Ethnobotany study of medicinal plants in Bengkulu as a medium of student learning: The Euphorbiaceae family

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Abstract. Ethnobotany study is a way to uncover the diversity of plants that are used in an ethnic or region. Although ethnobotany research has been done in Bengkulu, there are still a lot of data that has not been revealed and the results are still not well documented. From the results of the exploration of medicinal plants that have been done by Euphorbiaceae is one of the largest families reported utilization, and the types used are different between regions, so the utilization information has not been recorded as a whole. On the other hand, this family is one of the selected families to be studied by students. This study aims to inventory the medicinal plants of the Euphorbiaceae family that are utilized by Bengkulu society which can be used as media for student learning. Research methodology by conducting field surveys (by means of exploration, observation, interviews with informants chosen by purposive sampling) and literature studies. Data analysis was carried out descriptively. From the results of research on the family Euphorbiaceae found 18 types of medicinal plants including: candlenut (Aleurites moluccina), earrings (Acalypha australis) bone wood (Euphorbia tirucalli), Jatropha curcas and others. The use of these plants for the treatment of tonsils, headaches, wound medicine, malaria, jaundice, magh, itching, colds, warts, heart disease and so forth. Jatropha curcas is a commonly used plant and the benefits are varied. The data of 18 types of plants are then documented in a Bengkulu medicinal plant dictionary along with other plant species, so that they can be used as student learning media.

1. Introduction
In accordance with what is mandated in the National Education System Law that the curriculum of all levels and types of education are developed with the principle of diversification in accordance with the education unit, regional potential and students, taking into account the diversity of regional and environmental potential [1]. In connection with the Republic of Indonesia Ministerial Regulation no 2005, ethnobotany study is one way to support the implementation of this regulation where ethnobotany study is aimed at revealing the use of plants, one of which is medicine by the community in a particular region or ethnicity, so that the results of this study can be used as an alternative teaching materials for plant diversity based on local potential. Bennet states that at present, ethnobotany is very important and at any time, ethnobotany does not only have a traditional society but is an interaction between humans and plants [2]. Ethnobotany study is a study of local wisdom, Karyadi et al., states that science learning based on local wisdom can improve the ability of the science process and foster a positive paradigm for students [3]. By introducing the diversity of medicinal plants used by the community around students in
theory in class and practice in the field will increase the motivation and interest of students to learn the
diversity of plants that are around them.

Local wisdom in terms of utilizing medicinal plants has been stated for a long time for the Bengkulu
ethnic community. From research in the ancient script KagaNga Serawai ethnic, found 63 types of
medicinal plants [4]. In addition to the Serawai ethnic, Bengkulu Province also has other indigenous
tribes namely Kaur, Pekal, Pasemah, Rejang, Enggano, Lembak, Muko-muko [5]. In the Indonesian
Medicinal Plants Dictionary which introduces local knowledge of each ethnic group in the field of
medicine, 45 ethnic groups are gathered. Knowledge about plants, starting from the types of plants, the
parts used, methods of treatment, to diseases that can be cured is a wealth of knowledge of each ethnic
and passed down from generation to generation. This local knowledge is specific to each ethnic group
in accordance with the conditions of the environment / forest where each ethnic lives [6]. In the
dictionary the information about the culture of medicine in the Bengkulu Province which is documented
is the Rejang, even though Bengkulu has diverse tribes, meaning that ethnobotany studies are still
needed.

Indonesia is a country that is rich in plant diversity, along with the global tendency of the world
community to ‘return to nature’ the Indonesian people must be able to take advantage of this opportunity.
Indonesia is one of the biggest medicinal plants users in the world as well as China and India. The use
of plants as medicines has also taken place thousands of years ago, but their use has not been well
documented, except in Java. Some articles about medicinal plants and cosmetics are even written on
palm leaves so they must be recorded [7]. Plant biological resources become more attractive when they
are recognized by the international community as the raw material for traditional medicines / herbal
medicine [8]. Documentation of medicinal plants in Bengkulu province is always being carried out,
which will be designed to be a dictionary of medicinal plants in Bengkulu. Survey research among others
in the Lembak eight tribe obtained 106 types of drugs used in the treatment of various diseases by the
Lembak Eight tribe [9]. Furthermore, the survey in the area of the new village of Pelokan was based on
the book "History and Customs of Mukomuko Regency so that more complex data were obtained in the
form of Latin names, benefits, how to use of medicinal plants as many as 33 species, one type was no
longer found [10]. A survey of anti-microbial plants in the Serawai and Mukomuko tribes found 41
types of medicinal plants that have the potential to be anti-microbial [11]. Further surveys are ongoing.

From the survey conducted in the study of medicinal plants, the family Euphorbiaceae (Spacing) is
one of the dominant families found in the treatment of traditional diseases. According to Whitmore, the
Euphorbiaceae tribe houses 91 genera with 1354 species in the Malesia region (Indonesia, Malaysia,
Singapore, Brunei Darussalam, Philippines, Papua New Guinea) [12]. Euphorbiaceae is the fourth
largest of the 5 vascular plants which has a number of species above 1000, namely Orchidaceae (6500
species), Rubaceae (2000 species), Myrtaceae (1600 species), Euphorbiaceae s.l. (1354 species), and
Melastomataceae (1000 species). Djarwaningsih research based on Herbarium Bogoriense specimens
reported 5 endemic species in Sumatra [13]. This study aims to determine the use of the Euphorbiaceae
family as medicinal plants in Bengkulu and local environment-based learning resources. Teaching
material has the potential of being regional or local, will be able to bring an active learning process,
because the source of teaching material is around students.

2. Methods
The content of this paper based on the exploration held and literature study in Juli to Oktober 2019 di
Bengkulu. Research methodology by conducting field surveys by means of exploration, observation,
interviews at various ethnicities and literature study. Ethnobotanical information gained from interview
with key-informants. Data analysis was carried out descriptively.

3. Results and discussion
From the results of the study found 18 types of Euphorbiaceae that are used by the people of Bengkulu,
namely: Acalypha hispida (Cat's tail, mine flower), Acalypha australis (Earrings) Aleurites moluccanus
(candlenut), Bridelia pustulata / keniday, Codiaeum variegatum (horse cart and, puring), Croton
**Bridelia pustulata / keniday**, tree, 5-10 m tall, rooted stem of woody silendrais stem, branching, pinnate leaves, face-to-face position, egg-shaped leaf shape, rounded base, pointed tip, pointed end, green color, length 2-4 cm, width 3 -4 cm, round fruit is located under the branches, between the leaves. This plant is used for stomach pain by boiling the bark and then drinking it. This species was recorded in the Old Manuscript of the Serawai tribe as a medicine for wounds and headaches [14]. Juliana research results extracts of cat tail (Acalypha hispida Burm. F.) have healing effects on traumatic wounds in the oral mucosa of the rat (Rattus novergicus) Cat tail leaves contain flavonoids, saponins, tannins, alkaloids, and essential oils which plays an important role as an antibacterial, antioxidant, and anti-inflammatory in accelerating wound healing [15].

**Acalypha indica (Earring)**. Shrubs. Tap root, trunk straight, round, smooth hair, green. Single leaf, intermittent leaf location, rhombus shaped, pointed end, jagged edge. Compound flowers in the form of ears, out of the armpits of leaves and the tips of branches. Round fruit, black. Long, brown seeds. This plant is used by the serawai tribe as a medicine for wounds and headaches [16]. According to Firdaus n-hexane earring extract has the best antibacterial potential against Streptococcus mutans with a minimum inhibitory concentration value and a minimum kill concentration of 500 µg / mL [17]. Earring plants have a pharmacological effect that is as an anti-inflammatory, antibiotic, astringent, and art decays. According to research, compounds contained in the leaves of the earrings are aleuron, steroids, alkaloids, saponins and flavonoids [18].

**Aleurites moluccanus, candlenut**. Tall trees reaching 40 m. Young leaves, twigs and bouquets are adorned with star hair that is dense, short, and silver-colored butter; like flour. Single leaf, alternating, dark green, stemmed up to 30 cm long, leaf blade almost round, round egg, with the base of the heart shape, reinforced leaves perched only at first, with 3-5 triangular shapes at the ends. Compound interest, androgynous, white, short-stemmed. The female flower is at the end of the extra umbrella panicle; male flowers are smaller and bloom first around him, numbering more. Fruit stone rather oval flattened, green, whitish fleshy, does not break down, 2-seeded or 1. Seed hard and thick, slightly flat. This plant is used by the Serawai ethnic Kampai village for scabies, Kampai village for scabies while Javanese ethnic for diarrheal diseases by burning the seeds with charcoal, then smeared around the navel. In the ethnic Rejang according to Neswita utilizing candlenut for boils by processing 2-3 seeds of finely ground candlenut and then placed in a boil [19]. It is also used to help fertility by means of 5 finely ground candlenut seeds, plus egg yolks and honey and then eat.
Codiaeum variegatum / andong-andong, are also used as ornamental plants. leni, pyramid heat-lowering pyramid; leaves + squeezed water rubbed head, Clean the dirty blood processing; boiled plus grass roots plus palm sugar filtered and then drunk (Java). Menstrual blood a lot, coughing up blood; boil the leaves and roots in 3 cups of water to 1 cup, filtered and drunk. (Riveting soft, poisonous animal sting; ground leaves are heated on the fire, affixed to the sting and wrapped (Lembak kelingi). Croton tiglium (Sepancau Cerakin): shrub habitus. This plant is a hedge plant whose existence has begun to become scarce. Utilized to launch bowel movements or wash the stomach (in the gurah), according to the community the stomach is termed dirty. The method of treatment is 5-7 seeds, fried and eaten.

Euphorbia. hirta (patikan kebo), weed plants, herbal habitus, this plant is used to cure eye pain, Lembak people for canker sores by dropping the sap, diarrhea. Citronella ethnic, in addition to canker sores are also used for stomach ulcer drugs. Euphorbia tirucalli L. (Broken bone), ethnic Serawai calls it Ceridu. Habitus shrubs, many branches, the stems after growing about 1 inch will immediately branch off in a transverse position, and so on so that it looks like a broken branching. Society uses for toothache, warts, water fleas, by applying smear on the affected part, where the broken bones are distributed, the people use to be bitten by a wasp, a centipede. For stroke / die next to the ethnic kaur process by means of plants broken bones, plus the ruku-ruku, and black pelawi bark boiled and then bathed.

Jatropha curcas (jatropha), shrub habitus, taproot. Round rod. The use of this plant is very diverse and different ways of using it. For toothaches, wounds, canker sores, earaches (use by sticking the sap of the plant gets sick), magh, stomach ache, (boiled bark, drinking, leaf leaves, sticking to the stomach), itching (when the leaves are crushed back and forth). For the use of this growing fever is 2-3 leaves of castor oil smeared, heated over fire and taped on the stomach, the leaves of the plant will become dry. There is also another way (ethnic Minang), namely 7 leaves washed clean, soaked with water that has been cooked, drunk 2 sips, the rest is distributed kebadan. The interesting thing is found in the leaves arise blotches, the more hot the body temperature of the leaf spot more and more. Other benefits are eliminating flatulence, diarrhea in the Lembak ethnic, and worm medicine. In the Kaur ethnic community, they use magh for sickness by adding jatropha leaves and thinly sliced noni leaves to the stomach. In the Rejang Community, jatropha is also for diarrhea (jatropha leaves are finely chopped, added turmeric and then heated and pasted. Another benefit is to relieve stool pain in young children characterized by bright colored stools, heartburn, irregular menstruation, vomiting, feces, medicine worms (leaves boiled in water), oil sprinkled on the scalp as a hair fertilizer, zits: jatropha leaves finely ground, then apply on the pimples. jatropha contains flavonoids, saponins, tannins, alkaloids, glycosides, steroids, apigenin, vitexin, isovitexin [22], cyclic triterpene stigmasterol, campesterol, β-sitosterol and 7-keto-β-sitosterol [23].

Jatropha multifida, (betadin / tint distance) Annual shrubs, height ± 2 m, taproot, yellowish white. Stems woody, base enlarged, gummy, round cross-section, clear leaf marks, young green after dark green and white. Single leaf, scattered, rounded, gnarled, reinforced fingers, pointed end, rounded base, flat edge, green. Compound interest, panicle shape, stemmed, Kendaga fruit, ± 1.5 cm long, young green after dark brown. This plant is used for the sap for wounds and water lice. This plant also has the potential to be anti-malaria, Sundaryono et al., concluded that extracts of J. multifida stem might be a better anti-malaria drug than chloroquine diphosphate based on an increase in the number of uninfected Plasmodium berghet. erythrocytes in Mus.musculus mice [24].

Jatropha podagria, (Distance of Bali, jagak bungo, distance of ornamental), shrub, The plant is used for snakebite wounds, scorpions, wasps. How to use, all plants boiled water drank. boiled pulp placed on the wound. Jatropha gossypifolia (distance of brother / red distance); shrubs. Used for canker sores, burns, and magh. For use in the thrush of the sap attached, the burns are crushed leaves and placed on the affected part of the wound, for magh by using the root like as much as 3 fingers soaked in water or boiled and drunk.

Malootus paniculatus (behind the wind, baliak wind), shrubs, resembling small trees 5-10 m, branching, hairy stems, scattered leaves, gnarled, tapered ends, leaf bones running, flat leaf edges, green leaves on the top and green vaginal discharge at the bottom, compound interest at the end or armpit of the leaf. This plant is used for appendicitis, by the skin of the stem plus the skin "bayur: boiled and
drunk. *Manihot utilissima (cassava):* habitus shrubs. This plant is used for: Low blood, (the way: drinking boiled water), nosebleeds (how to: the leaves are rolled corked into the nose), wounds, ulcers (way: leaves crushed until crushed, affixed to the wounded), magh (how to: grated tubers are allowed to stand for a few minutes taken the juice of the starch drunk).

*Phyllanthus acidus (cermei),* a tree, stems reaching up to 9 m tall, plants are used for constipation, slimming (how: boiled leaves, drink water). *Phyllanthus niruri (green meniran):* herbaceous, growing upright, height up to 50 cm, used for abdominal pain (how to: crushed plus brown rice plus bangle smeared). fertility (method: boiled, drunk), diabetes, kidney, lumbago (10-15 leaves washed clean boiled with 2 cups of water made 1 glass of water to drink). *Phyllanthus urinaria (red meniran),* according Sangat et al. [6], in the ethnic Rejang this plant is used to treat malaria. Malaria is an endemic disease in Bengkulu. How to use, namely: all parts of the plant boiled and drunk. The red meniran plant is slightly different from the green meniran (*Phyllanthus niruri*) ie the stem has a difference, the green branching is monopodial and the green branching is red and the red branching is sympodial and red. At the roots are both rooted and yellowish white. Based on anatomical studies on green meniran (*Phyllanthus niruri.*) And red Meniran (*Phyllanthus urinaria*) have the same shape of the leaves, stems and roots. Based on the study of the identification of its chemical content in green meniran (*Phyllanthus niruri*) containing tannins (catechols), saponins and carbohydrates, while in red meniran (*Phyllanthus urinaria*) only contain tannins (catechols) and saponins.

*Sauropus androgynus (Katu),* shrub, this plant is used for stamina enhancer, treatment of high blood pressure (ethnic Kaur) how to: young leaves boiled or engulfed, canker sores (how to: leaves added brown sugar squeezed squeezed water, drunk, launch breast milk (ethnic Kaur), on ethnic leaves as well for enhancing and expediting breast milk, in the Javanese ethnic, young leaves and stems are used for postnatal medicine, increasing stamina and increasing milk. In ethnic Rejang it is also used for jaundice, in addition to smoothing breast milk. high blood pressure, boiled leaves, the water is drunk, the ethnic kaur is made into vegetables or engulfed in the treatment of high blood pressure.

The Katu / Sauropus androgynus plant has a phylogenetic / closely related relationship with Meniran (*Phyllanthus niruri*), derived from a common ancestor (monophyletic) [25]. This shows that the genetic patterns and biochemical properties are similar. This has strong implications for the discovery of compounds that act as immunomodulatory agents from plants other than meniran. From the results of this research, katuk is predicted to be strong containing immunomodulatory compounds, as well as meniran. Recent research according to Hidayat that Meniran plants are efficacious as immunomodulators (substances that can modulate (change or affect) the body’s immune system toward normal. Immunomodulators play a role in strengthening the body’s immune system (immuno stimulator) or suppressing excessive immune system reactions). Natural patterns resulting from phylogenetic studies can be used as a basis for making predictions of the characteristics of organisms that have not been observed.

Morphologically, the family Euphorbiaceae known as "Spacing" is very easy to recognize, with the characteristics of plants having sap, common leaves fingering, compound inflorescences in cyatium / panicle forms [26]. Plants that are included in this family are generally planted and also as weeds in the yard, the peculiarities of this feature such as the fringed leaves and the sapling of panicle flower, make this family very quickly recognized, understood by students and can be selected as a learning family. According to Keng Families are spread cosmopolitanly [27].

The use of Euphorbiaceae as a medicinal plant, has similarities and also differences with other locations or tribes as used by the Pekurehu tribe community in Wuasa Village and Kaduwaa Village, Central Sulawesi. Of the 17 species of plants Euphorbiaceae, the benefits of which are found there are 3 types used as medicine, namely: "Walungai ntvau" (*Euphorbia hirta.*) these plants have the same benefits which are the types of plants used to treat skin diseases such as warts by rubbing their sap. While to treat spinal pain can consume half a glass of "Iku meo" (*Acalypha indica*) root decoction as much as 2x a day, in Bengkulu society it is used for headache and wound medicine and "Tatanga" (*Jatropha curcas*) is used as a wound medicine, thrush and fever-lowering (fever). To reduce fever can use tatanga leaves sufficiently and compressed on the head and sap tatanga treat canker sores and wound
medicine by applying it [28], this method is different from the use of the people in Bengkulu, not by compressing it. *Kauragi / Codiaeum variegatum, Matepobu/ Euphorbia tirucalli* is only used as an ornamental plant. And cassava / *Manihot utilissima* as food. In Aceh, a different benefit was found from *Jatropha curcas*, namely by carrying out the abdomen of the mother giving birth by sticking a leaf [29].

The use of medicinal plants of the Euphorbiaceae family has a high utilization rate, for example for the Simalungun Ethnic Community consisting of 92 species of plants, the highest is in the Asteraceae and Euphorbiaceae families with a value of 10.78% [30]. This is because the Euphorbiaceae family is the fourth largest of the five vascular plants consisting of 1354 species from 91 genera [12]. In contrast to the results obtained by Fatiha and friends in the Oum Rbia region (Morocco) for Respiratory disease, 60 species of plants were obtained by the Lamiaceae family and followed by Myrtaceae, the most widely used, while from the Euphorbiaceae family, *Euphorbiaceae Takaout / Euphorbia resinifera Oral Powder Leaf for Asthma, Influenza, Cough* [31].

The Euphorbiaceae family can easily be used as a media and learning resource because of its distribution around students and is easy to recognize by the characteristics of gummy plants as well as its use as medicinal plants that can attract students to learn more, because it can be directly beneficial for himself and his environment. In the study of Sajria et al., *E. hirta* is the only family of Euphorbiaceae which is also found from 27 species of medicinal plants with growth rates are undergrowth, which can be used to increase students’ knowledge about medicinal plant species in the village production forest area Malonas Dampelas District, Donggala Regency [32]. According to Djohar, the results of the study can be used as a source of learning, among others, if the potential is clear, adjusted to the learning objectives [33]. Hamalik suggested that the use of instructional media in the teaching and learning process can arouse new desires and interests, generate motivation and stimulation of learning activities, and even bring psychological effects on students [34].

According to Harini and Sulistiono that the use of the environment as a learning medium can improve student learning outcomes and activeness [35], then Resviya states learning outcomes achieved before and after using local wisdom-based media can improve learning outcomes, provide a pleasant atmosphere, so that the impact in learning activities more actively follows the learning process and learning success [36]. The data of 18 species of plants are then documented in a Bengkulu medicinal plant dictionary along with other plant species, so that they can be used as student learning media.

### 4. Conclusion

Based on studies of ethnobotany studies of medicinal plants of the family Euphorbiaceae in various ethnicities in Bengkulu, 18 species of medicinal plants were found, namely *Acalypha hispida* (*Cat’s tail, mine flower*), *Acalypha australis* (*Earrings*), *Aleurites moluccanus* (candlenut), *Bridelia pustulata / keniday*, *Codiaeum variegum* (horse cart, croton), *Croton tiglium* (Sepancau Cerakin), *Euphorbia hirta* (*Kukon-kukon, Patikan Kebo*), *Euphorbia. tirucalli* (Ceridu; bone wood, urip wood), *Jatropha curcas* (*Castor, Jaghak*), *J. multifida* (betadin, distance of tint, forest spacing), *J. podogria* (bali distance, ornamental distance, bungo jagak), *J. gossyfolia* (distance of brother / red distance); *Malootus paniculatus* (wind baliak), *Manihot utilissima* (cassava / twill), *Phylanthus niruri* (green meniran), *Phylanthus acidus* (*Cermei*), *Phylanthus urinaria* (red meniran) *Sauropus androgynus*, (katu). The results of this study can be used as learning media based on local wisdom.

### Acknowledgments

The research team would like to thank the Faculty of Teacher Training and Education, University of Bengkulu for providing PPKP grants (Research Enhancement Quality Research) Sources of Funds: RBA FIKIP UNIB 2019 with contract number 2825 / UN30.7 / HK / 2019 on May 29, 2019, and Institutions Research and Service (LPPM) Bengkulu University. Thank you also to the key informants and various parties who have helped research so that the writing of this paper can be done.

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