



Ethnobotanical Survey and Quantitative Assessment of Medicinal Plants Used by the Banjarsari Community, in Bareng, Jombang, East Java

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Abstract

Traditional ecological knowledge (TEK) remains a vital component of primary healthcare in rural communities, yet it faces constant pressure from modernization. This study aims to document the diversity, utilization patterns, and cultural significance of medicinal plants used by the community of Banjarsari Hamlet, Jombang. An ethnobotanical survey was conducted using semi-structured interviews with local informants. Data were analyzed using quantitative indices, including Use Value (UV) and Relative Frequency of Citation (RFC), as well as botanical identification and growth-form classification. A total of 30 medicinal plant species belonging to 19 families and 28 genera were identified. The family Zingiberaceae emerged as the most dominant taxonomic group. Herbaceous plants were the most prevalent growth form (46.7%), with leaves (53.3%) and rhizomes (20.0%) being the most frequently utilized parts. Decoction was the primary mode of preparation, and oral administration was the most common route. Quantitative analysis highlighted *Curcuma longa* (UV = 1.25; RFC = 0.85) and *Zingiber officinale* (UV = 1.10; RFC = 0.75) as the most culturally and therapeutically significant species. These plants are primarily employed to treat metabolic disorders (hypertension, diabetes) and gastrointestinal ailments. The community relies heavily on medicinal flora, characterized by sustainable harvesting practices and strong consensus on the efficacy of key taxa. These findings provide a baseline for future pharmacological validation and highlight the importance of preserving biocultural heritage in local healthcare systems.

Keywords: Banjarsari, Ethnobotany, Medicinal plants, Relative Frequency of Citation, Traditional Ecological Knowledge, Use Value, Zingiberaceae

1. Introduction

The utilization of traditional medicinal plants is an inseparable component of global healthcare systems. The World Health Organization (WHO) estimates that approximately 80% of the global population continues to rely on plant-based medicines to fulfill their basic healthcare needs (WHO, 2025). As one of the world's premier megadiverse nations, Indonesia significantly contributes to this figure through its vast medicinal flora and traditional knowledge passed down through generations (Damayanti & I, 2024). Scientifically, this potential is supported by Indonesia's floral diversity, estimated at 30,000 to 35,000 species, with at least 31,750 species identified as of the 2025–2026 period. This figure represents approximately 10% to 15% of the total global plant diversity, of which approximately 9,600 species have been identified for their medicinal properties. However, the utilization of this intellectual wealth remains suboptimal; various ethnobotanical studies indicate that only about 27% of these medicinal species are actively employed by communities in traditional medical practices. This Traditional Ecological Knowledge (TEK) represents a strategic asset that encompasses not only species identification but also specialized processing techniques and therapeutic applications (Anju & Kumar, 2024).

The gap between biological potential and practical utilization is further exacerbated by the threat of knowledge erosion at the local level. In East Java, rural communities maintain a strong cultural attachment to the "Jamu" tradition; however, modernization, urbanization, and a lack of knowledge regeneration among the younger generation threaten the survival of these ancestral practices (Arjona-García et al., 2021). Beyond sociocultural threats, environmental degradation due to land conversion into residential areas and monoculture agriculture, as observed in the Jombang region, risks the loss of critical medicinal plant species before their pharmacological potential can be scientifically documented. Banjarsari Hamlet in Jombang Regency emerges as a unique study site, as its community actively integrates wild and home-garden plants into self-healthcare practices. Unfortunately, ethnobotanical documentation in this region remains sparse and largely descriptive. Without quantitative validation, it is challenging to determine the cultural importance and consensus regarding species usage within the community. Consequently, a quantitative ethnobotanical approach using the Relative Frequency of Citation (RFC) and Fidelity Level (FL) indices is crucial (Cordero et al., 2022). RFC measures the degree of community consensus on the general utility of a plant, while FL identifies the primary preference for specific therapeutic categories.

This study aims to inventory the medicinal plants used by the Banjarsari community and evaluate their significance through quantitative analysis. Furthermore, conservation aspects and challenges to the preservation of traditional knowledge are explored. The findings are expected to serve as a vital database for the preservation of Indonesia's biocultural heritage and provide a scientific foundation for future drug discovery efforts based on local indigenous knowledge.

2. Materials and Methods

This study employed a quantitative ethnobotanical approach with a descriptive research design. The field research was conducted in December 2025 at Banjarsari Hamlet, Bareng Village, Bareng District, Jombang Regency, East Java, Indonesia. Data were collected using a triangulation technique comprising interviews, observations, and documentation to ensure data validity. The systematic steps for data collection and analysis were as follows:

2.1. Informant Selection

A total of 20 informants were selected using a snowball sampling technique to ensure the reliability of the ethnobotanical data. The participants consisted of residents aged between 17 and 60 years who possessed knowledge of traditional healing. Among them, three individuals were designated as key informants: one traditional healer (tabib) and two housewives recognized by the community for their expertise in preparing herbal remedies.

2.2. Data Collection

Ethnobotanical data were gathered through a triangulation of qualitative and field-based methods:

- 1) Semi-structured Interviews: Interviews were conducted to document local plant names, therapeutic uses, parts used, and methods of preparation.
- 2) Participant Observation: The researchers observed the daily practices of the community in collecting and processing medicinal plants to ensure contextual accuracy.
- 3) Field-based Plant Identification: Plants mentioned by the informants were identified in situ. For species that required further verification, voucher specimens were collected and identified using standard botanical keys and literature.
- 4) Literature Review: Existing botanical databases and ethnobotanical literature were consulted to validate the scientific nomenclature and pharmacological potential of the identified species.

2.3. Data Analysis

The data analysis followed a mixed-methods approach, integrating qualitative thematic analysis with quantitative ethnobotanical indices.

Qualitative Analysis

Qualitative data were analyzed following the framework proposed by Creswell (2015). The process commenced with data organization, where information regarding the various plant species utilized by the community was categorized based on their functional roles in local activities. Subsequently, the documented flora underwent a systematic process of identification, description, and classification. This phase focused on interpreting the cultural significance, traditional preparation methods, and the local taxonomy as practiced by the Banjarsari community.

Quantitative Analysis

To provide statistical validation and evaluate the relative importance of the recorded species, the following quantitative indices were calculated:

Relative Frequency of Citation (RFC): This index was used to assess the local importance of each species based on informant consensus. It was calculated using the formula:

$$RFC = \frac{FC}{N}$$

Where FC is the number of informants who cited the species, and N is the total number of informants (N = 20).

Fidelity Level (FL): To identify the most preferred species for specific therapeutic categories, the FL was calculated as:

$$FL (\%) = \left(\frac{I_p}{I_u} \right) \times 100$$

Where I_p is the number of informants who cited a species for a specific primary use, and I_u is the total number of informants who mentioned the plant for any use.

3. Results

3.1. Sociodemographic Profile of Informants

Data collection was conducted through semi-structured interviews focusing on personal information and the specific medicinal plants utilized for addressing health concerns. The sociodemographic profile of the participants, comprising age, gender, educational attainment, and primary occupation, is systematically presented in Table 1.

Table 1. Sociodemographic characteristics of the informants in Banjarsari Hamlet.

Demographic profile	Variables	No. of Informants (20)	Percentage (%)
Gender	Male	5	27
	Female	15	75
Age (years)	17 – 25	1	5
	26 – 35	3	15
	36 – 45	4	20
	46 – 60	12	60
Education	Elementary school	12	60
	Secondary school	1	5
	High school	7	35
Occupation	Farmer	12	60
	Housewife	4	20
	Employed	4	20

3.2. Characteristics of Medicinal Plants

The present study documented a total of 30 medicinal plant species distributed across 28 genera and 19 botanical families. The family Zingiberaceae was the most well-represented with 6 species, followed by Asteraceae with 3 species, and Piperaceae, Myrtaceae, Rubiaceae, and Fabaceae, each represented by 2 species (Figure 1).

Zingiberaceae not only exhibited the highest species richness but also demonstrated the broadest therapeutic spectrum, addressing 9 different types of ailments, primarily dominated by gastrointestinal and respiratory disorders. Conversely, the families Asteraceae, Basellaceae, Myrtaceae, and Pandanaceae showed a highly specialized focus on metabolic disease categories, particularly in the management of diabetes and cholesterol. Furthermore, the utilization of *Acacia tomentosa* (Fabaceae) and *Psidium guajava* (Myrtaceae) indicated a high level of community consensus for treating gastrointestinal issues, specifically diarrhea.

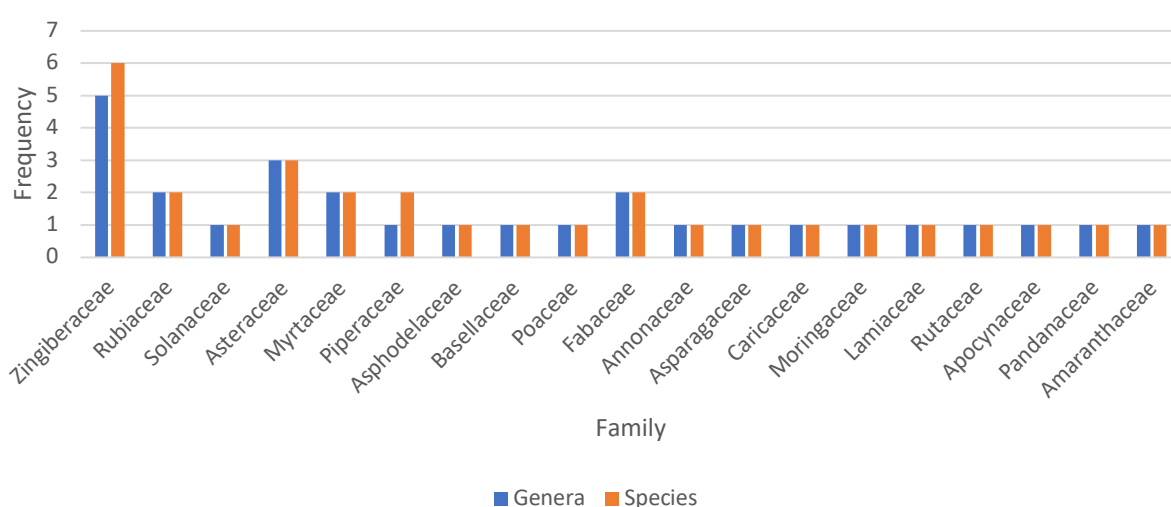


Figure 1. Comparative richness of medicinal plant genera and species per family

The medicinal plants utilized by the Banjarsari community exhibited diverse growth forms, categorized into herbs, shrubs, and trees. Herbs were the most dominant habitus, representing 46.7% (14 species) of the total documented flora. This was followed by shrubs at 33.3% (10 species), while trees constituted the remaining 20.0% (6 species) (Figure 2). The prevalence of herbaceous plants indicates their high accessibility and ease of cultivation in home gardens, making them a primary resource for immediate traditional remedy preparation.

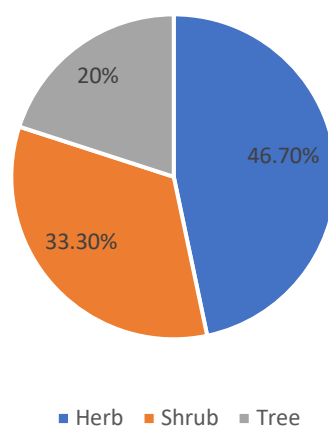


Figure 2. Morphological diversity of documented medicinal flora based on habitus classification

3.3. Plant Parts Used, Modes of Preparation, and Administration

The documentation of ethnomedicinal practices in Banjarsari Hamlet revealed that various plant parts are harvested for therapeutic purposes (Figure 3). Leaves represent the most frequently utilized organ, accounting for 53.3% (16 species) of the total documented flora. This is followed by rhizomes at 20.0% (6 species), predominantly from the Zingiberaceae family, such as *Curcuma longa* and *Zingiber officinale*. Other components, including fruits, stems, flowers, and bark, constitute smaller proportions of the local pharmacopeia. The high reliance on leaves is consistent with sustainable harvesting practices, as leaf removal is generally less detrimental to the plant's survival compared to bark or root extraction, thereby ensuring the long-term availability of medicinal resources within the community.

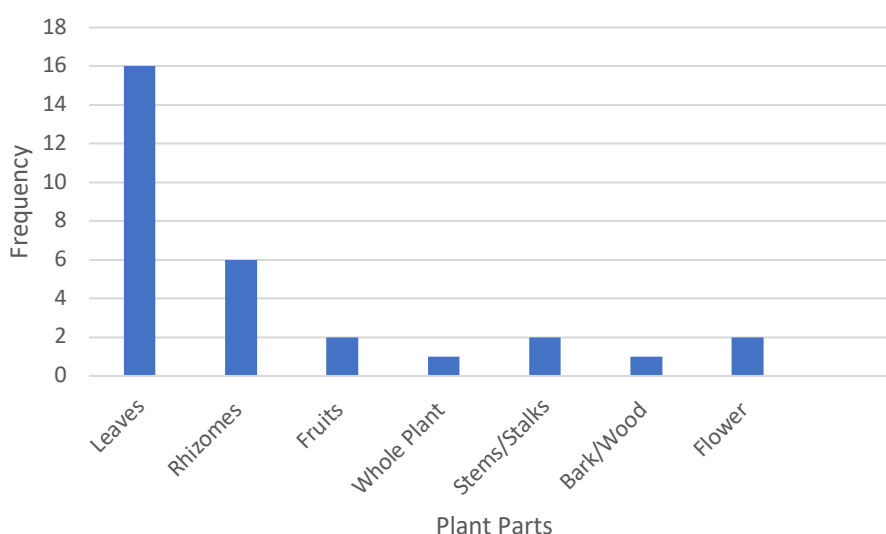


Figure 3. Frequency of plant organs utilized in the preparation of local medicinal treatments

The ethnobotanical survey in Banjarsari Hamlet successfully identified a comprehensive repertoire of medicinal flora utilized by the local community. The taxonomic identity, therapeutic applications, and traditional pharmacological processing of these species are systematically detailed in Table 2, which serves as the primary inventory for the documented botanical taxa. These data encompass 30 species across 19 families, illustrating a sophisticated integration of plant diversity into the local primary healthcare system.

Table 2. Systematic documentation of medicinal plant species and their traditional therapeutic uses

Local Name	Scientific Name	Therapeutic Uses	Mode of Preparation and Administration
Koner/Kunyit	<i>Curcuma longa</i>	Gastralgia (stomach ache), diarrhea, urticaria (hives), and an immune stimulant	Rhizome is grated, squeezed, and boiled (decoction); administered orally
Simbukan/Sembukan	<i>Paederia foetida</i>	Flatulence and meteorism	Crushed leaves are applied topically to the abdomen
Jahe/Jahe	<i>Zingiber officinale</i>	Sore throat, nausea, and as a thermogenic agent	Sore throat, nausea, and as a thermogenic agent
Ciplukan/Ciplukan	<i>Physalis angulata</i>	Hypertension and diabetes mellitus	Decoction of roots (oral); fruits are consumed fresh
Tapak liman/Tapak Liman	<i>Elephantopus scaber</i>	Glycemic control (diabetes)	Decoction of leaves or roots; administered orally
Salam/Daun salam	<i>Syzygium polyanthum</i>	Diabetes, hypercholesterolemia, and hypertension	Leaf decoction; administered orally
Suruh ijo/Sirih hijau	<i>Piper betle</i> L.	Epistaxis (nosebleed), body odor, and leucorrhea	Leaf decoction; administered orally or as an external vaginal wash

Local Name	Scientific Name	Therapeutic Uses	Mode of Preparation and Administration
Suruh abang/Sirih merah	<i>Piper ornatum</i>	Hypoglycemic agent and leucorrhea	Leaf decoction; administered orally or as an external vaginal wash
Kencor/Kencur	<i>Kaempferia galanga</i>	Pharyngitis (sore throat) and antitussive (cough)	Rhizome is grated, squeezed, and administered orally
Lidah buaya/Lidah buaya	<i>Aloe vera</i>	Burn wounds and internal heat (heatstroke/mouth sores)	Gel is applied topically or consumed as juice
Binahong/Binahong	<i>Anredera cordifolia</i>	Blood sugar stabilization, hypercholesterolemia, and hypertension	Leaf decoction; administered orally
Temulawak/Temulawak	<i>Curcuma zanthorrhiza</i>	Appetizer (orexigenic)	Rhizome is grated, squeezed, and administered orally
Jambu Biji/Jambu Biji	<i>Psidium guajava</i>	Antidiarrheal	Leaf extract (grated and squeezed); administered orally
Sereh/Serai	<i>Cymbopogon citratus</i>	Digestive aid and hypolipidemic agent	Stem decoction; administered orally
Klampus/Klampus	<i>Acacia tomentosa</i>	Antidiarrheal	Stem bark is crushed, squeezed, and administered orally
Muris/Sirsak	<i>Annona muricata</i>	Glycemic and blood pressure control, digestive aid	Fresh fruits are consumed directly
Andong/Andong	<i>Cordyline fruticosa</i>	Hemostatic (stops bleeding)	Fresh leaves are crushed, heated, and applied topically as a poultice
Kates/Pepaya	<i>Carica papaya</i>	Digestive aid and glycemic control	Fresh fruits are consumed directly
Kelor/Kelor	<i>Moringa oleifera</i>	Cardioprotective and hypoglycemic agent	Leaves are consumed as a cooked vegetable
Luntas/Beluntas	<i>Pluchea indica</i>	Hypolipidemic and hypoglycemic agent	Leaves are consumed as a side dish or fresh salad (<i>lalapan</i>)
Kemangi/Kemangi	<i>Ocimum basilicum</i> L.	Halitosis (bad breath) and antitussive/expectorant	Leaves are consumed as a side dish or fresh salad
Jeruk pecel/Jeruk nipis	<i>Citrus aurantiifolia</i>	Antitussive, sore throat, and respiratory aid	Fruit juice is squeezed and administered orally
Pule/Pule	<i>Alstonia scholaris</i>	Antipruritic (relieves itching)	Stem bark decoction for oral consumption or used in medicinal baths
Asem/Asam jawa	<i>Tamarindus indica</i>	Hypolipidemic and digestive aid	Fruit infusion (steeped in hot water); administered orally
Senikir/Kenikir	<i>Cosmos caudatus</i>	Hypertension, diabetes, and hypercholesterolemia	Leaves are consumed as a side dish or fresh salad
Laos/Lengkuas	<i>Alpinia galanga</i>	Digestive aid and analgesic for joint pain	Rhizome decoction; administered orally
Kunci/Temu kunci	<i>Boesenbergia rotunda</i>	Body odor and leucorrhea	Rhizome decoction; administered orally
Kudu/Mengkudu	<i>Morinda citrifolia</i>	Hypotensive and hypoglycemic agent	Fruits are processed into juice; administered orally
Pandan/Pandan	<i>Pandanus amaryllifolius</i>	Diabetes and hypercholesterolemia control	Leaf decoction; administered orally
Bayem/Bayam	<i>Amaranthus caudatus</i>	Hypotension and anemia	Leaves are consumed as a cooked vegetable

3.4. Use Value and Relative Frequency of Citation

The quantitative assessment of the medicinal flora through Use Value (UV) and Relative Frequency of Citation (RFC) provides a comprehensive understanding of species importance within the community. As summarized in Table 3, the calculated indices revealed a wide range of values, reflecting varying degrees of cultural consensus and multi-functional utility for each species.

Table 3. Ethnobotanical importance of medicinal flora based on Use Value and Relative Frequency of Citation

Scientific Name	UV	RFC
<i>Curcuma longa</i>	1,25	0,85
<i>Paederia foetida</i>	0,65	0,5
<i>Zingiber officinale</i>	1,1	0,75
<i>Physalis angulata</i>	0,45	0,2
<i>Elephantopus scaber</i>	0,3	0
<i>Syzygium polyanthum</i>	0,95	0
<i>Piper betle</i> L.	0,9	0,75
<i>Piper ornatum</i>	0,55	0
<i>Kaempferia galanga</i>	0,8	0,7
<i>Aloe vera</i>	0,5	0,2
<i>Anredera cordifolia</i>	0,75	0
<i>Curcuma zanthorrhiza</i>	0,4	0,05
<i>Psidium guajava</i>	0,6	0,35
<i>Cymbopogon citratus</i>	0,55	0,3
<i>Acacia tomentosa</i>	0,45	0,3
<i>Annona muricata</i>	0,65	0,15
<i>Cordyline fruticosa</i>	0,35	0,05
<i>Carica papaya</i>	0,7	0,35
<i>Moringa oleifera</i>	0,6	0,25
<i>Pluchea indica</i>	0,55	0,35
<i>Ocimum basilicum</i> L.	0,85	0,6
<i>Citrus aurantiifolia</i>	0,8	0,45
<i>Alstonia scholaris</i>	0,4	0,1
<i>Tamarindus indica</i>	0,7	0,5
<i>Cosmos caudatus</i>	0,65	0,4
<i>Alpinia galanga</i>	0,5	0,2
<i>Boesenbergia rotunda</i>	0,55	0,3
<i>Morinda citrifolia</i>	0,45	0,15
<i>Pandanus amaryllifolius</i>	0,4	0,15
<i>Amaranthus caudatus</i>	0,5	0,45

UV = Use Value; RFC = Relative Frequency of Citation

The species *Curcuma longa* exhibited the highest scores for both indices (UV = 1.25; RFC = 0.85), followed by *Zingiber officinale* (UV = 1.10; RFC = 0.75). These high values signify that these rhizomatous herbs are not only widely recognized by the informants but also possess a broad spectrum of therapeutic applications, ranging from gastrointestinal treatments to immune stimulation. Other significant taxa with high cultural importance include *Piper betle* L. (RFC = 0.75) and *Kaempferia galanga* (RFC = 0.70), both of which play central roles in local healthcare traditions.

Conversely, lower indices were observed in species such as *Curcuma zanthorrhiza* and *Cordyline fruticosa*, suggesting more specialized or less frequent utilization in current medicinal practices. The strong positive correlation between high RFC and UV values for dominant taxa, particularly within the Zingiberaceae family, underscores the community's reliance on easily accessible, high-utility species to address prevalent health concerns like metabolic and digestive disorders.

4. Discussion

The ethnobotanical survey in Banjarsari Hamlet documented 30 medicinal plant species, with a clear dominance of the Zingiberaceae family. This taxonomic prevalence is consistent with other studies in Southeast Asia, which highlight the cultural and pharmacological significance of rhizomatous plants in tropical communities. The high diversity of species used to treat metabolic disorders, such as diabetes and hypertension, suggests a shift in the local health burden toward non-communicable diseases, mirroring global health trends (Hossain et al., 2024). The predominance of herbaceous species (46.7%) and the frequent utilization of leaves (53.3%) reflect a sophisticated local strategy for ecological sustainability. Har-

vesting leaves is biologically less damaging to a plant's survival compared to the extraction of roots or bark. This "non-destructive harvesting" ensures that medicinal resources remain available throughout the year, particularly for species grown in home gardens (*pekarangan*). Furthermore, the high reliance on herbs and shrubs indicates that the community primarily sources its medicine from anthropogenic landscapes, which are more accessible than forest habitats (Lulesa et al., 2025).

The high Use Value (UV) and Relative Frequency of Citation (RFC) for *Curcuma longa* and *Zingiber officinale* underscore their status as "keystone" medicinal plants in the local pharmacopeia. A high RFC value indicates a strong consensus among informants, suggesting that the therapeutic efficacy of these plants has been validated through generations of communal experience. The versatility of these taxa (high UV) in treating various ailments from digestive issues to immune support is often attributed to their rich concentration of bioactive compounds, such as curcuminoids and gingerols, which possess well-documented antioxidant and anti-inflammatory properties. The prevalence of herbaceous growth forms (46.7%) and the primary use of leaves (53.3%) reflect a strategic adaptation to resource availability. According to the *Optimal Foraging Theory*, collectors tend to prioritize resources that offer the highest therapeutic return with the least energy expenditure. Herbs found in home gardens (*pekarangan*) provide immediate access compared to forest-dwelling woody species. Moreover, the preference for leaves over bark or roots represents a sustainable harvesting strategy. Physiologically, leaves are metabolic sinks where secondary metabolites such as alkaloids and flavonoids are synthesized in high concentrations to deter herbivory, thus providing a rich source of bioactive compounds for human medicine without compromising the plant's ontogeny (El-Saadony, 2025).

The preference for decoction as the primary mode of preparation is scientifically justified, as boiling effectively extracts polar secondary metabolites, such as alkaloids and flavonoids, which are often responsible for the plant's medicinal activity. Furthermore, the common practice of consuming medicinal plants as fresh vegetables (*lalapan*), such as *Pluchea indica* and *Cosmos caudatus*, integrates medicine into daily nutrition. This blurring of the boundary between "food" and "medicine" is a hallmark of traditional Indonesian health systems (*Jamu*), promoting preventative health through dietary habits.

The sociodemographic profile of the informants (Table 1) suggests that traditional knowledge is still actively maintained, though it may be influenced by educational levels and occupation. The persistence of these practices in Banjarsari Hamlet, despite the availability of modern medicine, highlights the resilience of local ecological knowledge as a reliable and affordable primary healthcare alternative. A compelling finding in this study is the high frequency of plants used to treat metabolic disorders (diabetes and hypertension) compared to infectious diseases. This reflects an epidemiological transition occurring even in rural hamlets, where sedentary lifestyles and dietary changes have increased the prevalence of non-communicable diseases (NCDs). The community's reliance on *Annona muricata* and *Morinda citrifolia* for blood pressure regulation demonstrates an indigenous response to modern health challenges. This reliance is often driven by the high cost or perceived side effects of synthetic pharmaceuticals, positioning traditional medicine as a resilient and culturally congruent primary healthcare alternative.

5. Conclusions

This study underscores the enduring significance of ethnomedicinal practices in Banjarsari Hamlet, documenting 30 medicinal plant species across 19 families that remain integral to the local primary healthcare system. The dominance of the Zingiberaceae family and the prevalence of herbaceous growth forms (46.7%) highlight a strategic reliance on accessible, home-garden-based resources. Furthermore, the high frequency of leaf utilization (53.3%) demonstrates a community-driven approach to sustainable harvesting, ensuring the long-term viability of botanical resources.

Quantitative analysis through Use Value (UV) and Relative Frequency of Citation (RFC) indices identified *Curcuma longa* and *Zingiber officinale* as the most culturally significant taxa, characterized by their high therapeutic versatility and strong communal consensus. The primary use of decoctions and the integration of medicinal plants into daily diets (e.g., *lalapan*) reflect a sophisticated traditional pharmacological system, particularly in managing prevalent metabolic and gastrointestinal disorders.

These findings suggest that traditional ecological knowledge in Banjarsari is still robustly maintained. However, further pharmacological validation and phytochemical screening of the high-UV species are recommended to substantiate their clinical efficacy. Ultimately, this documentation serves as a vital record for the preservation of biocultural heritage and provides a foundation for future drug discovery and community-based conservation programs.

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Conflicts of Interest: The authors declare that there is no conflict of interest regarding the publication of this research. There are no financial or personal relationships with other people or organizations that could inappropriately influence or bias the content of this paper.

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