The Effect of Addition Lempahong (*Baccaurea lanceolata)* Fruit Extract on pH, Organoleptic, and Antioxidants of the Making Yoghurt

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ABSTRACT
Yogurt is a dairy product made through a bacterial fermentation process. The addition of lempahong fruit (Baccaurea lanceolata) which contains antioxidant compounds, is expected to add the unique taste of lempahong fruit and as a source of antioxidants as a functional processed animal product. This research was conducted to determine the physical properties with a pH value, determine the quality of yogurt by organoleptic test, and determine the presence of antioxidant activity in yogurt. This study used a completely randomized design with six treatments and four replications, namely yogurt without the addition of lempahong fruit extract, yogurt with 2%, 4%, 6%, 8%, and 10% lempahong fruit extract. The results obtained were a pH value of 4.2 - 4.3 from each treatment. The average organoleptic test scored 3 (rather like) and the antioxidant activity test found the strong to very strong category. It could be concluded that adding lempahong fruit extract in yogurt did not significantly affect the pH value. In contrast, it had a significant effect on the organoleptic test and antioxidant activity. The best treatment was obtained from yogurt with the addition of 2% extract.

Keywords: *Baccaurea lanceolata fruit, pH, Organoleptic, Antioxidants*

1. INTRODUCTION

Lempahong fruit (Baccaurea lanceolata) is a rich source of tannins, saponins, flavonoids, and alkaloids [1]. This material is possible to inhibit free radicals. Free radicals are reactive oxygen compounds that have unpaired electrons or chemicals formed in the body as the trigger. Free radicals are very commonly formed in metabolic processes. This material has the potential to cause oxidative damage that can have an impact on the occurrence of cancer, dermatitis, heart attack, and cardiovascular disease [2]

Baccourea lanceolata come from the genera of Baccaurea (family: Euphorbiaceae). Most of the Baccaurea species are endemic to Borneo. B. lanceolata fruits are green to purple when young, and turn into yellow to orange when ripe [3]. This fruit grows naturally in large quantities in one tree and does not depend on the season. *B. lanceolatabears* thick skin, white arils, with a tasty, sour flavor which is common in the wild and unknown in cultivation.

Yogurt is considered one of the main dairy products. These products are gaining global recognition as healthy foods due to their nutritional and health ben-efits [4].Yogurt is one of the popular dairy drinks in Indonesia. The sour taste of the yogurt comes from the fermentation of lactic acid.

Adding lempahong fruit extract to yogurt is expected to add a unique taste and beneficial drink because it antioxidant compounds. Antioxidants are substances or compounds that interact with free radical chains and lipid oxidation reactions [5].

This research was conducted to determine the physical properties of the pH value, determine the quality of yogurt by organoleptic testing, and determine the

presence of antioxidant activity. A processed product made from fresh milk by utilizing antioxidant sources from lempahong fruit in yogurt as a functional food product.

2. METHODS

2.1. Material and Methods

The materials used in this study in yogurt yoghurt include Ultramilk whole cream UHT cow's milk as much as 3 liters, 20 g of sugar, 150 mL of yogurt starter, 500 g of lempahong, and 200 mL of distilled water. The materials used in activity antioxidants were yogurt samples, ethanol, aluminum foil, DPPH reagent (2-2 Diphenyl Picrylhydrazil), aquadest. The ingredients in pH testing were 5 mL of yogurt and 5 ml of aquadest.

The tools used in yogurt making are pots, stoves, incubators, thermometers, stirrers, and containers. The tool used for testing pH is a pH meter, while the tools used in testing antioxidant activity are a spectrophotometer, beaker glass, test tube, and an Erlenmeyer flask. Organoleptic testing does by questionnaire test.

2.2. Research Design

The design used in this study was a completely randomized design (CRD) with 6 treatments and 4 replications of organoleptic testing that are : P0 (yogurt without the addition of Lempahong fruit extract), P1(yogurt with the addition of 2% Lempahong fruit extract), P2 (yogurt with the addition of 4% lempahong fruit extract), P3 (yogurt with the addition of 6% lempahong fruit extract), P4 (yogurt with the addition of 8% Lempahong fruit extract) and P5 (yogurt with the addition of 10% Lempahong fruit extract).

2.3. Research Procedures

2.3.1. Lempahong fruit extract preparation

Five hundred g of lempahong fruit prepared, and wash using water then peel the fruit and cut into small pieces. Puree using a blender with 200 ml of water added after finely separated between the pulp and the juice. The juice of Lempahong is ready for use [6]

2.3.2.Yoghurt making

Yoghurt sample were prepared according to the method of [6]. Starter powder poured into 150 ml of mineral water. Next, homogenized and incubated at 34º C in for 24 hours. Twenty g of sugar mixed into 3 liters of UHT cow's milk, then homogenized and pasteurized at 90ºC for 10 minutes. Cooled it down to 45ºC, then add 150 ml of yoghurt starter, then homogenized. After that incubate at room temperature for 24 hours. Add the lempahong juice according to the treatment, namely: P0 0% lempahong extract: 500 ml yogurt + no lempahong extract, P1 2%: 500 ml + 10 ml lempahong fruit extract, P2 4%: 500 ml + 20 ml lempahong fruit extract, P3 6% : 500 ml + 30 ml lempahong fruit extract, P4 8% : 500 ml + 40 ml lempahong fruit extract, P5 10% : 500 ml + 50 ml lempahong fruit extract.

2.3.3. Measurement and Sample procedure

The test parameters observed were pH value, organoleptic test, and antioxidant activity assay. Measurement of the pH value is carried out with an electronic pH meter. Before using the electronic pH meter, the cathode tip was cleaned by distilled water, then cleaned with tissue paper. pH meter was calibrated first with solution of buffer 4 and buffer 7. The cathode tip was dipped in the yogurt sample. The sample used was 1:1 (5 ml yogurt sample + 5 ml aquadest). Before being measured, the cathode tip is cleaned using distilled water before reading is the value when the pH meter has stabilized [3].

Tests on organoleptic on yogurt, including taste, color, texture, aroma, were carried out with 25 trained panelist. Yogurt samples were served in small cups and then labeled according to a predetermined sample code. Each panelist filled out all the questionnaires that had been provided. The panelist requirements are that they have consumed yogurt before, are not allergic to milk or yogurt, do not smoke, and have taken at least once previous organoleptic tests. The parameters tested in the organoleptic test are Color, Texture, Aroma, and Taste. The hedonic test score consists of 5 scales, ranging from 1 (very dislike) to 5 (very much like)

Antioxidant activity testing was carried out according to [9]. Five ml of yogurt sample was put into an Erlenmeyer flask then added 100 ml of ethanol after letting it sit for 24 hours. The sample is filtered using filter paper and then put into a glass plate, after which it is steamed for approximately 90 minutes or until it dries. Mixed with 50 ml of ethanol. The dilution was carried out from 100 ppm to 500 ppm. Each dilution was added with 1 ml of DPPH reagent ((2-2 Diphenyl Picrylhydrazil). In contrast to the negative control (0 ppm), 1 ml of ethanol was added with 1 ml of DPPH reagent then allowed to stand for 30 minutes after measuring the absorbance on a spectrophotometer with a wavelength of 518 nm [8].

2.4 Data analysis

Organoleptic test data analysed by Kruskal Wallis. pH test carried out in a completely randomized design, with the mathematical model used as follows:

$$Yij = + ai + ij \quad (1)$$

Yij = observation response variable
ai = Effect of adding lempahong fruit extract
ij = Effect of the i-th experiment and replicates

Data obtained by analysis of variance tables or ANOVA, if significantly different, a further test is carried out using DMRT (Duncan Multiple Range Test) with a 95% confidence level.

3. RESULTS AND DISCUSSION

3.1. pH Value

The results of testing the pH value of yogurt with the addition of lempahong fruit extract can be seen in Table 1. Based on Table 1, the pH value ranges from 4.38 to 4.2. Based on the statistical analysis, the results show there is no significant effect. P0 treatment of yogurt with the addition of 0% or yogurt without the addition of Lempahong fruit extract Lempahong fruit extract had the highest pH value of 4.38 then the lowest pH value of; 4.25 in the P5 treatment. It shows that the higher the of addition level of lempahong fruit extract, the more acidic the yogurt (lower the pH value). According to research, pH value of yogurt with the addition of lempahong fruit extract was found to be in the range of 4.3-4.2 This indicates the suitability of the yogurt pH value that the study has determined. Previous research stated that the strength of the casein gel formed was determined by the strength of the bond between casein micelles and casein micelles, whose bond strength was influenced by pH, calcium concentration, and temperature [9].

3.2. Hedonic and Hedonik quality Test

Hedonic test and hedonic quality test of yogurt with the addition of Lempahong fruit extract included color, aroma, viscosity and taste. Hedonic test scores and hedonic quality can be seen in Table 2. Color is an essential component in organoleptic testing. Color can be influenced by adding flavorings or other ingredients to the product. Based on statistical analysis, hedonic and hedonic quality score of yogurt color with the addition of lempahong fruit extract at different levels show a significant effect (P>0.05). The hedonic quality of yogurt color with lempahong fruit extract at different levels is almost the same, getting 3 (yellow). The highest hedonic score is treatment 3 (4% lempahong extract) with a value of 3.84 (yellowish white), while the lowest was in treatment 5 (10% extract) with a score of 3.54. The two scores, if rounded up, will turn into a score of 4, which is white celebrating.

Table 1. pH value of yoghurt with variation lempahong fruit extract added

Treatments	Replication				Average
	U_1	U_2	U_3	U_4	
P_0	4,3	4,4	4,5	4,3	4,38±0,1
P_1	4,4	4,4	4,3	4,4	4,38±0,1
P_2	4,4	4,4	4,3	4,2	4,33±0,1
P_3	4,4	4,4	4,3	4,3	4,35±0,1
P_4	4,2	4,2	4,3	4,3	4,25±0,1
P_5	4,2	4,3	4,3	4,2	4,25±0,1

Note : P0 : yoghurt without the addition of lempahong; P1 : yoghurt with the addition of 2% lempahong; P2 : yoghurt with the addition of 4% lempahong; P3 : yoghurt with the addition of 6% lempahong; P4 : yoghurt with the addition of 8% lempahong P5: yoghurt with the addition of 10% lempahong

The color difference in yogurt can be influenced by the added addition level of added lempahong fruit extract. In contrast, the color of the lempahong fruit extract itself is yellowish-brown. The higher the level of addition, the more brown the color of the yogurt produced. In the 0% treatment, the color of regular yogurt is like plain commercial yogurt in general.

The aroma produced in yogurt with lempahong fruit extract has a distinctive aroma from the fruit. Based on the hedonic scale test, the scores obtained on yogurt with the addition of lempahong fruit averaged a score of 3 (rather like), the highest value was obtained by 0% treatment with a score of 3.48 (Table 2), this shows that the most preferred aroma is P0 or yogurt without the addition of lempahong fruit extract. Lempahong fruit does have a unique aroma that not familiar to the panelist.

The hedonic quality test score obtained in this organoleptic test is 3.69-3.26 (Table 2) when rounded up to 4-3, which is typical to somewhat typical. In the treatment without addition lempahong extract, the distinctive aroma of yogurt is like milk with a characteristic sour aroma obtained from lactic acid bacteria. In contrast in other treatments, the aroma has changed due to the addition lempahong fruit extract. The higher the level of addition of extract, the higher the distinctive aroma of lempahong fruit. The aroma that panelists flavour is the 0% treatment or without the addition of lempahong fruit extract. This phenomenon can be caused by the aroma of the lempahong fruit, which is less acceptable to the panelists because it has a less appetizing aroma. The viscosity or texture of yogurt is a success factor for lactic acid bacteria that develop or grow during fermentation. The addition of 10% extract of thick to liquid texture obtained from the appearance while from the panelists gave a score of 4.06 - 2.89 from the hedonic quality test (Tabel 2) a score of 3.71-3.05 from the hedonic score test. The highest value was obtained by 0% treatment without the addition of extract, then the lowest was obtained by P5 with the highest level of addition of Lempahong fruit extract, while in the hedonic scale test the highest score was obtained by P1 with an added level of 2%, thus the most preferred yogurt texture was P1 with an added level of 2% lempahong fruit extract.

Table 2. *Hedonic test and hedonic quality of yogurt with the addition of lempahong fruit extract*

Treatments	Colour		Scent		Viscosity		Flavour	
	Hedonic	Hedonic quality	Hedonic	Hedonic quality	Hedonic	Hedonic quality	Hedonic	Hedonic quality
P0	3.78ab	3.51 ab	3.48b	3.45b	3.48b	3.45b	2.63a	4.28b
P1	3.71c	3.61a	3.45ab	3.26c	3.45ab	3.26c	2.63a	3.91c
P2	3.73b	3.55ab	3.53a	3.50b	3.53a	3.50b	2.50b	4.43a
P3	3.84a	3.51b	3.23c	3.69a	3.23c	3.69a	2.39c	3.95c
P4	3.76ab	3.3c	3.31bc	3.26c	3.31bc	3.26c	2.56a	3.95c
P5	3.58c	3.35c	3.03c	3.29c	3.03c	3.29c	2.51b	3.79d

Note : P0 : yoghurt without the addition of lempahong; P1 : yoghurt with the addition of 2% lempahong; P2 : yoghurt with the addition of 4% lempahong; P3 : yoghurt with the addition of 6% lempahong; P4 : yoghurt with the addition of 8% lempahong P5: yoghurt with the addition of 10% lempahong

Taste is the most crucial parameter in organoleptic testing because it is one of the keys to acceptance. The flavors obtained on the hedonic scale testing in this study are; ranged from 2.63 to 2.39 (Tabel 2), while the values obtained in the hedonic quality test ranged from 4.43 to 3. Regular yogurt does have a sour taste. This sour taste is produced from the yogurt fermentation process by the proliferation of lactic acid bacteria. The sourer the yogurt taste the better the quality, but the acceptability or preference level of yogurt in this study only got a score of 2-3 which means that the panelist does not like it. Yoghurt taste added by lempahong fruit is still unfamiliar to the panelists. The amount of concentration of lempahong fruit extract added also affecte the taste. The best treatment was found in P1 because this treatment had the high preference by panelists.

3.3 Antioxidant activity Assay

The results of testing the antioxidant activity at a dilution of 100-500 ppm of yogurt with the addition of Lempahong fruit extract with different levels can be seen in Table 3.The value of the strength of the antioxidant activity was obtained from dilutions of 100 ppm, 200 ppm, 300 ppm, 400 ppm and 500 ppm, which will later be obtained values for each sample. is the sample concentration that can reduce DPPH (2-2 Diphenyl Picrylhydrazil) as much as 50%. The IC50 value has an inverse relationship with the percentage of DPPH inhibition. The smaller the value mean the higher the strength of the antioxidant activity [16]. The value is obtained from the value of the regression equation on the percentage of DPPH radical inhibition at several concentrations of sample extracts.

Table 3. IC_{50} Value of Antioxidant Activity Test Results on Yoghurt with the Addition of Lempahong Fruit Extract with Different Levels

Treatments	IC 50 (ppm)	Category	Percentage (%)
P0	105,708	Moderat	48
P1	37,794	Very strong	81
P2	49,306	Very strong	67
P3	83,491	Strong	58
P4	80,321	Strong	57
P5	71,440	Strong	60

Note :
Very strong : < 50
Strong : 50 ppm – 100 ppm
Moderat : 100 ppm – 150 ppm

The value of antioxidant activity contained in the results above (Table 3) shows that P0 has a moderate strength of antioxidant activity. In contrast, P1 and P2 have very strong strength, and P3-P5 has a strong antioxidant activity. The antioxidant activity has a positive correlation with the antioxidant content. The sample that has a weak antioxidant means it has little antioxidant content in it. The product is suitable for consumption, but if the sample has a higher antioxidant percentage was better. Several factors can affect the value of the antioxidant activity that occurs during testing procedures, tools, and materials, homogenization when mixing samples with reagents Click or tap here to enter text. Previous research stated that the antioxidant activity of Lempahong fruit itself was 94.36%[11] . Previous research explained that basically yogurt already contains antioxidants derived from the hydrolysis of bioactive peptides, but other food ingredients that can increase antioxidants are needed, namely Rome Beauty Apples [12]

4. CONCLUSION

The administration of Lempahong fruit extract in yogurt had no significant effect on the pH value of yogurt but added lempahong fruit extract significantly effects on organoleptic (color, aroma, viscosity and taste). Added

Baccaurea lanceolata fruit extract affects the antioxidant content in yogurt with antioxidant power from moderate to very strong. And the best treatment was P1 that is yogurt with2% addition lempahong extract.

AUTHORS' CONTRIBUTIONS

Arif Ismanto conceptualization of the study, acquisition, analysis and interpretation of data. Ari Wibowo formulation of proposed strategies, manuscript writing, as well as finalization of edits and revisions necessary. Muh Ichsan Haris provided substantial contribution to theory development and organization of data. Khoiru Indana and Lulu Khizanatusani provided material discussion on theory development and critical evaluation of research data and content.

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