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## THE STARTER DOSES EFFECT OF CACAO PULP ON FORMING NATA DE CACAO

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### Abstract

Pulp cacao (*Theobroma cacao* L.) is the waste of seed cacao fermentation process. The fermentation process pulp layer of cacao beans will produce mucus like sap containing glucose sugar. The purpose of this study was to utilize the waste pulp of cacao with how to process them into one of the food product, *nata de cacao*. The method used in the study started with the preparations, cacao pulp-making, rejuvenation starter, filtering and boiling, and also fermentation. Quantitative data that obtained from testing, were analyzed using analysis of variance (ANOVA) in the form of the F test with 5%, followed by LSD test. Starter dose used was 70 mL, 8 mL, and 90 mL. The test results were measured using parameters consists of *nata* weight and thickness, as well as organoleptic tests. The results showed the highest thickness were obtained at a starter dose of 90 mL, 373.33 grams for the weight and 0.73 cm of the thickness for *nata*. In terms of organoleptic testing obtained the highest yield for color is the dose of 90 mL, 70 mL dose of aroma, and dose of 70 mL for taste. Based on the results of data analysis can be concluded if the starter dose of *nata de cacao* had not significant effect on the weight and thickness of *nata de cacao* pulp made from cacao. Organoleptic test for starter dose significant effect on the color of *nata de cacao*, but no significant effect on the aroma and taste of *nata de cacao* made from cacao pulp.

**Keywords:** *cacao pulp, nata de cacao, Acetobacterxylinum, nata quality, starter doses*

### Background

The development of the cacao plant in Indonesia until 2005 of an area of 1.167.046 ha with a production of 748.828 tons of dry beans, and is expected in 2006 will increase to 1.191.742 hectares with a production of 779.474 tons of dry beans (Pujiswanto, 2011). Cacao fruit processing into dried cacao beans produce waste include cacao shells and pulp, the layer that envelops the wet cacao beans. Cacao pulp waste untreated immediately cause a strong pungent odor caused by the acid fermentation microbiology (BPTP Bali, 2006). Cacao pulp is agricultural waste which contains glucose and sucrose (Purwati, 2016).

The pulp consists of sugars (10-15%) and water (85-90%). Sugar content high enough in the pulp can be utilized by the bacteria *Acetobacterxylinum* as a growing medium and converted into food products, namely *nata de cacao* (BPTP Bali, 2006). Pulp is a meat packer seed, shaped like mucus enveloping seed, the cacao, in the cacao fruit contains 30-40 cacao beans which are all covered by mucous pulp. This pulp must be removed so that the cacao beans can be dried and have a longer shelf life as raw material

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for cacao processing. Fermentation in cacao beans is done to remove the pulp. Pulp surrounding the cacao beans consist largely of water and a small portion of sugar, which was instrumental in the process of fermentation (Nasution, 2006).

Liquid pulp with sugar content of 12-15% could potentially be used as a base material for the production of nata (Pairunan, 2009). Making nata occurs because the process of solution of sugar glucose uptake by cells *Acetobacterxylinum*. Glucose is combined with the fatty acid precursor form (identifier nata) on the cell membrane. Nata fact did not have significant nutritional value to humans, therefore this product can be used as low-energy food source for dietary purposes. Nata contains about 98% water, 0.2% fat, calcium 0.012%, 0.002% phosphorus, and vitamin B3 0.017% with slightly chewy texture, solid, solid, white, and transparent (resembling kolang forth). This product is classified as a low-calorie foods, but has a high fiber content, so good for digestion can maintain the slimness of the body, helping people with diabetes, and prevent colon cancer (Hamad, 2013).

### Method

The tools used in this research that stove, pans, strainers, measuring cups 250 mL, pan plastic 2 × 3 cm by 10 pieces, buckets / basins, rubber bands 10 pieces, clear plastic 10 pieces, spoons, rulers, scales analytic and indicators universal, syrup bottles. Materials used in this research that the pulp of cacao fresh 1 liter, young coconut water 1 liter, starter (seed bacteria *Acetobacterxylinum*) 650 mL, acetic acid / acetic acid 120 mL, pH indicators, ZA 30 grams, and sugar 600 grams and newspaper.

a. Preparation (modification Yusmarini, 2004)

Plastic baking dish as much as 9 pieces sterilized to avoid contamination by undesirable microorganisms. Sterilization is done by wetting tray with 70% alcohol or with hot water or dried in the sun for 2 hours until smooth and dry. After the trays covered with clear plastic and paper. Plastic and tied with rubber to keep kesterilannya. The plastic used is sterilized by means cleaned and heated.

b. Taking Pulp Cacao (modification BPTP Bali, 2006)

Cacao beans are squeezed to get the pulp. After getting the cacao pulp then collect the cacao pulp in 1 liter and stored in a sterile bottle.

c. Revitalization Starter (modification Yusmarini, 2004)

A total of 1 liter of coconut water boiled for 15 minutes. After boiling enter as many as 100 grams of sugar, add 5 grams of ZA fertilizer. After a cold glacial acetic acid is added gradually until a pH of 3-4. Enter the liquid into a sterile bottle. The tip of the bottle covered with aluminum foil paper and tied with a rubber band. Bottle is placed in an incubation chamber for 3 days or until it forms a white coating on top. At the bottom there is a layer of white turbid solution, this solution containing *Acetobacterxylinum*.

d. Screening and boiling (modification BPTP Bali, 2006)

Cacao pulp extracted from cacao pods 1 liter of water is added as much as 4 liters, then the cacao pulp is filtered so that no coarse fibers. Heat until boiling cacao pulp for ± 30 minutes. During the process auxiliaries consisting of ZA 25 grams and 500 grams of sugar, stirring constantly included in order to dissolve quickly and evenly. Add vinegar

gradually until the pH reaches  $\pm 3-4$ . If the pH level has been reached, the heating should be stopped immediately to prevent the evaporation of excess acid.

e. Fermentation (modification Yusmarini, 2004)

Fermentation media which has been given a starter is stored for 12 days. The success of the fermentation process can be seen through the presence or absence of a thin layer on the surface of the fermentation medium. When there is a thin layer means that the fermentation process runs properly. The layer will be thicker by the day. During the fermentation process, the fermentation container must not open the lid or moveable. After 12 days of stored, layers or sheets of Nata de Cacao lifted. Nata then washed with clean water, measured the thickness and weighed.

f. Data Analysis

Techniques Quantitative data were analyzed by analysis of variance (ANOVA) in the form of F test at 5%. Statistical analysis was used to test the research hypothesis. If the real effect then followed by LSD test with a level of 5%.

## Results and Discussion

### a. The weight and thickness of nata de cacao

Weight nata de cacao is determined by the ratio between the weight of nata with medium weights. The average weight of nata de cacao at a dose of 90 mL starter is 373.33 grams, while the lowest value that the starter dose of 70 mL with an average weight of 35.67 grams. Statistical analysis indicates that  $F_{\text{calculate}} < F_{\text{table}}$ , can be concluded that the dose of starter given no significant effect on weight nata formed.



Figure 1. Nata de Cacao

Based on the research results Putriana and Amina (2013), the higher dose of starter then formed nata heavier. Nata weight is affected by variations in the substrate, the composition of the material, environmental conditions, and the ability to produce cellulose *Acetobacterxylinum*. Results of other studies indicate that high doses of starter that can increase the thickness of nata de cacao (Putriana, 2013).

**Table 1. The Weight of Nata de Cacao**

Doses (mL)	Repetition			Weight (g)	Average (g)
	I	II	III		
70	0	0	107	107	35,67
80	95	126	0	221	73,67
90	500	620	0	1120	373,33

The thickness average of nata de cacao on a starter dose of 90 mL was 0.73 cm, while the lowest value that the starter dose of 70 mL with an average thickness of 0.06 cm. Statistical analysis indicates that  $F_{\text{calculate}} < F_{\text{table}}$ , can be concluded that the dose of starter given no significant effect on the thickness of nata formed. This is because the activity data of bacteria *Acetobacterxylinum* to produce cellulose affected starter dose was not spread evenly. *Acetobacterxylinum* bacteria formed a thick layer of nata growing up on a starter dose of 90 mL, and the bacteria *Acetobacterxylinum* is still able to move to grow and form the cellulose. Based Yogi study (2015) showed that the higher the dose of starter given the nata produced the better. This is due to the ability to produce cellulose *Acetobacterxylinum*.

**Table 2. The Thickness of Nata de Cacao**

Doses (mL)	Repetition			Thickness (cm)	Average (cm)
	I	II	III		
70	0	0	0,2	0,2	0,06
80	0,1	0,3	0	0,4	0,13
90	1	1,2	0	2,2	0,73

From the observation that there are a few samples in the fermentation process does not form a layer on the treatment nataie 70 mL, 80 mL and 90 mL, this is because the samples in several treatment contamination caused by a fungus that in some treatment nata is not formed. *Acetobacterxylinum* bacteria produce extracellular enzymes to construct (polymerize) sugars (glucose) into a thousand chains (homopolymer) or cellulose fibers. Of the millions of microorganisms that grow in the media, will produce millions of sheets of cellulose threads that eventually appear solid white to transparent, called nata including secondary metabolites (Nainggolan, 2009).

#### b. Test organoleptic

Organoleptic test is done with the criteria that have been given to provide a check mark, the more panelists who gave a check mark means better than others. Aspects considered include color, aroma and taste, which the panelists held personal feedback about the joy of a product according to SNI 01-4317-1996 based on quality standards in different packaging natanata de cacao for organoleptic testing. Nata quality standard in the packaging can be seen in the table below.

**Table 3. Organoleptic Result**

Indicators	Unit	Result
Smelt	-	Normal
Taste	-	Normal
Color	-	Normal
Texture	-	Normal

(Source: SNI 01-4317-1996)

**1) Color**

Good color for nata de cacao is a bit of white. The average yield for color assessment panelists can be seen in Table 3. According to Table 3 it can be seen that the highest value contained in the starter dose of 90 mL by 20, while the lowest value contained in the starter dose of 80 mL of 5. Based on the results Susanti (2006) nata thickness is influenced by the amount of light intensity. Nata thick, light intensity and absorbed the more so as it was getting dark (cloudy), contrary to the nata thin, light intensity and absorbed the less so, the brighter the color (white).

**2) Aroma**

The aroma is good for nata de cacao is a bit smelly. Based on table 3 it can be seen that the value of the preferred scent relatively the same at the starter dose of 70 mL, 80 mL and 90 mL, so that it can be concluded that doses of starter nata de cacao does not affect the aroma nata de cacao. Panelists favored nata de cacao with scent rather smelly.

**3) Taste**

The taste was good for nata de cacao is a bit sour. Based on table 3 it can be seen that the value of the preferred flavor is relatively the same at the starter dose of 70 mL, 80 mL and 90 mL, so that it can be concluded that doses of starter nata de cacao does not affect the taste of nata de cacao. Panelists favored nata de cacao with a slightly sour taste.

**Conclusion**

Based on the results of research on the effects of cacao pulp starter dose against nata de cacao production, it can be summed up as follows:

- a. Dose starter no significant effect on the weight nata de cacao.
- b. Dose starter no significant effect on the thickness of nata de cacao.
- c. Dose starter who gives the most effect on the production of nata de cacao cacao-based pulp is a dose of 90 mL.
- d. Test the starter dose organoleptic significant effect on the color of nata de cacao, but no significant effect on the aroma and taste of nata de cacao.

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