



# CONFERENCE PROGRAMS AND ABSTRACT

**The 3<sup>rd</sup> FIRST 2019 INTERNATIONAL CONFERENCE  
FORUM IN RESEARCH, SCIENCE, AND TECHNOLOGY  
OCTOBER 09-10, 2019  
*Palembang, Province of South Sumatera  
Indonesia***

Organized by :



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## **PREFACE**

The 3rd FIRST 2019 (Forum in Research, Science, and Technology) International Conference was initiated and organized by State Polytechnic of Sriwijaya in collaboration with Management and Science, University (MSU), Malaysia and National Chin-Yi University of Technology, Taiwan. The theme of the conference was “Integration of Advanced Technology to Enhance Social Welfare”. The 3rd FIRST 2019 International Conference facilitated the participants from all over the world to meet face to face to open chances in establishing connection and collaboration among them. It was not only for the researchers in academics, but also in industries and governments. This conference became an effective media to link the researchers from many parts of the world conference, for exchanging, sharing, following up and discussing the results of the latest research, industry’s needs, and government regulatory policies. The 3rd FIRST 2019 International Conference became worthwhile platform for researchers to present their finding in the areas on multidisciplinary of Engineering and Science (Track 1), Computer Science and ICT (Track 2), and Social Science (Track 3). It has also provided an opportunity for the professionals and researchers to learn and share about the latest development and research in those 3 tracks.

The 3rd FIRST 2019 International Conference attracted so many authors not only from Indonesia but also from other countries, such as Japan, Taiwan, and Malaysia. There were 180 papers were accepted in the 3rd FIRST 2019 International Conference, including 89 papers for Track 1 (Engineering and Science), 46 papers for Track 2 (Computer Science and ICT), and 45 papers for Track 3 (Social Science). In The 3rd FIRST 2019 International Conference, there were 4 keynote speakers and 2 invited speakers. As the keynote speakers, there were Prof. Yasushi Kiyoki, Ph. D from KEIO University, Japan, Prof. Nurul Taufiqu Rochman, M. Eng, Ph. D, From LIPI, Indonesia, Prof. Tjiptohadi Sawarjuwono, M. Ec., Ph. D., Ak, from Universitas Airlangga, Indonesia, and Prof. Win-Jet Luo, from National Chin-Yi University of Technology, Taiwan. As the invited speakers, there were Dr. R. Wisnu Nurcahyo, DVM from Universitas Gadjah Mada, Indonesia, and Assoc. Prof. Dr. Intan Zaurah binti Mat Darus from Universiti Teknologi, Malaysia. The 3rd FIRST 2019 International Conference committee would like to say thank you very much for all the participants and their respected institutions that have supported for the success of the 3rd FIRST 2019 International Conference, and also for all of the guess and sponsors of the 3rd FIRST 2019 International Conference.

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# Characterization of Red Beetroot Soft Jelly Candy with Guava Extract and Gel Colloid Added

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**Abstract.** Red beetroot is widely planted in the highlands in Indonesia. The content of vitamins and minerals is very useful in stimulating, building, cleaning red blood cells and can prevent the lack of red blood cells in the body. Beet tubers are enriched by high red phenotype pigments compared to orange and white. The red pigment is a high antidote to free radicals. Red beetroot is not only used as a natural coloring agent but can also be used as a sweetener because of its high sucrose content. However, beetroot is less popular because of its unpleasant taste and aroma. Beets and guava are innovations from food processing that have nutritional value to be used as a useful product. Red beetroot is processed into one functional food product in the form of soft jelly candy with a mix and hot process. The method used in this study is the extraction method and cooking by heating (80°C ) with stirring. The stages of the research include the stage of sample preparation, fruit extraction, jelly candy making, and the testing stage. Determination of the endpoint of making jelly is done by the fork test. To improve the characterization of jelly candy is to add guava extract and pectin. Characterization of jelly candies analyzed was water content, ash content, glucose content, sucrose content, and metal Pb metal content. Based on the results of research that has been done on the characterization of red beetroot soft jelly candies with variations of guava extract and colloidal pectin gel have met the SNI standard of soft jelly candies with the results of water content (0.96-2.28%), ash content (0.27 0.56%), glucose contents (18.06 -22.11), sucrose content (17-20%), Pb metal content (0.026 ppm)

**Key Word:** Jelly, Beetroot, Pectin, Guava

## 1. INTRODUCTION

Beetroot (*Beta Vulgaris L.*) including tubers, contains substances that are very necessary for health, including iron, vitamin C, potassium, phosphorus, magnesium, folic acid, and fiber. Beet bulbs contain mostly vitamin A and vitamin C, calcium iron, phosphorus, protein, and carbohydrates. Beet tubers are not only used as natural dyes but can also be used as sweeteners [1]. Beets are also high in folate and betacyanin [6]. According to Rao (2014), beetroot (*Beta vulgaris L*) has antibacterial activity at a minimum inhibitory concentration of 5 mg/ml against *Bacillus subtilis*, *Pseudoma aeruginosa* and *Escherichia coli*.

Beet tubers are usually consumed in the form of juice or fruit juice, but as a functional food ingredient, beetroot has not been much in demand by consumers because of its unpleasant taste and aroma. Several attempts to improve the taste of beetroot have been done, for example by adding beetroot to one type of food preparations, namely jelly candy. Jelly is one type of sugar candy that is preferred because it has unique properties. The specificity lies in the taste, shape, elasticity, and elasticity of the product [4].

The addition of guava fruit extracts and variations in the concentration of pectin in making beetroot jelly candy aims to produce jelly candies that have characterization in according to SNI 3547-2-2008 with variable water content, ash content, reducing sugar content, sucrose content and lead metal content (PB). Based on SNI 3547-2-2008, candy *jelly* is soft-textured candy which is processed by the addition of hydrocolloid components such as agar, gum, pectin, starch, carrageenan, gelatin and others which are used for texture modification to produce a chewy product. In making candies jelly the hydrocolloid material used is pectin which functions as a



gel-forming material and gives a chewy texture. The ability of pectin to form a gel is a unique characteristic of pectin. The use of pectin in addition to forming gels is also used in packaged fruit products, juice, and ice cream as a stabilizer [7].

Guava fruit is used in making jelly candy because this fruit contains various nutrients that can be used as medicine for health. The vitamin C content of guava is twice the sweet orange which is only 49 mg per 100 g of fruit. Vitamin C is concentrated in the skin and the outer flesh is soft and thick. The content of guava vitamin C peaked just before it was ripe. [9]. Besides guava has a distinctive aroma that is very interesting for consumption.

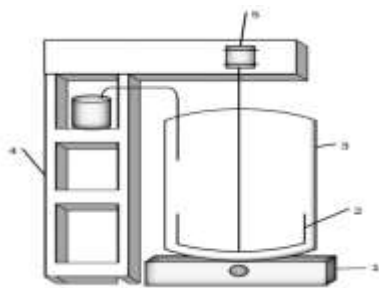
In principle, all types of fruit can be used to make jelly, especially fruits that contain pectin. To produce a lot of pectins, the fruit used should be ripe physiologically, but to get a taste (aroma and taste) morphological ripe fruit is used. In jelly making, physiological and morphological ripe fruits are used in the same ratio to produce the right pectin composition and good taste [5]. Thus the addition of various guava fruit extracts and pectin was done to improve the texture and characterization of jelly candies in according to SNI 3547-2-2008.

## 2. METHODE

The method used in this study is the extraction method and cooking by heating with stirring. The stages of the research include the stage of sample preparation, fruit extraction, jelly candy making, and the testing stage. Determination of the endpoint of making jelly is done by a fork test or test using a fork. In this study there are 2 types of research variables used, the fixed variable is sample A with a comparison of the composition of the beetroot tuber and guava sample A (A1-A5), which is 60: 40% v / v. and sample B with a ratio of 80:20% v / v. Dependent variable is the variation of pectin used in each sample that is 2%; 2.5%;3%; 3.5%; 4% into each mixture and add 100 ml water. Tests on the characterization of jelly candy include water content (%), ash content (%), reduced sugar content/glucose (%), total sugar content/sucrose (%) and lead-heavy metal content (ppm) in according to SNI 3547-2-2008.

### Tool

Blender, Hot Plate, Beker glasses, knives, Sieve, Thermometer, Spatula, Balance Analytical, Hardware extraction, mold jelly, equipment testing spectrophotometer, refractometer, Oven, Furnace, and mixer Jelly heated modest shown in figure 1 below:



### Information :

1. Hot Plate
2. Mixing rod
3. Mixing tank
4. Tank support pole
5. Mixing machine

Fig.1. Simple Jelly Mixer Tool

### Ingredients

Bit tubers, Fruit Guava, pectin, Air

## 3. RESULTS AND DISCUSSION

After a soft jelly candy making process beet and do some testing of the characterization of beet jelly candy soft covering water content, ash content, glucose content, sucrose content and Pb metal content to sample A with beetroot extract and guava extract (60: 40) with 5 variations of pectin namely A1 (2%), A2 (2.5%), A3 (3%), A4 (3.5%), A5 (4%) and sample B with a ratio of 80: 20 with 5 variations of pectin namely B1 (2%), B2 (2.5%), B3 (3%), B4 (3.5%), B5 ( 4%), then the results obtained in the following Table 1:

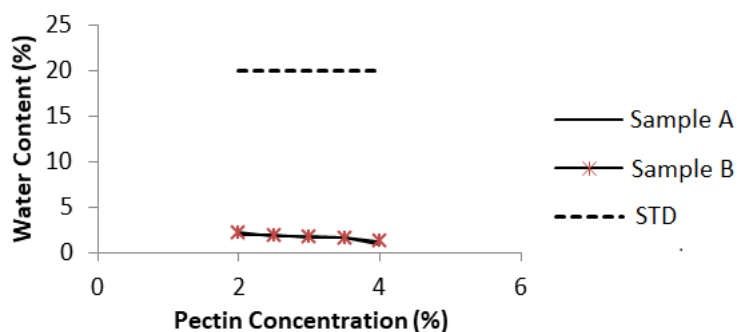
Table 1. Test Results Characterization of Soft Jelly Candy Beetroot

Sample	Water content (%)	Ash content (%)	Glucose content (%)	Sucrose content (%)	Pb Metal content (ppm)
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<b>A1</b>	1.96	0.27	18.06	20	0.129
<b>A2</b>	1.95	0.32	19.16	19	0.126
<b>A3</b>	1.77	0.36	20.39	19	0.104
<b>A4</b>	1.68	0.36	22.65	18	0.065
<b>A5</b>	0.96	0.37	22.71	18	0.026
<b>B1</b>	2.28	0.27	15.43	20	0.182
<b>B2</b>	1.91	0.37	17.83	18	0.156
<b>B3</b>	1.79	0.45	18.03	18	0.152
<b>B4</b>	1.64	0.45	21.60	17	0.117
<b>B5</b>	1.33	0.56	22.39	17	0.052
<b>SNI</b>	Maks 20	Maks 3	Maks 25	Maks 27	Maks 2

### Characterization of Beet Jelly Candy Water Content on Variation of Pectin Concentration

Concentration Water content is very influential in the quality and durability of jelly candies. Therefore, its excessive presence is reduced by heating, drying or evaporation. The analysis showed that the composition of the comparison of raw materials between A and B affected on the value of jelly candy water content. The more the concentration of pectin, the number of solids will be more and more water content will decrease. Weight loss due to the heating process is considered as the weight of the water content contained in the material that evaporates during heating. These conditions can be seen in the following figure 2.



**Fig.2.** Graph Effect of Pectin Concentration Treatment on Water Content

It can be observed that the highest water content value in sample A is seen in sample A1 of 1.96% and for sample B seen in sample B1 of 2.28% with a pectin concentration of 2%. Likewise, the lowest value of water content in samples A was A5 sample at 0.96% and sample B at B5 was 1.33% with a pectin concentration of 4%. This condition shows that the lower the concentration of pectin, the smaller the water content in jelly candy. This happens because pectin can bind water so that free water is reduced, then the water content in jelly candy decreases with the addition of pectin. Decreased water content in jelly candies is also caused by a uniform mixing process so that more evaporation of water content. The value of the water content of jelly candy produced in this study is still in accordance with the quality standards of jelly candy SNI 3574.2-2008 with a maximum value of 20%. So it can be observed that the addition of pectin in samples A and B with a concentration of 2% -4% still meets the Indonesian National Standard for water content variables.

### Characterization of Beet Jelly Candy Ash Content on Variation of Pectin Concentration

Determination of total ash content aims to determine the mineral content contained in the sample. The determination of ash content is closely related to the mineral content contained in an ingredient. The more the level of purity and cleanliness of a material produced increases the higher the ash content and the cleanliness of a product decreases. This can be seen in the following figure 3.



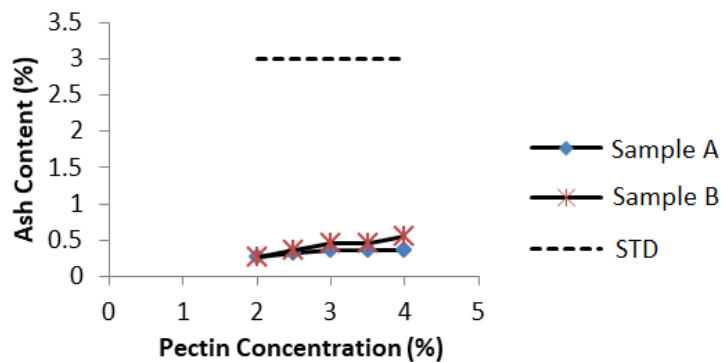


Fig.3. Graph Effect of Pectin Concentration Treatment on Ash Content

Testing ash content in principle is a graying process of inorganic substances. Testing the content of jelly candy using the method in according to SNI 01-2891-1992 on "How to Test Food and Beverage". The results of the ash content characterization graphs on the variation of pectin showed that the higher the pectin concentration the higher the ash content in soft jelly candies. This condition indicates that the higher amount of pectin can bind more minerals from water and dissolved solids thereby increasing ash content. The best value of ash jelly candy contained in samples A1 and B1 is 0.27%. These results indicate that the variation in composition between A and B does not affect on the value of ash content of soft jelly candies. However, the results of the analysis showed that the value of the ash content of jelly candy sample A (60:40) was worth 0.27% - 0.37% while sample B (80:20) was worth 0.27% - 0.45% SNI 3574.2-2008 which is a maximum of 3%.

#### Characterization of Beet Jelly Candy Glucose Content on Variation of Pectin Concentration

Reducing sugar (glucose content) is a very influential parameter in the quality of glucose jelly products produced. According to SNI 01-2891-1992 concerning "Test Method for Food and Beverage", testing of glucose levels is carried out using the Luff-Schoorl method. The endpoint of the titration is marked by the loss of dark blue. The variation of the concentration of pectin added in this study, gave influence on the glucose contents analyzed. The effect of increasing the concentration of pectin on the characterization of jelly glucose content can be seen in Figure 4.

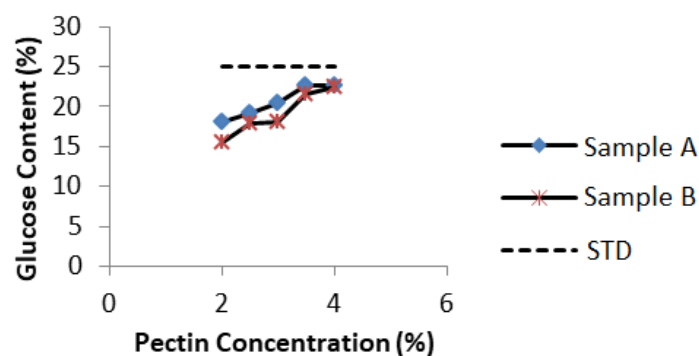


Fig.4. Graph Effect of Pectin Concentration on Glucose Content

The increase in reducing sugars is also caused by sucrose content in fruit, temperature and heating time which causes concentrated sugar content so that concentrations and acidic conditions occur in the cooking process triggering the partial inversion of sucrose into glucose and fructose which will increase sugar solubility. The higher the concentration of pectin, the greater the reducing sugar content. From the results of the analysis of jelly candy reducing sugar levels found that the highest level was in the B5 sample of 22.39% with a pectin concentration of 4% and the lowest yield was in the B1 sample of 15.43% with a pectin concentration of 2%.

Based on SNI quality standards no. 3547.2-2008 the sugar content of beetroot jelly candy in the addition of 2% pectin in both samples A and B is still according to the maximum SNI standard because it does not exceed 25%.

#### Characterization of Beet Jelly Candy Sucrose Content on Variation of Pectin Concentration

Total sugar (sucrose content) is the sugar content found in jelly candy derived from glucose and fructose. The amount of glucose in beets and guava fruit used is the main ingredient so that the total sugar (sucrose content) in jelly candies approaches the Indonesian National Standard (SNI). For SNI, the total sugar (sucrose content) of jelly candy is a minimum 27%. Sucrose has prominent properties, among others, which has a very desirable sweet taste, can act as a bulking agent, has a high level of solubility, and good preservatives. Sucrose will form flavor and color when heating, has a good storability, easy to digest, and non-toxic. Soft jelly candies made in this study do not use artificial dyes and sweeteners, because the color and taste of beetroot and guava provide a distinctive and sweet taste and flavor. The results of the analysis of sucrose levels in beetroot jelly candies on pectin variations can be seen in Figure 5 graph below:

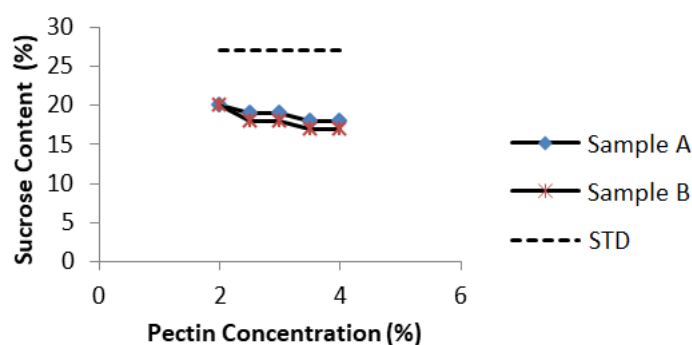
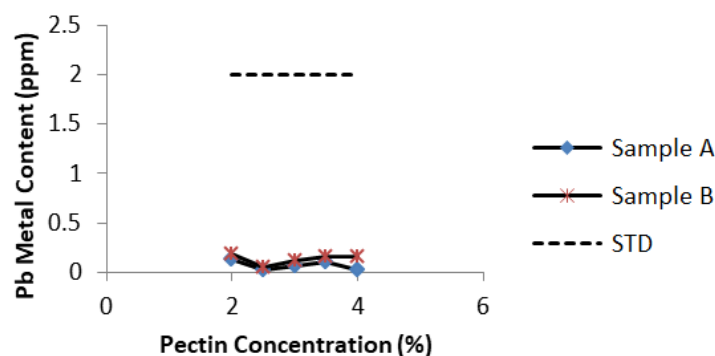


Figure 5. Graph Effect of Pectin Concentration Treatment on Sucrose Content

From the analysis of the graph in Figure 5 shows that the highest total sugar (sucrose content) is in the concentration of pectin 2% in samples A and B. The results of the analysis of total sugar (Sucrose content) in beetroot and guava jelly candies are in the range of 17-20%. The difference in sugar content in the basic ingredients can be the cause of the difference in the amount of sucrose beetroot jelly candy. Sucrose is dissolved in heated water, then some sucrose will break down into glucose and fructose called invert sugar [9]. The value of total sugar content is also influenced by the level of maturity of beets and guava. The fruit used is of medium maturity level so that the total sugar content is not too high and not too low. Total sugar levels increase with a decrease in water content during heating so that the mass of the material will also decrease along with increasing levels of sucrose. However, in this study, no additional sugar was used so that the total sugar content did not meet the quality standards for jelly candies (SNI 3574.2-2008) with a minimum value of 27%.

#### Characterization of Beet Jelly Candy Pb Metal Content on Variation of Pectin Concentration

Lead is a heavy metal that is very dangerous for living things because it is carcinogenic, can cause mutations, biodegrade over a long time and the toxicity is unchanged. PB can pollute the air, water, soil, plants, animals, and even humans. The entry of Pb into the human body can be through food from plants commonly consumed by humans such as rice, tea, and vegetables. Testing of Pb metal needs to be done because the beetroot that lives in the form of roots is in the soil. The results of the analysis of Pb heavy metal content on pectin concentrations can be seen in Figure 6 graph below:



**Figure 6.** Graph Effect of Pectin Concentration Treatment on Pb Metals Content

Based on the graph above it can be analyzed that the highest Pb heavy metal content is found in samples with the lowest pectin concentration of 2% in both samples A and B. Sample B1 with Pb metal content of 0.182 ppm is the sample with the highest Pb metal content value. The lowest Pb metal content with a value of 0.026 ppm is in sample A5 with the highest pectin concentration of 4%. The same result also occurred in sample B5 where the highest pectin concentration reduced the value of Pb metal content by a value of 0.052 ppm. It can be said that increasing the concentration of pectin added to beetroot jelly candies can reduce levels of heavy metals Pb. Characterization of Pb heavy metal content in beetroot jelly candies in samples A and B is still according to SNI with a maximum value of 2 ppm. Tests of the low value of Pb metal content of beetroot that is 0,026 ppm.

#### 4. CONCLUSIONS

Based on the results of tests that have been conducted on the characterization of red beetroot soft jelly candies with variations of guava extract and colloidal pectin gel have met the SNI standard of soft jelly candies with the results of water content (0.96 - 2.28%), ash content (0.27 - 0.56%), glucose contents (18.06 - 22.11%), sucrose content (17-20%), Pb metal content (0.026 ppm) In this study the best characteristics were obtained from jelly candies from beets and guava with the addition of 2% pectin. The exact composition of raw material for beetroot and guava is 60:40.

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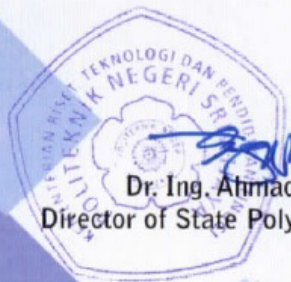
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