

Local wisdom-based instant cream soup as functional emergency food during health crises and disasters

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Abstract. Background: The development of functional food with local ingredients of black soybeans and brown rice in the form of cream soup as emergency food is important. These foods have high nutritional content for nutritional preparedness efforts in disaster and health crises. Objective: This study aims to determine the acceptability and nutritional value of three types of cream soup (original flavor, mushroom, and vegetable onion). Methods: There were 236 panelists from 3 provinces (West Java, Yogyakarta, and East Java) for the sensory acceptability test. Nutritional value is measured with HPLC, AAS, or Gravimetric methods according to AOAC (Association of Official Analytical Chemists). Result: The best results for the acceptability of the overall parameter of cream soup in 3 flavors of original (6.6 ± 2.3), mushroom (6.7 ± 2.3), and vegetable onion (7.2 ± 2.4) were in the provinces of West Java. The highest nutritional value of the 3 cream soup variants is found in the mushroom variant with nutritional values of energy (418.14 kcal), protein (12.75 gr), fat (12.65 gr), fiber (15.76 gr), and sodium (1,608 g). Conclusion: The best acceptable product in terms of color, aroma, texture, and taste was the vegetable onion cream soup variant. One portion of cream soup can meet daily energy requirements of 21.5%.

1 Introduction

Nutritional preparedness in disaster situations and health crises is a critical effort to mitigate health impacts. Indonesia's geographic location in a disaster-prone area necessitates proactive measures from stakeholders to address nutritional issues effectively as part of emergency response efforts. Food and nutritional insecurity conditions will increase the risk of malnutrition, poor nutrition, and stunting. This condition will be exacerbated if a natural disaster occurs, which causes limited intake of nutritious food in the community, especially in vulnerable groups such as infants, toddlers, pregnant women, and the elderly.

The development of functional food using local ingredients plays an important role in fulfilling the nutritional needs of the community during health crises and disasters [1]. This

product has developed with local ingredients rich in nutrients such as black soybeans and red rice. Black soybeans contain isoflavones and anthocyanins, which can reduce free radicals and oxidative stress [2]. Anthocyanins can also be obtained from brown rice, which can prevent non-communicable diseases from worsening PTSD (Post-Traumatic Stress Disorder) after a disaster [2, 3, 4]. Anthocyanin, an antioxidant compound found in black soybeans, can neutralize free radicals and prevent lipid peroxidation and DNA damage. The antioxidants in brown rice, derived from anthocyanin pigments, help protect against coronary heart disease, cancer, diabetes, and hypertension [5-6].

The primary output in this study is an instant cream soup, which is simple to prepare by brewing with warm water, making it suitable for use in post-disaster conditions. Local ingredients, such as black soybeans and brown rice, serve as the main raw materials, providing nutrients that help reduce oxidative stress, which can exacerbate conditions in vulnerable age groups.

This research aims to determine the acceptability and nutritional value of cream soup developed using black soybean flour and brown rice, incorporating various flavor variants. West Java, Yogyakarta, and East Java were chosen as test locations for acceptability because they are known as producing areas for black soybeans and brown rice in Indonesia [7, 8].

2 Materials and methods

This research was conducted at multiple locations: the Food Technology Laboratory of the Health Polytechnic of the Ministry of Health, Tasikmalaya as a trial location for making prototype cream soup variants; PT Choice Plus as a large-scale production site for sensory acceptance tests; and at the PT Saraswati Indo Genetech Laboratory (PT.SIG) as a place to test the nutritional value of 3 cream soup variants. Prototype trials with sensory acceptability tests were conducted in three provinces: West Java, Yogyakarta, and East Java using 236 panelists aged 12-65 as a target group. The preference test was conducted with at least 70 respondents for each target group [9]. The cream soup was made using of black soybean flour and brown rice in a 4:1 ratio, along with carrot flour, skim milk, margarine, powdered chicken stock, and other spices. There were three flavor variants: namely original, mushroom, and vegetable onion.

The variables measured in the acceptability test included color, aroma, texture, and taste. Nutritional value of the cream soup variants was analyzed using HPLC, AAS, or Gravimetric methods according to AOAC (Association of Official Analytical Chemists). Data analysis was conducted quantitatively using statistical software, employing Kruskal Wallis and a post-hoc statistical test (significance level $p < 0.05$) for three variants of cream soup. The Research Ethics Commission of the Health Polytechnic of Tasikmalaya issued an ethical clearance before the research began. This study's ethics was approved by the Ethical Committee of Health Polytechnic of Tasikmalaya (approval number: No.DP.04.03/F.XXVI.20/152/2023).

3 Results and discussion

This study was conducted in three locations: West Java, Yogyakarta Special Region, and East Java. Figure 1 shows that out of 236 respondents, 91% were female and 9% were male.

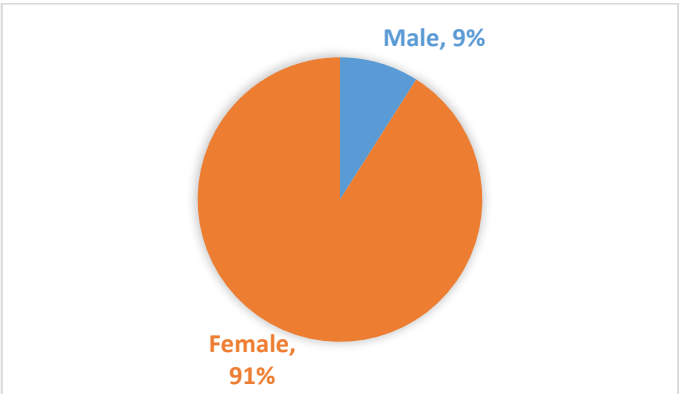


Fig 1. Proportion of respondents by gender

Figure 2 shows the age categories of the respondents in this study: adolescents with an (12-24 years), adults (25-45 years) and elderly (46-65 years).

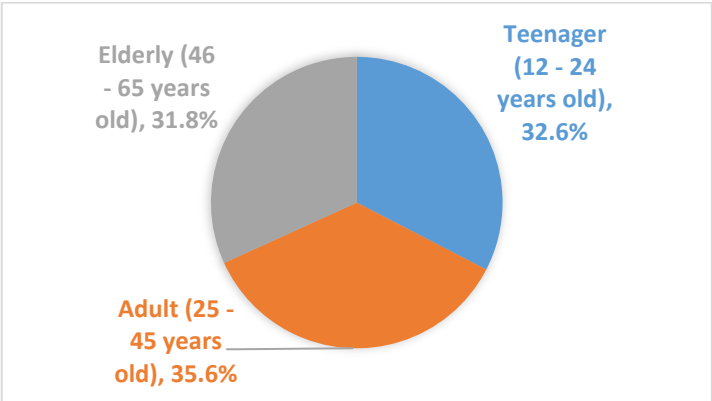


Fig 2. The proportion of respondents based on age group

The results of the acceptability test in 3 provinces for 3 flavours of cream soup based on color, aroma, texture and taste indicators are in the range of neutral to very good. The best results for the overall acceptability of 3 flavors of the cream soup were original (6.6±2.3), mushroom (6.7±2.3), and onion vegetables (7.2±2.4) in West Java province.

For the original variant of the three indicators of color, aroma, taste, and overall acceptability. However, the post-hoc test revealed a significant difference in preference for texture between regions. (Table 1).

Table 1. Differences in respondents' level of preference for cream soup variants

Varian	Provinces	Colour±SD	Aroma±SD	Texture±SD	Taste±SD	Overall±SD
Original	West Java	5.7±2.4	6.5±2.9	6.8±2.4	5.3±3.1	6.6±2.3
	DIY	6.7±5.9	6.5±2.4	5.3±2.5	6.2±2.7	5.3±2.5
	East Java	5.8±2.3	5.8±2.8	6.2±2.8	5.6±3	5.8±2.7
	p=value	0.58	0.12	0.00*	0.19	0.13
Mushroom	West Java	5.8±2.5	6.5±2.6	6.5±2.4	6.2±2.9	6.7±2.3
	DIY	5.2±2.3	5.4±2.3	4.9±2.6	4.1±2.7	5.0±2.3
	East Java	5.2±2.4	6.2±2.7	5.8±2.7	5.8±2.7	5.8±2.0
	p=value	0.21	0.00*	0.00*	0.00*	0.00*
Vegetable	West Java	6.7±2.4	6.9±2.6	6.9±2.5	7.0±2.9	7.2±2.4

Varian	Provinces	Colour±SD	Aroma±SD	Texture±SD	Taste±SD	Overall±SD
Onion	DIY	6.2±2.2	6.4±2.5	5.7±2.3	6.6±2.7	6.6±2.4
	East Java	5.9±2.7	6.6±2.8	6.0±3.1	7.2±3.0	6.8±3.0
	p=	0.17	0.49	0.01*	0.05	0.15

Type: Kruskal Wallis and *post-hoc

The average preference levels of respondents in the three provinces, based on indicators of color, aroma, texture, taste, and overall assessment, ranged from neutral to very good. The average preference for the instant cream soup with mushroom flavor generally fell within the range of neutral and very good. However, in the DIY area, the preference for texture and taste ranged from neutral to not good. Among the three regions, there is a significant difference in preference level between aroma, texture, taste, and overall acceptability. The results of the post hoc test indicated a difference in the preference level for aroma, texture, and taste for the West Java and DIY regions, as well as East Java and DIY. However, there was no difference for the West Java and East Java regions. Regarding the overall respondent assessment of the mushroom flavor variant, a significant difference in the preference level was observed between the West Java and DIY regions, as well as between West Java and East Java. No significant difference was found between preference levels in East Java and DIY regions.

The preference level for the vegetable onion flavor variant in the three regions showed no significant differences for the indicators of color, aroma, taste, and overall acceptability. However, there was a difference for the texture indicator. Post hoc tests revealed differences in texture preference between West Java and DIY regions, but no differences were found between West Java and East Java, or between East Java and DIY.

The results of the nutritional content analysis are presented per 100 g (Table 2). One serving size of cream soup is 25 grams. The highest nutritional content among the three cream soup variants is found in the mushroom flavor variants, with energy (418.14 kcal), protein (12.75 g), fat (12.65 g), fiber (15.76 g), and sodium (1608.59 mg). While the onion vegetable flavor variant contains the highest level of carbohydrates (69.77 g).

Table 2. The nutritional value of instant cream soup in 100 grams

Nutritional Value	Unit	Onion	Mushroom	Original
Energy	Kcal	401.18	418.14	414.6
Protein	g	12.19	12.75	12.51
Fat	g	8.28	12.65	11.61
Carbohydrate	g	69.77	68.06	68.80
Fiber	g	15.14	15.76	15.68
Water content	%	4.51	4.68	4.61
Sodium	mg	1313.05	1608.59 (high in sodium is not good for health)	1427.22

Original variant of cream soup contains a total of 162.59 µg/g isoflavones, which is equivalent to 69% of the total isoflavones in tempeh. It also contains 254.58 µg/g of anthocyanins, meeting 2% of daily needs, and has an antioxidant activity of 723.73 mg/100 g, comparable to vitamin C. Additionally, it provides 17.87 g of dietary fiber, fulfilling 71.48% of the recommended daily intake [2,10,11,12,13,14,15]. This product meets the Indonesian National Standard (SNI) requirements, except for its lower fat content [16]. Based on the analysis of nutrients, antioxidants, and total isoflavones, this product shows the potential as a functional food product to enhance lipid profiles and manage oxidative stress in vulnerable groups during disasters. This aligns line with research showing that the combination of black soybean cream soup and brown rice can increase HDL levels by 1.5 ± 9.7 mg dL – 1, reduced LDL by - 42.5 ± 48.7 mg dL – 1, and increase the activity of the

antioxidant enzyme SOD in serum by 2.46 ± 3.93 U mL⁻¹ in menopausal women [6]. The original variant of the instant cream soup provides 100 kcal per 25-grams serving, based on the 2013 Nutritional Adequacy Rate (AKG) for menopausal women with a daily energy requirement of 2,150 kcal.

4 Conclusion

The highest acceptability rates for three variants of cream soup original, mushroom, and onion vegetable was found in West Java. The nutritional value of the original variant of cream soup includes 100 kcal of energy, 3% total fat, 6% protein, 6% total carbohydrate, 15% fiber, and 36% sodium per 25-gram serving size (which variant? No discussion about it in the “Result and Discussion”). Instant cream soup made from local ingredients can serve as a nutrient-rich emergency food product for health crises and natural disasters.

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