

## Penggunaan Tradisional Obat Herbal di Baturraden, Jawa Tengah

### *Traditional Use of Medicinal Plants in Baturraden, Central Java*

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#### Kata Kunci

- Baturraden
- etnofarmakologi
- tumbuhan obat
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#### Keywords

- *Baturraden*
- *Ethnomedicine*
- *medicinal plants*
- *quantitative ethnobotany*

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#### ABSTRAK

Studi etnofarmakologi merupakan langkah awal dalam pengembangan jamu, yang mana telah dilakukan secara simultan di seluruh wilayah Indonesia. Penelitian ini bertujuan untuk mengeksplorasi penggunaan tumbuhan obat secara tradisional di Baturraden, Jawa Tengah. Penelitian ini merupakan studi kuantitatif aspek etnofarmakologi di Baturraden. Data dikumpulkan melalui wawancara semi terstruktur terhadap 36 informan, meliputi nama lokal, indikasi penggunaan, metode penyiapan, dan cara penggunaan dari masing-masing tumbuhan obat. Parameter etnobotani kuantitatif yang digunakan adalah nilai guna, frekuensi penggunaan relatif, dan tingkat fidelitas. Masyarakat Baturraden menggunakan 47 spesies tumbuhan obat untuk mengobati 32 gangguan kesehatan. Daun, dekok, dan oral masing-masing merupakan bagian tumbuhan, bentuk sediaan, dan cara penggunaan dari tumbuhan obat yang paling sering digunakan di Baturraden. Terdapat 24 sediaan herbal dengan tingkat fidelitas 100%, yang mana digunakan untuk perawatan 14 gangguan kesehatan. *Curcuma longa*, *Zingiber officinale*, *Piper betle*, *Cymbopogon citratus*, *Andrographis paniculata*, *Syzygium polyanthum*, *Citrus aurantiaca*, dan *Zingiber montanum* were merupakan tumbuhan obat dengan nilai guna dan frekuensi penggunaan relatif yang paling tinggi. Dengan demikian, aktivitas farmakologi dan pengembangan sediaan herbal yang terstandar dari tumbuhan-tumbuhan tersebut perlu dipelajari lebih jauh.

#### ABSTRACT

*An ethnopharmacological study is an initial step for the development of jamu, which has been simultaneously conducted throughout Indonesia. This study aimed to explore the utilization of medicinal plants in Baturraden, a region with relatively rich plant biodiversity in Java. Our research is a quantitative ethnobotanical study reporting the utilization of medicinal plants as a single plant botanical preparation in the studied area. The data were collected through semi-structured interviews with 36 informants on the local names, indications, parts used, method of preparation, and application of the plants. The species use-value (SUV), relative frequency citation (RFC), and the fidelity level (FL) of each species were calculated accordingly. The study recorded the utilization of 47 species of medicinal plants, which were employed to treat 32 ailments. Leaves, decoctions, and oral were recorded as the most commonly used plant part, herbal preparation, and application. There were 24 botanical preparations with the FL value of 100%, which were indicated for the treatment of fourteen diseases/symptoms. *Curcuma longa*, *Zingiber officinale*, *Piper betle*, *Cymbopogon citratus*, *Andrographis paniculata*, *Syzygium polyanthum*, *Citrus aurantiaca*, and *Zingiber montanum* were considered as the most important and valuable plants by the local community. Hence, those plants should be evaluated further for their pharmacological activity and developed into standardized botanical preparations.*



## INTRODUCTION

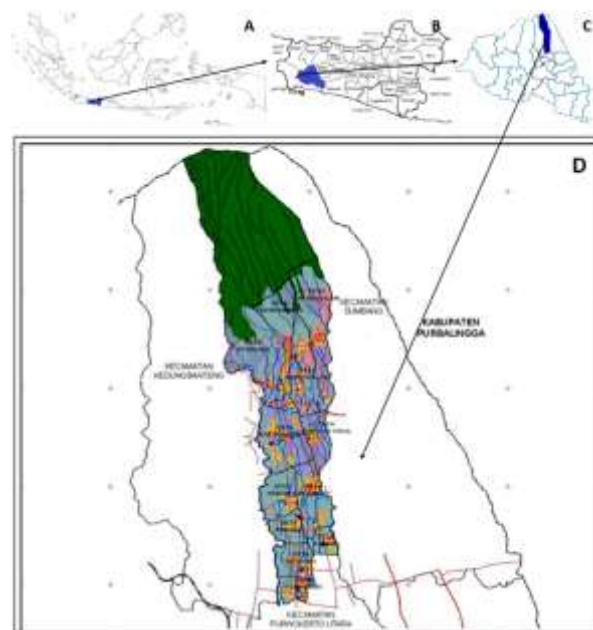
Jamu, the Indonesian traditional herbal medicine, is popularly used because low price, is widely available, perceived as natural and having no side effects, and safe to be consumed (Prabawani 2017). In order to achieve jamu status as the specific traditional medicine practice, the Indonesian Government established the science-based jamu development program (*saintifikasi jamu*) in 2010. It consists of four stages, in which the first one is the ethnopharmacological study to obtain the baseline data of the traditional utilization of medicinal plants (Aditama 2015). Such studies have been conducted nationwide through the multi-year National Research on Medicinal Plants and Jamu (*Riset Nasional Tanaman Obat dan Jamu*, RISTOJA) programs.

Baturraden is one of the sub-districts in Banyumas, with the highest altitude located on the side of Gunung Slamet. This geographical feature enables the richness of plant biodiversity in the area, which the locals might utilize for medicinal purposes. The abundance of plant diversity in the area is supported by establishing the Baturraden Botanical Garden in the northern-most regions of this sub-district (Mandiriati *et al.* 2016). Previously, the medicinal utilization of plants in the Rosidae sub-class and ten other plant species for treating diarrhea in Baturraden were reported

However, both studies were qualitative ones, which only reported the species of the plants without pointed their importance. Only recently, a quantitative study reported the use of plants for treating diabetes in Baturraden and the neighbor subdistrict, Sumbang (Utaminigrum *et al.* 2020).

The indices in a quantitative study, including species use-value (SUV), relative frequency citation (RFC), and the fidelity level (FL), are essential to rank the plants that are most useful or valuable to a given culture (Zenderland *et al.* 2019). The data obtained from a quantitative ethnobotanical study can be used as the basis for the further development of each plant. Plants with high SUV and RFC are considered important and valuable; hence, they should be prioritized further studies. Regarding the science-based jamu development program, those plants should be evaluated for their bioactivities and standardized to enable their uses as *jamu* ingredients in a formal health service.

This study aims to collect and analyze the utilization of medicinal plants in the area through qualitative and quantitative approaches. The qualitative aspect covers documentation of those plants for the database establishment, while the quantitative aspect deals with the determination of each plant's SUV, RFC, and FL.



**Figure 1.** Map of the studied area shows the location of Indonesia (A), Central Java (B), Banyumas (C), and Baturraden (D)

(Permatasari *et al.* 2011; Suparman *et al.* 2012). **METHOD**



### Study Area

Baturraden is a sub-district in Banyumas, Central Java, Indonesia. It covers a 45.53km<sup>2</sup> area between 7°14'-7°33' and 109°12'-109°14' north and east longitude, respectively. Baturraden is bounded by Tegal and Pemalang Regencies in the north and sub-districts of Sumbang, North Purwokerto, and Kedung Banteng in the east, south, and west, respectively (Figure 1).

### Collection of Ethnopharmacological Data

The protocol of this study was granted ethical approval from the Ethical Commission of Faculty of Medicine and Health Sciences, Universitas Jendral Soedirman (Ref: 187/KEPK/XI/2016). The survey was conducted from January – March 2017. A total of 36 informants were selected based on their knowledge and experience in using medicinal plants (Table 1). According to their respective populations, they were proportionally sampled from all villages in Baturraden. The data on the knowledge and experience of the respondents in the use of medicinal plants were collected through a semi-structured interview following the modified questionnaire of RISTOJA 2015 (Indonesian MoH 2015b). The written informed consent was obtained from the informants before interviews were conducted. All informants were asked to cite all

as the single plant preparation were reported here. Plant mentioned during interviews were collected, and their pressed specimens were prepared accordingly, which were deposited at the Faculty of Pharmacy, Universitas Muhammadiyah Purwokerto.

### Data Analysis

The descriptive statistic was used to analyze the data obtained from interviews (supplementary data). The part used, indication, method of preparation, and method of use of each plant were listed by their botanical name, which was presented according to The Plant List ([www.theplantlist.org](http://www.theplantlist.org)). The SUV, RFC, and FL of each species represented their relative importance, which was calculated using formula 1-3 as follow:

$$SUV = \sum \frac{U_i}{N} \quad (1)$$

$$RFC = \frac{FC}{N} \quad (2)$$

$$FL = \frac{I_p}{I_u} \times 100 \quad (3)$$

Where  $U_i$  is the total uses of a given plant species,  $N$  is the total number of informants,  $FC$  is the total informant number mentioning the use of a given species,  $I_p$  is the informant number citing the specific use of a given plant, and  $I_u$  is the total number of informants mentioning any uses of that plant.

**Table 1.** Sociodemographic profile of informants)








Characteristic	Frequency	Percentage (%)
Javanese ethnicity	36	100
Gender		
Male	5	13.9
Female	31	86.1
Age (years)		
21-29	5	13.9
30-39	3	8.3
40-49	6	16.7
50-59	11	30.5
60-69	10	27.8
70-79	1	2.8
Education level		
Elementary school	20	55.6
Junior high school	2	5.6
High school	11	30.5
University	3	8.3
Main livelihood		
Farmer	1	2.8
Merchant	10	27.8
Service provider	1	2.8
Employee	3	8.3
Others	21	58.3

medicinal plants they knew. However, only those used





**Table 2.** The plants traditionally used for medicinal purposes in Baturraden

Plant Name	Local Name	SUV	RFC	Uses/ Indication	FL (%)	Plant Part	Preparation	Application	Frequency
<b>Acanthaceae</b>									
<i>Andrographis paniculata</i> (Burm.f.) Nees 	Sambiloto	0.25	0.19	Blood cleansing	14	Leaves	Decoction	Oral	Twice a day
				Cancer	14	Leaves	Decoction	Oral	Twice a day
				Cough	14	Leaves	Decoction	Oral	Twice a day
				Diabetes	14	Leaves	Decoction	Oral	Once a day
				Dyspepsia	14	Leaves	Decoction	Oral	As needed
				Fatigue	29	Leaves	Decoction	Oral	Twice a day
				Muscular pain	14	Leaves	Decoction	Oral	Twice a day
<i>Aporuella napifera</i> (Zoll.) Bremk. 	Gempur batu	0.03	0.06	Kidney problem	50	Leaves	Decoction	Oral	Twice a day
<b>Amaranthaceae</b>									
<i>Amaranthus tricolor</i> L. 	Bayam merah	0.03	0.03	Promoting growth	100	Leaves	Meal	Oral	As needed
<b>Annonaceae</b>									
<i>Annona muricata</i> L. 	Sirsak	0.17	0.19	Cancer	14	Leaves	Decoction	Oral	Twice a day
				Gout	14	Leaves	Meal	Oral	As needed
<b>Apiaceae</b>									
<i>Centella asiatica</i> (L.) Urb. 	Pegagan	0.19	0.14	Dyspepsia	40	Leaves	Decoction	Oral	Once a day
				Hypertension	20	Leaves	Decoction	Oral	Twice a day
				Joint pain	20	Leaves	Meal	Oral	As needed
				Stroke	20	Leaves	Decoction	Oral	Twice a day
<b>Apocynaceae</b>									
<i>Catharanthus roseus</i> (L.) G. Don 	Tapak dara	0.03	0.03	Cancer	100	Aerial parts	Infusion	Oral	Twice a day
<b>Balsaminaceae</b>									
<i>Impatiens balsamina</i> L. 	Pacar air	0.03	0.03	Skin treatment	100	Leaves	Poultice	Topical	As needed



**Basellaceae**

*Anredera cordifolia*  
(Ten.) Steenis



Binahong	0.11	0.08	Diabetes	33	Leaves	Tea	Oral	Twice a day
			Hypertension	33	Leaves	Tea	Oral	1-2 times a day
			Masuk angin	33	Leaves	Tea	Oral	As needed

**Bromeliaceae**

*Ananas comosus*  
(L.) Merr.



Nanas	0.03	0.03	Stroke	100	Leaves	Warm dressing	Topical	As needed
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**Campanulaceae**

*Hippobroma longiflora* (L.) G. Don



Kitolod	0.03	0.08	Eyes problem	33	Flowers	Infusion	Topical	As needed
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**Caricaceae**

*Carica papaya* L.



Pepaya	0.03	0.08	Poor appetite	33	Leaves	Meal	Oral	As needed
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**Compositae**

*Smallanthus sonchifolius*  
(Poepp.) H. Rob.



Insulin	0.08	0.03	Blood cleansing	100	Leaves	Decoction	Oral	Twice a day
			Diabetes	100	Leaves	Decoction	Oral	Twice a day
			Hypertension	100	Leaves	Decoction	Oral	Twice a day

*Vernonia amygdalina* Delile



Asia afrika	0.19	0.14	Breathing difficulties	20	Leaves	Decoction	Oral	Twice a day
			Cough	20	Leaves	Decoction	Oral	Twice a day
			Diabetes	20	Leaves	Decoction	Oral	Twice a day
			Hypertension	20	Leaves	Decoction	Oral	Twice a day
			Kidney problem	20	Leaves	Decoction	Oral	Twice a day
			Stomachache	20	Leaves	Decoction	Oral	Twice a day
			Stroke	20	Leaves	Decoction	Oral	Twice a day

**Euphorbiaceae**

*Euphorbia stygiana*  
H.C. Watson



Malangan	0.06	0.06	Diarrhea	100	Leaves	Juice	Oral	Twice a day
			Diarrhea	100	Leaves	Meal	Oral	As needed

*Euphorbia tirucalli*  
L.

Tikel balung	0.06	0.06	Joint pain	100	Pseudostems	Poultice	Topical	As needed
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*Manihot esculenta*  
Crantz

Singkong 0.03 0.03 Dyspepsia 100 Tubers Meal Oral As needed



**Lamiaceae**

*Ocimum x africanum* Lour.

Kemangi 0.03 0.03 Bad body odor 100 Leaves Meal Oral As needed



*Orthosiphon aristatus* (Blume)  
Miq

Kumis kucing 0.06 0.14 Kidney problem 20 Leaves Decoction Oral Twice a day



**Lauraceae**

*Persea americana*  
Mill.

Alpukat 0.03 0.03 Hypertension 100 Leaves Decoction Oral Twice a day



**Leguminosae**

*Clitoria ternatea* L.

Bunga telang 0.03 0.03 Eyes problem 100 Flowers Tea Topical As needed



*Cynometra cauliflora* L.

Kopi anjing 0.03 0.03 Cough 100 Fruits Meal Oral As needed



**Lythraceae**

*Punica granatum* L.

Delima 0.03 0.03 Stomachache 100 Roots, leaves Decoction Oral As needed



**Malvaceae**

*Abelmoschus manihot* (L.) Medik.

Gedi 0.06 0.03 Dyspepsia 100 Leaves Meal Oral As needed  
Hypertension 100 Leaves Meal Oral As needed





**Menispermaceae**

*Tinospora crispa* (L.)  
Hook. f. & Thomson



**Moraceae**

*Ficus carica* L.



*Morus alba* L.



**Moringaceae**

*Moringa oleifera*  
Lam.



**Myrtaceae**

*Psidium guajava* L.



*Syzygium polyanthum* (Wight)  
Walp.



**Oxalidaceae**

*Averrhoa bilimbi* L.



**Phyllanthaceae**

*Sauropus amabilis*  
Airy Shaw

Bratawali	0.11	0.06	Blood cleansing	50	Stems	Tea	Oral	Twice a day
			Fatigue	50	Stems	Decoction	Oral	Twice a day
			Hypertension	50	Stems	Tea	Oral	2-3 times a day
			Itch	50	Stems	Infusion	Bath	As needed
Tin	0.03	0.03	Cancer	100	Leaves	Decoction	Oral	Twice a day
Murbei	0.03	0.03	Cancer	100	Leaves	Decoction	Oral	Twice a day
Kelor	0.11	0.11	Hypercholesterolemia	25	Leaves	Meal	Oral	As needed
			Hypertension	25	Leaves	Meal	Oral	As needed
Jambu biji	0.17	0.11	Dengue fever	50	Fruits	Juice	Oral	As needed
			Dengue fever	50	Fruits	Meal	Oral	As needed
			Diarrhea	75	Leaves	Decoction	Oral	Twice a day
Salam	0.25	0.19	Muscular pain	14	Leaves	Decoction	Oral	Twice a day
			Obesity	14	Leaves	Decoction	Oral	2-3 times a day
Belimbing wuluh	0.06	0.06	Hypertension	50	Leaves	Decoction	Oral	1-2 times a day
			Wound	50	Fruits	Poultice	Topical	As needed
Katuk	0.03	0.08	Lactogogum	33	Leaves	Meal	Oral	As needed







**Piperaceae**

*Peperomia pellucida*  
(L.) Kunth

Kangkung-kangkungan	0.06	0.08	Gout	33	Leaves	Decoction	Oral	Twice a day
			Stomachache	33	Leaves	Decoction	Oral	As needed



*Piper betle* L.

Sirih hijau	0.36	0.50	Aphthous ulcer	6	Leaves	Infusion	Topical	As needed
			Bad body odor	6	Leaves	Poultice	Topical	1-2 times a day
			Cough	11	Leaves	Infusion	Oral	2-3 times a day
			Cough	11	Leaves	Tea	Oral	2-3 times a day
			Excessive vaginal discharge	6	Leaves	Infusion	Topical	As needed
			Excessive vaginal discharge	6	Leaves	Tea	Topical	As needed
			Eyes problem	6	Leaves	Tea	Topical	As needed
			Nosebleed	6	Leaves	Unprocessed	Topical	As needed
			Toothache	6	Leaves	Infusion	Topical	As needed
			Stomachache	100	Leaves	Decoction	Oral	As needed

*Piper sarmentosum*  
Roxb.



*Piper crocatum* Ruiz  
& Pav.

Sirih merah	0.19	0.14	Diabetes	20	Leaves	Infusion	Oral	1-2 times a day
			Eyes problem	20	Leaves	Infusion	Topical	Twice a day
			Gout	40	Leaves	Infusion	Oral	Twice a day
			Gout	40	Leaves	Tea	Oral	Twice a day
			Hypertension	20	Leaves	Infusion	Oral	Twice a day
			Itch	20	Leaves	Infusion	Bath	As needed

**Poaceae**

*Cymbopogon citratus* (DC.) Staph



Sereh	0.31	0.25	Itch	11	Pseudostems, leaves	Infusion	Bath	As needed
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**Rutaceae**

*Citrus aurantiaca*  
Swingle



Jeruk nipis	0.17	0.36	Cough	15	Fruits	Juice	Oral	Twice a day
			Fatigue	8	Fruits	Juice	Oral	Once a day
			Hypercholesterolemia	8	Fruits	Juice	Oral	Once a day

**Thymelaeaceae**





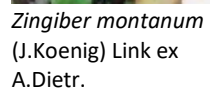
**Verbenaceae**



**Xanthorrhoeaceae**



**Zingiberaceae**



<i>Phaleria macrocarpa</i> (Scheff.) Boerl.	Mahkota dewa	0.11	0.08	Cancer	33	Fruits	Decoction	Oral	Twice a day
<i>Stachytarpheta mutabilis</i> (Jacq.) Vahl	Keji beling	0.03	0.06	Kidney problem	50	Leaves	Decoction	Oral	Twice a day
<i>Aloe vera</i> (L.) Burm.f.	Lidah buaya	0.14	0.11	Hair treatment	25	Gels	Unprocessed	Topical	As needed
				Hypertension	25	Gels	Unprocessed	Oral	As needed
				Wound	25	Gels	Unprocessed	Topical	As needed
<i>Curcuma aeruginosa</i> Roxb.	Temuireng	0.03	0.03	Stomachache	100	Rhizomes	Juice	Oral	As needed
<i>Curcuma longa</i> L.	Kunyit	0.53	0.56	Diarrhea	10	Rhizomes	Juice	Oral	As needed
				Dyspepsia	20	Rhizomes	Juice	Oral	As needed
				Itch	5	Rhizomes	Poultice	Topical	As needed
<i>Curcuma mangga</i> Valetton & Zijp	Kunyit putih	0.08	0.11	Cancer	25	Rhizomes	Infusion	Oral	Twice a day
<i>Curcuma zanthorrhiza</i> Roxb.	Temulawak	0.14	0.19	Poor appetite	14	Rhizomes	Juice	Oral	As needed
<i>Kaempferia galanga</i> L.	Kencur	0.19	0.14	Cough	40	Rhizomes	Meal	Oral	As needed
<i>Zingiber montanum</i> (J.Koenig) Link ex A.Dietr.	Bengle	0.08	0.25	Wound	11	Rhizomes	Poultice	Topical	As needed





*Zingiber officinale*  
Roscoe



Jahe	0.39	0.50	Cough	11	Rhizomes	Infusion	Oral	2-3 times a day
			Cough	11	Rhizomes	Juice	Oral	2-3 times a day
			Dyspepsia	11	Rhizomes	Juice	Oral	As needed
			Masuk angin	22	Rhizomes	Infusion	Oral	As needed

## RESULT AND DISCUSSION

There were 47 plant species from 30 families recorded during the survey (Table 2). The most commonly used species by the locals were *Piper betle*, *Andrographis paniculata*, *Vernonia amygdalina*, and *Piper crocatum*. *Piper betle* leaves were prepared into an infusion, tea, or poultice and mainly utilized for the topical treatment of aphthous ulcer, bad body odor, cough, excessive vaginal discharge, eyes problem, nosebleed, and toothache. The decoction of *Andrographis paniculata* leaves was exclusively taken by oral route for blood cleansing and treating cancer, cough, diabetes, dyspepsia, fatigue, and muscular pain. The oral-only uses were also demonstrated in *Vernonia amygdalina*, in which the decoction was indicated for easing a cough, diabetes, hypertension, kidney problem, stomachache, and stroke. Interestingly, those plants were also popularly used nationwide for medicinal purposes, as shown in RISTOJA 2015 and 2017 (Indonesian MoH, 2015a, 2017). The plants with the most species number used in Baturraden were *Zingiberaceae*, *Piperaceae*, and *Euphorbiaceae*. *Zingiberaceae* has been the main ingredients of jamu formulation. In Baturraden, it was the most commonly used family in the *Rosidae* sub-class (Suparman *et al.* 2012; Widyowati and Agil 2018). *Zingiberaceae* was also mentioned as the most popular family of medicinal plants in Blang Bungong (Aceh), Licin (East Java), Narmada (West Nusa Tenggara) (Ernilasari *et al.* 2018; Khotimah *et al.* 2018; Rahayu and Andini 2019).

About 32 diseases/symptoms, which can be grouped into nine major body systems, were treated with the plants (Table 2). The ailments in the digestive, cardiovascular, integumentary, and respiratory systems were the most frequently mentioned ones by the informants. Hypertension, cough, cancer, dyspepsia, diabetes, and stomachache were the most frequently cited ailments treated with 11, 9, 7, 6, 5, and 5, different botanical drugs, respectively. For example,

hypertension was traditionally treated with the decoctions of *Centella asiatica*, *Smalanthus sonchifolius*, *Vernonia amygdalina*, *Persea americana*, and *Averrhoa bilimbi* leaves. Besides, teas of *Anredera cordifolia* leaves and *Tinospora crispa* stems and unprocessed *Aloe vera* gels and the freshly eaten *Abelmoschus manihot* leaves, were also consumed for the same purpose. As for cancer, the decoction of *Andrographis paniculata*, *Annona muricata*, *Ficus carica*, *Morus alba* leaves, and *Phaleria macrocarpa* fruits were commonly used. Other than those, infusion of *Catharanthus roseus* leaves and *Curcuma mangga* rhizome were also utilized.

There were ten plant parts used for medicinal purposes in Baturraden. Leaves, rhizomes, and fruits were the most commonly used ones, with a frequency of 66.67%, 11.76%, and 7.84 %, respectively (Table 2). Leaves are famous for they are easy to collect and available year-long, and are reported as the most commonly used plant part for treating diabetes mellitus in Indonesia (Hartanti and Budipramana 2020; Neamsuvan *et al.* 2015). A similar pattern of popular plant parts used was also reported in other places nationwide (Malini *et al.* 2017; Nasution *et al.* 2018). The plant is usually utilized for one particular part, but two parts were simultaneously used. For example, leaves and pseudostems of *Cymbopogon citratus* were boiled and used for warm bathing to alleviate the itch. Also, a decoction of *Punica granatum* leaves and roots was orally consumed to alleviate stomachache.

There were eight botanical drug preparations recorded during the survey. Decoction, infusion, meal, juice, and tea were the most commonly used ones, with the percentage of 37%, 16%, 15%, 11%, and 10%, respectively (Table 2). Preparation of some plants with more than one method was reported, and both were usually used to treat different symptoms. For example, *Piper betle* leaves were pounded to poultice to eliminate body odor, whereas they were decocted and taken orally with salt to reduce cough. Three botanical drugs



were prepared with the different heating processes, i.e., decoction, infusion, and tea. The infusion was obtained from slight boiling to steamy water, while decoction was heated longer that water was reduced to a half or one-third of the initial volume used. As for tea, the water is boiled and subsequently poured onto plant materials. The decoction is a common practice to prepare *jamu godog*, one of the most popular forms of *jamu*. The high frequency of use of decoction is related to the belief that it can maximally extract the phytochemicals in plants (Neamsuvan *et al.* 2018). This belief has been validated in *Nepeta racemosa* Lam. extracts derived from the decoction process generated the highest concentration of flavonoids and total phenolic compounds and the most potent  $\alpha$ -amylase and  $\alpha$ -glucosidase inhibitory activities compared to infusion and hydro-ethanolic ones (Zarrabi *et al.*, 2019). Meals as herbal preparations were usually consumed freshly or as a rice side dish. A poultice is typically prepared for the topical treatment of ailments in integumentary and musculoskeletal systems. Interestingly, a warm dressing was prepared by the local from the steamed leaves of *Ananas comosus* to compress the skin of the person with stroke.

There were only three routes of application of herbal preparations in Baturraden, i.e., oral, topical, and bath with a percentage of 79, 18, and 3 %, respectively (Table 2). Oral as the most popular route of administration of botanical drugs has been described elsewhere (Astana and Nisa 2018; Megawati *et al.* 2016). Herbal preparations taken orally were typically decoction, infusion, juice, and tea. Some unprocessed plants,

were varieties in using plant preparations topically, including cleansing the vaginal area and the eyes, dropping into eyes, gargling, applying onto hair, putting in the nostril, warm compressing, and applying poultice onto the affected areas.

The SUV of medicinal plants used by Baturraden people was 0.03-0.53. The most important medicinal plants in Baturraden included *Curcuma longa*, *Zingiber officinale*, *Piper betle*, *Cymbopogon citratus*, *Andrographis paniculata*, and *Syzygium polyanthum*, with SUV of 0.53, 0.39, 0.36, 0.31, 0.25, and 0.25, respectively. Similarly, the RFC ranged from 0.03 to 0.58. The most valuable medicinal plants in the area were *Curcuma longa*, *Piper betle*, *Zingiber officinale*, *Citrus aurantiaca*, *Cymbopogon citratus*, and *Zingiber montanum*, whose RFC of 0.56, 0.50, 0.50, 0.36, 0.25, and 0.25, respectively. *Curcuma longa* has been used as the main ingredient of *jamu*, which currently constitutes the analgesic, anti-inflammatory, and immunomodulatory ingredients of science-based *jamu (jamu saintifik)* formulae with *Curcuma zanthorrhiza* and *Phyllanthus niruri* L (Rahayu *et al.* 2016; Triyono *et al.* 2018). It was also reported as the most commonly used plant species for medicinal purposes by To Manui people (Rahmawati *et al.* 2020). *Zingiber officinale*, *Andrographis paniculata*, and *Syzygium polyanthum* are the main ingredients of several science-based *jamu* formulae (Indonesian MoH, 2016). Also, the pharmacological activity of those plants related to their local uses in Baturraden, i.e., antidiabetic activity of *Andrographis paniculata*, gastroprotective effects of

**Table 3.** Plants with FL value of 100% for some ailments

Uses/Indication	Plant Name	FL (%)
Bad body odor	<i>Ocimum × africanum</i>	100
Blood cleansing	<i>Smallanthus sonchifolius</i>	100
Cancer	<i>Catharanthus roseus, Ficus carica, Morus alba</i>	100
Cough	<i>Cynometra cauliflora</i>	100
Diabetes	<i>Smallanthus sonchifolius</i>	100
Diarrhea	<i>Euphorbia stygiana</i>	100
Dyspepsia	<i>Manihot esculenta, Abelmoschus manihot</i>	100
Eyes problem	<i>Clitoria ternatea</i>	100
Hypertension	<i>Smallanthus sonchifolius, Persea americana, Abelmoschus manihot</i>	100
Joint pain	<i>Euphorbia tirucalli</i>	100
Promoting growth	<i>Amaranthus tricolor</i>	100
Skin treatment	<i>Impatiens balsamina</i>	100
Stomachache	<i>Punica granatum, Piper sarmentosum, Curcuma aeruginosa</i>	100

mainly fruits and leaves, were also taken oral. There

*Zingiber officinale*, and anti-inflammatory potentials of



*Syzygium polyanthum*, have been confirmed (Anwar *et al.* 2017; Hasan *et al.* 2020; Saiah *et al.* 2018). Hence, the standardization of herbal preparation should be subjected to those plants. On the other hand, the evaluation of pharmacological activities of *Piper betle*, *Citrus aurantiaca*, *Cymbopogon citratus*, and *Zingiber montanum* is still needed to support their traditional uses.

As the most important and valuable medicinal plant in Baturraden, *Curcuma longa* is used for many indications and showed a very low FL (5%). The FL value of 100% represented that a given plant was used in the same way by all the respondents citing it. There were 24 botanical drugs, with 100% of FL recorded during the survey (Table 3). Interestingly, some of those plants have shown potential pharmacological activity related to their indication of uses in Baturraden. *Catharanthus roseus* and *Morus alba* showed cytotoxicity effects, while *Smallanthus sonchifolius* exhibited anti-hyperglycemic activity (Chan *et al.* 2020; Pham *et al.* 2019; Santos *et al.* 2017). Further, the anti-hypertensive activity of *Persea americana* and anti-nociceptive effect of *Curcuma aeruginosa* were also recorded (Hossain *et al.* 2015; Márquez-Ramírez *et al.* 2018).

## CONCLUSION

This study described the utilization of medicinal plants as the single plant botanical preparation in Baturraden, Central Java. *Curcuma longa*, as the most important and valuable plants to Baturraden people, were locally used for treating diarrhea, dyspepsia, and itch. *Zingiber officinale*, *Piper betle*, *Cymbopogon citratus*, *Andrographis paniculata*, *Syzygium polyanthum*, *Citrus aurantiaca*, and *Zingiber montanum* subsequently showed the highest SUV and RFC among other plants. As the pharmacological activity data related to the local utilization of *Curcuma longa*, *Zingiber officinale*, *Andrographis paniculata*, and *Syzygium polyanthum* are available, the botanical preparations of those plants should be standardized to assure their quality. On the other hand, the of pharmacological evaluation of the less-studied *Piper betle*, *Cymbopogon citratus*, *Citrus aurantiaca*, and *Zingiber montanum* should be prioritized to provide scientific evidence to their traditional uses.

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