

Ethnobotanical study of plants used as food and for maternal health care by the Malays communities in Kampar Kiri Hulu, Riau, Indonesia

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Abstract. *Susandarini R, Khasanah U, Rosalia N. 2021. Ethnobotanical study of plants used as food and for maternal health care by the Malays communities in Kampar Kiri Hulu, Riau, Indonesia. Biodiversitas 22: 3111-3120.* Studies to reveal the diversity of food plants on communities living in remote areas with limited access to the market are important as an effort in documenting the traditional knowledge. The same applies to the diversity of medicinal plants used in maternal health care for communities that have limited access to public health facilities. The documentation of ethnobotanical knowledge is not only for the purpose of developing the potential of these plants, but also could have an impact on their conservation in nature. This study aims to document the traditional knowledge on the diversity of food plants and medicinal plants used in maternal health care by Malays tribes living within the Bukit Rimbang Bukit Baling Wildlife Reserve, Kampar Kiri Hulu Subdistrict, Kampar District, Riau Province, Indonesia. The research was conducted in three villages by collecting data through interviews and followed by fieldwork to collect plant specimens for identification. Data on food plant diversity data were obtained from 20 informants, while data on the diversity and use of medicinal plants for maternal health care were obtained from 73 informants. The results showed that there were 76 species of food plants from 35 families. These food plants were used as secondary food ingredients, vegetables, fruit and spices with most of these plants were obtained from the yard of the house. Plants used for maternal health care identified from this study were 34 species from 26 families. These plants were used for various purposes during pregnancy, child delivery, postpartum recovery, and infant health care. The diversity of food plants and medicinal plants for maternal health care documented in this study showed the valuable role of plant resources in supporting daily needs and health care of the communities living in the fringe of forest area.

Keywords: Ethnobotany, forest foods, medicinal plants, rural communities, traditional knowledge

INTRODUCTION

Communities living in remote areas especially nearby or within the forests, generally meet their needs for food and traditional medicine by utilizing plant resources obtained from the surrounding area. This condition creates traditional ecological knowledge (TEK) on plant species diversity and how to manage and utilize such biodiversity. In this case, the diversity of food plants that can be obtained from fields and nearby forests is very important in fulfilling daily nutrition. The important role of local food plants, both those originating from forests and fields, and those grown in home gardens, in maintaining food security has been mentioned by Neudeck et al. (2012), Amente (2017), and Aryal et al. (2018).

In addition to providing food, plant resources found around community settlements living in remote areas also play an important role in providing materials for traditional medicine. A number of studies showed that the traditional practice of using medicinal plants for health care is still found in communities living in remote rural areas (Malini et al. 2017, Zaki et al. 2019). Among various uses of medicinal plants traditionally used by rural communities is the use of plants for maternal health care. Maternal health

care includes medical treatments during the periods of pregnancy, childbirth, and postpartum recovery. The practice of using medicinal plants in pregnancy, childbirth, and postpartum recovery is still found in various countries, such as those reported by Malan and Neuba (2011) in Eastern Côte d'Ivoire, Nergard et al. (2015) in Mali, West Africa, and Ali-Shtayeh et al. (2015) in Palestine. The practice of traditional medicine in maternal health care is mainly important in areas with limited access to transportation, as well as those with limited availability of modern health facilities.

The uses of food and medicinal plants are influenced by the culture and perceptions of the local community. As evidence, Uprety et al. (2012) noted the influence of culture on the perception and utilization of wild food plants in Nepal. Similarly, strong influence of culture on the perception and use of local food plants was reported by Sukenti et al. (2016) on the Sasak tribe in Lombok, Indonesia. Nonetheless, the knowledge, culture, and perceptions of food and medicinal plants are generally passed down from generation to generation orally without written documentation, and thus face a risk of serious decline and even become lost. For example, a study by Pawera et al. (2020) in West Sumatra showed that there has

been a shift in public perception and acceptance of wild food plants, which is indicated to be caused by decreased availability of wild edible plants in nature and due to changes in people's lifestyles, especially for the younger generation.

The importance of documentation of traditional knowledge on diversity of plants for food and health in rural communities has been raised by a number of researchers, such as Rahman (2013), Silalahi et al. (2015), and Geng et al. (2016). The traditional knowledge of food plants is inherited from generation to generation in communities that have continued reliance or highly dependent on wild edible plants for their daily nutrition (Amente 2017). Begin with such rationales, this study aimed to explore the diversity of food plants and medicinal plants used in maternal health care by the Malays communities living within the Bukit Rimbang Bukit Baling Wildlife Reserve in three villages in Kampar Kiri Hulu Subdistrict, Kampar District, Riau Province, Indonesia and at the same time to document the traditional knowledge of the communities on botanical diversity in the study area. The object of this study provides an excellent context because of the high dependence of the communities on natural resources for their daily lives, especially on the forest ecosystem which is mostly lowland rain forest.

MATERIALS DAN METHODS

Study period and area

This study was conducted in November 2016 in three villages within the Bukit Rimbang Bukit Baling Wildlife Reserve area, namely Batu Sanggan Village, Aur Kuning Village and Kota Lama Village, Kampar Kiri Hulu Subdistrict, Kampar District, Riau (Figure 1). The study area is located at the foot of the Bukit Barisan Mountains. The settlements in the three villages are located at 90-130 m asl which are close to secondary forest with an altitude of 140-350 m asl. The main livelihood of the Malays communities is rubber farmers with occasional harvests and sells forest products such as bamboo, honey, and fruits. People do fishing in the river for daily consumption. The main transportation access to the three villages is rivers, and therefore rivers are also the center of the communities' daily activities.

The Malays communities in the study area consisted of several family tribes. There are four family tribes in Batu Sanggan Village, namely Melayu, Domo, Patopang, and Paliyang, whereas in Aur Kuning Village there are three family tribes, namely Malay, Domo, and Domo Kampai. The most diverse Malays communities was found in Kota Lama Village with six family tribes, namely Melayu, Domo, Melayu Ulak, Patopang, Piliang Bukit, and Piliang Bawah.

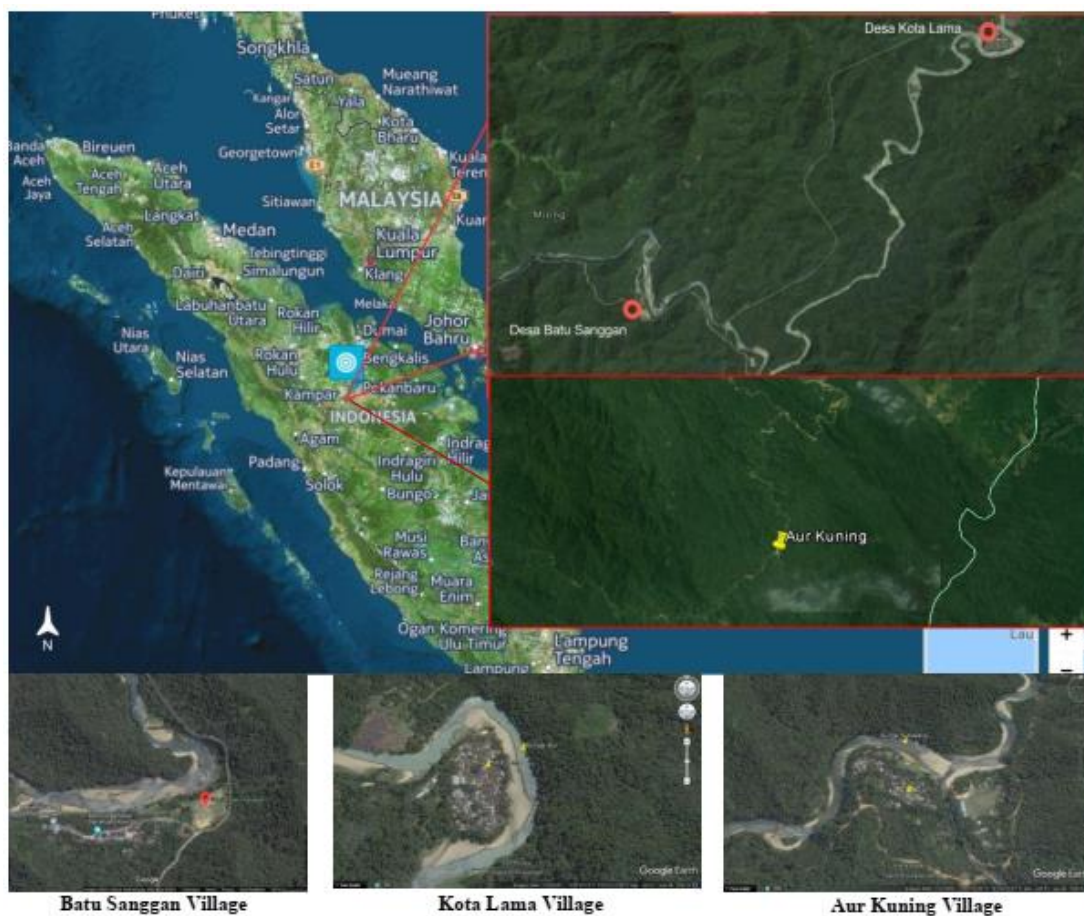


Figure 1. Map of study area showing the location of three villages in Kampar Kiri Hulu Subdistrict, Kampar District, Riau, Indonesia

Data collection and field survey

Ethnobotanical data on food plants and medicinal plants for maternal health care were collected by conducting semi-structured interviews using a questionnaire. Snowball sampling method was used to select the informants (Espinosa et al. 2014). The informants were interviewed individually. Data on food plant diversity was obtained from a total of 20 informants consisted of 10 informants from Aur Kuning Village and 10 informants from Kota Lama Village. Data on the diversity and the use of plants for maternal health care was collected from Batu Sanggan Village and Kota Lama Village, with a total of 73 informants participated in the study. The informants consisted of tribe leaders, village administration officers, traditional healers, traditional midwives, and representatives of households in the communities. The data collected include plant species used as food and plants used for maternal health care, location where they get the plants from, parts of plants used, and category of uses.

The collection of plant specimens for identification was carried out in their growing locations mentioned by the informants, namely forests, fields, and home gardens. A local field guide accompanied the researcher during field survey. The technique of plant sample collection and preparation of herbarium specimens followed the procedure of dos Santos et al. (2014).

RESULTS AND DISCUSSION

Diversity of food plants

A total of 76 plant species from 35 families were used by the Malays communities in Kampar Kiri Hulu as food (Table 1). Based on their uses, these food plants can be categorized as secondary food ingredients, vegetables, fruits, and spices. Vegetables shared the largest portion with 43.42%, followed by fruits (36.84%), spices (11.84%), and secondary food ingredients (7.90%). This result is similar to the study by Acquah et al. (2018) in Ghana and Sachula et al. (2020) in China in which vegetables and fruits were the two highest categories of food plant uses.

Plant species categorized as secondary food ingredients are those used as sources of carbohydrates. These included *Metroxylon sago* (sago), *Zea mays* (maize), *Manihot esculenta* (cassava), *Ipomoea batatas* (sweet potato), *Canna edulis* (edible canna), and *Xanthosoma sagittifolia* (cocoyam). The sago trees which grow in the forest or on the riverbank near the settlements are one potential plant as the substitute of rice as staple food. The superiority of sago trees as food plant species in the area was because this plant is well-adapted to marginal land and does not require intensive maintenance throughout its life stages (Tjokrokusumo 2018). Maize, which becomes major secondary staple food in many regions of Indonesia, has beneficial effect on health due to the presence of phytosterols and C-complex vitamins (Shah et al. 2016). Similarly, cassava tuber as secondary food has been known for a long time, and the tuber serves as high energy food from its carbohydrate content with high fiber good for

healthy diet, and also has high content of calcium, iron, potassium, magnesium, copper, zinc, and manganese (Bayata 2019). Meanwhile, the role of sweet potato as secondary food is not only justified by its carbohydrate content providing high energy but also from another nutritious components such as beta carotene, vitamin C, niacin, riboflavin, thiamin, and minerals (Zuraida 2003). The lesser-known plant species consumed as secondary food ingredients is the edible canna, in which its starch has high content of phosphorus, sodium, potassium and magnesium (Perez and Lares 2005). Another underutilized food plant species is the cocoyam, which in terms of secondary food is considered superior compared to other root and tuber crops due to its protein digestibility, vitamins and mineral content (Boakye et al. 2018).

Some of the vegetables used by the Malays communities are abundantly available in particular season, and are the basic ingredients of the typical cuisine in Kampar Kiri Hulu. These vegetables are *Archidendron pauciflorum*, *A. bubalinum*, and *Parkia speciosa*. Apart from being consumed as cooked vegetables for daily meal, people usually process the beans of *A. pauciflorum* into various products, such as chips and crackers (Rosalia 2017). The bean of *A. pauciflorum* with its sulfur-containing amino acids is widely consumed by people in Southeast Asian countries, and regardless of its unpleasant odor, it is known to have medicinal properties for purifying blood and antidiabetic agent (Bunawan et al. 2013). One of the unique forest ferns species used as food by people in the study area is *Diplazium esculentum*, in which the fiber-rich young shoots of the fronds are usually cooked as vegetable for healthy diet. This plant is considered a highly nutritious vegetable commodity in India where it is traded in the local market and also used as medicinal plant (Sarkar et al. 2018).

Studies in various countries indicated that wild edible plant species are multipurpose species, namely as food and medicinal plants, as reported by Amente (2017) in Ethiopia, Liao et al. (2018) in Guangdong, Southern China, and Sachula et al. (2020) in Inner Mongolia, China. The same results were found in Indonesia, as reported by Sujarwo et al. (2016) in Bali where a total of 16.28% of food plants are also used as medicinal plants. Among the food plants identified in this study, there were ten species that were used as medicinal plants by Malays communities in Kampar Kiri Hulu (Rosalia and Susandarini 2020). These multipurpose plants were *Carica papaya*, *Cocos nucifera*, *Garcinia atroviridis*, *Musa paradisiaca*, *Pometia pinnata*, *Nephelium lappaceum*, *Capsicum annum*, *Solanum torvum*, *Zingiber officinale*, and *Globba leucantha*.

The food plants identified in this study were obtained by people from three different locations, namely forest, field, and home garden. In terms of their location, the percentages of food plants obtained from forests, fields, and home gardens were 18, 36, and 46 percent, respectively. This shows that home garden plays an important role as productive site for growing food crops. Home gardens are usually planted with various species with multi-layer structures that can be managed to produce food crops in a sustainable way (Kehlenbeck and Maass 2004).

Table 1. List of food plant species used by the Malays communities in Kampar Kiri Hulu, Riau, Indonesia

Family	Species	Local name	Collection site	Category	Part used as food
Alliaceae	<i>Allium tuberosum</i> Rottler ex Spreng	Gando	HG	SP	Leaf, bulb
Amaranthaceae	<i>Amaranthus viridis</i> L.	Bayam	FI, HG	VG	Leaf
Anacardiaceae	<i>Mangifera foetida</i> Lour.	Ambacang	FO, HG	FR	Fruit
	<i>Mangifera indica</i> L.	Mangga	FI, HG	FR	Fruit
	<i>Mangifera</i> sp.	Kunungan	FO	FR	Fruit
Annonaceae	<i>Annona muricata</i> L.	Sirsak	HG	FR	Fruit
Araceae	<i>Xanthosoma sagittifolium</i> (L.) Schott	Talas	FI, HG	SF, VG	Corm, stem
Arecaceae	<i>Arenga pinnata</i> (Wurmb) Merr.	Enau	FI	FR	Fruit
	<i>Cocos nucifera</i> L.	Kelapa	FI, HG	VG	Fruit
	<i>Calamus</i> sp.	Rotan air	FO, HG	VG	Young leaf
	<i>Metroxylon sago</i> Rottb.	Rumbia	FO, HG	SF	Stem
	<i>Salacca zalacca</i> (Gaertn.) Voss.	Salak	FI	FR	Fruit
Asteraceae	<i>Blumea lacera</i> (Burm.f) DC.	Rambung-rambung	FI	VG	Leaf
Athyriaceae	<i>Diplazium esculentum</i> (Retz.) Sw.	Pakis	FO	VG	Young leaf
Brassicaceae	<i>Brassica rapa</i> L.	Sawi	FI	VG	Leaf
Bromeliaceae	<i>Ananas comosus</i> (L.) Merr.	Nanas	HG	FR	Fruit
Cannaceae	<i>Canna edulis</i> Ker.	Umbi kalin	FI, HG	SF	Rhizome
Caricaceae	<i>Carica papaya</i> L.	Pepaya	FI, HG	VG, FR	Leaf, flower
Clusiaceae	<i>Garcinia atroviridis</i> Griff. ex T.Anderson	Asam gelugur	FO	FR	Fruit
	<i>Garcinia mangostana</i> L.	Manggis	HG	FR	Fruit
Convolvulaceae	<i>Ipomoea aquatica</i> Forssk.	Kangkung	FI, HG	VG	Leaf
	<i>Ipomoea batatas</i> L.	Ubi jalar	FI	SF	Tuber
Cucurbitaceae	<i>Luffa acutangula</i> (L.) Roxb.	Gambas	FI	VG	Fruit
	<i>Lagenaria siceraria</i> (Molina) Standl.	Labu air	FI	VG	Fruit, leaf
	<i>Cucurbita moschata</i> Duchesne	Labu kuning	FI	VG	Fruit, leaf
	<i>Sechium edule</i> (Jacq.) Swartz	Labu siam	FI	VG	Fruit
	<i>Momordica charantia</i> L.	Pare	FI, HG	VG	Fruit
	<i>Cucumis sativus</i> L.	Timun	FI	VG	Fruit
Euphorbiaceae	<i>Manihot esculenta</i> Crantz	Singkong	FI	SF, VG	Tuber, leaf
Fabaceae	<i>Archidendron pauciflorum</i> (Benth.) I.C.Nielsen	Jengkol	FI, HG	VG	Fruit
	<i>Archidendron bubalinum</i> (Jack) I.C.Nielsen	Kabau	FI, HG	VG	Fruit
	<i>Vigna radiata</i> (L.) R.Wilczek	Kacang hijau	FI	FR	Fruit
	<i>Phaseolus vulgaris</i> L.	Kacang panjang	FI	VG	Fruit
	<i>Parkia speciosa</i> Hassk.	Petai	FI, HG	VG	Fruit
Gnetaceae	<i>Gnetum gnemon</i> L.	Seminyak	FO	VG	Leaf
Hypoxidaceae	<i>Molineria latifolia</i> (Dryand.)Herb. ex Kurz	Kutari	FO, HG	FR	Fruit
Lamiaceae	<i>Ocimum tenuiflorum</i> L.	Kemangi	FI, HG	VG	Leaf
Malvaceae	<i>Durio zibethinus</i> Rumph. Ex Murray	Durian	FO, FI, HG	FR	Fruit
Melastomataceae	<i>Melastoma malabathricum</i> L.	Keruduk	HG	VG	Leaf
Meliaceae	<i>Lansium domesticum</i> var. <i>duku</i> Correa	Duku	HG	FR	Fruit
	<i>Lansium domesticum</i> var. <i>domesticum</i> Correa	Langsat	HG	FR	Fruit
Moraceae	<i>Ficus racemosa</i> L.	Jambu	FO	VG	Fruit
	<i>Artocarpus integra</i> Merr.	Nangka	FI, HG	VG, FR	Fruit
	<i>Artocarpus champeden</i> (Lour.) Stokes	Nangka hutan	FO	VG, FR	Fruit
	<i>Ficus fulva</i> Reinw. ex Blume	Simantong	HG	VG	Fruit, young leaf
	<i>Ficus ampelas</i> Burm.f.	Simantong tanis	HG	VG	Fruit, young leaf
Musaceae	<i>Musa paradisiaca</i> L.	Pisang	HG	FR	Fruit
Myrtaceae	<i>Psidium guajava</i> L.	Jambu biji	HG	FR	Fruit
	<i>Syzygium aqueum</i> (Burm. f.) Alston	Jambu merah	HG	FR	Fruit
	<i>Syzygium polyanthum</i> (Wight) Walpers	Salam	HG	SP	Leaf
Oxalidaceae	<i>Averrhoa bilimbi</i> L.	Belimbing beras	HG	VG	Fruit
Pandanaceae	<i>Pandanus amaryllifolius</i> Roxb.	Pandan harum	HG	SP	Leaf
Passifloraceae	<i>Passiflora foetida</i> L.	Markisa	FI	FR	Fruit
Phyllanthaceae	<i>Sauropus androgynus</i> L.	Katuk	HG	VG	Leaf
	<i>Baccaurea motleyana</i> Mull.Arg.	Rambai	FO	FR	Fruit
	<i>Baccaurea macrocarpa</i> (Miq.) Mull.Agr.	Tampui	FO, HG	FR	Fruit
	<i>Baccaurea racemosa</i> (Reinw ex Blume) Mull. Arg.	Tungau	FO	FR	Fruit
Poaceae	<i>Dendrocalamus asper</i> (Schult.f.) Backer ex Heyne	Bambu petung/ Bambu batueng	HG	VG	Shoot
	<i>Zea mays</i> L.	Jagung	FI	SF	Fruit
	<i>Cymbopogon citratus</i> (D.C.) Stapf	Serai	HG	SP	Leaf, stem
Rutaceae	<i>Citrus hystrix</i> D.C.	Jeruk purut	HG	SP	Fruit

Sapindaceae	<i>Dimocarpus longan</i> Lour.	Kelengkeng	HG	FR	Fruit
	<i>Pometia pinnata</i> J.R.Forst. & G.Forst.	Kasai	FO, HG	FR	Fruit
	<i>Nephelium xerospermoides</i> Radlk.	Idan/Redan	FO	FR	Fruit
	<i>Nephelium mutabile</i> Blume	Pulesan	FI, HG	FR	Fruit
	<i>Nephelium lappaceum</i> L.	Rambutan	FI, HG	FR	Fruit
Solanaceae	<i>Nephelium juglandifolium</i> Blume	Turing	FO	FR	Fruit
	<i>Capsicum annum</i> L.	Cabai	FI	SP	Fruit
	<i>Solanum torvum</i> Sw.	Rimbang	FI, HG	VG	Fruit
	<i>Solanum melongena</i> L.	Terong	FI	VG	Fruit
	<i>Solanum lycopersicum</i> L.	Tomat	FI	VG	Fruit
Zingiberaceae	<i>Solanum</i> sp.	Imbang petani	FI, HG	VG	Fruit
	<i>Zingiber officinale</i> Roscoe	Jahe	HG	SP	Rhizome
	<i>Curcuma longa</i> L.	Kunyit	HG	SP	Rhizome
	<i>Alpinia galanga</i> (L.) Willd.	Lengkuas	HG	SP	Rhizome
	<i>Globba leucantha</i> Miq.	Silome	FO	FR	Fruit

Note: FO: forest, FI: field, HG: home garden, SF: secondary food ingredients, VG: vegetable, FR: fruit, SP: spices

A study by Mohri et al. (2013) on home gardens in Indonesia, Sri Lanka, and Vietnam showed that home gardens are ecologically, socially, and economically diverse, and greatly contribute to fulfilling nutritious diets and even might give additional income for the family. Moreover, Vlkova et al. (2011) mentioned that the home gardens represent subsistence farming in Vietnam with most of the plants have multiple uses. These studies showed the role of home gardens in creating food security, maintaining botanical diversity, and at the same time maintaining traditional knowledge for the local communities (Whitney et al. 2018). The advantage of cultivating food crops in the home garden is that it can be planted with species of varying growth cycles consisted of multipurpose species to guarantee food availability throughout the year (Galluzzi et al. 2010, Cruz-Garcia and Struik 2015).

Among the four food plant categories, the edible forest products that have the potential to be developed further for supporting sustainable food security are fruit trees (Liao et al. 2018). Some species found in the forest of Kampar Kiri Hulu which are classified as potential forest fruit trees included *Mangifera foetida*, *Garcinia atroviridis*, *G. mangostana*, *Durio zibethinus*, *Artocarpus integra*, *A. champeden*, *Baccaurea motleyana*, *B. macrocarpa*, *B. racemosa*, *Nephelium mutabile*, *N. xerospermoides*, *N. juglandifolium*, and *Pometia pinnata* (Rosalia 2017). These fruits contain nutrients and phytochemicals useful in fulfilling the healthy diet of the communities living close to the forests. The people in Kampar Kiri Hulu used the unripe *A. champeden* fruit as a vegetable, while the ripe fruit with its characteristic aroma is consumed as fresh fruit. In terms of nutritional content, Lim et al. (2011) noted that the unripe *A. champeden* fruit has higher content of crude fiber and crude protein than the ripe fruit, but the carbohydrate content was lower. Durian (*Durio zibethinus*) known as king of fruits, has a high polyphenol content which can reduce the risk of chronic diseases, and this fruit also contains high carotenoids and ascorbic acid (Aziz and Jalil 2019). Meanwhile, *Baccaurea motleyana*, one of three species of *Baccaurea* grows in the forest in the Kampar

Kiri Hulu area is one of the seasonal forest fruit with unique taste. The ripe fruit of *B. motleyana* which has an acid-sweet to sweet taste is known to contain 88 phytochemicals, as well as carbohydrates, vitamins, and minerals (Prodhan and Mridu 2021).

It is interesting to note that among the food plant species used by the Malays communities in Kampar Kiri Hulu, there were a number of species obtained from the forest, and thus can be categorized as forest plant foods. Due to the fact that these plants are not intensively cultivated, such plant species are referred to wild edible plants by some researchers. Forest plant foods or wild edible plants play an important role in creating food security for rural communities by providing nutrients for daily food and in certain situations of crop food scarcity (Upriety et al. 2012, Acquah et al. 2018). The contribution of forest food plants to the quality of rural diets is by providing a source of vitamins and minerals (Neudeck et al. 2012), especially from fruits and vegetable plant species. However, some of these plant species are considered as neglected and underutilized species (Hunter et al. 2019), and therefore more attention is needed so that their potential and contribution in providing nutritious food supply can be optimally developed. The important role of forest trees in providing food plants to maintain a sustainable diet was mentioned by Vinceti et al. (2013) and Liao et al. (2018) especially for people who live in the close vicinity to forest areas such as the Malays communities in this study.

Diversity of plants used in maternal health care

In this study, there were 34 plant species from 26 families traditionally used by the Malays communities in Kampar Kiri Hulu as medicinal plants for maternal health care. They used the plants for various purposes including during pregnancy, child delivery, postpartum recovery, and traditional health care for newborn babies (Table 2). The practices of using medicinal plants for maternal health care have been reported in a number of studies from various countries. Some studies on the use of medicinal plants for treatment during pregnancy include those reported by

Maliwichi-Nyirenda and Maliwichi (2010), Malan and Neuba (2011), John and Shantakumari (2015), and Nalumansi et al. (2017). The studies focusing on postpartum health care were those of Dudi and Singh (2018), Yusoff et al. (2018), and Sibeko and Johns (2021). Meanwhile, Lamxay et al. (2011), Ali-Shtayah et al. (2015), and Randrianarivony et al. (2016) reported studies on medicinal herbs for both ante-natal and post-natal cares.

Table 2. Plant species used in traditional practices of maternal health care by the Malays communities in Kampar Kiri Hulu, Riau, Indonesia

Family	Species	Local name	Plant part used	Medicinal use
Amaranthaceae	<i>Amaranthus spinosus</i> L.	Bayam duri	Leaf	Uterotonics
Apiaceae	<i>Pimpinella anisum</i> L.	Jintan manis	Flower	Induce breast milk production
Arecaceae	<i>Cocos nucifera</i> L.	Kelapa	Fruit, coconut water, oil	Uterotonics, uterus cleaning and wound healing
	<i>Areca catechu</i> L.	Pinang	Mesocarp, leaf sheath	Facilitate ease labor/child delivery, baby bathing
Asparagaceae	<i>Cordyline terminalis</i> (L.) A. Chev	Linjuang	Leaf	Uterotonics, maintain fetus health
Asteraceae	<i>Enhydra fluctuans</i> Lour.	Cikorau	Leaf	Facilitate ease labor/child delivery
Balsaminaceae	<i>Impatiens basalmia</i> L.	Pacar air	Leaf	Facilitate ease labor/child delivery
Brassicaceae	<i>Brassica juncea</i> L.	Sawi putih	Leaf	Uterotonics
Costaceae	<i>Costus speciosus</i> (J.Konig) Sm.	Sitawar	Leaf	Facilitate ease labor/child delivery, infant health care
Crassulaceae	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Sidingin	Leaf	Facilitate ease labor/child delivery
Cucurbitaceae	<i>Cucumis sativus</i> L.	Timun	Fruit	Uterotonics
	<i>Lagenaria siceraria</i> (Molina.) Standly.	Labu air	Fruit	Increase stamina; general wellbeing
Dioscoreaceae	<i>Tacca chantrieri</i> André	Sicucur	Leaf	Facilitate ease labor/child delivery
Lamiaceae	<i>Ocimum sanctum</i> L.	Lampes	Leaf	Induce breast milk production
Lauraceae	<i>Cinnamomum burmanii</i> (Ness & T. Ness	Kayu manis	Bark	Fertility, induce pregnancy, relieve pain
Malvaceae	<i>Hibiscus rosa-sinensis</i> L.	Byang ayu/ Bunga rayo	Flower	Newborn/infant health care
Musaceae	<i>Musa paradisiaca</i> L.	Pisang	Fruit	Uterotonics, facilitate ease labor/child delivery, induce breast milk production
	<i>Musa balbisiana</i> Colla	Pisang batu	Fruit	Uterotonics
Myristicaceae	<i>Myristica fragrans</i> Houtt.	Pala	Flower, fruit	Fertility, induce pregnancy, facilitate ease labor/child delivery
Myrtaceae	<i>Syzygium aromaticum</i> L.	Cengkeh	Leaf	Fertility, induce pregnancy
Papilionaceae	<i>Trifolium repens</i> L.	Akar samban		Facilitate ease labor/child delivery
Piperaceae	<i>Piper betle</i> L.	Sirih	Leaf	Uterotonics, maintain fetus health, facilitate ease labor/child delivery
Poaceae	<i>Oryza sativa</i> L.	Padi	Seed	Fertility, induce pregnancy
	<i>Dendrocalamus asper</i> (Schult.f.) Backer ex Heyne	Bambu petung/ Bambu batueng	Stem	Placenta cutting
Phyllanthaceae	<i>Sauropus androgynus</i> (L.) Merr.	Katuk	Leaf	Uterotonics, induce breast milk production
	<i>Phyllanthus niruri</i> L.	Dukung- dukung anak	Daun	Facilitate ease labor/child delivery
Rubiaceae	<i>Uncaria gambir</i> (Hunt.) Roxb.	Gambir	Leaf	Facilitate ease labor/child delivery, infant health care
Rutaceae	<i>Citrus aurantiifolia</i> (Cristm.) Swingle	Jeruk nipis	Fruit	Facilitate ease labor/child delivery, induce breast milk production
Solanaceae	<i>Capsicum frutescens</i> L.	Cabai rawit merah	Fruit	Induce breast milk production
Thymelaceae	<i>Aquilaria malaccensis</i> Lamk.		Leaf, bark	Overcome morning sickness
Zingiberaceae	<i>Amomum compactum</i> Willd.	Gaharu	Leaf	Overcome morning sickness
	<i>Boesenbergia pandurata</i> (Roxb.) Schult.	Temu kunci	Leaf	Facilitate ease labor/child delivery, induce breast milk production
	<i>Globba leucantha</i> Miq.	Silome	Leaf	Uterotonics
	<i>Curcuma longa</i> L.	Kunyit	Rhizome	Uterotonics, placenta cutting

The use of medicinal plants during pregnancy usually aims to overcome gastrointestinal complaints experienced by pregnant women such as nausea, bloating, flatulence, and vomiting (John and Shantakumari 2015). The plant species used by the Malays communities for pregnancy care included *Aquilaria malaccensis* and *Amomum compactum*. These plants were traditionally used to overcome morning sickness during the first trimester of pregnancy. A study conducted by Sarma et al. (2015) noted that in traditional medicinal system in India, *A. malaccensis* is known to have effects on preventing the unpleasant condition of vomiting, increase appetite, and function as a general tonic. Meanwhile, *A. compactum* is known to be used for aromatherapy with its soothing effect, and having the ability to strengthen the nervous system (Hartady et al. 2020), and this is associated with its use to reduce nausea.

Apart from overcoming various gastrointestinal complaints, traditional health cares during pregnancy using various medicinal plants also aims to prevent miscarriages (Maliwichi-Nyirenda and Maliwichi 2010, Malan and Neuba 2011). This is done by maintaining the health of the uterus and the developing fetus, which in general uses plants having pharmacological properties as uterotonics. A number of plant species believed to have benefits as uterotonics found in this study were *Amaranthus spinosus*, *Cocos nucifera*, *Cordyline terminalis*, *Brassica juncea*, *Cucumis sativus*, *Musa paradisiaca*, *Musa balbisiana*, *Piper betle*, *Sauropus androgynus*, *Globba leucantha*, and *Curcuma longa*. The use of these plants is often related to the cultural aspects of the communities in terms that sometimes it is related to a certain ritual based on spiritual beliefs (Khasanah 2017). Nevertheless, some studies on traditional medicine showed the use of these plants in maternal health care. *Globba leucantha*, a plant species commonly used as spices, is traditionally used for postpartum recovery by people in Negeri Sembilan, Malaysia (Ong et al. 2011), while the traditional use of *C. longa* in Thailand during postpartum period is to foster wound healing, secretion of lochia, and uterus recovery (Jaroengarmsamer et al. 2019). Decoction of *Amaranthus spinosus* root was used to relieve postpartum varicella, and a fiber-rich food prepared from inflorescence and young pseudostem of *Musa acuminata* was applied to ease delivery, postpartum recovery, and stimulate lactagouge (Lamxay et al. 2011). The fruit of *M. paradisiaca* is known to be rich in nutrients that are beneficial for health, especially the high potassium content which is important for muscle function and maintaining blood pressure, and thus it is recommended for women during menstruation because it can reduce pain, helps iron absorption, and at the same time is a source of energy (Sruthi 2019). Meanwhile, *M. balbisiana* fruit has been traditionally used as a health tonic in the form of an infusion made by soaking ripe fruit slices in water (Borborah et al. 2016). The use of *Cocos nucifera* fruit, especially its endocarp and coconut water, is very common among people in various regions as a tonic because of its high nutrient content, increase metabolic rate, overcome fatigue, serves as quick source of energy, and boosts endurance and immune system (Obidoa and Joshua 2010). Pharmacologically, the endocarp and

coconut water contain phytochemicals that mainly have antioxidant properties (Lima et al. 2015).

In this study, it was revealed that the people of Kampar Kiri Hulu still hold the traditional knowledge on the useful plants in handling processes relating to child delivery. One example is the use of bamboo strips from *Dendrocalamus asper* to cut the umbilical cord. The use of bamboo strip to cut the umbilical cord is accompanied by the application of juice from *Curcuma longa* rhizome (Khasanah 2017). *Curcuma longa* is widely known for having antimicrobial properties, including antibacterial, antifungal, and antiviral (Moghadamtousi et al. 2014). The same tradition is reported in another country, such as the use of bamboo string from *Gigantochloa parvifolia* to cut the umbilical cord in traditional practices of Kry ethnic group in Lao (Lamxay et al. 2011). The use of *D. asper* as a traditional tool for cutting the umbilical cord is based on its physical properties, including hard and strong material but reasonably flexible to be formed into a straight cutting tool and it is easily split into sharp, flattened strips (Baguna and Marasabessy 2020).

There were several plants traditionally used by the Malays communities to facilitate ease labor, save child delivery, and treatment on postpartum recovery. These plants included *Areca catechu*, *Enhydra fluctuans*, *Impatiens basalina*, *Costus speciosus*, *Bryophyllum pinnatum*, *Tacca chantrieri*, *Myristica fragrans*, *Trifolium repens*, *Phyllanthus niruri*, *Uncaria gambir*, *Citrus aurantiifolia*, and *Boesenbergia pandurata*. The application of these plant species can be scientifically explained by the presence of compounds with pharmacological properties related to child delivery, as mentioned in many pharmacological studies. *Areca catechu* has numerous secondary metabolites affecting the central nervous system as anti-depressant, and is traditionally used in wound healing (Fatma and Mazumder 2015). Similarly, *Bryophyllum pinnatum* is widely used for wound healing, menstrual problem, uterine contraction, and also has anti-depressant, anti-inflammatory, and analgesic properties (Thorat et al. 2017).

Meanwhile, *Boesenbergia pandurata*, plant species commonly used as spices, has pharmacological activities as anti-inflammatory, antibacterial, and has efficacy in strengthening the stomach (Chahyadi et al. 2014). It is also interesting to note that *Costus speciosus*, a wild plant species has a vast number of pharmacological effects and traditionally applied for cooling and relieving headache, fever, inflammation, wound healing, and could stimulate uterine contraction (Pawar and Pawar, 2012). Another wild plant species with medicinal properties is *Trifolium repens*, in which Ahmad and Zeb (2021) mentioned that flavonoids and isoflavonoids compounds in this species has pharmacological effect relating to pregnancy and child delivery including anti-inflammatory, reduce high blood pressure, and reduce postpartum depression.

The purpose of using medicinal plants during the postpartum period is to restore stamina, increase general wellbeing of the mother, stimulate the production of quality breast milk, and prevent various uncomfortable conditions including depression, insomnia, and constipation (Ali-Shtayeh et al. 2015). *Tacca chantrieri*, which was used by

the people of Kampar Kiri Hulu to facilitate childbirth, is known to be a medicinal plant with many properties for postpartum health care, including treating abdominal pain, postpartum bleeding, perineal healing, and uterine retraction (Lamxay et al. 2011). A study by Dudi and Singh (2018) in India showed that women health care during the first week after childbirth was done by giving high-calorie foods rich in healthy natural fats for stamina recovery and promote healthy breast milk production. The practice of this healthy diet in the following week was done by consuming foods with green vegetables high in fiber, vitamins, protein, and which are easy to digest. Plant species traditionally used to stimulate and increase the production of healthy breast milk included *Pimpinella anisum*, *Ocimum sanctum*, *Musa paradisiaca*, *Sauropus androgynus*, *Citrus aurantiifolia*, *Capsicum annum*, and *Boesenbergia pandurata*. A pharmacological review by Shojaii and Fard (2012) showed that the consumption of *P. anisum* by lactating women has beneficial impact in increasing milk production. The use of *C. annum* in inducing the production of breast milk might be due to the rich phytochemicals contents in the fruit, including vitamins, flavonoids, phenolics, and some minerals such as potassium, calcium, iron, phosphorus, and magnesium (Saleh et al. 2018). The same reason is applied for using *C. aurantiifolia* since fruit of this plant has many phytochemicals and bioactive compounds, and it is also reported as appetite stimulant (Enejoh et al. 2015). Another plant widely recognized as a traditional herb prepared for mothers after childbirth is *Sauropus androgynus*, in which the leaves are consumed as a vegetable, due to its uterotonic properties to facilitate expulsion of the placenta after birth and to stimulate the production of breast milk (Petrus 2013). The traditional use of medicinal plants for facilitating lactation reported in this study showed similarity to those reported by Sibeko and Johns (2021) including *P. anisum*, *Capsicum* spp., *C. nucifera*, *C. aurantiifolia*, and *M. paradisiaca*.

The people of Kampar Kiri Hulu also had a tradition of using a number of herbal ingredients for infant health care. These plants included *Areca catechu* for baby bathing, *Costus speciosus*, and *Hibiscus rosa-sinensis*. The use of these plants is based on the beneficial effect they have, for example, *A. catechu* contains various secondary metabolites including alkaloids, tannins, and terpenoids, and also has anti-fungal, anti-fungal and anti-depressant properties (Fatma and Mazumder 2015). *Costus speciosus* is a wild plant with natural cooling properties to relieve fever and pain, serves as muscle reluctant, also has antibacterial and antifungal activities (Pawar and Pawar 2012). The use of *H. rosa-sinensis* in infant health care could be traced from its phytochemicals content which has pharmacological properties as antibacterial, anti-inflammatory, used in treating fever, infection, and wound healing (Missoum 2018). The practice of applying medicinal herbs for infant health care was also reported in India using *Trachyspermum ammi*, *Curcuma longa*, *Myristica fragrans*, and *Syzygium aromaticum* to provide comfort to the baby and prevent digestive problems, colds and coughs (Dudi and Singh 2018).

Overall, the practice of using herbal medicine in pregnancy, childbirth and postpartum health care has been reported in many countries, such as in Lao PDR (Lamxay et al. 2011), Palestine (Ali-Shtayeh et al. 2015), Madagascar (Randrianarivony et a. 2016), Nigeria (Mainasara et al. 2017), Uganda (Nalumansi et al. 2017), Malaysia (Yusoff et al. 2018), and Thailand (Jaroengarsamer et at. 2019). Although some literature showed that plants used in maternal health care are known to have beneficial effects relating to their purpose of application to pregnant women, more in-depth research on their pharmacological and clinical effects needs to be done. This is in line with the statement by Tripathi et al. (2013) based on a review of plant species traditionally used as uterotonics by people in Sub-Saharan Africa, that research on uterotonic properties of these plants is very important to avoid the adverse effect on mother and fetus. A similar opinion was expressed by John and Shantakumari (2015) on the review of herbal preparations used during pregnancy in the Middle East. In this case, ethnobotanical research plays a role in providing basic information on the potential of medicinal plants, and opening opportunities for further research in the field of pharmacology and other aspects related to general health.

The use of medicinal plants for maternal health care by the Malays communities in Kampar Kiri Hulu is strongly influenced by the culture they hold as part of their tradition and local wisdom. This situation has positive impact on the preservation of traditional knowledge. In addition, the location of their settlements which is close to forest areas, and limited access to public health facilities are the factors that further strengthen the tradition of using herbal medicine. Similar situation was found in other areas where the use of medicinal plants is due to insufficiency in available health services (Maliwichi-Nyirenda and Maliwichi 2010), and limited access to public health facilities (Randrianarivony et al. 2016, Mainasara et al. 2017). Moreover, the fact that the traditional practices of using herbal medicine in maternal health care is closely related to culture and traditions in particular ethnics have been reported in Asian countries, such as those by Lamxay et al. (2011) in Lao PDR, Yusoff et al. (2018) in Malaysia, and Jaroengarmsamer et al. (2019) in Thailand.

Results of this ethnobotanical study showed that the Malays communities in Kampar Kiri Hulu still hold strong botanical knowledge on the diversity of food plants and medicinal plants used for maternal health care. The forest, field, and home gardens in their area stored a great potential of diversity of food and medicinal plants for their daily living. This botanical diversity is maintained by their culture and traditional knowledge-creating local wisdom for conserving the plants and good practices in their uses. The documentation of the diversity of food plants and traditional medicinal plants for maternal health care generated in this study contributes to the preservation of traditional knowledge, as well as providing information on the potential of these plants for further development, either in plant-based food products or herbal-based medicines.

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