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Physicochemical characteristics and anthocyanin content of analog rice made from mocaf, mung beans (*Vigna radiata*), and purple corn (*Zea mays* L.)

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Abstract. Analog rice was made from various raw materials namely mocaf (modified cassava flour), mung bean (*Vigna radiata*) flour, and purple corn (*Zea mays* L) flour. The experimental design used was 3 treatments with ratio mocaf: mung bean flour: purple corn flour as follows, J1= 60%: 20%: 20%, J2= 50%: 20%: 30%, J3= 40%: 20%: 40%. Physical properties measurements were water absorption and swelling power. Sensory analysis was carried out to determine the preference of panelist on taste, odor, color, and texture. Based on sensory analysis the preferred formula was the product with ratio of mocaf: mung beans flour: purple corn flour; 40%: 20%: 40%. The most preferred product was then analyzed for its chemical properties namely proximate analysis and anthocyanin content. The result showed that the content of moisture, ash, carbohydrate, protein, fat, fiber and anthocyanin in analog rice was 8.60%, 1.52%, 11.34%, 73.62%, 1.52%, 1.27%, and 27.15 mg CyE/g respectively and that content of cooked analog rice was 52.54%, 0.73%, 5.74%, 36.79%, 0.73%, 1.75%, and 8.45 mg CyE/g, respectively.

1. Introduction

Rice is a staple food for Indonesians. The need for rice as the people's main food is increasing along with the population number in Indonesia. This makes a high level of dependence number in Indonesian people on rice. In fact, Indonesia has a lot of local food sources, such as corn, cassava, sweet potato, and so on. So far, the diversification of local food besides rice is mostly processed only into flour, snacks, and pastries. One of the creative ways to make other food or diversify food based on local staples beside rice as an alternative to staple food is by producing analog rice. Analog rice was processed product in the form of rice grains but made from non-paddy, which can be produced using the extrusion method [1]. Purple corn was carbohydrates sources which have low glycemic index. Purple corn also contain anthocyanin as an antioxidant and dietary fiber [2]. Mung beans have good content of carbohydrates, protein, and fiber. The fiber content of mung beans is around 16.3 g/100 g and also contain 3.86 g/100 g protein [3].

Therefore, this research aimed to study the making process of anthocyanin rich-analog rice- and the final product was analyzed for its physical and chemical characteristics.

2. Methods

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2.1. Formulation of raw material composition

At this stage, analog rice was produced based on the raw material composition of mocaf, mung beans, and purple corn. Determination of amount used of flour and starch was based on Novitasari's [4] who made artificial rice based on cornflour and sago starch and added soybean flour with a ratio of flour and starch of 70: 30 and modified by the researcher. The analog rice raw material formulation of mocaf, mung beans flour, and purple corn was displayed in table 1.

Table 1. Formulation of raw material for making analog rice

Analog Rice Formulations	Mocaf	Mung Beans Flour	Purple Corn Flour
J1	60%	20%	20%
J2	50%	20%	30%
J3	40%	20%	40%

In each formulation, fixed component was added, i.e., 30% water and 2% Glyceryl Monostearate (GMS) of total flour dough (dry weight) [1]. This amount also referred to the manufacture process of analog rice granulation method patented by Kurachi's [5] which added water as much as 50% of flour amount and starch modified by the researcher. The use of GMS was in accordance with Kurachi's patent [5] which stated that the amount of the ingredients of the binder that can be added was 0.1-10% of the total flour and starch.

2.2. Making of analog rice

The analog rice-making process referred to the previous research, consisting of several stages, such as material preparation, mixing, extrusion, and drying [1, 4]. Raw materials preparation was carried out by weighing the ingredients according to the formulations in the table. The mixing process was carried out by mixing the dry ingredients for 5–10 minutes, then adding 30% water and the mixing process was continued again for 5 minutes. Furthermore, the dough extrusion process on the extruder machine was conducted in accordance with temperature treatment. The resulting extrudate rice was then dried using oven at 60°C for 3 hours which aimed to reduce the moisture content of analog rice to <14 percent.

2.3. Swelling power [6]

As much as 5 grams of sample was weighed. It was taken randomly and measured the diameter using a digital caliper then it was soaked and the diameter was measured again. The swelling power can be calculated using the following formula:

$$\text{SP (\%)} = \frac{rice\ diameter\ after\ soaking - rice\ diameter\ before\ soaking}{rice\ diameter\ after\ soaking}\ 100\% \qquad (1)$$

2.4. Water absorption [7]

An empty centrifuge tube was weighed then a 1 gram of sample was inserted into the tube. After that a 10 mL of distilled water was added and homogenized using vortex for 3 minutes, then the sample was centrifuged for 20 minutes at a speed of 2000 rpm. The resulting supernatant was separated and the centrifuge tube was weighed. The water absorption value was calculated using the formula:

$$\text{Water Absorption (\%)} = \frac{(Residual\ weight - Weight\ of\ empty\ tube) - Weight\ of\ sample}{Weight\ of\ sample} x100\% \qquad (2)$$

2.5. Sensory analysis

The method used was the hedonic or preference test. Eighteen semi-trained panelists were asked to rate the cooked analog rice. Panelists were asked to fill out the questionnaire on taste, color, texture (stickiness), aroma, and overall preference for analog rice samples the hedonic scale used was 1 (very dislike) to 5 (very much like).

2.6. *Moisture content* [6]
The porcelain cups were dried in the oven for 15 minutes, cooled in a desiccator for 10 minutes, then weighed (A). The sample with a certain weight (B) was put in the cups. The cups and their contents were dried in an oven at 105°C for 6 hours, cooled in a desiccator for 15 minutes, and then weighed. They were dried again until constant weight (C) was obtained. The moisture content of the sample can be calculated by the following equation:

$$\text{Moisture content (Wd\%)} = \frac{water\ content\ (Ww\%)}{100 - water\ content\ (Ww\%)}\ x\ 100 \quad (3)$$

2.7. *Ash Content* [6]
The porcelain cups were dried using the oven for 20 minutes, then cooled in a desiccator for 3-5 minutes and weighed. Furthermore, a sample of 3-5 grams was put into the cup with a known weight. Then the cup was put into the furnace using a temperature of 400°C-600°C. After that the sample was cooled in a desiccator and weighed. The ash content can be calculated using the formula:

$$\text{\% Ash content} = \frac{Ash\ content(gr)}{Weight\ of\ sample(gr)} x100\% \quad (4)$$

2.8. *Fat Content* [6]
A total of 1-2 grams sample was put into filter paper. The filter paper containing the sample was dried in oven at 105°C until dry. The dried filter paper was inserted into the sleeve with a cotton plug. The sleeve was then fed into the Soxhlet extraction device and connected to the condenser and fat flask. A condenser was placed on top of it and a fat flask placed under it. The hexane solvent was added to the fat flask sufficiently. Furthermore, the extraction was carried out for 6 hours. The solvent in the fat flask was distilled and collected again. Then the fat flask containing the extracted fat was dried in an oven at 105°C, cooled in a desiccator and weighed. Drying process was repeated until it reached a fixed weight. Fat content can be obtained by the equation below:

$$\text{Fat Level(\%Ww)} = \frac{\text{(flask weight+fat) - flask weight}}{\text{sample weight (g)}} \quad (5)$$

2.9. *Protein Content* [6]
A total sample of 0.1-0.25 gram was weighed in a Kjeldahl flask, then added 1.0 + 0.1 gram K_2SO_4, 40 + 10 ml HgO, and 2.0 + 0.1 ml H_2SO_4, then it was boiled until the liquid was clear and then cooled. After that, clear solutions were transferred to the distillation apparatus quantitatively. The kjeldahl flask was rinsed with 1-2 ml of distilled water, then the washing water was put into the distillation device. Rinsing was carried out 5-6 times. As much as 8-10 ml of 60% NaOH - 5% $Na_2S_2O_3.5H_2O$ solution was added to the distillation tool. Under the condenser was placed an Erlenmeyer containing 5 ml of saturated H_3BO_3 solution and 2-4 drops of indicator (a mixture of 2 parts 0.2% methylene red and 1 part 0.2% methylene blue in 95% ethanol). At last, the condenser tube must be immersed in H_3BO_3 solution, then distilled until 15 ml of distillate was obtained. The distillate was titrated with 0.02 N HCl until the color changed from green to gray. Crude protein content can be calculated by the equation:

$$N\ Content\ (\%bb) \frac{(VHCL\ sample - V\ HCL\ blank)x\ NHCL\ x14.007}{mg\ sample} x100\% \quad (6)$$

Protein content (% bb) =% N x cf
Description: cf = conversion factor (6.25)

2.10. Carbohydrate content by different [8]
Carbohydrate content was calculated by difference, namely subtracting 100 from the moisture, ash, protein and fat content on a wet basis. Carbohydrate content was calculated using the formula:

$$\text{Carbohydrate content (\%)} = 100\% - (\text{protein content\%} + \text{water content\%} + \text{ash content\%} + \text{fat content\%}) \quad (7)$$

2.11. Crude fiber content [6]
The sample was weighed as much as 1 gram (A) and put into an Erlenmeyer which was added with 1.25% H_2SO_4. The sample was heated in a hot plate for 1 hour. After that 3.25% of NaOH was added to the Erlenmeyer and heated again for 1 hour. Then the sample was filtered and weighed (B). After that, the filter paper was rinsed with 1.25% H_2SO_4 and put in an oven at 15°C for 10 hours. Then the sample was cooled in a desiccator and weighed (C). The filter paper and the weighed sediment were put in a porcelain cup (D) and put in the furnace at 600°C for 5 hours. After that the sample was placed in a desiccator and weighed (E). The formula for fiber content was below:

$$\text{Crude Fiber content (\%)} = \frac{(C\text{-}B) - (E\text{-}D)}{A} \times 100\% \quad (8)$$

Note:
A: sample weight (g)
B: empty filter paper weight (g)
C: weight of filter paper + sediment (g)
D: empty cup weight (g)
E: weight of cup + ash (g)

2.12. Total anthocyanin by pH differential analysis [9]
The sample in a certain amount was put into 2 test tubes. The first test tube was added with a solution of potassium chloride buffer (0.025 M) pH 1 until the volume became 5 mL. The second test tube was added with sodium acetate buffer solution (0.4 M) pH 4.5 until the volume became 5 mL. The absorbance of both pH treatments was measured by a spectrophotometer at a wavelength of 520 nm and 700 nm after standing for 15 minutes. The total anthocyanin content was expressed as mg CyE/g of the sample. The absorbance value was calculated by the formula:

$$A = [(A520 - A700)\ pH\ 1 - (A520 - A700)\ pH\ 4.5] \quad (9)$$

The anthocyanin concentration was calculated as cyanidine 3-glucoside with a molar extinction coefficient of 26,900 L mol-1 cm-1 and a molecular weight of 449.2 using the formula:

$$\text{Anthocyanin content (mg L-1)} = \frac{A \times BM \times FP \times 10000}{\varepsilon \times \text{cuvette diameter (1 cm)}} \quad (10)$$

Note:
A : Absorbance [(A_{510}-A700) pH1- (A510-A700) pH4.5]
BM : Molecular weight (449.2)
FP : dilution factor
ε : molar extinction coefficient (26,900)
L : cuvette diameter (1 cm)

3. Results and discussion

3.1. Swelling power
Mixing analog rice and the volume of water resulted in a larger diameter change (figure 1). These

changes occurred due to the entry of water into the granules of analog rice. The higher the amylopectin in food material, the greater its swelling power. Amylopectin, which was reactive to water molecules, caused the amount of water to be absorbed into food more and more [10]. The decrease in the swelling value of the 20% purple corn formulation could be due to the low amylopectin content compared to other formulas.

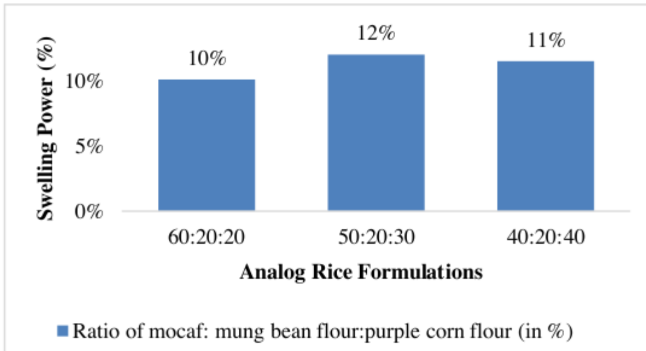

Figure 1. Swelling power of different analog rice formulation.

3.2. Water absorption

The result in figure 2 showed that the highest absorption capacity was the formulation of 60% mocaf flour and 20% mung beans flour with the addition of 20% purple corn. Starch composition in food ingredients affected water absorption. Water absorption was influenced by the composition of starch in food ingredients so that the greater the starch contained in the food material, the greater the water absorption value [11].

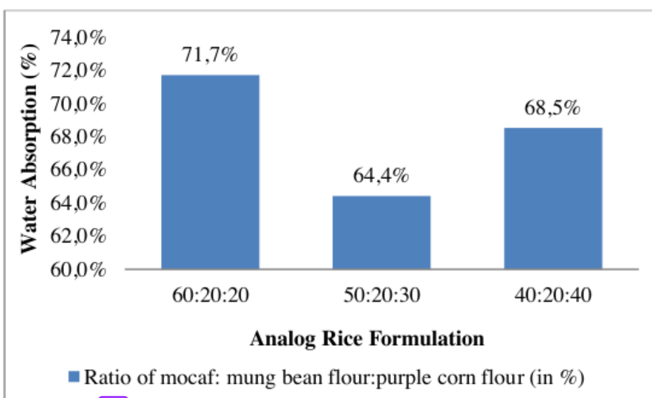

Figure 2. Water absorption of different analog rice formulation.

3.3. Sensory analysis

The best formula was determined by the cooked analog rice which has the highest preference score for each type of rice. The results in table 2 showed that the formula of 40% purple corn gave the highest preference score on the specific parameters tested such as color, aroma, texture, and also taste. Therefore, analog rice with 40% purple corn formula was chosen to be the most preferred sample and then continued by analyzing the chemical properties and anthocyanin content.

Table 2. The score of sensory evaluation of cooked analog rice.

Treatment	Average			
	Color	Taste	Aroma	Texture
Purple Corn 20%	2.61	2.72	2.78	2.94
Purple Corn 30%	2.50	2.61	2.78	2.83
Purple Corn 40%	2.72	2.78	2.83	3.06

3.4. Proximate analysis

3.4.1. Moisture content analysis. The yield of purple corn analog rice moisture content was 8.60 % and met the SNI Rice standard (SNI 6128: 2015), that the maximum moisture content was 14%. Low water content can prolong the storage period, whereas rice with a moisture content of more than 14% will accelerate the proliferation of microbial metabolism [12]. The result of moisture content of the cooked analog rice increased due to the water absorption during the rice cooking process. According to Harper [13], the higher the starch content in food, the easier it will absorb water due to the availability of amylopectin which was reactive to water molecules.

3.4.2. Ash content. The ash content of purple corn analog rice was quite low due to the content of quite high starch. The higher the mineral content will increase the starch content because the role of minerals with starch was able to form cross-links with amylose and amylopectin, so that it was not easily lost in the heating process [14]. A decrease in ash content of rice into cooked rice can be caused by the addition of water volume before cooking which can dissolve inorganic substances on analog rice surface.

3.4.3. Fat. Fat in purple corn has the highest levels. In general, after the processing of foodstuffs, there will be damage to the fat contained therein. The damage varied greatly level depending on temperature used and the length of processing time. The higher temperature used, the higher the fat breakdown [15]. In general, the fat content of analog rice in purple corn analogue rice was low.

3.4.4. Protein. The results showed that there was a decrease in protein content from rice to cooked rice due to the cooking process. Most food protein was denatured when heated to a moderate temperature of 60-90^{o}C [15]. The amount of protein in purple corn analog rice was quite high compared to ordinary rice. It is expected that analog rice will provide support for protein intake in daily consumption.

3.4.5. Carbohydrates. The result of carbohydrate analysis in cooked analog rice was lower than that of raw analog rice. This was due to the higher moisture content in cooked analog rice. With the higher moisture content, the carbohydrates proportion in analog rice was higher than cooked analog rice. Finally, in calculating process by difference, water content will have a large reducing effect. The heating process with a higher temperature will change the gelatinized starch form so that more and more starch granules will be damaged. The amount of amylose-amylopectin fraction greatly affected starch gelatinization. Gelatinization is a process of starch granules that can be made to swell extraordinarily, but it cannot be returned to normal. This happens because according to the temperature increase, the granules, which are the storage places for starch in the cell, will grow so that they can mix with water and paste form. Higher temperatures can result in the development of more swollen starch granules, dissolving low amylose fractions and subsequently breaking down the starch granules and then spreading evenly. In this case the polymer will be hydrolyzed and broken, which will cause damage to carbohydrates. Broken carbohydrates will result in decreased carbohydrates levels [16].

3.4.6. Fiber. Table 3 showed that fiber content in analog rice products to cooked analog rice increased along with the processing process. Research has shown that ripening the fibers during the extrusion process can result in changes in structural characteristics and physical-chemical properties, with the main effect being redistributing insoluble fiber to soluble fiber [17]. So, the fiber content was seen in analog rice products. The higher of starch content in analog rice composition, the higher the crude fiber content. This was due to the presence of resistant starch, which was an undigested (resistant) starch type in the human digestive tract [18].

Table 3. The result of proximate analysis of analog rice best formula.

Best Formula	Content (%)					
	Moisture	Ash	Protein	Carbohydrate	Fat	Food Fiber
Purple Analog Rice 40%	8.60	1.52	11.34	73.62	1.52	1.27
Purple Corn Cooked Rice 40%	52.54	0.73	5.74	36.79	0.73	1.75

3.5. Anthocyanin analysis

The anthocyanin content in purple corn flour was 36.99 mgCyE/g, while analog rice product added with purple corn flour was 27.15 mgCyE/g, and the anthocyanin content of analog rice that had been processed into cooked rice was 8.45 mgCyE/g. From the results of this analysis, it was known that anthocyanin content decreased along with the processing process. The analog rice manufacture in this study was using temperature as one of the limiting factors that can reduce anthocyanin stability. Heating for more than 30 minutes will reduce anthocyanin levels by more than 50%. The higher the heating temperature, the more anthocyanin is more damaged [8]. So, the longer the heating time the more anthocyanin is degraded. The decrease in anthocyanin levels was influenced by temperature amount during the process because it was one of the factors that caused anthocyanin instability [2]

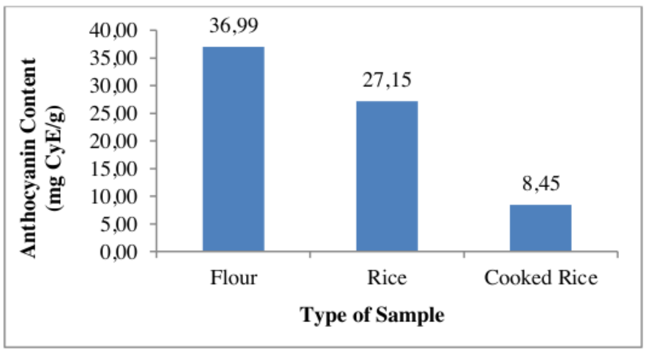

Figure 3. Result of anthocyanin content purple corn flour and analog rice made from purple corn.

4. Conclusions

Based on the research, it can be concluded that the most preferred formula was the formula with ratio of 40% mocaf: 20% mung bean flour: 40% purple corn flour. The chemical analysis resulted the content of moisture, ash, carbohydrate, protein, fat, fiber and anthocyanin in analog rice was 8.60%, 1.52%, 11.34%, 73.62%, 1.52%, 1.27%, and 27.15 mg CyE/g, respectively, and that content in cooked analog rice was 52.54%, 0.73%, 5.74%, 36.79%, 0.73%, 1.75%, and 8.45 mg CyE/g, respectively.

References

[1] Camire M., Camire A and K K 1990 Chemical and Nutritional Changes in Foods During Extrusion *Crit. Rev. Food Sci. Nutr.* **19** 35–7

[2] Noviasari 2016 Beras Analog Sebagai Pangan Fungsional dengan Indeks Glikemik Rendah *J. Gizi dan Pangan* **10**

[3] Astawan M 2004 *Sehat Bersama Aneka Serat Pangan Alami* (Solo: Tiga Serangkai)
[4] Palupi N 2007 Pengaruh Pengolahan terhadap Nilai Gizi Pangan *Modul e-Learning ENBP, Dep. Ilmu Dan Teknol. Pangan- Feteta-IPB* 1–14
[5] Kurniawan F, Hartini S and Hastuti K 2015 Pengaruh Pemanasan Terhadap Kadar Pati dan Gula Reduksi pada Tepung Biji Nangka *Pros. Semin. Nas. Sains dan Pendidik. Sains* 1–7
[6] AOAC 2006 Official Methods of Analysis of The Association of Officiial Agriculture Chemist 16th edition *AOAC International* (Virginia: AOAC International)
[7] Wulandari E, Sihombing F S P, Sukarminah E and Sunyoto M 2019 Karakterisasi Sifat Fungsional Isolat Protein Biji Sorgum Merah (Sorghum bicolor (L.) Moench) Varietas Lokal Bandung *Chim. Nat. Acta* **7** 14
[8] USDA 2015 National Nutrient Database for Standard Reference, Release 28 *U.S. Department of Agriculture, Agricultural Research Service* vol 28
[9] Handayani N H 2017 Kajian Karakteristik Beras Analog Berbahan Dasar Tepung dan Pati Ubi Ungu (Ipomea Batatas) *J. Apl. Teknol. Pangan* **6**
[10] Giusti M M and Wrolstad R E 2001 Characterization and measurement of anthocyanins by uv-visible spectroscopy. Current Protocols in Food Analytical *Chem. New York, John Willey Sons* **F1.2.1** 1–13
[11] Kurachi H 1995 Process of Making Enriched Artificial Rice *United States Pat.* **5,403,606** 1–8
[12] Budijanto 2012 Beras Analog, Diversifikasi Pangan dari IPB (Bogor: IPB)
[13] Herawati 2016 Karakteristik Beras Mutiara dari Ubi Jalar (Ipomea batatas) *Bul. Teknol. Pasca Panen* **5** 37–44
[14] Winarti 2012 Karakteristik dan Profil Inulin Beberapa Jenis Uwi (Dioscorea spp.) Characteristic and Inulin Profil of Wild Yam (Dioscorea spp.) *Agritech* **31** 1–1
[15] Setiawati H, Marsono Y and Maya A 2013 Kadar Antosianin Dan Aktivitas Antioksidan Flake Beras Merah Dan Beras Ketan Hitam dengan Variasi Suhu Perebusan *J. Teknol. Pangan dan Gizi* **12** 29–38
[16] Laleh G H, Frydoonfar H, Heidary R, Jameei R and Zare S 2006 The effect of light, temperature, pH and species on stability of anthocyanin pigments in four Berberis species *Pakistan J. Nutr.* **5** 90–2
[17] Dinarki A 2014 Physical Characteristics Test of Analog Rice Composed of Taro and “Onggok” Flours *Dep. Ilmu Dan Teknol. Pangan Unila*
[18] Harper J R and Balke N E 1981 Characterization of the Inhibition of K + Absorption in Oat Roots by Salicylic Acid *Plant Physiol.* **68** 1349–53

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