Study of medicinal plant used by the ethnic community of Karo around Lau Debuk-Debuk Tourism Park, Indonesia

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Abstract. Communities with habitat around the forest have used traditional medicine for quite long to maintain their health and treat various diseases. This research aimed to find out the medicinal plants utilized by the communities around Lau Debuk-debuk Tourism Park and to know the utilization of the medicinal plant species. This research implemented two approaches which consisted of field survey in two selected villages (Semangat Gunung Village and Doulu Village). There were sixty species of medicinal plants commonly used by people around Lau Debuk-Debuk Tourism Park. Parts of the plant used as medicines were leaves, root, flowers, plant bark, stem, and tubers. It was found that leaves are most widely used by people of both villages. The current research enlarges the knowledge of the application of endemic plants growing in the investigated area.

1. Introduction
The utilization of plants as medicine was a heritage of ancestors from a long time ago. Nowadays, Indonesia is one of the potential medicinal plants-producing countries with its biodiversity. Biodiversity of Indonesia ranked the third largest in the world preceded by Brazil and Zaire. Judging from the uniformity of flora, there are quite a lot of plants that can be utilized as medicinal plants. In tropical forests of Indonesia, there are about 30,000 species of flowering plants and it is estimated that about 3,689 species amongst it are medicinal plants. According to General Directorate of National Agency of Drug and Food Control (POM), 283 species of medicinal plants have been used in the traditional medicine industry for the treatment of various diseases [1–3]. In addition, the consumption of herbal infusions has increased all over the world due to the beneficial and preventive effect over the human body [4].

Forest contribution for the high value of human health has been realized after the tropical forests suffered a lot of damaged. Currently, the remaining of natural tropical forest ecosystem in Indonesia is as conservation forest area, especially in national parks and protected forests. Nevertheless, production forest should be seen as multi-product producer both timber and non-timber and must be managed in totality with a silvicultural multi-system approach [5].

Bukit Barisan forest park (Taman Hutan Raya Bukit Barisan) of North Sumatera is set in a management unit with 51,600 hectares of protected forest area and conservation area. Bukit Barisan forest park is located in four regencies, namely Langkat, Deli Serdang, Simalungun, and Tanah Karo. The forest areas which are largely a protected forest as natural mountains forest and have been established since the Dutch era are Sibayak Protected Forest I, Simancik Protected Forests I, Sibayak Protected Forest II, Langkat Selatan Wildlife Reserve, and Sinabung Protected Forest. Other parts of Tahura area consist of Sibolangit Nature Reserve, Langkat Selatan Wildlife Reserve (SM), Lau Debuk-
debuk Tourism Park, and Sibolangit Campground. Tongkoh is the core area of Tahura Bukit Barisan. Some areas of Tahura, especially Tongkoh and Brastagi, have developed into a famous tourist destination in North Sumatera [6].

Most of the plants, which are useful to treat various diseases, allergic diseases, metabolic diseases, and degenerative diseases associated with the aging process, have attracted many scientists for further research. Many types of plants have not been identified yet. None is used as a medicine by people around Tahura in Lau Debuk-debuk tourism park. Therefore, further experiments are necessary to find out about the utilization of medicinal plants by ethnic approach.

The aim of this research was to know the types of medicinal plants were used by ethnic Karo communities around Lau Debuk-debuk Tourism Park and how they use the medicinal plants [3, 7–9].

2. Research method

2.1. Location

The field survey was carried out in two villages, Semangat Gunung Village and Doulu Village. They are located around Lau Debuk-debuk Tourism Park, Sub District Karo Regency North Sumatra Province. The tools used in this research were a plastic bag, label paper, camera, calculator, stationery, and questionnaires.

2.2. Procedure

Research activities were conducted in two stages of preparation and data collection. Field preparation included: a) Field observation (data collection conducted by direct observation and interview (using questionnaire) the key informants to describe accurately and detail about field condition and community activities in the field); b) Sample determination (the approaches used in this point were surveyed location, and then two villages around Lau Debuk-debuk Tourism Park were selected. They are Semangat Gunung Village and Doulu Village; c) Key informants and respondents determination involved (village heads, tribal leaders/elders, religious leaders, traditional medicine man/shaman, local medication man (as key informant), and the community who utilize medicinal plants. In total, we were interview 60 respondents. They are 30 individuals (20 men and 10 women) in Semangat Gunung Village and 30 individuals (22 men and 8 women) in Doulu Village.

Besides interviews, botanical data were also collected. Ethnobotany surveys were conducted to find out how people use medicinal plants. The data collected covered type of medicinal plants used by villagers, method of medicinal plants utilization (type, part, way of use, or benefit) and location of medicinal plants source. Data from the interviews and questionnaires with key respondents and community were tabulated and analyzed descriptively to obtain a description of the utilization of medicinal plants in the field. Identification of the plants was done by comparing the plant picture in the medicinal plants’ catalogue.

3. Results and discussion

3.1. Knowledge of the medicinal plants

As can be seen in table 1, the inhabitants of Semangat Gunung and Doulu Village understood medicinal plants and its benefit for particular diseases grouped into two categories, internal and external. Internal diseases included fever, abdominal pain, ulcers, and so on while external diseases included wounds, skin diseases, scabies, and others. The community's knowledge of medicinal plants was mostly gained from generation to generation. The result of questionnaires in two villages showed that 50% of people know the type of forest plant used for medicine.

The utilization of plant as medicine to treat some diseases was initiated because the health institutions could not reach remote area in Karo. Sometimes, some of synthetic medicine was not able to cure certain type of disease, and its efficacy did not work. The application of medicine originated from plants can cope the health problems. The community cannot leave traditional medicine because it is simple to use, easy to obtain, and also relatively plentiful [7].
Based on the results of interviews to respondents, it is known that people knowledge about medicinal plants came from the previous generation obtained from their parents and grandparents so that this knowledge grows and develops in the community. Currently many species of medicinal plant were seldom to find so that the young generations have limited opportunity to recognize them. Thus, the young generation prefer chemical medicine because it is easier to implement.

Table 1. Percentage of respondent perceptions according to the characteristics of Semangat Gunung and Doulu Villages.

| Question category | Response category | Percentage of respondent’s answers (%) |
|-------------------|-------------------|----------------------------------------|
| 1. There are types of forest plants used for medicine | Well understand | 56.67 |
| | Less understand | 43.33 |
| | Do not understand | 0.00 |
| 2. There are flavorful types (aromatic plants) | Plentiful | 33.33 |
| | Slightly | 56.67 |
| | None | 10.00 |
| 3. Knowledge about medicinal plants | Heredity | 90.00 |
| | Neighbour/shaman | 6.66 |
| | Media information | 3.33 |
| 4. Places to look for plants | Inside forest area | 50.00 |
| | farm/ground | 43.33 |
| | Do not know | 6.66 |
| 5. Medicinal plants used for custom events | Yes | 23.33 |
| | Do not know | 66.67 |
| | None | 10.00 |
| 6. The potency of medicinal plants in the forest | Plentiful | 83.33 |
| | Has been reduced | 10.00 |
| | Do not know | 6.67 |

Community’s knowledge about the use of medicinal plants was also supported by Karo tradition. They used to apply various kinds of leaves from the forest (Bulung-bulung Kerangen) at certain ceremonies such as Ndilo Tendi (summoning the spirit of the deceased) or Pelawes Begu (exorcizing evil spirits). However, along with the modernization and development of religion, the ceremonies are abandoned. Finally, the knowledge have faded from generation to generation of ethnic Karo.

The tropical natural forest ecosystems in each location in Indonesia provide enough medicinal plant to nourish and cure all types of disease suffered by people. Forest resources (timber and non-timber) and culture of people in each forest location as a whole unity of human life since the beginning of its existence cannot be separated [5].

Today, the potential of medicinal plants in the forest has reduced because people use without cultivating them. Respondents (local people) admitted that it was hard to obtain medicinal plants. One of the triggers was the uncontrolled degradation of forest, especially in conservation areas in Sumatra and Kalimantan. The forest exploitation had very worrying negative impacts in the past four decades. Forest destruction has a potential to become a social problem since forest ecosystem is inhabited by thousands of indigenous people, tribes, and other traditional populations who depend on the forest for their livelihoods and their cultural survival. Due to the scarcity and far location to the forest to obtain medicinal plants, the community has turned to synthetic medicines. They think that it is available and easy to apply. However, parents prefer to use traditional medicines rather than synthetic medicines [5].

3.2. Ethnobotany aspects

Traditional medication is one of the methods that can heal and restrain healthcare. Medicinal and aromatic plants are an essential component in traditional medication. Through this method, the
community has provided first aid before the medical action. It has been heredity of various ethnic (tribe) living inside or around the forest to utilize medicinal plant species, to preserve the health, and to cure some diseases [3, 5, 8–10].

Based on the results of majority interviews (> 50%), respondents use medicinal plants for medication and healthcare. However, there are also respondents who do not use them in the two studied villages as shown in table 2.

**Table 2.** Names of medicinal plant utilized by community around Lau Debuk-Debuk Tourism Park (Semangat Gunung Village and Doulu Village).

| No. | Regional name | Parts used | Application | Advantage |
|-----|---------------|------------|-------------|-----------|
| 1.  | Benalu kauy manis | Leaves and roots | Boiled or brewed | Cancer medicines |
| 2.  | Benalu kopi (Surindan) | Leaves and roots | Boiled or brewed | Cancer medicines |
| 3.  | Besi-besi | Leaves | Splashed | Just for the custom event (for adoration) |
| 4.  | Binara | Leaves | Kneaded and roasted | Hemorrhoid and vomiting-diarrhea drugs |
| 5.  | Bulung sirahpah | Leaves | Kneaded | Irritation |
| 6.  | Bunga kembang sepatu | Leaves | Kneaded and compressed on the head | Febrifuge |
| 7.  | Bunga kiung | Flower | Kneaded | Irritation |
| 8.  | Bunga matahari | Leaves | Kneaded | Diarrhea |
| 9.  | Bunga punci | Flower | Milled | Used for custom event of entering a new house |
| 10. | Bunga ranke | Flower | Splashed | 
| 11. | Bunga sapra | Flower | Milled | Malajadi disease / epilepsy |
| 12. | Calung-calung | All parts of plants | Crushed and then cooked | For bathing the baby to keep skin smooth |
| 13. | Cekala | Stem | Burned and then boiled | Coughs |
| 14. | Cep-cepan | Bark | Boiled | Diabetes |
| 15. | Cingkam | Bark | Boiled | Ulcers |
| 16. | Daun jarak | Leaves | Heated | For asthma (put on the chest) |
| 17. | Daun kisik | Leaves | Boiled for bath water | The symptom makes the eyelashes illness on kids |
| 18. | Daun pait-pait | Leaves | Kneaded | Wounds |
| 19. | Daun paris | Leaves | Just left in the room | Contained aromatics and useful for air freshener |
| 20. | Depuk-depuk | Roots | Boiled | Hypertension |
| 21. | Gagatan harimau | Leaves | Edible or can be boiled | Abdominal pain |
| 22. | Garang-garang (poho) | Leaves | Boiled | Colds |
| 23. | Gulung kedah | Leaves | Burned | Colds |
| 24. | Inai | Leaves | Smereared | Wounds |
| 25. | Jeruk nipis | Fruits | Squeezed | Coughs |
| 26. | Kaling coy | Leaves | Cooked | Colds |
| 27. | Kalinjuhang | Leaves | Boiled (the water can be drunk) | Cleaned the inner body |
| 28. | Kayu lengit | Bark | Boiled | To lose the sugar content |
| 29. | Kelsi | Leaves | Kneaded | For skin irritation due to worm action |
| 30. | Kubis | Leaves | Vegetable dishes | Constipation medicines, to reduce cholesterol content |
| 31. | Kayu manis | Bark | Boiled or brewed | Diarrhea |
| 32. | Kumis kucing | Leaves | Boiled | Waist pain medicine, **Angin duduk medicine** |
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Table 2. Names of medicinal plant utilized by community around Lau Debuk-Debuk Tourism Park (Semangat Gunung Village and Doulu Village).

| No. | Regional name                  | Parts used | Application       | Advantage                                |
|-----|--------------------------------|------------|-------------------|------------------------------------------|
| 33  | Lancing                        | Leaves     | Boiled            | Sprain and pain-stiff medicines          |
| 34  | Lengah-lengah                  | Leaves     | Kneaded           | Wounds                                   |
| 35  | Loning                         | Leaves     | Boiled and the water can be drunk | an anthelmintic medicine              |
| 36  | Markisa                        | Leaves     | Boiled            | Colds                                    |
| 37  | Page-page                      | Leaves     | Boiled for bath water | The symptoms of scaly calf disease in children |
| 38  | Pia-pia                        | Roots      | Made slices and then mixed with water and added some pepper for a drink | Reduced hypertension                 |
| 39  | Pinus                          | Leaves     | Boiled            | Diabetes and gout medicines              |
| 40  | Raja daun                      | Leaves     | Crushed           | Make a herb drinks                       |
| 41  | Rih (alang-alang)              | Roots      | Boiled            | For cervical cancer                      |
| 42  | Sabih kabang                   | Leaves     | Boiled and kneaded | Abdominal pain or incision               |
| 43  | Sala gundi                     | Leaves     | Kneaded           | For eye illness                          |
| 44  | Sampilulut                     | Leaves     | Young leaves can be eaten | For abdominal pain or wounds            |
| 45  | Selantam                       | Leaves     | Boiled            | Reduced hypertension                    |
| 46  | Senduduk                       | Leaves     | Added some hot water and then mixed with laulas stem | For sauna                             |
| 47  | Serai                          | Tubers     | Boiled            | Colds                                    |
| 48  | Sibagori                       | Leaves and roots | Boiled the roots then the water can be drunk Milled the leaves and then added some areca nut water | Diabetes medicines and for smear the scabies |
| 49  | Sibarani sigaramata            | Leaves     | Boiled            | Abdominal pain                          |
| 50  | Silebur pinggan                | Leaves and roots | Boiled | Cancer medicines                      |
| 51  | Sirih                          | Leaves     | Edible directly or can be boiled | To strengthen the teeth or reduce leucorrhoea |
| 52  | Sitarkal                       | A kind of moss | Made herbal drinks | Restorative                            |
| 53  | Sitengkua                      | Leaves     | Added some candlenut plus oils and then crushed | Wounds                                |
| 54  | Sundur                         | Leaves     | Edible            | Ulcer                                    |
| 55  | Tapak kuda                     | Leaves     | Boiled            | To lose the sugar content                |
| 56  | Tawar ipuh                     | Leaves     | Chopped and crushed | Toxic prevention                      |
| 57  | Temulawak                      | Tubers     | Milled            | Breast cancer                           |
| 58  | Terbangun gara                 | Leaves     | Kneaded           | For eye illness and colds               |
| 59  | Terbangun hijau                | Leaves     | Kneaded and made dishes | For heatiness or as vegetables for people who give birth |
| 60  | Tongkap marigat                | Leaves     | Boiled            | For dislocated gut                       |

The use of medicinal plants directly without processing is considered as a first aid to treat disease or injury by the people of Karo. For example, to stop bleeding due to scratched wounds, leaves of Lenga-lenga (*Eupatorium odoratum* L.) and Sitengkua were used. It was usually done by farmers who often suffered injuries while working in the fields. The plant is easy to obtain because it is available in large quantities in the fields or carcasses. This treatment was faster than chemical medicines [8–10].

People can directly consume medicinal plants in fresh conditions to cure wounds or diseases. Some types of medicinal plants are processed first before being used to treat internal diseases such as heart...
attack, liver, diabetes, and so on. Medicinal plants can also be used in dry conditions because often certain types of medicinal plants are not available at any time or are difficult to obtain. The raw materials of traditional medicine are mostly from plants, both whole and part of plants such as leaves, fruits, roots, barks, and stems. The materials can be used in fresh or dry conditions. However, the dried material was very advisable to use for a long term. This dried material was also known as simplicia [11].

One type of medicinal plants can cure some types of diseases, such as Binara (Artemisia vulgaris L.) which serves to treat diarrhea, colds, diabetes and hemorrhoids; Lancing (Solanum verbascifolium L.) can serve to treat pneumonia and colds. Each type of plants has different parts to use and also different function.

In this study, the community of Karo used hibiscus flowers, generally found in the yard, to overcome fever. In Kesumbo Ampai village, fever was classified into two type, common fever (general) and fever in children. Common fever (general) used libuai (Mangifera indica) and kepayangan (Macaranga sp), while lawang (Cinnamomum sp), kalimau (Globa sp) kasambi (Pentas lanicolata), kodui (Ficus benjamina), and kakaik (Ziziphus horsfieldii) were used to treat fever in children [12].

Wawonii people used hoinu (A.esculentus), kompanga (Alstonia scholaris (L.) R.Br.), papaya (Carica papaya L.), kawu-kawu (Ceiba pentandra (L.) Gaertn.), Bontu (Hibiscus tiliaceus L.), tanga-tanga (Jatropha curcas L), langsat (Lansium domesticum Correa), kayu cina (L. amboinense) and punti bugisi (Moses sp.). Among these types, the most commonly used for febrifuge was C. papaya since this species was easy to find, and it was a common cultivation plant in yard or garden [13].

In this study, the people around Lau Debuk-debuk Tourism Park utilized 60 types of plants as the ingredient of medicine and the most used types were Lenga-lenga (Eupatorium odoratum L.) and Sitengkua as external medicine (table 2). Serawai community has identified and inventoried 47 species of plants that are often used for various treatments [14]. There were 205 species exploited as a medicine used by shamans in Sebangar Village and 106 species in the Kesumbo Ampai Village [12]. Among 108 types of beneficial plants in Wirakarya Sakti Conservation Area, there were 20 species used as traditional medicinal materials [13]. In Ghana, out of the total 31 plants species which belong to 16 families are used in the management and treatment of diseases [10].

3.3. Parts used in medicinal plants

Parts of medicinal plants used by community in the Semangat Gunung and Doulu Village consisted of leaves, root, flowers, all parts of plant bark, stem, and tubers (table 3). Part of the medicinal plants mostly used by the people of both villages was leaves.

| No. | The parts of plants used | Number of species | Percentage (%) |
|-----|--------------------------|-------------------|----------------|
| 1   | Leaves                   | 43                | 71.67          |
| 2   | Roots                    | 6                 | 10.00          |
| 3   | Flowers                  | 2                 | 3.33           |
| 4   | All parts of the plant   | 2                 | 3.33           |
| 5   | Stem                     | 1                 | 1.67           |
| 6   | Bark                     | 4                 | 6.67           |
| 7   | Tubers                   | 2                 | 3.33           |
|     | Total                    | 60                | 100            |

Some people use leaves because leaves are more abundant than others and contain medicinal compounds. If they utilize roots or other parts of the plant, it will lead to an extinction and scarcity of materials. The leaves were easier to obtain. Moreover, it can be easily processed because of its soft texture and high-water content (70% -80%). It also contains chemical compounds that act as antioxidants [12].

The high use of leaves as remedies explains the fact that the leaves are the center of bio-organic metabolism and secondary metabolite storage in some species especially aromatic plants. It is also
explained by the quick and easy harvest of medicinal plants and by the fact that aerial parts of plants are the center of photosynthetic phenomenon. However, picking leaves should not be done in an anarchic way and not pull the whole plant which contributes to deforestation. Leaves are used because they allow the preservation of the plant [3, 15].

3.4. Mode of preparation to use medicinal plants
Not all people know how to process the medicinal herbs. Generally, based on interviews with the respondents, they utilized medicinal plants in a single way, but the community around Lau Debuk-debuk Tourism Park did it in a very diverse way by being boiled (can be drunk or for bath) squeezed, milled, crushed, burned, eaten, chopped, smeared, made a herbal drink, and heated. Boiling is dominantly used, and the water can be drunk or bathed (table 4).

Traditional medicine of Indonesia was a nation's cultural heritage, so it is important to be preserved, researched, and developed the traditional Indonesian medicine experiment including research on single herbal medicine and in the form of herb [16]. The need for spices and medicines continues to increase in line with the emergence of a tendency to return to nature. Moreover, the opinion about their side effects is not as much as synthetic [17].

| No. | Way of Use                          | Number of species | Percentage (%) |
|-----|------------------------------------|-------------------|----------------|
| 1   | Boiled (can be drunk or to take a bath) | 28                | 46.67          |
| 2   | Affixed                            | 1                 | 1.67           |
| 3   | Kneaded                            | 6                 | 10.00          |
| 4   | Roasted                            | 1                 | 1.67           |
| 5   | Compressed on head                 | 1                 | 1.67           |
| 6   | Milled                             | 3                 | 4.84           |
| 7   | Crushed                            | 3                 | 4.84           |
| 8   | Burned                             | 3                 | 4.84           |
| 9   | Heated                             | 1                 | 1.67           |
| 10  | Edible                             | 2                 | 3.33           |
| 11  | Just left in the room              | 1                 | 1.67           |
| 12  | Smeared                            | 1                 | 1.67           |
| 13  | Squeezed                           | 1                 | 1.67           |
| 14  | Edible                             | 2                 | 3.33           |
| 15  | Made as herbal drinks              | 1                 | 1.67           |
| 16  | Chopped                            | 2                 | 3.33           |
| 17  | Added water                        | 1                 | 1.67           |
| 18  | Make dishes                        | 2                 | 3.33           |
|     | Total                              | 60                | 100.00         |

4. Conclusions
1. The ethnic community of Karo has local knowledge in utilizing medicinal plants. There are sixty species of medicinal plants used by a community of Karo in Semangat Gunung and Doulu Village. Lenga-lenga (Eupatorium odoratum L.) and Sitengkua are the most used as an external medicine.
2. Parts of medicinal plants used by the community are leaves (dominantly), root, flowers, plant bark, stem, and tubers.

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