

Ethnobotany of the Toba Batak Ethnic Community in Samosir District, North Sumatra, Indonesia

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Abstract. *Sitanggang NDH, Zuhud EAM, Masy'ud B, Soekmadi. 2022. Ethnobotany of the Toba Batak Ethnic Community in Samosir District, North Sumatra, Indonesia. Biodiversitas 23: 6114-6118.* The Toba Batak ethnic community is one of the ethnic groups in Indonesia that is believed to have unique characteristics in terms of ethnobotanical aspects. The objectives of this study were to identify the diversity of plant species that were used and collected by the Toba Batak ethnic community, analyze their Cultural Significance Index and determine the economic potential of plant species of high cultural value. The survey was conducted in four villages near Samosir Botanical Gardens and Aek Natonang Lake. We collected data through field observations and interviews with key respondents of chiefs, healers, homemakers and youth as users. We analyzed the data to determine the number of plant species collected and used by the Toba Batak ethnic community, to calculate the cultural importance of the plant species, and to determine the economic potential of the plant species. The result showed that the community collected and used 146 plant species from 53 families. We distinguished it into three categories, food (66 species), medicine (67 species) and traditional rituals (13 species). Twenty plant species had the highest cultural value (ICS > 30). Nine species had the highest cultural value, i.e., ginger (*Zingiber officinale*) (54), rice (*Oryza sativa*) (50), garlic (*Allium sativum*) and turmeric (*Curcuma longa*) (48), mango (*Mangifera indica*) and sweet potato (*Ipomoea batatas*) (40), and lime (*Citrus aurantifolia*), kaffir lime (*Citrus hystrix*) and rambutan (*Nephelium lappaceum*) (39). Six of the nine plant species with high cultural value were considered potential and priority economic commodities. These species were ginger, rice, garlic, turmeric, mango and sweet potato.

Keywords: CSI, ethnobotany, Index of Cultural Significance, plant species diversity, Toba Batak community

INTRODUCTION

The use of plants by local communities for their daily needs includes food, medicine, construction, dyes, fiber sources, rituals, ornaments and others. In addition, local knowledge, in general, can be passed down orally so that knowledge is only limited to a certain group of people, as it is known that more than 80% of drug use in the pharmaceutical industry has been adapted from local knowledge (Souza et al. 2018).

What is the relationship between community culture (anthropology) and plant resources (botany) in the environment, directly or indirectly? We can know from ethnobotany in practice as medicinal plants (Amzat et al. 2014). The relationship between humans and natural resources which has a variety of focuses and objectives from various studies shows that traditional communities know about managing natural resources and their environment, which can reduce the impact of damage and maintain their sustainability. In this case the local knowledge of a traditional community around a protected area has a role in supporting sustainable forest use, then summed and ranked (Pei 2013).

Ethnobotany should be carried out in multidisciplinary science development which includes pure Botany disciplines, such as taxonomy, ecology, cytology,

biochemistry and social sciences, especially cultural anthropology and other sciences from agriculture, forestry and horticulture which pay much attention to cultivation, harvesting, processing, production and market economy (Dossou et al. 2022). Although ethnobotanical research has progressed throughout the world, especially in Asia, ethnobotanical research is more directed at the knowledge of medicinal plants and traditional agricultural knowledge combined with rural development programs more focused on Africa (van Andel et al. 2012; Lawal et al. 2022).

The current most appropriate approach to documenting the use of plants by local communities is to use the methodology through surveys, interviews, independent exploration and participatory observation. However, one market survey method has advantages over other methods (Lu et al. 2022). Van Sam (2012) states that data on medicinal plants or other uses can be extracted using market surveys.

Indonesia has a high ethnic diversity. Ethnicity has its uniqueness and local wisdom (Walujo 2008). The use of various plant species is known as ethnobotany. Ethnobotany is a branch of ethnobiology. Ethnobotany can serve as a platform for studying specific relationships between indigenous cultures and plant species. The interaction of humans or a group of people (ethnic) with natural resources of flora and fauna was a very important study with interesting and dynamic issues (Gremillion

1989; Terashima 2001; Shoemaker 2010). Ethnobotany study was also very important in plant conservation efforts (Pei 2013). In addition to the need for food, clothing and shelter, plants also have socio-cultural value. One of the socio-cultural uses of plants is for traditional ceremonies or certain religious rituals.

The study of ethnobotany is also used as a basis for developing the value of plant use. This study shows an overview of values inheritance levels from generation to generation. Suansa (2011) explained that the level of local knowledge of the Baduy community in Banten Province on plants has declined. The indication is that the knowledge of local communities regarding the diversity of plant species and their use is getting eroded. This finding can be seen from the declining knowledge of the younger generation about using plants.

Ethnobotany studies in Indonesia showed that there was differences use of plant species. Generally, plants are used as food, medicine, aromatic ingredient, and traditional rituals or religions of various ethnicities in Indonesia (Iswandono 2015; Helida 2021; Silalahi 2016a,b; Susiarti et al. 2009). Silalahi (2016a,b) explained that plant species development and utilization approach was carried out by integrating the values of local wisdom. This phenomenon is based on the ethnobiological potential of the community on a wide scale. Therefore, the objectives of this study are to identify the diversity of plant species that are used and collected by the Toba Batak ethnic community, analyze their Index of Cultural Significance Index (ICS) and determine the economic potential of plant species that have high cultural value.

The implications of various market functions for local communities are the advantages of market surveys, namely as a place for trade, transactions, and exchange of information on the use of plants to improve the economy (Seminario et al. 2020) and livelihoods (Selvi et al. 2022).

MATERIALS AND METHODS

Study area

We conducted the study in villages representing the Toba Batak ethnic community in Samosir District, North Sumatra, Indonesia. The study was in the area of the Samosir Botanical Gardens and Aek Natonang Lake. The two locations are close to the settlements of the Toba Batak ethnic community in Samosir District, which still often interact with or access the botanical gardens and lake areas.

The villages, near the Samosir Botanical Gardens and Aek Natonang Lake, which were selected as research locations were Ambarita Village, Tomok Village, Parbalohan Village, and Tanjungan Village of Simanindo Sub-district, Samosir District, North Sumatra Province, Indonesia.

Procedures

Data collection

This study was conducted from July to December 2021. Data in this study were plant species used by the Toba Batak ethnic community as food, medicine, and rituals; Plant species collected or planted by the community in their yards, gardens or fields; Potential and socio-economic

value of important plant species. The methods were observation, field inventory, and interviews with the Toba Batak people living in the villages of Ambarita, Tomok, Parbalohan, and Tanjungan.

Interviews were conducted with two groups of key respondents. The first group was the chief, elders, healers and homemakers and the second group was youth as representatives of user groups. The general criteria for respondents in the first group were > 20 years and for respondents in the second group, > 14 years. The total number of respondents was 60 people.

Data analysis

Data were analyzed using a qualitative descriptive method. First, we classified the data according to species and family, and the number and percentage of their use (food, medicine, aromatic ingredients and traditional rituals). The Index of Cultural Significance (ICS), according to Turner (1988) and Cunningham (2001) which has been modified by Iswandono (2015), was used to determine the level of plant species diversity benefits or functions for the Toba Batak ethnic community. The basic formula can be seen below:

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

Each plant species has several uses. The ICS formula for each plant species can be seen below:

$$ICS = (q_1 \times i_1 \times e_1) n_1 + (q_2 \times i_2 \times e_2) n_2 + \dots + (q_n \times i_n \times e_n) n_n$$

Where :

ICS : Index of Cultural Significance.

q : The quality value of plant species utilization. Staple food = 5, secondary food = 4, other uses related to food such as fruits, aromatic ingredients and medicine = 3, traditional or religious rituals = 2, and other uses but not used specifically = 1.

i : The intensity value of plant species utilization. Very high = 5, high = 4, moderate = 3, low = 2 and very low = 1.

e : The exclusivity value of plant species utilization. Most preferred or primary choice = 2, there are other types as choices = 1, and secondary sources or secondary choice materials = 0.5

The potential economic value of plant species and their prospect of developing use are determined by the potential nutritional or bioactive content of plant species with high ICS.

RESULTS AND DISCUSSION

The diversity of plant species used and collected by the Toba Batak society

Categories of plant use that become the focus of this study are food, medicine and traditional/religious rituals. The results showed that 146 species of plants from 53 families were used or collected by the Toba Batak ethnic community. Plants used as food, medicine, and traditional rituals were 66 species (45.21%), 67 species (45.89%) and 13 species (8.90%), respectively (Table 1).

Table 1. Number of plant species by category of their use

Use category	Number of species	%
Food	66	45.21
Medicine	67	45.89
Traditional or religious ritual	13	8.90
Number of species	146	100.00

The Toba Batak ethnic community utilized and collected 100 species of plants for only one type of use as food, medicine, or traditional rituals. In addition, they also utilized, at least, eight plant species that are used both as food, medicine, and in traditional rituals. These species of plants were shallots (*Allium cepa*), garlic (*Allium sativum*), cloves (*Syzygium aromaticum*), black pepper (*Piper nigrum*), white pepper (*Piper nigrum*), betel (*Piper betle*), Chinese betel (*Peperomia pellucida*), and lemongrass (*Cymbopogon schoenanthus*). The lemongrass is named with sangge-sangge by Toba Batak ethnic community. These results indicate the importance of these species of plants to the Toba Batak ethnic community. Suppose a plant species is used for several purposes. In that case, the plant species has a high utility value and potential to get attention in the cultivation and preservation efforts.

The diversity of plant species used by the Toba Batak ethnic community is less than the Kerinci ethnic community (Helida 2016). The Kerinci ethnic community utilizes 234 species from 71 families. These plants are used as food, medicine, traditional rituals, building materials, local equipment or technology, food wrappers and secondary materials (hair fertilizer and cosmetics). For example, the Kerinci ethnic community uses 200 plant species as medicine (Helida 2021), the Flores Manggarai ethnic community uses 73 plant species as medicine (Iswandono 2015), while the Toba Batak community only uses about 67 plant species as medicine.

The plant use

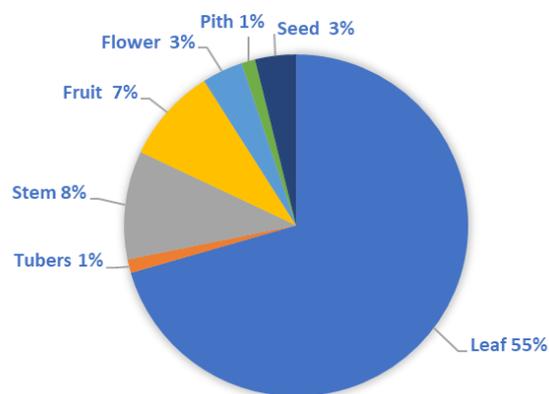
The most widely used plant parts were leaves (55%), followed by rhizomes (16%), stems (8%), fruits (7%), roots (6%), tubers (3%), flowers (3%), pith (1%) and seed (1%), respectively (Figure 1). The plant parts used by the Toba Batak ethnic community were relatively the same as the Kerinci ethnic community (Helida 2021). Helida (2021) also explained that the Kerinci ethnic community utilizes 112 plants species that only take their leaves.

Use of plants for food, medicine, and traditional rituals

The Toba Batak ethnic community utilized 66 types of plants as food sources. The categories were stapled foods (the main source of carbohydrates), additional foods (fruits, vegetables, additional carbohydrates, beverages), and other food ingredients (flavors, aromatics or stimulants and dyes). The analysis showed that only one type of plant, rice (*Oryza sativa*), was used as a staple food. The additional foods were 42 species used as a source of additional carbohydrates. The species were corn (*Zea mays*), cassava (*Manihot utilissima*), and sweet potato (*Ipomoea batatas*). More detailed information is presented in Table 2.

The Toba Batak ethnic community used 67 species of plants as medicine. This number of species is the most compared to traditional food sources and rituals. Generally, these plant species were used as a medicine for minor ailments. The minor ailments are headaches, fever, skin diseases, digestive tract diseases, minor injuries, postpartum wounds, fatigue, and others. The result showed that the plant species that are used as medicine by the Toba Batak ethnic community are also widely used by the Indonesian people. The species were *Strobilanthes crispus*, *Zingiber officinale*, *Curcuma zanthorrhiza*, *Curcuma longa*, *Sauropus androgynous*, and *Piper betle*. The results of a literature study on bioactive content showed that 19 species of medicinal plants have properties for treating diseases and supporting human body health.

The species of plants used for traditional rituals by the Toba Batak ethnic community were 13. These species were used in every traditional ceremony or religious ritual of the Toba Batak community. The species were shallots (*Allium cepa*), garlic (*Allium sativum*), *Hibiscus rosa-sinensis*, jabi-jabi (*Ficus sp.*), banyan (*Ficus benghalensis*), cloves (*Syzygium aromaticum*), black pepper (*Piper nigrum*), white pepper (*Piper nigrum*), betel (*Piper betle*) and lemongrass (*Cymbopogon schoenanthus*).

**Figure 1.** parts of plants used by the Toba Batak ethnic community, Samosir District, North Sumatra, Indonesia**Table 2.** The number of plant species used as a food source

Utilization	Number of species	(%)
Stapele food	1	1.59
Additional food:		
Carbohydrate	4	6.35
Fruit	9	14.29
Vegetable	13	20.63
Beverage	5	7.94
Other food ingredients:		
Flavor	15	23.81
Aromatic or stimulant	14	22.22
Dye	2	2.17
Total	63	100

Cultural value of plants based on the *Index of Cultural Significant (ICS)*

In the Toba Batak ethnic community, based on the results of the ICS calculation, 20 (13.7%) plant species from 146 species had ICS values in the moderate to very high category (ICS values 30-54) (Figure 2). The plant species that had the highest ICS value were ginger/*Zingiber officinale* (54), followed by rice/*Oryza sativa* (50), garlic/*Allium sativum* and turmeric/*Curcuma longa* (48), mango/*Mangifera indica* (40) and sweet potato/*Ipomea batatas* (40). Lime/*Citrus aurantifolia*, kaffir lime/*Citrus hystrix* (39), and rambutan/*Nephelium lappaceum* (39). Detailed information can be seen in Figure 2.

Plant species with moderate to very high ICS values are classified as species with the main use category as food. Its use can be as a staple food (*Oryza sativa*); food additives (fruits) and beverages; aromatic ingredients or stimulants, and medicine. For example, *Zingiber officinale*, with the highest ICS value (54), indicates that culturally, it is used not only as food but also used as medicine. The study by Helida (2021), in the Kerinci ethnic community, showed that the plant species with the highest ICS value was *Oryza sativa*, with an ICS value of 54. In contrast *Zingiber officinale* had an ICS value of 32. These findings indicate that each community has relatively different plant cultural values.

officinale (54), *Oryza sativa* (50), *Allium sativum* (48), *Curcuma longa* (48), *Mangifera indica* (40) and *Ipomea batatas* (40). The six plant species are included in the food source and medicine category. *Oryza sativa* and *Ipomea batatas* are the staple food and carbohydrate sources, whereas *Mangifera indica* is categorized as fruit food as a source of vitamins and protein for humans. *Allium sativum*, *Curcuma longa* and *Zingiber officinale* are used as flavors, aromatics, stimulants, and medicines.

The six plant species with the highest ICS, had not only high cultural value but also high economic potential. This plant species had a varied selling price, *Oryza sativa* had a selling price of 180,000 IDR per can (± 16 kg) or 12,000

IDR per kg; *Zingiber officinale* had a selling price of 10,000 IDR per kg; *Allium sativum* had a selling price of 22,000 IDR per kg; *Curcuma longa* had a selling price of 5,000 IDR per kg; *Mangifera indica* had a selling price of 15,000 IDR per kg, and *Ipomea batatas* had a selling price of 7,000 IDR per kg. The selling price of *Curcuma longa* and *Ipomea batatas* is lower than the other four species because most people in this ethnic community prefer to grow these plants in their yards or fields.

Allium sativum, *Mangifera indica*, *Oryza sativa*, and *Zingiber officinale* were the plants with the highest selling values. The high selling price of *Allium sativum* and *Zingiber officinale* is due to the high intensity of their use. The two species, not only used as aromatic ingredients or stimulants but also are used as medicine and traditional rituals. Therefore, the priority of potential and prospective plant species to be developed as economic commodities are *Allium sativum* and *Zingiber officinale*, in addition to *Oryza sativa* (as staple food), *Ipomea batatas* (as additional food), and *Mangifera indica* (as fruit).

Economic potential of plant species with high cultural value

The results of the ICS analysis found that 20 plant species had an ICS value > 30 (Figure 2). Among these species, six species had high to very high ICS values (40-54).

These plants were *Zingiber* A total of 146 plant species from 53 families are used and collected by the Toba Batak ethnic community in Samosir District. The use categories are divided into three, i.e. food (66 species), medicine (67 species), or traditional rituals (13 species). Eight plants are used as food, medicine and in traditional rituals. These species of plants are shallots (*Allium cepa*), garlic (*Allium sativum*), cloves (*Syzygium aromaticum*), black pepper (*Piper nigrum*), white pepper (*Piper nigrum*), betel (*Piper betle*), Chinese betel (*Peperomia pellucida*), and lemongrass (*Cymbopogon schoenanthus*).

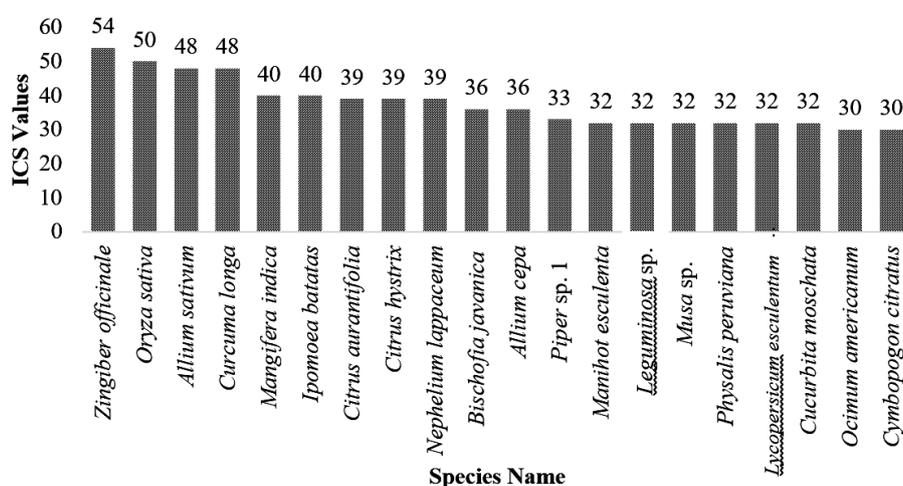


Figure 2. Plant species with moderate to very high ICS values

Plants with moderate to very high ICS are 20 species. The nine plant species that have the highest ICS were ginger (*Zingiber officinale*), rice (*Oryza sativa*), garlic (*Allium sativum*), turmeric (*Curcuma longa*), mango (*Mangifera indica*), sweet potato (*Ipomea batatas*), lime (*Citrus aurantifolia*), kaffir lime (*Citrus hystrix*), and rambutan (*Nephelium lappaceum*). Six species have high cultural value and the potential to be developed as economic commodities for the Toba Batak ethnic community. These species are *Allium sativum*, *Zingiber officinale*, *Oryza sativa*, *Ipomea batatas*, and *Mangifera indica*.

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