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Diversity of the medicinal plant in homegarden of local communities in the coastal area of Prigi Bay, Trenggalek, East Java, Indonesia

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Abstract. *Agustina N, Hutauruk TJW, Sulistyaningrum N, Yudhanto SM, Liza N, Kusumaningrum L,* Sugiyarto, *Yasa A, Saensouk S, Naim DMD, Setyawan AD. 2022. Diversity of the medicinal plant in homegarden of local communities in the coastal area of Prigi Bay, Trenggalek, East Java, Indonesia. Biodiversitas 23: 6302-6312.* Homegarden is a part of the agroforestry system that is essential in a food security program. It also reflects the social and traditional practices in certain areas that define the composition of plants. One common plant that grows in a homegarden area is herbal medicine. The knowledge about medicinal plants in society is essential to ensure the sustainability of this local wisdom to be passed through the subsequent generations. This research aimed to examine the diversity of medicinal plants planted in homegarden in Tasikmadu, Prigi, and Karanggandu Villages, Watulimo Sub-district, East Java, Indonesia. The research used a field survey of plant inventory and a semi-structured interview to gather ethnobotanical information. A total of 60 respondents were obtained by purposive sampling, with residents with homegardens preferred to be interviewed. The discussion results showed that 32 families of 59 medicinal plant species found in the study areas are consumed for medicinal purposes. Zingiberaceae is referred to as the highest family consumed by the respondents. Leaves and rhizomes are the most commonly utilized part, while decoction is the most popular preparation method. This study revealed that people aged 46-55 have the highest knowledge of medicinal plants. At the same time, women are considered to know more about herbal medicine compared to men.

Keywords: Coastal area, ethnobotany, herbal medicine, traditional knowledge

INTRODUCTION

A homegarden is land surrounding the residential area, usually intended as an agroforestry form to supply household needs (Mohri et al. 2013). This homegarden agroforestry system is commonly encountered in tropical areas and is cultivated by multipurpose plants (Setiani et al. 2022). Some of the most frequently cultivated plants in the homegardens are edible plants, such as vegetables, fruits, herbal medicines, fodder, and ornamental plants. A homegarden is usually composed of various plant growth forms, ranging from trees, poles, and shrubs to lower-level or herbaceous plants (Zaulya et al. 2022). These plants can support daily needs by obtaining the surrounding communities' economic, social, and cultural aspects (Mohri et al. 2013; Thesiwati 2020).

In terms of economy, the homegarden system supports household income by providing plants with economic value (Setiani et al. 2022). Regarding the social aspect, working together in the homegarden area and sharing the harvested products could lead to a closer connection between surrounding neighbors (Linger 2014). The existence of a homegarden also can contribute to cultural activities by serving important materials for traditional practices or rituals (Hakim et al. 2018). Meanwhile, homegarden can strengthen local functional diversity and increase texture heterogeneity and soil fertility from an ecological perspective (Junqueira et al. 2016; Ibarra et al. 2021). From those views, a homegarden system has improved nature and human well-being. In regards to certain society well-being, homegarden helps to provide medicinal herbal that could be beneficial for healthiness. That is because medicinal plants are one of the most popular plants in the homegarden.

The advantage of growing this medicinal plant is that it can increase income and maintain the health of a family. Furthermore, the community usually utilizes medicinal plants as an ingredient in traditional medicines (Dewi and Fikri 2021). One reason is that traditional herbal is considered safer and has few negative side effects. In addition, limited access to health centers makes growing medicinal plants useful to improve and maintain local

health (Kadarsah and Susilawati 2018). Therefore, the supply of medicinal plants in the nearby housing area is very important to provide faster access.

The cultivation and use of traditional medicine have been preserved for generations, mainly by oral and traditional practices. A high level of herbal medicine consumption has been stated by the 2001 National Socio-Economic Survey explained that about 57.7% of the Indonesian population did self-medication without medical assistance, and around 31.7% used traditional medicinal plants. The remaining 10.6% took treatment with medical assistance (Leki et al. 2020). Therefore, the application of medicinal plant knowledge in science and research can be used as information on the manufacture of traditional medicinal ingredients that would be beneficial for the community. Furthermore, herbal medicines inventory is important to determine the abundance status of natural plants. Therefore, effective conservation of medicinal plants needs to be done to maintain their diversity and sustainability.

A homegarden agroforestry system is also can be found in coastal areas. For example, coastal communities in three villages, Watulimo Sub-district, Trenggalek, East Java, Indonesia, usually use their homegarden to grow several kinds of plants, mainly edible ones. Even though most locals surrounding the coastal area are fishermen and rarely serve as farmers, the inhabitants mainly utilize their homegarden to provide daily food-based plants. Unfortunately, information about the diversity of medicinal plant species in coastal areas, specifically in the Tasikmadu, Prigi, and Karanggandu Villages, is not yet available. Therefore, the purpose of this study was to determine the level of diversity of medicinal plants and various types of medicinal plants used by the surrounding community in Tasikmadu, Prigi, and Karanggandu Villages.

MATERIALS AND METHODS

Study area

The study was conducted in June 2022 in the villages of Karanggandu, Tasikmadu, and Prigi Villages of Watulimo Sub-district, Trenggalek District, East Java Province, Indonesia (Figure 1). Watulimo Sub-district, Trenggalek District, is located at an altitude of 7-573 m above sea level and in the southeast of Trenggalek District. Watulimo District is located at latitude 8°8’31”-8°23’01” S and longitude 111°38’41’’-112°46’41” E with hilly structure and coastal areas. Rural communities in Tasikmadu, Prigi, and Karanggandu generally work as farmers in the forest and as fishermen. Prigi Bay dominates the coastline in this sub-district.

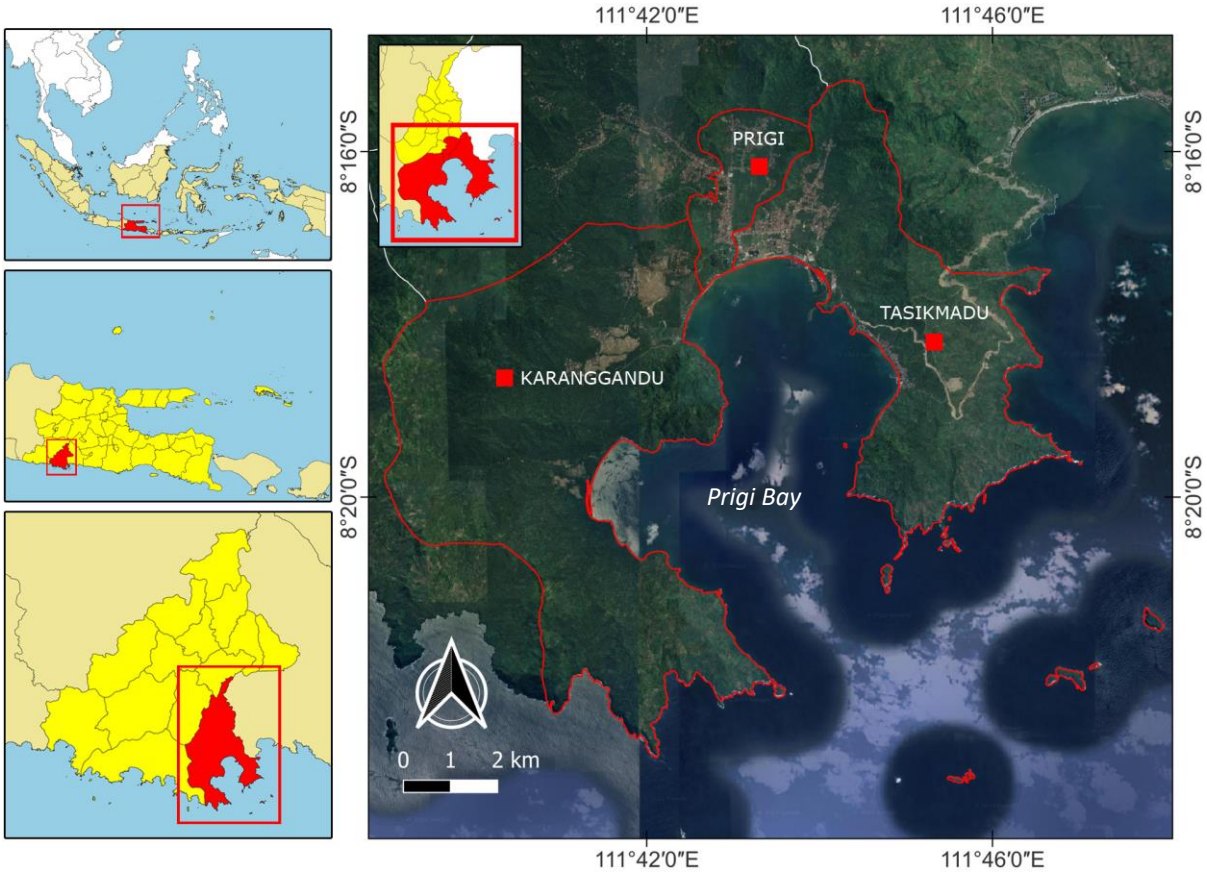

Figure 1. Map of the research location in the coastal area of Prigi Bay, Watulimo Sub-district, Trenggalek District, East Java, Indonesia

Data collection and analysis

A total of 60 respondents were obtained by purposive sampling, with residents with homegardens being preferred as informants. The purposive sampling technique is a technique of determining and taking samples determined by researchers with certain considerations (Maharani and Bernard, 2018). A direct survey gathered plant inventory. Data on the demographic structure of the respondents (Table 1) and the use of medicinal plants by each respondent were collected through a semi-structured interview using Indonesian and local languages (Javanese). Respondents are local residents of Tasikmadu, Prigi, and Karanggandu Villages aged 15 to 85 years. During the interview process and recording of conversations was carried out. The data obtained are several local names of medicinal plants, plant parts used, cured diseases, preparation methods, and consumption methods presented descriptively in tables and graphs, analyzed by frequency and percentage, and presented descriptively (Ammar et al. 2021). Plant species were identified using an online source (http://www.identify.plantnet.org/id).

RESULTS AND DISCUSSION

Respondents' profile

During the collected data, a total of 60 residents from three neighboring villages were interviewed. The data showed that females have more knowledge regarding using plants for herbal remedies than males (Table 1). In addition, women are more associated with domestic activities, such as preparing food materials, cooking, and farming in the homegarden. On the contrary, the male's role usually is correlated to doing things far from home, for example, working in an office and farming in the forest. Thus, females in this study site are more knowledgeable regarding traditional medicines. Mechaala et al. (2022) study result has been provided data that women were dominating the survey, but differ in Joshi et al. (2020) showed that herbal remedies familiarity was not correlated to gender.

Table 1 depicts the age range between 36 and 65 years old with profound knowledge of medicinal plants. The highest were people from 45 to 55 years old. Meanwhile, the younger (15-35 years old) and the oldest (66-more than 75 years old) have few references. The data indicated that people aged 45 to 55 were more associated with traditional plant-based medicine. Mechaala et al. (2022) research presented a similar result that mentioned communities from 40 to 50 years old were the most knowledgeable group during the survey. Less information the youth gains is an alarming sign that the local knowledge is not fully transferred to the next generation. Furthermore, it can widen the possibility of disappearing traditional knowledge about medicinal plants (Caballero-Serrano et al. 2019).

Diversity of medicinal plants

Based on the results of interviews, not all communities in Tasikmadu, Prigi, and Karanggandu villages grow medicinal plants in their home gardens. The majority of the population grows ornamental plants or food crops. They collect plants for medicinal ingredients by buying them from the market for practical reasons because the prices are relatively cheap and easy to obtain. This study shows that there are 59 species of medicinal plants from 32 families (Table 2, Figure 2). Zingiberaceae consists of the most significant proportion, consisting of 12 species. Acanthaceae follows it by four species; three species each belong to Asteraceae, Fabaceae, Myrtaceae, Piperaceae, and Poaceae; two species from Annonaceae, Melastomataceae, and Rutaceae; and one species each represents the remaining families. The highly frequent finding of Zingiberaceae was also proposed in the study conducted by Radha et al. (2022) in India, Silalahi et al. (2015), and Jadid et al. (2020) in Indonesia. In contrast, other studies mentioned that Asteraceae is the most widely-used family, such as research conducted by Arifah et al. (2022) in Indonesia, Birjees et al. (2022) in Pakistan, and Mechaala et al. (2022) in Algeria.

Species with the Zingiberaceae family were the most common species found in Tasikmadu, Prigi, and Karanggandu villages. The diversity of this family can be caused by various factors such as annual cycles, temperature, and rain (Jalil 2019). The characteristics of the research area, which are classified as tropical climates, are important points for the distribution of the Zingiberaceae family. The tropical climate makes Zingiberaceae easy to thrive, even with a low level of maintenance (Paramita et al. 2019). According to the direct survey, cultural influences such as tradition, local wisdom, and local knowledge also play a role in the use of medicinal plants in the research area. That is also in line with research conducted by Marwati and Amidi (2019), which shows that culture, perceptions, and beliefs influence people's use of herbal medicine.

Table 1. Respondents' profile (n = 60)

Parameter	Specification	Freq.	Percentage (%)
Gender	Male	24	40
	Female	36	60
Age	15-25	3	5
	26-35	6	10
	36-45	11	18.33
	46-55	21	35
	56-65	13	21.67
	66-75	5	8.33
	>75	1	1.67
Education	No education	2	3.33
	Elementary School	23	38.33
	Junior High School	9	15
	Senior High School	20	33.33
	University	6	10

Based on the interview results, *Zingiber officinale* is widely consumed as herbal medicine. The plant, traditionally known as ginger, is considered easy to thrive and does not need special treatment to grow or a large area of land. Because of these reasons, many locals choose to grow this spice in their homegarden in order to make it easier for them to pick it up when needed. In addition, ginger also has a variety of substances that are beneficial to the health of the human body. According to Syaputri et al. (2021), ginger contains 4.8 g of calories, 1.07 g of carbohydrates, 0.12 g of fiber, 0.11 g of protein, 0.05 g of fat, and 0.1 g of sugar. In addition, ginger also contains various vitamins and minerals that are beneficial to human health, as well as high antioxidants that are useful as an anti-inflammatory. Ginger is also useful in treating aches and overcoming nausea, headaches, rheumatism, coughs, colds, and other diseases (Aryanta 2019). The findings show that people in Tasikmadu, Prigi, and Karanggandu usually use ginger as a herbal drink or medicine. These findings align with research conducted by Hotimah et al. (2019), where many ginger plants are found in Banyior Village and are commonly used as basic ingredients for medicine. In addition, according to Azizah et al. (2019), the East Java region is one of the centers of ginger production in Indonesia and a supplier of about a third of the national ginger production. From 2011 to 2017, ginger production in Indonesia increased from 94,743 tons to 216,587 tons. This result follows the research managed by Caballero-Serrano et al. (2019) that presented a significant consumption of *Z. officinale* for treating several health problems in Amazon.

Subsequently, Acanthaceae is the second-largest family used in research areas for medicinal purposes. Some of the plants found such as *Ruellia tuberosa* (*kencana ungu liar*), *Andrographis paniculata* (*sambiloto*), *Strobilanthes crispus* (*keji beling*), dan *Graptophyllum pictum* (*tanaman ungu*). From those species mentioned. The *A. paniculata (Sambiloto*) is the most frequently consumed by the locals. Usually, it is consumed by mixing with other ingredients, such as curcuma and ginger, to give a warm sensation to the body and avoid influenza. The *A. paniculata* provides a variety of benefits for the body. Based on research conducted by Jadhav and Karuppayil (2021), it is stated that sambiloto can be an inhibitor to break down proteins from SARS-CoV-2 through molecular docking, target analysis, toxicity, and ADME prediction. *Sambiloto* also has a positive effect on other diseases such as Chikungunya Virus (CHIKV), Zikka virus, Human Papilloma Virus (HPV), and Hepatitis C virus. Considerable use of Acanthaceae members was also revealed by the research managed by Fongod et al. (2013) in Cameroon due to deeply correlation to the local culture.

Another family encountered in the research areas is Euphorbiaceae. The plant used is *Codiaeum variegatum* or *puring* (croton plants). People usually use this plant for traditional events, which are believed to be beneficial for health. The plant will be brewed with the andong plant or *Cordyline fruticosa* (Asparagaceae) and the fragrant pandan plant or *Pandanus amaryllifolius* (Pandanaceae). Locals believed that *C. variegatum* decoction could prevent influenza. Research has proven that *C. variegatum* has moderate oxidant content (Seri 2018). At the same time, *C. fruticosa* and *P. amaryllifolius* help to improve health. The mixed method in the preparation mode of *C. fruticosa* is also practiced in Hawaii, mostly to treat respiratory diseases (Lim 2015). This plant is quite interesting because, in general, *puring* and carriage plants are commonly used by the community as ornamental plants in the homegarden. This condition was also found in Mamek Village, Menyuke Sub-district, Landak District, Indonesia. The Kanayatn Dayak tribe utilizes *puring* plants as medicinal plants (Riadi et al. 2019). Croton plants have a variety of properties that are beneficial to health. The leaves of the *puring* plant are useful in curing stomach aches, toothaches and facilitating sweating. The roots and stems of the *puring* plant can be useful in preventing the venereal disease of the lion king (Yanti and Fitriani 2019; Meisia et al. 2020).

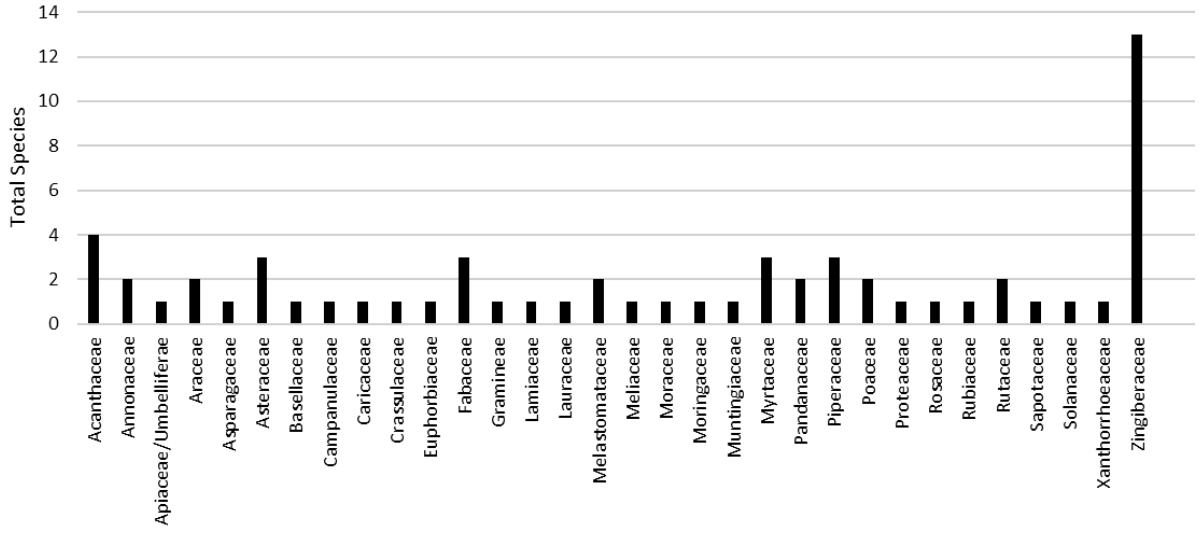

Figure 2. Family of plants used by the community in the villages of Tasikmadu, Prigi, and Karanggandu, Trenggalek, East Java, Indonesia

Table 2. Plants used as medicinal plants by people in Tasikmadu, Prigi, and Karanggandu Villages, Trenggalek, East Java, Indonesia

Family	Scientific name	Local name	Growth form	Part used	Preparation	Application methods	Disease
Acanthaceae	*Andrographis paniculata* (Burm. f.) Nees.	Sambiloto	Shrub	Leaf	Decoction	Oral	Flu
Acanthaceae	*Strobilanthes crispus* L.	Keji beling	Shrub	Leaf, flower, stem	Decoction	Oral	Kidney illness
Acanthaceae	*Graptophyllum pictum* (L.) Griff.	Daun ungu	Shrub	Leaf	Infused, Extracted	Oral	Inflammation, hemorrhoids, constipation
Acanthaceae	*Ruellia tuberosa* L.	Kencana ungu liar	Shrub	All part	Decoction	Oral	Diabetes, hypertension
Annonaceae	*Annona muricata* L.	Sirsak	Tree	Leaf	Decoction	Oral	Lymph node disease, hypertension
Annonaceae	*Annona squamosa* L.	Srikaya	Tree	Leaf	Decoction	Oral	Anticancer, hypertension, rheumatic
Apiaceae	*Cuminum cyminum* L.	Jinten	Shrub	Leaf	Decoction	Oral	Digestion, control of blood sugar, cholesterol
Acoraceae	*Acorus calamus* L.	Delingo	Herbaceous	Leaf	Decoction	Oral	Inflammation, fever
Araceae	*Typhonium flagelliforme* (Lodd.) Blume	Keladi tikus	Herbaceous	Leaf, rhizome	Crushed, decoction	Oral	Lung cancer
Asphodelaceae	*Aloe vera* (L.) Burm. f.	Lidah buaya	Herbaceous	Leaf	Extracted, crushed	Oral, smearing	Hair fertilizer, indigestion
Asteraceae	*Smallanthus sonchifolius* (Poepp.) H.Rob.	Insulin	Shrub	Leaf	Decoction	Oral	Diabetes
Asteraceae	*Elephantopus scaber* L.	Tapak liman	Herbaceous	Leaf	Boiled, decoction	Oral	Nephritis, edema, chest pain, fever, bladder stones, eczema, ulcers, prevent vomiting, anti-bacterial, anti-cancer
Asteraceae	*Pluchea indica* (L.) Less.	Luntas/beluntas	Shrub	Leaf	Raw, decoction	Oral	Body odor, hypertension
Basellaceae	*Anredera cordifolia* (Ten.) Steenis	Binahong	Climber	Leaf	Boiled, decoction	Oral, smearing	Inflammation heals wounds, accelerate the formation of collagen in the skin
Campanulaceae	*Isotoma longiflora* (L.) C.Presl	Gurah mata/kitolod	Herbaceous	Leaf	Decoction, infused	Dropping	Clean eyes, cataract
Caricaceae	*Carica papaya* L.	Pepaya	Tree	Flower, leaf	Raw, decoction	Oral, smearing	Low blood pressure, fever, increased breast milk supply
Crassulaceae	*Kalanchoe pinnata* (Lam.) Pers.	Cocor bebek	Herbaceous	Leaf	Decoction	Oral	Fertility
Euphorbiaceae	*Codiaeum variegatum* (L.) Rumph. ex A.Juss.	Puring	Shrub	Leaf	Decoction	Oral	Improve health
Fabaceae	*Erythrina subumbrans* (Hassk.) Merr.	Dadap serep	Shrub	Leaf	Crushed	Smearing	Fever
Fabaceae	*Caesalpinia sappan* L.	Secang	Tree	Bark	Infused	Oral	Pain reliever, control blood sugar
Fabaceae	*Tamarindus indica* L.	Asem Jawa	Tree	Fruit	Raw, decoction	Oral	Boost immunity, maintain liver health, heart disease
Lamiaceae	*Basilicum polystachyon* (L.) Moench	Sangket	Herbaceous	Leaf	Crushed	Smearing	Fever
Lauraceae	*Persea Americana* Mill.	Alpukat	Tree	Leaf	Decoction	Oral	Gout
Asparagaceae	*Cordyline fruticosa* (L) A. Chev.	Andong	Shrub	Leaf	Decoction	Oral	Improve health
Melastomataceae	*Medinilla speciosa* Blume	Pari joto	Shrub	Fruit	Raw, extracted	Oral	Increase breast milk supply, fertility
Melastomataceae	*Melastoma candidum* D. Don	Senggani	Shrub	Flower, leaf	Decoction, crushed	Oral, smearing	Pain reliever, swollen
Meliaceae	*Melia azedarach* L.	Mindi	Tree	Leaf	Decoction	Oral	Sore muscle

Moraceae	*Ficus elastic* Roxb. ex Hornem.	Karet tebu	Shrub	Leaf	Decoction	Oral	Stroke
Moringaceae	*Moringa oleifera* Lam.	Kelor	Tree	Leaf	Decoction	Oral	Cholesterol, hypertension, diabetes
Muntingiaceae	*Muntingia calabura* L.	Kersem	Tree	Leaf	Decoction	Oral	Gout arthritis
Myrtaceae	*Syzygium polyanthum* (Wight) Walp.	Salam	Tree	Leaf	Decoction	Oral	Cholesterol, hypertension, stomachache, flatulency
Myrtaceae	*Psidium guajava* L.	Jambu biji	Tree	Leaf, fruit	Decoction	Oral	Diarrhea
Myrtaceae	*Syzygium aromaticum* (L.) Merr. & L.M.Perry	Cengkeh	Tree	All part	Extracted, decoction	Oral, smearing	Digestive, reducing nausea, stomachache, diarrhea, chronic dysentery
Pandanaceae	*Pandanus amaryllifolius* Roxb.	Pandan	Shrub	Leaf	Decoction	Oral	Stomachache, diarrhea, improved health
Piperaceae	*Piper betle* L.	Sirih	Climber	Leaf	Raw, decoction	Medicinal bath	Nosebleed, itchy
Piperaceae	*Piper crocatum* Ruiz & Pav.	Sirih merah	Climber	Leaf	Boiled, decoction	Oral, smearing	Wound triggers collagen production
Piperaceae	*Piper retrofractum* Vahl	Cabai puyang	Climber	Fruit	Decoction	Oral	Fever, headache
Poaceae	*Cymbopogon citratus* (DC.) Stapf	Sereh	Herbaceous	Rhizome	Decoction	Oral	Detoxification
Poaceae	*Cymbopogon nardus* L. Rendle	Sereh merah	Herbaceous	Rhizome	Decoction	Oral	Immunity, increased hemoglobin
Poaceae	*Saccharum officinarum* L.	Tebu ireng	Herbaceous	Stem	Extracted	Oral, smearing	Analgesic, anti-inflammatory
Proteaceae	*Macadamia hildebrandii* Steenis	Maladewa	Tree	Leaf	Decoction	Oral	Eyes diseases
Rosaceae	*Prunus domestica* L.	Plum	Tree	Fruit	Raw	Oral	Constipation
Rubiaceae	*Morinda citrifolia* L.	Bentis/mengkudu/pace	Tree	Fruit	Decoction	Oral	Cough, hypertension, vertigo
Rutaceae	*Citrus aurantiifolia* (Christm.) Swingle	Jeruk nipis	Shrub	Fruit	Infused, squeezed	Oral	Immunity, digestion, cough
Rutaceae	*Citrus limon* (L.) Osbeck	Jeruk lemon	Shrub	Fruit	Infused, squeezed	Oral	Ulcer
Sapotaceae	*Manilkara zapota* L. P.Royen	Sawo	Tree	Fruit	Raw	Oral	Anti-inflammatory, anti-parasitic, anti-viral, anti-bacterial
Solanaceae	*Solanum torvum* Sw.	Terong pokak	Shrub	Fruit	Raw, boiled	Oral	Fight free radicals, gout
Zingiberaceae	*Alpinia galangal* (L.) Willd.	Lengkuas	Herbaceous	Rhizome	Crushed	Smearing	Skin diseases
Zingiberaceae	*Zingiber officinale* Rosc.	Jahe	Herbaceous	Rhizome	Decoction	Oral	Immunity, sore throat, cough
Zingiberaceae	*Kaempferia galangal* L.	Kencur	Herbaceous	Rhizome	Crushed, decoction	Oral, smearing	Sleep problems, cough, immune booster, diarrhea, stomachache
Zingiberaceae	*Curcuma longa* L.	Kunyit	Herbaceous	Rhizome	Decoction	Oral	Relieve stomach aches, immune booster, kidney health
Zingiberaceae	*Zingiber officinale* var. *rubrum* Theilade	Jahe merah	Herbaceous	Rhizome	Decoction	Oral	Immune booster
Zingiberaceae	*Zingiber cassumunar* Roxb.	Bangle	Herbaceous	Rhizome	Crushed	Smearing	Gout arthritis
Zingiberaceae	*Boesenbergia pandurata* (Roxb.) Schlecht	Kunci	Herbaceous	Rhizome	Decoction, boiled	Oral	Anti-inflammatory, relieves inflammation, sore throat
Zingiberaceae	*Amomum compactum* Sol. ex Maton	Kapulaga	Herbaceous	Rhizome	Decoction, boiled	Oral	Immune booster
Zingiberaceae	*Curcuma zanthorrhiza* Roxb.	Temulawak	Herbaceous	Rhizome	Infused, crushed	Oral	Immune booster, sore throat, fever, stomachache, internal disease
Zingiberaceae	*Curcuma aeruginosa* Roxb.	Temu ireng	Herbaceous	Rhizome	Decoction	Oral	Fever
Zingiberaceae	*Curcuma zedoaria* (Berg.) Roscoe	Kunyit putih/kunir putih	Herbaceous	Rhizome	Decoction, boiled	Oral	Immunity, indigestion, seizures, loss of appetite, flatulence, constipation
Zingiberaceae	*Zingiber zerumbet* (L.) Sm.	Puyang	Herbaceous	Rhizome	Decoction, boiled	Oral	Inflammation, anti-microbes, fever, joint pain, cancer, control blood sugar

Growth form and partly used of medicinal plant

Medicinal plants used by the community in Tasikmadu, Prigi, and Karanggandu villages have several kinds of habitus composition (Figure 3). Herbaceous was the most common habitus species with 22 species, followed by shrub and tree with 17 and 16 species, respectively. In contrast, climber plants are only represented by only 4 species. The results align with Fongod et al. (2013) and Susanti and Zuhud's (2019) experiments that also found the major use of herbaceous plants for medicinal purposes. The minimal utilization of climber plants in medicinal practices is also consistent with the study result in Nigeria (Lawal et al. 2010). However, climber plants such as betel are widely used as medicinal ingredients in various regions in Indonesia, such as in Bali, which is called *loloh* (Yuliana 2020; Sumarya 2021; 2022). In addition, betel leaf is widely cultivated as a medicinal plant that can effectively be an antifungal agent in India (Pawar et al. 2017).

Herbaceous is the most frequently consumed herbal plant by the locals in the research sites. Zingiberaceae is the most representative of this type of growth (12 species), also by Poaceae (3 species). The local inhabitants prefer to grow herbaceous plants in their homegarden than other grow. Herbaceous plants have multiple functions, mainly for daily edible plants. Due to this reason, people choose to grow herbaceous types to avoid long journeys when they need plants for cooking. Even though the herbaceous type could die if the growing season ended, it can thrive again because the remaining part underground is considered living tissue. Thus, that part able the plant to grow in the following season (Rahman et al. 2013). Another function of herbaceous is an ornamental plant. *Aloe vera* is one of the instances of both decorative and medicinal plants used in society. According to the respondents, it can be useful to maintain hair health and the digestive system by consuming regularly.

In addition to herbaceous plants, plants with the growth of shrubs and trees are also widely used as medicinal plants. They took a similar proportion of 27% and 29% for trees and shrubs, respectively. Acanthaceae and Rutaceae dominated the shrub type, while Myrtaceae made the biggest part in tree form. The dominant using tree and shrub growth had been mentioned in the previous study conducted in Ethiopia. However, the existence of those medicinal plants is threatened because of the agriculture extension (Assefa and Abebe 2014).

The review conducted in three villages showed that leaf was the most commonly applied, and rhizome was the second most popular part (Figure 4). The domination of leaf usage in ethnobotanical practices is also depicted in other studies, for instance, in a certain tribe in South Sulawesi (Azis et al. 2020). Furthermore, Ribeiro et al. (2017) and Xiong et al. (2020) depicted the popular utilization of leaves of medicinal plants in Brazil and China, respectively. In addition, Silalahi et al. (2015) explained that the leaf of medicinal plants was the highest sought in certain traditional markets in Indonesia.

Leaves as the most preferred part among the locals because they are easy to get and have been applied for many generations. Based on the research results from all the total medicinal plants found, the community utilizes the leaves of plants as much as 46% and rhizomes 24%. In contrast, other plant parts such as stems, fruit, flowers, or bark are only used on a small scale. A study by Aminah and Wardenaar (2016) also found that the most widely used body parts were leaves (32 species) and rhizomes (26 species) out of a total of 78 species used. Besides, the abundance of leaves per species becomes an additional factor in this preference (Suwardi et al. 2021). Locals believed that plant leaves contain numerous useful secondary metabolites for human well-being. This statement is strengthened by research by Kurnia et al. (2020) that *Psidium guajava* leaves contain flavonoids, tannins, alkaloids, and essential oils, which contain anti-bacterial tannins. Another research mentioned that *P. guajava* leaves have a higher anti-bacterial effect than other parties, such as flesh and peel (Zhang et al. 2018). Additionally, the leaves of *Kalanchoe pinnata* have antioxidant, analgesic, and anti-inflammatory properties (Saputra et al. 2018; Rezani et al. 2020). In this research, *P. guajava* leaves were consumed to heal diarrhea, while *K. pinnata* leaves functioned to cure infertility.

As the second-most frequently used part, communities usually consumed rhizomes from the Zingiberaceae family. Society in the research sites also makes herbal medicine from the rhizome of Araceae. *Typhonium flagelliforme*, locally called *keladi tikus*, has been recognized for lung cancer treatment. This fact has been proved by several studies that mention this species has anti-cancer properties to battle several kinds of cancer, including lung, liver, breast, colon, cervix, and leukemia (Sianipar et al. 2016).

Respondents who participated in this research stated that they use more than one part of herbal medicines in their practices. Although this system only took a small percentage of the total, it proves that society has recognized parts of herbal medicine they can use. A total of 3% of species consumed the whole plant (*R. tuberosa* and *Syzygium aromaticum*). Respondents prefer to utilize the entire part of *R. tuberosa* because this flowering plant has a shrub type of growth that makes the method possible. Although *S. aromaticum* belongs to tree plants, it gained much attention due to its enormous potential in the medical field. For instance, a high level of antioxidants is detected in the clove fruit and stem (Al Mashkor 2015). Indigenous people in Luhak Nan Duo also reported the entire plants' consumption, West Pasaman, Sumatra, Indonesia that consumed all parts of the wild grass plant as medicine, such as *Oxalis barrelieri*, *Oxalis corniculata*, and *Polygala paniculata* species as asthma medications (Rizki et al. 2019).

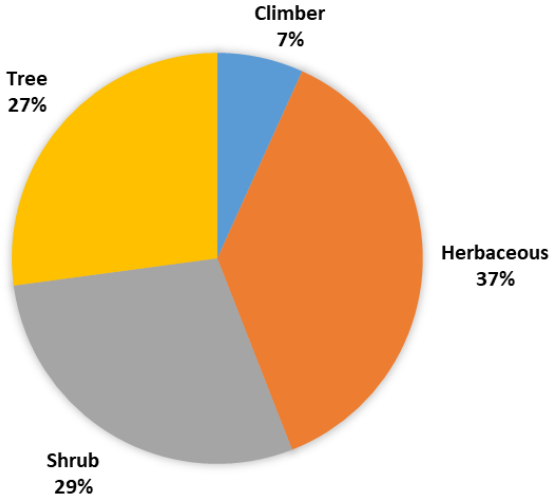

Figure 3. Types of plants used as medicinal plants by people in the villages of Tasikmadu, Prigi, and Karanggandu, Trenggalek, East Java, Indonesia

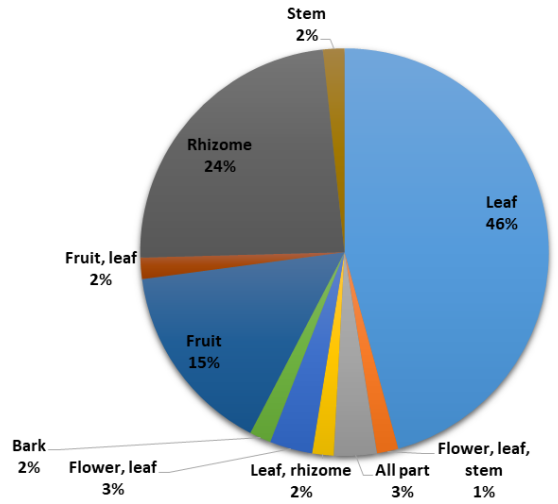

Figure 4. Plant parts used as medicinal plants by the community in Tasikmadu, Prigi, and Karanggandu Villages, Trenggalek, East Java, Indonesia

Method of preparation and application

Preparing methods for producing herbal medicines by the locals in the research locations are generally defined in seven ways. Those include boiled, crushed, decoction, extracted, infused, raw, and squeezed. Figure 5 shows that decoction was the most preferred mode of preparation. This preparation mode has been dominantly used in other studies, such as those mentioned by Suwardi et al. (2021), Birjees et al. (2022), and Jadid et al. (2022). In the method of preparation with a decoction, people apply it to several parts of the plant, such as leaves, rhizomes, fruit, stems, and flowers. There are even plants where all parts of the plant are boiled, such as cloves and wild purple gold. The plant parts are boiled to obtain boiled water and then drunk. Usually, they boil the plant materials with water and then add honey or brown sugar as flavor agents. The boiling water is then consumed regularly with a certain portion. Sometimes, a combination of several plants is used because it is believed to increase efficacy. Besides the practical reason, the major application of decoction is also strengthened by the popular belief that this mode can maintain the plant's active compound and remove the toxic ones (Chaachouay et al. 2022). Thus, the decoction way is to heal internal diseases.

The crushing method accounted for less than 10%, mostly for leaves and rhizomes. *Curcuma zanthorrhiza* rhizome is commonly crushed before infusing into the water, and it is believed can heal a sore throat. Regarding the leaves, they are usually crushed and then applied directly to the body. In this study, *Erythrina subumbrans*, *Basilicum polystachyon*, and *Melastoma candidum* leaves are commonly crushed to heal external illnesses. Even though fever does not belong to external pain, the society agreed that fever could be treated by placing the *E. subumbrans* on the forehead. The use of *E. subumbrans* leaves as a fever medicine is also carried out by the Balinese people. People usually use the leaves by grinding them until they are smooth and then applying them to the forehead, neck, and stomach. This treatment is repeated until the fever goes down (Pariata et al. 2022). The *E. subumbrans* leaves contain cooling, anti-inflammatory substances, and absorbing heat. According to Wahyuni and Maa'idah (2019) that *E. subumbrans* contains flavonoids, saponins, tannins, polyphenols, and alkaloids that make this plant have anti-inflammatory, antimicrobial, antipyretic, and antimalarial properties. The same result about *E. subumbrans* as a fever reliever has been mentioned by Fahmy et al. (2018).

Subsequently, oral admission is the most common way to consume medicinal plants (Figure 6). Internal intake domination is popular elsewhere, such as in Thailand and India (Inta et al. 2013; Radha et al. 2022). This way is suggested as the most effective way to treat diseases, mainly internal illness. In contrast, the rest mode of application is intended for external injuries. Medicinal bath was also identified during the interview as one of the least popular methods, along with the dropping mechanism (2%). *Piper betle* is used by many as a material for medicinal baths. This practice is believed could treat skin-related illnesses. This kind of disease also can be healed by *A. cordifolia* leaves. It can be applied both orally and using the smearing method (externally on the injured skin). Regarding the dropping method, *Isotoma longiflora* is widely used to treat eye illness by dropping the decoction water on the eyes. It could be hurt at first, but the effect can immediately emerge.

Treated disease

Numerous kinds of diseases could be healed by consuming plant medicines. Some illness groups include internal disease, reproductive system, digestive system, cardiovascular, respiratory, skeleton-muscular, dermatological, and other kinds of problems.

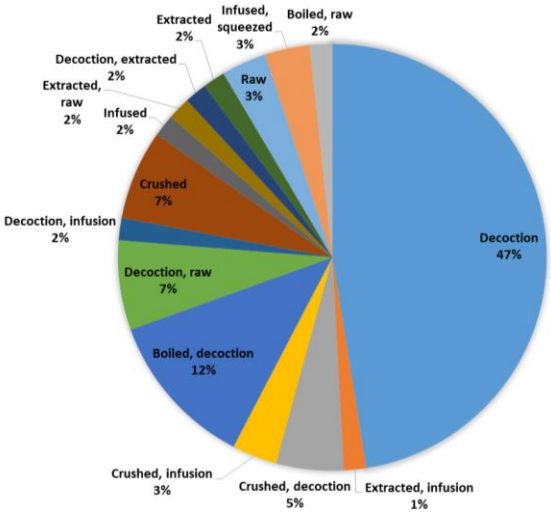

Figure 5. Methods of plant preparation used as medicinal plants by the community in the villages of Tasikmadu, Prigi, and Karanggandu, Trenggalek, East Java, Indonesia

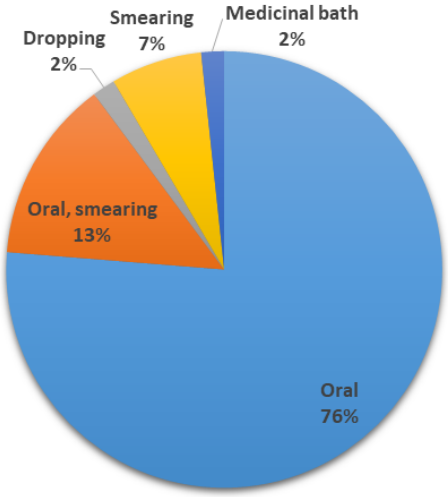

Figure 6. How to apply plants used as medicinal plants by the community in the villages of Tasikmadu, Prigi, and Karanggandu, Trenggalek, East Java, Indonesia

Regarding cardiovascular disease, several plants are used to relieve hypertension. However, according to Ariyanti et al. (2020), hypertension is a degenerative disease without symptoms, often referred to as the silent killer, so efforts and prevention of hypertension are needed. One of the efforts is to use garden plants as hypertension drugs, such as soursop leaves, bay leaves, moringa leaves, srikaya leaves, beluntas leaves, and wild purple golden plants. The process of processing these plants to be used as medicine is to boil and take the juice from the plant leaves and then drink the boiled water.

Lime, delingo, binahong, cumin, sapodilla, and cloves are frequently used for digestive problems. These plants use the fruit for lime and sapodilla plants and then take the extract or consume it directly. Then for delingo, binahong, and cumin by boiling the leaves of the plant and drinking the boiled water. Based on research conducted by Bhattarai (2020), 54 species can overcome digestive problems, and 6 species to treat inflammation.

Medicinal plants around the community homegarden are widely used to maintain immunity; the majority come from members of the Zingiberaceae family, which local people mostly use as cooking spices and traditional medicines. Among them are Zingiberaceae plants with immunosuppressant activity, such as *temu kunci*, cardamom, and *lempuyang*, as well as plants with immunosuppressant and immunostimulant activities, such as turmeric and ginger (Hidayah and Indradaji 2020).

In conclusion, 59 plant species from 32 families grown in homegarden in Tasikmadu, Prigi, and Karanggandu were utilized as medicinal plants. The locals used various parts of plants and methods of application while preparing the ingredients, with decoction being the most popular preparation technique. Younger generations in the study areas have less understanding about the kind of plants for medicinal purposes than the older ones because they find it less interesting to know and grow beneficial plants in their homegardens. Therefore, growing medicinal plants in homegarden help surpass the next generation's knowledge about types of plants that have medicinal usage and raises interest in growing useful plants.

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