

# The Effect of Additional Spirulina Flour on Organoleptic Characteristics and Level of Liked on Donuts

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## ABSTRACT

This study aims to determine the best level of addition of spirulina flour to the most preferred donuts based on organoleptic characteristics. The research method was carried out experimentally consisting of 4 treatments with the addition of spirulina flour of 0%, 8%, 10%, and 12% with 15 semi-trained panelists as replicates. Parameters observed were organoleptic characteristics which included appearance, smell, taste and texture and proximate analysis. Analysis of the preference test using the test Friedman and to determine the most important characteristics using the test Bayes. Hedonic test and proximate test were analyzed descriptively. Based on the results of the study, the most preferred product by the panelists was spirulina donuts with the addition of 10% spirulina flour which had a good appearance, had a distinctive smell but not too strong, a sweet and savory taste, and a dense and crunchy texture, with a median value. the appearance, smell, taste, texture of each 7. The results of the proximate test showed that the most preferred donut with the addition of 10% spirulina had a water content of 23.21%, an ash content of 0.93%, a carbohydrate content of 72.15%, a protein content of 18, 36%, and 6.95% fat content.

**Keyword :** Spirulina Flour, Donuts, Liked Level.

## 1. INTRODUCTION

Spirulina sp. is one type of microalgae that has the potential as a food source because spirulina sp. rich in nutrients including protein, vitamins, amino acids, -linolenic acid (GLA), phycocyanins, tocopherols, chlorophyll, and -carotene (Belay et al. 1996). The use of spirulina flour has been widely developed in Indonesia, such as for beauty, health products, food additives, animal feed additives, and fish feed additives. This is because spirulina flour contains 55-70 % protein in it, 4-6% fat, 17-25% carbohydrates, polyunsaturated fatty acids such as linoleic and linolenic acids, several vitamins such as nicotinic acid, riboflavin (vitamin B2), thiamin (vitamin B1), cyanocobalamin (vitamin B12), minerals, amino acids, and other active ingredients such as carotenoids, chlorophyll pigments, and phycocyanins. (Public Relations of KKP 2018).

Donuts are one of the most popular and favorite types of snacks for the Indonesian people, from children, teenagers to adults as well as from various economic groups. One of the food product developments is spirulina donuts, where the addition of spirulina flour is expected to improve the nutritional quality of donuts. The addition of spirulina to food products will scientifically increase the protein content, but the addition will have implications for the appearance and taste and smell. Therefore, this article aims to determine the scale of acceptance of these spirulina donuts.

## 2. Methods

The method used in this study is an experimental method, with organoleptic testing (hedonic test) to determine the effect of adding spirulina flour to the characteristics and level of preference for donuts. The research design used for the parameters of appearance, smell, taste and texture using four treatments and

15 panelists as replicates and then analyzed with non-parametric statistics Friedman test. The 4 treatments are as follows:

1. Treatment A : Addition of 0% spirulina flour (control)
2. Treatment B : Addition of 8% spirulina flour
3. Treatment C : Addition of 10% spirulina flour
4. Treatment D : Addition of 12% spirulina flour

## 2.1 Research Procedure

Making donuts based on a preliminary test with the addition of spirulina flour was carried out in several stages as follows:

1. Wheat flour, spirulina flour, granulated sugar, instant yeast, milk powder and baking powder are stirred using a spatula then slowly add 100 ml of water until well mixed.
2. Butter and egg yolks are added to the dough that has been formed and then kneaded continuously until the dough is elastic and does not stick to your hands.
3. After the dough is smooth, let the dough sit for 45 minutes until it expands.
4. After the dough expands, the dough is taken a little and flattened using a dough roll on a cutting board then printed with a donut printer and baked in the oven at 160° for 12 minutes.
5. The donuts are then served on a serving plate or container to be assessed by a panel of 15 people.

Based on the results of the preliminary test of the donut formulation, it can be seen in Table 1, which is as follows:

**Table 1.** Donut Formulation

Ingredients	Amount
Cakra Flour	250 grams
Sugar	50 grams
Milk Powder	35 grams
Yeast	5 grams
Margarine	50 grams
Baking Powder	1,25 grams
Egg Yolk	1 egg

## 2.2 Organoleptic Test

Testing is an assessment method using the human senses (eyes, nose, hands, tongue) with sensory abilities. One of the organoleptic tests is the hedonic test (level of preference). Hedonic test is used to assess the final product (Soekarto 1985). Hedonic testing includes the characteristics of appearance, smell, taste and texture so that it can determine the level of panelists' preference for spirulina donuts. This test was carried out by 15 semi-trained panelists. The preference test procedure includes:

1. Prepared tools and materials such as: plates for spirulina donut samples, water to neutralize the taste, organoleptic test forms, and donuts sample.
2. An explanation was given to the panelists regarding the test parameters which include appearance, smell, taste and texture with a value scale of 1 to 9.
3. Each panelist was asked to give an assessment of the spirulina donuts in each treatment on the *score sheet*.

The results of the organoleptic test assessment will usually produce the same number of numbers so that an analysis is needed that can provide differences in each treatment. The analysis in question is the *Bayes*, a test that aims to determine the comparison of determining criteria in a product. The processes produced by the *Bayes* are a basis used in determining the most preferred product. test calculation *Bayes* will show that the element that has the highest priority value is the most preferred by the panelists (Marimin 2004).

## 2.3 Data analysis

From the organoleptic test were analyzed by non-parametric statistic Friedman method. The test method used to determine the priority value of the selected product is the *Bayes*. The selection of the best sample using the *Bayes* is based on the highest total value of each treatment. The weighted parameters include organoleptic characteristics (appearance, smell, taste and texture).

### 3. RESULTS AND DISCUSSION

#### 3.1 Hedonic

Test Hedonic test was conducted to determine the quality based on the panelists' responses to the level of preference for spirulina donuts. Hedonic test is used to assess the level of final preference of the product. Hedonic testing was carried out by 15 semi-trained panelists. The parameters tested included the appearance, smell, taste, and texture characteristics of the donuts from various treatments with the addition of spirulina flour.

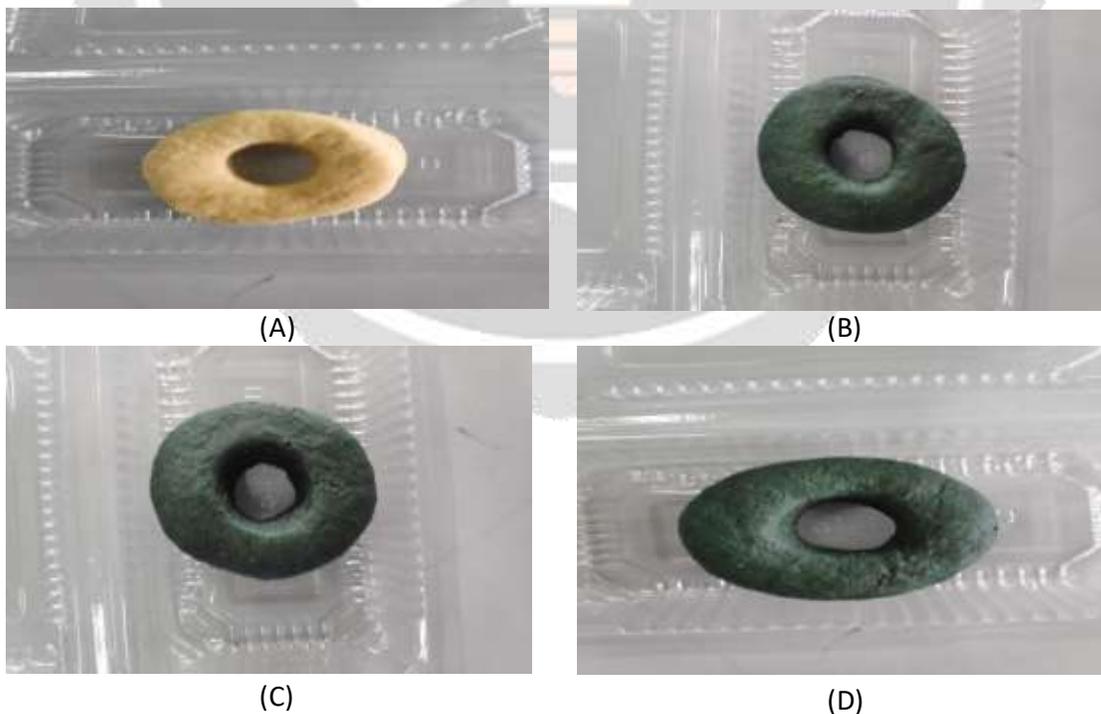
##### 3.1.1 Appearance

Appearance is the first parameter that is seen by consumers visually before moving on to other factors. Appearance is one of the parameters that determine the level of acceptance of panelists who are assessed by sight including shape, size, color and surface properties (smooth, rough, gloomy, glossy, homogeneous, heterogeneous and flat wavy) (Kaya 2008). The result value of the level of preference for the appearance of spirulina donuts is presented in Table 2.

**Table 2.** Level of Preference for the Appearance of Spirulina Donuts

Treatment	Median	Average
A ( Control)	7	6.20a
B ( Added 8% Spirulina Flour)	5	6.07a
C ( Added 10% Spirulina Flour)	7	6.60ab
D ( Added 12% Spirulina Flour)	5	4.60a

Based on the results of research on appearances conducted by panelists, it can be seen that the average value ranges from 4.60 to 6.60 and has a median value of 5 to 7 from a scale of 1 to 9 which is included in the neutral category and favored by the panelists. The results of Friedman's statistical test showed that there was a significant difference so that it could be concluded that the addition of spirulina flour could affect the level of acceptance and significantly affect the appearance of spirulina donuts. Based on the results of the research on the appearance of spirulina donuts, the results in Figure 1 are as follows.



**Figure 1.** Appearance of Donuts With Addition of Spirulina Flour with concentrations of 0% (A), 8% (B), 10% (C), and 12% (D)

The test results showed that treatment C, namely the treatment with the addition of 10% spirulina flour, had the highest average value with a value of 6.60 with a perfectly round shape, smooth surface and bright green color. While treatment D with the addition of 12% spirulina flour had the lowest average value of 4.60 with a slightly rough surface and a slightly darker green color. Color is the dominant factor in the appearance parameter that affects the donut acceptance scale because color can give a sign of a chemical change in a food product and visually the color factor will appear first compared to the shape and size (Deski 2017).

### 3.1.2 Smell

One of the important factors that determine the level of preference of a product by the panelists is smell. If a product has a bad smell, it will result in the product being less favored by the panelists. Smell is more influenced by the sense of smell. In general, the smell that can be received by the nose and brain is a mixture of four types of smell, namely fragrant, sour, rancid, and charred (Winamo 2008). The result value of the level of preference for the smell of spirulina donuts is presented in Table 3.

**Table 3.** Level of Preference for the smell of Spirulina Donuts

Treatment	Median	Average
A ( Control)	7	6.87ab
B ( Added 8% Spirulina Flour)	7	6.33a
C ( Added 10% Spirulina Flour)	7	6.07a
D ( Added 12% Spirulina Flour)	5	4.73a

Based on the assessment of the smell of the spirulina donut product, it was found that the addition of spirulina flour to the donut resulted in an assessment of the smell that was significantly different. Based on the results of the tests carried out, it was found that the donuts with the addition of 0% spirulina flour (A) were the most preferred treatment by the panelists with an average value of 6.87. While the treatment with the addition of 12% spirulina flour (D) is the treatment that has the lowest level of preference by the panelists with an average value of 4.73. The low acceptance scale for the smell parameter on the test donuts with a spirulina composition of 12% was due to the strong smell of spirulina compared to other donuts which had a lower spirulina composition. The concentration of the addition of spirulina flour greatly affects the smell of the donuts, the higher the concentration added to the donut formulation, the more the smell of the donuts is disliked by the panelists. The smell of spirulina as it is known is like the typical smell of seaweed where this smell is not liked by the panelists.

### 3.1.3 Taste

Taste is a very decisive factor in consumer decisions on the acceptance of a food product. Although other parameters are good such as appearance, smell, and texture, if the taste of a product is not good then consumers will not like the product. The result value of the level of preference for the taste of spirulina donuts is presented in Table 4.

**Table 4.** Level of Preference for the taste of Spirulina Donuts

Treatment	Median	Average
A ( Control)	7	6.47a
B ( Added 8% Spirulina Flour)	7	6.47a
C ( Added 10% Spirulina Flour)	7	6.87a
D ( Added 12% Spirulina Flour)	5	5.40a

Statistical test *Friedman* showed that there was no significant difference in the taste parameters. The results of the analysis explained that all treatments had almost uniform values, meaning that the taste of spirulina flour did not have a significant effect on the taste of spirulina donuts. The taste of the donuts produced is influenced by the ingredients for making the donuts such as butter, eggs, sugar and powdered milk. Due to the use of the same composition for the four test donuts, the resulting taste tends to be the same.

Based on the results of the tests carried out, it was found that donuts with the addition of 10% spirulina flour (C) were the most preferred treatment by the panelists with an average value of 6.87. While the treatment with the addition of 12% spirulina flour (D) is the treatment that has the lowest level of preference by the panelists with an average value of 5.40. All treatments were included in the neutral category and favored by the panelists with a median value of 5 to 7.

### 3.1.4 Texture

Texture is a very important factor for the acceptance of a food product (Hasnelly et al. 2014). Texture is important in soft and crunchy foods. Texture test is a sensation associated with the sense of touch or touch. The most important characteristics are the hardness, cohesiveness, and water content of the food (Oktarina 2013). The result value of the level of preference for the texture of the spirulina donut is presented in Table 5.

**Table 5.** Level of Preference for the texture of Spirulina Donuts

Treatment	Median	Average
A ( Control)	5	5.67a
B ( Added 8% Spirulina Flour)	7	6.33a
C ( Added 10% Spirulina Flour)	7	7.13ab
D ( Added 12% Spirulina Flour)	7	6.07a

Statistical test results *Friedman* showed that there was a significant difference, meaning that different treatments could have different effects on the texture of spirulina donuts. The results of the analysis carried out found that donuts with the addition of spirulina flour by 10% (C) were the most preferred treatment by the panelists with an average value of 7.13. Meanwhile, the treatment with the addition of 0% spirulina flour (A) was the treatment that had the lowest level of preference by the panelists with an average value of 5.67.

Donuts with 10% spirulina content have a stiff texture so that when baked they become soft and crunchy because they have less water content than donuts with 0% spirulina content, so they are relatively favored by panelists. Meanwhile, donuts with *spirulina* have an elastic texture and tend to return to their original shape when printed so that when baked the results become denser and dry so that the level of crispness is low and panelists are less interested in it.

The texture of donuts is generally influenced by the ingredients of the dough and the baking process. The texture of the donut is thought to be influenced by the use of wheat flour. The use of wheat flour in donut dough can affect the density of the dough which in turn affects the texture of the donuts, this is in accordance with (Manlay. 2000) that the presence of wheat flour (starch) in the manufacture of donuts will cause glatinization during the baking process which causes the donuts to have very soft texture.

### 3.2 Decision making Using Bayes

Method *Bayes* aims to determine the best treatment based on the characteristics of appearance, smell, taste and texture. this method is one of the techniques that can be used to conduct analysis in making the best decisions from a number of alternatives by considering various criteria (Marimin 2004). The results of the calculation of the weight of the criteria and in determining the best treatment by considering the appearance, smell, taste and texture of the donuts from 15 panelists are presented in Table 6.

**Table 6.** Weight Value of Donut

Criteria	Weight Criteria
Appearance	0,13
Smell	0,20
Taste	<b>0,57</b>
Texture	0,11

Based on the calculation of the weight of the criteria for appearance, smell, taste and texture of the donuts, it was found that the taste criteria had the highest value with a criterion weight value of 0.57. This is then followed by the smell parameter with a criterion weight value of 0.20. and the weight value of appearance and texture criteria is 0.13 and 0.11.

Decision making on alternative weight values from appearance, smell, taste and texture criteria is carried out by using multiple comparison tests (*Pairwise Comparison*). Completion of the results of pairwise comparisons is done by manipulating the matrix to determine the weight of the criteria. The results of the calculation of the weight criteria for appearance, smell, taste and texture of donuts are presented in Table 7.

**Table 7. Decision Matrix for Spirulina Donut Assessment**

Treatment	Criteria				Alternative Value	Priority Value
	Appearance	Smell	Taste	Texture		
A	7	7	7	5	6.78	0.264
B	5	7	7	7	6.75	0.262
C	7	7	7	7	7	<b>0.272</b>
D	5	5	5	7	5.22	0.203
Bobot	0.13	0.2	0.57	0.11	25.75	1

Based on calculations using the *Bayes* was found that the addition of 10% spirulina flour obtained the highest alternative value of 7.00, followed by the addition of 0% spirulina flour of 6.78, followed by the addition of 8% spirulina flour of 6.75, then the last one with the addition of 12% spirulina flour was 5.22. Donuts with the addition of 10% spirulina flour was the most preferred treatment by the panelists.

#### 4. CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that the level of adding spirulina flour by 10% to the donuts produces the most preferred product with good appearance characteristics, has a distinctive smell but not too pungent, a sweet and savory taste, and a dense and thick texture. crunchy, with a median value of appearance, smell, taste, and texture of 7 (preferred).

#### 5. REFERENCES

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