

# **KLASICS**

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# Melting Time and Fe Content of Soybean Ice Cream by Utilizing Moringa Flour, Southeast Sulawesi Varieties, Indonesia

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#### Keywords: Ice cream, Iron, Moringa Oleifera

Abstract. Adolescents are a high-risk group for anemia. The prevalence of anemia in adolescents was 32% in 2018. One of the risk factors for anemia is the low intake of iron (Fe). Local food diversification is an effort to increase iron intake, one of which is by making ice cream using Moringa and soybean flour. Moringa leaves contain higher iron than other vegetables, namely 17.2 mg / 100 g. Ice cream is a snack that is loved by all levels of society. This study aims to determine the melting time and fe content of ice cream by utilizing Moringa leaf flour. This study used a one-factor completely randomized design (CRD). The research data were analyzed descriptively. The results of this study indicate that the ice cream with the addition of 5 gram of Moringa leaf flour has an average melting time of 49,18 minutes, and the laboratory results show the ice cream content is 0.114 mg / L and the addition 10 grams of Moringa leaf flour has an average melting speed of 58.26 minutes, and the laboratory results show the ice cream content is 0.135 mg / L. The results of this study indicate that the ice cream with the addition of 10 grams of Moringa leaf flour has an average melting speed of 58.26 minutes, and the laboratory results show the ice cream content is 0.135 mg / L. The results of this study indicate that the ice cream with the addition of 10 grams of Moringa leaf flour has an average melting speed of 58.26 minutes, and the laboratory results show the ice cream content is 0.135 mg / L. Soybean ice cream with the use of Moringa leaf flour can be used as an alternative healthy snack for adolescents.

#### Introduction

Adolescents are a high-risk group for anemia<sup>1-4</sup> The prevalence of anemia in adolescents was 32% in 2018<sup>5</sup>. One of the risk factors for anemia is the low intake of iron (Fe) caused by eating behavior in adolescents. Adolescents tend to prefer eating junk food, one of them is ice cream. Ice cream is snacks favored by all levels of society <sup>6</sup>. Efforts to overcome anemia in adolescents through diversification of iron-rich local food (Fe).<sup>7 8</sup>. One of the foods that contain high iron is the moringa plant. Diversification of ice cream through the use of moringa and soybeans to increase nutritional content, especially ice cream products<sup>9,10</sup>.

rich Moringa leaves in are macronutrients and micronutrients as well as antioxidants <sup>11,12</sup>. Moringa leaves contain higher iron than other vegetables, namely 17.2 mg / 100 g<sup>13</sup>. To increase nutrient content and extend shelf life, fresh Moringa leaves become Moringa leaf powder<sup>14</sup>. According to the research results of Mayangsari R and Rasmiati K 2020, when compared to fresh Moringa leaves, the nutritional content in the form of Moringa leaves is much higher, such as carbohydrates 36.16 grams; 2.16 grams of fat; 27.75 grams of protein; in 100 grams of Moringa leaf powder<sup>15</sup>. According to the results of previous research, the nutritional content of Moringa leaf flour is beta-carotene content 10 times carrots, 25 times banana

potassium, 25 times iron spinach, <sup>1</sup>/<sub>2</sub> times vitamin C oranges, 17 times calcium milk, and 9 times yogurt protein. <sup>16</sup>. Moringa leaves also function as a natural coloring agent in ice cream and provide a longer melting rate for ice cream, add flavor, give good shape and density<sup>17,18</sup>.

Soy milk contains protein and inhibitory amino acid composition similar to cow's milk. Soy milk contains minerals (calcium, phosphorus, and iron) and vitamins (vitamin A, vitamin B1, and vitamin C), soy milk also does not contain cholesterol <sup>19,20</sup>.

Ice cream is a dairy product that is made by freezing and cream and other ingredients such as fruit juice, chocolate and other food ingredients <sup>6</sup>. The making of this cream uses a new innovation, namely by adding Moringa leaf flour which can increase the nutritional content of ice cream, especially the use of milk with low-fat milk, namely soy milk. This ice cream with the addition of Moringa flour and soybeans is expected to be a healthy alternative snack to increase intake for teenagers. The purpose of this study was to analyze the physical properties of soy ice cream with the addition of Moringa leaf flour.

# MATERIAL AND METHOD

#### **Research Design and Participants**

This research is an experimental study with a one-factor completely randomized design, namely the concentration of adding Moringa flour to soy ice cream <sup>21</sup>. There are 2 levels of treatment, namely the addition of 5 gr (K1) moringa flour and 10 g (K2) of soybean ice cream. Making and observing the melting speed of soybean ice cream using moringa flour was carried out at the Laboratory of Culinary Nutrition, STIKes Karya Kesehatan, testing of ice cream levels was carried out at the Chemical Laboratory of Mathematics and Natural Sciences, Halu Oleo University. The subjects in this study were Moringa leaf flour and soy milk. The object in this study was ice cream. The sample of this study was the size of the addition of Moringa leaf flour.

#### Intervention

# a. Tools and Materials

1. Tools

The tools used for the preparation of ice cream are the dough basin, small bowl, measuring cup, tablespoon, spatula, scale, scissors, sieve, and blender. The tools used to process ice cream are gas stoves, pans, mixers, whisks, ice cream cups <sup>22</sup>.

2. Materials

The ingredients needed to make modified ice cream from Natasya (2019) are Moringa leaf flour (5 grams and 10 grams), 1000 mL of soy milk, 250 grams whipping cream, 15 grams of cornstarch, 250 grams of sugar, 1 tablespoon of agar, and warm water. <sup>23</sup>.

#### b. Making Moringa Leaf Flour

The moringa leaves used are young moringa leaves that are located at the top of the tree, then the moringa leaves are washed with clean water and then plucked from the leaf stalks, then spread on a wire net in the sun for 6 hours (it's dry enough). The manufacture of flour from dry moringa leaves is often used in a dry blender and sieved with a 100 mash sieve to separate the small stalks that are not crushed with a blender, then stored in an airtight plastic container. <sup>1524</sup>.

#### c. Ice Cream Making

The making of this ice cream consists of several stages which are a modification of Faubun and Sinay (2017):

- 1. Beat granulated sugar and egg yolk with a whisk until thickened and white then set aside.
- 2. Combine the whipping cream with soy milk then stir until evenly mixed, followed by the addition of Moringa leaf flour with a variation of each treatment of 5 gr and 10 g, stirring and beating using a mixer until the mixture is evenly mixed.
- Heat the ingredient (b) while stirring until it almost boils. (± 80°C) then removed and put into the egg mixture while continuing to stir using a mixer. After that, shake it using a mixer until the dough is evenly mixed.
- 4. Pour into a clean container and let it cool down.

- 5. Put the dough in the refrigerator for about 2 hours.
- 6. Remove the dough from the refrigerator then shake it using a mixer and put it back in the refrigerator until it is half frozen for about 5 hours.
- 7. Repeat the beating up to three times.
- 8. Pour the ice cream into the ice cream cup provided.
- 9. Store in the freezer until it hardens and is ready to serve <sup>25</sup>.

#### **Observation of Parameters**

The monitoring parameters carried out included physical properties in the form of storage speed of cream and analysis of nutritional content in the form of ice cream content.

# **Data Collection and Analysis**

Primary data obtained by direct measurement. Measurements are made by direct observation from the results of the analysis of nutritional content carried out in the laboratory. Fe content test was obtained using the dry ashing method with Atomic Absorption Spectroscopy (AAS) <sup>26</sup>. This test was carried out by officers of the Halu Oleo University Mathematics and Natural Sciences Laboratory. For data on melting time, it is obtained by means of frozen ice cream which is allowed to melt at room temperature, and the melting time is calculated $^{27,28}$ . The data obtained in this study were presented in tabular form and analyzed descriptively by displaying the frequency value of the nutritional content of ice cream.

This research has obtained an ethical license number: 130 / KEPK-IAKMI / VII / 2020.

#### **RESULTS AND DISCUSSION**

# Result

a.	Melting	Time
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Table 1. Ice Cream Melting Time				
Moringa	Melting Time (minutes)			
Flour	Ι	II	Average	
5 gr	49, 15	49,21	49,18	
10 gr	58, 22	58,30	58,26	

Based on Table 1, the melting time of ice cream shows the average melting time of ice cream is between 49.18 -58.26 minutes.

# b. Fe Content

 Table 1. Information on Nutritional Value

 of Soybean Ice Cream Using Moringa Flour

Moringa Flour	Fe Content (mg/L)
5 gr	0,114
10 gr	0,135

Based on table 2 shows that the more Moringa flour is added to the ice cream, the higher the Fe content in the ice cream..

#### DISCUSSION

a. Melting Time

The more Moringa leaves are added, the melting time of the ice cream will be slower <sup>29</sup>. Moringa leaves are a nonfat dry substitute used in the manufacture of ice cream with protein content which can inhibit melting speed and provide good shape and density. In addition, the protein content can stabilize the fat emulsion after the homogenization process and produce a soft ice cream texture <sup>3025</sup>.

This is inversely proportional to the research of Salman et al. (2016) on the effect of adding Moringa leaf flour on the physicochemical and sensory characteristics of ice cream that the higher the addition of Moringa leaf flour, the faster the melting time <sup>31</sup>. This is due to the different processing of moringa. In previous studies, Moringa was processed into fruit juice, while in this study, Moringa was processed into Moringa flour.

Ice cream melting is caused by a decrease in the freezing point of the ice cream. The time it takes for the ice cream to melt is greatly influenced by the composition of the ingredients used in the ice cream making. The addition of a thickener such as milk to ice cream is able to bind ice particles in the ice cream dough and cause the water-holding power to become stronger, which causes it not to melt quickly. Besides that, the melting time of the ice cream is also getting longer due to the fat content in moringa and soy milk. Fat in ice cream making can enhance the flavor of the ice cream, produce a soft texture, help shape the ice cream, and help with good melting properties<sup>32 18</sup>.

# b. Fe Content

Iron is one of the minerals contained in moringa <sup>33</sup>. Iron is a very important micromineral in the body because it functions in the formation of red blood cells, namely the process of hemoglobin synthesis.<sup>34</sup>. Iron deficiency can cause anemia. In addition, it can reduce immunity because it is closely related to the decreased function of antibody-forming enzymes <sup>35</sup>.

Moringa leaves contain high iron, the results of an analysis of Fe content in Moringa leaves at the Research Institute for Spices and Medicines in 2014 showed quite good results, namely 1 kg of Simplicia can produce an iron content of 54.92 mg. Meanwhile, the iron content in Moringa leaf flour is much higher, namely 28.2 mg / 100 grams. Moringa leaves have hematopoietic activity, this is useful for increasing the number of platelets (when consumed in low doses) and is also useful for the formation of human blood cells. Moringa leaves contain more amino acids than those found in eggs. Therefore, Moringa leaves can help the absorption of iron<sup>36 37</sup>.

#### CONCLUSIONS AND SUGGESTIONS

Based on observations, the ice cream with the addition of 5 gram of Moringa leaf flour has an average melting speed of 49,18 minutes, and the laboratory results show the ice cream content is 0.114 mg / L and the addition 10 grams of Moringa leaf flour has an average melting speed of 58.26 minutes, and the laboratory results show the ice cream content is 0.135 mg / L.. Soybean ice cream using canned moringa flour is used as a healthy snack for adolescent.

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