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A varied presentation of brown rice as a substitute for white rice

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Abstract. White rice is in great demand by Indonesians. However, in terms of nutrition and health impacts, brown rice is superior. The texture of brown rice is complex, and the taste is bland, so it is necessary to vary the presentation of brown rice and side dishes. In addition to the cooking method, brown rice is essential to maintain the nutritional value and give brown rice a softer texture. Organoleptic test method to see the texture and taste of brown rice. Literature review to find relevant research results with cooking methods and nutritional value.

1. Introduction

White rice (*Oryza sativa*), processed into white rice, is still a trend today compared to brown rice from brown rice (*Oryza nirvana*). Countries in Asia are familiar with consuming white rice. The habit of consuming white rice for the people of Indonesia cannot be avoided from the culinary culture. Some areas in Indonesia consume corn and sago as a substitute for white rice because they are related to their respective cultures. However, it needs to be realized that consuming too much white rice can cause diseases in the human body such as diabetes, cholesterol, and hypertension. Therefore, in addition to white rice, it can be substituted for brown rice.

In terms of health, red rice contains genes that produce anthocyanins. The resulting anthocyanins are a source of red colour found in the physical condition of rice. The compounds in the red layer of rice are helpful as antioxidants, anti-cancer, high anti-glycemic agents. Brown rice bran is rich in natural oils, essential fats, and fibre [1,2]. However, people are starting to become aware of the importance of health, so people start consuming foods that are beneficial for health, such as fibrous foods. Examples of foods that contain fibre are brown rice and bran [2,3].

In terms of nutrition, mashed brown rice contains 216.45 calories, 88% of the daily value (DV) of dietary minerals, 27% DV of selenium, 21% DV of magnesium, 18.8% DV of amino acid trifofan. 3.5 grams of fibre (rice white contains less than 1 gram), and its protein is 2.5% higher than white rice. It also contains alpha-linolenic fatty acids, iron, vitamin B complex, and vitamin A [1] The source of minerals in brown rice is higher than white rice [4]. In Indonesia, rice whose rice is red (brown rice) has received less attention compared to rice whose rice is white (white rice), even though brown rice is high in nutrients [5]. Brown rice contains high fibre content compared to white rice. Brown rice contains high levels of vitamins and minerals, especially vitamin B1 and magnesium. Brown rice dietary fibre may explain the increased endothelial function [6]. Thus high fibre intake in brown rice and the content of vitamins and minerals can be nutritional intake for the human body.



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Brown rice is a local food that must be intensified because it has nutrition and health benefits. Brown rice is beneficial for people with diabetes and prevents the increase in blood glucose levels which can lead to diabetes. Rensiansi and Iwaningsih (202) stated that "Diabetics can still consume several types of rice that have a low to moderate GI range, such as rice from rice varieties IR-36 and brown rice.[7]" Brown rice is a food category with a moderate glycemic index. The lower the GI of a food, the lower its ability to raise blood glucose [8,9] The results of research by concluded that intervention with a fibre-rich diet with brown rice effectively improved endothelial function without changing HbA1c levels through a reduction in glucose content. Rice contributes to the primary energy of the diet for the body. Pre-sprouted brown rice has twice as much protein as white rice, 14.6 g / 100 g (brown rice) versus 7.3 g / 100 g (white rice).

In contrast, the fat content is very high, namely 24.8 g / 100 g for pre-sprouted brown rice and 1.5 g / 100 g for white rice [10]. In addition, brown rice is known to increase glucose intolerance and prevent the onset of diabetes [11] Furthermore, insulin and total cholesterol resistance and LDL cholesterol levels are reduced after the consumption of brown rice. Consumption of brown rice is beneficial because it partially decreases the glycemic response and may protect postprandial endothelial function in subjects with metabolic syndrome [12]. This means that brown rice can prevent an increase in glycemic blood glucose content and reduce it because it has high fibre.

However, another problem is the low public interest in enjoying processed red rice in form of brown rice. There is more use of white rice, and the habit of the Indonesian population to consume white rice compared to brown rice even though they already know its health benefits. Therefore, to realize the idea of brown rice as a substitute for white rice, it is necessary to serve various types of brown rice with different and healthy side dishes.

Several studies are similar to brown rice, namely: brown rice is made into brown rice flour, substituted for wheat flour in the manufacture of noodles [1]. Making plain bread based on brown rice and bran [3]. Another study on brown rice shows that brown rice (BR) germination is a natural way to improve the nutritional quality of gluten-free rice bread. Germination of brown rice for 48 hours provides nutritious bread of superior quality based on its higher protein content, lipids and bioactive compounds (GABA and polyphenols), increase anti-oxidant activity and reduces phytic acid content and glycemic index [13]. In addition, coloured brown rice exhibits better health benefits than polished rice, and the design is attractive demanding brown rice cooking etiquette [14]. However, the authors will utilize brown rice (*Oryza nirvana*) in processed brown rice in this research. Make brown rice a healthy local food in today's culinary industry, and determine cooking methods to maintain the nutritional value to improve the rigid texture of brown rice.

2. Research Method

2.1. Design Method

This research is a descriptive qualitative research method [15] by serving brown rice as a substitute for white rice. In addition, the correct cooking method for brown rice is also presented in this study. Brown rice is complemented with healthy side dishes such as chicken breast, organic vegetables, tempeh, and traditional seasonings without preservatives [16,17]. The research procedure is the making of brown rice with side dishes made by a group of students. Furthermore, the brown rice product is tested organoleptically, namely the Preference/Acceptance test. Moreover, the results of the organoleptic test are discussed in a Focus Group Discussion [18]. With lecturers who have food technology expertise. Acceptance test includes preference test or hedonic test and hedonic quality test [19]. In the hedonic test, the panellists expressed their personal responses, like it or not. Besides that, they also stated their level of preference. The liking level is also called the hedonic scale. The hedonic scale is transformed into a numerical scale with numbers increasing according to the level of preference. Whereas in the hedonic quality test, the panellists stated their impressions of good or not (the belief of hedonic quality). The impression of hedonic quality is more specific than the impression of like it or not and can be more general. Helaluddin and Wijaya (2020), after conducting the organoleptic test, the panellists joined the Focus Group Discussion (FGD) as an evaluation of the two brown rice products [20].

2.2. Data Collection

Data was collected by collecting literature reviews [21] sourced from books, national and international journals [20]. In addition, organoleptic results are made in tabular form. The number of respondents is 35 respondents consisting of students who take entrepreneurship courses.

2.3. Data Analysis

The analysis of the organoleptic test results data is described to explain the organoleptic results. Organoleptic results [19] are evaluated based on a literature review. The literature [26] view is related to the cooking method for brown rice. The cooking method for brown rice influences the texture of the brown rice and the shelf-life of the brown rice [22].

3. Result and Discussion

3.1. Organoleptic Test

The method used for the organoleptic test in this study was the hedonic test. Panellists were asked to give an impression of whether they liked or disliked a quality characteristic that was presented and then continued with the level of their liking. The level of liking on the hedonic scale ranges from very, very, very much to very, very dislike. In this section, brown rice was processed by two groups to test the texture and taste of brown rice with different treatments, namely brown rice with a certain cooking treatment and treatment with the addition of certain agar and water. Thirty-five panellists provided hedonic test assessments described in tables 1 and 2.

Table 1. Texture Assessment of Brown Rice with two different cooking treatments.

No	Texture indicator	Product	
		Original's brown rice	Fit's brown rice
1	hard	-	4 (11.43%)
2	bit hard	20 (57.14%)	23 (65.71%)
3	little soft	15 (42.86 %)	8 (22.86%)
4	soft	-	-

The assessment of the texture of brown rice in the original red rice product shows that the panellists who chose their preferences were 20 (57.14%) panellists and 15 (42.86%) panellists who chose soft brown rice. Meanwhile, for Fit brown rice, the researcher also chose his preference that the brown rice used in Fit brown rice was a bit hard 23 (65.71%), 8 (22.86%) panellists chose a slightly soft texture and 4 (11.43%) panellists prefer fit brown rice because of its tough texture. Panellists chose a bit hard texture because the texture of the brown rice was rather hard, and it was scattered. Even though it is different from the slightly soft texture of white rice, the somewhat hard surface is the hallmark of brown rice. [9]

Table 2. The taste of brown rice is judged by two different cooking methods.

No	Taste indicator	Original's brown rice	Fit's brown rice
1	The taste is the same as white rice	-	-
2	Bland taste	32 (91.43%)	31 (88.57%)
3	The taste is slightly sweet	3 (8.57%)	4 (11.43%)
4	Sweetness	-	-

The assessment of the taste of brown rice on the taste showed that the panellists chose that the original brown rice was 32 (91.43%) tasteless and a bit sweet for 3 (8.57%) panellists. While for fit brown rice, there were 31 (88.57%) who stated that it was bland, and 4 (11.43%) said that the taste was rather sweet (8.33%). The taste of white rice is sweet in contrast to brown [10]e, which tends to be bland. The bland taste in brown rice indicates that it is lower in glucose than white rice. This brown rice is not mixed with white rice because this culinary product uses 100% brown rice.

The assessment of original brown rice and fit brown rice products was carried out through discussions using the FGD (Focus Group Discussion) method. This section discusses the panellists' overall assessment of the two brown rice products. In Figure 1 below, the original red rice menu without flavouring of Monosodium glutamate (MSG) is available, namely brown rice, flour fried chicken, tempeh, and corn vegetables. Panellists' judgments are based on the overall side dishes and brown rice. The flavours of soybean cake, corn vegetable, and flour chicken can help the panellists finish the brown rice, which seems challenging to complete and the coarse grains of brown rice when the panellists chew it. The use of natural spices without MSG does not reduce the taste of side dishes combined with brown rice. Corn vegetable broth can help panellists chew brown rice while in the panellists' mouths. Evaluation of original brown rice lies in flour chicken which is not too crunchy.



Figure 1. Original's Rice Brown.

The fit's brown rice product in Figure 2 has a target audience aimed at people who like to exercise and like healthy food. Brown rice, corn greens, red beans, and chicken breast soup with spices give off an unusual taste. Panellists understand that this fit brown rice is like a culinary delicacy aimed at people who want healthy food and diabetics—the doneness of red beans, which must be soaked beforehand to soften the texture. In addition, the brown rice is dense, and there is the addition of gelatin to add to the taste of the brown rice, which is slightly different from the original's brown rice.



Figure 2. Fit's Brown Rice.

3.2. Cooking Brown Rice and nutritional value

How to cook white rice is different from how to cook brown rice. Brown rice requires more water and a longer cooking time than white rice. The water ratio determines the brown rice to be hard or soft. Cook 190 grams of brown rice requires 600 ml of water. The cooking duration of brown rice is 45-60 minutes using a rice cooker [23]. At the same time, brown rice has a high fibre content. The study by Huan et al. (2021) shows that brown rice (BR) is not suitable for consumption, hard texture, and low digestibility. However, Brown rice does have high fibre [24]. In the study of Huang et al. (2021) cooking and storage characteristics of functional Brown Rice (BR) prepared by parboiling (100 °C, 15 minutes) and microwave drying (100 kW, 8 rpm, 91 °C, 40 minutes) [24]. The procedure in this study was able to increase the resistant starch content (RS) by 1.5 times and total dietary fibre content (TDF) by 1.8 times. The parboiling and microwave drying processes can reduce the hardness of brown rice texture by 10% using a texture analyzer. Higher RS and TDF content, enhanced umami taste, and longer shelf life of BR will help patients with obesity and diabetes. Research by Huang et al. (2020) modified atmosphere packaging of different oxygen levels obtained 90% N₂ + 10% O₂ packaging, significantly maintaining the cooking quality of brown rice [25].

8 Brown rice contains many valuable active ingredients. However, due to its long cooking time, hard texture, heavy bran flavour, and short shelf life. This becomes an obstacle to be widely accepted by consumers [26]—developing a new processing technology called high-temperature air fluidization (HTAF) for processing brown rice. The results showed that the optimal temperature of HTAF treatment was 130 °C, the adsorption of brown rice water increased to 25.3% after soaking for 160 minutes. In addition, the results indicated that TBR-130 had a greater degree of volume expansion than untreated brown rice (UBR), and cooked TBR-130 had a softer texture than UBR. Furthermore, the results of research by Li et al. (2021) showed that HTAF treatment could improve cooking and eating quality and storage stability without causing significant damage to the nutritional quality 18 brown rice [26]. Therefore, HTAF technology plays an essential role in efforts to promote the use of brown rice as a staple food. 18 24

Some of his research focuses on the cooking methods of brown rice and the nutritional value of brown rice—Qi et al. (2019) regarding the exogenous enzyme treatment increasing the fluidity [27]. And solubility of brown rice powder as well as the digestion rate of protein and starch. The synergistic treatment of germination and exogenous enzymes significantly increases starch digestibility but worsens fluidity. Compared to the drum-dried germinated brown rice with cellulase and α -amylase (DGBRE) method, drum-dried brown rice with cellulase and α -amylase (DBRE) produces instant brown rice powder with better quality. Research by Yu et al. (2021) the effect of cooking pressure on bioactive compounds, antioxidant activity and volatile taste of brown rice [28]. The results show that high-pressure cooking significantly reduces the compound of brown rice that is cooked without a volatile taste compared to low-pressure cooking.

4. Conclusions

The brown rice served with various side dishes will increase people's interest in consuming it. Brown rice can be a substitute for white rice in the future because of its good nutritional value for fibre. Suitable cooking methods and processing of brown rice can reduce the rigid texture of brown rice. Research on brown rice cooking methods enables improved eating quality and maintains the nutritional value found in brown rice. Brown rice is a local food with high fibre value, with various side dishes being a healthy local food alternative.

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