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Original Research

Organoleptic Evaluation and Acceptability of Red Bean-Porang Snack Bar as An Alternative Snack for Obesity Adolescents

Evaluasi Organoleptik dan Daya Terima Snack Bar Kacang Merah-Porang sebagai Alterinatif Selingan Remaja Obesitas

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Abstract: *Obesity is one of nutritional problems in adolescents. obesity among adolescents may be associated with the selection of snacks that are high in caloric density. The utilization of local food ingredients, such as red bean flour and porang flour, in the development of snack bars has the potential to provide a healthy alternative snack that supports adolescents' nutritional needs. The purpose of this study was to develop a snack bar formulated from red bean flour and porang flour as the primary ingredients. The research was conducted on 3 snack bar formulations with varying compositions of red bean flour and porang flour, F1 (95:5), F2 (96:4), and F3 (97:3). Organoleptic and hedonic quality tests were assessed to determine the level of panelists' preference. Testing was conducted on 26 semi-trained panelists. The collected data were analyzed using One-Way ANOVA and Duncan Test for significant results (p<0.05). The results of organoleptic tests on color, aroma, texture, taste and overall the most preferred red bean - porang snack bar were F2 with a color preference value of 4.23, aroma 4.46, texture 3.92, taste 4.26, and overall 4.50. Meanwhile, the hedonic quality test on taste showed no statistical difference (p = 0.920), but the hedonic quality test on texture showed a significant difference (p=0.002). Organoleptic evaluation and acceptability of the red bean-porang snack bar reported that the best formulation was F2, with a proportion of 96g red bean flour and 4g porang flour. This was indicated by the highest scores for each organoleptic aspect.*

Key word: adolescent, porang, red bean, snack bar

1. INTRODUCTION

Adolescents are a vulnerable group experiencing nutritional problems such as malnutrition or overnutrition. The adolescent age group is included in the group experiencing a rapid growth and development phase, commonly known as the growth spurt (1). This requires balanced nutrition to meet daily nutritional needs. Based on age, adolescence is classified into three stages: early adolescence (ages 10-13 years), middle adolescence (ages 14-17 years), and late adolescence (ages 18-21 years) (2). Overnutrition or obesity is one of the dominant nutritional problems occurring in adolescents. The World Health Organization reported in 2022 that more than 390 million children and adolescents aged 5-19 years are overweight and another 160 million are obese (3).

Based on data from the 2023 Indonesian Health Survey, it was reported that the prevalence of overweight and obesity among 13 – 15 year olds was 12.1% and 4.1%, respectively. Meanwhile, the prevalence of overweight and obesity among 16 – 18 year

olds was 8.8% and 3.3%, respectively (4). The results of a meta-analysis conducted by Zhang et al. (2024) reported that 1 in 5 children or adolescents is overweight. The factors causing obesity are behavioral, environmental, and sociocultural factors, so appropriate attention and intervention are needed to address this problem (5). In addition, obesity in adolescents occurs due to lack of physical activity and poor eating patterns, various types of snacks containing high sugar and high fat (6). The most frequently consumed snack food groups among adolescents are wafers, ice cream, and donuts, with a frequency of eating 3-6 times a week (7). Research conducted by Ramadhan et al. (2025) shows a relationship between snack consumption habits and nutritional status. Adolescents who frequently consume snacks tend to have better nutritional status (8).

Choosing good snacks or snacks for teenagers should meet 5-10% of daily needs to help achieve normal nutritional status (9). One type of snack that can be recommended for teenagers is a snack bar. Snack bars are light, solid food products. Snack bars can be consumed as a meal replacement or between meals. The purpose of providing snack bars is to delay hunger or to increase energy during exercise. Snack bars are usually made from 3 to 5 ingredients that can support energy, protein, fat, minerals, vitamins, and fiber (10). The characteristics of snack bars according to SNI 01-4216-1996 concerning Quality Requirements for Diet Foods for Weight Control have a fat content of 1.4-14%, protein of 25-50% and calories of 120 kcal (11).

One local food ingredient that has the potential to be developed into an innovative food product is red beans. Red beans are a good source of protein, approximately 2-3 times more than other grains, and contain bioactive compounds such as phytochemicals, antioxidants, and flavonoids, including anthocyanins, proanthocyanidins, flavonols, phenolic acids, and isoflavones, which play an important role in maintaining digestive health (12,13). Red bean flour can be developed by processing it into flour as a base ingredient. Red bean flour is high in protein. The nutritional composition of red bean flour per 100 grams contains 375.28 calories, 17.24 g protein, 2.21 g fat, and 71.08 g carbohydrates (14). Meanwhile, the nutritional value of red bean flour per 100 grams is 12.83 g carbohydrates, 4.57 g protein, 0.48 g fat, 86.04 mg phosphorus, and 39.15 mg calcium (15).

A combination of several ingredients is necessary in developing a food product to maximize nutritional value. Porang (*Amorphophallus Onchophyllus and Amorphophallus Mueller*) is characterized by a high glucomannan content, comprising approximately 65% of its total composition. Glucomannan is beneficial for health, namely making people feel full faster. However, the utilization of porang among the Indonesian population remains limited, both as part of dietary practices and as a potential antidiabetic food. The benefits of porang tubers need to be maximized for Indonesian consumption (16). In the food sector, porang can be used as a food bar because porang is a plant that is rich in fiber, low in calories and high in protein (17). Saniyya et al. (2024) reported that porang tuber flour is a food ingredient that is low in fat, at 0.02%. The addition of porang tuber flour to some products can reduce the fat content of a food product. Products with low fat content can reduce total calories and therefore can be recommended for diet programs (18). The results of chemical analysis of porang flour include water content of 5.025%±0.095 and crude fiber content of 5.025%±0.095, macronutrient analysis includes: carbohydrates 43.48%±0.18; fat 5.17% ± 0.13; protein 5.70% ± 0.11; and glucomannan content of 15.49% ± 1.02 (19).

Red bean flour and porang flour have the potential to produce food products that meet daily nutritional needs, both macro and micronutrients. Therefore, the aim of this study was to design a snack bar formulation using red bean flour and porang flour to assess the product's organoleptic acceptability. This research is expected to serve as an alternative snack for obese adolescents and increase opportunities for innovative food products based on local food ingredients with the potential for widespread development.

2. METHODS

The method in this study is a laboratory experimental study with a Completely Randomized Design (CRD) on 3 product formulations. The study was conducted from December 2025 to February 2026 at the Organoleptic Laboratory, Institut Kesehatan Mitra Bunda. Product development is carried out by changing materials and compositions by trial and error, namely changing the composition of the constituent materials so as to produce nutritional value content in accordance with the standard of snack bar. Ethical clearance was obtained from the Research Ethics Commission of Institut Kesehatan Mitra 253/K/KEP/IKMB/XII/2025. The testing in this experiment involved 26 semi-trained panelists as organoleptic and product acceptability testers. The data presented in the research results are organoleptic test data and product acceptability data. The inclusion criteria included students of the Nutrition Study Program of the Institut Kesehatan Mitra Bunda who had received the Acceptability Test course, were willing to become panelists, were in good health, and did not have allergies to the main ingredients used for making enteral formulas. The exclusion criteria included having disorders such as a sense of smell, suffering from diseases related to decreased immune function and body metabolism. The sample used in this study was the red bean flour and porang flour with a ratio of the proportion of red bean flour : porang flour, namely F1 (95:5), F2 (96:4), F3 (97:3). he composition of the snack bar product was modified based on the formulation proposed by Zaddana et al., 2021 (20). The research process is presented in the flow diagram figure 1.

Table 1. Ingredient Composition of *Snack bar* Formula

Material	Formula Level		
	F1	F2	F3
Red bean flour (g)	95	96	97
Porang flour	5	4	3
Skimmed milk powder (g)	20	20	20
Dates (g)	20	20	20
Choco chips (g)	10	10	10
Margarine (g)	15	15	15
Eggs (pcs)	2	2	2
Sugar (g)	10	10	10
Serving size (g)	18	18	18

Modified recipes of Zaddana et al (2021)

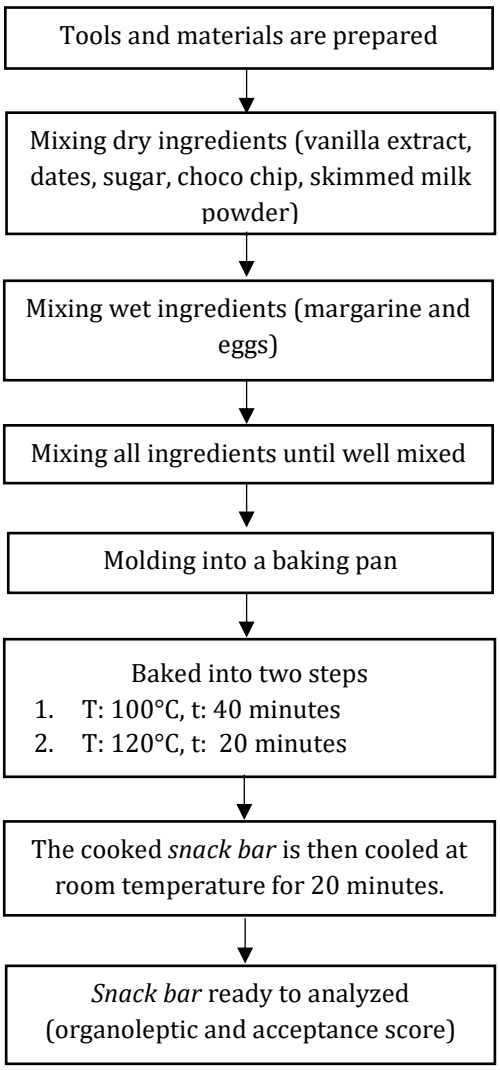

Figure 1. Research Process Flow Chart

An organolepic evaluation was conducted using a hedonic test to assess panelist acceptance of snack bar. Moderately trained panelists is appropriate for acceptance tests aimed to evaluating general consumer preferences rather than for descriptive sensory attribute analysis. The snack bar were evaluated based on color, aroma, taste, texture, overall, acceptability of taste and acceptability of texture, using a five-point hedonic scale ranging from "strongly dislike" to "strongly like" (20). The samples were coded with random numbers and served in a random order, with each sample weighing approximately 5 grams. Drinking water was provided to neutralize the taste between samples. Collected data from the sensory evaluation were analyzed using One-Way ANOVA statistical test. If the results show there is a significant difference, it will be followed by the Duncan Test.

3. RESULTS

Snack bar formulas with different ratios of red bean flour and porang flour. Each formula had distinct characteristics in color, aroma, texture, taste, and overall appearance. The composition of each formula was determined based on the ingredients used and the calculated nutritional value. Therefore, an analysis was conducted to assess panelists' preference through organoleptic testing of each formulation.

Organoleptic analysis was conducted to determine panelists' preference for the three snack bar formulations. The assessment consisted of five parameters: color, aroma, texture, taste, and overall. The results of the organoleptic analysis can be seen in Table 2.

Table 2. Organoleptic Evaluation of Red Bean – Porang Snack bar

Variable	Average of Preference			p-value
	F1 (95:5)	F2 (96:4)	F3 (97:3)	
Color	4.11±0.81 [a]	4.23±0.86 [a]	4.57±0.57	0.002*
Aroma	4.11±0.99 [a]	4.46±0.76[a]	4.34±0.74[a]	0.210
Texture	3.26±0.96	3.92±0.93[a]	3.76±1.14[a]	0.014*
Taste	3.42±1.17[a]	4.26±0.91[ab]	3.84±1.12[b]	0.013*
Overall	3.84±0.73	4.50±0.76[a]	4.26±0.82[a]	0.002*

*) There are significant differences (p<0.05)
similar notations in the same line indicate not significantly differences

Statistical test results showed significant differences in color parameters. F3 had a higher average preference score than F1 and F2, with a score of 4.57. Meanwhile, the aroma parameters of the three formulas showed no statistical differences. However, the highest average preference score was found in F2, which contained 96g of red bean flour and 4g of porang flour. Based on table 2, there are significant differences in texture and taste between formulations with a p-value <0.05. In the texture and taste parameters, the highest average preference value is found in F2, namely 3.92 and 4.26. This may be due to the amount of porang flour composition that affects the texture and taste *o*f the snack bar when compared to F1. Meanwhile, the overall organoleptic evaluation between formulations shows that F2 has a higher average preference value compared to F1 and F3 with a value of 4.50. This is evidenced by the p-value of 0.002 which reports that there is a difference in the overall appearance of the snack bar from each formula.

Table 3. Acceptability Evaluation of Taste in Red Bean-Porang Snack bar

Formula	Composition	Acceptability Evaluation of Taste (Mean±SD)	p-value
F1	95g Red bean flour and 5g Porang Flour	3.53±1.06[a]	
F2	96g Red bean flour and 4g Porang Flour	4.15±0.88[a]	0.920
F3	97g Red bean flour and 3g Porang Flour	4.23±0.90[a]	

similar notations in the same column indicate not significantly differences

In addition to organoleptic testing, this study also conducted a hedonic test on the taste of the red bean-porang snack bar on 26 panelists. The categories used for this parameter were unpleasant (1), somewhat unpleasant (2), neutral (3), pleasant (4), and very pleasant (5). Based on Table 3, it is known that there was no difference in taste assessments for the three formulations. However, the highest hedonic value was found in F3 with a value of 4.23.

Table 4. Acceptability Evaluation of Texture in Red Bean-Porang Snack bar

Formula	Composition	Acceptability Evaluation of Texture (Mean±SD)	p-value
F1	95g Red bean flour and 5g Porang Flour	2.80±1.16	
F2	96g Red bean flour and 4g Porang Flour	3.53±1.10[a]	0.002*
F3	97g Red bean flour and 3g Porang Flour	3.42±1.13[a]	

*) There are significant differences (p<0.05)
similar notations in the same column indicate not significantly differences

Statistical analysis of the texture of the red bean–porang snack bar was carried out on each formula, namely F1, F2, and F3. The categories used in this parameter were not crunchy (1), somewhat not crunchy (2), neutral (3), crunchy (4), and very crunchy (5). The statistical results reported that there were differences in texture assessments for the three formulations. Next, a Duncan post hoc test was conducted to determine the differences between the formulas. The results of the Duncan test reported that there were differences between F1 and F2, as well as F1 and F3. The highest average value of preference for texture acceptance was found in F2 with a value of 3.53.

4. DISCUSSION

Organoleptic evaluation is a type of test that involves the human senses to assess a food product (21). This study was a laboratory experiment to determine the differences in parameters between three formulas. The organoleptic results for aroma, texture, taste, and overall taste showed that the highest average preference value was found in F2 (96g red bean flour and 4g porang flour). Meanwhile, the highest organoleptic color preference value was found in F3 (97g red bean flour and 3g porang flour). In addition to organoleptics, this study also assessed the hedonic quality of taste and texture of the three formulas. Hedonic testing plays a very important role in assessing food quality. This includes measuring individual acceptance of food ingredients that have the potential to convince consumers (22). The hedonic quality results of taste and texture showed the highest values were found in F3 and F2. Based on the analysis results, it was found that the composition of porang flour with a small amount was inversely proportional to the level of panelists' preference. This is due to the physical characteristics of porang flour which is chewy so it will interfere with the taste of *the* snack bar consumed. Porang flour contains glucomannan which is hydrophilic so it can bind water and form a gel (23). The results of this study are in line with the research of Abdurrahim *et al* (2025) who reported that increasing the composition of porang flour will cause an unpleasant aftertaste in snack bar products (24).

The color parameters in the organoleptic test of the three formulations showed statistical differences in F1 and F2 compared to F3. Color plays an important role in food commodities, functioning as an attraction, a marker of food type, and an indicator of quality. Visual perception of food, such as color, level of dullness, and gloss, can influence appetite stimulation (25). The color of *the* snack bar produced from each formula is brown. The high proportion of red bean flour results in a darker color of *the* snack bar. In addition, the brownish color of the snack bar can also be caused by a caramelization reaction resulting from the heating process of the sugar contained in the snack bar (24). Exposure to air humidity may cause certain components of the product to reabsorb moisture, which can facilitate the restoration of some pigments to their original form, thereby enhancing color intensity (25). The aroma of the red bean – porang snack bar did not show any significant differences in organoleptic tests. This is in line with research conducted by Shafaria et al., (2025) in making snack bars based on red bean flour and almonds, which showed that differences in the formulation of the composition of the ingredients did not affect the aroma results, the resulting aroma character tended to be similar. The typical aroma of red beans tends to be unpleasant, which comes from compounds such as hexanal (26). However, based on Table 2, it is known that F2 with a composition of 96g red bean flour had a high average preference value. This is inconsistent with previous research that reported that increasing the composition of red bean flour will affect the level of panelists' preference (10).

Texture is defined as the sensation of pressure that can be felt in the mouth and is felt when biting, chewing, swallowing, and touching. Food texture can arouse individual interest; if the food shape is not good, consumer interest in the food will decrease (27). The results of the study reported that there were significant differences between the three formulas. The average value of preference for the texture parameter of the red bean – porang snack bar was F2 with a value of 3.92. The F2 formulation (96:4) was selected as the best treatment due to its optimal balance between sensory acceptability and physical characteristics, resulting in a compact yet chewable texture. This condition is attributed to the presence of glucomannan in porang flour, which enhances water-binding capacity and gel-forming properties, thereby improving the structural stability of the snack bar without adversely affecting taste and aroma at moderate levels (28). In addition, this formulation provides added functional benefits through its soluble fiber content, which has been associated with improved satiety and glycemic control, while still maintaining a high level of consumer acceptance (29). The texture of a food product is greatly influenced by water content. The higher the water content in the product, the less crunchy the resulting texture. The resistant starch content found in porang flour also affects the formation of the structure and the resulting final product (24,30). The development of the snack bar formulation in this study was subject to several limitations, as the evaluation was restricted to organoleptic and hedonic assessments. Comprehensive proximate analysis of all formulations is therefore required to further elucidate the nutritional composition of each product. Additionally, further investigation is necessary to examine the potential effects of red bean–porang snack bar consumption on metabolic outcomes related to obesity among adolescents..

5. CONCLUSION

Based on the results of the analysis of organoleptic tests and the acceptability of the snack bar taste, there was no significant difference in aroma parameters (p-value>0.05). However, there were significant differences found in the parameters of color, taste, texture, overall appearance and acceptability of the snack bar texture (p-value <0.05). Based on the comparison of the preference values between formulas, the best snack bar formulation was F2 with a proportion of 96g red bean flour and 4g porang flour because it had the highest score in each aspect compared to other formulas. Therefore, the snack bar product in this study has the potential to be a healthy alternative snack that can meet daily nutritional needs and contains protein and fiber for obese adolescents.

CONFLICT OF INTEREST

The authors declare that there were no conflicts of interest in this study.

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