International Journal of
Applied Science and Sustainable Development (IJASSD)
Vol. 6 No. 1, April 2024
p-ISSN: 2656-9051/e-ISSN: 2775-6874
DOI: https://doi.org/10.36733/ijassd.v6i1.9124

ETHNOBOTANY OF LOCAL FOODSTUFF PLANTS USED BY BUGBUG COMMUNITY IN KARANGASEM, BALI, INDONESIA

Dewa Ayu Sri Ratnani[1], I Ketut Junitha[2], Eswaryanthi Kusuma Yuni[2], Desak Nyoman Budiningsih[1]
[1]Biology Department, Faculty of Teacher Training and Education, Universitas Mahasaraswati Denpasar, Denpasar, Indonesia.
[2]Biology Department, Faculty of Mathematics and Natural Sciences, Universitas Udayana. Badung, Indonesia
Email: Sri.ratnani@unmas.ac.id

ABSTRACT

The aims of this research were (1) Reveal to the diversity of local foodstuff plants utilized by Bugbug community; (2) to analyze traditional knowledge of local foodstuffs plants of Bugbug community; (3) to analyze the Use Value (UV) and Index Cultural Significance (ICS) of local foodstuffs plants. The research was conducted in Bugbug Karangasem, Bali, from January 2021-March 2021. Data were collected using qualitative methods, semi-structured interviews, moderate participation observation, and documentation. Key informants were selected using purposive and snowball sampling to obtain ten key informants and 48 respondents. The use value of plants is calculated by UV, cultural importance with ICS. The level of traditional knowledge was measured by the Phillips and Gentry equations and analyzed by the Kruskal Wallis and Mann Whitney Test. The traditional knowledge of local foodstuff plants was calculated using the Phillips and Gentry equations and analyzed with the Kruskal Wallis and Mann Whitney Test. Traditional knowledge of local foodstuff plants between age groups is different. Meanwhile, knowledge between genders is not different. The diversity of local foodstuff plants in Bugbug Village is 126 species, 47 families, the most families being Musaceae. The high diversity of plants found is caused by specific ecosystems from hilly areas and beaches. The most widely used part of the plant is the fruit. Most plant habitus is an herb. Herbs are easy to grow in various locations and are found in semi-wild status. The highest plant use value and ICS are *Arenga pinnata* L.

Keywords: *Bali Aga*, ethnobotany, local food stuffs plant, traditional knowledge

INTRODUCTION

The use of plants, each region in the Republic of Indonesia has its local wisdom which is the hallmark of its people. The daily life of local people depends on the rich diversity of plants, especially local foodstuff plants. Food plants are anything that grows, lives, has stems and roots, is environmentally friendly which, can be eaten directly or in advance (Apriliani et al., 2014). Foodstuff plants in ethnobotany research embezzlement become staple food, vegetables, fruit, food additives, drinks, and seasonings (Sujarwo & Caneva, 2016). Various factors influencing local communities in choosing food ingredients include availability in nature, culture, taste, and nutritional value so that variations in food ingredients are found between community groups (Purba, 2015). Community interactions with plants have been passed down from generation to generation to produce traditional knowledge

of plant diversity. This knowledge is determined by interactions, processes, and attitudes to the use of plants by the community (Elisa et al., 2015)

The traditional knowledge of Bugbug community about the use and processing of foodstuffs is currently experiencing degradation due to the emergence of modern food in society. This is due to various factors, including information and technology sophistication, the presence of modern food (Sujarwo et al., 2014), various foodstuffs are becoming increasingly difficult to find (Purba et al., 2015), and lack of nutritional value information (Pawera et al., 2020). Traditional knowledge is one of the Indonesian heritage and the young generation is one of the parties contributing to traditional knowledge loss.

The loss of traditional knowledge in the young generation occurs in several countries, including Africa (Fongod et al., 2014), North America (Vásquez et al., 2016), and the Semende tribe (Wiryono et al., 2019). The youth's poor traditional knowledge mainly results from an inadequate education system that fails to maintain local knowledge inherited from their ancestors (Khastini et al., 2019). Loss of traditional knowledge is one of the main factors that threaten biodiversity conservation (Ju et al., 2013). Loss of botanical knowledge causes food insecurity and triggers diseases such as diabetes, and threatens community-based conservation efforts (Aswani et al., 2018). Efforts that can be made to prevent the loss of the community's traditional knowledge are by documenting and exploring the potential for diversity of local plants, especially local foodstuffs. Ethnobotany is a tool for documenting community knowledge about using plants for food, buildings, dyes, traditional ceremonies, and medicine (Tamalene et al., 2016; Mesfin et al., 2018). Ethnobotany is very important for the conservation of biodiversity and for meeting the needs for food, health, and culture (Pieroni et al., 2014).

The Bugbug Indigenous Village community is an agricultural society of 12 traditional hamlets in the Karangasem sub-district. At the beginning of the history of the formation of the Bugbug community, they lived as nomads or moved around, but now they live sedentary lives by farming. Agrarian communities spend most of their time interacting with plants individually and socially so that they have traditional knowledge about the use and management of plants. Bugbug Village has a hilly area (Sang Hyang Ambu Hill, Gumang Hill, and Asah Hill) and a coastal area (Candidasa) which is a tourist area.

The region’s uniqueness with a specific ecosystem determines the local knowledge of the community. Each ethnic group grows according to the uniqueness of the region, the availability of natural resources, and its culture (Suryadarma, 2017). As a tourist area, local foodstuff has potential and can be developed to support the tourism economy in the Bugbug Village area. It is a unique and valuable differentiation source used to enhance the tourist. For this reason, it is essential to carry out an ethnobotanical study on the diversity of local foodstuff plants in Bugbug Village, Karangasem, Bali.

METHODS

Research Sites

The research time is January 2021-March 2021 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, the temperature is 28-32^{o}C. It is a lowland, with part of the area being a beach. Bugbug Village is an agricultural village dominated

by wetland agriculture (rice fields). Paddy field area is 126.96 Ha, dry land is 756.89 Ha.

Figure 1. Map of the location of Bugbug community in Karangasem Subdistrict, Karangasem District, Bali, Indonesia

Data Collections

Ethnobotany data were collected through semi-structured interviews, observation, and documentation. Key informants and respondents were obtained by Purposive Sampling and Snowball Sampling. Key informants were selected by the village head, community leaders, and researchers. Furthermore, using the snowball sampling technique, which is carried out in sequence by asking for information from people who have been interviewed or contacted before (Hariyadi & Ticktin, 2012). Respondent selection criteria were grouped based on age 17-30 years (adolescents), 31-50 years (adults), and > 50 years (elderly) in each age group of 16 people so that 48 respondents were obtained.

Data Analysis

The data obtained were analyzed using qualitative and quantitative approaches. The qualitative data analysis was carried out in a narrative descriptive manner and presented as tables and graphs. Quantitative analysis is:

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 knowledge of local foodstuff 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) Calculation of Use Value (UV)

The UV calculation for each plant species is calculated based on the following formula:

$$Uvs = \sum Uvis / is$$

Where:

Uvs = use value of species s as a whole

Uvis = use value of species s determined by informant i.

is = total number of respondents interviewed for type s

Source: Kayani et al., (2015).

3) Calculation of the Index of Cultural Significance (ICS)

Index of Cultural Significance used a more in-depth data analysis for the utilization of each plant species from Purwanto (2003). Index of Cultural Significance is the result of quantitative ethnobotanical analysis showing Index of Cultural Significance is the result of quantitative ethnobotanical analysis showing the importance values of each useful plant species based on community needs. The ICS calculation results show the level of importance of each beneficial plant species by the community. To calculate ICS is done with the following equation:

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

Where:

ICS : Index of Cultural Significance

q : Quality value

I : Intensity value

e : Exclusivity value

The plants were collected with the informants and then identified by matching with the herbarium specimen of the Bali Botanical Garden, the picture on the flora book, and images on plantNet. Their scientific names were verified using online sources (e.g theplantlist.org)

RESULTS AND DISCUSSION

The Diversity of Local Foodstuff Plants

As many as 126 local foodstuff plant species are spread over 47 families, with the most family being Musaceae (Figure 2). The diversity of local foodstuff Plants can be seen in Table 1.

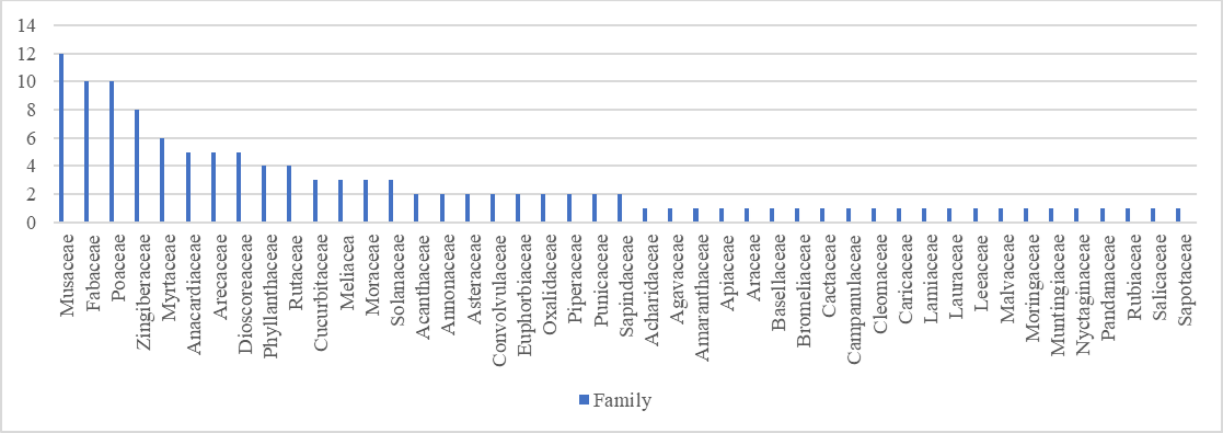

Figure 2. Family of Foodstuff Plants used by Bugbug Community in Karangasem, Bali

Table 1. The Diversity of Local Foodstuff Plants Used by The Bugbug Community

Family/Scientific Name	Local Name	Plant Parts	Habitus	Cultivation Status	*UV*	*ICS*
Acanthaceae						
***Gratophyllum pictum* L.**	Don temen	leaf	shrub	SW	0.5	26

Family/Scientific Name	Local Name	Plant Parts	Habitus	Cultivation Status	*UV*	*ICS*
***Acanthus ilicifolius* L.**	Jaruju	fruit	herb	W	0.26	6
Achariaceae						
***Pangium edule* Reinw.**	Pangi	seed	tree	W	0.24	36
Agavaceae						
***Dracaena marginata* Lam.**	Kayu sugih	leaf	tree	SW	0.93	30
Amaranthaceae						
***Amaranthus hybridus* L.**	Bayem	leaf	herb	SW	0.82	6
Anacardiaceae						
***Anacardium occidentale* L.**	Nyambu mente	fruit, seed	tree	C	0,82	6
***Mangifera caesia* Jack.**	Wani	fruit	tree	W	0.06	6
***Mangifera indica* L**	Poh manalagi	fruit	tree	SW	0.53	
***Mangifera indica* L**	Poh arum manis	fruit	tree	SW	0.53	6
***Mangifera indica* L**	Poh Madu	leaf, fruit	tree	SW	0.53	6
***Spondias pinnata* L.**	Kecemcem	leaf	shrub	W	0.46	10
Annonaceae						
***Annona muricata* L.**	Srikaya	fruit	shrub	SW	0.63	22
***Annona squamosa* L.**	Silik	fruit	shrub	SW	0.46	10
Apiaceae						
***Centella asiatica* L.**	Piduh	leaf	herb	W	0.36	16
Araceae						
***Colocasia esculenta* Schott.**	Kaumbang	leaf, tubers	herb	W	0.83	30
Arecaceae						
***Arenga pinnata* Merr**	Jaka	fruit	tree	W	1	55
***Cocos nucifera* L**	Nyuh barak	fruit	tree	C	0.82	31
***Cocos nucifera* L**	Nyuh gading	fruit	tree	SW	0.82	31
***Cocos nucifera* L**	Nyuh gadang	fruit	tree	C	0.82	31
***Salacca zalacca* L**	Salak	fruit	tree	C	0.7	12
Asteraceae						
Blumea balsamifera (L) DC.	*Sembung*	leaf	herb	SW	0.53	6
***Pluchea indica* L.**	Baluntas	leaf	herb	SW	0.24	6
Basellaceae						
***Anredera cordifolia* (Ten) Steenis**	Binahong barak	leaf	herb	SW	0.24	12
Bromeliaceae						
***Ananas comosus* Mer.**	Manas	fruit	herb	SW	0.53	18
Cactaceae						
Hylocereus polyrhizus	Buah Naga	fruit	herb	SW	0.56	18
Campanulaceae						
***Garcinia mangostana* L.**	Manggis	fruit	tree	SW	0.66	16
Cleomaceae						
***Cleome rutidosperma* DC**	Buangit	leaf, flower	herb	W	0.3	12
Caricaceae						
***Carica papaya* L.**	Gedang	fruit	tree	SW	0.53	12
Comvolvulaceae						
***Ipomoea aquatica* L.**	Kangkung	leaf	herb	SW	0.82	12
***Ipomoea batatas* L.**	Ubi belook	tubers	herb	C	0.46	18
Cucurbitaceae						
Benincasa hispida	Baligo	fruit	herb	SW	0.26	12
***Cucurbita moschata* Duchesne.**	Tabu	fruit	herb	SW	0.7	6
Cucumis sativus	Ketimun	fruit	herb	C	0.46	33
***Momordica charantia* L.**	Paye	fruit	herb	W	0.46	33
***Sechium edule* Sw.**	Jepang	fruit	herb	SW	0,7	6
Dioscoreaceae						
***Dioscorea alata* L**	Ubi injin	tubers	herb	W	0.26	8

Family/Scientific Name	Local Name	Plant Parts	Habitus	Cultivation Status	*UV*	*ICS*
***Dioscorea bulbifera* L.**	Ubiaung sungga	tubers	herb	W	0.26	8
***Dioscorea bulbifera* L.**	Umbi gadung	tubers	herb	W	0.26	8
***Dioscorea bulbifera* L.**	Ubi ipit	tubers	herb	W	0.06	8
***Dioscorea communis* L.**	Ubi Abe	tubers	herb	W	0.06	8
Euphorbiaceae						
***Aleurites moluccanus* L.**	Tingkih	seed	tree	W	0.26	24
Manihot utilissima Pohl.	Ubi perahu	leaf, tubers	shrub	C	0.9	26
***Phyllanthus emblica* L.**	Amla	fruit	tree	W	0.56	6
Fabaceae						
***Cajanus cajan* (L) Mill**	Undis	seed	shrub	W	0.03	8
***Clitoria ternatea* L.**	Bunga celeng	flower	shrub	SW	0.56	10
Glycine max	Kedele	seed	shrub	C	0.56	20
***Lablab purpureus* L.**	Komak putih	seed	herb	W	0.56	8
***Mucuna pruriens* Wilmot.**	Juleh	seed	herb	W	0.03	8
Phaseolus vulgaris	Kacang buncis	seed	herb	SW	0.06	14
Psophocarpus tetragonolobus	Cipir	seed	herb	SW	0.63	20
***Pisum sativum* L.**	Kacang Botor	seed	herb	SW	0.5	20
***Vigna unguiculata* L.**	Kacang lilit	seed	herb	C	0.63	22
Vicia faba	Kacang kara	seed	herb	SW	0.56	20
Gnetaceae						
***Gnetum gnemon* L.**	Melinjo	seed	tree	W	0.43	6
Lamiaceae						
***Ocimum tenuiflorum* L.**	Tulasi	leaf	herba	SW	0.46	8
Lauraceae						
***Persea americana* P.Mill.**	Apokat	fruit	tree	W	0.43	12
Leeaceae						
***Leea indica* Burm.f**	Gegirang	leaf	shrub	W	0.3	24
Malvaceae						
***Durio zibethinus* L.**	Duren	fruit	tree	SW	0.7	12
Meliaceae						
***Baccaurea racemose* (Reinw.) M.Arg**	Kepundung	fruit	tree	W	0.26	12
***Lansium domesticum* L.**	Ceroring	fruit	tree	W	0.26	12
***Sandoricum kotjape* (Burm.F) Merr**	Sentul	fruit	tree	W	0.26	4
Moraceae						
Artocarpus camansi Blanco.	Timbul	fruit	tree	W	0.43	6
Artocarpus communis Forst.	Sukun	fruit	tree	W	0.43	6
Arthocarpus heterophyllus Lam.	Nangka	fruit	tree	W	0.5	9
Moringaceae						
***Moringa oleifera* L.**	Kelor	leaf, fruit	shrub	SW	0.93	16
Muntingiaceae						
***Muntingia calabura* L.**	Singapur	fruit	shrub	W	0.5	8
Musaceae						
***Musa brachycarpa* Back**	Biyu Jelutuk/batu	stem, fruit	herb	SW	0.53	23
***Musa paradisiaca* L.**	Biyu gedang saba	stem, fruit	herb	SW	0.53	20
***Musa acuminata* L.**	Biyu ketip	fruit	herb	SW	0.53	20
Musa AAA	Biyu kayu	fruit	herb	SW	0.26	20
***Musa acuminata* Colla.**	Biyu keladi	fruit	herb	C	0.53	20
Musa AAA	Biyu sangket	fruit	herb	SW	0.53	20
***Musa paradisiaca* var. sapientum**	Biyu gadang	fruit	herb	C	0.56	20
***Musa sapientum* var. mas**	Biyu Mas	fruit	herb	C	0.53	20
Musa velutina	Biyu Tembaga	fruit	herb	SW	0.26	30

Family/Scientific Name	Local Name	Plant Parts	Habitus	Cultivation Status	*UV*	*ICS*
Musa AA	Biyu Gancan	fruit	herb	SW	0.26	30
***Musa textilia* L.**	Biyu raja	fruit	herb	C	0.53	30
***Musa acuminata* var.silk**	Biyu susu	fruit	herb	C	0.53	30
Myrtaceae						
***Psidium guajava* L.**	Nyambu Sotong	fruit	tree	W	0.7	24
***Syzygiumaromaticum* (L)Merr**	Cengkeh	flower	tree	SW	0.7	10
***Syzygium aqueum* Alston**	Nyambu wer	fruit	tree	SW	0.7	24
***Syzygium cumini* (L) Skeels**	Juwet	fruit	tree	W	0.26	6
***Syzygium polyanthum* Walp.**	Don Juwet	leaf	tree	W	0.26	10
***Syzygium polycephalum* (Miq) Merr**	Kaliasem	fruit	tree	W	0.26	8
Nyctaginaceae						
***Pisinia grandis* Span.**	Dagdag see	leaf	tree	SW	0.7	20
Oxalidaceae						
***Averrhoa bilimbi* L.**	Belimbing buluh	fruit	tree	SW	0.6	8
***Averrhoa carambola* L.**	Belimbing besi	leaf, fruit	tree	SW	0.9	18
Pandanaceae						
***Pandanus amiryllicolius* Roxb.**	Pudak arum	leaf	shrub	SW	0.9	24
Phyllanthaceae						
***Antidesma bunius* Spreng**	Boni	fruit	tree	W	0.66	18
***Baccaurea racemosa* Reinw.**	Kepundung	fruit	tree	W	0.3	12
***Phyllanthus acidus* Skeels.**	Cermen	fruit	tree	W	0.66	6
***Sauropus androgynus* (L) Merr.**	Don kayu manis	leaf	shrub	SW	0.66	9
Piperaceae						
***Peperomia pellucida* (L) Kunth**	Damuh-damuh	leaf, stem	herb	W	0.26	7
***Piper retrofractum* Vahl.**	Tabia bun	leaf , fruit	herb	W	0.57	10
Poaceae						
***Bambusa vulgaris* Schrad**	Tiying ampel Gading	shoots	herb	SW	0.46	15
***Cymbopogon citratus* (DC) Stapl**	See	stem	herb	SW	0.7	7
***Gigantochloa apus* (Schult.) Kurz**	Tiying tali	shoots	herb	SW	0.93	15
***Imperata cylindrica* L.**	Ambengan	root	herb	W	0.9	30
***Oryza sativa* L.**	Padi Bali	seed	herb	C	0.7	30
***Oryza sativa* L.**	Padi biasa	seed	herb	C	0.93	44
***Oryza sativa* L. var.glutinosa**	Ketan putih	seed	herb	C	0.7	44
***Oryza sativa* L. var.glutinosa**	Injin	seed	herb	C	0.66	30
***Saccharum officinarum* L.**	Tebu	stem	herb	SW	0.93	18
***Zea mays* L.**	Jagung	fruit	herb	C	0.7	21
Polypodiaceae						
***Diplazium esculentum* Swartz.**	Paku	leaf	herb	W	0.86	6
Punicaceae						
***Punica granatum* L.**	Delima wanta	fruit	shrub	SW	0.86	20
***Punica granatum* L.**	Delima	fruit	shrub	SW	0.86	20
Rubiaceae						
***Morinda citrifolia* L.**	Tibah	fruit	shrub	W	0.53	7
Rutaceae						
***Citrus amblycarpa* Hassk**	Limo	fruit, leaf	shrub	SW	0.66	20
***Citrus aurantifolia* (Chistm) Swingl**	Juuk lengis	fruit	tree	SW	0.5	16
***Citrus grandis* L.**	Jerungga	fruit	tree	SW	0.7	16
***Citrus sinensis* L.**	Juuk	fruit	tree	SW	0.66	12
Salicaceae						
***Flacourtia indica* L.**	Ngkem	fruit	shrub	W	0.26	7
Sapindaceae						
***Nephelium lappaceum* L.**	Buluan	fruit	tree	SW	0.7	12
***Schleichera oleosa* Merr.**	Kesambi	fruit	tree	W	0.3	14
Sapotaceae						
***Manilkara zapota* L.**	Sabo	fruit	tree	SW	0.53	12

Family/Scientific Name	Local Name	Plant Parts	Habitus	Cultivation Status	*UV*	*ICS*
Solanaceae						
***Capsicum frutescens* L.**	Tabia	fruit	shrub	C	0.63	12
***Physalis angulate* L.**	Ceplukan	fruit	herb	W	0.13	6
Solanum melongena	Tuwung	fruit	shrub	SW	0.56	10
Zingiberaceae						
Alpinia galanga	Isen	rhizome	herb	SW	0.46	21
***Curcuma longa* Linn.**	Kunyit	rhizome	herb	SW	0.26	23
Curcuma zanthorhiza	Temu lawak	rhizome	herb	SW	0.26	9
***Etlingera elatior* (Jack)**	Kecicang	shoots, flower	herb	SW	0.26	6
***Gastrochillus panduratum* Ridl**	Temu kunci	rhizome	herb	SW	0.26	6
***Kaempferia galangal* L.**	Cekuh	rhizome	herb	SW	0.26	21
***Zingiber cassumunar* L.**	Bangle	rhizome	herb	SW	0.3	10
***Zingiber officinale* Rosc.**	Jahe	rhizome	herb	SW	0.53	25

High diversity indicates knowledge of the aspects of the benefits of local foodstuff plants, which are grouped into staple foods (8), vegetables (35), fruit (40), complementary foods (6), drinks (20), and seasonings (17). This finding is higher than 106 foodstuffs species of the Mandailing Tribe (Nasution et al., 2018), Simpang Teritip, Bangka 79 species (Camelia et al., 2019), Bulumario, North Sumatra 83 species (Silalahi et al., 2021). The Bugbug community is used by the musaceae family as a means of yadnya ceremonies. Some of them are staples and are exclusive (irreplaceable), namely *Musa AAA* (*biyu kayu*), *Musa velutina* (*biyu temaga*), *Musa AA* (*biyu gancan*). The uniqueness of hilly and coastal areas reflects biodiversity, including plants in specific ecosystems. Each ethnic group develops according to the region's uniqueness, culture, and availability of natural resources (Suryadarma, 2017)

Part of Local Foodstuff Plants

The parts of plants used as foodstuff by the Bugbug people are roots, stems, buds, leaves, flowers, fruit, seeds, tubers, and rhizomes. The fruit was the most commonly used plant part for foodstuffs (56%), followed by leaf (20%) and seed (12%). Similar to findings in Nepal (Uprety et al., 2012), Cipinang Kiri Hulu Village, Riau (Wahyuni et al., 2021). Plant parts of local foodstuff is presented in Figure 3.

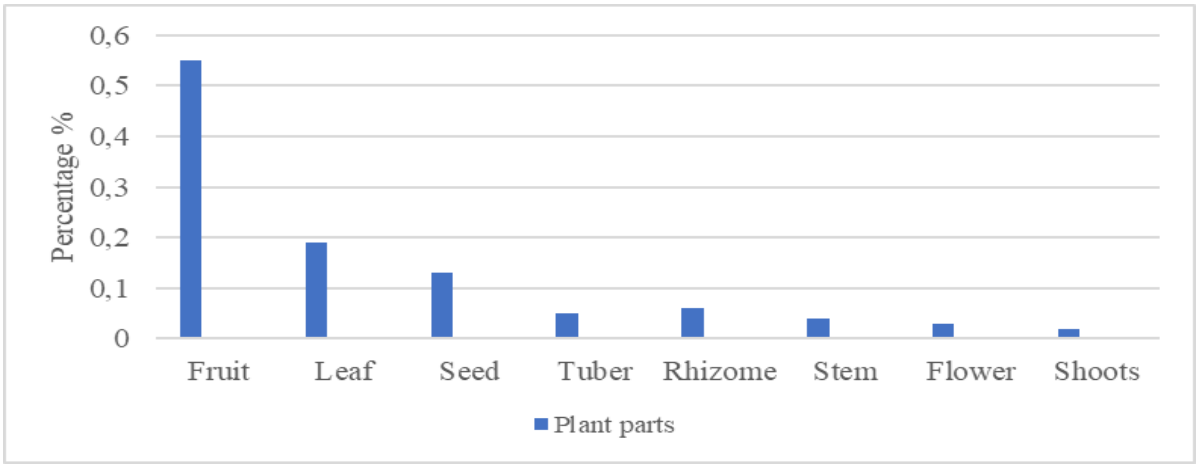

Figure 3. Plant parts of local foodstuffs used by Bugbug community

The fruit is mainly used as a fruit that is eaten directly. It is used for ceremonies as an offering material too. According to Sujarwo (2020), plants or their parts are the most important elements in material offerings related to the Yadnya ceremony. Upakara a yadnya uses a lot of leaves, flowers, fruit, seeds, and tubers (Adiputra, 2017). Several fruits are processed into a salad, such as *Syzygium polycephalum* (Miq) Merr., *Sandoricum kotjape* (Burm.F) Merr, *Syzygium aqueum* Alston., *Antidesma bunius* Spreng., *Phyllanthus acidus* Skeels., *Averrhoa carambola* L., *Morinda citrifolia* L., and *Carica papaya* L., *Arthocarpus heterophyllus* Lam., *Musa brachycarpa* Back. processed into a local dish called *lawar*. Some fruits are usually sold to tourist namely *Sallaca zalacca* L., *Garcinia mangostana* L., and *Durio zibethinus* L.

The highest habitus is herbs (50%), followed by the tree (33%) and shrubs (17%) (Figure 4). Herbs have a fast rate of growth and reproduction and are easy to grow in various locations (Nasution et al., 2018). The herb habitus is also highest in the Pedundung community (Silalahi et al., 2021). The local foodstuff plants that is utilized by the Bugbug community is most obtained from semi-wild (50%), followed by wild (35%) and cultivation (16%) (Figure 5). Local foodstuff plants liked by the community are usually planted to meet daily food needs and for ceremonies.

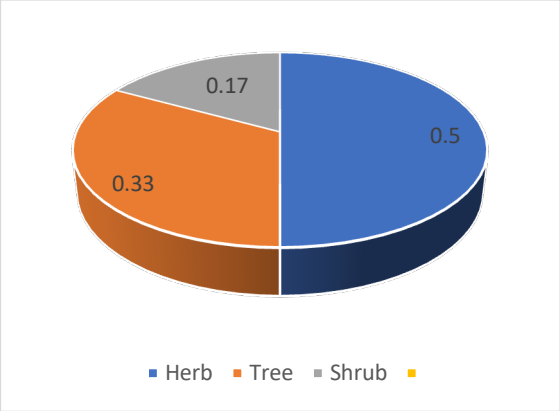

Figure 4. Habitus of Foodstuff Plants

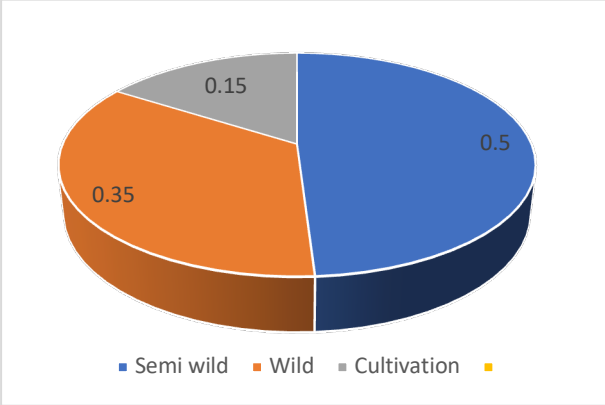

Figure 5. Cultivation Status of Foodstuff Plants

Traditional knowledge of Local Foodstuff Plants

Availability factors at the location and frequency of use significantly affect the respondent's knowledge. The local community in Bugbug village uses *Ipomoea batatas* L. tubers in the local name *ubi belook* as an additional food ingredient. At the same time, the leaves are used as animal feed, especially for pigs. These foodstuffs are alternative foodstuffs with high carbohydrate content which are used as substitutes for staple foods when staple foods are not available. Several plant species from the Dioscoreaceae family that the Bugbug people like, such as *Dioscorea alata* L., *Dioscorea bulbifera* L., and *Dioscorea communis* L., come from wild habitats. The preferred taste of wild food causes people to use it as a substitute for carbohydrates. Apart from being consumed, the community utilized these species for ceremonies too. These species have the potential to be developed as local food for tourism. This resulted in variations in food as a source of carbohydrates in various local communities, such as *Colocasia esculenta* for Balinese ethnicity (Sujarwo & Caneva, 2016). Wild plants contribute to fulfilling

food needs, survival, sustainability of traditional ecology and knowledge.

The level of traditional knowledge of local foodstuff plants of the Bugbug community aged 17-30 years was 37.3% in the less category, aged 31-50 years, 64.28% in the sufficient category, aged> 50 years, 77.7% in the good category. The level of knowledge is interpreted with a qualitative scale based on the percentage value into three categories, namely: (1) Good category ≥75%; (2) sufficient category 55-74%; (3) Less category < 55% (Arikunto, 2013). The results of the average level of traditional ethnobotanical knowledge (Mg) of respondents were 0.373 at the age of 17-30 years, 0.642 at the age of 31-50 years, and 0.777 aged of> 50 years. The level of traditional knowledge of local foodstuff plants is presented in Table 2. The results of the Kruskal Wallis test for traditional knowledge of local foodstuff plants for different age groups were very significant, with a P = 0.000 (<0.05).

Table 2. Traditional Knowledge on Local Foodstuff Plants of Bugbug Community

No	Age Group	Traditional knowledge		Category
		Mg	(%)	
1.	17-30	0.373	37.3	Less
2.	31-50	0.642	64.28	Sufficient
3.	> 50	0.777	77.77	Good

The level of traditional knowledge aged 17-30 is included in the less category because they have little time to interact with plants. It is caused by the education of the younger generation, which is increasing, so that is less time to interact with plants. This agrees with Vasques et al. (2016) that the level of education has a negative correlation with the botanical knowledge of the local Zapotec community in Mexico. Age is related to the amount of time interacting with plants. Each age group has a different level of knowledge, whereas a person's age increases, the more time he interacts with plants, the more his knowledge increases.

The younger generation prefers fast food more than traditional food, which is also one reason for their lack of knowledge of traditional local foodstuff plants. The process of inheriting traditional knowledge is influenced by sociocultural backgrounds introduced through daily activities and customs. However, the tourism culture, which introduces a modern, all-practical culture, influences the mindset of the people, especially the younger generation, regarding the use and management of plants. Meanwhile, the results of the Mann-Whitney test for gender did not differ from the value of P = 0.388 (> 0.05). This result is because of the Bugbug community; both men and women work together in utilizing and cultivating local foodstuff plants in line with Sousa et al. (2012) and Wiryono et al. (2017).

Use Value (UV) of Local Foodstuff Plants

Based on UV calculations from 48 respondents, the highest use value (UV) of the local foodstuffs plant was *A. pinnata* L. (1). This means that all respondents know the benefits of *A. pinnata* as a foodstuff. While the lowest UV was obtained from *Cajanus cajan* (L) Mill and *Mucuna pruriens* Wilmot. (0.03). The high use value of *A. pinnata* is due to the large number of uses by the community for various purposes; namely, sap water (*tuak*) is consumed daily as a drink, processed into alcohol, a mixture for making cakes, for ceremonies,

traditional events and for sale. The fruit, called *beluluk*, is used as a mixture of ice drinks and fibers for building materials and sale. The highest or lowest Use Value can become rare and eventually disappear from the location because by knowing the many benefits that can be obtained, plants have the potential to be exploited by the community. Meanwhile, if the UV is very low, it has the potential to be ignored by the community.

Index Cultural significance (ICS) of Local Foodstuff Plants

The highest Index of Cultural Significance (ICS) of local foodstuff plants was *A. pinnata* L. (55). While the lowest ICS is *Sandoricum kotjape* (Burm. F) Merr. Plants with the highest ICS are plant species that are widely used by the community, especially those with high exclusivity and intensity. In this study, the ICS value is high because it is used for various needs, including food (food and beverages), ceremonies, medicinal materials, and building materials as basic and irreplaceable (exclusive) ingredients.

The Bugbug community uses almost all parts of this plant, namely fruit and sap water for food, drink and medicine, leaves for ceremonies, and fibers for sacred buildings. Plants that have more uses will have a more excellent ICS value. This means these plants become more valuable and exclusive (Hager, 2008). The community places *A. pinnata* L. plants as the highest level and the most useful and valuable plants because these plants are used with high intensity and exclusivity. Ethnobotanical studies are efforts made by the community to manage their knowledge systems regarding plants in their environment which are used not only for their daily needs but also for spiritual needs and cultural values.

CONCLUSION

The diversity of species used by The Bugbug community is relatively high, namely 126 species spread across 47 families. The high diversity of plants found is caused by specific ecosystems from hilly areas and beaches. The most used family is Musaceae. The community mostly cultivates the musaceae family to meet their daily needs for food, ceremonial materials, and commodities. The most widely used part of the plant is the fruit. The level of traditional knowledge of local foodstuff plants varies between age groups; age is related to the amount of time needed to interact with plants. The older a person is, the more traditional knowledge he has. In contrast, the level of traditional knowledge between genders is not different. The highest Use Value and Index Cultural Significance of local foodstuff plants are *Arenga pinnata* L. High Index Cultural Significance are plant species widely used by the community, especially those with high exclusivity and intensity.

Acknowledgments

The authors are grateful to all people in the studied village, especially to the local informants, for their kind hospitality, the sharing of traditional knowledge on plants, and the provision of the opportunity and facilities needed in Bugbug, Karangasem Bali, Indonesia

References

Adiputra N. 2017. Functions of Fruits and Leaves of Plants in Balinese Culture A Study of Ceremonial Plants. Sustainable Earth Journal 17(2):118-125.

Apriliani A, Sukarsah dan Hidayah H.A. 2014. Ethnobotanical Study of Plants as Traditional Food Additives by Communities in Pekuncen District, Banyumas Regency. Scripta Biologica 1(1):76-84.

Arikunto, S. 2013. Research Procedures A Practice Approach. Revised Edition. Rineka Cipta Jakarta.

Aswani S, Lemahieu A, Sauer, W.H.H. 2018. Global Trends of Local Ecological Knowledge and Future Implications. PLoS ONE 13 (4): e0195440.

Camelia A, Afriyansyah B, Juairiah L. 2019. Ethnobotanical Study of Food Plants of the Jerieng Tribe in Simpang Teritip District, West Bangka Regency. Ekotonia: Biologi, Botany, Zoology and Microbiology Research Journal 4(1):12-17.

Elisa I, Ervizal A.M.Z, Agus H, Nandi K. 2015. Ethnobotanical Knowledge of the Manggarai Tribe and Its Implications for the Utilization of Forest Plants in the Ruteng Mountains. Journal of Indonesian Agricultural Sciences 20(3):171.

Fongod AGN, Ngoh ML, Libalah MCV. 2014. Ethnobotany, Indigenous Knowledge, and Unconscious Preservation of the Environment: An Evaluation of Indigenous Knowledge in South and Southwest Regions of Cameroon. International Journal of Biodiversity and Conservation. 6(1):85-99.

Hager TF. 2008. Processing and Storage Effects on Monomeric Anthocyanins, Percent Polymeric Color, and Antioxidant Capacity of Processed Blackberry Products. J Agric Food Chem 56:689-695.

Hariyadi B, and Ticktin, T. 2012. Uras: Medicinal dan Ritual Plants of Serampas, Jambi Indonesia. Jurnal ethnobotany research and applications 10:133-149.

Ju, Y, Zhuo J, Lui B, Long C. 2013. Eating from the wild: diversity of wild edible plants used by Tibetans in Shangri-laregion, Yunnan, China. Journal of Ethnobiology and Ethnomedicine 9(28).

Kayani S, Mushtaq A, Shazia S, Zabta KS, Muhammed Z, Ghulam Y, Manzoor H, Tahira B. 2015. Ethnobotany of Medicinal Plants Among the Communities of Alpine and Sub-Alpine Regions of Pakistan. Journal of Ethnopharmacology 164: 186-202.

Khastini RO, Wahyuni I, Saraswati I, Alimuddin A, Nuangchalerm. 2019. Ethnobotanical Study of Medicinal Plants Utilized by The Baduy Tribe Used as A Learning Resource 5(2):197-206.

Mesfin K, Beyene D, Tesfaye, Addise D, Amare M, Biniyam D. 2018. Drug-Resistance Patterns of Mycobacterium Tuberculosis Strain and associated Risk factors Among Multi drug Resistant Tuberculosis Suspected Patients from Ethiopia. PLoS ONE 13(6): e0197737.

Nasution A, Chikmawati T, Walujo EB, Ervizal AMZ. 2018. Empirical Utilization of Medicinal Plants in the Mandailing Tribe in Batang Girl National Park, North Sumatra. Indonesian Journal of Biotechnology & Bioscience 5(1):64-74.

Pawera L., Khomsan A, Zuhud EAM, Hunter D, Ickowitz A, Polesny Z. 2020. Wild Food Plants and Trends in their Use: from Knowledge and Perceptions to Drivers of Change in West Sumatra, Indonesia. Foods 9(1240):1–22

Phillips O, and Gentry AH. 1993a. The Useful Plants of Tambopata. Peru. I. Statistical Hypothesis Tests with A New Quantitative Technique. Economic Botany 47(1):15-32.

Pieroni A, Anely N, Avni H, Mustafa B, Bruno S, Kevin C, Cassandra LQ. 2014. Local Knowledge on Plant and Domestic Remedies in The Mountain Village of Eshkopia (Eastern Albania). Journal of Mountain Science 11(1):180-193.

Purba EC. 2015. Ethnobotany of the Karo ethnic community in Merdeka District, North Sumatra [Thesis]. Biology Study Program, Postgraduate Program, University of Indonesia, Depok. [Indonesian]

Purwanto Y. 2003. The Ethnobiological Society of Indonesia. J Tropic Etnobiol 1(1):3-5.

Silalahi M, Anggraeni, R, Nisyawati. 2018. Ethnobotanical Study of Food Plants That Are Not Cultivated by Local Communities of the Toba Batak Sub-Ethnicity, in Peadungdung Village, North Sumatra, Indonesia. Journal of Natural Resources and Environmental Management 8(2):241–250.

Silalahi M, Asmara KT, Nisyawati. 2021. The Ethnobotany Studi of the Foodstuffs by Local Communities in the Bulumario Village, North Sumatra. Biodjati Journal. 6(1): 45-58.

Sousa RS, Hanazaki N, Lopes J.B, Barros RFM. 2012. Are Gender and Age Important in Understanding the Distribution of Local Botanical Knowledge in Fishing Communities of the Parnaíba Delta Environmental Protection Area? Ethnobot. Res Appl 10: 551-559.

Sujarwo W, Arinasa IBK, Salomone F, Caneva G, Fattorini S. 2014. Cultural Erosion of Balinese Indigenous Knowledge of Food and Nutraceutical Plants. Economic Botany 68(4):426–437.

Sujarwo W, Caneva G. 2016. Using Quantitative Indices to Evaluate the Cultural

Importance of Food and Nutraceutical Plants: Comparative Data from The Island of Bali, Indonesia. Journal of Cultural Heritage 18:342-348.

Sujarwo W, Caneva G, Zuccarello V. 2020. Patterns of Plant Use in Religious Offerings in Bali, Indonesia. Acta Botanica Brasilica, 34(1):40-53.

Suryadarma IGP. 2017. Building Independent Character an Ethnobiological Approach to Local Uniqueness in a National Perspective and Global Reflection. Proceedings of National Semester of Biotics. Yogyakarta. 26 November 2017. [Indonesian]

Tamalene MN. 2016. Conservation Perspective Based on Local Wisdom and Ethnobiology of Biodiversity of the Togutil Tribe on Halmahera Island as Material for Developing an Ethno-Conservation Reference Book [Dissertation]. Biology Education Study Program, Postgraduate Program, State University of Malang. [Indonesian]

Uprety Y, Asselin H, Bergeron Y. 2012. Review article Contribution of Traditional Knowledge to Ecological Restoration: Practices and applications. Écoscience 19 (3): 224-237.

Vásquez A, Vibrans H, Vergara SF, Caballero J. 2016. Intracultural Differences in Local Botanical Knowledge and Knowledge Loss Among the Mexican Isthmus Zapotecs. PLoS ONE 11 (3): e0151693.

Wahyuni S, Afidah M, Ramadansur R. 2021. Ethnobotany of Food Plants in Cipinang Kiri Hulu Village, Riau Province, Bio-Lectura 8(2):174-179.

Wiryono, Japriyanto, Erniwati. 2017. The Diversity of Locally Utilized Plants and Local Botanical Knowledge in Central Bengkulu District, Bengkulu Province, Indonesia. Biodiversitas 17(2):1589-1595.

Wiryono, Wanandi Y, Aisyah KI, Deselina, Senoaji G, Siswahyono. 2019. The Local Knowledge of The Plant Names and Uses by Semende Tribe People in Kaur District, Bengkulu Province, Indonesia. Biodiversitas 20(3):754-761.