

## **Test of Acceptance and Iron Content of Baymor “Red Spinach & Moringa” as a Treat to Prevent Anemia in Adolescent Women**

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### **ABSTRACT**

Based on DP3AK 2021 East Java, 23% of young women and 12% of young men suffer from anemia. Red spinach and Moringa leaves are contain high levels of iron so it can be used as alternative foods to prevent anemia in young women. The purpose was to analyze the results of tests of acceptability and iron levels of "red spinach & moringa" baymor cake as a snack to prevent anemia in young women. The research method is experimental research. Data will be analyzed using the Kruskal Wallis test, if the results are  $p < 0.05$  then it will be continued using the Mann Whitney test. The average result of the acceptability test is the BM 1 formulation which is 4.04 (likes it), BM 2 which is 3.49 (rather likes it) and BM 3 which is 3.2 (rather likes it). The results of iron levels in the control formulation (BM 1) were 3.63 mg/100g and the most preferred formulation was BM 2 of 9.81 mg/100g. The control formulation (BM 1) with iron content of 3.63 mg/100g was the most preferred formulation by the panelists, while the second most preferred formulation was BM 2 of 9.81 mg/100g.

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### **INTRODUCTION**

Adolescence is the developmental stage from childhood to adulthood, generally occurring from ages 10 to 18 and not yet married.<sup>1</sup> An individual entering adolescence will experience rapid changes and development, including mental, emotional, physical growth, and puberty, which can influence their nutritional needs.<sup>2</sup> Adolescent girls who reach the age of 10 or 11 will generally experience puberty, beginning with their first menstruation.<sup>3</sup> At this time, adolescent girls are more vulnerable to nutritional problems, such as anemia.<sup>4</sup>

Anemia is a nutritional problem where an individual has low levels of hematocrit, erythrocyte count, and hemoglobin, or red blood cells in the blood.<sup>5</sup> Therefore, the hemoglobin levels in the bodies of adolescent girls should not be less than 12 gr/dl.<sup>6</sup> One of the causes of anemia is the low iron content found in the foods consumed by adolescent girls.<sup>7</sup> For this reason, it is recommended that adolescent girls consume 8 to 15 mg of iron.<sup>8</sup>

Based on the Basic Health Research 2018 data, it shows that the Indonesian population within the vulnerable age range of 15 to 24 years, or classified as adolescents, has a high prevalence of anemia, which is 84.6%.<sup>9</sup> According to the DP3AK of East Java Province, 23% of adolescent girls and 12% of adolescent boys suffer from anemia.<sup>10</sup>

Anemia or iron deficiency is more dominantly experienced by adolescent girls than by adolescent boys.<sup>11</sup> The high prevalence of anemia among adolescent girls is caused because they experience menstruation every month and sometimes experience menstruation for a full month.<sup>12</sup> Therefore, adolescent girls need to increase their iron intake to prevent anemia, and when considering iron requirements, the needs of adolescent girls are greater than those of adolescent boys.<sup>13</sup>

Efforts to prevent and manage anemia include consuming iron supplementation.<sup>14</sup> However, the provision of iron supplementation for adolescent girls in Indonesia has not been realized as well as expected.<sup>15</sup> Therefore, one of the prevention efforts aside from the provision of iron tablets is to choose food ingredients or utilize high-iron food sources for consumption by adolescent girls.<sup>16</sup>

Moringa leaves (*Moringa oleifera*) are a type of vegetable with a relatively high iron content. According to the Indonesian Food Composition Table (TKPI) 2017, 100 grams of fresh moringa leaves contain a significant amount of iron, which is about 6 mg.<sup>17</sup> Besides moringa leaves, another food high in iron is red spinach (*Amaranthus tricolor*). According to the Indonesian Food Composition Table 2017, fresh red spinach has an iron content of 7 mg per 100 grams of red spinach.<sup>18</sup>

Steamed cake is one of the popular snacks among the community.<sup>19</sup> This is due to the soft texture of the steamed cake and its sweet flavor, which makes the snack widely favored by people and can be consumed by all groups.<sup>20</sup> Steamed cake is a snack made from basic ingredients such as wheat flour, eggs, and sugar. It takes 25 minutes to cook the steamed cake until it's perfectly done.<sup>21</sup>

Based on the issues discussed, one effort to prevent and address anemia in adolescent girls is to select food ingredients or utilize high-iron food sources for consumption by adolescent girls. In this case, research will be conducted on food products that have a high iron content and are favored by adolescent girls with the title "Acceptance Test and Iron Content of Baymor Red Spinach & Moringa Cake as a Snack to Prevent Anemia in Adolescent Girls."

## **MATERIALS AND METHODS**

This study is experimental research conducted from October 2022 to June 2023. The making and testing of the acceptance of Baymor Cake were carried out in the Laboratory of Diploma-III Nutrition, Poltekkes Kemenkes Surabaya, while to determine the iron content in Baymor

Cake, testing was conducted at the Laboratory of PT. Saraswanti Indo Genetech, AMG Tower, 19th-20th Floor, Jalan Dukuh Menanggal No 1 Surabaya.

The samples used were cakes that had been supplemented with red spinach flour and moringa leaf flour in three different formulations. Each of the 25 panelists, categorized as semi-trained, received 5 grams of Baymor Cake for each formulation, and all panelists assessed the three formulations regarding color, taste, texture, and aroma with the rating details being 1) strongly dislike, 2) dislike, 3) somewhat like, 4) like, and 5) strongly like through a questionnaire provided. After obtaining the results of the organoleptic test, two samples will be selected for iron content testing, namely the control formula and the formula most liked, with a sample size of 200 grams for each formulation and two repetitions.

The results of the acceptance test of the three Baymor Cake samples will be processed using a computer, using the Kruskal Wallis test, and if the results show  $p < 0.05$ , it will be followed by the Mann Whitney Test aimed at determining the differences in the 4 indicators of the three Baymor Cake samples. The final result of this physical analysis is the determination of the Cake most liked by the panelists. Meanwhile, the iron content test on Baymor Cake samples uses the Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES) test.

## RESULTS

The research includes organoleptic tests (color, aroma, texture, and taste) and iron content tests on the control formula and the formula most liked by the panelists, with the following results.

**Tabel 1 Characteristics of Baymor Sponge Cake**

No	Indikator	Formulasi Bolu Baymor		
		BM 1	BM 2	BM 3
1	Color	Yellow	Dark green	Dark green
2	Aroma	Characteristic of vanilla milk powder	Characteristic of moringa leaves	Characteristic of moringa leaves
3	Texture	Soft	Soft and slightly dense	Soft and slightly dense
4	Taste	Sweet	Like greentea	Like greentea

Source: Primary Data, 2022

The differences in characteristics of the three formulations of Baymor Cake "Red Spinach & Moringa" serve as the basis for the panelists to assess or score these three formulations.

**Tabel 2 Average Test Results for Acceptability Of Baymor Sponge Cake**

No	Indikator	Bolu Baymor Formulation		
		BM 1	BM 2	BM 3
1	Color	4.32	3.88	3.52
2	Aroma	4.28	2.92	2.92
3	Texture	3.44	3.88	3.44
4	Taste	4.12	3.28	2.92
<b>Avarage</b>		<b>4.04</b>	<b>3.49</b>	<b>3.2</b>

Source: Primary Data, 2022

According to the data above, the Baymor cake with the highest score is the control formulation (code BM 1) with the highest average result of 4.04, falling into the 'like' category.

**Tabel 3 Kruskal Wallis Baymor Sponge Cake Test Results**

No	Indikator	Kruskal Wallis Test Values
1	Color	0.005
2	Aroma	0.000
3	Texture	0.128
4	Taste	0.000

Source: Primary Data, 2022

Based on the data above, the results show that for the indicators 1) color, 2) aroma, and 3) taste, the values were  $p < 0.05$ , meaning that the hypothesis is accepted and there are differences in color, aroma, and taste in the Baymor Cake "Red Spinach & Moringa" formulations. However, for the texture indicator, the Kruskal Wallis test resulted in a value of  $p > 0.05$ , indicating that there is no difference in texture, or the hypothesis is rejected for the Baymor Cake "Red Spinach & Moringa" formulations".

**Tabel 4 Man Whitney Baymor Sponge Cake Test Results**

No	Indikator	Nilai Uji Man Whitney		
		BM 1:BM 2	BM 1:BM 3	BM 2:BM 3
1	Color	0.057	0.001	0.152
2	Aroma	0.000	0.000	0.918
3	Taste	0.001	0.000	0.217

Source: Primary Data, 2022

According to the data above, for the comparison between Formulations BM 1 and BM 2 for the indicators of aroma and taste, the hypothesis is accepted, indicating there are differences in aroma and taste, whereas for the color indicator, the hypothesis is rejected, indicating there is no difference in color. For the comparison between Formulations BM 1 and BM 3 for the indicators of color, aroma, and taste, the hypothesis is accepted, indicating there are differences in color, aroma, and taste. For the comparison between Formulations BM 2 and BM 3 for the indicators of color, aroma, and taste, the hypothesis is rejected, indicating there are no differences in color, aroma, and taste.

**Tabel 5 Iron Content Test Results of Baymor Sponge Cake “Red Spinach and Moringa”**

No	Formulation	Unit	Iron Levels		
			Simplo	Duplo	Average
1	BM 1	mg/100g	3.61	3.65	3.63
2	BM 2	mg/100g	9.75	9.88	9.81

Source: Primary Data, 2022

According to the data above, in one recipe of Baymor Cake "Red Spinach & Moringa" in Formulation BM 2 weighing 400 grams, it produces 5 cups of cake with a portion weight of 80 grams each, so in 1 portion of Baymor Cake, there is an iron content of 7.8 mg. Meanwhile, in one recipe of the control formula weighing 380 grams, it produces 4.5 cups of cake with a portion weight of 80 grams each, so in 1 portion of the cake, there is an iron content of 2.9 mg.

## **DISCUSSION**

### **Organoleptic Characteristics of Baymor Sponge Cake “Red Spinach and Moringa”**

#### **Color**

According to the acceptance test results, it is known that the highest average value for the color indicator among the three formulations shows that the control formulation (BM 1) received the highest score of 4.32 (like), while the formulation with the lowest score is formulation BM 3, scoring 3.52 (somewhat like). This is due to the difference in color among the three Baymor cake formulations, where the control formulation with code BM 1 has a yellow color, while the formulations with codes BM 2 and BM 3 have a dark green color.

The addition of red spinach flour and moringa leaf flour can provide a color difference in the Baymor cake formulations, with the dough that includes red spinach flour and moringa leaf flour resulting in a green color. It is this color difference that causes the panelists to prefer less the darker color and favor the cakes with a brighter color, as found in the control formulation with code BM 1, which produces a yellow color.

## **Aroma**

According to the acceptance test results, it was found that the highest average value for the aroma indicator among the three formulations shows that the control formulation (BM 1) received the highest score of 4.28, which falls into the 'like' category, while the formulations with the lowest scores are BM 2 and BM 3, each scoring 2.92, falling into the 'dislike' category. The low ratings given by the panelists to these formulations are suspected to be due to the dominant aroma of the added red spinach flour and moringa leaf flour, and the panelists are also not accustomed to the aroma of red spinach flour and moringa leaf flour.<sup>23</sup>

## **Texture**

According to the acceptance test results, it was found that the highest average value for the texture indicator among the three formulations shows that the formulation with code BM 2 received the highest score of 3.88 (somewhat like), while the formulations with code BM 1 and BM 3 scored the lowest at 3.44, also falling into the 'somewhat like' category. This is suspected to be because the panelists tend to dislike denser textures; the higher the addition of red spinach flour to the steamed cake batter, the denser the product's texture. The dense texture is caused by the water content in the red spinach, which can affect the appearance, texture, and taste of a food product.<sup>24</sup>

## **Taste**

Furthermore, the acceptance test results revealed that the highest average score for the taste indicator among the three formulations shows that the control formulation (BM 1) received the highest score of 4.12, falling into the 'like' category, while the formulation with the lowest score, BM 3, scored 2.92, falling into the 'dislike' category. The reason for the low ratings given by the panelists is that the more red spinach flour is added, the less the panelists tend to like that particular formulation.<sup>25</sup>

## **Nutritional Content of Baymor Sponge Cake “Red Spinach and Moringa”**

According to the table above, the iron content in the Baymor cake with code BM 2 was found to be 9.81 mg per 100 grams, which means that one serving of Baymor cake weighing 80 grams/cup contains 7.84 mg of iron. The difference in the iron content values between the NutriSurvey calculation and the laboratory test results is because the NutriSurvey calculation uses fresh red spinach and moringa leaves, while the laboratory tests use red spinach and moringa leaves that have been processed into flour.

Based on the Recommended Dietary Allowances (RDA) of 2019, it is suggested that adolescent girls consume 12.66 mg of iron per day, thus it is recommended to consume 10% of the

daily requirement per snack, which is about 1.26 mg. To avoid anemia, adolescent girls can consume one cup (80 grams) of Baymor cake per day, which provides 7,84 mg/cup

## CONCLUSION

Conclusions obtained according to the research results are as follows:

- 1 Based on the acceptance test data on 3 formulations of Baymor cake, namely BM 1, BM 2, and BM 3 covering color, aroma, texture, and taste, it was found that 25 panelists most preferred the control formulation (BM 1) with a score of 4.04, with a flour composition ratio of wheat flour:red spinach flour:moringa leaf flour at 75:0:0. Meanwhile, the formulation with the second-highest rating or second most liked by the 25 panelists is BM 2 with a score of 3.49, with a flour composition ratio of wheat flour:red spinach flour:moringa leaf flour at 75 : 15 : 10.
- 2 Based on the laboratory test results, the formulation most liked by the panelists is the control formulation (BM 1) with an iron content of 3.63 mg/100g, while the second most liked formulation, BM 2, shows that the iron content in that formulation is higher compared to the control formulation (BM 1) at 9,81 mg/100g.

The suggestions that can be given related to this research are as follows:

- 1 Perform modifications or improvements to the recipe by reducing the proportion of red spinach flour to moringa leaf flour in the Baymor cake to improve the acceptance test results including color, aroma, texture, and taste by the panelists.
- 2 Conduct analysis on the macronutrient content such as energy, protein, fat, and carbohydrates, or micronutrient content such as Vitamin C, aimed at enhancing the iron absorption process in the human body.
- 3 Add additional ingredients to the Baymor cake recipe, such as pandan essence, to eliminate any unpleasant odors in the Baymor cake and function to enhance the aroma and taste during food processing.

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