Fat Content, Calcium Content, and Sensory Characteristics of Silky Soy Milk Pudding With The Addition of Jackfruit Seed Flour

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Abstract. Soy milk is a good choice as an alternative raw material for making soy silky milk pudding with the addition of jackfruit seed flour because it con-tains macronutrients (energy, protein, fat, and carbohydrates) and micronu-trients (calcium and phosphorus), which are beneficial for health. Jackfruit seed flour is added to add nutritional value to the silky pudding. This re-search aimed to determine the effect of adding jackfruit seed flour on silky soy milk pudding's fat content, calcium, and sensory characteristics. The re-search design used a completely randomized design with four treatments, namely F0, F1, F2, and F3. The fat content test used the soxhletation meth-od, the calcium content used the complexometric method, and the sensory characteristics test used 26 moderately trained panelists. Bivariate data analysis of chemical levels used the one-way ANOVA test with Duncan's advanced test; the sensory characteristics test used the Friedman test with Wilcoxon's advanced test. The analysis showed that adding jackfruit seed flour influenced the highest fat content, 1,213 ± 1,666 p = 0.00, and the highest calcium content, 1,375 ± 2,244 p = 0.009 ($p < 0.05$). The addition of jackfruit seed flour had a significant effect on the sensory characteristics of color p=0.00, taste p=0.00, and texture ($p<0.05$), while aroma p=0.398 had no significant effect ($p>0.05$). The test results with the addition of jackfruit seed flour had the highest fat content and calcium content in F3, the highest color in F0, the highest aroma in F0, the highest taste in F0, the highest tex-ture in F0 with the best formulation being F1.

Keywords: Calcium, Fat, Silky Pudding, Soy Milk, Jackfruit Seed Flour

1 INTRODUCTION

In Indonesia, the adult population estimates that lactose intolerance is between 51 and 90.6%, while the prevalence of lactose malabsorption in children aged 3-5 years is 21.3%, aged 6-11 years is 57.8%, and aged 12-14 years is 73%. In children who drink

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milk regularly and not routinely, the prevalence of lactose intolerance was found to be 56.2% and 52.1% [1].

One of the main problems with milk is lactose intolerance. Lactose intolerance is a clinical syndrome that occurs due to lactose not being hydrolyzed due to lactase deficiency [2]. Lactose cannot be broken down into glucose and galactose which will cause various clinical manifestations, ranging from abdominal pain, nausea, vomiting and bloating. The main source of milk is usually cow's milk, goat's milk or milk of animal origin.

Soy milk is a good choice as an alternative raw material for making silky pudding because it contains high levels of micronutrients (calcium and phosphorus) and macronutrients (energy, protein, fat and carbohydrates) which are beneficial for health. Soy milk is an alternative to animal milk for those who are allergic or lactose intoler-ant. The disadvantage of soy milk is the unpleasant smell (beany flavour) caused by the lipoxygenase enzyme found in soybeans, especially during processing of soy milk. One alternative to overcome this problem is to know the correct ratio of adding soybeans and water in the soy milk processing process [3].

The abundant production of jackfruit seeds is not in line with its utilization, which has not been maximized, namely only using jackfruit seeds as discarded and unused waste. The very low use of jackfruit seeds in the food sector is only 10%, which is caused by the lack of public interest in processing jackfruit seeds. To improve the quality and increase the economic value of jackfruit seeds, for example, processing jackfruit seeds into jackfruit seed flour can be done.

The use of processing jackfruit seed flour and soy milk as the main ingredients for making silky pudding needs to be optimized in people's lives because of the nutri-tional content they contain. The addition of jackfruit seed flour to silky pudding is to increase the nutritional value. The researchers chose to test the fat content and calcium content because the fat content in jackfruit seed flour is 1.12 grams, while the nutri-tional value of high-fat soy milk is 2.5 grams, calcium is 50 mg per 100 grams [4].

The choice of silky pudding was because previous research chose products such as cookies, biscuits and brownies. Apart from that, silky pudding is also easily accepted by all groups of people with its soft texture making silky pudding a favorite of many people, besides that the raw material for making silky pudding is soy milk as an alternative ingredient to animal milk for those who are lactose intolerant.

2 METHOD

2.1 Materials and Tools

Jackfruit seeds without skin are the ingredients used to make jackfruit seed flour. The ingredients used to make silky pudding are soy milk, sugar, cornstarch, plain jelly, jackfruit seed flour, lychee essence. Soybean seeds are the ingredients used to make soy milk. The tools used are digital scales, 100 mesh sieve, cabinet dryer, steamer, tray, grinder, knife, cutting board, spoon, blender. The tools used are stoves, pans, spoons, digital scales, basins, balloon whisks, cups, measuring cups. The tools used are digital scales, spoons, basins, blenders, measuring cups, filters.

2.2 Research Design

This type of research is truly experimental. The independent variable in this research is soy milk with the addition of jackfruit seed flour for the dependent variable, name-ly calcium content, fat content and sensory characteristics. In this study, a Complete-ly Randomized Design was used for the treatment of soy milk, the addition of jack-fruit seed flour with 4 treatments, namely Formulation F0 (0%), F1 (10%), F2 (20%) and F3 (30%).

2.3 Place and Time of Research

Making soy milk silky pudding with the addition of jackfruit seed flour at the Food Processing Laboratory, testing fat content and calcium content at the Food Chemistry Laboratory, hedonic quality testing at the Organoleptic Laboratory at Muhammadiyah University Semarang in February 2024.

2.4 Silky Pudding Formula

Table 1. Silky Pudding Composition

Formula Ingredients	F0	F1	F2	F3
Soy milk (ml)	550	550	550	550
Jackfruit seed flour (g)	0	10	20	30
Jelly powder (g)	7,5	7,5	7,5	7,5
Corn starch (g)	3	3	3	3
Sugar (g)	60	60	60	60

2.5 Making Jackfruit Seed Flour

The first ingredient used is jackfruit seeds. Wash both jackfruit seeds until clean. Third, boil at 80ºC for 30 minutes. Fourth drain. Fifth, peel the jackfruit seeds from the epidermis. Sixth, slice the jackfruit seeds into 4-6 pieces. Seventh, dry them in a dry cabinet at a temperature of 50 ºC for 24 hours, then grind the jackfruit seeds using a blender and sift them using a 100 mesh sieve. Finally, the jackfruit seed flour is ready to be used.

2.6 Making Soy Milk

The first ingredient used is soybeans. Second, wash the soybeans until clean. Third, soak the soybeans in water for 12 hours. Fourth, rewash the soybeans until they are separated from the epidermis. Fifth, grind the soybeans using a blender and add 500 ml of boiled water. Sixth, strain the soybeans and separate them from the dregs. Sev-enth,

boil the soybeans at 80-100ºC for 15 minutes then add granulated sugar and lychee essence. Finally the soy milk is ready to use.

2.7 Making Silky Pudding

First, mix soy milk, granulated sugar, jelly powder, stir until evenly mixed and boil at 90 ºC for 10 minutes. When it is mixed evenly, add jackfruit seed flour and corn-starch which have been dissolved in enough water, add lychee essence, strain so as not to clump and mold. then cool in a showcase or refrigerator for 30 minutes and the silky pudding is ready to use.

2.8 Fat Level

Soxhlet flask drying. First, wash the soxhlet flask and rinse it with distilled water. Second, dry the pumpkin in the oven at 75ºC for 15 minutes. Third, cool the flask by placing it in a desiccator for 15 minutes. Fourth, weigh the empty flask and record the mass as W1 [5].

Determining the fat content is by weighing 1 gram of sample and recording the mass as W. Wrap the two samples using filter paper by inserting it into the assem-bled soxhlet apparatus. Third, insert petroleum benzene into the soxhletation appa-ratus for up to 2.5 turns or up to ¾ of the volume of the soxhletation flask with the extraction for 4 hours. Fourth, wait 4 hours then enter the soxhletation flask (extrac-tion result). Fifth, weigh the pumpkin that has been dried in the oven, repeat until the mass of the pumpkin is constant, record it as W2.

$$Fat\ level = \frac{W2-W1}{W} \times 100\% \qquad (1)$$

2.9 Calcium Level

First, weigh 1 gram of the ground sample into an Erlenmeyer flask. Then add 10 ml of distilled water. Add 2 ml of pH 10 buffer, EBT indicator, then titrate using a 0.01 N Na EDTA solution which has been standardized using a ZnSO4 solution. The end point of the titration is the color change from wine red to blue [6].

2.10 Rendement of Jackfruit Seed Flour

Yield is a comparison of the weight of the extract produced with the weight of sim-plicia as the raw material. The higher the yield value indicates that the extract pro-duced is more significant [7]. In this research, the jackfruit seed flour used was pro-duced by ourselves.

2.11 Sensory Test

Preparatory stage. Provide different entry and exit access for panelists. Then, prepare waiting chairs for the panelists who have arrived. Preparing the organoleptic test chamber. Provide stationery and informed consent sheets at each table in the organoleptic booth. Provide water serving equipment and samples to be tested. This research has received ethical approval letter no. 269/KE/10/2023.

2.12 Data Analysis

Univariate analysis was carried out to describe the data with a numerical data scale, namely fat content, calcium content and sensory characteristics which were presented in descriptive form and in the form of minimum, maximum and standard deviation.

Bivariate analysis of fat and potassium tests with the Shapiro Wilk normality test used with data that was normally distributed with a significant value of $p > 0.05$. The data obtained were processed using ANOVA (Analysis of Variance) with a significance value of $p \leq 0.05$, then the Duncan test was carried out to determine the differences between treatments. Sensory test data uses the Friedman test and Wilcoxon test. To get the best formulation, namely the Bayes method.

3 RESULTS AND DISCUSSION

3.1 Rendement of Jackfruit Seed Flour

Yield compares the weight of the extract produced with the weight of Simplicia as the raw material. The higher yield indicates that the extract is more significant [7]. In this research, we produced the jackfruit seed flour. The yield of jackfruit seed flour was 45% w/w.

Table 2. Fat Level Result

Treatment	Fat Level
F0	1.213 ± 0.535^{a}
F1	1.358 ± 0.277^{b}
F2	1.449 ± 0.480^{c}
F3	1.666 ± 0.749^{d}

Different letters indicated significant difference . silky pudding F0 (550 : 0), F1 (550:10), F2 (550:20), F3 (550:30)

3.2 Fat Level

Table 2 shows that the highest fat content is in the F3 silky pudding formulation with an average value of 1,666%, while the lowest average is in the F0 formulation, namely 1,213%. The results of the ANOVA statistical test showed p 0.00 ($p<0.05$), indicating

that there was a significant effect of the addition of jackfruit seed flour on the fat content of soy milk silky pudding and jackfruit seed flour.

Duncan test analysis results show ($p<0.05$) F1 is different from F2 and F3, F2 is different from F1 and F3, F3 is different from F1 and F2.

3.3 Calcium Levels

Based on table 3 shows that the calcium content ranges between 1.375-2,244%. The highest value is in the F3 silky pudding formulation of soy milk and jackfruit seed flour, with an average value of 2.244%, while the lowest average value is in the F0 formulation, namely 1.375%. Each treatment obtained different potassium levels. The results of the ANOVA test showed that soy milk and jackfruit seed flour significantly affected the calcium levels of silky pudding, $p=0.009$ ($p<0.05$). Duncan's further test results showed that there were differences in each treatment. F0 shows that it is not different or the same as F1, F1 is not different from F2, F2 is the same as F3, and F1 treatment shows that it is different from F3. The calcium content in jackfruit seed flour per 100 grams is 33 mg, and in soy milk is 50 mg [4].

Table 3. Calcium Level Result

Treatment	Calcium Level
F0	1.375 ± 0.641a
F1	1.625 ± 0.184ab
F2	2.007 ± 0.347bc
F3	2.244 ± 0.273c

Different letters indicated significant difference . silky pudding F0 (550 : 0), F1 (550:10), F2 (550:20), F3 (550:30).

3.4 Sensory Test

The results for sensory test can be seen on table 4.

Table 4. Sensory Test Result

Treatment	Sensory Test Indicator			
	Color	Aroma	Taste	Texture
F0	4.96± 0.196[a]	3.69 ± 1.258	4.54±0.811[a]	4.19±0.749
F1	3.96 ± 0.344[b]	3.69 ± 1.050	4.19±0.567[b]	4.00±0.566
F2	2.62 ± 0.637[c]	3.35 ± 0.977	3.65 ± 0.846[c]	3.69 ± 0.618
F3	1.92 ± 0.560[d]	3.46 ± 1.067	3.12 ± 1.211[d]	3.54 ± 0.811

Different letters indicated significant difference . silky pudding F0 (550 : 0), F1 (550:10), F2 (550:20), F3 (550:30)

Colour. Based on Table 4, the average value for the color of the silky pudding is obtained with the highest average value in the F0 formulation without treatment in the white category, namely 4.96%, while the lowest value is in the F3 formulation, namely 1.92 % (dark chocolate). Based on the results of the Friedman test, the color showed a significant value with p-value (0.00) < (0.05); there was a significant influ-ence between color treatments on silky pudding. To determine the effect of color for each treatment, the Wilcoxon test was continued. The Wilcoxon test results showed color differences in each treatment F0, F1, F2 and F3.

Aroma. Based on the data in Table 4, the highest average value was obtained for the F0 formulation without adding jackfruit seed flour at 3.69% (not unpleasant), while the lowest average value was for the F2 formulation, namely 3.35% (somewhat unpleasant). The research results of the F0 formulation of silky pudding without the addition of jackfruit seed flour can still be covered by the distinctive aroma of lychee flavor without the distinctive aroma of jackfruit seed flour. The pleasant aroma comes from soy milk; the aroma of the lipoxygenase enzyme is naturally present in the bean content. The lipoxygenase enzyme hydrolyzes fatty acids with unsaturated fatty acids. It converts volatile compounds such as aldehydes and ketones, so the higher the use of soy milk added, the more pungent the delicious aroma of soybeans [8].

Taste. Based on the data in Table 4, the highest average value for the F0 formulation is 4.54% (sweet), while the lowest average value for the F3 formulation is 3.12% (slightly sweet, slightly bitter). The more jackfruit seed flour added, the slightly bit-ter the taste of the silky pudding will be, and the sweetness of the added sugar will decrease. This causes the starch granules in jackfruit seed flour to undergo hydrolysis, which can produce monosaccharides, which are used as raw materials for producing organic acids. Volatile acids produce a pleasant aroma in jackfruit seed flour. The difference in taste in silky pudding is due to the addition of jackfruit seed flour. Jack-fruit seed flour has a different calcium and phosphorus chemical content, affecting the resulting taste [9].

Texture. Based on the data in Table 4, the highest average value was obtained for the F0 formulation, namely 4.19% (very soft), while the lowest average value was for the F3 formulation, namely 3.54 % (hard). The results of the Friedman test with a p-value of (0.002) < (0.05) showed that there was a significant effect between treatments on silky pudding.

To determine the difference in texture of each treatment, the Wilcoxon test was continued. The results of the Wilcoxon test show that the texture of silky pudding formulation F0 is not different from formulations F1, F2, and F3. The F2 formula-tion is no different from the F3 formulation. This is because the texture of soy milk dissolves easily with other ingredients.

The F0 formulation does not include the addition of jackfruit seed flour, so, during the processing process, the texture becomes liquid because it is mixed with soy milk and other ingredients. The addition of jackfruit seed flour during the processing pro-cess quickly thickens because of its dense texture. In making silky pudding, no water is added, so it relies only on soy milk as a liquid solvent. This is because the more jackfruit seed flour you add, the higher the percentage of silky pudding texture that is less smooth [10].

Best Formulation Results. The analysis of the best formulation of silky pudding using the Bayes method showed that silky pudding with soy milk and the addition of jackfruit seed flour had the best formulation, ranking 1, namely F0. However, because F0 is a control, the best formulation is F1, which gets ranked 2 with a fat content of 1.666%, calcium content of 2.244%, color value of 1.92 (dark chocolate), aroma of 3.46 (flavorful), taste 3.12 (slightly sweet, slightly bitter), texture 3.54 (relatively soft).

4 CONCLUSION

Silky soy milk pudding with the addition of jackfruit seed flour significantly af-fects fat and calcium content. Silky pudding had a significant influence between treatments on the sensory characteristics of color, taste, and texture, but there was no real significant influence on the aroma characteristics. The best formulation of silky pudding with soy milk and jackfruit seed flour using the Bayes method was obtained in the F0 formulation. However, because F0 was a control, the best formulation was F1, which got rank 2 with a fat content of 1.666% and calcium content of 2.244%, getting a color value of 1.92 (chocolate). Thick), aroma 3.46 (flavorful), taste 3.12 (slightly sweet, slightly bitter), texture 3.54 (slightly soft).

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