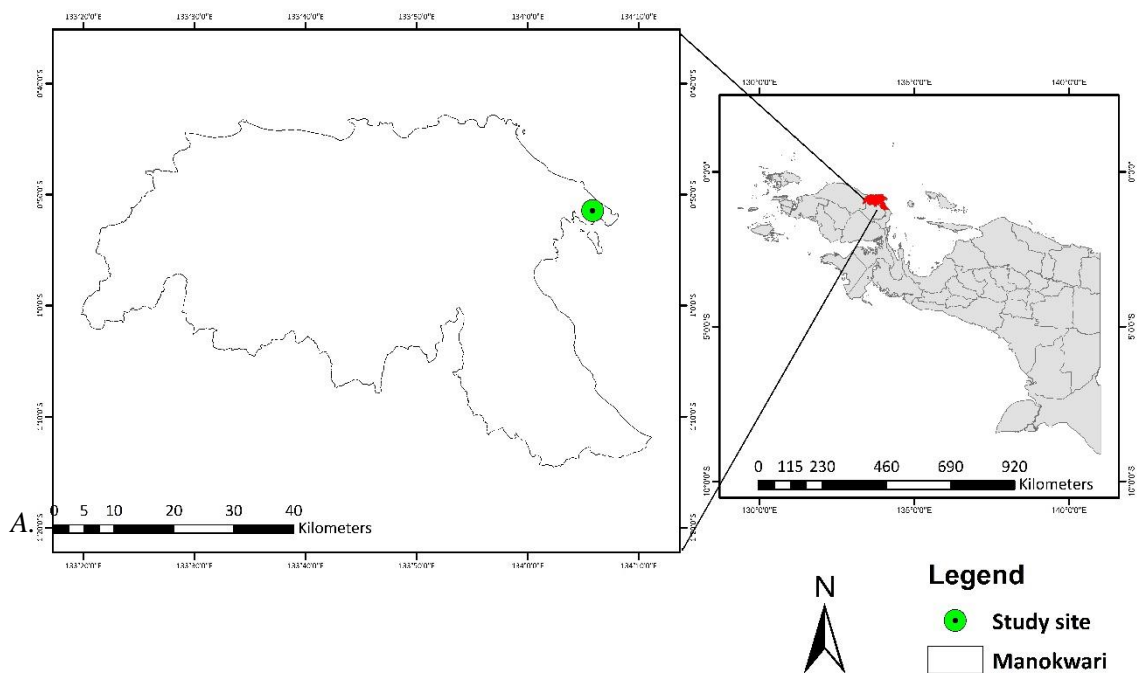


Figure 1. The location of the study site.

2.2. Procedures and Data analysis

The method used in this study was the observation method with survey techniques. Literature reviews were performed to identify medicinal plants that are generally used by local communities of Papua. This method has been performed by Hutapea [8] to investigate the medicinal potency of plants in a logging concession in West Papua Province. The medicinal plants were grouped into parts of plants, life forms, benefits, and utilization methods. The conservation status of medicinal plants was observed from the international union for Conservation of Nature (IUCN) website (www.iucnredlist.org). Data analysis was performed using Microsoft Excel 365.

3 Results and Discussion

The Inamberi Research Station was occupied by 43 plants that are considered medicinal plants by the local people of Papua (Table 1). The number of medicinal plants in Inamberi Research station is almost equal to Martelu Purba Nature Reserve in North Sumatra Province (44 species) [11], and higher than other locations such as the Special Purpose Forest Area (*Kawasan Hutan Dengan Tujuan Khusus, KHDTK*) of Samboja (37 species) [12], and *KHDTK* UM Palangkaraya (30 species) [13], and *KHDTK* Rantau (South Kalimantan, 16 species) [14]. However, the number of medicinal plants in the study sites is lower than that of Lambung Mangkurat Education Forests (South Kalimantan, 56 species) [15] and Kelimutu National Park (East Nusa Tenggara, 47 species) [16]. Variation in the number of medicinal plants is highly affected by climatic and geographical conditions, forest type, and local wisdom [14, 16]. The lower number of medicinal plants at the study site (compared to other regions) might also be related to the small size of the research station and management intervention to introduce 11 species of trees for research purposes [10].

Medicinal plants in Inamberi Research Station can treat various diseases (Table 1). Some plants, such as *Bidens pilosa*, were utilized by local people of Papua to cure several diseases. The ability of plants to cure diseases is attributed to secondary metabolites [17]. For example, *Alstonia scholaris* bark contains a high level of alkaloids that can act as anti-malarial [18, 19]. *A. scholaris* also contains flavonoids, tannins, saponins, and triterpenoids that may act as antioxidants, antihypertensives, and antidiarrheal [20]-[22].

Table 1. Medicinal plants in Inamberi Research Station in Susweni, Manokwari

No	Species	Family	Utilization	Part used	Processing method	Conservation status*	References
1	<i>Ageratum conyzoides</i>	Asteraceae	Wound	Leaves	Chewed and attached	-	[18, 23]
2	<i>Alstonia scholaris</i>	Apocynaceae	Fever, Malaria	Bark	Boiled and drank	LC	[18, 24]
3	<i>Alstonia macrophylla</i>	Apocynaceae	Malaria	Bark	Mixed with hot water and drank	LC	[25]
4	<i>Artocarpus altilis</i>	Moraceae	Stomachaches	Leaves	Boiled and drank	-	[26]
5	<i>Bauhinia acuminata</i>	Fabaceae	Stomachaches	Stem	Burned, scraped, mixed with hot water, and drank	LC	[24]
6	<i>Bidens pilosa</i>	Asteraceae	Umbilical cord care	Leaves	Heated on fires, rolled up, squeezed, and the water was dropped on baby's navel	-	[24]
7	<i>Calophyllum inophyllum</i>	Calophyllaceae	Irritated eyes	Leaves	Mixed with water	LC	[18,27]

No	Species	Family	Utilization	Part used	Processing method	Conservation status*	References
8	<i>Canna hybrida</i>	Cannaceae	Malaria, Syphilis	Tuber	Crushed, mixed with water, and drank	-	[24]
9	<i>Costus speciosus</i>	Costaceae	Ear pain	Stem	Crushed and the water dripped on the ear	-	[24]
10	<i>Endospermum moluccanum</i>	Euphorbiaceae	Fever, Malaria	Barks, leaves	Boiled and drank	LC	[18, 19, 25]
11	<i>Euphorbia geniculata</i>	Euphorbiaceae	Diarrhea, Malaria	Leaves, stem, and root	Boiled and drank	-	[24]
12	<i>Euphorbia hirta</i>	Euphorbiaceae	Diarrhea, stomachaches	Leaves	Ate; Crushed, mixed with water, and drank	-	[24]
13	<i>Ficus septica</i>	Moraceae	Sprained legs	Leaves	Boiled and drank	LC	[23]
14	<i>Ficus variegata</i>	Moraceae	Chest pain	Leaves	Boiled and drank	LC	[24]
15	<i>Flagellaria indica</i>	Flagellariaceae	Wound, Fever, Cough	Leaves	Chewed and attached; crushed, squeezed, and drank	-	[24]
16	<i>Gnetum gnemon</i>	Gnetaceae	New wounds	Bark	Chewed and the water is dropped	LC	[25]
17	<i>Intsia bijuga</i>	Fabaceae	Wounds, asthma, cough	Bark, and leaves	Crushed, mixed with coconut oil, and attached (leaves); scrapped, mixed with hot water, and drank (bark)	NT	[24]
18	<i>Kleinhovia hospita</i>	Sterculiaceae	Mouth ulcers	Leaves	Burned, mixed with coconut oil, and rubbed	LC	[24]
19	<i>Urticastrum decumanum</i>	Urticaceae	Body aches	Leaves	Rubbed	-	[28]
20	<i>Merremia peltata</i>	Convolvulaceae	Snake antivenom, old wounds	Exudate, leaves	Drank (exudate), crushed and attached (leaves)	-	[25]
21	<i>Mikania micrantha</i>	Asteraceae	Energy booster	Leaves	Ate	-	[24]
22	<i>Morinda citrifolia</i>	Rubiaceae	Spleen disease	Fruits	Ate	-	[25]
23	<i>Mussaenda frondosa</i>	Rubiaceae	Malaria	Leaves	Boiled and drank	-	[24]
24	<i>Peperomia pellucida</i>	Piperaceae	Ulcers	Leaves	Kneaded, mixed with oil, and attached	-	[29]
25	<i>Physalis angulata</i>	Solanaceae	Malaria	All parts	Boiled and drank	LC	[24]

No	Species	Family	Utilization	Part used	Processing method	Conservation status*	References
26	<i>Pimelodendron amboinicum</i>	Euphorbiaceae	Headaches and unspecified men sexual diseases	Leaves	Crushed and applied	LC	[18]
27	<i>Pometia coreacea</i>	Sapindaceae	Toothache	Bark	Scratched, heated, and attached	-	[25]
28	<i>Pometia pinnata</i>	Sapindaceae	Snake antivenom	Exudate	Drunked	LC	[25]
29	<i>Premna corymbosa</i>	Lamiaceae	Itchy body	Leaves	Boiled and bathed	-	[25]
30	<i>Selaginella sp.</i>	Slaginellaceae	Wounds	Leaves	Chewed and attached	-	[24]
31	<i>Smilax sp1.</i>	Smilacaceae	Stomach aches	Leaves	Chewed and drunked	-	[25]
32	<i>Solanum torvum</i>	Solanaceae	Hemorrhoid	Fruits	Crushed and drunked	-	[24]
33	<i>Stachytarpheta jamaicensis</i>	Verbenaceae	Bruise	Leaves	Crushed and attached	-	[30]
34	<i>Clerodendron japonicum</i>	Lamiaceae	Bruises	Leaves	Heated and attached	-	[25]
35	<i>Ficus sp.</i>	Moraceae	Wounds	Leaves	Chewed, squeezed the water to the wound, and attached	-	[24]
36	<i>Ficus trachypison</i>	Moraceae	Increase the appetite	Leaves	Boiled and ate	-	[25]
37	<i>Lantana camara</i>	Verbenaceae	Cough	Leaves	Boiled and drank	-	[31]
38	<i>Lunasia amara</i>	Rutaceae	Malaria	Leaves	Crushed, squeezed, and drank	LC	[24]
39	<i>Homalanthus populneus</i>	Euphorbiaceae	Wounds	Leaves	Chewed and attached	LC	[25]
40	<i>Pterocarpus indicus</i>	Fabaceae	Sarampa	Exudate	Smeared on the skin	EN	[25]
41	<i>Rhaphidophora peekilii</i>	Araceae	Wounds	Leaves	Heated and attached	-	[24]
42	<i>Smilax sp2.</i>	Similaceae	Enlarge male genitalia	Leaves	Crushed, mixed with coconut oils, and applied	-	[24]
43	<i>Villebrunea rubescens</i>	Urticaceae	Bruised	Leaves	Heated and attached	-	[24]

*LC: Least concern; NT: Near threatened; EN: Endangered

In general, the local people of Papua utilize medicinal plants with simple methods, including boiling parts of plants and drinking them, chewing and attaching them to the wounds, rubbing them on the skin, and eating it directly (Table 1). The utilization of medicinal plants in Papua might differ from other parts of Indonesia, depending on culture and plant compositions [32]-[35]. The utilization of medicinal plants by local people is inherited from previous generations [20], [35].

Medicinal plants in Inamberi Research Station are dominated by trees (Figure 2). This finding is identical with [8], [12], [13], and [15] which also found the same domination. This condition might bring advantages to the environment as local people might reduce illegal logging activities [17]. Parts of plants generally used by local people of Papua as medicinal plants are leaves (Table 1). This finding is identical to previous studies that also found that leaves are the dominant parts of plants used by local communities as medicinal plants [8], [11], [15]. In general, leaves are abundant in nature and easy to harvest and utilize without destroying the whole plant [17], [36]. Moreover, leaves contain high secondary metabolites [20]. The utilization of exudate and flowers tends to be minor in Papua and other regions of Indonesia [37].

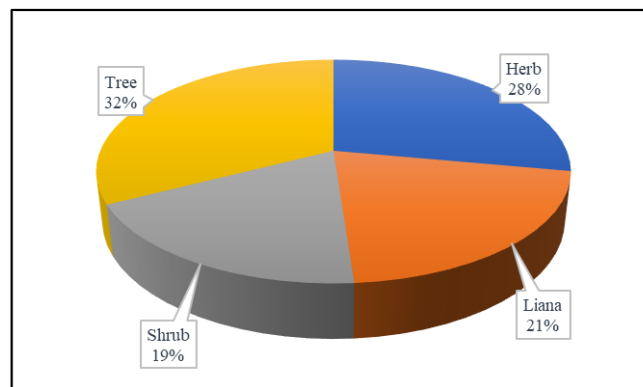


Figure 2. The habitus of medicinal plants in Inamberi Research Station.

Medicinal plants in Inamberi Research Station are grouped into 24 families, dominated by Euphorbiaceae and Moraceae (Figure 3). In general, medicinal plants are varied among regions. In the logging concessions of Wijaya Sentosa (West Papua), medicinal plants are dominated by the Fabaceae family [8]. Similarly, medicinal plants in Lambung Mangkurat Education Forests are also dominated by species from Fabaceae [15]. In *KHDTK* UM Palangkaraya, medicinal plants are dominated by Myrtaceae [13].

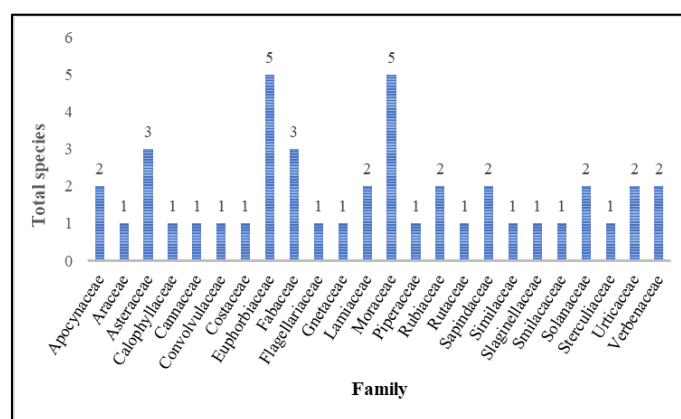


Figure 3. The family of medicinal plants in Inamberi Research Station.

The conservation status of most medicinal plants in Inamberi Research Station is categorized as low risk (Least Concern) (Table 1), indicating that the population of most medicinal plants in the wild is still abundant. However, some concerns should be given to *P. indicus* that is categorized by IUCN as an Endangered species due to overexploitation for timber purposes [38]. The strategy that can be performed to conserve this species is ex-situ and in-situ conservation. The ex-situ conservation programs can be conducted through the development of facilities for medicinal plants collection [4].

4 Conclusions

The Inamberi Research Station has 43 medicinal plants. The local people of Papua used them to treat various diseases. Several medicinal plants in the study site can cure more than one disease. Medicinal plants in the research station are dominated by trees (family of Euphorbiaceae and Moraceae). The dominant parts of medicinal plants are leaves. Local people utilized medicinal plants using simple methods, such as boiling and drinking, directly eating, chewing and attaching to the wounds, and rubbing on the skin. The conservation status of medicinal plants at Inamberi Research Station is categorized as low risk. However, some concern should be given to *P. indicus* as it has been classified as an Endangered species by the IUCN due to excessive harvesting for timber purposes. Ex situ and in situ conservation is needed to protect this species.

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