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Utilization of Plants as Traditional Medicine for Various Diseases: Ethnobotany Study in Sumenep, Indonesia

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Abstract. The Madurese are also known as one of the ethnic groups in Indonesia and still maintain the practice of plant utilization as a traditional medicinal herb. This ethnobotany research aimed to explore the kind of plants used as medicinal plants in Sumenep, along with ways to use and types of diseases that can be treated. The study was conducted in three villages, such as Bangselok, Pabarasan, and Tanjung, which involves village elders, herbalist, and local communities as research respondents. Observations, interviews, and documentation were used as research data collection techniques, and qualitative descriptive techniques were used as research data analysis. The results of the study informed that the people of Sumenep utilize 36 plants as a traditional medicine that can overcome various health problems, from body odor to diabetes. Leaves are the most frequent use of organs, and the pound is the most common technique used by the community. Scientifically, these various plants contain various secondary metabolites that can act as bioactive compounds in healing various diseases.

INTRODUCTION

In line with increased awareness of healthy lifestyles, community interest in medicinal plants-based also increased. The statement was according to the increasing number of medical plant-derived products in various parts of the world [1]. Natural products and their derivatives have been known as sources of therapeutic agents for years [2]. From a pharmaceutical perspective, several compounds from various plants have been known to contain bioactive activities or pharmacological activities [3]. Therefore, medical plants can be processed in various ways and forms, such as powder, capsules, tea, extracted, or directly consumed [4].

Plants utilization as a source of medicines is begun with trial and error method, thus gradually, the community is succeeding to utilize the plants around them optimally and inherits to the next generations [1]. This utilization method has been documented for hundreds of years ago and found in various parts of the world [5]. Some communities in many developing countries still maintain the plant utilization as traditional medicine, such as Pakistan [6], Nigeria [7], and in several regions in African continents [8,9]. The use of traditional medicinal plants is also still found in some developed countries, such as in China and Taiwan [10] and Japan [11].

Besides those countries, Indonesia is also one of the countries where people still practice traditional use of medicines. Indonesia has an abundance of medical plants that grow in various regions [12]. Many studies reported that these plants contain a variety of secondary metabolites and useful in healing diseases [13], have antioxidant activity [14], antibacterial [15], and reduce hypertension [16]. On the other hand, Indonesia is also rich in culture [17], has many tribes and ethnicities [18,19], and has a variety of local wisdom [20]. Thus, the use of traditional medicines is influenced by prevailing conditions, environmental factors, and geographical conditions [4]. Therefore, the diversity of plants and culture of the local community will lead to the diversity of utilization of medicinal plants in various regions in Indonesia.

The diversity of medicinal plant utilization in Indonesia has encouraged many researchers to conduct ethnobotany studies in various regions of the country. Some of these studies include the medical plants utilization by Tidung tribe in northern Kalimantan ([21], Sasak ethnicity in Lombok [22], Dayak Tagol in North Sumatra [23], Serampas [24],

communities in Karangwangi [25] and Ranggawulung Urban Forest, West Java [26], Bali [27], and several villages in East Java [28]. Based on this information, ethnobotany studies have not been carried out thoroughly in Indonesia. One such area is Madura.

Madura is one of the islands located in the north Java. The majority of the people who occupy Madura Island are the native [29]. They continue to maintain their cultural entities, which are influenced by ecological aspects and the characteristics of the local community [30]. Madura is also known as one of the ethnic groups that has wealth knowledge about traditional medicine. Not surprisingly, the use of herbal medicine traditional-based is commonly practiced on Madura Island [31,32]. Unfortunately, many ethnographic studies that have been carried out in Madura are still limited to the social dialects of Madurese [29], communication culture [30], traditional body care of Madurese women [32], and the type of interpersonal communication about health between herbal medicine maker and herbal consumers on the island [31]). However, no research focuses on medicinal plant exploration by the Madurese community. Therefore, the purpose of this study is to examine the types and ways of using plants by the people of Sumenep, Madura, in treating various diseases through ethnobotany studies.

EXPERIMENTAL METHODS

This research is qualitative research with ethnographic methods. Descriptive research aims to provide an overview or describe everything that includes facts, phenomena, opinions, and attitudes of local communities in Sumenep Regency in regards to knowing, processing, and utilizing medicinal plants that are proven to be true in the field. This research was carried out in July 2019 and was located in three villages in two sub-districts, such as Sumenep sub-district in Bangselok and Paberasan villages, and Saronggi sub-district in Tanjung village. The selected village was determined by some specific considerations found at the research location, including a gradation in terms of the availability of health facilities, public facilities (access roads or transportation), the fulfillment of needs (natural products or crops trading), and customs. According to the reasons above, the village selection was divided into three groups that were considered to be modern, middle villages and traditional villages.

There are three stages of data collection methods, such as observation, survey and interview, and documentation. Observations type used non-participatory observations, or during the process of observation, the researcher is not directly involved with the activity but only as an observer. The interviews focused on three types of respondents, such as the community who knows medicinal plants, the seller or maker of traditional herbal medicine, and traditional healers or herbalists. The documentation is in the form of photographs to collect the presence of medicinal plants and their habitus. The following documentation is in the form of a video to collect evidence in the community while using medicinal plants as well as interview data. This study involved 90 respondents. Respondents in each village were 30 respondents with several divisions, namely: five respondents of village elders, three respondents of herbalist, six respondents of herbal medicine sellers, six respondents' buyers or consumers, and ten respondents of the local community. The number of respondents is based on information from the local community.

Data analysis techniques in this study were descriptive qualitative. Interview data were clustered based on plant type (family), source of acquisition, location of acquisition, habitus, part of plant used, method of processing, method of use, benefits of medicinal plants on aspects of health, consumption, cultivation, income, customs and diseases that can be treated using medicinal herbs.

RESULTS AND DISCUSSION

The Madurese has been applied to various traditional treatments until nowadays. Based on this study, some Madurese still use traditional medicine when they or their families experience health problems. Based on interviews with people in three villages in Sumenep, almost half of the people of Tanjung and Paberasan villages frequently use traditional medicinal plants to overcome their health problems. On the other hand, the majority of people in Bangkselok Village only use traditional medicine when they need them. In more detail, the frequency of plants used as a traditional medicine in the three villages is presented in Figure 1. The discovery of traditional medical practices using various plants by the community in Sumenep is in line with various other ethnobotany studies that inform similar results, such as in Java [26], Bali [27], Lombok [22], Sumatra [23], and Kalimantan [21].

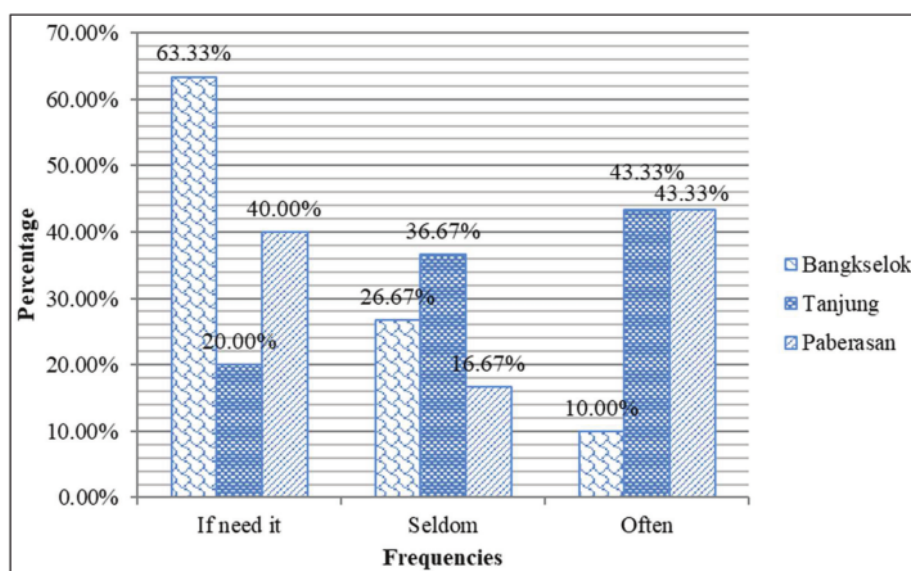


FIGURE 1. Frequency of plant use in the practice of traditional medicine in three villages in Sumenep

This study informs that various types of plants are used to overcome various health problems. The information of the plant used by the Madurese community, the parts of the plant, and health disorders that have been collected in this study are presented in Table 1. In the Table, the plants are ordered based on the most frequent to the least frequent mentioned by respondents. According to Table 1, there are 36 plants used by the Sumenep community in treating various diseases. Utilization of *Piper betle* is also carried out by the Indonesian people in several other places, such as in Cianjur [25], Bali [27], and Karo [33].

TABLE 1. List of plants, parts of plants used, and health problems collected during the study (Ordered from the most frequently mentioned to the least frequent mentioned by the community)

No.	Scientific Name	Indonesia's Name	Parts Used	Therapeutic Effects to Health Problems
1	<i>Piper betle</i> L.	Sirih	Leaves	Eliminate body odor, maintain oral and dental health, internal treatment (gout, cough, vaginal discharge, nosebleeds, and accelerate blood circulation).
2	<i>Curcuma domestica</i> Val.	Kunyit	Leaves	Cure appendicitis, anthelmintic, stomach ache, the decay of breast milk, stomatitis, fever, and deep infection (deep wounds).
3	<i>Curcuma xanthorrhiza</i> Roxb.	Temulawak	Rhizome	Increase appetite, colds
4	<i>Curcuma aeruginosa</i> Roxb.	Temuireng	Rhizome	Increase appetite, circulate out deoxygenated blood after childbirth.
5	<i>Boesenbergia rotunda</i> Roxb.	Temu Kunci	Rhizome	Increase appetite, phlegm decay.
6	<i>Kaempferia galangal</i> L.	Kencur	Rhizome	Cough and low back pain medicine.
7	<i>Zingiber officinale</i> Roxb.	Jahe	Bulbs	Cold, increase appetite, cough, headache, an antidote to snake venom, external treatment (swelling, bruising, sprains).
8	<i>Piper Retrofractum</i> Vahl.	Cabe Jawa/Cabe Jamu	Fruit	Increase stamina, fever, and rheumatism.
9	<i>Andrographis paniculata</i>	Sambiloto	Leaves	Prevent diabetes mellitus, increase appetite, gout medicine.
10	<i>Curcuma zedoaria</i> Rosc	Kunyit Putih	Leaves	Pain killer, reduce fever, menstrual disorders.
11	<i>Moringa oleifera</i> Lmk.	Kelor	Leaves	Low back pain and eyes.

TABLE 1. Continued

No.	Scientific Name	Indonesia's Name	Parts Used	Therapeutic Effects to Health Problems
12	<i>Alpinia galanga</i> L.	Lengkuas	Fruit	Treating Tinea versicolor.
13	<i>Areca catechu</i>	Pinang	Fruit	Strengthens teeth and gums, intestinal worms, diarrhea, vaginal discharge, no appetite, constipation, treating wounds.
14	<i>Azadirachta indica</i> A.Juss	Mimba	Leaves, Fruit, Twigs, and Sap	Skin disease (burns), toothache.
15	<i>Citrus aurantiifolia</i>	Jeruk nipis	Fruit	Cure cough and influenza.
16	<i>Averrhoa bilimbi</i> L.	Belimbing wuluh	Fruit and Flower	Reduces high blood pressure, bleeding gums, pimples, coughs and stomatitis.
17	<i>Paederia foetida</i>	Kentut Leaf	Leaves	Flatulence, infants with impaired food absorption
18	<i>Pluchea indica</i>	Beluntas	Leaves	Eliminating body and mouth odor, overcoming lack of appetite and digestive disorders in children, relieving pain in rheumatism.
19	<i>Momordica charantina</i> L.	Pare	Leaves and Fruit	Reducing fever, increase appetite.
20	<i>Psidium guajava</i> L.	Jambu Biji	Leaves	Cure diarrhea, ulcers, maintain blood pressure, boost the immune system.
21	<i>Morinda citrifolia</i> L.	Mengkudu	Fruit	Treat fever, high blood pressure, headaches, heaviness.
22	<i>Vernonia amygdalina</i> Del.	Afrika Leaf	Leaves	Decrease cholesterol and diabetes.
23	<i>Tamarindus indica</i> L.	Asam jawa	Fruit	Relieves headaches.
24	<i>Cymbopogon citratus</i>	Serai	Leaves and Stem	Low back pain, treat toothache, and swollen gums.
25	<i>Sauropus androgynus</i> (L) Merr	Katuk	Leaves	Increase breast milk and treat fever.
26	<i>Imperata cylindrical</i>	Alang-alang	Rhizome	Treat heartiness, accelerate urinating, kidney stones, vaginal discharge, and broken bones.
27	<i>Jatropha curcas</i> L.	Jarak	Sap and Leaves	Treat burns, clean the children tongue who are white, and thickened.
28	<i>Ocinum cannum</i>	Kemangi	Leaves	Eliminate mouth odor
29	<i>Syzygium polyanthum</i> (Wight.) Walp	Salam Leaves	Sap and Leaves	Cure diabetes mellitus
30	<i>Anredera cordifolia</i> (Ten.)	Binahong	Leaves	Cure various wounds, nosebleeds.
31	<i>Musa paradisiaca</i>	Pisang susu	Sap and Leaves	Prevent and protect tooth decay, prevent and treat anemia, facilitate absorption in the intestine.
32	<i>Phyllanthus emblica</i> L.	Malaka	Fruit and Stem	Cure liver
33	<i>Coccinia cordifolia</i> L.	Papasan	Fruit and Stem	Cure diabetes.
34	<i>Phyllanthus niruri</i> L.	Meniran	Leaves, Stem and Root	Cure malaria, increase appetite.
35	<i>Nicotiana tabacum</i> L.	Tembakau	Leaves	Toothache and strengthen the tooth.
36	<i>Talinum paniculatum</i> Gaertner.	Gingseng	Leaves and Root	Reduce fatigue, treat diabetes, reduce cholesterol levels.

Piper betle is commonly used by Sumenep community to overcome the problem of body odor and maintain oral and dental health. Body odor is caused by bacteria when the compounds in human sweat are metabolized by these bacteria [34,35]. Interestingly, *Piper betle* has antibacterial activity and fight bacterial isolates from human sweat in regards to these body odor problems [36]. This plant is also scientifically proven to overcome oral and dental health problems [37]. Besides, the presence of antihypercimeia in *Piper betle* leaves extracts that have been reported by previous studies [38] are relevant with the use of this plant to treat gout by the Sumenep community.

The study also revealed that the Sumenep community utilized not only plants in external treatment but also internal treatment. There is a various technique that appears from trials and errors carried out by local people from one generation to the next [1]. Through the experience, the community is finally able to determine which technique is most

optimal for plants when they are used as medicine. As a result, various ways of processing plants appear, according to the type of plant and the disease. Figure 2 presents the various making technique carried out by the Sumenep community. Based on Figure 2, the pound is the most common technique, while chewed up is rarely used. Another ethnobotany study conducted in Ethiopia also reported that pounding was among the most commonly used techniques by people after crushing [39]. Several other studies also support this information, such as studies in Uganda [40] and Zambia [41].

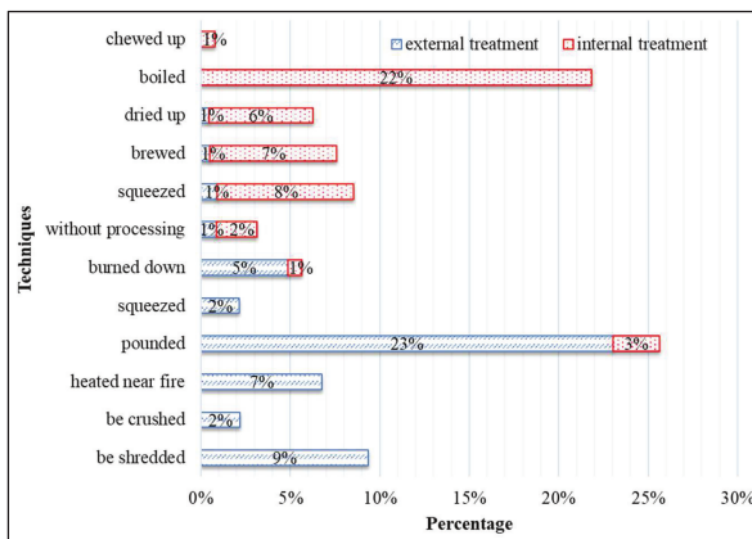


FIGURE 2. Various techniques in plant utilization by the community in Sumenep for external and internal treatment

This ethnobotany study also informs that various parts of the plant can be utilized in the traditional treatment process. The leaves are the most commonly used, while the sap is the least used by the community. In more detail, frequency comparisons of utilization among parts of medical plants by Sumenep community are presented in Figure 3. Similar to the technique, the experiences of the local community determine the use of plant parts. From a scientific point of view, secondary metabolites are components that act as bioactive compounds when plants are used as medicines [42]. Besides, minerals, vitamins, proteins, and other nutrients contained in plants also play an essential role in optimizing the treatment process. In this regard, one and another part of the plant have different chemical contents [43,44]. This condition is caused by the mechanism of gene expression regulation in the constituent cells of the plant body [45]. Therefore, it is not surprising that the determination of plant parts to be used also plays a role in the effectiveness of the healing process.

Based on the types of plants listed in Table 1, *Zingiberaceae* is considered most frequently used by the Madurese community. They include *Zingiber officinale* Roxb., *Curcuma xanthorrhiza* Roxb., *Curcuma aeruginosa* Roxb., *Boesenbergia rotunda* Roxb., *Curcuma domestica* Val., *Curcuma zedoaria* Rosc., And *Kaempferia galangal* L. The Indonesian people commonly use these plants as a traditional medicine in various regions. This family was informed that it was always used as a composition of Indonesian herbal drinks known as "jamu" [46]. In another study, eight species of *Curcuma*, one of the genera in the *Zingiberaceae* family, were used to treat 73 different diseases [47]. A rhizome is a major part of the *Curcuma* species, which are most frequently used as medicine.

Various secondary metabolites have been reported to be contained in various species of *Curcuma*. Many of these compounds are able to show antibacterial, antioxidant, anti-inflammatory, antidiabetic, as well as antimutagenic activity [48–50]. One of the secondary metabolites is curcumin. The existence of these secondary metabolites is useful for a natural remedy for various health complaints. From this information, it can be seen that various plants used by the Sumenep community have certain ingredients that have been reported scientifically useful. On the other hand, several plants have not yet been studied for their content and benefits. Therefore, the exploration of various plants commonly used by the people of Indonesia and the compound content is vital to provide reliable information.

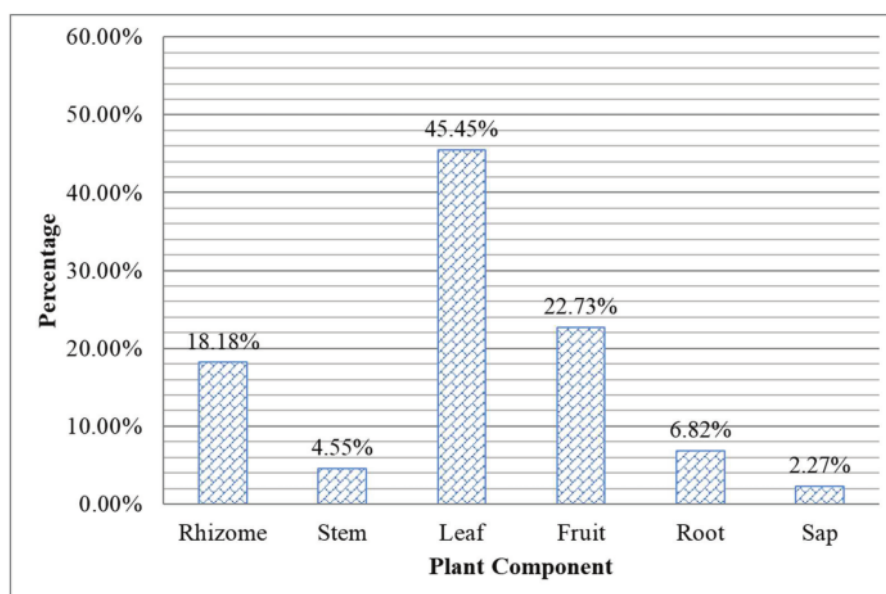


FIGURE 3. Frequency comparison of the plant parts used by the Sumenep community

SUMMARY

The results of this ethnobotany study inform that plant utilization in traditional medicine is still commonly practiced in Madura. From 36 plants that were utilized, *Piper betle* L is most frequently mentioned by the Madurese community, which aims to eliminate body odor, maintain oral and dental health, and internal treatment.

On the other hand, the Zingiberaceae family is the most frequently used for traditional medicine. The community and leaves utilize various parts of the plant, and the organs are most frequently used. Some of these plants are used directly, some are processed first, from squeezed to pounded.

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PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8