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An Ethnobotanical Study of Plants Used as Traditional Medicine and Its Processing in Gapura District, Sumenep, Madura

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Abstract

The aim of this study is to describe the variety of medicinal plants, the ingredients of medicinal plants, and its utilization in Gapura District, Madura Regency. This study was conducted on June – October 2021. This study methodology was started by collecting the data, observation, and documentation. This study consisted of 60 respondents aged over 35 years because they are more experienced in making traditional medicines. The analysis of data used UVS, FUVS, ICS, and SWOT. This study found that 37 of 30 families of medicinal plants were utilized by Gapura societies. Based on the results of FUVs (Family Use Value), the families that are often used by the people of Gapura District are Zingiberaceae with a percentage of 1.75%, and the Moringaceae family with a percentage of 0.5%. The commonly utilized plant organ is the rhizome which is processed using a grater. The strategy for conserving the diversity of medicinal plants in Gapura District is wild and cultivated. Wild plants are usually only considered pests by the local community, but some wild plants have very good potential to be used as traditional medicines. Cultivated plants are a way of processing medicinal plants with the aim of bringing maximum results with good quality. Furthermore, Gapura District made the farmers' community conserve the medicinal plants through biological conservation.

Keywords: Conservation strategy, ethnobotany, medicinal plants

INTRODUCTION

Medicinal plants are beneficial plants for paregoric, body immune booster, virus killer, and damaged organs reparation [1]. Parts of medicinal plants which are frequently used in traditional medicinal sciences are roots, barks, woods, leaves, flowers, and seeds [2]. Historically, Indonesian ancestors had already implemented traditional treatment using forest plants or the surrounding house plants to recover all kinds of illnesses, either external or internal diseases [3]. Scientifically, traditional medicine is a science, skill, and practical theory. It is also a belief, collective experiences of societies with a variety of cultures for health maintenance [4].

In traditional medical treatment, Madura ethnic use various forest and house plants. For example, weeds (*Imperata cylindrica*) used as cholesterol neutralizer, fertility, hematemesis medicine, snake potion neutralizer. Other examples of medicinal plants are star gooseberry and marsh fleabane, used as breast milk boosters, menstruation boosters, fluor albus neutralizers, also heartleaf maderavine madevine as scars infection medicine, etc. [5].

The existence of traditional natural resources emphasizes the correlation between the conservation systems and biological conservation. This fact relates to the finding of this study, which is expected to find a new and innovative medicinal plant to be observed further by some pharmacists for developing public health quality. Madura ethnic has their own manners in using the medicinal plants. Therefore, it is needed to explore more about the various medicinal plants usually utilized by Gapura District societies purposed to the medicinal plant's cultivation approach and involve the societies in natural resources preservation. The study of ethnobotany of medicinal plants aims to know the quantity and the variety of frequent medicinal plants used by Gapura District societies. This research aimed to describe the variety of medicinal plants in the Gapura district. Moreover, to describe the ingredients of medicinal plants and their utilization by societies in Gapura District.

MATERIAL AND METHOD

Research Location and Observation

This research was conducted in Gapura Sub-District, Sumenep District, Madura Regency (Fig. 1). The research was conducted from July-October 2021. The researcher started to approach Gapura District societies to get more data about the medicinal plants that existed in Gapura District, taking notes of the societies' names, ages, jobs, education, and their perceptions toward medicinal plants'

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conservation and utilization. The observations delegated several observers who collected the data by taking notes of all that they heard and saw in the research location.

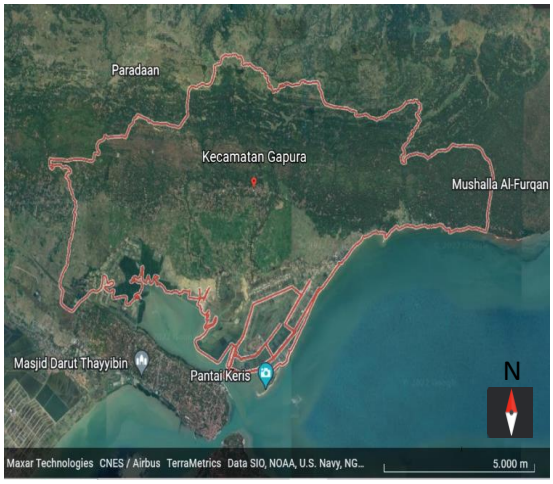

Figure 1. Gapura Distric, Sumenep, Madura (**Source:** Google Earth, 2022)

Interview and Documentation

The researcher collected the data by interviewing the respondents to get their perceptions and opinions about the study. The additional data was completed using questionnaires distributed to Gapura District societies, Gapura Head District, and other respondents related to the study. Questions posed to respondents include the types of plants used, processing methods, and parts used. The number of respondents is 60 people who are over 35 years old because they are more experienced in making traditional medicines. After the interview section and data about medicinal plants have been collected, the researcher also captured the variable location and made crucial notes to make the structural documents to strengthen the conductivity of the research observation.

Data Analysis

The data was collected by structural interview, observation, and documentation. Those data collected are analyzed using Species Uses Value (UVs), Family Use Value (FUVs), Index Cultural Significant (ICS), and SWOT analysis. UVs analysis aims to find out the utility of plants species using the following patterns [6]:

$$UVs = \frac{\Sigma UVis}{is}$$

Description

UVs : The total value of *s*
UVis : *s* value determined by respondent i
is : The total of respondents interviewed

UVs pattern can be extended to be FUVs when the data has a lot of species that can be representative of a certain family [1]. Meanwhile, ICS analysis aims to find out the form value of medicinal plants in the local culture. FUV and ICS analysis was calculated with the following patterns [1]:

$$FUV = \frac{\Sigma FUi}{n}$$

Description

FUV : Family form utility
FUi : The quantity of form utility of every family by the respondents
N : The total of species in a certain family

$$CSI = \Sigma(ixexc)x\ CF$$

Description

i : Species cultivation (a species effect toward community daily life). Score 2 assigns cultivation species, and score 1 assigns species in the uncultivated area.
e : Utilization options (a species that can replace another species' utility). Score 2 indicates unselected substitute.
C : The frequency of use (plants which are effectively used). Score 2 is assigned to the plants often used while score 1 indicates unknown plants/rarely used.
CF : The justification factor (informant consensus) is a deal intensity between informants. CF score is counted by dividing the total certain species citation and the total of most frequent species citations.

SWOT Analysis

SWOT analysis aims to know the potential recommendation in conservation support. Several factors of strategy in biodiversity conservation in Gapura District are grouped into some categories; those are *Strength (S), Weakness (w), Opportunity (O),* and *Strength (S).* This analysis can logically maximize the strengths and opportunities and also minimize weaknesses and threats.

RESULT AND DISCUSSIONS

Medicinal plants species in Gapura District

Based on the observation, there are 37 medicinal plant species, including 30 families most frequently utilized (Table 1). The interview records of Central Gapura and West Gapura societies show that they consume all the medicinal trees as traditional medicine formulated through some processes. They could easily find those medicinal plants around their house, in a garden, or even in the jungle as a wild

plant. The use of plants by local communities is influenced by various factors, including yield and availability, language, social relations [7], cultural history, understanding [8], belief, and trust [9].

Table 1. Medicinal Plants

No	Species
1.	Ginger (*Zingiber officinale*)
2.	Turmeric (*Curcuma longa*)
3.	Galangal (*Alpinia galanga*)
4.	Curcuma (*Curcuma xanthorriza*)
5.	Aromatic Ginger (*Kaempferia galanga*)
6.	Noni (*Morinda citrifolia*)
7.	Cassava (*Manihot esculenta*)
8.	Physic Nut (*Jatropha Curcas*)
9.	Star Gooseberry (*Sauropus androgynus*)
10.	Basil (*Ocimum sanctum)*
11.	Lemongrass (*Cymbopogon nardu*)
12.	Betel nut (*Areca catechu*)
13.	Coconut (*Cocos nucifera*)
14.	Date (*Phoenix dactylifera*)
15.	Palm Fruit (*Borassus flabellifer*)
16.	Betel leaf (*Piper betle*)
17.	Chili (*Piper retrofractum*)
18.	Guava (*Psidium guajava*)
19.	Water apple (*Syzigium aqueum*)
20.	Heartleaf Maderavine (*Anredera cordifolia*)
21.	Star fruit (*Averrhoa bilimbi*)
22.	Lime (*Citrus aurantifolia)*
23.	Purple leaf *(Graptophylum pictum)*
24.	Cherry *(Muntingia* calabura)
25.	Aloe Vera (*Aloe vera*)
26.	Morel Berry (*Physalis angulata*)
27.	Celery (*Apium graveolens*)
28.	Neem (*Azadirachta indica*)
29.	Papaya (*Carica papaya*)
30.	Star of Bethlehem (*Isotoma longiflora*)
31.	Jasmine (*Jasminum sambac*)
32.	Tamarind (*Tamarindus indica*)
33.	Sappan Wood (*Caesalpinia sappan*)
34.	Cinnamon (*Cinnamomum burmannii*)
35.	Lotus Thorn (*Ziziphus spina-christi*)
36.	Moringa Leaf (*Moringa oleifera*)
37.	Pine tree (*Acous calamus*)

Medicinal Plants Utilization in Gapura District

Traditional medicinal treatment with medicinal plants had been implemented by their ancestors in hereditary. With the development of modern medical treatment, Gapura District societies are still concerned to use traditional medical treatment using medicinal plants since they still believe in black magic (*santet;* witchcraft) or possessed.

The finding of the percentage of medicinal plants utilization by Gapura District is illustrated in (Fig. 2). The most consumed medicinal plant by Gapura District places ginger (its rhizome) which is crucial in daily life since ginger is not only used as a traditional medicine but also primarily needed to make food.

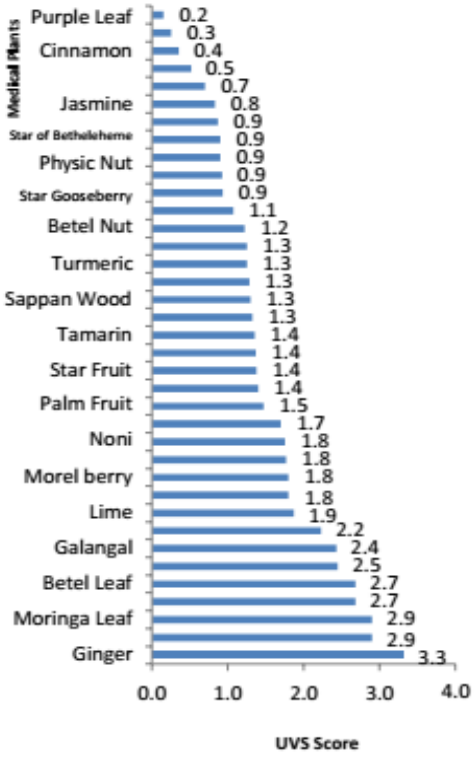

Figure 2. UVS of Medicinal Plants in Gapura District

The existence of biodiversity utilization shows Gapura District's nature and ecosystem sustainability. In this area, the wild herbs regenerate naturally without human intervention. This fact shows that Gapura District societies still conserve medicinal biodiversity. Medicinal plants are easy to get and widely available or used more often [10]. However, the main factor influencing the use of plants by local communities is the purpose of their use [11].

Medicinal plants Utilization based on its Family

The most frequently used medicinal plant for traditional medical treatment in 3 villages of Gapura District is the Zingiberaceae family. FUVs results from the three villages show 1.75% in East Gapura, 1.35% in Central Gapura, and 0.85% in West Gapura. Mostly Gapura District uses the Zingiberaceae family because this family is consumed in their daily life. This kind of family is easily got and found since Gapura District societies still conserve it around their house. Zingiberaceae family is used to increasing appetite, body warming, and injury treatment.

Zingiberaceae Family contains volatile oil, starch, tannins, and resins. Volatile oil works on stabilizing the nerve system, fun booster, curing several illnesses, and expediting blood circulation [3]. Medicinal plants are more secure since it

does not consist of chemical, it also costs cheaper, are accessible, and can be very helpful to be alternative medicine in an emergency [12], such as Corona Virus Disease 2019.

Analysis of Index Cultural Significance (ICS)

The research finding shows that the highest index culture goes to *Zingiber officinale* species with 222 scores and followed by *Moringa Oleifera* with 216 scores, while the lowest index is *Jatropha curcas* with 1 score and followed by *Graptophylum Pictum* with 2 scores. This fact is caused by the high-intensity use of ginger as the primer needs and the accessible product. Ginger is claimed as a medicinal plant for medical treatment to warm the body, relieve cough, relieve nausea, and relieve menstruation cramps. Additionally, ginger is also proven as a traditional medicine for immunity boosters. The mixture of ginger and honey is the best concoction to recover children's cough, while the bioactive substance is beneficial for other diseases [5].

Moringa leaf (*Moringa oleifera*) is also another accessible medicinal plant in Gapura District; otherwise, the societies rarely consume this medicinal plant since they just need this plant at a certain time. In contrast, Gapura District societies almost every day consume ginger since ginger has a lot of benefits for medical treatment, and it is also an ingredient. Moringa (*Moringa oleifera*) is a plant that is recognized to have many uses nationally and internationally. In Indonesia, Moringa is used for food, medicine, cosmetic ingredients, and cultural rituals [13].

Star Gooseberry (*Sauropus androgynus*) is used to boost breast milk and relieve fever, while the purple leaf is used for expediting menstruation. These two medicinal plants are rarely consumed because of low cultivation and are just consumed by certain people, for example; massager, and midwives. Currently, the management of medicinal plants needs to be considered a basic necessity of life because today's society prefers traditional treatment with basic ingredients from herbal plant parts [6].

Utilized Plants Organ by Gapura District

Several traditional herbs in Gapura Districts are from cultivated medicinal plants or wild medicinal plants. There are a lot of cultivated medicinal plants in Gapura Districts, such as turmeric, ginger, and galangal, since those medicinal plants are not only medicinal herbs for Gapura District societies but also ingredients or spices. Contradictory, wild medicinal plants will be extinct if those plants are neglected and low-cultivation; otherwise, this matter can be solved by exploration and data collection.

As has been mentioned previously, not all Gapura District societies consumed medicinal plants every day, but only certain people like massagers, midwives, or physicians to cure their patients' illnesses. It is noted that every single physician has their ritual in making the medicinal herbs, but they prefer to keep it privately because it is their own ancestor's confidential.

There are a lot of kinds of medicinal plants that can be used for medical treatment, for example, medicinal plants, ornamental plants, vegetable plants, and fruity plants. Additionally, the useful parts of trees used as traditional herbs are roots, tubers, rhizomes, twigs, stems, leaves, flowers, fruit, and seeds (Fig. 3).

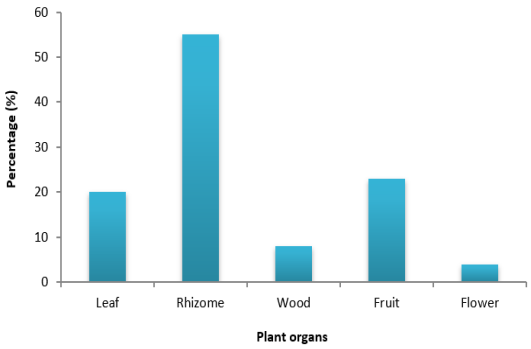

Figure 3. Plants organ frequently used

Based on the percentage graphic above, the most frequently used plant organ is rhizome, proven by mostly Gapura District societies consumed Zingiberaceae since it is considered as primer needs and easily found. Cultivation of ginger plants is in great demand by the people of Gapura because, in addition to easy maintenance, ginger can also be grown in arid lands such as in Gapura District. Ginger vegetative growth is not affected by increasing periods of drought stress [14].

The most rhizomes used are the ginger plant because apart from being made for medicinal, ginger plants are also needed by people for spices. The content contained in the ginger plant nutrients in ginger can complement the nutrients in the main menu and help launch the digestive process Active substances in essential oils, among others: shogaol, gingerol, zingerone, and other natural antioxidant substances, have properties to prevent and treat various diseases from mild to severe, such as colds, coughs, headache, aches, rheumatism, nausea, motion sickness,

impotence, Alzheimer's, cancer and heart disease.

Pharmacy Process of Medicinal Plants by Gapura District Societies

The use of medicinal plants or medical treatment has been implemented in the ancestor's era and inherited to their generation. Mostly, Gapura District societies still consume traditional medicine because they still trust in their ancestors that medicinal plants have more potential in curing any illness, such as betel leaf, which can clean dirt in eyes.

Traditional medicine in Java is widely documented by the nobility for the legacy of knowledge. Herbal medicine is used by the elite in addition for treatment. People generally use empirical knowledge about herbs that are passed down orally, putting more emphasis on information about ingredients for herbal medicinal mixtures [15].

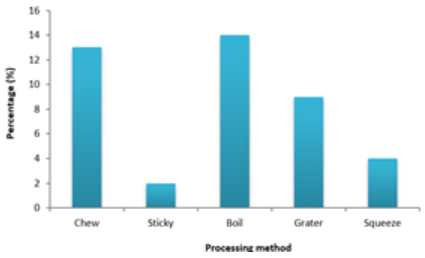

Figure 4. The process of medicinal plants

The graphic above (Fig. 4) shows that most people use the boiling manner to make medicinal herbs since they process the medicinal herbs based on their needs, and the boiling method tends to suit. Besides, they sometimes mix the medicinal herbs while boiling with other medicinal plants based on their hereditary sciences. The second manner mostly used to make the medicinal herbs is by a grater. It is usually used to process rhizomes into medicinal herbs by squeezing them to separate the water and the pulp. Then they will consume the squeezed water as medicinal herbs.

There are more methods to process the medicinal plants into medicinal herbs. Those are being dried, pounded, grated, brewed, boiled, roasted, chewed, dripped, squeezed, smeared, or directly eaten and drunk.

Traditional Chinese medicine is a treatment that has an older history than chemical drugs originating from the West. Traditional medicine has been part of Chinese culture for more than 3000 years and has spread for decades throughout the world, and one of them is Indonesia. Traditional Chinese medicine has been known as a medicine that has fast effect and potent properties. The traditional medicine is mostly in the form of powder and processed by grinding [16].

Conservation Strategy Medicinal Biodiversity in Gapura District

Strategy is planning, direction, and management united to achieve the goals by balancing strategic superiority and the environmental challenge. The strategy of medicinal plant cultivation must highlight the technical, social, cultural, and economic aspects. The technical aspects reviewed from the ecology aspects are abiotic and biotic.

Table 2. SWOT analysis

Strength	Weakness
Gapura District societies	Gapura District societies still lack in developing the agriculture of medicinal plants
Mostly, Gapura District societies still keep the medicinal plant sustainability	The low education of Gapura District societies
Gapura District societies are still consume medicinal herbs as *Jamu*, which made traditionally	The low awareness of Gapura District societies about the decrease of medicinal plants
There are still a lot of massagers, midwives, and physicians that use medicinal plants	The low knowledge of young generations toward the medicinal plants
Gapura District societies do not only use medicinal plants as a traditional medicine but also use them as primer needed in their kitchen	The low interest of Gapura District societies in medicinal plants growth
Opportunities	**Threat**
Supportive natural resources	The medicinal plant's habitat damage is caused by the low attention to the environment
Government support to make farmer community of medicinal plants	The extinction of medicinal plants
In most of the Gapura District area, the medicinal plants self-regenerate without humans interventions	The extinction of local culture about the benefit of medicinal plants
The opportunities for medicinal plants spread	

The abiotic aspect includes temperature, temperature, humidity, rainfall, pH, type of soil, soil structure, soil depth, and soil fertility, while the biotic aspect includes types associated with

trees and herbs with medicinal plants [3]. The strategy of ethnobotanical processing of medicinal plants around the house yard in Gapura District can be analyzed using SWOT in Table 2. Based on the SWOT points in Table 2, the following is a conservation strategy using the SWOT matrix (Table 3).

Table 3. Conservation Strategy of Medicinal Plants in Gapura District

Internal factors / External factors	Strength	Weakness
	S-O Strategy	**W-O Strategy**
Opportunity	Preserving the wealth of natural resources owned, including local species that exist and the fertility of the soil	Providing knowledge to the younger generation about the importance of medicinal plants and how to process them
	S-T Strategy	**W-T strategy**
Threat	Invites the community to use land or gardens for cultivating medicinal plants	Conducting educational activities about biodiversity conservation for the surrounding community

CONCLUSIONS

Based on the research results, there are 37 species of 30 families utilized by Gapura societies. On the other hand, the most frequent method used to process medicinal herbs production is by a grater. The conservation strategy of biodiversity, especially for medicinal plants in Gapura District, is individual cultivation through renewal habitation. Besides, Gapura District societies still believe in their ancestors' sciences about the medicinal herbs process. Unforgettably, they make farmer communities keep the medicinal plant's sustainability and the conservation of biodiversity.

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