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Extract Of Nuts As A Natural-Nitrogen Source In The Making Of Cane Nata

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Abstract

Natural nitrogen sources derived from the extracts of green beans, soybeans, and peanuts used for making sugarcane juice have been studied. Organoleptic quality for nata was analyzed by indicators of color, texture, aroma, and taste. The level of community preference for sugarcane juice on sugarcane juice is observed in the community. The data analysis method used single classification Variance Analysis for selection using descriptive analysis, fiber content using proximate analysis, and protein content using the Kjeldahl method. The single classification variant analysis results show significant differences in the aspects of color and texture. The results of the community preference test were selected nata using ZA protein. The amounts of fiber and protein in the sugarcane juice and green bean extract samples were 0.79% and 24.319%, respectively, as best results. Other sugarcane juice's fiber and protein content is lowest than 0.68% and 5.359%, respectively. The best quality organoleptic qualities were samples with fertilization using ZA and green beans. The observation results showed that the sugar cane juice with green bean extract was more acceptable to the community and had better nutritional content.

Keywords: fermentation, protein, fiber, descriptive analysis; green bean

INTRODUCTION

Nata is cellulose that resembles a gel (gelatin) with floating conditions on a medium containing sugar and acid resulting from the formation of Acetobacter xylinum (Arifiani et al., 2015). Good nata is chewy, transparent (Masri et al., 2020), and tastes like fro. The main ingredient in making nata is a substrate containing cellulose. Ammonium sulfate (ZA) support material is fertilizer or nutrient. Sugar for energy or food for Acetobacter and glacial acetic acid (99.8% vinegar) condition the environment of nata seeds (Acetobacter xylinum). Other additives to enhance the taste of aroma essences or syrups, coloring agents, and preservatives are permitted (Phisalaphong et al., 2012. Nata is made by inoculating Acetobacter xylinum bacteria in the medium, its ability to oxidize glucose to gluconic acid and other organic acids simultaneously and polymerize glucose to form cellulose. In its growth, Acetobacter xylinum bacteria need a nitrogen source from the growing medium. ZA or known by the public as urea fertilizer. ZA is an artificial chemical fertilizer designed to provide additional nitrogen nutrients for plants. ZA fertilizer contains 24% sulfur (in the form of sulfate) and 21% nitrogen (in ammonium). ZA in food products includes making nata with nitrogen from natural/organic ingredients such as bean sprouts extracts, green bean extract, coconut milk. Acetobacter xylinum bacteria form natural cellulose pellicles from the palm sap (Mandey et al., 2020).

Nata producers have not used ZA that meets the requirements for food quality (food grade). Along with changes in people's mindsets that tend to go back to nature, natural nitrogen sources are being developed, making nata. Natural-nitrogen sources come from foods that contain lots of protein. Several developing studies have utilized natural nitrogen sources by using nuts in making nata. Green beans are a good source of nitrogen and protein with a content of about 16% protein (Kusumah et al., 2020)

The use of peanut extract is effective as a substitute for ZA as a nutrient. Nitrogen sources naturally are of better quality to make nata than inorganic nitrogen sources (Jagannath et al., 2008). The use of natural nitrogen sources from the extracts of soybeans, green beans, and peanuts, the researchers will apply to nata products with the essential ingredients of sugarcane juice. The application of sugarcane juice in making nata has been made by adding various substrates containing sugar, such as coconut water, syrup water from multiple fruits, and Javanese sugar water (Arifiani et al., 2015).

Sugarcane juice contains sucrose, protein, calcium, fat, vitamin B1, vitamin B2, vitamin B6, vitamin C, and amino acids. Sugarcane juice is an alternative product diversification from sugarcane commodity. Apart from being sweet, sugar cane juice is rich in properties, namely treating burning pain, coughs, fighting cancer, cleaning urine flow, and help the kidneys to carry out their functions.

This study aims to determine the differences in the use of natural nitrogen sources to replace ZA obtained from soybean, green bean, and peanut extracts on the organoleptic quality of Nata de cane in terms of color, texture, aroma, and taste indicators to analyze the content. Fiber and protein and to determine the level of people's preference for sugarcane juice.

METHOD

The object of this research is sugarcane juice from sugarcane juice sellers (drinks). Materials in the form of sulfuric acid p.a Merck 98% and Sodium hydroxide pellet p.a. e-Merck. The sample of this research is the use of ZA and three types of natural nitrogen sources, namely green bean extract, peanut extract, and soybean extract. Sugarcane juice samples used a nitrogen source in the form of ZA (called NTZ). Samples of sugarcane juice used a nitrogen source from soybean extract (NTK). Addition of nitrogen sources from mung bean extract (NTJ), peanut (NTH). Other supporting ingredients are Starter Glacial Acetic Acid Acetobacter xylinum, 70% alcohol, and sugar syrup.

Sugarcane Juice Extraction

Sugarcane juice was from a beverage cane juice seller. The sap was then filtered to separate the dregs of forceps in the filtrate. The filtrate was stored in a closed sterile container and kept away from sunlight.

Preparation Extraction of Protein from Nuts

Beans 3 types (soybeans, green beans, and peanuts) as much as 250 g were washed and crushed in a blender. The following process was boiling with 500 mL of water, and boiling continues until the extract volume becomes 250 mL. The peanut filtrate was stored in a sterile closed refrigerator.

Making Sugar Cane Nata

Protein extract from nuts and sap was mixed and boiled in a container. Glacial acetic acid was added until the solution reaches pH 4, then the boiling was finished. The medium was conditioned to a temperature cool enough. The starter of 20% v/v was added with the sauce, stirring it in the following process. Due to the semi-anaerobic process, the container was covered with a cloth and fermented for 14 days at room temperature. During the fermentation process, there should be no shaking. It was changing from the white layer on the ceiling until the white layer is thickened. Harvesting sugarcane juice had to be done and washed thoroughly with water. The sour smell was removed by boiling it with water until it boils. Then, clean nata can be cut to the desired size and soaked in hot water again, then drained and cut into pieces.

Quality of sugarcane juice

Based on the SNI-01-4317-1996 standard, the tests carried out were organoleptic tests, covering:

color, texture, taste, and smell—the nutrient content tests, including protein and fiber tests. Organoleptic quality of sugar cane juice was analyzed by indicators of color, texture, aroma, and taste, the people's preference for sugarcane juice, and the nutritional content of sugarcane juice which includes fiber and protein. In assessing color, texture, taste, and smell, a score of 0-1 has no criteria, 1.01-2.00 has flawed measures, 2.02-3.00 has sufficient standards, 3.01-4.00 has standards somewhat, and 4.01 - 5.00 have the trait criteria analyzed. These properties are apparent, chewy, typical of nata, and sweet.

In this study, the data were obtained by conducting organoleptic tests, preference tests, and laboratory tests for fiber and protein content. The organoleptic test was carried out using four trained panelists. The preference test was carried out using 80 untrained panelists. The fiber and protein content test was carried out in the Chemistry and Biology Laboratory of the Faculty of Mathematics and Natural Sciences, UNNES. The data were analyzed using single classification variant analysis, percentage descriptive, ketjdhal test for protein content analysis, and crude fiber content with proximate analysis.

RESULT AND DISCUSSION

Assessment of the quality of sugarcane juice using different nitrogen sources using the organoleptic indicator test. The test is in the form of evaluating the color, texture, aroma, and smell of the sugarcane juice product.

Color

Color is a material property that was thought to originate from the spread of the light spectrum. Color is the first indicator seen and observed by consumers because the color is a prominent factor that consumers can immediately see.

Based on the results of the organoleptic test, which 80 trained panelists carried out. The best organoleptic quality, the color indicator of the experimental results of sugarcane sap, was clear. Samples that produced transparent colors were NTZ samples, while NTK and NTJ samples paid slightly clear colors and NTH samples had less clear colors. The clearer the nata color, the more consumers will like it.

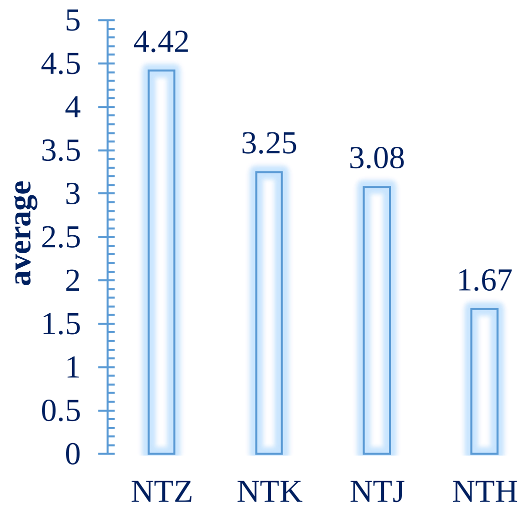

Figure 1. Comparison of the Color Value of Sugarcane Sap Nata

Texture

The texture of the sample of sugarcane juice using a nitrogen source in the form of ZA resulted in a mean of 3.83, so the panelists assessed that the surface of sugarcane juice was somewhat chewy. Other sugarcane juice samples using nitrogen sources of soybeans and green beans have the same texture criteria, namely slightly strict with a mean of 3.08. The different two sugarcane juice samples using nitrogen sources from peanuts had a standard of 2.67 and 2.08 with more minor chewy texture criteria. The texture indicator is shown in Figure 2. The texture is a pressure sensor that can be felt with the mouth (Juda et al., 2018) and felt when bitten, chewed, or swallowed.

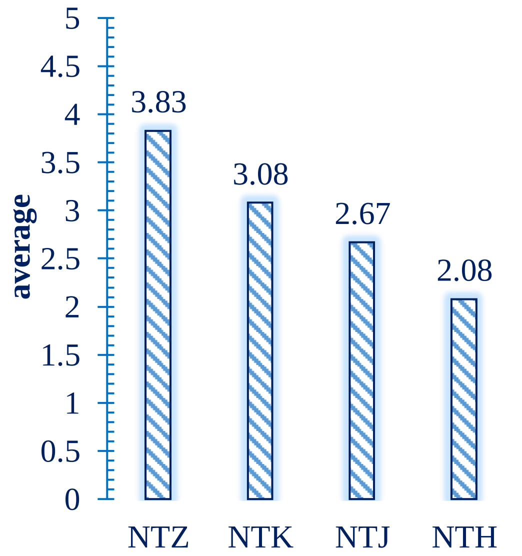

Figure 2. Texture Comparison of Sugar Cane Nata Nira using different proteins

The factors that influence the texture of nata are nutritional factors that strongly influence the properties, yield, and composition of the formed cellulose. The source of nutrition in question is the adequacy of carbon sources and nitrogen sources (Safitri et al., 2017). The nitrogen in ZA is 21%, while soybean extract requires 83.6 mL to achieve the same nitrogen percentage in ZA (Basalamah et al., 2018). What is different between green bean extract and peanut extract requires further research to determine its nitrogen content. The type and age of the starter also affected the texture yield of the nata. The most optimal starter age is 7-13 days, where bacteria are in an exponential phase so that the growth of bacteria transferred to the substrate will be faster in forming nata sheets. If the starter age is more than 13 days, it tends to decrease because the bacteria are in a stationary phase, so they are slower to form nata sheets (Hamad et al., 2014).

Aroma

Samples of sugarcane juice using a nitrogen source in the form of ZA produced a mean of 3.83 so that the criteria were quite typical of nata. Samples of sugarcane juice using soybean extracts resulted in a mean of 3.33, having a somewhat exceptional standard for nata. The example of sugarcane juice using green bean extract resulted in a mean of 3.42, the criteria were quite typical, and the sample of sugarcane juice using peanut extract resulted in an average of 3.67, having quite specific standards for nata. The indicator aroma's graph is shown in Figure 3. Although it does not offer a high value, the difference is very slight that the smell is typical of nata. The difference in aroma depends on the source of the medium and the type of other ingredients added. A person's sense of smell is different. Although they can distinguish between smells, everyone has different preferences. The respondents' assessment found that respondents liked the aroma of nata from various sources, namely coconut juice, banana juice, and durian juice (Masri et al., 2020).

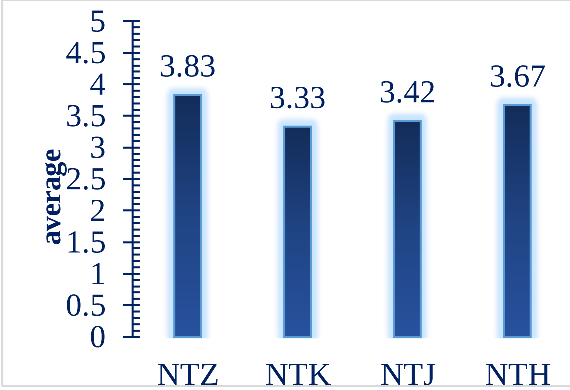

Figure 3. Average Aroma Indicator on sugarcane nata for various nitrogen sources

In the food industry, aroma testing is considered very important because it will quickly produce an assessment of its acceptance or rejection. Aroma is the most crucial factor in a food product. The scent is difficult to define objectively.

The data analysis shows that the sample of sugarcane juice from the experimental results does not significantly differ in the aroma indicator. Of the four sugarcane juice samples, three have the same aroma criteria, which is quite typical of nata, but the NTK sample has a somewhat distinctive nata aroma criterion.

Taste

Based on the results of the organoleptic test on the taste of sugarcane juice, the average value given by the panelists ranged from 4.72 - 5.00 or were in the sweet criteria. Graph of taste indicator is shown in Figure 4 for The variation of protein types from each source.

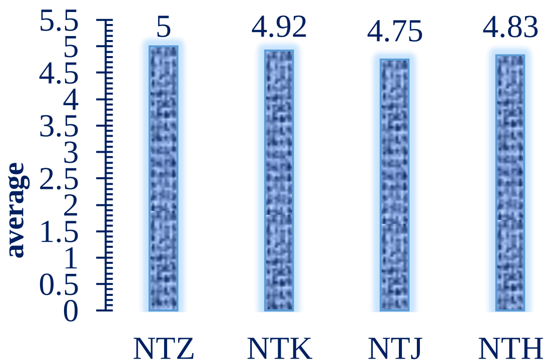

Table 1. Recapitulation Results of Single Classification Variant Analysis Calculations for Sugarcane Nata

No	Indicator	F_{count}	F_{table}	Keterangan
1	Color	7,83	2,89	significant
2	Texture	4,08	2,89	significant
3	Aroma	0,18	2,89	insignificant
4	Taste	2,33	2,89	insignificant

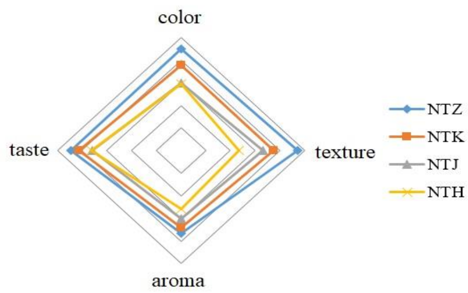

Figure 5. Frequency Test Radar Graph of Sugarcane Nata Nira

Based on Table 1, it is shown that in the aspect of color and texture, the calculated F is greater than the F table, which means that there is a significant difference in each sample of sugarcane juice from the experimental results. This analysis implies that the working hypothesis (Ha) is accepted and the null hypothesis (Ho) is rejected. In aroma and taste testing, which resulted in an F count smaller than the F table, there was no significant difference between the sugarcane juice samples and the protein from various experimental sources.

The results of the descriptive percentage analysis are aimed at how the level of people's preference for sugarcane juice from the experimental results. Sensory responses to taste (taste and aroma), color, and texture of food are determinants of consumers' individual food choices playing a preference (Bhuiyan & Rahim, 2015). The preference test in this study used 80 untrained panelists. The aspects assessed by the panelists included elements of color, texture, aroma, and taste. Based on the test results can be seen in Table 2.

Table 2. Summary of Test Results for Sugar Cane Nata Nira

Indicator	percentage			
	NTZ	NTK	NTJ	NTH
color	90.25	75.75	59.75	58.75
texture	94.00	74.75	66.25	47.25
aroma	73.25	68.00	60.25	51.75
taste	92.75	82.75	71.50	72.25
average	87.56	75.31	64.44	57.50

The sample of sugarcane juice from the experimental results as a whole is included in the criteria preferred by the community, which is presented in Figure 5 regarding the community preference level rada. The area of sugarcane juice product using nitrogen sources in the form of ZA has the most significant size with a mean of 4.38, which means that sugar cane juice using nitrogen sources in the form of ZA is preferred than NTK, NTJ, and NTH.

The product of sugarcane sap was tested for protein and fiber content, with the results of the analysis of fiber and protein content in the experimental results of sugarcane sap can be seen in Figure 6—sugarcane juice which has the most protein and fiber besides green bean extract. In the natural protein quality after green beans are peanuts and soybeans. On the other hand, in fiber quality, soybeans are more than peanuts. The chemical composition of sugarcane juice with the addition of ZA as a nitrogen source of ZA reaches almost 5%, which is still higher than nata de coco, which produces 95% moisture content and 0.45% protein (Anam, 2019). Meanwhile, making nata with nata media formulas, namely rice water washing media (lindi) and tofu whey with a ratio of 1:1, have a crude protein content test result of 1.35% (Shagti, 2017). The percentage of natural fiber in sugarcane juice obtained was smaller, namely 0.79% from the gain of 2.54% in nata de grass jelly. The rate of fiber increases with the increase in substrate concentration and the number of starters (Naja et al., 2019). Acetobacter xylinum converts sugar into cellulose to produce fiber (Asri et al., 2018).

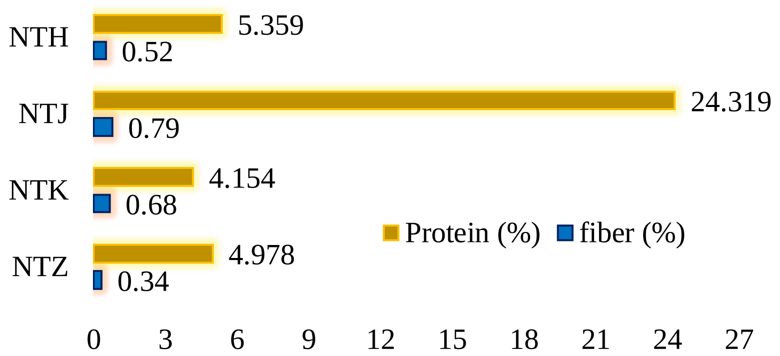

Figure 6. Testing Results of Sugar Cane Nata Content on a variety of protein sources

CONCLUSION

The preparation of nata from sugarcane juice has been made with a single classification variant analysis on different natural nitrogen sources. The best quality of sugar cane nata is not significantly different in terms of color and texture. Based on the results of the organoleptic test, the sugarcane juice has the maximum quality, namely the sugarcane juice using ZA with the criteria of transparent color, chewy texture, a pretty distinctive aroma of nata, and sweet taste. Based on the community preference test results, sugarcane juice using a nitrogen source in the form of ZA was very popular, with a percentage of 87.56%. The sugarcane sap that is liked by the community comes from the natural protein in the form of soybean, green bean, and peanut extracts, amounting to 75.31%, 64.44%, and 57.50%, respectively. Based on chemical tests, sugarcane juice using natural nitrogen sources in green bean extract had an average fiber content of 0.79% and 24.319% protein, followed by peanuts and soybeans.

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