

Ethnobotanical Study of Edible Plant Communities on the Slopes of Mount Merapi and Merbabu, Indonesia

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Abstract

Ethnobotany is a study of the interaction between local people and their natural environment, especially regarding the use of plants as food and medicinal ingredients. Edible plants are a daily basic need whose existence is a necessity for the people on the slopes of Mount Merapi and Merbabu. How to use plants is transferred from generation to generation to form a culture. The research was carried out in March-May 2020 with the aim of digging local knowledge about plants used as food, including staple food, vegetables and medicines by studying the species diversity, including the benefits of plant parts, habit, how to use, process and how to obtain these species. The data were collected by using a combination of qualitative and quantitative methods with in-depth interviews through 40 respondents who were selected by purposive sampling. The results showed that the communities on the slopes of Mount Merapi and Merbabu used 74 plant species from 37 families as food sources. The favorite family is Fabaceae, followed by Zingiberaceae and Solanaceae. The most widely used habitus of plants were herbs (36.49%), followed by bush (28.38%), shrubs (18.92%) and trees (16.22%). Plant parts that are widely used are leaves (29.73%), fruit (17.57%), tubers (10.81%), seeds (9.46%), roots, rhizomes and flowers (6.76%), shoots (5.40%), stems (2.70%) and water, skin and heartwood (1.35%). The most common ways to use it are eaten raw as vegetables (29.73%), boiled (16.22%) and drink (12.16%). How to obtain it are through own cultivation (72.97%), and buying at the market (21.62%). The highest use values were Adas (*Foeniculum vulgare* Mill.) (0.25), chili pepper (*Capsicum annum* L.) (0.20), turmeric (*Curcuma dosmetica loir*) and water spinach (*Ipomoea aquatica* Forsk.) (0.17). The highest importance values were rice (*Oryza sativa* L.) (5.23%), and fennel (*Foeniculum vulgare* Mill.) (4.57%).

Keywords: Culture; Ethnobotany; in-depth interviews; Rice (*Oryza sativa* L.); Mount Merapi; Mount Merbabu.

INTRODUCTION

The existence of plants is a pleasure and a blessing given by Allah SWT to his creatures in interacting and managing nature. Humans are given a mandate from Allah, namely first, Allah allows humans to take and make the best use of natural products, humans are required to be able to take lessons from natural phenomena and events that occur. Humans are required to maintain and maintain environmental sustainability (Zuhdi, 2012). Ethnobotany is a study of the interaction between local communities and their natural environment, especially regarding the use of plants in their daily life (Martin, 1998). These uses can be in the form of plants as food and medicine.

The demand for food has undergone a shift from being very dependent on nature, switched to unhealthy fast food (Anggraini, 2013). Some people nowadays are starting to realize the importance of healthy living by trying to consume foods that have physiological effects to the body to get maximum health (Astawan, 2003). Based on the Food Law (UU) number 18 of 2012, food

is anything that comes from biological sources intended for human consumption that has certain functions to the body, used for medicinal purposes and as daily food (Hariyani, 2013).

Each region has a specific plant use system and differs from other regions according to the diversity of plants in its environment. This includes the use of food on the slopes of Mount Merapi and Merbabu to support human life. The area is well-known as a center for producing green vegetables with a majority of the population of farmers, besides that the area also has high enough rainfall causing the soil to become fertile and the abundance of plants and has a high variance. Edible plants in the area are used by the community as medicinal plants, food as well as traditional ceremonies used in everyday life. How to use plants by the community is obtained and has been carried out from generation to generation to form a culture (Gunawan, 2014).

Advances in science and technology as well as the increase in the level of public education are very influential in the knowledge of the younger generation

of the culture that has been formed in society. One such knowledge is the use of the diversity of edible plants, resulting in this knowledge being increasingly marginalized, even though so far little has been stated in writing. Based on this, a comprehensive research is needed to answer the problems that arise, namely how the community's knowledge of the use of food plants on the slopes of Mount Merapi and Merbabu, precisely in Mliwis Village, Cepogo, Boyolali on plants that are used as food, including use as staple food, vegetables and medicine by specifically studying the diversity of species, including plant parts, habits, their use, processing methods and how to obtain these species.

MATERIALS AND METHODS

Research Period and Location

The research was carried out on the slopes of Mount Merapi and Merbabu, mainly in Mliwis Village, Cepogo District, Boyolali Regency, covering 2 hamlets, namely Baksari and Ngarsapura (Figure 1). The reason for choosing the two locations was because these two hamlets were the centers of agricultural and food production in the Boyolali area. The research began in March - May 2020. Mliwis is located at 110 "22" - 110 "50" East Longitude and 7 "36" - 7 "71" LS.

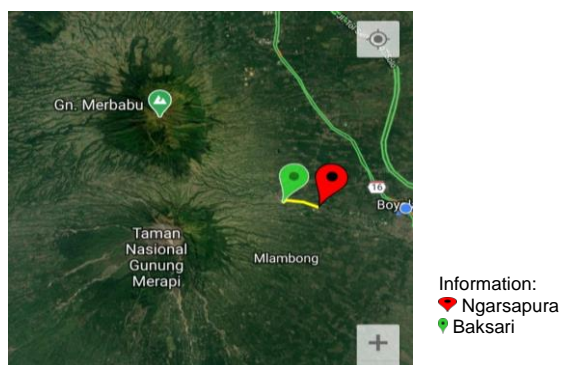


Figure 1. Research locations on the slopes of Mount Merapi and Merbabu, in the hamlets of Baksari and Ngarsapura.

The Profile of Respondents

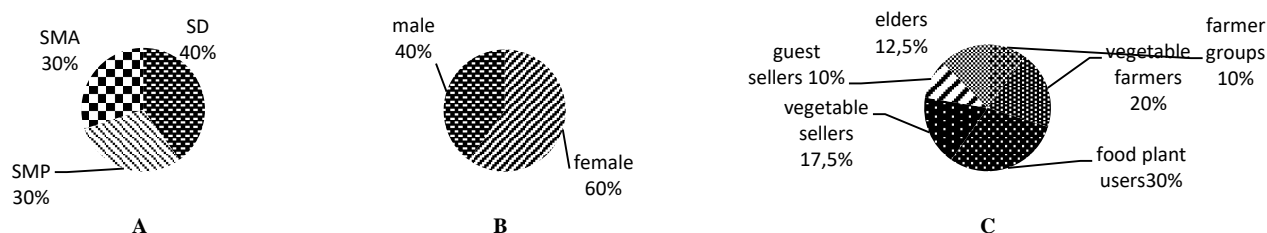


Figure 2. The profile of the respondents in the studied area based on: **A.** Education; **B.** Gender; **C.** employment.

Respondents are considered as representatives of the people on the slopes of Mount Merapi and Merbabu, represented by the Mliwis community as users of edible

Data Collection

Data collected by all edible plants that have been used by the people on the slopes of Mount Merapi and Merbabu including staple food, vegetables, medicines including species, plant parts, habits and methods of use. This information was obtained with the help of 40 respondents who were selected by purposive sampling with a total of 10% of the number of households (heads of households) in the study location.

Collecting data on communities consisting of traditional, local, vegetable farmers, vegetable sellers, herbalist sellers and other users through in-depth interviews through open questionnaires to be analyzed descriptively, qualitatively, and quantitatively. Plants found were identified using the book Flora of Java volume I (1963), volume II (1965), and volume III (1968) by Backer and van der Brink Jr., and Indonesian Useful Plants by Heyne (1987). Meanwhile, quantitative data are used for botanical data collection, including inventory and identification of plants used by the community as food plants.

The benefit value data uses a modified formula from Cotton (1996) and Nahdi and Ardyan et al., (2019), as follows:

1. Use Value

$$UV_s = \frac{\sum UV_{is}}{is}$$

Information:

UV_s : total number of use values of a type s

UV_{is} : total value of type s given by the informant i

is : total number of informants interviewed for the type s use value

2. Important Value

Importance value index calculation using a formula

$$IV = \frac{N_i}{N} \times 100 \%$$

Information:

IV : important value

N_i : number of respondents using type A

N : total number of respondents

plants. They were selected from various profiles of gender, educational level and occupation. The percentage of female respondents are higher than male

respondents (60% and 40% respectively). Based on the level of education, 40% of them are only elementary school (SD) graduates, 30% junior high school (SMP) graduates, and 30% junior high school (SMA) graduate. According to occupations include vegetable farmers

(20%), vegetable sellers (17.5%), elders (12.5%), farmer groups (10%), guest sellers (10%) and food plant users (30%). Meanwhile, according to gender 60% of them are women, and 40% are men (Figure 2).

RESULTS AND DISCUSSION

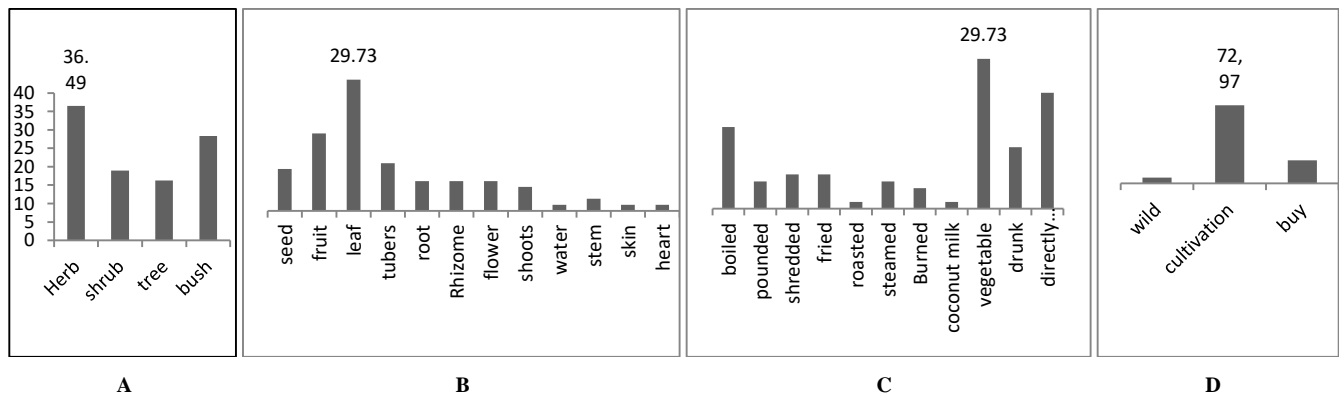


Figure 3. The summary of information on the use of edible plants based on: **A.** Habitus; **B.** The part of the plant being used; **C.** How to use; **D.** The locations where the plants being collected.

The diversity of edible plants. Based on the results of the research, the people on the slopes of Mount Merapi and Merbabu use 74 species of food plants from 37 families (Table 1) with details, Baksari Village has 64 plant species as food used by the community and Ngarsapura Village has 59 species from 40 respondents. The same number of species found in the two hamlets is used by the community either as daily staples, vegetables or medicine. The number of food and medicinal plant species in this study is more than the research conducted by Nita (2017) in the Arfak tribe, namely 29 species of edible plants and 16 species of medicinal plants. This is because the use of edible and medicinal plants by local communities is different from one region to another.

Some of the factors that influence it are the efficacy and availability, language, social relations, cultural history, understanding, local beliefs and beliefs (Silalahi, et al., 2018). Usually, food and medicinal plants that are easily available with sufficient availability will be more used by the community. However, Gudro, et al., (2014) stated another reason, where the factors that influence the use of plants by the community is the purpose of their use.

The food plants, most widely used by the people on the slopes of Mount Merapi and Merbabu come from the Fabaceae family, which is used as a vegetable, followed by the Zingiberaceae family as a cooking and medicinal spice. Meanwhile, there are fewer types of plants from other families. Previous research conducted by Zulharman (2015) in the Sambori tribe, Bima, East Nusa Tenggara showed the same results, namely the Fabaceae

family is the family most widely used by the community as food.

Based on the results of interviews with respondents, the main reason for the higher use of plants of the Fabaceae family is that these families are easily found in gardens, yards and in markets for sale. Zulharman (2015) adds, the Fabaceae family is widely used by the community because it is easy to cultivate and does not really need specific soil. In addition, according to Permana et al., (2011) that almost every community has unique local wisdom as an adaptation to the environment and food in the form of fruit, vegetables and medicinal.

Plant habitus used as food. The results showed that there were four habitus of plants that were used by the community as food ingredients, namely trees, shrubs, shrubs and herbs. Herbs are the most widely used habitus habitus with a percentage of 36.49% of 74 species, followed by bush (28.38%), shrubs (18.92%) and trees (16.22%). The results of research conducted by Nita (2012) in the Arfak tribe, Manokwari Regency, Sukmawati, et al., (2013) in Toga Village, Central Sulawesi and Nahdih, et al., (2016) in the Turgo area, Yogyakarta showed the same results, namely the majority of herbal habitus are the habitus most widely used by people as raw material for food and medicine with varying percentages.

The reason the people of the slopes on Mount Merapi and Merbabu use more of the herb and bush habitus as food plants compared to others, which is easy to obtain and has highly adapted to the environment so that the growth rate and development are very fast and easy to

grow in various locations besides that there is no need for proper cultivation specifically (Sukamto, 2007).

The part of food plants. Based on the results of the study, some people use food plants using plant parts or organs for consumption, which can be grouped into twelve (12) types of organs. Leaves occupied the top position with the most percentage (29.73%), followed by fruit (17.57%), tubers (10.81%), seeds (9.46%), roots, rhizomes and flowers, respectively (6.76%), shoots (5.40%), stems (2.70%) and the last position was occupied by water, skin and heart, respectively (1.35%) (Figure 3.B). Sukmawati, et al., (2013) in the Kaili Rai tribe also showed the same thing, namely that people use more leaf parts than other parts with a percentage of 47.36% of 46 species. The same thing also happened in the research by Nahdi, et al., (2016) that leaves were the highest part that was used by the community with a percentage of 51.39%.

Based on the results of interviews, favorite leaves are used because they are easy to obtain, there are always many leaves in one plant and easy to produce, so that people use them more than other parts, beside-leaves also contain various substances needed by the body. According to Payung, et al., (2016) the high utilization of leaves is because the leaves are used almost every day for vegetables and spices. Apart from leaves, fruit and tubers are also parts that are widely used, because both are places to store food reserves that contain carbohydrates and other substances that are beneficial to the body (Savitri, 2008).

The serving method of food plants. Based on the way it is used, people use food plants in eleven ways: boiling, pounding, grated, fried, roasted, steamed, roasted, coconut milk, vegetable, drunk and immediately consumed. The most widely used method by the community is by using vegetables with a percentage of 29.73%. The reason for the high processing method using vegetables is because people generally consume it as a complement to rice in their daily lives, it is easy to process, besides that people are also aware of their health and the many substances contained in plants that are very beneficial for the body. According to Teo (2001) vegetables are a source of vitamins, minerals and phytochemicals that contain dietary fiber which is good for health.

In contrast to research conducted by Efremila, et al (2015) by drinking directly is the most common way, because beside being practical, cost-effective, it can also react directly in the body both for food and internal medicine.

The source of food plants. The people on the slopes of Mount Merapi and Merbabu obtain food plants by taking plants that come from wild plants, self-cultivating products, and buying at the market with details that the most widely used methods is self-cultivation (72.97%) (Figure 3.D) compared to plants illegal (5.4%) and buying in the market (21.62%). This is because the

cultivation process is very simple, namely by using the empty land around the house or garden using makeshift tools. Generally, land in yards and gardens is used by the community to grow vegetable plants so that it is easy to collect them without having to travel long and cheap distances. In addition, medicinal plants are usually used as spices in cooking. In contrast to Zaman's research, et al (2013), the people of Sumenep district, East Java mostly uses wildy obtained plants because of their economic value without spending money to get them.

The way to get the second most widely used food plant by the community is buying at the market (21.62%) because food plants are the main and important need for the local community, and are an easy and practical way without carrying out the planting and harvesting process which requires time quite long and usually carried out by landless communities. Meanwhile, how to obtain it by taking wild plants is very little due to the lack of public knowledge of the potential of these plants.

Value Benefits (Uvs) and Important Value (INP). Based on the research results, the food plants that had the highest use value were fennel species (*Foeniculum vulgare* Mill.) With a value of 0.25, followed by chili pepper (*Capsicum annum* L.) with a value of 0.20, and turmeric (*Curcuma dosmetica loir*) and water spinach (*Ipomoea aquatica* Forsk.) With a value of 0.17 (Table 1).

Several types of food plants above, are already well known among the surrounding community because in addition to being used for daily food they also have many benefits to cure various diseases, fennel (*Foeniculum vulgare* Mill.) In addition to plants that are unique and favored by the surrounding community, are also a plant that has many medicinal benefits. According to (Kurniawan, et al., 2015), fennel can treat diseases such as itching, coughing and motion sickness. The essential oil content in fennel has anethol and estragole compounds as antipyretics (Newall et al., 1995).

The highest importance value based on the research results was Padi (*Oryza sativa* L.) with a value of 5.23%, followed by fennel (*Foeniculum vulgare* Mill.) 4.57%, and cassava (3.27%) (Table 1). The important value of these two plants is not too far apart, so it can be said that both of them are excellent plants and are typical of the people of the slopes on Mount Merapi and Merbabu. It is said so because at the beginning of the interview with respondents almost all of them mentioned these plants. Regardless of the plant's content, the community's use of plants as a source of food and medicine is only based on hereditary knowledge and personal experience without knowing its contents. People make use of plants based on knowledge obtained from their parents or elders.

Based on the use value (UVs) and important value (INP), it is not always the plants that have the highest use value also have the highest importance value. This is

because the use value only looks at how many benefits a species has, while the important value is seen not only in terms of benefits, but how much people use these plants,

so that even if the benefits are not as many as other species, these plants trusted and idolized by the community.

Table 1. List of Edible Plants Used by the Community of village of Baksari and Ngarsapura, Boyolali.

Family	Scientific Name	Local Name	Benefits	Uvs	INP
Amaranthaceae	<i>Amaranthus tricolor</i> L.	Bayem Cabut	detoxify body toxins	0,12	1,96
Anacardiaceae	<i>Mangifera indica</i> L.	Pelem	cure anemia	0,1	1,31
Apiaceae	<i>Foeniculum vulgare</i> Mill.	Adas	overcome menstrual disorders, cure fever	0,25	4,57
	<i>Daucus carota</i> L.	Wortel	Improve eye health,	0,1	2,61
	<i>Apium graveolens</i> L.	Ledri	Anti inflammatory	0,07	1,31
Araceae	<i>Colocasia esculenta</i> L.	Tales	Overcoming heart disease	0,07	0,65
	<i>Xanthosoma sagittifolium</i> L.	Kimpul	Overcoming digestive problems,	0,07	0,65
	<i>Amorphophallus paeoniifolius</i>	Suweg	Anti-poison, treat wounds	0,07	2,61
Arecaceae	<i>Cocos nucifera</i> L.	Kelopo	Neutralizing body toxins	0,1	1,96
Asteraceae	<i>Tagetes erecta</i> L.	Ningkir	treat ulcer disease	0,1	0,01
	<i>Lactuca sativa</i> L.	Selada	Maintain eye health	0,07	0,01
Bombaceae	<i>Durio zibethinus</i> L.	Duren	fight infection (antibacterial)	0,05	1,96
Brassicaceae	<i>Brassica rapa</i> L.	Sawi bakso	lose weight	0,1	0,65
	<i>Brassica oleracea</i> L.	Kobis	Increase immunity	0,07	0,01
	<i>Brassica olearacea</i> L.	Brokoli	improve the health of bones and teeth,	0,12	0,65
	<i>Nasturtium officinale</i> L.	Cenil	prevent constipation	0,12	0,65
Cactaceae	<i>Hylocereus undatus</i> Haw.	Buah Naga	blood circulation	0,1	0,01
Cannaceae	<i>Canna discolor</i> L.	Ganyong	relieves heartburn symptoms	0,07	0,01
Caricaceae	<i>Carica papaya</i> L.	Kates	Digestion	0,12	1,96
Chenopodiaceae	<i>Beta vulgaris</i> L.	Bit	Lower blood pressure	0,07	2,61
Convolvulaceae	<i>Ipomoea batatas</i> L.	Telo	Source of carbohydrates, lose weight,	0,1	0,01
	<i>Ipomoea aquatica</i> Forsk.	Kangkung	against liver damage,	0,17	0,01
Cucurbitaceae	<i>Sechium edule</i> L.	Jepan	mineral source of the body	0,1	0,01
	<i>Cucurbita moshcata</i> Durh.	Pumpkin	Improve the immune system,	0,07	0,01
	<i>Cucumis sativus</i> L.	Timun	Antioxidants, smooth digestion	0,07	0,01
	<i>Momordica charantia</i> L.	Pare	Relieves asthma, fights cancer cells,	0,1	0,65
	<i>Cucumis melo</i> L.	Melon	prevent skin aging	0,07	0,65
Dendrocalamaeae	<i>Dendrocalamus asper</i> L.	Boung	lowering the risk of stroke	0,07	0,65
Dioscoreaceae	<i>Dioscorea alata</i> L.	Uwi	Lowering blood sugar and cholesterol levels	0,05	0,65
	<i>Dioscorea esculenta</i> L.	Mbili	Prevent diabetes,	0,07	0,65
Ebenaceae	<i>Diospyros kaki</i> L.	Tledung	stop bleeding	0,07	1,96
Euphorbiaceae	<i>Manihot utillissima</i> Pohl.	Pohung	relieves pain	0,07	3,27
	<i>Euphorbia heterophylla</i> L.	Patik Mas	Reduces swelling due to snake bites	0,07	1,96
Fabaceae	<i>Clitoria ternatea</i> L.	Telang	contains antioxidants, heal wounds	0,1	0,01
	<i>Glycine max</i> L.	Dele	Lower blood pressure	0,07	0,01
	<i>Arachis hypogea</i> L.	Kacang Brol	Prevent cancer	0,07	0,65
	<i>Vigna cylindrica</i> L.	Kacang Panjang	increase immunity	0,1	0,65
	<i>Sesbania grandiflora</i> L.	Turi	Treat coughs, dysentery	0,1	0,01
	<i>Phaseolus vulgaris</i> L.	Buncis	Maintain heart health	0,07	0,01
	<i>Pisum sativum</i> L.	Kapri	Free radical scavenger	0,07	0,65
	<i>Leucaena leucocephala</i>	Metir	eradicate worms, prevent diabetes	0,07	0,65
Gnetaceae	<i>Gnetum gnemon</i> L.	Melinjo	Smooth urine,	0,1	0,65
Graminaceae	<i>Zea mays</i> L.	Jagung	Source of carbohydrates (daily staple food)	0,02	0,01
Lamiaceae	<i>Ocimum sanctum</i> L.	Kemangi	Prevent fever	0,07	0,65
Liliacea	<i>Allium cepa</i> L.	Brambang	Prevent colds,	0,1	0,65
	<i>Allium sativum</i> L.	Bawang Putih	natural antibiotics	0,12	0,65

Family	Scientific Name	Local Name	Benefits	Uvs	INP
	<i>Aloe vera</i> L.	Lidah Buaya	Speed up wound healing,	0,07	0,01
Malvaceae	<i>Abelmoschus esculentus</i> L.	Okra	prevent kidney disorders	0,07	0,01
Marantaceae	<i>Maranta arundinacea</i> L.	Garut	Overcoming digestive diseases	0,02	0,65
Moraceae	<i>Artocarpus altilis</i> Park.	Sukun	treat gout	0,07	0,65
	<i>Artocarpus heterophyllus</i> Lam.	Gori	cure insomnia	0,1	0,65
Musaceae	<i>Musa paradisiaca</i> L.	Gedang	accelerating the digestive system	0,07	0,65
Myrtaceae	<i>Psidium guajava</i> L.	Kepok			
	<i>Syzygium aromaticum</i> L.	Jambu Klutuk	tackle dengue fever	0,1	0,01
Pandaneaceae	<i>Syzygium aromaticum</i> L.	Cengkeh	Treating stomach ulcers,	0,1	0,01
	<i>Pandanus amaryllifolius</i> Roxb.	Pandan	strengthens nerves	0,12	1,96
Phyllanthaceae	<i>Sauropus androgynus</i> L.	Katu	Smooth out milk production	0,1	1,96
	<i>Phyllanthus niruri</i> L.	Meniran	Cure liver disease	0,07	0,01
Piperaceae	<i>Piper betle</i> L.	Suroh	antiseptic	0,12	0,01
Poaceae	<i>Oryza sativa</i> L.	Pari	Source of carbohydrates	0,02	5,23
	<i>Cymbopogon citratus</i> L.	Sere	Antioxidants, control, regulate muscle function	0,07	0,65
Portulacaceae	<i>Portula oleracea</i> L.	Krokot	Prevent kidney stones, treat rheumatism	0,07	0,01
Rosaceae	<i>Rosa</i> L.	Mawar	improves immunity	0,07	0,01
	<i>Fragaria anansa</i> L.	Stoberi	Maintain heart health, prevent allergies	0,07	1,96
Rutaceae	<i>Citrus hystrix</i> D.C	Jeruk Purut	Clean the blood, increase endurance	0,07	1,96
Solanaceae	<i>Solanum lycopersicum</i> L.	Tomat	maintain eye health, treat acne	0,12	0,65
	<i>Capsicum annum</i> L.	Lombok	Streamlining bowel movements, treating thrush,	0,2	1,96
Zingiberaceae	<i>Solanum melongena</i> L.	Terong	Overcoming stomach acid	0,15	2,61
	<i>Solanum tuberosum</i> L.	Kentang	Maintain heart health, antioxidants,	0,15	0,01
	<i>Capsicum annum</i> L.	Paprika	prevent anemia, control blood sugar	0,07	0,01
	<i>Curcuma dosmetica</i> loir	Kunir	Overcoming menstrual problems	0,17	0,65
	<i>Kaempferia galanga</i> L.	Kencur	Treating coughs, treating diarrhea	0,15	0,01
	<i>Zingiber officinale</i> Rosc	Jahe	Strengthens immunity, warms the body	0,12	0,01
	<i>Curcuma zanthorrhiza</i> L.	Temu Lawak	pain reliever, increases milk production	0,1	0,65
	<i>Alpinia galaga</i> L.	Laos	Cure asthma	0,07	0,65

CONCLUSION

Based on the results and discussion, it can be concluded that the people on the slopes of Mount Merapi and Merbabu use 74 species of plants from 37 families. The most commonly used plants are dominated by the Fabaceae, Zingiberaceae and Solanaceae families. The most widely used plants organs were leaves (29.73%), fruit (17.57%), and tubers (10.81). Based on its use, it has the highest value (29.73%), followed by direct consumption (10.81%) and boiled (16.22%). The method of obtaining food plants by cultivation was in the highest ranking (72.97%), followed by buying in the market (21.62%) and wild plants (5.4%). Plants that have a high use value (Uvs) of fennel with a value of 0.25, chili pepper 0.20 and turmeric 0, 17. Food plants that are excellent with the highest index of importance value are rice 5.23%, fennel 4.57% and cassava 3.27%. All the knowledge they have is knowledge acquired from generation to generation.

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