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Ethnobotany of Medicinal Plant Diversity as A Traditional Medicine in Bugbug Karangasem, Bali, Indonesia

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A R T I C L E I N F O

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A B S T R A C T

Traditions and cultures used as tourism assets can ignore traditional practices with a concurrent loss of traditional knowledge. This study aims to reveal the traditional knowledge of medicinal plants used by the Bugbug community through analysis of the traditional knowledge of the diversity of medicinal plants, the fidelity level (FL) and Index of Cultural Significance (ICS) of medicinal plants. The study was conducted in Bugbug Village, Karangasem, from May to July 2022. Data were collected using qualitative methods through semi-structured interviews, moderate participation observation, and documentation. Key informants and respondents were selected using purposive and snowball sampling; 10 informants and 48 respondents were obtained. The fidelity level was calculated by FL; and cultural importance by ICS. The level of traditional knowledge of medicinal plants was measured by the Phillips and Gentry equations and analyzed by the Kruskal Wallis and Mann Whitney Test. As many as 124 species in 46 families are found at Bugbug Village. The best represented families were Fabaceae. Leaves are the most widely used plant parts for traditional medicine. The highest habitat is obtained from the roadsides. In terms of the life form, most of the used species were herbaceous. Traditional knowledge between age groups differs significantly. In contrast, traditional knowledge of gender was not found to be different. The highest fidelity levels are *Piper betle* L. and *Imperata cylindrica* L. And the most ICS is *Piper betle* L

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INTRODUCTION

Bali is known for its unique characteristics in the form of natural beauty combined with culture. This uniqueness makes Bali Aga villages attractive to tourists. Tourism provides an opportunity for the entry of foreign cultures that can bring changes to culture and modern lifestyles that are all practical. Traditions and cultures used as tourism assets can potentially lose traditional practices (Picard 2018). Lifestyle changes brought by globalization can ignore traditional practices with a concurrent loss of traditional knowledge.

Bugbug traditional village is a Bali Aga village which has a unique mountain area to the beach. The specific ecosystem determines the traditional knowledge of the community (Suryadarma 2017). There is a fact that many medicinal plants grow, but the younger generation of Bali is not interested in traditional medicine (Adiputra 2017); this will lead to scarcity and even loss of these medicinal plants. The loss of one plant species affects the ecosystem, which leads to the degradation of the community's traditional knowledge. The loss of traditional knowledge will cause local people to no longer know how to manage plant resources sustainably.

LITERATURE REVIEW

The threat of degradation comes from the decreased understanding of the younger generation towards their traditional practices (Sujarwo et al., 2014). The young generation's tendency to be curious about medicinal plants' properties and how to cultivate them is, in fact, low (Gallois and Reyes-García 2018; Caballero-Serrano et al. 2019). Traditional knowledge between men and women is different (Elisa et al. 2015).

To Be Able to Express Traditional Knowledge about the diversity of traditional medicinal plants used by the Bugbug community is carried out through ethnobotanical studies. Ethnobotany expresses traditional knowledge about biodiversity, conservation, and culture of an ethnic group (Tapundu and Anam 2015). Ethnobotany is also a tool for documenting community knowledge about using plants for food, medicine, dyes, buildings, and traditional ceremonies (Setiawan & Qiptiyah 2014; Tamalene et al. 2016; Mesfin et al. 2018).

Knowledge about the use of plant diversity as a traditional medicinal ingredient by the Bugbug community is very valuable information for modern medicine. Documentation of local knowledge about the use of plant resources by the community is very helpful in the domestication of important medicinal plants and in maintaining their sustainability (Kandari et al. 2012). Traditional knowledge of Bugbug community about using plants for traditional medicine has never been studied yet. Before being degraded by external environmental and cultural influences, it is very important to carry out ethnobotanical studies of traditional knowledge of medicinal plants. This study aims to reveal the traditional knowledge of medicinal plants used by the Bugbug community through analyze the traditional knowledge of the diversity of medicinal plants, the fidelity level (FL) (Alexiades, 1996) and Index of Cultural Significance (ICS) of medicinal plants (Turner, 1992)

METHODOLOGY

Data were collected using qualitative methods by means of semi structured interviews, moderate participation observation, and documentation. Key informants were selected using purposive and snowball sampling, 10 key informants and 48 respondents were obtained. The value of cultural importance of each useful plant species was calculated using the FL formula, while Index of Cultural Significance was calculated by ICS.

Study Area

The research time was May to July 2022 in Bugbug Village, located in Karangasem District, Karangasem Regency, ± 8 km from the regency city and ± 76 km from Denpasar (Figure 1). The altitude is 42 - 500 above sea level, and the temperature is 28-32oC. It is a lowland, with part of the area being a beach. Bugbug Village is an agricultural village dominated by wetland agriculture (rice fields). The Paddy field area is 126.96 Ha, and dry land is 756.89 Ha.

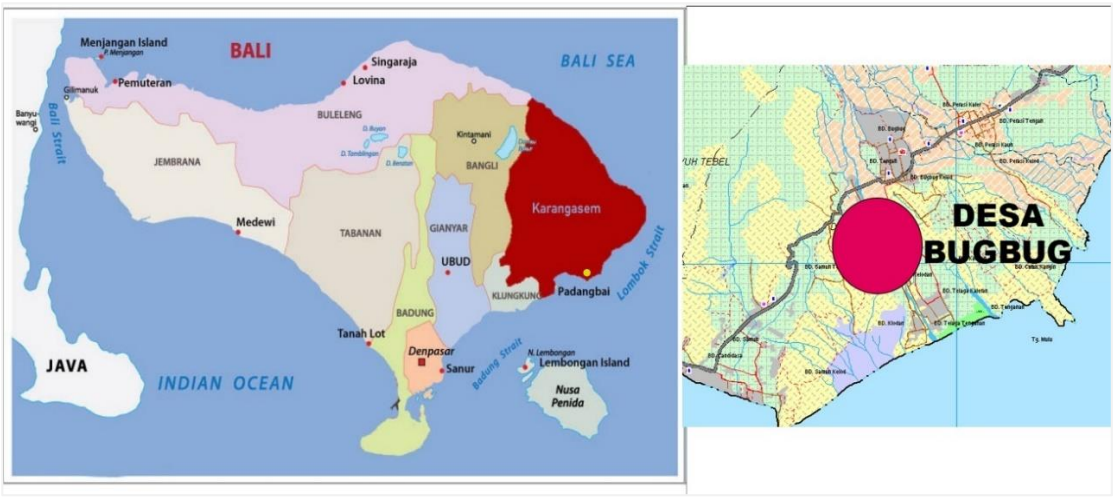

Figure 1. Map of the Location of Bugbug Community in Karangasem, Bali

Informan Selection

Key informants were consulted with community leaders and selected using the purposive sampling technique. The respondents of this study were selected from the Bugbug community using the snowball sampling,which is carried out in a chain by questioning those that have been interviewed or contacted previously. Furthermore, they have much information about the medicinal plants. The sample was determined based on information obtained from the key informants (traditional healer and community leaders). A total 48 respondents who represented demographic characteristics were invited to the interviews.

Data Collection

Snowball sampling technique combined with a semi-structured interview using Balinese and Indonesian language. These data consist of traditional knowledge of medicinal plant (local name, parts of the plant used, mode of preparations, habitat, habitus, and diseases treated by the plant). The plants were collected with the key informants and then identified by matching with the picture on the flora book, and images on plantNet. Their scientific names were verified using online sources (http://www.theplantlist.org) and (http://www.plantamor.com). A descriptive narrative was carried out for

qualitative analysis. The quantitative analysis of medicinal plants was done through the Phillips and Gentry equation, Fidelity level, and Index Cultural Significance.

1. To measure the level of respondent's ethnobotanical knowledge according to age group using the Phillips and Gentry equation (1993a), namely:

$$Mgj = 1/ n \sum Vi$$

Where:
Mgj = average level of ethnobotanical knowledge of group j;
n = number of members in group j;
Vi = total traditional knowledge of member i of group j;
j = age

Testing the significance of factors affecting the level of traditional knowledge of medicinal plants with non-parametric statistics with a significant level of 0.05, namely: 1) Kruskal Wallis test, testing differences in knowledge between age groups; 2) Mann Whitney test, testing differences in knowledge between genders

2. Fidelity Level (FL)

The fidelity level (FL), the percentage of informants claiming the use of a certain plant for the same major purpose, was calculated for the most frequently reported diseases or ailments as:

$$FL (\%) = (Np / N) \times 100$$

Where:
Np = the number of informants that claim the use of a plant species to treat a particular disease,
N= the number of informants that use the plants as a medicine to treat any given disease
(Alexiades, 1996).

3. The ICS showed the importance values of each useful plant species based on the community's needs, and its calculation results showed each plant's importance level. The equation provided is to be employed to calculate ICS:

$$ICS = \sum_{i=1}^{n} (q \times i \times e) ni$$

Where:
ICS : Index of Cultural Significance
q : Quality value
I : Intensity value
e : Exclusivity value

Table 1. Number of Species (with ICS Value)

ICS values	Category
ICS 100 and over	Very High Significance
ICS 50-99	High Significance
ICS 20-49	Moderate Significance
ICS 5-19	Low Significance
ICS 1-4	Very Low Significance
ICS 0	Negligible Significance

Turner (1992)

RESULTS AND DISCUSSION

The Diversity of Medicinal Plants

As many as 124 medicinal plant species are spread over 46 families to treat 55 diseases. The most family are Fabaceae (11), Poaceae (8), Asteraceae, and Zingiberaceae (6). The diversity of medicinal plants is presented in Table 2. This finding is higher than the 120 species used by the Tengger tribe in East Java as medicines and poison (Batoro et al. 2013), 104 plant species by the Ammatoa Kajang tribe (Azis et al. 2020), much lower than 181 medicinal plant species by villagers Poncokusumo District of East Java (Batoro and Siswanto, 2017).

Table 2. The Diversity of Medicinal Plants Used by the Bugbug Community

Family/Scientific name	Local name	Plant parts	habitus	habitats	Disease	FL	ICS
Acanthaceae							
Acanthus ilicifolius	Jaruju	root,fruit	shrub	B	tumor, smallpox	6.25	12
Andrographys paniculata Burm.f.	Samiroto	all parts	shrub	Rs	diabetes, nephrolithiasis, gout	47.91	9
Borreria hispida, Schum.	Pecah batu	all parts	herb	Rs	bladder calculi	6.25	3
Justicia gendarussa Burm. f.	Dausa keling	leaf	herb	Y	cough	6.25	3
Ruellia tuberosa L.	Krepetan	leaf	herb	Rs	cough, nephrolithiasis, gout	12.5	6
Acoraceae							
Acorus calamus L.	Jangu	rhizome	herb	Y	tumor, asthma, *pemalinan*	39.58	12
Anacardiaceae							
Spondias pinnata (L.f) Kurz	Kecemcem	leaf	tree	Mo	hypertension	35.41	12
Annonaceae							
Annona muricata L.	Srikaya	leaf	shrub	Mo, Rs	gout	10.41	6
Apiaceae							
Apium graviolens	Suladri	leaf , stem	herb	Y	hypertension	41.66	9
Centella asiatica L.	Piduh	leaf	herb	Rs	hypotension, lumbago	41.66	6
Coriandrum sativum L.	Ketumbah	seed	herb	M	cough, smallpox	4.16	12
Foeniculum vulgare Mill.	Adas	seed	herb	M	stomachache, constipation, wound, lumbago, swollen foot	10.41	6
Apocynaceae							
Alstonia scholaris	Pule	latex	tree	Rs	gastritis	8.33	9
Araujia sericifera Brot.	Pepe	leaf	herba	Y	fever	4.16	9
Plumeria alba L.	Jepun	bark	tree	Rs	headache	6.25	12
Arecaceae							

Areca catechu L.	Buah jebug	fruit	tree	Mo	urinary incontinence, beri-beri	4.16	18
Cocos nucifera L	Nyuh barak	fruit	tree	Mo	stomatitis, pharyngitis	39.58	24
Cocos nucifera L	Nyuh gading	fruit, latex	tree	Mo	stomatitis, cough	39.58	28
Cocos nucifera L	Nyuh mulung	fruit	tree	Mo	gastritis, liver	22.91	12
Cocos nucifera L	Nyuh gadang	fruit	tree	Mo	fever	83.33	15
Asteraceae							
Ageratum conyzoides	Buyung-buyung	leaf	herb	Rs	gout	6.25	3
Blumea balsamifera (L) DC.	Sembung	leaf	perdu	Y	fever, hypotension	22.91	6
Eclipta prostrata (L) Hassk., Sin	Padang guwak	all parts	herb	Rs	wound	16.66	3
Pluchea indica (L) Less.	Beluntas	leaf	shrub	Rs	lumbago	4.16	3
Tagetes erecta L	Gumitir	leaf	shrub	Rf	leprosy, breast cancer	39.58	6
Vernonia amygdalina Del.	Daun afrika	leaf	shrub	*T*	kidney disease	12.5	3
Balsaminaceae							
Impatiens balsamina L.	Pacah	flower	herb	Rf	paronikia	4.16	9
Basellaceae							
Anredera cordifolia (Ten) Steenis	Pinahong barak	leaf	herb	Y	fracture	47.91	3
Boraginaceae							
Heliotropium indicum L.	Tumbelele gajah	flower	shrub	Rs	boil, bladder calculi	4.16	6
Campanulaceae							
Isotoma longiflora Presl.	Sembung bikul	leaf, flower	herb	Rs	breast cancer, conjunctivitis	4.16	6
Capparaceae							
Polanisia viscosa	Buangit	leaf, flower	herb	Rs	headache	22.91	6
Caricaceae							
Carica papaya L	Gedang	root, leaf, fruit	herb	Mo	bladder calculi, nephrolithiasis, itchy, dysuria, fever	6.25	12
Convolvulaceae							
Ipomoea batatas L.	Sela	tubers	herb	Mo	parotitis	43.75	17
Cucurbitaceae							
Momordica charantia L.	Paye	leaf	herb	Rs	fever	6.25	9
Euphorbiaceae							
Euphorbia thymifolia L.	Don keratak	leaf, stem	herb	Rs	smallpox	22.91	3
Jatropha curcas L.	Jarak	leaf, latex	shrub	Mo	stomatitis, fever, cough, lumbago	18.75	12
Fabaceae							
Caesalpinia sappan L.	Kayu cang	stem	shrub	M	deoxygenated blood	29.16	5
Caesalpinia pulcerrima	Merak kuning	bark	shrub	*T*	itchy, cough	6.25	6
Casia glauca Lamk.	Kembang kuning	flower	shrub	Rs	varicose vein	16.66	7
Erythrina subumbrans	Dapdap	root, leaf	tree	*T*	conjunctivitis, cough, cold	37.5	12
Erythrina fusca	Delundung	root, bark	tree	Rs	bladder calculi, urinary incontinence	22.91	6
Euchresta horsfieldii	Purnajiwa	fruit	tree	M	fever	6.25	3
Flemingia macrophylla Willd.	Ingan-ingan	leaf, flower	shrub	F	sprain, rickets	52.08	6
Gliricidia sepium Jacq.	Gamal	leaf	shrub	Mo	wound, headache	18.75	6
Leucaena leucocephala	Lamtoro	fruit	tree	Mo	wormy	54.16	7
Mimosa pudica L.	Maling-maling	all parts	herb	Rs	lumbago, impotence	22.91	6
Tamarindus indica L.	Celagi	fruit	tree	Rs	fever, headache	37.5	10
Lamiaceae							
Coleus Scutellarioides	Miana	leaf	shrub	*T*	conjunctivitis	8.33	6
Orthosiphon aristatus	Kumis kucing	leaf	herb	*T*	nephrolithiasis, gout	39.58	6
Vitex trifolia L.	Liligundi	leaf	shrub	Rs	lumbago	29.16	3
Lauraceae							
Cinnamomum verum	Kayu manis	bark	tree	M	stamina	39.58	9

Cryptocarya massoy (Oken)Kostern	Mesui	bark	tree	M	fever, hypertension, asthma *pemalinan*, tumor	37.5	10
Persea americana	Apokat	leaf	shrub	Mo	nephrolithiasis	6.25	12
Liliaceae							
Allium cepa L.	Bawang	tubers	herb	M	cough, fever, headache, nephrolithiasis, sprain	22.91	10
Allium sativum L.	Kesuna	tubers	herb	M	headache, smallpox, asthma, *pemalinan*, tumor	35.41	10
Loranthaceae							
Loranthus europaeus Jacq.	Pasilan delima	leaf	shrub	Y	cough	4.16	3
Malvaceae							
Abelmochus manihot L.	Gedi	leaf	shrub	Y	hypertension, kidney disease	14.58	6
Abutilon indicum (L) Sweet	Keben-keben	leaf	shrub	Rs	*belahan*	2.08	3
Hibiscus tiliaceus L.	Waru	leaf	tree	Rs	diarrhea	43.75	10
Sida rhombifolia	Selegwi	flower	shrub	Rs	sapurative otitis media	8.33	3
Sterculia foetida	Kepuh	bark	tree	Mo	rheumatism	14.58	3
Meliaceae							
Azadirachta indica A.Juss	Intaran	leaf	tree	F	liver, breast cancer	8.33	12
Moraceae							
Artocarpus heterophyllus Lamp.	Nangka	leaf, bark	tree	Mo	earache, beri-beri	8.33	10
Artocarpus camansi Blanco	Timbul	leaf	tree	Mo	itchy	4.16	9
Ficus benyamina L.	Bingin	aerial root	tree	Te	backache	4.16	15
Ficus septica Burm.f	Awar-awar	root, leaf, fruit	shrub	Rs	dysentery, *pemalinan*	6.25	3
Ficus religiosa	Ancak	leaf	tree	Te	myalgia	4.16	15
Moringaceae							
Moringa oleifera	Kelor	leaf	shrub	Y	sore eyes, sprain	54.16	12
Muntingiaceae							
Muntingia calabura L.	Singapur	leaf	shrub	Rs	diabetes	14.58	7
Musaceae							
Musa paradisiaca L.	Biyu gedang saba	stem, oilcake	herb	Mo	wound, hypotension	43.75	27
Musa brachycarpa Back.	Biyu batu	root	herb	Mo	nephrolithiasis	4.16	15
Myristicaceae							
Knema glauca Warb.	Kayu jelema	bark	tree	F	beri-beri	10.41	3
Myristica fragrans Houtt.	Jebug arum	fruit	tree	M	headache, nausea	4.16	6
Myrtaceae							
Melaleuca cajuputi Powell	Kayu putih	leaf	tree	F	ringworm	37.5	3
Psidium guajava	Nyambu sotong	fruit	shrub	*T*	diarrhea	79.16	15
Syzygium aromaticum(L) Merr.	Cengkeh	flower	tree	M	rheumatism, stamina	33.33	6
Oleaceae							
Jasminum sambac L.	Menuh	leaf	shrub	*T*	cold	6.25	9
Oxalidaceae							
Averrhoa bilimbi L.	Belimbing buluh	leaf, bark flower	shrub	*T*	cough	45.83	9
Averrhoa carambola L.	Belimbing besi	leaf, fruit bark	tree	Y	cough, fever, gastritis	70.83	13
Piperaceae							
Peperomia pellucida (L) Kunth	Damuh-damuh	all parts	herb	Rs	gout	33.33	3
Piper betle L.	Base	leaf	herb	Y, Mo	vertigo, stamina, deep heat, nausea, fever, deoxygenated blood, epistaxis, gastritis, asthma,	100	48

					smallpox, dysuria, *pemalinan*, wound, tumor		
Piper nigrum L.	Mice	seed	herb	M	fever, cough, headache, nausea, typhus, stamina	6.25	9
Phyllanthaceae							
Phyllanthus urinaria L.	Isep nanah isep getih	all parts	herb	Rs	dysentery	6.25	3
Sauropus androgynus (L) Merr.	Don kayu manis	leaf	shrub	Y	pharyngitis	45.83	9
Plumbaginaceae							
Plumbago zeylanica L.	Bama	root	shrub	Rs	leprosy	6.25	3
Poaceae							
Bambusa vulgaris Schrad	Tiying ampel Gading	root	herb	Mo	liver	54.16	11
Coix lacryma jobi L.	Jali-jali	fruit	herb	Mo	swollen foot	6.25	3
Cymbopogon citratus (DC) Stapl	See	leaf, stem	herb	*T*	hypertension, lumbago	25	6
Imperata cylindrica (L) Raeusch.	Ambengan	root, tunas	herb	Mo	*pemalinan*, leprosy, bladder calculi, kidney disease, dysuria	100	14
Oryza sativa L.	Baas	seed	herb	Rs	smallpox	6.25	40
Oryza sativa L. var.nigra	Ketan	seed	herb	Rs	*belahan*	4.16	17
Cyperus rotundus L.	Padang teki	root	herb	Rs	nephrolithiasis	14.58	6
Zea mays	Jagung	fruit, seed	herb	Mo	parotitis, nephrolithiasis	79.16	12
Polytricaceae							
Polytricum commune Hedw.	Lumut genuk	all parts	herb	Y	cough	4.16	3
Portulacaceae							
Portulaca grandiflora Hook.	angeroh	leaf, flower	herb	Rs	hemorrhoid	4.16	7
Dryopteridaceae							
Nephrolepis cordifolia	Paku	root	herb	Rs	stamina	6.25	9
Punicaceae							
Punica granatum L.	Delima putih	fruit	shrub	Y	hypotension	33.33	7
Rubiaceae							
Hedyotis corymbosa L.	Kacengcengan/ kemeniran	all parts	herb	Rs	sprain, rheumatism, nephrolithiasis	6.25	6
Morinda citrifolia L.	Tibah	leaf, fruit, bark	shrub	Rs	chest pain	52.08	7
Paederia foetida L.	Kesimbukan	leaf	herb	Rs	wound, hypertension	10.41	6
Uncaria gambir (Hunter) Roxb.	Gambir	leaf	shrub	M	beri-beri	4.16	4
Rutaceae							
Citrus aurantiifolia	Juuk lengis	fruit	tree	Y	gastritis, cough, liver, stamina, menstrual disorders, bladder calculi, rheumatism	72.91	17
Citrus amblycarpa Hassk	Limo	fruit	tree	M	nausea	52.08	9
Citrus maxima	Jeruti	bark	tree	Y	*pemalinan*	31.25	15
Sapindaceae							
Schleichera oleosa Merr.	Kesambi	bark	tree	F	stamina	10.41	6
Santalaceae							
Santalum album L.	Cenana	stem	tree	M	cough, smallpox	31.25	6
Solanaceae							
Datura metel L.	Kecubung	leaf, flower	shrub	F	headache, earache	4.16	6
Nicotiana tabacum L.	Temako	leaf	shrub	M	*pemalinan*, tumor	10.41	6
Physalis angulata L.	Ceplukan	all parts	herb	Mo	deep heat	12.5	5
Zingiberaceae							
Amomum villosum Lour.	Ilak	root	herb	F	nephrolithiasis	4.16	3

Amomum compactum Sol.ex Maton	Kapulaga	rhizome	herb	Mo	deep heat, stamina	6.25	9
Alpinia galanga (L) Willd.	Langkuas/isen	rhizome	herb	Mo	cough, stamina, menstrual disorders, stomachache, rheumatism	10.41	15
Curcuma aeruginosa Roxb.	Temu ireng	rhizome	herb	Y	menstrual disorders, cough, stamina, rheumatism	4.16	12
Curcuma aromatica	Temu agung	rhizome	herb	M	cough, stamina, menstrual disorders, rheumatism	4.16	12
Curcuma longa Linn.	Kunyit	rhizome	herb	*T*	cough, stamina, gastritis, wound, hypertension, menstrual disorders, nephrolithiasis, rheumatism	45.83	21
Curcuma Xanthorrhiza Roxb.	Temu lawak	rhizome	herb	M	cough,liver, stamina, menstrual disorders, rheumatism	31.25	15
Etlingera elatior (Jack)	Kecicang	rhizome	herb	Mo	cough	12.5	7
Gastrochillus panduratum Ridl.	Temu kunci	rhizome	herb	M	stamina	4.16	5
Kaempferia galangal L.	Cekuh	rhizome	herb	Y	cough, stamina, menstrual disorders, rheumatism	52.08	12
Zingiber officinale var.rubrum	Jahe barak	rhizome	herb	M	rheumatism, stamina	41.66	6
Zingiber officinale Rosc.	Jahe	rhizome	herb	Y	cough, fever, hypertension, backache, lumbago, stomachache, menstrual disorders, stamina, impotence, rheumatism	52.08	33
Zingiber cassumunar Roxb.	Bangle	rhizome	herb	Y	liver, gastritis, stamina, menstrual disorders, rheumatism	31.25	18
Zingiber zerumbet (L) Roscoe ex Sm.	Gamongan	rhizome	herb	F	smallpox, maag, lumbago	31.25	9

Note: B=beach, F=forest, M=market, Mo=moor, Rf=ricefields, Rs=roadsides, T=telajakan, Te=temple, Y=yard

Most of the plants from the Fabaceae family have medicinal properties, containing various secondary metabolites with the potential as antimicrobials (alkaloid compounds, glycosides, essential and organic oils); antidiabetic (flavonoids, anthocyanins, organic sulfur, alkaloids, and IAA); antitumor (alkaloids, terpenes, flavonoids, lignin); and antifertility (gosipiol and diosgenin) (Gratitude et al. 2011). Another potential of Fabaceae is as a source of food, natural dyes, fodder, and craft materials. The most widely used plant for traditional medicine is *Piper betle* (15) disease. *Piper betle* contains various chemical compounds, including alkaloids, saponins, flavonoids, polyphenols, tannins, terpenoids, steroids, essential oils, and amino acids (Pradhan et al. 2013; Fitri et al. 2017). Compounds in *P. betle* have antimicrobial properties.

Plant Parts Used, Habitus and Habitat

Local people used different parts of the plant species to prepare herbal medicine. All parts of various plants are used in the traditional medication for different diseases; however, leaves are the most frequently used parts (Figure 2). In line, Batak Phakpak (Silalahi et al. 2018), Ammatoa Kajang tribe (Azis et al. 2020). People generally use leaf organs that are easily pounded because of their soft texture. Another thing is related to the way of processing that is usually done by the Bugbug community, mostly by pounding it (71%). Leaf organs are easier to use to extract the essence or properties of these plants. The leaves have various medicinal chemical compounds. Leaves are the center of bioorganic metabolism and provide storage for secondary metabolites (Bouyahya et al. 2017). Utilization of leaf organs as traditional medicine has a positive impact on plant sustainability compared to the use of other organs

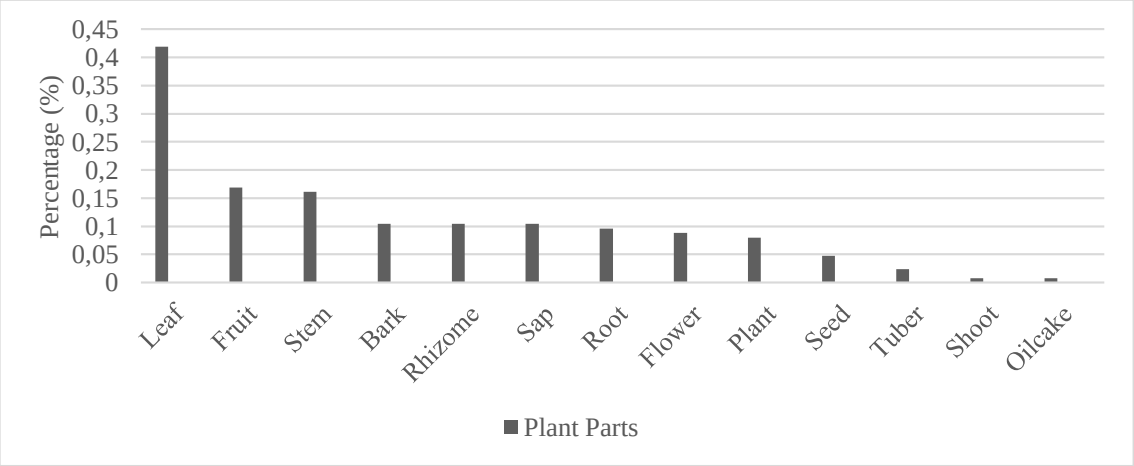

Figure 2. Plant Parts of Medicinal Plant Used by the Bugbug Community

In terms of the life form, most of the used species were herbaceous (46.77%), followed by shrubs (27.41%) and trees (25.80%). Many herbaceous that can be used as traditional medicine grew a wild along village roadsides. On the other hand, herbal preparation methods and extraction of active metabolites are easier to carry out with herbaceous plants than with woody materials (Sabo, 2015). Herbs have a fast rate of growth and reproduction and are easy to grow in various locations (Nasution et al. 2018). The medicinal plant is obtained from various habitats: roadsides, moors, rice fields, beaches, grounds, forests, *telajakan*, temples, and markets. Most of the habitat is obtained from the roadsides (Figure 3).

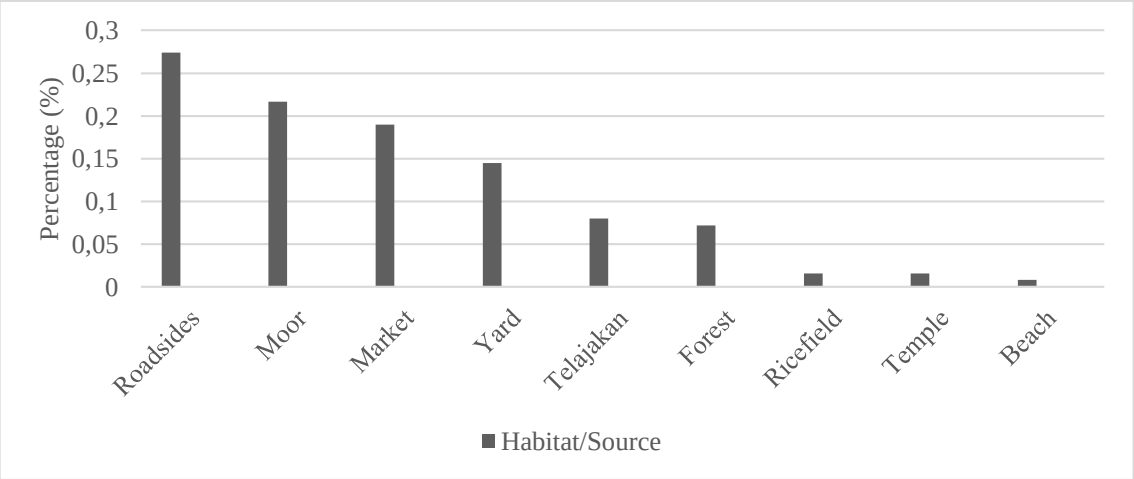

Figure 3. Habitat/Source of Medicinal Plant Used by the Bugbug Community

Documentation of the diversity of medicinal plant species in the Bugbug community is very important as a basis for the development of traditional medicine. Likewise, efforts to domesticate plants that are used for medicine are needed considering that most of the plant habitats are obtained from the wild.

Mode of Preparation and Usage in Traditional Medicines

Traditional medicine plant preparation mode varies among pounded, boiled, squeezed, chewed, shredded, soaked, baked, fried, and dredged (Figure 4.). The preparation of traditional medicinal plants of the highest Bugbug community was carried out through pounded mode (71%) and the lowest in dredged mode (0.8%). The local people also used other ingredients, such as salt, vinegar, shrimp paste, palm sugar, honey, chicken eggs, bulih sutra, seahorse, buffalo skin, fire wine, whiting, ash, and frankincense to prepare the remedies. Traditional medicine plant usage varies among drinks, sprayed, smeared, pasted, dripped, eaten, and rubbed (Figure 5). The most widespread usage was drinking (61.6%), and the lowest was rubbed (0.8%).

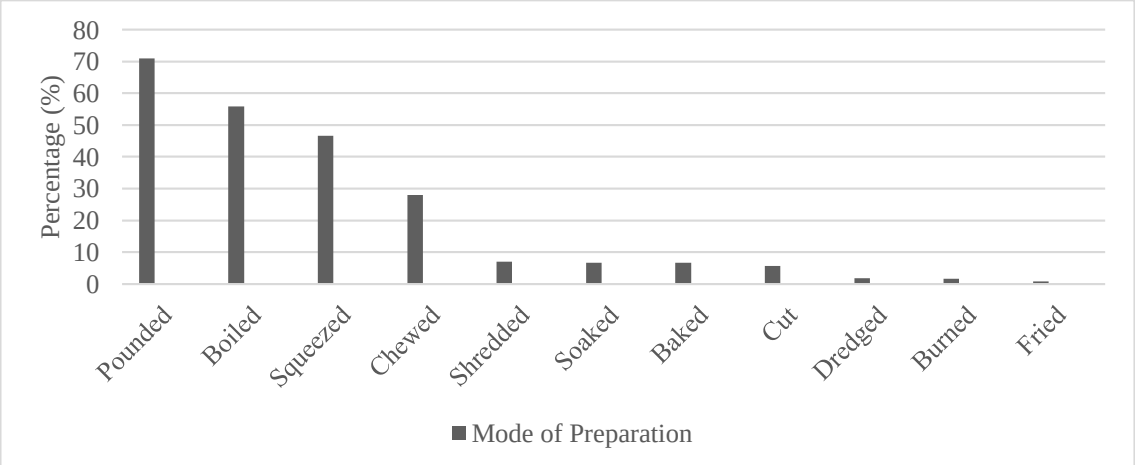

Figure 4. Mode of Preparation in Traditional Medicines

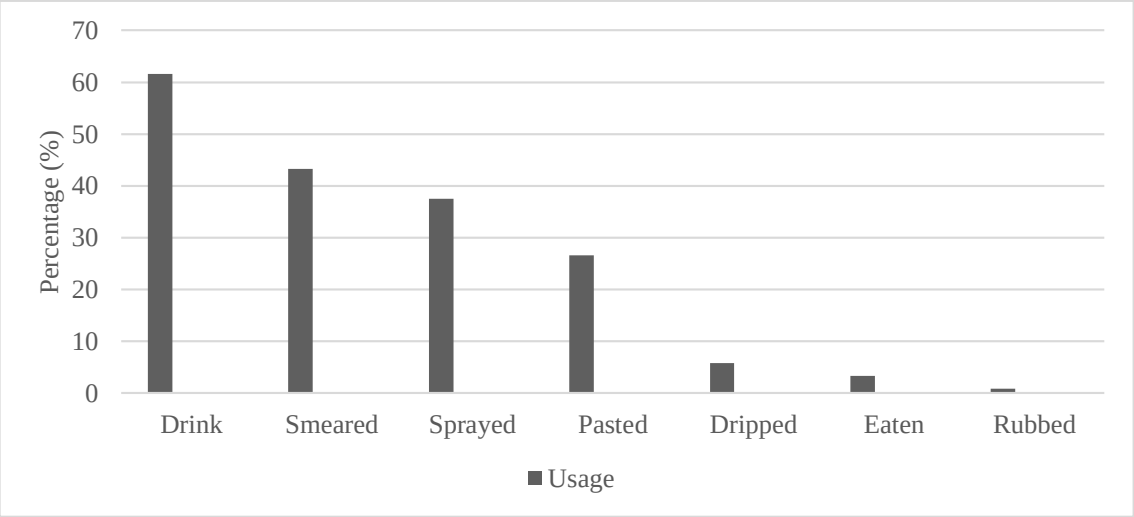

Figure 5. Usage of Traditional Medicines

Traditional Knowledge of Medicinal Plant

Based on the results of calculating the level of traditional knowledge of medicinal plants (Mg), 0.222 in the age group 17-30, 0.296 in the age of 31-50, age 51 and over 0.304. The results of the Kruskal Wallis test for traditional knowledge of medicinal plants for different age groups were very significant, with a P = 0.000 (<0.05). The low value of Mg in the three age groups is due to the lack of time people interact with plants. Age relates to the amount of time spent interacting with plants. The experience of interacting with plants is accumulated across generations which is embodied in culture. Botanical knowledge can be maintained among young people if they engage in activities that allow them to interact with plants. Progress in the field of education also determines the reluctance of the younger generation to practice traditional medicine. This is what causes the erosion of knowledge among the younger generation. The same is true for the younger generation of Tibetan Nepalese, Chinese (Boesi 2014), Gallois and Reyes-García 2018; Caballero-Serrano et al. 2019; Semende (Wiryono et al. 2019).

Degradation of traditional knowledge about plant diversity occurs due to reduced time interacting with plants due to changes in livelihoods and formal education, likewise with Vasques et al. (2016) and Bruyere et al. (2016) stated that education level had a negative correlation with local community botanical knowledge. Along with the rapid development of tourism, many local people have switched professions to become workers in the tourism sector, including tour guides, inn managers, hotel employees, souvenir traders, etc.). Tourism is a very promising economic sector, so not a few local people have switched professions to become tourism workers and tend to leave their previous jobs (Shantika and Mahagangga, 2018) in line with Wiryono et al. (2019) which states that the decline in ethnobotanical knowledge is due to changes in livelihoods. All this time, the Bugbug community has obtained knowledge of medicinal plants through hereditary and orally, so that the knowledge has slowly decreased and eventually become rare in the young generation.

The results of the Mann-Whitney test on the gender difference factor showed a value of P = 0.388 (> 0.05). This means that there is no difference in traditional knowledge of medicinal plants between men and women. In the Bugbug community, both men and women work together to prepare medicinal ingredients for their families. In contrast with Elisa et al (2015) which states that the traditional knowledge of medicinal plants between men and women is different.

Index Cultural Significance

Piper betle has the highest ICS value (48), followed by Oryza sativa (40) and Zingiber officinale (33); all three are in the moderate category. Medicinal plants are mostly in the category of low (92), very low (25), and medium (7). Judging from the ICS value, plants with low ICS values are plant species that show a low quality of use, intensity of use, and exclusivity. This happens because the local community, on average, knows only one-use category. Plants that have more benefits will have a greater ICS value. The lack of public knowledge of the use of plants has an impact on natural stimuli and willingness to cultivate them. Variations of plants that are beneficial to a community group determine the importance of conservation efforts by the community. Some of the used plants intensively are planted near their residence. But most of them are wildly obtained around the village. Plants are used in various activities of people's daily life where one plant species can be used for various purposes, including food, ceremonial materials, fodder, building materials, and ornamental plants. To fulfill this interest, it is important to carry out conservation efforts, especially for plants used continuously and exclusively.

Fidelity Level (FL)

Fidelity Level value is used to find out which types of plants are the most preferred for a particular use, so many plants used by local community certain uses have FL values higher than other plants less popular (Alexiades, 1996). Khan (2014) adds that value FL shows the percentage of informants using a type of plant for that main purpose The same. Based on the calculation results in Fidelity Level (FL) of 124 species plants used by the Bugbug community obtained results the highest with an average value of 100% as many as two types of plants are. The category that has the highest FL value are Piper betle and *Imperata cylindrica* (100%), followed by *Cocos nucifera* (83.33%) and *Psidium guajava* (79.16%). The lowest is Abutilon indicum (2.08%). The fidelity level calculated for medicinal plants showed (Table 2).

CONCLUSIONS AND RECOMMENDATIONS

There were 124 species of plants used for traditional medicine by the Bugbug community spread over 46 families, with most families being Fabaceae. The most widely used species is *Piper betle* L. Leaves are the most frequently used parts. People generally use leaf organs that are easily pounded because of their soft texture. In terms of the life form, most of the used species were herbaceous. The highest of the habitat is obtained from the roadsides that live wildly. Pounded is the highest preparation mode of traditional medicinal plants. The most widespread usage was drinking. Traditional knowledge of the diversity of medicinal plants differed among the three age groups but did not differ between men and women. Traditional knowledge of medicinal plants from the three age groups was included in the low category. This is due to the lack of time for people to interact with plants in consquence of changes in the profession towards the tourism sector. The highest Fidelity level is *Piper betle* L.; and *Imperata cylindrica* L. Meanwhile, the highest Cultural Significance Index is *Piper betle* L.

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