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The effect of local yeast formulation of coconut water as a starter in the process of making commercial bread

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ABSTRACT

The composition of coconut water contains amino acids, organic acids, vitamins, and sugars that can be used for microbial growth and is very suitable for use as a medium for yeast growth. *Saccharomyces cereviceae* L is a yeast-type microorganism that is well known by the public as baker's yeast. The initial method for producing yeast was using the yeast culture method on a substrate in the form of coconut water and adding boiled sweet potato as an additional source of nutrients. Observations were made every 6, 12, and 24 hours. Local yeast from fermented coconut water was then applied to the process of making commercial bread. The study found several important things: 1.) The length of time of fermentation gave a very significant effect (P>0.01) at a significant level of 1% on the volume of bread development, moisture content, and organoleptic tests (color and aroma) of the bread produced. 2.) Appropriate treatment in producing good bread products (12 hours of fermentation) the average value of water content for each variable was 35.193%, expansion volume 123%), and color organoleptic test 3.6 hedonic scale really like, smell 3.667 hedonic scales really like. 3.) Microbes identified on petri dishes and on slanted agar were pure cultures of *S. cereviceae* L. Morphologically, *S. cereviceae* L. colonies had an oval shape, cream color, glossy, smooth, and flat surface characteristics, and had a distinctive aroma.

Key words : *Coconut water, Local yeast, Commercial bread, Sweet potato, Culture collection*

Introduction

Coconut water has a chemical composition such as protein, fat, vitamin C, vitamin B complex, potassium, and minerals. The chemical composition of coconut water is 2.56% sugar and 0.17% chloride compounds. The mineral content of potassium in coconut water is very high: 203.70 mg/100g in young coconut water and 257.52 mg/100g in old coconut water (Santoso, 2003).

Widyastuti (1997) *in* Saraswati (2014), said that coconut water contains amino acids, organic acids, vitamins, and sugars. More than half of it is sucrose and the rest is glucose and fructose. The sugar alcohols contained in it are monitol, sorbitol, and m-inositol. Yeast growth media and sugar need to be added because this fungus will thrive in habitats that contain sugar. Seeing the substances contained in coconut water, coconut water is very suitable to be used as a medium for yeast growth.

In a previous study, BanoEt, *et al.* (2017) said that palm sap that has been processed into alcoholic beverages, especially red laru, can be extracted from the nuts and made for a culture collection or can also be

directly applied in the bread-making process as local yeast. In a previous study on fermented palm sap, the ratio of the volume of red nut laru to the weight of the material on the direct use of red nut laru as yeast in making bread was 1:2. (Bano Et, 2018)

Bread is a common food consumed daily. Bread is also one of the important elements (besides wine) used by Christians in the sacrament of Holy Communion. The requirements for bread for a banquet include, among other things, that bread cannot be colored, white is the color of the expected banquet bread.

This research aimed to (1) studies the effect of local yeast breeding time from coconut (*Cocos nucifera* L) on commercial bread products; (2) Study the optimal breeding time for local yeast from coconut water as a starter in producing commercial bread; (3) Create a culture collection of yeast-type microbes from coconut water.

Materials and Methods

This research was carried out starting from harvesting coconut water to microbial breeding in the laboratory and its application in making commercial bread from coconut water

Research Design

This research was carried out in 4 (four) stages: Stage one was carried out in the field for the collection and sorting of coconuts to be used. Stage two was the process of forming yeast from coconut water which was given additional nutrition of boiled sweet potato. Stage three was the process of making bread with local yeast as a starter and the testing process, organoleptically, analysis of water content and volume of expansion. The fourth stage was the microbial culture collection process from the best products. Data from this experimental study were analyzed using a completely randomized design (CRD). With three treatments and three replications. The treatments consist of:

A. Control: 600 g wheat flour + commercial yeast + 900 ml mineral water with a commercial yeast fermentation time of 1 hour
B. Treatment 1: 600 g wheat flour + 900 ml coconut water that has been fermented into local yeast for 6 hours
C. Treatment 2: 600 g wheat flour + 900 ml coconut water which has been fermented into local yeast for 12 hours
D. Treatment 3: 600 g wheat flour + 900 ml coconut water that has been fermented into local yeast for 24 hours

Data Analysis

This research was experimental and used a mathematical model from a Completely Randomized Design (Hanafiah, 2010) :

$$Y_{ij} = \mu + T_{ij} + \Sigma_{ij}$$

Where:

$\mathbf{Y_{ij}}$ = The mean value of observations in the experimental unit
$\boldsymbol{\mu}$ = Average value of expectations
$\mathbf{T_{ij}}$ = Effect of treatments
Σ_{ij} = TrialError

Method of making local yeast from Coconut water

Sorting and selecting old coconuts, then cutting the plucked coconuts, and then separating the water in a prepared glass basin. The coconut water that has been filled in the basin filled with sweet potatoes that have been previously boiled (by weight of sweet potato as a yeast medium with a ratio of 1: 3 from coconut water), was allowed to stand according to the treatment (6,12 and 24 hours) so that the local yeast needed in making bread can be produced from the microbial growth phase.

Application in making commercial Bread

Local yeast was applied in making bread according to the bread-making procedure. The best bread results were taken from 1 full dose of microbial culture initially and cultured on a PDA that was given a standard dose of Chloramphenicol and stored in the laboratory so that it could be used in further research (Bano *et al.,* 2016).

Preparation of Medium for microbial culture

Preparation of Medium for microbial culture consists of (a). Liquid medium (culture medium) The culture of microorganisms requires a medium that contains nutrients and a growth environment that is suitable for the needs of microorganisms. The preparation of the medium carried out in this study was to provide coconut water inserted into Erlenmeyer tubes for each type of treatment with the same volume; (b). Solid medium for the manufacture of this medium, 39 g of Potato Dextrose Agar (PDA) was

needed and dissolved in 1000 ml of distilled water.

Microbial culture and morphological identification

The stages of microbial culture from fermented coconut water were by taking one loop dose of liquid and inoculating it into a petri dish containing 5 ml of PDA media with the addition of 100 mg/1 chloramphenicol. Cultures were incubated for three to four days (72–96 hours) at 20–22 ^{0}C. The growing microbial colonies were transferred to new PDA media by the etching method. Colonies that grow on the last stroke wee pure colonies. This colony was moved into a slanted agar to be used as material for further research (Sudana, 2014).

Results and Discussion

Rising Bread Volume

The Result of Analysis of Variance (ANOVA) showed that the duration of local yeast fermentation had a very significant effect (P>0.01) at a significant level of 1% on the volume of bread rising.

Table 1. The Average Value of Bread Rising Volume (%)

Treatments		Average Value
A.	Control	155 a
B.	Treatment 1 (6 hours Fermentation)	110 b
C.	Treatment 2 (12 hours Fermentation)	123 b
D.	Treatment 3 (24 hours Fermentation)	55 c

notes:
- *Numbers followed by unequal letters show a very significant difference at the 1% level*
- *Numbers followed by the same letter show no significant difference at the 1% level*

The high value of the bread rising volume in treatment 2 was due to the perfect fermentation so that the local yeast used could react well in the bread rising process so that it could approach the bread expansion volume in the control treatment. If the fermentation process was well controlled, it will produce bakery products such as bread and donuts that have good volume and texture, and good taste. Winarno (2004), stated that the function of yeast in bread making is to aerate the dough byconverting sugar into carbon dioxide gas.

Bread Moisture Content

The results of ANOVA showed that the duration of local yeast fermentation had a very significant effect (P>0.01) at a significant level of 1%.

Table 2. The averagevalue of Bread Moisture Content (%)

Treatments		Average Value
A.	Control	32, 005 d
B.	Treatment 1 (6 hours of Fermentation)	36,118 b
C.	Treatment 2 (12 hours of Fermentation)	35,193 c
D.	Treatment 3 (24 hours of Fermentation)	40,390 a

notes:
- *Numbers followed by unequal letters show a very significant difference at the 1% level*
- *Numbers followed by the same letter show no significant difference at the 1% level*

The treatment that had the highest moisture content value was found in treatment P3 (fermentation duration of 24 hours). As a result, the water moisture around the material could enter the material and cause the water content in the material to increase. Water is one of the most important characteristics of foodstuffs because water can affect the texture and taste of food (Winarno, 2004). The amount of water in the bread will affect the texture of sweet bread because when the wheat flour particles are moistened with sufficient water and then treated mechanically, a sticky mass is formed and has viscoelastic properties called gluten which can form the structure of the bread because of its ability to hold gas (Wijayanti *et al.*, 2007).

Bread Color

The results of ANOVA showed that the length of fermentation gave a very significant effect (P>0.01) at a significant level of 1% on the color of bread.

Table 3. The Average value of Bread Color

Treatments		Average Value
A.	Control	3,850 a
B.	Treatment 1 (6 hours Fermentation)	3,333 b
C.	Treatment 2 (12 hours Fermentation)	3,600 ab
D.	Treatment 3 (24 hours Fermentation)	2,067 c

notes:
- *Numbers followed by unequal letters show a very significant difference at the 1% level*
- *Numbers followed by the same letter show no significant difference at the 1% level*

During baking, the skin color changed to brown which was the result of the Maillard reaction. Ningrum (2006), stated that the use of the right yeast

Saccharomyces cerevisiae can provide a good fermentation effect in producing attractive product colors and help the Maillard reaction process which causes the skin of bread to brown by melanoidin compounds so as to improve the color quality of products including local bread. This was shown in treatment 2.

Bread Aroma

The results of ANOVA showed that the length of time of fermentation gave a very significant effect (P>0.01) at a significant level of 1% on the aroma of bread.

Table 4. The Average value of bread Aroma

Treatments	Average Value
A. Control	3,733 a
B. Treatment 1 (6 hours of Fermentation)	3,250 b
C. Treatment 2 (12 hours of Fermentation)	3,667 ab
D. Treatment 3 (24 hours of Fermentation)	2,133 c

notes:

- *Numbers followed by unequal letters show a very significant difference at the 1% level*
- *Numbers followed by the same letter show no significant difference at the 1% level*

The high value of the level of preference for the aroma of bread in treatment 2 was due to the fact that the fermentation was going well so that during the fermentation, yeast could give a distinctive aroma to the bread produced.Yeast can work optimally in the formation of gas during fermentation followed by other fermentation reactions such as the formation of intermediate metabolites that affect the consistency of the dough and the formation of volatile compounds which were aroma precursors. Aroma is one of the important sensory attributes in various baked products. According to Winarno (2004), aroma determines the delicacy of food ingredients. A good aroma will increase the level of panelists' preference for a food product. In addition, the formation of alcohol from the fermentation process could also give the dough a distinctive aroma

Morphological identification

The morphological analysis according to Campbell, *et al.* (1996) showed that the culture shown in the figures below was a culture of *Sacharomyces cerevisiaa* with the characteristic morphology of *Sacharomyces cereviceae* colonies having an oval shape, cream color, glossy surface characteristics, smooth and flat, fragrant. Observation of yeast morphology with crystal violet with observations on the results obtained showed that there was a similarity with the characteristics of *Saccharomyces cereviceae* according to Campbell, *et al.* (1996).

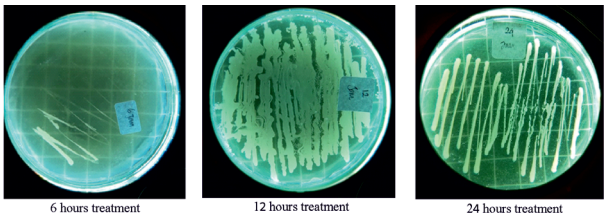

Fig. 1. The third day of purification in different treatments

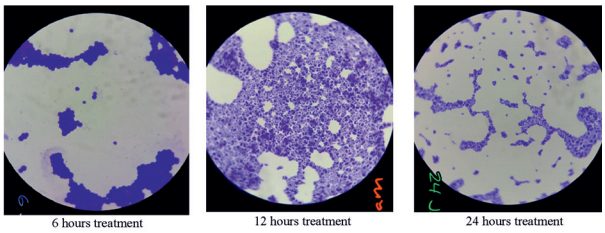

Fig. 2. Gram Painting in different treatments

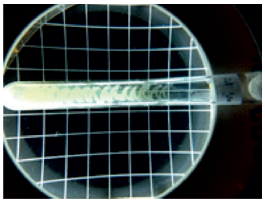

Fig. 3. Pure culture collection of*S. cereviceae*L

Conclusion

1. The length of time for fermentation of coconut water into the starter and local yeast gave a very significant effect (P>0.01) at a significant level of 1% on the volume of bread rising, moisture content, and organoleptic tests (color and aroma) of the bread produced.
2. The results of the analysis show that the right treatment for producing good bread products was found in treatment 2 (12 hours of fermentation).
3. Microbes in Petri dishes were purified repeatedly 3 times and pure cultures of *Sacharomyces cereviceae* were obtained with the characteristics of oval shape, cream color, glossy, smooth, and flat surface characteristics, fragrant, then kept in test tubes as culture collection.

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