Journal of Indonesia Applied Nutrition

1(2):100-110, 2026, https://doi.org/10.56303/jian.v1i2.1612

E-ISSN: 3125-1188, https://www.journalmpci.com/index.php/jian

Optimization of Stellorice Ice Cream Made from Soy Milk and Jack Bean Flour as a Nutritious Snack for School-Age Children

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ARTICLES

Submitted: Jul 12, 2026

Accepted: Aug 03, 2026

Keywords:

Ice cream, Jack bean flour, Schoolchildren, Snack, Soybeans

OPEN ACCESS

ABSTRACT

School-aged children (6–12 years old) need adequate nutrition to support their growth and development. The habit of consuming unhealthy snacks in the school environment can lead to nutritional problems in children. Therefore, there is a need for snack alternatives that children enjoy and that have good nutritional value. This study aims to develop a soy milk ice cream product with the addition of jack bean flour. Additionally, butterfly pea flower extract is used as a natural coloring agent to make the ice cream's color more appealing. An experimental method was employed, with three formulations incorporating jack bean flour at levels of 5%, 10%, and 15%. A hedonic test was conducted with 54 untrained panelists, specifically sixth-grade elementary school students. Data analysis for physical properties—specifically overrun and melting point—was performed using ANOVA and Duncan's test, while hedonic evaluations of color, aroma, taste, and texture were analyzed using the Kruskal-Wallis and Mann-Whitney tests. The resulting ice cream was named Stellorice and for the three formulations showed that the addition of jack bean flour had a significant effect on overrun and melting point, as well as on hedonic evaluations related to texture parameters; however, there was no significant effect on color, aroma, and taste. The selected formulation was F2, with the addition of 50 grams of jack bean flour. This ice cream product has an energy content of 133 kcal, 4.2 grams of protein, 4 grams of fat, and 19.7 grams of carbohydrates, as well as an overrun of 44.8% and a melting time of 57 minutes.

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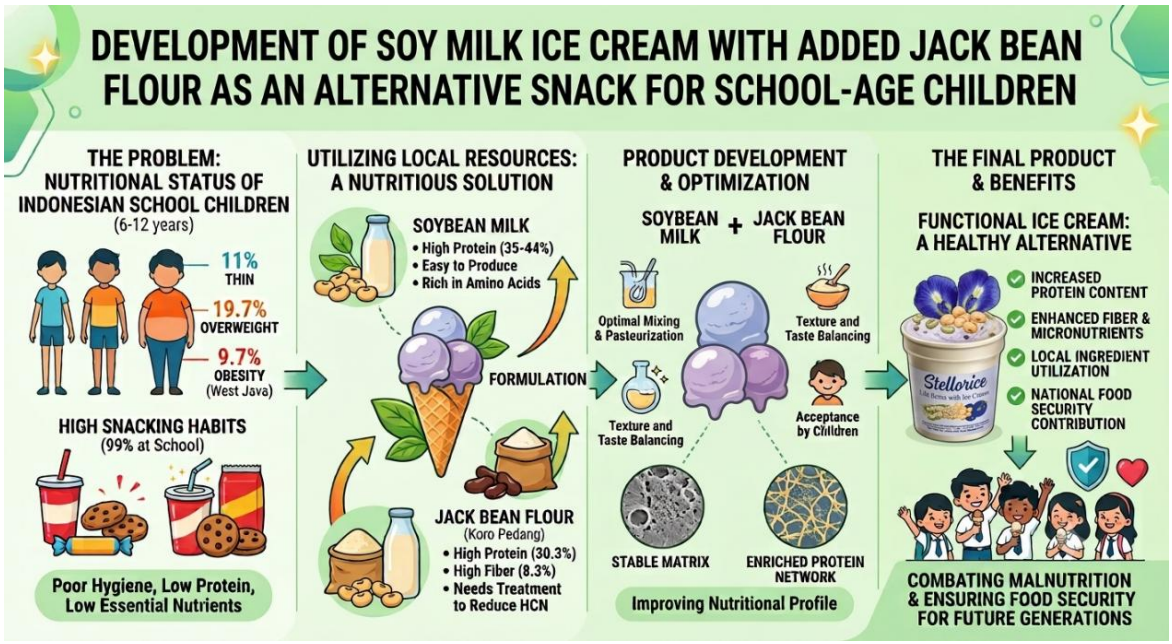
Key Messages:

- The development of soy milk ice cream with added jack bean flour provides a nutritious, protein-rich snack alternative that helps reduce unhealthy snacking habits among school-age children.
- The use of local food ingredients such as jack bean flour adds value to the product and encourages healthier eating habits among school-age children.
- Natural butterfly pea flower extract provides an attractive color without synthetic additives.
- The selected formulation shows promising potential as a nutritious and palatable functional dessert product.

GRAPHICAL ABSTRACT



INTRODUCTION

The Indonesian government continues to strive to improve nutritional status and food security as part of its national commitment to Sustainable Development Goal (SDG's) "Zero Hunger," including through school nutrition programs that emphasize the importance of ensuring a balanced diet for children (1). School-aged children (6–12 years) are in a phase of growth and development—physically, emotionally, socially, and intellectually. Diet plays a key role in children's nutritional status (2). Data from the 2023 Indonesian Health Survey (SKI) show that children aged 5 to 12 years in Indonesia face malnutrition issues, with a prevalence of 11% being underweight and 19.7% being overweight (3). The 2023 West Java Health Profile also shows the prevalence of nutritional status (BMI-for-age) among children aged 6–12 years, including 1.9% who are severely underweight, 5.2% who are underweight, 5% who are overweight, and 9.7% who are obese (4).

Eating patterns and preferences begin to form in childhood and are influenced by various factors, such as family circumstances, food availability, early taste experiences, parental roles, and peers. School-aged children tend to choose foods they like without considering their nutritional content (5). One type of food that children enjoy is school snacks (PJAS), such as candy, soda, packaged tea, and sweet pastries. A survey conducted by the Indonesian Food and Drug Administration (BPOM) also showed that more than 99% of children consume snacks while at school (6).

However, the snacks currently available in school settings do not guarantee hygiene or nutritional quality. The snacks consumed by schoolchildren are often high in carbohydrates, sugar, and fat, while their protein, vitamin, and mineral content is low. As a result, children feel full due to the high calorie density, but their other nutritional needs remain unmet, which can increase the risk of health problems in children (7). Health problems that can arise from poor snack choices among schoolchildren include appetite disorders, nutritional deficiencies, diarrhea, food poisoning, and infections (8).

To address this nutritional gap, local crops such as soybeans (Glycine max L.) and jack bean (Canavalia ensiformis) hold great potential for integration. According to 2023 data from the Ministry of Agriculture, Indonesia's soybean production reached 301.52 thousand metric tons of dry beans, a 41.65% increase from the previous year (9). Soybeans are known as a high-protein plant-based source, with protein content ranging from 35% to 44% in high-yielding varieties (10). Processed soy milk is in high demand because it is easy to make (11). and its beany odor, caused by the enzyme lipoxygenase, can be masked with ginger, lemongrass, or pandan leaves (12). Soy milk contains 41 kcal, 3.5 grams of protein, 2 grams of fat, and 5 grams of carbohydrates per 100 grams (13). Jack bean has a high nutritional content, consisting of 60.1% carbohydrates, 30.3% protein, and 8.3% fiber (14). Although it contains cyanide, its levels can be reduced through soaking, boiling, and drying (15), making it

https://doi.org/10.56303/jian.v1i2.1612

a potential candidate for processing into protein-rich flour (PRF) to enhance the nutritional value of food (16).

On the other hand, the consumption of ice cream in Indonesia continues to rise each year, reaching 0.73 L per person in 2020 (17). According to 2022 data from the Central Statistics Agency (BPS), ice cream consumption in Indonesia accounted for 79% of total consumption (18), and in the city of Bogor in 2025, average weekly per capita ice cream consumption reached 0.284 per capita (19). Therefore, in addition to the rising consumption rate, ice cream was chosen as the ideal product because it is sure to be popular with children.

Based on this background, this study aims to develop an innovative soy milk-based ice cream product with the addition of jack bean flour as a healthy alternative to PJAS that is appealing to children. Through this food diversification, the resulting ice cream formulation is expected to optimize the utilization of local commodities and address the challenge of meeting the nutritional needs of school-age children. The main conclusion of this study is that the combination of soy milk and jack bean flour can produce functional ice cream with excellent characteristics that significantly increases children's protein intake while making a tangible contribution to national food security.

METHODS

This study employed a completely randomized design (CRD) involving a single factor with three different treatment formulations based on the concentration of jack bean flour added. These formulations are F1 (5% jack bean flour), F2 (10% jack bean flour), and F3 (15% jack bean flour), which were developed based on previous research. This study was conducted from January to April 2026, covering the preparation phase, product formulation, testing of physical and sensory properties, proximate analysis, data processing, production cost analysis, product distribution, and the preparation of the final report. Product formulation trials and ice cream processing were conducted at the researcher's residence in Cibeureum, Batu City, Indonesia. Sensory evaluation was conducted at SDN Cibeureum 04 Bogor, while proximate analysis was performed at PT Saraswanti Indo Genetech. The resulting ice cream product was named "Stellorice," reflecting a soy-based ice cream with the addition of jack bean flour, which provides freshness, smoothness, and enjoyment. The ingredients used in making soy milk ice cream consisted of unsweetened soy milk, jack bean flour, coconut milk, butterfly pea flower extract, FiberCreme, granulated sugar, sweetened condensed milk, eggs, vanilla powder, carboxymethyl cellulose (CMC), SP, salt, and pandan leaves. The formulation is shown in Table 1.

Table 1. Ice Cream Ingredients and Formulations

No.	Bahan	Satuan	Formulasi		
			(F1 5%)	(F2 10%)	(F3 15%)
1	Susu kedelai tawar	ml	500	500	500
2	Tepung koro pedang	g	25	50	75
3	Santan	g	30	30	30
4	Ekstrak telang	ml	50	50	50
5	*FiberCreme*	g	35	35	35
6	Gula Pasir	g	70	70	70
7	SKM	g	30	30	30
8	Telur	g	20	20	20
9	Vanili bubuk	g	1	1	1
10	CMC	g	3	3	3
11	SP	g	3	3	3
12	Garam	g	2	2	2
13	Daun pandan	buah	2	2	2 buah

The equipment used includes preparation, processing, and serving tools such as bowls, scales, measuring cups, pots, spatulas, mixers, blenders, refrigerators, ice cream makers, and ice cream cups. Flowcharts of the soy milk and ice cream production processes are shown in Figures 1 and 2. Physical property testing included overrun and melting point tests, each conducted three times. Hedonic testing was conducted by 54 untrained panelists consisting of sixth-grade elementary school students aged 10–12 years. The inclusion criteria are as follows: willingness to serve as a panelist, no color blindness, no allergies to the materials used, and good health at the time of the organoleptic test. These criteria are established to ensure the quality of the research results while protecting the health of the panelists during the organoleptic test. Before beginning the sensory test, panelists will

https://doi.org/10.56303/jian.v1i2.1612

be given general or specific instructions—either verbally or in writing—regarding how to conduct the test and the samples that will be provided. In addition, panelists will also receive a form containing instructions and response options that must be filled out as part of the evaluation. The hedonic scale consisted of: 1 (dislike very much), 2 (dislike), 3 (like), 4 (like very much), and 5 (like extremely much). The sensory attributes evaluated included color, aroma, texture, and taste. Physical and sensory data were tabulated using Microsoft Excel 2019 and analyzed using IBM SPSS Statistics version 27 with a significance level of $p < 0.05$. Data from the physical property test were first tested for normality using the Shapiro–Wilk test, followed by one-way analysis of variance (ANOVA). If significant differences were found, Duncan's Multiple Range Test was performed as a post hoc analysis. Sensory data were first analyzed descriptively and tested for normality using the Kolmogorov–Smirnov test because the number of observations exceeded 50. Since the sensory data were not normally distributed ($p < 0.05$), differences between formulations were determined using the Kruskal–Wallis test. Significant results were then analyzed using the Mann-Whitney test to identify specific differences between formulations. The selected formulation was determined using the Weighted Sum Method (WSM), which combines overrun, melting point, and hedonic tests. The weighting criteria consist of 60% for organoleptic characteristics and 20% for physical property tests. Nutritional content analysis will be conducted through proximate laboratory testing, after which the contribution to the Recommended Dietary Allowances (RDAs) for school-age children and the General Nutrition Labeling Reference Values (ALG) will be calculated.

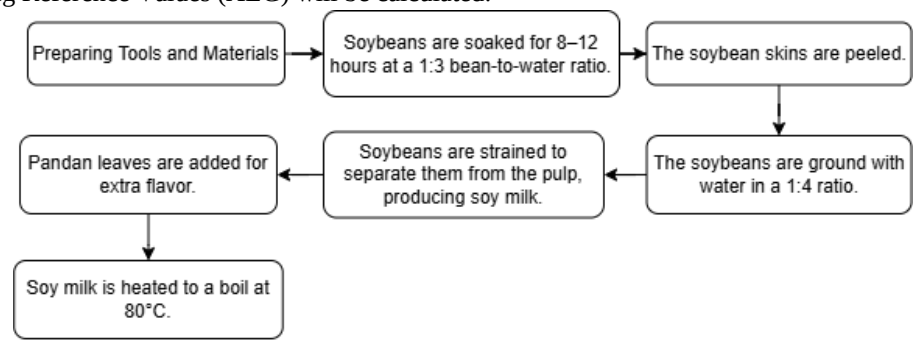


Figure 1. The flowchart of the soy milk production process

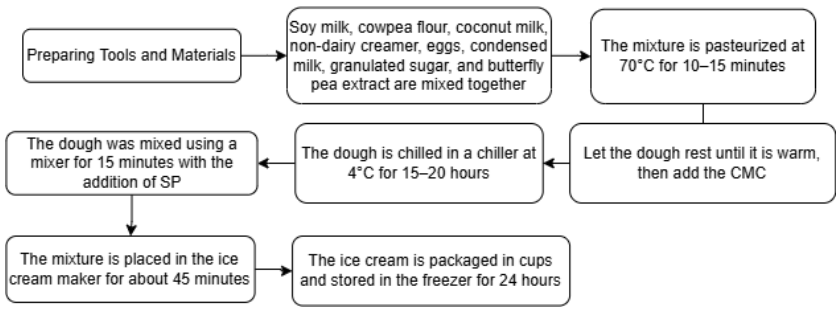


Figure 2. The flowchart of the ice cream production process

CODE OF HEALTH ETHICS

This study has been approved by the IPB University Health Research Ethics Committee under number 2278/IT3.KEP-IPB/SK/2026.

RESULTS

Stellorice is a snack typically served as a dessert in 100-ml cups. In this study, the innovation focused on developing an ice cream formulation by adding jack bean flour to produce a product with distinctive sensory characteristics and enhanced nutritional value, particularly as an alternative snack for school-age children. The results of the Stellorice product development are presented in Figure 3.

https://doi.org/10.56303/jian.v1i2.1612

Figure 3. Stellorice product development result

Quality testing of soy milk ice cream with added jack bean flour was conducted using two main methods: physical property testing and hedonic organoleptic testing. Physical property testing included measuring the ice cream's overrun and melting point. Meanwhile, organoleptic testing was conducted to assess consumer preference based on the product's color, aroma, texture, and taste. The statistical results of the physical property tests are shown in Table 2.

Table 2. The results of the overrun and melting rate test

Parameter	Mean Value of physical properties			P-Value
	F1	F2	F3	
Overrun (%)	47.0 ±1.70[a]	44.8 ± 1.73[a]	25.5 ±1.07[b]	0.001*
Daya leleh (menit)	51.3 ± 0.90[a]	57.6 ± 1.25[b]	61.9 ± 2.75[c]	0.001*

Note: Different superscript letters (a, b) within the same row indicate significant differences between samples based on the Duncan test ($p < 0.05$).

The analysis of physical property test results in Table 2 represents the average of three replicate tests for overrun and melting point for each formulation, conducted to ensure the data is more representative and to minimize the influence of random errors in measurement (20). Data analysis was performed using SPSS 27.0 for Windows, beginning with the Shapiro-Wilk normality test, the results of which indicated that the data were normally distributed. The data were then analyzed using a one-way ANOVA, which revealed significant differences in the overrun and melting point tests ($p < 0.05$), prompting the application of Duncan's post-hoc test. The results of the Duncan test for overrun showed that F1 was the same as F2 but not the same as F3; similarly, F2 was the same as F1 but not the same as F3; and F3 was not the same as F2 or F1. Furthermore, the results of the Duncan test for melting point showed that F1, F2, and F3 were not the same and differed significantly.

A hedonic test was conducted to determine the panelists' preference levels for Stelllorice products based on sensory attributes, including color, aroma, texture, and taste. This evaluation aimed to assess the effect of varying proportions of jack bean flour on overall consumer acceptance of the final ice cream product. A total of 54 untrained panelists—sixth-grade elementary school students—participated in this evaluation. Each panelist was asked to evaluate three different samples, which were coded with random numerical labels to minimize product identification bias. The results of the hedonic test are presented in Table 3.

Table 3. The results of the hedonic test

Parameter	Mean Value of Sample Hedonic Test			P-Value
	F1	F2	F3	
Warna	3.52 ± 0.771[a]	3.56 ± 0.883[a]	3.35 ± 0.872[a]	0.426
Aroma	3.63 ± 0.853[a]	3.67 ± 0.932[a]	3.28 ± 0.834[a]	0.066
Tekstur	3.56 ± 0.883[a]	3.35 ± 0.850[ab]	3.09 ± 0.937[b]	0.026*
Rasa	3.83±0.947[a]	3.87 ± 0.953[a]	3.43 ± 1.143[a]	0.088

Note: Different superscript letters (a, b) within the same row indicate significant differences between samples based on the Mann–Whitney test ($p < 0.05$).

https://doi.org/10.56303/jian.v1i2.1612

The hedonic test analysis in Table 3 was conducted using Microsoft Excel and SPSS Version 27 for Windows, beginning with a normality test using the Kolmogorov-Smirnov test to assess the data distribution, since the sample size exceeded 50 (21). The resulting data were not normally distributed, so a Kruskal-Wallis test was conducted, which revealed significant differences in the texture parameter ($p < 0.05$), while the color, aroma, and taste parameters did not differ significantly. Next, a Mann-Whitney test was conducted on the texture parameters to determine differences between groups, showing that F1 was equal to F2 and F2 was equal to F3; however, F1 was not equal to F3, indicating a significant difference marked by a different notation. The range of mean values for all parameters was 3.09–3.87, with the lowest mean value observed for the texture parameter in Formula 3 and the highest mean value observed for the taste parameter in Formula 2.

The selected ice cream formula was determined using the Weighted Sum Method (WSM), which involves summing the products of attribute rankings and attribute weights (22). This method was used to select the most optimal formula based on the results of physical property tests and hedonic tests, which included the parameters of color, aroma, texture, flavor, overrun, and melting point. The weight values can be adjusted according to the characteristics and objectives of the product being tested (23). The rankings are multiplied by the weights for each parameter, and the resulting scores are summed to obtain a total score. The formula with the highest total score receives the lowest ranking, while the formula with the lowest total score receives the highest ranking (24). The composition of ingredients in ice cream plays a role in determining the flavor and texture of the final product; thus, the right combination and use of ingredients will produce a flavor and texture that meet ice cream standards (25). The results of the summation indicate that the selected ice cream formulation is Formulation 2 with the addition of 50 g of jack bean flour.

Nutritional content testing was conducted on a selected ice cream formula, namely Formula 2 (F2), with the addition of 50 g of jack bean flour. The results of the proximate analysis, conducted at the PT Saraswanti Indo Genetech (SIG) laboratory, are shown in Table 5.

Table 5. Proximate analysis results for ice cream

Parameter	Unit	Kandungan per 100 g (%)	SNI Es Krim (3713:2018)
Kadar Abu	%	0.71	-
Energi Dari Lemak	kkal/100 g	36.85	-
Kadar Lemak Total	%	4.0	Min 5.0
Kadar Air	%	71.24	-
Energi Total	kkal/100 g	132.65	-
Kadar Karbohidrat	%	19.67	-
Kadar Protein	%	4.28	Min 2.7

The minimum fat content in ice cream is 5%; therefore, it can be concluded that the fat content of soy milk ice cream with added jack bean flour does not yet comply with the Indonesian National Standard (SNI) for ice cream (3713:2018), as the fat content of soy milk ice cream is lower than that of whole milk ice cream due to differences in the fat content of the raw materials used. The non-compliance of the fat content with the SNI standard for ice cream can affect the texture of the ice cream. Although the fat content does not yet meet the SNI standard for ice cream, this product. The nutritional contribution of the ice cream product was calculated by comparing the nutrient content per serving to the Recommended Dietary Allowances (RDAs) for schoolchildren aged 10–12 years and the general RDAs. The serving size used in this study was 100 ml/cup, equivalent to 60 grams/cup, in accordance with BPOM Regulation No. 26 of 2021 regarding ice cream serving sizes, which range from 50 to 150 ml (26). The contribution of the nutrients in ice cream with added jack bean flour per serving toward the NRVs for schoolchildren aged 10–12 years is shown in Table 6.

https://doi.org/10.56303/jian.v1i2.1612

Table 6. Energy and Nutrient Intake of School-Aged Children

Parameter	Takaran saji (60 g)	AKG 10–12 Tahun Anak Usia Sekolah			
		Laki-laki		Perempuan	
		Kecukupan	Kontribusi (%)	Kecukupan	Kontribusi (%)
Energi (kkal)	80	2000	4	1900	4
Protein (g)	2.5	50	5	55	4.5
Lemak (g)	2.4	65	3.6	65	3.6
Karbohidrat (g)	11.8	300	4	280	4.2

Based on Table 6, it can be concluded that soy milk ice cream with added jack bean flour can meet 4% of schoolchildren's energy needs. In addition, this ice cream can also meet 4–5% of their protein needs; 3.6% of their fat needs; and 4% of their carbohydrate needs. Snack requirements can be met by consuming other healthy foods to achieve the appropriate percentage contribution. The 4–5% protein contribution from Stelloric ice cream is sufficient for children, since this product is intended only as a snack and not as a main meal; thus, their daily protein requirements can be met by their main meals. The energy and nutrient contributions of general snacks can be seen in Table 7.

Table 7. Energy and Nutrient Contributions of Common ALG

Parameter	ALG Umum	Takaran Saji (60 g)	100 g	% ALG 60 g	% ALG 100 g
Energi (kkal)	2150	80	133	4	6
Protein (g)	60	2.5	4.2	4	7
Lemak (g)	67	2.4	4	3.5	5.9
Karbohidrat (g)	325	11.8	19.7	3.6	6

DISCUSSION

The highest overrun value was found in Formula 1, which contained the lowest amount of jack bean flour (25 grams) and yielded an overrun of 47.0%. The lowest overrun value, 25.5%, was found in Formula 3, which contained the highest amount of jack bean flour (75 g). This decrease in overrun was influenced by increased viscosity resulting from the addition of jack bean flour. This is consistent with the study by (27), which showed that overrun decreases as flour concentration increases in ice cream production with added mung bean flour. The increasing use of flour causes the ice cream mixture to become too thick, resulting in slower mixing and reduced ability to incorporate air. Additionally, a study by (28), on ice cream production with added jack bean paste stated that higher additions of jack bean bean paste lead to a decreasing overrun percentage. According to the SNI 01-3713-2018 standard for ice cream, the ideal overrun for household-scale production ranges from 35–50%, while for large-scale industrial production, it ranges from 70–80% (29).

The longest melting time was observed in Formula 3, which contained the highest amount of jack bean flour—75 g—with a melting time of 61 minutes and 9 seconds. The fastest melting time was observed in Formula 1, which contained the lowest amount of jack bean flour—25 g—with a melting time of 51 minutes and 30 seconds. Factors influencing melting time include protein content, total solids, stabilizers, and processing methods such as homogenization (30). Research conducted by (27), on ice cream production with the addition of mung bean flour indicated that an increase in solids in the ice cream mixture results in a longer melting time. According to (31), a good melting time at room temperature is 20–30 minutes per 50 g of ice cream. In this study, melting time tests were conducted on each formula using 50 g of ice cream. An increase in melting time for each formula occurred as the amount of jack bean flour was increased.

The results of the Kruskal-Wallis statistical test on the color parameter showed a p-value of 0.426 ($p > 0.05$), indicating no significant difference in the color of Stellorice ice cream among the formulas. This is due to the similarity in the formulations that impart color to the ice cream. Stellorice ice cream has a blue color derived from butterfly pea flower extract, which contains anthocyanins—water-soluble pigments that form blue vacuoles—and can therefore be classified as a natural colorant (32). In this study, the panelists' preference ratings for the ice cream's color ranged from an average of 3.35 to 3.56, which descriptively falls into the "like" to "very like" categories. The colors produced in each soy milk ice cream formula containing jack bean flour were as follows: F1, with 25 grams of jack bean flour, produced a pale blue ice cream; F2, with 50 grams of jack bean

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flour, produced a light blue ice cream; and F3, with 75 grams of jack bean flour, produced a dark blue ice cream. This is consistent with the research by (33), on making nuggets with the addition of jack bean flour, where the more jack bean flour used, the darker the product's color becomes. This is due to a reaction between reducing sugars and free amino groups from proteins, commonly known as the Maillard reaction. Additionally, in a study conducted by (34), on the production of yogurt using corn milk and jack bean beans, it was found that as the amount of jack bean beans added increased, the panelists' preference for the product decreased. The results of the organoleptic test for color showed that F2 received the highest acceptability rating compared to the other formulations. The panelists' evaluations indicated that the highest acceptability rating for texture in the ice cream product was found in the formulation containing 50 g of jack bean flour.

The results of the Kruskal-Wallis statistical test for the aroma parameter showed a p-value of 0.066 ($p > 0.05$), indicating that there was no significant difference in the aroma of Stellorice ice cream among the formulas. The panelists' preference ratings for the ice cream's aroma ranged from an average of 3.28 to 3.67, which descriptively falls into the "like" and "very like" categories. Jack bean flour has a pungent and musty aroma characteristic caused by the lipoxygenase enzyme, which produces ethyl phenyl ketone (35). The panelists' responses to each soy milk ice cream formula containing jack bean flour were generally positive. This is attributed to the addition of vanilla, which creates a strong aroma that masks the musty odor of jack bean flour (36). Additionally, a study by (37), indicated that coconut milk contains high levels of galactomannan and phospholipids, which can improve unpleasant aromas such as mustiness. The results of the organoleptic test for aroma showed that F2 received the highest likability rating compared to the other formulations. Panelist evaluations indicated that the highest aroma likability in the ice cream products was found in the formulation with the addition of 50 g of jack bean flour. Increasing the amount of jack bean flour resulted in a musty aroma, which is often referred to as a "beany flavor" in legumes (38).

The results of the Kruskal-Wallis statistical test on the texture parameter showed a p-value of 0.026 ($p < 0.05$), indicating a significant difference in the texture of Stellorice ice cream among the formulas. The statistical analysis continued with the Mann-Whitney test to identify differences between groups. Based on the results of the Mann-Whitney test, F1 was not significantly different from F2 ($p < 0.185$), and F2 was not significantly different from F3 ($p < 0.132$), indicating that there were no significant differences in texture parameters. However, F1 was significantly different from F3 ($p < 0.009$), indicating a significant difference. The panelists' preference ratings for the ice cream's texture ranged from an average of 3.09 to 3.56, which descriptively falls into the "like" to "very like" categories. This was due to differences in the formulations, specifically the progressively increasing amount of jack bean flour added, which caused changes in the ice cream's texture. This is consistent with research conducted by (39), on the production of ice cream with koro benguk beans, which showed that the more koro beans added, the coarser the resulting ice cream texture became. This is because the addition of jack bean flour increases the product's density. The gelatinization properties of jack bean starch enable it to form a gel; when this gel absorbs water, the starch granules swell, making the mixture thick and firm (40,41). However, this can be addressed by refining the flour production process through additional sifting to produce a finer flour texture. Panel evaluations indicated that the highest level of texture preference for the ice cream products was found in the formulation containing 25 g of jack bean flour.

The results of the Kruskal-Wallis statistical test on the flavor parameter showed a p-value of 0.088 ($p > 0.05$), indicating that there was no significant difference in the flavor of Stellorice ice cream among the formulas. The panelists' preference ratings for the ice cream flavors ranged from an average of 3.43 to 3.87, which descriptively falls into the "like" to "very like" categories. No significant differences were found in the statistical analysis of the taste parameter; however, F3 was identified as the formulation with the lowest average score. This was due to the highest addition of jack bean flour, at 75 grams. The characteristic bitter and astringent taste of jack bean beans is due to the presence of cyanide acid, even at low concentrations (42). A study conducted by (34), on yogurt production also found that the higher the concentration of jack bean added, the lower the panelists' ratings. The method for reducing cyanide in jack bean flour involves carrying out certain stages during the flour-making process, such as soaking the jack beans, drying them and boiling them, in order to reduce the bitter taste of the resulting flour. The panelists' ratings indicated that the highest level of taste preference for the ice cream product was found in the formulation with 50 g of jack bean flour added.

https://doi.org/10.56303/jian.v1i2.1612

CONCLUSION

This study shows that the addition of jack bean flour to soy milk ice cream products can significantly affect both the sensory characteristics and nutritional composition of the product. Among the three formulations tested, F2—with a 10% addition of jack bean flour (50 g)—achieved the highest overall acceptance, particularly in terms of color, aroma, and taste. A balanced proportion of ingredients contributed to a product with desirable sensory attributes without compromising palatability due to an overpowering flavor. Nutritional analysis of the selected formulation (F2) with a 100-ml serving size showed 133 kcal of energy, 4.2% protein, 4% fat, and 19.7% carbohydrates. The contribution of the selected ice cream formula's energy and nutrients to the Recommended Daily Allowance (RDA) for children aged 10–12 years is 4% for energy, 4–5% for protein, 3.6% for fat, and 4% for carbohydrates, while for the General Recommended Daily Allowance (RDA), it contributes 4% for energy, 4% for protein, 3.5% for fat, and 3.6% for carbohydrates. In this study, the fat content of Stellorice ice cream did not meet the SNI standard of 4%; however, this lower fat content can make the ice cream healthier, and the 4–5% protein content can still be considered sufficient for school-age children since this ice cream product is intended only as a snack. Based on the results of this study, recommendations for future researchers include conducting total sugar tests to determine the sugar content in ice cream products, thereby providing more comprehensive information; conducting shelf-life tests to determine product quality stability during storage; adding other ingredients to improve the quality and nutritional content of the ice cream; and processing jack flour through sieving to produce a smoother Stellorice ice cream.

FUNDING

This research received no external funding.

ACKNOWLEDGMENTS

The author would like to express sincere gratitude to SDN Cibeureum 04 for the willingness of the sixth-grade students to participate as panelists in the researcher's data collection.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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