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by Marina Silalahi

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Original Article

Gastronomic ethnobiology of "*terites*"—a traditional Batak Karo medicinal food: A ruminant's stomach content as a human food resource

Endang C. Purba [a,*], Marina Silalahi [b], Nisyawati [a]

[a] Universitas Indonesia, Departemen Biologi, Depok, West Java, Indonesia
[b] Universitas Kristen Indonesia, Fakultas Keguruan dan Ilmu Pendidikan, Departemen Biologi, Jakarta, Indonesia

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ABSTRACT

Background: *Terites* is a traditional food of Batak Karo ethnic group, which is cooked with a juice of partly digested food (chyme) of slaughtered cattle. The stomach juice serves as a soup base, cooked together with certain wild and cultivated vegetables, aromatic herbs and possibly also meat. The objectives of this ethnobiological study were to describe *terites* preparation, document plant species used and to discuss possible implications for the human nutrition.
Methods: The data were gathered through individual interviews and group discussions with informants from 6 villages in Karo regency of North Sumatra. The plant specimens were collected in the field and identified taxonomically.
Results: A total of 29 plant species belonging to 17 families were used to prepare *terites*. The main rationale behind consuming this indigenous food was its perceived medicinal value, particularly for the treatment of digestive disorders. Karo people use several lesser-known wild food plants for preparation of this local specialty. To best of our knowledge, consumption of chyme in tropical Asia is so far unique solely to the Batak Karo people. The present ethnographic record of consuming chyme as a medicinal food is also discussed in the context of paleodietary reconstructions.
Conclusion: This extraordinary food heritage of Karo indigenous gastronomy, based on traditional knowledge, indicates rich foodscapes and bio-cultural diversity of the Batak Karo ethnic group.

1. Introduction

Most of modern medicines were discovered because it was known that certain plants were very effective to treat for particular ailments. Ethnobotanical study can serve as a platform for studying specific relationships between indigenous cultures and plants, thus identifying new chemical compounds used as drugs [1–4]. The traditional food and consumption of healthy and edible plants play an important role in supporting ethnobotany. Unfortunately, many of the traditional foods are approaching extinction even in developing countries such as Indonesia.

Local knowledge in Indonesia is quite extensive because of the considerable diversity of local cultures. Batak Karo is one of the ethnic groups who inhabit in *Taneh Karo* (Karo Land) in North Sumatra. According to the study by Harsono and Restuati [5], Batak Karo ethnic group has traditional food, *terites*, which is unique and only can be found in this area. The primary meaning of the word *terites* is the liquid of the partially digested grass from the rumen of ruminants. They add some different plants, spices, and meat into the *terites*. Nowadays, the young generations of Batak Karo prefer not to consume this local cuisine.

The Batak Karo people in North Sumatra are endowed with local knowledge about use of plants. They have many culinary specialties and use lot of plants and spices. Furthermore, they believe that all diseases can be cured with healthy food prepared from natural products that have medicinal properties. Unfortunately, most of them have not been documented very well. To initiate for not loosing it, the ethnobotanical study was conducted in the Batak Karo community. The aims of this study were to provide information about the process of *terites* preparation, document the plant species used, and discuss possible implications for the human nutrition and further research.

* Corresponding author.
E-mail address: endang.christine@yahoo.com (E.C. Purba).

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2. Materials and methods

2.1. Study area

The study was conducted in Semangat Gunung, Jaranguda, Merdeka, Cinta Rayat, Doulu and Lingga villages of Karo Regency in North Sumatra, Indonesia (Fig. 1). Batak Karo people who live in Semangat Gunung, Jaranguda, Merdeka, Cinta Rayat, and Doulu generally maintain a traditional medicine and have access to forests areas near to Mt. Sibayak. Meanwhile, Lingga is a cultural village that preserves some local knowledge of Batak Karo, e.g., food, medicinal plants, and traditional buildings. Geographically, these villages are situated about 1,162–1,453 m above sea level.

The Karo is one of the six Batak tribes with traditional homelands in the periequatorial highlands of North Sumatra, Indonesia [6] (Fig. 2). The majority of Batak Karo people are farmers, primarily cash crop and subsistence agriculturalists. They use traditional farming implements and water buffalo or cow for traction.

Batak Karo ethnic group is known as the group of people who have local knowledge about the use of plants. They believe that food and medicinal plants are of equal importance to prevent and treat disease. They use plants as pharmaceuticals and food and during ceremonials [6,7]. Various studies have been conducted to assess local knowledge about the use of plants by those ethnic groups such as the use of medicinal plants in the village Tongkoh, Karo [6] and in Kaban Tua, Karo [8].

2.2. Interviews and data collection

Information for this study was collected during April–June 2014 and August 2016 through questionnaires and semistructured and general conversations from the herbalists, village elders, and farmers. The interview was carried out with the help of 29 informants; Semangat Gunung (7), Jaranguda (3), Merdeka (2), Cinta Rayat (4), Doulu (4), and Lingga (9). The head of the village was used as a key informant who could provide information on how many people know about *terites*. The informants were chosen based on traditional ecological knowledge, professional activity, and age. Each informant was interviewed individually in Batak Karo language.

Informants were asked to provide a list of ingredients used to prepare *terites*. The local names of all the plants used, use of plants, plant parts used, and mode of preparation of *terites* were then collected under the guidance of whoever gave the information about the preparation of *terites*. The plants used included not only wild species but also cultivated plants that had been taken from the

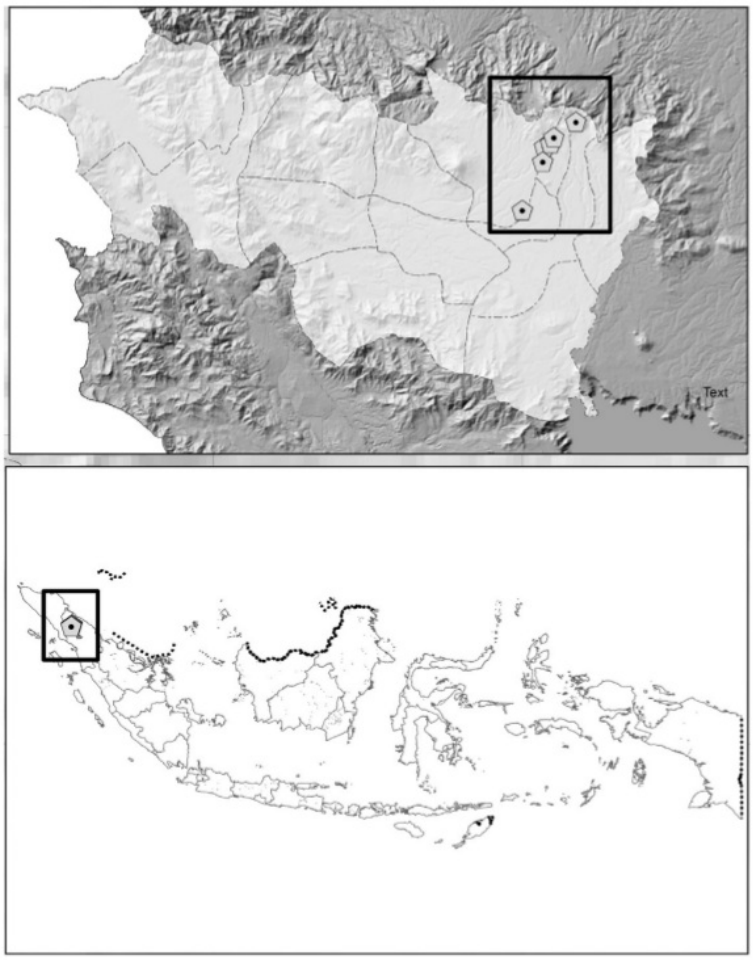

Fig. 1. The location of Karo Regency in North Sumatra, Indonesia. Karo's geography with mountainous area provides cool weather.

Fig. 2. Batak Karo people. Traditional food is an important part of Batak Karo culture. They usually treat others with meals to make new friends and enhance relationships.

forest and planted in gardens or agricultural fields. The specimens were identified and deposited at the herbarium of the Universitas Indonesia, Depok, Indonesia. Scientific names of the plants species were verified using The Plant List online source.

3. Results

3.1. Plant species used in terites soup

A total of 29 plant species were used to prepare *terites* which belong to 17 families and 26 genera (Table 1). Among them, 18 (62 %) were herbs, six (21 %) were shrubs, and five (17 %) were trees. The family Zingiberaceae had the highest proportion of herbs represented by five species, followed by Liliaceae with four, and Euphorbiaceae and Solanaceae, each with 3 (Fig. 3). Leaves are the most frequently used to prepare *terites* (Fig. 4). This adds up to about 34% of wild edible plant species. *Bischofia javanica* Blume was cited by 29 informants as an ingredient of *terites*, *Aleurites moluccanus* by 27 informants, and *Begonia laruei* by 22 informants in the same way. These and other most widely used wild edible plants are listed and described in Table 2.

3.2. Preparations and prescription

Terites actually refers to the juice of partially digested grass from the rumen of ruminants; the juice is then filtered using a clean cloth or sieve (Fig. 5). Batak Karo people use the filtrate as a stock to make traditional soup that is cooked with spices, herbs, and meat and served during cultural occasions. *Pagit-pagit* is another name for *terites*. "*Pagit*" means "bitter," which refers to the taste of *terites* soup.

Cooking *terites* involves pounding and grinding ingredients. Briefly, *terites* soup was prepared by grinding and filtering *Bischofia javanica* (bark); pounding *Etlingera elatior* (fruits), *Alpinia galanga* (rhizome), and *Cymbopogon citratus* (whole plant); chopping *Solanum lycopersicum* (fruits), *Begonia laruei* (leaves and stems), and *Medinilla speciosa* (leaves and stems); and grinding spices such as *Allium fistulosum* (leaves), *A. cepa* (bulbs), *A. sativum* (bulbs), *Capsicum annuum* (fruits), *Aleurites moluccanus* (fruit), *Curcuma domestica* (rhizome), *Zingiber* sp. (rhizome), and *Zingiber officinale* (rhizome). The stock that contains the filtrate of the rumens and water was cooked with beef or pork. The stock was cooked until the meat becomes tender. The juice of *Bischofia javanica* and pounded *Alpinia galanga* and *Cymbopogon citratus* were added to the stock until its color changed to light green. Then, *Citrus hystrix*, the fruit of *Etlingera elatior*, and whole spices are added and cooked until the stock gets spicy and piquant flavor. Furthermore, ground *Aleurites moluccanus*, *Begonia laruei*, flowers of *Etlingera elatior*, and *Manihot esculenta* were added and cooked until the leaves of *Manihot esculenta* were cooked well. At the end, *Cocos nucifera*, *Solanum lycopersicum*, *Allium fistulosum*, and salt were added and cooked well (Fig. 6). The fruit of *Cocos nucifera* provides coconut milk that is commonly called as *santan* in Indonesian language. It is generally used to get a savory taste in Minang cuisines such as *ketupat bareh* and *katan kapau* [9]. *Cocos nucifera* has a high cultural importance and high frequency of use and is irreplaceable with other species among the Sasak tribe, Lombok Island [10].

In some cases, the Batak Karo people add *Artabotrys suaveolens*, *Apium graveolens*, *Enhydra fluctuans*, *Allium tuberosum*, *Medinilla speciosa*, *Polygonum chinense*, *Zanthoxylum acanthopodium*, *Solanum torvum*, *Debregeasia longifolia*, and *Musa acuminata* to improve the acceptability of *terites* soup.

4. Discussions

Terites is a unique cuisine and belongs only to the Batak Karo culture (Fig. 7). *Terites* is served during cultural occasions such as weddings and harvest festivals. In special occasions, Batak Karo people have a cultural ceremony of slaughtering cows. It determines how big the occasions is; the more the cows, the bigger the occasion. Now, many Karo restaurants in Medan, Berastagi, and Kabanjahe serve *terites* soup in their menu. Batak Karo people believe that *terites* soup is good for humans, especially for elders, because it can treat gastritis and cold, act as an appetite enhancer, and lower cholesterol levels. According to a study carried out by Harsono and Restuati [5], *terites* was commonly used to treat gastritis, to support the availability of energy reserves in the human body, and to keep the body warm in low temperatures. Besides the Batak Karo people, in high latitude environments such as Arctic, where there is little edible vegetation for humans, Inuit people consume the chyme from seal, narwhal, walrus, and reindeer [11]. This potentially explains the reason why Batak Karo people, living in an area mainly consisting of mountains (Sinabung and Sibayak) and highlands, are familiar with chyme consumption [6,12].

The chyme consumption for humans has played a particular role in the diet of the young and the old [11]. The chyme from an herbivore with a specialized digestion system and microbiota capable of digesting chitin and cellulose, which humans cannot, could be the potential energy source because this provides additional benefits in enabling access to otherwise inedible plant species [11]. Ruminants evolved to digest grass; hence, the four stomachs were dedicated to the digestion of cellulose. Bacterial fermentation creates a high level of conjugated linoleic acid (fatty acid) [13–15].

Rumen fluid is an organic material that has been digested by rumen microbes; the cattle rumen fluid contains protein (10.56%), vitamin, ash (18.38%), Ca (1.34%), and P (0.32%), and the buffalo rumen fluid contains protein (7.97%), vitamin, ash (24.40%), Ca (0.67%), and P (0.63%) [16–18]. *Terites* soup contains protein (19.9%), fat (15.4%), and crude fiber (1.68%) [19]. The fat was considered to have come from the meat that was added to the soup. The *terites* stock that is obtained from the rumen fluid contains high

Table 1
Plant species used in the preparation of *terites*.

Scientific name	Plant life form	Habitat	Local name	Parts used	Number of informants	Villages
Annonaceae						
Artabotrys suaveolens (Blume) Blume	Shrub	W	Bidung-bidung	Leaves	4	Sg
Apiaceae						
Apium graveolens L.	Herb	C	Daun sop	Leaves	2	Do
Arecaceae						
Cocos nucifera L.	Tree	C	Tualah	Fruit	26	Li, Me, Sg, Ja, Cr, and Do
Asteraceae						
Enhydra fluctuans Lour	Herb	W	Kurmak ndekah	Leaves	5	Cr and Do
Begoniaceae						
Begonia laruei M. Hughes	Herb	W	Riang-riang	Leaves	22	Li, Me, Sg, Ja, and Do
Euphorbiaceae						
Manihot esculenta Crantz	Shrub	C	Gadung	Leaves	29	Li, Me, Sg, Ja, Cr, and Do
Aleurites moluccanus (L.) Willd.	Tree	W	Kembiri	Fruits	27	Li, Sg, Ja, Cr, and Do
Bischofia javanica Blume.	Tree	W	Cingkam	Barks	29	Li, Me, Sg, Ja, Cr, and Do
Liliaceae						
Allium fistulosum L.	Herb	C	Daun pere	Leaves	17	Li, Cr, and Do
Allium tuberosum Rottler ex Spreng	Herb	C	Gundera mbelang	Leaves	1	Do
Allium cepa L.	Herb	C	Pia	Bulbs	29	Li, Me, Sg, Ja, Cr, and Do
Allium sativum L.	Herb	C	Lasuna	Bulbs	29	Li, Me, Sg, Ja, Cr, and Do
Melastomataceae						
Medinilla speciosa Blume	Herb	W	Kambing-kambing	Leaves	11	Me, Sg, and Ja
Moraceae						
Ficus fistulosa Reinw	Tree	W	Ober	Leaves	1	Do
Musaceae						
Musa acuminata Colla	Herb	C	Galuh si uncim	Flowers	4	Sg
Myrtaceae						
Eugenia polyantha Barb. Rord.	Tree	W	Salam	Leaves	13	Li and Cr
Poaceae						
Cymbopogon citratus (DC.) Stapf	Herb	C	Sere	Leave	29	Li, Me, Sg, Ja, Cr, and Do
Polygonaceae						
Polygonum chinense Linn	Herb	W	Siang-siang	Leaves	10	Sg and Ja
Rutaceae						
Citrus hystrix DC.	Shrub	C	Rimo mungkur (purut)	Leaves	13	Li and Cr
Zanthoxylum acanthopodium DC	Shrub	C	Tuba	Fruits	1	Do
Solanaceae						
Solanum lycopersicum L.	Herb	C	Tomat	Fruits	29	Li, Me, Sg, Ja, Cr, and Do
Capsicum annuum L.	Herb	C	Cina	Fruits	29	Li, Me, Sg, Ja, Cr, and Do
Solanum torvum Sw	Shrub	C	Rimbang	Fruits	17	Me, Sg, Ja, Cr, and Do
Urticaceae						
Debregeasia longifolia (Burm.f.) Wedd	Shrub	W	Cepira	Leaves	5	Cr and Do
Zingiberaceae						
Etlingera elatior (Jack.) R.M.Sm.	Herb	C	Asam patikala/ Asam cekala/Kincung	Fruits and flowers	29	Li, Me, Sg, Ja, Cr, and Do
Alpinia galanga L. (Willd.)	Herb	C	Kelawas	Rhizomes	27	Li, Sg, Ja, Cr, and Do
Curcuma domestica Valeton	Herb	C	Kuning gersing	Rhizomes	23	Li, Sg, Ja, and Do
Kaempferia galanga L.	Herb	C	Kaciwer	Rhizomes	14	Sg, Ja, and Do
Zingiber sp.	Herb	C	Alia	Rhizomes	14	Sg, Ja, and Do

C, cultivated; Cr, Cinta Rayat; Do, Doulu; Ja, Jaranguda; Li, Lingga; Sg, Semangat Gunung; W, wild.

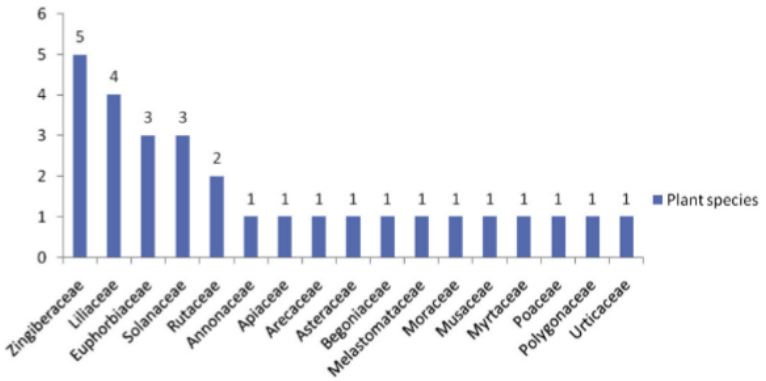

Fig. 3. Number of species and families used for preparing *terites*. Zingiberaceae contributed the highest number of species to the cuisine. It is consisted of five species.

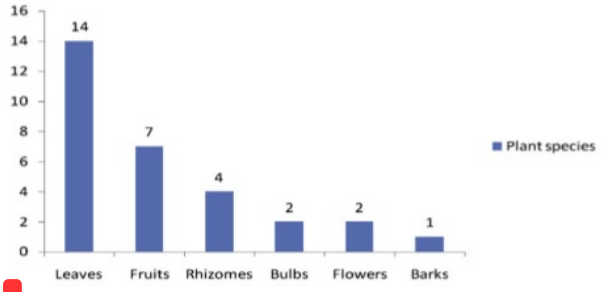

Fig. 4. Number of species and plant parts used for preparing *terites* soup. Leaves are more widely used than barks. The bark of *Bischofia javanica* is used not only as an ingredient of *terites* soup but also as a medicinal plant.

Table 2
Informant consensus on most commonly used wild edible plants.

Scientific name of wild edible plants	No. of informants	Percentage
Bischofia javanica Blume.	29	22.8
Aleurites moluccanus (L.) Willd.	27	21.3
Begonia laruei M. Hughes	22	17.3
Eugenia polyantha Barb. Rord.	13	10.2
Medinilla speciosa Blume	11	8.7
Polygonum Chinense Linn	10	7.9
Enhydra fluctuans Lour	5	3.9
Debregeasia longifolia (Burm.f.) Wedd.	5	3.9
Artabotrys suaveolens (Blume) Blume	4	3.1
Ficus fistulosa Reinw	1	0.8
		100

Fig. 5. Filtering the juice of partially digested grass from the rumen of ruminants. The filtered *terites* is used as a stock to prepare the *terites* soup. Water is added to the stock before cooking it.

Fig. 6. Cooking the *terites* soup. Meat, spices, and herbs are put into a pot to which coconut milk is added, and the whole thing is simmered until done.

Fig. 7. The *terites* soup. *Terites* is a Batak Karo soup. It is cooked using 29 herbs and meat. This soup is usually served with rice during a wedding or harvest festival. It is the favorite among the Batak Karo elders.

amounts of crude fiber. It is mixed with spices and vegetables which is good for the digestive system of the human body.

Traditions related to gathering and cooking food plants are very popular in the Karo area. Ten wild and 19 cultivated plants species were identified which Karo uses as ingredients of *terites* soup. The Karonese used to collect common food plants for cooking before returning home after spending the entire day working in the fields. Most of them are vegetables and spices such as *Apium graveolens, Manihot esculenta, Allium fistulosum, Cymbopogon citratus, Zanthoxylum acanthopodium, Solanum lycopersicum, Capsicum annuum, Etlingera elatior,* and *Curcuma domestica*. Generally, men collect a few wild plants from the woods located further from the village surrounding fields (*kerangen*). Today, some of the wild plants that are used as medicinal or food plants can be found in traditional markets in Karo Regency: these include *Begonia laruei Aleurites moluccanus, Bischofia javanica,* and *Eugenia polyantha.*

The Zingiberaceae is the most represented family in the ingredients of *terites*. It is well known as the most important source of medicinal plants in Karo [20] and Indonesia [8,21–23]. A large number of informants cited *Etlingera elatior*. It is native to Sumatra, Indonesia, and has been found in many places throughout Southeast Asia [24,25]. In Karo, *E. elatior* is locally known as *asam cekala* or *asam patikala* (fruit) and *kincung* (flower). Both are important spices in Karonese dishes including *arsik*. In Bali, the flower buds of the plant are used for chili sauce such as *sambal bongkot* and *sambal kecicang*. In Malaysia, they called it as *bunga kantan*, which is used as a spice in Malaysian dishes such as *laksa* and *nasi ulam* [26]. In Thailand, they eat the young shoots and flower buds as a vegetable [27]. *E. elatior* is also known to have medicinal uses in treating diseases. In Malaysia, fruits of *E. elatior* are used to treat earache; the leaves are used for cleaning wounds and during bathing to removing body odor [28,29]. Batak Simalungun people used the leaves and stems to cure cough and ulcer and the decoction to maintain health [7]. Batak Karo people used stems and leaves to prepare a decoction *tawar* that is used to cure weakness and have a steam bath by postpartum women [20,30]. Some results showed that flowers of *E. elatior* had high values of antimicrobial, antibacterial, antifungal, antioxidant, antibacterial [29], and anticancer [31] properties. Leaves have the highest level of antioxidants. It has great potential to be developed into natural preservatives that are applicable to be used in the food, and most are represented as nutraceuticals [29].

The Indonesian Food and Drug Administration has recommended in its traditional health maintenance program the following nine species of medicinal plants: (1) *Piper retrofractum*, (2) *Curcuma xanthorrhiza*, (3) *Curcuma domestica*, (4) *Guazuma ulmifolia*, (5) *Andrographis paniculata*, (6) *Zingiber officinale*, (7) *Morinda citrifolia*, (8) *Eugenia polyantha*, and (9) *Psidium guajava* [32]. Among the nine species, two species are used in the preparation of *terites*—*Curcuma domestica* and *Eugenia polyantha*. Indonesians use these species for various purposes, from cooking to medicine. *Curcuma domestica* is known to have medicinal uses in treating abdominal pain [33]. This species has been extensively studied and has demonstrated several pharmacological activities e.g., antibacterial, antifungal [34], and antioxidant [35] properties. Meanwhile, *Eugenia polyantha* has various ethnobotanical uses (in treating hypertension, gastritis, diarrhea, diabetes mellitus, and high cholesterol) [8].

A large number of informants cited *Bischofia javanica* (Table 2). Batak Karo people use this species to minimize the strong aroma of the rumen. Some studies have been conducted to evaluate its antiulcer, anthelmintic, antidysenterics [36], antiparasitic [37], antiinflammatory, antinociceptive [38], antileukemic [39], and antimicrobial [40] activities. These activities do not explain all the current uses for *terites*, so probably this species could have other pharmacological activities that are still unknown. The leaves and bark of *Bischofia javanica* are known to be rich in tannin, so it can be used as a food-coloring agent [41]. Fatty acid profile of *Bischofia javanica* seed oil indicates that it is an important source of omega-3 fatty acids and can be used as food supplement and for medicinal purposes in the future [30]. Some local people in Indonesia use *Bischofia javanica* to treat some diseases; for example, people in Lahat Regency, South Sumatra, used the leaves to treat diarrhea [42], and Batak Simalungun people of North Sumatra used the roots and barks to treat diarrhea, diabetes mellitus, gastritis, stomach ache, and injuries [7]. In India, local people use the stem bark of *Bischofia javanica* to cure nervous disorders, to stimulate hair growth [43], and to treat skin diseases [44].

Aleurites moluccanus (Euphorbiaceae) is also cited by a large number of informants. It is native to the Moluccas and widely found in Southeast Asia. It is commonly used in Indonesian dishes as curry pastes that are eaten with vegetables and rice and as a meat tenderizer. In Java, the bark is used to treat diarrhea and dysentery; meanwhile in Malaysia, the leaves are used to treat headaches, fevers, ulcers, gonorrhea, and joint inflammation [45]. The nuts of *Aleurites moluccanus* inhibit the growth of bacterial species associated with the onset of rheumatoid arthritis, ankylosing spondylitis, and rheumatic heart disease [46].

Both medicinal plants and foods are considered to have healthful properties, preventing disease by strengthening the body's defense system [47]. Several plants cited in this study are poorly investigated for their pharmacological activity or chemical profiles. Considering that many other plant species instead have already been researched to cure many diseases and health problems, we believe that these understudied plant species also could have interesting applications in pharmacology and as new food plants.

This study indicated that Batak Karo people in Karo Regency of North Sumatra have made efficient use of cow's stomach content within the indigenous food system. The local people perceive *terites*, an indigenous food, to be of high medicinal value, particularly because of the bitter flavor of the chyme and also because of the aromatic plants added to compensate the bitterness and unpleasant scent of the stomach fluid. In conjunction with the consumption of *terites*, the Batak Karo people still preserve traditional knowledge related to remarkable wild ingredients and processing of the chyme. The present study revealed a complex relationship between a human food culture and biodiversity of the surrounding environment. A detailed ethnobiological view on one complex cultural food showed importance of this approach by discovering several uncommon food plant species. Some of the species would be interesting to study for their nutritional content and pharmacological properties, e.g., *Bischofia javanica*. In (sub-)tropical Asia, the consumption of animal stomach content seems to be unique to Batak Karo people in Sumatra, which is particularly interesting, considering the evergreen tropical environment with abundance of natural resources. Noteworthy is also the fact that this practice has been associated with hunter-gatherers and pastoralists, whereas Karo people are farmers combining both crop production and animal husbandry. Therefore, this is the first record of consuming the stomach content of cows. The reason behind the consumption of chyme among Karo lies rather on the medicinal perception of the chyme. Considering the scientific discussion whether the early hominins were using bitter-tasting plants for self-medication or as a food resource (condiments, or as part of herbivore's stomach content), the contemporary use of chyme among Batak Karo people may indicate that stomach content could have been consumed by our ancestors as food that had medicinal properties as well.

Conflicts of interest

The authors have no conflicts of interest to disclose.

Acknowledgments

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jef.2018.06.002.

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