Review:
Traditional knowledge of the Dayak Tribe (Borneo) in the use of medicinal plants

FATIHA RISTYA AZ-ZAHRA1, NERIZA LARAS WIDYA SARI1, RAIHANI SAPUTRY1, GILANG DWI NUGROHO2, SUNARTO3, TEGUH PRIBADI3, AHDAD DWI SETYAWAN4.*
1Department of Environmental Science, Faculty of Mathematics and Natural Sciences, Universitas Sebelas Maret. Jl. Jend. Urip Sumoharjo No. 179, Surakarta 57128, Central Java, Indonesia. Tel.: +62-271-663375, *email: volatilernis@gmail.com
2Biodiversitas Study Club, Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Sebelas Maret. Jl. Ir. Sutami No. 36A, Surakarta 57126, Central Java, Indonesia
3Department of Forestry, Faculty of Agriculture, Universitas PGRI Palangkaraya. Jl. Hiu Putih, Tjilik Riwut Km.7, Palangka Raya 73112, Central Kalimantan, Indonesia

Manuscript received: 8 August 2021. Revision accepted: 30 September 2021.

Abstract. Az-Zahra FR, Sari NLW, Saputry R, Nugroho GD, Sunarto, Pribadi T, Setyawan AD. 2021. Review: Traditional knowledge of the Dayak Tribe (Borneo) in the use of medicinal plants. Biodiversitas 22: 4633-4647. Dayak is the name for the native inhabitants of the island of Borneo. The Dayak Tribe uses natural and forest products in plants as traditional medicine for health treatment. This study aims to obtain information about the utilization of medicinal plants in the Dayak Tribe. The knowledge about traditional medicine by utilizing medicinal plants has been obtained from their ancestors since ancient times and inherited from generation to generation. The use of various medicinal plants used by the Dayak Tribe has differences in terms of the part of the plant taken, how to process it, and how to use it. This is because each Dayak Sub-tribe has its role model for using these medicinal plants. For example, the leaves are used in one area, and it could be that the plant roots are used in other areas. This paper reviews the use of medicinal plants to treat various diseases by 6 Dayak sub-tribes, namely: Desa Dayak Sub-tribe (member of Iban Dayak), Jungkang Dayak Sub-tribe (member of Klemantan Dayak), Bakumpai Dayak Sub-tribe (member of OrDanum-Ngaju Dayak), Kenyah Dayak Sub-tribe (member of Apokayan Dayak), Tagol Dayak Sub-tribe (member of Murut Dayak), and Siang Dayak Sub-tribe (member of Punan Dayak). The results from 6 Dayak Sub-tribes revealed 63 families of plants from which 133 species. The family most widely used for medicinal plants, namely Euphorbiaceae, consists of 9 species, and the leaf is the most commonly used part of the plants (47%). The traditional knowledge of the Dayak Tribe in utilizing plant resources will significantly help preserve biodiversity and domestication of medicinal plants. Suppose medicinal plants are exploited more than they should. In that case, it will undoubtedly have a significant impact on their availability in the forest area, and if it continues, it will cause the extinction of certain species. This implies the importance of preserving local wisdom in the Dayak Tribe so that the use of nature is done wisely and so that it remains sustainable. By knowing the benefits of medicinal plants, Dayak Tribe will want to conserve these medicinal plants to be used in the future.

Keywords: Borneo, Dayak Tribe, ethnobotany, Kalimantan, medicinal plants

INTRODUCTION

Indonesia's biodiversity is significant for the sustainability of the nation's life. This is not because Indonesia is one of the wealthiest countries globally in terms of biodiversity, but because it is closely related to local cultural diversity and traditional knowledge (Sujarwo et al. 2014). The relationship between biodiversity and local systems that live in the community can be seen in the daily life of traditional communities in meeting the needs for food, clothing, shelter, medicine, and spirituality (Khan et al. 2013; Matthew et al. 2013; Putri et al. 2016; Batoro et al. 2019; Rohman et al. 2019a,b; Panjaitan et al. 2020). These traditional and local ecological knowledge are valuable sources of information that get international recognition (Junior and Santos 2017).

Traditional medicine, which generally comes from plants, has been known for a long time. Traditional medicinal plants are natural ingredients that have traditionally been used for treatment based on the experiences of local communities themselves (Ragragio et al. 2013; Balangcod and Balangcod 2015; Molina et al. 2015; Che et al. 2017; Hussain et al. 2019; Tounekti et al. 2019). Knowledge about traditional medicine is passed down from generation to generation by the ancestors of the Indonesian nation (Gruyal et al. 2014; Sabran et al. 2016; Ducusin 2017; Gaddy 2020).

Medicinal plants in Indonesia have been going on since ancient times and have even become a culture (Son et al. 2019). Although broadly the same, each region or ethnic group has its characteristics in terms of traditional medicine, this is triggered by natural conditions, especially the availability of medicinal plants in each region, as well as differences in culture and customs the background for the use of these medicinal plants (Jaiswal et al. 2016). Medicinal plants can be used from certain parts, including roots, stems, leaves, fruit, seed, and their excretions that
can heal or relieve pain (Fukuyama et al. 2012; Roslinda et al. 2016; Sharma and Yadav 2017; Tantengco et al. 2018).

Kalimantan is the Indonesian region of Borneo, an island with a very high level of biodiversity due to its diverse ecosystems. There are seven different ecoregions in Borneo, i.e., (i) lowland rain forest, which covers most of the island; the other lowland areas are covered by (ii) heath forest (kerangas); (iii) peat swamp forest; (iv) freshwater swamp forest in the southwest; (v) mangrove forest in all coastal areas; (vi) there are also mountain rain forest highlands, which is located in the center and northeast of the island with the peak of Mount Kinabalu, Sabah; and (vii) in this region there are alpine meadows and bushes that consist of many endemic species (Setyawarno 2010).

The diverse ecosystems in Kalimantan are home to a wealth of medicinal plants that the Dayak Tribe uses to treat various ailments. The traditional knowledge of various species of forest medicinal plants owned by the Dayak Tribe is invaluable, especially for developing health and industrial medicine (Cheikhhouyousef et al. 2011; Shosan et al. 2014; Haeruddin et al. 2017; Qamariah et al. 2020). In addition, the knowledge of traditional medicine and the use of medicinal plants is an essential element in increasing an individual's ability to have a healthy life (Panjaitan et al. 2013; Elfahmi et al. 2014; Sujawal et al. 2015; Fitmawati et al. 2017; Setiawati et al. 2019). Therefore, efforts to spread the use of medicinal plants are needed.

Unfortunately, the knowledge about traditional medicine in the Dayak Tribe is currently threatened with extinction due to several reasons, namely: (i) the knowledge is eroded by the younger generation's lack of interest in learning medicinal plants and the diversity of medicinal plants used by their ancestors; (ii) the traditional knowledge is still conveyed orally and not well documented; (iii) the older generations who know traditional medicine is decreasing and only a few elders are conveying information about types of medicinal plants and their use techniques to their children; (iv) the influence of foreign cultures is starting to enter to the Dayak Tribe; (v) the influence of technological progress which is increasingly leaving traditional elements.

Dayak Tribe communities lack access to modern health care, and the loss of medicinal plant knowledge will be a massive loss for the Dayak Tribe because it will lower their health quality. As a result, the Dayak Tribe's tradition of using nearby plants for treatment or health care must be practiced and preserved. Therefore, this study aims to review the utilization of medicinal plants for the Dayak Tribe.

THE DAYAK TRIBE, THE NATIVE PEOPLE OF KALIMANTAN

The Indonesian Borneo (Kalimantan) is administratively divided into five provinces, namely: East Kalimantan with capital city of Samarinda, South Kalimantan with capital city of Banjarmasin, Central Kalimantan with capital city of Palangka Raya, West Kalimantan with capital city of Pontianak, and North Kalimantan with capital city of Tanjung Selor. The northern part of Borneo Island belongs to Brunei Darussalam and Malaysia, consisting of Sabah and Sarawak (Britannica 2019).

Dayak is the name for indigenous communities which are the original inhabitants of the island of Borneo. Other than Borneo, there were no Dayaks on other islands. Kalimantan has about 15 million people, with the main components of the Malays, Dayaks, and Chinese. Dayak Tribe has several about 3.4 million, of which the largest group is the Iban Dayak consisting of 710,000 people living in the northwest of the island. In addition, there are also ethnicities of Javanese, Madurese, and Bugis in significant quantities (MacKinnon et al. 1996).

At first, the Dayak communities lived spread out along the rivers downstream and then inhabited the coast of the island of Borneo. However, when the Malays from Sumatra and the Land of the Melaka Peninsula came, the Dayaks moved away gradually farther into the interior of Kalimantan on the one hand. Historically, the Dayak Tribe had built a kingdom. The Dayak oral tradition is often called "Nansarunai Usak Jawa," a Nansarunai Dayak kingdom destroyed by Majapahit, estimated to have occurred between 1309-1389. This incident resulted in the Dayak Tribe being pushed and scattered, some entering the interior (Fridolin Ukur 1971). On the other hand, the Dayak community has a shifting cultivation tradition. From year to year, they look for forests considered fertile for farming and planting as a livelihood. Finally, for many years, almost all remote areas of Kalimantan have not been separated from the dwellings of the Dayak community (Darmadi 2017).

Since thousands of years ago, the Dayak community of Borneo has used technology and traditional knowledge, namely shifting cultivation to manage natural resources and biodiversity in the forest. They build and use specific steps as a strategy for the conservation of natural resources and the environment. At first, learn the limitations of natural resources, where excessive and unwise use will reduce their availability and sustainability. Traditional knowledge is the unique local knowledge owned by a particular culture or society. This knowledge is the accumulation of human knowledge and understanding of the universe, including the spiritual relationship with the Almighty, the relationship with nature, and relationship with humans, and it is reflected in language, organization, values, and law system, to be the ethics that govern the behavior of a society. Dayak Tribe always believes that there is a limitation of natural resources, thus requiring conservation, except for certain types of resource availability which exceed demand (Uluk et al. 2001). Review of the literature shows that people who intentionally build conservation strategy usually has limited natural resources and easy to decline. Therefore, the strengthening conservation strategies in the traditional culture are essential to help survive in the limited natural resources, especially when natural resources run out (Setyawaran 2010).
Dayak Tribe is divided into six major clusters, namely: Apokayan (Kenyah-Kayan-Bahau), generally living in the eastern part of Kalimantan, OtDanum-Ngaju in the southern part of Kalimantan, Iban (Sea Dayak) in the northwestern inland to the coastal area of Borneo, Klemantan (Land Dayak) in the northwest outback of Borneo, Murut in northern Borneo, and Punan (Penan) in the center to the east of Borneo (Lontaan 1975) (Figure 1). Every major cluster can be divided into several sub-tribes, so there are 405 sub-tribes among the Dayak Tribe, they have comparable rituals and cultures (Lontaan 1974). Dayak Tribe lives in groupings of spots/areas where they are domiciled, hence there are differences between them. They use ethnicity for naming particular entities, such as the river’s name, the hero’s name, and the realm’s name. For example, Dayak rod Loepar is named after the Loepar trunk; Dayak Lebang is named after the Lebang river; Dayak Ketungau is named after the Muualang river; Dayak Seberuang is named after the Seberuang river; Dayak Tidung is named after the Tidung river; and Dayak Hill (Kanayatn/Ahe) is named after the Bawang Hill (Darmadi 2017).

Dayak Tribe has a loose grouping, with many sub-tribes, each of which has a dialect of its territory’s language, customs, laws, and culture. Still, their general appearance showed the same characteristics and is easily identified (Grimes 2000). This tribe shares physical features, architecture, language, oral traditions, customs, social structure, weapons, agricultural technology, and similar views of life (Davis 1993). In addition, they have a genuine belief in Kaharingan (animism), although many are now an official religious follower (Kana 2004; Winzeler 2008).

Ethnicity and diversity the Dayak community of Central Kalimantan has a relatively different ethnicity than West Kalimantan and other regions. The majority of the ethnic groups that inhabit Central Kalimantan are ethnic Dayak Ngaju, Ot Danum, Maanyan, Dusun, etc. While the religion they profess is very varied. The Dayak, who are Muslim in Central Kalimantan, still maintain their ethnicity as a Dayak and the Christian Dayak. The original religion of the Dayak Tribe in Central Kalimantan is Kaharingan. This religion was born from the local culture before the Indonesians recognized the first religion, namely Hinduism. Because Hinduism has spread widely in the world, especially Indonesia, and is more widely known when compared to the Dayak religion, the Kaharingan Religion is categorized as a branch of Hinduism (Darmadi 2017).

West Kalimantan Province has its uniqueness to cultural acculturation or the transfer of religious culture for the local community. In this case, the process is closely related to the three largest tribes in West Kalimantan, namely the Chinese (Tionghoa), Dayaks (Dayak), and Malays (Melayu) (TIDAYU). There is TIDAYU batik and TIDAYU dance tunes. At first, the Dayak people inhabited the coastal areas of West Kalimantan, living with their respective traditions and culture, then traders from Gujarat who were Muslim (Arab-Malay) came to buy and sell goods from and to the community. The Dayaks, then because of their frequent interactions, go back and forth to pick up and deliver merchandise from and to the Malacca Strait (which was a trading center in the past), causing them to want to settle in a new area that has excellent trade potential for profit (Darmadi 2017).

Most Dayak Tribe who embrace Islam no longer recognize themselves as Dayaks but refer to themselves as "Malays" or "Banjarese" people. Meanwhile, the Dayaks who did not embrace Islam returned to the river, entering the interior of Kalimantan. In South Kalimantan, for example, they live around the areas of Kayu Tangi, Amuntai, Margasari, Watang Amandit, Tabuan Lawas and Watang Balangan. Others continue to enter the jungle. The Dayak people who embrace Islam are mostly in South Kalimantan and parts of Kotawaringin, one of the famous Sultans of the Banjar Sultanate is Lambung Mangkurat, a Dayak Maanyan or Ot Danum. His name is immortalized as the name of Lambung Mangkurat University in Banjarmasin (Fridolin Ukur 1971).

Each Dayak cultivates and develops their own culture in daily life. For example, there is a growing trend in dance or other arts apparel that is based on location. Saber is considered magical in the art of old weaponry and is exclusively used in select rituals such as combat, headhunting, fixtures, traditional dance, and ceremonial. Saber is thought to have effective or miraculous properties. The power of magic is drawn not just from manufacturing rituals, but also from the headhunting tradition. The more people who will be more powerful dikayau mandaunya. The results of the hair kayau were utilized to embellish the handle of the "Saber." They think that individuals who die

Figure 1. The Dayak sociolinguistic map described by Tjilik Riwut in 1954 divided the Dayak groups into I. Ngaju, II. Apokayan, III. Iban, IV. Klemantan, V. Murut, VI. Punan, and VII. Ot Danum. Recently, OtDanum-Ngaju Dayaks have been categorized as one group.
in-kayau, his spirit, will reincarnate as a magical Saber in their mandau. However, the function of the Saber has changed significantly over time, including as objects of art and culture, souvenirs, collectibles, and weapons for hunting, pruning shrubs, and farming, though it still be recognized Dayak in the forest and in the mountains that preserve the ritual as sacred goods (Darmadi 2017).

THE ETHNOBOTANY OF MEDICINAL PLANTS USED BY DAYAK TRIBE

Ethnobotany is defined as the relationship between humans and plants, which is developed through traditional culture and ways of life on how plants provide value for humans (Erinoso and Aworinde 2012; Ningthoujam et al. 2014; Parvaiz 2014; Kusma et al. 2015; Sunarayati 2018; Yeung et al. 2020). Traditional tribal communities in Indonesia widely apply ethnobotany because it results from interactions, processes, and attitudes between indigenous peoples and the use of plants in the forest.

In forested regions such as in the tropics, local communities or indigenous peoples have a strong connection and play an essential role in forest management using the ethnobotanical knowledge and practice they always do (Mary et al. 2012; Ningthoujam et al. 2012; Balilla et al. 2013; Thakar et al. 2015; Alzina et al. 2017; Andrade et al. 2017). If there are changes to forest areas, it will affect the loss of traditional knowledge, and forest resources are no longer sustainable (Pieroni et al. 2014). The application of ethnobotany itself is one of the indicators used for sustainable use of natural resources (Nahdi et al. 2016). In the forest-based community, the decline in ethnobotany knowledge indicates forest degradation because the role of local communities in managing forest resources has decreased.

As part of ethnobotanical knowledge possessed by indigenous peoples, the traditional use of plants has developed and has been hereditary. One of the uses of plants by indigenous people is for medicinal purposes. It is easy for them to get plants with medicinal properties, which can be planted around the house and processed by themselves. In broader society, the documentation of the use of medicinal plants through ethnobotanical studies enables drug development and plant conservation (Calzada and Bautista 2020).

The Indonesian population has long used plants as medicines. The use of plants for medicine is also varied according to the ethnic diversity they have. One of the ethnic groups in Indonesia that extensively and traditionally uses medicinal plants as a traditional medicine in treating health problems is the Dayak Tribe in Kalimantan. Dayak Tribe has been using plants in the treatment of various diseases since ancient times. The Dayak Tribe uses medicinal plants that exist in their nature in various ways and purposes (Luardini et al. 2019, Yusro et al. 2020b). The means and objectives in this utilization are very concerned about environmental sustainability and the preservation of medicinal plants themselves. This utilization is also one of the cultural heritage and customs of their tribe so that the Dayak Tribe still maintains it today. Knowledge about traditional medicine by utilizing medicinal plants around them has been obtained from generation to generation from the ancestors since ancient times (Pieroni et al. 2015). The traditional use of medicinal plants has many advantages for the Dayak Tribe because it is easy to obtain and process them, the Dayak Tribe also do not need to pay a lot of money when compared to modern medicines, and besides that, the use of these medicinal plants has no side effects when compared to modern medicine (Dias et al. 2012; Bahmani et al. 2014; Karimi et al. 2015; Sari et al. 2015).

Typical uses of medicinal plants by Dayak Tribe are for daily health complaints, such as fever, skin diseases (Oun et al. 2015; Rajput et al. 2014), flu, mouth sores, digestive diseases, external wounds, coughs, colds, toothaches, and other frequently encountered diseases (Abdelgadir and van Staden 2013). However, some plants can also be used to treat more severe disease conditions such as diabetes, cancer, hypertension, malaria, antidote, antimicrobial, diuretic, antibacterial, diarrhea, and anti-inflammatory. It also becomes the basis for researchers to explore further bioactive compounds which have a significant role in disease healing (Choudhury et al. 2011; Shah et al. 2011; Alnajar et al. 2012; Dey and Rahman 2013; Ruslin et al. 2013; Seyed et al. 2014; Junejo et al. 2015; Kong et al. 2015; Lenta et al. 2015; Sangrueng et al. 2015; Tangjitan et al. 2015; Abdulla et al. 2016; Kalt and Cock 2016; Keshava et al. 2016; Zarate-municad 2016; Azman and Atun 2017; Carag and Buot 2017; Gunadi et al. 2017; Rauf et al. 2017; Salleh and Ahmad 2017; Napagoda et al. 2018; Muhammad et al. 2020; Ratnadewi et al. 2020).

The processing of medicinal plants by the Dayak Tribe is generally done in a relatively simple and very traditional way. In the form of processing, the methods used are somewhat similar to the habits practiced by their ancestors, such as boiling, pounding, roasting, mixing in cooking, or they can also be used directly (Jadid et al. 2020). Among such methods, boiling is the most commonly used preparation method of medicinal plants by Dayak Tribe. They believe that the boiling method applied to medicinal plants will release more chemical substances than other methods. The boiling process on medicinal plants can secrete lots of natural compounds in plants compared to different ways. This is because the higher the temperature used to process a substance, the greater the substance's solubility (Sari et al. 2015). Other researchers have found similar findings, with boiling being the most prevalent way of preparation (Mussarat et al. 2014; Ahmed 2016; Jadid et al. 2017; Shaheen et al. 2017; Malik et al. 2018; Taibi et al. 2020). Simple, easy handling, and inexpensive are the significant reasons why this mode of preparation will affect the loss of traditional knowledge and culture, souvenirs, collectibles, and weapons for humans (Erinoso and Aworinde 2012; Ningthoujam et al. 2012; Alnajar et al. 2012; Dey and Rahman 2013; Ruslin et al. 2013; Seyed et al. 2014; Junejo et al. 2015; Kong et al. 2015; Lenta et al. 2015; Sangrueng et al. 2015; Tangjitan et al. 2015; Abdulla et al. 2016; Kalt and Cock 2016; Keshava et al. 2016; Zarate-municad 2016; Azman and Atun 2017; Carag and Buot 2017; Gunadi et al. 2017; Rauf et al. 2017; Salleh and Ahmad 2017; Napagoda et al. 2018; Muhammad et al. 2020; Ratnadewi et al. 2020).

Plant parts commonly used include the roots, stems, fruit, leaves, seeds, flowers, rhizomes, tubers, and others (Putri et al. 2016; Riadi et al. 2019). Leaves are the part most commonly used as a medicinal ingredient, while the
minor part is the flower (Bradacs et al. 2011; Leto et al. 2013; Mesfin et al. 2013; Nedelcheva 2013; Samoisy and Mahomodally 2015; Umair et al. 2017; Jadid et al. 2020; Kadir et al. 2015). According to research by Maryadi et al. (2012), the selection of leaves as the material for processing traditional medicinal is that the leaves are considered not to disturb the life of medicinal plants so that the plant’s existence can be sustainable. In addition, leaves are very easy to process, have a lot of chemical content, and the texture of the leaves is soft (Rehman et al. 2015; Sauini et al. 2020). Therefore, the use of leaves as medicinal ingredients does not significantly impact the growth of a species and does not damage plant survival. Moreover, many reports have shown that leaves contain diverse plant secondary metabolites (Zahoor et al. 2017; Ullah et al. 2020). This is in line with the principles of the Dayak Tribe in the sustainable use of nature.

There are seven ways of using plants as traditional medicine by the Dayak Tribe: drinking, sticking, eating, smearing, soaking, bathing, and compressing. Among such modes, drinking is the most commonly practiced by the Dayak Tribe (Norvalia et al. 2018). This is because the Dayak Tribe believes that the use of drugs by drinking will react more quickly to cure diseases than by other modes, such as being rubbed, eaten, compressed, bathed, soaked, and pasted (Khairiyah et al. 2016).

**DAYAK SUB-TRIBE UTILIZATION OF MEDICINAL PLANTS**

The utilization of medicinal forest plants has been done by various ethnic Dayak Tribe in Borneo for generations, such as Dayak Paramasan (Anshari et al. 2015), Dayak Ngaju (Kuswantoro 2017; Maimunah et al. 2020), Dayak Tunjung (Setyowati 2011), Dayak Iban (Supiandi and Leliaiv 2020), Dayak Kanayatn (Sari et al. 2021), Dayak Karo’, Dayak Bukat (Yusro et al. 2014), and other Dayak ethnic in Borneo. Each community group or tribe certainly has its knowledge and ways of using plants as medicinal ingredients.

The use of various species of medicinal plants used by the Dayak Tribe has differences in terms of the part of the plant taken, how to process it, how to use it, and its use in each region or the Dayak Sub-tribe that uses it. This is because each Dayak Sub-tribe or region has its role model for using these medicinal plants. For example, for a similar ailment, the leaves of a plant species are used in one area by a Dayak sub-tribe, but it could be that the plant roots are used in other areas. Considering that almost all Dayak sub-tribes are familiar with the use of medicinal plants to treat various diseases, this paper selects six sub-tribes as examples, namely: Desa Dayak Sub-tribe (member of Iban Dayak), Jangkang Dayak Sub-tribe (member of Klemantan Dayak), Bakumpai Dayak Sub-tribe (member of OtDanum-Ngaju Dayak), Kenyah Dayak Sub-tribe (member of Apokayan Dayak), Tagol Dayak Sub-tribe (member of Murut Dayak), and Siang Dayak Sub-tribe (member of Punan Dayak).

**Desa Dayak**

The Desa Dayak Sub-tribe (member of Iban Dayak) lives in Pakak Village, Sintang District, West Kalimantan use at least 25 species plants from 9 families as traditional medicinal ingredients (Table 1). Medicinal plants are utilized as the first line of defense against sickness. The plants, whether grown or wild, are harvested directly from the forest or the backyard. The Araceae family dominates the medicinal plants used by the Desa Dayak community, with the leaves being the most extensively used component of the plants. The highest value was observed in *Colocasia esculenta* (Keladi). By the Desa Dayak community, all parts of the Keladi are boiled and then eaten to treat high blood pressure. In addition, Desa Dayak people invest specific philosophical meanings in using plants as traditional medicines. The plants that have philosophical implications include: *Anisopylea disticha* (Kayu Ribu), which is believed to have a thousand benefits, such as fatty liver, *Dracaena marginata* (Telusuh Punan), which is supposed to provide protection when a mother gives birth, *Cheilocostus speciosus* (Pentawar), which has the meaning of being conditioning because the plants are cold, *Alstonia scholaris* (Paelaik), which is said to be able to mend organs harmed by falls, *Merremia peltata* (Akar Jelayan) and *Cordyline fruticosa* (Sabang Balek), which is thought to repel or be an antidote to poison (Supiandi et al. 2019a).

**Jangkang Dayak**

The Jangkang Dayak Sub-tribe (member of Klemantan Dayak) uses at least 38 families of 65 plant species for traditional medicinal ingredients (Table 1). Euphorbiaceae, Liliaceae, and Zingiberaceae are the most commonly used families (Sari et al. 2015). The emergence of dominant plant species and families are linked to favorable environmental and climate conditions (Farooq et al. 2019; Qaseem et al. 2019). In the Euphorbiaceae family, several plants are used as medicinal plants, including: *Pedilanthus tithymaloides* (Penawar Lipan) which the community uses to treat venomous animal bites, *Jatropha multifida* (Betadine Hutan), which almost all parts of the plant (roots, leaves, sap, and seeds) can be used to treat various kinds of complaints such as coughs, tooth decay, and also treat wounds. *Acalypha wilkesiana*, which the leaves are used to treat headaches, and *Hevea brasiliensis*, which the surrounding community can use the sap as a nutritional medicine to treat venomous animal bites, such as snakes. In the Liliaceae family, *Eletherina americana* (Bawang Hutan) can be used by the community to treat high blood pressure or hypertension, *Allium cepa* (Bawang Merah) can be used as a medicine to treat various diseases ranging from headaches, flatulence, and fever. In addition, there is also *Allium sativum* (Bawang Putih) used to treat toothaches and skin diseases, such as tinea versicolor, and *Dianella ensifolia* (Siak-Siak) to treat pain when urinating. In Zingiberaceae family, *Zingiber officinale* (Liaik) is used to medicine after childbirth, sprains, rheumatism. While *Kaempferia galanga* (Kencur) for relieving fatigue. Sharifi-Rad et al. (2017) described that plants from the Zingiberaceae family are a potential
source of bioactive phytochemicals. Zingiberaceae is the most widely used family in Asia, especially in the tropical region (Kumar et al. 2013).

**Bakumpai Dayak**

In the Bakumpai Dayak Sub-tribe (member of OtDanum-Ngaju Dayak), at least 10 plants are very common to be used for treating various diseases (Table 1) (Reynaldi et al. 2019). Their use has been carried out from generation to generation since ancient times by their ancestors (Panjaitan et al. 2021). Medicinal plants include Caulerpa racemosa (Alga Hijau), often found in lakes and utilized in all the parts by mashed and dried and used as a powder for treating various skin diseases such as leprosy, ringworm, and measles. Then Senna alata (Ketepeng China) is utilized its roots by boiling them and use them similarly with the same function as the green algae. Sena alata is reported to have antimicrobial properties (Jayachitra et al. 2018) and is antidiabetic (Kazeem et al. 2015). Besides, the leaves and roots of S. alata are also proven to be antioxidants (Abubakar et al. 2015). Morinda citrifolia (Noni) can also be utilized in its origins to treat high blood pressure. Albizia saponaria (Langir) is often found in forests, and its roots are nutritious for treating hair by smoothing it and mixing it with water to wash it on the hair. Calameae calamus (Rotan) is utilized by burning, and the ashes are applied to maintain dental health. Studies carried out on the Musa acuminate (Pisang) show that its flowers are reported to have anticancer properties (Timsina and Nadumane 2014), and its leaves can be used to treat wounds (Putra et al. 2017). Furthermore, various research results summarize that banana plant can be used as a diuretic, analgesic, wound healing, antioxidant, allergy, antibacterial, antihypertensive (Lakshmi et al. 2015), and Bambusa vulgaris (Bambu Kuning), whose stems are boiled to treat jaundice. Fitri et al. (2020) stated that B. vulgaris extract contains compounds that have the potential as an analgesic, antipyretic, anti-diabetic, anti-inflammatory, antimicrobial, antioxidant, antiviral, hepatoprotective, and diuretic. Cananga odorata (Kenanga) is also used its bark by boiling it to treat malaria and asthma, and Dillenia excelsa (Simpur) is used its bark to cure wounds. Achillea millefolium (Daun Seribu), which the Bakumpai Dayak Tribe uses by boiling it. Based on the use of medicinal plants as ingredients for traditional medicinal roots are part of the medicinal plants most widely used by the Bakumpai Dayak Tribe (Reynaldi et al. 2019).

**Kenyah Dayak**

The Kenyah Dayak Sub-tribe that lives in Umaq Bekuai Village, Tabang, Kutai Kartanegara, Kalimantan (member of Apokayan Dayak) uses at least 18 families of 26 species plants used as traditional medicine (Table 1). There are three families with the most dominant uses, namely Acanthaceae, Compositae, and Euphorbiaceae. The processing of medicinal plants in the Kenyah Dayak community is by boiling, pounding, drinking, and making Pupur (glued or rubbed on the sick part). In the Acanthaceae family, there are Graftophyllium pictum (Kemba), and Justicia gendarussa (Kembat), which are used to treat itchiness in infants, Hemigraphis bicolor (Tumbuh Daging) leaves are used as bloody stools. In the Compositae family, there is Vernonia amygdalina (Udo Lepek) which can treat diabetes by drinking boiled water from its leaves, Ageratum conyzoides (Tambora) which can treat blood laxative disease (menstruation) in women, Tagetes erecta (Bunga Sareet Batak) can treat a cough with phlegm by drinking boiled water from its roots. Finally, in Euphorbiaceae, the plant Excoecaria cochinchinensis (Serat Merah) can treat rheumatic diseases by drinking boiled water from its leaves, and Euphorbia tithymaloides (Patah Tulang) can treat fractures (Sagala et al. 2020).

**Tagol Dayak**

The Tagol Dayak Sub-tribe (member of Murut Dayak) living in Tau Lumbis Village, Nunukan Regency, North Kalimantan Province, frequently uses 12 species of plants as traditional medicine. These plants are: Nauclea orientalis (Tembalu), whose bark is used as a medicine for blood vomits, Arcangelisia flava (Bala’an), which is used for stomachaches, Clibadium surinamense (Turiaris), which is used as a wound medicine, Crotalaria spectabilis (Balilang) which is used as a medicine as a cure for ringworm, the sap from the plant Schismatoglottis calyptra (Natu) is used to treat the external wound, the leaves of the Stachyurapheta jamaicensis (Kalam) to treat toothache, Cinnamomum iners (Lawang) which its bark is used to the prevention of flu, indigestion, and flatulence control. Shorea spp. (Kawang) which is used as a traditional oil to treat aches (Royyani and Efendy 2015).

**Siang Dayak**

The Siang Dayak Sub-tribe who lives in the Uut Murung Subdistrict, Murung Raya District, Central Kalimantan (member of Punan Dayak) uses 104 medicinal plant species from 98 genera and 58 families. Most of the families were Rubiaceae (11 species), Fabaceae (9 species), Euphorbiaceae (7 species), Moraceae (6 species), Zingiberaceae (4 species), Acanthaceae, Apocynaceae, Thelypteridaceae, Rutaceae, Phyllanthaceae (3 species) respectively, and other families were one species. Only a few complete species of functional organ parts with their medicinal functions (Table 1). Only 4 species of rare Indonesian medicinal plants have been identified (Rifai et al. 1992). These include tabat Barito (Ficus deltoidea), bajakahendak (Arcangelisia flava), jelutung (Alstonia scholaris), and tikang siau (Eurycoma longifolia). Many traditional markets in Kalimantan sell medicinal plants utilized by the native Dayak Tribe, such as Arcangelisia flava, Eurycoma longifolia, Alstonia scholaris, Luvanga sarmentosa, and Psychotria leptothyrsa roots.
Table 1. Medicinal plants species that used by Dayak Tribe in: Desa Dayak Sub-tribe (member of Iban Dayak), Jangkang Dayak Sub-tribe (member of Klemantan Dayak), Bakumpai Dayak Sub-tribe (member of OtDanum-Ngaju Dayak), Kenyah Dayak Sub-tribe (member of Apokayan Dayak), Tagol Dayak Sub-tribe (member of Murut Dayak), and Siang Dayak Sub-tribe (member of Punan Dayak)

| Family         | Scientific name            | Local name       | Part          | Utilization medicine                                                                 |
|----------------|---------------------------|------------------|---------------|--------------------------------------------------------------------------------------|
| Acanthaceae    | Graptophyllum pictum      | Kembang          | Leaf          | For bathing babies and itching<sup>d</sup>, Bloody stools<sup>f</sup>, blood booster<sup>f</sup> |
|                | Hemigraphis bicolor       | Tumbuh Daging<sup>g</sup>, Bemulom<sup>i</sup> | Leaf          |                                                                                        |
|                | Hemigraphis sp.            | Sugi Gajah       | Leaf          | Internal infection<sup>d</sup> (For bathing babies and itching)<sup>j</sup>, (rheumatism, thrush, fevers, cough, dysuria, jaundice and as antivenin)<sup>f</sup> |
|                | Justicia gendarussa       | Kembar<sup>i</sup>, Kumat Sirang<sup>i</sup> | Leaf          |                                                                                        |
| Acoraceae      | Acorus calamus             | Jerangau         | Rhizome, stem | A cough<sup>i</sup>                                                                       |
| Agavaceae      | Parthenocissus quinquefolia| Sabang           | Shoot         | Pain in the ribs area<sup>e</sup>                                                      |
| Amaranthaceae  | Amaranthus spinosus        | Bayam Duri       | Root, Stem, leaf | Treating dry eyes, eczema, ulcers, fever<sup>e</sup>                                      |
| Amaryllidaceae | Amaryllidaceae             | Bayam Merah      | Leaf          | Wounds venomous animal bites<sup>d</sup>                                                |
|                | Crinum asiaticum          | Bukung           | Tuber         | Orchitis<sup>a</sup>                                                                    |
|                | Crinum sp.                | Bukung           | Leaf          | Fracture<sup>d</sup>                                                                    |
| Anisophylleaceae| Anisophyllea disticha      | Kayu Rubu        | Root          | Fatty liver<sup>a</sup>                                                                 |
| Annmonaceae    | Annona muricata           | Nangka Belanda   | Leaf          | (High blood pressure, gout)<sup>j</sup>, (treating back pain, rheumatism)<sup>b</sup>    |
|                | Cananga odorata           | Kenanga          | (Roots, leaf)<sup>a</sup>, Bark<sup>c</sup> | Used for battle<sup>e</sup>, (malaria, asthma)<sup>c</sup>                              |
| Apiaceae       | Goniothalamus macrophillus| Sopung           | Root          | After giving birth<sup>i</sup>                                                          |
| Apocynaceae    | Apium graveolens          | Seledri          | Roots, stem   | Treating dry eye, rheumatism<sup>b</sup>                                               |
|                | Alstonia scholaris        | Pelai<sup>k</sup>, Pulai<sup>p</sup>, Jelutung<sup>l</sup>| Sap<sup>j</sup>, Whole part<sup>i</sup> | Internal wounds (contusion) from falling<sup>j</sup>, (malaria fever, abdominal pain, cough, menstrual smoothing, appetite enhancer and diabetes<sup>j</sup>) |
| Annonaceae     | Parameria polyneura       | Kayu Rapet       | Leaf          | Treat vaginal discharge, stop bleeding<sup>b</sup>                                       |
| Aroaceae       | Acorus calamus             | Jeringau         | Leaf          | Treat nosebleeds<sup>b</sup>                                                            |
|                | Arisaema tortuosum        | Buruk Sisi       | Leaf          | A headache<sup>a</sup>                                                                 |
|                | Colocasia esculenta       | Keladi           | Whole part    | High blood pressure<sup>e</sup>                                                         |
|                | Homalomena occulta        | Ilung            | Whole part    | Burnt<sup>f</sup>                                                                       |
|                | Schismatoglottis calyptrata| Natu            | Sap           | Cure wounds<sup>c</sup>                                                                 |
| Areaceae       | Areca catechu             | Finang           | Fruit         | Ulceration<sup>a</sup>                                                                 |
|                | Calaneae calamus          | Rotan            | Root          | To maintain dental health<sup>c</sup>                                                    |
|                | Cocos nucifera            | Kelapa           | Flower<sup>i</sup>, (Coconut water, roots, Coconut oil)<sup>i</sup>                      |
|                |                           |                 |               | Maintain breast milk supply<sup>j</sup>, (treat gerumut, fever, diarrhea, toothache, dandruff, exposure to venomous animals, flatulence, headaches, excessive breast milk, shiny hair)<sup>b</sup> |
| Asparageaceae  | Cordyline fruticosa       | Sabang Balek     | Leaf          | An antidote to the poison<sup>i</sup>                                                   |
| Aspleniaceae   | Dracaena marginata        | Telusu Punan     | Root          | Childbirth<sup>e</sup>                                                                 |
|                | Asplenium nidus           | Kajang<sup>b</sup>, Paku Kajang<sup>b</sup> | Shoot<sup>e</sup>, Leaf<sup>b</sup> | Deep wounds, remove dandruff<sup>e</sup>                                              |
| Asteraceae     | Achillea millefolium      | Daun Seribu      | Leaf          | Body care<sup>c</sup>                                                                   |
|                | Ageratum conyoides        | Kayu Atit        | Root, leaf    | Wound<sup>d</sup>                                                                         |
|                | Arcangelsia flavo         | Bala'an          | Bark          | Stomach ache<sup>e</sup>                                                                |
|                | Clidium surinamense       | Turiaris         | -             | Cure wounds<sup>e</sup>                                                                  |
|                | Elephantopus mollis       | Sawi Hutan       | Leaf, stem    | Treat stomach pain, lack of blood, vaginal discharge<sup>b</sup>                         |
|                | Elephantopus scaber       | Sawi Hantu<sup>k</sup>, Daun Pencolap<sup>j</sup> Urinang  | Leaf          | Malaria<sup>a</sup>, (treat headaches, flatulence, fever)<sup>b</sup>                   |
|                | Eupatorium triplinerve     | -                | Leaf          | Toothache, headache, exposure to venomous animals<sup>d</sup>                           |
| Blechnaceae    | Stenochlaena palastris    | Pakis Miding     | Root          | Internal wounds and erection problem<sup>(man)</sup>                                  |
| Brassicae      | Cardamine hirsuta         | Inai Anan        | Leaf, flower  | Wash body<sup>e</sup>                                                                   |
| Cactaceae      | Epiphyllylum oxypetalum   | -                | Leaf          | Reduce bleeding<sup>b</sup>                                                            |
| Family          | Genus               | Common Name | Part利用 | Use/Property                                    |
|-----------------|---------------------|-------------|----------|------------------------------------------------|
| Caesalpiniaae   | Cassia alata        | Gelenggangab, Ketepeng Cinaa | Leafb, Rootc | Ringwormc, (tinea versicolor, canker sores, intestinal worms)b, (treat leprosy, measlesf) |
| Caricaceae      | Carica papaya       | Pepaya      | Leaf     | Fever, intestinal worms, toothache and headachea |
| Caurerpaceae    | Caurerpa racemosa   | Alga Hijaua | Whole part | Powderc |
| Clusiaceae      | Garcinia mongostana | Manggis     | Rind, leaf | Treat headaches, cholesterol, achesb       |
| Compositae      | Ageratum conyzoides | Tambora     | Leaf     | Bleedingd |
|                  | Blumea balsamifera  | Mambung     | Leaf     | Fevera |
|                  | Tagetes erecta      | Bunga Saret Batak | Root | Cough with phlegmd |
|                  | Vernonia amygdalina | Udo Lepek   | Leaf     | Treat diabetesd |
| Convolvulaceae  | Argyreia nervosa    | Ampur       | Leaf     | Refine the skina |
|                  | Merremia aegyptia   | -           | Leaf     | "Treating alma"ab |
|                  | Merremia pelata     | Akar Jelayan Shoot | A venomous animal bitea |
| Costaceae       | Chellocostus speciosus | Pentawara | Leaf | Stamina refresher or enhancera |
| Crassulaceae    | Kalanchoe waldheimii | Cocor Bebek | Leaf | "Treating ambienceb |
| Cyatheaceae     | Cyatheola mollucana | Paku Rajang | Leaf | Treat boils, cure woundsb |
| Cyperaceae      | Cyperus kyllingia   | Kaput Burit | Leaf | For vaginal cleaningd |
| Dilleniaceae    | Dillenia excelsa    | Simpur      | Bark     | Wound medicinec |
|                  | Dillenia suffrutcosa | Leaf       | Leaf     | Smoothing breast milk, wound medicineab  |
| Dipterocaraceae | Shorea spp.         | Kawang      | Leaf     | Traditional oil to treat achesc |
|                  | Acalypha wilkesiana | -           | Leaf     | "Treating headachesb |
|                  | Euphorbia hirta     | Rumpat Patikan Kerbau | Leaf | "Treating asthma"ab |
|                  | Euphorbia tithymaloides | Patah Tulang | Leaf | For broken bonesd |
|                  | Excoecaria cochinchnensis | Serat Merah | Leaf | Rheumatismd |
|                  | Hevea brasiliensis  | Karet       | Sap      | "Treating venomous animal bitesb |
|                  | Jatropha multifida  | Betadin Hutan | Leaf, sap, root, seed | Coughs, tooth decay, and also treat woundsb |
|                  | Manihot utilisima   | Singkong    | Leaf, stem, bark | Fever, intestinal worms, diarrhea, rheumatismm |
|                  | Pedilanthus tithymaloides | Cangkok Manis | Leaf | "Treating venomous animal bitesb |
|                  | Sauropus andruinosis | Asam Kandisa | Leaf, fruit | "Treating acne, earacheb |
| Fabaceae        | Albizia saponaria   | Langir      | Root     | For shampooingc |
|                  | Crotalaria spectabilis | Balilang | Leaf | Ringwormd |
|                  | Pithecellobium lobatum | Jengkol | Fruit | "Treating deficiency of limeb |
|                  | Chrysothemia pulchella | Leaff       | Leaf | "Treating alinab |
|                  | Garania celebica    | Asam Kandis | Leaf, fruit, root | "Treating alinab |
|                  | Molineria latifolia | Leaff       | Leaf | "Treating alinab |
|                  | Eleutherine bulbosa | Udo Lembak | Root | Tonsilsd |
|                  | Calliandra longifolia | Sangkareho | Leaf | Stomach painf |
|                  | Ocymum basilicum    | Kemangi     | Leaf, stem | "Treating dry eye pain, overcoming flatulenceb |
|                  | Orthosiphon aristatus | Kumis Kucing | Leaf | Stomach achef, facilitate urinationh |
|                  | Cinnamomum inersius | Lawang      | Bark     | Prevention of flu, digestion, and flatulence controlf |
| Lauraceae       | Allium cepa         | Bawang Merah | Tuber | "Treatinab |
|                  | Allium sativum      | Bawang Putih | Tuber | Toothache, tinea versicolorb |
|                  | Dianella ensifolia  | Rumpat Siak-Siak | Root | Pain when urinatingb |
|                  | Eleutherina americana | Bawang Hutan | Tuber | High blood pressureb |
|                  | Lawsonia inermis    | Pacar       | Leaf | For wounds / swellingd |
| Magnoliaceae    | Magnolia elegans    | Leaff       | Leaf | "Treating alinab |
| Malvaceae       | Durio zibethinus   | Durian      | Kind     | "Treat boilsb |
| Melastomaceae   | Hibiscus rosa-sinensis | Kembang Sepatu | Leaf | Gonorreaeab |
| Menispermaeae   | Melastoma malabaricum | Kemunting | Leaf, root | "Treat woundsb |
|                  | Fibraxea tiborica   | Aker Kuning | Root | Malariaab |
|                  | Pycnarrhena cauliflora | Bekaiai, j | Leaf | Cancerf, fi |
| Mimosaceae      | Mimosa pudica       | Puti Malu   | Root | "Treating breast cancerb |
| Moraceae        | Artocarpus heterophyllus | Nangka | Leaf | "Speeds up the release of the baby's umbilical cordb |
|                  | Ficus deltoidea     | Tabat Barito | Leaf | After giving birthf |
|                  | Ficus racemosa      | Ara         | Leaf, fruit | Launching breast milk, wartsb |
| Musaceae        | Musa acuminata      | Pisang     | Stem    | Antioxidet |
| Myrsinaceae     | Lasia pumila        | Cula Adam   | Leaf    | Process of giving birthf |
| Family      | Species                                      | Part Used  | Medicinal Uses                                                                 |
|-------------|----------------------------------------------|------------|-------------------------------------------------------------------------------|
| Myrtaceae   | Psidium guajava                              | Leaf       | Diarrhea<sup>a</sup>                                                          |
|             | Syzygium cuminum                            | Leaf       | Heartburn, lower blood, diabetes, high blood<sup>b</sup>                       |
|             | Syzygium cumini                             | Leaf, bark | Treating canker sores<sup>b</sup>                                              |
| Nephrolepidaceae | Nephelepis cordifolia                      | Root       | Vaginal health<sup>c</sup>                                                     |
| Oleaceae    | Jasminum sambac                             | Leaf, flower| Treating red eye pain, exposure to venomous animals, fever, headache,         |
|             |                                              |            | shortness of breath/asthma<sup>b</sup>                                         |
| Orchidaceae | Olea dioica                                  | Leaf       | Treating internal wounds<sup>b</sup>                                           |
| Phyllanthaceae | Phyllanthus niruri                        | Leaf, Root | Scabies and wounds<sup>d</sup>                                                 |
| Piperaceae  | Piper betle                                  | Leaf       | Sore throat<sup>e</sup>, reduce excess breast milk<sup>b</sup>                 |
|             | Piper crocatum                              | Leaf, Merah| Diabetes, ulcer<sup>e</sup>                                                    |
|             | Piper nigrum                                | Leaf       | Fever<sup>e</sup>                                                             |
| Poaceae     | Bambusa vulgaris                            | Stem       | Treating jaundice<sup>e</sup>                                                  |
|             | Cymbopogon citrates                         | Leaf, root | Streamlining menstruation<sup>b</sup>                                          |
|             | Imperata cylindrica                         | Root       | For bone pain<sup>d</sup>                                                       |
|             | Orzya sativa                                | Fruit, rind| Eliminate fatigue, shiny hair<sup>b</sup>                                       |
|             | Panicum sp.                                 | Leaf       | For back pain<sup>d</sup>                                                       |
| Polypodiaceae | Pyrrosia piloselloides                    | Letek      | Tumor<sup>d</sup>                                                              |
| Rubiaceae   | Morinda citrifolia                          | Leaf<sup>e</sup>, fruit<sup>e</sup>, Root<sup>e</sup> | (Jaundice, influenza)<sup>d</sup>, treating high blood pressure<sup>e</sup> |
|             | Myrmecodia beccarii                         | Sarang Semut| Tumors, tbc asthma, hemorrhoids, and postpartum women<sup>f</sup>              |
|             | Myrmecodia tuberose                         | Sarang Semut| Tuber                                                                            |
|             | Nauclea orientalis                          | Travel<sup>e</sup> | Anti-lee<sup>e</sup>                                                          |
|             | Nauclea sp.                                 | Bark       | Medicine for vomiting blood<sup>f</sup>                                        |
|             | Psychotria leptophyrsa                      | Root       | Increase stamina<sup>f</sup>                                                    |
| Rutaceae    | Citrus aurantifolia                         | Fruit      | Shiny hair, tonsils<sup>b</sup>                                                |
|             | Luvunga sarmentosa                          | Root       | Increase stamina<sup>f</sup>                                                    |
| Simaroubaceae | Eurycoma longifolia                     | Root<sup>c</sup>, | Tumor<sup>c</sup>                                                               |
|             | Myrtaceae                                   | Tumor<sup>c</sup>, | Tumor<sup>c</sup>, after giving birth<sup>f</sup>                             |
| Solanaceae  | Capsicum anum                               | Cabe       | Relieve fatigue<sup>b</sup>                                                    |
|             | Physalis angulata                           | Seed       | Treating lung disease, influenza<sup>b</sup>                                   |
|             | Solanum torvum                              | Root, fruit| Myopic eyes, swelling due to being hit<sup>b</sup>                             |
| Thymelaeaceae | Phaleria macrocarpa                      | Leaf, fruit| Treat itching, diabetes<sup>b</sup>                                            |
|             | Tiliaceae                                   | Leaf       | Cough<sup>c</sup>                                                              |
| Verbenaceae | Stachyphorpha jamaicensis                   | Leaf       | Toothache medicine<sup>e</sup>                                                |
|             | Vitex pinnata                               | Leaf       | Stomachache, headache<sup>b</sup>                                              |
| Zingiberaceae | Alpinia galanga                            | Rhizome    | Medicine after childbirth, backache, fever<sup>d</sup>                         |
|             | Curcuma domestica                           | Rhizome    | Overcoming tonsils, after giving birth<sup>b</sup>                            |
|             | Kaempferia galanga                          | Leaf, rhizome| Relieving fatigue<sup>b</sup>, Medicine after childbirth, sprains,            |
|             | Zingiber officinale                         | Leak       | rheumatism<sup>b</sup>                                                        |

Note: a: Desa Dayak Sub-tribe (member of Iban Dayak) (Supiandi et al. 2019a), b: Jangkang Dayak Sub-tribe (member of Klementan Dayak) (Sari et al. 2015), c: Bakumpai Dayak Sub-tribe (member of OtDanum-Ngaju Dayak) (Reynaldi et al. 2019), d: Kenyah Dayak Sub-tribe (member of Apokayan Dayak) (Sagala et al. 2020), e: Tagol Dayak Sub-tribe (member of Murut Dayak) (Royyanie and Efendy 2015), and f: Siang Dayak Sub-tribe (member of Punan Dayak) (Wardah and Sundari 2019)

To promote stamina, *Eurycoma longifolia* (Tikangsiau), *Psychotria leptophyrsa* (Ginseng), and *Ficus deltoidea* (Tabat Barito) are utilized, especially for males, and usually after childbirth for women, *Arcangelisia flava* (Bajakahendak) and *Alstonia scholaris* (Jelutung) is empirically used by the Dayak people to treat malaria, *Luvunga sarmentosa* (Saluang Balum) which its roots are boiled and drunk to increase stamina, aphrodisiac, and male fertility, *Labisia pumila* (Cula Adam) is better known for its role in medicine related to the postpartum process, *Myrmecodia beccarii* (Sarang Semut) is one species of medicinal plant that is widely used to treat TBC and asthma, *Goontothalamus macrophillus* (Sopung) is used for fever, the leaves of *Callicarpa longifolia* (Sangkareho) is helpful to treat stomach pain and the leaves of *Pycnarrhena cauliflora* (Sokai) which is used as a substitute for cooking spices to replace synthetic chemicals in modern flavoring cuisine which can interfere human health (Wardah and Sundari 2019).
The results from 6 Dayak Sub-tribe revealed 63 families of plants from which 133 species came (Table 1). The family most widely used for medicinal plants, namely Euphorbiaceae, consists of 9 species. Plants of the Euphorbiaceae family are easy to grow so they are found in various habitats. Plants generally consist of roots, stems, leaves, flowers, fruits, and seeds. The results (Table 1) showed that most of the people in the community usually use the leaf (47%), root (18%), stems (6%), fruits (5.4%), bark (4.2%), rhizomes (3.6%), (Sap 3%), Tuber (3%), Shoot (3%), whole part (2.4%), flowers (2.4%), other parts: coconut water, coconut oil, nest (1.8%), rind (1.8%), and seed (1.2%) (Figure 2). Dayak Tribe believes that they will not kill the plants if they only use the leaves because they will grow back and be used continuously. On the other hand, it will be dangerous if they use different parts of the plants such as stems, roots, rhizomes, tubers, and bark as medicine because it can kill these plants if used continuously.

In terms of management, the Dayak Tribe has not specifically managed medicinal plants. Most of the medicinal plants used by the Dayak Tribe are wild plants that grow around residential areas (Aryadi et al. 2014). However, in some cases, medicinal plants are cultivated because of their difficulty in finding them in the forest (Palupi 2013). Plant cultivation will ease the medication processes because the plants used as medicine are located nearby, and easy to take, so faster handling will be carried out (Yusro et al. 2020a). The management or conservation of medicinal plants can also be carried out with pharmaceutical technology, encouraging efforts to utilize forest resources, especially medicinal plants. By knowing the benefits of medicinal plants, people will want to conserve these medicinal plants to be used in the future.

**LOCAL WISDOM OF THE DAYAK TRIBE ON THE USE OF MEDICINAL PLANTS**

Local wisdom is behavior that is related to a positive relationship between humans and nature and the environment around them. Local wisdom is known as a view of life, knowledge, and life strategies by local people to answer their problems in their daily needs. The local wisdom of the community is usually passed down from generation to generation (Tamalene et al. 2016; Supiandi et al. 2019a,b). Local wisdom is found by certain local communities who have tried and integrated it with local culture and natural conditions. In a balanced life relationship with nature, local wisdom is basic knowledge obtained by humans (Mungmachon 2012; Pornpimon et al. 2014; Widisono 2019; Dewi et al. 2020). Local wisdom is also interpreted as a tool to preserve the environment, such as in the Dayak Tribe related to environmental management in agricultural or plantation land. With local wisdom, the rate of environmental damage can be contained, and the environment is well preserved (Humaida et al. 2018). However, if the local wisdom began to decrease, one may be caused by a lack of public awareness of the importance of intellectual property assets (Setyowati 2011).

The use of plants as traditional medicine also continues to exist today due to local wisdom. The medicinal plants in the Dayak Tribe have been passed down from generation to generation. The life of the Dayak Tribe is very dependent on nature and forests. For them, nature has excellent benefits for their lives, not infrequently they often use forest products for traditional medicine, which is beneficial for the health of the Dayak Tribe. The Dayak people also believe that not all diseases can be cured by medical means or synthetic drugs, but they can be cured with traditional medicine. This is because plants with medicinal properties are considered to have no harmful side effects (Safitri et al. 

---

**Figure 2. Parts of plants used as medicine by Dayaks**

![Bar graph showing the percentage of parts of plants used as medicine by Dayaks.](image-url)
2015). So that the Dayak people get a lot of knowledge about traditional medicine through their ancestors in various ways, such as accompanying them in collecting plants to caring for patients (Molina et al. 2015). Furthermore, traditional leaders provide knowledge about the usage of medicinal plants in the form of instructions when they take medication, as well as as ancestral messages through dreams or those that are commonly connected with mystical qualities. The limited facilities and infrastructure they have are also a reason for Dayak Tribe to continue using traditional medicinal plants as an option for first aid or as a last alternative if modern medicine does not produce results (Riadi et al. 2019). In addition, people affected by the economic crisis and local communities prefer to do traditional medicine because modern medicines are relatively more expensive.

Traditional medicine is often said to be one of the nation’s wealth in the form of local wisdom. Traditional medicine techniques that have been developed to date are using plants around the community, both in the yard and in the forest, to treat various external and internal diseases. The diversity of medicinal plants in nature can support the availability of ready-to-use traditional medicines (Umair et al. 2015). Their availability must accompany the high utilization of medicinal plants in nature to maintain the continuity of the use of medicinal plants (Rahman 2013). Knowledge of local wisdom from the Dayak Tribe in utilizing plant resources will significantly help preserve biodiversity and domestication of medicinal plants (Kandari et al. 2012; Yusro et al. 2014; Budiman et al. 2018; Mediastari 2020). Suppose medicinal plants are exploited more than they should. In that case, it will undoubtedly have a significant impact on their availability in the forest area, and if it continues, it will cause the extinction of certain species (Jima and Megersa 2018; Sarquis et al. 2019; Susanti and Zuhud 2019). According to Neelo et al. (2015) local communities need to be educated about plant conservation, especially those widely used for various important activities such as medicine. That’s where the importance of preserving local wisdom in the Dayak Tribe is so that the use of nature is done wisely and it remains sustainable.

CONCLUDING REMARKS

The original people of Borneo’s island are known as Dayak. For their communities, the Dayak Tribe employs natural and forest resources in plants as traditional medicine. Since ancient times, the Dayak Tribe has used plants to heal a variety of ailments. The Dayak Tribe employs medicinal plants found in nature in various methods and for a variety of purposes. This utilization is also one of their communities’ cultural heritage and customs so that the Dayak Tribe still maintains it today. The knowledge about traditional medicine by utilizing medicinal plants around them has been obtained from generation to generation from the ancestors since ancient times. The use of various medicinal plants used by the Dayak Tribe has differences in terms of the part of the plant taken, how to process it, and how to use it. This is because each Sub-tribe or region has its role model on how to use these medicinal plants. No wonder if the leaves are used in one area, it could be that the plant roots are used in other areas. Considering that almost all Dayak Sub-tribes are familiar with the use of medicinal plants to treat various diseases, this paper selects 6 sub-tribes as examples, namely: Desa Dayak Sub-tribe (member of Iban Dayak), Jangkang Dayak Sub-tribe (member of Klemantan Dayak), Bakumpai Dayak Sub-tribe (member of OiDanum-Ngaju Dayak), Kenyah Dayak Sub-tribe (member of Apokayan Dayak), Tagol Dayak Sub-tribe (member of Murut Dayak), and Siang Dayak Sub-tribe (member of Punan Dayak). The results from 6 Dayak sub-tribe revealed 63 families of plants from which 133 species came. The family most widely used for medicinal plants, namely Euphorbiaceae, consists of 9 species, and the leaf is the most commonly used part of the plants (47%). Dayak Tribe believes that they will not kill the plants if they only use the leaves because they will grow back and be used continuously. On the other hand, using components of the plants as medicine, such as stems, roots, rhizomes, tubers, and bark, is risky because it can kill the plants if done repeatedly. Traditional knowledge of the Dayak Tribe in utilizing plant resources will significantly help preserve biodiversity and domestication of medicinal plants. If medicinal plants are exploited more than they should, it will undoubtedly impact their availability in the forest area. If it continues, it will cause the extinction of certain species. By knowing the benefits of medicinal plants, Dayak Tribe will want to conserve these medicinal plants to be used in the future.

ACKNOWLEDGMENTS

The author would like to thank all colleagues for supporting the writing of this paper, as well as fruitful comments from anonymous reviewers. Hopefully, this review can benefit both the authors and readers.

REFERENCES

Abdelgadir HA, Van Staden J. 2013. Ethnobotany, ethnopharmacology and toxicity of Jatropha curcas L. (Euphorbiaceae): A review. S Afr J Bot 88: 204-218. DOI: 10.1016/j.sajb.2013.07.021.

Abdulrahman P, Meshar H, Sardar AS, Vida G. 2016. Phytochemistry and ethnopharmacology of medicinal plants used on Safeen Mountain in the Kurdistan Region of Iraq. Nat Prod Commun 11(12): 1923-1927. DOI: 10.1177/1934578X1601101236.

Abubakar I, Mann A, Mathew JT. 2015. Phytochemical composition, antioxidant and anti-nutritional properties of root-bark and leaf methanol extracts of Senna alata L. grown in Nigeria. Afr J Pure Appl Chem 9(5): 91-97. DOI: 10.5897/AJAPC2015.0622.

Ahmed HM. 2016. Ethnopharmacobotanical study on the medicinal plants used by herbalists in Sulaymaniyah Province, Kurdistan, Iraq. J Ethnobiol Ethnemol 12(1): 8. DOI: 10.1186/s13002-016-0081-3.

Alnajar ZAA, Abdulla MA, Ali HM, Alshawsh MA, Hadi AHA. 2012. Acute toxicity evaluation, antibacterial, antioxidant and immunomodulatory effects of Melastoma malabathricum. J Molecules 17: 3547-3559. DOI:10.3390/molecules17033547.

Alzina DGL. 2017. A conceptual approach to unveil traditional homegardens as fields of social practice. Ethnobiol Conserv 6: 19. DOI: 10.15451/ec2017116.19116.
by traditional healers and indigenous people in Chittagong Hill Tracts, Bangladesh, for the treatment of snakebite, 2015: 1-23. DOI: 10.1155/2015/761765.

Kalt FR, Cock IE. 2016. An examination of the medicinal potential of Planchonella queenslandica: Toxicity, antibacterial, and antiviral activities. J Ethnopharmacol 11: 125-269. DOI: 10.1016/j.jep.2015.06.003.

Kana MP. 2004. Christian Mission in Malaysia: Past Emphasis, Present Engagement and Future Possibilities. [Dissertation]. Australian Catholic University, Victoria, QLD.

Kandari LS, Phoendani PC, Payal KC, Rao KS, Maikhu RK. 2012. Ethnobotanical study toward conservation of medicinal and aromatic plant in upper catchments of Dhaul Ganga in the Central Himalaya. J Mt Sci 9: 286-296. DOI: 10.1007/s11629-012-0249-7.

Karinim A, Majlesi M, Rafieian-Kopaei M. 2015. Herbal versus synthetic medicines: Beliefs and facts. J Nephropathol Pharmacol 4(1): 27-30.

Kazeem MI, Azeez GA, Aisha AOT. 2015. Effect of Senna alata (L) Roxb (Fabaceae) Leaf extracts on alpha-amylase, alpha-glucosidase and postprandial hyperglycemia in rats. Trop J Pharm Res 14(10): 1843-1848. DOI: 10.4314/tjpr.v14i10.15.

Keshava R, Manniyappa N, Gope R, Ramaswamaih AS. 2016. Anti-cancer effects of Imperata cylindrica leaf extract on human oral squamous carcinoma cell line SCC-9 in vitro. Asian Pac J Cancer Prev 17(4): 1891-1898. DOI: 10.7314/APJCP.2016.17.4.1891.

Khanriyeh N, Anam S, Khumaidi A. 2016. Ethnopharmacological study of plants with medicinal properties in the Banggai Tribe in Banggai Laut District, Central Sulawesi Province. GALENKA 21(1): 1-7. DOI: 10.22487/g2428744.2016.v2.i1.5224, [Indonesian].

Khan J, Khan R, Qureshi RA. 2013. Ethnobotanical study of commonly used weed of District Bannu, Khyber Pakhtunkhwa (Pakistan). J Med Pl Stud 1(2): 1-6.

Kho D-G, Zhao Y, Li G-H, Chen B-J. 2015. The Genus Litsea in traditional Chinese medicine: An ethnomedical, phytochemical and pharmacological review. J Ethnopharmacol 164: 256-264. DOI: 10.1016/j.jep.2015.02.020.

Kumar KM, Asish GR, Sabu M, Balachandran KS. 2013. Significance of medicinal use of wild shrub and herbaceous plant species of the Bentian Tribe from Madakand Division KP, Pakistan. J Sci Res 10(1): 65-71.

Kopaei M. 2015. Herbal and synthetic medicines: Beliefs and facts. J Nephropathol Pharmacol 4(1): 27-30.

Kuswantoro F. 2017. Traditional anti malaria plants species of Balikpapan Botanic Garden, East Kalimantan. Periplus Zoologi d Biologi, 84. DOI: 10.6026/97320630008389.

Kusuma IW, Murdiyanto, Arung ET, Syafrizal, Kim Y. 2012. Antimicrobial and antioxidant properties of medicinal plants used by the Jerieng Tribe in West Bangka District. Jurnal Penelitian Zoologi d Mikrobiologi 3(3): 63-70. DOI: 10.33019/ekotonia.v3i2.761. [Indonesian]

Kuswanto S. 2010. Ethnobotanical study of medicinal plants in Shorobe and Xobe Villages, Northwest Region of Botswana. Ethnobot Res App 14: 367-379. DOI: 10.1016/j.fshw.2010.04.003.

Kwak J, Kwon JZ, Yoo DI, Rho Y-K, Lee S-S, Won HS. 2014. NoSQL data model for semi-automatic integration of ethnomedicinal plant data from multiple sources. Phytochem Anal 25(6): 495-507. DOI: 10.1002/pca.2502.

Kwak J, Kwak J, Wook J, Hyun H, Kim Y. 2014. Use of ethnomedicinal plants by the people living around Indus River. Evid Based Complementary Altern Med 2014:212634. DOI: 10.1155/2014/212634.

Kwan HS, Ng Gym Ch. 2014. Use of ethnomedicinal plants by the people living around Indus River. Evid Based Complementary Altern Med 2014:212634. DOI: 10.1155/2014/212634.

Mesfin K, Gebra T, Teklemichael T. 2013. Ethnobotanical study of traditional medicinal plant used by indigenous people of Gemad District Northern Ethiopia. J Ethnobot Res App 11: 315-339.

Medistara AAPA. 2020. Local wisdom traditional medicine for the health and beauty of postpartum mother in Denpasar City, Bali Province, Indonesia. Int J Health Med Sci 3(1): 65-71.

Mehroz J. 2017. Ethnomedical and cultural uses of Ziziphus species in flora of Malakand Division KP, Pakistan. J Sci Res 10(1): 1-7. DOI: 10.3922/jares.2020.1.7.

Mumgachon MR. 2012. Knowledge and local wisdom: Community treasure. Int J Human Soc Sci 2(13): 174-181.

Mustar S, AfidEl-Salim NM, Tariq A, Wazir SM, Ullah R, Adnan M. 2014. Use of ethnomedicinal plants by the people living around Indus River. Evid Based Complementary Altern Med 2014:212634. DOI: 10.1155/2014/212634.

Mynah MS, Martwi INA, Arsyah DC. 2016. The ethnomedical plants in medicinal plants in supporting the family health in Turgo, Yogyakarta, Indonesia. Biodiversitas 17(2): 900-906. DOI: 10.14710/bd.2017.17.2.900-906.

Nabang MT, Sundaraparumma T, Fonseka D, Amarasingri S, Gunaratna P. 2014. An ethnomedical study of the medicinal plants used as anti-inflammatory remedies in Gampaha District, Western Province, Sri Lanka. Scientifica 9395052: 1-8. DOI: 10.1155/2018/9395052.

Nedelcheva A. 2013. An ethnobotanical study of wild edible plants in Bulgaria. Eurasia J Biosci 7: 77-94. DOI: 10.5053/ebiosci.2013.7.10.0.13057/biodiv/d070268.

Nimhae J, Kashe K, Teketay D, Masamba W. 2015. Ethnobotanical survey of woody plants in Shorobe and Xobe Villages, Northwest Region of Botswana. Ethnobot Res App 14: 367-379. DOI: 10.1016/j.fshw.2012.02.042.

Norvalia, Afriyansyah B, Juariah L. 2018. Utilization of medicinal plants by the Jerieng Tribe in West Bangka District. Jurnal Penelitian Biologi, Zoologi dan Mikrobiologi 3(3): 63-67. DOI: 10.33019/ekotonia.v3i2.761. [Indonesian]

Oon SF, Nalappan M, Tee TT, Shohami S, Kassim NK, Sarawuayjilk MSF et al. 2015. Xanthorrhizol: A review of its pharmacological activities and anticancer properties. Cancer Cell Int 15(100): 1-15. DOI: 10.1186/s12935-015-0255-4.

Palupi NP. 2013. Local wisdom of medicinal plants of the Dayak Agabag community in Nunukan District, East Kalimantan. Jurnal Agrifor 12(1): 83-95. [Indonesian]

Panajitan RGP, Handhayuni E, Chiralur, Manalu W. 2013. Hepatoprotective activity of Eucommia longifolia Jack. roots. Indian J Tradit Knowl 12(2): 225-230.

Panajitan RGP, Mitalia, Partsasamita R. 2020. Indigenous knowledge of the people in Karya Usaha Hamlet (Kubu Raya, West Kalimantan, Indonesia) on the processing and diversity of plants that enhance toddler’s appetite. Biodiversitas 21(9):4284-4290. DOI: 10.1155/2015/871675.

Panajitan RGP, Titin, Yuliana YGS. 2021. Ethno-Medicinal plants used for medication of Jaundice by The Chinese, Dayak, and Malays Ethnic in West Kalimantan, Indonesia. Pharamacoen J 13(4): 916-923. DOI: 10.5530/pj.2021.13.118.
Rohman F, Lestari SR, Utomo DH, Purwanto, Juma Y, Arifah SN et al. 2015. Ethnobotany of medicinal plants in Rambah Samo District, Rokan Hulu Regency. Jurnal Ilmiah Mahasiswa FKIP Prodi Biologi 1(1): 1-4. [Indonesian]

Sagala Z. 2016. Ethnopharmacological of the Dayak Kenyah Bukang Tribe, Umaq Bekuai Village, Tabang District, Kuti Karetanega Regency, East Kalimantan. National Seminar on Indonesian Ethnobiological Society Association 4(1): 1-5. [Indonesian]

Salleh WMH, Ahmad F. 2017. Phytochemistry and biological activities of the genus Koemera (Myristicaceae). Pharm Sci 24(4): 249-255. DOI: 10.15171/ps.2017.37.

Samosy AK, Mahomodally MF. 2015. Ethnopharmacological analysis of medicinal plants used against non-communicable diseases in Rodrigues Island, Indian Ocean. J Ethnopharmacol 173: 20-38. DOI: 10.1016/j.jep.2015.06.036.

Sangwang, K. 2015. Antidiabetic activity of Acorus camus (sweet flag) with cytotoxic potential. Am J Appl Sci 12(9): 650-653. DOI: 10.3844/ajassp.2015.650.653.

Sari A, Lina R, Lovadi I. 2015. Utilization of medicinal plants in the Pakuk Jangkang Tanjung Community in Ribau Village, Kapus District, Sanggau District, Pontobintang 4(2): 1-8. [Indonesian]

Sari RP, Yuso F, Mariani Y. 2021. Medicinal plants used by Dayak Kanayatn traditional healers in Tonang Village Sengah Temila District Landak Regency, J Trop Bud 21(2): 324-335. DOI: 10.29300/jpt.2112.2557.

Sanfàs, J. 2014. Ethnobotanical study of medicinal plants in Rambah Samo District, Rokan Hulu Regency. J Res Pharm Sci 194. DOI: 10.13057/biodiv/d170126.

Sarquis RDSFR, Sarquis IR, Sarquis IR, Fernandes CP, da Silva GA, Sibiro Planta, Lodi et al. 2020. Participatory methods on the recording of strategies for species conservation in slope environments of the local mountain village of Peshkopia (Eastern Albania). J Mt Sci 1(1): 97-108. DOI: 10.1007/s11629-013-1538-6.

Sarquis ÍR, Sarquis IR, Fernandes CP, da Silva GA, E Silva RBL, Jardim MAG, Sánchez-Ortíz BL, Carvalho JCT. 2019. The use of medicinal plants in the Riverside community of the Mazagão River in the Brazilian Amazon, Amâpá, Brazil: Ethnobotanical and ethnopharmacological studies. Evid Based Complementary Ther Nutr Med 19(1):1-25. DOI:10.1155/2019/6087509.

Sarquis IR, Fernandes CP, da Silva GA, E Silva RBL, Jardim MAG, Sánchez-Ortíz BL, Carvalho JCT. 2019. The use of medicinal plants in the Riverside community of the Mazagão River in the Brazilian Amazon, Amâpá, Brazil: Ethnobotanical and ethnopharmacological studies. Evid Based Complementary Ther Nutr Med 19(1):1-25. DOI:10.1155/2019/6087509.

Rohman F, Juma Y, Sulisetijono, Utomo DH, Purwanto, Lestari SR et al. 2015. Ethnobotany of medicinal plants in the Dayak Kenyah Bukang Tribe, Umaq Bekuai Village, Tabang District, Kuti Karetanega Regency, East Kalimantan. National Seminar on Indonesian Ethnobiological Society Association 4(1): 1-5. [Indonesian]
AZ-ZAHRA et al. – Medicinal plants used by Dayak Tribes of Borneo

Agriculture in We...