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THE EFFECT OF RED BEAN ADDITION ON THE MELTING POWER AND ACCEPTABILITY OF ICE CREAM

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Abstract

Utilization of red beans to be used as food ingredients is not maximized. Ice cream at room temperature melts easily and has a less soft texture, this is due to several factors, one of which is the emulsifier. To improve the quality of ice cream, researchers use natural emulsifiers in the form of red beans. The aim of this study was to determine the effect of the addition of red beans on the melting power of ice cream and organoleptic properties (color, aroma, taste and texture) of ice cream. The research design was a Completely Randomized Design (CRD) with 5 different treatments of adding red beans to ice cream, namely 0%, 30%, 50%, 70% and 100% with data analysis using the SPSS One way-ANOVA test for normal data, Kruskall-Wallis test for abnormal data, as well as Duncan's advanced test. The results showed that the addition of red beans had a significant effect on melting power (0.00<0.05), color (0.00<0.05), and texture (0.00<0.05). The addition of red beans had no significant effect on aroma (0.41>0.05) and taste (0.011>0.05).

Keywords: Acceptability, Melting Power, Red Bean

1. INTRODUCTION

According to the United States Department of Agriculture (USDA) in 2010, kidney beans are rich in nutrients, namely fiber, B vitamins, potassium, iron and magnesium. Most of the nutritional content is starch and protein, with 43g of starch per 100g and 24g of protein per 100g. The high component of starch and protein in peanuts causes peanuts to have different functional properties from starch and protein.

The emulsifying property of kidney beans plays an important role in the stability of fatty foods, which can reduce oxidation. The emulsifying properties of red bean protein in food ingredients can be used in pastries, bread, meat sausages, salad dressings, frozen foods and dairy products. Natural ingredients that can be used for emulsifiers and binders are red beans because they contain quite a lot of protein. According to Rosida et al. (2015), “the emulsifying power of a protein is the condition in which a protein is able to lower the surface tension between the two phases (interfacial tension) to facilitate the formation of an emulsion. This ability is called the ability of proteins as emulsifiers”.

Red beans have been used by the community to meet food needs in Indonesia, but their use is still not widespread. The technique for making red beans is still simple, generally red beans are used for cooking or made into porridge. Until now, red beans have not been processed into tempting preparations, for example ice cream because Indonesians do not know the benefits of red beans. The reason is, it is necessary to increase the variety of food, one of which is processed into red bean ice cream (Simanungkalit, 2016).

The composition of good ice cream contains ingredients and stabilizers such as thickeners, which can bind fat, water and air to keep them stable. Carboxymethyl cellulose (CMC), gelatin, carrageenan, gum arabic and pectin are generally used as stabilizers (Effendi & Hamzah, 2017). A common weak point in ice making is the relatively fast melting. This will cause the ice cream to melt easily in the room. Therefore, efforts must be made to obtain a stable melting level by adding emulsifiers to obtain quality ice cream. If processed ice cream is not given a stabilizer, the previously mixed fat and water molecules slowly separate, forming water groups and fat groups. The fat will solidify while the water crystallizes. Therefore, the stabilizer acts on the emulsion in such a way that it forms a micro fine film and binds the fat, water and air molecules. Thus, water does not crystallize and fat is not hard (Arbuckle, 2000). The desired texture of ice cream is soft, has cream and is well blended. While the desired appearance is solid (solids fused in the form of foam). The fact that ice is difficult to melt is an important factor in consumer appreciation (Sari et al., 2019).

Based on the background described above, the research aims are to find out whether red bean affects the melting power of ice cream and to find out whether red bean affects the organoleptic (color, aroma, taste and texture) of ice cream.

2. RESEARCH METHOD

The yield strength test study used a completely randomized design (CRD) and then analyzed using anova analysis and if it was significantly different, Duncan's further test was carried out. Melting power is expressed in minutes to see the resistance of ice cream to melting when served at room temperature (29 ^{o}C) using a stopwatch and done by sight. The organoleptic test was analyzed using the Kruskal-Wallis test. If there is a significant difference, then it is continued with the hypothesis test summary test. The study consisted of 5 treatments (F_0, F_1, F_2, F_3, F_4) and 5 replications. The organoleptic test was carried out using a sensory quality test consisting of 30 semi-trained panelists consisting of men and women. The research stages of red bean ice cream processing consist of:

1) Making red bean ice cream
2) Meltability test
3) Organoleptic test consisting of color, aroma, taste and texture.

The stages of making red bean ice cream are as follows:

1) Production of red bean juice
2) Red beans are washed with clean water, then soaked for 10 hours then boiled until soft and blended until smooth.

The method of processing ice cream in red bean ice cream is as follows:

1) Add ingredients such as whippy cream, full cream milk, sugar into a saucepan and stir continuously until all ingredients are well blended. Heat until boiling while stirring evenly.
2) Dissolve the meizena with a little milk, then put the meizena in the pan
3) Put the ingredients into the container while filtering
4) The ingredients are put in a bowl covered with plastic wrap, frozen in the freezer for 4 hours, then taken out and scooped out with a spoon.

5) The ingredients for the ice cream were mixed homogeneously, added to the red beans which had become mush according to the formulation and added 100 ml of water, stirred using a mixer for 7 minutes until the ice cream swelled.
6) Put the ice cream in the freezer for 10 hours.
7) Ice cream is ready to be analyzed.

3. RESULT AND DISCUSSION

3.1. Melt Power

The melting power of ice cream is measured using the melting time of ice cream in an open room temperature. The melting power test was carried out in 5 treatments and 5 repetitions. The data obtained from the measurement of melting power are:

Table 1 Ice Cream Melting Power Test Result

Ice Cream Melting Power Test (seconds)					
Repetition	**Treatment**				
	F0 (0%)	F1 (30%)	F2 (50%)	F3 (70%)	F4 (100%)
P1	800	674	1133	1250	1287
P2	814	1031	1172	1432	1482
P3	891	1205	1308	1376	1329
P4	960	1187	1224	1300	1322
P5	917	1397	1454	1481	1502
Amount	4382	5467	6291	6839	6922
Average	876.4	1098.8	1258,2	1367,8	1384.4

Based on the results of obtaining the value of the melting power calculation data, the data was analyzed using the SPPS application to determine the difference in the average melting power of each red bean formulation in ice cream. Before carrying out the data analysis test, normality and homogeneity tests were carried out first and the results obtained from the melting power data were normal and homogeneous so that it was continued with the One-Way ANOVA test to test the hypothesis related to the effect of adding red beans on the melting power of ice cream. The further test was carried out to determine the difference in the effect of adding red beans using Duncan's advanced test.

Table 2 Duncan's Test Power Results

Component	**Melting Power**				
	F0	**F1**	**F2**	**F3**	**F4**
Melt Power	68.156±68.156^{a}	1098.80±270.63^{b}	1258,20±127,566^{b,c}	1367.80±94.176^{c}	1384.40±99.756^{c}

Note: a, b = similar letter notation means that there is no significant difference in level

In the research that has been done, the treatment meets these criteria. The table shows the average melting time of red bean ice cream, which is 876.4 to 1384.4 seconds/10 gr. The

longest average melting power was obtained from the addition of red beans in the F4 treatment (100%), while the fastest average melting time in this study was ice cream with the addition of red beans in the F0 treatment (0%) of red beans.

In the One way-Anova test the results obtained showed a significant value of 0.000 <0.05, so that H0 was rejected and H1 was accepted, meaning that there was a difference in the average effect of each red bean ice cream formulation. Differences in the effect of the formulation can be known further with the Duncan test. The results of the Duncan test are in table 2. The results of the Duncan test show that the melting power of F_0 is significantly different from the melting power of F_1, F_2, F_3 and F_4. The F_1 ice cream melting power test was significantly different from F_0, F_3, and F_4. The melting power test of F_2 ice cream was significantly different from F_0, F_3, and F_4. The F_3 ice cream melting power test was significantly different from F_0, F_1, and F_4. The F_4 ice cream melting power test was significantly different from F_0 and F_1.

The results of this study indicate that the addition of red beans has an effect on the melting power of ice cream. This is because red beans contain protein and starch. Protein and starch in kidney beans function as emulsifiers, foam formers, gel formers, absorb water and oil. The emulsifier properties of red beans have an influence on the melting power of ice cream because the more red beans added to ice cream, the higher the protein content, so that the ability to bind water increases and results in increased melting power and longer time for ice cream to melt at room temperature.

3.2. Organoleptic Test

After the melting power test is carried out, next is the organoleptic test. Organoleptic testing or also known as sensory testing is a form of evaluating a product using the senses that exist in a person using either the sense of touch, the sense of sight, the sense of smell or the sense of taste (Suryono et al., 2018). The organoleptic table is:

Table 3 The average value and standard deviation of the organoleptic test result

Parameter	Average ± stands. Deviation					The Kruskal-Wallis N-Par Test (Asymp Sig.)
	F0	F1	F2	F3	F4	
Color	2,00±0,000	1,47±0,507	1,37±0,490	2,73±0,583	3,57±0,504	0,000
Aroma	3,27±0,521	3,37±0,615	3,43±0,626	3,47±0,629	3,57±0,568	0,410
Flavor	3,10±0,305	3,57± 0,568	3,27±0,640	3,33±0,661	3,30±0,596	0,011
Texture	2,93±0,944	3,57±0,898	3,50±0,820	3,60±1,070	3,90±0,845	0,001

3.3. Discussion

3.3.1. Color

The results of the organoleptic test (color) of ice cream with the addition of red beans have a different average value for each formulation which is presented in table 3.The results of the Kruskal-Wallis test analysis for testing the average difference between each treatment sample obtained a result of 0.00 <0.005. These results show that H0 is rejected and H1 is

accepted, meaning that the addition of red beans has an effect on the color of the ice cream. As for knowing the average difference is significant, further testing is carried out regarding the summary of the hypothesis test (hypothesis test summary). The results of the Kruskal-Wallis test showed that the color of red bean ice cream F1 was significantly different from F2 and F3. F0 ice cream is significantly different from F2 and F3. The results of the average data stated that the highest texture score was obtained in the ice cream sample using red bean F4 at a ratio of red bean and meizena flour 100%: 0% with an average score of 3, 57 and the lowest score is held by the ice cream sample with the sample from the formulation (F2) with a value of 1.37 or with a ratio of red beans: meizena flour 50%: 50%. The color of the ice cream depends on the amount of red beans added to the ice cream. This shows that the best formulation of red bean ice cream is F4.

The color of the ice cream without the addition of red beans is bone white (Sipahutar et al., 2021). The cause of the white color of ice cream bones is the content of beta-carotene in protein-coated fat. The degree of reddish color in ice cream increases with increasing proportion of red beans because it contains functional compounds in the form of anthocyanins. Anthocyanin which can cause red color in red beans. Anthocyanins are found in nuts, fruits, grains, vegetables and many other foods (Suda et al., 2003). Anthocyanins are substances that create color.

3.3.2. Aroma

Aroma is produced from the concentration of compounds dissolved in water and fat. The sense of smell perceives aromas that spread with compounds in the air. Milk has a distinctive aroma, when it binds to certain compounds, it can change the aroma of milk (Nurwantoro, 2009).

The results of the analysis of the Kruskal-Wallis test to test the average difference between each treatment sample showed an Asymp Sig value of 0.410. These results show that H0 is accepted and H1 is rejected, meaning that the addition of red beans has no effect on the aroma of ice cream.

The results of the average data stated that the highest aroma score was obtained in the ice cream sample using red bean F4 at a ratio of 100%: 0% red bean and meizena flour with an average score of 3.57 and the lowest score was held by the ice cream sample with the of the formulation (F0 with a value of 3.30 or with a ratio of red beans: meizena flour 0% : 100%. The aroma of ice cream depends on the large amount of red beans added to the ice cream. This shows that the formulation to produce a good aroma from making This red bean ice cream is on F4.

3.3.3. Flavor

The purpose of the taste assessment is to know the panelist's assessment of the level of taste of a food which is assessed through the sense of touch with the tongue. Taste has an important influence on ice cream products with additional ingredients in red bean formulations in ice cream. The results of the analysis of the Kruskal-Wallis test to test the average difference between each treatment sample showed an Asymp Sig value of 0.011. These results show that H0 is accepted and H1 is rejected, meaning that there is no effect of adding red bean with ice cream flavor.

The results of the average data stated that the highest taste score was obtained in the ice cream sample using red bean F1 at a ratio of red bean and meizena flour 30%: 70% with an average score of 3.57 and the lowest score was held by the ice cream sample with sample from the F0 formulation with a value of 3.10 or with a ratio of red beans: meizena flour 0% : 100%. This shows that the formulation to produce a good taste of red bean ice cream is in F1. In food, taste is a combination of taste and aroma. Manufacturers use certain flavor enhancers to create the desired taste for consumers. Taste has an important influence on consumers' preferences for ice cream, even taste can be the main determinant of the assessment of ice cream preferences (Thompson et al., 2009).

3.3.4. Texture

The results of the Kruskal-Wallis test analysis for testing the average difference between each treatment sample showed an Asymp Sig value of 0.001. These results show that H0 is rejected and H1 is accepted, meaning that there is an effect of adding red beans to the texture of ice cream.

The results of the average data stated that the highest texture score was obtained in the ice cream sample using F4 red beans at a 100%: 0% ratio of red beans and meizena flour with an average score of 3.90 and the lowest score was held by the ice cream sample with sample from the F0 formulation with a value of 2.93 or with a ratio of red beans: meizena flour 0% : 100%. This shows that the formulation to produce a good taste of red bean ice cream is found in F4. Soft ice cream comes from a mixture of ingredients such as carbohydrates, non-fat milk solids, and protein. The presence of protein and carbohydrates in red beans makes the texture of ice cream softer. This is in accordance with Uswatun (2011) that “carbohydrates contained in red beans are used to improve the texture of ice cream and stabilize water holding capacity, and affect the thickness and texture of soft serve ice cream”.

4. CONCLUSION

Based on the research that has been done by researchers, the conclusions from the research that has been done are as follows:

1) Based on the results of statistical data analysis and averaged data, it can be concluded that the addition of red beans affects the melting power of ice cream, namely the higher the percentage of adding red beans to making ice cream, the melting power increases so that the melting time of ice cream at room temperature is longer.
2) The organoleptic test results showed that the addition of red beans to ice cream had a significant effect on color and texture with the Kruskall-Wallis asymp values of 0.000 and 0.011, but had no significant effect on aroma and taste.

Based on the result, we suggest that in making ice cream, it is better to use red beans at the F4 formulation level to produce ice cream with organoleptic and longer melting power.

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