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The characteristics of nata-de guava (*Syzygium samarangense*) with certain interaction on the proportion of sprout extract (*Phaseolus vulgaris*) and sucrose

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Abstract. This research was aim to determine the interaction between the proportion of sprout extract and sucrose on the characteristics of nata made from indigenous water guava of Demak. The yields, thicknesses, water content and organoleptic characteristics of nata including taste, colour and texture were become parameters which obtained through over analyzed the data. The parameters were treated by addition of bean sprout extract (A) and sucrose (C) in a variety of concentrations (5%, 10% and 15%). This research used a complete randomized design (CRD) factorial pattern with 2 factors of 9 treatments and 3 repetitions. The data obtained were being analyzed by ANOVA for rendemen, thicknesses, and water content of nata. While for the organoleptic was subjected to the Kruskal-Wallis test. The results showed that there were some effect between the addition of bean sprout and sucrose extract to the rendemen, thicknesses and color value of nata. The addition of 5% bean sprouts extract and 5% sucrose were being the best treatment that resulted in rendemen = 9.53%, thickness = 6.65mm, water content = 98.22%. In terms of preferences, nata with the addition of 5% bean sprouts extract and 5% sucrose were being the most desirable both in color, taste, and texture.

Keywords: nata-de guava, sprout extract, sucrose, certain interaction

1. Introduction

Water guava (*Syzygium samarangense*) is a potential commodity as main food ingredient. Its easily degraded physical condition may affect its selling point. Because of that, water guava diversification is needed to make as a product such as nata. Nata is a food product that floats on a medium that contains sucrose and acid from the fermentation of *Acetobacter xylinum* of fruit juices^[1]. The growth of microorganisms in the production of nata is affected by factors such as nitrogen and carbon source, the acidity of media, the temperature and time of fermentation, and the concentration of the starter^[2]. Demak's water guava has lots of nutritional value in order for *Acetobacter xylinum* to use in the fermentation process. The addition of organic or an organic nitrogen increases the activity of

Acetobacter xylinum^[3]. In this research, the nitrogen needed to produce nata will be obtained from bean sprouts extract (*Phaseolus vulgaris*) which undergoes symbiosis with *Rhizobium* bacteria. *Acetobacter xylinum* produces nata whenever the medium contains carbon and nitrogen throughout a controlled process^[4]. Sucrose is used in the metabolism of *Acetobacter xylinum*. The extract of pineapple is used as a source of acidity and is capable of controlling the pH of the fermentation process. This research is done because it has not been specialized in Indonesia to diverse and produce from degrading food ingredients and improve shelf-life.

2. Materials and methods

2.1. Materials

The materials used in the making of nata were including indigenous water guava of Demak, bean sprouts, sucrose, *Acetobacter xylinum*, and pineapple juices. The ingredients used for hedonic testing covered the produced nata samples and mineral water. The tools used in this research included a knife, pan, stove, analytical weighing scale, micrometer, spoon, petri dish, oven, desiccator, glass beaker, cheese cloth and tissue. The amount of ingredients needed in the process includes 250 grams of water guava, bean sprout extract (5%, 10%, and 15%), sucrose (5%, 10%, and 15%), 5% pineapple extract and 10% *Acetobacter xylinum*.

2.2. Methods

2.2.1. Processing of nata de guava. This research was begins with the preparation of materials. Firstly, the tools were being wash and sterilizing then continued by cleaning the ingredients such as the water guava, bean sprouts and pineapples using clean water. The process of making nata continued by extraction of water guava, extraction of bean sprouts and extraction of pineapples.

The extraction of water guava was begun through weighing the fruit. Then, the fruit put in the blender to be able to filter the liquid form through a cheese cloth. These filtrate would be used as the main ingredient of nata. Prior to extract bean sprouts begun through weighing and blending, continued by cooking process at 75°C for 5 minutes. Before filtering with cheese cloth, the bean sprout extract then leaved to cool down up to 30°C. The repetition method was done to produce pineapple extract.

The following method is to homogenize bean sprout extract and water guava extract in a pan, according to the treatment. The mixture is then boiled together at 75°C for 5 minutes while adding sucrose and 5% pineapple extract and stirred clockwise. The nata mixture is let to cool down until temperature drops to 60°C, then placed in a plastic platter with dimensions of 25 cm x 15 cm x 10 cm covered with paper. The nata mixture is then cooled down to around room temperature. The inoculation with 10% *Acetobacter xylinum* bacteria for 5 days until a layer of nata is produced. In this process there should be no sudden impact or movement in nata mixture otherwise nata will not shape. After incubation process, the nata is cooked down for 5 minutes and submerged in clean water for 24 hours, where water should be changed every 6 hours. Afterwards, the nata is cut in to cubes of 1 cm x 1 cm x 1 cm and boiled down again for 10 minutes.

2.2.2. Yield Assay. The yield of nata is measured by gravimetric. In principle, the nata produced is weighed and the medium is also measured in a measuring glass and is measured in weight (g) and volume (ml)^[5].

$$\text{Yield} = \frac{\text{weight of nata} \times 100\%}{\text{Volume}}$$

2.2.3. Texture Analysis. The thickness of the nata layer is measured with a micrometer. This is done in 5 different points of the surface of the nata. The average data obtained is used^[6].

2.2.4. Water Content Analysis. The measurement of water content is done by heating porcelain dishes in the oven for 1 hour in 105°C. Then the dish is weighed and 2 grams of nata is put in it. The

nata in the dish is then put back in the oven for 3 hours at the same constant temperature. After this process, the nata and the porcelain dish is cooled down inside the desiccator for 20 minutes and then weighed. After weighing, the nata and dish is returned in the oven for 30 minutes in the same temperature and back to cool down in the desiccator for another 20 minutes before weighing the final weight^[7]. Water content is then calculated with the following formula:

$$\text{Water content (\%)} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100\%$$

2.2.5. Organoleptic Analysis. The organoleptic analysis is done hedonically and includes parameters such as colour, taste, and texture of water guava nata. This analysis uses a scoring scale, which is from 1 to 5^[8].

3. Results and Discussions

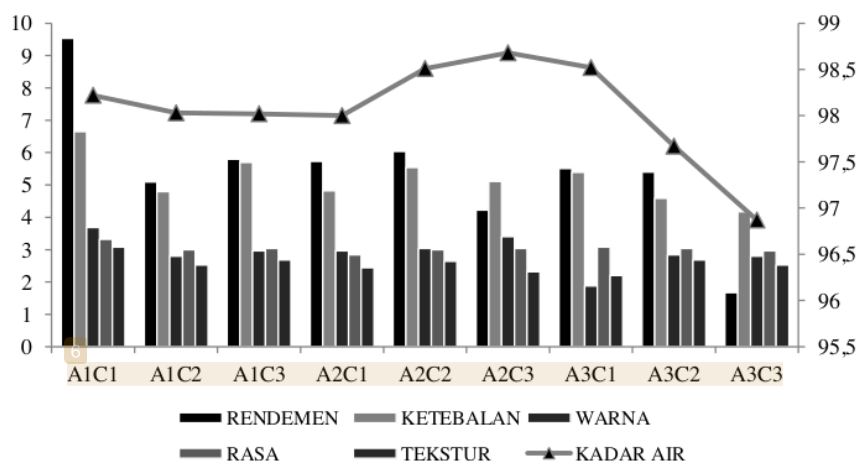


Figure 1. Result analysis of sample nata from water guava.

3.1. Total Yield

Based on the nata yield analysis of water guava with different treatments, the highest yield of nata is the one given the treatment of 5% bean sprout extract and 5% sucrose, and the lowest yield is the one given 15% bean sprout extract and 15% sucrose. This shows that there is an interaction between the treatments towards the thickness of nata ($p < 0,05$). From this, it is shown that bean sprout extract and sucrose addition effects the yield of nata. This is caused by the use of nitrogen by *Acetobacter xylinum* in the fermentation process. This kind of media will cause the viscosity of the fermentation medium higher and decrease oxygen supply for *Acetobacter xylinum*^[9]. That *Acetobacter xylinum* is an aerobic microorganism, which mean it, needs oxygen in order to grow and develop^[4].

3.2. Thickest

The thickest nata is also produced with 5% bean sprout and sucrose extract, and the thinnest with 15% of bean sprout extract and sucrose. This shows that there is in fact an interaction between the treatments towards the thickness of nata ($P < 0,05$). The thickness of nata is directly proportional to its yield, where in the higher the yield, the thicker the nata. This may happen because in the process of fermentation, *Acetobacter xylinum* needs nitrogen and carbon that is obtained by the addition of sucrose, which causes the shaping of cellulose. *Acetobacter xylinum* is reproducing, nitrogen is used to create amino acids that will play a role as the precursor of nucleic acid, which also holds genetic

information and will derive it ^[5].

3.3. Water Content

Based on the test of water content of nata from water guava with the addition of bean sprout extract and sucrose obtained the result that is the highest water content of nata in the treatment of 15% bean sprouts extract and 10% sucrose is 98.68% and water content of nata in the treatment of 10% bean sprout and sucrose 15% that is equal to 97.78%. There is no interaction effect between the addition of the concentration of the bean sprout extract and sucrose to the water content of Demak guava water ($P < 0.05$). The concentration of bean sprout and sucrose extract were not significantly different ($P < 0.05$). This means that the two treatment factors, is not affect each other in the formation water content of nata. The result of analysis water content of nata by Demak guava water on all treatments was not significantly different ($P < 0.05$).

The high water content of nata influence from that texture such as thick and chewy, because that effect during the process of making nata cellulose thickening or layers of nata and cellulose cavities filled with water. Generally nata contain water content of 95%-98% and 2%-5% cellulose^[9].

3.4. Organoleptic Test

Analysis of organoleptic test is necessary for each product because it is related to the level consumer acceptance of the product. In this organoleptic test used hedonic test by parameters of colour test, taste test and texture test.

Based on organoleptic test the colour of nata guava water addition bean sprout and sucrose extract obtained the result which is the most preferred nata colour obtained in the treatment of bean sprout 15% and 5% sucrose with a score 1.88 which means very like and the colour of the most unlikely nata obtained at the treatment of 5% bean sprout extract and 5% sucrose with a score of 3.63% which means neutral – rather not like. This shows that the colour on the nata of Demak guava water there is a significant difference between treatments ($P < 0.05$).

This shows the two factors of treatments of bean sprout extract and sucrose affect each other in the formation of nata colour. The result organoleptic test, the most preferred colour on the treatment bean sprout extract 15% an 5% sucrose with a score 1.88 which shows very like criteria. Nata with the treatment of bean sprout 15% and sucrose 5% have interesting colour between all treatment influence panelists. It can be concluded that the average panelist most like nata with transparent colour, while the colour that is not favored panelist that have a brown transparent colour. Generally the colour of food product affect consumer ^[10]. Visually, the colour of nata guava water is less attractive that is not white transparent. It is not standard SNI 01-4317-1996 which states a good nata have a normal colour, that is white transparent ^[11].

Based on organoleptic test of nata guava water with addition of bean sprout extract and sucrose obtained result, the most favorite taste of nata by panelist on treatment 10% bean sprout extract and 5% sucrose with a score 2.84 which means favorite-neutral and the most unfavorite of nata by panelist on treatment 5% bean sprout extract and 5% sucrose with a score 3.32 which means neutral-rather not. This shows taste of nata Demak guava water is not significantly difference between one and another treatment ($P < 0.05$).

4. Conclusions

Based on the results of nata research from cashew water demak with the addition of tauge and sucrose extract can be concluded that the yield of nata, nata layer thickness, and nata color is determined by the concentration of bean sprouts extract and sucrose concentration and determined by the interaction between the two, except in water content nata, and nata texture.

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PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6
