Preparation of cookies from banana flour, soy flour, and Moringa leaf flour as an emergency food product

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Abstract. Emergency food is a processed food product specifically designed for consumption in post-natural disaster conditions. The food can be provided for 15 days until having adequate assistance. Emergency food products must meet the daily energy requirements of individuals, around 2100 kcal per day. One of the emergency food products is cookies. The purpose of this study was to evaluate the nutritional compound, hardness, and organoleptic properties of emergency food in the form of cookies, prepared from Saba banana flour, soy flour, and Moringa flour. The treatment in this research using a single factor, namely different composition of the flour with three variables and three replications. The three variables were F1 (banana flour 25%, soy flour 10%, and Moringa flour 10%), F2 (banana flour 15%, soy flour 15%, and Moringa flour 15%), and F3 (banana flour 20%, soy flour 20%, and Moringa flour 5%). The parameters were macro nutritional components, such as protein (Kjedhal extraction), fat content (Soxhlet method), and carbohydrate (difference method). It was also evaluated water content (wet basis by drying oven), ash content (furnace), fiber content, hardness (Texture analyzer), calorie (by calculation), and hedonic sensory test in terms of color, taste, aroma, and texture. The results showed that all treatments fulfill the calorie requirement of emergency food. In terms of hardness, F2 resulted in the hardest texture of cookies but still eatable. Organoleptic test results showed that cookies with the use of 20% banana flour, 20% soybean flour, and 5% moringa flour favored by the panelists.

1. Introduction
Indonesia is a country that has a high level of natural disaster threats. This is because Indonesia’s position is located in the confluence area of three world tectonic plates namely the southern Indo-Australia plate, the northern Eurasia plate and the eastern Pacific plate [1]. In post-disaster conditions, food is the main needs of disaster victims. Post-disaster conditions are an abnormal condition, so people cannot live normally, including to meet food needs. Therefore, we need food aid that can be directly consumed and does not require processing but can meet nutritional needs per day (2100 kcal). Providing food aid in the form of instant noodles, instant porridge, or rice is less effective because it requires processing before consumption. The nutritional content is only limited to carbohydrates,
whereas for human growth, especially children need other nutrients such as fat, protein, vitamins, and minerals.

The types of food needed by victims of natural disasters should be ready to eat, making it easier for victims to consume them. Besides, it contains carbohydrates, fats, proteins, vitamins, and minerals that meet their nutritional needs so that it is not only filling but also healthy and has appropriate caloric value as normal human daily needs. The food provided is expected to not only block the stomach but also can function as a substitute for breakfast and food that can provide enough energy. One alternative food that can be given to refugees is emergency food.

Emergency food products (EFP) are processed food products specifically designed for consumption in post-disaster conditions. Emergency food products must meet the daily energy needs of individuals around 2100 kcal/day. These calorie needs are following the needs that can be consumed directly. The number of macronutrients recommended by the Institute of Medicine was 10-15% protein, 35-45% fat, and carbohydrates 40-50% of total calories.

Processed food products that have the potential to be developed as emergency food are cookies because cookies are a durable product. Sutomo [3] stated that cookies can be stored for long periods ranging from 3-6 months. In general, the quality of cookies, which has a crunchy, brittle, dry, brownish-yellow structure or following the color of the material used, has a special fragrant aroma and tastes delicious, tasty and sweet [3]. According to the Institute of Medicine [4], some specifications for emergency food are durable storage, can be consumed in a mobile state, meet nutritional needs, can be used as the only source of food to survive for up to 15 days, and can be distributed from the air without damaging the product and without endangering people on land [2].

Local food that can be used in making emergency food production is Moringa oleifera leaves. Moringa leaves are a nutrient-dense food that is easy to obtain and process and is safe for consumption when dried and turned into powder (flour). Vitamins A, C, and E-pro vitamins present in Moringa leaves [5]. Vitamin A contained in Moringa leaf powder is equivalent to 10 (ten) times the vitamin A found in carrots, equivalent to 17 (seventeen) times the calcium contained in milk, equivalent to 15 (fifteen) times the calcium found in bananas, equivalent to 9 (nine) times the protein contained in yogurt and equivalent to 25 (twenty-five) times the iron contained in spinach according to Joni et al. [6][7]. In making emergency food products, there are nutritional standards that must be met. Therefore it is necessary to add a source of fat and carbohydrates so that the specified nutritional standards can be met. Soybeans and Kepok bananas are two types of food that have high protein and carbohydrate contents and are easily found in almost all regions of Indonesia. According to Winarsi [8] soybeans are a source of protein, fat, vitamins A, E, K and several types of B vitamins and minerals K, Fe, Zn, and P. Soybeans also contain high average amino acids, except methionine and phenylalanine. While Kepok bananas according to Prabawati et al. [9] contain high carbohydrates, so they can replace rice and flour consumption, Kepok bananas also contain important minerals such as potassium, vitamins A, B1, B2, and C. In this study will be examined further on comparison of the use of Moringa flour, soy flour and Kepok banana flour, physicochemical properties and organoleptic properties of emergency food in the form of cookies.

2. Materials and methods
Ingredients used in making cookies as emergency food are Moringa flour (Timur Rasa), soy flour (Hasil Bumiku), banana flour (Hasil Bumiku), full cream milk powder (Dancow), refined granulated sugar, margarine (Blue Band), water and chemicals for testing.

The research was conducted in several stages. The first step is the determination of the formulation of cookies from Kepok bananas, soy flour and Moringa flour and predicting the adequacy of nutrition of each formula. The second is the analysis of protein (Kjedhal extraction), fat content (soxhlet method), and carbohydrate (difference method). It was also evaluated water content (wet basis by drying oven), ash content (furnace), fiber content, hardness (Texture analyzer), calorie (by calculation), and hedonic sensory test in terms of color, taste, aroma, and texture.
2.1. Determination of product formulation
The determination of this cookie formulation refers to the fulfillment of emergency food macronutrient standards issued by the Institute of Medicine in Zoumas et al., [2] namely 10-15% protein, 35-45% fat and 40-50% carbohydrate from total calories. To get products that meet these standards, formulations are calculated based on the composition of the macronutrient value of each ingredient used in making cookies, with the amount of material used using Microsoft Excel calculations to reach emergency food standards. Soy flour and moringa flour. The macronutrient values of the ingredients to be used in making cookies as emergency food are listed in the following table 1.

| Ingredients          | Macronutrients (100 / g ingredients) |
|----------------------|--------------------------------------|
|                      | Protein | lipid | Carbohydrate |
| Banana flour [13]    | 3.8     | 1     | 79.6         |
| Soybean Flour [12]   | 31.32   | 20.36 | 35.9         |
| Moringa flour [11]   | 28.4    | 2.7   | 57.01        |
| Full cream milk powder* | 27     | 26    | 40           |
| Margarine [10]       | 0.5     | 81.6  | 1.4          |
| Sugar [10]           | 0       | 0     | 94           |
| Water                | 0       | 0     | 0            |

*Data on the packaging label of the product

The initial formula is shown in table 1. The three formulations have different compositions in the main ingredients, namely banana flour, soy flour, and moringa flour. The recommended emergency food product weight to provide a total calorie of 2100 kcal is 450 grams. This amount is equivalent to consuming 10 pieces of cookies, and each piece contains 72.2345 kcal.

2.2. Preparation of the cookies
Moringa flour, soy flour, banana flour, mixed dry then margarine, sugar, full cream milk powder, water (table 2) and then cooked until the dough is smooth, the dough is then printed and baked in an oven at 140°C for 40 minutes. Cooked cookies are then removed from the baking sheet and cooled.

| Table 2. Emergency food formulation based on banana flour, soy flour, and moringa flour. |
|---------------------------------------------------------------|
| Ingredients     | Formula (%)         |
|                 | F1     | F2     | F3     |
| Banana flour    | 25     | 15     | 20     |
| Soy Flour       | 10     | 15     | 20     |
| Moringa flour   | 10     | 15     | 5      |
| Full cream milk powder | 28 | 28     | 28     |
| Margarine       | 10     | 10     | 10     |
| Sugar           | 7      | 7      | 7      |
| Water           | 10     | 10     | 10     |

3. Results and discussion
Based on the proximate analysis, we calculated the percentage composition of the materials for the emergency food formula. The prediction of emergency food nutritional adequacy based on every piece (100 g) can be seen in table 3. The protein content of the emergency food is in the range of 7.06 to
7.97 g every piece of the product. Based on the nutritional requirements, emergency food should contain 7.9 to 8.1 g of protein [2]. Based on these requirements, F1 formula (25% banana flour, 10% soy flour and 10% Moringa flour), F2 (15% banana flour, 15% soy flour, and 15% Moringa flour), and F3 (20 banana flour %, 20% soy flour, and 5% Moringa flour) meet the standards recommended by the Institute of Medicine [4].

**Table 3.** Prediction of the adequacy of emergency food formula.

| Nutrition     | Calorie Content (%) | Emergency Food |
|---------------|---------------------|----------------|
|               | F1                  | F2             | F3             |
| Protein       | 11.94               | 13.71          | 13.04          | 10-15          |
| Lipid         | 36.35               | 38.04          | 37.16          | 35-45          |
| Carbohydrate  | 40.40               | 37.08          | 37.16          | 40-45          |
| Total energy (kcal) | 536.62          | 539.87          | 544.66          | 233            |

**Table 4.** Nutrition content of emergency food.

| Formula | Repetition | Water Content (%) | Protein Content (%) | Lipid Content (%) | Carbohydrate Content (%) | Ash Content (%) | Fiber Content (%) |
|---------|------------|-------------------|---------------------|-------------------|--------------------------|----------------|------------------|
|         | U1         | 11.49             | 12.26               | 35.04             | 46.26                    | 4.26           | 2.18             |
| F1      | U2         | 12.25             | 11.32               | 35.15             | 48.02                    | 3.97           | 1.55             |
|         | U3         | 12.84             | 11.89               | 35.96             | 45.51                    | 4.57           | 2.07             |
|         | U1         | 13.07             | 14.5                | 37.33             | 40.7                     | 4.78           | 2.69             |
| F2      | U2         | 12.48             | 14.13               | 37                 | 41.4                     | 4.85           | 2.61             |
|         | U3         | 13.43             | 14.42               | 37.57             | 39.68                    | 5.25           | 3.08             |
|         | U1         | 13.24             | 14.46               | 36.55             | 42.82                    | 3.96           | 2.21             |
| F3      | U2         | 12.24             | 14.82               | 37.15             | 41.69                    | 3.91           | 2.43             |
|         | U3         | 13.21             | 14.78               | 37.01             | 41.85                    | 3.92           | 2.44             |

3.1. **Proximate analysis**

3.1.1. **Water content.** Water content is the amount of water contained in a material expressed in percent. The water content was also one of the very important characteristics in food because it can affect the appearance, texture, and taste of food. The water content in food will determine the freshness and shelf life of the food ingredients.

![Figure 1](image-url)  
**Figure 1.** Analysis of water content-based cookies banana flour, soy flour, moringa flour.
Figure 1 shows that water content ranged from 12.19% - 12.99%. The results of the analysis of variance on the water content of cookie products showed that the flour ratio in each treatment had no significant effect on the 5% level of the moisture content of the resulting cookie products, so no further tests were performed. The high water content in cookie products is influenced by the raw materials used and the addition of water to the dough. The water content in soy flour is 7.78%, the water content in banana flour is 6.08% and Moringa flour is 4.09%. According to Setyadi [13] the high content of starch found in banana flour and soy flour. Starch serves to bind water, the higher the concentration of the addition of banana flour and soy flour causes water levels to increase. The starch will absorb the added water when mixing the dough through the starch gelatinization reaction. According to the research results of Setyadi [14] and Adejumo [15] stated that banana flour contains a starch of 73.36%, and soy flour 13.27%. Banana flour starch granules have the ability to absorb water through the starch gelatinization reaction.

3.1.2. Protein content. Protein is a macronutrient material group. Protein was instrumental in the formation of biomolecule rather than as an energy source. However, if the organism’s lack of energy, the protein can be used as an energy source. The energy content of protein average 4 kcal/gram, equivalent to the energy content of carbohydrates Sudarmadji [16].

![Figure 2](image.png)

**Figure 2.** Analysis of protein content-based cookies banana flour, soy flour, moringa flour.

In figure 2, we can see that the protein content test results ranged from 11.82% - 14.68%. Results of analysis of variance in protein content in cookie products shows that the comparison of the use of banana flour, soy flour, and Moringa flour has a significant effect on the level of 5% on protein levels so that Duncan's test was performed. The results of further tests in show that the treatment with variations in the addition of banana flour 25%: soy flour 10%: Moringa flour 10% is significantly different from the variation in the addition of banana flour 15%: soy flour 15%: moringa flour 15% and variations in addition 20% banana flour: 20% soy flour: 5% Moringa flour. The increase in the level of protein cookies is influenced by the protein content of the raw material used protein in soy flour 31.32% higher than 3.8% banana flour, and 28.4% Moringa flour so that the more soy flour additions the higher the protein content contained in cookies Bilang (2013) [17].

3.1.3. Fat content. Fats and oils are important food substances to maintain human health. In addition, fats and oils are a more effective source of energy compared to carbohydrates and protein. The energy produced per gram of fat 1 gram of fat produces 9 calories (cal). Fat in food is a mixture of heterogeneous fat which mostly consists of triglycerides. The fat content in emergency food has an important contribution that is as one of the energy contributors.
Figure 3. Analysis of fat content-based cookies banana flour, soy flour, moringa flour.

Figure 3 shows that fat content ranging between 35.38% - 37.3%. Results of analysis of variance on fat content in cookie products show that the comparison of the use of banana flour, soy flour, and Moringa flour has a significant effect on the level of 5% on fat content so that the Duncan test was performed. The results of further tests in show that the treatment with variations in the addition of banana flour 25%: soy flour 10%: 10% Moringa flour is significantly different from variations in the addition of banana flour 15%: soy flour 15%: moringa flour 15% and variations in addition 20% banana flour: 20% soy flour: 5% Moringa flour. The high-fat content in cookies comes from soy flour and margarine which is used based on Fajri [11] stated that the fat content of soy flour is 20.36 grams / 100 grams of ingredients and margarine is 81.6 grams / 100 grams. Based on the statement Gaman, et al. (1992)[18] which states that overall all treatments meet these requirements, namely the fat content of 35 - 45%.

3.1.4. Carbohydrates. Carbohydrates are the main source of calories or macronutrients for heterotrophic organisms, the number of calories that can be produced by 1 gram of carbohydrate is only 4 (kcal). Carbohydrates also have an important role in determining the characteristics of food ingredients, such as taste, color, texture, and others.

Figure 4. Analysis of carbohydrates based cookies banana flour, soy flour, moringa flour.

Figure 4 results of the calculation of carbohydrate content by the method of difference in making cookies ranged from 40.59% - 46.59%. Results of analysis of variance on carbohydrate content in cookie products show that the comparison of the use of banana flour, soy flour, and Moringa flour has
a significant effect on the level of 5% on carbohydrate content, so Duncan test was performed. The results of further tests showed that the treatment with variations in the addition of banana flour 15%: soy flour 15%: moringa flour 15% and addition of banana flour 20%: soy flour 20%: moringa flour 5% is significantly different in the variation of flour addition Banana 25%: 10% soy flour: 10% Moringa flour. This is due to the percentage use of Kepok banana flour more than the use of soy flour. The carbohydrate content of soybean flour is lower at 35.9% [12] compared to 79.6% banana flour [13] Chong Li Coo (2007). Overall according to emergency food requirements, all treatments meet the requirements as emergency food that is a carbohydrate content of 40-50%.

3.1.5. Ash Content. Ash content is a mixture of inorganic or mineral components found in a food ingredient of Astuti [19]. Determination of ash content is intended to determine the content of non-volatile components (inorganic components or mineral salts) that remain in combustion and incandescent organic compounds Nurilmala [20]. The lower the ash content of an ingredient, the higher the purity. The high or low ash content of a material is partly due to the different mineral content at the source of raw materials and can also be influenced by the demineralization process at the time of making Sudarmaji [16].

![Figure 5](image_url)

Figure 5. Analysis of ash content based cookies banana flour, soy flour, moringa flour.

Figure 5 test results for ash content ranged from 3.93% - 4.96%. Results of analysis of variance on ash content in cookie products. Shows that the comparison of the use of banana flour, soy flour, and Moringa flour has a significant effect on the level of 5% on the ash content so that Duncan's further test is carried out. The results of further tests in show that the treatment with variations in the addition of banana flour 20%: soy flour 20%: moringa flour 5% and addition of banana flour 25%: soy flour 10%: moringa flour 10% is significantly different from variations in the addition of flour banana 15%: soy flour 15%: moringa flour 15%. The high ash content of cookies is influenced by the mineral content of the ingredients used. Moringa leaf flour has a high mineral content, namely calcium and potassium according to Algafari [21]. Moringa leaf calcium content is 603.77 mg / 100 gram, and potassium 264.96 mg / 100gram Setyaningtyas [22] explained that ash content for food flour-based emergencies range from 2-3%.

3.1.6. Fiber content. Dietary fiber, or dietary fiber, is a part of plants that can be consumed and composed of carbohydrates that have resistance to digestion and absorption processes in the human small intestine and undergo partial or total fermentation in the large intestine [23].
Figure 6 test results of fiber content ranged from 1.93% - 2.88%. Results of analysis of variance in fiber content in cookie products. It shows that the comparison of the use of banana flour, soy flour, and Moringa flour has a significant effect on the level of 5% of the fiber content so that Duncan test was performed. The results of further tests in show that the treatment with variations in the addition of banana flour 25%: soy flour 10%: Moringa flour 10% and addition of banana flour 20%: soy flour 20%: 5% Moringa flour are significantly different in the variation of flour addition banana 15%: soy flour 15%: moringa flour 15%. The difference in the value of crude fiber is caused by differences in the type of flour used and the amount of material added to the formulation of cookies as emergency food. The fiber content tends to increase in accordance with the addition of Moringa leaf flour in the formulation of cookies according to Melo et al. [24] levels of Moringa leaf flour are 12.63%. the higher fiber content, the better for digestion Baliwati et al. in Turisyawati [25].

3.2. Hardness (Texture analyzer)
The texture is a very important parameter in cookie products. Textures are usually used to assess the good quality of cookies products. Textures in cookies include hardness and ease of breaking. Cookies’ texture is influenced by the amount and type of carbohydrates and proteins that make up Fellows [26]. The tool that is generally used in the measurement of texture profiles is the Texture Analyzer, which determines the strength or durability of the material against pressure in the form of curves.

Figure 7 the hardness test results obtained mean values ranged from 192.61 N / mm² - 587.72 N / mm². Results of analysis of variance in hardness in cookie products. Shows that the comparison of the use of banana flour, soy flour, and Moringa flour has a significant effect on the level of 5% on
hardness so Duncan test was performed. The results of further tests in show that the treatment with variations in the addition of banana flour 20%: soy flour 20%: moringa flour 5% and addition of banana flour 25%: soy flour 10%: moringa flour 10% significantly different in the variation of flour addition banana 15%: soy flour 15%: moringa flour 15%. The hardness value of cookies is influenced by the addition of soy flour and Moringa flour which have high protein content. Protein levels (gluten) and the ability to bind water affect the hardness of cookies Gaines et al. (1992) [27]. The amount of flour affects the hardness of cookies because of its hydrophilic nature which can bind water. The higher the protein content, the higher the hardness of the cookies. According to Burt and Fearn (1983) in Christian (2011) [28], during the heat penetrates rapidly on the bottom and top of the cookies, causing the loss of developer gas and water in that part. The heat penetration into the inside of cookies is slower, allowing for the formation of more air cavities. The longer the water holds, allowing more starch to gelatinize in the middle of the cookies so that the resulting cookie texture is sturdy and increases the hardness value of the cookie when given style.

3.3. Calories
A calorie is the value of food energy that can be obtained from the conversion of protein, fat, and carbohydrates into energy. Energy units are expressed in units of heat or kilocalories (kcal). The biggest energy source is fat which produces 9 kcal of energy per gram, while carbohydrate and protein produce energy of 4 kcal per gram Almatsier [29]. The energy content of emergency food must meet the energy requirements standard of 2,100 kcal/day. According to Zoumas et al. [2], emergency food products have a protein content of 10-15 percent of total energy, the fat content of 35 - 45 percent of total energy, and carbohydrate content of 40 - 50 percent of total energy.

![Figure 8](image_url)

**Figure 8.** Analysis of total calories based cookies banana flour, soy flour, moringa flour.

Based on Figure 8 shows that the average value of the calculation of total calories ranges from 552.13 kcal - 559.35 kcal. Results of analysis of variance in hardness on cookie products. Shows that the comparison of the use of banana flour, soy flour, and Moringa flour has a significant effect on the level of 5% on hardness so Duncan test was performed. The results of further tests showed that each treatment with the addition of banana flour, soy flour, Moringa flour is significantly different. The high-calorie content in cookies is influenced by the nutritional content of each treatment where the F3 treatment is higher in protein, fat and carbohydrate content compared to F2 and F1. Based on the calculation of total calories to meet the total calories of 2100 kcal/day, the consumption of emergency food cookies is assumed as much as 3 times a day. In this study cookie made weighing 13 grams / per chip. The energy content per chip is around 72.2345 kcal so for the serving size, it is recommended that 10 pieces of cookies meet the energy of 700 kcal.
3.4. Organoleptic test of the Hedonic Method

3.4.1. Color. Color is an important determinant of quality food that is easy to observe. Color can be an indication of the quality of food. Foodstuffs if they have unsightly colors to look at or give the impression of having poor quality will affect consumers' impressions. Color parameter assessment can be done by seeing with the eyes. The processing of cookies by using high temperatures will give color according to the material used. The color change caused by sugar is called the Maillard reaction. The temperature that is too high will result in discolored colors, darker colors, and the caramelization process of Winarno [30].

![Figure 9](image9.png)

**Figure 9.** Organoleptic analysis of color cookies based on banana flour, soybean flour and moringa flour.

Figure 9 Organoleptic test results color parameters ranged from 2.84 - 3.08. The results of the analysis of variance on organoleptic values of color parameters in cookie products showed that the flour ratio in each treatment did not significantly affect the 5% level of organoleptic values of the resulting cookie product color parameters, so no further tests were performed. The average score of panelists' preference for the color most favored by the panelists was formula F3 (3.08%). This treatment had good color, not too pale and not too green. The green color of these cookies is influenced by the presence of Moringa leaf flour which has a green color because it contains leaf green substance, namely chlorophyll. In addition, cookies also have a slightly brownish color that occurs because of a Maillard reaction. This Maillard reaction is formed due to the addition of banana flour which causes an enzymatic reaction by the polyphenol oxidation, the nonenzymatic reaction is the Maillard reaction during roasting and soy flour which basically contains the amino acid lysine. The lysine amino acid is formed from two amen groups that are reactive to reducing sugars, causing a brown color to the cookies [31].

3.4.2. Aroma. The aroma is a very subjective taste and smell and difficult to measure because each person has a different sensitivity and likeness. Although they can detect, each individual has different preferences Meilgaret et al (1999) [31].

![Figure 10](image10.png)

**Figure 10.** Organoleptic analysis of aroma cookies based on banana flour, soybean flour, and moringa flour.
Figure 10. Organoleptic test results of aroma parameters ranged from 2.68 - 3.57. Results of analysis of variance on organoleptic values of aroma parameters in cookie products. It shows that the comparison of the use of banana flour, soy flour, and Moringa flour has a significant effect on the level of 5% on the organoleptic value of the aroma parameters so that Duncan test was performed. The results of further tests in show that the treatment with variations in the addition of banana flour 15%: soy flour 15%: moringa flour 15% and addition of banana flour 25%: soy flour 10%: moringa flour 10% significantly different in the variation of flour addition banana 20%: soy flour 20%: moringa flour 5%. The average score of panelists’ preference for the aroma most favored by panelists is formula F3 (3.57%) The less the addition of moringa leaf flour the higher the panelist preference level. This happens because of the substitution of Moringa leaf flour which basically has a pleasant aroma. The sweet aroma of moringa leaf flour is because in it there is a lipoxidase enzyme which is a hexal group 7 and hexanol [33]. High addition of banana flour, soy flour and the addition of supporting ingredients cookies such as margarine, refined sugar, and full cream milk powder will give the fragrant aroma of cookies and the unpleasant aroma of Moringa flour obscured [34].

3.4.3. Texture. According to Kartika et al. 1988 [35], the texture is a sensation of pressure that can be observed with the mouth (when bitten, chewed and swallowed) or palpation with fingers. In this study, conducted by texture observation sensory texture determination by touching with a finger.

![Figure 11. Organoleptic analysis of texture cookies based on banana flour, soybean flour and moringa flour.](image)

Figure 11 showed that the texture parameters ranged from 2.91 - 3.2. The results of the analysis of variance on organoleptic values of texture parameters on cookie products showed that the flour ratio in each treatment did not significantly affect the 5% level of organoleptic values of the texture parameters of cookie products produced, so no further tests were performed. Both the poor texture of food is influenced by water content, fat content, protein, and the amount and type of carbohydrates. The F3 treatment had the highest percentage of somewhat liking categories (3.2%). The difference in the use of moringa leaf flour, and soy flour and banana flour make the panelists have a different degree of preference for textures. The more addition of Moringa leaf flour and soy flour make the cookies harder, this happens because both the flour contains high enough protein, while making cookies that are used are low protein flour so that the resulting texture is more crispy Rudianto (2014) [36].

3.4.4. Taste. Taste is one of the organoleptic tests related to the sense of taste. Taste is a unity of interaction between the characteristics of aroma, taste, and texture is the whole food assessed by Rosniar (2016) [37].
Figure 12 Organoleptic test results taste parameters ranged from 2.17 - 3.62. Results of analysis of variance on organoleptic values of flavor parameters in cookie products. Showed that the comparison of the use of banana flour, soy flour, and Moringa flour had a significant effect on the level of 5% on the organoleptic value of the flavor parameters so that Duncan test was performed. The results of further tests showed that each treatment with the addition of banana flour, soy flour, Moringa flour is significantly different. The average score of panelists’ preference for taste most liked by panelists is formula F3 (3.62%). Showing the less addition of Moringa flour, and the more additions to banana and soy flour the more liked by the panelists. According to Rosyida [33]. This happens because of a special taste caused by Moringa leaves. This flavor arises because there are tannins in the leaves of tannin which gives a bitter and bitter taste effect. This bitter taste can be disguised by the addition of banana flour, soy flour, refined sugar, and full cream milk to the processing of cookies.

3.5. Emergency food
The determination of the best formula is based on organoleptic test parameters and the adequacy of energy donations for emergency food. Organoleptic test results on the attributes of color, aroma, texture, and taste show that the F3 formulation 20: 20: 5 has a high degree of preference compared to F1 formulas 25:10:10 and F2 15:15:15 based on organoleptic tests. The proximate analysis gives the results that each formulation has a contribution value of macronutrient proteins, fats, carbohydrates that have fulfilled the requirements for emergency food namely 10-15% protein, 35-45% fat and 40-50% carbohydrate.

The three formulations of emergency food cookies meet the characteristics of emergency food that are safe to consume with acceptable color, odor, aroma, texture, and appearance, have adequate nutrition, are easily transferred, and are easy to use and produce a total calorie treatment F1 25:10:10 that is 552.13 kcal, F2 15:15:15 that is 555.47 kcal, F3 20: 20: 5 that is 559.35 kcal this result has fulfilled the maximum requirement of the total energy / 50 grams of emergency food which is 250 kcal.

Cookies that need to be consumed for one serving size is about 10 pieces with the aim to meet the needs of 700 kcal. This is based on human daily energy needs of 2100 kcal which is assumed to eat three times a day so that one serving size must meet the energy of 700 kcal. F1, F2, and F3 treatments weighing 13 grams / per chip. The energy content per chip around 72.2345 kcal is recommended to consume as many as 10 pieces for one serving size can meet the needs of 700 kcal. In other words, you have to consume as much as 5 pieces/13 grams to meet the needs of 233 kcal / 50 grams of one-time products. This cookie product besides can be used as an alternative emergency food can also be used as a nutritious snack that is consumed in between meals, can be consumed by various ages (infants aged 0-12 months are not included in it).
4. Conclusions
The best composition of emergency food in the form of cookies, prepared from banana flour, soy flour, and moringa flour is F3 banana flour 20%, soy flour 20%, and Moringa flour 5%. The nutrient composition of each 100 g of product was 14.68 g of protein, 36.9 g of lipids, 42.12 g of carbohydrate and 559.35 kcal of energy. In terms, emergency food already fulfills the adequacy standard, which is a minimum energy of 233 kcal/50 gram and 7.9 to 8.1 g protein. This product is swallowed easiest, delicious, with no bitter aftertaste and most preferable compared to other formulas.

References
[1] Sunarjo., Gunawan, M. T., Pribadi, S 2010 Gempa Bumi Edisi Populer (Jakarta: BMKG) (in bahasa)
[2] Zoumas, B.L., L.E. Armstrong, J.R. Backstrand., W.L. Chenoweth., P. Chinachoti, B. P. Klein, H. W. Lane., K.S. Marshall., M. Tolvanen 2002 High-Energy, Nutrient-Dense Emergency Relief Food Product. Food and Nutrition Board : Intitute of Medicine (Washington DC: National Academy Press)
[3] Sutomo, Budi 2012 Cookies Entrepreneurial Success (Jakarta: Kriya Pustaka)
[4] Institute of Medicine 1995 Estimated mean Energy per Capita Requirement for Pahning Emergency Food Aid Rations (Washington DC: National Press Academy)
[5] Adi A, Rachmah Q and Arimbi A 2019 The Acceptance and Nutritional Value of Crispy Noodles Supplemented with Moringa oleifera as a Functional Snack for Children in a Food Insecure Area Prev. Nutr. food Sci. 24 387–92
[6] Joni M.S., Sitorus M, dan Katharina N. 2008. Prevent Malnutrition with Moringa. (Yogyakarta: Kanisius Publisher)
[7] Muslimatin W, Jadid N, Safitri C E and Kuncoro E P 2018 In vitro germination of Moringa oleifera synthetic seed on different composition of medium Biosci. Res. 15 1982–91
[8] Winarsi, H 2010 Soy Protein and Sprouts Benefits for Health (Yogyakarta: Kanisius Publisher) Page 227.
[9] Prabawati, S., Suyanti dan Setyabudi, D. A 2008 Postharvest Technology and Banana Processing Techniques. Editor: Wisnu Broto. Balai Besar Penerbitan dan Pengembangan Pertanian.
[10] Prawiranegetara, D. D 1981 Daftar Komposisi Bahan Makanan (Jakarta: Bhratara Karya Aksara) (in bahasa)
[11] Syarifah Aminah et. al 2015 Nutrient Content and Functional Properties of Moringa oleifera. Urban Agriculture Bulletin 5 (2)
[12] Basito., Muhammad Aji. D.R. 2013 Physicochemical and Organoleptic Characteristics of Pumpkin Yellow Food Bars (Cucurbita Máxima) With the Addition of Dantepung Soybean Beans Flour as an Alternative. J. of Agric Product Tech, 6 (2)
[13] Chong, Li. C 2007 Utilisation of Matured Green Banana (Musa Parasisiacavar Awak) Flour and Oat Beta Glucaen as fibre Ingridients in Noodles. Thesis.University of Malaysia. 6-24.
[14] Setyadi Anindita Didit 2016 Effect of Banana Flour Type (Musa Paradisiaca) and Roasting Time on the Characteristics of Banana Flakes. Essay. (Bandung: Pasundan University)
[15] Adejumo, A. L., Fatai A. A. And Rasheed U. O 2013 Relationship Between alpha-Amylase Amylase degredation and Amylose/Amylopectin Content of Maize Starches-Advances in Applied. Science Research 4 (2) 315-319.
[16] Sudarmadji. S. dkk 2007 Analysis of food and agriculture. Liberty. Yogyakarta.
[17] Bilang, Mariyati 2013 Studying the Addition of Soybean Yogurt Powder as a Substitution of Cow's Milk in the Biscuit Formula. Proceedings of the PATPI National Seminar. Jember
[18] Gaman, P. M., dan Sherrington, K. B 1992 Food Sciences: Introduction to Food Science, Nutrition, and Microbioligy, Second Edition (Yogyakarta: UGM – Press)
[19] Astuti 2007 Practical Instructions on Material Analysis by Oven Drying Method (Yogyakarta :
Jurdik Biologi FMIPA UNY)

[20] Nurilmala, M, M. Wahyuni, H. Wiratmaja 2006 Improving the Value Added of Tuna (thunnusspp) Bone Waste into Gelatin and Physics-Chemical Analysis. J. of Fish. Product Tech. Bulletin 9 (2): 22-33

[21] Algafari B. Manggara, Muh. Shofi 2018 Analysis of Mineral Content of Moringa Leaves (Moringa oleifera Lamk.) Using XRF Spectrometers (X-Ray Fluorescence). Akta Kimindo 3 (1): 104-111

[22] Setyaningsi, Anggraeni Gigih 2008 Formulation of Emergency Food Products Based on Sweet Potato Flour, Banana Flour and Green Bean Flour Using Intermediate Moisture Foods (IMF) Technology Essay (Bogor: Agricultural Technology. IPB)

[23] Jansen Silalahi and Netty Hutagalung 2010 Bioactive Components in Food and Their Effects on Health. Department of Pharmacy (Medan: Faculty of Math and Science. University of North Sumatra)

[24] Melo, N. V., Vargas, T. Quirino and C. M. C. Calvo 2013 Moringa oleifera L. An underutilized tree with macronutrients for human health. Buletin Pemanganan Perkotaan 5 (2), 2015 43 Emir. J. Food Agric, 25 (10): 785-789.

[25] Turisyawati Ratih 2011 Utilization of Suweg Flour (Amorphopallus Campanulatus) As a Substitution of Wheat Flour in Making Cookies. Essay. Surakarta: Universitas Sebelas Maret

[26] Fellows, P. J 2000 Food Processing Technology: Principles and Practice (London: Woodhead Publishing)

[27] Gaines C. S 1992 Objective assessment of cookie and cracker tecture. Di dalam: H. Faridi (ed). The Science of Cookie and Cracker Production (New York Chapman and Hall)

[28] Christian Melia 2011 Processing of Banana Bars with Inulin as an Alternative to Emergency Food. Essay. (Bogor: Bogor Agricultural University)

[29] Almatsier, S 2002 Basic Principles of Nutrition (Jakarta: PT. Gramedia Pustaka Utama)

[30] Winarno, FG 2002 Food Chemistry and Nutrition (Jakarta: Gramedia)

[31] Avianty S, Ayustaningwarno F 2013 Nutritional Content and Preferred Level of Black Soy Sweet Potato Snack Bars as Alternative Alternatives for Patients with Type 2 Diabetes Mellitus. J. of Nutr Coll, 2 (4):622-9

[32] Meilgard, M., G. V. Civille, and B. T. Carr 1999 Sensory evaluation techniques 3rd Ed. CRC Press, Boca Raton.

[33] Rosiydah, A.Z 2016 The study of respondents' preference level for the diversification of side dishes from Moringa oleivera leaves E-journal Boga, 5 (1), 17-22.

[34] Kustiani A 2013 Development of protein and mineral source crackers with African catfish (Clarias gariepinus). [essay]. Bogor (ID): Bogor Agricultural University.

[35] Kartika, Bambang, Puji Hastuti, Wahyu Supartono 1988 Guidelines for sensory testing of food ingredients. (Yogyakarta: UGM)

[36] Rudianto 2014 Study of making and analyzing nutrients in the moringa oleifera biscuit product with the substitution of Moringa leaf flour. Thesis. (Makassar: Universitas Hasanuddin)

[37] Rosniar, M 2016 Differences in the level of hardness and acceptability of biscuits from sorghum flour which is milled and not milled. Scient J of Muhammadiyah University Surakarta 1 (1).