

Ethnobotanical study on traditional cosmetics practiced by the Dayak Kayong of West Kalimantan, Indonesia

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Abstract. Sari LCS, Lovadi I, Wardoyo ERP, Randi A. 2024. *Ethnobotanical study on traditional cosmetics practiced by the Dayak Kayong of West Kalimantan, Indonesia. Biodiversitas 25: 2937-2944.* Various ethnic groups across the globe have practiced traditional cosmetics and many studies on cosmetic plants and their uses in Indonesia have been conducted. However, there is no ethnobotanical information on cosmetic plants and their uses, particularly in Dayak Kayong of Ketapang District, West Kalimantan, Indonesia. This study reports on cosmetic plants and their traditional uses by the Dayak Kayong community. We conducted semi-structured interviews from April to June 2022 with 30 respondents living in Nanga Tayap Sub-district in Ketapang District. Non-probability sampling was employed to select respondents based on their knowledge and practice of traditional cosmetics. Three indices, namely Frequency of Citation (FC), Informant Consensus Factor (ICF), and Fidelity Level (FL), were employed to analyze the ethnobotanical data. The Dayak Kayong community utilizes 26 plant species from 20 families for traditional cosmetics. The most frequently used plant part are leaves (34.62%), followed by fruits (19.23%), sap (15.38%), rhizomes (11.54%), flowers (11.5%), roots (3.85%), and seeds (3.85%). Important cosmetic plants based on FL include *Aquilaria malaccensis*, *Areca catechu*, *Dendrobium* sp., *Gluta renghas*, *Lansium domesticum*, and *Sindora* sp. The high FL documented for cosmetic plants in this study needs further investigation into potential plants for use in the cosmetics industry.

Keywords: Cosmetic plants, Dayak Kayong, fidelity level, West Kalimantan

Abbreviations: FC: Frequency of Citation, ICF: Informant Consensus Factor, FL: Fidelity Level

INTRODUCTION

Plants have provided benefits to humanity, e.g., for housing, food, and medicinal properties (Rahman et al. 2019). Due to safety and efficacy reasons, plants are now widely used as sources for cosmetic purposes, leading to increasing demand for herbal cosmetics in the market. Research in various fields has been conducted to develop safe and efficient herbal cosmetics (Lourith and Kanlayavattanakul 2021). Ethnobotanical studies play fundamental roles in searching for plants that have potential benefits for cosmetic purposes. Lourith and Kanlayavattanakul (2021) argue that botanical information (i.e., botanical identity, plant parts to use, and preparation modes) documented in the literature will be a foundation for further investigations on active compounds and contaminants. The results of such studies may be used as indicators for potential sources of plant-based cosmetics.

Studies on the ethnobotany of traditional cosmetics reveal that plants were the primary sources for cosmetics long before synthetic substances with similar properties were discovered (Aburjai and Natsheh 2003). The estimated time of using plants for traditional cosmetics dates back to 5000 BC when the Sumerians and Assyrians utilized plants to remove skin problems (Agüero and Stella

2007). Since then, plant uses for cosmetic applications have emerged in Babylonians, ancient Egypt, Greece, Rome, Arabs, and China (González-Minero and Bravo-Díaz 2019).

Indigenous people around the world have used plants for traditional cosmetics, using them for treating sunburns, reducing wrinkles, removing spots, moisturizing skin, making soap, oral and hair care, and facial wash (Mwinga et al. 2019; Ndhlovu et al. 2019; Othman et al. 2020; Pranskuniene et al. 2022). Moreover, the number of cosmetic plants used by indigenous people varies among cultures globally. Mahomoodally and Ramjuttun (2016) documented the use of 25 plants for 29 cosmetic applications by local people on the tropical island of Mauritius. Tribal women of Kashmir Himalayas reportedly use 39 plants for 13 cosmetic applications (e.g., lip and nail care, body smell, and allergy) (Shaheen et al. 2014). According to Mwinga et al. (2019), Xhosa women in the Eastern Cape, South Africa, still use plants for cosmetic purposes, including sun protection, treating sunburns, and removing spots. These differences in the number of cosmetic plants used by indigenous people worldwide reflect variations in traditional knowledge due to differences in traditions, environments, and attitudes (Febriyanti et al. 2022).

In Indonesia, research on cosmetic plants and their uses has been conducted among various ethnic groups, each with their own knowledge of traditional cosmetics utilizing several plants for different purposes. For example, local people inhabiting the Mbeling Forest in East Nusa Tenggara Province use *Cocos nucifera* for hair care and *Albizia chinensis* for soap (Mulu et al. 2020). The Wonokerto people in Yogyakarta consume *Ocimum citriodorum* to eliminate body odor, as one of the practices that has been passed down for hundreds of years (Nahdi and Kurniawan 2019). The use of plants for traditional cosmetics is also documented in other cultures in Kalimantan, such as Dayak Salako in Singkawang municipality of West Kalimantan (Lovadi et al. 2021), Dayak Kanayatn in Landak District of West Kalimantan (Noviantina et al. 2018), and Dayak Krayan in North Kalimantan (Susanti and Zuhud 2019). Despite ethnobotanical studies on cosmetic plants and their uses being carried out in Kalimantan, to our knowledge, no investigation has been conducted on cosmetic plants used by the indigenous people of Ketapang, West Kalimantan.

This study aims to report on cosmetic plants and their use by the Dayak Kayong tribe of Ketapang, West Kalimantan, Indonesia. Through interviews with the Dayak Kayong community in the Nanga Tayap Subdistrict, located in Ketapang District, we attempt to identify the plant species and parts used for cosmetic purposes, categorizing them into six categories: skin, face, hair, lips and mouth, female hormones, and nails.

MATERIALS AND METHODS

Study area

The study was conducted in three villages of Nanga Tayap Sub-district located in Ketapang District, West

Kalimantan, Indonesia: Betenung, Kayong Hulu, and Kayong Tuhe. The study area is approximately 350 km south-southeast of Pontianak, the capital city of West Kalimantan (Figure 1). The three villages were selected based on the population of the Dayak Kayong tribe in the Nanga Tayap Sub-district being the highest. The total areas of Betenung, Kayong Hulu, and Kayong Tuhe are 79.29 km², 122.95 km², and 19.82 km², respectively. Based on the recent census, the total populations of Betenung, Kayong Hulu, and Kayong Tuhe are 1,441, 1,360, and 713, respectively (Central Bureau of Statistics for Ketapang District 2021).

Procedures

Ethnobotanical data collection

Data were collected from April to June 2022 using semi-structured interviews. Respondents interviewed in this study were selected using purposive sampling (Palinkas et al. 2015) based on their knowledge of traditional cosmetic practices, without gender distinction (Fongzossie et al. 2017). Before the interviews, all respondents gave oral informed consent and agreed to participate in this study solely for academic purposes. Each respondent was asked about plants used in traditional cosmetics, the parts of the plants used, preparation methods, and administration methods.

Plant identification

Plants were identified in the field whenever possible. Unidentified plant samples were collected, preserved as herbarium specimens, and then transported to the ecology laboratory of the Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Tanjungpura, Pontianak, Indonesia, for further identification and reference.

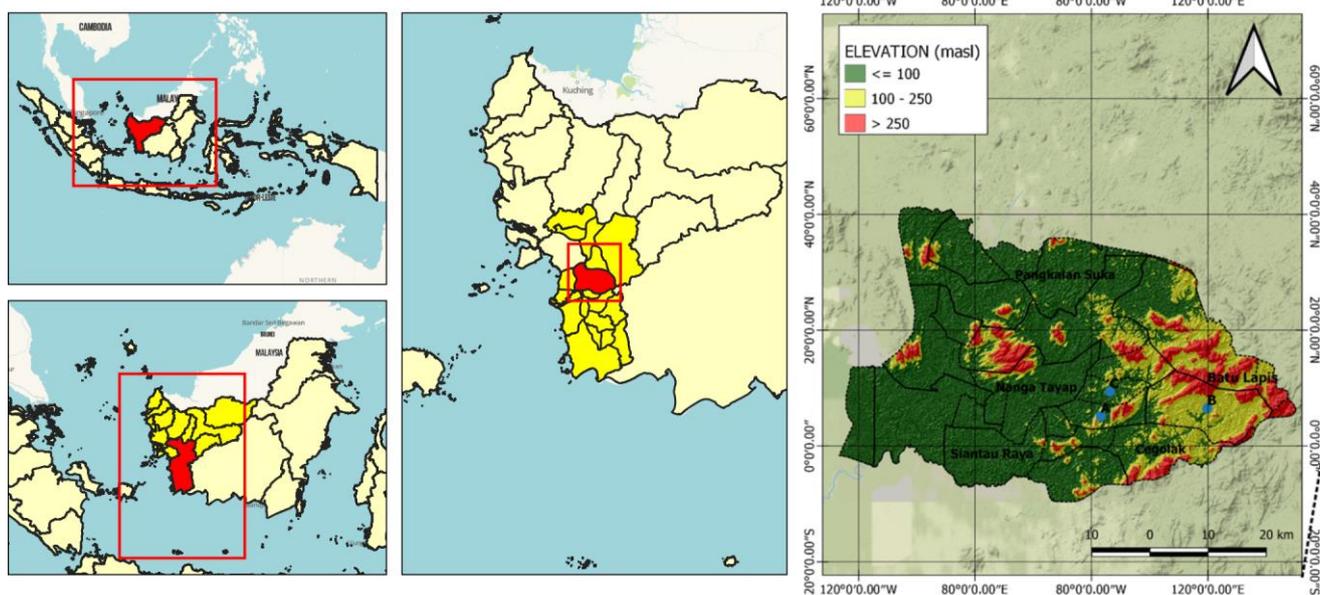


Figure 1. The study area is in the Nanga Tayap Sub-district of Ketapang, West Kalimantan, Indonesia. The blue dots represent three studied villages: Betenung, Kayong Hulu, and Kayong Tuhe

Data analysis

Cosmetic uses were grouped into six categories modified based on Elansary et al. (2015). Those six categories are (1) skin (anti-aging, sunburn, bleach, and tattoos), (2) face (natural moisturizer, anti-aging, and bleach), (3) hair (hair dye, hair care, anti-dandruff, and lice), (4) lips and mouth (natural coloring, oral care), (5) female hormones (reducing menstrual pain), and (6) nails.

Ethnobotanical data were analyzed through three ethnobotanical indices, i.e., Frequency of Citation (FC), Informant Consensus Factor (ICF), and Fidelity Level (FL).

FC is calculated using the formula used by Kumar and Bharati (2014).

$$FC (\%) = (N/T) \times 100$$

Where: N: the number of respondents who cited cosmetic uses; T: the total number of respondents interviewed.

ICF is calculated for six categories of cosmetic uses to identify the agreements of the informants on the reported cosmetic uses using the formula used by Trotter and Logan (1986).

$$ICF = (nur-nt)/(nur-1)$$

Where: nur: represents the number of use reports of a specific plant for cosmetic use; nt: indicates the total species that all respondents use for a particular cosmetic category.

Fidelity Level (FL) measures the importance of a species for a particular use (Jost et al. 2016). FL is calculated using the formula from Friedman et al. (1986).

$$FL = N_p / N \times 100$$

Where: N_p : represents the number of respondents that specify the use of species for a particular cosmetic category, N: indicates the number of respondents that use them for any cosmetic category.

RESULTS AND DISCUSSION

Demographic information

Table 1 indicates the demographic data of respondents, i.e., age, gender, occupation, and education. The majority of respondents were aged between 71 and 80 (40%), 61-70 (26.7%) and 51-60 (13.3%). Compared to women, men outnumbered them by 56.7% to 43.3%. Most traditional cosmetics users were farmers (86.7%), and two-thirds of respondents had primary education (Table 1).

Plant diversity used in traditional cosmetics

In total, 26 plant species belonging to 20 families were reportedly used by the Dayak Kayong for traditional cosmetics. The most common families are Zingiberaceae (3 species), Annonaceae, Arecaceae, Fabaceae, and Poaceae (2 species found in each family), with only one species

reported for the 15 remaining families (Figure 2, Table 2). The Frequency of Citation (FC) ranged between 3.3% and 73.3%, with the highest FC found in *Alphitonia philippinensis* (73.3%) and *Uvaria micrantha* (73.3%). The lowest FC was observed in *Alpinia galanga*, *Magnolia champaca*, and *Sindora* sp. (3.3% each) (Table 2).

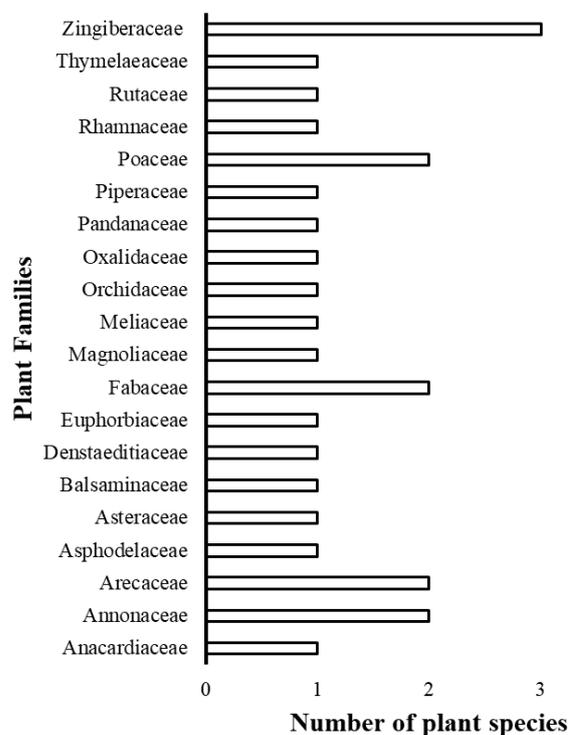


Figure 2. Plant families reportedly used in traditional cosmetics by Dayak Kayong in Ketapang, West Kalimantan, Indonesia

Table 1. Demographic characteristics of respondents (n = 30)

Demographic characteristics	Number of respondents	Percentage (%)
Age		
30-40	1	3.3
41-50	2	6.7
51-60	4	13.3
61-70	8	26.7
71-80	12	40
81-90	3	10
Gender		
Female	13	43.3
Male	17	56.7
Occupation		
Farmers	26	86.7
Teachers	1	3.3
Housewives	3	10
Education		
No formal education	10	33.3
Primary	20	66.7
Secondary	0	0

Table 2. Plants used as traditional cosmetics by Dayak Kayong, Ketapang, West Kalimantan, Indonesia

Family and scientific name	Vernacular name	FC (%)	Plant part used	Preparation modes	Cosmetic uses
Anacardiaceae <i>Gluta renghas</i> (L.)	<i>Rongas</i>	10.0	Sap	The sap is painted onto the body and then rubbed with crushed charcoal	Tattoo
Annonaceae <i>Uvaria micrantha</i> (A.DC.) Hook. f. & Thomson	<i>Langer</i>	73.3	Root	The root bark is cleaned and then beaten with wood until foam emerges. Water is added and rubbed into hair and body	Soap and shampoo
<i>Cananga odorata</i> (L.) Hook. f. & Thomson	<i>Kenanga</i>	10.0	Flower	Yellowish flowers are harvested and then tucked under the bed	Body fragrance
Areaceae <i>Cocos nucifera</i> (L.)	<i>Kelapa</i>	53.3	Fruit	<ul style="list-style-type: none"> Coconut fruit is grated for the water and then cooked until the oil comes out. After the oil is cooled, rub it on the head The brown coconut husk is taken for teeth brushing and then cleaned with water 	Hair oil The husk is used for brushing teeth
<i>Areca catechu</i> (L.)	<i>Pinang</i>	50.0	Fruit	The nut skin is cut evenly and then rubbed into the teeth	Teeth whitening
Asphodelaceae <i>Aloe vera</i> (L.)	<i>Lidah Buaya</i>	6.7	Leaf	The leaf skin is cut, and the mucus is rubbed on the head until smooth. Let it sit for three minutes, then wash it with clean water	Hair smoothing
Asteraceae <i>Eclipta alba</i> Hassk	<i>Urang-arang</i>	13.3	Leaf	The leaves are cleaned first, then pounded and rubbed into the hair	Elongate the hair
Balsaminaceae <i>Impatiens balsamina</i> (L.)	<i>Kepacar</i>	50.0	Leaf	The leaves are pounded until smooth, applied to nails, wrapped with a cloth, left for 4-5 hours, and cleaned with water	Nail coloring
Denstaedtiaceae <i>Stenochlaena palustris</i> (Burm. F.) Bedd.	<i>Paku ikan</i>	13.3	Leaf	The leaves are taken, squeezed, and rubbed into the skin and face. They are then let stand for 10 minutes and rinse with clean water	Remove scars and acne scars on the face
Euphorbiaceae <i>Aleurites moluccanus</i> (L.) Willd	<i>Keminting</i>	23.3	Seed	The burnt waste burns the seeds, pounded until smooth, and then wrapped in a cloth. Then, it is applied to the hair	Hair oil and black hair
Fabaceae <i>Archidendron bigeminum</i> (L.)	<i>Potai Aria</i>	23.3	Leaf	Some leaves are taken, crushed using water until foamy, and rubbed into the hair and skin	Soap and hair extensions
<i>Sindora</i> sp.	<i>Sindur</i>	3.3	Sap	The sap is painted onto the body; then, the crushed charcoal is applied	Tattoo
Magnoliaceae <i>Magnolia champaca</i> (L.)	<i>Cempaka</i>	3.3	Flower	Flowers are taken and then boiled; after the water is boiled and cooled, it is rubbed into the hair	Body deodorizer
Meliaceae <i>Lansium domesticum</i> Jack	<i>Langsat</i>	16.7	Sap	The sap is painted onto the body; then, the crushed charcoal is applied	Tattoo
Orchidaceae <i>Dendrobium</i> sp.	<i>Bunga Bakah</i>	13.3	Flower	Flowers are cooked with water mixed with hazelnut, and then the water is taken and rubbed on the body	Body deodorizer
Oxalidaceae <i>Averrhoa bilimbi</i> (L.)	<i>Belimbing Tunjuk</i>	36.7	Fruit	The fruit is split and then rubbed into the nails	Nail cleaner
Pandanaceae <i>Pandanus amaryllifolius</i> Roxb.	<i>Pandan Wangi</i>	23.3	Leaf	<ul style="list-style-type: none"> The leaves are pounded, put in coconut oil, and rubbed into the hair The leaves are pounded until smooth, rubbed on all body parts, and cleaned with water 	Hair perfume Body deodorizer

Piperaceae						
<i>Piper betle</i> (L.)	<i>Sirih</i>	56.7	Leaf	<ul style="list-style-type: none"> The leaves are washed, then boiled, and then drank the water The leaf is smeared with a small quantity of lime, mixed with pounded Areca nut, and then a little gambier is added after it is chewed 	Body odor remover and menstrual pain reliever Strengthen teeth	
Poaceae						
<i>Cymbopogon nardus</i> (L.) Randle	<i>Sorai Wangi</i>	23.3	Leaf	The leaves are cooked with water and mixed with hazelnut; then, the water is taken and rubbed on the body and hair	Body and hair perfume	
<i>Oryza sativa</i> (L.)	<i>Padi</i>	36.7	Fruit	Rice is soaked for 24 hours, dried in the sun, pounded until smooth, mixed with water, rubbed on the skin and face, let stand for 10 minutes, and rinsed with clean water	Smooth skin and facial whitening	
Rhamnaceae						
<i>Alphitonia philippinensis</i> Braid	<i>Segayang</i>	73.3	Leaf	<ul style="list-style-type: none"> The leaves are sun-dried for 24 hours; after that, they are grounded until smooth, and then a little water is added, kneaded, and rubbed on the body The leaves are sun-dried for 24 hours; after that, it is pounded until smooth; then, the mashed rice is added with a small quantity of water, applied to the face, let dry for 10 minutes, then rinse onto the water The leaves are sun-dried for 24 hours; after that, they are ground until smooth, then a little water is added, kneaded, and rubbed on the hair 	Soap Facial whitening Shampoo	
Rutaceae						
<i>Citrus aurantifolia</i> (Christm.) Swingle	<i>Limau Lipis</i>	26.7	Fruit	<ul style="list-style-type: none"> Fruit split, squeezed into the hair, and rubbed for 4-5 minutes; then, rinse with clean water The fruit is split and then rubbed into the nails 	Anti-dandruff Nail cleaner	
Thymelaeaceae						
<i>Aquilaria malaccensis</i> Benth	<i>Monyan</i>	6.7	Sap	The sap is rubbed on the nails, left for 3-4 hours, and then rinsed with water	Nail color	
Zingiberaceae						
<i>Curcuma longa</i> (L.)	<i>Kunyit</i>	13.3	Rhizome	Grated turmeric boiled with water, then strain and take the water. Turmeric water is mixed with mashed <i>Aloe vera</i> flesh and rubbed on the face and all over the body; it is rinsed with water	Facial whitening and skin smoothing	
<i>Curcuma zanthorrhiza</i> Roxb.	<i>Temulawak</i>	16.7	Rhizome	It is washed, peeled until clean, pounded until smooth, mixed with mashed rice, and rubbed on the skin and face	Skin and face whitening	
<i>Alpinia galanga</i> (L.) Willd	<i>Lengkuas</i>	3.3	Rhizome	Galangal is cleaned and grated, then squeezed until the water comes out. It is then used as a face mask, let stand for 20 minutes, and cleaned with water	Skin whitening	

Note: FC: Frequency of Citation

Plant parts used, preparation modes, and plant sources

Leaves are the most utilized part, with a usage percentage of 34.62%, followed by fruits (19.23%), sap (15.38%), rhizomes (11.54%), flowers (11.5%), roots, and seeds (3.85% each) (Figure 3). Common preparation modes for traditional cosmetics are raw, pounding, boiled, kneaded, shredded, sun-drying, burned, and soaking (Table 2). The Dayak Kayong people obtain cosmetic plants from various sources, including yards, forests, and vegetable

gardens (Figure 4).

Informant Consensus Factor (ICF)

The ICF value calculation of all cosmetic usage categories ranged from 0.786 to 1. The highest ICF value was for female hormones (1), followed by nails (0.909), lips and mouth (0.895), hair (0.845), and skin (0.810), while the lowest was documented for the face (0.786) (Table 3).

Fidelity Level (FL)

FL values ranged from 9.09 to 100% (Table 4). The FL of 100% was documented in 15 plants scattered across four cosmetic categories. *Alpinia galanga*, *Cananga odorata*, *Curcuma longa*, *Dendrobium* sp., *Gluta renghas*, *Lansium domesticum*, *Sindora* sp., had an FL of 100% in the skin category. Similarly, *Averrhoa bilimbi*, *Aquilaria malaccensis* and *Impatiens balsamina*, had an FL of 100% in the nail category, while *Aleurites moluccanus*, *Aloe vera*, *Eclipta alba*, and *Magnolia champaca* were noted for the hair category. *Areca catechu* had an FL of 100% in the lips and mouth category. In contrast, *Alphitonia philippinensis* had the lowest FL (9.09%).

Discussion

This study demonstrates that the Dayak Kayong people use plants for traditional cosmetic purposes. The application of cosmetic plants among respondents falls into six categories: female hormones, nails, lips, mouth, hair, skin, and face. Interestingly, respondents knowledgeable about plants for traditional cosmetic purposes were not predominantly female; although it was unintentional, more men were interviewed than women. Nearly 57% of respondents were males and used plants for body odor removal and tattooing. According to the interviews, male respondents prefer something that smells good and often use plants to eliminate body odor after working outdoors, i.e., forests and vegetable gardens. Both male and female respondents in this study were selected because they have traditional knowledge about cosmetic plants and their uses. Even though the Dayak Kayong people use domesticated resources (e.g., from yards, vegetable farms, and paddy fields), they also collect cosmetic plants from the forest resources (Figure 4). The use of wild resources has also been reported by Ndhlovu et al. (2019), who found that the Vhavenda women in Vhembe District Municipality, Limpopo, South Africa, collected cosmetic plants from the wild.

The most valuable plant family for cosmetic purposes is Zingiberaceae. The Dayak Kayong people use rhizomes of this plant family for facial whitening and smoothing. The use of Zingiberaceae for cosmetic purposes has also been reported in other countries and cultures around the world. Boonma et al. (2023) reported the traditional use of Zingiberaceae for cosmetic purposes in four Nakhon Nayok Province, Thailand districts. Local people have also used it in some parts of Oyo, Ogun, Ekiti, and Lagos States of Nigeria as Phyto cosmetics (Fred-Jaiyesimi et al. 2015). Zingiberaceae may be used for cosmetic purposes due to the content of essential oils. For instance, Genus *Curcuma* has various biological activities, such as antioxidant, anti-inflammatory, cytotoxic, and neuroprotective (Elhawary et al. 2024).

Important cosmetic plant families differ among ethnic groups across the globe. This study found that Zingiberaceae is the most common plant family for the Dayak Kayong people. However, other cultures in many countries have documented different important plant families for traditional cosmetic purposes. Marquesan traditional practitioners in the Northern and the Southern Marquesas

frequently used Apocynaceae, Euphorbiaceae, Lamiaceae, Poaceae, and Rutaceae (Jost et al. 2016). Gamage et al. (2021) reported Fabaceae as the most dominant plant family used by Ayurveda physicians and traditional practitioners in cosmetic treatments in Sri Lanka. These differences reflect that different cultures have different indigenous knowledge of using specific plants for cosmetic purposes (Aburjai and Natsheh 2003).

Langer (*Uvaria micrantha*) and *Segayang* (*Alphitonia philippinensis*) have the highest FC values (73.3%); this result indicates that the Dayak Kayong community widely uses both plants. After outdoor activities, the Dayak Kayong people often use the two species as soap, shampoo, and facial whitening; the roots of *Langer* and the leaves of *Segayang* can produce foam when it is crushed and mixed with water. Furthermore, the two plant species have never been reported in the literature for the Dayak tribe. This finding shed light on traditional knowledge of plants used as cosmetics and its cultural significance among the Dayak tribe in Borneo. The lowest FC value was reported in *Lengkuas* (*Alpinia galanga*), *Cempaka* (*Magnolia champaca*), and *Sindur* (*Sindora* sp.), with a value of 3.3% each, indicating that the three plants are rarely used for cosmetic purposes. Generally, these three plants are used more as spices, ornamental plants, and building materials for houses for the Dayak Kayong Community.

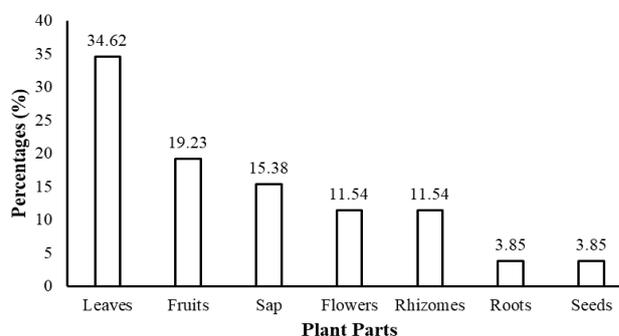


Figure 3. Plant parts used in traditional cosmetics by Dayak Kayong in Ketapang, West Kalimantan, Indonesia

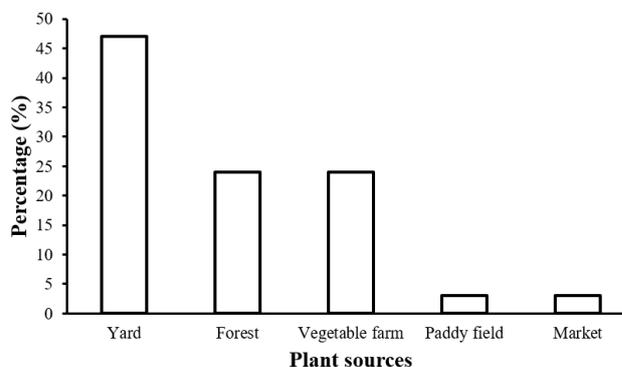


Figure 4. Plant sources for traditional cosmetics by Dayak Kayong in Ketapang, West Kalimantan, Indonesia

Table 3. Informant Consensus Factor (ICF) for six cosmetic categories

Cosmetics category	nur	Nt	ICF
Female hormone	4	1	1.000
Nail	34	4	0.909
Lips and mouth	20	3	0.895
Hair	59	10	0.845
Skin	85	17	0.810
Face	15	4	0.786

Note: nur: the number of use reports of a specific plant for the cosmetic category; nt: the total species that all respondents use for a particular cosmetic category

Table 4. Fidelity Levels (FL) of cosmetic plants reported by respondents

Plant species	Usage category	Np	N	FL (%)
<i>Aleurites moluccanus</i>	Hair	7	7	100.00
<i>Aloe vera</i>	Hair	2	2	100.00
<i>Alphitonia philippinensis</i>	Skin	21	22	95.45
<i>Alphitonia philippinensis</i>	Face	3	22	13.64
<i>Alphitonia philippinensis</i>	Hair	2	22	9.09
<i>Alpinia galangal</i>	Skin	1	1	100.00
<i>Aquilaria malaccensis</i>	Nail	2	2	100.00
<i>Archidendron bigeminum</i>	Hair	5	7	71.43
<i>Archidendron bigeminum</i>	Skin	2	7	28.57
<i>Areca catechu</i>	Lips and mouth	15	15	100.00
<i>Cananga odorata</i>	Skin	3	3	100.00
<i>Citrus aurantifolia</i>	Nail	6	8	75.00
<i>Citrus aurantifolia</i>	Hair	3	8	37.50
<i>Cocos nucifera</i>	Hair	15	16	93.75
<i>Cocos nucifera</i>	Lips and mouth	3	16	18.75
<i>Curcuma longa</i>	Skin	4	4	100.00
<i>Curcuma zanthorrhiza</i>	Skin	3	5	60.00
<i>Curcuma zanthorrhiza</i>	Face	2	5	40.00
<i>Cymbopogon nardus</i>	Skin	5	7	71.43
<i>Cymbopogon nardus</i>	Hair	2	7	28.57
<i>Dendrobium</i> sp.	Skin	4	4	100.00
<i>Eclipta alba</i>	Hair	4	4	100.00
<i>Gluta renghas</i>	Skin	3	3	100.00
<i>Impatiens balsamina</i>	Nail	15	15	100.00
<i>Lansium domesticum</i>	Skin	5	5	100.00
<i>Magnolia champaca</i>	Hair	1	1	100.00
<i>Oryza sativa</i>	Skin	7	13	53.85
<i>Oryza sativa</i>	Face	6	13	46.15
<i>Overrhoa bilimbi</i>	Nail	11	11	100.00
<i>Pandanus amaryllifolius</i>	Skin	6	7	85.71
<i>Pandanus amaryllifolius</i>	Hair	1	7	14.29
<i>Piper betle</i>	Skin	12	17	70.59
<i>Piper betle</i>	Female hormone	4	17	23.53
<i>Piper betle</i>	Lips and mouth	2	17	11.76
<i>Sindora</i> sp.	Skin	1	1	100.00
<i>Stenchaena polustris</i>	Face	3	4	75.00
<i>Stenchaena polustris</i>	Skin	1	4	25.00
<i>Uvaria micrantha</i>	Hair	14	22	63.64
<i>Uvaria micrantha</i>	Skin	11	22	50.00

The most common part of plants used for cosmetics is the leaves (35%). Other cultures in many countries, including Indonesia, have documented a similar pattern. Leaves are the most utilized plant part for cosmetic purposes by the Dayak Kanayatn Community of Landak District (Noviantina et al. 2018) and Ayurveda physicians and traditional practitioners in Sri Lanka (Gamage et al. 2021). The higher percentage of leaf usage is due to this part being easy to harvest and affordable (Dharmadasa et al. 2016).

This study reports ICF ranges from 0.786 to 1. The female hormone category documented the highest ICF. This result suggests that plant species reported for female hormones are culturally important by Dayak Kayong people. A low value of ICF was observed in the face category (0.786). The low value indicates that respondents in this study disagree on the taxa used in the face category. Several respondents who used the face-use category reported *Alphitonia philippinensis*, *Curcuma longa*, *Curcuma zanthorrhiza*, and *Oryza sativa*,

In this study, the FL of the 26 plant species ranged from 9.09% to 100%. Seven of 15 plant species with the highest FL belong to the skin category, while the other eight are scattered in the nail, mouth, and hair categories. The seven plant species in the skin category are *Alpinia galanga*, *Cananga odorata*, *Curcuma longa*, *Dendrobium* sp., *Gluta renghas*, *Lansium domesticum*, *Sindora* sp. The high percentage of FL among 15 plant species suggests that Dayak Kayong people use those species more frequently for cosmetic purposes, namely skin, nail, lips and mouth, and hair categories. Therefore, those 15 plant species need further research from the pharmacological perspective (Elansary et al. 2015).

The study documents the diversity of cosmetic plants and their uses by Dayak Kayong in Ketapang, West Kalimantan, Indonesia. Even though instant cosmetics are widely available in the market, the Dayak Kayong tribe still knows and actively uses plants as a primary material for daily cosmetics. As many as 26 plant species are utilized for cosmetic purposes under six categories: skin, face, hair, lips and mouth, female hormones, and nails; the most important plant family for cosmetic uses is Zingiberaceae. Leaves are the most common plant part used in traditional cosmetics. Moreover, 15 plants reportedly had the highest Fidelity Level, most under the skin category. These findings may offer candidate plants to be used in plant-derived cosmetics.

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REFERENCES

- Aburjai T, Natsheh FM. 2003. Plants used in cosmetics. *Phytother Res* 17 (9): 987-1000. DOI: 10.1002/ptr.1363.
- Agüero LCL, Stella AM. 2007. Dermatología estética a través del tiempo aesthetic dermatology through the time. *Rev Argent Dermatol* 88 (4): 227-233.
- Boonma T, Saensouk S, Saensouk P. 2023. Diversity and traditional utilization of the Zingiberaceae plants in Nakhon Nayok Province, central Thailand. *Diversity* 15 (8): 904. DOI: 10.3390/d15080904.
- Central Bureau of Statistics for Ketapang District. 2021. Kecamatan Nanga Tayap dalam angka 2020. Central Bureau of Statistics for Ketapang District, Ketapang. [Indonesian]
- Dharmadasa RM, Akalanka GC, Muthukumarana PRM, Wijesekara RGS. 2016. Ethnopharmacological survey on medicinal plants used in snakebite treatments in Western and Sabaragamuwa Provinces in Sri Lanka. *J Ethnopharmacol* 179: 110-127. DOI: 10.1016/j.jep.2015.12.041.
- Elansary HO, Mahmoud EA, Shokralla S, Yessoufou K. 2015. Diversity of plants, traditional knowledge, and practices in local cosmetics: A case study from Alexandria, Egypt. *Econ Bot* 69 (2): 114-126. DOI: 10.1007/s12231-015-9308-9.
- Elhawary EA, Moussa AY, Singab ANB. 2024. Genus *Curcuma*: Chemical and ethnopharmacological role in aging process. *BMC Complement Altern Med* 24 (1): 31. DOI: 10.1186/s12906-023-04317-w.
- Febriyanti RM, Slikkerveer LJ, Spaink HP, Lestari K, Saefullah K. 2022. Ethnomedicinal study of Ubar Kampung for diabetes mellitus: Indigenous knowledge, belief, and practice of medicinal, aromatic, and cosmetic (MAC) plants in Sunda region, West Java, Indonesia. *Intl J Appl Pharm* 14 (5): 148-153. DOI: 10.22159/ijap.2022.v14s5.31.
- Fongnzossie EF, Tize Z, Fogang Nde PJ, Nyangono Biyegue CF, Bouelet Ntsama IS, Dibong SD, Nkongmeneck BA. 2017. Ethnobotany and pharmacognostic perspective of plant species used as traditional cosmetics and cosmeceuticals among the Gbaya ethnic group in Eastern Cameroon. *S Afr J Bot* 112: 29-39. DOI: 10.1016/j.sajb.2017.05.013.
- Fred-Jaiyesimi A, Ajibesin KK, Tolulope O, Gbemisola O. 2015. Ethnobotanical studies of folklore phytocosmetics of South West Nigeria. *Pharm Biol* 53 (3): 313-318. DOI: 10.3109/13880209.2014.918155.
- Friedman J, Yaniv Z, Dafni A, Palewitch D. 1986. A preliminary classification of the healing potential of medicinal plants, based on a rational analysis of an ethnopharmacological field survey among Bedouins in the Negev Desert, Israel. *J Ethnopharmacol* 16 (2-3): 275-287. DOI: 10.1016/0378-8741(86)90094-2.
- Gamage DGND, Dharmadasa RM, Abeysinghe DC, Wijesekara RGS, Prathapasinghe GA, Someya T. 2021. Ethnopharmacological survey on medicinal plants used for cosmetic treatments in traditional and ayurveda systems of medicine in Sri Lanka. *Evidence-Based Complement Altern Med* 2021 (1): 5599654. DOI: 10.1155/2021/5599654.
- González-Minero FJ, Bravo-Díaz L. 2019. The use of plants in skin-care products, cosmetics and fragrances: Past and present. *Cosmetics* 5 (3): 50. DOI: 10.3390/cosmetics5030050.
- Jost X, Ansel JL, Lecellier G, Raharivelomanana P, Butaud JF. 2016. Ethnobotanical survey of cosmetic plants used in Marquesas islands (French Polynesia). *J Ethnobiol Ethnomed* 12 (55): 1-22. DOI: 10.1186/s13002-016-0128-5.
- Kumar R, Bharati KA. 2014. Ethnomedicines of Tharu tribes of Dudhwa National Park, India. *Ethnobot Res Appl* 12: 001-013.
- Lourith N, Kanlayavattanukul M. 2021. Introduction to cosmetic science and phytocosmetics. In: Lourith N, Tsim KW (eds.). *Phytocosmetics and cosmetic science*. CRC Press, Milton. DOI: 10.1201/9781003107385.
- Lovadi I, Budihandoko Y, Handayani NW, Setyaningsih D, Setiawan I. 2021. Ethnobotanical survey of medicinal plants in the Salako Dayak community around Raya Pasi Nature Reserve, West Kalimantan Province. *Bioscientist: Jurnal Ilmiah Biologi* 9 (1): 29-44. DOI: 10.33394/bjib.v9i1.3584. [Indonesian]
- Mahmoodally MF, Ramjuttun P. 2016. A quantitative ethnobotanical survey of phytocosmetics used in the tropical island of Mauritius. *J Ethnopharmacol* 193: 45-59. DOI: 10.1016/j.jep.2016.07.039.
- Mulu M, Ntelok ZRE, Sii P, Mulu H. 2020. Ethnobotanical knowledge and conservation practices of indigenous people of Mbeliling Forest Area, Indonesia. *Biodiversitas* 21 (5): 1861-1873. DOI: 10.13057/biodiv/d210512.
- Mwinga JL, Makhaga NS, Aremu AO, Otang-Mbeng W. 2019. Botanicals used for cosmetic purposes by Xhosa women in the eastern Cape, South Africa. *S Afr J Bot* 126: 4-10. DOI: 10.1016/j.sajb.2019.03.038.
- Nahdi MS, Kurniawan AP. 2019. The diversity and ethnobotanical study of medicinal plants in the southern slope of Mount Merapi, Yogyakarta, Indonesia. *Biodiversitas* 20 (8): 2279-2287. DOI: 10.13057/biodiv/d200824.
- Ndhlovu PT, Mooki O, Otang Mbeng W, Aremu AO. 2019. Plant species used for cosmetic and cosmeceutical purposes by the Vhavenda women in Vhembe District municipality, Limpopo, South Africa. *S Afr J Bot* 122: 422-431. DOI: 10.1016/j.sajb.2019.03.036.
- Noviantina E, Linda R, Wardoyo ERP. 2018. Ethnobotanical study of natural cosmetic plants of the Dayak Kanayatn tribe of Sebatih Village, Sengah Temila Sub-district, Landak District. *Protobiont* 7 (1): 61-68. DOI: 10.26418/protobiont.v7i1.23630.
- Othman SNN, Lum PT, Noor AAM, Mazlan NA, Yusri PZS, Ghazali NF, Idi HM, Azman S, Ismail M, Mani S, Sekar M. 2020. Ten commonly available medicinal plants in Malaysia used for cosmetic formulations-A review. *Intl J Pharm Sci Res* 11 (2): 1716-1728. DOI: 10.26452/IJRPS.V11I2.2073.
- Palinkas LA, Horwitz SM, Green CA, Wisdom JP, Duan N, Hoagwood K. 2015. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Adm Policy Ment Health Ment Health Serv Res* 42 (5): 533-544. DOI: 10.1007/s10488-013-0528-y.
- Pranskuniene Z, Grisiute R, Pranskunas A, Bernatoniene J. 2022. Ethnopharmacology for skin diseases and cosmetics during the Covid-19 pandemic in Lithuania. *Intl J Environ Res Public Health* 19 (7): 4054. DOI: 10.3390/ijerph19074054.
- Rahman IU, Afzal A, Iqbal Z, Ijaz F, Ali N, Shah M, Ullah S, Bussmann RW. 2019. Historical perspectives of ethnobotany. *Clin Dermatol* 37 (4): 382-388. DOI: 10.1016/j.clindermatol.2018.03.018.
- Shaheen H, Nazir J, Firdous SS, Khalid A. 2014. Cosmetic ethnobotany practiced by tribal women of Kashmir Himalayas. *Avicenna J Phytomed* 4 (4): 239-250. DOI: 10.22038/ajp.2014.2680.
- Susanti R, Zuhud EAM. 2019. Traditional ecological knowledge and biodiversity conservation: The medicinal plants of the Dayak Krayan people in Kayan Mentarang National Park, Indonesia. *Biodiversitas* 20 (9): 2764-2779. DOI: 10.13057/biodiv/d200943.
- Trotter RT, Logan MH. 1986. Informant consensus: A new approach for identifying potentially effective medicinal plants. In: Nina LE (eds.). *Plants in indigenous medicine and diet: Biobehavioural approaches*. Redgrave Publishers, Bedford Hills, New York. DOI: 10.4324/9781315060385-6.