



Ethnobotanical investigation of medicinal plants of serawai tribe in Bengkulu as a potential of biology teaching materials

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ABSTRACT

The Serawai tribe is one of the indigenous tribes who live in the Bengkulu Province. The Serawai people still use medicinal plants because of the high trust of the Serawai people towards traditional medicine. Local plants have enormous potential to be developed as a source of learning biology. Therefore, the purpose of this study was to obtain information about the species of plants used by the Serawai tribal community in Tanjung Aur Village, Bengkulu as medicinal plants that have the potential as learning resources in biology learning at the high school level. The ethnobotanical studies covered include plant species, plant families, organs used, processing methods, and use value indexes (UV) for each plant. The ethnobotany study in this research used a qualitative descriptive-analytical method. Based on the results of the ethnobotanical study, there are 44 species of medicinal plants and 23 families. The most widely used plant part is the leaf with a percentage of 52.27%. The highest Use Value is *Kaempferia galangal* L from the Zingebareceae family. Based on the curriculum, the results of the investigation of medicinal plants can be used as teaching materials in biodiversity and plant topics for the grade of 10th of high school. Teaching materials can form to be learning modules of medicinal plants.

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INTRODUCTION

The use of plants as medicine takes place thousands of years ago. In the mid-XVII century, a botanist named Jacobus Rontius (1592-1631) announce the efficacy of plants in his book *De Indiae Untriusquere Naturali et Medica*. Although only 60 species of plants are studied, this book is the basis of research on medicinal plants (Widjaja et al., 2014). Indonesia is a country that has a fairly large wealth of plants that can be developed, especially traditional medicines which are plant materials that have been used for generations based on experience (Wasito, 2011). Medicinal plants are all plant species located around settlements, cultivated or growing wild which are known and believed to have medicinal properties (Anggana 2011). A tribal group in terms of utilizing plants has specificity in accordance with the living conditions of the community (Suryadarma, 2010).

Indonesia is known as a source of raw materials for tropical medicines that can be used to treat various diseases. Local knowledge of plants as the medicine takes for thousands of years, but this condition is now starting to disappear. The study of ethnobotany is one of the sciences to explore and document society knowledge about medicinal plants (Ramadhani et al., 2020). Ethnobiological studies are a field of study used to explore the local wisdom of communities in sustainably managing biodiversity. Ethnobiological data related to the status of biodiversity in nature can be information for determining the conservation of these plants (Purwanto, 2020).

The potential of South Bengkulu's natural resources, especially medicinal plants, is widely used by the community to treat diseases. The Serawai tribe is one of the indigenous tribes who live in the Bengkulu Province. Most of the Serawai people live in the southern part of Bengkulu. Serawai tribal communities are widely spread to various regencies in Bengkulu such as South Bengkulu Regency, Seluma Regency, Kaur Regency, and Rejang Lebong Regency.

Serawai tribal people use natural medicinal plants as alternative medicine in curing various diseases. The Serawai people use medicinal plants a lot because of the high trust of the Serawai people towards traditional medicine. Then, access to health facilities in South Bengkulu Regency is still low, causing the Serawai people to prefer to use traditional medicine. Based on previous research evidence conducted by Fadila et al. (2020), the Serawai tribe in Seluma Regency uses 67 medicinal plant species consisting of 62 genera and 32 families. Medicinal plants are also used by other tribes, such as the To Manui tribe in Central Sulawesi Province, Indonesia. Research conducted by Rahmawati et al., (2020) reported that this tribe uses 89 species of medicinal plants distributed in 50 families and 80 genera have been documented. Bengkulu also has a Pekal tribal community in North Bengkulu that utilizes 36 medicinal plants belonging to 24 families (Sitorus et al, 2014). These various studies show the medicinal plants of various tribes in Indonesia.

Medicinal plants are still an alternative by many traditional communities in the treatment process. Local knowledge of medicinal plants by traditional communities is very important. But at this time, medicinal plants have begun to be replaced. In line with the development of the market economy, the sale of modern medicines from the city to the village is very uncontrolled. Another thing that is in the spotlight is also due to the reduced interest of the younger generation in exploring and preserving local knowledge about these traditional medicinal plants and not being fluent in the local language. This case causes the dissemination of local knowledge about traditional medicinal plants to be not conveyed to many people so that over time it becomes lost. Therefore, learning traditional medicinal plants is very important if it is implemented in the field of education. Medicinal plant-based learning can preserve local wisdom.

However, the application of local wisdom-based learning is also not maximal in schools. Learning textbooks generally have learning materials and activities that are not following the conditions of students, teachers, and the school environment. Most students consider learning sources necessary to integrate local potential and wisdom in biology learning. Therefore, the educators must develop teaching materials and learning media based on potential and local wisdom (Jayanti et al., 2017). Local plants have enormous potential to be developed as a source of learning biology. Various materials can use local plants, for example, materials on biodiversity, biological conservation, plant concepts, classification, and the use of living things. Educators are expected to be more creative and innovative in compiling teaching and learning resources by paying attention to local advantages to improve scientific literacy and the survival of students' future lives (Mumpuni et al., 2014). Primack (2013) explains that textbooks written based on local conditions can contribute to high biodiversity conservation. One way to introduce biodiversity conservation is to use local content and language. Research by Ramadoss & Moli (2011) in India also states that the application of local biodiversity learning and conservation for sustainable development has a potential long-term impact on students' attitudes towards local biodiversity and shapes attitudes for the future. Therefore, the purpose of this study is to obtain information about the species of plants used by the people of Tanjung Aur Village, South Bengkulu Regency as medicinal plants that have the potential as learning resources in biology learning at the high school level. This study discusses the existence of the traditional wisdom of the Serawai tribe in the use of medicinal plants to treat various diseases. This study requires identification of plant species, families, parts used, and methods of processing medicinal plants.

METHODS

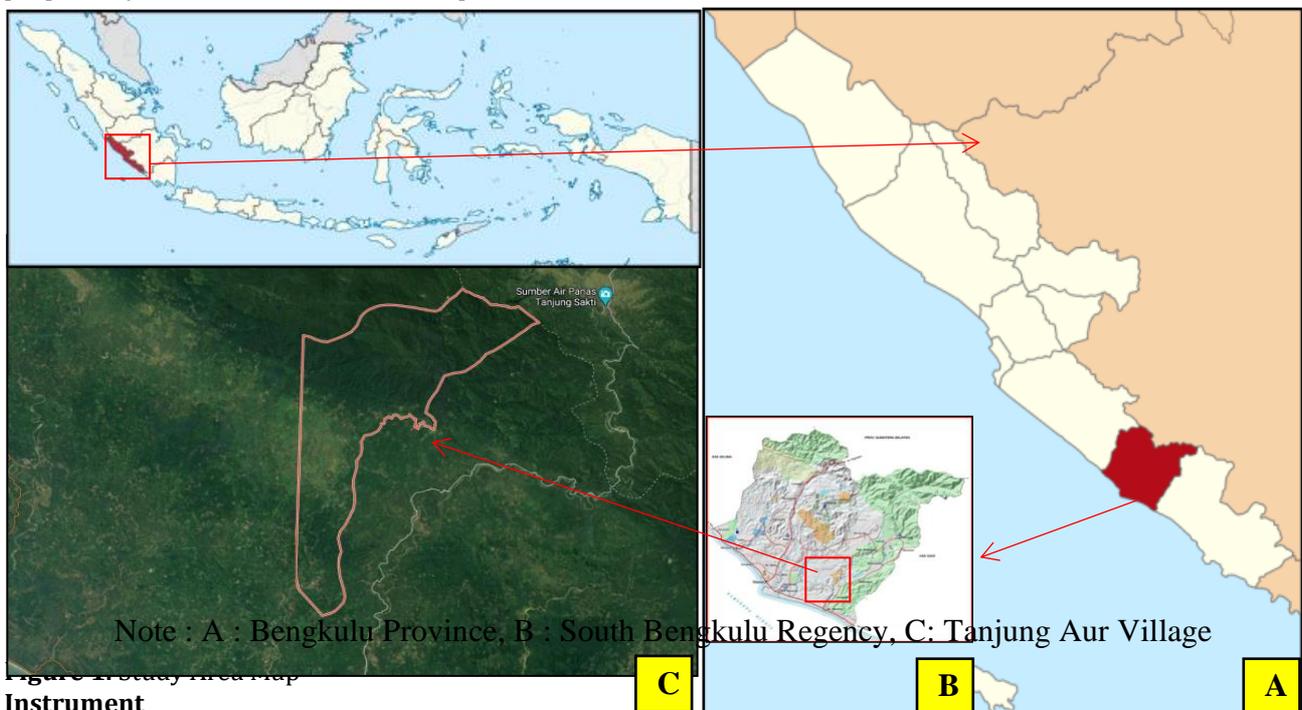
Research Design

The ethnobotanical study in this research used qualitative descriptive analytical methods. According to

Sugiyono (2009), this method focuses on the problems as they are when the research is carried out, the research results are then processed and analyzed to conclude. The sample selection technique is the purposive sampling technique. Sampling with consideration is a sampling technique using certain considerations after knowing the characteristics of the population (Subali, 2017). Data collection techniques are carrying out by direct observation of population activities in the research area. In collecting data, semi-structured interviews are also carrying out with informants of residents (Iskandar, 2018). In this case, only certain people master and understand medicinal plants. Informants in this study are usually village heads, community leaders, traditional birth attendants, and residents who know and use these medicinal plants. The validity of the data for this study was based on four criteria, namely the credibility test, transferability test, dependence test, and confirmability test. The credibility test was carried out with several techniques, namely increasing persistence in research, triangulation, discussions with colleagues, using appropriate references, and negative case analysis.

Population and Sampless

The location of this research was conducted in Tanjung Aur Village, South Bengkulu Regency, Bengkulu Province. South Bengkulu Regency is astronomically located at 40-10⁰ North Latitude and 40-34⁰ South Latitude and between 102⁰-103⁰ East Longitude. The village of Tanjung Aur was chosen as the object of this research because this village had many informants who understood the medicinal plants of the Serawai tribe. Based on data from the Tanjung Aur Village government, 225 villagers are the Serawai tribe. According to data from the Central Statistics Agency for Bengkulu Province in 2020, the percentage of the Serawai tribe in Bengkulu is 18,9% of the total Bengkulu community of 2,010,670 people. Out of 225 indigenous people in Tanjung Aur village, South Bengkulu Regency, we choose 30 qualified informants who understand the medicinal plants of the Serawai tribe purposively as our informants. The sample consisted of 18 men and 12 women.



Instrument

This study conducts semi-structured interviews with informants of residents around Tanjung Aur Village. This interview is conducted to explore information related to medicinal plants of the Serawai tribe, such as how to use them, local names of plants, organs used, diseases treated, and frequency of use of these medicinal plants. The interview instrument of this research is described in Table 1, while the tally sheet of the data is as written in Table 2.

Table 1.

Interview instrument

Number	Question item
1.	When did you start practicing as a traditional healer?
2.	What do you know about traditional medicinal plants?
3.	Does the Serawai tribe have traditional medicinal plants?
4.	How did you find out about the disease?
5.	Do you use plants in medicine?
6.	How many species of traditional medicinal plants do you know?
7.	What species of plants are used as medicine?
8.	How to process each of these medicinal plants?

Number	Question item
9.	Where did you get the medicine plants?
10.	Do you consume or use medicinal plants every day?
11.	How do you measure a patient's drug dose?
12.	Is the dose of the drug in each disease the same?
13.	How many days is the drug usually used?
14.	When did the patient stop taking the medication?

Table 2.

Table of interview results notes

Number	Plant Local Name	Plant Organs Used	Treating Method	Type of disease being treated
1.
2.
3.

Procedure

Collecting data on medicinal plants in the Serawai tribal community in Tanjung Aur village through 5 stages. The first stage is observation, collecting information from the people of Tanjung Aur village. Information includes, for example, people knowing the use of medicinal plants, farmers of medicinal plants, and people who often use medicinal plants. The second stage is an interview to obtain information from informants. The third stage is documentation of several plants based on information from informants. The fourth stage is the identification of medicinal plants regarding their taxonomy using libraries and references. The tools used to identify plants are a list of Indonesian medicinal plants for identification of medicinal plant species, ropes, tally sheets, cameras for documenting research objects, stationery to record data obtained in the field, a list of questions or questionnaires for selected respondents, materials for making herbarium such as 70% alcohol, insulation, scissors, labels, newsprint. All plants are collected based on the plant species informed by the informants. After that, all collections are preserved in the field using alcohol through the herbarium technique. Then, all specimens are photographed, classified, and identified using a reference book based on each morphology. The fifth stage is analyzing the data descriptively qualitatively. This stage is also calculating the use-value index for each medicinal plant. The illustration of the stages of this research procedure is as [Figure 2](#).

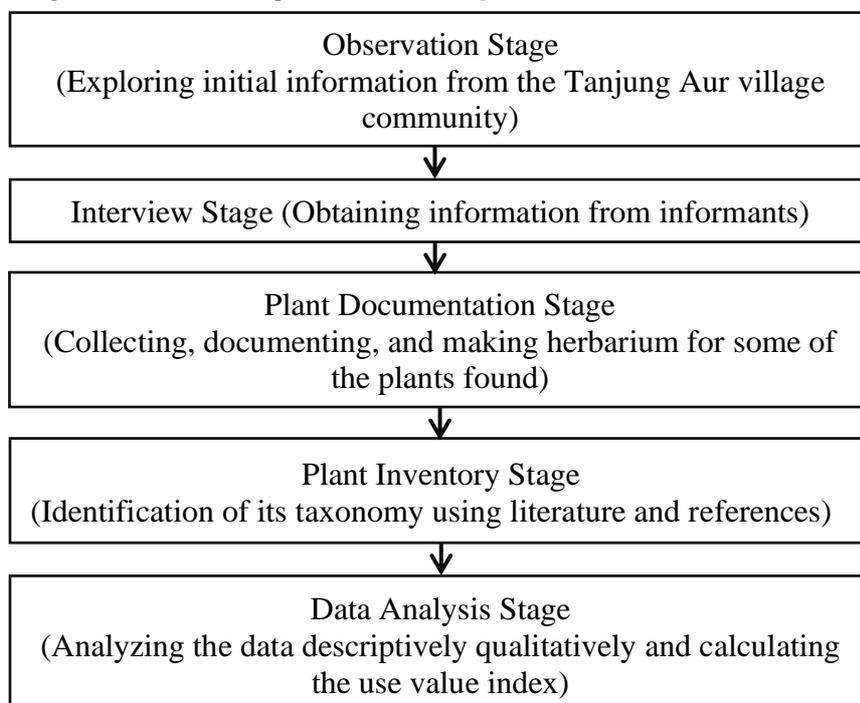


Figure 2. The stages of the research carried out.

Data Analysis Techniques

The data analysis is qualitative through a literature study on medicinal plants known by the informants. After that, a cross-check is carried out between the information obtained and the results of direct observations in the field. This stage also summarizes data, synthesizes data, and narrates the results systematically with descriptive analysis and evaluative. After that, the data is quantified by determining the Use-Value (UV) for each

medicinal plant obtained. Use-Value (UV) describes the use-value of plants used as medicine by the Serawai tribal community in Tanjung Aur Village, South Bengkulu Regency, Bengkulu Province.

$$UV = U_i/n$$

U_i : The number of informants who use one species of medicinal plant.

n : The total number of informants interviewed

(Musa et al., 2011).

RESULTS AND DISCUSSION

Ethnobotanical investigation of Medicinal Plants

Based on the results of interviews with informants, it is known that there are 44 species of medicinal plants, from 23 families. The species of plants that are mostly used as medicine by the people of Tanjung Aur Village are from the *Zingiberaceae*. The community obtains medicinal plants from several sources such as from their yards, rice fields, community gardens, and forests near the village. The results of the investigation of this medicinal plant can be seen in Table 3. The 44 species of medicinal plants used by all informants spread over 23 families and various vernacular names commonly used by the Serawais. Use Values (UV) among all species varied from 0.008 to 0.050 with Kencur (*Kaempferia galangal* L) from the *Zingiberaceae* showing the highest value (UV = 0.050; Table 3). Of the 44 species of medicinal plants used by the Serawais, the highest Use Value is *Kaempferia galangal* L from the *Zingiberaceae* family. Species with the highest use value index are important for local communities and important to be one of the considerations in local biological conservation strategies (Rahmawati et al., 2020). Based on this research, *Kaempferia galanga* L has a function to treat uric acid. The chemical content of the *Kaempferia galanga* L are ethyl cinnamate, ethyl p-methoxycinnamate, p-methoxystyrene, karen, borneol, and paraffin (Setyawan et al., 2012). The medicinal plants use by the Serawais can treat various diseases (Table 3) and categorized in families (Figure 3).

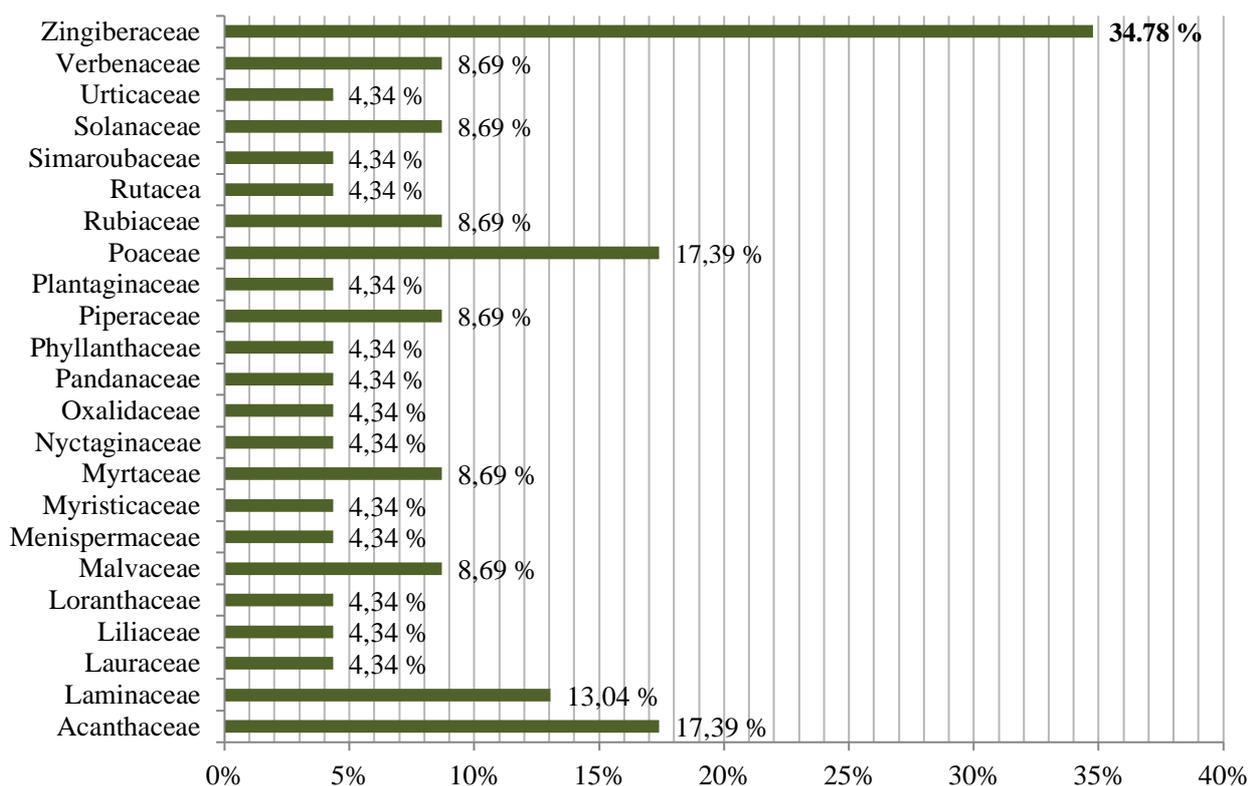


Figure 3. Various of families of medicinal plants of the Serawais.

Table 3.

List of medicinal plants used by the Serawai tribal community in Tanjung Aur Village, South Bengkulu Regency

No.	Family	Local Name	Scientific Name	Parts used	Processing Method	Treated disease	Use Value
1.	<i>Acanthaceae</i>	Kiji beling	<i>Strobilanthes crispa</i> (L.) Blume	Leaf	Boil the leaves of <i>Strobilanthes crispa</i> (L.) Blume. Mixed with rock sugar. Then, drink the water.	Urinary Stones, Back Pain	0.017
2.	<i>Acanthaceae</i>	Puding Abang	<i>Graptophyllum pictum</i> (L.) Griff.	Leaf	Boil the leaves of <i>Graptophyllum pictum</i> (L.) Griff. Then, drink the water. Heat the leaves using fire. Then, stick the leaves to the boil area.	Bleeding Carbuncle	0.025 0.017
3.	<i>Acanthaceae</i>	Gandagusau	<i>Justicia gendarussa</i> Burm.f	Leaf	Heat the leaves using fire. Then, stick the leaves to the waist area.	Backache	0.025
4.	<i>Acanthaceae</i>	Penyangan	<i>Hemigraphis alternata</i> Burm.f.	Leaf	Cut some leaves. Then, mixed with rice and attached to the waist.	Diarrhea	0.017
5.	<i>Laminaceae</i>	Daun Bilam	<i>Pogostemon cablin</i> (Blanco) Benth.	Leaf	Squeeze the leaves until slightly crushed. Then, mixed with cold rice. Then, stick it on the stomach.	Heat inside for adults	0.033
6.	<i>Laminaceae</i>	Kumis Kuciang	<i>Orthosiphon stamineus</i> Benth.	Leaf	Boil the leaves of <i>Orthosiphon stamineus</i> Benth and <i>Strobilanthes crispa</i> (L.) Blume. Then, drink the water.	Back pain	0.025
7.	<i>Laminaceae</i>	Bungau Abang	<i>Coleus paniculatus</i> Benth.	Leaf	Washed leaves. Then, squeeze the leaves using cooking water. Then, drink the water.	Stomach ulcer	0.025
8.	<i>Lauraceae</i>	Kayu Manis	<i>Cinnamomum burmanni</i> (Nees & T.Nees) Blume	Bark	Scrape the bark of <i>Cinnamomum burmanni</i> (Nees & T.Nees) Blume. Then, put oil and eat in moderation. Then, stick it on the head.	Headache	0.033
9.	<i>Lilidaceae</i>	Lidah Buayau	<i>Aloe vera</i> (L.) Burm.f.	Leaf	Remove the thorns on the aloe vera leaf and wash it thoroughly. Then, cut into pieces. Then boil it in 3 cups of water until it becomes 1.5 cups of water. Then, drink.	Diabetes	0.017
10.	<i>Loranthaceae</i>	Benalu	<i>Loranthus</i> sp	Leaf	Grind the dried leaves of <i>Loranthus</i> sp and <i>Styrax sumatrana</i> . Then, stick the leaves to the boil area.	Carbuncle	0.025
11.	<i>Malvaceae</i>	Sepulut	<i>Urena lobata</i> L	Leaf	Wash the leaves. Then, squeeze the leaves and add water. Then, filtered the leaf water and add brown sugar. Then, drink the water.	Intestinal Infection	0.017
12.	<i>Malvaceae</i>	Bungau Spatu	<i>Hibiscus rosa-sinensis</i> L	Leaf	Squeeze the leaves using water and drink the water.	Diabetes	0.025
13.	<i>Menispermaceae</i>	Rantauwali	<i>Tinospora crispa</i> (L.) Hook.f. & Thomson	Stem	Boil the stems and drink the water	Malaria Fever	0.017
14.	<i>Myristicaceae</i>	Pala	<i>Myristica fragrans</i> Houltt	Fruit	Break the fruit and take the contents. Then, put it in the water. Then, drink the water	Insomnia	0.033

No.	Family	Local Name	Scientific Name	Parts used	Processing Method	Treated disease	Use Value
15.	<i>Myrtaceae</i>	Jambu Batu	<i>Psidium guajava</i> L	Leaf	Wash the leaves. Then chew the leaves and add salt.	Bloody vomit	0.017
16.	<i>Myrtaceae</i>	Daun dalam	<i>Eugenia polyantha</i> Phil	Leaf	Boil 20 leaves of <i>Eugenia polyantha</i> Phil and 20 leaves of <i>Piper betle</i> L. Then, drink the water. Boil leaves of <i>Eugenia polyantha</i> Phil and leaves of <i>Averrhoa bilimbi</i> L. Then, drink the water.	Defecate blood and nosebleed High blood pressure	0.025
17.	<i>Nyctaginaceae</i>	Bungau Pukul Empat	<i>Mirabilis jalapa</i> L	Tuber	Grate the tuber and stick it on the head	Malaria Fever	0.017
18.	<i>Oxalidaceae</i>	Belimbing besi	<i>Averrhoa bilimbi</i> L	Leaf	Boil the leaves and drink the water.	High blood pressure	0.017
19.	<i>Pandanaceae</i>	Pandan Dughi	<i>Pandanus tectorius</i> Parkinson ex Du Roi	Leaf	Boil the leaves and drink the water.	Pain during menstruation	0.025
20.	<i>Phyllanthaceae</i>	Meniran	<i>Phyllanthus niruri</i> L	Root, stem, leaf and flower.	Boil all the parts and wash them. Then, boil using water. Then, drink the water.	Dysentery	0.033
21.	<i>Piperaceae</i>	Ambagh Nasi	<i>Peperomia pellucida</i> (L.) Kunth	Leaf	Squeeze the leaves. Mixed with rice. Then, stick them on the stomach.	Heat inside for baby	0.017
22.	<i>Piperaceae</i>	Sighih	<i>Piper betle</i> L	Leaf	Heat the leaves with fire. Then, apply it to the wound area.	Reduces pain from wounds	0.025
23.	<i>Plantaginaceae</i>	Ambang Ughat	<i>Plantago major</i> L	Leaf	Heat the leaves with fire. Then, apply it to the wound area	Wound medicine	0.008
24.	<i>Poaceae</i>	Seghai	<i>Cymbopogon citratus</i> (DC.) Stapf	Stem	Bake the stems and add the Kencur (<i>Kaempferia galanga</i> L). Then, grease it to uric acid area Mix the stems of <i>Cymbopogon citratus</i> (DC.) Stapf with the oil. Then, heat and stick to the chest. By saying the special mantra.	Uric acid Asphyxiate	0.033
25.	<i>Poaceae</i>	Lalang	<i>Imperata cylindrica</i> (L.) P.Beauv.	Root	Boil the root and drink the water.	Fever	0.017
26.	<i>Poaceae</i>	Padi	<i>Oryza sativa</i> L	Stem	Boil 3 stalks of rice. Then, drink the water.	Pain in the breast	0.025
27.	<i>Poaceae</i>	Tebu hitam	<i>Saccharum officinarum</i> L	Stem and root	Boil the root and stem. Then, drink the water.	Treating a sudden pounding heart	0.025
28.	<i>Rubiaceae</i>	Cepiring	<i>Gardenia jasminoides</i> J.Ellis	Leaf	Squeeze the leaves and drink the extract from the leaves.	Fever	0.017
29.	<i>Rubiaceae</i>	Mengkudu	<i>Morinda citrifolia</i> L	Fruit	Drink the extract of the leaves and mix it with a tablespoon of honey.	High blood pressure	0.033
30.	<i>Rutacea</i>	Limau Nipis	<i>Citrus × aurantiifolia</i> (Christm.) Swingle	Fruit	Mix a tablespoon of honey with half a tablespoon of lime juice. Stir and drink.	Cough with phlegm	0.017

No.	Family	Local Name	Scientific Name	Parts used	Processing Method	Treated disease	Use Value
31.	<i>Simarubaceae</i>	Pedu Beghuang	<i>Brucea javanica</i> (L.) Merr	Fruit	Grind the fruit and add hot water. Then drink the water.	Bloody vomit and diabetes	0.025
32.	<i>Solanaceae</i>	Teghang	<i>Solanum torvum</i> Sw	Fruit	Eat the fruit	Myopic	0.017
33.	<i>Solanaceae</i>	Cung Kedirau	<i>Solanum lycopersicum</i> L	Leaf	Mix <i>Solanum lycopersicum</i> L leaves and <i>Graptophyllum pictum</i> leaves. Then, chew them.	Chest pain	0.008
34.	<i>Urticaceae</i>	Jelatang Kebau	<i>Laportea interrupta</i> (L.) Chew	Leaf	Mix the leaves and oil. Paste them on the chest.	Chest pain	0.017
35.	<i>Verbenaceae</i>	Ikuk Tikus	<i>Stachytarpheta jamaicensis</i> (L.) Vahl	Root	Wash the roots thoroughly. Then boiled and drink.	Uric acid and rheumatism	0.025
36.	<i>Verbenaceae</i>	Bunsai	<i>Duranta erecta</i> L	Leaf	Cut the leaves and mix with lime. Heat with fire. Stick them on the chest.	Malaria Fever	0.033
37.	<i>Zingebareceae</i>	Cekugh	<i>Kaempferia galanga</i> L	Rhizome	Roasted rhizomes with lemongrass. Then, apply to the uric acid area.	Uric acid	0.050
38.	<i>Zingebareceae</i>	Kunyit	<i>Curcuma longa</i> L	Rhizome	Slice the rhizomes. Then, boil the rhizomes with glutinous rice and lime in the bamboo. Then, put them in the eye. Grate turmeric tubers. Then, squeeze and drink the water.	Sore eyes Stomach ulcer	0.025
39.	<i>Zingebareceae</i>	Kunyit Putih	<i>Curcuma zedoaria</i> (Christm.) Roscoe	Rhizome	Boil the rhizomes and drink the water.	Asthma	0.017
40.	<i>Zingebareceae</i>	Temulawak	<i>Curcuma zanthorrhiza</i> Roxb.	Rhizome	Boil the rhizomes and drink the water.	Liver Disease	0.008
41.	<i>Zingebareceae</i>	Temu hitam	<i>Curcuma aeruginosa</i> Roxb	Rhizome	Boil the rhizomes and drink the water.	Dysentery	0.025
42.	<i>Zingebareceae</i>	Pegho Abang	<i>Elettaria cardamomum</i> (L.) Maton	Leaf	Heat the leaves with fire and pound with water. Apply to the body.	Itchy rash	0.017
43.	<i>Zingebareceae</i>	Banglai	<i>Zingiber purpureum</i> Roscoe	Rhizome	Grate the rhizome and apply them to the affected area.	Sore	0.025
44.	<i>Zingebareceae</i>	Jahe Abang	<i>Zingiber officinale</i> Roscoe	Rhizome	Mix the rhizomes and brown sugar. Drink the water.	Catching a Cold	0.017

Based on information from informants, the Zingiberaceae family is the most widely used, because Zingiberaceae is not only used to treat diseases but it is also used for cooking spices, for example, Turmeric (*Curcuma longa* L) and Cardamom (*Elettaria cardamomum* (L.) Maton) as a kitchen spice or flavoring in food. Aside from being a cooking spice, the Zingiberaceae family is effectively used to cure disease. Saparinto and Susiana (2015) state that *Curcuma longa* L and *Elettaria cardamomum* (L.) Maton plants have substances that contain essential oils, starch, tannins, which are good for the body in fighting various diseases. This ethnobotanical investigation also groups of the plant-based on organs used by the Serawai tribe as medicinal plants, which can be seen in Figure 4 :

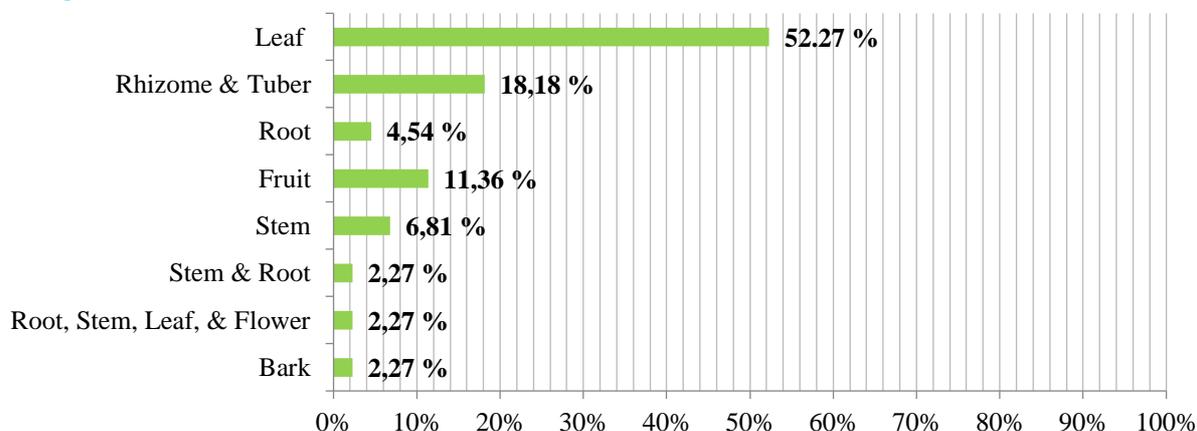


Figure 4. Various organs of medicinal plants used by the Serawais.

The plant parts used as medicine are the leaves, tubers, roots, fruits, and stems. The most widely used plant parts are the leaves with a percentage of 52,27%, while the percentage for other parts are less than 20% (Figure 4). As the percentage of use in tuber organs or rhizomes is 18,18%. The percentage of use of root organs is 4,54%. The percentage of use of fruit organs is 11,36%. The percentage of use of stem organs is 6,81%. The results of this study are similar to the data from the ethnobotanical study in Ranggawulung, West Java, Indonesia (Putri et al., 2016), but differ from the results of the ethnobotanical research on the Taming tribal community in Aceh, Indonesia, which predominantly uses fruit as medicine (Navia et al., 2020). Leaves are organs that provide storage of secondary metabolites and act as centers of bioorganic metabolism (Bouyahya et al., 2017). Leaves also have a role important in photosynthesis (Ghorbani, 2005). Therefore, secondary bioactive compounds also function to defend themselves from herbivores (Bhattarai et al., 2006).

Many people use leaves as medicinal ingredients because the leaves contain secondary metabolites such as alkaloids, flavonoids, polyphenols, saponins, and other compounds used for medicine. As in the leaves of *Plantago major* L contains plantain, aucubin, ursolic, acid, beta-sitosterol, n-hentriacontane, and plantaglucide compounds consisting of methyl d-galacturonate, D-3 galactose, L-arabinose, L-rhamnose, vitamins B1, C, A, potassium, and anti-inflammatory (anti-inflammatory) (Saparinto and Susiana, 2016).

This study found that the processing of the medicinal plants vary, such as boiled, drank the water, eaten directly, kneaded, ground, and burned. The processing method most often used by the Serawai people is by grinding and slicing the plant organs. This method of processing is used to treat internal and external diseases by means of affixing. Examples of plants that use milled processing methods are *Coleus paniculatus* Benth, *Hemigraphis alternata* Burm.f, *Urena lobate* L, *Hibiscus rosa-sinensis* L, and *Mirabilis jalapa* L. However, there is also processing by kneading and chopping that uses more than one type of plants, such as *Graptophyllum pictum* (L.) Griff and *Solanum lycopersicum* L which are ground and pasted to treat chest pain. Medicinal plants are also processed by taking their extracts directly from plants and by eating them directly, such as *Solanum torvum* Sw, *Cinnamomum burmanni* (Nees & T.Nees) Blume, *Myristica fragrans* Houtt, *Psidium guajava* L, *Citrus × aurantiifolia* (Christm.) Swingle, and *Piper crocatum* Ruiz & Pav plants.

There are various ways of processing so that the compounds contained in plant organs are more effective and active in curing diseases. Wikanda (2014) stated that the use of herbal medicines does not use chemical compounds, herbal medicines also undergo absorption processes in the digestive tract, circulation, and excretion. Therefore, appropriate doses are needed to minimize the side effects of using medicinal plants.

Malaria is one of the diseases treated using medicinal plants of the Serawais. Based on research, it is shown that malaria is treated by several species of medicinal plants such as *Tinospora crispa*, *Mirabilis jalapa*, and *Duranta erecta* L. This is also based on information by residents of Tanjung Aur Village that there are still many people who suffer from malaria. According to Musdalifa et al. (2014) that a chemical compound in *Tinospora crispa* has been identified, namely tinocrisposide. Stem extract of *Tinospora crispa* contains tinocrisposide compound which is proven to be able to suppress the development of *Plasmodium berghei* bacteria in the blood of mice and prolong the life of infected mice.

Chest pain is one of the diseases treated by medicinal plants of the Serawai tribe. The species of medicinal plants that can treat chest pain are *Solanum lycopersicum* L, *Laportea interrupta* L, and *Cymbopogon citratus* (DC.) Stapf. The leaves and stems of *Solanum lycopersicum* L contain alkaloids and saponins (Santoso et al., 2018). Meanwhile, the leaves of *Laportea interrupta* L contain secondary metabolites of alkaloids, tannins, terpenoids and saponins (Safitri et al., 2018). *Cymbopogon citratus* (DC.) Stapf has secondary metabolites, namely flavonoids, steroids, phenolics and terpenoids (Panggabean et al., 2013).

Based on the results of the study, it can be concluded that there are 44 species of medicinal plants from 23 families that can treat various diseases by the Serawai tribal community, South Bengkulu Regency. The processing method of these plants in various ways, such as boiled, drank the water, eaten directly, kneaded, ground, and burned.

Potential Study as Teaching Material

Teaching materials are a set of materials that contain learning materials/contents to achieve learning objectives (Sungkono et al., 2003). According to Abdul (2009), teaching materials are all forms of materials used to assist teachers in carrying out teaching and learning activities. Teaching materials are part of learning resources. Teaching materials are materials that help teachers, students, or instructors in carrying out learning activities. Abdul (2009) states that teaching materials are grouped into four, as follows:

- a) Printed teaching materials such as handouts, books, modules, student worksheets, brochures, leaflets, wall charts, photos/pictures, models/markets.
- b) Hearing teaching materials (audio) such as cassettes, radios, LPs, and audio compact disks.
- c) Hearing teaching materials (audiovisual) such as video compact disks, films.
- d) Interactive teaching materials such as interactive compact disks.

Biology is the study of objects and problems concerning life. The phenomenon of life and living things is the target studied in Biology. As stated by Suratsih (2010), biology is a science that studies objects and problems of natural phenomena. Biology as a science has its characteristics compared to other sciences.

Biology is one of the sciences that studies living things and their lives from various aspects of problems and levels of the organization. Biological scientific products are in the form of a collection of facts and concepts as a result of the biological scientific process (Sudjoko, 2001). Local potential describes the characteristics of an area that is used for the benefit of the community, in the fields of economy, culture, information technology, and ecology (Lase et al., 2016).

Ethnobotany can be used as a tool to document public knowledge about the use of medicinal plants in everyday life (Suryadharma, 2008). One effective way of introducing medicinal plants that exist in the environment where students live through environment-based learning is by developing teaching materials from the potential of the environment around students.

Local potential can be linked to local realities and the local environment. Local reality is all conditions from real life and phenomena in the environment around students which are arranged systematically. Local realities include physical, social, understanding, beliefs, and local insights of students (Kahar & Fadhilah, 2018). Therefore, this diversity of medicinal plant species can be used as teaching materials that are relevant to learning biology in schools. Zukmadini et al. (2018) stated that various species of medicinal plants of the Serawai tribe can be developed into a Pocketbook on the biodiversity of traditional medicinal plant species. So the material on the diversity of medicinal plant species of the Serawai tribe can be implemented in high school biology learning on biodiversity concept.

Previous research by Handini et al. (2018), also stated that the potential for the diversity of medicinal plant species of the Serawai tribe can be developed into a handout in biology learning material in biodiversity. Based on the score from the validation by the experts and the students' readability test, the biology handout developed is very valid and good for being a teacher's teaching material. In addition to the material on biodiversity, the potential of medicinal plants can also be implemented in the concept of biological plantae for grade of 10th of high school. The diversity of medicinal plant species can be developed into an encyclopedia containing the morphological characteristics of these medicinal plants. Then students can group plants into the appropriate division. The encyclopedia also contains the efficacy of these plants to find out the function of these medicinal plants in life. Basic Competencies related to the material of various species of medicinal plants of the Serawais based on the Regulation of the Minister of Education and Culture Number of 37 on 2018 can be seen in **Table 4**:

Table 4.

Basic Competencies related to various species of medicinal plants of the Serawais.

Basic Competence (Knowledge)	Basic Competencies (Psychomotor)
Biodiversity Materials of Class 10 High School	
3.2 Analyzing various levels of biodiversity in Indonesia and their threats and conservation	4.2 Presenting the results of observations of various levels of biodiversity in Indonesia and proposed conservation efforts

Basic Competence (Knowledge)		Basic Competencies (Psychomotor)	
Biodiversity Materials of Class 10 High School			
3.3	Explain the principles of classifying living things in five kingdoms	4.3	Compile a cladogram based on the principles of classification of living things
Plantae Materials of Class 10 High School			
3.8	Grouping plants into divisions based on general characteristics, and relating their roles in life	4.8	Presenting reports on the results of observations and phenetic and phylogenetic analyzes of plants and their role in life
The role of this ethnobotanical research data :		As a source of material presented in the learning module in studying the diversity of medicinal plant species of the Serawai tribe. Data on medicinal plant species of the Serawais can be presented in the form of a matrix or table in the learning module as an identification guide.	

Biodiversity is material that discusses various species of flora and fauna in terms of the level of diversity ranging from genes, species, and populations. Biodiversity can also be discussed in terms of community use, because biodiversity can be useful as a source of food, clothing, shelter, medicine, cosmetics, and cultural values. Therefore, the substance of the study of ethnobotany on various species of medicinal plants of the Serawais can be implemented on the concept of Biodiversity of biology learning for the grade of 10th of high school grade of high school. The implementation can be in the form of handout teaching materials or learning modules on biodiversity of medicinal plant species based on the local wisdom of Serawais.

This research data serves to present material on various species of medicinal plants of the Serawais and their classification in the learning module. Students will be oriented to actively participate in searching for scientific names of medicinal plants and looking for supporting literature on the efficacy of medicinal plants. All information can be adjusted and supplemented with scientific data. Medicinal plants can inspire the development of teaching materials in the form of practicum modules. In addition, students can be oriented to participate in learning by using learning models in nature or school gardens. In the end, the context of medicinal plants can make Biology learning based on local knowledge.

To support the achievement of competence in understanding the concept of Biodiversity, the module can be designed in the form of two learning activities. The first activity discusses 1) The Definition of biodiversity, 2) The level of biodiversity, 3) The Benefits of biodiversity, and 4) The Diversity of medicinal plant species based on the local wisdom of the Serawais. Students can carry out practicum on "Identification of the Diversity of Medicinal Plant Species of the Serawais". In this practicum, students will observe the morphology of each species of medicinal plant and understand the taxonomy of each species.

Meanwhile, the second learning activity, it contains learning materials regarding 1) Threats and factors that can affect biodiversity, 2) Efforts to conserve and conserve biodiversity, 3) Family medicinal plant gardens. In the second learning activity, there will be a practical implementation of "Making a Living Pharmacy from Medicinal Plants of the Serawais". In this practicum, students will create a family medicinal plant garden or a living pharmacy using the seeds of the Serawais' medicinal plants. This practicum aims to enable students to apply biodiversity conservation of medicinal plant species based on the local wisdom of the Serawais.

The relevance of local potential with the real world encourages the formation of practical applications in contextual biology learning. Therefore, learning biology must contain knowledge and attitudes about the conservation of local potential to motivate students to learn and develop skills according to local potential. The data of medicinal plants used by the Serawais plays a role in developing the potential of local resources and in learning about how to use and conserve them.

CONCLUSION

Based on the results of the ethnobotanical study of medicinal plants in the Serawai tribal community in Tanjung Aur Village, there are 44 species of medicinal plants and 23 families. The most widely used plant species as medicine by the Serawai tribal community in Tanjung Aur Village are plants from the Zingiberaceae family. The plant parts used as medicine are the leaves, tubers, roots, fruits, and stems. The most widely used plant part is the leaf with a percentage of 52,27%, while the percentage for other parts is less than 20%. As the percentage of use of tuber organs/rhizomes is 18,18%. The percentage of use of root organs is 4,54%. The percentage of use of fruit organs is 11,36%. The percentage of use of stem organs is 6,81%. The highest use-value is *Kaempferia galanga* L from the Zingiberaceae family. The results of this investigation of medicinal plants can be used as teaching materials in learning material on biodiversity and Plantae material for grade of 10th of high school. Teaching materials can form to be learning modules of medicinal plants.

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