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POTENTIAL MEDICINAL PLANT SPECIES FOR FEVER USED BY MINANGKABAU ETHNIC AT NAGARI TARUANG-TARUANG, WEST SUMATRA, INDONESIA

SPESIES TANAMAN OBAT BERPOTENSI UNTUK PENYEMBUHAN DEMAM PADA ETNIS MINANGKABAU DI NAGARI TARUANG-TARUANG, SUMATRA BARAT, INDONESIA

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Abstract

Fever is a symptom of illness that is commonly found in the Minangkabau ethnic community. This way, the Minangkabau ethnic community has local knowledge of utilizing plants to cure fever. The purpose of this study was to obtain species of plants used by the Minangkabau ethnic community in the treatment of diseases with symptoms of fever, as well as their potential as modern medicinal ingredients. The research method was carried out by using the open, semi-structural, and participatory observation techniques. Interviews were conducted with 9 key informants selected by purposive sampling and 126 respondents selected by snowball sampling. Data were analyzed qualitatively with descriptive statistic and quantitatively by calculating the Cultural Significance Index (CSI) and fidelity value. The medicinal plants used were 40 species from 22 families. The most used families were *Euphorbiaceae* (5 species), *Musaceae*, and *Poaceae* (each of 4 species), and *Rubiaceae* (3 species). *Cocos nucifera* had the highest CSI value, indicating the species was widely used in Minangkabau community. Based on the value of fidelity, 70% value was obtained by 4 plants to treat fever, namely *Costus speciosus*, *Kalanchoe pinnata*, *Sacciolepeis interrupta*, and *Enhydra fluctuans*. The four plants have the potential to be further developed into modern medicinal ingredients.

Keywords: Ethnomedicine; Fever; Infection; Medicinal plants; Minangkabau

Abstrak

Demam merupakan gejala sakit yang umum ditemukan pada masyarakat etnis Minangkabau. Masyarakat etnis Minangkabau memiliki pengetahuan lokal dalam memanfaatkan tumbuhan untuk penyembuhan demam. Tujuan penelitian ini adalah untuk memperoleh jenis tumbuhan yang digunakan oleh masyarakat etnis Minangkabau dalam pengobatan penyakit dengan gejala demam, serta potensinya sebagai bahan obat modern. Metode penelitian dilakukan dengan teknik wawancara terbuka, semistruktural dan observasi partisipasif. Wawancara dilakukan pada 9 orang informan kunci yang dipilih secara purposive sampling dan 126 orang responden yang dipilih menggunakan snowball sampling. Data dianalisis secara statistika deskriptif dan kuantitatif dengan menghitung nilai kultural (Index of Cultural Significance) dan nilai Fidelitas. Tumbuhan yang obat yang dimanfaatkan sebanyak 40 jenis yang berasal dari 22 suku. Famili terbanyak yang dimanfaatkan yaitu Euphorbiaceae (5 jenis), Poaceae dan Musaceae (masing masing 4 jenis), dan Rubiaceae (3 jenis). Cocos nucifera merupakan tumbuhan obat dengan nilai kultural (CSI) tertinggi. Berdasarkan nilai fidelitas terdapat 4 tanaman yang memiliki nilai 70% dalam penyembuhan demam, yaitu Costus speciosus, Kalanchoe pinnata, Sacciolepeis interrupta, dan Enhydra fluctuans. Keempat tanaman tersebut memiliki potensi untuk dikembangkan menjadi bahan obat modern.

***Keywords**: Etnomedisin; Demam; Infeksi; Minangkabau; Tumbuhan obat*

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INTRODUCTION

Local people have different knowledge of utilizing plants in their environment. The local knowledge of ethnicity gives rise to diversity in the use of plants, including as medicinal plants. Medicinal plants are known to have efficacy in health maintenance, disease treatment and contain active ingredients which have the potential to become modern medicinal ingredients (FitzGerald et al., 2020). There are 10,000 plant species found in Sumatra (Susiarti et al., 2008), and around 7,500 species have been used as medicinal plants.

The Minangkabau people who live in West Sumatra are known as an ethnic that is rich in knowledge of food and spice plants. However, their knowledge of the use of medicinal plants for traditional medicine has not been explored in depth. Research data on the use of plants in the island of Sumatra is still not comprehensive and is only clustered in a few locations. In the northern part of the island of Sumatra, study has been carried out on the Toba Batak ethnic (Simbolon, 1994), the Sakai ethnic, Riau (Wulandari et al., 2014), the Batak sub-ethnic (Silalahi et al., 2018), and the Karo (Purba et al., 2016), while in the southern part, research has been conducted on the ethnic of Rejang (Kasrina et al., 2021), Kubu (Setyowati & Wardah, 2007; Hariyadi & Ticktin, 2012), and Kerinci (Azzikri et al., 2020). The Minangkabau ethnic in the western part of the island of Sumatra seems to be missed in term of data collection, so this research is expected to complement the research data on the use of plants on the island of Sumatra. Research data regarding the use of medicinal plants by the Minangkabau ethnic group is still limited. However, research related to ethnomedicine in the Minangkabau ethnic group has been carried out in the village of Simanau area (Arifin et al., 2018) besides the study on medicinal plants for postpartum health care (Silalahi et al., 2020).

Knowledge about medicinal plant utilization is obtained from experience or inherited from close family over generations (Emmanuel, 2012). The knowledge shared in a limited circle raises concern about the unwitting loss of information. In addition, the process of verbally transferring knowledge within the Minangkabau ethnic community, known as 'bakaba', has a weakness because the information conveyed is incomplete. It would be very unfortunate if the information on the knowledge about the use of medicinal plants just disappeared from the midst of society. In connection with this, it is necessary to conduct research to reveal and document local knowledge of medicinal plants in Minangkabau ethnic.

Fever is one of the common diseases in developing countries (Ogoina, 2011), including in the Minangkabau ethnic group. Fever generally occurs as a reaction of the immune system against virus, bacterial, fungal, or parasitic infections that cause disease. Some of the diseases frequently cause fever were flu, sore throat, and urinary tract infections. Fever can happen to anyone, from infants and children to adults. It generally develops due to infection with microorganisms. Fever causes an increase in temperature following the action of thermoregulatory pyrogens on the hypothalamus. Exogenous pyrogens released by microorganisms act directly on the Organum Vasculosum Laminae Terminalis (OVLT) of the anterior hypothalamus, which response with an increase in temperature (Walter et al., 2016).

The global COVID-19 pandemic that has lasted for 2 years has prompted the search for new therapies that is capable of fighting a fever and the causative agents of fever. The search for drugs derived from plants is considered a rational approach. Information on the latest development of synthetic alkaloid derivative from plants shows that it has strong inhibitory effects against COVID-19 (Jahan & Onay 2020). This study aims to obtain species of plants used by the Minangkabau ethnic community in the treatment of diseases with symptoms of fever, as well as their potential as modern medicinal ingredients. Documentation of plants and their use provides a database for future phytochemical studies.

MATERIALS AND METHODS

Study Area

Nagari Taruang-Taruang is located at coordinates 0°46'31.116"–100°46'7.719". The distance between Nagari Taruang-Taruang and the capital of Solok Regency is about 44 km or 80 km from

Padang (capital of West Sumatra Province). The village covers an area of 5,200 ha consisting of 4 jorongs, namely Jorong Balai Okak, Jorong Pankua Kaciak, Jorong Sawah Baruah, and Jorong Sawah Jantan where most of population works as farmers. The location represents the Minangkabau ethnic group in West Sumatra.

Method of Collecting Data

To obtain data on local knowledge and diversity of medicinal plants in the Minangkabau ethnic group, open and semi-structural interview techniques and observation of participation in community activities were carried out (Montagne, 1997). Interviews were conducted to explore local knowledge of the community in the use of medicinal plants. Sources of knowledge obtained from key informants and respondents. The selection of key informants by purposive sampling is based on the wealth of knowledge and experience in using medicinal plants (Silalahi et al., 2020). The information was collected between December 2018 and February 2019. There were 9 key informants consisted of Wali Nagari, Panghulu (traditional elder), and village shamans. Open interviews were conducted with key informants, and data on respondents were obtained based on the recommendations of the key informants. The research respondents were 127 people in total, selected using the snowball sampling method. Interviews with the respondents were conducted in a semi-structured manner, beginning with explaining the aims and objectives of the study to seek their consent and cooperation before collecting ethnobotanical data. Interviews were conducted using the Minangkabau language, the local language. At the first stage of the interview, we collected data on common diseases in communities. Later, we asked about the kinds of plants or ingredients derived from several plants commonly used to cure the diseases.

Plant Collection and Identification

Documentation was done for unrecognized plants. Unrecognized plant species were sampled for further identification. Accompanied by key informants, specimens from natural vegetation, such as rice fields, fields, forests, and people's house yards, were also collected. Identification of evidence specimens was carried out at the Research Institute for Spices and Medicinal Plants (BALITRO) Laing, Solok, Laboratory of Plant Taxonomy, Faculty of Mathematics CSI and Natural Sciences, Universitas Indonesia and Herbarium Bogoriense, Institute of Sciences (LIPI) Cibinong. Scientific names were verified using the Plantlist Database (www.theplantlist.org.)

Data Analysis

Data of interview with the community were analyzed qualitatively with descriptive statistics and quantitatively by calculating the fidelity value and Cultural Significance Index (CSI). The fidelity value was determined using the formula from Friedman et al. (1986) *in* Hoffman and Gallaher (2007). High fidelity values obtained by plant species interpret the use of these plants as very important for the community for certain purposes. The formula for calculating the fidelity value is as follows $\mathrm{FL}(\%) = \frac{\mathrm{Np}}{\mathrm{N}} \times 100\%$.

With description, FL= fidelity value of plant species, Np= number of informants who mention the use of a plant species for certain uses and N= total number of informants who mention the use of a plant species for many uses. The calculation of cultural value is done by computing the importance value of a plant species using the formula developed by Turner (1988) $\mathrm{CSI} = \sum_{i=1}^{n} (\mathrm{q} \times \mathrm{i} \times \mathrm{e})_{\mathrm{ni}}$. The CSI value is the total use value of a plant species with usage starting from 1 ton, where n indicates the last use of a plant species. For any given use, q= quality value, i= intensity value, and e= exclusivity value.

RESULTS

Diversity of Medicinal Plants for the Treatment of Fever

The Minangkabau ethnic mentions their area "*alam* Minangkabau" which is defined as the territorial unit and the existing socio-cultural system within them. Interaction of the Minangkabau community with nature adds to the wealth of knowledge about the use of plants. The Minangkabau

ethnic group recognizes fever as a common ailment. In their knowledge, fever is divided into three groups, namely “damam paneh” which is characterized by an increased body temperature, “damam dek takajuik” when fever caused by disturbances by spirits, and “damam katumbuahan” fever which is a fever that is a sign of getting measles. Minangkabau ethnic community also recognizes fever which is a symptom of malaria and symptoms due to infection in the body.

The Minangkabau ethnic community in Nagari Taruang-Taruang, District IX Koto Sungai Lasi, District IX recognized 40 species of medicinal plants in the treatment of fever (Table 1). The medicinal plants were frequently reported to have multiple uses, for example, one plant may be used for two or more fever symptom or other ailments.

The Minangkabau people were observed to treat fever by using individual plants or using several plants in the convocation, such as "Ureh nan ampek” concovation, consists of “Sitawa” (*Costus speciosus*), “Sidingin” (*Kalanchoe pinnata*), “Sikumpai” (*Sacciolepeis interrupta*), and “Cikarau” (*Enhydra fluctuans*). The most used families were *Euphorbiaceae* (5 species), *Musaceae* and *Poaceae* (each of 4 species), and *Rubiaceae* (3 species) (Figure 1).

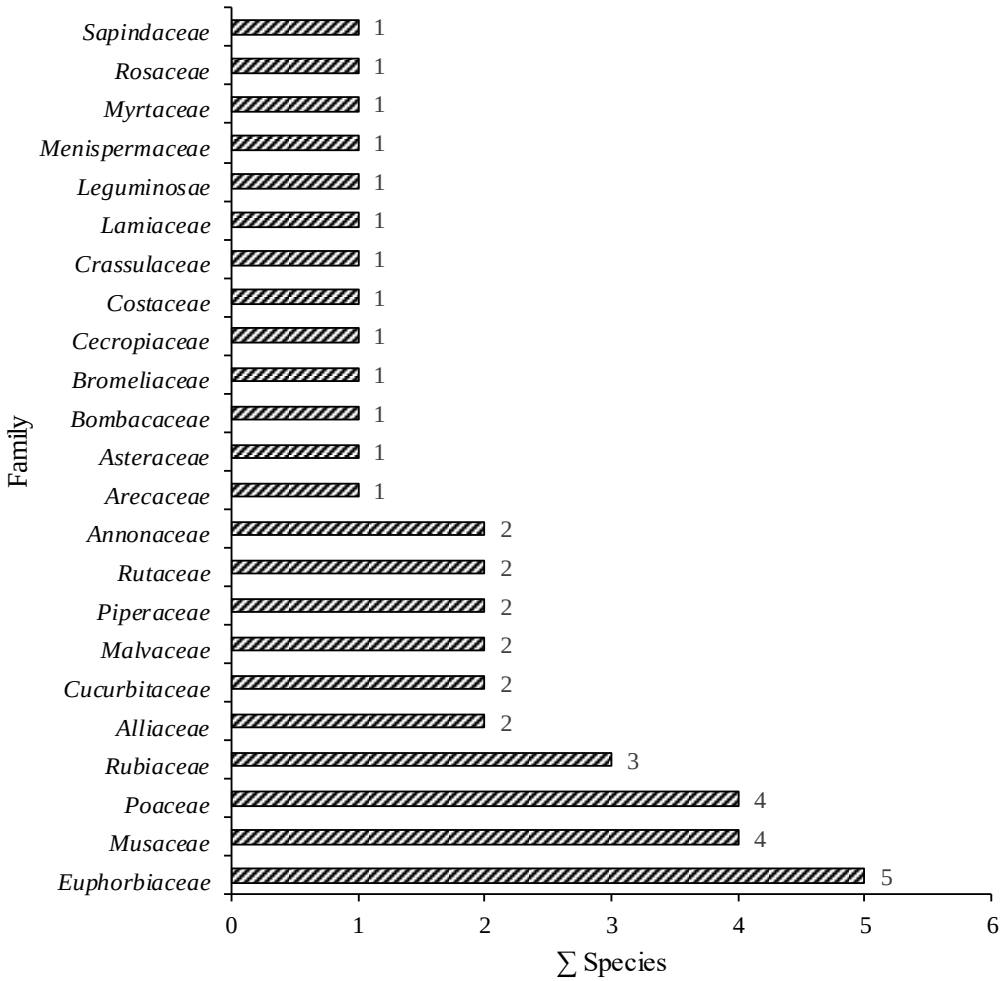

Figure 1. The number of species from each family used to treat fever in the Minangkabau ethnic in Nagari Taruang-Taruang

In terms of regional status according to the Solok Regency Government, insufficient and lack of health facility was still found in Nagari Taruang-Taruang, hence people will search for medicine only in the emergency condition. They used plants as first aid in the treatment of fever. In addition, judging from the name of the Nagari Taruang-Taruang which means “space", similar to the pattern of scattered community settlements. The people of the Nagari Taruang-Taruang usually build houses near their respective “parak” (fields), creating strong relationship with nature while enriching the traditional knowledge in utilization of medicinal plants.

Table 1. List of plants used as fever medicine by the Minangkabau ethnic community

Family	Scientific name	Local name	Part of plant used	How to use	Single or convocation	CSI	Fidelity
Alliaceae	*Allium cepa* L.	Bawang merah	Tubers	Boil, drink	Single	49	32%
Alliaceae	*A. sativum* L.	Bawang putiah	Tubers	Boil, drink	Single	49	32%
Annonaceae	*Annona muricata* L	Durian cino	Leaves	Boil,drink	Single	17	9%
Arecaceae	*Cocos nucifera* L.	Karambia	Fruits	Fresh, drink	Single	72	62%
Asteraceae	*Enhydra fluctuans* Lour.	Cikarau	Leaves	Fresh, affixing	Convocation	13	70%
Bombacaceae	*Ceiba pentandra* (L.) Gaertn.	Kapuak	Leaves	Boil, drink	Single	14	17%
Bromeliaceae	*Ananas comosus* (L.) Merr.	Sangene	Barks	Boil, drink	Convocation	21	16%
Cecropiaceae	*Poikilospermum suavolens* (Blume) Merr.	Lundang	Leaves	Pounded drink	Single	9	16%
Costaceae	*Costus speciosus* (J. Koenig.) Sm.	Sitawa	Leaves	Fresh, affixing	Convocation	9	70%
Crassulaceae	*Kalanchoe pinnata* Pers.	Sidingin	Leaves	Fresh, affixing	Convocation	9	70%
Cucurbitaceae	*Benincasa hispida* Cogn.	Kundua batang	Fruits	Fresh, drink	Single	9	16%
Cucurbitaceae	*Sechium edule* (Jacq.) Sw.	Siam	Leaves	Fresh, affixing	Convocation	21	16%
Euphorbiaceae	*Aleurites moluccanus* (L.) Willd.	Dama	Bark,latex	Smeared on the tongue	Single	12	52%
Euphorbiaceae	*Bridelia monoica* Merr.	Kanidai	Leaves	Fresh, drink	Convocation	9	16%
Euphorbiaceae	*Flueggea virosa* (Roxb. Ex Willd.) Royle	Cimote	Leaves	Fresh, drink	Convocation	9	16%
Euphorbiaceae	*Jatropa curcas* L.	Jarak	Leaves	Fresh, affixing	Single	9	70%
Euphorbiaceae	*Phylanthus niruri* L.	Dukuang anak	Leaves	Boil, drink	Convocation	6	16%
Lamiaceae	*Ocimum sanctum* L.	Ruku-ruku	Leaves	Fresh, affixing	Single	41	16%
Leguminosae	*Phaseoulus lunatus* Haberle.	Kacang 7 helai daun	Leaves	Pounded drink	Single	9	36%
Malvaceae	*Abelmoschus manihot* (L.) Medik	Bintang-bintang	Leaves	Pounded drink	Single	9	29%
Malvaceae	*Hibiscus rosa-sinensis* L.	Bungo rayo	Leaves	Fresh, drink	Single	9	32%
Menispermaceae	*Cyclea barbata* Miers.	Kalimpanang	Leaves	Pounded drink	Single	9	16%
Musaceae	*Musa balbisiana* Colla.	Pisang batu	Leaves	Fresh, affixing	Convocation	17	16%
Musaceae	*M. paradisiaca* L. 'Pisang kalek'	Pisang kalek	Leaves	Fresh, affixing	Convocation	9	16%
Musaceae	*M. paradisiaca* L. 'Pisang kumbali'	Pisang kumbali	Leaves	Fresh, affixing	Convocation	9	16%
Musaceae	*M. paradisiaca* L. 'Pisang lidi'	Pisang lidi	Leaves	Fresh, affixing	Convocation	9	16%
Myrtaceae	*Eugenia aromatica* Kuntze	Cengkeh	Fruits	Pounded, affixing	Convocation	21	21%
Piperaceae	*Piper betle* L.	Siriah	Leaves	Boil, drink	Single	21	21%
Piperaceae	*P. sarmentosum* Roxb.	Siriah kaduak	Leaves	Boil, drink	Convocation	6	12%
Poaceae	*Coix lacryma-jobi* L.	Anjalai, Batiah-	Leaves	Boil, bathing	Convocation	9	14%

Family	Scientific name	Local name	Part of plant used	How to use	Single or convocation	CSI	Fidelity
		batiah					
Poaceae	*Eleusine indica* Gaertn.	Rumpuik saruik	Leaves	Boil, bathing	Convocation	9	19%
Poaceae	*Saccharum officinarum* L.	Tabu udang	Roots	Pounded, drink	Single	9	40%
Poaceae	*Sacciolepeis interrupta* Stapf	Sikumpai	Leaves	Fresh, affixing	Convocation	9	70%
Rosaceae	*Rubus moluccanus* L.	Pancarinek	Leaves	Fresh, drink	Convocation	9	16%
Rubiaceae	*Gardenia augusta* Merr.	Kacang piriang	Leaves	Fresh, drink	Single	9	21%
Rubiaceae	*Timonius* sp.	Mingkaso	Leaves	Boil, drink	Convocation	6	10%
Rubiaceae	*Uncaria gambir* (W. Hunter) Roxb.	Gambia	Leaves	Pounded, affixing to head	Single	25	17%
Rutaceae	*Citrus histryx* DC.	Limau puruik	Leaves	Boil, drink	Convocation	13	16%
Rutaceae	*Clausena excavata* Burm.f.	Sicerek	Leaves	Boil, drink	Convocation	9	13%
Sapindaceae	*Nephelium lappaceum* L.	Rambutan, Rangguang	Leaves	Pounded drink	Single	17	14%

Most of the Minangkabau ethnic community in Nagari Taruang-Taruang mention the parts used in naming medicinal plants. The naming makes it easier to remember the useful parts of the plant as medicine. For the example, people in Nagari Taruang-Taruang mention the name of plant: "Aka kalimpanang" (*Cyclea barbata*) just because they use the root of the "Aka kalimpanang" plant as medicine for headache and fever. "Aka" in Minangkabau language means root.

In facilitating interaction with plants, the Minangkabau ethnic community in Nagari Taruang-Taruang names plant parts. People call "aka" for the roots of creeping plants, "urek" for roots in the ground, "pungko" for the part of the stem that is close to the ground, "umbuik" for the part of the stem that has just sprouted and juvenile, "kulik" for the bark and fruit skin, "pucuak" for young leaves, and "putiak" for young fruit. In addition, certain plant parts are given special names, such as the rhizomes on *Curcuma domestica* called "ampu".

The Minangkabau ethnic community in Nagari Taruang-Taruang was found to utilize various plant parts such as roots, rhizomes, tubers, stems, shoots, leaves, flowers, fruits, and seeds (Figure 2). This shows that people have knowledge about the efficacy of each plant organ. For example, the barks and latex of *Aleurites moluccanus* were used to treat fever. The most widely used parts of plants as medicine were leaves (80%, 32 species), while the least used were roots (2,5%, 1 species).

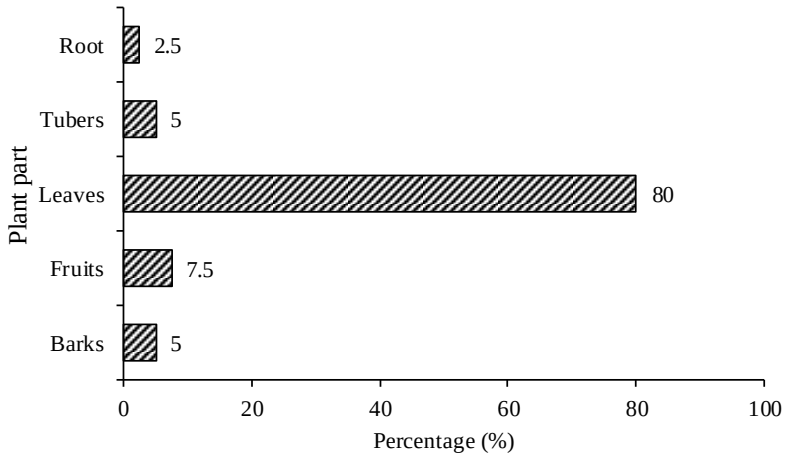

Figure 2. Percentages of plant part used to treat fever in the Minangkabau ethnic in Nagari Taruang-Taruang

The use of medicinal plants in society varies depending on the type of disease. People who treat medicinal plants in different ways will produce different effects and efficacy in treating diseases. The most widely used medicinal plant processing method was affixing fresh plant part to the sick parts of the body (Figure 3). The boiled water will be drunk or used to rinse the body.

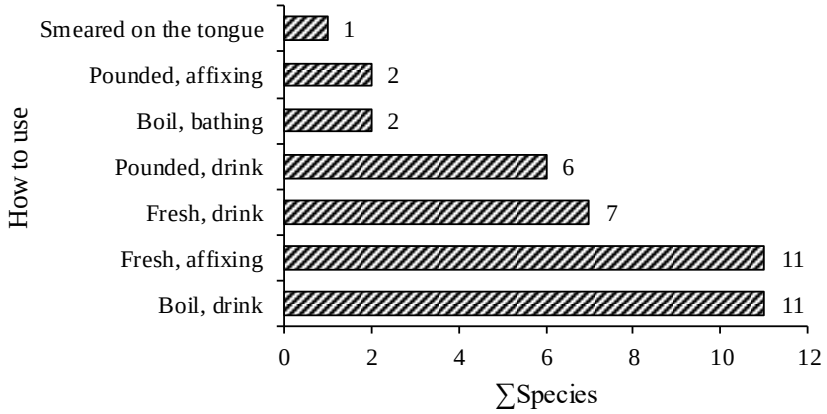

Figure 3. Modes of preparation and uses of medicinal plants to treat fever in the Minangkabau ethnic in Nagari Taruang-Taruang

The Minangkabau ethnic community in Nagari Taruang-Taruang was observed to categorize the treatment of fever through: external and internal medicine, that is by attaching useful organ

plants to the head or body (external treatment) and by drinking or eating fresh or processed plants (internal medicine). People who treat medicinal plants in different ways will produce different effects and efficacy in treating diseases.

Boiling is one of modes of preparation and uses of medicinal plants for fever. Boiling is believed by the Minangkabau people to accelerate the medicinal properties contained in medicinal plants to react and be utilized by the body. Plants that have been boiled will be consumed as drink. The results of the decoction of the plant are believed to help reduce heat which is a sign of fever.

Medicinal plants can be processed singly or in combination with other plants or ingredients such as sugar, eggs and honey. The species used in its singular form, for example, is *Phaseolus lunatus,* while for processing in mixed form with other plants, for example, mixture of leaves of *C. speciosus, K. pinnata, S. interrupta, E. fluctuans,* and *Musa balbisiana* soaked in the water, then the soaking water is applied to the entire body starting from the head, right, and then left body.

In contrast to modern medicine which has precise dosage, medicinal plants used by the Minangkabau ethnic in Nagari Taruang-Taruang were found to have no exact dosage. The dose agreed by the Minangkabau community in using medicinal plants described in estimates, such as a handful or the size of one finger. For example, the dose of *Hibiscus rosa-sinensis* for internal fever is a handful of *H. rosa-sinensis* leaves squeezed with a glass of water. The dose used is also based on the condition of the disease and the age of the patient.

Fidelity Value of the Plants

The fidelity value is used to determine the most preferred species of medicinal plant for certain uses. To say, plants widely used by local communities will have a higher fidelity value compared to those less used. The fidelity value shows the percentage number of informants who utilize a plant species for the same main purpose. Based on the results in the field, plants with the highest fidelity value (70%) included *C. speciosus, K. pinnata, S. interrupta,* and *E. fluctuans* followed by *Cocos nucifera* (62%) and *Jatropa curcas* (52%). Plants with high fidelity value are plants frequently referred by the Minangkabau ethnic community to treating a fever. Some of these plants are plants easily found in the yard, hence they are selected as the first choice when people are suffering from fever.

Cultural Significance Index (CSI) of the Plants

Cultural value (CSI) shows the importance of a medicinal plant in the life of a community group. The assessment is influenced by the quality, intensity, and exclusivity of a medicinal plant species. The cultural value (CSI) of medicinal plants for treating skin diseases is classified as very low (<2), low (3–25), moderate (26–48), high (49–100), and very high (>100). Based on calculation, 3 species obtained high CSI value, 1 species had moderate value, and 36 species got low CSI value.

Out of 40 plant species identified according to CSI values, *Co. nucifera* was found to be the most important species in Minangkabau ethnic for its widely utilize in daily life. The fruit of *C. nucifera* is medicine for headache. The young coconut water is used for drink, cure the internal fever, chapped lips, coughs, fever, measles, and skin ailments. They also used the skin of the *C. nucifera* fruit called “tampuruang” for postnatal care, besides as a hair care. The mid-rib of *C. nucifera* is used as a medicine for bleeding during pregnancy and used as ingredients for shortness of breath, rheumatism and gout. Apart from being used as medicine, *C. nucifera* is also used as food and in traditional rituals. The coconut milk from the fruit of *C. nucifera* is used by the community as the main ingredient in making various types of Minangkabau traditional cuisine.

DISCUSSION

The ethnomedicine knowledge possessed by the Minangkabau ethnic community shows the closeness of community interactions with nature. The ethnomedicine knowledge of the Minangkabau ethnic community is reflected in the community's ability to recognize and utilize various plant organs for medicinal purposes. The Minangkabau perception of illness is influenced by the environment. They believe in the relationship between nature and the communities and they

share similar perceptions and conceptions. Traditional communities that constantly interact with the surrounding environment tends to have deep local knowledge related to the surrounding resources (Brondízio et al., 2021).

In Minangkabau ethnic, the most common forms of fever are cause of the entry of pathogens into the body, dengue fever, and malaria. The true function of fever in disease recovery is unknown, it is conceived that fever is part of an infection-fighting mechanism wherein the host's core body temperature increases to the point that stresses the pathogenic microbe (Alexandria et al., 2016). Although fever is not considered life-threatening, it creates enough discomfort to become a barrier to normal activities in society.

In the treatment of fever, the utilization of plants is a culture inherent in Minangkabau society. The plants with the highest fidelity value (70%) included *C. speciosus, K. pinnata, S. interrupta,* and *E. fluctuans* followed by *Co. nucifera* (62%), and *J. curcas* (52%). The fidelity value shows the percentage number of informants in utilizing a plant species for the same main purpose. Some of these plants are used together for their benefits. The medicinal plants recognized in this study were also reported to be used by other ethnic groups such as *C. speciosus* and *E. fluctuans* by the Serampas community (Hariyadi & Ticktin, 2012); *K. pinnata* in the Sakai community (Wulandari et al., 2014); and *Ceiba petandra* by the people in Candi Muaro Jambi area for the same medicinal purpose (Susanti et al., 2020).

Treatments that debilitate or treat fever are mechanically diverse. Some treatments target the pathogen while others target the symptoms. Alternatively, some therapies target the fever itself via inhibition of the release of the specific pyrogens that communicate with the hypothalamus to bring about elevated body temperature (Phumthum & Sadgrove, 2020). Based on literature studies, several common plants used as fever ingredients contain chemical compounds that act as antioxidants and anti-inflammatory. For example, *Ce. pentandra* extract that is reported to contain antioxidant and free radical activity. This finding reinforces and increases the interest and potential use of medicinal plants as a nutraceutical and pharmacological agent (Loganayaki et al., 2013). The extract of *E. fluctuans* has been reported to be pharmacologically active against cytoprotective, analgesic and anti-inflammatory, antimicrobial, thrombolytic, anti-oxidant, phagocytic and cytotoxic, and has neuroprotective potential activities (Barua et al., 2020).

In Minangkabau language, they call a bunch of plant used for special purpose as "ureh". "Ureh" is the most cited convocation in the treatment of fever which consists of 4 plants: *C. speciosus, K. pinnata, S. interrupta,* and *E. fluctuans.* The use of this plants is mostly without the presence of a shaman. The same species has been documented in Hariyadi and Ticktin (2012) in Serampas ethnic. The Minangkabau ethnic in Nagari Taruang-Taruang admits that the convocation makes their body temperature return to normal and recovered. The species of *C. specious* is reported to have antioxidant activity. Antioxidant activity derived from plants such as tannins, lignans, stilbenes, cou-marin, quinones, xanthones, phenolic acids, flavones, flavonols, catechins, anthocyanins, and proanthocyanins can delay or provide protection for living organisms from damage caused by uncontrolled ROS and lipid peroxidation simultaneously, protein breakdown, and DNA strand breaks (Pawar & Pawar, 2014).

Flavonoid compounds are able to reduce compounds that inhibit oxidation reactions since flavonoids can transfer an electron to free radical compounds. Antioxidants are reductant compounds with small molecular weight but have the ability to inactivate the development of oxidation reactions, by binding free radicals and highly reactive molecules so that cell damage can be inhibited (Rice-Evans et al., 1997). Medications that attenuate or treat fever mechanically vary. For example, aspirin from *Salix* sp. could inhibit and reduce the levels of PGE(2) in the hypothalamus (Aronoff & Neilson, 2001).

According to the community, each plant organ has properties for the treatment of certain diseases. Leaf is more frequently used compared to other plant parts because the leaves are easier to obtain, easy to process, do not damage plants, and can grow back (Pitopang & Ramawangsa, 2016). The high utilization of leaves was also found in the Maybrat tribe (Howay et al., 2003), Dayak Iban (Meliki et al., 2013), and the Seko tribe, Central Sulawesi (Pitopang & Ramawangsa, 2016). The

high use of leaves in the Minangkabau ethnic community shows the local wisdom of sustainable plant use.

In some plant species, people distinguish leaves as old leaves and leaf shoots (young leaves). According to Minangkabau society, old leaves contain a lot of *sagun* (medicinal substances) compared to young leaves. They prefer using young leaves for treatment by boiling and drinking. As for external utilize such as for bathing or pounding, they choose the older leaves.

Minangkabau people in Nagari Taruang-Taruang believe that processing medicinal plants in different ways produces different effects and efficacy in treating diseases. The most common method of processing medicinal plants is boiling and drinking (11 species) and affixing the fresh organs directly to the head, chest, stomach, and armpits (11 species). Processing by boiling makes the active compounds in plants such as flavonoids soluble in water, thus it is easier for the body to digest (Ioku et al., 2001). Processing by boiling is not always effective for all plant species because it can cause damage to certain compounds contained in plants. According to the community, they prefer to soak part of plants that have bitter taste in warm water rather than boiling it since the bitter substance due to the boiling process will make the potion too bitter to drink (Gunathilake, 2018). Based on the literature, bitter taste is caused by the content of alkaloids, terpenoids, and saponins (Roth & Lindorf, 2002).

The Minangkabau people agree on the dosage in using medicinal plants in estimates, such as a handful or the size of one finger. For example, the dose of *Hibiscus rosa-sinensis* for fever is a handful of *H. rosa-sinensis* leaves squeezed with a glass of water. The dose used is also based on the condition of the disease and the age of the patient. The same dose perception was also found in the local community in Konta, Ethiopia (Bekalo et al., 2009).

The CSI value indicates the importance of a medicinal plant in the life of ethnic. The assessment is influenced by the quality, intensity, and exclusivity of a medicinal plant species (Turner, 1988). Plants with high value of CSI means that plants are rich in benefits for the community, easy to find, and recognized. Based on CSI analysis, there were 3 species that had CSI values (>42, high); *C. nucifera*, *A. cepa*, and *A. sativum*, indicating that the species are important for the community in Minangkabau ethnic. The most useful plant that obtained the highest CSI value was *C. nucifera* since it has the wider benefits in medicine and cuisine. Furthermore, the intensity and exclusivity of *C. nucifera* utilization is also higher because this species is irreplaceable in Minangkabau traditional cuisine. Also, *C. nucifera* obtained the highest CSI value in Mandailing Tribe (Nasution et al., 2018). Because one species has other benefits, the CSI value cannot be used as a benchmark in determining medicinal plants that have the potential to cure fever.

CONCLUSION AND SUGGESTIONS

Minangkabau ethnic community still relies on medicinal plants to treat ailments. Therefore, surrounding plant resources are used to cure fever. Plants used traditionally are able to maintain health and recover from fever. Further investigation for the potential compound on several species consistently mentioned for curing fever, namely *C. speciosus, K. pinnata, S. interrupta*, and *E. fluctuans* is necessary. To conclude, several plants mostly mentioned by the Minangkabau people are recommended as plants with high potential to treat fever.

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