

NUTRITION, FIBER, ANTHOCYANIN AND ORGANOLEPTIC ICE CREAM BASE ON FERMENTED BLACK GLUTINOUS RICE AS ALTERNATIVE PREVENTING CONSTIPATION

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ABSTRACT— Functional constipation is the perception of defecation frequency reduce. According to the results of research in 2016 in children aged 3-6 years, the incidence of constipation of preschoolers is 76.5%. Ice Cream base on Fermented Black Glutinous Rice (IC-FBGR) products that are rich in fiber and anthocyanin are needed as an alternative snack for constipation sufferer. This study aims to obtain a formulation and determine the effect of the addition of Fermented Black Glutinous Rice (FBGR) on organoleptic properties, fiber content, and anthocyanin. Design an experimental study research with a Completely Randomized Design (CRD). Ice cream formulations with the addition of FBGR obtained were F1 (30%), F2 (50%), and F3 (70%). Kruskall Wallis test results showed only significant differences in the color of the product. Fiber test results contain 4.5 grams / 100 grams that meet 225% of the adequacy of dietary fiber in each portion. The results of anthocyanin test as much as 1 portion of IC-FBGR (100 grams) contains 13.90 mg / L so that it can meet 154.4% adequacy of anthocyanin. It is expected that further research on the effectiveness of giving IC-FBGR to constipation sufferers in preschool children.

KEYWORDS: Ice Cream base on Fermented Black Glutinous Rice, Nutrient, Fiber, Anthocyanin Organoleptic, Constipation

1. INTRODUCTION

In children aged 3-6 years or also called preschool age, children will prefer play activities and the environment compared to eating. Nutritional deficiencies during this preschool period will be easily attacked by diseases and health problems, one of which is often experienced is constipation. [1] Functional constipation is the perception of bowel obstruction in the form of reduced frequency of bowel movements. It is said functional constipation if defecation less than 3 times a week or 3 days do not defecate and excessive straining is needed. [2] In Indonesia there is no national data, but according to research by Journalists, et al., 2013, the prevalence of constipation in children is 0.3% -8%. Another study was also conducted by Firmansyah, 2007 in kindergarten school children in the Senen area, Jakarta. The prevalence of constipation is 4.4%. The results of research conducted by Maghfuroh, 2016 in children aged 3-6 years in RW 02 Sidoarjo Lamongan, the distribution of constipation events from 34 samples of 26 preschoolers or 76.5% of children experiencing constipation. [1] According to Sudoyono, 2006 in Wulandari, 2016 explained that constipation can cause severe stress for sufferers due to discomfort. Chronic constipation can cause diverticulosis, colon cancer, and hemorrhoids. [3] Research conducted by Eva, 2015 explains that there is a relationship between the inadequate concentration of the amount of dietary fiber intake and the incidence of constipation in kindergarten school children in Denpasar. Inadequate concentration of the amount of dietary fiber intake is a risk factor for constipation in children. [4] Dietary fiber cannot be digested by human digestive enzymes, but in the large intestine there are colon bacteria that can break down dietary fiber into fiber components. Fiber has the ability to bind water in the colon making the stool volume larger and will stimulate the nerves in the rectum, giving rise to a desire for defecation. [2] As many as 90-95% of colon

cancer cases are caused by external factors, namely modern dietary patterns that are low in food fiber and bioactive compounds and rich in animal food. Glasauer et al, 2014 stated that mutation of normal cell DNA into colon cancer cells can be prevented by anthocyanin pigments which are antioxidant compounds. [5] Black glutinous rice (*Oryza sativa* var. *Glutinosa*) according to Yanuar, 2009 is one of the most potential commodities as a source of antioxidants, bioactive compounds, and fibers that are important for health. The high antioxidant activity in black rice, brown rice, and fermented black glutinous rice is caused by the large content of anthocyanin pigments that act as antioxidants. [6] One of the foods in Indonesia made from black glutinous rice is fermented black glutinous rice, which contains anthocyanin, phenol, and antioxidant activity. Glutinous tape has anthocyanin content of 257 ppm or equivalent to 25.7 mg / 100 grams and fiber content of 5.9 grams / 100 grams. [7] Fermented black glutinous rice also has a high total sugar content, which is as much as 18.39% so that when processed into a product can reduce the use of added sugar. Seeing the advantages of fermented black glutinous rice and to increase consumption of fermented black glutinous rice do food diversification in order to get new products that are rich in fiber and anthocyanin as a snack for constipation sufferers in preschool children. Ice cream is one type of food that is loved by consumers of all ages, ranging from children to adults. Ice cream products that exist in the community usually lack of fiber nutrients and anthocyanin. To answer these assumptions, it is necessary to conduct an experimental research on the manufacture of products which in the end will be analyzed the fiber content, anthocyanin, and organoleptic properties of the product.

2. METHOD

The research design used was an experimental study design with the amount of fermented black glutinous rice added to the amount of ice cream ingredients used namely F1: 30%, F2: 50%, and F3: 70%. Preliminary research was carried out on November 28-29 and December 4, 2019. Preliminary research was carried out to obtain formulas and procedures for making products Black Glutinous Ice Cream Base on Fermented Black Glutinous Rice observed its organoleptic quality by organoleptic test on aspects of color, taste, aroma, and texture using a hedonic test questionnaire. The scale used is 1-7 with details 1 (very dislike), 2 (dislike), 3 (somewhat dislike), 4 (neutral), 5 (somewhat like), 6 (like), 7 (very like). Panelists who tested as many as 30 people with somewhat trained criteria. The primary data of organoleptic research were obtained from the results of organoleptic tests that have been conducted by panelists one-time test. Primary data on anthocyanin content and fiber content were obtained from laboratory test results using spectrophotometric methods and gravimetric methods after obtaining the best formula according to the organoleptic test results. To determine the effect of adding different fermented black glutinous rices to the organoleptic properties of fermented Ice Cream Base on Fermented Black Glutinous Rice, a normality test was conducted using Kolmogorov-Smirnov with a 95% degree of confidence ($\alpha = 0.05$). The data obtained is not distributed normal then we use the Kruskal Wallis test, if significant ($p < \alpha$) followed by the Mann Whitney test.

3. RESULTS

The preliminary research was carried out in several steps, namely by determining food ingredients that are rich in fiber and anthocyanin content, determining the formula for making ice cream by modifying the recipe contained in the journal and comparing with SNI ice cream quality requirements, then conducting initial trials of the formula is obtained. The formula obtained is the formula of adding black rice tape as much as 30%, 50%, and 70% of the ice cream. Table 1 presents the types and amounts of ingredients used in the process of making fermented Ice Cream Base on Fermented Black Glutinous Rice products for each formula.

Table 1. Black Glutinous Ice Cream Base on Fermented Black Glutinous Rice Making Material

		Black Glutinous Rice Addition	Black Glutinous Rice Addition	Black Glutinous Rice Addition
1	Fermented black glutinous	315g	525 g	735 g
2	riceSusu powdered skim	50 g	50 g	50 g
3	Sugar	13 g	13 g	13 g
4	CMC	8 g	8 g	8 g
5	Salt	2 g	2 g	2 g
6	Water	700 mL	700 mL	700 mL
7	Full Cream Milk Powder	259 g	259 g	259 g
8	Chicken egg yolk	20 g	20 g	20 g

Source: [8, 9,10]

The ingredients used in the process of making Black Glutinous Ice Cream Base on Fermented Black Glutinous Rice are fermented black glutinous rice, skimmed milk powder, granulated sugar, CMC, salt, water, full cream powdered milk, and chicken egg yolk. According to Susilorini, 2009 in Trisnaningtyas, 2013 the use of skim milk types was done to increase the density of ice cream and as a source of protein. [11] The ingredients used are the same for each formula, the difference being the percentage of the addition of fermented black glutinous rice to each formula.

3.1 Organoleptic Test Results

After the normality test of the organoleptic test results obtained $p(0.00) < \alpha(0.05)$ for the aspects of color, aroma, taste, and texture which means the data is not normally distributed.

3.2 Color Assessment Results

Organoleptic test results on the color of the Black Glutinous Ice Cream Base on Fermented Black Glutinous Rice presented as much as 6.7% of the panelists stated somewhat disliked, 10% neutral, 33.3% somewhat liked, 40.0% liked, and 10.0% stated strongly liked F1 color product with the formula of adding 30% fermented black glutinous rice. In F2 with the formula of adding 50% fermented black glutinous rice, 10% of the panelists stated neutral, 30.0% liked it a bit, 40.0% liked it, and 20.0% said they really liked the color of the product. F3 with the formula of adding 70% fermented black glutinous rice, as much as 3.3% expressed a slight dislike, 20.0% neutral, 10.0% somewhat liked, 33.3% liked, and 33.3% really liked the color of ice products fermented black glutinous rice rice cream. The Kruskal Wallis test obtained $p(0.284) > \alpha(0.05)$ which means that there are no significant differences in the results of the three formulas' color test.

3.3 Taste Assessment Results

Based on the results of the assessment of taste in fermented Ice Cream Base on Fermented Black Glutinous Rice products as much as 3.3% of the panelists said they did not like, 3.3% of the panelists stated rather disliked, 16.7% neutral, 16.7% somewhat liked, 41.7% liked, and 43.3% stated that they really liked F1 taste of Black Glutinous Ice Cream Base on Fermented Black Glutinous Rice with the formula of adding 30% black glutinous tape. In F2 with the formula of adding fermented black glutinous rice 50%, 3.3% of panelists stated they did not like it, 3.3% stated somewhat dislike, 3.3% of panelists stated neutral, 23.3% somewhat liked, 53.3% liked, and 13.3% said they really liked the taste of the product. F3 with the formula of adding fermented black glutinous rice 70%, as much as 6.7% expressed a slight dislike, 23.3% neutral, 30.0% somewhat liked, 33.3% liked, and 6.7% were very fond of the taste of ice products fermented black glutinous rice rice cream. The Kruskal Wallis test obtained $p(0.047) < \alpha(0.05)$, which means that there are significant differences in the taste results of the three formulas so that it is continued with the Mann Whitney statistical test to determine the location of the differences between fermented Ice Cream Base on Fermented

Black Glutinous Rice formulas. Information was obtained that there were statistically significant differences for F1 and F3 with p values $(0.036) < \alpha (0.05)$ and F2 and F3 with p values $(0.035) < \alpha (0.05)$. However, for F1 and F2 there were no statistically significant differences for the taste of Ice Cream Base on Fermented Black Glutinous Rice product $p (0.433) > \alpha (0.05)$.

3.4 Aroma Assessment Results

As many as 3.3% of panelists said they did not like it, 3.3% of panelists said they rather disliked it, 23.3% were neutral, 13.3% liked it somewhat, 46.7% liked it, and 10.0% said they really liked F1's aroma Ice Cream Base on Fermented Black Glutinous Rice products with the formula of adding 30% fermented black glutinous rice. In F2 with the formula of adding fermented black glutinous rice 50%, 3.3% of panelists stated rather dislike, 23.3% of panelists stated neutral, 13.3% rather liked, 43.3% liked, and 16.7% expressed very like to the aroma of the product. F3 with the formula of adding 70% fermented black glutinous rice rice, as much as 6.7% expressed a slight dislike, 16.7% neutral, 33.3% somewhat liked, 33.3% liked, and 10.0% were very fond of the scent of ice products fermented black glutinous rice rice cream. The Kruskal Wallis test obtained $p (0.648) > \alpha (0.05)$ which means that there is no statistically significant difference in the aroma test results of the three formulas. 1. Texture Assessment Results A total of 13.3% of panelists said they disliked it a little, 10.0% were neutral, 30.0% liked it a little, 23.3% liked it, and 23.3% said they really liked the F1 texture of the Black Glutinous Ice Cream Base on Fermented Black Glutinous Rice with the addition formula 30% fermented black glutinous rice. In F2 with the formula of adding fermented black glutinous rice 50%, 6.7% of panelists stated rather dislike, 6.7% of panelists stated neutral, 26.7% somewhat liked, 50.0% liked, and 10.0% expressed very like on the texture of the product. Whereas for F3 with the formula of adding fermented black glutinous rice 70%, as many as 23.3% stated neutral, 43.3% somewhat like, 20.0% like, and 13.3% really like the texture of fermented Ice Cream Base on Fermented Black Glutinous Rice products. The Kruskal Wallis test obtained $p (0.420) > \alpha (0.05)$ which means that there is no statistically significant difference in the results of the texture test of the three formulas.

3.5 Analysis Results of Black Glutinous Ice Cream Nutrition Values

The formula of Ice Cream Base on Fermented Black Glutinous Rice analyzed was F2 with the formula of adding fermented black glutinous rice as much as 50%. The formula is based on the highest average level of preference compared to other formulas.

1. Analysis of Energy, Protein, Fat, and Carbohydrates

The nutritional value of energy, protein, fat, and carbohydrates in one serving (100 g) of each formula can be seen in the table below:

Table 2. Nutritional Value of Black Glutinous Ice Cream Base on Fermented Black Glutinous Rice Per Serving Size

No	Energy and Nutrition	F1	F2	F3
		30%	50%	70%
		Fermented Black Glutinous Rice Addition	Fermented Black Glutinous Rice Addition	Fermented Black Glutinous Rice Addition
1	Energy (Kkal)	151,5	153,5	154,9
2	Protein (g)	7,0	6,6	6,2
3	Fat (g)	6,1	5,4	4,9
4	Carbohydrate (g)	18,3	20,5	22,1

Sumber: [12]

Table 2 shows the nutritional value of fermented Ice Cream Base on Fermented Black Glutinous Rice in each formula. Calculations are based on the Indonesian Food Composition Table (TKPI 2017), nutrisurvey, and packaging materials used for manufacturing products. The following is a table of contributions per serving (100 grams) of fermented Ice Cream Base on Fermented Black Glutinous Rice to the nutritional adequacy of preschoolers.

Table 3. The Contribution of Energy and Nutrients Per Serving Size of Black Glutinous Ice Cream Base on Fermented Black Glutinous Rice Against Nutrition Adequacy

No	Energy and Nutrition	Nutrition Content per serving	Adequacy of snacks	% Adequacy of Nutrition
1	Energy (Kkal)	153,5	140	110%
2	Protein (g)	6,6	2,5	264%
3	Fat (g)	5,4	5	108%
4	Carbohydrate (g)	20,4	22	93%

Sumber: [12, 13]

Based on Table 3, 100 grams of fermented Ice Cream Base on Fermented Black Glutinous Rice can fulfill 110% of energy adequacy, 264% of protein adequacy, 108% of fat adequacy, and 93% of carbohydrate adequacy based on 2019 Nutrition Adequacy Figures for children aged 4-6 years.

1. Fiber Content Analysis

The following is a table of the contribution of food fiber content per serving (100 grams) of fermented Ice Cream Base on Fermented Black Glutinous Rice to the nutritional adequacy of preschoolers:

Table 4. Contribution of Food Fiber Levels Per Serving Size of Ice Cream Base on Fermented Black Glutinous Rice Against Nutrition Adequacy

Nutritional Substances	Nutrition Content per serving	Adequacy of snacks	% Adequacy of Nutrition
Fiber	4,50 g	2,0 g	225%

Sumber: [13]

Based on Table 4 as much as 1 portion (100 grams) of fermented Ice Cream Base on Fermented Black Glutinous Rice can meet 225% of the adequacy of food fiber for pre-school children interludes in one day.

2. Analysis of Anthocyanin Levels

The following is a table of the contribution of anthocyanin levels per serving (100 grams) fermented Ice Cream Base on Fermented Black Glutinous Rice to the nutritional adequacy of preschoolers

Table 5. Contribution of Anthocyanin Levels Per Serving Size of Ice Cream Base on Fermented Black Glutinous Rice Against Nutrition Adequacy

Nutritional Substances	Nutrition Content per serving	Adequacy of snacks	% Adequacy of Nutrition
Anthocyanin	13,90 mg/L	9 mg	154,4%

Sumber: [14]

Based on Table 5 as much as 1 portion of fermented Ice Cream Base on Fermented Black Glutinous Rice (100 grams) can meet 154.4% adequacy of anthocyanin based on research conducted by Pojer, Elisa. by 30-

45% in the digestive system cancer model.

4. DISCUSSION

The preliminary research was carried out in several steps. The steps in making a product are started by weighing all the ingredients that will be used, destroying the fermented black glutinous rice using a blender then mixing it with other ingredients, pasteurizing, and cooling using an ice cream maker and evaluating the organoleptic properties of the product to 10 panelists. Some panelists complained about the texture of Ice Cream Base on Fermented Black Glutinous Rice which was not smooth enough so that in the next product trial the destruction of the fermented black glutinous rice was longer by using a blender. In addition, there are inputs to reduce the amount of sugar used because the ice cream tastes too sweet due to the basic ingredients of fermented black glutinous rice that is already sweet so researchers reduce the amount of sugar used. The use of salt is also reduced because for Formula 1 it feels a bit savory on the fermented Ice Cream Base on Fermented Black Glutinous Rice products that have been made. The main research was conducted in December 2019-January 2020 through two stages of testing, namely organoleptic testing with the hedonic test method and testing of food fiber content and anthocyanin of fermented Ice Cream Base on Fermented Black Glutinous Rice products. The manufacturing of the product was carried out on December 25, 2019 and organoleptic testing was carried out on December 26, 2019 in the Taste Test Laboratory by involving 30 rather trained panelists consisting of Level III and Level IV Nutritionist Students who had obtained material regarding organoleptic testing. Testing of anthocyanin levels was carried out on December 27, 2019 at the Food Technology Laboratory of UNPAS Bandung, while testing of food fiber content was carried out on January 16, 2020 at the Indonesian Center for Agro Industry (BBIA) Bogor. Ice Cream Base on Fermented Black Glutinous Rice is ice cream modified with the addition of fermented black glutinous rice that has been smoothed to the ice cream mixture according to the content of distilled food fiber needed for sufferers of constipation in preschoolers. [18] Ice cream base on fermented black glutinous rice can be consumed directly after the cooling process using an ice cream maker or cooled and stored in the freezer. The characteristics of the expected Ice Cream Base on Fermented Black Glutinous Rice are: purplish, sweet taste, soft texture, and has a strong fermented black glutinous rice aroma.

The color produced from fermented Ice Cream Base on Fermented Black Glutinous Rice products in all three formulas tends to have a purple color. But there is a difference in the level of color brightness from pale to bright. In F1 the ice cream color is paler than the other two formulas. This is because the amount of the addition of fermented black glutinous rice is only 30% so that the anthocyanin content in the tape that can give any color is reduced. [19] Anthocyanin is a polyphenol pigment that belongs to the red or purple flavonoid group and is found in plant parts such as fruit, flowers and leaves. [15] In contrast to F1, F3 has a brighter purple color due to the addition of fermented black glutinous rice as much as 70%. The taste produced from fermented Ice Cream Base on Fermented Black Glutinous Rice products in all three formulas tends to have a sweet taste. But there is a difference in the sweetness level from sweet, rather savory to very sweet. [21] In F1 the taste of ice cream tastes less sweet than the other two formulas. This is because the amount of added fermented black glutinous rice is only 30% so that the sugar content in the tape that can give a sweet taste is reduced. Fermented black glutinous rice has a high total sugar content, which is as much as 18.39% so that when processed into a product can reduce the use of added sugar. [7] In contrast to F1, F3 has a sweeter taste because of the addition of 70% fermented black glutinous rice. The scent produced from fermented Ice Cream Base on Fermented Black Glutinous Rice products in the three dominant formulas with the typical aroma of fermented black glutinous rice. In F1 the aroma of ice cream was less pungent than the other two formulas.

This is because the amount of added fermented black glutinous rice is only 30% so that the alcohol content

in the tape which can give the distinctive aroma of the tape is reduced. Yeast or yeast on the tape will convert some of the simple sugar into alcohol so that the aromatic smell arises on the tape. [16] In contrast to F1, F3 has a stronger aroma due to the addition of fermented black glutinous rice by as much as 70%. The texture produced from fermented Ice Cream Base on Fermented Black Glutinous Rice products in the three formulas tends to be soft. In F1 the aroma of ice cream feels softer than the other two formulas. This is because the amount of adding fermented black glutinous rice is only 30% so that the water-insoluble fiber content of the tape is reduced. 5.9-gram fiber content / 100 gram fermented black glutinous rice. [7] In contrast to F1, F3 has a rougher texture because of the addition of 70% fermented black glutinous rice. The high fiber content in the Black Glutinous Ice Cream Base on Fermented Black Glutinous Rice product is inseparable from the contribution of its constituent ingredients. Yashinta's research (2018) showed that pie with fermented black glutinous rice and purple sweet potato ingredients had a fiber content of 6.07 grams / 100 grams of product. [7] Fajriyanti's research (2018) showed that black tapai berry ice sherbet products made from fermented black glutinous rice and strawberries had a fiber content of 3.25 grams / 100 grams of the product. [15] Slanikovita's research (2018) showed that muffin products using fermented black glutinous rice and black rice as raw material had a fiber content of 5.8 grams / 100 grams of product. [17] High levels of anthocyanin in Black Ice Cream Base on Fermented Black Glutinous Rice are not regardless of the contribution of its constituent materials. [20] Yashinta's research (2018) showed that pie with fermented black glutinous rice and purple sweet potato ingredients had anthocyanin levels of 27.3 mg / 100 grams of product. [7] Fajriyanti's research (2018) showed that black tapai berry ice sherbet products made from fermented black glutinous rice and strawberries had anthocyanin levels of 22.1 mg / 100 gram of product. [15] Slanikovita's research (2018) showed that muffin products using fermented black glutinous rice and black rice as anthocyanin content were 21.91 mg / 100 gram of product. [17]

5. CONCLUSION

Based on the results of the organoleptic test assessment, it was found that there was an effect of the difference in the formula of adding fermented black glutinous rice to the organoleptic properties of taste but there was no difference in color, aroma, and texture. In the organoleptic test results, F2 is superior in the characteristics of color, taste, aroma, and texture. Fiber test results contain 4.5 grams / 100 grams that meet 225% of the adequacy of dietary fiber in each portion. The results of anthocyanin test as much as 1 portion of fermented Ice Cream Base on Fermented Black Glutinous Rice (100 grams) contains 13.90 mg / L so that it can meet 154.4% adequacy of anthocyanin.

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