JPPIPA 10(11) (2024)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Weeds Ethnobotanical Studies: Use of Midicinal Plant as A Self-Medication by The Community of Bayan Traditional Village, North Lombok District, West Nusa Tenggara

Nihla Farida[1*], I Ketut Ngawit[1], Ahmad Jupri[2]

[1]Program Studi Agroekoteknologi, Fakultas Pertanian, Universitas Mataram, Mataram, Indonesia.
[2]Program Stidi Biologi, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Mataram, Mataram, Indonesia.

Received: February 14, 2024
Revised: July 23, 2024
Accepted: November 25, 2024
Published: November 30, 2024

Corresponding Author:
Nihla Farida
nihla.farida@unram.ac.id

DOI: 10.29303/jppipa.v10i11.7231

Abstract: The study aimed to describe and inventory the diversity of medicinal plant species used by the people of Bayan traditional village. The study used descriptive methods and data collection using survey techniques and semi-structured interviews. The survey location was determined by random sampling in the yards of the Sasak, Balinese, and Javanese tribes, each with three sampling points. Parameters observed were population characteristics, morphology, and how to use medicinal plants. The results showed that medicinal plants were found in the yards of the Javanese tribe in 50 species with 1197 individuals, the Balinese tribe in 47 species with 974 individuals, and the Sasak tribe in 35 species with 548 individuals. The dominant species with the highest abundance index were star gooseberry, agathi, turmeric, ginger, white tumeric, halviva, cat's whiskers, and noni. The medicinal plant species found have been used to treat 28 kinds of diseases. The form of plant life that is widely used for medicine is herbaceous. The part of the plant organ that is most widely used for traditional medicine raw materials is the leaf. The most common way to process medicinal plants is by boiling them, then drinking boiled water, finely grinding them, and drinking the juice.

Keywords: Diversity; Ethno-botany; Evenness; Symplasia; Traditional medicine

Introduction

Bayan Traditional Village, North Lombok Regency, West Nusa Tenggara, still intends to implement entobotany, namely utilizing surrounding plants for food, medicine and animal feed. This traditional village is mostly a buffer zone for Mount Rinjani National Park. So that it is included in the tourist village that continues to develop the potential of customs, culture and traditions that have been owned as ancestral heritage. One of them is the use of plants for traditional medicine from generation to generation (Ngawit & Farida, 2022). Ethnobotany is knowledge that comes from local wisdom regarding the reciprocal relationship between humans and plants in an effort to meet basic life needs including health needs based on customary customs that have been believed in for generations (Al-Hakim et al., 2021; Behl et al., 2020). Traditional medicine is a concoction that comes from natural ingredients and/or galenical preparations that do not yet have clinical data and are used in treatment efforts based on experience (Kusuma et al., 2023). Simplasia is a dried natural material used for treatment and has not undergone any processing (Adiyasa & Meiyanti, 2021).

Products in fresh form, can be in the form of extract preparations from squeezed juice, tincture or liquid extract and oil macerate are referred to as

How to Cite:
Farida, N., Ngawit, I. K., & Jupri, A. (2024). Weeds Ethnobotanical Studies: Use of Midicinal Plant as A Self-Medication by The Community of Bayan Traditional Village, North Lombok District, West Nusa Tenggara. *Jurnal Penelitian Pendidikan IPA*, *10*(11), 8640–8654. https://doi.org/10.29303/jppipa.v10i11.7231

traditional medicine products or herbal medicine (Wirasti et al., 2021). Simplasia can be in the form of powder, tea, thick or dry extract (Al-Hakim et al., 2021). The main reason people use traditional medicine is to maintain health, overcome metabolic and degenerative diseases, safer from side effects and as a tradition (Menon et al., 2020). The basic consideration of utilizing plants as traditional medicine is its more practical use supported by the availability of materials that are easier to obtain and cheaper (Oktarlina et al., 2018). In addition, the lack of health facilities and the increasing cost of modern medicine for Indonesian people living in rural areas, has led to the increasing development of the use of plants with medicinal properties (Tania & Novsa, 2023). The efficacy of medicinal plants has generally been tested based on empirical knowledge and that knowledge can be used by other people outside their area (Hexa et al., 2022). Medicinal plants can be found in various types of habitats such as forests, agricultural land and yard land. Yard land is one of the lands that has the potential to be used to plant medicinal plants, such as turmeric, ginger, kencur, temulawak, katuk leaves, bluntas, sambaloto, cat's whiskers and lemongrass (Nouf et al., 2022).

The use of medicinal plants initially started from the yards of people in their residential areas in rural areas. Because rural communities mostly use plants in their yards for traditional medicine (Menon et al., 2020). The benefits of traditional medicine felt by the community are the ease of obtaining it and the raw materials can be planted in their own yards, are cheap and can be mixed by themselves (Larassati et al., 2019). The use of yards for medicinal plants by the community varies from one region to another. Differences in the diversity and use of medicinal plants in the yard are greatly influenced by the level of need, socio-culture, community education, and physical and ecological factors of the local area (Adiyasa & Meiyanti, 2021). The healing tradition of a community cannot be separated from the local culture. Perceptions about the concept of sick, healthy, and the diversity of plant species used as traditional medicine are formed through a socialization process that is believed and believed to be true from generation to generation (Hasria et al., 2021).

However, knowledge about plants used for traditional medicine tends to be known only by the bathera, traditional elders, and community leaders. It is feared that this local knowledge and wisdom will become increasingly rare in society, therefore research on the diversity and utilization of medicinal plants is important to be conducted (Alvina et al., 2022). Research on the utilization of plants for traditional medicine is still very lacking. Research is still limited to the process of inventory and identification of medicinal plants such as research on the utilization of medicinal plants by the Sangihe ethnic group in the Sangihe Islands, North Sulawesi (Pelokang et al., 2018) and in Musi Banyuasin Regency, South Sumatra (Rizal & Sustriana, 2019). There is also research on the effect of administering a combination ointment of Morinda citrifolia leaf extract and Euphorbia tirucalli stem on wound healing (Pertiwi et al., 2020) and the potential of ferns collected at the Cibodas Botanical Gardens as medicine (Nikmatullah et al., 2020). Based on reports from several researchers, there are similarities in several species of medicinal plants found in each region in Indonesia (Hasria et al., 2021; Tima et al., 2020). The most striking similarities are the diseases that can be cured and how to use them to cure a disease (Trisna et al., 2020).

The problem is, the knowledge of the batera, community leaders and traditional elders is still limited about how to use, the plant organs that are taken and the diseases that can be cured by medicinal plants, as a result many species are ignored and threatened with extinction (Park et al., 2021). In addition, local knowledge and wisdom regarding traditional medicine using medicinal plants are also threatened with degradation due to the lack of interest of the current millennial generation (Qamariah et al., 2018). In this regard, a study has been conducted that aims to inventory and describe the plant species used as traditional medicine by the bathera in the Bayan traditional village. The results of this study are expected to increase the knowledge of the batera, community leaders, traditional elders and other community members regarding medicinal plants. In addition, with the results of this inventory and description, it is hoped that local knowledge and wisdom about traditional medicine will be of interest again to the younger generation.

Method

Time, Place, and Research Materials

This research was conducted from June 2023 to October 2023. The research was conducted in the yard and mixed gardens belonging to the Sasak, Javanese and Balinese ethnic groups located in the Bayan Traditional Village area, Bayan District, North Lombok Regency, West Nusa Tenggara. The tools used in this study were stationery, notebooks, rulers, scissors, cutters, label paper, plastic clips, questionnaires, cameras, and laptops. Book of CITES Appendices I, II, and III (CITES, 2015), and The IUCN Red List of Threatened Species (IUCN, 2023). While the materials used in this study were mineral water, 70% alcohol,

distilled water and medicinal plants used by the community in the Bayan Traditional Village area.

Data Collection Techniques and Design

The study used descriptive methods and data collection in the field with exploratory survey methods and participatory rural appraisal (PRA) methods, namely the assessment process that is oriented towards the involvement and active role of the community as respondents (Saudah et al., 2019). Measurement of plant populations was carried out using the census quadrat method using the parameters of relative density, relative frequency, relative dominance to determine the important value index and the summed dominance ratio of each medicinal plant species (Nanlohy et al., 2024).

Determination of sampling locations was carried out randomly on each yard of the Sasak, Balinese and Javanese tribes, where in each location three sampling point hamlets were determined whose distribution was determined by proportional sampling based on the densest population. Observations of yards for the Sasak tribe population were carried out in the hamlets of Karang Salah, Bayan Barat and Bayan Timur. The yards of the Javanese tribe were in the hamlets of Mandala, Sembalun and Montong Baru. While observations of the yards of the Balinese tribe were in the hamlets of Ujung Mekar, Bual and Batu Jombang. In each sampling point hamlet, tiered quadrat plots were made with sizes of 2 x 2 m^2 (for measuring vegetation at the herb level < 1.5 m), 5 x 5 m^2 (for measuring vegetation at the sapling level > 1.5 m), 12 x 12 m^2 (for measuring vegetation at the pole level with a diameter limit of between 10 cm ≤ diameter at breast height < 20 cm), and 25 x 25 m^2 (measuring vegetation at the tree level at breast height and with a diameter size ≥ 20 cm). The quadrat plots were repeated three times in each sampling point hamlet with a distance of 1.0 - 2.0 km (Ngawit & Farida, 2022).

The interview method used began with determining the target respondents (key person) using the snowball technique, namely selecting respondents based on previous respondent information (Fanisah et al., 2023). The number of respondents at each location was determined by proportional sampling based on the number of residents in each sample point hamlet, namely for the Sasak tribe as many as 9 people, Java 6 people and Bali 6 people. Determination of respondents was based on recommendations from key respondents.

Key respondents are respondents who are determined based on their abilities and figures in each tribe in the expertise and practice of traditional medicine that has been carried out for generations (Yujin et al., 2021). Data was collected using a questionnaire fill-in table, which includes the plant species used, the variety of uses, the plant organs used, the manufacturing process and how to use them. Documentation was carried out by taking photos of medicinal plants used by the batera, traditional elders and community leaders.

Observation Data Analysis

Data analysis was carried out using quantitative analysis of several parameters: Absolute density (KM) is the total population of medicinal plant species divided by the total area of the sample plot. Relative density (KR) is the absolute density of a species divided by the total absolute density of all species multiplied by 100%. The absolute frequency (FM) of a species is the number of sample plots containing a species and the relative frequency (FR) is the absolute frequency of a species divided by the absolute frequency of all species multiplied by 100%. Absolute dominance (DM) is the total population of a species divided by the total population of all species and relative dominance (DR) is the absolute dominance of a species divided by the total absolute dominance of all types multiplied by 100%. The Importance Value Index (INP) is Relative density (KR) + Relative frequency (FR) + Relative dominance (DR). The Standard Dominance Ratio (SDR) is the importance value divided by three. The importance value and SDR are then used to analyze several indices (criteria) of vegetation properties (Ngawit & Farida, 2022).

The similarity index (C) is used to assess the variation or similarity of species and populations of medicinal plants in various garden communities of the Sasak, Javanese and Balinese tribes. The community coefficient is calculated using the formula (Nanlohy et al., 2024).

$$C = \frac{2W}{a + b} \times 100\% \quad (1)$$

Where, C = Community coefficient (%), W = Lower SDR value of each species in the two communities being compared, a = Sum of SDRs of all species in the first community being compared and b = Sum of SDRs of all species in the second community being compared.

The Shannon-Wiener diversity index (H') is a very useful parameter for comparing two or more communities, especially for studying the effects of biotic disturbances on the level of stability of a community. The calculation of H′ is done using the following formula (Nikmatullah et al., 2020).

$$H' = \sum_{n=1}^{n} \left(\frac{ni}{N}\right)\left(\mathrm{Ln}\frac{ni}{N}\right) \quad (2)$$

Where, H′ = Shannon-Wiener diversity index, ni = Sum of SDR values of a species, N = Sum of SDR values of all species and Ln = Natural logarithm. Criteria H′ < 1 = low species diversity; 1 ≤ H′ ≤ 3 = moderate species diversity; H′ > 3 = high species diversity.

Species evenness index to determine whether each species of medicinal plant has a relatively equal number of individuals and is evenly distributed throughout the planting area. The species evenness index formula is as follows (Suveltri et al., 2014).

$$E = \frac{H'}{H'_{max}} \quad (3)$$

Where, E = Evenness index, H′ = Shannon-wiener diversity index, H′max = log2 S (S = number of species). The evenness value of the species used criteria: E > 0.6 = high evenness, 0.3 ≤ E ≤ 0.6 = medium evenness, and E < 0.3 = low evenness.

Abundance index, used to determine species richness and the balance of the number of individuals of each species in an ecosystem. To determine the dominance index value, the following formula is used (Fanisah et al., 2023).

$$Ci = \sum_{n=1}^{n} \left(\frac{ni}{N}\right)^2 \quad (4)$$

Where, Ci = Dominance index, ni = Important value of the nth species and N = Total important value of all species. The criteria for the results of the species dominance index, namely 0 < Ci < 0.5 means that there is no dominant species, and 0.5 < Ci < 1 means that there is a dominant species (Kusuma et al., 2023).

Result and Discussion

Diversity of Medicinal Plants

Medicinal plants were found in the yards of the Bayan traditional village community, as many as 21 families consisting of 54 species. The family with the largest number of species and population found was Zingiberaceae (8 species). The number of medicinal plant species found was the largest in the yards of the Javanese tribe, namely 50 species, then the Balinese tribe 47 species, and the least in the yards of the Sasak tribe, namely 35 species (Table 1). The species with the highest abundance or number of individuals are the Katuk Leaf plant (*Sauropus androgynus* (L.) Merr.), Turi (*Sesbania grandiflora* (L.) Poir.), Turmeric (*Curcuma longa* L.), Ginger (*Zingiber officinale* Roscoe), White Turmeric (*Curcuma zedoaria* L.), Sambiloto (*Andrographis paniculata* Nees.), Cat's Whiskers (*Orthosiphon aristatus* (Blume) Miq.) and Noni (*Morinda citrifolia* L.). The number of medicinal plant species in the yard found in this study was greater when compared to those found in the yards of the Umbu Langang Village community, Central Sumba Regency, 19 families and 31 species (Yowa et al., 2019). Then in the yard of the Dumoga Utara community, Bolaang Mongondow Regency, North Sulawesi, there were 25 families consisting of 46 species (Larassati et al., 2019). Likewise, in Urug Traditional Village, Urug Village, Sukajaya District, Bogor Regency, fewer medicinal plants were found, namely 53 species, which are classified into 20 families (Izzuddin & Azrianingsih, 2015). The cause of the different number of medicinal plant species found in one region compared to another region is thought to be due to environmental factors, traditions and the level of community knowledge about the use of medicinal plants (Adiyasa & Meiyanti, 2021).

Dominant and abundant of several populations of medicinal plants, such as katuk leaves (*Sauropus androgynus* (L.) Merr.), and turi (*Sesbania grandiflora* (L.) Pers.), because they are believed to be able to help the production of breast milk (ASI) for nursing mothers who have less smooth or little breast milk. Because katuk leaves contain several aliphatic compounds that are thought to be able to provide hormonal effects of sterol chemical compounds that are estrogenic, so these aliphatic compounds have properties to increase breast milk production (Patonah et al., 2018). In addition, the leaves of this plant are also delicious as vegetables (Fadilah et al., 2023).

Turi leaves contain flavonoid, saponin and steroid compounds that function as antioxidants, antibacterial, antifungal, antiviral and anti-inflammatory as well as cytotoxic activity (Supriningrum et al., 2020). Turi leaf extract is also used to treat climacteric syndrome with a dominant pattern of blood deficiency (Park et al., 2021). The use of turi leaves by processing them into various vegetables is very beneficial for increasing and facilitating breast milk for breastfeeding mothers. In the research area, turi leaves are more widely used as vegetables and animal feed compared to therapeutic drugs (Ngawit & Farida, 2022).

Sambiloto (*Andrographys paniculata* L.) is used as a medicine to increase immunity, help relieve flu symptoms such as sore throat, runny nose, cough, and sneezing (Rajanna et al., 2021). Sambiloto can also relieve fever, relieve inflation, lower high blood pressure, lower blood sugar levels, maintain liver and skin health (Irene et al., 2023). Sambiloto leaf extract has quite good potential as an antidiabetic drug because it contains several compounds such as andrographolide, andrografin, flavonoids, peniculin and other compounds that can also act as antidiabetics (Adha et al., 2019).

Cat's whiskers plant (*Orthosiphon spicatus* (Blume) Miq.) is known in Indonesia as a family medicinal plant. This plant is widely used to cure urinary tract infections, kidney stones, edema, hepatitis, jaundice, hypertension, diabetes mellitus, rheumatism, influenza and internal heat (Surahmaida et al., 2019). Turmeric (*Curcuma longa* L.) is a plant that is widely used by people to reduce cramps or stomach pain when approaching menstruation. Turmeric rhizomes are also believed to cure dysmenorrhea (menstrual pain), urinary tract infections and stomach aches. Because the phenolic compound content in turmeric can be used as an antioxidant, analgesic, antimicrobial, anti-inflammatory (Vina et al., 2023). More specifically, the curcumine content in turmeric can inhibit the occurrence of Cyclooxygenase (COX) reactions so that it can inhibit and reduce inflammation and inhibit uterine contractions that cause menstrual pain (Larassati et al., 2019).

Ginger (*Zingiber officinale* Roscoe) belongs to the Zingiberaceae family and is a dominant plant found in all Sasak, Javanese and Balinese gardens. This plant is widely found because it is relatively easy to grow, using rhizomes with shoots that can grow quickly. Ginger plants are widely planted and used by the community as a cough medicine and to increase body immunity. Ginger drinks mixed with sufficient honey can reduce the severity of coughs in children, because the essential oil content in ginger is an active substance that can treat coughs (Supriningrum et al., 2020). In addition, the content of bioactive compounds such as anti-inflammatory, antioxidants, andrografin, and flavonoids, can treat diabetes including increasing stamina and fitness in men (Mehran et al., 2019; Lashgari et al., 2022).

Noni (*Morinda citrifolia* L.) is a medicinal plant that is most commonly found in Balinese gardens. Noni fruit contains scopoletin, polysaccharides, ascorbic acid, β-carotene, ᾱ-arginine, proxironin, and proxeroninase, iridoids, asperolusid, iridoid anthraquinone, fatty acids, calcium, vitamin B, amino acids, glycosides, and also glucose (Melati, 2021). Noni seeds have the potential to be a source of functional food, cosmetic and pharmaceutical products, and healthier vegetable oils due to their content of omega-6 fatty acids, carbohydrates, low FFA, and high antioxidant activity (Jahurul et al., 2022). Noni plants, especially the fruit, have many uses, including as anti-diabetic and anti-hypertensive (Algenstaedt et al., 2018). Noni fruit juice can cure kidney inflammation, gallbladder inflammation, intestinal inflammation, dysentery, constipation, spleen pain, swollen spleen, liver pain, bloody saliva, worms, chicken pox, obesity, back pain (lumbago), stomach ache (colic), and stomach ache due to colds, rough feet (skin softener), eliminate dandruff, antiseptic, menstrual flow (emenagogue), and blood purifier (Arniyanti et al., 2023). The juice of grated ripe fruit is used for gargling in diphtheria or tonsillitis. The remaining fruit juice, bark or roots are used to wash wounds and eczema. Noni fruit can inhibit tumor growth by stimulating the immune system involving macrophages and/or lymphocytes (Arjita et al., 2023; Zahra & Jutti, 2018).

The abundant medicinal plant species are plant species that are deliberately cultivated in the yards of the people in the Bayan Traditional Village, North Lombok because they are easy to care for. Medicinal plants found in the yards of the Sasak, Balinese and Javanese people are types of plants that are easy to cultivate and can survive in dry land environmental conditions with a dry climate. Therefore, the number of species and population of each medicinal plant species is quite diverse in the three observation locations.

The data in Table 2 shows that the value of the similarity index of medicinal plant species in the yards of the Javanese and Sasak tribes is significantly different with a difference value of more than 25%, namely 27.62% and a similarity value of less than 75%, namely 72%. So, the number of species and populations of medicinal plants in the yards of the Javanese tribe is significantly greater than in the yards of the Sasak tribe. If the value of the species similarity index is less than 75%, then in the two communities being compared there are some plants that do not grow so that their populations are significantly different. Conversely, if the value of the species similarity index is greater than or equal to 75%, then the members of the species population in the two communities being compared do not experience damage, death or loss but continue to grow and develop so that they are not significantly different (Fanisah et al., 2023).

The highest abundance of medicinal plant species was obtained in the yards inhabited by the Javanese (1197), then the Balinese (974) and the lowest in the Sasak tribe's yards (548). These results are in accordance with the values of the species richness, diversity and evenness index, that the highest index value was obtained in the Javanese tribe's yards. The lowest evenness index was found in the Sasak tribe's yards (Table 3).

Species abundance is determined by counting the number of medicinal plant individuals in each yard sample point location (Behl et al., 2020). Abundance is a qualitative parameter that reflects the relative distribution of species in a community (Hasria et al., 2021). Abundance is a form of proportion presented by each species with all individuals in its community (Alshibani et al., 2023). The difference in abundance of

plant species in natural habitats is very different from yard habitats (Pauzi et al., 2018).

In artificial habitats such as yards, the abundance of medicinal plants in each yard inhabited by various tribes is determined by the level of need, socio-culture, community education, and physical and ecological factors of the local area (Rejimon & Reghu, 2018). The area of the yard is also a factor that influences the abundance of plant species planted in a yard (Hasria et al., 2021). Medicinal plant species that have the largest number of individuals or populartions are plant species that dominate in people's yards. Plants that dominate an area have a high density value, because these plants have the largest population compared to the number of other species (Choi et al., 2018). The population density of plant species is a value indicated by the number of populations of a species per unit area, meaning that the greater the density value of the plant species, the more individuals of the species (Supriningrum et al., 2020).

Table 1. Number of families, species and individual populations of medicinal plants found in the yard Sasak, Balinese and Javanese tribes, Bayan Traditional Village, Bayan District, North Lombok

Familia	Local name	Species Name	SDR value (%) of medicinal plant species			Habitus
			Sasak tribe	Balinese tribe	Javanese tribe	
Zingiberaceae	Jahe	*Zingiber officinale* Roscoe	4.45	3.97	4. 25	Herb
Zingiberaceae	Kunyit	*Curcuma longa* L	4.23	3.15	3.92	Herb
Zingiberaceae	Kencur	*Kaempferia galanga* L	2.99	2.59	3.47	Herb
Zingiberaceae	Lengkuas	*Alpinia galanga* (L.) Willd.	1.29	1.12	2.14	Herb
Zingiberaceae	Temu lawak	*Curcuma xanthorrhiza* Robx.	0.85	0.92	1.92	Herb
Zingiberaceae	Lempuyang	*Zingiber zerumbet* (L.) J.E. Smith	0.85	0.58	1.47	Herb
Zingiberaceae	Temu putih	*Curcuma zedoaria* (Berg.) Roscoe.	0.85	0.65	1.30	Herb
Zingiberaceae	Temu kunci	*Boesenbergia rotunda* (L.) Mansf.	0.85	0.00	1.02	Herb
Euphorbiaceae	Teh-tehan	*Acalypha siamensis* Oliv. Ex Gage	0.85	0.58	1.14	Shrubs
Euphorbiaceae	Betadin	*Jatropha multifida* L.	1.12	1.37	1.25	Shrubs
Euphorbiaceae	Daun katuk	*Sauropus 8645ndrogynous* (L.) Merr.	4.30	2.67	4.31	Shrubs
Euphorbiaceae	Jarak pagar	*Jatropha curcas* L.	2.61	2.19	1.97	Shrubs
Euphorbiaceae	Jarak merah	*Jatropha gossypifolia* (L.) Pohl.	2.29	1.84	1.58	Shrubs
Poaceae	Sereh	*Cymbopogon citratus* L.	2.29	1.84	1.64	Herb
Poaceae	Sereh wangi	*Cymbopogon nardus* L.	2.29	1.84	1.64	Herb
Poaceae	Alang-alang	*Imperata cylindrica* (L.) Raeusch	2.88	2.39	0.00	Herb
Poaceae	Tebu ireng	*Saccharum officinarum* L.	2.13	2.19	1.97	Herb
Fabaceae	Asem jawa	*Tamarindus in*dica L.	0.00	0.65	0.91	Tree
Fabaceae	Dadap tis	*Erythrina variegate* L.	0.00	2.12	1.92	Tree
Fabaceae	Turi	*Sesbania grandiflora* (L.) Pers.	4.83	2.88	2.64	Tree
Solanaceae	Terung kokak	*Solanum torvum* L.	0.00	1.84	1.58	Herb
Solanaceae	Cabe jawa	*Piper retrofractum* Vahl.	0.00	1.78	1.58	Herb
Solanaceae	Ceplukan	*Physalis angulata* L.	0.00	2.32	2.08	Herb
Acanthaceae	Kecebling	*Strobilanthes crispus* Bl.	2.29	1.44	1.53	Herb
Acanthaceae	Sambiloto	*Andrographys paniculata* L.	2.99	3.35	3.53	Herb
Acanthaceae	Gandurasa	*Justicia gen*darussa Burm.f	0.00	0.98	1.08	Herb
Acanthaceae	Daun wungu	*Grapthophyllum pictum* (L.) Griff.	0.00	0.79	0.91	Herb
Piperaceae	Kumukus	*Piper cubeba* L. F	0.00	0.00	0.51	Herb
Piperceae	Sirih	*Piper betle* L.	2.77	2.12	2.03	Herb
Piperaceae	Sirih hutan	*Piper aduncum* L.	1.84	1.43	1.41	Herb
Annonaceae	Srikaya	*Annona 8645quamosal* L.	2.27	1.57	1.47	Tree
Annonaceae	Kepelan	*Stelechocarpus burahol* (Blume)	0.00	0.00	1.25	Tree
Annonaceae	Sirsak	*Annona muricata* L.	2.50	1.78	1.58	Shrubs
Lamiaceae	Kumis kucing	*Orthosiphon spicatus* (Blume) Miq	2.77	273	3.01	Herb

Lamiaceae	Mint	*Mentha piperita* L.	0.00	0.98	0.91	Herb
Lamiaceae	Legundi	*Vitex trifolia* L.	0.00	1.45	1.30	Herb
Rubiaceae	Simbukan	*Paederia foetida* L.	2.29	2.12	1.86	Herb
Rubiaceae	Mengkudu	*Morinda citrifolia* L.	2.51	4.17	4.31	Tree
Arecaceae	Pinang	*Areca catechu* L	2.51	1.64	1.36	Tree
Arecaceae	Nyuh gading	Cocos nucifera L.	2.02	1.91	1.64	Tree
Anarcadiaceae	Kloncing	*Spondias pinnata* L.	0.00	0.72	0.00	Shrubs
Anarcadiaceae	Kecemcem	*Spondias pinnata* (Lf) Kurz.	0.00	0.72	0.62	Shrubs
Asteraceae	Sembung Rky.	*Blumea balsamifera* L.	0.00	2.19	1.97	Herb
Asteraceae	Sambung Ny.	*Gynura procumben* (Lour.) Merr.	0.00	1.71	1.41	Herb
Rutaceae	Jeruk nipis	*Citrus maurantifolia* (Cristm.) Sw	2.29	1.91	1.69	Shrubs
Rutaceae	Jeruk purut	*Citrus hystrix* DC.	2.29	1.91	1.64	Shrubs
Myrataceae	Daun salam	*Syzygium polyanthum* (Wight.)	2.51	2.12	1.92	Tree
Myrantaceae	Jambu klutuk	*Psidium guajava* L.	2.51	2.12	1.80	Tree
Polypodiaceae	Sisik naga	*Drymoglossum piloselloides* (L) P	0.00	1.50	0.00	Epiphytes
Punicaceae	Delima	*Punica granatum* L.	1.29	1.12	0.91	Tree
Moringaceae	Kelor	*Moringa oliefera* L.	2.53	2.67	2.25	Tree
Malvaceae	Sidagori	*Sida rhombifolia* L.	0.00	0.00	0.62	Shrubs
Basellaceae	Binahong	*Anredera cordifolia* (Ten.) Steenis.	0.00	1.84	1.75	Herb
Apiaceae	Purwaceng	*Pimpinelle alpine* Molk.	0.00	0.00	0.52	Herb
SDR value of plants that are not used as medicine			17.95	9.58	7.54	
Total SDR value of medicinal plants			82.05	90.42	92.46	

Source: Tabulation results and analysis of research data

The data in Table 3 shows that the abundance index and species richness index use the Margalef index which states the highest plant species in each different family. While the species diversity index and species evenness index use the Shannon-Wiener value. The species abundance index value obtained has a high value if there are a large number of species and individuals in each species. So that the species richness index value obtained is also high if it is arranged by the number of species that occupy the yard land. If an area is only dominated by certain species, then the area has low species diversity and evenness (Lestari et al., 2021). The yard land in the three research locations is dry land with a dry climate. In general, yard land owners plant plants that vary in type and benefit. The number of species and individual populations of each species in the yard land of the Javanese tribe is greater than in the yards of the Balinese and Sasak tribes. Therefore, in the yard land of the Balinese and Sasak tribes, the evenness and diversity index of species is lower than in the yards of the Javanese tribe. So it can be stated, in the yard of the Balinese and Sasak tribes there is control of the area by one or more species. This is what causes the value of abundance and species richness to depend on the number of species and the number of individuals of each plant species found (Ngawit, 2023).

The medicinal plant diversity index obtained in this study was 3.313 - 3.791. This value is categorized as high because the H' value is > 3 (Ngawit, 2023). So the medicinal plant diversity index in the observation area of the Javanese, Balinese and Sasak tribe's yards is categorized as high diversity, with a diversity value (H') > 3, which is 3.79 for the Javanese tribe's yard, in the Balinese tribe's yard 3.75 and in the Sasak tribe's yard 3.31 (Table 3).

Table 2. Value of the similarity index (community coefficient) of medicinal plant vegetation populations in the three observations of the yard lands of the Javanese, Balinese and Sasak tribes

SDR values at compared observation locations	Similarity Index Value (%)	Similarity (%)	Difference (%)
Javanese VS Balinese	87.20	88.00	12.79 NS
Javanese VS Sasak	72.38	72.00	27.62 s*/
Balinese VS sasak	75.89	76.00	24.11

*/Note: The discriminant value > 25% and the similarity value <75% of the two vegetation populations being compared are significantly different. The discriminant value ≤ 25% and the similarity value ≥ 75% are not significantly different.

The evenness index (E') of medicinal plants species at the observation location in the Sasak tribe's yard is 0.575, this value is in the low category. At the observation location in the Balinese and Javanese tribe's yard, the evenness index value is 0.65 - 0.66 which is in the high category. The low evenness index of medicinal plants in the Sasak tribe's yard is due to the presence of plants that have high abundance, namely the Katuk Leaf plant (*Sauropus ndrogynous* (L.) Merr.) and Turi (*Sesbania grandiflora* (L.) Pers. The dominance of one or more plants in a yard habitat will cause the diversity index and evenness index to be low. Because the evenness index describes the balance between one community and another. If the evenness index approaches one, it means that the distribution of vegetation species in its community is more even, conversely if the evenness value approaches zero, it indicates that the distribution is increasingly uneven (Lestari et al., 2021).

Table 3. Index of diversity, evenness, species richness and abundance of medicinal plants on land the yard of the Sasak, Balinese and Javanese people of the Bayan traditional village, Bayan District, Lombok Regency North, West Nusa Tenggara

Observation Location	Abundance	Wealth (Ci)	Diversity (H')	Evenness (E)
Sasak tribe yard	548	0.55	3.31	0.57
Balinese tribal yard	974	2.70	3.75	0.65
Javanese tribal yard	1197	2.92	3.79	0.66

Source: Tabulation results and analysis of research data

Utilization of Medicinal Plants

Based on the results of observations in 9 research hamlets, 54 species of yard plants were obtained which were used to treat 18 types of diseases (Table 1). Plants that are widely used by the community are plant species that are known to have properties to cure diseases and are deliberately cultivated in the yard (Behl et al., 2020). In addition to being medicinal plants, several plant species also play a role in meeting the food needs of the population and animal feed (Rejimon & Reghu, 2018). The medicinal plants found from the results of this study were fewer in number when compared to research on the Tolaki tribe in Puundoho Village, North Kolaka, Southeast Sulawesi, namely 60 species of medicinal plants used to treat 49 types of diseases (Hasria et al., 2021). Meanwhile, in the Kalisalak Traditional Village, Banyumas, Central Java, 73 species of medicinal plants were found which were used to treat various types (Hexa et al., 2022). This difference is caused by environmental factors in which plants grow, the knowledge of the Bathera about the use of medicinal plants and customs that differ between regions and tribes.

The habitus of medicinal plants found in the yards in the Bayan Traditional Village area are types of epiphytic plants, herbs, shrubs and trees. The most widely used plant habitus is herbs, then trees, and the least shrubs and epiphytes (Figure 1).

Many herbal plants are used by the community for traditional medicine because they are easy to obtain and abundant (Hasria et al., 2021). Several parts of the organs of herbal plants have been widely used for symplasia and medicine because they have properties that can empirically treat various diseases (Arini, 2018). Another causal factor is the large number of herbal plants found in the yard because this group is mostly from the group of plants with C4 photosynthesis pathways, efficient use of water, drought resistance, very easy to care for so that they are widely cultivated (Katherine et al., 2023). Several herbal plants such as lemongrass, ginger, turmeric, temulawak, temu kunci, galangal, sambiloto, cat's whiskers, and lempuyang, which initially grew wild, were then cared for and used by residents in the village for symplasia and traditional medicine (Fanisah et al., 2023).

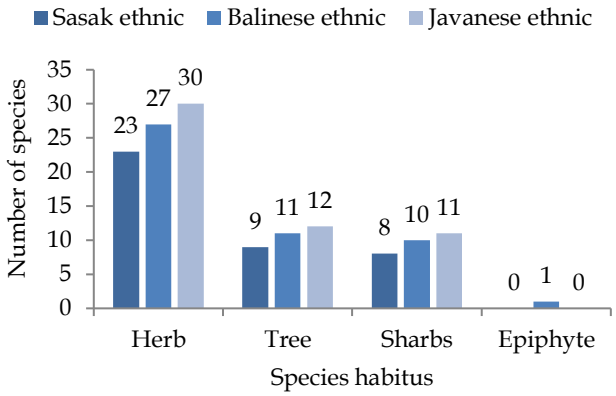

Figure 1. Medicinal plant habitus

Tree and shrub habitus groups are less used for symplasia and traditional medicine compared to herbaceous habitus, because they are plants that experience a long growth process. In addition, shrubs are considered as hedge plants and trees as plantation, greening and forest plants are less known for their use so they are rarely used in traditional medicine (Azizah et al., 2023). Epiphytes are also very rarely found in yard areas because these plants usually live attached to large, dense trees, such as coconuts, guava, mango and other ponon plants. Epiphytes are often found in medium and highland areas with average rainfall above 2500 mm year-1 (Arjita et al., 2023).

Plant organs that are widely used by the community as medicine in the yard of the Bayan Traditional Village, Bayan District, North Lombok, are leaf organs with 31 species in the Javanese tribe's yard, 23 species in the Balinese tribe's yard and 22 species in the Sasak tribe's yard (Figure 2). The reason is because the leaf organ is the easiest to obtain and easy to mix for medicine, compared to the stem, skin, and root organs of the plant. Leaves also have a texture that is generally softer because they have a high water content, besides leaves are a place for the accumulation of photosynthates containing organic compounds to cure various diseases (Saudah et al., 2019). Therefore, the plant organ that is most widely used in mixing traditional medicine is leaves with a quantity of 749 species (33.50%) of the total tropical forest medicinal plants (Yowa et al., 2019; Widiyastuti et al., 2018).

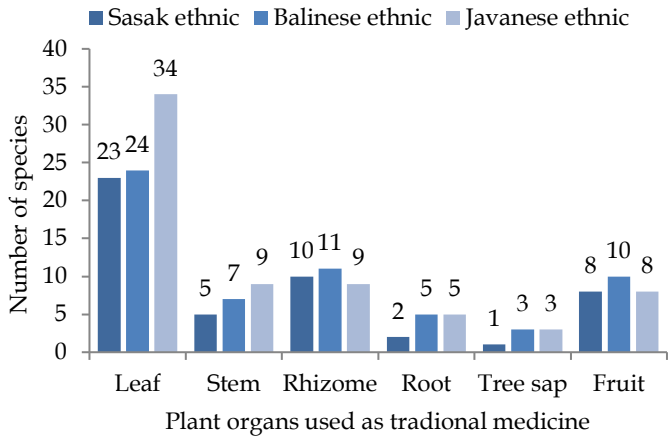

Figure 2. Plant organs used as symplasia and medicine based on the number of species

Based on the results of interviews and direct observations in the field, 6 processes of processing plants to be used as traditional medicine were found, namely boiled then the water is drunk, finely ground then squeezed and the juice is drunk, squeezed directly and the water is drunk, finely ground then applied as a body scrub, rubbed directly and without processing. The processing most commonly carried out by Bhatera and the community is by boiling then the water is drunk for 26 species and finely ground then squeezed and the juice is drunk for 24 species (Figure 3). The reason is because processing medicinal plants in the form of potions and by boiling is the easiest processing method to do and is more hygienic than other methods (Astutik et al., 2019).

Several researchers reported that the most common form of processing of medicinal plants is by boiling. The process of boiling medicinal plants will dissolve more of the efficacious substances contained in the medicinal plants into the boiled water (Lingkubi et al., 2018). The Bathera at the research location also mix medicinal plants more by pounding them finely, then squeezing them and drinking the juice. This traditional herbal concoction is called loloh. In general, loloh consists of several mixtures of plants such as one handful of sambung nyawa leaves, purple leaves, jarak pagar leaves plus 3 grated turmeric rhizomes and white ginger for the treatment of digestive tract infections, internal heat and increasing appetite. In several cases of disease therapy, the process of pounding, then squeezing and drinking the juice is quite effective in treating several degenerative diseases such as high blood pressure, diabetes, heart and urinary tract disorders. However, according to Yowa et al. (2019), processing in the form of herbal medicine, loloh, boreh, scrub and applying directly from fresh ingredients is considered wasteful of raw materials and cannot be stored for long. Utilization of root organs, rhizomes, stolen, bark and dried fruit and stored in the form of symplasia, the dominant processing is by boiling and drinking the boiled water (Astutik et al., 2019). However, therapy for several diseases such as sprains, dislocations, strains and bruises on the skin and muscles, the use of boreh and lulur is quite effective compared to the use of other processed forms (Yowa et al., 2019; Astutik et al., 2019).

The types of diseases that can be treated and treated with medicinal plants based on the results of this study are 28 types of diseases. The most abundant and suitable species of medicinal plants used to treat diseases are high blood pressure, blood vessels, heart pain, urinary tract, diabetes, cholesterol, kidney pain, deep heart symptoms and men's strong medicine (Figure 4). Symptoms of cough, hemorrhoids and stimulating breast milk, the number of plant species that can be used for therapy in the yards of the Sasak, Balinese and Javanese tribes do not differ significantly. However, for 25 other types of diseases, medicinal plants that grow in the yards of the Javanese tribe are significantly more than those in the yards of the Balinese and Sasak tribes (Figure 4).

A total of 22 types of diseases are classified into four groups, namely chronic diseases, infectious diseases, non-infectious diseases and health care can be treated and treated with medicinal plants (Pelokang et al., 2018). Based on the results of this study, the types of diseases that are widely experienced by the community and treated by the Bathera are types of diseases that are classified as non-infectious such as high blood pressure, heart, circulatory system, urinary tract, cholesterol, diabetes, kidney disease and symptoms of internal heat. These types of diseases are classified as chronic diseases, which are treated therapeutically using herbal ingredients, providing positive progress (Katherine et al., 2023). Problems of body odor, bad breath, vaginal discharge, and how to increase body stamina are classified as health maintenance, which have long been treated therapeutically using traditional herbal medicines that we know as herbal medicine (Astutik et al., 2019).

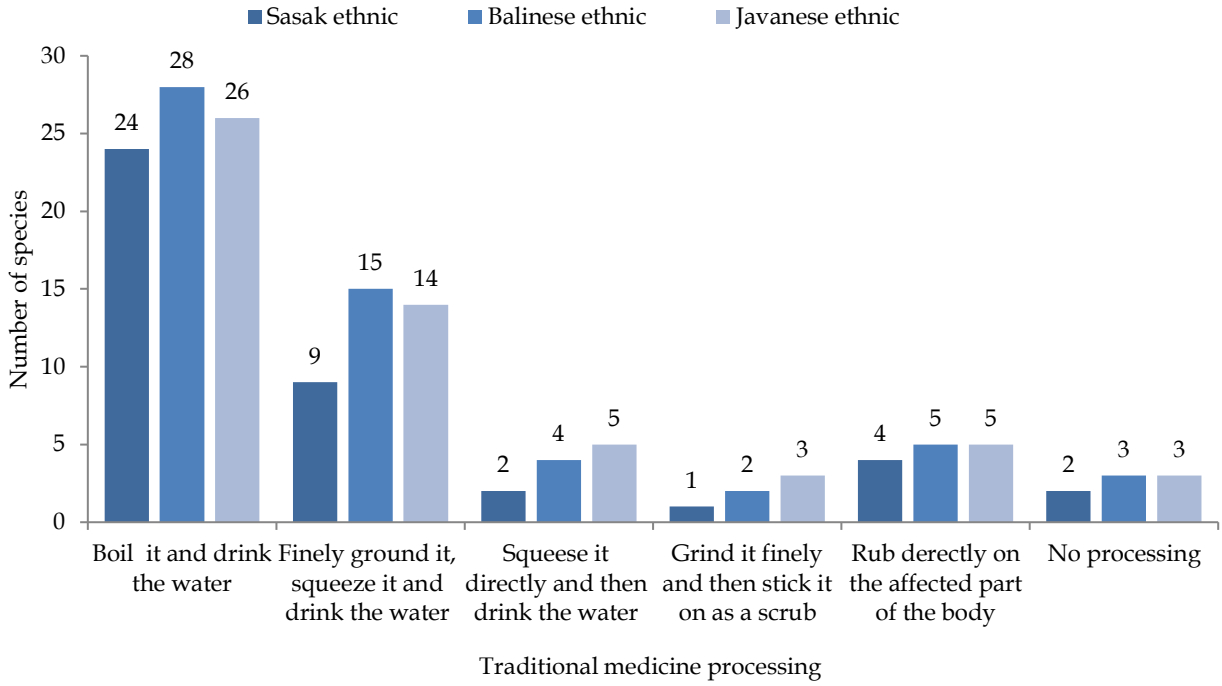

Figure 3. Plant processing process for traditional medicine based on number of species

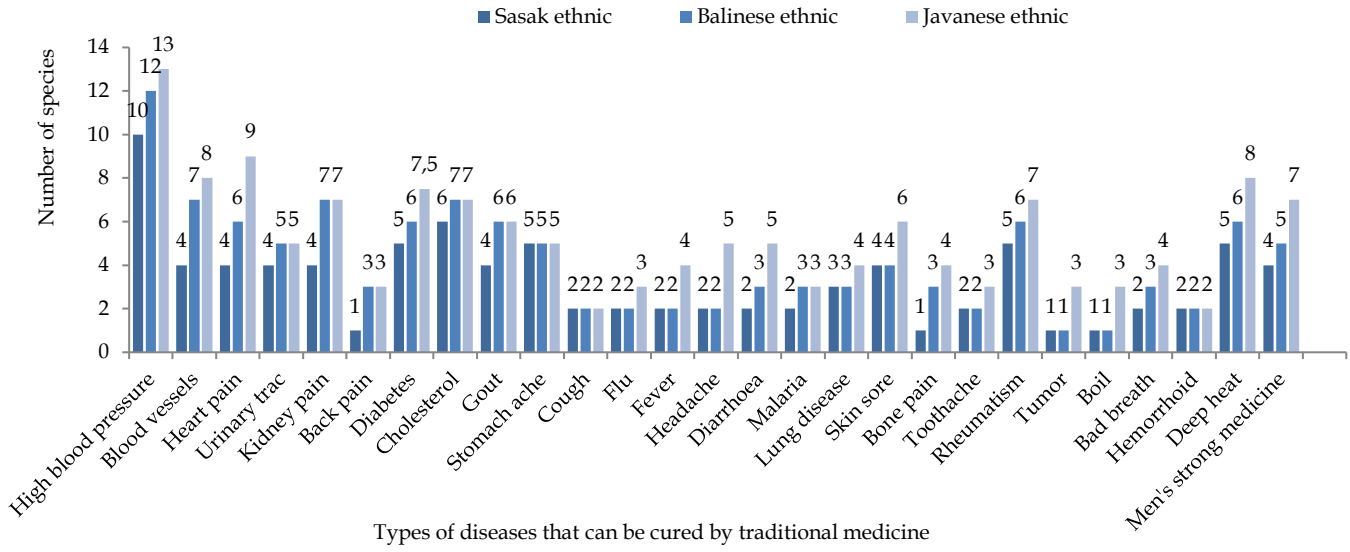

Figure 4. Types of diseases that can be cured based on the number of medicinal plant species

Sambiloto, cat's whiskers, ground cherry, meniran, cogongrass roots and rhizomes, katuk leaves and mengkudu fruit are plants that are widely used by the Javanese and Balinese people, because these plants are considered able to overcome several diseases at once such as high blood pressure, cholesterol, urinary tract, kidney stones and diabetes (Arjita et al., 2023). Katuk and turi leaves are widely used by the community as breast milk stimulants and as vegetables. In addition, the simbukan plant (*Paederia foetida* L.) is a type of plant that is often used to treat internal heat in babies. Sembung rangki (*Blumea balsamifera* L.), Sambung nyawa (*Gynura procumbens* (Lour.) Merr.), and wungu leaves (*Grapthophyllum pictum* (L.) Griff.) are very familiar among Indonesian people in rural areas, to overcome high blood pressure, blood vessel tract and internal heat (Qosimah et al., 2023; Jamshidi-Kia et al., 2018). The common way of use by the community at the research location is to take one handful of leaves and young shoots of the three plants each, then squeeze or finely crush them, then fill them with one glass of water and one young green coconut (cengkir) water. Then the water is filtered and drunk as loloh (herbal drink) twice a day, morning and evening before eating. This kind of therapy is very helpful in overcoming immunity in overcoming infectious diseases such as coughs, flu and internal heat (Kaihena et al., 2024; Yuan et al., 2016). Therefore, the sambung nyawa, sembung rangki and wungu leaf plants are often found in the yards of the Sasak and Balinese tribes. However, in the wild, these three plant species are categorized as rare (CITES, 2015; IUCN, 2023).

Conclusioan

Medicinal plants found in the Javanese tribe's yard are 50 species with 1197 individuals, Balinese tribe 47 species with 974 individuals and Sasak tribe 35 species with 548 individuals. The dominant species with the highest abundance index are katuk leaves, turi leaves, turmeric, ginger, white ginger, sambiloto, cat's whiskers and mengkudu. The medicinal plant species found have been used to treat 28 types of diseases. The life form of plants that are widely used for medicine is herbs. The part of the plant organ that is most widely used as raw material for traditional medicine is the leaves. The most common processing of medicinal plants is by boiling then the boiled water is drunk and finely ground, squeezed and the squeezed water is drunk.

Acknowledgments

The researcher would like to thank the Honorable Rector of Mataram University, the Head of LPPM Mataram University and the Dean of the Faculty of Agriculture, Mataram University, for the funds and facilities provided through the research scheme for accelerated research for senior lecturers in the 2023 budget year.

Author Contributions

Conceptualization, N.F. and I.K.N.; methodology, N.F., I.K.N. and M.J.; formal analysis, N.F., and I.K.N.; investigation, N.F., I.K.N. and M.J.; resources, N.F., I.K.N., and M.J.; writing—original draft preparation, N.F.; writing—review and editing, I.K.N. and M.J.; visualization, I.K.N.; supervision, I.K.N.; project administration, N.F.; funding acquisition, N.F. and I.K.N. All authors have read and agreed to the published version of the manuscript.

Funding

This research did not receive external funding from any party in any form.

Conflict of Interest

The author declares that there is no conflict of interest in publishing this scientific article.

References

Adha, S. A., Febriyanti, R. M., & Milanda, T. (2019). Potensi Sambiloto sebagai Obat Antidiabetes Berbasis Herbal. *Medical Sains*, *4*(1), 7–12. https://doi.org/10.37874/ms.v4i1.118

Adiyasa, M. R., & Meiyanti, M. (2021). Pemanfaatan Obat Tradisional di Indonesia: Distribusi dan Faktor Demografis yang Berpengaruh. *Jurnal Biomedika dan Kesehatan*, *4*(3), 130–138. https://doi.org/10.18051/jbiomedkes.2021.v4.130-138

Algenstaedt, P., Alexandra, S., & Johannes W. (2018). The Effect of Morinda citrifolia L. Fruit Juice on the Blood Sugar Level and Other Serum Parameters in Patients with Diabetes Type 2. *Evidence Based Complementary and Alternative Medicine*, *1*(1), 1-10. https://doi.org/10.1155/2018/3565427

Al-Hakim, R. R., Nasution, E. K., Rizaldi, R., & Rukayah, S. (2021). Provisioning Food Given by Visitors to Alpha-Male Long-Tailed Macaques at Recreation Forest, All of Them are Halal. *Journal of Halal Product and Research (JHPR)*, *4*(2), 50–58. https://doi.org/10.20473/jhpr.vol.4-issue.2.50-58

Alshibani, N., AlKattan, R., Allam, E., Alshehri, F. A., Shalabi, M. M., Almuhanna, N., Almarshad, H., & Aljamili, A. (2023). Effects of Metformin on Human Gingival Fibroblasts: An in Vitro Study. *BMC Oral Health*, *23*(1), 292-303. https://doi.org/10.1186/s12903-023-02978-0

Alvina, Y. T., Syamsiah, S., & Hiola, S. F. (2022). Etnobotani Tumbuhan Obat Masyarakat Etnis Buton. *Jurnal Biotek*, *10*(1), 1-35. https://doi.org/10.24252/jb.v10i1.28753

Arini, D. I. D. (2018). Pengetahuan Lokal Masyarakat Sulawesi Utara dalam Pemanfaatan Pohon Hutan sebagai Bahan Obat Tradisional. *Jurnal Masyarakat dan Budaya*, *19*(1), 161-174. https://doi.org/10.14203/jmb.v19i2.444

Arjita, I. P. D., Saputra, I. P. B. A., & Sukmana, D. J. (2023). Noni (Morinda Citrifolia) Ethanol Extract Lowered Blood Glucose Levels, Increased Glutathione Peroxidase Activity, and Decreased Malondialdehyde in White Rats Model of Diabetes. *Jurnal Penelitian Pendidikan IPA*, *9*(12), 10698–10704. https://doi.org/10.29303/jppipa.v9i12.6076

Arniyanti, M., Farah, S. A. A., Jelita, A. S., Veren, Y. S., Lailiyah, M. H., & Su'udi, M. (2023). Pemanfaatan Buah Mengkudu (Morinda citrifolia L.) sebagai Antidiabetesdan Antihipertensi. *JCPS (Journal of Current Pharmaceutical Sciences)*, *6*(2), 605-611. Retrieved from https://journal.umbjm.ac.id/index.php/jcps/article/view/678

Astutik, S., Pretezsch, J., & Kimengsi, J. N. (2019). Asian Medicinal Plants Productionand Utilization Potentials. *Journal of Sustainability*, *11*(17), 111-119. https://doi.org/10.3390/su11195483

Azizah, A., Fakhri, F., & Sajiman, S. U. (2023). Development of Flashcard Media in Introducing Medicine Plant Biodiversity. *Jurnal Penelitian Pendidikan IPA (JPPIPA) Indonesia*, *8*(1), 16–26. https://doi.org/10.26740/jppipa.v8n1.p16-26

Behl, T. K., Brisc, K., Rus, C., Nistor, M., Bustea, D., Aron, C., Pantis, L., Zengin, C. G., & Sehgal, A. (2020). Exploring the Multifocal Role of Phytochemicals as Immunomodulators. *Biomedicine and Pharmacotherapy*, *133*, 1–18. https://doi.org/10.1016/j.biopha.2020.110959

Choi, Y. J., Chung, S. Y., & Cho, S. H. (2018), The Efficacy and Safety of a Huanglian-jie-du Decoction on Hwa-byung Patients: A Study Protocol for a Randomized Controlled Trial. *Journal of Pharmacopuncture*, *21*(1), 7-13. https://doi.org/10.3831/KPI.2018.21.001

CITES. (2015). CITES Appendices I, II, and III. *Journal of Minimal Access Surgery*, *4*(3), 85–87. Retrieved from http://www.cites.org

Fadilah, N. N., Agustien, G. S., Suhardiana, E., & Krisdwiyantika, F. (2023). Acute Toxicity Screening of Katuk Leaf Extract (Breynia androgyna (L.) Chakrab. & N.P. Balakr) in Mice (Mus musculus) Using the Thompson and Weil Methods. *Tropical Journal of Natural Product Research*, *7*(3), 2516-1519. http://www.doi.org/10.26538/tjnpr/v7i3.7

Fanisah, K., Setiawan, I., Parlindungan, D., Karyadi, B., Defianti, A., & Yani, A. P. (2023). Identification of the Diversity of Medicinal Plants Used by Battra in North Bengkulu. *Jurnal Penelitian Pendidikan IPA*, *9*(10), 7969–7978. https://doi.org/10.29303/jppipa.v9i10.3876

Hasria, A., Hastuti, H., & Yusal, S. M. (2021). Inventarisasi Tumbuhan Obat sebagai Upaya Swamedikasi oleh Masyarakat Suku Tolaki Desa Puundoho, Kabupaten Kolaka Utara, Sulawesi Tenggara. *Jurnal Ilmiah Farmasi (Scientific Journal of Pharmacy)*, *17*(1), 19-33. http://dx.doi.org/10.20885/jif.vol17.iss1.art3

Hexa, A. H., Muthia, D. A., Sukarsa, S., & Rosyid, R. A. H. (2022). Studi Etnobotani sebagai Obat Tradisional Masyarakat di Desa Adat Kalisalak, Banyumas, Jawa Tengah. *Jurnal Life Science*, *11*(1), 1-12. https://doi.org/10.15294/lifesci.v11i1.59787

Irene, P. D., Verawaty, V., & Tuty, T. (2023). Aktivitas Imunomodulator Ekstrak Etanol Daun Sambiloto (Andrographis paniculata Ness.) pada Mencit Putih. *Jurnal Kesehatan Perintis*, *10*(1), 01-06. http://dx.doi.org/10.33653/jkp.v10i1.967

IUCN. (2023). *The IUCN Red List of Threatened Pecies*. Retrieved from https://www.iucnredlist.org/

Izzuddin, M. Q., & Azrianingsih, R. (2015). Inventarisasi Tumbuhan Obat di Kampung Adat Urug, Desa Urug, Kecamatan Sukajaya, Kabupaten Bogor. *Jurnal Natur*, *1*(1), 83-92. http://dx.doi.org/10.21776/ub.naturalb.2015.003.01.11

Jahurul, M. H. A., Jack, C. S. C., Syifa, A. A. B., Shahidul, I., Norazlina, M. R., Shihabul, A., & Zaidul, I. S. M. (2022). Physicochemical and Antioxidant Properties, Total Phenolic and Nutritional Contents of Noni (Morinda citrifolia) Seed and Its Oil Cultivated in Sabah, Malaysia. *Food Chemistry Advances*, *1*(1), 1-7. https://doi.org/10.1016/j.focha.2022.100079

Jamshidi-Kia, F., Lorigooini, Z., & Amini-Khoei, H. (2018). Medicinal Plants: Past History and Future Perspective. *Journal of Herbmed Pharmacology*, *7*(1), 1-7. https://doi.org/10.15171/jhp.2018.01

Kaihena, M., Ukratalo, A. M., Killay, A., & Kaliky, N. A. P. S. B. (2024). Theimmunomodulatory Activity of Cinnamomum burmanni Bark Extract on leucocyte differentiation of mice (Mus musculus) in diabetes mellitus model. *Jurnal Penelitian Pendidikan IPA*, *10*(1), 55–62. https://doi.org/10.29303/jppipa.v10i1.5947[62

Katherine, A. H., Aaron, M. L., Elizabeth, B., Yue, M. L., Kim, F., & Elise, S. G. (2023). Relationship between Local-Scale Topography and Vegetation on the Invasive C4 Perennial Bunchgrass Buffelgrass

(Pennisetum ciliare) Size and Reproduction. *Invasive Plant Science and Management*, *16*(1), 38–46. https://doi.org/10.1017/inp.2023.9

Kusuma, I. A., Eliza, N. A., Nugraha, M. S., & Kurnia, I. (2023). Inventory of Simplisia of Medicinal Plants Traded in Bogor Traditional Market. *Jurnal Biologi Tropis*, *23*(3),155–163. http://dx.doi.org/10.29303/jbt.v23i3.4922

Larassati, A., Marmaini, M., & Trimin, K. (2019). Inventarisasi Tumbuhan Berkhasiat Obat di Sekitar Pekarangan di Kelurahan Sentosa. *Jurnal Indobiosains*, *1*(1), 76-89. https://doi.org/10.31851/indobiosains.v1i2.3198

Lashgari, N. A., Momeni, R. N., Khayatan, D., Shayan, M., Momtaz, S., Roufogalis, B. D., Abdolghaffari, A. H., & Sahebkar, A. (2022). Ginger and Its Constituents: Role in Treatment of Inflammatory Bowel Disease. *Biofactors*, *48*(1), 7-21. https://doi.org./10.1002/biof.1808

Lestari, D., Koneri, R., & Mabuat, P. V. (2021). Keanekaragaman dan Pemanfaatan Tanaman Obat pada Pekarangan di Dumoga Utara, Kabupaten Bolaang Mongondow, Sulawesi Utara. *Jurnal Bios Logos*, *11*(2), 82-93. https://doi.org/10.35799/jbl.11.2.2021.32017

Lingkubi, J. R., Sumakud, M. Y., Nurmawan, W., & Pangemanan, E. F. (2018). Pemanfaatan Tumbuhan Obat di Kecamatan Bunaken, Kota Manado, Provinsi Sulawesi Utara. *Cocos Journal*, *1*(6), 1-9. https://doi.org/10.35791/cocos.v6i5.7189

Mehran, R., Zahra, Y., Elham, R., Seyed, A. K., Seyedahmad, H., Nava, M., & Azita, H. (2019). Effects of Ginger Supplementation on Anthropometric, Glycemic and Metabolic Parameters in Subjects with Metabolic Syndrome: A Randomized, Double-Blind, Placebo-Controlled Study. *Journal of Diabetes & Metabolic Disorders*, *18*(1), 1-7. https://doi.org/10.1007/s40200-019-00397-z

Melati, D. (2021). Efektifitas Olahan Buah Mengkudu (Morinda citrifolia. L) dalam Menurunkan Tekanan Darah. *Jurnal Kesehatan*, *11*(2), 478-500. Retrieved from https://jurnal.ikbis.ac.id/infokes/article/view/421

Menon, P., Perayil, J., Fenol, A., Rajan, P. M., Lakshmi, P., & Suresh R. (2020). Effectiveness of Ginger on Pain Following Periodontal Surgery–A Randomized Cross Over Clinical Trial. *Journal of Ayurveda and Integrative Medicine*, *12*(1), 65–69. https://doi.org/10.1016/j.jaim.2020.05.003

Nanlohy, F. N., Moko, E. M., Ngangi, J., Ngangi, C. M., & Roring, V. I. Y. (2024). Composition and Diversity of Forestry Plant Species in Forest Areas Manado State University, North Sulawesi. *Jurnal Penelitian Pendidikan IPA*, *10*(1), 12-18. https://doi.org/10.29303/jppipa.v10i1.4794

Ngawit, I. K. (2023). Integrasi Ekologis antara Ternak Sapi dengan Pengelolaan Tanaman Jagung yang Ditumpangsarikan dengan Tanaman Kacang-Kacangan di Lahan Kering. *Jurnal Sains Teknologi & Lingkungan (JSTL)*, *9*(3), 563-581. https://doi.org/10.29303/jstl.v9i3.555

Ngawit, I. K., & Farida, N. (2022). Potential of Weed as Raw Material for Animal Feed on the Integration of Cattle with Coconut Plantations. *Jurnal Penelitian Pendidikan IPA*, *8*(Specialissue), 76-86. https://doi.org/10.29303/jppipa.v8iSpecialIssue.2488

Nikmatullah, M., Renjana, E., Muhaiman, M., & Rahayu, M. (2020). Potensi Tumbuhan Paku (Ferns & Lycophytes) yang Dikoleksi di Kebun Raya Cibodas sebagai Obat. *Al-kauniyah: Jurnal Biologi*, *13*(2), 278-287. https://dx.doi.org/10.15408/kauniyah.v13i2.16061

Nouf, Al-S., Reem, Al-K., Lamees, A., & Eman A. (2022). Effects of Ginger (Zingiber officinale) on Gingival Fibroblasts: An in Vitro Study. *Clinical and Experimental Dental Research*, *8*(4), 906-9011. https://doi.org/10.1002/cre2.575

Oktarlina, R. Z., Tarigan, A., Carolia, N., & Utami, E. R. (2018). Hubungan Pengetahuan Keluarga dengan Penggunaan Obat Tradisional di Desa Nunggalrejo Kecamatan Punggur Kabupaten Lampung Tengah. *Jurnal Kedokteran Unila*, *2*(1), 42–46. https://doi.org/10.23960/jkunila2142-46

Park, E-J., Baek, S-E., Kim, M., Kim, A-R., Park, H-J., & Kwon, O. (2021). Effects of Herbal Medicine (Danggwijagyaksan) for Treating Climacteric Syndrome with a Blood-Deficiency-Dominant Pattern: A Randomized, Double-Blind, Placebo-Controlled Pilot Trial. *Integrative Medicine Reserach*, *10*(3), 1007-1015. https://doi.org/10.1016/j.imr.2021.100715

Patonah, P., Susilawati, E., & Riduan, A. (2018). Aktivitas Antiobesitas Ekstrak Daun Katuk (Sauropus androgynus L. Merr) pada Model Mencit Obesitas. *Pharmaceutical Journal of Indonesia*, *14*(2), 137-152. http://dx.doi.org/10.30595/pharmacy.v14i2.1715

Pauzi, N., Mohd, K. S., Hidayah, N., & Halim, A. (2018). Orthosiphon Stamineus Extracts Inhibits Proliferation and Induces Apoptosis in Uterine Fibroid Cells. *Asian Pacific Journal of Cancer Prevention*, *19*(1), 2737–2744. https://doi.org/10.22034/APJCP.2018.19.10.2737

Pelokang, C. Y., Koneri, R., & Katili, D. (2018). Pemanfaatan Tumbuhan Obat Tradisional oleh Etnis Sangihe di Kepulauan Sangihe Bagian Selatan, Sulawesi Utara. *Jurnal Bioslogos*, *8*(1), 45-51. https://doi.org/10.35799/jbl.8.2.2018.21446

Pertiwi, R., Manaf, S., Supriati, R., Saputra, H. M., & Ramadhanti, F. (2020). Pengaruh Pemberian Salep Kombinasi Ekstrak Daun Morinda citrifolia dan Batang Euphorbia tirucalli terhadap Penyembuhan Luka. *Jurnal Farmasi dan Ilmu Kefarmasian Indonesia*, *7*(1), 42–50. https://doi.org/10.20473/jfiki.v7i12020.42-50

Qamariah, N., Mulyani, E., & Dewi, N. (2018). Inventarisasi Tumbuhan Obat di Desa Pelangsian Kecamatan Mentawa Baru Ketapang Kabupaten Kotawaringin Timur, Borneo. *Journal of Pharmacy*, *1*(1), 1-10. https://doi.org/10.33084/bjop.v1i1.235

Qosimah, D., Laminem, L., Mandasari, C., & Setyawati, D. (2023). Review of the Role of Probiotic and Herbal Supplements as Antibacterial, Antioxidant, and Immunomodulatory against Aeromonas hydrophila). *Jurnal Penelitian Pendidikan IPA*, *9*(6), 178–189. https://doi.org/10.29303/jppipa.v9i6.3621

Rajanna, M. B., Shivakumar, B., Deepak, M. P., Vijayabhaskar, D., & Arun, T. B. (2021). Immunomodulatory Effects of Andrographis Paniculata Extract in Healthy Adults – An Open-Label Study. *Journal of Ayurveda and Integrative Medicine*, *12*(3), 529–534. https://doi.org/10.1016/j.jaim.2021.06.004

Rejimon, G., & Reghu, R. (2018). Drug Utilization Pattern of Non-Steroidal Anti-Inflammatory Drugs in Patients Attending Orthopaedic Department of a Hospital in Kerala. *Journal Pharmaceut Scienece Reserach*, *10*(5), 1014-1016. https://doi.org/10.24198/mfarmasetika.v7i3.37711

Rizal, S., & Sustriana, S. (2019). Inventarisasi dan Identifikasi Tanaman Bekhasiat Obat di Kabupaten Musi Banyuasin Sumatera Selatan. *Jurnal Indobiosains*, *1*(2), 50-62. http://dx.doi.org/10.31851/indobiosains.v1i2.3199

Saudah, S., Vera, V., & Ernilasari, E. (2019). Eksplorasi Spesies Tumbuhan Berkhasiat Obat Berbasis Pengetahuan Lokal di Kabupaten Pidie. *Jurnal Tumbuhan Obat Indonesia*, *12*(2), 56-67. https://doi.org/10.22435/jtoi.v12i2.952

Supriningrum, R., Achmat, K. A., & Rahmasuari, D. (2020). Karakterisasi Spesifik dan Non Spesifik Simplasia Daun Kawau (Millettia sericea L.). *Jurnal Al Ulum Sains dan Teknologi*, *6*(1), 12-18. http://dx.doi.org/10.31602/ajst.v6i1.3657

Surahmaida, S., Umarudin, U., & Junairiah, J. (2019). Senyawa Bioaktif Daun Kumis Kucing (Orthosiphon spicatus (Blume) Miq.). *Jurnal Kimia Riset*, *4*(1), 81-88. https://doi.org/10.20473/jkr.v4i1.13176

Suveltri, B., Syam, Z., & Solfiyeni, S. (2014). Analisa Vegetasi Gulma pada Pertanaman Jagung (Zea mays L.) pada Lahan Olah Tanah Maksimal di Kabupaten Lima Puluh Kota. *Jurnal Biologi Universitas Andalas*, *3*(2), 103–108. https://doi.org/10.25077/jbioua.3.2.%25p.2014

Tania, A., & Novsa, F. (2023). Quality Analysis of Organic Jam from Noni Fruit as a Home Scale Business Product. *Jurnal Sains Boga*, *5*(2), 111-117. https://doi.org/10.21009//JSB.005.2.04

Tima, M. T., Wahyuni, S., & Murdaningsih, M. (2020). Etnobotani Tanaman Obat di Kecamatan Nangapanda Kabupaten Ende Nusa Tenggara Timur. *Jurnal Penelitian Kehutanan Faloak*, *4*(1), 23-38. https://doi.org/10.20886/jpkf.2020.4.1.23-38

Trisna, R. N. K., Mayun P. I. D. G., & Diah, P. G. K. (2020). Pengaruh Waktu Maserasi terhadap Aktivitas Antioksidan Ekstrak Daun Pegagan (Centella asiatica (L.) Urban). *Jurnal Ilmu dan Teknologi Pangan*, *9*(4), 482-493. https://doi.org/10.24843/itepa.2020.v09.i04.p12

Vina, J. A., Dewi, K., Dadang, D. & Mardiyani, S. (2023). Komposisi Kimia dan Penentuan Senyawa Aktif Antioksidan dari Minyak Atsiri Kunyit (Curcuma longa L.). *Farmasi Higea*, *15*(1), 54-63. http://dx.doi.org/10.52689/higea.v15i1.508

Widiyastuti, Y., Adi, M. B. S., & Widayat, T. (2018). Spesies Tumbuhan Obat di Cagar Alam Sigogor Ponorogo Jawa Timur. *Jurnal Tumbuhan Obat Indonesia*, *10*(2), 78-97. http://dx.doi.org/10.22435/toi.v10i2.6736.78-87

Wirasti, W., Rahmatullah, S., & Muthoharoh, A. (2021). Formulasi Sediaan Kombinasi Simplisia Daun Katuk, Daun Kelor, dan Jahe sebagai Minuman Instan. *Jurnal Ilmiah Kesehatan*, *14*(1), 83–86. https://doi.org/10.48144/jiks.v14i1.537

Yowa, M. K., Boro, T. L., & Danong, M. T. (2019). Inventarisasi Jenis-Jenis Tumbuhan Berkhasiat Obat Tradisional di Desa Umbu Langang Kecamatan Umbu Ratu Nggay Barat Kabupaten Sumba Tengah. *Jurnal Biotropikal Sains*, *16*(1), 1–13. Retrieved from https://ejurnal.undana.ac.id/biotropikal/article/download/1248/991

Yuan, H., Ma, Q., Ye, L., & Piao, G. (2016). The Traditional Medicine and Modern Medicine from Natural Products. *Molecules*, *21*(5), 1-18. https://doi.org/10.3390/molecules21050559

Yujin, C., Kim, Y., Kwon, O., Chung, S. Y., & Cho, S. H. (2021). Effect of Herbal Medicine (Huanglian-jie-du granule) for Somatic Symptoms and Insomnia in patients with Hwa-byung: A Randomized Controlled Trial. *Integrative Medicine Reserach*, *10*(2), 104-1053. https://doi.org/10.1016/j.imr.2020.100453

Zahra, D. A., & Jutti, L. (2018). Buah Mengkudu (Morinda citrifolia L.), dan Biji Jinten Hitam (Nigella sativa L.) dan Teori Uji Toksisitas. *Jurnal Farmaka Suplemen*, *16*(1), 295-303. https://doi.org/10.24198/jf.v16i1.17482.g8649