

PAPER • OPEN ACCESS

Exploration of Aceh traditional food: Chemical quality characterization of *asam sunti* in Banda Aceh

To cite this article: C Nilda *et al* 2022 *IOP Conf. Ser.: Earth Environ. Sci.* **951** 012040

View the [article online](#) for updates and enhancements.

You may also like

- [Optimum sensory formulation of bilimbi jam \(*Averrhoa bilimbi* L.\)](#)
J Juanda, R Agustina, S Hartuti et al.
- [Durability and Taste of Tofu with "Ie Asam Sunt" Coagulant](#)
Salmyah, Fachraniah, Fajri et al.
- [Optimization of sensory characteristics of bilimbi tea drink \(*Averrhoa Tea*\)](#)
Juanda, Raida Agustina and Sri Hartuti

Exploration of Aceh traditional food: Chemical quality characterization of *asam sunti* in Banda Aceh

C Nilda¹, M Muzaifa^{1*}, I Y Hasbi¹, D Hasni¹, F Rahmi²

¹Post Harvest Technology Department, Universitas Syiah Kuala, Jalan Tgk.Hasan Krueng Kalee 3, Darussalam-Banda Aceh 23111, Indonesia

²Agricultural Department, Universitas Gajah Putih, Blang Bebangka Aceh Tengah 24560, Indonesia

*Email: murnamuzafa@unsyiah.ac.id

Abstract. As a result of its diverse culture and nature, Indonesia is rich in traditional cuisine. In Aceh province, located in the western part of Indonesia, there is a special condiment known as *asam sunti*, made of fermented bilimbi (*Averrhoa bilimbi* L.). *Asam sunti* is used as a spice to give a sour taste and specific aroma in Acehnese cuisine. Although *asam sunti* is widely used by the people in Aceh, but until now there is no standard quality that shows the quality of *asam sunti*. The quality of *asam sunti* products that existing on the market is very diverse, especially in colour and texture. This study aims to analyse the chemical quality of *asam sunti* obtained from several markets in the city of Banda Aceh. Samples were obtained from 5 markets, namely Gampong Baroe, Peunayong, Seutui, Ulee Kareng and Gampong Peuniti Market. Chemical parameters analysed were moisture content, ash content, salt content and titrated acid content. The result shows that *asam sunti* in Banda Aceh city market has diverse chemical characteristic with moisture content range 21.38%-33.8% with average 29.48%, ash content 0.13%-0.45% with average 0.27%, salt content 6.11%-18.34% with average 8.15% and titrated acid content 7.5%-14.5% with average 11%. This chemical data needs to be correlated in further research with the level of consumer preference through descriptive and hedonic sensory tests so that later a complete *asam sunti* quality character can be obtained and can be made into a standard that is practically and scientifically acceptable.

1. Introduction

Bilimbi (*Averrhoa bilimbi* L.) is one of the fruits that is known quite well by the people of Indonesia. The sour taste of the fruit and the distinctive aroma make bilimbi often added in cooking. In addition, bilimbi has several advantages, such as easy to thrive in all regions in Indonesia, can bear fruit throughout the year and is believed to have quite a lot of medicinal properties. The use of bilimbi in Indonesia is generally in fresh form either as a mixture in cooking, traditional medicine, fishy odour remover, cosmetics, or rust remover on iron and steel [1,2].

Based on its history, bilimbi is presumed to have come from Malaysia. Its distribution is very wide, including to Indonesia, because of the ease of this plant to grow. Bilimbi can grow in almost all regions in Indonesia and each region has a specific name, so that in Indonesia bilimbi has more than 25 names, including: *limeng* (Aceh); *selemeng* (Gayo); *asom belimbing*, *balimbing* (Batak); *malimbi* (Nias); *balimbing*, *blimbing*, *blimbing wuluh* (Jawa); *balingbing*, *calingcing*, *calingcing wulet* (Sunda);



Content from this work may be used under the terms of the [Creative Commons Attribution 3.0 licence](https://creativecommons.org/licenses/by/3.0/). Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

bhalingbing bulu (Madura); *blingbing buloh* (Bali); *calene* (Bugis). This plant is also known abroad by the name *malibi* (Halmahera); *bilimbi* (Inggris); *cucumber tree* (Inggris); and *kamias* (Filipina). In Aceh province, Indonesia, bilimbi is widely used in its processed form, known as *asam sunti*. This product is a kind of pickle which is fermented with dry salting, brown in colour, sour and slightly salty in taste and has a soft, slightly chewy texture. The appearance of *asam sunti* is very different from its basic ingredient in the form of fresh bilimbi (Figure 1). *Asam sunti* is used as a spice, especially to give sour taste and specific aroma in Acehnese cuisine [3,4].

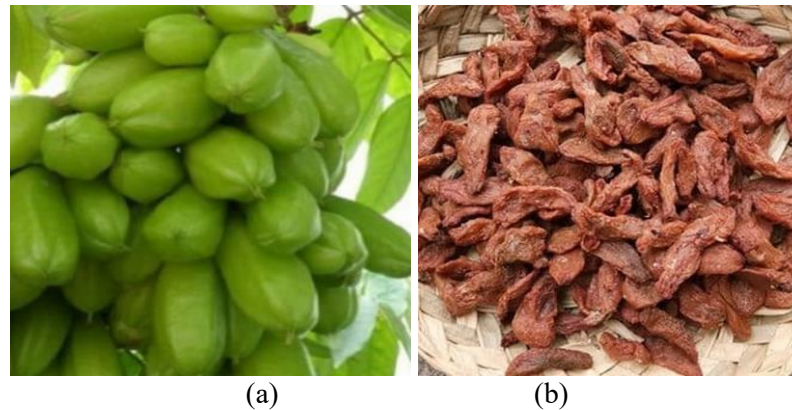


Figure 1. Fresh bilimbi (*Averrhoa bilimbi* L) (a) and *asam sunti* (b).

The fermentation process of *asam sunti* can be characterized as traditional fermentation. This category based on the tools used are still very simple, preserving perishable materials, the overall production costs are quite cheap and the processing method is relatively easy, obtained from generation to generation from ancient people [4]. The process of *asam sunti* production is done by drying and salting the bilimbi repeatedly, drying is done traditionally under the sun and followed by an incubation process for a certain time. In addition to providing a sour taste and specific aroma in Acehnese cuisine, *asam sunti* can also use as a certain thickener in food. These characteristics result from physicochemical and microbiological changes that occur during the process of *asam sunti* processing [4,5].

Based on the simple processing, it's routine use in Acehnese cuisine and has a long shelf life, it can be said that the processing of bilimbi into *asam sunti* is one form of food preservation that is quite efficient. So far, only in Aceh that has been discovered that there is a commercial preservation of bilimbi, even though bilimbi can be found throughout Indonesia. When production increases, of course, efforts are needed to increase its economic value. The existence of *asam sunti* needs to be raised to increase knowledge of the diversity of Indonesian traditional food products.

There are different forms of using *asam sunti* in Acehnese cuisine, some of them are used whole or sliced and then put directly into the dish. There is also *asam sunti* that is ground finely or coarsely first and then mixed into dishes or made chili sauce [3]. For practical reasons in the use of *asam sunti*, several studies have tried to make *asam sunti* in the form of pastes and powders [6–8]. However, so far, the use of *asam sunti* still survives in its original form.

Although *asam sunti* is widely used by the people in Aceh, until now there is no quality standard that shows the grade of *asam sunti*. *Asam sunti* products on the market are very diverse, especially in colour and texture. The colour of *asam sunti* is reddish yellow, dark brown, light brown and the texture is from soft to very hard. People generally only evaluate organoleptically which is limited to physical properties, such as colour and texture of *asam sunti*. To make a comprehensive quality standard of *asam sunti*, it is necessary to study scientifically and in depth how the quality characteristics of *asam sunti* that have been circulating in the market, both physically, chemically, sensory and microbiologically. This study aims to analyse the chemical quality of *asam sunti* obtained from several markets in the city of Banda Aceh.

2. Materials and methods

2.1. Sampling

The main ingredient used as a sample was *asam sunti* which are obtained from 5 markets in Banda Aceh city consisting of Gampong Baroe, Peunayong, Seutui, Ulee Kareng and Gampong Peuniti. Sampling was carried out intentionally according to the number of *asam sunti* traders from each market, then the producers with the most interest were chosen by buyers. From each producer 500 g samples were taken, coded and ready for analysis. The complete number of samples analysed and the origin of the samples can be seen in Table 1.

Table 1. The *asam sunti* sample obtained and the origin of the sample.

No.	Sample code	Market of sample origin
1.	GB1	Gampong Baroe
2.	GB2	Gampong Baroe
3.	ST1	Setui
4.	ST2	Setui
5.	PT1	Gampong Peuniti
6.	UK1	Ulee Kareng
7.	UK2	Ulee Kareng
8.	UK3	Ulee Kareng
9.	PN1	Peunayong
10.	PN2	Peunayong
11.	PN3	Peunayong
12.	PN4	Peunayong

2.2. Chemical analysis of *asam sunti*

Chemical analysis was carried out on *asam sunti* obtained from each market. Chemical analysis carried out includes analysis of moisture content [9], ash content [9], total acid titrated [10], and salt content [11].

2.3. Data analysis

Data analysis was performed using simple statistics. Each analysis was repeated 3 times and the resulting data was presented in tabular form with an average value. The data were then analysed descriptively.

3. Results and discussion

A total of 12 samples of *asam sunti* obtained from 5 (five) market locations in the city of Banda Aceh have varied physical appearances as shown in Figure 2. The results of the chemical analysis of the 12 samples of *asam sunti* can be seen in Table 2.

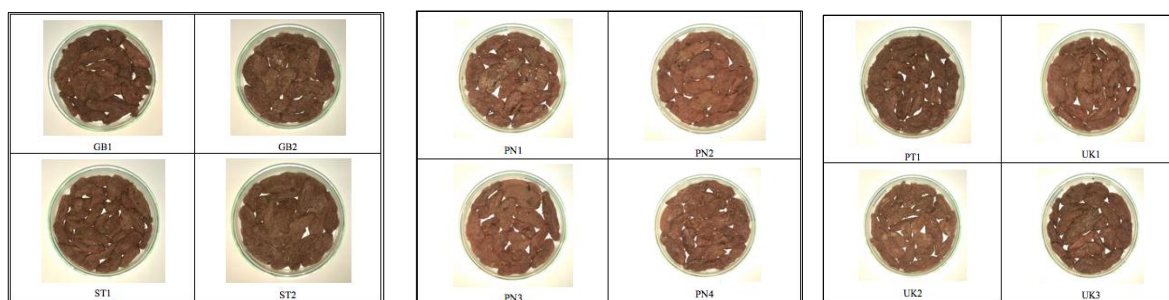


Figure 2. Asam sunti sample from five different market in Banda Aceh City.

Table 2. Data recapitulation of *asam sunti* chemical quality.

Sample	Chemical analysis (%)			
	Moisture Content	Ash Content	Salt Content	Total Acid
GB1	21,38	0,45	6,11	10,00
GB2	29,75	0,29	6,11	12,00
ST1	32,63	0,22	6,11	13,00
ST2	32,63	0,38	6,11	14,00
PT1	27,38	0,06	6,11	13,50
UK1	29,00	0,34	6,11	8,00
UK2	26,25	0,26	12,23	14,50
UK3	28,38	0,37	12,23	11,50
PN1	34,13	0,13	6,11	9,50
PN2	30,37	0,28	18,34	7,50
PN3	33,38	0,17	6,11	9,50
PN4	28,50	0,29	6,11	10,50
Average	29,48	0,27	8,15	11,00

Table 2 indicate that the moisture content of *asam sunti* ranges from 21.38%-33.8% with an average of 29.48%. The results of moisture content of *asam sunti* obtained from market of Banda Aceh city are lower than that of *asam sunti* studied by Muzaiifa [5] and Wijaya [12] which reached 46.07% and 62.16%, respectively. This difference in results is thought due to the differences in the process and the amount of salt used. Furthermore, compared to the raw material, the moisture content of *asam sunti* is much lower than fresh bilimbi, which is 94.78% [12] and 95.62% [5]. Fresh fruit is known contain very high water, which will cause damaged easily [13]. The significant decrease in moisture content in *asam sunti* was due to the processing process in the form of drying and repeated salting which contributed to the reduced water content of bilimbi. It is known that salting and drying is a type of processing that can reduce the water content of the material by absorbing the water of the raw material. Salt is a hygroscopic ingredient [14,15].

Ash content can describe the total minerals in a food ingredient. The ash content of *asam sunti* obtained in this study ranged from 0.06%-0.45% with an average of 0.27%. The results of the ash content are not much different from the ash content analysed by Wijaya [12], which is 0.3%. The ash content of *asam sunti* obtains from the minerals contained in bilimbi, most of ash obtain from the adding of in the process. The addition of salt in the processing of bilimbi can reach 3% [5], while at the community this level amount can vary widely and without a clear dose (only based on estimates or feelings). This difference can cause the range of ash content obtained in this study to have a wide range among all

samples. Mahatir [16] has analysed several important minerals in bilimbi, including potassium, calcium, magnesium and sodium.

In addition to sour taste, *asam sunti* is also known to have a salty taste. *Asam sunti* salt levels obtained in this study ranged from 6.11% to 18, 34% % with an average of 8.11%. The detection of salt levels in *asam sunti* was caused by the addition of salt which was carried out at the processing stage. Salting bilimbi is one of the most important process in the manufacture of *asam sunti*. The amount of salt added is different and without any standard rules. This difference can be seen from the range of differences in salt content is very large, as has been mentioned in the results of the previous ash content analysis. Compared to other salt fermented products, the salt content of *asam sunti* products is very high. The high level of salt is due to the addition of repeated salt and the desalting process is not carried out as is generally done in the vegetable fermentation process [17]. Hsieh and Li [18] mention that fermented vegetable products in China are generally washed to reduce their salt content.

The total titrated acid shows the organic acid content in a food ingredient. *Asam sunti* titrated acid levels obtained in this study ranged from 7.50%-14.50% with an average of 11%. Fruits generally contain organic acids, and the acidity of the fruit is related to its acid content. Organic acids are naturally present in fresh fruit and are intermediate products of basic metabolic reactions, such as the tricarboxylic acid cycle and other metabolic cycles. Several other organic acids that are not bound by the metabolic cycle and whose role is not known physiologically can accumulate in large quantities. The presence of organic acids causes the fruit has a sour taste. Some organic acids that are often found in fruits are formic, acetic, fumaric, malic, succinic, citric, tartaric, oxaloacetic, quinic, shikimic, and oxalic acids. Organic acids contained in bilimbi include citric acid, oxalic acid, formic acid, gallic acid and ferulic acid [19–21]. The organic acids found in *asam sunti*, apart from naturally originating from the raw material (bilimbi), are thought to also be produced from the fermentation process. It is known that certain microorganisms with their biosynthetic mechanism (fermentation) can produce various organic acids [22]. The role of microorganisms in increasing the total titrated acid is seen in the fermentation of several other food products such as dairy products [23], meat [24], vegetables [25,26] and coffee beans [27].

The results of Muzaifa's research [5] showed that oxalic acid, ascorbic acid, citric acid, malic acid and lactic acid were found in bilimbi and *asam sunti*. Muchtadi [28] mentions that organic acids can be produced by fermenting foodstuffs by certain microorganisms to produce specific flavours. These organic acids play a role in flavour formation and help in food preservation. Organic acids also play a textural role due to their reaction with protein, starch, pectin, gums and other food components, and can affect the colour of food.

4. Conclusions

Asam sunti in Banda Aceh market has various chemical characteristics. *Asam sunti* obtained has a moisture content ranging from 21.38%-33.8% with an average of 29.48%, ash content of 0.13%-0.45% with an average of 0.27%, salt content of 6.11%-0.45%. 18.34% with an average of 8.15% and titrated acid levels of 7.5%-14.5% with an average of 11%. This chemical data needs to be correlated in further research with the level of consumer preference through descriptive and hedonic sensory tests so that later a completed *asam sunti* quality character can be obtained and can be made into a standard that is practically and scientifically acceptable.

References

- [1] Tampubolon O T 1995 *Tumbuhan Obat* (Jakarta: Bhratara)
- [2] Manan O T 2002 *Belimbing Wuluh Hari. Suara Merdeka*
- [3] Ayu T S D 2004 *Kajian Pembuatan Asam Sunti (Belimbing Kering Asin) berkadar Oksalat Rendah dengan Penambahan Ekstrak Daun Tempuyung, Keji Beling, dan Tapak Liman Skripsi. Fak. Pertan. Univ. Syiah Kuala, Banda Aceh*
- [4] Muzaifa M 2008 *Perubahan karakteristik mikrobiologis dan fisikokimia belimbing wuluh selama fermentasi asam sunti dan identifikasi bakteri asam laktat selama pembuatan asam sunti*

- (Universitas Brawijaya, Malang)
- [5] Muzaifa M 2018 PERUBAHAN KOMPONEN KIMIA BELIMBING WULUH (*Averrhoa bilimbi* L.) SELAMA PEMBUATAN ASAM SUNTI *J. Teknol. Pertan. Andalas* **22** 37
 - [6] Rahmi F 2015 Pembuatan Bubuk Asam Suntir Melalui Optimasi Suhu dan Lama Pengeringan *J. Teknol. dan Ind. Pertan. Indones.* **7** 54–6
 - [7] HUSIN H 2016 FORMULASI DAN KARAKTERISASI SAOS ASAM SUNTI DENGAN PENAMBAHAN MAIZENA
 - [8] Yulita R 2019 *Optimasi suhu dan waktu pengeringan asam suntir pada pembuatan bubuk asam suntir* (Universitas Syiah Kuala)
 - [9] AOAC 2005 *Official Methods of Analysis. Association of Analytical Chemist*
 - [10] Apriantono A, Fardiaz D, Puspitasari N L and Budiyanto S 1989 Petunjuk Laboratorium Analisis Pangan, Pusat Antar Universitas Pangan Dan Gizi Institut Pertanian Bogor
 - [11] Saleha 2017 *Penetapan kadar garam (NaCl) pada ikan asin blamo (blame) yang direndam kertas hvs (houtvrij schrijfpapier) (Studi di Pasar Legi Kota Jombang)*. (STIKES ICME Jombang)
 - [12] Wijaya 2015 *Karakterisasi Komponen Aroma Aktif Pada Belimbing Wuluh (Averrhoa Bilimbi L.) Dan Produk Fermentasinya* (Institut Pertanian Bogor)
 - [13] Samadi, Wajizah S and Munawar A A 2018 Fast and simultaneous prediction of animal feed nutritive values using near infrared reflectance spectroscopy *IOP Conference Series: Earth and Environmental Science* vol 122 (Institute of Physics Publishing)
 - [14] Indiarto R, Jeanette G, Zdikri H M, Yusra N A and Subroto E 2021 A Mini-Review Of Salting Techniques To Improve Food Quality **10** 285–9
 - [15] Amit S K, Uddin M M, Rahman R, Islam S M R and Khan M S 2017 A review on mechanisms and commercial aspects of food preservation and processing *Agric. Food Secur.* **6** 1–22
 - [16] Muhammad M 2017 Penetapan Kadar Kalium, Kalsium, Natrium dan Magnesium dalam Buah Belimbing Wuluh (*Averrhoa bilimbi* L.) Secara Spektrofotometri Serapan Atom
 - [17] Basyir F, Munawar A A and Aisyah Y 2021 Near infrared reflectance spectroscopy: Classification and rapid prediction of patchouli oil content *IOP Conf. Ser. Earth Environ. Sci.* **667**
 - [18] Li J and Hsieh Y-H P 2004 Traditional Chinese food technology and cuisine. *Asia Pac. J. Clin. Nutr.* **13**
 - [19] Sugiyono M T R and 1992 *Ilmu Pengetahuan Bahan Pangan* (Departemen Pendidikan dan kebudayaan Direktorat Jenderal Pendidikan Tinggi Pusat Antar Universitas (PAU) Pangan dan Gizi Institut Pertanian Bogor)
 - [20] Susanto T 1993 Pengantar pengolahan hasil pertanian *Fak. Pertanian, Univ. Brawijaya, Malang*
 - [21] Belitz D H and W G 1999 *Food chemistry* (Springer-Verlag)
 - [22] Khan I, Qayyum S, Maqbool F, Hayat A and Farooqui M S 2017 Microbial organic acids production, biosynthetic mechanism and applications-Mini review
 - [23] Choi Y J, Jin H Y, Yang H S, Lee S C and Huh C K 2016 Quality and storage characteristics of yogurt containing *Lactobacillus sakei* ALI033 and cinnamon ethanol extract *J. Anim. Sci. Technol.* **58** 1–7
 - [24] Ortiz L S, Sinning L L and Castillo P M M 2019 Evaluation of the Physicochemical Properties of Fermented Sausages with *Staphylococcus xylosus* and *Lactobacillus Sakei* *Pakistan J. Nutr.* **18** 1068–74
 - [25] Yang F, Wang Y-P and Zhao H 2019 Quality enhancement of fermented vegetable juice by probiotic through fermented yam juice using *Saccharomyces cerevisiae* *Food Sci. Technol.* **40** 26–35
 - [26] ALAN Y and YILDIZ N 2021 Effects of *Lactobacillus* used as the starter culture on naturally fermented pickled cabbage *Food Sci. Technol.*
 - [27] Muzaifa M, Hasni D, Patria A and Abubakar A 2019 Fermentation of coffee beans with inoculation of *Bacillus subtilis* and its impact on coffee sensory quality *IOP Conference Series: Earth and Environmental Science* vol 364 (IOP Publishing) p 12010

- [28] Muchtadi T R 1997 Teknologi Proses Pengolahan Bahan Pangan *Dep. Pendidik. dan Kebudayaan. Bogor*