Proportion of Kimpul Flour and Brown Rice Flour on Food Bar Processing

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Proportion of *Kimpul* Flour and Brown Rice Flour on Food Bar Processing

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Abstract: *Food bar is a rod-shaped food product, a mixture of various dry ingredients combined using a binder. The binder used were kimpul and brown rice flour. Kimpul flour serves as a substitute for wheat flour, which has a high IG value and contains gluten, which cannot be consumed by people with celiac disease and children with autism. Brown rice flour serves as a source of protein and vitamins. The study aimed were: (1) to determine the effect of the proportion of kimpul and brown rice flour on the nutritional content and organoleptic properties, (2) determine the best alternative process. This study used Randomized Block Design with the treatment of the proportion of Kimpul and Brown Rice Flour with four levels, namely: P1=90:10; P2=80:20; P3=70:30; P4=60:40 and repeated three times. The research parameters were an organoleptic test, the content of water, protein, fat, carbohydrate, and calories. The results showed that the proportion of kimpul and brown rice flour significantly affected color, texture, protein and carbohydrate content, but did not significantly affect the content of water, and fat.*

Keywords: *Food bar, Kimpul flour, Brown rice flour, Process engineering.*

1. Introduction

The pattern of life of the people who realize the importance of health and the level of the busyness of the community causes food needs are not limited to the fulfillment of conventional nutrition with excellent taste. Still, the food is also expected to be able to function to maintain health and fitness, safe for consumption, and practical in its presentation. One of the functional value fast food products that are developing in various countries is a food bar.

The food bar is a solid food product in the form of a rod and is a mixture of various dry ingredients such as cereals, nuts, dried fruits, which combined into one with the help of a binder. In general, the adhesive used is wheat flour and soy flour,

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which is an Indonesian imported commodity. Wheat flour has a high glycemic index and contains gluten, so it cannot use for diabetics and celiac diseases. Therefore, it is necessary to conduct research using local non-gluten flour to substitute wheat flour, namely *kimpul* flour. However, the protein content of *kimpul* flour is low, so it is necessary to fortify with red rice flour to increase the protein content of the food bar produced.

2. Theoretical Framework

The food bar is a solid food product in the form of a rod and is a mixture of various dry ingredients combined into one with the help of a binder. Binder in a food bar can be syrup, nougat, caramel, chocolate, and others (Rahmi, 2003). Food bar has an increasingly vital role in the modern lifestyle because of the convenient forms they can use, such as ready-to-consume instant (Silva *et al*., 2014). Food bar can meet consumer demand for nutrition, practical, and taste, and can reduce hunger in a short time (Christian, 2011).

The food bar is usually in the form of bars made from cereals or nuts, which have high carbohydrate and protein content that often consumed in between meals. Food bar regularly packaged in units weighing 25 to 30 grams (Izzo & Niness, 2001). Anandito (2016) research on emergency food in the form of a food bar uses a mixture of white millet (*Panicum miliceum* L.) flour and beans flour with the addition of glycerol as a humectant. Carella (2016) researched on food bar as a snack for people with diabetes made from purple sweet potato and parboiled red beans.

Kimpul planted in the countryside as a crop between other crops. The high water content of *kimpul*, causes the need for proper post-harvest handling or as soon as possible to process the tuber of the pimple into processed products (Marinih, 2005). One of the specific characteristics of the *kimpul* and a problem in the consumption of *kimpul* is the presence of Ca-oxalate crystalline content that causes itching and saponin content, which have a bitter taste and can cause the breakdown of blood items. Both of these compounds in processing can be removed by soaking salt or boiling (Marinih, 2005).

Brown rice (*Oryza navira*) is one type of rice in Indonesia that contains high nutrition, contains phenolic compounds, namely flavonoid compounds. Flavonoid group compounds such as anthocyanins (glycone and anthocyanidin) are one of the natural material groups in plants that act as antioxidants, antimicrobials, antiallergics, and anti-inflammatory agents (Pietta, 2000; Suliartini, 2011). The superiority of red rice flour has amylose and amylopectin content, high protein and fiber, and a low glycemic index value of 41 (Foster *et al*., 2002), besides gluten-free brown rice (Sarofa *et al*., 2000).

3. Research Method

3.1 Sample preparation

The materials used in this study were: *kimpul* flour, brown rice, milk, sugar, eggs, margarine, maltodextrin, soybeans, and chemicals for proximate analysis.

3.2 Preparation of food bar

The stage of food bar processing was mixing margarine, eggs, sugar, and maltodextrin using a mixer until it evenly mixed for 10 minutes. Then add milk, *kimpul* flour, and brown rice flour according to the treatment until the mixture is evenly mixed. After that, it is added boiled soybeans. Then the dough that has flattened was baked initially at a temperature of 120^{o}C for 80 minutes. After that, the cutting done with a size of 10 x 2 x 1 cm^{3}. The dough that has been cut is then baked at 120^{o}C for 20 minutes. After it cools, the packaging was done.

3.3 Design of experiments

The experimental design in this study used a single factor Randomized Block Design (RBD) with the treatment of *kimpul* flour and brown rice flour with four levels and repeated three times. The treatment (the proportion of *kimpul* flour and brown rice flour) levels are as follows: 90:10 (P1), 80:20 (P2), 70:30 (P3), and 60:40 (P4).

3.4 Observation parameters

The parameters tested were the yield, water content (AOAC, 2005), protein content (AOAC, 2005), fat content (AOAC, 2005), carbohydrate content by difference, and organoleptic test on color and texture.

3.5 Data Analysis

Chemical data were analyzed using analysis of variance, and if there were significant differences between treatments, the analysis continued with the Duncan test at a significance level of 95%. While organoleptic data were analyzed using the Friedman test and descriptive analysis.

4 Results and Discussion

4.1. Color

The percentage acquisition of the color parameter score presented in Figure 1. Friedman's test results of the acquisition of color scores indicate that there are significant differences between treatments. That was because red rice flour has a red color, resulting in food bar products that tend to be dark brown. The higher proportion of brown rice flour used causes the browning level of the food bar to increase, and the yellowish level of the food bar decreases because of the higher the ash content, the browner color of the product produced (Martunis, 2012).

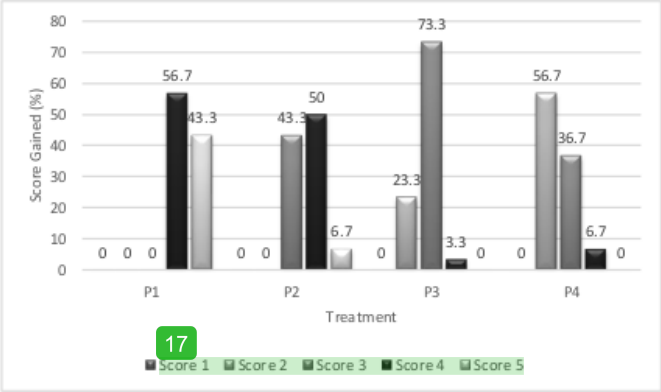

Figure 1. Graph of color parameter score acquisition (%)

4.2. Texture

The percentage acquisition of the texture parameter score presented in Figure 2. Friedman test results obtained texture scores indicate that there were significant differences between treatments.

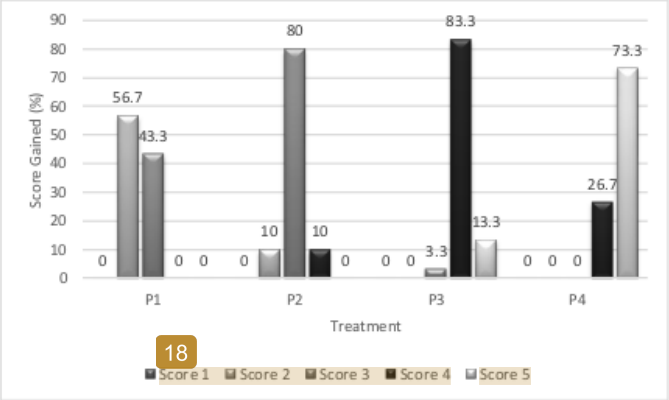

Figure 2. Graph of texture parameter score acquisition (%)

Kimpul flour has a lower water content than brown rice flour. The lower the water content of food ingredients, the texture will be harder and drier (Gaines, 1993). According to Puspitasari *et al.* (2015), *kimpul* flour has a water content of 12.35%, whereas according to Kristamtini and Purwaningsih (2009), brown rice has a water content of 14.38%.

4.3. Moisture content

The measurement results of the food bar water content showed in Figure 3.

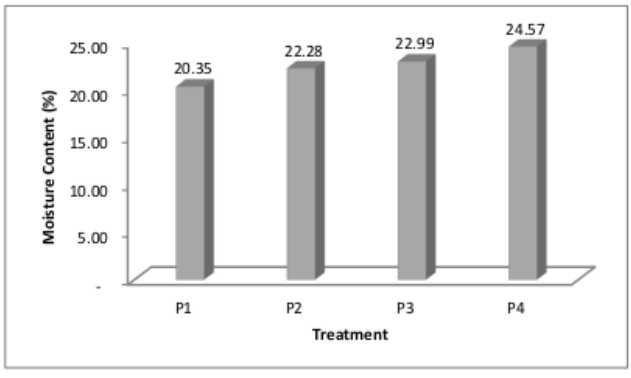

Figure 3. Graph of food bar moisture content (%)

nn

The results of the analysis of variance showed that there were no significant differences between treatments. Figure 3 shows that the greater the proportion of brown rice flour, the higher the water content of the food bar produced. That is likely due to differences in water content in *kimpul* flour and brown rice flour.

4.4. Protein content

The results of the protein content test showed in Figure 4. The results of the analysis of variance indicate that there were significant differences between the treatments of the food bar protein levels produced. That is because the protein content of brown rice is higher than that of *kimpul* flour. Brown rice contains protein as much as 9.16% (Kristamtini and Purwaningsih, 2009). Brown rice protein is higher than white rice because brown rice has an endosperm layer. The high content of brown rice protein is caused by brown rice, which contains a lot of essential amino acids.

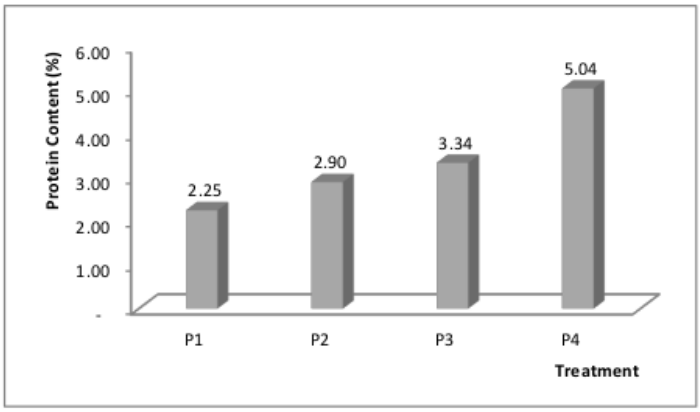

Figure 4. Graph of food bar protein content (%)

4.5. Fat content

The measurement results of the food bar fat content showed in Figure 5. The results of the analysis of variance showed that there were no significant differences between treatments to food bar fat content. That is because the fat content in raw materials is quite low, namely *kimpul* flour, by 0.4%, and brown rice by 2.5%. This low-fat content, when mixed, will not have an impact on the fat content in the food bar.

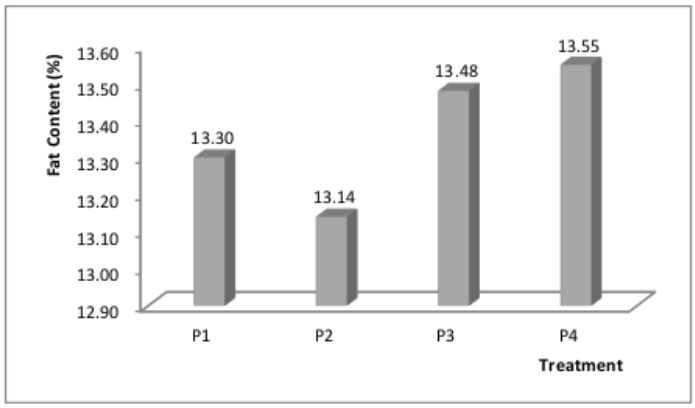

Figure 5. Graph of food bar fat content (%)

4.6. Carbohydrate content

The measurement results of the food bar carbohydrate content showed in Figure 6. In Figure 6, showed that the lower the proportion of *kimpul* flour, the higher the carbohydrate content produced. That is because *kimpul* flour contains 82.05% carbohydrates (Puspitasari *et al*., 2015), while brown rice contains as much as 70.03% carbohydrates (Kristamtini and Purwaningsih, 2009). Besides, the method used in the carbohydrate test is by different methods, so that the test results of water, ash, fat, and protein content also affect.

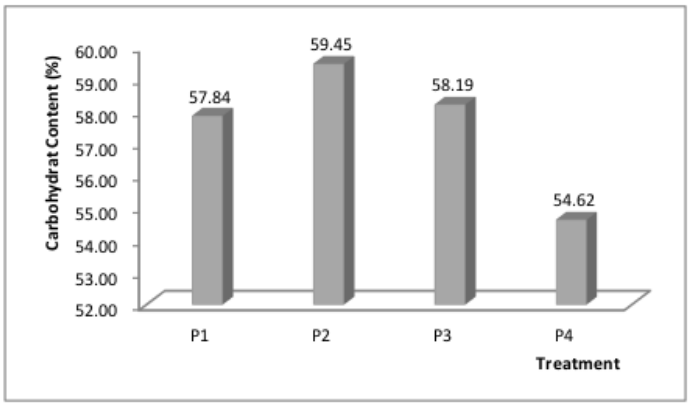

Figure 6. Graph of food bar carbohydrate content (%)

5 Conclusion, Implication, and Limitation

5.1. Conclusion

Based on the results of the study, it concluded that the alternative chosen from the food bar processing with the use of *kimpul* flour and brown rice flour was P4 treatment, namely the proportion of white flour 60% and 40% brown rice flour. The selected treatment resulted in a food bar product containing 24.57% water content, 2.23% ash content, 5.04% protein content, 13.55% fat content, and 54.62% carbohydrate content.

5.2. Implication and Limitation

The research implications developed of local food resources, namely *kimpul* tuber, and its use as a food source of carbohydrate. Besides, this research also adds non-gluten food products.

The research limitation used brown rice flour to increase the protein content in *kimpul* food bar. So, further research was needed to produce a food bar with higher nutritional value by using other protein sources. Besides that, it is also necessary to do product fortification with added vitamins and minerals.

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