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# Rastame Bar Formulation made from Black Rice Flour and Red Bean Flour as An Alternative to Emergency Food

**Vina Cahyani Putri**[1], **Wiwit Estuti**[2]
[1] Tasikmalaya Ministry of Health Health Polytechnic, West Java, Indonesia

**Abstract.** Geographically and demographically, Indonesia is an area that is prone to natural objects. The National Disaster Management Agency (BNPB) recorded 3,431 natural disasters that have hit various regions in Indonesia from early January to December 2022. Emergency Food Product (EFP) is a product that is designed and used in emergencies without having to go through various cooking processes so that it can be directly consumed. EFP is designed to meet the caloric needs of 233-250 kcal / 50 grams of ingredients. One example of an emergency food product is a snack bar or food bar. This type of research uses the Hedonic Scale Test, which is in the manufacture of Black Rice Flour and Red Bean Flour Rastame Bar products with a Complete Randomized Design (RAL) research design with 3 formulations and 2 repetitions. The organoleptic test was carried out by panelists with a total of 25 moderately trained panelists who were students of the Cirebon Nutrition Study Program level II and III by obtaining the best nutritional content formulation (energy, protein, fat, and carbohydrates) Bar Rastame using the Indonesian Food Composition Table (TKPI) 2017. The treatment used was the ratio of black rice flour to red bean flour respectively by F1 (40%:5%), F2 (35%:10%), and F3 (30%:15%). The selected snack bar is a ratio of 35% black rice flour and 10% red bean flour. The nutritional content of 50 grams of Rastame Bars with a protein content of 5.3 grams, fat content of 4 grams, carbohydrate content of 21.8 grams, and total calories of 143.6 kcal. The characteristics of selected Rastame Bars are a slightly faded blackish color, skimmed milk aroma but not too smelly, hard texture but soft inside, and less sweet taste.

**Keywords:** Snack Bar, Black Rice Flour, Red Bean Flour, Emergency Food

## INTRODUCTION

Geographically and demographically, Indonesia is an area prone to natural and non-natural disasters such as tectonic earthquakes, tsunamis, floods, and tornadoes. Non-natural disasters caused by human activities that do not manage nature properly can lead to natural disasters, such as landslides, flash floods, forest fires, and droughts. In addition, the socio-cultural diversity of the community (BNPB, NA). The National Disaster Management Agency (BNPB) recorded 3,431 natural disasters that have hit various regions in Indonesia from early January to December 2022. The province with the most disaster incidents is West Java with 811 incidents. In Cirebon City, BPBD Cirebon City has recorded 85 disaster events.

The impact of the disaster, both natural disasters and social conflicts, resulted in emergencies in all fields including emergencies of health and nutrition problems. Food aid that is often late, unsustainable, and limited availability of local food can worsen existing conditions. Feeding disaster victims is intended to meet food needs in carrying out daily activities and maintain or improve nutrition to get an optimal level of immunity to deal with possible outbreaks of disease when in an emergency. If the food consumed by disaster victims is not safe, it will worsen their health condition. One of its manifestations is the presence of extraordinary events (outbreaks) in the form of poisoning. (Karimah, et.al, 2021).

Emergency Food Product (EFP) is a product that is designed and used in emergencies without having to go through various cooking processes so that it can be directly consumed by the community. One example of a product that can be said to be EFP is a snack bar (Ekafitri and Faradilla, 2011). According to Zoumas et al., (2002) in emergency food development, several critical characteristics must be considered, namely: safe, has an acceptable color, aroma, texture, and appearance, easy to distribute, easy to use, and complete nutrition. EFP is designed to have an energy content of 2100 kcal consisting of 35-45% fat, 10-15% protein, and 40-50% carbohydrates. Emergency food for disaster victims, especially ready-to-eat ones, has not yet been developed in Indonesia but has developed a lot for the benefit of soldiers in the field.

Indonesia is rich in local food sources that have a high potential to be developed as emergency food. Black rice has a protein content of 8%, fat of 1.3%, carbohydrates of 76.9%, and fiber of 20.1%. Black rice has potential as a functional food because it contains bioactive components, namely polyphenolic compounds, flavonoids, phytic acid, and ɣ-oryzanol which act as antioxidants, anti-inflammatory and have other important benefits for health (Kong et al., 2012; Pang et al., 2018). Red beans are a potential source of vegetable protein as well as a high source of energy (Astawan in Heluq and Mundiastuti, 2018). Red beans are one of the most famous pea groups in the world that have bright prospects in the future.

EFP that is ready to eat and its practical form is *a snack bar.* Snack bars are known as snack products that have a rod shape and are a mixture of various ingredients such as cereals, fruits, and nuts that are tied to each other with the help of binding agents (Maulidia, 2023). This study aims to determine the formulation of snack bars made from black rice flour and red bean flour as an alternative to emergency food.

## LITERATURE

EFP is a product that is designed and used in emergencies without having to go through various cooking processes so that it can be directly consumed by the community. One example of a product that can be said to be EFP is a snack bar (Ekafitri and Faradilla, 2011). EFP is a food that has high energy and nutrients for natural disasters and emergency food use is carried out for 3 to 7 days a maximum of 15 days. According to Widjanarko (2008), food bars are made from a mixture of food ingredients with enriched nutrients and then formed into solid and unified forms. This food is resistant to pressure compared to dry food products because it includes semi-wet products produced in traditional and modern ways (Antonia, 2019).

Snack bars are used for snacks or can also be used as a substitute food. Consuming snack bars can prevent hypoglycemia. Carbohydrates contained in snack bars will be absorbed by the body slowly so that they can be a source of continuous glucose. Snack bars are good for consumption in the morning or afternoon and are not suitable for night consumption (Jauhariah, 2013 in Rachman, 2019). Snack bars are formulated with healthy ingredients such as oatmeal, nuts, and fruits. Energy in snack bars is not always low in calories but has high nutritional value. With a combination of proteins, carbohydrates, vitamins, and minerals. Snack bars can meet nutritional needs both in the morning and evening.

In making snack bars that are good and safe for consumption by the public during emergencies, they must meet the requirements of quality standards that have been set in general in Indonesia, namely based on the Indonesian National Standard with SNI code 01-2886-1992, as listed in Table 1.

Table 1 Quality Standards of Snack Bars According to SNI 01-2886-1992

| No | Kriteria Uji | Satuan | Persyaratan |
|---|---|---|---|
| 1. | Keadaan | | |
| 1.1 | Bau | - | Normal |
| 1.2 | Rasa | - | Normal |
| 1.2 | Warna | - | maks. 4 |
| 2. | Kadar Air | % | 1,4 – 14 |
| 3. | Keadaan Lemak | % | 9 – 25 |
| 4. | Keadaan Protein | % | 120 |
| 5. | Nilai Kalori | Kkal | maks. 0,1 |
| | Kadar silikat (b/b) | % | |
| 6. | Bahan tambahan makanan | | |
| 6.1 | Pemanis buatan | - | Sesuai SNI 01-0222-1995 |
| 6.2 | Pewarna buatan | - | Sesuai SNI 01-0222-1995 |
| 7. | Cemaran logam | | |

| | | | |
|---|---|---|---|
| 7.1 | Timbal (Pb) | mg/kg | maks. 1,0 |
| 7.2 | Tembaga (Cu) | mg/kg | maks. 10 |
| 7.3 | Seng (Zn) | mg/kg | maks. 40 |
| 7.4 | Merkuri (Hg) | mg/kg | maks. 0,05 |
| 7.5 | Arsen (As) | mg/kg | maks. 10 |

Sumber : Badan Standardisasi Nasional dalam Ningrum, 2021

## METHOD

The type of research used is experimental research or experiments with descriptive analysis. This study aims to determine the formulation of Bar Rastame made from black rice flour and red bean flour as emergency food through organoleptic testing using hedonic tests including color, aroma, texture, and overall taste. Research in the form of making Rastame Bars, black rice flour, and red bean flour tested organoleptic using hedonic tests. The Complete Randomized Design was used in this study with three treatments and two repeats so that there were six experimental units. The design can be seen in Table 1.

Table 1 Complete Randomized Design

| Deuteronomy | Formula | | |
|---|---|---|---|
| | F1 | F2 | F3 |
| 1 | | | |
| Kode | 603 | 278 | 600 |
| Penyajian | 2 | 1 | 3 |
| 2 | | | |
| Kode | 318 | 641 | 401 |
| Penyajian | 3 | 1 | 2 |

The formulation begins to determine the proportion of purple sweet potato flour and red bean flour in a ratio (90:10, 80:20, 70:30) and adds other ingredients such as dates, corn sugar, margarine, skim milk, eggs, salt, vanilla flavor, water, and oats (Zaddana, et.al. 2021). To make emergency food snacks, nutritional value estimates are carried out according to (Zamous*, et al.,* 2002) can be seen from Table 2.

Table 2 Emergency Food Nutrition Requirements

| Nutrients | Minimum needs/50 gr EEP | Maximum needs/50 gr EEP |
|---|---|---|
| Energi | 233 kcal | 250 kcal |
| Protein | 7,9 gr | 8,9 gr |
| Lemak | 9,1 gr | 11,7 gr |
| Total Karbohidrat | 11,7 gr | 14,7 gr |

Ket : *EFP = Emergency Food Product

Sumber: Zoumas, et.al., 2002

The determination of the formulation and proportion of black rice flour and red bean flour was obtained from the results of research (Zaddana, et.al. 2021) by modifying the

modified purple sweet potato flour ingredients with black rice flour as the main ingredient and oatmeal, sugar, skim milk, eggs, and margarin as supporting ingredients. After calculating the estimated nutritional content of the Rastame bar formulation, can be seen in Table 3.

Table 3 Bar Rastame Formulation (ingredient composition (% ) of each type of formula

| Material | (F1) | | (F2) | | (F3) | |
|---|---|---|---|---|---|---|
| | Gram | % | Gram | % | Gram | % |
| T. beras hitam | 80 | 40 | 70 | 35 | 60 | 30 |
| T. kacang merah | 10 | 5 | 20 | 10 | 30 | 15 |
| *Oatmeal* | 10 | 5 | 10 | 5 | 10 | 5 |
| Gula | 5 | 2,5 | 5 | 2,5 | 5 | 2,5 |
| Susu skim | 20 | 10 | 20 | 10 | 20 | 10 |
| Telur | 20 | 10 | 20 | 10 | 20 | 10 |
| Margarin | 15 | 7,5 | 15 | 7,5 | 15 | 7,5 |
| Air | 40 | 20 | 40 | 20 | 40 | 20 |
| SUM | 200 | 100 | 200 | 100 | 200 | 100 |

The ingredients used are black rice flour, red bean flour, oatmeal, sugar, skim milk, eggs, and margarine. Tools used include digital scales, electric ovens, cake pans, spatulas, basins, bowls, spoons, cutting boards, and knives. The independent variable in this study was the formulation of black rice flour and red bean flour, while the dependent variable was organoleptic properties (including color, aroma, taste, texture, and whole) and the control variables were temperature, time, tools, and ingredients.

The assessment of snack bar formulations was carried out by trained panelists as many as 25 students of level 2 and 3 nutrition study programs. Panelists rated based on organoleptic properties (including color, aroma, taste, texture, and whole) using the formula provided. Panelists' inclusion criteria are willing to be panelists, like snack bars, not allergic to red beans, and healthy conditions. The criteria for inclusion of panelists were physically and psychologically unhealthy, allergic to kidney beans, and not present at testing.

## DISCUSSION

Making snack bar formulations consists of 3 formulations with 2 repetitions. The formulation is carried out according to a pre-designed formula. Bar Rastame formulation of black rice flour and red bean flour with a percentage of total ingredients, namely F1 (40%:5%), F2 (35%:10%), and F3 (30%:15%). Making snack bars is carried out at the Food Laboratory of the Cirebon Nutrition DIII Study Program, Tasikmalaya Health Polytechnic by going through several stages, namely the preparation stage of ingredients to the stage of

product packaging. The ingredients used in making Bar Rastame are black rice flour, red bean flour, oatmeal, skim milk, margarine, sugar, eggs, and enough water. After researching making products, results were obtained from one recipe F1 (40%: 5%), F2 (35%: 10%), F3 (30%: 15%), namely with a weight of 200gr Rastame Bar dough divided by each 50gr portion obtained 4 servings of Rastame Bars with a total of 4 bars/portion, weight per bar is 12.5gr.

Organoleptic tests on snack bar products with parameters of color, aroma, taste, texture, and overall on 3 formulas, namely F1 F1 (40%:5%), F2 (35%:10%), F3 (30%:15%). The favorability level used in organoleptic assessment consists of 1 (strongly dislike), 2 (dislike), 3 (somewhat like), 4 (like), and 5 (strongly like). Organoleptk assessment uses hedonic tests with trained panelists as many as 25 people who are 2nd and 3rd year students of the Nutrition study program. The following are the results of the organoleptic snack bar assessment by panelists presented in Table 4.

Table 4 Organoleptic Bar Rastame Assessment Results

| Formulation | Average favorability score | | | | Average |
|---|---|---|---|---|---|
| | Color | Aroma | Taste | Texture | |
| F1 | 3,7 | 3,6 | 3,5 | 3,5 | 3,5 |
| F2 | 3,8 | 3,5 | 3,4 | 3,7 | 3,6 |
| F3 | 3,8 | 3,5 | 3,3 | 3,4 | 3,5 |

Source: Research Data

The highest average favorability value in color parameters is found in F2 and F3 which is 3.8, aroma is found in F1 which is 3.6, taste is found in F1 which is 3.5, and texture is found in F2 which is 3.7. Snack bar products with the best formulation variations based on the average research of the overall test results which include the color, aroma, taste, and texture of each treatment. The highest average in F2 is 3.6.

The estimated nutritional content of each snack bar formulation per recipe includes energy, protein, fat, and carbohydrate content illustrated in Table 5.

Table 5 Estimated Nutritional Content of Snack Bars Per 100 Grams

| Treatment | Nutritional Content | | | |
|---|---|---|---|---|
| | Energy | Protein | Fat | Carbohydrates |
| F1 | 289,0 | 9,9 | 8,1 | 44,5 |
| F2 | 287,2 | 10,6 | 8,0 | 43,5 |
| F3 | 285,3 | 11,3 | 8,0 | 42,5 |

Source: Indonesian Food Composition Table, 2017

Based on Table 5 of the estimated nutritional content of Bar Rastame per 100 grams made from black rice flour and red bean flour per the best recipe, namely, F2 has an estimated value of energy content of 306.6 kcal, protein 11.4 grams, fat 8.4 grams, and carbohydrates 46.8 grams. The estimated nutritional content per 50-gram (4 bars) snack bar is presented in Table 6 using the formula for calculating the daily value as follows:

$$\%\text{AKG} = \frac{Kandungan\ zat\ gizi\ per\ 50\ gram}{Kecukupan\ gizi\ dewasa\ (19-29\ thn)}\ x\ 100$$

Table 6 Estimated Nutritional Content of Snack Bars Per Serving (50 grams)

| Serving Size | 4 bar (50 gram) | |
|---|---|---|
| Number of servings per pack | 1 | |
| QUANTITY PER SERVING | | %AKG |
| Total Energy | 143,6 | 6,4% |
| Protein | 5,3 | 8,8% |
| Total Fat | 4 | 6,2% |
| Total Carbs | 21,8 | 6,1% |

In this study, snack bar formula processing was divided into 1 processing, namely snack bar processing. Processing was carried out 2 times in the Food Laboratory of the D3 Nutrition Study Program of Cirebon, Tasikmalaya Health Polytechnic. Snack bar processing goes through several stages. The first stage of making a snack bar is the preparation of the ingredients to be used. The ingredients used in making snack bars are black rice flour, red bean flour, oatmeal, skim milk, sugar, margarine, eggs, and enough water.

With the weighing of each ingredient is different for each formulation, for F1 the ingredients used are black rice flour 80 gr, red bean flour 10 gr, oatmeal 10 gr, sugar 5 gr, skim milk 20 gr, eggs 20 gr, and margarine 15 gr. Furthermore, F2 ingredients include black rice flour 70 gr, red bean flour 20 gr, oatmeal 10 gr, sugar 5 gr, skim milk 20 gr, eggs 20 gr, and margarine 15 gr. And then F3 ingredients used black rice flour 60 gr, red bean flour 30 gr, oatmeal 10 gr, granulated sugar 5 gr, skim milk 20 gr, eggs 20 gr, and margarine 15 gr. In each formulation, 40 ml of water is added as a diluent so that all ingredients are mixed evenly.

The next stage is the process of beating off the eggs, then mixing oatmeal, skim milk, sugar, and margarine that have been weighed according to the weight of each formula and then stirred using a spoon or spatula. Next, add black rice flour and red bean flour according to the weight of each formula. Then the snack bar dough is printed using a spoon on a baking sheet measuring 30 x 24 x 3 cm. Then the snack bar dough in the oven at a temperature of 120oC for 10 minutes. After the first 10 minutes, remove the dough from the oven and cut

into cubes the snack bar dough. After that in the oven again with a temperature of 120oC for 10 minutes. Researchers used an electric oven to bake a snack bar.

If the time on the oven timer has sounded, then immediately remove and remove the dough that has become a snack bar and let it sit for a while so that the snack bar is easy to remove from the pan. The last stage is snack bar packaging, snack bar packaging is packaged using mica plastic and given a code for each treatment, then the snack bar is ready for organoleptic testing. The results of each formula get a snack bar of 16 bars with a weight per bar of 50 grams.

Organoleptic test results are used to determine the best snack bar product. The level of liking for snack bars is given a rating on a scale of 1 (very dislike), 2 (dislike), 3 (somewhat like), 4 (like), and 5 (very like). The color, aroma, taste, and texture of food play a major role in the appearance of food because it is the first stimulation to the senses of the eye. The following is the average organoleptic value of color, aroma, taste, and texture parameters from the results of Bar Rastame analysis as shown in Table 7.

Table 7 Organoleptic Test Results of Color, Aroma, Taste, and Texture Parameters

| Organoleptic Components | Formula | N | Average |
|---|---|---|---|
| Color | F1 | 25 | 3,7 |
| | F2 | 25 | 3,8 |
| | F3 | 25 | 3,8 |
| Aroma | F1 | 25 | 3,6 |
| | F2 | 25 | 3,5 |
| | F3 | 25 | 3,4 |
| Taste | F1 | 25 | 3,5 |
| | F2 | 25 | 3,4 |
| | F3 | 25 | 3,3 |
| Texture | F1 | 25 | 3,5 |
| | F2 | 25 | 3,7 |
| | F3 | 25 | 3,4 |

The color on the snack bar product with the best average value or the most liked by the panelists is the F2 and F3 snack bars, which is 3.8 (somewhat liked). For the color of the snack bar, the second and third formulations are rather thick black, because the percentage of black rice flour is more than the percentage of red bean flour. Compared with the results of Zaddana's research, et al. (2021) has an average value of 4.1 (likes) because the study used purple sweet potato flour so that it can produce an attractive color. The aroma on the snack bar with the highest average value is found in the snack bar with the formula F1, which is 3.6 (somewhat like). The resulting snack bar has a distinctive aroma of black rice flour. The aroma of snack bars in Zaddana's research, et al. (2021) has a result of 4.3 (likes) because in the study researchers used vanilla flavoring to add fragrance.

The taste on the snack bar with the highest average value is found in the snack bar with the F1 formula, which is 3.5 (somewhat like). The resulting snack bar is less sweet and a bit savory because black rice flour and red bean flour do not have a sweet taste. Compared to Zaddana research, et.al. (2021) The taste that has the highest value is 4.6 (likes) because sweet potato flour has a sweet taste. The texture on the snack bar with the highest average value is found in the snack bar with the F2 formula which is 3.7 (somewhat like). The F2 snack bar has a dry texture on the outside but is rather soft on the inside. Compared with Zaddana, et al. (2021) has a texture value of 4.2 (likes) with a crunchy texture.

The determination of the selected formulation was based on organoleptic tests by 25 moderately trained panelists, the best formulation was obtained which was F2 with an overall average value of 3.6 which means that the panelists were rather fond of snack bar products in the F2 formula. The results of the proximate analysis, namely the adequacy of nutrients and the contribution of snack bar energy that meets emergency food requirements, namely the use of 35% black rice flour and 10% red bean flour which has an energy of 143.6 kcal. Black rice flour and red bean flour have a bland taste or no sweetness, therefore organoleptic tests on color, aroma, taste, texture, and overall will also affect the assessment given by the panelists. With an energy yield of 143.6 kcal, it can meet half of the portion specified in emergency food requirements. For one portion in an emergency, food requirements are 233-250 kcal per 50 grams. To achieve nutritional adequacy, it is recommended as a reference for further research to add several ingredients such as full cream milk and melted chocolate so that an energy of 205 kcal is obtained.

## CONCLUSION

The best formulation is found in F2 with a percentage of black rice flour 35% and red bean flour 10% (3.6). The method to determine the estimated nutritional content of Bar Rastame uses the Indonesian Food Composition Table (TKPI) 2017. The best nutritional content of Bar Rastame per 100 grams, namely energy 287.2 kcal, protein 10.6 gr, fat 8 gr, and carbohydrates 43.5 gr. To meet the energy needs of emergency food, it is recommended that Bar Rastame products be served as much as 50 grams (4 bars). With nutritional content per 50 grams, namely energy 143.6 kcal, protein 5.3 gr, fat 4 gr, and carbohydrates 21.8 gr.

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