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Inventory and Biodiversity of Medicinal Plants from Tropical Rain Forest Based on Traditional Knowledge by Ethnic Dayaknese Communities in West Kalimantan Indonesia

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Abstract

The use of plants as medicine is widespread throughout the world. Traditional knowledge is common and important among the Dayaknese communities in West Kalimantan Province, Indonesia, but much of the information is empirical at best and lacking logical validation. A number of ethnic communities residing in the study area are partially or fully dependent on the forest resources to meet their requirements. Plants have traditionally been used as a source of medicine in Dayaknese communities in West Kalimantan. However, little work has been done in the past to properly document and promote that knowledge. Today medicinal plants and the associated knowledge in the area are threatened due to deforestation, environmental degradation and acculturation. The objective of this study was to carry out a comprehensive ethno-medicinal survey of plants used from the tropical rain forest in West Kalimantan as medicine in Dayaknese communities. The study area included Mempawah Regency, Sanggau Regency and Landak Regency in West Kalimantan Province. West Kalimantan Province has a climate that belongs to the equatorial area. It has two seasons with a long rainy season (at least 8 months), heavy rainfall (about 400 mm per year), high temperature (28°C) and the relative humidity of the air remains high throughout the year.

It has been found that various traditional knowledge systems have been continually practiced and followed since long ago by the inhabitants of different Dayaknese communities in West Kalimantan Province. The study was conducted in seven villages encompassing different village development families of the Mempawah Regency, Sanggau Regency and Landak Regency in West Kalimantan Province. During 120 household visits, traditional information about medicinal plants was gathered through oral interviews and discussion with knowledgeable persons of the ethnic community. The information gathered concerned the plants used to treat diseases. Only species for which the effects were known were selected. Voucher specimens were collected from the field. While noting the information, every care was taken to record the local names of the plants, the parts used, the method of drug preparation and dosage uses.

The results showed that 120 households were surveyed and provided 68 species of medicinal plants. Several species were recorded to have more than one use. The informants were 85% male and 15% female; 60 % were traditional healers and 10% were herb sellers while the others were knowledgeable with regard to the utilization of medicinal plants. Elderly Dayaknese people are familiar with the plant species, their uses for common ailments and with the plant remedies being used on a regular basis. The majority of people in the younger generation of Dayaks are not familiar with the majority of plants or their medicinal values. Only a small number of younger people have followed the medicinal practices and traditional knowledge by the elders and healers. The majority of household informants reported that they kept their medicinal plant knowledge secret. They further revealed that free transfer of knowledge could only take place along the family line, usually from parents to sons. The Dayaknese people used plants and their parts such as roots, rhizomes, tubers, leaves, stem, wood, bark, flowers, seeds, and fruits in various purposes in their daily life.

Key words: medicinal plants, traditional, knowledge, Dayaknese community, West Kalimantan, Indonesia

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Introduction

Man has used plant drugs for health care delivery for centuries. The use of plants as medicine is widespread throughout the world. Plants and plant products have augmented human culture since time immemorial but few people realize that plant species are an important part of our environment (Singh, 1993). Disease remedies for mankind from plant sources are as old as human history and still in use in the 21st century. It is estimated that about 75% of useful bioactive plant derived pharmaceuticals used globally have been discovered by systemic investigation of leads from the field of traditional herbal medicine (Tomoko *et al.*, 2002).

Traditional medical practices and information play an important role in scientific research, particularly when the literature and fieldwork data have been properly evaluated. The documentation of traditional knowledge on the utilization of local plant resources by different ethnic groups or communities is one of the main objectives of ethno-botanical and ethno-pharmacological research. In general, traditional knowledge study focuses on the indigenous people. Indigenous people are the ones who were the original inhabitants of any area and who live a self-sufficient life with no foreign involvement. Shengji (1999) said that indigenous knowledge systems are not only important for the cultures from which they evolve, but also for scientists and planners striving to improve conditions in rural societies.

Rural people have developed unique indigenous knowledge related to the uses of plant resources due to constant association with the forests. This existing valuable information needs to be documented before it is lost or vanishes. As a documentation system is lacking, priority should be given to recording the traditional knowledge regarding the plants used for medical purposes and developing a listing of the ethno-pharmacological uses of the various plant species. Shrestha and Dhillion (2003) stated that ethnic communities have immense knowledge of the medicinal plants species that they pass on from generation to generation simply through oral communication. Traditional medical knowledge of medicinal plants and their uses by ethnic communities is not only useful for conservation of cultural traditions and biodiversity but also for community healthcare and drug development in the present and future. Herbal medicines are of value in treating many diseases including infectious diseases, hypertension, and dengue, that they can save the lives of many people, particularly in the developing countries. Traditional knowledge is a relatively new field of study in West Kalimantan, Indonesia, as it is

in many other developing countries. It has taken its own way of development, depending on local traditions. It is known that the way of administering a particular plant to cure diseases widely differs among indigenous groups (Oladele *et al.*, 2011).

Traditional herbal medicine knowledge is common and important among the Dayaknese communities in West Kalimantan Province Indonesia, but much of the information is empirical at best and lacking logical validation. A number of ethnic communities residing in the study area are partially or fully dependent on the forest resources to meet their requirements. Plants have traditionally been used as a source of medicine in Dayaknese communities in West Kalimantan. However, little work has been done in the past to properly document and promote that knowledge. Today medicinal plants and the associated knowledge in the area are threatened due to deforestation, environmental degradation and acculturation. The objective of this study was to carry out a comprehensive ethno-medicinal survey of those plants from the tropical rain forest in West Kalimantan that are used medicinally in Dayaknese communities.

Materials and methods

Study Area

The study area was Mempawah Regency, Sanggau Regency and Landak Regency in West Kalimantan Province, Indonesia. West Kalimantan Province has a climate that belongs to the equatorial area. It has two seasons with a long rainy season (at least 8 months), heavy rainfall (about 400 mm per year), high temperature (28°C) and the relative humidity of the air remains high throughout the year. The three Regencies are made up of the following villages: Mempawah Regency consists of Sekabuk village and Pak Nungkas village; Sanggau Regency consists of Bantai village, Darok village, and Nyaroda village; Landak Regency consists of Raba village and Marinsu village. The major occupation of the indigenous people is farming which they practice at subsistence level due to lack of facilities and fragmented farmlands resulting from land tenure systems. The vegetation of the area is rich tropical rain forest.

Data Collection

The ethno-medicinal plant inventory was conducted with the aid of a pre-tested semi structured questionnaire administered among traditional healers, herb sellers and other knowledgeable persons of the ethnic community. During the 120 household visits, traditional information about medicinal plants was gathered through oral

interviews and discussion based on the questionnaire. The purpose of the interview was explained to the respondents and their consent to publish the findings was obtained before questioning. A token sum was paid to some respondents for their time and the knowledge shared. Both rural and urban communities were visited between December 2011 and May 2012.

The information gathered concerned the plants used to treat diseases. Only species for which the beneficial effects were known were selected. Voucher specimens were collected from the field. While noting the information, every care was taken to record the local names of the plants, parts used, the method of drug preparation and dosage uses.

Results and discussion

A total of 120 informants were interviewed on their knowledge of medicinal plants. The survey group consisted of 85% males and 15% females (Table 1). Traditionally, medical practice has been dominated by males due to the secrecy involved in transmitting medicinal knowledge from one generation to the next. Kudngaongarm (2011) stated that males are culturally viewed as the heirs of family heritage for preservation and continuity along with the belief that females leave the family after marriage. In addition, apprentices of traditional medicine practice are mostly males due to

Table 1. Demographic features of informants on traditional herbal plants in Mempawah Regency, Sanggau Regency and Landak Regency in West Kalimantan Province, Indonesia.

Informant's data	Frequency	%
Gender:		
Male	102	85
Female	18	15
Age		
Above 50 years	78	65
20-50 years	42	35
Residency		
Urban	12	10
Rural	108	90
Education		
Literate	70	58
Non-Literate	50	42
Occupation		
Traditional healers	72	60
Herb sellers	12	10
Other	36	30

the rigors of medicinal plant collection from forest and preparation. However, females are especially knowledgeable in pediatric herbal medicine obtained in the course of raising children (Voeks, 2007). Sixty-five percent of the informants were over 50 years of age and 35% were between 20-50 years of age; the informants predominantly resided in rural areas (90%).

WHO (2008) stated that poor rural populations depend on herbal medicine for their health care needs, due to lack of modern health care centers in rural areas. Where modern health centers are available, the purchasing power of the rural population is usually low and they turn to herbal therapies that are readily available and within reach. The occupation of the informants influences their knowledge of the use of plants for medicinal purposes. Traditional healers (TH) make up 60% of the informants. TH are the primary custodians of knowledge in regard to herbal remedies and serve as the first port of call during health emergencies in rural areas, they are well respected, popular and acceptable to the people in their area. TH help in preserving the indigenous knowledge of herbal therapy over generations by training their family members and accepting apprentices. Services offered by TH are usually affordable by the rural poor and are sometimes free, in contrast to the non-affordability of modern health care system. About 10% of the informants were comprised of herb sellers or herb vendors. The interactions between herb sellers and TH over years help them to acquire some degree of knowledge in traditional health care delivery and utilization of plants for therapeutic purposes. A final group of other knowledgeable individuals (30%) was selected randomly for interview. This group included students and parents who often used herbal remedies for curing disease.

Here are the results from the interviews and from a survey in the forest location in the seven villages area from Mempawah Regency, Sanggau Regency and Landak Regency in West Kalimantan Province, Indonesia, which provided 68 species of medicinal plants (Table 2).

Medicinal plants are used in treatment and prevention of various health problems from simple to complex disease situations among rural populations globally, thereby improving the quality of life. The inability to afford modern drugs among the rural population in Mempawah regency, Sanggau regency and Landak regency have caused a large proportion of rural people to depend on traditional herbal drugs. Modern health care delivery is beyond the reach of people of people living in rural area, hence they greatly rely on readily available medicinal plants in their local neighborhoods. It is esti-

Table 2. Plants used for herbal medicine.

No	Local name	Plant name/family	Plant form	Parts used	Uses
1	Asam Kalimantan	<i>Mangifera</i> sp. / Anacardiaceae	Tree	bark of stem	stomach ache
2	Basi motu onu	<i>Schizaea dichotoma</i> (L.) / Schizaeaceae	Herb	all parts	headache
3	Belian	<i>Eusideroxylon zwageri</i> / Lauraceae	Tree	leaves	injury
4	Bemban	<i>Donax cannaeformis</i> / Marantaceae	Herb	leaves	acne
5	Bobol	<i>Costus speciosus</i> (Koenig) / Costaceae	Herb	flower	menstrual cramps
6	Boik cola	<i>Piper bsormentosum</i> Roxb / Piperaceae	Herb	leaves	fever
7	Bungkang	<i>Syzygium polyanthum</i> (Wight) / Myrtaceae	Tree	bark of stem	stomach ache
8	Cempedak	<i>Artocarpus integer</i> (Thumb) / Moraceae	Tree	bark of stem	stomach ache
9	Daun kentut	<i>Paederia scandens</i> (Lour.) Merr / Rubiaceae	Herb	All parts	cough and influenza
10	Daun mondayan	<i>Litsea firma</i> Hook / Lauraceae	Tree	leaves	stomach ache and fever
11	Daun ribu	<i>Selaginella doederleinii</i> / Selaginellaceae	Herb	All parts	acne
12	Durian	<i>Durio zibhetinus</i> Murr / Bombacaceae	Tree	stem of bark	fever
13	Engkoram	<i>Rubus moluccanus</i> L. / Rosaceae	Climber	leaves	influenza
14	Hajah	<i>Asplenium nidus</i> L. / Aspleniaceae	Climber	leaves	headache
15	Himan tutuh	<i>Curculigo latifolia</i> / Hypoxidaceae	Shrub	all parts	stomach ache
16	Himan toba	<i>Cyrtandra vaginata</i> Burt / Gesneriaceae	Shrub	leaves	heart attack
17	Hisak	<i>Melastoma malabathricum</i> / Melastomaceae	Shrub	leaves	stomachache
18	Jambu hutan	<i>Bellucia pentamera</i> / Melastomaceae	Tree	leaves	stomachache
19	Jurupa	<i>Urena lobata</i> L. / Malvaceae	Shrub	flower	acne
20	Kembang bulan	<i>Chassalia chartacea</i> Craib / Rubiaceae	Shrub	root	menstrual cramps
21	Kibang bukuh	<i>Tetrastigma dubium</i> Planch / Vitaceae	Herb	leaves	bone injury
22	Kolas halus	<i>Cnetis plantantha</i> Griff / Connaraceae	Herb	leaves	bone injury
23	Langsat	<i>Lansium domesticum</i> / Moraceae	Tree	bark of stem	malaria fever
24	Mahang	<i>Macaranga triloba</i> (Bl.) Arg / Euphorbiaceae	Tree	leaves	fever
25	Manggis	<i>Garcinia mangostana</i> L. / Clusiaceae	Tree	bark of stem	stomachache
26	Mentawa	<i>Artocarpus anisophyllus</i> / Moraceae	Tree	bark of stem	stomachache
27	Mopar Doyo	<i>Amischotolype griffithii</i> (C.B. Clarke) I.M.Turner / Commelinaceae	Herb	leaves	for cleaning the eye
28	Kantong semar	<i>Nepenthes ampullaria</i> / Nepenthaceae	Herb	root	yellow fever
29	Leban	<i>Vitex pubescens</i> Vahl / Verbenaceae	Tree	bark of stem	stomachache
30	Bakung	<i>Piper vestitum</i> C.DC. / Piperaceae	Climber	leaves	stomachache
31	Nyoman subi	<i>Aeschynanthus parvifolius</i> R. Br.) / Gesneriaceae	Climber	leaves	skin disease
32	Ojuo Pelanduk	<i>Davallia heterophylla</i> J. Sm.) / Davalliaceae	Epifit	leaves	fever
33	Ojuo Kutui	<i>Dracaena congesta</i> Br. / Agavaceae	Herb	root	cough and influenza
34	Ongkah Pamba	<i>Bauhinia</i> sp. / Caesalpinioideae	Shrub	leaves	fever
35	Pohon Arok	<i>Baccaurea lanceolata</i> (miq.) M. A / Phyllanthaceae	Tree	bark of stem	fever
36	Pulai	<i>Alstonia spatulata</i> / Apocynaceae	Tree	exudate	toothache
37	Simpur	<i>Dillenia excelsa</i> (Jack) Gilg / Dilleniaceae	Tree	root	cough and influenza
38	Sisiek	<i>Scleria purpurescens</i> Steud / Cyperaceae	Herb	leaves	stomachache
39	Sirih merah	<i>Piper porphyllum</i> N.E.Br / Piperaceae	Herb	leaves	cleaning the eye, hypertension, diabetes
40	Songa tipo	<i>Zingiber aromaticum</i> Boehm. In. Ludw / Zingiberaceae	Herb	all parts	menstrual cramps, diarrhea
41	Sumpit Angin	<i>Cymbidium pubescens</i> / Orchidaceae	Epifit	all parts	head ache
42	Tengkawang Tungkul	<i>Shorea stenoptera</i> Burck / Dipterocarpaceae	Tree	fruit	toothache
43	Tonji Berdiri	<i>Lecananthus erubescens</i> Jack / Rubiaceae	Shrub	leaves	stomachache
44	Jahe	<i>Zingiber opicinale</i> / Zingiberaceae	Shrub	fruit	stomachache
45	Jambu Biji	<i>Psidium guajava</i> L / Myrtaceae	Tree	leaves	stomachache, diarrhea
46	Belimbing Wuluh	<i>Avverchoa bilimbi</i> / Oxalidales	Herb	fruit and leaves	hypertension
47	Kembang Sepatu	<i>Hibiscus rosasinensis</i> L / Malvaceae	Herb	leaves	fever, headache
48	Kumis Kucing	<i>Orthosiphon aristatus</i> (Bl.) Miq / Lamiaceae	Herb	leaves	diabetes
49	Kunyit	<i>Curcuma domestica</i> Vall / Zingiberaceae	Herb	leaves and fruit	stomachache

No	Local name	Plant name/family	Plant form	Parts used	Uses
50	Mahkota Dewa	<i>Phaleria macrocarpa</i> / Thymelaeaceae	Tree	leaves and fruit	hypertension, cancer, diabetes
51	Mengkudu	<i>Morinda citrifolia</i> / Rubiaceae	Tree	fruit	hypertension, cancer
52	Sirsak	<i>Annona muricata</i> L / Annonaceae	Tree	leaves	cancer, diabetes, hypertension
53	Lalang	<i>Imperata cylindrica</i> / Poacea	Herb	leaves	hypertension
54	Paku Gajah	<i>Angiopteris avecta</i> / Marratiaceae	Herb	all parts	acne
55	Paku Keminding	<i>Angiopteris</i> sp. / Marratiaceae	Herb	all parts	headache
56	Putri Malu	<i>Mimosa pudica</i> L. / Amaryliadeceae	Herb	all parts	influenza
57	Para Babi	<i>Hyptis capitata</i> Jacq / Lamiaceae	Herb	all parts	stomachache
58	Sabang Merah	<i>Cordyline fruticosa</i> / Asparagaceae	Shrub	all parts	bone injury
59	Rora	<i>Rhahidphora korthasiel</i> / Aracea	Herb	all parts	bone injury
60	Pokuh Bohumbo	<i>Nephrolepis biserrata</i> (Sw). Schott / Oledraceae	Herb	all parts	head ache
61	Mambong Bolai	<i>Gynura procumbes</i> (lour). Merr / Asteraceae	Shrub	leaves	headache
62	Cocor Bebek	<i>Kalanchoe pinanta</i> (Lam) / Crassulaceae	Herb	all parts	headache
63	Pohon Ara	<i>Ficus</i> sp.	Tree	leaves	headache
64	Akar kolera	<i>Shore</i> sp. / Dipterocarpaceae	Tree	root	cough, stomach ache
65	Daun kopoyiek	<i>Paederia</i> sp. / Rubiaceae	Tree	leaves	headache
66	Himan kuyan	<i>Melastoma</i> sp. / Melastomaceae	Shrub	leaves	cough and influenza
67	Kolas hingi	<i>Cnetis</i> sp. / Connaraceae	Herb	leaves	bone injury
68	Kolas mantikus	<i>Tetrastigma</i> sp. / Vitaceae	Herb	leaves	bone injury

mated that over 70% of people in Mempawah regency, Sanggau regency and Landak regency are farmers, live in rural areas and use medicinal plants for their health care needs.

The elder Dayaknese people are familiar with the rainforest plant species and these plants are used regularly for common ailments. Most members of the younger generation are not familiar with these plants or their medicinal value. Only a small minority of young people have followed the medicinal practices and kept the traditional knowledge passed down by the elders and healers. The majority of household informants reported that they kept their medicinal plant knowledge secret. They further revealed that the free transfer of knowledge could only take place along the family line, usually from parents to sons. The Dayaknese people used plants and their various parts such as roots, rhizomes, tubers, leaves, steam, wood, bark, flowers, seeds, and fruits for various purposes in their daily life.

Conclusion

Plant materials in the form of herbs, leaves of trees, stem bark, and shrubs constitute an unlimited source of phytochemicals available for improving human health including memory improvement and aging. Knowledge of utilization of plant resources for health care delivery varies with cultural background globally. The future scope of this research also concerns phytochemical and

phytopharmaceutical screenings.

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