Natural Resources for Human Health

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Original Research

View Article Online

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Received 23 July 2024
Revised 23 September 2024
Accepted 30 September 2024
Available online 02 January 2025

Edited by Kannan RR Rengasamy

KEYWORDS:
Natural Disaster
Climate change
Functional Food
Force majour
Local food

Natr Resour Human Health 2025; 5 (1): 171-180
https://doi.org/10.53365/nrfhh/193924
eISSN: 2583-1194


# The Utilization of Rice and Red Bean as Indigenous Food Source in Emergency Food Products

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**ABSTRACT:** This study investigated the composition of rice flour and red bean flour in formulating emergency food products (EFP). The rice flour and red bean flour were added individually according to nine levels as a mixture of the other ingredients. EFP should meet the minimum values of Carbohydrates and protein. Soft cookies are the EFP made in this research. The characteristics evaluated were sensory evaluation, hardness level, colour, and proximate analysis to fulfil its EFP properties. The best-known treatment is a ratio of 50% rice flour and 50% red bean flour combination. Soft cookies have a characteristic hardness of 11846.5 Kgf at this concentration based on texture tests with a hedonic value of 3.77. The proximate analysis results show that the carbohydrate content is 66.3%, and the protein content is 11.6%. It follows the characteristics of emergency food with the requirement of 40-50% carbohydrates and 10-15% protein. Rice flour and red bean flour provide different characteristics in soft cookie products. With the richer rice flour in its composition, the soft cookies would gain a crunchier texture and a slightly white, brown colour. Meanwhile, the richer red bean flour, on its composition, would make the soft cookies stiffer, having a brittle texture, a slightly reddish-brown colour, and a dominant red bean aroma and taste.

## 1. INTRODUCTION

Emergency Food Product (EFP) is a processed product specifically designed to be consumed by disaster victims' nature or in an emergency. The situation can be considered an emergency if a disaster hits an area and experiences damage. The facilities are pretty bad, so the impact on the community is that it is challenging to look for food. The principles of emergency food products are that food must be ready to be consumed directly (ready to eat) and can be consumed by all ages, from toddlers to adults. Products used for emergency food must have characteristics such as safe, acceptable, easy to share, easy to transport, easy to use, and complete Nutrition (Toland et al., 2023).

The requirements for emergency food are 10-15% protein content, 35-45% fat, 40-45% carbohydrates, and 233-250 kcal/50 g calories (Jablonski et al., 2021). EFP contains high energy and nutrients intended for victims of natural disasters and can be consumed for 3 - 7 days to a maximum of 15 days (Li et al., 2023). Carbohydrates play an important thing in filling and protein helps maintain body muscle mass in disaster victims. Having a long shelf life of food is also one of the requirements for emergency food.

Biscuits are a ready-to-eat food that can have a long shelf life. Regulating the conditions of free and bound water content in products can help extend their shelf life. However, biscuits that should be served as emergency food are those that have a soft texture to make them easier to digest in disaster areas where clean drinking water is usually difficult. Soft cookies have a crunchy texture on the outside, but when bitten, they have a sticky and smooth texture. Soft cookies are a type of snack consumed for all ages. However, as time passes, soft cookies can be found as a daily snack or an option as EFP because they are small, easy to pack, and have high nutritional content. It fits the criteria for EFP that it must be ready to eat and could be consumed by all ages, from toddlers to adults (Cairano et al., 2018).

Several severe natural disasters have occurred worldwide regarding climate change in the last three years (Gomez-Zavaglia et al., 2020). Therefore, in preparing for emergencies, it is necessary to design exceptional food for disaster emergencies that can be consumed immediately (ready to eat), practical to distribute, and nutritious. (Kusumastuty et al., 2015). Carbohydrates and protein are critical in EFP in terms of fulfilling its Nutrition.

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Rice and red bean flour are evaluated as the primary raw materials for making Soft Cookies. Those primary raw materials are Indonesia's indigenous natural resources, considering the Indonesian government's self-sufficiency program makes staple rice and red beans a national priority. This is because most Indonesians still consume rice as the leading food (Handani & and, 2021). Rice is a source of carbohydrates which is the staple food of Asian nations, and has a high glucose content, so it can provide fast and efficient energy for the body. Additionally, rice is easy to digest, making it an ideal choice for all groups, including children and the elderly. Rice also does not contain allergenic ingredients, unlike some other carbohydrate sources such as wheat, which can cause allergic reactions in some people. Rice is the most accessible source of carbohydrates to digest, and it has a glycemic index value of 72.84% (Xu et al., 2022). This glycemic index value indicates that rice is straightforward to digest.

The red beans are needed to increase the protein value of Soft Cookies. Red beans are local foods that can be used as alternative ingredients because they have a protein content of 17.24 grams in 100 grams and are cheaper than other beans (Hill, 2022). Red beans can be used as an emergency food raw material because they have a distinctive bean odor, and the risk of allergens tends to be lower than other beans produced as a local food source (Cornelia & Lessy, 2018). The advantage of red beans compared to other local Indonesian beans is that they do not contain allergenic compounds, are high in vegetable protein, and are low in saturated fat, making them a healthy choice for those who want to increase protein intake without adding excess calories. In addition, red beans are rich in fiber, which not only helps digestion but also makes you feel full for longer. Based on previous research, the content of red beans used in bakery preparation formulations is acceptable, with a 25 - 50% concentration range.

The amount of rice composition can be unlimited; however, in this study, carbohydrates and protein are required for a product to be categorized as EFP. Apart from the primary raw materials of rice flour and red bean flour, the formulation contains auxiliary ingredients used to improve the texture and sensory acceptance of the product. Therefore, this study aimed to determine the effect of rice flour and red bean flour in making soft cookies as emergency food.

## 2. MATERIAL AND METHODS

### 2.1. The design of soft cookie product formulation

The comparative composition of auxiliary and primary raw materials is (40:60) (Novidahlia et al., 2022). The complete composition of auxiliary material is 100%. The method used was an experimental study with Complete Randomized Design (CRD). The total amount of ingredients in the auxiliary materials is 100%, as well as the primary raw materials. However, the number of comparative compositions in production is 40% for auxiliary materials and 60% for the primary raw materials. The formulations used for both auxiliary materials and primary raw materials are presented in Table 1 based on a completely randomized design where the implementation was repeated three times so that eighteen research activities were carried out.

The manufacturing process begins with the mixing stage, carried out twice. In the first stage, sugar and butter were mixed until homogeneous. In the second stage, rice flour, red bean flour, purple sweet potato flour, soy protein isolate, and melted milk powder were added to the mixture and stirred until smooth. After the dough was soft, the dough was formed with a size of D = 13cm and a thickness of 1cm. Put the dough that has been shaped according to size into the electric oven at the baking stage at a temperature of 150°C for 20 minutes.

### 2.2. Sensory Evaluation

Prepare a 1x1 sample and serve it on a small plate. Then, code randomly to show the differences between the formulas. Next, the researcher involved 30 people to become panelists. Panellists were asked to try the sample and then give a score of 1-5, where number 1 is a very disliked response while number 5 is a very like response. The parameters tested included colour, aroma, taste and texture (Visalli & Galmarini, 2024) .

### 2.3. Physical Characterization

#### *2.3.1 Colour Analysis*

Open the ImageJ application and select open to select the image to be colour tested. Then, select the rectangle tool and select the area to be tested. Then, select analyze histogram to see the RGB results of the sample Yudiastuti et al. (2021)

#### *2.3.2 Hardness Analysis*

Prepare a Texture Plus tool with a cell size of 30 kg and a cylindrical probe (P/50) with a flat tip. Set the pre-test speed of 0.50 mm/s, test speed of 0.50 mm/s and post-test speed of 0.50 mm/s and the Force associated with deformation of 50% of the sample height. Prepare a 1x1 sample and click start to operate the TA—XT plus tool (Shikama et al., 2024) .

### 2.4. Determination of the Selected Formula

Determination of the selected formulation in this research was carried out using the de Garmo method, weight value (WV). The assessment parameters used for this test were sensory characteristics (colour, taste, aroma and texture) and physical characteristics (colour and texture). The de Garmo method determines the selected formula based on the effectiveness value (EV). The chosen formula can be determined with all treatments' highest productivity value (PV). This value was obtained by considering the parameters chosen to determine product quality (Yulianti et al., 2024). The determination was done as follows:

Determine the best and worst results for each parameter

Determine the weight value of each parameter

Calculate the effectiveness value (EV using the formula:

$$Efectiveness\ \ value\ \ (EI) = \frac{(Treatment\ value - lowest\ value)}{(highest\ value - lowest\ value)}$$

**Table 1**
Soft cookies formulation.

| | Material | Treatment Design | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A0 | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 |
| Auxiliary (g) | Purple sweet potato flour | 3.2 | 3.2 | 3.2 | 3.2 | 3.2 | 3.2 | 3.2 | 3.2 | 3.2 | 3.2 |
| | soy protein isolate | 3.2 | 3.2 | 3.2 | 3.2 | 3.2 | 3.2 | 3.2 | 3.2 | 3.2 | 3.2 |
| | powdered sugar | 13.6 | 13.6 | 13.6 | 13.6 | 13.6 | 13.6 | 13.6 | 13.6 | 13.6 | 13.6 |
| | Buter | 11.2 | 11.2 | 11.2 | 11.2 | 11.2 | 11.2 | 11.2 | 11.2 | 11.2 | 11.2 |
| | Milk powder | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 |
| Primary raw (g) | Rice flour | 0 | 17.16 | 19.98 | 24 | 26.64 | 30 | 32.7 | 34.26 | 36 | 40.02 |
| | Red bean flour | 0 | 42.84 | 40.02 | 36 | 33.36 | 30 | 27.3 | 25.74 | 24 | 19.98 |
| | Wheat flour | 60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Calculating productivity value with a formula:

$$PV = EI\ x\ weight\ value$$

### 2.5. Chemical Characteristics Based on Selected Formulas

#### 2.5.1 Water content

Measurement of moisture content is carried out using the oven method. First, dry the cup in an oven at 100-105°C for 30 minutes or until a fixed weight is obtained. After that, cool it in a desiccator for 30 minutes and then weigh it. Weigh the sample as much as five salts (A) in a cup. Then, the sample is put into the oven at 100-105 ° C for 8-12 hours. Cool the sample in a desiccator for (30 minutes) and then weigh (B) (Yao et al., 2024).

#### 2.5.2 Total Fat

The determination of fat content was carried out using the Soxhlet method. The procedure for testing fat content is to dry the fat flask in an oven at 105°C for 30 minutes, then cool it in a desiccator (15 minutes) and weigh it (A). Weigh the sample as much as 5 g (S), then wrap it using filter paper and put it on a fat sleeve. The fat sleeve was covered with fat-free cotton and put into the extractor chamber of the soxhlet tube, then watered with fat solvent (hexane), and then the tube was attached to the soxhlet distillation device. The fat flask that has been prepared is then attached to the distillation device on an electric heater at a temperature of about 80 T. Reflux is carried out for 8 hours, or the solvent that descends into the fat flask is explicit. The solvent in the fat flask is distilled, and then the flask containing the extraction results is heated in an oven at 105°C for 60 minutes or until the weight remains. Then, the fat flask is cooled in a desiccator for 20-30 minutes and weighed (B) (Guo et al., 2023) .

#### 2.5.3 Total ash

Determination of ash content is done using the dry ashing method. This analysis aims to oxidize all organic substances at high temperatures (around 550 °C) and then weigh the substances left after combustion. The cup is dried for 30 minutes or until a fixed weight is obtained in an oven at 100-105°C. After that, it was cooled in a desiccator for 30 minutes and weighed (A). Samples of as much as 5 grams are put in a cup with known weight and then burned on a bunsen or electric stove until they are not smoking. After that, it was placed in an ashing furnace and then burned at 400 ° C until grey ash was obtained, or the sample weight remained. Then, the furnace temperature was increased to 550°C for 12-24 hours. Then, the sample was cooled in a desiccator for 30 minutes and weighed (B) (Ismail, 2024) .

#### 2.5.4 Crude Protein

The determination of protein content is carried out using the micro Kjeldahl method. The principle of this analysis is to determine protein based on the oxidation of carbonaceous materials and the conversion of nitrogen to ammonia. Furthermore, ammonia reacts with excess acid to form ammonium sulfate. After the solution becomes alkaline, ammonia is evaporated to be absorbed in the boric acid solution. The amount of nitrogen contained is determined by HCL titration. There are three stages in testing the protein content of the Kjeldahl method, namely the deconstruction, distillation, and titration stages (Jiang, 2020) .

#### 2.5.5 Carbohydrates

The results of the calculation of carbohydrate content are obtained from the total minus the total amount of water content, ash content, protein content, and fat content (Makizadeh et al., 2020).

## 3. RESULTS

### 3.1. Sensory Characterization

The sensory test uses the hedonic test to determine and measure consumer preference for soft cookie products. Assessment of hedonics using an odd number scale can provide a balanced final evaluation and get the best final assessment results. The results of sensory testing with the hedonic test method can be seen in Table 2.

#### 3.1.1 Colour

Colour is one of the test parameters included in hedonic sensory testing to know how much consumers like a product's colour. One of the main things in determining a product is colour. Colour can be a consumer attraction to a product,

**Table 2**
Sensory Evaluation Result.

| Code | Parameters | | | |
|---|---|---|---|---|
| | Colour | Aroma | Taste | Texture |
| A0 (Wheat flour=60) | $3{,}40 \pm 0{,}62^{a}$ | $3{,}57 \pm 0{,}67^{abc}$ | $3{,}43 \pm 0{,}56^{a}$ | $3{,}23 \pm 0{,}72^{a}$ |
| A1 (RF:RBF=17.16:42.84) | $3{,}50 \pm 0{,}73^{ab}$ | $3{,}33 \pm 0{,}66^{a}$ | $3{,}50 \pm 0{,}63^{a}$ | $3{,}50 \pm 0{,}68^{abc}$ |
| A2 (RF:RBF=19.98:40.02) | $3{,}83 \pm 0{,}87^{bc}$ | $3{,}73 \pm 0{,}82^{bc}$ | $3{,}70 \pm 0{,}98^{ab}$ | $3{,}67 \pm 0{,}95^{bc}$ |
| A3 (RF:RBF= 24:36) | $3{,}40 \pm 0{,}72^{a}$ | $3{,}53 \pm 0{,}62^{abc}$ | $3{,}63 \pm 0{,}85^{ab}$ | $3{,}43 \pm 0{,}72^{abc}$ |
| A4 (RF:RBF=26.64:33.36) | $3{,}53 \pm 0{,}73^{ab}$ | $3{,}50 \pm 0{,}68^{abc}$ | $3{,}47 \pm 0{,}73^{a}$ | $3{,}43 \pm 0{,}81^{abc}$ |
| A5 (RF: RBF=30:30) | $3{,}93 \pm 0{,}78^{c}$ | $3{,}83 \pm 0{,}74^{c}$ | $4{,}00 \pm 0{,}83^{b}$ | $3{,}77 \pm 0{,}89^{c}$ |
| A6 (RF:RBF=32.7:27.3) | $3{,}50 \pm 0{,}82^{ab}$ | $3{,}33 \pm 0{,}84^{a}$ | $3{,}40 \pm 0{,}85^{a}$ | $3{,}50 \pm 0{,}82^{abc}$ |
| A7 (RF:RBF=34.26:25.74) | $3{,}80 \pm 0{,}71^{bc}$ | $3{,}67 \pm 0{,}66^{abc}$ | $3{,}67 \pm 0{,}71^{ab}$ | $3{,}60 \pm 0{,}67^{abc}$ |
| A8 (RF: RBF=36:24) | $3{,}57 \pm 0{,}67^{ab}$ | $3{,}43 \pm 0{,}67^{ab}$ | $3{,}47 \pm 0{,}73^{a}$ | $3{,}23 \pm 0{,}77^{a}$ |
| A9 (RF:RBF=40.02:19.98) | $3{,}37 \pm 0{,}85^{a}$ | $3{,}40 \pm 0{,}89^{ab}$ | $3{,}40 \pm 0{,}77^{a}$ | $3{,}33 \pm 0{,}78^{ab}$ |

Notes: Numbers followed by different letters in each column indicate significant differences at 0.05% $\alpha$ level.
RF = Rice Flour; RBF = Red bean flour

making colour a critical factor. According to (Akbar et al., 2020) Color in food products is the main attraction before consumers recognize or like other properties. By looking at the colour, consumers can assess product quality easily and quickly. The colour parameter sensory test results can be seen in Table 2. The sensory test results with the colour parameter showed that the panelists liked the A5 treatment the most, with the ratio of rice flour and red bean flour 50%: 50%. This means that a balanced ratio makes the colour of soft cookies the most preferred. Rice flour is white, and red bean flour is yellow with a little red spot. When the two ingredients are mixed in a product, it will produce a reddish brown colour and a little dark red spot. Rice flour, red bean flour, and other supporting ingredients can also affect a product's colour. According to (Azmi et al., 2021), there are five causes of changes in food: pigments, caramelization reactions, Maillard reactions, oxidation reactions, and additional dyes.

#### 3.1.2 Aroma

Aroma is one of the test parameters included in hedonic sensory testing to determine how much consumers like the aroma of a product. The aroma parameter is no less important than the colour parameter. Aroma has a critical role, namely as an attraction by consumers. Consumers can judge whether the product likes the AromaAroma by smelling the smell of the product. According to Zuhrina (2011) (Khalisa et al., 2021), they are told that the aroma present in food products is a powerful attraction and can stimulate the sense of smell so that it arouses appetite. The following sensory test results for aroma parameters can be seen in Table 2.

The results of the hedonic sensory test on the aroma parameter were most favored in A5, with favored rice flour and red bean flour of 50%: 50%. In contrast, the treatments that were least favored by panelists were A1 and A6 because they had the lowest average level of favorability of 3.33. This proves that the balanced composition of rice and red bean flour makes panelists like the Aroma of soft cookies. The panelists said the soft cookie product had a slightly languorous aroma. This is because when making soft cookie products, the flour used, such as red bean flour, rice flour, purple sweet potato flour, and soy protein isolate, has not gone through the roasting process, causing a slightly languorous Aroma.

#### 3.1.3 Taste

Taste is one of the test parameters included in hedonic sensory testing to determine how much consumers like the taste of a product. Taste is a test parameter that is closely related to AromaAroma. After the AromaAroma, consumers will taste the taste of a product. Good taste can be an attraction and interest of consumers. Besides that, taste can also determine whether the product is acceptable to consumers (Khalisa et al., 2021).

The data in Table 2 show that adding red bean flour and rice flour significantly affects the taste preference of soft cookie products. The results of the hedonic sensory test on the taste parameters were most liked by the panelists, namely in the A5 treatment with the ratio of rice flour and red bean flour 50%: 50%. In contrast, the treatments that were least liked by the panelists were A9 and A6 because they had the lowest average level of favorability of 3.40. This proves that the balanced composition of rice flour and red bean flour makes panelists like the taste of soft cookies. The panelists said the taste in the A5 treatment tended to be evenly distributed compared to other treatments, such as red bean taste and the right sweetness level because the redder bean flour used, the stronger the red bean Taste of the soft cookies will be. This aligns with research (Putri et al., 2023) that the higher the use of red bean flour, the more distinctive the red bean taste will be.

#### 3.1.4 Texture

Texture is a product's appearance that consumers can see and feel directly, which affects the product's acceptance. Texture is one of the test parameters included in hedonic sensory testing to know how much consumers like the texture of a product. Consumers will be less interested in eating a product with the wrong texture. A good texture can be influenced by the essential ingredients used (Hasniar et al., 2019). Based on the results of the analysis according to the data in Table 2, it shows that

the addition of red bean flour and rice flour has no significant effect on the level of the hedonic texture of soft cookie products because the results of the ANOVA test on the texture parameter are p> 0.05% so there is no need for further testing.

The results of the hedonic sensory test on the texture parameter were most liked by the panelists, namely in the A5 treatment with the ratio of rice flour and red bean flour 50%: 50%. In contrast, the treatments that were least liked by the panelists were A0 and A8 because they had the lowest average level of favorability of 3.23. According to the panelists, soft cookie products have different textures in each treatment. Some are crispy on the outside, but when bitten, they become relatively soft or chewy; some are slightly hard and easily broken until they are smooth and chewy. This difference is caused by the effect of rice flour and red bean flour, which do not contain gluten in ingredients, so the more rice flour and red bean flour are used in soft cookie products, the more complex the texture will be. However, supporting ingredients such as margarine can affect the product's texture. According to Fairus et al. (2021), margarine can increase the volume of a product so that the texture stability of soft cookies improves.

### 3.2. Physical Characterization

This physical characteristic test includes colour, which was tested using ImageJ software, and texture, using a texture analyzer tool to know the physical characteristics of soft cookie products. The results of sensory testing with the hedonic test method can be seen in Table 3.

#### *3.2.1 Colour with ImageJ*

In colour testing, ImageJ software can be used in Table 3 to produce three colour-dimension models: L, A, and B. In the L dimension, describe the brightness of the colour, with a value of 0 for black and 100 for white. The A value represents the green-redish colour, with 0 to +80 for red and 0 to -80 for green. The B dimension describes blue-yellow, 0 to +70 for yellow and 0 to -70 for blue (Sinaga & L*a*b, 2019).

The analysis results, according to the data in Table 3 using ImageJ software, show that adding red bean flour and rice flour does not significantly affect a product's L value or brightness. This is because rice flour is white while red bean flour is red, so when these two flours are combined, it will produce a dark colour. The highest brightness level is in treatment A4, with a value of 38.03; treatment A0 or control has the lowest brightness level.

Based on the data analysis results on dimension A's value, adding rice flour and red bean flour to soft cookie products has a significant effect. The results showed that the highest A value or redness level was in treatment A1, with a value of 18.67, and the lowest redness level was in treatment A0, with a value of 12.72. This proves that if the ratio of red bean flour is more than that of rice flour, the resulting colour is redder (Tilohe et al., 2020) Explained that the higher the concentration of red bean flour, the darker the product will be because red bean flour contains melanoidin, which is not resistant during the heating process.

Based on the data analysis results on dimension B's value, adding rice flour and red bean flour to soft cookie products has a significant effect. The results showed that the highest B value or yellowish level was in treatment A6, with a value of 23.25, and the lowest yellowish level was in treatment A3, with a value of 9.76. This proves that if the ratio of rice flour is more than red bean flour, the soft cookies product produces a yellow colour dimension. Therefore, it can be said that the combination of the three dimensions can determine the colour of soft cookie products.

#### *3.2.2 Textur with TA XT*

In texture testing using a texture analyzer tool, it can be seen in Table 3, which is the result of the hardness or hardness level of the soft cookie product. According to Paula & Conti (2014), in the book, Purnomo (2014) explained that hardness is the Force exerted by graham teeth to press food until it is destroyed. Based on the results of the data in Table 3, it show that the addition of red bean flour and rice flour has a very significant effect on the hardness test.

The study results in Table 3 show that treatment with the highest hardness or hardness is found in treatment A9 with a value of 14640.2 gf, while treatment A0 has the lowest hardness. This proves that adding rice flour and red bean flour will produce a complex product texture. Rice flour is a raw material with a reasonably high starch content of 76-82%. The high starch content found in rice flour can affect the hardness level of a product. According to Rospiati, (2007), research Hapsari and Niken (2018) said that a significant starch content in an ingredient could make the texture dense and tend to be complicated. In addition, the high protein content in red bean flour can also affect the level of firmness where protein can bind to water. This is reinforced by Damayanti, Bintoro, & Setiani, (2020) in their research, saying that high protein content can increase hardness because complex compounds are formed between starch and protein, making the product's texture harder.

### 3.3. Determination of the Selected Formula

Based on the calculations using the de Garmo method, the selected formula for soft cookies with red bean flour and rice flour was A5 because it has the highest product value (PV). The result of the de Garmo method can be seen in Table 4 and Table 5. The ranking values in Table 4 are determined based on the level of product importance based on consumer survey analysis. In this research, the most crucial ranking value is the result of sensory analysis based on the hedonic level of consumer preferences. The ranking value will be inversely proportional to the parameter score value. The weight values presented in Table 5 are the result of dividing the score value of each parameter by the total score value in Table 4. EV is obtained by dividing the results by the difference between the value of each parameter and the lowest value of the treatment by the difference between the highest and lowest values of the treatment. PV is

**Table 3**
Physical characterization analysis result.

| Code | Parameters | | | |
|---|---|---|---|---|
| | L | A | B | Hardness |
| A0 (Wheat flour=60) | $33,09 \pm 3,78^{a}$ | $12,72 \pm 0,28^{a}$ | $10,51 \pm 0,70^{a}$ | $7841,46 \pm 510,01^{a}$ |
| A1 (RF:RBF=17.16:42.84) | $33,78 \pm 1,0^{a}$ | $18,67 \pm 0,45^{e}$ | $22,73 \pm 1,66^{c}$ | $8563,65 \pm 1440,48^{ab}$ |
| A2 (RF:RBF=19.98:40.02) | $34,02 \pm 0,7^{a}$ | $16,91 \pm 1,99^{de}$ | $20,13 \pm 5,57^{c}$ | $8893,3 \pm 299,119^{abc}$ |
| A3 (RF:RBF= 24:36) | $34,88 \pm 0,19^{a}$ | $14,67 \pm 0,32^{bc}$ | $9,76 \pm 0,60^{a}$ | $9292,16 \pm 1538,30^{abc}$ |
| A4 (RF:RBF=26.64:33.36) | $35,16 \pm 2,21^{a}$ | $18,49 \pm 1,04^{e}$ | $23,16 \pm 1,28^{c}$ | $10721,6 \pm 1262,41^{bcd}$ |
| A5 (RF: RBF=30:30) | $35,45 \pm 1,62^{a}$ | $16,57 \pm 1,54^{def}$ | $21,33 \pm 0,59^{c}$ | $11846,5 \pm 1541.41^{d}$ |
| A6 (RF:RBF=32.7:27.3) | $37,39 \pm 2,40^{a}$ | $18,24 \pm 0,45^{ef}$ | $23,25 \pm 1,27^{c}$ | $11340,6 \pm 1892,37^{cd}$ |
| A7 (RF:RBF=34.26:25.74) | $35,82 \pm 2,10^{a}$ | $13,70 \pm 0,67^{ab}$ | $12,59 \pm 1,25^{ab}$ | $12038,5 \pm 1827,33^{d}$ |
| A8 (RF: RBF=36:24) | $37,55 \pm 3,30^{a}$ | $16,22 \pm 0,96^{cd}$ | $22,65 \pm 1,26^{c}$ | $12248,9 \pm 919,10^{d}$ |
| A9 (RF:RBF=40.02:19.98) | $38,03 \pm 2,66^{a}$ | $13,23 \pm 1,89^{ab}$ | $15,65 \pm 1,16^{b}$ | $14640,2 \pm 1131,62^{e}$ |

Notes: Numbers followed by different letters in each column indicate significant differences at 0.05% $\alpha$ level.
RF = Rice Flour; RBF = Red bean flour

obtained from WV and EV products. The highest PV value is the best treatment that can be used.

### 3.4. Chemical Characteristics Based on Selected Formula

The selected formula was a ratio of 50% rice flour and 50% red bean flour combination; it was evaluated for its characteristics and whether it could meet the EFP and Indonesia National Standard (SNI) (Table 6).

#### *3.4.1 Water Content*

Water content is an essential factor for a food product. This test was conducted to determine the water content of soft cookies made from rice flour and red bean flour. Moisture content is a critical point in a food product. The higher the water content that depends on the food, the more quickly the product will be damaged because mold or other bacteria will soon grow. According to Alifianita and Sofyan (2022) (, water content in food can also affect consumer acceptability, especially in texture.

Based on the results of Table 6, the water content in soft cookie products was 13.9%. This result means that it exceeds the predetermined requirements. According to SNI 2973-1992, the quality requirement for soft cookies is a maximum of 5%, so the water content in soft cookie products with red bean flour and rice flour does not meet the SNI 2973-1992 standard. The high-water content in soft cookies is caused by the food fibre content contained in rice flour and red bean flour. According to Mukhoiyaroh et al. (2020) said that food fibre could bind water, and water that has been bound will be challenging to evaporate even through the drying process.

#### *3.4.2 Total Fat*

Total fat is one of the lipid group's organic compounds derived from glycerol and fatty acids. Fat content in food products is an essential factor. Food products have different fat content depending on the ingredients used. Fat has the content as a source of energy more efficiently than carbohydrates and proteins. One gram of fat contains 9 kcal of energy, while carbohydrates and proteins contain 4 kcal of energy Pargiyanti (2019), affecting soft cookies' texture and taste.

Based on the results of Table 6, the fat content contained in soft cookie products is 11.1%. This result means that the fat content in soft cookies made from rice flour and peanut flour has met the predetermined requirements. According to SNI 2973-1992, the quality requirement for fat content in soft cookies is at least 9.5%. Although it has met the requirements of SNI 2973-1992, this soft cookie product cannot be said to be an emergency food in terms of fat content. This is because the fat content in soft cookie products cannot meet the requirements of emergency food products. According to Zoumas et al. (2002), The minimum fat content in products for emergency food is around 35%-45%.

#### *3.4.3 Crude Protein*

Protein is a nutrient that has an essential role in the human body. Protein in a food product is helpful as the body's primary forming, building, and regulating element. Protein is a vital parameter for food products because it can determine a product's nutritional content. The higher the protein in the product, the higher the nutritional content. However, several factors can affect a product's protein content: temperature, time, the optimum amount of water to collagen ratio, and the number of processing steps taken Salmahaminati (2022).

Based on the results, the protein content contained in soft cookie products is 11.6%. This result means that the protein content in soft cookies made from rice flour and peanut flour has met the specified requirements, both SNI and requirements as emergency food. According to SNI 2973-1992, the protein content contained in soft cookie products is at least 9%, while according to SNI 2973-1992, the protein content contained in soft cookie products is at least 9% Zoumas et al. (2002). Product requirements for emergency food are 10-15%.

The high protein content in soft cookies is influenced by adding red bean flour and rice flour. Both ingredients have protein content with values of 17.24% and 7%. This proves that the more rice flour and red bean flour are added, the higher the

**Table 4**
Rank and score of all parameters tested.

| **Rank** | 1 | 2 | 3 | 4 | 5 | 6 | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Score** | 6 | 5 | 3 | 4 | 3 | 1 | | | **21** |
| **Parameters** | **Sensory Evaluation** | | | | **Hardness** | **Colour (ImageJ)** | | | |
| **Code** | **Taste** | **Aroma** | **Colour** | **Texture** | | **L** | **A** | **B** | |
| A0 (Wheat flour=60) | 3.43 | 3.57 | 3.40 | 3.23 | 7841.46 | 33.09 | 12.72 | 10.51 | |
| A1 (RF:RBF=17.16:42.84) | 3.5 | 3.33 | 3.5 | 3.5 | 8563.65 | 33.78 | 18.67 | 22.73 | |
| A2 (RF:RBF=19.98:40.02) | 3.7 | 3.73 | 3.83 | 3.67 | 8894.3 | 34.02 | 16.91 | 20.13 | |
| A3 (RF:RBF= 24:36) | 3.63 | 3.53 | 3.40 | 3.43 | 9292.16 | 34.88 | 14.67 | 9.76 | |
| A4 (RF:RBF=26.64:33.36) | 3.47 | 3.5 | 3.53 | 3.43 | 10721.6 | 35.16 | 18.49 | 23.16 | |
| A5 (RF:RBF=30:30) | 4 | 3.83 | 3.93 | 3.77 | 11846.5 | 35.45 | 16.57 | 21.33 | |
| A6 (RF:RBF=32.7:27.3) | 3.4 | 3.33 | 3.5 | 3.5 | 11340.6 | 37.39 | 18.24 | 23.25 | |
| A7 (RF:RBF=34.26:25.74) | 3.67 | 3.67 | 3.80 | 3.60 | 12038.5 | 35.82 | 13.7 | 12.59 | |
| A8 (RF:RBF=36:24) | 3.47 | 3.43 | 3.57 | 3.23 | 12248.9 | 37.55 | 16.22 | 22.65 | |
| A9 (RF:RBF=40.02:19.98) | 3.4 | 3.4 | 3.37 | 3.33 | 14650.2 | 38.03 | 13.23 | 15.65 | |
| **Highest value** | **4** | **3.83** | **3.93** | **3.77** | **14650.2** | **38.03** | **18.67** | **23.25** | |
| **Lowest value** | **3.4** | **3.33** | **3.37** | **3.23** | **7841.46** | **33.09** | **12.72** | **9.76** | |
| **Difference** | **0.6** | **0.5** | **0.56** | **0.54** | **6808.73** | **4.94** | **5.95** | **13.49** | |

Notes: RF = Rice Flour; RBF = Red bean flour

**Table 5**
EV and PV values for each analysis parameter to determine the best treatment

| | **Effectiveness Value (EV)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Parameters** | **Sensory Evaluation** | | | | **Hardness** | **Colour (ImageJ)** | | | **EV Total** |
| **Code** | **Taste** | **Aroma** | **Colour** | **Texture** | | **L** | **A** | **B** | |
| A0 (Wheat flour=60) | 0.06 | 0.47 | 0.05 | 0.01 | 0.00 | 0.00 | 0.00 | 0.06 | 0.64 |
| A1 (RF:RBF=17.16:42.84) | 0.17 | 0.01 | 0.23 | 0.50 | 0.11 | 0.14 | 2.00 | 0.96 | 3.01 |
| A2 (RF:RBF=19.98:40.02) | 0.50 | 0.81 | 0.83 | 0.81 | 0.15 | 0.19 | 0.70 | 0.77 | 4.60 |
| A3 (RF:RBF= 24:36) | 0.39 | 0.41 | 0.05 | 0.38 | 0.21 | 0.36 | 0.33 | 0.00 | 1.92 |
| A4 (RF:RBF=26.64:33.36) | 0.11 | 0.34 | 0.29 | 0.38 | 0.42 | 0.42 | 0.97 | 0.99 | 3.50 |
| A5 (RF:RBF=30:30) | 1.00 | 1.01 | 1.01 | 0.99 | 0.59 | 0.48 | 0.65 | 0.86 | 5.99 |
| A6 (RF:RBF=32.7:27.3) | 0.00 | 0.01 | 0.23 | 0.50 | 0.51 | 0.87 | 0.93 | 1.00 | 3.54 |
| A7 (RF:RBF=34.26:25.74) | 0.44 | 0.67 | 0.77 | 0.69 | 0.62 | 0.55 | 0.16 | 0.21 | 3.50 |
| A8 (RF:RBF=36:24) | 0.11 | 0.21 | 0.35 | 0.01 | 0.65 | 0.90 | 0.59 | 0.96 | 3.12 |
| A9 (RF:RBF=40.02:19.98) | 0.00 | 0.14 | 0.00 | 0.19 | 1.00 | 1.00 | 0.09 | 0.44 | 1.85 |
| **Weight Value (WV)** | **0.29** | **0.24** | **0.14** | **0.19** | **0.1** | **0.5** | | | |
| | **Productivity Value (PV)** | | | | | | | | |
| **Parameters** | **Sensory Evaluation** | | | | **Hardness** | **Colour (ImageJ)** | | | **PV Total** |
| **Code** | **Taste** | **Aroma** | **Colour** | **Texture** | | **L** | **A** | **B** | |
| A0 (Wheat flour=60) | 0.02 | 0.11 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.14 |
| A1 (RF:RBF=17.16:42.84) | 0.05 | 0.00 | 0.03 | 0.10 | 0.01 | 0.01 | 0.05 | 0.05 | 0.29 |
| A2 (RF:RBF=19.98:40.02) | 0.14 | 0.19 | 0.12 | 0.15 | 0.01 | 0.01 | 0.03 | 0.04 | 0.70 |
| A3 (RF:RBF= 24:36) | 0.11 | 0.10 | 0.01 | 0.07 | 0.02 | 0.02 | 0.02 | 0.00 | 0.34 |
| A4 (RF:RBF=26.64:33.36) | 0.03 | 0.08 | 0.04 | 0.07 | 0.04 | 0.02 | 0.05 | 0.05 | 0.38 |
| A5 (RF:RBF=30:30) | 0.29 | 0.24 | 0.14 | 0.19 | 0.06 | 0.02 | 0.03 | 0.04 | 1.009 |
| A6 (RF:RBF=32.7:27.3) | 0.00 | 0.00 | 0.03 | 0.01 | 0.05 | 0.04 | 0.04 | 0.05 | 0.31 |
| A7 (RF:RBF=34.26:25.74) | 0.13 | 0.16 | 0.11 | 0.13 | 0.06 | 0.03 | 0.01 | 0.01 | 0.63 |
| A8 (RF:RBF=36:24) | 0.03 | 0.05 | 0.05 | 0.00 | 0.06 | 0.04 | 0.03 | 0.05 | 0.31 |
| A9 (RF:RBF=40.02:19.98) | 0.00 | 0.03 | 0.00 | 0.04 | 0.10 | 0.05 | 0.00 | 0.02 | 0.24 |

Notes: RF = Rice Flour; RBF = Red bean flour

**Table 6**
Proximate Analysis of Selected Soft Cookies Formula

| Selected Formula | Chemical | | | | |
|---|---|---|---|---|---|
| | Water Content (%) | Total Fat (%) | Crude Protein (%) | Total Ash (%) | Carbohydrate (%) |
| A5 | 13,9 | 11,1 | 11,6 | 2,1 | 66,3 |
| SNI 01-2973-1992 | Max 5 | Min 9,5 | Min 9 | Min 1,5 | Min 70 |
| Emergency Food Requirements | - | 35-45% | 10-15% | - | 40-50% |

protein content of soft cookie products. According to Naurah (2013) in (Nurlita & Asyik, 2017), legumes have a role in increasing a product's protein content.

#### 3.4.4 Total Ash

Ash content is an inorganic residue or residue of materials that have passed through the combustion process with temperatures reaching 550°C -600°C (Hutomo et al., 2012); that ash content is a material left behind in food samples that burn entirely in an oven or heater. In food products, ash content is crucial because it can determine whether a product is good. Therefore, the purpose of testing ash content is to determine the mineral content in a food product because the higher the ash content contained in food products, the worse the quality of soft cookie products.

Based on the results of Table 6, the ash content contained in soft cookies is 2.1%. This result means that the ash content in soft cookies made from rice flour and peanut flour has exceeded the maximum limit of the predetermined requirements. According to SNI 2973-1992, the maximum ash content in soft cookies is 1.5%. The high ash content in soft cookies can be caused by the influence of the mineral content contained in the raw materials. The ash content in red bean and rice flour is 5.89% and 0.41%. This means that adding kidney beans significantly affects the ash content of soft cookie products compared to rice flour. According to (Devi et al., 2019), ash and mineral content are related to food ingredients. The mineral content in food is organic salts and inorganic salts, so the higher the ash content contained in soft cookies, the worse the product quality.

#### 3.4.5 Carbohydrate

Carbohydrates are one of the primary sources needed by the body to produce power or energy. The energy contained in 1 gram of Carbohydrate is 4 kcal. In addition to playing an essential role in fulfilling energy in the body, carbohydrates also have a role in food products, namely as a determinant of product characteristics such as taste, colour and texture. As for the other functions of carbohydrates, such as protein saving, the fat metabolism regulator helps with faeces excretion (Siregar, 2014).

Based on the results of Table 6, the carbohydrate content in soft cookie products is 66.3%. This result means that the carbohydrate content in soft cookies made from rice flour and peanut flour has not met the minimum requirements that have been determined. According to SNI 2973-1992, the minimum carbohydrate content in soft cookie products is 70%. However, when included in emergency food, the carbohydrate content of soft cookie products meets emergency food requirements. This is because the carbohydrate content exceeded the predetermined 40-50% limit (Zoumas et al., 2002).

The high carbohydrate content in this study was influenced by the raw materials used, namely red bean flour and rice flour. Both ingredients have a high carbohydrate content with a content value of 71.4% and 80%. Therefore, the more rice flour and red bean flour are used in soft cookie products, the higher the carbohydrate content.

## 4. CONCLUSION

Based on research that has been conducted, rice flour and red bean flour have a significant effect on the level of liking (color, aroma, taste, and texture), level of hardness, and color. Determination of the selected formulation is carried out using the de Garmo method or weighting test based on hedonic organoleptic characteristics (color, taste, aroma, and texture) and physical characteristics (texture and color). After carrying out calculations, the selected formulation was A5 with a ratio of rice flour and red bean flour of 50%:50%. The chemical test results for the best formula were water content 13.9%, fat content 11.1%, protein content 11.6%, ash content 2.1%, and carbohydrate content 66.3%. Based on these results, it can be said that the best formula can be categorized as emergency food because the protein and carbohydrate levels meet the requirements of emergency food.

Some suggestions that can be carried out in further research are that it is necessary to roast the flour so that when the product is finished it does not have an unpleasant aroma. Apart from that, further research needs to be carried out regarding the addition of local food which can increase the fat content of soft cookie products so that they can meet emergency food requirements of at least 35-45%.

## CONFLICTS OF INTEREST

The authors declare no competing or financial conflict of interest.

## ACKNOWLEDGMENTS

The authors thank the National Research and Innovation Agency (BRIN) and Politeknik Negeri Jember for providing the necessary facilities for this research project.

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