The Effect of Adding Pure Golden Berry on the Organoleptic Properties and Preference Level of Ice Cream

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Article Info	ABSTRACT
	This research is an experimental study in the form of an ice cream product with added pure Golden Berry, aiming to determine 1) The effect of the finished ice cream product with the addition of pure Golden Berry fruit on the sensory quality of ice cream in terms of color, aroma, taste, texture, and preference level of ice cream; 2) The best formula for the addition of pure Golden Berry fruit to ice cream based on the research results; 3) The fat, protein, and antioxidant content found in Golden Berry ice cream from the best formula. The data obtained used an organoleptic test and preference test research instrument validation sheet, which was then given to respondents and tested with the help of SPSS 25 software using one-way ANOVA and Duncan tests. Based on the data analysis results, the results of this experimental study show that the addition of pure Golden Berry fruit has an effect on the sensory quality of ice cream in terms of color, aroma, taste, texture, and preference level of ice cream, showing the best formula at 40% percentage based on the panelists' preference level, so that the best formula has a fat content of 12.50%, protein of 7.5%, and antioxidants of 88.15 mg/100g ice cream.

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INTRODUCTION

Golden berry (Ciplukan), with the Latin name Physalis peruviana, grows wild and belongs to the monocotyledonous plant category that grows in subtropical regions, such as rice fields, wet fields, bushes, forest edges, or settlements. Golden Berry can also be said to be an annual plant, as it grows during the rainy season. This fruit belongs to the tomato and cherry family and has a unique characteristic where the fruit is wrapped in a calyx. The plant has characteristics of green fruit when unripe and yellowish-orange when ripe, an upright stem with a height of about 1 meter, elongated round leaves with pointed tips and a diameter of 5 - 15 cm long and 2.5 - 10.5 cm wide (Ii & Pustaka, 2022). Golden berry has a sweet and slightly sour taste (Usahatani et al., 2025). The distribution of Golden berry in Indonesia is quite wide, but almost all communities consider this plant only as a weed that interferes with cultivated plants. The lack of knowledge in the community about the potential of Golden berry makes this plant not optimally utilized, even though if proper handling is carried out from cultivation to processing, it will make Golden berry fruit a functional processed product.

Functional processed products made from pure Golden berry are due to this fruit having diverse nutritional content ranging from vitamin A which is useful for eye health, vitamin C which supports the increase of biochemical processes for the body, vitamin K which functions to improve reproductive health, vitamin D

which is beneficial for bone and teeth health (Setyanto & Sela, n.d. 2023). Ciplukan fruit is often eaten directly to treat epilepsy, difficulty urinating, and jaundice (Calvin, 2022). Many researchers also state that Golden berry contains antioxidants, anti-inflammatory, anticancer, antidiarrheal, and antimicrobial properties. Golden berry is one type of fruit that has a high water content and is easily damaged, either due to chemical or natural damage, so proper and appropriate post-harvest handling must be carried out to maintain the nutritional value contained in Golden berry fruit. The abundance of nutritional content produced by this plant makes Golden berry fruit a multifunctional plant, usually used as medicine. In addition to medicine, there are several types of food made from ciplukan fruit, including jam, yogurt, syrup, and ice cream (Silalahi, 2018).Ice cream is a semi-solid food that undergoes a solidification process or freezing of a mixture of ice cream ingredients such as milk, animal or vegetable fat, sugar, and food additives for flavoring (Pertanian et al., 2020). Ice cream is a popular food in society, consumed in large quantities. Besides being a favorite food, ice cream also has many benefits, such as boosting mood and temporarily relieving or soothing pain, because ice cream is also a food rich in potassium and ice cream sugar, which is beneficial for additional body energy intake. This food is known for its semi-solid characteristics. Ice cream on the market usually has chocolate, vanilla, and common fruit flavors that are widely consumed. Therefore, researchers are innovating with Golden Berry fruit flavor in ice cream, which is not only a new innovation but can also increase the productivity of ciplukan farmers in utilizing, developing, and improving the production of bio-food using ciplukan fruit, which has not been optimally done. Another reason is that Golden Berry fruit also contains antioxidants, which will be lost if subjected to high heating processes (Wedang & Siap, 2014). Therefore, ice cream processing is considered appropriate to maintain the nutritional value in Golden Berry fruit by paying attention to the ingredients used in the ice cream making process.

The ingredients for making ice cream generally include fat, non-fat dry solids, stabilizers, emulsifiers, and sweeteners. With the right processing techniques and ingredients, good ice cream flavor, texture, and quality can be produced. One way to utilize Golden Berry is as a flavor in ice cream. This food product is processed through whipping and freezing. Based on the background explanation above, the researcher is interested in conducting research using Golden Berry fruit juice as a flavor in ice cream with certain proportions, which will then be tested to determine the best results in sensory quality testing.

METHOD

The type of research used is experimental. The experimental method is a research method used to find the effect of a certain treatment. The object of this research is pure Golden Berry ice cream product. This research will be conducted in food processing lab 1, S1 Culinary Education Study Program, Faculty of Engineering, Universitas Negeri Surabaya. This research will be carried out from March 2025 – May 2025.

RESULTS

A. Ice Cream Organoleptic Test Results

Based on the treatment of adding Golden Berry puree (20%, 40%, 60%) to ice cream, the following is an analysis of the ice cream organoleptic test results presented in the data:

1. Color

The organoleptic test results were analyzed using the ANOVA test to determine whether or not it affected the ice cream color, as shown in Table 4.1

Table 4.1 ANOVA Test Results for Ice Cream Color

ANOVA

Color

	Sum of Squares	df	Mean Square	F	Sig.	
Between Groups	37.899	2	18.949	52.384	.000	<0,05
Within Groups	34.727	96	.362			
Total	72.626	98				

Based on the ANOVA test results for color in Table 4.1, it shows that an F-count of 52.384 was obtained with a significance of .000<0.05, which means H0 is rejected and H1 is accepted. This indicates that there is a difference in color evaluation with the addition of golden berry puree to ice cream.

The Duncan test results are also explained to determine the difference in ice cream color due to the addition of golden berry puree.

The Duncan test results for color are presented in Table 4.2.

Table 4.2 Duncan Test Results for Color

Duncan*		Subset for alpha = 0,05		
Perlakuan	N	1	2	3
20% pure *golden berry*	33	1.70		
40% pure *golden berry*	33		2.48	
60% pure *golden berry*	33			3.21
Sig.		1.000	1.000	1.000

Based on the Duncan test results from Table 4.2, it shows that the 20% golden berry puree addition treatment has a clear difference compared to the 40% and 60% golden berry puree addition treatments. From the average evaluation of 33 respondents, the highest rating was given to the 60% golden berry puree addition treatment with a bright yellow color level. This is because each formula has a different ratio of golden berry puree added, and the ice cream making process also affects the ice cream color. Other factors affecting ice cream color are the duration of whipping and storage time; the longer these are, the brighter the resulting ice cream color will be (Setiawan et al., 2022).

2. Aroma

The next analysis results are on the ice cream aroma, which was tested using the ANOVA test to determine whether or not it affected the ice cream aroma, as presented in Table 4.3.

Table 4.3 ANOVA Test Results for Aroma

ANOVA

Aroma

	Sum of Squares	df	Mean Square	F	Sig.	
Between Groups	8.727	2	4.364	9.974	.000	<0,05
Within Groups	42.000	96	438			
Total	50.727	98				

Based on the ANOVA test results for aroma in Table 4.3, it shows that an F-count of 9.974 was obtained with a significance of .000<0.05, which means H0 is rejected and H1 is accepted. This indicates that there is a difference in aroma evaluation with the addition of golden berry puree to ice cream. The Duncan test results are also explained to determine the difference in ice cream aroma due to the addition of golden berry puree. The Duncan test results for aroma are presented in Table 4.2.

Table 4.4 Duncan Test Results for Aroma

AROMA

Duncan*		Subset for alpha = 0,05		
Perlakuan	N	1	2	3
20% pure *golden berry*	33	2.82		
40% pure *golden berry*	33		3.18	
60% pure *golden berry*	33			3.55
Sig.		1.000	1.000	1.000

Based on Table 4.4, the Duncan test results for Golden Berry puree ice cream aroma show that there are aroma differences in each formula. From the average evaluation of 33 respondents, the addition of 60% golden berry puree was the most preferred aroma, as it contained more golden berry puree compared to the 20% and 40% golden berry puree additions. This is because the more fruit content, the stronger the fruit aroma that emerges (Ice Cream, n.d.).

3. Taste

The next analysis results are on the ice cream taste, which was tested using the ANOVA test to determine whether or not it affected the ice cream taste, as presented in Table 4.5.

Table 4.5 ANOVA Test Results for Ice Cream Taste

	Sum of Squares	df	Mean Square	F	Sig.	
ANOVA						
Taste						
Between Groups	33.596	2	16.798	65.861	.000	<0,05
Within Groups	24.485	96	.255			
Total	58.81	98				

Based on the ANOVA test results for taste in Table 4.5, it shows that an F-count of 65.861 was obtained with a significance of .000<0.05, which means H0 is rejected and H1 is accepted. This indicates that there is a difference in taste evaluation with the addition of golden berry puree to ice cream. The Duncan test results are also explained to determine the difference in ice cream taste due to the addition of golden berry puree. The Duncan test results for taste are presented in Table 4.6.

Table 4.6 Duncan Test Results for Taste

		Subset for alpha = 0,05		
Taste				
Duncan*				
Perlakuan	N	1	2	3
20% pure *golden berry*	33	2.55		
40% pure *golden berry*	33		3.33	
60% pure *golden berry*	33			3.97
Sig.		1.000	1.000	1.000

Based on Table 4.6, the Duncan test results from Table 4.6 show that there are taste differences in each formula, where the 20% golden berry puree addition has a very clear difference compared to the 40% and 60% golden berry puree additions. From the average assessment of 33 respondents, the highest rating was given to the addition of 60% pure golden berry. This is because Golden Berry fruit contains a pH of 6, giving it a sour taste. The more of this fruit used in ice cream, the more sour the ice cream tastes (Ummah, 2019).

4. Texture

The next analysis results are on the texture of the ice cream, which was tested using an ANOVA test to determine whether it had an effect on the ice cream's texture, as presented in Table 4.5.

Table 4. 7 ANOVA Test Results for Ice Cream Texture

	Sum of Squares	df	Mean Square	F	Sig.	
ANOVA						
Textur						
Between Groups	20.990	2	10.495	23.817	.000	<0,05
Within Groups	42.303	96	.441			
Total	63.293	98				

Based on the ANOVA test results for texture in Table 4.5, it shows that an F-count of 23.817 was obtained with a significance of .000<0.05, which means H0 is rejected and H1 is accepted. This indicates that there is a difference in texture assessment with the addition of pure golden berry to ice cream. The Duncan test results are also explained to determine the difference in ice cream texture due to the addition of pure golden berry. The Duncan test results for texture are presented in Table 4.8.

Table 4. 8 Duncan Test Results for Texture

TEKSTUR

Duncan*

Perlakuan	N	Subset for alpha = 0,05		
		1	2	3
60% pure *golden berry*	33	2.61		
40% pure *golden berry*	33		3.06	
20% pure *golden berry*	33			3.73
Sig.		1.000	1.000	1.000

Based on the Duncan test results from Table 4.8, it shows that there is a clear difference in texture with the addition of 20% pure golden berry compared to the addition of 40% and 60% pure golden berry in ice cream. From the average assessment of 33 respondents, the formula with 20% pure golden berry had the most preferred texture. Ice cream texture is influenced by several factors, such as ice cream composition, processing method, and storage method. Good ice cream volume development can result in a lighter, less dense, and softer ice cream texture (Oktafiyani & Susilo, 2019).

5. Liking

The next analysis results are on the liking of ice cream, which was tested using an ANOVA test to determine whether it had an effect on the liking of ice cream, as presented in Table 4.9.

Table 4. 9 ANOVA Test Results for Ice Cream Liking

ANOVA

Liking

	Sum of Squares	df	Mean Square	F	Sig.	
Between Groups	2.566	2	1.283	2.218	.114	>0,05
Within Groups	55.515	96	.578			
Total	58.081	98				

Based on the ANOVA test results for liking in Table 4.9, it shows that an F-count of 2.218 was obtained with a significance of .114>0.05, which means H0 is accepted and H1 is rejected. This indicates that there is no difference in the assessment of liking with the addition of pure golden berry to ice cream. The Duncan test results are also explained to determine the difference in ice cream liking due to the addition of pure golden berry. The Duncan test results for liking are presented in Table 4.10.

Table 4. 10 Duncan Test Results for Ice Cream Liking

Liking

Duncan*

Perlakuan	N	Subset for alpha = 0,05	
		1	2
60% pure *golden berry*	33	2.97	
20% pure *golden berry*	33	3.18	3.18
40% pure *golden berry*	33		3.36
Sig.		.260	.334

From the Duncan test results in Table 4.10, it shows that there is a difference in the level of liking for each formula regarding the effect of adding pure Golden Berry to ice cream. From the average assessment of 33 respondents, the addition of 40% pure golden berry was the most preferred formulation compared to the addition of 20% and 60% pure golden berry. Although the Duncan test results for sensory quality (color, aroma, taste) showed that the average addition of 40% pure golden berry was the most chosen, after an overall assessment, the formulation with 60% pure golden berry had the highest value with a total of 3.36.

B. Determination of the Best Product

The results of the organoleptic and hedonic (liking) tests with the addition of pure golden berry, made from three treatments, are presented in Table 4.11.

Table 4. 11 Organoleptic and Hedonic Test Results for Ice Cream

Criteria	Formula		
	P1	P2	P3
Color	1.70[a]	2.48[b]	**3.21[c]**
Aroma	2.82[a]	3.18[b]	**3.55[c]**
Taste	2.55[a]	3.33[b]	**3.97[c]**
Texture	**3.73[a]**	3.06[b]	2.61[c]
Liking	3.18[ab]	**3.36[b]**	2.97[a]

Based on Table 4.11, it can be seen that the calculation results for the addition of pure golden berry to ice cream show no significant difference in color and have the highest color rating with a bright yellow criterion (3.21). For aroma, the calculation results show no significant difference and have the highest aroma rating with a fresh fruit criterion (3.55). For taste, the calculation results show no significant difference and have the highest taste rating with a sour criterion (3.97). the texture calculation results show an insignificant difference and have the highest texture rating with soft criteria (3.73), while the liking calculation results show a significant difference and have the highest liking rating with slightly liked criteria (3.36). Based on the assessment results conducted on 33 panelists, if viewed from the level of liking, P2 is the best product in the research results, and if viewed from the overall assessment results, P3 is the best product. Therefore, a nutritional content test was carried out on P2 and P3 to determine the nutritional value of each formula, which was then compared with the nutritional content of the standard recipe and the Indonesian National Standard for finished ice cream.

C. Nutritional Content of Golden Berry Puree Ice Cream

The nutritional content is obtained from ice cream products with the addition of Golden Berry puree. There are 3 contents tested, namely fat, protein, and antioxidants. These tests are based on laboratory tests, presented in Table 4.12

Table 4.12 Nutritional Content Results

NUTRITIONAL CONTENT OF PURE GOLDEN BERRY ICE CREAM			
Characteristics of Finished Ice Cream	Ice cream STANDAR	Ice cream *GOLDEN BERRY* P2	Ice cream *GOLDEN BERRY* P3
SNI No 01-3713-1995, year 1995 1. Fat 1.484% 2. Protein 5.295% According to (Krisanty., 2023) 3. Antioxidant 37.617 mg/100 g	1. Fat 6,81% 2. Protein 11,80% 3. Antioxidant 11,70 mg/100g	1. Fat 7,05 % 2. Protein 12,50 % 3. Antioxidan 88,15 mg/100g	1. Fat 7,07% 2. Protein 12,53% 3. Antioxsidan 130,215 mg/100g

Based on the laboratory test results for the nutritional content of ice cream, it is shown that treatment P2 has a nutritional content comparison that is not significantly different from P3. P2 has a fat content of 7.05%, protein 12.50%, and antioxidants 88.15 mg/100g, while P3 has a fat content of 7.07%, protein 12.53%, and antioxidants 130.215 mg/100g. When compared with the nutritional content of standard ice cream, which has a fat content of 1.484%, protein 5.295%, and 37.617 mg/100g, and the Indonesian National Standard for Finished Ice Cream Characteristics, which has a fat content of 6.81%, protein 11.80%, and antioxidants 11.70 g/100g. Thus, the fat and protein content of standard ice cream, Golden Berry puree ice cream P2, and Golden Berry ice cream P3 are in accordance with SNI No. 01-3713-1995, year 1995, while the antioxidant content for standard ice cream recipes, Golden Berry puree ice cream P2, and Golden Berry puree ice cream P3 do not

meet the requirements because the antioxidant content of Golden Berry puree ice cream is below the required antioxidant content of 37.617 mg/100g. The following is a study of protein, fat, and antioxidants:

1. Protein

  The results of protein analysis in standard ice cream show (%) of 11.80, meaning that every 100 grams of ice cream with the standard recipe has 6.81% fat. For ice cream with the addition of 40% Golden Berry puree, it shows (%) of 12.50, meaning that every 100 grams of ice cream with the addition of Golden Berry puree has a protein content of 12.50% protein. Meanwhile, the results of protein analysis in ice cream with the addition of 60% Golden Berry puree show (%) of 12.53, meaning that every 100 grams of ice cream with the addition of Golden Berry puree has a protein content of 12.53% protein. The function of protein in the human body is for growth and tissue selection, so that the body can support and maintain tissues (Sehari-hari et al., 2024).

2. Fat

  The results of protein analysis in standard ice cream show (%) of 6.81, meaning that every 100 grams of ice cream with the standard recipe has 6.81% fat. Meanwhile, the addition of 40% Golden Berry puree shows (%) of 7.05, meaning that every 100 grams of ice cream with the addition of Golden Berry puree has a fat content of 7.5%. Meanwhile, the results of protein analysis in ice cream with the addition of 60% Golden Berry puree show (%) of 7.07, meaning that every 100 grams of ice cream with the addition of Golden Berry puree has a fat content of 7.07%. Fat in the body functions as an energy producer and a component of cell membranes (Santika, 2016).

3. Antioxidant

  The results of protein analysis in standard ice cream show (mg/100g) of 11.70, meaning that every 100 grams of ice cream with the standard recipe has 11.70 mg/100g of antioxidants.""""Meanwhile, the addition of 40% pure golden berry showed (mg/100g) of 88.50, meaning that every 100 grams of ice cream with added pure golden berry has an antioxidant content of 88.50mg/100g. Whereas the protein analysis results for ice cream with 60% pure golden berry addition showed (mg/100g) of 130.215, meaning that every 100 grams of ice cream with added pure golden berry has an antioxidant content of 130.215mg/100g. The antioxidants in this product come from golden berry fruit. Antioxidants function in the body to improve health and protect cells from damage caused by free radical molecules (Fadlilah & Lestari, 2023).

CONCLUSION

  Based on the research results regarding the addition of Golden Berry puree to ice cream, the following conclusions are drawn :
1. The addition of Golden Berry puree affects the color, aroma, taste, texture, and preference for ice cream.
2. Ice cream with 20% Golden Berry puree addition is the best ice cream in terms of preference, and ice cream with 60% Golden Berry puree addition is the best ice cream when considering the overall sensory quality calculation.
3. Laboratory tests show that the fat and protein content of standard ice cream, P2 Golden Berry puree ice cream, and P3 Golden Berry ice cream comply with SNI No. 01-3713-1995, year 1995. However, the antioxidant content for standard ice cream, P2 Golden Berry puree ice cream, and P3 Golden Berry puree ice cream does not meet the requirements because the antioxidant content of Golden Berry puree ice cream is below the expected antioxidant content value of 37.617 mg/100 g.

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