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Abstract: Tengger tribe is one of the tribes in Indonesia that live around Bromo Tengger Semeru National Park (BTSNP) area. BTSNP area inhabited by the Tengger tribe people is an area in Indonesia with high biodiversity. The local wisdom of the Tengger tribe is in terms of the use of natural resources for various requirements of their lives. This study aimed to explore the utilization of multiple plants by the Tengger tribe in Ngadas and Ranupani villages around BTSNP. This research used surveys and group discussion (GDF) methods involving traditional leaders and some people of the Tengger tribe. The data obtained were analyzed descriptively and qualitatively. The results showed that the plants used for traditional medicinal materials were 25 species, food sources were 17 species, industrial materials and household were 11 species, building materials were 17 species, ecological functions were nine species, and traditional ritual ceremonies were seven species. The Tengger tribe used the natural resources in the form cultivation plants and non-cultivation plants to support in all aspects of their livelihood.

Keywords: Ethnobotany, plant utilization, plant diversity, Tengger tribe, BTSNP

1. Introduction

In this globalization era, many countries adopt capitalism and Western culture in the economic development area. This adopted idea also caused a negative impact, which the people in a country become less aware of their original traditional knowledge. The urbanization also brings about the younger generation to become less or not aware of the traditional knowledge from their origin [1,2]. Indonesia is one of the developing countries of which people are still dominant with traditional culture. Indonesian people have a variety of cultures, rituals, tribes, and traditional knowledge related to medicine and language [3]. Indonesia has around 55 tribes throughout the archipelago. The rural people in some tribes have traditional knowledge and culture inherited from generation to generation, known as local wisdom [3,4]. Tengger tribe is one of the tribes in Indonesia living around the Bromo Tengger Semeru National Park (BTSNP) area since before Majapahit kingdom era [3,5].

Indonesia is an Asian country that has the highest biodiversity level and also has second rank in the topic of biodiversity [6,7]. The BTSNP area inhabited by the Tengger tribe is an area in Indonesia that has high biodiversity. The local wisdom of the Tengger tribe is in terms of the uses of natural resources for various requirements in their lives. Diverse plants found surrounding their environment also have an important role in their life and culture of the Tengger tribe [4,5]. The Tengger tribe people used plants for various activities such as medicine, food for them and also for livestock, rituals, etc [3].

Ethnobotany is a multidisciplinary study in the relationship between plants and society. Ethnobotany can be used as a connector to communicate local wisdom from a rural area [8]. The focus of ethnobotany studies is about how plants were used, their roles and utilization in the environment, including their use as food, medicine, cosmetics, coloring, textiles, for building, ecology, rituals, and also traditional music [4]. Ethnobotanical study in Lhoba tribe showed that the people that lived around Tibet Region in China used wild plants for their livelihood. The utilization of wild plants were as ethnomedical (28 species), local edible plants (29 species), and used for other purpose in daily life (24 species) [9]. Another report from Sahu *et al*. revealed that tribes of Dantewada where located in Chhattisgarh India used 104 plants for medicinal uses [10]. The people from Dantewada tribe used those plants for various diseases such as skin disorder, diarrhea, cough, wound healing, urinary trouble, etc. They also have their own procedure for preparation of medicinal uses [10]. However, in this era, the Lhoba tribe has lost their ethnomedicinal knowledge caused by the development of the tourism that can change their lifestyle [9]. Research related to ethnobotany is very crucial especially to identify and preserve the plants they used. Furthermore, ethnobotany is also a need for understanding concepts related to culture with plant perceptions used in the culture [11]. This study aimed to identify and classify plants in the BTSNP area according to their utilization by the Tengger tribe local people.

2. Methods

This study used a survey method in the villages of Ngadas and Ranupani around the area of BTSNP. The survey was conducted in the group discussion forum (GDF). The target of the survey could be divided into two, namely cultivation and non-cultivation plants around the Tengger tribe people and a survey of the Tengger tribe residents to explore and verify the prospecting of plant species used by the people.

3. Results and Discussion

Table 1. Utilization of plants as herbal medicine

No	Scientific name	Local Name	Function
1.	*Rubus lineatus*	Glunggungan	Sprue
2.	*Physalis peruviana*	Ciplukan gunung	Sprue Cardiovascular diseases Lung diseases Hypertension
3.	*Solanum nigrum*	Ranti	Produce breast milk
4.	*Mentha sp*	Permenan	Colds Cough
5.	*Achyranthes sp1*	Ranggitan	Abscesses
6.	*Sonchus sp*	Ketiyu	Sprue
7.	*Gonostegia sp*	Gajian	Skin fungus
8.	*Urticaceae*	Jabrangan	Dizzy

9.	*Ricinus communis*	Jarak Merah	Colds
10.	*Plantago major*	Suri pandak	Inflammation
11.	*Solanum capsicastrum*	Lombok udel	Typhus
12.	*Artemesia vulgaris*	Ganjan	Ear disfunction
13.	*Eupatorium inulifolium*	Triwulan	Inflammation
14.	*Bidens pilosa*	Jaringan	Convulsions
15.	*Acacia decurrens*	Kasia	Colds
16	*Dodonaea viscosa*	Kesek	Colds
17	*Brugmansia candida*	Kecubung	- eyes
18	*Cestrum parquii*	Trabasan	Abscesses
19	*Chromolaena odoata*	Krinyuh	- itchy - insect repllent
20	*Curculigo orchio*	Tlotok	Bee sting
21	*Ageratum conyzoides*	Wedusan	- producing breast milk - wound healing
22	*Ficus septica*	Awar-awar	- abscesses - ear disfunction
23	*Rubus rosifolius*	Calingan	Stomachache
24	*Tithonia diversifolia*	Paitan	Diabetes mellitus
25	*Polygala sp*	Ragitan	Abscesses

Table 2. Utilization of plants as food

No	Scientific name	Local Name	Function
1	*Rubus rosifolius*	Calingan	The fruits are for human's food
2	*Solanum nigrum*	Ranti	The leaves are for human's food/vegetable food
3	Phytolacea dioica	Bayam gunung/ Bayeman	The leaves are for human's food/vegetable food
4	*Oxalis corniculata*	Semanggi	The leaves are for human's food/vegetable food
5	*Galinsoga parviflora*	Kuningan/ layaran	The leaves are for human's food/vegetable food
6	*Polygala sp*	Poroh	The stem contain water
7	*Erechtites valerianifolia*	Junggul	The leaves are for human's food/vegetable food
8	*Calliandra portoricensis*	Kaliandra putih	The leaves are for livestock feed
9	*Cestrum parquii*	Trabasan	The leaves are for livestock feed
10	*Debregeasia longifolius*	Mencokan	The fruits are for human's food The leaves are for livestock feed
11	*Ageratum conyzoides*	Wedusan	The leaves are for livestock feed
12	*Ricinus communis*	Jarak kepyar	The fruits are for seasoning
13	*Vasconcellea papaya*	Pepaya gunung, Srikaya, Karikaya	The fruits are for human food
14	*Achyranthes sp1*	Ranggitan	The leaves are for livestock feed

15	*Carex sp*	Empritan	The leaves are for livestock feed
16	*Rumex sp*	Asem-aseman/ surengan	The leaves are for livestock feed
17	*Gliricidia maenlaka*	Kelorwono	The leaves are for livestock feed

Table 3. Utilization of plants as industry and households

No	Scientific name	Local Name	Function
1	*Phytolacea dioica*	Bayam gunung/ bayeman	Detergent
2	*Ricinus communis*	Jarak merah	Fuel
3	*Cinnamomum burmanni*	Keningar/kayu manis	Seasoning
4	*Agerantina riparia*	Teh-tehan	Stimulating buds
5	*Acacia decurrens*	Kasia	Tanning of cowhide Firewood
6	*Casuarina junghuhnia*	Cemara gunung	charcoal
7	*Cyanthea contaminans*	Pakis arjuno	orchid growth media
8	*Lithocarpus sundaicus*	Pasang putih	mushroom growth media
9	*Chromolaena odoata*	Krinyuh	growth stimulating charcoal
10	*Eupatorium inulifolium*	Klasih gede	charcoal briquittes
11	*Gliricidia maenlaka*	Kelorwono	fertilizer

Table 4. Utilization of plants as building materials and households

No	Scientific name	Local Name	Function
1	*Acer laurinum*	Putih dada	House frame
2	*Breonia chinensis*	Jabon	House frame
3	*Casuarina junghuhnia*	Cemara gunung	House frame
4	*Celtis sp*	Tritih	Holder
5	*Cestrum parquii*	Trabasan	Decorative plants
6	*Curculigo orchio*	Tlotok	Container
7	*Cyanthea contaminans*	Pakis arjuno	Wood bridge
8	*Dahlia sp*	Mahdalia	Decorative plants
9	*Dendrocalamus sp*	Pring/bambu	Pole materials
10	*Dodonaea viscosa*	Kesek	Pole materials
11	*Engelhardia spicata*	Danglu	Mortar materials
12	*Omalanthus gigantheus*	Tunjung	Chair materials
13	*Verbena sp*	Kembang sekolahan	Decorative plants
14	*Carex sp*	Empritan	Rooftop materials
15	*Ficus sp*	Dampul	Building materials
16	*Toona sureni*	Suren	Building materials
17	*Michelia campaca*	Rekisi	Building materials

Table 5. Utilization of plants in ecological fields

No	Scientific name	Local Name	Function
1	*Acacia decurrens*	Kasia	Erosion resistance
2	*Casuarina junghuhnia*	Cemara gunung	Erosion resistance
3	*Dodonaea viscosa*	Kesek	Erosion resistance
4	*Engelhardia spicata*	Danglu	Marker of rainy season
5	*Lithocarpus sundaicus*	Pasang putih	Marker of rainy season
6	*Pittosporum moluccanum*	Randu basin	Herbal pesticides
7	*Chromolaena odoata*	Krinyuh	Water saver
8	*Dahlia sp*	Mahdalia	Erosion resistance
9	*Agerantina riparia*	Teh-tehan	Land covering Erosion covering

Table 6. Utilization of plants as rituals

No	Scientific name	Local Name	Function
1	*Cocos nucifera*	Kelapa	Janur for ritual
2	*Erythrina sp*	Dadap	Ritual for dead
3	*Macropanax dispermus*	Pampung	Entas-entas ritual ceremony
4	*Curculigo orchio*	Tlotok	Entas-entas ritual ceremony
5	*Ricinus communis*	Jarak kepyar	Entas-entas ritual ceremony
6	*Acanthaceae sp*	Anting-anting	Karo ritual ceremony
7	*Amaranthaceae sp*	Genjret	Rituals

Based on the results of the survey and DGF with Tengger tribe local people, there were 25 species of plants which were used as herbal medicine (Table 1) for various types of diseases, ranging from minor illnesses such as cough and colds, until degenerative diseases such as cardiovascular disease, diabetes, hypertension, etc. Plants have an important role in human's life related to natural resources used in the medical and pharmaceutical [12]. Plants are an alternative medicine, especially in rural areas that have limited medical physician. According to WHO, traditional medicine is a knowledge of medicine that develops from generation to generation (inheritance) in a particular area. The utilization of plants as traditional medicine was carried out by indigenous people in a majority area through a preparation process that has been developed by local people using one kind of plant or a mixture of more than 1 species of plant [13]. Each tribe has different local and traditional knowledge in utilizing medicinal plants, started from the types of plants, parts used, and how to treat them [4,9,10].

Ethnobotany studies showed that the utilization of plants as an herbal medicine at this time is for traditional medicine not only in rural areas but also around the world. More than 25% of pharmaceutical products were obtained from tropical plants [8]. There was also a lot of research conducted on drug screening projects on plants used for traditional medicine so it can be a candidate for new drugs derived from herbal resource [12].

In the food materials, plants are also a source of food for the Tengger tribe and their livestock. Based on the results of the survey and GDF, there were 17 species of plants that had a role in the food sector (Table 2). Food is a primary human requirement; thus that the food sector will always grow and develop in a country along with its population growth [14]. Foodstuffs were divided into foods from an animal and vegetable foods. Indonesia is a country rich of biodiversity which can utilize the various plant species to support food sector. Ethnobotany studies were expected to increase the utilization of plant diversity as food so that we can reach out food independence for Indonesia.

Plants diversity found in the BTSNP area is used as food not only for the residents there, but also for their animal feed. Fodder are all types of plants grown to provide the nutritional of livestock [15]. The types of animals which were bred by Tengger tribe were chickens, cow, goat, sheep and pig. Plants were used for fodder were trabasan (*Cestrum parauii*), kaliandra putih (*Calliandra portoricensis*), wedusan (*Ageratum conyzoides*), ranggitan (*Achyranthes sp.*), empritan (*Carex sp.*), surengan (*Rumex sp.*), and keloworno (*Gliricidia maenlaka*). Plants which are good for animals feed were plants that can provide the nutritional needs of livestock and do not cause side effects on livestock. Livestock fed plant feed containing active compounds of saponin can increase body mass of sheep [16]. In addition, the content of active compounds such as flavonoids and triterpenoids can treat various diseases in livestock [15].

Tengger tribe local people also use plants in the industrial and household fields. Based on the results of the survey and GDF, there were 11 species of plants used for industry and households (Table 3). This utilization includes detergent materials, fuel, food flavoring, for hormones, tanning of cow skin, firewood, growing media for orchids and mushrooms, and for fertilizer. Firewoods were used by the Tengger tribe for cooking and making a warm for body from cold air. Rahayu *et al.* (2006) stated that basically, all types of woody plants could be used to produce firewood. However, generally plants or trees used as firewood had certain criteria, including wood "dry", durable or not quickly run out and the heat energy produced was high enough and later could be used as a charcoal. Some main types of firewood include cassia (*Acasia decurrens*), mountain cypress (*Casuarina junghuhnia*), krinyuh (*Chromolaena adoata*), and klasih gede *(Eupatorium inufolium*)[17].

Based on the results of the survey and GDF, 17 plant species were used by Tengger tribe local people as building materials (Table 4). Tengger tribe people has difficulty in building houses because the materials were needed for building relatively expensive and should be brought in from outside the BTSNP area such as iron, sand, brick, cement, paint, and others. Plants (wood) are also used for building materials and households such as making frames, roof frames, chairs, etc. The potential local resources of woody plants used for building materials could help the Tengger tribe people to save more money. The characteristic of wood which has good quality to be used as building material is having stronger and greater the mass [18]. Plants (wood) are also used to build cages or shelter in the rice fields. The utilizations of plants in local technology are hereditary experiences, such as making houses, household appliances, traditional ritual equipment, agricultural equipment, according to their requirement.

In the ecological field, plants biodiversity was used by the Tengger tribe to resist erosion, become the marker of rainy season, natural pesticides, and store water reserves. There were 9 species of plants used in the ecological field (Table 5). One of the utilizations of plants by Tengger tribe local people was as natural pesticides. Natural pesticides are pesticides that are made from natural resource and contain active compound such as plants. These pesticides were biodegradable in nature so they did not make any pollutant o the environment and they were relatively safe for humans and livestock, because the residue would be decomposed and easily gone. One of the natural pesticides used by the Tengger tribe is from the randu basin (*Pittosporum moluccanum*) [19]. Plants also have a role in the ecosystem used as a barrier to erosion. The diversity could reduce soil erosion. The mechanism of this function was each plant had a root with a special character which could be bound to particles in the soil so if there are more species of plants, the various types of particles in the soil that cause erosion will be bound by each plant species [20].

Plants also have an important role in various kinds of rituals ceremonies in Tengger tribe. Based on the results of the survey and FGD, there are 7 species of plants used in the ritual process (Table 6). The utilization of plants by indigenous people is not only for of physical requirements, but also as of spiritual requirements. A vital role of plants is a complement in traditional ceremony or religious activity. Tengger tribe people used various species of plants in their rituals such as ‘sesajen’ (the sacred food) [5]. The Tengger tribe had a variety of rituals, i.e the Kasada ceremony, Karo ceremony (for cleaning the village), Kapat, Kawulu, and Kasanga ceremonies (to ask for salvation), the Entas-entas ceremony (to purify the spirit), and rituals for the death.

Those results indicated that Tengger tribe used various plants around BTSNP for their livelihood. Batoro and Siswanto reported that Tengger tribe used plants for above 60 diseases and the medicinal uses were done by a man or shaman from Tengger people by ritual treatment called "*suwuk"* [4]. It showed that Tengger tribe local people had strongly reliance n ethnomedicinal treatment compared to modern medicine.

4. Conclusion

The Tengger tribe is one of the tribes in Indonesia that live around BTSNP. Tengger tribe people have local wisdom to the use of plant in various requirements including medicine, food, industry and household, building materials, ecological values, and components used for ritual processes. This knowledge hopefully can encourage Indonesian people to continue for maintaining their ancestral heritage.

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