

# Organoleptic tests of pigeon peas (*Cajanus cajan* L.) ice cream mixed with soursop leaf (*Annona muricata* L.) Extract

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**Abstract.** *Antioxidant capacity of pigeon peas ice cream mixture with soursop leaf extract ( $0.82 \pm 0.94$  GAEAC), phenolic compounds ( $12.63 \pm 1.13$  GAE/g). The purpose of this study was to test the organoleptic test of pigeon peas ice cream (*Cajanus Cajan* L.) mixed with soursop leaf extract (*Annona muricata* L.). Experimental research with completely randomized design (CRD), with design; pigeon peas formulation (G/g): soursop leaf extract (D/g) G1D1 (15: 85), G2D2 (25: 75), G3D3 (35: 65), G4D4 (55: 45), G5D5 (75: 25), G6D6 (65: 35), G7D7 (85: 15), Control one. The highest score level for color, aroma, and taste was obtained in the G7D7 sample, so that a good comparison concentration was seen from the antioxidant capacity, phenol content, color, aroma, and taste was the G7D7 sample (85g:15g), using hedonic scale sensory evaluation method. Ice cream quality assessment: color, aroma, taste, and texture. The results of the study using ANOVA analysis, LSD follow-up test, panelists' preference for the G2D2 texture was the preferred.*

## 1 Introduction

Testing of pigeon peas to be tempeh has been conducted to determine sensory characteristics, nutritional value, and antioxidant activity. Furthermore, pigeon peas have a lower fat content, minimizing the negative effects of consuming fatty foods [1]. Generally, the color, taste, and aroma of ice cream are the first things consumers notice when purchasing ice cream. The coloring of ice cream is also attractive to consumers, as it can stimulate appetite. Many people have switched to using synthetic colorings, including for ice cream, which are actually unhealthy.

Natural dyes from plants can be used, whether from the fruit, stems, or leaves. One such natural dye is soursop leaves, which have been empirically used by the community to treat cancer due to their Annonaceous acetogenin content, which plays a crucial role in killing cancer cells without harming healthy cells in the body [2]. Traditionally, soursop leaves are used as an herbal remedy, consumed by boiling them. However, they are now commercially available in capsule form. In ice cream, pigeon peas are pureed, while soursop leaves are extracted. Because soursop leaves are quite thick, only the leaf juice is used in the extract process to avoid a grainy texture. The green leaf pigment in soursop leaves acts as a natural coloring agent.

According to [3], soursop leaves are useful for reducing cholesterol at a dose of 100 mg/kg BW, equivalent to 5 wet soursop leaves, while to increase HDL (high density lipoprotein) cholesterol, a dose of 200 mg/kg BW is equivalent to 10-11 wet soursop leaves. Testing of ice cream with the addition of mangosteen peel has been conducted in organoleptic

tests to determine antioxidant activity [4]. Testing of ice cream with soursop leaf extract substitution has also been conducted to determine the quality of ice cream in terms of color, flavor, texture, and taste [5]. In this study, the organoleptic test of pigeon peas ice cream mixed with soursop leaf is conducted.

## 2 Method

Pigeon peas were sorted, selected for good quality by washing and soaking, and then pre-boiling them in water at 60-75°C for 10 minutes to reduce trypsin inhibitor activity in the beans. After that, the pigeon peas are drained and mashed using a blender and obtained pigeon peas puree with concentration (G1 (15 g), G2 (25 g), G3 (35 g), G4 (55 g), G5 (65 g), G6 (75 g), G7 (85 g), G8 (100 g). Making Soursop leaf extract with an extraction process, namely grinding 20 g of fresh soursop leaves with 350 ml of cold water using a blender for 10 minutes to get the concentration; D1 (85g), D2 (75g), D3 (65g), D4 (45g), D5 (35g), D6 (25g), D7 (15g). This ice cream making process refers to the Ice Cream Mixture (ICM) method according to [6] and has been modified for the measurements of each ingredient. The pigeon peas puree and soursop leaf extract are put in a container according to the measurements. The ingredients used in making ice cream include 200 ml of low-fat UHT milk, 20 g of granulated sugar, and 10 g of corn starch. The pigeon peas puree according to the treatment is then put into a pan and heated over medium heat until it boils, stirring constantly to prevent clumping.

After the dough is slightly thick and removed from the stove, the dough is left to cool at room temperature, then put in the freezer until frozen for 10 hours at a

temperature of -180C, -250C. After freezing, the dough is 100 grams and added with pigeon peas puree and soursop leaf extract according to the treatment. After that, mix for 10 minutes until fluffy. The dough is then stored in a container and put in the freezer until frozen at a temperature of -18°C - (-25) °C for 12 hours. The ice cream is then ready for testing.

Hedonic testing, or preference testing, is a type of acceptance test. In this test, panellists are asked to express their personal responses regarding whether they like or dislike the product. They also state their level of liking or disliking the product.

These levels of preference are called hedonic scales with a scale of 1 to 5, namely 1 = Dislike (TS), 2 = Less Like (KS), 3 = Normal (B), 4 = Like (S) and 5 = Very Like (SS). The sample consisted of 8 types of samples with each concentration. The samples were placed in white ice cream cups that had been given a sample code. The ice cream was served to panellists to provide an assessment of the quality of the ice cream which included color, aroma, taste, and texture. Organoleptic tests were carried out twice.

In the first stage, 10 panellists entered simultaneously and sat separately. Researchers ensured that the panellists did not engage in any discussion regarding the sample assessment. Sample coding was carried out randomly. The overall assessment was carried out by 20 panellists, consisting of consumer panellists (ice cream enthusiasts) and half-trained panellists. The requirements for becoming a panellist were being in good health and not being hungry.

The sense of taste was first neutralized with water. Data were collected using experimental methods. Statistical analysis of the samples and treatments used one-way analysis of variance (ANOVA). If the treatment showed a significant difference ( $P < 0.05$ ) in the tested parameters, further analysis was performed using the least significant difference (LSD).

### 3 Results and discussion

Organoleptic testing, also known as sensory assessment, is a method of evaluation that utilizes the five human senses to observe the texture, color, aroma, and taste of a food product, often referred to as a panel. Panellists are individuals involved in organoleptic assessments of various subjective impressions of the products presented. The parameters used were the panellists' level of preference (hedonic scale) for taste, color, texture, and aroma. The panellists selected for this study were 20 semi-trained students from the Nutrition Study Program at Dyana Pura University. Selection of 20 panellists and combining consumer panellists and semi-trained panellists in one analysis with the aim of approaching conditions with the general public, almost all of whom can consume ice cream. Data from the organoleptic test results of pigeon peas ice cream mixed with soursop leaf extract are in Table 1.

Based on the results of the analysis of variance, the treatment of soursop leaf extract mixture in pigeon pea ice cream had a significant effect at the 5% error level of the ANOVA statistical test ( $p < 0.05$ ) on the organoleptic test. The results of the further test of the smallest significant difference showed that each treatment could be explained as follows: In terms of taste, the G1D1 treatment was significantly different from the G2D2 and G3D3 treatments, but the G3D3 treatment was not significantly different from the G4D4 treatment, the G5D5 treatment was significantly different from the G6D6 and G7D7 treatments. In terms of aroma, the G1D1, G2D2, G3D3 and G4D4 treatments had significant differences, but the G5D5 and G6D6 treatments were not significantly different, the G7D7 treatment showed a significant difference from the treatment. The results of the BNT analysis on the color of all treatments showed a significant difference.

The highest results were obtained in sample G7D7 in terms of color, taste, and aroma and the lowest in sample G1D1. The results of the ANOVA test in terms of texture because  $F_{count} < F_{table}$  then the BNT test was not continued. In terms of texture, sample G2D2

Table 1. Average Organoleptic Test Values

Treatment	Average Organoleptic Values			
	Taste	Aroma	Color	Texture
G1D1(15g: 85 g)	3.18 <sup>a</sup> ±0.02	3.13 <sup>a</sup> ±0.02	3.58 <sup>a</sup> ±0.07	3.33 <sup>b</sup> ±0.76
G2D2(25 g: 75 g)	3.35 <sup>b</sup> ±0.05	3.31 <sup>b</sup> ±0.05	3.80 <sup>b</sup> ±0.50	3.36 <sup>b</sup> ±0.76
G3D3(35 g: 65 g)	3.78 <sup>c</sup> ±0.15	3.65 <sup>c</sup> ±0.10	3.86 <sup>b</sup> ±0.10	3.28 <sup>a</sup> ±0.76
G4D4(55 g: 45 g)	3.91 <sup>cd</sup> ±0.10	3.91 <sup>d</sup> ±0.10	4.00 <sup>c</sup> ±0.50	3.26 <sup>a</sup> ±0.12
G5D5(65 g: 35 g)	4.03 <sup>c</sup> ±0.07	3.96 <sup>de</sup> ±0.07	3.83 <sup>b</sup> ±0.07	3.23 <sup>b</sup> ±0.76
G6D6(75 g: 25 g)	4.18 <sup>c</sup> ±0.07	4.06 <sup>ef</sup> ±0.05	3.85 <sup>b</sup> ±0.50	3.26 <sup>a</sup> ±0.76
G7D7(85 g: 15 g)	4.50 <sup>f</sup> ±0.50	4.61 <sup>g</sup> ±0.10	4.20 <sup>c</sup> ±0.15	3.16 <sup>a</sup> ±0.76
PK(100 g: 0 g)	4.66 <sup>g</sup> ±0.07	4.20 <sup>f</sup> ±0.46	4.01 <sup>d</sup> ±0.02	3.30 <sup>ab</sup> ±0.05

Note: \* differences in notation (a,b,c,d,e) indicate significant differences with  $p < 0.05$

was preferred and the lowest results were in sample G7D7.

### 3.1 Color

Color is the first sensory element directly observed by panelists. Determining the quality of food ingredients generally relies on their color. Color that does not deviate from the expected color will provide a distinct impression to the panelists. According to [8], color plays an important role in food acceptance. Color is also used as an indicator of the quality of mixing or processing, as indicated by the presence of a uniform and even color.

The average hedonic score for pigeon pea ice cream ranged from 3.58 to 4.20 with a neutral - like value. The highest score was obtained by the sample with a treatment ratio of pigeon peas mixed with soursop leaf extract of 85%:15% (G7D7) and the lowest score was obtained by the sample with a treatment ratio of pigeon peas with soursop leaf extract of 15%:85% (G1D1). The BNT test results showed that the more soursop leaf extract added, the greener the ice cream became [5]. The greenish color of the ice cream comes from soursop leaves because they contain a pigment called chlorophyll. Chlorophyll, or green leaf substance, is the pigment that causes the green color in plants.

### 3.2 Aroma

The average hedonic score for the aroma of pigeon peas ice cream ranged from 3.13 to 4.62 with a neutral to liking range. The highest score was obtained by the sample with the pigeon peas and soursop leaf ratio of 85%:15% (G7D7) and the lowest score was obtained by the sample with the pigeon peas and soursop leaf ratio of 15%:85% (G1D1). Based on the ANOVA test results, the interaction between the addition of pigeon peas puree and soursop leaf extract significantly affected the ice cream aroma. This is indicated by the significant value of  $F_{\text{calculated}} > F_{\text{table}}$ , which is 116.41, greater than 2.657. Therefore, further BNT testing is necessary to determine the difference.

Based on further BNT tests, the interaction of the addition of pigeon peas puree and soursop leaf extract on the aroma of ice cream showed different results. The difference in aroma in each treatment was influenced by the addition of soursop leaf extract, the less soursop leaf extract used, the resulting aroma would smell like milk, while the more soursop leaf extract used, the more distinctive soursop leaf aroma [5].

The aroma of ice cream is influenced by the ingredients used to make it. The distinctive aroma found in soursop leaf extract is due to soursop leaves containing essential oils and acetogenin compounds that can cause unpleasant odors in ice cream. Therefore, adding the appropriate pigeon peas puree will be able to mask the unpleasant aroma produced by soursop leaf extract.

### 3.3 Texture

The average hedonic score for the texture of ice cream made from pigeon peas mixed with soursop leaf extract ranged from 3.33 to 3.37 with a neutral to liking value range. The highest score was obtained by the sample with the treatment ratio of pigeon peas mixed with soursop leaf extract 25%:75% (G2D2) and the lowest score was obtained by the sample with the treatment ratio of pigeon peas mixed with soursop leaf extract 85%:15% (G7D7). Ice cream texture is determined by using the senses of touch, taste, and sight when assessing the appearance and tasting the ice cream. The desired texture in ice cream is smooth, creamy, and homogeneous. The larger the pigeon peas, the resulting texture is coarser.

Several factors can affect the softness or meltability of ice cream, namely the volume of the ice phase, the size of the ice crystals, overrun, and fat instability. The larger the ice crystals, the less soft the texture will be. Furthermore, the size of the air foam in the ice cream also affects the softness of the ice cream.

The results of the ANOVA test of the interaction of the addition of pigeon peas puree and soursop leaf extract did not affect the texture of ice cream, this is indicated by a significant value of 2.657 greater than 0.185. The texture results that the panellists preferred were sample G2D2 at 3.37 because it still had a soft and slightly rough texture than other ice cream samples. The texture of ice cream is greatly influenced by the composition of ICM (Ice Cream Mix), processing methods and storage temperature conditions.

### 3.4 Taste

Taste is a biological perception such as sensation used by material that enters the mouth. Taste is caused by water-soluble compounds and interacts with receptors on the tongue in the oral cavity. The results of the average hedonic score for the taste of pigeon pea ice cream averaged between 3.18 - 4.67 with a range of neutral - like values. The highest score was obtained by the sample with a treatment ratio of pigeon pea mixed with soursop leaf extract 85%: 15% (G7D7) and the lowest score was obtained by the sample with a treatment ratio of pigeon pea and soursop leaf 15%: 85% (G1D1).

The addition of pigeon peas puree mixed with soursop leaf extract has a significant effect on the taste of ice cream, this is shown by a significance value of 110.557 which is greater than 2.657. The more soursop leaf extract added, the more bitter the ice cream will taste, the less soursop leaf extract used, the sweeter the resulting taste will be [5]. The addition of pigeon peas puree can mask the bitter taste of soursop leaf extract. The sweetness comes from sugar (sucrose), lactose in cow's milk, and a combination of other ingredients, such as pigeon peas extract. Pigeon peas contains 62 grams of carbohydrates per 100 grams, which can enhance the sweetness of ice cream [10].

## 4 Conclusion

The combination of pigeon pea ice cream mixed with soursop leaf extract significantly affects the level of preference which includes taste, aroma, color value range (neutral - like). However, the level of preference for texture value range (neutral). The highest score in terms of color, aroma, and taste was obtained in sample G7D7 with a concentration of pigeon pea 85 grams: soursop leaf extract 15 grams, while for the texture of sample G2D2, it was preferred with pigeon pea 15 grams: soursop leaf extract 85 grams.

## 5 Suggestion

Based on the results of the research conducted, to obtain better texture results, it is best to pay attention to the softness or meltability of the ice cream because it can affect the volume of the ice phase, the size of the ice crystals, overrun, and fat instability. Research is needed on the shelf life and melting speed of pigeon pea ice cream mixed with soursop leaf extract. Further research is needed on macro and micronutrients.

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