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Exploration of Medicinal Plants: *Tinuktuk* Concoction in Simalungunese, Indonesia

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Abstract
Plant species have been applied in the traditional treatment of certain diseases since ancient history. The purpose of this study is to explore the efficacy of medicinal plants, specifically *tinuktuk,* in Simalungunese, North Sumatra, Indonesia. This effort shows the potentials of local knowledge in preparing herbal mixtures, based on geographical existence. The sample concoction was analyzed qualitatively for its health properties, using a pragmatic approach. Subsequent data were obtained from focus group discussions and field demonstrations to determine the plant types, processing mechanisms and efficacy. The results showed that the leaves, stems, fruits, seeds, tubers, and rhizomes of 18 herbal plant varieties were utilized, alongside the evaluation of 8 medicinal properties. Among the species, *Zingiberaceae, Arecaceae,* and *Euphorbiaceae* belonged to genera, while *Areacaceae, Poaceae, Rutaceae,* and *Zingiberaceae* families were predominantly applied. Therefore, the efficacy determination of *tinuktuk* concoction appears significant in terms of facilitating lactation during childbirth and subsequently eliminating the unclean blood, enhancing immunity, maintaining stamina and increasing the appetite. In summary, the sample is suitable as a herbal medicine and a product of local knowledge in the treating various ailments across generations.

Keywords: Simalungunese, *Tinuktuk*, Healing, Spice

1. Introduction

This research was motivated by the local use of ethnobotanical spices to prepare *tinuktuk* concoction as a herbal treatment alternative in Simalungunese, North Sumatra province, Indonesia. Based on empirical experience, certain ethnomedicine and ethnopharmacology concerns were considered, including the available raw materials dependent on the geographical environment, plant parts, specie compositions, mechanisms and processing, as well as the consumption and indications of medicinal efficacy. Ethnobotanical studies, particularly on *tinuktuk*, appears very limited, although the present article is perceived as the most comprehensive and very preliminary.

In addition to process documentation, the findings also contribute immensely to modern healthcare systems, in terms of exploring local knowledge.

The present study was also influenced by 7 realities, including inadequate exploration and documentation, nutritious spice sources, absence of testing in the laboratory or by the Food and Drug Administration, non-registration with the Director General of Culture as well as the Indonesia's Ministry of Education, Culture, Research and Technology as a national intangible heritage (*Warisan Budaya Tak Benda-Nasional (WBTB-Nasional*) occurrence of management degradation among younger generations, efforts in obtaining derivative products for micro and small business sectors and the ethnobotanical conservation of medicinal herbs. However, the first and second points, documentation of spice ingredients, manufacturing mechanisms, and indications of initial efficacy were the primary focus. These concepts serve as the first step in complementing the last five outcomes. For the record, *tinuktuk* is an intangible cultural heritage in Simalungun that requires international registration and protection (UNESCO, 2003).

According to World Health Organization (WHO), 60-80% of the global population currently rely on medicinal plants for disease treatment (Joy, Thomas, Mathew & Skaria, 1998; Duke, Bogenschutz-Godwin, duCeliier & Duke, 2002; Peter, 2001; Harrison & Waterlow, 2009; Whyte, van derGeest & Hardon, 2003). Indonesia's Ministry of Health also reported that 80% of its population depends on traditional medicines (Silalahi, Supriatna, Walujo & Nisyawati, 2015). In Simalungun region, 239 medical plant species, comprising 170 genera and 70 families, showed the ability to treat 18 natural and 2 supernatural diseases (Silalahi, Supriatna, Walujo & Nisyawati, 2015), in addition to enhancing stamina, immunity, lactation, and recovery during the puerperium.

Similarly, five main points were considered very useful to the present study, in terms of species exploration and documentation, efficacy based on its origin and empirical experience, institutionalization and protection, commodification, technology and marketing as well as plant conservation. Based on experimental outcomes, *tinuktuk* is known to demonstrate substantial therapeutic properties, with no side effects despite the absence of laboratory testing. This study also provides the preliminary basis for exploring local knowledge in curative applications (Martin, 1995). The objectives offer an effective substitute in restoring raw materials, properties, and traditional healing methods for modern medical science. Therefore, the present research bridges the gap between traditional and modern knowledge in exploring herbal plants (Nawaningrum, Widodo, Suparta & Holil, 2004) as well as conservation for advanced medical science (Suryadarma, 2010).

Ethnobotanical studies are known to contribute extensively to the fulfillment of human nutrition (Martin, 1995; Macbeth & Mac Clancy, 2006), in the form of vegetables, fruits, staples and complementary foods, beverages, as well as spices (Sujarwo & Cuneva, 2016; Silalahi, Nisyawati & Anggraeni, 2018). There are also other aspects closely related to culture, including technology, social institutions and religion. As a consequence, nutrition does not show any significance unless perceived in cultural or social interactions (Nurti, 2017; Richards, 2013; Bates, 1984).

Additionally, nutrition is obtained from spices and etnobotanically adapted to the geographical environment, particularly as related to ethnomedicine and ethnopharmacology. In an ancient ethnographic study, traditional health institutions were viewed as embryos of modern healing (Rivers, 1924; Clements, 1932). Ethnobotany contains beliefs and practices specific to plants with implicit medicinal properties, according to the laws of cause and effect (Wellin, 1977). For instance, chenopodiumseeds are consumed in India and Mexico to prevent worms (Foster & Anderson, 2016). Further analysis on ethnobotany provides the scope of ethnomedicine, known as a socio-cultural framework about disease and healing (Martin, 1995).

In anthropology, ethnomedicineis described as a biocultural discipline oriented towards biological and cultural aspects of human behavior, in terms of health and disease (Foster & Anderson, 1978; Colson & Selby, 1974), or the specific consequences of lifestyle (Fiennes, 1964). Ethnobotany also presents human perceptions according to individual culture in comprehending the surrounding plants (Harrison & Waterlow, 2009). Proper plant understanding correlates with the study of medicine, including social efficacy, experience, control, skepticism,

cultural politics, health commodification and technological fascination, such as image and value marketing (Whyte, van derGeest & Hardon, 2003; Harrison & Waterlow, 2009).

Ethnobotanical products such as spice are very effective for stamina, emerging as a basic diet response to diseases. The disorders do not only appear physiological or under environmental influences, but are also personal (Foster & Anderson, 2016). Special methods and herbs are necessary for treatment in both contexts. However, it is important to comprehend that past and present health-related behaviors that appear adaptive, in order to achieve endurance and improve health (Foster & Anderson, 2016). This paradigm provides an in-depth overview of the structure and dynamics of healthy behavior, rational response and human cognitive orientation to diseases.

Health institutions emphasize on common elements underlying the overall medical aspects dependent on culture (Foster & Anderson, 2016). The objectives of the discovery of plants as food components include new diet alternatives, conservation, genetic diversity, preservation of traditional ingredients, healthy diet preferences, local spices, and bioprospection (Heinrich, Leonti, Nebel & Peschel, 2005; Pieroni, Nebel, Santoro & Heinrich, 2005;Leonti, Nebel, Rivera & Henrich, 2006). These intentions reflect the cultural context necessary for adequate sustainability (Pieroni, 2001; Sujarwo & Cuneva, 2016).

Spices are biological resources that play an important role in human life as aromatic plant parts with limited use for seasoning, flavor enhancers, fragrances and preservatives. The stems, stalks, leaves, bark, tubers, rhizomes, roots, seeds, fruits and flowers are also utilized (Duke, Bogenschutz-Godwin, duCellier & Duke, 2002; Ebadi, 2006; Csekeetal, 2006; Peter, 2001). These plants contain phytochemical compounds generated from metabolic processes (De Guzman & Siemonsma, 1999).

Spices occur as fresh and dry plants that are integrated into food, cosmetic and medical materials (Soediarto, Guhardja & Sudramadi, 1978). In ethnobotanical studies, a correlation exists between humans and plants, data collection and documentation of traditional knowledge in supporting life, as food, medicine, cosmetics, ceremonies, rituals and dyes (Robi, Kartikawati & Muflihati, 2019). This concept also includes the entire monocotyle and dicotyle correlated with human sustainability and also reflects the relevance of local plant knowledge, based on geographical environment (Amrul, Susilo & Huda, 2019). However, each source demonstrates distinct varieties that significantly impact ethnomedicine and ethnopharmacology (Silalahi, Purba & Mustaqim, 2018; 2019).

The processing of medicinal spices based on empirical experience produces herbal medications. For instance, over 30,000 herbs have been applied for preventive and curative purposes in Indonesia (Braziaet al, 2020). As the product undergo laboratory testing, clinical trial or BPOM, it becomes a standardized herbal or phytopharmaceutical commodity (Alexiades, 1996; Hakim, 2015:1). In Simalungun, *Torbangun* (*Coleus amboinicus Lour*) containing lactogen that plays a significant role in increasing milk production during parturition or breastfeeding, has been registered as a phytopharmaceutical product at Indonesia's Ministry of Health (Damanik, 2008; 2014; Iwansyah, Damanik, Kustyah & Hanafi, 2017).

Ethnobotany studies also appear relatively limited in Simalungun, although a recent study confirmed the existence of 239 species, comprising 170 genera and 70 families applied in the treatment of 18 natural and 2 supernatural diseases (Silalahi, Supriatna, Walujo & Nisyawati, 2015). Additionally, the leaf portionas a major plant segment is extensively utilized in a total of 119 species. However, as a basis for future drug development, traditional concoctions, including other medicinal herbals require biological evaluation (Purba, Nisyawati & Silalahi, 2016; Silalahi & Nisyawati, 2017).

Hasairin (2010) showed the variety and uniqueness of traditional food in Simalungunese, including *Nitak putih, nitak merah, dayokbinatur,* and *sambal tawar.* Four alternatives employed spices as raw materials, seasonings, flavorings, dyes, and preservatives. Another study focused on the social capital necessary in *tinuktuk* preparation (Saragih, 2020). Furthermore, the manufacturing techniques involved collection, cleaning, slicing, roasting,

grinding and mixing of the samples. A range of 5-7 workers are needed in processing 3-4 kg of *tinuktuk* and are mostly relatives without salary, but are allotted products at equal proportions. Furthermore, social capital encompasses cooperation, collaboration, trust, networks, and kinship as well as brotherhood.

Further studies are expected to link process complexity, spice scarcity, and the absence of standard compositions threatening to impact culinary lexicon. Younger generations, particularly between 20-30 years are unaware of the *tinuktuk* spice, processing mechanism and rarely consume the product. These entire phenomena also adversely contribute to the risk of culinary lexicon (Batsu, 2017), mainly due to 5 crucial points, termed science and technology development, catering, instant spices, fast foods and restaurants, as well as the absence of inheritance. However, other investigations compared *tinuktuk* during the puerperium and breastfeeding stage (Saragih, 2016). The trend of processing in both intervals demonstrates an impact on general knowledge, where consumption is only suitable for pregnant women. Furthermore, the concoction contains compounds to facilitate lactation, wound recovery, removal of dirty blood and stamina renewal after childbirth.

Sidauruk (2019) further discussed the added value of spices for business feasibility. The value of *tinuktuk* concoction on a home industry scale (IRT) underfour months of production was approximately IDR 27,468,933, while the higher added-value ratio was 64.39%, greater than the average 50%. This calculation indicates that manual production obtained a significant economic rating and business feasibility. Finally, a recent study examined *tinuktuk* concoction comprehensively, based on documentation, processing mechanisms, efficacy indications and developmental potentials (Damanik, Hasairin, Baiduri, Saragih & Rajagukguk, 2021). In addition, the article was the essence of a published book with ISBN. No other reference was known to discuss *tinuktuk* in Simalungun, apart from the research.

Recent studies on Simalungun by Damanik served as the basis of kinship in extended and conjugal families (2021a), pentagonal kinship-based dispute resolution (2021b), confirming kinship at marriage ceremonies (2020), social history (2018), social dynamics and ethnic identity (2017a), *tortor* or dance (2017b), traditional clothing (2019; 2016a), passage rites (2016b), work and life orientation (2016c), and social revolution (2015). This article was included in the study of cultural engineering that contributes to welfare in determining the main *tinuktuk* concepts (Damanik, 2018).

2. Method

This study was conducted qualitatively (Creswell, 2007), using an ethnographic approach (Spraedly, 1997) and the data validity was obtained by empirical experience (Creswell, 2014). Ethnobotany (Martin, 1995) and health anthropology (Foster & Anderson, 2016) paradigms were employed with the purpose of determining the ethnobotanical spices influencing ethnomedicine and ethnopharmacology based on hereditary.

The research was performed in 5 months between April-September 2021 in Simalungun regency with *tinuktuk* spices as the object, including raw materials, processing mechanisms, equipment, supplies, and health benefits. In addition, the subjects were parents above 55 years, with wider experience in *tinuktuk* preparation, in the form of spice types, processing mechanisms, composition, compounding, and drug indication.

The data collection involved four mechanisms, termed periodic field visits in search of objects and subjects as well as short interviews, in-depth interviews with key subjects at individual residences, focus group discussions (FGD) involving 18 participants on July 15, 2021 in Bayutongah village, and solid demonstration of *tinuktuk* concoction processing, including raw materials, cleaning, slicing, roasting, refining and compounding on July 16, 2021. The resulting data were written and recorded, while the processing was documented using photos and videos.

The names of spices according to the local language and the benefits were recorded in a logbook. Furthermore, each variety was organized depending on the taxonomy and efficacy, compared to the medicinal indications from ethnobotanical analysis. Subsequently, the main compounds, including health benefits were compared to

the online results, while the overall data were manually reviewed, tabulated and categorized. This information was further analyzed qualitatively and quantitatively to determine the conclusions, novelty, practical as well as theoretical contributions and follow-ups. Qualitative assessment was used to classify plants, as an indication of initial efficacy, processing process, and material type. Meanwhile, the quantitative approach was aimed at evaluating the index of cultural significance (ICS) based on the formula by Turner (1988) and the use of values (UVs) for each species according to Prance, Balle, Boom, andCarneiro (1987).

3. Results

Figure 1 is a representation of Simalungun regency stretching southwest from an altitude of 1,400 above sea level (masl) to 80 masl east. The geographical location occurs at 2º 36"-3º 18 North Latitude and 98º 32'-99º-35 East Longitude, with a total area pf 438,660 ha, comprising 138 838.46 ha of forest, while the remaining encompass settlements, fields, plantations, and industries. Also, the region is described as fertile, tropical, and highly humid on an annual basis, with the upper portion reserved for a horticultural cultivation, including potato (*Solanumtuberosum*), cabbage (*Brassicaoleraceavar.capitata*), carrots (*Daucuscarotasub sp.sativus*), red chili (*Capsicum annum L*), cayenne pepper (*Capsicum frutescens*), broccoli (*Brassica oleraceavar.italica*), tomato (*Solanumly copersicum*), and others developed by Botje in 1915. Conversely, the lower segment features the lowland suitable for tea plantations (*Camellia sinensis*), oil palm (*Elaeis*), rubber (*Hevea brasiliensis*), and cocoa (*Theobro macacao L*), developed since colonialism in 1907. Evidently, dry and wet agriculture are practiced in the upper and lower Simalungun regions, respectively.

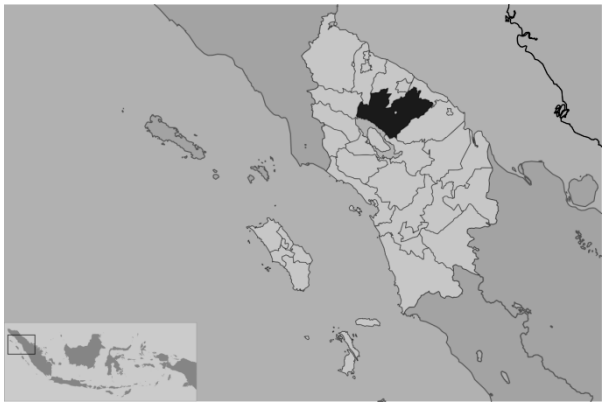

Figure 1:Map of Simalungun Regency, North Sumatra Province, Indonesia

Source: Central Bureau of Statistics (Central Bureau of Statistics [BPS], 2021)

In addition to influencing soil management and social structure (Damanik, 2020; 2021b), the variations in geographical location also impact significantly on ethnobotanical types with medicinal properties for *tinuktuk* preparation. For instance, *kincung* (*Etlingeraso. 1*) and musk orange (*Citrus mitis*) appear more popular at the upper and lower areas, respectively. The potential use of both spices is to generate an acidic effect, although only one item is preferred. Furthermore, *bungle* (*Zingiber purpureum*) or *laos* (*Alpina sp.1*) are occasionally replaced with *temulawak* (*Curcuma xanthorrhiza*) while salt (*natrium chloride*) and rice *(Oryza Sativa*) are not commonly applied.

Despite the use of separate spices, the taste, color, aroma, and particularly the medicinal properties, are not very distinct. The *tinuktuk* mixture currently occurs in various areas, including Bayutongah, Pamatangraya, Dologsilou, Nagoridolog, and Bandarmariah. This research reported 8 health benefits of the concoction, in form of the increase of endurance and stamina, protection against colds, provision of body warmth, cleaning of dirty blood after childbirth and menstruation, milk production during puerperiumor lactation, as well as increment in appetite, improvement in blood circulation, and the boost in body fitness. In particular, the sample was categorized into two groups, including support in stamina, immunity, and body fitness (*tinuktuk sambaltawar*), as well as assistance in breastfeeding mothers to recover and treat postpartum wounds, immunity and facilitate lactation (*tinuktuk paranggietek*).

Tinuktuk etymologically originates from the basic word "*tuktuk*," indicating mashed and is based on the manufacturing process, involving the pounding of various medicinal plants. The sample is also called "*giniling*" from the word "*giling*," meaning to grind. Also, both forms incorporate the use of a mortar and pestle, often referred to as "*siralada*" from "*sira*" (*natrium cloride*), and "*lada*" (*Piper ningrum*), respectively, depending on the resulting taste and aroma. Currently, *tinuktuk* exists in several regions, including Bayutongah, Pamatangraya, Dologsilou, Purba, and Nagoridolog, but rarely occur in other areas. Furthermore, the concoction is commonly traded in traditional markets, including Pamatangraya, Tigarunggu, Saribudolog, Haranggaol, Parapat, Siantar, Tanohjawa, and Saranpadang.

In summary, 117 and 11 spice species were used to produce *tinuktuk sambaltawar* and *tinuktuk paranggietek*, respectively. Table 1 represents the raw materials, comprising 15 mandatory, 3 optional and 2 additional ingredients.

Table 1:Ingredients and spices

Material category	Indonesian name	Local name	Scientific name	Part used
Main materials	Jahe Merah	PogeiSigerger	*Zingiber officinale*	Rhizome
	Kencur	Hasihor	*Kaempferia galangga L*	Rhizome
	Lempuyang	Lappuyang	*Zingiber americanus*	Rhizome
	Temulawak	Tomulawak	*Curcuma xanthorrhiza*	Rhizome
	Bawang Putih	Bawang silopak	*Allium sativum*	Tuber
	Bawang Merah	Bawang sigerger	*Allium cepa L*	Tuber
	Lada Hitam	Tuba	*Piper nigrum*	Seed
	Serai	Sasanggei	*Cymbopogon citratus*	Stem
	Lengkuas	Halaos	*Alpinia galangga*	Rhizome
	Kemiri	Gambiri	*Aleurites moluccana*	Seed
	Kunyit	Huning	*Curcuma demostica*	Rhizome
	Andaliman	Andaliman	*Zanthoylum acanthopodium*	fruit
	Lokio/Kucai	Hosaya	*Allium chinense*	Tuber
	Kincung	Sihala	*Etlingera Sp. 1*	Rhizome, stem
	Wijen Hitam	Longa Sibirong	*Sesamun indicum*	Seed
Optional materials	Jeruk Kesturi	Uttei Jungga	*Citrus mitis*	Root, fruit
	Bungel	Bangel	*Zingiber pupureum*	Rhizome
	Laos	Laja	*Alpinia sp.1*	Rhizome
Additional materials	Garam	Sira	*Natrium chloride*	Granules
	Beras	Boras Sinanggar	*Oriza sativa*	seed

Source: Field data, 2021

Table 1 show that the genera species include *Zingiberaceae, Arecaceae,* and *Euphorbiaceae,* while *Arecaceae, Poaceae, Rutaceae,* and *Zingiberaceae* were mostly applied. The Simalungunese recognized 239 species, comprising 170 genera and 70 families (Silalahi, Supriatna, Walujo & Nisyawati, 2015). Also, the ethnobotanical types were composed of 230 spermatophyta, 8 pteridophytes, and 1lichen while the main families encompassed 20, 16, 13, and 12 species of *Arecaceae, Poaceae, Rutaceae,* and *Zingiberaceae*, respectively. The largest genera consisted of 13, 12, 11 and 10 species of *Arecaceae, Euphorbiaceae, Poaceae* as well as *Fabaceae* and *Asteraceae*, correspondingly.

Furthermore, 72, 64 and 41 varieties contained compounds capable of curing digestive disorders, fever and fractures. The raw materials were cultivated in Simalungun, and were further applied in the treatment of 18 natural and 2 supernatural diseases. These 18 natural ailments include hypertension, cough, asthma, diarrhea, gastro intestinal disorders, stomach ache, fractures, rheumatism, itching, ulcer, kidney dysfunctions, diabetes mellitus, aphrodisiac injury, fever, eye infection, thrush, and toothache. Meanwhile, the 2 supernatural diseases

are *busung* (liver disease) and *logo-logo* (malnutrition). More specifically, the spice type in preparing *tinuktuk* obtained index of cultural significance (ICS) and use value (UVs), as recorded in Table 2.

Table 2: ICS and UVs and the content of *tinuktuk* concoctions

Scientificname	ICS	UVs	Active compound	Use*
Zingiber officinale	112,0	2,6	Antioxidant phenol, gingerol, paradol, and shogaol	Gas, Sto, Inj, Fev, Aph, Tt, Tp
Kaempferia galangga L	90,0	3,2	Etip P-methoxycinnamte	Cou Ash, Gas, Sto, Rhe, Aph
Zingiber americanus	18,0	2,2	Antioxidant polyphenols, flavonoids, calcium, and vitamin C.	Dia, Gas, Tt
Curcuma xanthorrhiza	108,0	3,6	Curcuminoids and essential oils.	Ash, Sto, DM, Fev, Inj, Tt.
Allium sativum	90,0	2,4	Protein, fat, carbohydrates, fiber, calcium, magnesium, and phosphorus.	Hyp, Dia, Bus Tt
Allium cepa L	96,0	3,6	Carbohydrates, proteins, fiber, calcium, magnesium, and pottasium.	Cou, Dia, Gas, Rhe, Ulc, Inj, Fev
Piper nigrum	60,0	2,0	Alkaloids and essential oils	Rhe, Fev, Bus, tt, Tp
Cymbopogon citratus	24,0	0,8	Citronellal and geraniol	Alg, Tt, Tp
Alpinia galangga	56,0	2,8	Galaning, quercetin, kaempferol, and vitamins A, B1 and B2.	Fev, Itc, Dia, Gas, Rhe, Tt, Tp
Aleurites moluccana	129,0	3,2	Glycerides, linoleic, palmitic, stearic, myristic, fattyacids, and vitamin B1	Dia, Gas, Sto, Kid, Fev, Tt
Curcuma demostica	142,0	2,6	Curcumin and essential oil	Dia, Gas, Sto, Inj, Fev, Eye, Alg, Tt, Tp.
Zanthoxylum acanthopodium	60,0	2,0	polyphenolss, monoterpenes, and sesquiterpenes	Cou, Tt
Allium chinense	90,0	4,8	vitamin C, beta carotene, and minerals such as calcium, phosphorus and potassium	Hyp, Dia, Gas, Itc, Ulc, DM, Fev, Tt
Etlingera sp.1	30,0	4.0	Alkaloids, steroids, and essential oils.	Ash, Tt
Sesamun indicum	45,0	1,8	Omega-6 fatty acids, calcium, iron, fat, magnesium, fiber, and phosphorus,	DM
Citrus mitis	9,0	1,6	Protein, fat carbohydrates, fiber, calcium, phosphorus, iron, sodium, potassium, beta-carotene, thiamin, riboflavin, and vitamin C	Fra, Fev, Bus, T
Zingiber purpureum	114,0	2,6	Essential oils, starch, tannin, saponins, and glycosides	Dia, Gas, Tt
Alpinia sp.1	112,0	2,6	Essential oil	Dia, Gas, Tt
Natrium Chloride			crystalline mineral	
Oriza sativa			protein, fat, fiber, and carbohydrates	

Source: Silalahi, Supriatna, Walujo &Nisyawati (2015)

*Note: Alg *(Alogo-alogo),*Aph (Aphrodisiac), Ash (Ashma), Bus *(Busung),*Cou (Cough), Dia (Diarrhea), DM (Diabetes mellitus), Eye (Eyeinfection), Fev (Fever), Fra (Bone fractures), Gas (Gastrointestinal disorders), Hyp (Hypertension), Inj (Injury), Itc (Itchy), Kid (Kidney disease), Rhe (Rheumatism), Sto (Stomachache), Thr (Thrush), Too (Toothache), (Tp) *Tinuktuk paranggietek*, Tt *(Tinuktuk tawar),*Ulc (Ulcer).

According to Silalahi, Supriatna, Walujo & Nisyawati (2015) and Pieroni (2001), ICS refers to plant cultural value and based on the uses, is divided into five categories, termed >200 (very high), 100-199 (high), 20-99 (moderate), 5-19 (low), and (5) <5 (very low). A variation range of 1.5-142.0 was observed in Simalungun medicinal plants, with the highest occurrence related to turmeric or *huning* (*Curcuma domestica*), indicating

multiple use, while samples with low values were less applied. Plants with moderate ICS value were garlic (*Allium sativum*) and higher ICS score was subsequently obtained for Simalungun, compared to Malays (Susiarti, Purwanto & Walujo, 2005), but lower than the Karonese (Silalahi, Supriatna, Walujo & Nisyawati, 2013). The use of medicinal plants is strongly influenced by culture and spiritual beliefs (Cocks & Dold, 2006; Cocks, 2006), as well as the geographical environment (Pieroni, 2001).

Furthermore, UVs aims to determine the use value (UV) of medicinal plants depending on the applied types and informant experience. Age is also a major influencing factor, with range of 30-50 years showing a lower score, compared to samples above 50 years (Silalahi, Supriatna, Walujo & Nisyawati, 2015). For instance, shallots (*Allium cepa*) achieved values of 2.2 and 3.6 in the young and older groups, respectively. This difference in UVs points to the knowledge degradation in younger generations, in terms of medicinal plant types and concoction ingredients. The degradation is impacted by four primary factors, including the development of robust health systems and medical technology, tendency of the oral tradition to transfer *tinuktuk* knowledge to younger generations, variations in cultural values, and the perception of traditional medicine among the younger group.

This phenomenon, however, does not only occur in Simalungun but across the world. Based on scientific advancement, younger generations tend to neglect local knowledge of medicinal plants. As a consequence, the challenges of *tinuktuk* production in future conservation potentially involve three crucial points, termed the process complexity and the duration of raw material preparation, absence of standard references on raw material composition, and efficacy of the method. These factors are exacerbated by the availability of modern medicines and perceptions of traditional alternatives.

4. Discussion

The processing of *tinuktuk* requires between 4-7 workers probably composed of relatives or neighbors. Spices are typically collected from fields, forests, or purchased from the market, while bucket, knife, cauldron, mortar, pestle and spoon are the major equipment. Currently, traditional patterns are also applied, without the use of machines. Roasting and pounding exhibit the most extensive duration, although gathering, cleaning, slicing, roasting, pounding or grinding and mixing formed the primary steps. These efforts are performed manually to produce a thick liquid, yellowish, distinctive aroma and spicy taste.

In certain Simalungun regions, the raw spices are employed, such as in Nagoridolog and Siloukahean, but are initially roasted before applying in Pamatangraya, Purba, and Silimahuta. The two mechanisms generate different flavors and expiration dates, while the raw materials with relatively high water contents attain fairly short expirations of usually 6 months. Conversely, the roasting of samples, in addition to reducing water content, offers a distinctive aroma and relatively extensive expiration, mostly beyond a year.

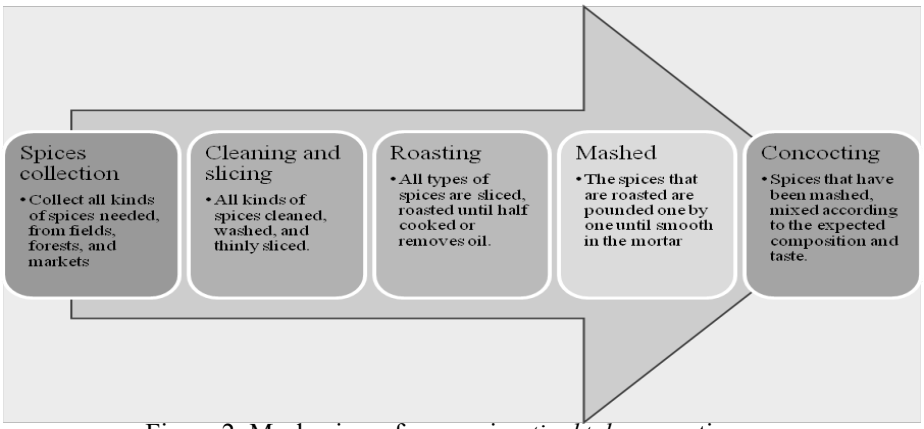

Figure 2: Mechanism of processing *tinuktuk* concoction

The manufacturing process does not involve any application of dyes or preservatives, except salt. However, the yellowish or brownish-black color in the ingredients is due to the presence of candlenut (*Aleurites moluccana*),

turmeric (*Curcuma demostica*), or gingers (*Zingiberaceae*) that are the dominant constitutes. Roasted rice is added to smooth dark colors to neutralize the excessive salt and acid effects, while the main preservatives originate from *Andaliman* (*Zanthoxylum acanthopodium*). The *tinuktuk* concoction, commonly placed and stored in bottles or bamboo, is tightly closed against sunlight. Furthermore, plastic containers are not recommended because of the tendency to alter the taste or speed up the expiration date.

Despite the non-existing standardization, empirical experience serves as a guide in obtaining quality *tinuktuk*. Table 3 highlights the raw material composition in generating 2 kg of *tinuktuk*, based on the resulting information from focus group discussions. This comparison shows that the sample constituents are possibly calculated as the basis for *tinuktuk* processing for the general public in Simalungun.

Table 3: Ingredients for 2 kg of *tinuktuk* concoction

Ingredients	Part used	Dosage (gram)
Zingiber officinale	Rhizome	1000
Kaempferia galangga L	Rhizome	500
Zingiber americanus	Rhizome	100
Curcuma xanthorrhiza	Rhizome	100
Allium sativum	Tuber	500
Allium cepa L	Tuber	1000
Piper nigrum	Seed	250
Cymbopogon citratus	Stem	100
Alpinia galangga	Rhizome	50
Aleurites moluccana	Seed	100
Curcuma demostica	Rhizome	250
Zanthoxylum acanthopodium	fruit	150
Allium chinense	Tuber	100
Etlingera sp.1	Rhizome, stem	100
Sesamun indicum	Seed	100
Citrus mitis	Root, fruit	100
Zingiber purpureum	Rhizome	100
Alpina sp.1	Rhizome	150
Natrium chloride	Granules	100
Oriza sativa	Seed	1000

Source: Field data, 2021

Table 3 shows the use of red ginger (*Zingiber officinale*), shallot (*Allium cepa L*), *kencur* (*Kaempferia galangga L*), turmeric (*Curcuma demostica*), black pepper (*Piper ningrum*), and *andaliman* (*Zanthoxylum acanthopodium*) in different proportions. Each material was roasted and pounded successively using mortar and pestle, followed by a thorough mixed and re-mashing to obtain a uniform distribution. In particular areasmixing are achieved in a bucket with a spoon, but the recommendation for this study involved pounding with mortar to accommodate only 1-1.5 kg per mix. The above comparison becomes a formula for determining the composition of ingredients in future *tinuktuk* production.

This concoction is very familiar among the Simalungunese, with an extensive local knowledge of medicinal ethnobotany. Pounding or grinding is a traditional practice, based on the capacity of the ancestors to process spices into healthy ingredients. In terms of benefits, the mixture appears significant in increasing the stamina, immunity, and body strength, as well as for maternity purposes. This segment describes local knowledge, including the habits, rules, and cognitive values on nutrition considered good and wise, or acceptable by every member. Local knowledge is greatly applied in health perspectives, particularly in terms of ethnomedicine and ethnopharmacology. The nutrients in *tinuktuk* do not only contribute to food, but the ability to maintain body strength, stamina, immunity, support lactation, and post-partum recovery, appears very important.

In Simalungunese, *tinuktuk* reflects traditional wisdom in form of a self-referential system that is actualized in a contingent social structure. Local ideas about medicinal plants and treatment based on the geographical environment are also integrated. The overall spices are further combined with the traditional healing social system institutionalized in Simalungun culture. This reality is in accordance with Pesurnay (2008) where local knowledge is perceived as a communicative social system that results in self-organization in a cultural framework.

Therefore, *tinuktuk* is local wisdom containing cognitive realities, including life views, ideas, patterned activities, artifacts, and nutritional fulfillment. Based on these descriptions, medicinal plant utilization greatly depends on the intended use. For instance, in an empirical study, the efficacy of medicinal plants is applied according to treatment objectives, and not every sample shows the capacity to cure the entire diseases. Therefore, the Simalungunese demonstrated sufficient knowledge in the identification of various medicinal plants and their efficacy for nutritional and healing purposes.

Tinuktuk concoction is a curative mechanism based on empirical experience within the scope of ethnomedicine. In medical anthropology, ethnomedicine is a biocultural discipline concerned with the biological and cultural aspects of human behaviors, particularly in terms of health and diseases (Foster & Anderson, 1978; Colson & Selby, 1974), as well as specific lifestyle consequences (Fiennes, 1964). Ethnobotany, according to its culture, presents a human perspective that comprehends plants in the surrounding environment (Harrison &Waterlow, 2009). Medicinal plant knowledge correlates with drug studies involving social efficacy, experience, control, health commodification, technology appeal and value marketing (Whyte, van derGeest & Hardon, 2003; Harrison & Waterlow, 2009). Therefore, *tinuktuk* is a summary of the Simalungunese view on plants in the natural environment, both defensively and curatively related to health efficacy.

This description complements the *tinuktuk* concoction as a local knowledge that utilizes the leaves, stems, fruits, seeds, tubers, and rhizomes, with medicinal properties for health and recovery purposes. In addition, the efficacy is believed to trigger lactation during childbirth and subsequently remove dirty blood, increase immunity, maintain stamina, and also enhance appetite. The present study concludes that *tinuktuk* concoction is a herbal medicine and product of local knowledge for healing and treatment, based on empirical experience. The documentation provides an effective alternative in restoring raw materials, properties, and healing methods for modern medical practice. Therefore, the results of this study bridge the gap between traditional and modern knowledge in obtaining medicinal and conservational plant species.

Anthropologically, *tinuktuk* exhibits high empirical efficacy for stamina, immunity and lactation as the basic response to understanding diseases. However, the treatment of physiological ailments is not personal but requires an extensive process. Health institutions are also related to cultural contexts emphasizing common elements from the entire medical aspects (Foster & Anderson, 2016).

Tinuktuk is a product of local knowledge on medicinal plants and its locality reflects specific values and ideas due to the interaction with the physical environment. This concoction is largely associated with positive values, habits, and traditions of the Simalungunese, based on a social, cultural and environmental perspective. The reflection of a blend of external cultural ideas are accommodated, integrated, and internalized into individual culture as the right way of life (Sartini, 2007). Therefore, *tinuktuk* is a cognitive product adopted in Simalungunese to determine the responses, actions and behaviors on disease treatment. The inherent values are transferable to future generations, and are developed according to certain cultural levels (Meliono, 2012; Ariyanto, 2011). This context does not only focus on the sustainability of *tinuktuk*, but also on derivative products from similar ingredients packaged in tablets, pills, powders, sachets and etc.

Tinuktuk is a product of local knowledge and smart ideas, moral values, and practical experience adhered by every member (Wijayanti, 2019). Based on empirical experience of Simalungun, the mixture is widely known as traditional medicine and mechanism practiced by several generations. However, related studies on *tinuktuk* and ethnobotany of spices are currently limited but only one article linked the sample to health perspective. This

study, therefore, provides a complete documentation of *tinuktuk* as a traditional herb with substantial medicinal properties.

5. Conclusions

The documentation of *tinuktuk* herb provides an effective alternative in raw material recovery, efficacy and its indications, as well as treatment methods in modern medical practice. This study bridges the gap between traditional and modern knowledge in an attempt to determine the medicinal and conservational plant types. *Tinuktuk* is a product and insight into the structure and dynamics of healthy behaviors, rational responses or human cognitive orientations to diseases. As a consequence, the sample is believed to show high treatment efficacy, both in preventive and curative terms as well as other health segments, including stamina, immunity, lactation and appetite. Efficacy is based on empirical experience according to the index of cultural significance (ICS) and use values (UVs). This concoction includes not only nutritional fulfillment but cognitive responses and local ideas on geographic environments and diseases. *Tinuktuk* also reflects local knowledge that is actualized and implemented in a contingent social system. In addition, the phenomenon appears common in health institution related to the cultural context that emphasizes the general elements underlying every fitness aspects, including diet, disease types, treatment and recovery, as well as the medicinal plant species. The tendency to employ herbs for treatment purposes is based on empirical experience, although the present study concludes that *tinuktuk* is a herbal medicine from local knowledge, depending on heredity. This trend of applying concoctions requires a biological and laboratory evaluation of the herbal efficacy to determine the nutritional adequacy rate (RDA), side effects and health value. The present research recommends the need for laboratory testing and exploration of *tinuktuk* derivative products. Furthermore, equipment assessment appears very significant in accelerating the production processes involving extensive manual applications, while maintaining the job quality and efficiency.

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