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Submission date: 03-May-2021 02:15PM (UTC+0700)
Submission ID: 1576589772
File name: Jurnal_Internasional_3_Budi_Santosa.pdf (305.94K)
Word count: 2996
Character count: 14890

IEESE International Journal of Science and Technology (IJSTE), Vol. 1 No. 1, Mar 2012,6-11
ISSN : 2252-5297

Dextrin Concentration and Carboxy Methyl Cellulosa (CMC) in Making of Fiber-Rich Instant Baverage from Nata de Coco

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Abstract. Nata de coco is a type of beverage component is a cellulose compound produced from coconut water through a process that involves microbial fermentation known as *Acetobacter xylinum*. To increase the economic value, shelf life, and the benefits of diversification do nata product of nata de coco wet a fiber-rich instant drink of nata de coco.

This research used Completely Randomized Design (CRD) are compiled factorial, the factors studied were: Factor I Concentration Dextrin consisting of 3 level: D1 = 10% = 12.5% D2, D3 = 15%. CMC concentration Factor II consists of 5 level: C1 = 0.5%, C2 = 1%, C3 = 1.5%, C4 = 2%, C5 = 2.5% each treatment combination was repeated 3 times. Parameters observed in this study are: solubility, crude fiber levels, water levels, and organoleptic tests include: colour, odor and appearance.

This study shows that the CMC and dextrin were added to instant beverages rich in fiber from nata de coco significant effect on solubility, crude fiber content, water content, color, flavor and appearance. The best treatment is D3C5 Dextrin concentration of 15% and 2.5% CMC.

Key-Words: *Nata de coco, dextrin, Carboxy Methyl Cellulosa (CMC)*

1. INTRODUCTION

Nata de coco is a cellulose compound produced from the fermentation of coconut water using microbes known as *Acetobacter xylinum*. Nata de coco is a low-energy diet for the nutritional value of this product is very low so it is good for diet purposes, but on the other hand nata de coco is rich in fiber that is needed by the body to maintain health such as improving digestion, preventing colon cancer attacks [7].

Nata de coco is a wet product, the weakness of this product when kept in damp conditions did not lead to a long shelf life due to high water content, it is not easy in the preparation and storage, and is not easy to carry everywhere, causing economic value of nata de coco wet to be low .

Efforts to diversify the food has not been much done to overcome these problems, a diversified food products to do that is by treating nata de coco become instant drinks are rich in fiber. Instant drinks rich in fiber from nata de coco is obtained by the use of the method of drying. To speed drying and increase the volume of material used as a filler dextrin. However, the stabilizer is needed in the product. Therefore, CMC is used as a stabilizer in the product. It is necessary to do research on the addition of dextrin and the CMC to get the quality or the quality of the fiber-rich instant drink nata de coco is good.

2. METHODS

2.1. Place and Time Research

The experiment was conducted at the Laboratory of Engineering Process and Production Systems Program Industrial Technology Faculty of Agriculture, University of Agricultural Tribhuwana Tunggadewi from December 2010 to February 2011.

2.2. Materials and Devices

The equipment used in this study consisted of aluminum pans (Java), gas stove (Rinnai), nata de coco fermentation tubs (local), blender (miyako), mixer (miyako), pan (local), non electric (local), plastic (petromak), oven (Memmert), desiccators, filter paper, porcelain crucible, pH meter and digital scales (Ohaus).

The materials used in this study is coconut milk (raw material for making nata de coco), sugar obtained from traditional markets in Malang, ZA, NPK obtained from the farm shop in Malang, citric acid, acetic acid, H_2SO_4 (pro analysis) and NaOH (pro analysis) were obtained from the chemical store in Malang and starter nata

de coco (*Acetobacter xylinum*) were purchased from the Laboratory of Engineering Process and Production Systems Tribhuwana Tunggadewi University.

2.3. Making Process Nata de Coco

Nata de coco is made with the following steps: coconut water is taken as 6 liters of water and filtered to separate the oil from the entrained dirt, then boiled until boiling unwanted microbes that grow off, after it entered into the boiling sugar (100 grams) as a source of nutrients *Acetobacter xylinum*, ZA (15 grams) function to *Acetobacter xylinum* nutrients, NPK (1.8 grams) function to nutritional *Acetobacter xylinum*, citric acid (3 g) to pH acid, acetic acid (48 ml) to acidic pH . After all materials are included, the coconut water boil for another 5 minutes so that all the ingredients are incorporated homogeneously mixed with coconut water.

Coconut water contains nutrients that have been put into the fermenting tubs that have previously been sterilized doused with hot water. Each tub is filled as much as 2 liters then covered with parchment paper and tied with a rubber band. Media coconut water and then allowed to cool overnight because if *Acetobacter xylinum* inserted into the media in hot conditions it will die. After a cold medium, *Acetobacter xylinum* put into it with the ratio of 2 liters of *Acetobacter xylinum* media as much as 200 ml and fermented for 2 weeks.

2.4. Harvesting Process Nata de Coco

After 2 weeks of fermentation, nata de coco harvested by means of nata de coco slabs taken from fermenting tub and then washed thoroughly. Nata de coco freshly harvested still smelled sour, to remove the sour smell is carried out by means of nata de coco slabs cut shaped dice then boiled using lime solution, then washed up to the smell of chalk is gone. Nata de coco is then boiled again until clear white color.

2.5. Porridge Making Process Nata de Coco

The process of making porridge nata de coco made in the following manner: nata de coco destroyed using a blender at maximum speed (scale 3) for ± 10 minutes with lukewarm water plus water by comparison and nata de coco 2: 1 (volume / weight) in order to produce nata de coco watery porridge.

2.6. Instant Beverage Process Fiber Rich From Nata de Coco

This stage uses experimental design factorial completely randomized design, a factor which is the first factor dextrin concentration consists of three levels, namely D1 = 10% = 12.5% D2, D3 = 15%, the second factor concentration CMC consists of 5 levels, namely C1 = 0 , 5%, 1% = C2, C3 = 1.5%, C4 = 2%, C5 = 2.5%, so the combination of those two factors will produce 12 combinations of treatments, each treatment combination was repeated 3 times so that obtained 36 samples.

The process of making instant drinks made in the following ways: pureed nata de coco widened 12 sections divided according to the experimental design. Dextrin and CMC was dissolved in each part of nata de coco pulp by the number corresponding to the treatment. Porridge nata de coco that has given filler then dried in the oven at 57^0C for 7 hours. Porridge nata de coco dry pulverized using a blender and then sieved to pass 100 mesh sieve to obtain a fine particle size.

Instant beverage products analyzed include chemical, physical and organoleptic properties include: solubility (oven method), crude fiber levels (oven method), water levels (oven method), color (hedonic method), odor (hedonic method), and appearance (hedonic method).

3. RESULTS AND DISCUSSION

3.1. Solubility

Product is instant food products in powder form (without water) plus water and easily soluble. Instant whether a product can be seen from the ease of powder dissolved in water during reconstruction.

From Figure 1 it can be seen that the instant drink of nata de coco by the addition of dextrin and CMC at different concentrations shows the effect of the treatment. The higher the concentration of dextrin and CMC, the solubility of instant beverages increased. Real interaction occurs from a combination of treatments. Highest solubility achieved instant beverage products are added dextrin and CMC at the highest concentration (D3C5: 15% CMC Dextrin 2.5%) of 85.95%.

The higher the concentration of dextrin is added to the processing of instant drink products will further increase the solubility product in water. The process with the help of acid starch repolimerisasi at dekstrinasi making dextrin molecules split into smaller sizes with more hygroscopic components, so that when subjected to heating

at low pressure, damaged starch particles. As a result the water easily move into it while releasing components that easily dissolves in water, the high solubility [4].

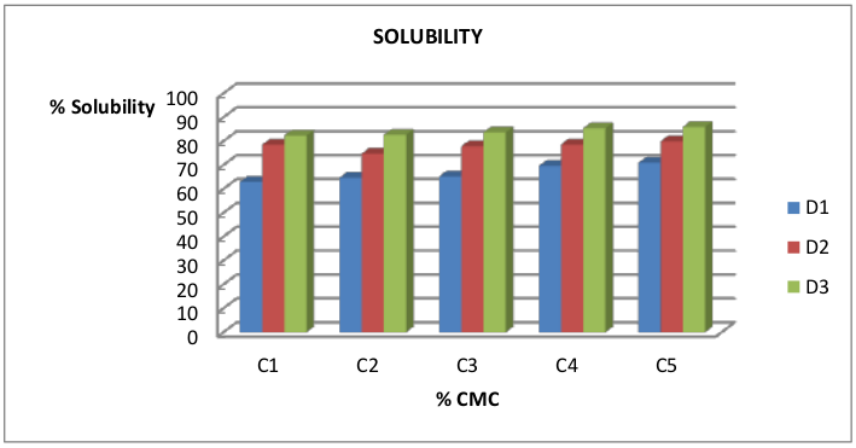

Figure 1. Average Solubility of Fiber Rich Instant Beverages from Nata de Coco

Similarly, the addition of CMC. Instant drinks rich in fiber from nata de coco still have nature in nata ie there are solid materials that are soluble and insoluble, these ingredients are well blended initially but when left to settle. Nata de coco containing sediment at the bottom is less preferred by consumers, so stable, it can be added to the CMC (Deman, 1997). With increasing the concentration of CMC solubility power will be higher.

In general, instant beverages stored subsequent precipitation and deterioration. To prevent this, needs to be added by adding material to stabilize the CMC. The addition of CMC aims to form a liquid with a viscosity stable and homogeneous but does not settle in a relatively long time. The use of CMC is more effective than gum arabic or gelatin. The addition of CMC at concentrations from 0.5 to 3% is often used to maintain the stability of the suspension (Deman, 1997).

3.2. Crude Fiber Levels

Application dextrin and CMC in instant drinks rich in fiber from nata de coco can be seen in Figure 2. Figure 2 shows that the addition of dextrin and CMC can increase the levels of crude fiber in the instant drink. This is caused by the content of nata de coco and CMC fiber in the form of cellulose [1] [5] Increasing levels of CMC were added, the higher the crude fiber content of the instant beverage.

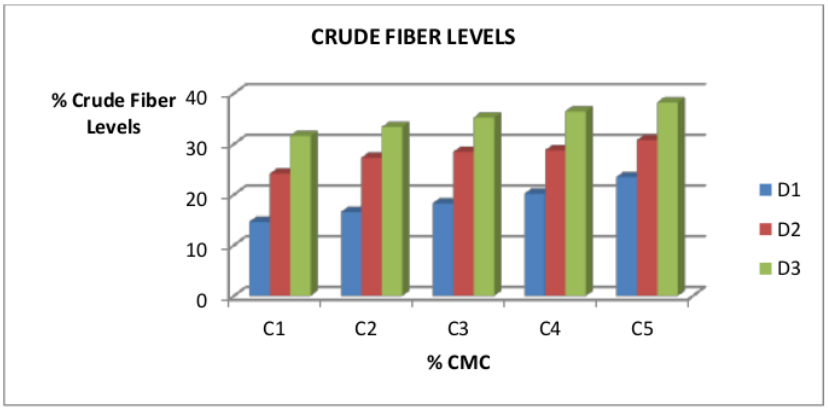

Figure 2. Average Crude Fiber Levels of Fiber Rich Instant Beverages from Nata de Coco

Highest levels of crude fiber present in the treatment D3C5 (Dextrin 15% and 2.5% CMC) that is equal to 38.2%. High crude fiber content in instant drinks from nata de coco would be very beneficial for health,

especially digestive health, in addition to fiber also has the function to absorb excess cholesterol in the body (Suryani et al., 2005).

3.3. Water Levels

Water content in instant drinks associated with the shelf life of the product. Observation of the water content of instant beverage products is a very important parameter for the evaluation of the drying process and to determine the level of product stability during storage. Instant beverage products with low moisture content resilient to high microbiological damage due to free water that can be used microorganisms to live and grow very limited [2].

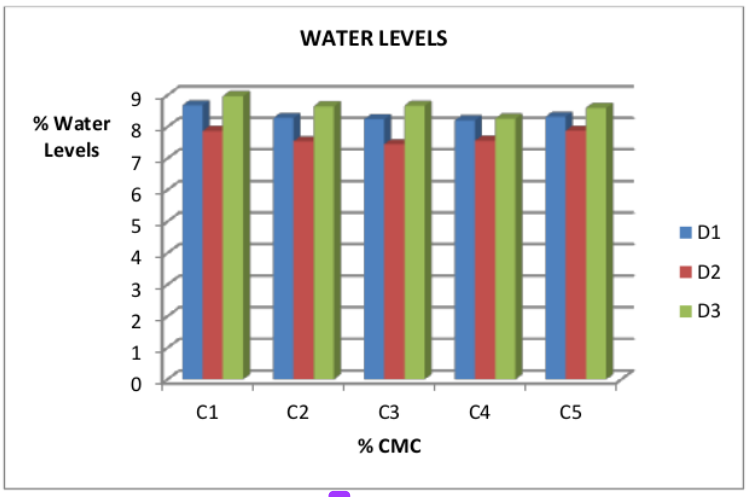

Figure 3. Average Water Levels of Fiber Rich Instant Beverage from Nata de Coco

In figure 3 shows that the addition of CMC did not bring much change to the water content, while adding to the amount of 12.5% dextrin can reduce the water content and the addition of dextrin instant beverages by 15% instead increase the water content of instant drink again. It is possible the level of compactness or porosity smaller mass evaporation of water during drying is reduced. Dextrin has low molecular weight and molecular structure that is simple, easily water can be evaporated when the drying process takes place either in the form of free water, bound physically or chemically bound [6].

3.4. Colour

Based on the results of organoleptic tests, gained instant drink rich colours of nata de coco fiber ranged from 3.01% to the 5.88%. In figure 4 shows that treatment of D3C5 (Dextrin 15% and 2.5% CMC) provides the highest value for the test of love for the colour. The trend toward increasing levels of preference panel color associated with the addition of dextrin which were related to the degree of white product, the higher the concentration of dextrin were added product colours become brighter after the product is dissolved in water. Increased CMC dextrin and the colour of the powder will be protected. This is because dextrin also serves as a carrier coating materials odour and filler material, temporal CMC addition to functioning as a stabilizer also functions as a protective, binding and texture control [9]. Colour is one of the factors determining the quality of a product.

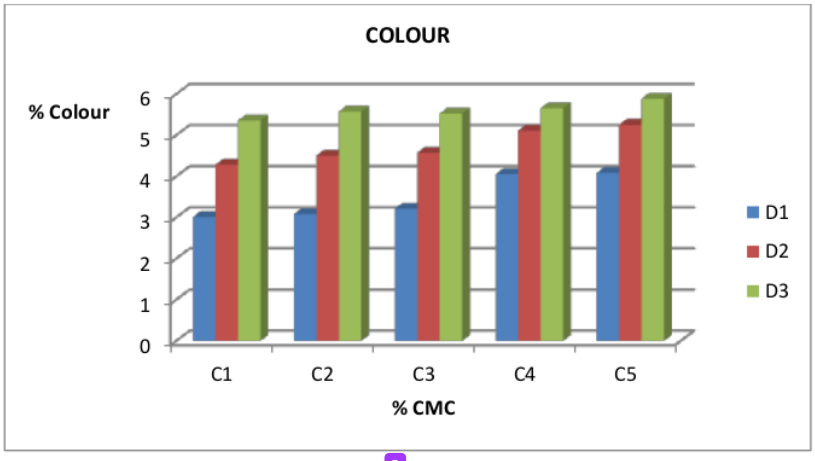

Figure 4. Average Passions for Colour of Fiber Rich Instant Beverage from Nata de Coco

According to [8] that a material assessed nutritious, tasty and the texture is very good but it will not be eaten if it has an unsightly color or colors that deviate from colour.

3.5. Odor

Level of preference panel for odor of instant beverages ric of nata de coco fiber tends to increase as more dextrin were added. This is because as more concentration dextrin added it will expand the surface of the filtrate thus easier binding odor component contained [9].

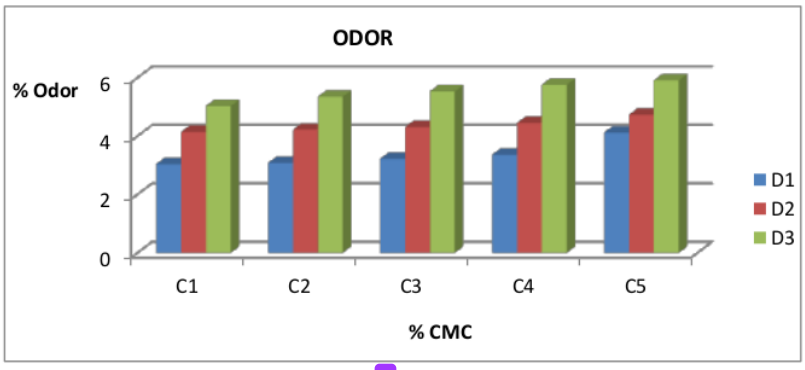

Figure 5. Average Passions for Odor of Fiber Rich Instant Beverage from Nata de Coco

In figure 5 shows that treatment of D3C5 (CMC Dextrins 15% and 2.5%) gave the highest values of the odor from panelists. The higher the value of dextrin and CMC were added increasing the panelists also liking the smell of instant beverages rich in fiber from nata de coco. According to [3] during the drying process volatile materials can be separated or experiencing diffusion through the pores of the coating. The crust that formed during drying will cause a reduction in component so as more fillers will reduce the odor components and by reducing the formation of crust during drying will lead to the faster drying time and loss of volatile compounds can be reduced.

In addition, the other possibility is the molecular structure of the dextrin. According [4] states that the spiral-shaped molecular structure, so that the flavor molecules will be trapped inside a helical spiral structure, thus adding dextrin can suppress loss of volatiles during the drying process. While CMC has a role as a protector, texture control and have the power to bind aroma compounds cause of instant beverages rich in fiber from nata de coco in order to prevent loss of odor during drying. Odor is volatile components and the addition of CMC to reduce loss of scent components [9].

3.6. The Appearance

Value panelists for appearance's favorite instant beverage rich in fiber from nata de coco is high ranging from 4.12% to 5.96% and D3C5 treatment (15% and CMC Dextrin 2.5%) had the highest value compared to the value of the other treatments .

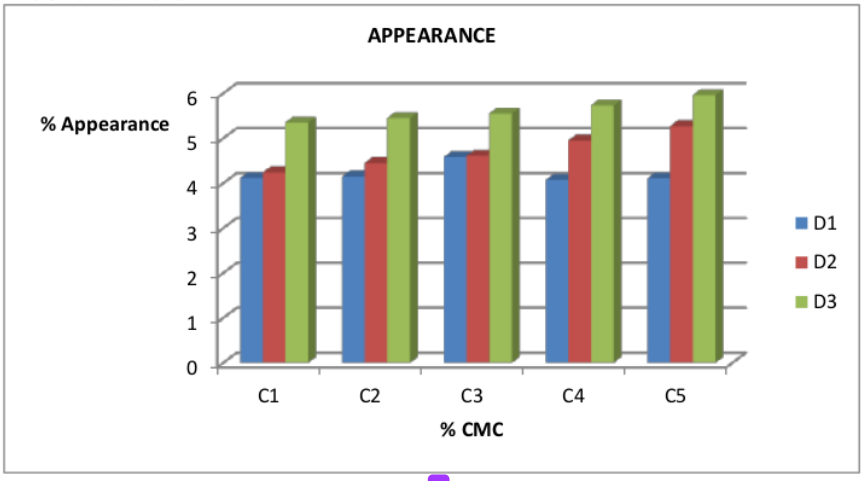

Figure 6. Average Passions for Appearance of Fiber Rich Instant Beverage from Nata de Coco

In figure 6 shows that the higher the addition of CMC and dextrin, the higher the value the appearance of instant beverages rich in fiber are preferred by the panelists. This is caused by the addition of dextrin that causes this instant beverage product colours seem brighter. Increased dextrin and CMC powder causes the colour will be protected. This is because dextrin coating serves as a flavor carrier and filler, while the CMC in addition to functioning as a stabilizer also functions as a protective, binding and texture control [9].

4. CONCLUSION

Physical, chemical and organoleptic instant drink of nata de coco shown to be affected by the concentration of dextrin and Carboxy Methyl Cellulose (CMC) were added. Instant drinks rich in fiber from nata de coco is best treated with a concentration of dextrin D3C5 15% and 2.5% CMC.

REFERENCES

[1] Astawan, M., 2004. Nata de Coco Fiber Rich. http://www.kompas.com/kesehatan/news/ 0402/25.htm.
[2] Farkye N, Smith K, Schonrock FT. , 2001. An Overview of Changes in the Characteristics, Functionality and Nutritional value of Skim Milk Powder (SMP) during Storage. Journal of Dairy Science.
[3] Lewis, MJ. 1987. Physical Properties of Food and Food Processing Systems. Ellis Hrawood LTD., Chichester, UK.
[4] Loksuwan J. , 2006. Characteristics of microencapsulated Betacarotene Formed by Spray Drying with Modified Tapioca starch, Native Tapioca Starch and Maltodextrin. Food hydrocolloids.
[5] Pambayun, R. 2002. Nata de Coco Processing Technology. Publisher Canisius. Yogyakarta.
[6] Sutardi.,2004.Introduction-Processing Nata de coco. http://www.bi.go.id/sipuk/lm/ind /natadecoco/ pendahuluan.htm.
[7] Sutarminingsih. , 2004. Business Opportunity Nata de Coco. Publisher Canisius. Yogyakarta.
[8] Winarno, F.G. 1993. Nutrition, Food, Technology and Consumer. Scholastic. Jakarta.
[9] Winarno, F.G. 2002. Chemistry of Food and Nutrition. Scholastic Press Tama. Jakarta

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