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Ethnobotany of medicinal plants in homegarden of Menoreh Karst Area, Purworejo District, Indonesia

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Abstract. *Igustita, Fatikha LA, Astikasari L, Kusuma D, Nugraheni RS, Muryanto BS, Anshory DA, Hidayat S, Yasa A, Naim DM, Setyawan AD. 2023. Ethnobotany of medicinal plants in homegarden of Menoreh Karst Area, Purworejo District, Indonesia. Asian J Ethnobiol 6: 171-181.* Many medicinal plants can grow in karst areas, one of which is found in the Menoreh karst mountain area, southern of Central Java, Indonesia. Therefore, this research was conducted to determine the diversity and utilization of medicinal plants in the homegarden of the Menoreh Karst area, i.e. Donorejo Village, Purworejo District, Indonesia. The data was collected from plant inventory and interview activities. The plant inventory is carried out through direct house-to-house surveys to observe existing plants and then record and document each species of plant, while interviews were conducted primarily to determine its use as a medicinal ingredient. 46 respondents (households) were interviewed, mostly farmers (47.8%). The result showed that there were 55 species of plants from 34 families used to treat various diseases, such as wounds, digestive disorders, diarrhea, cold/flu, hypertension, etc. The most commonly treated disease is wounds (7 species). The plants commonly used were ginger, turmeric, and vanilla, while the mostly plant family used was Zingiberaceae (7 species and 1 variety). The tree (36%) and shrub (31%) were the most plant habitus used, and the leaves (49%) were the most part used. Most medicinal plants were boiled and then drunk. Almost all species used was cultivated plant (90%). Knowledge about medicinal plants passed down from generation to generation, through trial processes by ancestors, was still maintained. This research shows that homegardens are very important for public health, because of the diversity of plants and the diversity of diseases they can treat.

Keywords: Ethnobotany, homegarden, karst, medicinal plants, Menoreh

INTRODUCTION

Karst is a landscape with unique characteristics due to the karstification process in carbonate rock and limestone from water (Pertiwi et al. 2020), with an attractive morphology affecting available resources (Salawangi et al. 2021). The soil composition in the karst area is built from limestone fragments with low nutrients but high calcium and magnesium content, which results in the uniqueness of plants in the karst area (Suhendar et al. 2018). This uniqueness makes this area potentially have many underground water sources (Suprayogi et al. 2019) and a provider of plant diversity. The soil formation rate controls changes in the diversity of plant species in karst areas and soil moisture (Zhang et al. 2022), while mid and low-latitude karst areas are controlled by human intervention (Zhao et al. 2020). The Menoreh Karst Mountains are connected through three districts in Indonesia: Purworejo, Kulon Progo, and Magelang. The soils of the three districts combine limestone mountains lined up and covered by forests. The existence of forests with underground and surface river systems is a useful carrying capacity as a habitat for organisms and supports species diversity. Biodiversity in karst areas provides economic, ecological, educational, and cultural functions (Septiasari et al. 2021).

A home garden is a traditional house garden where land management combines various useful plants, livestock, and fisheries (Purnomo et al. 2019). The community grows various useful plants to fulfill their needs, including food, ornamental, and medicinal plants. According to Hong and Zimmerer (2022), the plants that dominate in their presence in the yard are food and medicinal plants. Utilization of the house's yard applies the concept of an agroecosystem where people grow plants to benefit from the surrounding environment. Apart from fulfilling daily needs, planting plants in the yard also helps to conserve natural resources (Naigaga et al. 2020). Geologically, parts of Donorejo Village, Kaligesing Sub-District, Indonesia are around the

Menoreh Mountains, part of the Jonggrangan Formation. The area around this formation used to have a cave community settlement with the Menoreh Mountains Area, primarily used as mixed gardens, rice fields, dry fields, and settlements (Kurniawan and Sadali 2018). The local community takes advantage of the condition of this area to grow various plants in their yards. Mudawaroch and Zulfanita (2020) report that this area was mountainous, with the most cultivated forest, including mangosteens and empon-empon.

Plants are still used as medicine to cure various diseases (Harefa 2020). The use of these plants is included in the category of ethnobotany with the specification of medicinal plants or ethnobotany medicine. Ethnobotany medicine introduces natural resources in an area using the traditions and traditional knowledge of the local community to determine interactions between the community and the surrounding environment, especially those related to plants as medicine (Najib 2020). People believe medicinal plants are useful for curing diseases but have few side effects. The community have obtained plants as medicine from the forest or plants them in their yards (Mulyani et al. 2020). Several medicinal plants that have been reported include *Mahkota Dewa,* used for its fruit as a fever remedy (Puspita et al. 2020), and *Ciplukan* (*Physalis angulata* L.), which affects flu healing, pharyngitis, coughs, respiratory disorders, mumps, high blood pressure, and diabetes (Tajidan et al. 2020). Community knowledge about medicinal plants needs to be documented so the data can develop to advance to other expertise. Various medicinal research has been developed modernly, where basic knowledge is obtained from traditional knowledge in the community. The benefits of medicinal plants could be one of the breakthroughs in drug discovery for previously unknown diseases. It is proven by research using medicinal plants for COVID-19 (Benarba and Pandiella 2020). Based on the existing phenomena, it is necessary to conduct similar research to benefit from using plants around. Thus, this research aims to determine the utilization and diversity of various medicinal plants in the home garden of the Menoreh Karst Area located in Donorejo Village, Purworejo, Indonesia.

MATERIALS AND METHODS

Study area

The research was held in Donorejo Village, Kaligesing Sub-district, Purworejo District, Central Java Province, Indonesia (Figure 1). The boundary of Donorejo Village to the north is Tlogoguwo Village, to the south is Jatirejo Village, to the west is Kaligono Village, and to the east is Kulon Progo District, Yogyakarta. The astronomical location of Donorejo Village is 7°46’24” S, 110°06’55” E with a regional structure in the form of a plateau with an altitude of 800 meters above sea level. Donorejo Village is part of the Menoreh Karst Mountains, which has endokarst in the caves and epikarst in the form of tower-type karst hills.

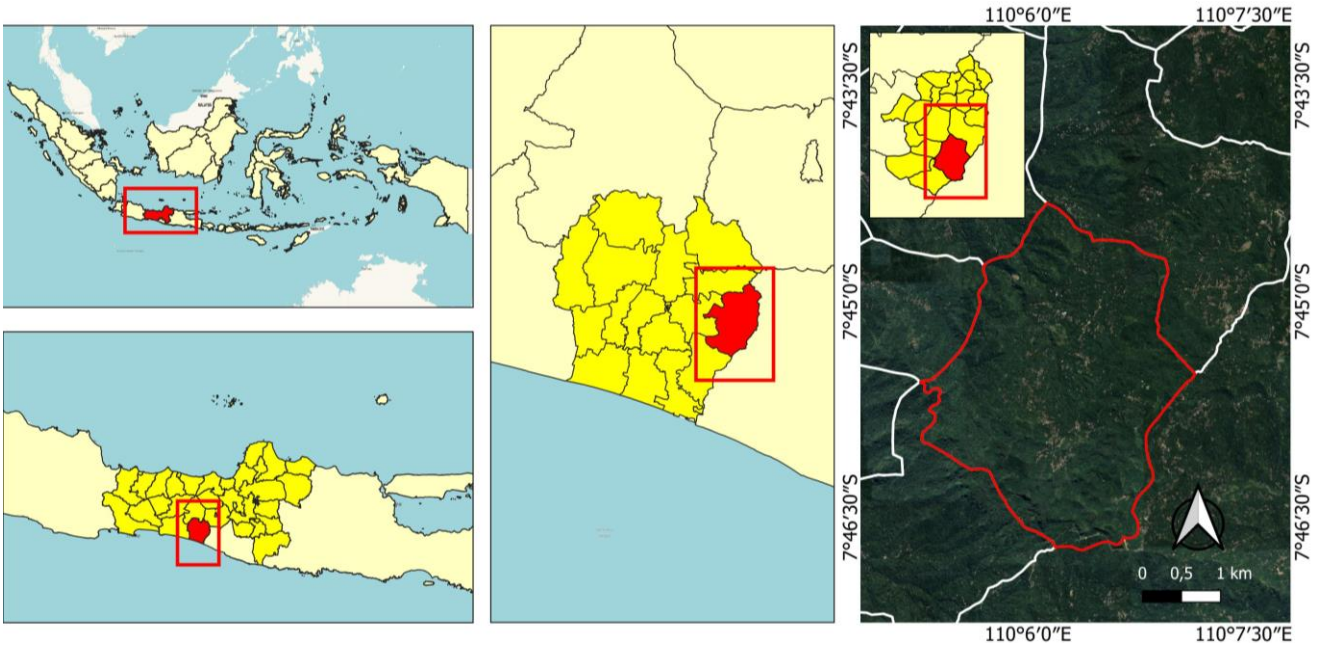

Figure 1. Map of the study area in Donorejo Village, Kaligesing Sub-district, Purworejo District, Central Java Province, Indonesia

Data collection and analysis

The data collected in this research was primary data derived from plant surveys and interview activities. Surveys were conducted to determine the diversity of medicinal plants, while interviews with a semi-structured system were conducted primarily to determine their use as medicinal ingredients, as well as local diversity and names. The interview technique applied was snowball sampling, with the target of the first informant being the Village Head (*Kepala Desa*) with 45 supporting respondents (*warga*) (each respondent representing one household), therefore 46 respondents were interviewed. The snowball sampling technique led researchers to find other respondents based on information provided by previous respondents (Siregar et al. 2021). Plant diversity was carried out through direct surveys from house-to-house to observe the presence of medicinal plants in homegarden (house's yard). Plants are recorded and documented for each species that grows in the community's homegarden for further identification using POWO (Plants of the World Online, https://powo.science.kew.org/).

Furthermore, research data was analyzed using qualitative methods (Andina et al. 2020) to explain the diversity of medicinal plants used in the community. The data shown as the results of this study are local plant names, scientific names, family groups, species, parts of plants used, properties, and consumption manner presented with a descriptive approach provided with tables and graphs and descriptive results.

RESULTS AND DISCUSSION

Respondent characteristic

In this study, 46 respondents (each representing one household) were found, with the oldest respondent aged 86-95 years (1 respondent) and the youngest respondent aged from 15 to 25 years (2 respondents). Young respondents (15-25 years) rarely use traditional medicine because technological advances have made healthcare facilities more modern and sophisticated (Naz et al. 2022). The majority of the gender of informants were women, with a total of 31 female informants (67.4%); it happens because a woman generally knows more about medicinal plants. On average, women often deal with home gardens and household needs such as kitchen needs, so they know about the benefits and efficacy of the medicinal plants used. However, the presence of male respondents also cannot be ruled out as being ignorant of medicinal plants. Several male respondents have knowledge of medicinal plants in their yards because they have experience using these plants to treat health.

Table 1 shows that the education level of the majority of respondents is in elementary school, with a percentage of 52.1%. It shows that the number of community education graduates in the Donorejo Village community is relatively low (Abidin 2019). According to Has et al. (2020), the large number of village people who have their last education at the elementary school level is affected by limitations in terms of facilities, infrastructure, and accessibility. The education level can affect respondents' knowledge regarding medicinal plant utilization. The interviews show respondents with a higher education level, such as universities, will provide more data on medicinal plants and their utilization. In this case, respondents with an education level up to elementary school will provide data on medicinal plants based only on their experience. They need some examples of medicinal plants and their benefits to name medicinal plants in their yards. Following Kusuma and Maida's (2022) research, the level of education attained affects the capabilities possessed, where the higher the educational attainment, the wider the mindset held will be. However, according to Utami et al. (2019), the level of education does not significantly affect knowledge about medicinal plants because their knowledge is obtained from ancestors.

Based on the research data (Table 1), it is known that most of the respondents are farmers, with a total of 47.8% (22 people). Therefore, farmers' contribution to using medicinal plants as an alternative to preserving medicinal plants is better (Utami et al. 2019). Apart from farmers, the majority of respondents work as housewives (41.3%), laborers (2.2%), village officials (2.2%), traders (4.3%), and students (2.2%).

Table 1. Respondent Characteristics of Donorejo Village, Kaligesing Sub-district, Purworejo District, Central Java Province, Indonesia

Variable	Count	Percentage
Age		
15-25	2	4,3%
26-35	9	19,6%
36-45	11	24%
46-55	12	26%
56-65	7	15,3%
66-75	2	4,3%
76-85	2	4,3%
86-95	1	2,2%
Gender		
Male	15	32,6%
Female	31	67,4%
Education		
Elementary	24	52,1%
Junior High School	10	21,7%
Senior High School	11	24,0%
University	1	2,2%
Profession		
Housewive	19	41,3%
Laborer	1	2,2%
Village official	1	2,2%
Farmer	22	47,8%
Trader	2	4,3%
Student	1	2,2%

Medicinal plant cultivation

Based on the interviews, we observed that 90% or 50 medicinal plant species found in the Donorejo village were plants that residents deliberately planted, while 10% or 5 other plants were naturally grown in the homegardens (Figure 2). As we know, Javanese *jamu* mostly used cultivated plants and not wild plants. The local community deliberately plants medicinal plants found in Donorejo Village because besides being ornamental plants for their yards, medicinal plants are also very beneficial for health and cooking spices (Pratiwi et al. 2018). Furthermore, according to Probowati et al. (2022), medicinal plants in homegarden can be used for emergencies and increase the body's immunity. Moreover, a homegarden, as the land around the house, has clear boundaries and ownership; this land has the potential to produce valuable crops. In addition to the garden aesthetic and production benefits, vegetable and medicinal plants support the medical needs of family members. These gardens also reap additional benefits; we follow a green lifestyle by planting gardens; we can start from home to overcome global warming trends.

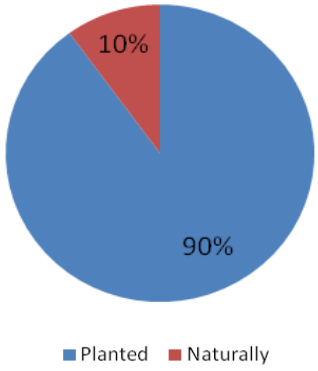

Figure 2. Comparison of medicinal plants planted and naturally in Donorejo Village, Purworejo, Indonesia

Diversity of medicinal plants

Based on surveys and interviews, there are 55 species of medicinal plant consisting of 34 families in Donorejo homegardens (Table 2). This result is higher than Nahdi and Kurniawan (2019) that found 46 species from 26 families in the homegarden's karst area of Planjan and Giricahyo Villages in Gunung Kidul District, and Ammar et al. (2021) that found 51 species from 29 families in the homegarden's karst area of Bungur and Tulakan Villages, Pacitan District, but lower than Agustina et al. (2022) that found 59 species from 32 families in homegarden of Tasikmadu, Prigi, and Karanggandu Villages, Trenggalek District which is a coastal karst area.

The most used medicinal plant family are Zingiberaceae (8 species) (Figure 3), including *Curcuma aeruginosa* (*temu ireng*), *C. heyneana* (*temu kuning*), *C. longa* (*kunir*, turmeric), *C. xanthorrhiza* (*temu lawak*), *Kaempferia galanga* (*kencur*, galangal), *Wurfbainia compacta* (*kapulaga*), *Zingiber montanum* (*bangle*), *Z. officinale* (*jahe*, ginger), and *Z. officinale* var. rubrum (*jahe merah*, red ginger) (Table 2). Zingiberaceae is also the most common homegarden medicinal plant found in the following studies. Ammar et al. (2021) found 6 species in Bungur and Tulakan (Pacitan), Nahdi and Kurniawan (2019) found 8 species in Planjan and Giricahyo (Gunung Kidul), even Agustina et al. (2022) found 12 species in Tasikmadu, Prigi, and Karanggandu (Trenggalek).

According to Rukmana and Zulkarnain (2022), Zingiberaceae is widely used as a food and medicinal plant worldwide. Members of this family are very popular herbs in many traditional medicinal systems, especially ginger rhizome. This plant has a long history of ethnobotanical use due to the antimicrobial properties derived from essential oils of rhizomes (Shahrajabian et al. 2019). For example, galangal, turmeric and ginger have been used extensively for decades; and are still used for traditional and medicinal purposes today, with easy access and low costs, allowing more people to benefit from this plant.

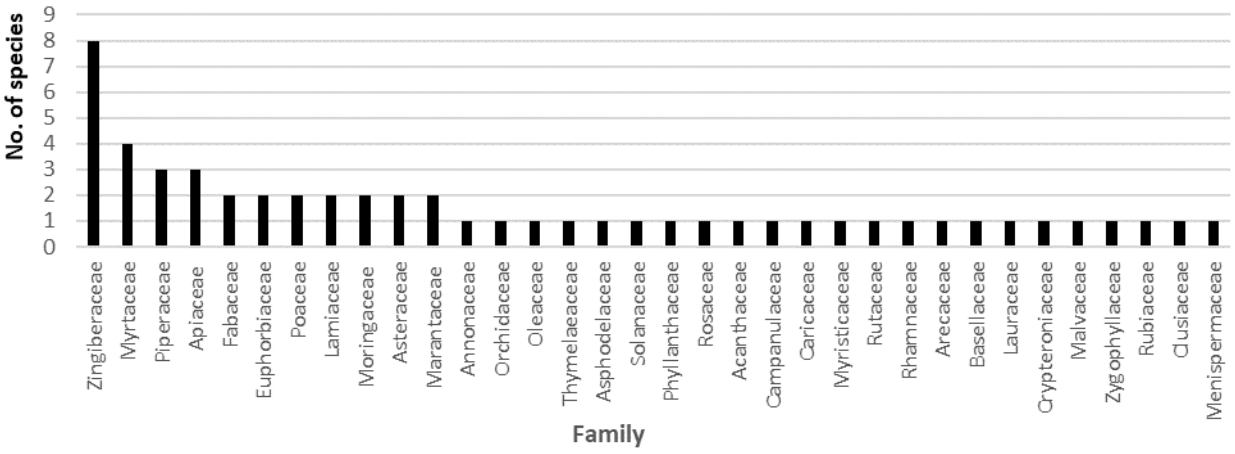

Figure 3. The plant family is used as a medicinal plant by the people of Donorejo Village, Kaligesing Sub-district, Purworejo District, Central Java Province, Indonesia

Table 2. Plants used as medicinal plants by people in Donorejo Village, Purworejo, Indonesia

Family	Scientific name	Local name	Growth form	Part used	Preparation	Application methods	Disease
Acanthaceae	*Strobilanthes crispa* L.	*Kenci beling*	Shrub	Leaves	Boiled	Drink	To help shed kidney stones
Annonaceae	*Annona muricata* L.	*Sirsak*	Tree	Leaves	Boiled	Drink	Cancer medicine
Apiaceae	*Carum carvi* L.	*Jinten*	Shrub	Leaves	Boiled	Drink	Body health
Apiaceae	*Centella asiatica* (L.) Urb.	*Pacul gowing*	Shrub	Leaves	Boiled and then mashed, smoothed	Pasted; rubbed	To reduce joint and bone inflammation, relieve fever, and toothache medicine.
Apiaceae	*Foeniculum vulgare* Mill.	*Adas*	Shrub	Leaves	Pounded	Smeared	Fever
Arecaceae	*Cocos nucifera* L.	*Kelapa*	Tree	Stem	-	Smeared	Wound medicine
Asphodelaceae	*Aloe vera* (L.) Burm. F.	*Lidah buaya*	Shrub	Sap	The sap is taken	Smeared	For medicine for fall scars
Asteraceae	*Ageratum conyzoides* L.	*Bandotan*	Shrub	Leaves	Crushed or boiled	Smeared on the wound	Diabetes medication and treating wounds
Asteraceae	*Gynura procumbens* (Lour.) Merr.	*Sambung nyawa*	Tree	Leaves	Boiled	Drink	Blood sugar medication
Basellaceae	*Anredera cordifolia* (Ten.) Steenis	*Binahong*	Climber	Leaves	Pounded	Smeared	Wound medicine
Campanulaceae	*Hippobroma longiflora* (L.) G. Don	*Bunga sandi*	Shrub	Leaves	Crush the dry leaves, then pour in the water	Dropped into the eye	Eye health and cataract eye medication
Caricaceae	*Carica papaya* L.	*Pepaya*	Tree	Leaves	Boiled	Drink	Stomachic
Clusiaceae	*Garcinia mangostana* L.	*Manggis*	Tree	Rind	Boiled	Drink	Medicine for diarrhea and intestinal infections
Crypteroniaceae	*Loranthus* L.	*Benalu*	Climber	Leaves	Boiled	Drink	Cancer and cyst medicine
Euphorbiaceae	*Euphorbia tithymaloides* L.	*Tulangan*	Tree	Stem	Boiled	Drink	Bone medicine
Euphorbiaceae	*Ricinus communis* L.	*Jarak tintir*	Tree	Sap	Apply directly to wound	Smeared	Wound medicine
Fabaceae	*Clitoria ternatea* L.	*Telang*	Climber	Flower	Dried then brewed	Drink	Increase blood circulation in the head, over-come hair loss, maintain a healthy scalp, and reduce the appearance of gray hair
Fabaceae	*Erythrina variegata* L.	*Dadap*	Tree	Leaves	Boiled	Drink	To reduce joint and bone inflammation
Fabaceae	*Mimosa pudica* L.	*Putri malu*	Shrub	Leaves	Boiled	Drink	Treating baby shock
Lamiaceae	*Coleus scutellarioides* (L.) Benth.	*Iler*	Shrub	Leaves	Boiled	Drink	Pregnant women
Lamiaceae	*Orthosiphon stamineus* Benth	*Sungut kucing*	Shrub	Leaves and Flower	Boiled	Drink	High blood pressure
Lauraceae	*Persea americana* Mill.	*Alpukat*	Tree	Leaves	Brewed	Drink	Hypertension
Malvaceae	*Hibiscus rosa-sinensis* L.	*Bunga sepatu*	Tree	Flower	Mixed with oranges	Drink	Weight loss drug
Marantaceae	*Maranta arundinacea* L.	*Garut*	Herbaceous	Tuber	Made flour	Eat	Stomachic
Menispermaceae	*Tinospora cordifolia* (Willd.) Miers	*Brotowali*	Climber	All parts	Cut into small pieces, mixed with other medicinal plants, then boiled	Drink	Lowers blood sugar levels
Moringaceae	*Moringa oleifera* Lam.	*Kelor*	Tree	Leaves	Boiled	Drink	For supplements, hypertension
Myristicaceae	*Myristica fragrans* Houtt.	*Pala*	Tree	Fruit	Boiled	Drink	Cold medicine
Myrtaceae	*Psidium guajava* L.	*Jambu biji*	Tree	Leaves	Mashed	Eat	Diarrhea medicine
Myrtaceae	*Syzgium aromaticum* (L.) Merr. & Perry	*Cengkeh*	Tree	Fruit	Made into herbal medicine	Drink	Diarrhea medicine and nauseous
Myrtaceae	*Syzygium aqueum* (Burm. F.) Alston	*Jambu air*	Tree	Leaves	Boiled	Drink	Ulcer medicine and diarrhea medicine
Myrtaceae	*Syzygium polyanthum* (Wight) Walp.	*Salam*	Shrub	Leaves	Boiled	Drink	Uric acid medication

Oleaceae	*Jasminum sambac* (L.) Aiton	*Melati*	Shrub	Flower	Brewed	Drink	Cough medicine
Orchidaceae	*Vanilla planifolia* Andrews	*Vanili*	Climber	Sap	-	Spotted or rubbed directly into the wound	Wound medicine
Phyllanthaceae	*Breynia androgyna* (L.) Chakrab. & N.P.Balakr.	*Katuk*	Tree	Leaves	Made vegetables	Eat	Pregnant women
Piperaceae	*Peperomia pellucida* (L.) Kunth	*Sirih cina*	Shrub	All parts	Grind it, take the juice, mix it with honey. For acne medicine, pure it	Drink and attach to wound	Reduce high fever and treat acne
Piperaceae	*Piper betle* L.	*Sirih*	Climber	Leaves	Boiled with water	Bathing	Feminine cleanser
Piperaceae	*Piper cubeba* L.fil.	*Kemukus*	Climber	Leaves	Boiled	Drink	Aches and pains medicine
Poaceae	*Chrysopogon zizanioides* (L.) Roberty	*Akar wangi*	Shrub	Root	Boiled	Drink	Treat rheumatic diseases and increase stamina
Poaceae	*Cymbopogon nardus* L. Rendle	*Sereh*	Herbaceous	Stem	Boiled	Bathing	Itching and massage
Rhamnaceae	*Ziziphus mauritiana* Lam.	*Bidara*	Tree	Leaves	Boiled	Rubbed into the wound	Wound medicine
Rosaceae	*Rosa x hybrida* Schleich. Ex W.D.J.Koch & Ziz	*Mawar*	Shrub	Flower and Leaves	Flowers and leaves are brewed using water and sugar	Drink	Cough medicine
Rubiaceae	*Morinda citrifolia* L.	*Mengkudu*	Tree	Leaves and Fruit	Boiled; brewed; blended	Drink	Hypertension
Rutaceae	*Citrus* × *aurantiifolia* (Christm.) Swingle	*Jeruk nipis*	Tree	Fruit	Brewed	Drink	Cold medicine
Solanaceae	*Physalis angulata* L.	*Ciplukan*	Shrub	All parts	Boiled	Drink; eat immediately	Gout and heart disease
Thymelaeaceae	*Phaleria macrocarpa* (Scheff) Boerl.	*Mahkota dewa*	Tree	Fruit	Dried then brewed	Drink	For itching
Zingiberaceae	*Curcuma aeruginosa* Roxb.	*Temu ireng*	Herbaceous	Tuber	Boiled	Drink	To treat worms and increase appetite
Zingiberaceae	*Curcuma heyneana* Valeton & Zijp	*Temu kuning*	Herbaceous	Tuber	Grated tuber	Smeared on the wound	Treating peeling wounds
Zingiberaceae	*Curcuma longa* L.	*Kunir*	Herbaceous	Tuber	Herbal medicine	Drink	*Padaran* (stomach ache medicine)
Zingiberaceae	*Curcuma xanthorrhiza* D.Dietr	*Temu lawak*	Herbaceous	Tuber	Herbal medicine	Drink	To increase appetite and for cancer
Zingiberaceae	*Kaempferia galanga* L.	*Kencur*	Herbaceous	Tuber	Crushed and then mixed with rice	Bandaged to the wound	Sprain medicine, cough medicine, and health medicine
Zingiberaceae	*Wurfbainia compacta* (Sol. Ex Maton) Skornick. & A.D.Poulsen	*Kapulaga*	Herbaceous	Fruit	Made into herbal medicine	Drink	Cold medicine
Zingiberaceae	*Zingiber montanum* (J.Koenig) Link ex A.Dietr	*Bangle*	Herbaceous	Leaves	Boiled	Drink	Convulsion medicine
Zingiberaceae	*Zingiber officinale* Roscoe	*Jahe*	Herbaceous	Tuber	Crushed, boiled with water, then filtered	Drink	Cold medicine
Zingiberaceae	*Zingiber officinale* var rubrum	*Jahe merah*	Herbaceous	Tuber	Boiled	Drink	Cold medicine (influenza)
Zygophyllaceae	*Tribulus terrestris* L.	*Sigar polo*	Shrub	Leaves	Boiled	Drink	Medicine for headache

The Donorejo Village people use medicinal plants, namely ginger (*Zingiber officinale*), which can be used in several ways as an ingredient in traditional medicines, culinary seasonings, and drinks. In Indonesia, ginger is divided into three varieties, i.e.: red ginger (*merah*, berem), big ginger (*gajah*, *badak*), and spicy little ginger (*sunti*, *emprit*). Ginger is an herbal medicine because its essential oils contain active ingredients such as curcumin, camphor, limonin, borneol, eucalyptol, and gingerol, which effectively treat and prevent various diseases (Setyawan 2002). Donorejo Village people usually use the ginger plant to treat colds, nausea, and body aches due to the flu. Ginger can reduce nausea (Li et al. 2019) and is known to have active anti-inflammatory, antioxidant (Aryanta 2019), and antibacterial compounds (Mao et al. 2019). Ginger also relieves body aches because it has an active anti-inflammatory compound namely gingerol (Balmaseda et al. 2020).

Furthermore, there is the turmeric plant (*Curcuma longa*), which the local community usually uses to treat inflammatory diseases. It helps increase endurance and relieve pain, which is useful for reducing menstrual pain. Turmeric is used in various manners, such as health care, cooking, and beauty. The yellow flesh of the turmeric plant is caused by curcumin, a bioactive component of secondary metabolites in turmeric. Curcumin has enormous therapeutic activity and potential, including anti-inflammatory, biological antioxidant, anticancer, antimutagenic, anti-coagulant, fertility, antidiabetic, antibacterial, antifungal, antiprotozoal, antiviral, antifibrotic, antivenom, antiulcer, antihypertensive, and hypocholesterolemia (Kusbiantoro 2018: Ansari et al. 2020: Srivastava et al. 2022).

On the other hand, lemongrass (*Cymbopogon nardus*), included in Poaceae, is usually used by the community to treat itching on the body and is often mixed with massage oil. This plant can manufacture essential oils because the parenchyma contains oil cells (glands). According to Murni and Rustin (2020) lemongrass contains citronellal, citronellol and geraniol. Moreover, lemongrass oil compounds in piperitone contain active anti-inflammatory, antioxidant, and antimicrobial compounds that can prevent microbial oxidation and decay (Mukarram et al. 2021), are aromatic (smelling pleasant), and have therapeutic properties. Many people use lemongrass for sore throats, headaches, colitis, stomach ulcers, gargles, colds, stomachaches, diarrhea, coughs, and salves for rheumatism and eczema.

Another plant, *jarak tintir* or jatropha (*Ricinus communis*), is often used by the local community to heal wounds, and the plant part used is the sap. According to Zaetun (2018), this Euphorbiaceae plant is commonly the main ingredient in traditional medicine for the *Labuapi* community from North Lombok, Indonesia, including seeds, roots, fruit, leaves, and sap. The sap produced from the jatropha plant is also widely used as an additional ingredient to treat skin wounds. This plant effectively accelerates wound healing (Bawotong et al. 2020) and helps blood clot due to its flavonoid content (Kujawska and Hirschmann 2022). Several studies have proven that this plant has antibacterial (Ivan et al. 2019) and anti-dengue compounds for the treatment of dengue fever (Yuniyanti et al. 2022).

The residents deliberately plant the medicinal plants *kapulaga* or cardamom (*Wurfbainia compacta*) and *vanili* or vanilla (*Vanilla planifolia*) for personal use and economic potential (Figure 4). *Kapulaga* is a spice generally used to add aroma and flavor to dishes. The part of *kapulaga* used for treatment is the fruit, where the fruit is processed and can be used as herbal medicine to treat colds. According to Yunitasari (2018), *kapulaga* seeds also help lower blood sugar levels. It is because *kapulaga* seeds contain compounds that have the potential to antidiabetics, namely phenolic compounds and flavonoids. In addition, it contains fat, protein, calcium oxalate, and citric acid, which have diuretic ingredients. Many studies show flavonoids have pharmacological effects such as protecting the heart, anti-oxidation, and diuresis (Husna et al. 2021).

On the other hand, besides being a flavor enhancer for food, *vanili* can also treat wounds. This plant contains ethanol (Sarak et al. 2021), which can play a role in wound healing because it has anti-inflammatory and antimicrobial properties. According to Costantini et al. (2021), a study of anti-inflammatory activity showed that *vanili* at higher doses was effective in the early phase of inflammation, which could be hypothesized due to the histamine and serotonin release inhibition responsible for the initial phase of inflammation; therefore, *vanili* shows its effectiveness by inhibiting histamine release. In addition, the antinociceptive effect of *vanili* is also important in wound healing by reducing pain or soreness (Ueno et al. 2019).

Growth form

The habitus of medicinal plants used by the people of Donorejo include climbers, trees, shrubs, and herbaceous (Figure 5). Plants with a tree habitus of 36%, followed by Shrubs with a percentage of 31%, herbs with 20%, and climber with 13%. Several trees found in Donorejo Village that can be used as medicinal plants include nutmeg, clove, avocado, noni, and coconut, with various benefits for treatment and are still often used. In addition, the local community often uses several shrub plants, including *iler* (*Coleus scutellarioides*), *adas* (*Foeniculum vulgare*), and *jinten* (*Carum carvi*), while herbaceous plants such as ginger, turmeric, *temulawak*, and vines such as *telang* (*Clitoria ternatea*), *benalu* (*Loranthus* sp.), and *binahong* (*Anredera cordifolia*). Not all medicinal plants used by residents come from homegardens, but some come from forest or forest gardens (agroforests) or even from the market. This result is different from Ammar et al. (2021) which states that the most commonly found habitat is bushes (35%), while according to Agustina et al. (2022), the most commonly found habitat is herbaceous (37%). This indicates that there is a tendency for differences in plant use at the three research locations.

Figure 4. A. *Vanili* plant (*Vanilla planifolia*) and B. *Kapulaga* plant (*Wurfbainia compacta*)

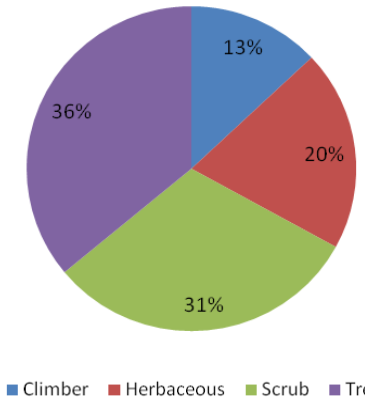

Figure 5. Medicinal plant habitus in Donorejo Village, Purworejo, Indonesia

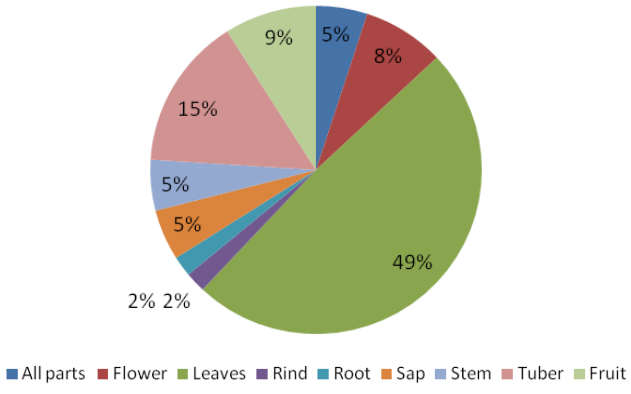

Figure 6. Parts of medicinal plants used in Donorejo Village, Purworejo, Indonesia

Part used, preparation and application methods

The plant part used for medicinal purposes varies depending on the species of plant to be used. In this study, the plant part commonly used for treatment is the leaf (49%) (Figure 6). This finding is in line with Ammar et al. (2021)(67% leaf) and Agustina et al. (2022)(46% leaf). Qasrin et al. (2020) reported that leaves are part of a medicinal plant that the Malays tribe in Sumatra island often uses in the Riau province because they contain beneficial substances compared to other plant parts. The leaves become medicinal because they are the plant part used for photosynthesis and have many valuable substances (Nurchayati and As'ari 2021). In addition, the leaves are one of the plants' easiest parts to use because they are easily accessible and will not cause death while picking. According to Helmina and Hidayah (2021), researching in Kampung Padang, Sukamara District, also stated that leaves are part of the medicinal plant that is often used because it has many benefits and is one of the easiest parts of the plant to process.

The local people of Donorejo Village utilized medicinal plants in various ways; most processed medicinal plants are boiled and then drunk. It is in line with research conducted in Kutalanggeng and Kutamaneuh Villages, Tegalwaru Sub-district, Karawang, which reported that 70% of medicinal plants were used by drinking because, according to the village community, drinking was the most effective way, boiling the medicinal plants was carried out before making medicinal plants as a drink (Gunarti et al. 2021). According to research by Haziki et al. (2021), medicinal plants processed by boiling are also conducted by people in the Setapuk Kecil Village, Singkawang, West Kalimantan and Pagar Ruyung Village, Lahat, South Sumatra (Rizal et al. 2021). Qasrin et al. (2020) also reported that the public believes medicinal plants that are processed by boiling to kill bacteria that live on these plants; most people will prefer to use medicinal plants by drinking. Therefore, most medicinal plants are processed by boiling with water, and the boiled water can be consumed directly as a drink.

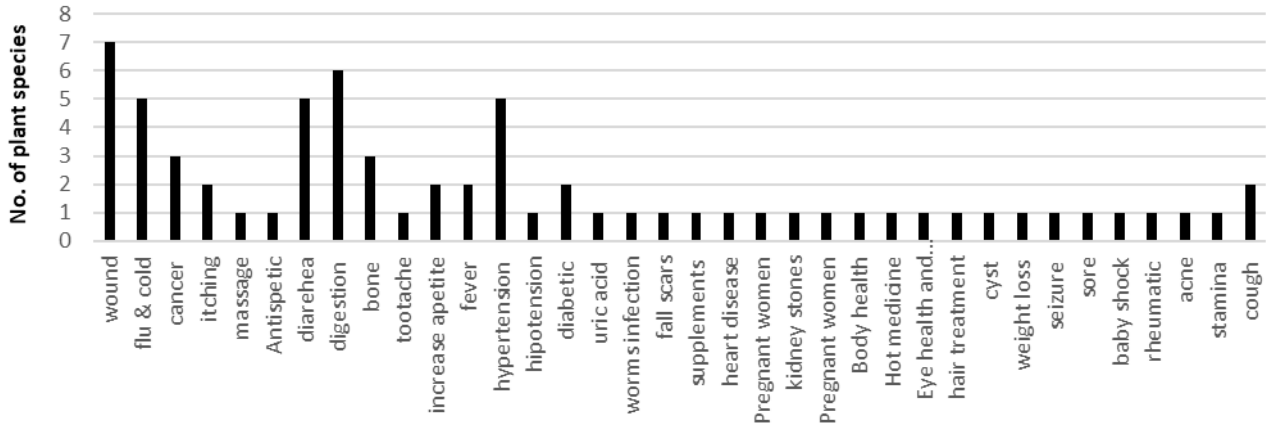

Figure 7. Disease treated using plants in Donorejo Village, Purworejo, Indonesia

An example of a medicinal plant processed by boiling is all parts of *ciplukan* plant (*P. angulata*) (roots, stems, trees, and fruit). This plant is processed by boiling the plant parts for use, and then the boiled water is consumed directly as a drink. In addition, the *ciplukan* fruit is also directly consumed for treatment like diabetes mellitus since the fruit contains antidiabetic activity (Raju and Estari 2015). Similar research was conducted by Afriyeni and Surya (2019), in which the *ciplukan* plant contains flavonoids and phenolic compounds, which are potential antioxidants. On the other hand, *kapulaga* (*W. compacta*) is also used by Donorejo Village people to cure colds; the fruit part will be processed as herbal medicine. Husna et al. (2021) also revealed that *kapulaga* fruit is used for fever, anti-asthma, stomach ulcers, antibacterial, deodorizing, and influenza. Apart from these plants is a *vanili* (*V. planifolia*), which the Donorejo Village people use to treat wounds. The part used is sap, which will be applied directly to the wound.

Diseases treated

People's knowledge about using plants as medicine has been passed down from generation to generation and is still maintained. People believe their traditional knowledge about medicinal plants has gone through a lengthy trial process by their ancestors. So, people still use these plants as medicine without any harmful effects as long as they are not consumed excessively. Several types of cured diseases also often occur in the surrounding community. The illness often treated using medicinal plants by the people around the Menoreh karst is wound (Figure 7). In healing wounds, 7 plants were used, namely *R. communis*, *V. planifolia*, *Ziziphus mauritiana*, *Cocos nucifera*, *Anredera cordifolia*, *Ageratum conyzoides*, and *Curcuma heyneana*. Some other diseases that are cured with many plants are cold/flu (6 species), diarrhoea (5 species), digestive disorders (5 species), and hypertension (5 species). The use of medicinal plants (or their derivatives) as wound medicine is well known, for example, Shedoeva et al. (2019) state 36 species are used for wound healing, Farahpour (2019) states 25 species, Albari et al. (2023) state 13 species. Many of these medicinal plants can be planted in the homegarden.

In conclusion, in the karst area of Donorejo Village, a wide variety of medicinal plant diversity has been identified, with 55 species belonging to 34 families. These medicinal plants include ginger, *jarak tintir*, *kapulaga*, and vanilla. The identification shows that the medicinal plant families' dominance in Donorejo Village is Zingiberaceae. Rural communities widely use the Zingiberaceae family as medicinal, where these medicinal plants include ginger and turmeric. In addition, the plant part mostly used as medicinal is the leaf because the leaf is a plant part that is relatively easy to process. The Donorejo Village people generally process plant parts used as medicinal by boiling them, and then the boiled water is consumed directly for drinking. Moreover, medicinal plants have been used to treat various diseases, such as wounds, digestive disorders, diarrhea, cold/flu, and hypertension.

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REFERENCES

Abidin Z. 2019. Pemanfaatan tanaman obat dalam mengatasi keluhan kesehatan pada kelompok tani tebu Jatiroto Lumajang. Indones J Health Sci 11 (1): 9-21. DOI: 10.32528/ijhs.v11i1.2233. [Indonesian]

Afriyeni H, Surya S. 2019. Efektivitas antihiperkolesterolemia ekstrak etanol dari bagian batang dan buah tumbuhan *Ciplukan* (*Physalis angulata* L.) pada tikus putih hiperkolesterolemia. Jurnal Farmasi Higea 11 (1): 49-61. DOI: 10.52689/higea.v11i1.211. [Indonesian]

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. DOI: 10.13057/biodiv/d231226

Albahri G, Badran A, Hijazi A, Daou A, Baydoun E, Nasser M, Merah O. 2023. The therapeutic wound healing bioactivities of various medicinal plants. Life (Basel) 13(2): 317. DOI: 10.3390/life13020317

Ammar LA, Kurniawati B, Anggorowati D, Cahyaningsih AP, Setyawan AD.2021. Ethnobotanical study of the medicinal plant used by local communities in karst area of Pacitan District, East Java, Indonesia. Intl J Trop Drylands 5: 84-93. DOI: 10.13057/tropdrylands/t050205.

Andina AN, Barokah S, Wulandari OAD, Girsang AA, Afifah RAN. 2020. Strategi pengembangan ekowisata hutan mangrove Pandansari Kabupaten Brebes untuk mengurangi kemiskinan. Syntax Literate: Jurnal Ilmiah Indonesia 5 (7): 251-261. DOI: 10.36418/syntax-literate.v5i7.1457. [Indonesian]

Ansari S, Jilani S, Abbasi H, Hashimi A, Ahmed Y, Khatoon R, Rifas AL. 2020. *Curcuma longa*: A treasure of medicinal properties. Cell Med 10 (2): 9.1-9.7. DOI: 10.5667/CellMed.2020.0009.

Aryanta IWR. 2019. Manfaat jahe untuk kesehatan. Widya Kesehatan 1 (2): 39-43. DOI: 10.32795/widyakesehatan.v1i2.463. [Indonesian]

Balmaseda DD, Vega ID, Larrosa M, Juan AFS, Issaly N, Pérez DM, Burgos S, Quintana MS, Gonzalez C, Bas A, Roller M, Ruiz MP. 2020. Effect of a blend of *Zingiber officinale* Roscoe and *Bixa orellana* L. herbal supplement on the recovery of delayed-onset muscle soreness induced by unaccustomed eccentric resistance training: A randomized, triple-blind, placebo-controlled trial. Front Physiol 11: 826. DOI: 10.3389/fphys.2020.00826.

Bawotong RA, Queljoe ED, Mpila DA. 2020. Uji efektivitas salep ekstrak daun jarak pagar (*Jatropha curcas* L.) terhadap penyembuhan luka sayat pada tikus putih jantan galur wistar (*Rattus norvegicus*). Pharmacon 9 (2): 284-293. DOI: 10.35799/pha.9.2020.29283.

Benarba B, A Pandiella. 2020. Medicinal plants as source of active molecules against Covid 19. Front Pharmacol 11 (1189): 1-16. DOI: 10.3389/fphar.2020.01189.

Costantini E, Sinjari B, Falasca K, Reale M, Caputi S, Jagarlapodii S, Murmura G. 2021. Assessment of the vanillin anti-inflammatory and regenerative potentials in inflamed primary human gingival fibroblast. Mediat Inflamm 2021: 5562340. DOI: 10.1155/2021/5562340.

Farahpour MZ. 2019. Medicinal plants in wound healing. In: Dogan KH (ed.) Wound Healing-Current Perspectives. IntechOpen, London. DOI: 10.5772/intechopen.80215

Gunarti NS, Fikayuniar L, Hidayat N. 2021. Studi etnobotani tumbuhan obat di Desa Kutalanggeng dan Kutamaneuh Kecamatan Tegalwaru Kabupaten Karawang Jawa Barat. Majalah Farmasetika 6 (1): 14-23. DOI: 10.24198/mfarmasetika.v6i0.36668. [Indonesian]

Harefa D. 2020. Pemanfaatan hasil tanaman sebagai Tanaman Obat Keluarga (TOGA). Madani Indones J Civil Soc 2 (2): 28-36. DOI: 10.35970/madani.v2i2.233. [Indonesian]

Has DH, Zuhud EAM, Hikmat A. 2020. Etnobotani obat pada masyarakat suku penguluh di KPHP Limau Unit VII Hulu Sarolangun, Jambi. Media Konservasi 25 (1): 73-80. DOI: 10.29244/medkon.25.1.73-80. [Indonesian]

Haziki, Syamswisna, Wahyuni ES. 2021. Studi etnobotani tumbuhan obat tradisional oleh masyarakat di Kelurahan Setapuk Kecil Singkawang. Biocelebes 15 (1): 76-86. DOI: 10.22487/bioceb.v15i1.15471. [Indonesian]

Helmina S, Hidayah Y. 2021. Kajian etnobotani tumbuhan obat tradisional oleh masyarakat Kampung Padang Kecamatan Sukamara Kabupaten Sukamara. Jurnal Pendidikan Hayati 7 (1): 20-28. [Indonesian]

Hong Y, Zimmerer KS. 2022. Useful plants from the wild to home garden: An analysis of home garden ethnobotany in context of habitat conversion and land use change in Jeju, South Korea. J Ethnobiol 42 (3): 1-21. DOI: 10.2993/0278-0771-42.3.6.

Husna N, Handayani R, Zakiah N, Aulianshah V. 2021. Efek diuretik ekstrak etanol *Kapulaga* (*Amomum compactum*) pada mencit (*Mus musculus*) jantan. Jurnal Ilmiah Simplisia 1 (2): 112-118. [Indonesian]

Ivan I, Sudigdoadi S, Kartamihardja AHS. 2019. Antibacterial effect of *Jatropha multifida* L. leaf infusion towards *Staphylococcus aureus* and *Pseudomonas aeruginosa*. Althea Med J 6 (2): 95-99. DOI: 10.15850/amj.v6n2.1622.

Kujawska M, Hirschmann GS. 2022. The use of medicinal plants by Paraguayan migrants in the Atlantic Forest of Misiones, Argentina, is based on Guarani tradition, colonial, and current plant knowledge. J Ethnopharmacol 283: 114702. DOI: 10.1016/j.jep.2021.114702.

Kurniawan A, Sadali MI. 2018. Keistimewaan Lingkungan Daerah Istimewa Yogyakarta. Universitas Gajah Mada Press, Yogyakarta. [Indonesian]

Kusbiantoro D. 2018. Pemanfaatan kandungan metabolit sekunder pada tanaman kunyit dalam mendukung peningkatan pendapatan masyarakat. Kultivasi 17 (1): 544-549. DOI: 10.24198/kultivasi.v17i1.15669. [Indonesian]

Kusuma PO, Maida S. 2022. Hubungan karakteristik dengan pengetahuan masyarakat mengenai pemanfaatan TOGA di Kelurahan Cileungsi Kidul. Jurnal Kefarmasian 9: 10-19. DOI: 10.56319/bhj.v9i1.24. [Indonesian]

Li H, Liu Y, Luo D, Ma Y, Zhang J, Li M, Yao L, Shi X, Liu X, Yang K. 2019. Ginger for health care: An overview of systematic reviews. Complement Ther Med 45: 114-123. DOI: 10.1016/j.ctim.2019.06.002.

Mao QQ, Xu XY, Cao SY, Gan RY, Corke H, Beta T, Li H.B. 2019. Bioactive compounds and bioactivities of ginger (*Zingiber officinale* Roscoe). Foods 8 (6): 185-206. DOI: 0.3390/foods8060185.

Mudawaroch RE, Zulfanita. 2020. Evaluasi pelatihan pembuatan jamu ternak fermentasi. Jurnal Masyarakat Mandiri 4 (5): 930-939. DOI: 10.31764/jmm.v4i5.3066. [Indonesian]

Mukarram M, Sadaf C, Mo AK, Palmiro P. 2021. Lemongrass essential oil components with antimicrobial and anticancer activities. Antioxidants (Basel) 11 (1): 20. DOI: 10.3390/antiox11010020.

Mulyani Y, Sumarna R, Patonah. 2020. Kajian etnofarmakologi pemanfaatan tanaman obat oleh masyarakat di Kecamatan Dawuan Kabupaten Subang Provinsi Jawa Barat. Jurnal Farmasi Galenika 6 (1): 37-54. DOI: 10.22487/j24428744.2020.v6.i1.13572. [Indonesian]

Murni M, Rustin L. 2020. Karakteristik kandungan minyak atsiri tanaman sereh wangi (*Cymbopogon nardus* L.). Prosiding Seminar Nasional Biologi 6 (1): 227-231. DOI: 10.24252/psb.v6i1.15835. [Indonesian]

Nahdi MS, Kurniawan AP. 2019. Ethnobotanical studyof medicinal plants inkarst environment in Gunung Kidul, Yogyakarta, Indonesia. Nusantara Biosci 11: 133-141. DOI: 10.13057/nusbiosci/n110204.

Naigaga H, Joseph S, Ablye N, Godfrey S, Mame SM, Kandioura N. 2020. Ethnobotanical knowledge of home garden plant species and its effect on home garden plant diversity in Thies region of Senegal. Environ Dev Sustain 23: 7524-7536. DOI: 10.1007/s10668-020-00930-8.

Najib NN. 2020. Kajian etnobotani masyarakat sekitar Kawasan Taman Nasional Bantimurung Bulusaraung. Journal TABARO 4 (1): 1-8. DOI: 10.35914/tabaro.v4i1.352. [Indonesian]

Naz A, Amjad MS, Umair M, Altaf M, Ni J. 2022. Medicinal plants used as therapeutic medicine in the Himalayan region of Azad Jammu and Kashmir. South Afr J Bot 150: 194-216. DOI: 10.1016/j.sajb.2022.07.007.

Nurchayati N, As'ari H. 2021. Studi inventarisasi ragam tanaman obat keluarga di Dusun Umbulrejo Desa Bagorejo Kecamatan Srono Kabupaten Banyuwangi. Biosense 4 (1): 1-10. DOI: 10.36526/biosense.v4i01.1426. [Indonesian]

Pertiwi W, Bahri S, Rokhim S, Firdhausi NF. 2020. Keanekaragaman dan kemerataan jenis *Collembola* gua di Kawasan Karst Malang Selatan. Biotropic J Trop Biol 4 (2): 134-139. DOI: 10.29080/biotropic.2020.4.2.134-139. [Indonesian]

Pratiwi R, Saputri FA, Nuwarda RF. 2018. Tingkat pengetahuan dan penggunaan obat tradisional di masyarakat: Studi pendahuluan pada masyarakat di Desa Hegarmanah, Jatinangor, Sumedang. Dharmakarya 7 (2): 97-100. DOI: 10.24198/dharmakarya.v7i2.19295. [Indonesian]

Probowati W, Fuad GT, Sunartiyah. 2022. Tangguh hadapi Covid-19 dengan budidaya tanaman obat keluarga di Desa Margomulyo, Seyegan, Sleman. PengabdianMu Jurnal Ilmiah Pengabdian kepada Masyarakat 7 (1): 245-251. DOI: 10.33084/pengabdianmu.v7iSpecial-1.2692. [Indonesian]

Purnomo, Batoro J, Hakim A. 2019. Ethnobotany home garden in Puspa Jagad Tourism ecology area. J Indones Tour Dev Stud 7 (1): 50-55. DOI: 10.21776/ub.jitode.2019.07.01.08.

Puspita D, Notosoedarmo S, Fauzi MR. 2020. Studi etnobotani di Kawasan Karst Bukit Bulan untuk mendukung studi arkeologi. J Nat Resour Environ Manag 10 (2): 270-283. DOI: 10.29244/jpsl.10.2.270-283. [Indonesian]

Qasrin U, Setiawan A, Yulianti, Bintoro A. 2020. Studi etnobotani tumbuhan berkhasiat obat yang dimanfaatkan masyarakat suku Melayu Kabupaten Lingga Kepulauan Riau. Jurnal Belantara 3 (2): 139-152. DOI: 10.29303/jbl.v3i2.507. [Indonesian]

Raju P, Estari M. 2015. Antidiabetic activity of compound isolated from *Physalis angulata* fruit extract in alloxan-induced diabetic rats. Am J Sci Med Res 1 (1): 40-43. DOI: 10.17812/ajsmr2015111.

Rizal S, Kartika T, Septia GA. 2021. Studi etnobotani tumbuhan obat di Desa Pagar Ruyung Kecamatan Kota Agung Kabupaten Lahat Sumatera Selatan. Sainmatika Jurnal Ilmiah Matematika dan Ilmu Pengetahuan Alam 18 (2): 222-230. DOI: 10.31851/sainmatika.v18i2.6618. [Indonesian]

Rukmana R, Zulkarnain. 2022. Etnobotani tanaman obat famili Zingiberaceae sebagai bahan herbal untuk kesehatan di masa pandemi Covid 19. Media Informasi Sains dan Teknologi 16 (1): 74-80. DOI: 10.24252/teknosains.v16i1.25970. [Indonesian]

Salawangi R, Arif AKD, Djainal H. 2021. Studi geomorfologi kawasan bentang alam karst di Desa Sagea Kecamatan Weda Utara Kabupaten Halmahera Tengah. Jurnal Teknik 14 (2): 77-81. [Indonesian]

Sarak AS, Dawane JS, Pandi VA. 2021. Experimental evaluation of anti-inflammatory effect of ethanolic extract of *Vanilla planifolia* seeds in Wistar rats. Natl J Physiol Pharm Pharmacol 12 (7): 937-942. DOI: 10.5455/njppp.2022.12.12433202107122021.

Septiasari A, Balgis M, Lathifah MN, Hanugroho PD, Setyawan AD. 2021. Identification and potential of vascular plants in the karst ecosystem of Somopuro Cave, Pacitan, East Java, Indonesia. Intl J Trop Drylands 5: 75-83. DOI: 10.13057/tropdrylands/t050204.

Setyawan AD. 2002. Keragaman varietas jahe (*Zingiber officinale* Rosc.) berdasarkan kandungan kimia minyak atsiri. BioSMART. 4 (2): 48-54. [Indonesian]

Shahrajabian MH, Wenli S, Qi C. 2019. Clinical aspects and healyh benefits of ginger (*Zingiber officinale*) in both traditional Chinese medicine and modern industry. Acta Agric Scand 69 (6) : 546-556. DOI: 10.1080/09064710.2019.1606930.

Shedoeva A, Leavesley D, Upton Z, Fan C. 2019. Healing and the use of medicinal plants. Evid-Based Compl Altern Med 2019: 2684108. DOI: 10.1155/2019/2684108

Siregar MRA, Perawati S, Andriani L. 2021. Etnofarmakognosi pada Suku Anak Dalam di Desa Hajran Kecamatan Bathin Xxiv Kabupaten Batanghari. J Healthc Technol Med 6 (1): 215-220.

Srivastava BBL, Ripanda AS, Mwanga HM. 2022. Ethnomedicinal, phytochemistry and antiviral potential of turmeric (*Curcuma longa*). Compounds 2 (3): 200-221. DOI: 10.3390/compounds2030017.

Suhendar AS, Yani E, Widodo P. 2018. Analisis vegetasi kawasan karst Gombong Selatan Kebumen Jawa Tengah. Scr Biol 5 (1): 37-40. DOI: 10.20884/1.sb.2018.5.1.639. [Indonesian]

Suprayogi TD, Nengse S, Hakim A. 2019. Analisis kualitas air sungai bawah tanah Gua Ngerong, Kecamatan Rengel, Tuban. Jurnal Teknik Lingkungan 5 (1): 45-53. DOI: 10.29080/alard.v5i1.748. [Indonesian]

Tajidan, Sahidu A, Suparmin. 2020. Penyuluhan pemanfaatan buah *Ciplukan* sebagai bahan makanan sehat melalui metode jaga jarak fisik akibat wabah Covid 19. Jurnal Gama Ngabdi 2 (2): 139-146. DOI: 10.29303/jgn.v2i2.85. [Indonesian]

Ueno H, Shimada A, Suemitsu S, Murakami S, Kitamura N, Wani K, Takahasi Y, Matsumoto Y, Okamoto M, Fujiwara Y, Ishihara I. 2019. Comprehensive behavioral study of the effects of vanillin inhalation in mice. Biomed Pharmacother 115: 108879. DOI: 10.1016/j.biopha.2019.108879.

Utami RD, Zuhud EAM, Hikmat A. 2019. Medicinal ethnobotany and potential of medicine plants of Anak Rawa ethnic at The Penyengat Village Sungai Apit Siak Riau. Media Konservasi 24 (1): 40-51. DOI: 10.29244/medkon.24.1.40-51. [Indonesian]

Yunitasari N. 2018. Pemanfaatan daun pandan wangi, jahe, dan biji *Kapulaga* sebagai minuman teh untuk obat herbal antidiabetes. UNES J Sci Technol Res 3 (2): 197-203. [Indonesian]

Yuniyanti MM, Nugrahaningsih DA, Wahyuningsih MSH. 2022. Phytochemical screening and antidengue activity of *Jatropha multifida* extract against DENV-2. Majalah Obat Tradisional 27 (1): 75-82. DOI: 10.22146/mot.73368.

Zaetun S. 2018. Daya hambat getah tanaman *Jarak Tintir* (*Jatropha multifida* Linn) terhadap proses penyembuhan luka di tinjau dari hasil pemeriksaan Cloting TIME. Jurnal Kesehatan Prima 8 (2): 1308-1315. DOI: 10.32807/jkp.v8i2.52. [Indonesian]

Zhang S, Baia X, Zhao C, Tan Q, Luo G, Caoa Y, Deng Y, Lia Q, Li C, Wua L, Wang J, Chen F, Xi H, Ran C, Liu M. 2022. Limitations of soil moisture and formation rate on vegetation growth in karst areas. Sci Total Environ 810 (1): 151209. DOI: 10.1016/j.scitotenv.2021.151209.

Zhao S, Pereira P, Wu X, Zhou J, Cao J, Zhang W. 2020. Global karst vegetation regime and its response to climate change and human activities. Ecol Indic 113: 110-121. DOI: 10.1016/j.ecolind.2020.106208.