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by Choirun Nissa

Submission date: 15-Jul-2020 07:22PM (UTC+0700)

Submission ID: 1357802530

File name: gar_on_Nutrient_Composition_and_Shelf_Life_of_Red_Guava_Jams.pdf (205.03K)

Word count: 2928

Character count: 15199

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To cite this article: Choirun Nissa *et al* 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **406** 012027

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Effect of Sugar on Nutrient Composition and Shelf Life of Red Guava Jams

Choirun Nissa¹, Fahmi Arifan², Rico Febrianto², William Aditya², Ida Hayu Dwimawanti³, Reyno Pramudyono Widyasmara⁴

¹Nutrition Department, Faculty of Medicine, Diponegoro University, Jl. Prof Soedharto, Tembalang, Semarang, 50239, No Telp/Fax: (024) 7460058

²Chemical Engineering Department, Diponegoro University, Jl. Prof Soedharto, Tembalang, Semarang, 50239, No Telp/Fax: (024) 7460058

³Public Administration Department, Diponegoro University, Jl. Prof Soedharto, Tembalang, Semarang, 50239

⁴Public Health Study Program, Hakli College of Health Sciences, Jl. Dr. Ismangil No.27 Bongsari, Semarang, Telp / Fax: (024) 7601844

nissaeyong@gmail.com, fahmiarifan80@gmail.com, ricofebrianto98@gmail.com, william.ayodyasena@gmail.com, idahade@gmail.com, rpwidyasmara@gmail.com

Abstract. Red guava as fruit jams normally preserved using added sugar to prolong its shelf life. Heating process and different sugar content could affect in nutrient content and expiration date. Hence, the aim of this study was to evaluate the nutrient content and shelf life of jams based on two different sugar content. Two hundred (jam A) and two hundred and fifty grams of sugar (jam B) was added in 800 grams of guava then cooked at 70°C within an hour. Protein and fat was measured using Kjeldahl and soxhlet, while water and ash content was analyzed using thermogravimetry and dry ash method. Carbohydrate was calculated using by difference method. Shelf life determination was obtained using organoleptic test, containing taste, aroma, and visual sensory. In result, jam A have a higher protein (0.334%), fat (1.567%), and water (29.21%) than jam B (0.306%; 1.092%; 27.32%). On the other hand, ash (0.34%) and carbohydrate (68.549%) in jam A are lower than B (0.37% and 70.912 respectively). Overall, jam A have a higher protein, fat, water and carbohydrate content than jam B. A higher water content potentially indicate a lower shelf life which seen in jam A. In conclusion, terms of nutritional composition, jam A have higher content than jam B, but have lower shelf life.

Keywords: red guava, jam, shelf life, nutrition composition, organoleptic



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Introduction

Food is anything that comes from biological sources and water, whether it is processed or not, which is intended as food or drinks for human consumers, including food additives and other materials used in the process of preparing, processing and the making of food or drinks. Food processing is food or drinks that is processed by particular methods with or without additives.

One of biological sources that can be used as a food resources is red guava fruit. Red Guava (*Psidiumguajava L.*) is a part of the Myrtaceae family, where guava has been planted and developed in various countries in the world. Red guava is famous for its distinctive taste, scent, nutritional value as a fruit and is a potential source of *phytochemicals*[5].The characteristics of red guava fruit, namely oval-shaped with green or yellow color, with red or pink guava grains depending on the variety [11]. Red guava grows as a green tree with a height up to 2-11 meters. The plants grow quickly and will bear fruit within 2-4 years from the beginning of the seeding period. Red guava production alone is estimated to reach 500,000 tons worldwide. Red guava itself is used to be processed into drinks, syrup, ice cream, jams, and *jelly*[7]. Based on an analysis conducted by McCook-Russell [11], red guava has quite a lot of nutrients. These contents include fat, protein, ash, fiber, calcium, polyphenols, anti-oxidant and absolutely red guava fruit is also rich of vitamin C.

In Indonesia alone, red guava is quite abundant. Based on data from the Central Bureau of Statistics [2], the production of red guava reached 200,495 tons where Central Java became the highest-producing areas. More specifically, in Temanggung, red guava fruit is quite abundant found in Kaloran and Bejen. However, the red guava is still only used for direct sales so that it has a fairly low economic value. In addition, because red guava is rich with vitamin C, the fruit tends to easy to rot when it is ripe, which is 2 weeks after the ripe phase. This decay can occur because of the vitamin C in red guava will be oxidized irreversibly by the enzyme *Ascorbate oxidase*. *Ascorbate oxidase* is a copper-containing enzyme which will oxidize and degrade vitamin C and increase microbial activity in fruit [10]. More clearly, the enzymatic activity is influenced by the storage process. The storage process in the open air, places exposed to sunlight, and places exposed to pathogens and chemicals will affect the enzymatic activity that results in the decay of red guava. Therefore, it needs the correct storage processes. The storage process can be in the form of processing red guava to other products that are more durable.

However, the processing of red guava has not varied. Nevertheless, one of the processing solutions is by processing red guava into jam.

Jam is food that is cooked using the meat/juice of fruits or vegetables which are then converted into jelly-like form. In general, jam is made using only one type of fruit with the characteristics of a good jam is to have a soft and even texture, favorable color and good fruit taste [3]. Jam production can use various types of fruit, but in general the fruit that is used contains pectin. *Pectin* is a sugar/*polysaccharide* compound that makes jam to have a soft but thick texture. One of them is in red guava. Red guava is suitable for jam because it contains quite a lot of *pectin*. The pectin in red guava is around 1.4% -1.6% of the total content. Regarding the content of pectin in various fruits, red guava has a fairly high content of pectin. Furthermore, the red guava pectin content is close to the pectin content in fruits which are generally processed into jams, such as strawberries, blueberries, grapes, etc. The advantages of processing besides red guava jam have good economic value, red guava jam products have also a long shelf life, and have a delicious and nutritious taste. In this study using the variable of sugar amount with the expected results is to know the nutrition of red guava jam and its durability.

Research Methods

The material used to make red guava jam is 800 grams red guava fruit, sugar for variable A is 200 gram and variable B is 250 gram, 3 cinnamons, and 3 cloves. The steps to make red guava jam is, first the juice in red guava is taken using a blender and separated from the seeds, then the juice is heated on a pan to a temperature of 70°C for one hour, when it has reached the temperature, ingredients such as sugar, cinnamon and cloves are added and stirred evenly. Stirring is carried out until the red guava jam reaches a consistency like jam in general. After that, red guava jam is put into aluminum foil as a storage container. Then, to find out the nutrition contained and endurance in red guava jam, a proximate test was performed. This proximate test includes a protein content test, a fat content test, a water content test and an ash content test. In the protein content test, the test uses the Kjeldahl method where the sample will undergo desctruction using concentrated sulfuric acid and catalyts. In the fat content test, the test is carried out using the Soxhletation method where the sample will be extracted using a petroleum ether solvent. In the ash content test, the test is carried out by the method of drying ash in which the sample will be made up on the flame and blended in a furnace at 550°C until s

complete ashing. In the water content test, this test uses a thermogravimetric method in which the sample will be dried to a certain constant weight [12]. For carbohydrate content can be obtained from the calculation results, which are:

$$\% \text{Carbohydrate} = 100\% - \%(\text{Protein} + \text{Fat} + \text{Water} + \text{Ash}) \text{ [12]}$$

For red guava jam durability can be seen from the water content and the endurance supported through direct observation of changes with organoleptic tests. Organoleptic test is a test based on the body's sensory stimulus to an object, especially food. This organoleptic test aims to determine the quality of products based on direct consumer acceptance [1]. With organoleptic testing, the quality of the jam can be known to determine whether the jam is still suitable for consumption or not. Organoleptic tests were carried out for 4 weeks in the second month with an assessment of 1-10 in the categories of taste, color, and scent. The greater the value in each category shows that the quality in each category is still maintained. Proximate test in this study was conducted at UPT Laboratory Diponegoro University. Organoleptic tests were carried out in the Department of Chemical Engineering, Diponegoro University.

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Results and Discussion

The results of the proximate test include protein content tests, fat content tests, ash content tests, and water content tests. For carbohydrate levels, these levels can be obtained through the calculation of the difference between the levels 100% with the amount of percent protein, fat, ash and water. For dissolved solids, it can be obtained through a percentage of protein, fat, ash and carbohydrate. These results can be seen in the following Table 1.

Tabel 1 Proximate Test Result Data

Variable	Protein (%)	Fat (%)	Ash (%)	Water (%)	Carbohydrate (%)	Dissolved Solids (%)
A Jam	0,334	1,567	0,34	29,21	68,549	70,79
B Jam	0,306	1,092	0,37	27,32	70,912	72,68

Data from Indonesian National Standard [14] states that the minimum dissolved solid content requires for fruit jam is 65%. When compared with A jam and B, both of them have successively higher levels of dissolved solids than the requirements of the Indonesian National

Standard. Thus, A jam and B have met the requirements of the Indonesian National Standard as a fruit jam.

There are found differences in levels of protein, fat, ash, water and carbohydrates in the A jam and B. This can be caused by the amount of sugar added to the jam. The addition of different level sugars will cause different results as well. The more addition of sugar will affect the reduction which is also more on the levels of protein, fat, ash and water. This is also supported by a temperature increase in the processing of red guava fruit into jam [9]. However, carbohydrates have increased levels because sugar contains glucose where glucose is one of the constituent compounds of carbohydrate polymers [13]. The addition of sugar will result in more glucose in the jam. So, from the results we can get that the jam which experiences more sugar additions will cause a decrease in levels of protein, fat, ash, water but also causes an increase in carbohydrate levels.

From the results of the proximate test, we also found out the water content of each jam variable. This content is related to jam microbial activity and the durability. The water content test results can be seen in Table 1 above.

Based on Table 1, we found out the results of the water content of the two jam variables. The A jam has a higher water content than B jam. A jam has 29.21% water content and in B jam has a 27.32% water content. The water content has a relation with microbial activity and the durability of jam itself. The higher the water content is, then microbial activity will increase. According to the research results from Bussiere[4], the water content in jams generally ranges between 20% -40% where in that range there are *Mycotoxigenicaspergilli* microbes. *Mycotoxigenic aspergilla* microbes are a type of microbe that plays a role in the breakdown and destruction of components in food. Furthermore, with a water content in range of 20% -40%, jam has an estimated shelf life of approximately 4 months [4]. Furthermore, the water content plays an important role in the growth period, especially in the exponential phase of the bacterium *Mycotoxigenic aspergilla*. The exponential phase is the phase in which bacteria undergo the most active processes of growth and activity before entering the peak and death phases. This bacterium has an exponential phase of 1,5 months [6]. To find out if there is a change in the quality of jam during storage, an organoleptic test is performed. The collection of organoleptic assessment data was carried out for 4 weeks in order to find out if there were changes when the

Mycotoxigenic Aspergilla bacteria entered an exponential growth phase. Organoleptic assessment data can be seen in Table 2 below.

Tabel 2 Organoleptic Assessment Results

Category	A Jam				B Jam			
	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4
Color	9	9	8	8	9	9	9	8
Taste	8	8	8	7	8	8	8	8
Scent	8	8	7	7	8	8	8	7

Based on the requirements from Indonesian National Standard (SNI) [14], good quality jam have a normal aroma, taste, and color. Based on the above organoleptic data, A jam and B jam have quality that is still maintained during the storage period. In more detail, it can be seen that the quality of B Jam has more consistent endurance than A Jam. This can occur because in the A jam the sugar has less water content. The lower water content indicates less microbial and bacterial activity so that it has a longer life. So that, during the 4 weeks test period, the quality of guava jam B was maintained.

Conclusion

The result, the B jam contains less protein, fat, water, and ash than the jam A due to reduction, but it has more carbohydrate levels because sugar contains glucose as a constituent part of carbohydrates. In durability, the B jam has less water so it has less microbial activity as a result, the jam has better endurance. Therefore, the B jam has better endurance and has higher carbohydrate content, but for protein, fat, water and ash content, the A jam is much higher.

References

- [1] Ana, A., Subekti, S., Hamidah, S., Komariah, S. 2017. "*Organoleptic Test Patisserie Product Based on Consumer Preference*". IOP Publishing: IOP Conf. Series: Materials Science and Engineering 180.
- [2] Badan Pusat Statistik (BPS). 2017. "*Statistik Tanaman Buah-Buahan dan Sayuran Tahunan, tahun 2017*". Indonesia.
- [3] Berolzheimer, Ruth. 1969. "*Culinary Arts Institute Encyclopedic Cookbook*". United State: Chicago, Culinary Arts Institute, Page 830.
- [4] Bussiere G and Serpelloni M. 1985. "*Confectionery and Water Activity Determination of a_w by Calculation*". In: Simato D and Multon JL, (eds.) Properties of Water in Foods in

- Relation to Quality and Stability. Dordrecht, The Netherlands: MartinusNijhoff Publishers. Page 626-645.
- [5] De Souza, Tercio da Silva et al. 2018. "*Chemotype diversity of Psidiumguajava L.*", Phytochemistry 153, Page 129-137.
- [6] Gibson, Angela M., Baranyi, Jozsef, Pitt, John I., Eyles, Michael J., Roberts, Terry A. 1994. "*Predicting Fungal Growth: The Effect of Water Activity on Aspergillusflavus and Related Species*". International Journal of Food Microbiology Vol. 23, Issues 3-4, Pages 419-431.
- [7] Jimenez-Escrig, A., Rincon, M., Pulido, R., danSaura-Calixto, F. 2001. "*Guava Fruit (Psidiumguajava L.) as a New Source of Antioxidant Dietary Fiber*". Journal of Agricultural and Food Chemistry, 49, Page 5489-5493.
- [8] Joshi, Homi. 2016. "*Nutritional Evaluation of Different Varieties of Guava (Psidiumguajava L.) and Their Preserved Products*". Pakistan: Department of Food and Nutrition, Punjab Agricultural University.
- [9] Khan, Aftab Ahmed et al. 2016. "*Influence of Sugar Concentration on Physicochemical Properties and Sensory Attributes of Sapodilla Jam*", Pakistan: Institute of Agricultural Sciences, Quaid-e-Azam Campus, University of the Punjab.
- [10] Lee, Seung K., Kader, Adel A. 2000. "*Preharvest and Postharvest Factors Influencing Vitamin C Content of Horticultural Crops*". Journal of Postharvest Biology and Technology, 20, Page 207-220.
- [11] McCook-Russell, Kayanne P. et al. 2012. "*Nutritional and Nutraceutical Comparison of Jamaican Psidiumcattleianum (Strawberry guava) and Psidiumguajava (Common guava) Fruits*". Journal of Food Chemistry vol.134, Page 1069-1073.
- [12] Musfiroh, I., Indriyati, W., Muchtaridi, Yudhi, S. 2010. "*AnalisisProksimatdanPenetapan Kadar β -KarotendalamSelaiLembarangTerungBelanda (CyphomandrabetaceaSendtn.) denganMetodeSpektrofotometriSinarTampak*", Bandung: FakultasFarmasi, UniversitasPadjajaran.
- [13] Prentice, Ann. 2015. "*Carbohydrates and Health*". London: Scientific Advisory Committee on Nutrition, The Stationery Office.
- [14] Standard Nasional Indonesia (SNI). 2008. SNI 3746:2008. Indonesia.

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