PROCEEDINGS
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UNIVERSITY THE QUALITY OF NATA DE SAGO FROM SAGO WASTE LIQUID

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Abstract

Sago waste liquid is the waste product in sago processing. It can be used as nata de sago raw material. The starch in sago waste liquid is used by *Acetobacter xylinum* to form polysaccharides layer during fermentation process. This result aimed to study the quality of *nata de sago* from sago waste liquid. This was a descriptive study with five replications. Each plate was contained 500 mL medium, 80 mL *Acetobacter xylinum* starter, and 14 days fermentation period. *Nata de sago* quality was measured by color, aroma, elasticity, gross weight, dry weight, residual volume, sulfate residue, and sucrose level. The results then compared with SNI 01-4317:1996. The result shows that the color of *nata de sago* is white-gray (scale 7) with the sourish aroma and rather chewy. The gross weight is 176,60 g, dry weight is 2,40 g, the residual volume is 48,20 mL, percentage of sucrose is 0,627%. The result also found that the nata contain sulfate residual positively. Aroma and elasticity was matched with SNI 01-4317:1996.

Keywords: *nata de sago, sago waste liquid, Acetobacter xylinum, polysaccharides layer, nata quality*

1. Background

Sago is one of the main food raw in South Sulawesi, specially at Luwu Raya. Sago starch made from *Metroxylon sago* pith's extraction process. During that process, there also sago waste liquid production. It can be used as nata de sago raw material. Nata is a kind of bio-cellulose which has distinct gel-like texture and produced by *Acetobacter xylinum's* metabolism. Nata from sago waste liquid was reported by Kasi, et.al. (2016) dan Harningsih, et.al. (2016). The starch in sago waste liquid is used by *Acetobacter xylinum* to form polysaccharides layer during fermentation process.

Nata can be used as biomaterial for medical field, electrical instrument, food ingredients (Esa, et.al., 2014), biodegradable plastic (Anas, 2012; Pratomo & Rohaeti, 2011) Nata can be use also for wound dressings, paper, or audio acoustic diaphragms (Manguiat, et.al., 2001). Most of nata utilization is using as the food ingredients. To be use as food ingredients, nata de sago must be qualify food security. Nata food safety standards for nata in packaging that apply in Indonesia is SNI 01-4317:1996. This standard are consists of nine parameters.

This result aimed to study the quality of *nata de sago* from sago waste liquid based on SNI 01-4317:1996, in three parameters: condition, odd material, and percentage of sucrose. In addition, *nata de sago* also measured by gross weight, dry weight, and residual volume. The result can be used as a reference for the utilization of *nata de sago* as a food ingredient.

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2. Method

This study was conducted in September-November 2016 in Science Laboratory of Universitas Cokroaminoto Palopo. This was a descriptive study with five replications. Each replication was contained 500 mL medium, 80 mL *Acetobacter xylinum* starter, and 14 days fermentation period.

Sago waste liquid collected from home industry in Luwu district. The medium was containing fresh sago waste liquid, sugar, acetate acid, and ammonium sulfate. pH of the medium was about 4. *Acetobacter xylinum* was two days old culture.

Nata de sago quality was measured by color, aroma, elasticity, gross weight, dry weight, residual volume, sulfate residue, and percentage of sucrose. Data of color, aroma, and elasticity was collected from 30 respondents. Color was categorized by achromatic hues black (scale 1) and white (scale 9). Aroma was caterorized by four category: very sour, sour, sourish, and not sour. Elasticity was also categorized by four category: very chewy, chewy, rather chewy, and not chewy. Gross weight was measured before dried and dry weight after dried. Residual volume measured by nata liquid remains in the tray. Sulfate residue was collected by mixed the nata de sago, HCl 6 M, and $BaCl_2$ 1 M and observed the white precipitate which is sufat positive. Percentage of sucrose was measured by Luff School method. The results then compared with SNI 01-4317:1996.

3. Results and Discussion

Layer of *nata de sago* produced by *Acetobacter xylinum* after 14 days fermentation. *Nata de sago* color is shows in Figure 1.

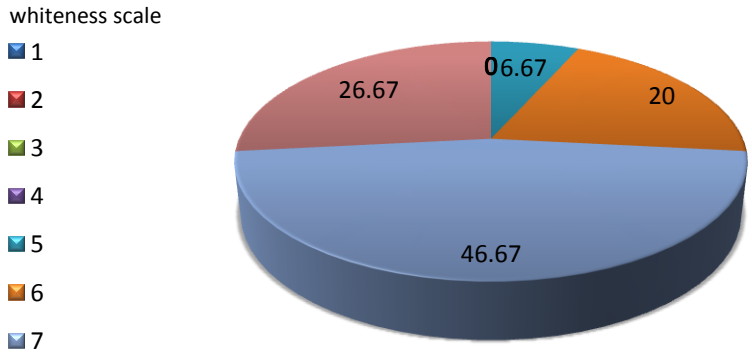

Figure 1. Percentage of respondent's choice about *nata de sago* color

Figure 1 shows that the color of *nata de sago* is white-gray (scale 5 to 8). It caused by the pigment in the raw material. Sago starch color is white to reddish white, with the white varying degrees (Limbongan, 2007). The color of *nata de sago* also caused by the thickness of layer nata and the interaction between the medium ingredients. The thicker, the darker nata produced. The heating can be made the sugar browning. All these medium pigments will be trapped in the fiber of *nata de sago* and effect to the color of nata (Purwaningsih, et.al., 2007). The normal color of nata is white transparent. *Nata de sago* color is not matched with SNI 01-4317:1996. That means it needed another treatment to whitening the color of nata.

The normal nata is sour (Saragih, 2004), but nata in packaging should be odorless. Figure 2 shows that *nata de sago* aroma is not sour to sour. Sour aroma in *nata de sago* caused by pH medium and from *Acetobacter xylinum*. It is an acid bacteria and grow well at pH 5 or sour pH (Purnomo, et.al., 2009). The acid production also will decrease pH volume (Sutanto, 2012). Aroma of harvest *nata de sago* is normal and matched with SNI

01-4317:1996. The food aroma will stimulate the desire to consume it. That means, it needed a treatment to be odorless before packaging. Sour aroma in nata de sago can be removed by washing or soaking or boiling many times.

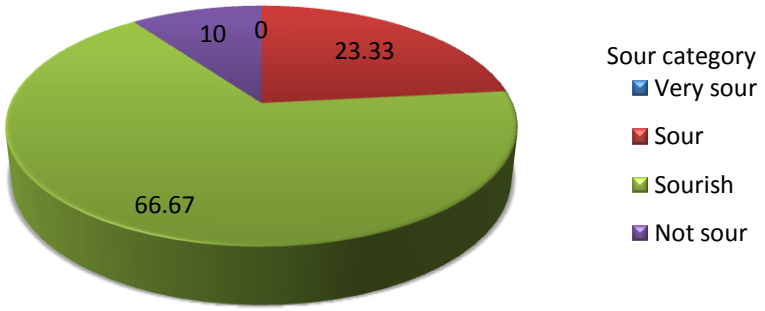

Figure 2. Percentage of respondent's choice about *nata de sago* aroma

Figure 2 shows that gross weight of nata is 176,60 g and dry weight is 2,40 g. The different between the gross weight and dry weight caused by the trapped water in the of nata's cellulose fiber was evaporated during dried process. The thicker, the more the cellulose fibers, the more water is tapped in fibers, so the weight is increase (Setyaningtyas, et.al., 2014). Another factor that effects to the nata's thickness is the compactness of the bonds between the cellulose fibers (Hastuti and Hadi, 2009). The number of fibers produced is influenced by the amount of nutrients available in medium. If the dry weight is high, then the texture will be more chewy (Fifendy and Annisah, 2012). Based on respondent's choice, the range of *nata de sago* elasticity is not chewy to chewy, and the most respondent choose rather chewy. The elasticity of *nata de sago* shows in Figure 3.

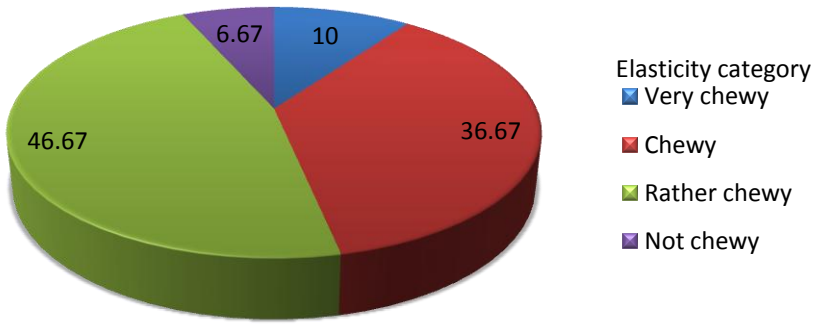

Figure 3. Percentage of respondent's choice about *nata de sago* elasticity

The residual volume of *nata de sago* is 48,20 mL from 580 mL substrate. It is about 8,31% from substrat total. That means *Acetobacter xylinum* used the 91,69% of substrate to produced *nata de sago*. If the *Acetobacter xylium* are planted in the medium, they will produce nata and acetic acid or acetate (Sutanto, 2012) and caused the sour aroma.

Table 1. Quality of *nata de sago*

Parameter	Average Result	SNI Value
Color	White-gray (scale 7)	Normal
Aroma	Sourish	Normal
Elasticity	Rather chewy	Normal
Gross weight	176,60 g	-
Dry weight	2,40 g	-
Residual volume	48,20 mL	-
Sulfate Residue (odd material)	Positive	No odd material
Percentage of Sucrose	0,627 %	Min. 15%

Based on SNI 01-4317:1996, nata in packaging should be no odd material. Result shows is *nata de sago* containing sulfat residue positively. The sulfate residue was came from ammonium sulfate as that adding in medium. Ammonium sulfate used as nitrogen source for *Acetobacter xylinum* growth (Rossi, et.al., 2008). The essential components for *Acetobacter xylinum* are carbon and nitrogen (Afreen and Lokeshappa, 2014). It is needed to find other nitrogen source from plant or animal to change the an-organic nitrogen source.

Precentage of sucrose in *nata de sago* as shows in Table 1 is 0,627%. It is not eligible for SNI 01-4317:1996 which standardized minimal 15%. It shows that *nata de sago* has less of sucrose. It is may caused by the thin layer and less number of cellulose fibers.

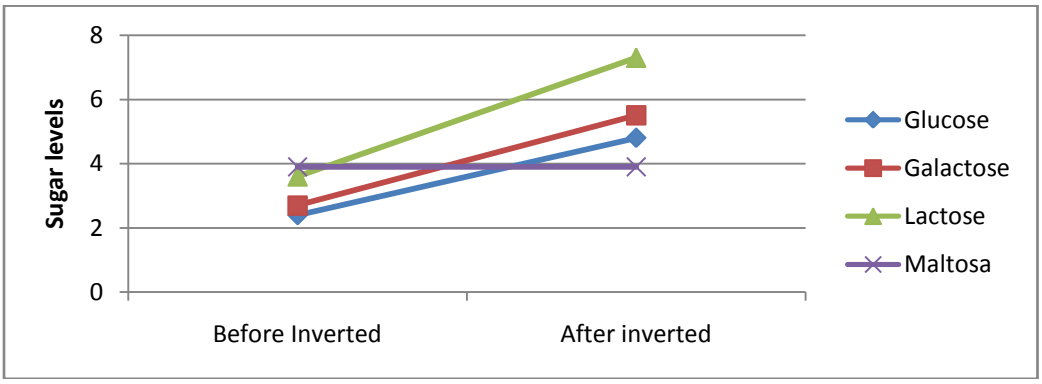

Figure 4. The sugar levels in *nata de sago*

The sugar content in nata de shows in Figure 4. It shows that the glucose, galactose, and lactose was increased after inverted. But maltose was remained. Glucose and galactose are monosaccharide, but lactose and maltose are disaccharide. Lactose formed by glucose and galactose, while maltose formed by glucose and glucose (Campbell, at.al., 2010).

4. Conclusion

The result shows that the color of *nata de sago* is white-gray (scale 7), has the sourish aroma, rather chewy, gross weight is 176,60 g, dry weight is 2,40 g, residual volume is 48,20 mL, percentage of sucrose is 0,627% and contains sulfate residual positively. Aroma and elasticity was matched with SNI 01-4317:1996.

5. References

Afreen, S.S. dan Lokeshappa, B. (2014). Production of bacterial cellulose from *Acetobacter xylinum* using fruit wastes as substrate. *The International Journal of Science and Technololedge*, 2 (8), 57-64.

Anas, A.K., Salma, A., Nugroho, F., Linguistika, Y., & Filinoristi, W. (2012). Pengaruh Variasi Massa Umbi Ganyong (*Canna edulis*) pada pembuatan dan karakterisasi plastic *biodegradable* ramah lingkungan berbahan dasar umbi ganyong. *Prosiding Seminar Nasional Penelitian, Pendidikan, dan Penerapan MIPA Universitas Negeri Yogyakarta*, K1-K11.

Campbel, N.A., Reece, J.B., Urry, L.A., Cain, M.L., Wasserman, S.A., Minorsky, P.V., Jackson, R.B. (2010). Biology Eight Edition. Jakarta: Erlangga.

Esa, F., Tasirin, S. M., & Rahman, N. A. (2014). Overview of bacterial cellulose production and application. *Agriculture and Agricultural Science Procedia*, 2, 113-119.

Fifendy F. dan Annisah, N. (2012). Kualitas nata de citrullus dengan menggunakanberbagai macam starter. *Jurnal Sainstek*, 4 (2), 158-164.

Harningsih, T., Nururrahmah, Tenriawaru, E.P. (2016). Pengaruh pemberian konsentrasi ammonium sulfate terhadap produksi nata de sago. *Dinamika*, 7 (2), 49-57.

Hastuti, B. dan Hadi, S.. (2009). Pengaruh penambahan konsentrasi gula terhadap kualitas nata de soya dari limbah cair tahu. *Makalah Seminar Nasional Kimia Jurusan Pendidikan FMIPA UNY*, 1-8.

Kasi, P.D., Tenriawaru, E.P., Anggraini, L.G.S. (2016). Pemanfaatan limbah cair sagu sebagai bahan baku nata de sago. *Prosiding Seminar Nasional Kimia Lombok*, 377-384.

Limbongan, J. (2007). Morfologi beberapa jenis sagu potensial di Papua. *Jurnal Litbang Pertanian*, 26 (1), 16-24.

Manguiat, L.S., Sabularse, V.C., Sabularce, D.C. (2001). Development of carboxymethilcellulose from nata de coco. ASEAN Journal on Science and Technology for Development, 18 (2), 85-96.

Pratomo, H. & Rohaeti, E. (2011). Bioplastik nata de cassava sebagai bahan edible film ramah lingkungan. *Jurnal Penelitian Saintek*, 16 (2), 172-190.

Purnomo, H., Amintarti, S., Ajizah, A. (2009). Perbandingan kualitas nata de soya antara limbah pembaceman dan limbah pewarnaan dari limbah tempe. *Jurnal Wahana-Bio*, 2, 40-51.

Purwaningsih, S., Salamah, E., Setiani, A. (2007). Pengaruh konsentrasi sukrosa dan ammonium sulfat terhadap mutu nata *Gracillaria* sp. *Buletin Teknologi Pertanian*, 10 (2), 35-47.

Rossi, E., Pato, U., Damanik, S.R. (2008). Optimalisasi pemberian ammonium sulfat terhadap produksi nata de banana skin. *Sagu*, 7 (2), 30-36.

Saragih, Y.P. (2004). Membuat nata de coco. Jakarta: Puspa Swara.

Setyaningtyas, N., Kusrijadi, A., Suryatna, A. (2014). Pembuatan nata de cassava dari kulit singkong menggunakan sumber nitrogen ekstrak tauge sebagai sumber nitrogen. *Jurnal Sains dan Teknologi Kimia*, 5 (2): 124-131.

SNI 01-4317:1996. Nata in packaging.

Sutanto, A. (2012). Pineapple liquid waste as nata de pina raw material. *Makara, Teknologi*, 16 (1), 63-67.