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Formulation of Recipes and Organoleptic Properties of Tinuktuk as Simalungun Traditional Food

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ABSTRACT
Tinuktuk is a traditional spice sauce of the simalungun ethnic group. It is believed as a traditional health icon To search the best formulation of ingredients', to search the best production process and to evaluate its organoleptics properties. The search for formulation ingredients is an exploratory qualitative study with participant observation method. The organoleptic test was carried out by fifty untrained panelists on a scale of 1 (dislike) to 5 (very like). Organoleptic values including taste, aroma, texture and color Six formulations of tinuktuk, containing of 8 to 15 ingredients. Three kinds of production process: first by mashing the fresh ingredients and then roasting them. The second process is mashing the rosated material. The third is a combination of both processes. These processes could be distingueished by the organoleptic values. The incremented values resulted from T5, T1, T3 formulations. T3 formula contains 15 ingredients use the third production process. This value could be taken as a reference for tinuktuk standard.

INTRODUCTION

Tinuktuk is an old spice sauce inherited by simalungun ethnic group based on their long past empirical experiences and their claim that tinuktuk is a traditional health icon (1). Tinuktuk was consumed by women after delivering babies (2). A study (3) revealed eight health benefits of tinuktuk including improves the body stamina and body fitness, protects body against influences, warming the body, cleansing the blood during menstruation and delivering baby, increasing breast milk, increasing appetite, increasing blood circulation,

Tinuktuk is a result of mixing several spices and herbs. These ingredients were crushed or pounded waterless by a pair of manual tools of boulder mortar and wooden pestle. The result is a mushy sauce. Tinuktuk is consumed with other side dishes and rice, or mixed in soup and tea. The word tinuktuk was coming from "ti: and "nuktuk." Ti is an adverb, means product of. Nuktuk is an articulated verb of Tuktuk, means crushing or pounding or grinding. Tinuktuk was produced by slightly various different processes from region to region in simalungun. They use various compositions and ingredients (Damanik et al., 2021; Hasairin, 2010; Saragih, 2020)

Some study revealed that these ingredients are reach of bio-acitve, including phenolic, flavonoids, alkaloids, terpenoids, saponin, tannin, and antioxidant (Benzie & Galor, 2011;

Burapan et al., 2020; Nooreen et al., 2017; Shahidi & Hossain, 2018; Wang et al., 2021). The combination of herbs and spices is aiming multiple targets in the body that could excite a physiological synergic effect.

This study would reveal the composition, kinds and quantity of ingredients of tinuktuk and how the people make it and finally records its organoleptic properties.

METHOD

Formulation of tinuktuk

This study is a qualitatively explorative when recording the receipts that currently available among all Simalungun population. Population means everyone that produces tinuktuk in Simalungun District and sells it.

Data were collected in April to September 2021. Samples were chosen purposely from district Raya, Purba and Silimakuta. The addresses of those sample producers were collected from one informant in each District. Those informants were traced by using information from friends. Then those informants gave the telephone numbers of producers. Then we established a verbal communication and meeting appointments.

There were six producers that have been interviewed. They were coded as T1, T2, T3, T4, T5, and T6. They bought the raw material from traditional market place. We (the researchers) and the producer were together when processing these tinuktuk as participant observation.

Each raw material were cleaned with water, drained, chopped, and roasted according to each formulation. Each raw material pounded in boulder mortar by wooden pestle. All fined material then mixed and become a mushy humid sauce. We have done six formulations using different name and amount of ingredients, and different process.

Assessment organoleptic properties

There were fifty untrained panelists who test the organoleptic properties using the hedonic scale of 1 (dislike) to 5 (as very like). Organoleptic values were including taste, aroma, textures and colors. Each sample was served in a small white plate with its label. Each panelist got a paper to read the test instruction and the evaluation criteria and to write her/his identity.

Data analysis

The data of formulations has been analyzed descriptively. And the organoleptic data has been evaluated by its normality. The abnormal data would be transformed, followed by ANOVAs test. The level of confidence $\alpha = 0.05$, when $p < \alpha$, then Ho would be rejected, means that there was a significant physical quality different between each kind of actions. In this case, the analysis would be continued by Duncan test to assess which kind of actions that has real or unreal different.

RESULTS AND DISCUSSION

Simalungun District is located in North Sumatra, inhabited originally by Simalungun ethnic group. They have several specific traditional culinary that mostly served in ethnical rituals and often served as daily diet. Beside natinuktuk, they have other famous diets including dayok nabinatur, nitak, and hinasumba.

Table 1 shows the interviews' summary with the six producers. The oldest producer is 75 years old age, and the youngest is 54. Producer T1 has 37 years production, while T3 and T5 have 20. The producer's old age shows that it is still chances to transfer their knowledge to younger

generations. The millennial generation were not interested in natinuktuk perhaps because they have overwhelmed by other more attractive food stuff, or by their perception that tinuktuk is an exclusive threat for maternity mothers only. Study (2) revealed that there were lacks of social contributions to promote the manufacturing of natinuktuk that lead to scarcity of knowledge transfer.

Table 1. Age, duration of making and selling tinuktuk

Tinuktuk maker	Age (Year)	Duration of making and seling tinuktuk (year)
T1	75	37
T2	64	8
T3	66	20
T4	69	10
T5	64	20
T6	54	8

The result from six formulas revealed that each of them has significant variation of ingredients. Table 2 shows the names of ingredients in local language and in Latin. There were three kinds of gingers and lemons.

Table 2. Names and types of ingredients used in the formulation of T1-T6 . recipes

English name	Scientific name	Part used
Red ginger	Zingiber officinale var. rubrum	Rhizome
White ginger	Zingiber officinale var. amarum	Rhizome
Yellow ginger	Zingiber officinale var. officinale	Rhizome
Aromatic ginger	Kaempferia galangga L	Rhizome
Shallot	Allium cepa	Tuber
Garlic	Allium sativum	Tuber
Black pepper	Piper nigrum	Seed
Candle nut	Aleurites moluccana L. Willd	Seed
Lime sour	Citrus aurantifolia Swingle	Fruit
Calamondin	Citrus mitis	Fruit
Citrus limon	Citrus amblycarpa	Fruit
Torch ginger	Etlingera elatior	Stem, Fruit
Salt	Nacl	Granules
Tumeric	Curcuma longa	Rhizome
Java tumeric	Curcuma xanthorrhiza	Rhizome
Fingerroot	Boesenbergia rotunda	Rhizome
Sichuan pepper	Zanthoxylum acanthopodium	Fruit
Dried pumpkin seeds	cucurbita moschata	Seed
Cloves	Syzygium aromaticum	Fruit

Dried cucumber seeds	cucumis sativus	Fruit
Chives	Allium schoenoprasum	Tuber
Lemongrass	Cymbopogon citratus	Stem
Rice	Oryza sativa	Seed
Galangal	Alpinia officinarum	Rhizome

(It was believed that) Simalungun ethnic group has two kinds of tinuktuk with significant different composition yet similar physical appearance, their name are tawar and paranggelek. Tinuktuk tawar consist of 117 kinds of raw material, while paranggelek has 11 (Silalahi et al., 2018). It was likely that this last composition have been used by the producers in the three sub-districts.

Table 3 shows the number of kinds of ingredients. T3 uses 15 kinds, T1 uses 14. T2 uses the least 8 kinds. Three formulas used 11 kinds with different kinds and amount. T1 and T6 used more ginger almost two times over other ingredients. T3, T4 and T5 used similar ingredients, in spite different amount, but the ratios were same, that was 1:1. T2 uses two times of red onion, black pepper and hazelnut over other ingredients. T1 uses the least turmeric, curcuma, and boesenbergia.

Eight main ingredients used by all formulas are red ginger/white ginger/yellow ginger, aromatic ginger, shallot, garlic, black pepper, candle nut, salt and lime sour. They use different sour. Some used two kinds of (sour), the other used two or three as shown in T1 that is lime sour, calamondin, citrus limon. The other sours are torch ginger trunk and torch ginger fruit. Other additional ingredients are tumeric, java turmeric, fingeroot, Sichuan pepper, lemongrass, galangal, chives, cloves, dried pumpkin seeds and rice.

Each formula has different composition. Although the producers have claimed that their formula is a legacy of their forefather, but there were possibilities that they have reduced or increased certain quantity of ingredient.

Several studies revealed that spices and herbs of tinuktuk contains antioxidants higher than vitamin E (Hemalia et al., 2019). Jahemerah is considered as a strong antioxidants (Herawati & Saptarini, 2019). Aromatic ginger could hinder the grow of Bacillus subtilis and Escherichia coli (Fajeriyati & Andika, 2017), and contains anti-inflammation (Hasanah et al., 2011). Shallot contains antioxidants (Yuniarti et al., 2018), and protects body against hyperglycemia and dislipidemia caused by diabetes (Ülger & Çakiroglu, 2020), and was used as complementary medicine for inhibiting metabolic syndromes (Choudhary et al., 2018), and contains antimicrobials (Moulia et al., 2018). Pepper is good to loosen breathing (Peter, 2012), contains antioxidants, anti inflammation, and antimicrolan (Sari & Bare, 2020), prevents the decreasingof spermatogoniaa quantity. Gel of nutzel oil has an ability to heal burns (Leny et al., 2021). Galngal contains ethanol for defeating Streptococcus mutans (Santi et al., 2021).

Tabel 3. Tinuktuk formulation composition recipes T1, T2, T3, T4, T5, T6

No	Recipes T1	amount	Recipes T2	amount	Recipes T3	amount	Recipes T4	amount	Recipes T5	amount	Recipes T6	amount
1	Red ginger	100 gr	White ginger	100 gr	Red Ginger	100 gr	Red ginger	100 gr	White ginger	100 gr	Yellow ginger	100 gr

2	Aromatic ginger	80 gr	Aromatic ginger	100 gr	Aromatic ginger	100 gr	Aromatic ginger	100 gr	Aromatic ginger	100 gr	Aromatic ginger	50 gr
3	Shallot	250 gr	Shallot	200 gr	Shallot	100 gr	Shallot	100 gr	Shallot	100 gr	Shallot	25 gr
4	Garlic	250 gr	Garlic	100 gr	Garlic	100 gr	Garlic	100 gr	Garlic	100 gr	Garlic	25 gr
5	Black pepper	150 gr	Black pepper	200 gr	Black pepper	100 gr	Black pepper	100 gr	Black pepper	100 gr	Black pepper	25 gr
6	Candle nut	400 gr	Candle nut	200 gr	Candle nut	100 gr	Candle nut	100 gr	Candle nut	100 gr	Candle nut	25 gr
7	Salt	125 gr	Salt	100 gr	Salt	100 gr	Salt	100 gr	Salt	100 gr	Salt	20 gr
8	Tumeric	1bh	Torch ginger steem	10 sdm	Lemongrass	100 gr	Dried pumpkin seeds	50 gr	Chives	100 gr	Tumeric	1 ptg
9	Java tumeric	1ptg			Java tumeric	1ptg	Dried cucumber seeds	50 gr	Lime sour	200 gr	Chives	10 gr
10	Fingerroot	1ptg			Rice	100 gr	Buah kincung	200 gr	Dried cucumber seed	100 gr	Lemon grass	1 btg
11	Sichuan pepper	100 gr			Sichuan pepper	100 gr	Jeruk nipis	200 gr	Rice	100 gr	Torch ginger fruit	25 gr
12	Lime sour	2bh			Galangal	1ptg						
13	Camondin	2bh			Torch ginger fruit	100 gr						
14	Citrus limon	2bh			Dried pumpkin seeds	100 gr						
15					Cloves	15bh						

The extract o Sichuan pepper could hinder the Staphylococcus aureus (Muzafri, 2019), gives an effective anti-migration (Harahap et al., 2018) and effective as anti cancer (Satria et al., 2019), and heals the damaged lever and kidney of experiment rats (Simanullang et al., 2021). The water from boiling kunyit contributes in decreasing elderly high blood pressure. (Muti, 2017). The most prominent.pharmacological activities of torch ginger is anti-microbe, antioxidant and anti-tumor depends on it's contained of flavonoid, terpenoids, and fenolic (Juwita et al., 2018). Chives contains antimicrobials mainly Candida (Naibaho et al., 2015), has a strong ability of hindering salmonella (Fahmi & Sitompul, 2019). The extract of fingerroot showed its ability to repair diabetic peripheral neuropathy by its anti-inflammation and antinociceptive, so that minimalizing the overwhelming pains (Wang, P., Wen, C., & Olatunji, 2022). Treatment by extract of fingerroot showed a drastic suppression on the activities of virus SARS-CoV-2 on Vero E6 cells (Kanjanasirirat, P., Suksatu, A., Manopwisedjaroen, 2020).

Clover gives a protection against testicular torsion injury (Moghimian et al., 2017), and protect kidneys from diabetes (Abtahi-Eivari et al., 2021). Pharmacologically, clover contains antimicrobial, antioxidant, anti-inflammation, analgesic, anticancer, and anesthetic effect, insecticide, mosquito repellence, aphrodisiac, and antipyretic (Batiha et al., 2020). The seed of labu could replace rennet commercial animal to produce cheese and contains natural antioxidant (Dash & Ghosh, 2017). This seed plays important role to provide micronutrient and is used in diabetic treatments and medicines against inflammation, hyperlipidemia, hypertension, and to manage the hearth protection (Syed et al., 2019). Some pharmacologic properties of the seed of

lemon contains antimicrobials, antioxidant, anti-allergy, anticancer, anti-diabetes (Gupta et al., 2021). Salt is used as a preserver of food due to its ability to absorb the humid of the food. The dry environment would hinder microbes grows.

Table 4. Tinuktuk processing process

Recipes	Fresh and mashed	Roast and mashed	Blackmailed
T1	Red ginger, Kaempferia galanga, shallot, garlic, tumeric, java tumeric, fingerroot, sichuan pepper	Candle nut, balck pepper	Lime sour, calamondin, citrus limon
T2		Shallot, garlic, white ginger, Kaempferia galanga, candle nut, black pepper	Stem Etlingera elatior
T3	Shallot, garlic, red ginger, Kaempferia galanga, java tumeric, lemongrass, sichuan pepper	Balck pepper, dried pumpkin seeds , cloves, candle nut, rice	Fruit Etlingera elatior
T4	Reg ginger, Kaempferia galanga	Shallot, garlic, balck pepper, candle nut, dried cucumber seeds, dried pumpkin seeds	Lime sour, Fruit Etlingera elatior
T5	Shallot, garlic, chives, Kaempferia galangal, white ginger	Rice, black pepper, dried pumpkin seeds, candle nut	Lime sour
T6		Balck pepper, candle nut, Kaempferia galanga,, tumeric, chives, shallot, garlic, yellow ginger, lemongrass	Fruit Etlingera elatior

In addition to different kinds and amount of ingredients, the production process of T1-T6 is completely different as shown by table 4. Some of ingredients of T1, T3, T4, and T5 still fresh when they were pounded, some were roasted. Finally they were mixed together. Meanwhile, in formulas T2 and T6, all ingredients were roasted before they were pounded.

Roasting is a way to reduce the water contents and to ease the pounding process. Roasting is also one of the oldest natural preservation. The water activities (A_w) are reduced by reducing water content. Dried food stuff has a longer shelf life (Asiah & Djaeni, 2021). The extract of sun-dried ginger shows an increasing of its antioxidant properties compared to fresh ginger (Mustofa et al., 2019).

In this study, the sample's parameters were tested hedonically. The tested parameters were including color, aroma, texture, and taste. The test results were summarized in table 5. Average value of organoleptic test lay within intermediate category that is between like and very

like. Some panelists have never taste this tinuktuk before this test and that was why they did not give the highest test value for all parameters. The highest test value was provided by color (Winarno, 2002). Visually, color is a factor that emerged in the first place and often become a defining factor to value a product. Color is the first value to be considered rather than other variables. The color did affect the panelists' perception directly. More peppers will darken the tinuktuk. Different kinds and amount of ingredients and production process will differentiate the color and other organoleptic properties of tinuktuk. T3 provided the highest value of all parameters, followed by T1 and T5. The result has been proven by ANOVAs test that shown a different preference of panelists base on all parameters of tinuktuk formula. The Duncan test shows that there were different color between T3 and T2, T4, T5 and T6; different texture between T3 and T6; different aroma between T3 and T4; different taste between T3 and T4.

Table 5. Organoleptic values of the formulations for T1-T6

Parameter	Formulations (average ± SD)						P value
	T1	T2	T3	T4	T5	T6	
Coler	3,51±0,63	3,30±0,57	3,66±0,63	3,30±0,69	3,39±0,64	3,40±0,55	0,020
Texture	3,34±0,58	3,37±0,53	3,52±0,63	3,18±0,68	3,44±0,60	3,05±0,68	0,002
Aroma	3,40±0,83	3,16±0,79	3,45±0,80	2,93±0,88	3,39±0,74	3,24±0,76	0,012
Flavor	3,10±0,79	2,91±0,88	3,33±0,81	2,56±0,84	2,94±0,90	2,80±0,97	0,001

Formula T3 contains the most kinds of ingredients, that are 15. It was resulted from pounding the roasted material and pounding the fresh ones. . The panelists' preference on color, texture, aroma and taste on formula T3 could be a standard of tinuktuk.

Since tinuktuk is a heritance of distant past culture, it is needed to carry out further researches to know it better, and to answer its health's' claims. This advanced civilization has lead people to the modern medication that somehow shown as instant lifestyle. As easy as they buy medicines or supplements, so that easy they ignore that they have their own medicines inherited as local wisdoms that has been produced and consumed from past generations till now. This tendency could be anticipated by providing tinuktuk to be consumed any time when needed. The research (3) suggests that tinuktuk needs biological and laboratory evaluation to assess its herbal efficacy and to assess its nutritional adequacy, its side effects and its health values. This study recommends the important of laboratory tests and exploration of its derivative products. Furthermore, it is important to assess the production equipments which are operated by extensive manual labors to achieve its work efficiency and to get high quality products.

CONCLUSION

There were six formulation of tinuktuk receipts that using different kind and different amount of ingredients, and produced by different process, that is pounding the fresh ingredients and pounding the roasted ingredients or combination of both. All those factors were resulting

different organoleptic properties that are colors, textures, aroma, and tastes. The highest organoleptic has found on T3, follows by T1 and T5. Formulation T3 using the most kinds of ingredients, that is 15 kinds, and was produced by the combination of pounding the fresh raw material and pounding the roasted ones. The tester's preference on T3 could be a taken as a standard to produce tinuktuk.

We need to analyze the bioactive compounds and their antioxidant activities to confirm the traditional health claims of Simalungun population. Furthermore we need to improve tinuktuk through acceptance tests and shelf life tests so that we could easy and practical to enjoy it.

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