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Convention Hall Politeknik Pertanian Negeri Payakumbuh

INDONESIA

QUANTUM-LEAP OF AGRI-FOOD SYSTEM 4.0 AND DELIVERY OF SUSTAINABLE DEVELOPMENTS GOALS (SDGS)

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Jl. Raya Negara Km. 7 Tanjung Pati Kec. Harau, Kab. Limapuluh Kota, Sumatera Barat 26271, Telp: (0752) 7754192, Fax : (0752) 7750220, Email: p3m@politanipyk.ac.id

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Nutrient Contents of Parboiled Rice as Affected by Palm Oil Addition

Cesar Welya Refdi[1], Gita Addelia Nevara[2]
[1] *Agricultural Product Technology Department, Andalas University, Unand Limau Manis, Padang, 25163, Indonesia*
E-mail: cesarwelya@ae.unand.ac.id
[2]*Nutrition Science, Mohammad Natsir University, Bukittinggi, JL Tan Malaka, Guguak Panjang, Bukittingi. 26138, Indonesia*
E-mail: gitanevara@umnyarsi.ac.id

Abstract. This study aims to evaluate the nutrient contents of rice after the partially boiled process and the addition of various concentrations of palm oil. The result showed that modification of palm oil and parboiled process on paddy was not significantly increased water, protein, and carbohydrate, but increase its ash and fat content in 20% oil addition substantially. The increase in fat content is indicated to increase the complexity of the ingredient and has the potential to have a low glycemic index.

Keywords: concentration, nutrients, palm oil, parboiled, rice.

INTRODUCTION

The number of people with Diabetes Mellitus (DM) in Indonesia is estimated at 10 million and ranks seventh in the world for the highest prevalence of DM sufferers. This number tends to increase every year. Considering that DM will have a significant impact on the quality of human resources and rising health costs. Various efforts have been made to prevent and prevent DM from one of them through the selection of appropriate foods. Rice, as the primary food ingredient for Indonesian people, influences the increased risk of DM disease.

The majority of Indonesian people like to consume fluffier rice. The mentioned rice is not recommended for people with DM because it is hyperglycemic (low amylose and high IG). Therefore, it needs rice processing technology to produce rice with high RS and low IG. Parboiled rice is produced from unhulled rice, which has a lower GI than ground rice (Foster-Powell *et al*.2002). Besides, the study of Farooq et al. (2017) found that the addition of palm oil to the process of cooking rice increases resistant starch and decreases the digestibility of starch in vitro. However, it is necessary to know in advance how the nutrient content of parboiled rice is due to the pre-cooking process and the addition of palm oil.

This study aims to evaluate changes in the nutritional quality of rice that has been modified by the parboiling process and the addition of several concentrations of palm oil in the pre-cooking process compared to ordinary rice without the parboiling process and palm oil addition.

MATERIAL AND METHODS

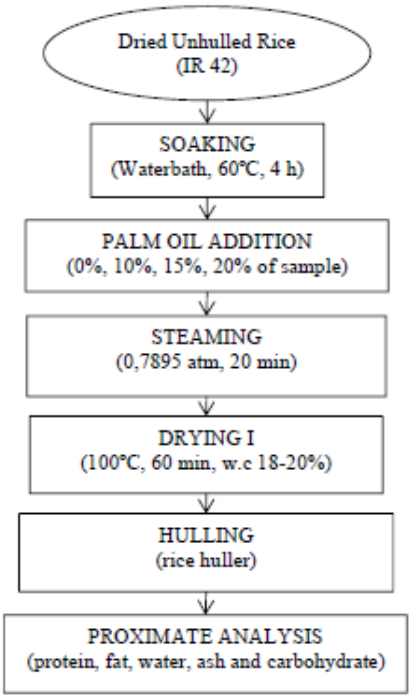
A. Material

The research material includes a high-amylose variety of rice seeds (IR42), which were obtained from Limo Kaum Village, Tanah Datar District, West Sumatra. Modified parboiled rice is obtained by adding Sania palm cooking oil in different concentrations (i.e., 0%, 10%, 15%, and 20% of the total grain) in the parboiling process. Analytical grade chemicals for rice nutrition quality analysis.

The tools used in research, tools for making parboiled rice include water baths, presto, hullers, and tools for analyzing the quality of rice nutrition.

B. Methods

The parboiling process refers to the practice carried out by Widowati with some modifications (Figure 1).



C. *Statistical Analysis*

The researchers conducted all experiments in triplicates, and describe the data as mean ± standard deviation (S.D). One-way analysis of variance (ANOVA) and Duncan's multiple range test was carried out to determine the significant difference ($p<0.05$) between the means by Statistical Packages for Social Sciences (SPSS version 12.0).

RESULT AND DISCUSSION

A. Water Content

Water content resulted in this study ranged from 14.38 to 16.36% each treatment, and after the treatment process of treatment A (15.53%), B (15.75%), C

(16.36%), and D (14.38%) in table 1. Different test results between each treatment did not show any significant difference (p> 0.05). Water is an essential component in food because it affects the texture, appearance, and taste of food. Low water content in food can affect the shelf life. It happens because microbes are challenging to grow in dry conditions. It also can prevent chemical and biochemical changes in rice. Data for measuring water content using the gravimetric method (Association of Official Analytical. 2006). is showed in the following Tabel I.

Table 1.Water Content

Treatments	Water Content (%) ± SD
D (20% oil addition)	14.38 ± 0.38 a
A (0% oil addition)	15.53 ± 1.45 a
B (10% oil addition)	15.75 ± 3.17 a
C (15% oil addition)	16.36 ± 0.31 a

*) Mean value in each column wich the same letter are not significantly different by DNMRT (p=5%)

B. Ash Content

All treatments carried out increased ash content. The ash content can roughly reflect the mineral content contained in rice. The mineral is in the form of oxide, sulfate, phosphate, nitrate, and chloride salts. The increase in ash content in each treatment is also likely to come from the component added material, namely palm oil. From the data produced, ash parboiled rice showed no significant difference (p> 0.05). According to Hasbullah et al. (2012), the parboiling process can increase ash content by 0.32 to 0.33%, which is caused by minerals contained in palm oil absorbed into parboiled rice.

Table 2. Ash content

Treatments	Ash Content (%) ± SD
A (0% oil addition)	1.01 ± 0.09 a
B (10% oil addition)	1.02 ± 0.08 a
C (15% oil addition)	1.21 ± 0.09 a
D(20% oil addition)	1.63 ± 0.08 b

*) Mean value in each column wich the same letter are not significantly different by DNMRT (p=5%)

C. Protein Content

The protein content of parboiled rice in each treatment ranged from 7.60-9.10%. In each treatment, protein levels decreased. According to Akhyar (2019), the protein content of parboiled rice is lower than that of hulled rice due to the presence of heat, which can damage the protein (degraded and coagulated), thereby reducing the protein content (Muchtadi, D. 2001). The main fractions of protein in cereals are promalin and globulin. Proteins that contain lots of polar amino acid residues (e.g., albumin and globulin) will be more soluble in water (Kusnandar, Feri. 2010). The parboiling process can decrease protein caused by protein dissolved in water during

the parboiling process (Widowati, S.*at al* 2009). The results in each treatment showed that the protein content was not significantly different (p> 0.05). Protein content using the Kjeldahl method (Association of Official Analytical. 2006), the following results were obtained in Table 3.

Table3. Protein Content

Treatments	Protein Content (%) ± SD
D (20% oil addition)	7.60 ± 0.40a
B (10% oil addition)	7.97 ± 1.33a
A (0% oil addition)	8.69 ± 0.84a
C (15% oil addition)	9.10 ± 1.32a

*) Mean value in each column which the same letter are not significantly different by DNMRT (p=5%)

D. Fat Content

Fat content in parboiled rice with the addition of palm oil ranged from 2.43-4.12%. For each treatment, the fat content has increased. This increase in fat content is due to the addition of palm oil. During the parboiling process, gelatinization of starch occurs and the formation of amylose and lipid complex crystals whose levels are affected by temperature and water content (Derycke, V *et al* 2005). Test results on treatments C and D showed significantly different (p <0.05). Fat content using the soxhlet method (Association of Official Analytical. 2006) is shown in Table 4 below.

Table 4. Fat Content

Treatments	Fat Content (%) ± SD
A (0% oil addition)	2.43± 0.33 a
B (10% oil addition)	2.64± 0.06 a
C (15% oil addition)	2.77± 0.01 ab
D (20% oil addition)	4.12± 0.93 b

*) Mean value in each column wich the same letter are not significantly different by DNMRT (p=5%)

High-fat content in parboiled rice can also reduce the value of the glycemic index because high fat and protein tend to slow the rate of gastric emptying so that it can delay the digestion process. It happens because the glycemic index value decreases (Rimbawan dan A. Siagian. 2004).

E. Carbohydrate Content

The researchers calculated the carbohydrate content using different methods. Carbohydrate content in parboiled rice ranges from 70.59 to 72.62% for each treatment. The test results for each treatment did not show significant differences (p> 0.05). Carbohydrate content using the different methods (Association of Official Analytical. 2006), the following results are obtained in Table 5.

Table 5. Carbohydrate Content

Treatments	Carbohydrate Content (%) ± SD
C (15% oil addition)	70.59 ± 1.20 a
D (20% oil addition)	72.28 ± 2.93 a
A (0% oil addition)	72.35 ± 4.10 a
B (10% oil addition)	72.62 ± 0.01 a

*) Mean value in each column wich the same letter are not significantly different by DNMRT (p=5%)

CONCLUSIONS

The result of this study showed that parboiled rice with the addition of oil was not significantly different on water, protein, and carbohydrate content. The addition of oil has a very significant effect on ash content and fat content on 20% oil addition. The increase in fat content indicated that the rise in the complexity of the ingredient and decrease the glycemic index.

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