Food ScienTech Journal

ISSN 2685-4279
Vol. 3, No. 1, July 2021

Department of Food Technology
Faculty of Agriculture
Universitas Sultan Ageng Tirtayasa

Vol 3, No 1 (2021)

DOI: http://dx.doi.org/10.33512/fsj.v3i1

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Submission date: 30-Apr-2022 11:43AM (UTC+0700)
Submission ID: 1824498435
File name: Tape.pdf (196.04K)
Word count: 3427
Character count: 17289

Food ScienTech Journal Vol. 3 (1) 2021 ISSN : 2685-4279 DOI:10.33512/fsj.v3i1.12046

THE EFFECT OF NATRIUM METABISULFITE IMMERSION AND DRYNG TEMPERATURE FOR TAPAI FLOUR PRODUCTION

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ABSTRACT

Tapai is one of the food ingredients that is processed into various food dishes and preferred. The shelf life of the tapai is easily damaged after being produced, because tapai has high moisture content, it is necessary to make an effort to extend the shelf life. The purpose of this research was to get the best treatment and to analyze the effect of different concentrations of Natrium Metabisulfite and drying temperatures on the quality of tapai flour. The method used in this study is an experimental research method with Completely Randomized Design (CRD). The first factor is concentration of natrium metabisulfite as much as 0 ppm, 1000 ppm, 2000 ppm, 3000 ppm and 4000 ppm. The second factor is the drying temperature of 45°C, 55°C, and 65°C. The results of data analysis obtained the best treatment at concentration of 2000 ppm Natrium Metabisulfite with temperature of 55°C, reducing sugar content of 4.35%, ash content of 1.5%, moisture content of 4.8%, yield 52.4% and value of the degree whiteness of 85.49.

Keywords: Drying, immersion, natrium metabisulfite, tapai flour

INTRODUCTION

Cassava commodities become potential product for Bondowoso Regency (Hermanuadi *et al*, 2020). According to the results of research, processed cassava products that have the potential to be a regional superior product are Tapai and it's processed products (Hermanuadi, 2018). Tapai is a processed product from cassava that involves microorganisms with the fermentation process. The process of fermentation, microorganisms involved are yeast, khamir and bacteria. Tapai has a sweet taste and soft texture. In the Bondowoso area, the production of this tapai is very abundant, and can increase economic value. But the Tapai does not have a long shelf life, the life of the tapai is only a maximum of 5 days after it is ready for consumption. Therefore, an innovation is needed to extend the shelf life of tapai.

Tapai flour is an alternative for preserving tapai. In addition, tapai flour can also be used as a substitute for wheat flour, so as to reduce the amount of wheat flour consumption in Indonesia. According to Natsir (2014) tapai flour can be made or used as a mixing material for bread, various cakes, ice cream, and biscuits, where each preparation has a variety of shapes. Tapai flour has a longer shelf life than the tapai itself. So with the tapai flour can reduce production losses due to decreased quality of tapai. There are so many products based on tapai in Bondowoso Regency, so the availability of tapai is very meaningful for several agroindustries that produce them (Novitasari *et al*, 2020).

Drying is one of the important methods to extend shelf life. This method aims to reduce the moisture content of the material, so that it can inhibit microbial growth and unwanted reactions. The drying stage can reduce the nutritional content of the tapai. To inhibit the release of nutrients and starch content in the material, before drying the tapai must be soaked in a solution of Natrium Metabisulfite. The purpose of this study was to determine the optimal process for making tapai flour, based on the concentration of natrium metabisulfite immersion with drying temperature, and flour weight.

MATERIALS AND METHODS

Tools and Materials

The main raw material used in this research is cassava tapai which is directly purchased from one of the cassava tapai entrepreneurs in Bondowoso Regency. Other materials used are citric acid, sulfite, water, aquades, and chemicals for analysis. The tools used in this research are oven, sieve, baking sheet, mixer, knife, spoon, measuring cup, scale, desiccator, porcelain cup, tray, kjeldahl flask and other equipment

Methods

Experimental Design

This research was carried out at the Food Processing Laboratory and Food Analysis Laboratory of the Jember State Polytechnic, from February to April 2021. The study was arranged in a factorial manner using a Completely Randomized Design (CRD) with two factors and three replications. The first factor is the concentration of Na-metabisulfite with a level of 0 ppm; 1000 ppm; 2000 ppm; 3000 ppm; and 4000 ppm. The second factor is the drying temperature of 45ºC, 55ºC, and 65ºC. The data obtained are analyzed by variance test at a significant level of 0.05. If there is a significant difference continued by the Tukey Test to find out the significant difference between treatments at a significance level of 5%.

Tapai flour production process

In the production of cassava Tapai flour, the first step is to reduce the size of the Tapai then dried in a cabinet dryer for 24 hours, ground, sieved through an 80 mesh sieve and packed. The flour was then analyzed for physicochemical variables. The physicochemical variables observed included: Value of reducing sugar content, moisture content, ash content, degree of whiteness, and yield.

The next stage is the application of high cassava tapai flour in the manufacture of food products (cookies) with a comparison to wheat flour (Wijaya. and Hariono, 2020).

Data Analysis

All analyses were performed in triplicate. Data analysis was performed by analysis of variance (ANOVA) using statistical software applications Minitab. The comparison of means was performed by Tukey test at 5% significance level (Bressiani et al, 2017; Rambing, 2013).

RESULTS AND DISCUSSION

Physicochemical Characteristics of Tapai Flour

Physicochemical analysis results are shown in Table 1. It consists of reducing sugar, ash content, moisture content, whiteness degree and yield.

a. Reducing Sugar

The reducing sugar content of the production tapai flour ranged from 2.47 to 4.94%. The highest reducing sugar content was found in the Na-metabisulfite immersion treatment concentration of 4000 ppm at a drying temperature of 55ºC, while the lowest was at a concentration of 0 ppm at a drying temperature of 65ºC. The sugar content produced in cassava tapai flour contains dextrin due to the microbial fermentation process that will break down starch into simple sugar components, so that the starch content decreases over time. In addition, the activity of the amylase enzyme contained in

cassava will work optimally in hydrolyzing starch into simpler components (Susanto et al, 2017).

Analysis of variance showed that the initial treatment had a significant effect on reducing sugar content, because of the immersion treatment with natrium metabisulfite where the solution can inhibit the release of nutrients and starch levels in materials. According to Sudarmi et al (2010), tapai flour has a starch content of 91.92%, while according to Majzoobi et al (2011), stated that wheat flour has a starch content of 77.3%.

b. Ash Content

Ash is an organic substance left over from the combustion of an organic material. Ash content is a mixture of inorganic or mineral components contained in a food ingredient. The ash content of the resulting tapai flour ranged from 1.2 to 1.7%. This is because most of the ingredients for this cassava tapai flour still contain high inorganic components. The highest ash content was found with natrium metabisulfite immersion treatment at a concentration of 2000 ppm at a drying temperature of 65ºC, while the lowest was at a concentration of 0 ppm at a drying temperature of 55ºC. The ash content and composition depend on the material and method of ashing.

c. Moisture Content

Water in food will effect the damage to the food. Violalita (2019) said that food damage is caused by chemical, microbiological, enzymatic processes or a combination of them. The results of the analysis of the moisture content in tapai flour showed that the highest moisture content was at 0 ppm with a drying temperature of 45ºC, with a moisture content of 6.1%. The lowest moisture content in with 4000 ppm metabisulfite immersion and drying at 55ºC was 3.4%. This may be due to the moisture content of the tapai in the treatment decreased in volume, while the tapai at 0 ppm natrium metabisulfite concentration had a constant volume. Natrium metabisulfite when reacted with water will release heat. This is supported by Lisa (2013), which states that the moisture content in the control has a higher value than the moisture content in the treatment with a combination of temperature and soaking time. As stated by Estiasih (2011), that the higher the temperature of the drying air, the greater the heat carried by the air so that the more water is evaporated from the surface of the material being dried. This is also in accordance with the opinion of Riansyah et al. (2013) that the ability of the material to release water will be greater with increasing the temperature of the drying air used and the longer the drying process, so that the resulting moisture content is lower.

The hypothesis test used minitab data analysis with the results of the length of time and concentration of immersion, as well as temperature differences that affect the moisture content of Tapai flour not significantly different.

d. Whiteness Degree

Whiteness degree of the tapai flour produced based on the initial treatment ranged from 50.17 to 81.24%. Analysis of variance showed that the initial treatment had a significant effect on the degree of whiteness, where the higher concentration of natrium metabisulfite immersion treatment made the tapai flour whiter. In addition, the longer the immersion time and the higher the concentration of natrium metabisulfite, the whiter Tapai flour produced.

The addition of natrium metabisulfite solution will resolve the brown color in the flour recommended for food products (Suratno et al, 2021). According to Buckle et al (2010), natrium metabisulfite apart from being an anti-microorganism, is also used in various foodstuffs to inhibit non-enzymatic browning, inhibit other enzymatic browning catalyzed by enzymes, and as an antioxidant and reducing agent. According to Muchtadi

et al (2011), besides being a preservative, sulfite can interact with the carbonyl group. The result of this reaction will bind the melanoid so as to prevent the appearance of brown color.

e. Yield

Yield is percentage number of products produced with the amount of basic ingredients used. Yield is obtained by comparing the initial weight of the material with the final weight. The yield of Tapai flour produced based on the initial treatment ranged from 42.62 - 52.41%. Analysis of variance showed that the initial treatment had a significant effect on the yield value, where the natrium metabisulfite immersion treatment with a higher concentration reduced the tapai flour. According to Rizal (2013), the low yield value is due to weight loss due to water lost due to heating. The heating process makes the membrane cells more permeable, so that the movement of water is not hampered and water is more easily removed during drying.

Table 1. Chemical properties of sausage

Na-Metabisulfite	Drying temperature	Chemical Test				
		Reducing Sugar	Ash Content	Moisture Content	Whiteness Degree	Yield
ppm	°C			(%)		
0	45	2,30^{d}	1,3^{a}	6,13^{a}	61,60^{i}	42,62^{c}
	55	2,47^{d}	1,2^{a}	6,05^{a}	58,49^{j}	42,00^{c}
	65	2,14^{d}	1,4^{a}	5,94^{a}	56,77^{k}	41,93^{c}
1000	45	2,68^{c}	1,4^{a}	5,80^{b}	77,79^{f}	49,70^{b}
	55	2,78^{c}	1,4^{a}	5,78^{b}	74,43^{g}	46,70^{b}
	65	2,58^{c}	1,4^{a}	5,24^{b}	73,00^{h}	46,75^{b}
2000	45	4,33^{b}	1,4^{a}	4,80^{c}	83,31^{c}	52,40^{a}
	55	4,35^{b}	1,5^{a}	4,80^{c}	85,49^{b}	52,44^{a}
	65	4,32^{b}	1,4^{a}	4,53^{c}	76,66^{g}	50,17^{a}
3000	45	4,55^{a}	1,5^{a}	3,15^{d}	78,63^{de}	51,34^{a}
	55	4,67^{a}	1,4^{a}	3,16^{d}	79,66^{d}	50,33^{a}
	65	4,43^{ab}	1,5^{a}	3,05^{d}	78,64^{de}	51,70^{a}
4000	45	4,73^{a}	1,4^{a}	3,44^{d}	86,77^{a}	50,17^{ab}
	55	4,84^{a}	1,4^{a}	3,40^{d}	86,00^{ab}	50,02^{ab}
	65	4,52^{a}	1,5^{a}	3,55^{d}	85,45^{b}	51,70^{ab}

Note: Value with different notation in the same column has a significant differences at 5% (Tukey test)

Organoleptic Test of Tapai Flour Based Cookie Products

The results of organoleptic tapai flour cookies test is shown in Table 2. The sensory parameter include color, flavor, taste, and texture of tapai flour cookies.

a. Color

The panelists' level of preference for the cookies color attribute ranged from 2.68 to 3.92 or slightly disliked it to neutral. Based on the graph above, the highest value for the color parameter is in the A3 treatment (50% wheat flour: 50% Tapai flour), because the A3 treatment has a bright yellow color. The color of cookies is affected by the millard reaction. The millard reaction is a browning reaction due to the browning reaction between reducing sugars and amino acids that occurs during roasting, as well as the caramelization process that occurs due to the heating process (Winarno, 2004)..

b. Aroma

The panelists' level of preference for the aroma attribute of cookies ranged from 2.68 to 3.8 or disliked to neutral. The lower the use of tapai flour, the panelists' preference

for the aroma of cookies will also be lower. This is because Tapai flour has a distinctive aroma. The panelists' highest level of preference for the aroma of cookies was in the A1 formulation (0% wheat flour: 100% Tapai flour) with a preference value of 3.8. The aroma of cookies is influenced by various mixtures of ingredients used in the manufacture of food products. Different types of flour will produce different aromas to cookies. Tapai flour has a sour and ethanol aroma (Susanto, et al., 2017).

c. Flavor

The level of panelists' acceptance of the taste parameters ranged from 3.12 to 3.88 or neutral. In treatment A1 (0% wheat flour: 100% Tapai flour) to A3 treatment (50% wheat flour: 50% Tapai flour) there was an increase in the preference value for the cookies flavor parameter. So the more tapai flour used, the lower the preference value. This is because tapai flour has a sweet taste. The sweet taste of tapai flour is obtained from the fermentation process in the tapai. In the fermentation process there is a process of reshuffling carbohydrates into glucose and fructose, as well as other compounds that will produce a sweet taste (Nirmalasari and Liana, 2018).

d. Texture

The panelists' preference for texture parameters ranged from 3.48 to 3.64 or neutral for all treatments. From the table above, it can be seen that the higher the flour used, the higher the preference value for the texture parameter. The texture of a product is closely related to the moisture content and protein content in a food ingredient. Wheat flour has a higher protein content than tapai flour. According to the Directorate of Nutrition, Ministry of Health RI (2018) wheat flour has a protein content of 8.90 g per 100 g of material, while tapai has a protein content of 0.5 g per 100 g of material. The high protein content will increase water absorption, so the resulting cookie texture will be more sturdy (Hariono et al, 2020).

Table 2. Organoleptic test results of tapai flour cookies

Tapai Flour	Cassava Flour	Sensory test			
		Color	Flavor	Taste	Texture
%					
100	0	3,08	3,8	2,78	3,64
75	25	3,72	3,6	3,48	3,64
50	50	3,92	3,36	3,88	3,68
25	75	2,76	3,32	3,2	3,64
0	100	2,68	2,68	3,12	3,4

Note:
1. Color: If the value is higher, the color is getting darker
2. Flavor: If the value is higher, the flavor of tapai is getting stronger
3. Taste: If the value is higher, the taste of the tapai is getting stronger
4. Texture: If the value is higher, the texture is getting thicker

CONCLUSION

The optimum conditions for production flour from cassava tapai by drying are obtained from Tapai soaked by natrium metabisulfite with concentration 2000 ppm and dried in the oven at 55°C. The results of the analysis showed that the product of tapai flour has a reducing sugar content of 4.35%, ash content of 1.5%, moisture content of 4.8%, yield of 52.4% with a whiteness degree of 85.49. The preference level of cookies with a ratio of 50% : 50% cassava flour was preferred by the panelists with an average aroma value of 3.88 and a texture of 3.64.

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