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Od: editor@potravinarstvo.com

Komu: iketutbudaraga@unespadang.ac.id

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Best regards
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Bukti review 1

Potravinarstvo Slovak Journal of Food Sciences
Slovak Journal of Food Sciences

Study of biscuit quality with the addition of banana stone flour and purple rice flour as a replacement for wheat flour
I Ketut Budaraga, Amurita, Yolan Novena

ABSTRACT
Biscuits are processed food products made from wheat flour. Another alternative is to find a substitute for flour to avoid dependence on outside parties. The isolation with use banana flour and purple rice. This study aims to determine the effect of the ratio of purple rice flour and stone banana flour on the quality characteristics of biscuits to determine the best ratio of purple rice flour and stone banana flour. This study used a one-factor, Completely Randomized Design (CRD) with 5 levels of treatment and 3 replications. The results of the observational data were analyzed using ANOVA with the further test of DMSRT at 5% significance level. The assessment in this study was the comparison between starch, protein, fat, crude fiber, protein, and carbohydrate and had no significant effect on antioxidant activity. All treatments the SNI requirements for biscuit quality except protein. The biscuits with the best quality were in treatment E (comparison of purple rice flour and stone banana flour 50:50). Based on the organoleptic test of taste, aroma, texture, and color favored by panelists with recapitulation A (90-10) 3.52%, B (80-20) 3.97%, C (70-30) 4.42%, D (60-40) 5.03%, and E (50-50) 5.52%.

INTRODUCTION
Biscuits are processed food products made from wheat flour. According to [1] biscuits are products obtained by baking dough from wheat flour with the addition of other food ingredients or without the addition of permitted food additives. Biscuits are one of the snacks or snacks that are widely consumed by the community. This product is a dry product that has low water content. According to [2], based on industry association data in 2012 biscuit consumption is estimated to increase by 55-50% driven by an increase in domestic consumption. Biscuits are consumed by all ages, both infants and adults but with different types [3].

Most of the biscuits on the market use wheat flour as the raw material. The flour used in the manufacture of biscuits is wheat flour which many manufacturers biscuits is wheat flour with a low protein content. The use of non-wheat flour for making biscuits is currently being developed especially currently being developed for making biscuits, especially for gluten-free biscuits [4]. Therefore, currently, many efforts are being made to substitute wheat flour with various flour from local resources such as flour from rice, seeds, and fruits, one of which is purple rice and stone bananas.

Rice (*Oryza sativa* L.) is a type of food crop selected as a staple food or a source of carbohydrates in developing countries [5]. So-called "speaking", there is rice in various varieties such as white rice, brown rice, black rice, and purple rice.

Purple rice with pigmented grains has long been a unique and traditional food for desserts and some medical purposes in many cultures [6]. Today, its benefits have been widely recognized, and pigmented rice is used in commercial food production as well as in dietary supplements, cosmetics, and medicines [7]. Colored rice

MATERIAL AND METHODOLOGY
Sample
This research has been carried out at the Agricultural Product Technology Laboratory, Ekasakti University, Padang. The research was conducted from March to April 2021. The main raw materials used in this study were purple rice obtained from Kenangan Kasang, Padang Panjang City, and stone bananas obtained from Pasar Raya Padang City. The researchers made purple rice flour and stone banana flour themselves.

Chemicals
The materials for chemical analysis are (1) Potassium dichromate, 1.25% concentrated sulfuric acid (H₂SO₄) and Aquadest, 2% of NaOH, Methyl Indicators, Methyl red 0.2%, Methyl blue 0.2%, selenium mix, 1.00%, Hg 0.1N, (2) Analysis of fat content, n-hexane (3) Analysis of crude fiber content, ethanol, sulfuric acid (H₂SO₄), 1.25% NaOH, and 10% potassium sulfate (K₂SO₄), (4) Amphoteric test DPPH 45 ppm, methanol. The tools used for making biscuits are scales, stove, calendar, biscuit trays, spoon, sieve, mixer, knife, blender, sieves, ovens, mixer, cake pans, and molds. Additional ingredients used are margarine, eggs, honey, skim milk, salt, and vanilla.

Animals and Biological Material
Animals and special biological materials were not used in this research.

Instruments
The tools for chemical analysis are (1) moisture content, scales, oven, porcelain cup, and desiccator, (2) ash content, porcelain cup, blast furnace, furnace, stove, (3) fat content, socket with the condenser, electric heater, oven, analytical balance, (4) crude fiber, reflux, electric heating, filter paper, and analytical balance, (5) protein content, 500 ml Kjeldahl flask, distillation apparatus, 50 ml burette, 5 ml measuring pipette, 50 ml Bismeyer, dropper pipette, 250 ml beaker, and fume hood, (6) Antioxidant test, UV-VIS spectrophotometer (7) Organoleptic test by 25 untrained panelists.

Laboratory Method:

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The design used in this study was a one-factor Simple Completely Randomized Design (CRD) with 5 treatment levels and 3 replications. Observational data were analyzed using Analysis of Variance (ANOVA) and Duncan's New Multiple Range Test (DNMRT) advanced test at a 5% significance level. The treatments in this study were the ratio of purple rice flour to stone banana flour (%), namely: A= 90:10, B= 80:20, C= 70:30, D= 60:40, E= 50:50. The formulation for making biscuits using purple rice flour and stone banana flour refers to [14] in [15].

Table 1 Standard formulations for making biscuits

No	Material type	Percentage (%)
1	Flour	50
2	Egg Yolk	20
3	Honey	10
4	Margarine	10
5	Skimmed Milk	10
6	Baking soda	0,2
7	Salt	0,2

Source: [14] in [15]

The formulation of ingredients for the manufacture of biscuits is presented in Table 2.

Table 2 Biscuit formulation in 200 g of ingredients

No	Material type	Unit	Treatment				
			A	B	C	D	E
1	Purple rice flour	g	90	80	70	60	50
2	Stone banana flour	g	10	20	30	40	50
3	Egg yolk	g	40	40	40	40	40
4	Honey	g	20	20	20	20	20
5	Margarine	g	20	20	20	20	20
6	Skimmed Milk	g	20	20	20	20	20
7	Baking soda	g	0,4	0,4	0,4	0,4	0,4
8	Salt	g	0,2	0,2	0,2	0,2	0,2

Source: [14] in [16]

Description of the Experiment
 Sample preparation: The raw materials for making biscuits are purple rice and stone bananas obtained from Pasar Raya Padang City. While other ingredients used for making biscuits are egg, powdered sugar, margarine, skim milk, baking soda, and salt.
 The number of samples analyzed: We analyzed Purple rice flour 500 g, Stone banana flour 150 g, Egg yolk 200 g, Honey 100 g, Margarine 100 g, Skimmed Milk 100 g, Baking soda 2 g, and Salt 2 g samples.
 The number of repeated analyses: 5 repeated treatment levels.
 The number of experiment replications: 3 replications.
 Design of the experiment: The researcher made the biscuits themselves as follows:
 a. Production of modified rice flour [17]
 • Purple rice washed with running water
 • Drain and dry in the sun for 8 hours
 • Smoothing with a blender and then sifting 60 mesh
 • Get purple rice flour
 b. Production of modified banana stone flour [16]
 • Stone bananas
 • Peeling the stone banana skin and then soaking it in citric acid for 5 minutes

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- Washing with clean water
- Slicing stone bananas and then drying in the sun for 7 hours for 3 days
- Smoothing with a blender and then sifting 60 mesh
- Get stone banana flour
- Biscuit making [14] in [15]
 - Mixing I
 - Margarine, egg yolks, and honey, mixing with a hand mixer for 10 minutes
 - Mixing II
 - Purple rice flour and stone banana flour according to the treatment, baking soda, skim milk, and salt was mixed using a high-speed mixer for 2 minutes
 - This dough with a thickness of 2 cm
 - Printing with a diameter of 3 cm
 - Baking in the oven (150°C, 10 minutes)
- Biscuits

Observations were made on the nutritional content of biscuits, namely: water content [18], protein content [18], ash content [18], crude fiber content [18], fat content [18], antioxidant with DPPH method [19] and organoleptic test [20].

Statistical Analysis:
 The data from this research were entered into SPSS 26.0 (SPSS Analytic Partner) and then the data were evaluated by using ANOVA (Analysis of Variance) and the Tukey-Kramer test to determine the significant difference.

RESULTS AND DISCUSSION
Moisture Content
 The results of the analysis of diversity showed that the ratio of purple rice flour to stone banana flour was very significant (p<0.01) in the moisture content of the resulting biscuits. Based on the further test of DNMRT at the level of 0.01, all treatments showed a very significant difference in the moisture content of the biscuits. The average moisture content of biscuits is presented in Table 3.

Table 3 Average moisture content of biscuits
Comparison of purple rice flour with stone banana flour (%)

flour (%)	Water Content (%)
A = 90:10	5,01 a
B = 80:20	4,70 b
C = 70:30	4,35 c
D = 60:40	3,82 d
E = 50:50	3,56 e

RK: 3,85 %
 Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DNMRT follow-up test at the level of $\alpha = 0.01$.

The moisture content of the biscuits ranged from 3.56-5.01%. The value of the moisture content of the biscuits showed a decrease in yield along with an increase in the amount of stone banana flour. Banana flour has a low water content because the biscuits are processed by baking at a temperature of 150°C so that the baking process can evaporate and reduce the amount of moisture in the biscuit dough [21]. The highest water content was found in treatment A (comparison of purple rice flour with stone banana flour 90:10), which was 5.01%. While the lowest water content was found in treatment E (comparison of purple rice flour with stone banana flour 50:50), which was 3.56%. The less the use of purple rice flour and the more stone banana flour, the water content will decrease, and vice versa.

According to [22] the water content of rice flour is 13%, while banana stone flour has a water content of 7.44% [9]. This is under the research that has been done, the more the use of stone banana flour in the manufacture of biscuits, the lower the water content of the biscuits. The moisture content of the biscuits produced for all treatments except treatment A, which did not meet the Indonesian National Standard [23] for biscuits, was a maximum of 5%.

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The water content of each treatment is different, this is because the relationship of water in food ingredients is also different, the water content in food can be distinguished between bound water and free water [24]. Water absorption into rice seeds is influenced by amylose content and soaking temperature [25]. Based on the amylose content, rice (non-amylose) can be grouped into three, namely: low amylose (<20%), medium amylose (20-25%), and high amylose (>25%) (Arunali, et al 1976). At temperatures above 65°C, water absorption and swelling will increase if the amylose content is low [26].

Ash Level
 The results of the analysis of diversity showed that the ratio of purple rice flour and stone banana flour was very significant (p<0.01) on the ash content of the resulting biscuits. Based on the DNMRT further test at the level of 0.01, all treatments showed a very significant difference in the ash content of the biscuits. The average ash content of biscuits is presented in Table 4.

Table 4 Average ash content of biscuits
Comparison of purple rice flour with stone banana flour (%)

flour (%)	Ash content (%)
A = 90:10	1,70 a
B = 80:20	1,83 b
C = 70:30	1,95 c
D = 60:40	2,04 d
E = 50:50	2,11 e

RK: 3,93 %
 Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DNMRT follow-up test at the level of $\alpha = 0.05$.

Biscuit ash content ranged from 1.70 to 2.11%. The more the use of stone banana flour and the less purple rice flour in making biscuits, the higher the ash content of the biscuits. This is because banana stone flour has high minerals causing the ash content to increase. Ash content is known as mineral element or organic substances [27].

The highest ash content of biscuits was found in treatment E (comparison of purple rice flour with stone banana flour 50:50) that is 2.11%, while the lowest ash content was in treatment A (comparison of purple rice flour with stone banana flour 90:10) that is 1.70%. The less the use of purple rice flour and the more stone banana flour, the ash content will increase, and vice versa.

Biscuit ash content for all treatments has met the Indonesian National Standard [28] which is at least 1.4%. This is because banana stone flour has a higher ash content than purple rice flour. The ash content of banana stone flour is 3.3% [9], while the ash content of rice flour is 1.0 [21].

Ash is one of the components in foodstuffs. This component consists of minerals such as potassium, phosphorus, sodium, and copper. In the body, there are mineral elements that combine with organic substances or free ions, in the body the mineral elements function as building blocks and regulators. The number of minerals in the body must be within optimal limits [29]. The more use of stone banana flour, the higher the ash content of the biscuits. So that biscuits that use a lot of stone banana flour contain higher minerals.

Fat Content
 The results of the analysis of diversity showed that the ratio of purple rice flour and stone banana flour was very significant (p<0.01) in the fat content of the biscuits produced. Based on the DNMRT further test at the level of 0.01, all treatments showed a very significant difference in the fat content of the biscuits. The average fat content of biscuits is presented in Table 5.

Table 5 Average fat content of biscuits
Comparison of purple rice flour with stone banana flour (%)

flour (%)	Fat level (%)
A = 90:10	16,66 a
B = 80:20	19,19 b
C = 70:30	21,13 c
D = 60:40	23,10 d

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The numbers in the same column followed by different lowercase letters show a very significant difference in the DNMRT follow-up test at the level of $\alpha = 0.01$.

Biscuit fat content ranged from 16.66-23.13%. The more addition of stone banana flour in the manufacture of biscuits, the higher the fat content. This is because the fat content of stone banana flour is higher than purple rice flour. The highest fat content was found in treatment E (comparison of purple rice flour with stone banana flour 50:50), which was 23.13%. While the lowest fat content was found in treatment A (comparison of purple rice flour with stone banana flour 90:10), which was 16.66%. The less the use of purple rice flour and the more stone banana flour, the fat content will decrease, and vice versa.

The fat content of biscuits produced for all treatments was above the maximum fat content limit in the Indonesian National Standard [23], which is a minimum of 9.5%. This is because the fat in biscuits is also obtained from butter, egg, and cream milk which is added to the biscuit dough formulation [30] and banana stone flour has a higher fat content than purple rice flour. The fat content of stone banana flour is 0.4% [9]. While in contrast, the fat content in rice flour is 0.5% [31]. This statement follows the results showing that the increase in purple rice flour in the manufacture of biscuits reduces the fat content in the product.

Crude Fiber Content
 The results of the analysis of diversity showed that the ratio of purple rice flour and stone banana flour showed a very significant difference (p<0.01) to the crude fiber content of the biscuits produced. Based on the DNMRT further test at the level of 0.01, all treatments showed a very significant difference in the crude fiber content of the biscuits. The average crude fiber content of biscuits is presented in Table 6.

Table 6 Average content of crude fiber of biscuits
Comparison of purple rice flour with stone banana flour (%)

flour (%)	Crude Fiber Content (%)
A = 90:10	8,38 a
B = 80:20	10,08 b
C = 70:30	12,74 c
D = 60:40	14,50 d
E = 50:50	17,85 e

RK: 4,91 %
 Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DNMRT follow-up test at the level of $\alpha = 0.01$.

The crude fiber content of biscuits ranged from 8.38-17.85%. The more the use of stone banana flour in making biscuits, the higher the crude fiber content. This is because banana stone flour has a high crude fiber compared to purple rice flour. The highest crude fiber content of biscuits was found in treatment E (comparison of purple rice flour with stone banana flour 50:50) that is 17.85%, while the lowest crude fiber content was found in treatment A (comparison of purple rice flour with stone banana flour 90:10) that is 8.38%. This statement is following the results of the study showing that the crude fiber content is inversely proportional to the water content, the higher the crude fiber content the water content will decrease and vice versa, the lower the crude fiber content, the higher the water content produced. The less the use of purple rice flour and the more stone banana flour, the more purple rice flour and banana stone flour, the more crude fiber content will increase, and vice versa.

The crude fiber content of biscuits produced for all treatments was above the maximum limit of crude fiber content in the Indonesian National Standard [23], which is 0.5%. This is because banana stone flour has a higher crude fiber content than purple rice flour. The crude fiber content of stone banana flour is 13.71% [9]. The more the use of stone banana flour in the manufacture of biscuits, the crude fiber content of the biscuits is also high. Crude fiber is a component of cellulose, pectin, and other compounds. This component of crude fiber has no nutritional value but is very important to facilitate facilitating the digestive process in the body [32].

Protein Levels:
 The results of the analysis of diversity showed that the comparison of purple rice flour and stone banana flour showed a very significant difference (p<0.01) in the protein content of the biscuits produced. Based on the

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further test of DDMRT at the level of $\alpha = 0.01$ that, all treatments showed a very significant difference in the protein content of biscuits. The average protein content of biscuits is presented in Table 7.

Table 7 Average protein content of biscuits

Comparison of purple rice flour with stone banana flour (%)	Protein level (%)
A = 90:10	7,78 a
B = 80:20	6,75 d
C = 70:30	5,59 c
D = 60:40	5,00 b
E = 50:50	4,72 a

KK: 11,1 %
 Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DDMRT follow-up test at the level of $\alpha = 0,01$.

Biscuit protein content ranged from 4.72-7.78%. The more use of purple rice flour in making biscuits, the higher the protein content of the biscuits produced. This is because banana stone flour contains low protein, the highest protein content of biscuits is found in treatment A (comparison of purple rice flour with banana stone flour 90:10) that is 7.78%, while the lowest protein content is in treatment E (comparison of purple rice flour with stone banana flour 50:50) that is 4.72%. The less the use of purple rice flour and the more banana stone flour, the fewer protein levels will decrease, and vice versa.

The protein content of the biscuits produced for all treatments did not meet the Indonesian National Standard [23] which was 9%. This was because purple rice flour had a higher protein content than stone banana flour. The protein content of rice flour is 7.59% [3], while the stone banana flour is 4.3% [9]. The more use of purple rice flour in the manufacture of biscuits, the higher the protein content of the biscuits.

Antioxidant Activity

The analysis of diversity showed that the comparison of purple rice flour and stone banana flour showed no significant difference ($p > 0.01$) in the antioxidant content of the biscuits produced. The average antioxidant content of biscuits is presented in Table 8.

Table 8 Average antioxidant content of biscuits

Comparison of purple rice flour with stone banana flour (%)	Antioxidant Activity (%)
A = 90:10	85,83
B = 80:20	80,00
C = 70:30	70,66
D = 60:40	61,62
E = 50:50	55,83

The antioxidant activity levels of biscuits ranged from 55.83-85.83%. The less use of stone banana flour in the manufacture of biscuits, the higher the antioxidant content of the biscuits produced. The increase in the addition of purple rice flour in the manufacture of biscuits causes the antioxidant activity to increase. This is because purple rice flour contains 97.64% antioxidant compounds [4]. As a comparison of antioxidants that have been studied by [35] showed levels of antioxidant activity in brown rice flour. The highest content of antioxidant activity of the two varieties was Mandel Handayani variety brown rice flour, which ranged from 92.236-92.97%, while for the Segana Handayani variety it ranged from 79.207-89.970%.

The highest antioxidant levels of biscuits were found in treatment A (comparison of purple rice flour with banana stone flour 90:10), that is 85.83%, while the lowest antioxidant levels were found in treatment E (comparison of purple rice flour with stone banana flour 50:50) that is 55.83%. The less the use of purple rice flour and the more banana stone flour, the antioxidant activity will decrease, and vice versa.

For antioxidant activity, it is not written in the SNI for biscuits, because antioxidants are very important to examine to determine the antioxidant content of the mixture of purple rice flour and stone banana flour in biscuits. This purple rice flour can be an alternative food *as a source of antioxidants* that are good for the body. *For banana stone flour content, the purple rice flour content will also be higher. The antioxidant activity will also be higher for biscuits with more purple rice flour content.* The antioxidant activity of biscuits produced for all treatments was 70.83%. According to [34], the level of antioxidant activity in purple rice is 67.64%.

Carbohydrate Levels

The results of the analysis of diversity showed that the ratio of purple rice flour and stone banana flour showed a very significant difference ($p < 0.01$) in the carbohydrate content of the biscuits produced. Based on the further test of DDMRT at the level of $\alpha = 0.01$ that, all treatments showed a very significant difference in the carbohydrate content of biscuits. The average carbohydrate content of biscuits is presented in Table 9.

Table 9 Average carbohydrate content of biscuits

Comparison of purple rice flour with stone banana flour (%)	Carbohydrate level (%)
A = 90:10	71,72 a
B = 80:20	69,28 b
C = 70:30	66,91 c
D = 60:40	64,27 d
E = 50:50	61,49 e

KK: 2,58%
 Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DDMRT follow-up test at the level of $\alpha = 0,01$.

The carbohydrate content of biscuits ranged from 61.49-71.72%. The more the use of stone banana flour in making biscuits, the lower the carbohydrate content of the biscuits produced. This is because purple rice flour contains high carbohydrates compared to stone banana flour. The highest carbohydrate content of biscuits was found in treatment A (comparison of purple rice flour with banana stone flour 90:10) that is 71.72%, while the lowest carbohydrate content was found in treatment E (comparison of purple rice flour with banana stone flour 50:50), namely 61.49%. The less the use of purple rice flour and the more banana stone flour, the carbohydrate content will decrease, and vice versa.

The results of this analysis *show that the results follow the statement that biscuits with purple rice flour contain more carbohydrates, so that the carbohydrate content will be higher.* The carbohydrate content of biscuits produced for treatment A has met the Indonesian National Standard [23] for biscuits, which is at least 70%.

This value is slightly below the minimum SNI limit for biscuits which stipulates the minimum carbohydrate content of biscuits is 70%. The carbohydrate content of stone banana flour is indeed lower, namely 47.8-49.3% [9]. Although the stone banana flour biscuits have not been able to reach the minimum limit of carbohydrates *compared to the minimum carbohydrate content limit in [23] biscuits.* Carbohydrates are the main source of calories for humans. Carbohydrates also play a role in determining the characteristics of food ingredients, such as taste, color, and texture. In addition, carbohydrates are useful in the body to prevent the breakdown of excessive body protein, and loss of minerals and help fat and protein metabolism [36].

Organoleptic Test

The organoleptic test was carried out through sensory assessment, namely by tasting the taste, and aroma, and observing the texture, and color of the biscuit. The test was carried out through biscuits made according to the treatment formulation. By being tested by 25 untrained panelists.

Flavor

Taste is the most important parameter in consumer acceptance of a product. *Taste is influenced by: Smell and involves the five senses of the tongue. Taste can be influenced by several factors, namely chemical compounds, temperature, concentration, and interaction with other flavor components [36].* Panelists' assessment data on the taste of biscuits are presented in table 10.

Table 10 Biscuit taste test value

Comparison of purple rice flour with stone banana flour (%)	Flavor value (%)	Description
A = 90:10	3,56	do not like (tasteless)
B = 80:20	4,88	kinda like (kinda banana)
C = 70:30	4,24	kinda like (kinda banana)
D = 60:40	5,60	like (flavor banana)
E = 50:50	5,60	like (flavor banana)

7 = very much like, 6 = very much like, 5 = like, 4 = somewhat like, 3 = do not like, 2 = do not like very much, 1 = very much do not like

Table 10 shows that the panelists' highest assessment of the biscuit taste was found in treatment E (comparison of purple rice flour with banana stone flour 50:50), which was 5.60% (like). The panelists' lowest assessment of the biscuit taste was in treatment A (comparison of purple rice flour with banana stone flour 90:10) which was 3.56% (didn't like it).

The data obtained showed that the higher the addition of purple rice flour, the panelist acceptance rate decreased. This is because purple rice flour has a slightly bland taste that affects the taste of the biscuit. The taste of the biscuits can come from the addition of stone banana flour and other additives. However, from the panelists' acceptance data, it can be concluded that the *mixing of purple rice flour with stone banana flour has been accepted by the panelists. This is because the mixing of purple rice flour with stone banana flour has been accepted by the panelists. This is because the mixing of purple rice flour with stone banana flour has been accepted by the panelists.*

Food products in general, do not have only one taste but a combination of various integrated flavors. Taste is the perception of taste buds *which includes, includes salty, sweet, sour, and bitter tastes caused by substances dissolved in the mouth [37].*

b. Aroma

[34] states that *aroma is much influenced by the sense of smell, five senses of small, much influence*. In general, there are four types of odors that can be received by the nose, namely, fragrant, sour, rancid, and charred.

The aroma also determines the delivery of food products *as well as taste, which consists of three components: aroma and taste, which consists of three components: small, taste, and stimulation [38].* Panelists' assessment data on the aroma of biscuits are presented in Table 11.

Table 11 Biscuit aroma test value

Comparison of purple rice flour with stone banana flour (%)	Aroma Value (%)	Description
A = 90:10	3,58	do not like (not typical)
B = 80:20	3,88	do not like (not typical)
C = 70:30	4,44	kinda like (kinda banana)
D = 60:40	4,84	kinda like (kinda banana)
E = 50:50	5,44	like (typical banana aroma)

Notes: taste scores include 7 = very much like, 6 = very much like, 5 = like, 4 = somewhat like, 3 = do not like, 2 = do not like very much, 1 = very much do not like

Table 11 shows that the panelists' highest assessment of the biscuit aroma was found in treatment E (comparison of purple rice flour with banana stone flour 50:50), which was 5.44% (like). *While in comparison, the panelists' lowest assessment of the biscuit aroma was in treatment A (comparison of purple rice flour with banana stone flour 90:10), which was 3.58% (didn't like it).*

The addition of purple rice flour resulted in lower aroma reception. This is because purple rice flour itself does not have a strong aroma. The aroma contained in the biscuits comes from raw materials and other additive during baking.

c. Texture

The appearance of food is largely *primarily* determined by the water content and also the fat content and the fat content, and number of carbohydrates and proteins. Texture changes can be caused by loss of water or fat content, breakdown of emulsions, and hydrolysis [39]. Panelists' assessment data on biscuit texture are presented in Table 11.

Table 11 Value of biscuit texture test

Comparison of purple rice flour with stone banana flour (%)	Texture Value (%)	Description
A = 90:10	3,52	do not like (rough)
B = 80:20	3,96	do not like (rough)
C = 70:30	4,48	kinda like (rather rough)
D = 60:40	5,20	like (gentle)
E = 50:50	5,52	like (gentle)

1 = do not like very much, 2 = very much like, 3 = do not like, 4 = somewhat like, 5 = like, 6 = very much like, 7 = do not like.

Table 12 shows that the highest assessment of biscuit texture was found in treatment E (comparison of purple rice flour and banana stone flour 50:50), which was 5.52% (like), while the biscuit texture was found in treatment A (comparison of purple rice flour and stone banana flour 90:10), which is 3.52% (dislike). *While in comparison, the panelists' acceptance rate is on a scale of dislike to like.*

The higher the assessment of stone banana flour, the softer the resulting product, and the higher the panelist acceptance rate. The low level of panelist acceptance of treatment A (comparison of purple rice flour and banana stone flour 90:10) was due to the addition of purple rice flour. *The biscuits would become hard or solid.* The texture of food is largely determined by the content of water, fat, protein, and carbohydrates. The texture is a sensation of pressure that can be observed with the mouth (when biting, chewing, and swallowing). Texture sensing varies, including wetness, dryness, hardness, smoothness, roughness, and oily [40].

d. Color

According to [41], color *has an important role in meeting human taste.* Color assessment is done by observing the product directly with the sense of sight of each panelist. Panelists' assessment data on the color of biscuits are presented in Table 13.

Table 13 Nilai uji warna biscuit

Comparison of purple rice flour with stone banana flour (%)	Color Value (%)	Description
A = 90:10	3,64	do not like (light yellow)
B = 80:20	4,16	kinda like (yellow)
C = 70:30	4,52	kinda like (yellow)
D = 60:40	5,08	like (dark yellow)
E = 50:50	5,52	like (dark yellow)

Notes: taste scores include 7 = very much like, 6 = very much like, 5 = like, 4 = somewhat like, 3 = do not like, 2 = do not like very much, 1 = very much do not like

Table 13 shows that the highest assessment of the color of the biscuits was found in treatment E (comparison of purple rice flour and 50:50 banana stone flour), which was 5.52% (like). *Because the dark yellow color is more attractive to the panelists. While the lowest assessment was found in treatment A (comparison of purple rice flour and banana stone flour 90:10), which was 3.64% (didn't like it).* Because the color of light pink is less attractive to panelists.

Color assessment is done by direct visual observation of the product with the sense of sight of each panelist. Determining the quality of a product depends on many factors, but before other factors are tested and analyzed, the color factor visually appears first in determining panelists' acceptance of the product [36].

CONCLUSION

A comparison of purple rice flour and banana stone flour on the quality of antioxidant-rich biscuits had a very significant effect on water content, ash content, crude fiber content, fat content, protein content, and

carbohydrate content and had no significant effect on antioxidant activity, in its treatment E (comparison of purple rice flour and brown banana flour 5:50), with 3.6% water content, 2.1% ash content, 2% fat content, 17.4% crude fiber content, 4.72% protein content, 55.83% antioxidant activity, and 61.49% carbohydrate content. It is recommended to the community and biscuit entrepreneurs develop antioxidant-rich biscuit products using purple rice flour and brown banana flour to reduce the use of wheat flour.

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Your organization name	-
Organization address	-
ID number of the organization	-
Internal order number issued by your organization	-
VAT ID of your organization if applicable	-
Organization bank account No.	-
SWIFT code	-
Preferred Payment method (PayPal, Bank Transfer)	-
Provide any other information you need to have on the invoice	-

If you like to pay as an individual




Name and surname	I Ketut Budraga
Address	Komplek Puskod Minang Blok E/1 Kelurahan Koto Panjang Ibur Koto Kac Koto Tangah Kota Padang Provinsi Sumatera Barat
E-mail	iketutbudraga@unespadang.ac.id
Your bank account No.	Bank BRI 54'601-0018'0-33'
SWIFT code	BRINDIA058
Preferred Payment method (PayPal, Bank Transfer)	Bank Transfer

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Hasil review 1

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This part of review checklist will be sent to the Author					
Article title Study of biscuit quality with the addition of banana stone flour and purple rice flour as a replacement for wheat flour					
Author(s) I Ketut Endang, Amaria, Yolan Novra					
Reviewer's professional title Reviewer 1 Major revision is required, there is many formal problems.					
Requirement The scope of the article in the article relevant to the International Science Index or Food Science?	OK	Requirement The scope of the article in the article relevant to the International Science Index or Food Science?	OK	Requirement The scope of the article in the article relevant to the International Science Index or Food Science?	OK
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Study of biscuit quality with the addition of banana stone flour and purple rice flour as a replacement for wheat flour

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ABSTRACT
 Biscuits are processed food products made from wheat flour. Another alternative is to find a substitute for flour, such as banana flour and purple rice. This study aims to determine the effect of the ratio of purple rice flour and stone banana flour on the quality characteristics of biscuits to determine the best ratio of purple rice flour and stone banana flour. This study used a one-factor Simple Completely Randomized Design (SCRD) with 5 levels of treatment and 3 replicates. The results of the observational data were analyzed using ANOVA with the Fisher test of DMRT at a 5% significance level. This study's treatment was comparing purple rice flour and stone banana flour in making biscuits. The results showed that the ratio of purple rice flour and stone banana flour had a very significant effect ($p < 0.01$) of water content (3.26%), ash content (2.11%), fat content (25.18%), crude fiber content (7.83%), protein content (9.7%), and carbohydrate content (61.49%), while it had no significant effect ($p > 0.05$) on antioxidant activity (55.8%). All treatments met the DV requirement for biscuit quality except protein. The biscuits with the best quality were in treatment 2 (comparison of purple rice flour and stone banana flour 50:50). Based on the organoleptic test of taste, aroma, texture, and color observed by panelists with recognition A (90-10) 3.24, B (80-20) 3.97%, C (70-30) 4.42%, D (60-40) 5.03%, and E (50-50) 5.52%.

Keywords: biscuit, flour, rice, banana, addition
INTRODUCTION
 Biscuits are processed food products made from wheat flour. According to [1] biscuits are products obtained by baking dough from wheat flour with other food ingredients or without the addition of permitted food additives. Biscuits are one of the snacks or snacks that are widely consumed by the community. This product is one of the biscuits that has low water content. According to [2], based on industry association data, in 2012 biscuit consumption is estimated to increase by 55-58% driven by an increase in domestic consumption. Biscuits are consumed by all ages, both adults and children.
 Most of the biscuits on the market use wheat flour as the raw material. The flour used to manufacture biscuits is wheat flour with low protein content. The use of low-protein flour is currently being developed for making biscuits, especially for gluten-free biscuits [4]. Therefore, many efforts are being made to substitute wheat flour with various flours from local resources such as flour from tubers, seeds, and fruit, one of which is purple rice and stone banana.
 Rice (*Oryza sativa* L.) is a type of food crop selected as a staple food or a source of carbohydrates in developing countries [5]. There is rice in various varieties such as white, brown, rice, black, rice, and purple rice.
 Purple rice with pigmented grains has long been a unique and traditional food for diabetics and some medical purposes in many cultures [6]. Today, it benefits have been widely recognized, and pigmented rice is used in commercial food production and is dietary supplements, cosmetics, and medicines [7]. Colored rice contains a lot of phenolic compounds. One group of phenolic compounds that have benefits as antioxidants is a group of flavonoid compounds [8].

The use of wheat flour as the main raw material in various processed food products in Indonesia causes the high use of wheat flour so dependence on imports of wheat flour is increasing. This can be reduced by utilizing local food ingredients, such as stone banana. The stone banana (*Musa sapientum*) is one of the wild banana and is diploid [9]. Whereas the stone banana plant (*Musa balbisiana*) has many benefits, including the sap containing antimicrobial compounds, one of which can reduce the risk of Alzheimer's [10]. Stone bananas have a reasonably high starch content, approximately 90% [11]. This high enough starch content makes banana stone suitable for processing into flour. Bananas can be used as flour when the fruit is not ripe, and the skin color is still green due to the high starch and acro-starch polyaccharides [12]. Processing into flour has the benefit of a long shelf life and is more practical when used to make other food products. In addition to starch content, stone banana and seeds have a reasonably high mineral content (in ppm), such as calcium, magnesium, potassium, sodium, manganese, and phosphorus [13].

Scientific Hypothesis
 We have studied the effect of using stone banana flour as an alternative raw material to substitute wheat flour in making biscuits. Addition of stone banana flour will significantly affect the reduction of dependence on wheat flour and also increasing the economic value of stone banana. Further, it also can determine the effect of the ratio of purple rice flour and stone banana flour on the quality of biscuits and to determine the comparison of purple rice flour and stone banana flour in making biscuits that consumer like.
 This hypothesis is supported by the research that has been conducted by [9] on the ratio of wheat flour 30%, 70% stone banana flour which is the most preferred by the panelists, furthermore it is known that the resistant starch content of stone banana flour is higher (55.5%) than other types of banana so banana Stone has a great opportunity to be processed into functional products, one of which is the manufacture of biscuits.

MATERIAL AND METHODOLOGY

Samples
 This research has been carried out at the Agricultural Product Technology Laboratory, Silangit City University, Padang. The research was conducted from March to April 2021. The main raw material used in this study were purple rice obtained from Kusanjani Kanang, Padang Pariaman City, and stone banana obtained from Pasar Pasar Padang City. The researchers made purple rice flour and stone banana flour themselves.

Chemicals
 All reagents were of analytical grade and were purchased from ROFA Laboratories Center (Indonesia). The materials for chemical analysis are (1) Protein analysis, 1.25% concentrated sulfuric acid (H₂SO₄) and Aquadest, 30% 4 NaOH, Methylthiohydrazine, Methylred 0.2%, Methyl Blue 0.2%, potassium nitrate (KNO₃), H₂O 0.1N, (2) Analysis of fat content - banana (2) Analysis of crude fiber content, ethanoic sulfuric acid (H₂SO₄), 1.25% NaOH, and 10% potassium sulfate (K₂SO₄). (4) Antioxidant test DPPH: 4 ppm, methanol. The tools used for making biscuits are scales, stove, cauldron, banana, mixer, spoon, sieve, mixer, knives, blender, sieve, cruet, mixer, cake pan, and mold. Additional ingredients are emergency egg, honey, skim milk, salt, and vanilla.

Animal and Biological Material
 Animal and special biological materials were not used in this research.
Instruments
 All tools were of analytical grade and were purchased from ROFA Laboratories Center (Indonesia). The tools for chemical analysis are (1) protein analysis, 500 ml Erlenmeyer flask, distillation apparatus, 50 ml buret, 2 of measuring pipettes, 5 ml Erlenmeyer, erlenmeyer pipette, 25 ml beaker, and some beed. (2) Antioxidant test, UV-VIS spectrophotometer (3) Organoleptic test by 25 untrained panelists.

Laboratory Method
 The treatment in this study was the ratio of purple rice flour to stone banana flour (%), namely: A = 90:10, B = 80:20, C = 70:30, D = 60:40, E = 50:50. The formulation for making biscuits using purple rice flour and stone banana flour refers to [14] is [15].

Description of the Experiment
Sample preparation: The sample preparation of making biscuit can be seen in the following table.

Table 1 Standard formulations for making biscuits

No	Material type	Percentage (%)
Volume XX	2	2023

1	Flour	50
2	Egg Yolk	20
3	Honey	10
4	Margarine	10
5	Skimmed Milk	10
6	Baking soda	0.2
7	Salt	0.2
Source: [14] in [15]		

The formulation of ingredients for the manufacture of biscuits is presented in Table 2.

Table 2 Biscuit formulation in 200 g of ingredients

No	Material type	Unit	Treatment				
			A	B	C	D	E
1	Purple rice flour	g	90	80	70	60	50
2	Stone banana flour	g	10	20	30	40	50
3	Egg yolk	g	40	40	40	40	40
4	Honey	g	20	20	20	20	20
5	Margarine	g	20	20	20	20	20
6	Skimmed Milk	g	20	20	20	20	20
7	Baking soda	g	0.4	0.4	0.4	0.4	0.4
8	Salt	g	0.4	0.4	0.4	0.4	0.4
Source: [14] in [16]							

The number of samples analyzed: We analyzed Purple rice flour 350 g, Stone banana flour 150 g, Egg yolk 200 g, Honey 100 g, Margarine 100 g, Skimmed Milk 100 g, Baking soda 2 g, and Salt 2 g samples.
 The number of repeated analysis: 3 repeated treatment levels.
 The number of experiment replication: 3 replicates.

Design of the experiment: The researcher made the biscuits themselves as follows:
 a. Production of modified rice flour [7]
 • Purple rice washed with running water
 • Drain and dry in the sun for 8 hours
 • Smoothing with a blender and then sifting 60 mesh
 • Get purple rice flour
 b. Production of modified banana stone flour [16]
 • Stone bananas
 • Peeling the stone banana skin and then soaking in citric acid for 5 minutes
 • Washing with clean water
 • Slicing stone bananas and then drying in the sun for 3 hours for 3 days
 • Smoothing with a blender and then sifting 60 mesh
 • Get rock banana flour
 c. Biscuit making [14] in [15]
 • Mixing I
 • Margarine, egg yolk, and honey, mixing with a hand mixer for 10 minutes
 • Mixing II
 • Purple rice flour and stone banana flour according to the treatment, baking soda, skim milk, and salt was mixed using a high-speed mixer for 2 minutes
 • This dough with a thickness of 2 cm
 • Printing with a diameter of 2 cm
 • Baking in the oven (150°C = 10 minutes)
 • Biscuits

Observations were made on the nutritional content of biscuits, namely water content [16], protein content [18], ash content [18], crude fiber content [18], fat content [18], antioxidant with DPPH method [19] and organoleptic test [20].
Statistical Analysis
 The design used in this study was a one-factor Simple Completely Randomized Design (SCRD) with 5 treatment levels and 3 replicates. Observational data were analyzed using Analysis of Variance (ANOVA) and Duncan's New Multiple Range Test (DMRT) advanced test at a 5% significance level. The data from this research was entered into SPSS 26.0 (SPSS Analytics Partner) and then the data were evaluated by using ANOVA (Analysis of Variance) and the Tukey-Kramer test to determine the significance difference.

RESULTS AND DISCUSSION

Moisture Content
 The analysis of diversity showed that the ratio of purple rice flour to stone banana flour was significantly different ($p < 0.01$) in the moisture content of the resulting biscuits. Based on the further test of DMRT, the result of $p < 0.01$, all treatments showed a very significant difference in the moisture content of the biscuits. The average moisture content of biscuits is presented in Table 3.

Table 3 Average moisture content of biscuits

Comparison of purple rice flour with stone banana flour (%)	Water Content (%)
A = 90:10	5.01 a
B = 80:20	4.70 b
C = 70:30	4.35 c
D = 60:40	3.82 d
E = 50:50	3.58 e
KK: 3.85%	

Note: The numbers in the same column followed by different lowercase letters show a significant difference in the DMRT follow-up test at the level of $\alpha = 0.01$.

The moisture content of the biscuits ranged from 3.58-5.01%. The value of the moisture content of the biscuits showed decrease in yield along with an increase in the amount of stone banana flour. Stone flour has a low water content because the biscuits are processed by baking at a temperature of 150°C so that the baking process can evaporate and reduce the amount of moisture in the biscuit dough [21]. The highest water content was found in treatment A (comparison of purple rice flour with stone banana flour 90:10), which was 5.01%. While the lowest water content was found in treatment E (comparison of purple rice flour with stone banana flour 50:50), which was 3.58%. The less the use of purple rice flour and the more banana stone flour, the water content will decrease, and vice versa.

According to [22] the water content of rice flour is 13%, while banana stone flour has a water content of 7.46% [9]. This is under the research that has been done, the more the use of stone banana flour in the manufacture of biscuits, the lower the water content of the biscuits. The moisture content of the biscuits produced for all treatments except treatment A, which did not meet the Indonesian National Standard [23] for biscuits, was a maximum of 5%.

The water content of each treatment is different, this is because the relationship of water in food ingredients is also different, the water content in food is distinguished between hard water and soft water [24]. Water absorption into rice needs to be influenced by amylose content and cooking temperature [25]. Based on the amylose content, rice (low-amylose rice) can be grouped into three, namely low amylose (<20%), medium amylose (20-25%), and high amylose (>25%) (Armita, et al 1978). At temperatures above 60°C water absorption and swelling will increase if the amylose content is low [26].

Ash Level
 The analysis of diversity showed that the ratio of purple rice flour and stone banana flour was very significant ($p < 0.01$) on the ash content of the resulting biscuits. Based on the DMRT further test at the level of $\alpha = 0.01$, all treatments showed a very significant difference in the ash content of the biscuits. The average ash content of biscuits is presented in Table 4.

Table 4 Average ash content of biscuits

Volume XX	4	2023

Comparison of purple rice flour with stone banana flour (%)

	Ash content (%)
A = 90:10	1.70 a
B = 80:20	1.83 b
C = 70:30	1.95 c
D = 60:40	2.08 d
E = 50:50	2.11 e
KK: 3.83%	

Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DMRT follow-up test at the level of $\alpha = 0.05$.

Biscuit ash content ranged from 1.70 to 2.11%. The more the use of stone banana flour and the less purple rice flour in making biscuits, the higher the ash content of the biscuits. This is because banana stone flour has high minerals, causing the ash content to increase. Ash content is known as mineral elements or organic substances [27].

The highest ash content of biscuits was found in treatment E (comparison of purple rice flour with stone banana flour 50:50) that is 2.11%, while the lowest ash content was in treatment A (comparison of purple rice flour with stone banana flour 90:10) that is 1.70%. The less the use of purple rice flour and the more banana stone flour, the ash content will increase, and vice versa.

Biscuit ash content for all treatments has met the Indonesian National Standard [28] at least 1.4%. This is because banana stone flour has a higher ash content than purple rice flour. The ash content of banana stone flour is 5.3% [9], while the ash content of rice flour is 1.0 [22].

Ash is one of the components in flour. This component consists of minerals such as potassium, phosphorus, sodium, and copper. In the body, these are mineral elements that combine with organic substances or free ions, in the body the mineral elements function as building blocks and regulators. The number of minerals in the body must be within optimal limits [28]. The use of stone banana flour, the higher the ash content of the biscuits. So that biscuits that use a lot of stone banana flour contain higher minerals.

Fat Content
 The analysis of diversity showed that the ratio of purple rice flour and stone banana flour was very significant ($p < 0.01$) in the fat content of the biscuits produced. Based on the DMRT further test at the level of $\alpha = 0.01$, all treatments showed a very significant difference in the fat content of the biscuits. The average ash content of biscuits is presented in Table 5.

Table 5 Average fat content of biscuits

Comparison of purple rice flour with stone banana flour (%)	Fat level (%)
A = 90:10	16.66 a
B = 80:20	19.19 b
C = 70:30	21.18 c
D = 60:40	23.10 d
E = 50:50	25.18 e
KK: 1.24%	

Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DMRT follow-up test at the level of $\alpha = 0.01$.

Biscuit fat content ranged from 16.66-25.18%. The more addition of stone banana flour in the manufacture of biscuits, the higher the fat content. This is because the fat content of stone banana flour is higher than purple rice flour. The highest fat content was found in treatment E (comparison of purple rice flour with stone banana flour 50:50), which was 25.18%. While the lowest fat content was found in treatment A (comparison of purple rice flour with stone banana flour 90:10), which was 16.66%. The less the use of purple rice flour and the more banana stone flour, the fat content will increase, and vice versa.

The fat content of the biscuits produced for all treatments was above the maximum fat content limit in the Indonesian National Standard [23], which is a minimum of 9.5%. This is because the fat in biscuits is also obtained from butter, egg, and cream milk which is added to the biscuit dough formulation [29] and banana stone flour has a higher fat content than purple rice flour. The fat content of stone banana flour is 0.4% [9]. In

contrast, the fat content in rice flour is 0.5% [31]. This statement follows the results showing that the increase in purple rice flour in the manufacture of biscuits reduces the fat content in the product.

Crude Fiber Content
 The analysis of diversity showed that the ratio of purple rice flour and stone banana flour showed a very significant difference ($p < 0.01$) in the crude fiber content of the biscuits produced. Based on the DMRT further test at the level of $\alpha = 0.01$, all treatments showed a very significant difference in the crude fiber content of the biscuits. The average crude fiber content of biscuits is presented in Table 6.

Table 6 Average crude fiber content of biscuits

Comparison of purple rice flour with stone banana flour (%)

	Crude Fiber Content (%)
A = 90:10	6.38 a
B = 80:20	10.08 b
C = 70:30	12.74 c
D = 60:40	14.50 d
E = 50:50	17.85 e
KK: 4.93%	

Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DMRT follow-up test at the level of $\alpha = 0.01$.

The crude fiber content of biscuits ranged from 6.38-17.85%. The more the use of stone banana flour in making biscuits, the higher the crude fiber content. This is because banana stone flour has a high crude fiber compared to purple rice flour. The highest crude fiber content of biscuits was found in treatment E (comparison of purple rice flour with stone banana flour 50:50) that is 17.85%, while the lowest crude fiber content was found in treatment A (comparison of purple rice flour with stone banana flour 90:10) that is 6.38%. This statement is following the results of the study showing that the crude fiber content is inversely proportional to the water content, the higher the crude fiber content, the water content will decrease and vice versa, the lower the crude fiber content, the higher the water content produced. The less purple rice flour and stone banana flour, the more crude fiber content will increase, and vice versa.

The crude fiber content of biscuits produced for all treatments was above the maximum limit of crude fiber content in the Indonesian National Standard [23], which is 0.5%. This is because banana stone flour has a high crude fiber content than purple rice flour. The crude fiber content of stone banana flour is 13.7% [9]. The more the use of stone banana flour in the manufacture of biscuits, the crude fiber content of the biscuits is also high. Crude fiber is a component of cellulose, pectin, and other components. This component of crude fiber has a nutritional value but is very important in facilitating the digestive process in the body [32].

Protein Level
 The analysis of diversity showed that the comparison of purple rice flour and stone banana flour showed a very significant difference ($p < 0.01$) in the protein content of the biscuits produced. Based on the further test of DMRT, at the level of $\alpha = 0.01$, all treatments showed a very significant difference in the protein content of biscuits. The average protein content of biscuits is presented in Table 7.

Table 7 Average protein content of biscuits

Comparison of purple rice flour with stone banana flour (%)

	Protein level (%)
A = 90:10	7.78 a
B = 80:20	6.73 d
C = 70:30	5.50 c
D = 60:40	5.00 b
E = 50:50	4.72 a
KK: 2.1%	

Note: The numbers in the same column followed by different lowercase letters show a significant difference in the DMRT follow-up test at the level of $\alpha = 0.01$.

Biscuit protein content ranged from 4.73-7.14%. The more use of purple rice flour in making biscuits, the higher the protein content of the biscuits produced. This is because banana stone flour contains low protein, the highest protein content of biscuits in treatment A (comparison of purple rice flour with banana stone flour 90:10) that is 7.14%, while the lowest protein content is in treatment C (comparison of purple rice flour with stone banana flour 50:50) that is 4.73%. The less the use of purple rice flour and the more banana stone flour, the lower the protein levels will decrease and vice versa.

The protein content of the biscuits produced for all treatments did not meet the Indonesian National Standard (SI) which was 9%. This was because purple rice flour had a higher protein content than stone banana flour. The protein content of rice flour is 5.94 (SI), while the stone banana flour is 4.8 (SI). The more use of purple rice flour in the manufacture of biscuits, the higher the protein content of the biscuits.

Antioxidant Activity

The analysis of diversity showed that the comparison of purple rice flour and stone banana flour showed no significant difference ($p > 0.05$) in the antioxidant content of the biscuits produced. The average antioxidant content of biscuits is presented in Table 6.

Table 6 Average antioxidant content of biscuits

Comparison of purple rice flour with stone banana flour (%)	Antioxidant Activity (%)
A = 90:10	85.83
B = 80:20	80.00
C = 70:30	70.66
D = 60:40	61.83
E = 50:50	55.83

The antioxidant activity levels of biscuits ranged from 55.83-85.83%. The less use of stone banana flour in the manufacture of biscuits, the higher the antioxidant content of the biscuits produced. The increase in the addition of purple rice flour in the manufacture of biscuits causes the antioxidant activity to increase. This is because purple rice flour contains 67.64% antioxidant compound (SI). As a comparison of antioxidants that have been studied by [8] showed levels of antioxidant activity in brown rice flour. The highest content of antioxidant activity of the two varieties was Malsed; Randomly variety brown rice flour, which ranged from 62.28-92.97%, while for the Segudh Randomly variety it ranged from 79.20-89.87%.

The highest antioxidant levels of biscuits were found in treatment A (comparison of purple rice flour with banana stone flour 90:10), that is, 85.83%, while the lowest antioxidant levels were found in treatment E (comparison of purple rice flour with stone banana flour 50:50) that is, 55.83%. The less use of purple rice flour and the more banana stone flour, the antioxidant activity will decrease and vice versa.

For antioxidant activity, it is not sufficient to see the SI for biscuits, because antioxidants are very important to examine to determine the antioxidant content of the mixture of purple rice flour and stone banana flour in biscuits. This purple rice flour can be an alternative food with antioxidant compounds that are good for the body. The antioxidant activity will also be higher for biscuits with more purple rice flour content. The antioxidant activity of biscuits produced for all treatments was 70.83%. According to [84] the level of antioxidant activity in purple rice is 67.64%.

Carbohydrate Levels

The results of the analysis of diversity showed that the mix of purple rice flour and stone banana flour showed a very significant difference ($p < 0.01$) in the carbohydrate content of the biscuits produced. Based on the further test of DMS-BRT at the level of $\alpha = 0.01$, all treatments showed a very significant difference in the carbohydrate content of biscuits. The average carbohydrate content of biscuits is presented in Table 9.

Table 9 Average carbohydrate content of biscuits

Comparison of purple rice flour with stone banana flour (%)	Carbohydrate levels (%)
A = 90:10	61.73 a
B = 80:20	69.28 b

C = 70:30	66.91 c
D = 60:40	64.27 d
E = 50:50	61.49 e

Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DMS-BRT follow-up test at the level of $\alpha = 0.01$.

The carbohydrate content of biscuits ranged from 61.49-71.73%. The more the use of stone banana flour in making biscuits, the lower the carbohydrate content produced. This is because purple rice flour contains high carbohydrates compared to stone banana flour. The highest carbohydrate content of biscuits was found in treatment A (comparison of purple rice flour with banana stone flour 90:10) that is, 71.73%, while the lowest carbohydrate content was found in treatment E (comparison of purple rice flour with banana stone flour 50:50), namely, 61.49%. The less the use of purple rice flour and the more banana stone flour, the carbohydrate content will decrease and vice versa.

This study's results follow the statement above that biscuits with purple rice flour contain more carbohydrates than the carbohydrates content will be higher. The carbohydrate content of biscuits produced in treatment A has met the Indonesian National Standard (SI) for biscuits, which is at least 70%. This value is slightly below the minimum SI limit for biscuits which requires the minimum carbohydrate content of biscuits is 70%. The carbohydrate content of stone banana flour is indeed lower, namely 47.4-49.8% [9]. Although the stone banana flour levels have not reached the minimum carbohydrate content limit in (SI) biscuits. Carbohydrates are the main source of calories for humans. Carbohydrates also play a role in determining the characteristics of food ingredients, such as taste, color, and texture. In addition, carbohydrates are useful in the body to prevent the breakdown of accurate body protein, and loss of animal's metabolism and protein metabolism [84].

Organoleptic Test

The organoleptic test was carried out through sensory assessment, namely by tasting the taste, and aroma, and observing the texture, and color of the biscuit. The test was carried out through biscuits made according to the treatment formulation. By being rated by 25 untrained panelists.

A Flavor

Taste is the most important parameter in consumer acceptance of a product. Taste differs from smell and involves the five senses of the tongue. Taste can be influenced by several factors, namely chemical composition, temperature, consistency, and interaction with other flavor sources [84]. Panelist's assessment data on the taste of biscuits are presented in table 10.

Table 10 Biscuit taste test value

Comparison of purple rice flour with stone banana flour (%)	Flavor Value (%)	Description
A = 90:10	3.56	do not like (strongly)
B = 80:20	4.88	kinda like (kinda banana)
C = 70:30	4.24	kinda like (kinda banana)
D = 60:40	5	like (love banana)
E = 50:50	5.60	Suka (love banana)

1 = very much like, 2 = very much like, 3 = like, 4 = somewhat like, 5 = do not like, 6 = do not like very much, 7 = very much do not like

Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DMS-BRT at the level of $\alpha = 0.01$, all treatments showed a very significant difference in the biscuit taste test value.

The data obtained showed that the higher the addition of purple rice flour, the panelist's acceptance rate decreased. This is because purple rice flour has a slightly bland taste that affects the taste of the biscuit. The taste of the biscuits can come from the addition of stone banana flour and other additives. However, from the panelist's acceptance data, it can be concluded that the panelists have accepted the mixing of purple rice flour

with stone banana flour has accepted the mixing of purple rice flour with stone banana flour on a scale of 1 to 5 (6), which means that the panelists already like the taste of the biscuits.

Food products in general, do not have only one taste but a combination of various integrated flavors. Taste is the perception of taste buds, including salty, sweet, sour, and bitter tastes caused by substances dissolved in the mouth [9].

b. Aroma

[84] states that the five senses of smell much influence aroma. In general, there are four types of odors that can be received by the nose: fragrant, sour, acidic, and starchy.

The aroma also determines the delicacy of food products and taste, which consists of three components: smell, taste, and stimulation [84]. Panelist's assessment data on the aroma of biscuits are presented in Table 11.

Table 11 Biscuit aroma test value

Comparison of purple rice flour with stone banana flour (%)	Aroma Value (%)	Description
A = 90:10	3.38	do not like (not typical)
B = 80:20	3.88	do not like (not typical)
C = 70:30	4.44	kinda like (kinda banana)
D = 60:40	4.84	kinda like (kinda banana)
E = 50:50	5.44	like (love banana aroma)

Note: taste scores include 1 = very much like, 2 = very much like, 3 = like, 4 = somewhat like, 5 = do not like, 6 = do not like very much, 7 = very much do not like

Table 11 shows that the panelist's highest assessment of the biscuit aroma was found in treatment E (comparison of purple rice flour with stone banana flour 50:50), which was 5.44% (like). In contrast, the panelist's lowest assessment of the biscuit aroma was in treatment A (comparison of purple rice flour with stone banana flour 90:10), which was 3.38% (do not like).

The addition of purple rice flour resulted in lower aroma reception. This is because purple rice flour itself does not have a strong aroma. The aroma contained in the biscuits comes from raw materials and other additive during baking.

c. Texture

The appearance of food is primarily determined by the water content, fat content, and number of carbohydrates and proteins. Texture changes can be caused by loss of water or color, breakdown of emulsions, and protein hydrolysis [84]. Panelist's assessment data on biscuit texture are presented in Table 12.

Table 12 Value of biscuit texture test

Comparison of purple rice flour with stone banana flour (%)	Texture Value (%)	Description
A = 90:10	3.52	do not like (rough)
B = 80:20	3.96	do not like (rough)
C = 70:30	4.48	kinda like (rather rough)
D = 60:40	5.20	like (gentle)
E = 50:50	5.52	like (gentle)

1 include 1 = very much like, 2 = very much like, 3 = like, 4 = somewhat like, 5 = do not like, 6 = do not like very much, 7 = very much do not like

Table 12 shows that the highest assessment of biscuit texture was found in treatment E (comparison of purple rice flour and banana stone flour 50:50), which was 5.52% (like), while the lowest texture was found in treatment A (comparison of purple rice flour and stone banana flour 90:10), which is 3.52% (do not like), means that the panelist's acceptance rate is on a scale of dislike to like.

The higher the use of stone banana flour, the softer the resulting product, and the higher the panelist's acceptance rate. The low level of panelist's acceptance of treatment A (comparison of purple rice flour and banana stone flour 90:10) was due to the addition of purple rice flour. The biscuits would become hard or solid. The texture of food is largely determined by the content of water, fat, protein, and carbohydrates. The texture is

a sensation of pressure that can be observed with the mouth (biting, chewing, and swallowing). Texture sensing varies, including viscosity, dryness, hardness, smoothness, roughness, and oily [40].

Color

According to [44], color is important in meeting human taste. Color assessment is done by observing the product directly with the use of color chart Panelist's assessment data on the color of biscuits are presented in Table 13.

Table 13 Nilai uji warna biscuit

Comparison of purple rice flour with stone banana flour (%)	Color Value (%)	Description
A = 90:10	3.84	do not like (light yellow)
B = 80:20	4.16	kinda like (yellow)
C = 70:30	4.52	kinda like (yellow)
D = 60:40	5.08	like (dark yellow)
E = 50:50	5.52	like (dark yellow)

Note: taste scores include 1 = very much like, 2 = very much like, 3 = like, 4 = somewhat like, 5 = do not like, 6 = do not like very much, 7 = very much do not like

Table 13 shows that the highest assessment of the color of the biscuits was found in treatment E (comparison of purple rice flour and 50:50 banana stone flour), which was 5.52% (like). Because the dark yellow color is more attractive to the panelist. While the lowest assessment was found in treatment A (comparison of purple rice flour and banana stone flour 90:10), which was 3.84% (do not like). Because the color of light like is less attractive to panelists.

Color assessment is done by direct visual observation of the product with the sense of sight of each panelist. Determining the quality of a product depends on many factors, but before other factors are tested and analyzed, the color factor visually appears first in determining consumer's acceptance of the product [84].

CONCLUSION

A comparison of purple rice flour and banana stone flour on the quality of antioxidant-rich biscuits had a very significant effect on water content, ash content, coarse fiber content, fat content, protein content, and carbohydrate content and had no significant effect on antioxidant activity in a treatment E (comparison of purple rice flour and stone banana flour 50:50) with 3.6% water content, 21.1% ash content, 23.7% fat content, 17.5% crude fiber content, 4.7% protein content, 5.83% antioxidant activity, and 61.49% carbohydrate content. It is recommended that the community and biscuit entrepreneurs develop antioxidant-rich biscuit products using purple rice flour and stone banana flour to reduce the use of wheat flour.

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The authors declare no conflict of interest.

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This article does not contain any studies that would require an ethical statement.

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We have reached a decision regarding your submission to Potravinarstvo Slovak Journal of Food Sciences, "- Study of biscuit quality with the addition of banana stone flour and purple rice flour as a replacement for wheat flour: -".


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Dear authors your article was accepted for publication, but you should solve the issues recommended by second reviewer:

Review 2:
This manuscript described the effect of replacing wheat flour with plaintain flour and purple rice flour on the proximate analysis, antioxidant content and sensory evaluation of the biscuit.

Previous studies have been reported on the incorporation of plaintain flour or purple rice flour on the properties of biscuits. This manuscript combines the two flours together. The manuscript has used different terms for plaintain such as banana stone, stone banana and

rock banana. please use plain text throughout the manuscript.

The manuscript needs proof reading and a meticulous editing.

For the data, there are no standard deviation stated. for the sensory evaluation, optimally at least 30 panelists are needed. The scale description used in the sensory evaluation need to be checked as scale 6 and 7 is similar and there is also translation issues whereby the Indonesian version is not similar to English version.

The manuscript need more in depth discussion.

Some comments has been made in the softcopy of the manuscript.

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Best regards

Peter Zajac

Editor-In-Chief

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Bukti review 2



Received: XXXXXXXXXX
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Accepted: XXXXXXXXXX
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Study of biscuit quality with the addition of banana stone flour and purple rice flour as a replacement for wheat flour

I Ketut Budawaga, Amurita, Tolen Novera

ABSTRACT
Biscuits are processed food products made from wheat flour. Another alternative is to find a substitute for flour, such as banana flour and purple rice. This study aims to determine the effect of the ratio of purple rice flour and stone banana flour on the quality characteristics of biscuits to determine the best ratio of purple rice flour and stone banana flour. This study used a one-factor, Completely Randomized Design (CRD) with 5 levels of treatment and 3 replications. The results of the observational data were analyzed using ANOVA with the further test of Duncan's Multiple Range Test (DMRT) at a 5% significance level. This study's treatment was comparing purple rice flour and stone banana flour in making biscuits. The results showed that the ratio of purple rice flour and stone banana flour had a very significant effect (p<0.01) of water content (3.45%), ash content (2.11%), fat content (21.18%), crude fiber content (17.85%), protein content (4.72%), and carbohydrate content (61.49%), while it had no significant effect (p>0.01) on antioxidant activity (55.83%). All treatments met the SN1 requirements for biscuit quality except protein. The biscuits with the best quality were in treatment E (comparison of purple rice flour and stone banana flour 50:50). Based on the organoleptic test of taste, aroma, texture, and color showed by panelist with hesperidinized A (90:10) 3.52%, B (80:20) 3.97%, C (70:30) 4.42%, D (60:40) 5.03%, and E (50:50) 5.52%.

Keywords: biscuit, flour, rice, banana, addition

INTRODUCTION
Biscuits are processed food products made from wheat flour. According to [1] biscuits are products obtained by baking dough from wheat flour with other food ingredients or without the addition of permitted food additives. Biscuits are one of the snacks or snacks that are widely consumed by the community. This product is a dry product that has low water content. According to [2], based on industry association data, in 2012 biscuit consumption is estimated to increase by 55-58% driven by an increase in domestic consumption. Biscuits are consumed by all ages, both infants and adults just with different types [3].
Most of the biscuits on the market use wheat flour as the main material. The flour used to manufacture biscuits is wheat flour with a low protein content. The use of non-wheat flour is currently being developed for making biscuits, especially for gluten-free biscuits [4]. Therefore, many efforts are being made to substitute wheat flour with various flours from local resources such as flour from tubers, seeds, and fruits, one of which is purple rice and stone banana.
Rice (*Oryza sativa* L.) is a type of food crop selected as a staple food or a source of carbohydrates in developing countries [5]. There is rice in various varieties such as white rice, brown rice, black rice, and purple rice.
Purple rice with pigmented grains has long been a unique and traditional food for desserts and some medical purposes in many cultures [6]. Today, its benefits have been widely recognized, and pigmented rice is used in commercial food production and in dietary supplements, cosmetics, and medicines [7]. Colored rice contains a lot of phenolic compounds. One group of phenolic compounds that have benefits as antioxidants is a group of flavonoid compounds [8].

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The use of wheat flour as the main raw material in various processed food products in Indonesia causes the high use of wheat flour so dependence on imports of wheat flour is increasing. This can be reduced by utilizing local food ingredients, such as stone bananas. The stone banana (*Musa balbisiana*) is one of the wild bananas and is diploid (2n). Whereas the stone banana plant (*Musa sapientum*) has many benefits, including the sap containing antioxidant compounds, one of which can reduce the risk of Alzheimer's [10]. Stone bananas have a reasonably high starch content, approximately 90% [11]. This high enough starch content makes banana stone suitable for processing into flour. Bananas can be used as flour when the fruit is not ripe, and the skin color is still green due to the high starch and non-starch polysaccharides [12]. Processing into flour has the benefit of a long shelf life and is more practical when used to make other food products. In addition to starch content, stone bananas and sweet have a reasonably high mineral content (in peel), such as calcium, magnesium, potassium, sodium, manganese, and phosphorus [13].

Scientific Hypothesis:
We have studied the effect of using stone banana flour as an alternative raw material to substitute wheat flour in making biscuits. Addition of stone banana flour will significantly affect the reduction of dependence on wheat flour and also increasing the economic value of stone bananas. Further, it also can determine the effect of the ratio of purple rice flour and stone banana flour on the quality of biscuits and to determine the comparison of purple rice flour and stone banana flour in making biscuits that consumers like.
This hypothesis is supported by the research that has been conducted by [9] on the ratio of wheat flour 30% : 70% stone banana flour which is the most preferred by the panelists, furthermore it is known that the resistant starch content of stone banana flour is higher (20.35%) than other types of bananas so banana Stone has a great opportunity to be processed into functional products, one of which is the manufacture of biscuits.

MATERIAL AND METHODOLOGY

Samples
This research has been carried out at the Agricultural Product Technology Laboratory, Ekasakti University, Padang. The research was conducted from March to April 2021. The main raw materials used in this study were purple rice obtained from Karangas Karang, Padang Pariaman City, and stone bananas obtained from Pasar Raya Padang City. The researchers made purple rice flour and stone banana flour themselves.

Chemicals
All reagents were of analytical grade and were purchased from ROFA Laboratorium Centre (Indonesia). The materials for chemical analysis are (1) Protein analysis, 1.25% concentrated sulfuric acid (H₂SO₄) and Aquadet, 30% d NaOH, Methyl Indicator, Methyl red 0.2%, Methyl blue 0.2%, selenium mix, H₂SO₄, H₂O, I.N. (2) Analysis of fat content, n-hexane. (3) Analysis of crude fiber content, ethanol, sulfuric acid (H₂SO₄), 1.25% NaOH, and 10% potassium sulfate (K₂SO₄). (4) Antioxidant test DPPH 45 ppm, methanol. The tools used for making biscuits are scales, stoves, ovens, basins, trays, spoons, sieves, mixers, knives, blenders, sieves, ovens, mixers, cake pans, and molds. Additional ingredients are margarine, eggs, honey, skin milk, salt, and vanilla.

Animals and Biological Material
Animal and special biological materials were not used in this research.

Instruments
All tools were of analytical grade and were purchased from ROFA Laboratorium Centre (Indonesia). The tools for chemical analysis are (1) protein analysis, 500 ml Kjeldahl flask, dimethylammonia, 50 ml burette 5 ml measuring pipette, 50 ml Erlenmeyer, dropwise pipette, 250 ml beaker, and fume hood. (2) Antioxidant test, UV-VIS spectrophotometer (3) Organoleptic test by 25 untrained panelists.

Laboratory Methods
The treatments in this study were the ratio of purple rice flour to stone banana flour (%), namely: A = 90:10; B = 80:20; C = 70:30; D = 60:40; E = 50:50. The formulation for making biscuits using purple rice flour and stone banana flour refers to [14] in [15].

Description of the Experiment
Sample preparation: The sample preparation of making biscuit can be seen in the following table.

No	Material type	Percentage (%)
1	Wheat flour	90
2	Purple rice flour	10

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Comment [A1]: The correctly used term phytanin instead of Phytanin derive on stone banana

Comment [A2]: The number in brackets representing value?

Comment [A3]: No other issue

Comment [A4]: Correct description by paragraph

Comment [A5]: Please explain comparison with other term

Comment [A6]: Based on the latest information, the new scientific name *Enicostema* is *Enicostema* 8 (10:30)

Comment [A7]: replace

Comment [A8]: replace banana stone-banana banana with phytanin

Comment [A9]: phytanin

Comment [A10]: please use phytanin throughout the manuscript

Comment [A11]: Different sentence?

Comment [A12]: Acceptance text?

1	Flour	50
2	Egg Yolk	20
3	Honey	10
4	Margarine	10
5	Skimmed Milk	10
6	Baking soda	0,2
7	Salt	0,2

Source: [14] in [15]

The formulation of ingredients for the manufacture of biscuits is presented in Table 2.

Table 2 Biscuit formulation in 200 g of ingredients

No	Material type	Unit	Treatment				
			A	B	C	D	E
1	Purple rice flour	g	50	80	70	60	50
2	Stone banana flour	g	10	20	30	40	50
3	Egg yolk	g	40	40	40	40	40
4	Honey	g	20	20	20	20	20
5	Margarine	g	20	20	20	20	20
6	Skimmed Milk	g	20	20	20	20	20
7	Baking soda	g	0,4	0,4	0,4	0,4	0,4
8	Salt	g	0,4	0,4	0,4	0,4	0,4

Source: [14] in [16]

The number of samples analyzed: We analyzed Purple rice flour 350 g, Stone banana flour 150 g, Egg yolk 200 g, Honey 100 g, Margarine 100 g, Skimmed Milk 100 g, Baking soda 2 g, and Salt 2 g samples.

The number of repeated analyses: 5 repeated treatment levels.

The number of experiment replications: 3 replications.

Design of the experiment: The researcher made the biscuits themselves as follows:

- a. Production of modified rice flour [17]
 - Purple rice washed with running water
 - Drain and dry in the sun for 6 hours
 - Smoothing with a blender and then sifting 60 mesh
- b. Get purple rice flour
- c. Production of modified banana stone flour [16]
 - Stone bananas
 - Peeling the stone banana skin and then soaking it in citric acid for 5 minutes
 - Washing with clean water
 - Slicing stone bananas and then drying in the sun for 7 hours for 3 days
 - Smoothing with a blender and then sifting 60 mesh
 - Get rock banana flour
- d. Biscuit making [14] in [15]
 - Mixing I
 - Margarine, egg yolk, and honey, mixing with a hand mixer for = 10 minutes
 - Mixing II
 - Purple rice flour and stone banana flour according to the treatment, baking soda, skim milk, and salt was mixed using a high-speed mixer for 2 minutes
 - Thin dough with a thickness of 2 cm
 - Printing with a diameter of 3 cm
 - Baking in the oven (150°C, = 10 minutes)
 - Biscuits

Comment [A13]: The phytosterol in rice banana

Observations were made on the nutritional content of biscuits, namely: water content [18], protein content [18], ash content [18], crude fiber content [18], fat content [18], antioxidant with DPPH method [19] and organoleptic test [20].

Statistical Analysis

The design used in this study was a one-factor Simple Completely Randomized Design (CRD) with 5 treatment levels and 3 replications. Observational data was analyzed using Analysis of Variance (ANOVA) and Duncan's New Multiple Range Test (DNNMRT) advanced test at a 5% significance level. The data from this research was entered into SPSS 26.0. (SPSS Analytica Partner) and then the data were evaluated by using ANOVA (Analysis of Variance) and the Tukey-Kramer test to determine the significant differences.

RESULTS AND DISCUSSION

Moisture Content

The analysis of diversity showed that the ratio of purple rice flour to stone banana flour was significantly different ($p < 0.01$) in the moisture content of the resulting biscuits. Based on the further test of DNNMRT at the level of $\alpha = 0.01$, all treatments showed a very significant difference in the moisture content of the biscuits. The average moisture content of biscuits is presented in Table 3.

Table 3 Average moisture content of biscuits

Comparison of purple rice flour with stone banana flour (%)	Water Content (%)
A = 90:10	5,01 a
B = 80:20	4,70 b
C = 70:30	4,35 c
D = 60:40	3,82 d
E = 50:50	3,26 e

KK: 3,35 %

Note: The numbers in the same column followed by different lowercase letters show a significant difference in the DNNMRT follow-up test at the level of $\alpha = 0.01$.

The moisture content of the biscuits ranged from 3.56-5.01%. The value of the moisture content of the biscuits showed a decrease in yield along with an increase in the amount of stone banana flour. Banana flour has a low water content because the biscuits are processed by baking at a temperature of 150°C so that the baking process can evaporate and reduce the amount of moisture in the biscuit dough [21]. The highest water content was found in treatment A (comparison of purple rice flour with stone banana flour 90:10), which was 5.01%. While the lowest water content was found in treatment E (comparison of purple rice flour with stone banana flour 50:50), which was 3.26%. The less the use of purple rice flour and the more banana stone flour, the water content will decrease, and vice versa.

According to [22] the water content of rice flour is 13%, while banana stone flour has a water content of 7.46% [9]. This is under the research that has been done, the more the use of stone banana flour in the manufacture of biscuits, the lower the water content of the biscuits. The moisture content of the biscuits produced for all treatments except treatment A, which did not meet the Indonesian National Standard [23] for biscuits, was a maximum of 5%.

The water content of each treatment is different, this is because the relationship of water in food ingredients is also different, the water content in food can be distinguished between bound water and free water [24]. Water absorption into rice seeds is influenced by amylose content and soaking temperature [25]. Based on the amylose content, rice (non-waxy rice) can be grouped into three, namely low amylose (< 20%), medium amylose (20-25%), and high amylose (> 25%) (Arumita, et al 1976). At temperatures above 850°C water absorption and swelling will increase if the amylose content is low [26].

Ash Level

The analysis of diversity showed that the ratio of purple rice flour and stone banana flour was very significant ($p < 0.01$) on the ash content of the resulting biscuits. Based on the DNNMRT further test at the level of $\alpha = 0.01$, all treatments showed a very significant difference in the ash content of the biscuits. The average ash content of biscuits is presented in Table 4.

Table 4 Average ash content of biscuits

Comparison of purple rice flour with stone banana flour (%)	Ash Content (%)
A = 90:10	1,70 a
B = 80:20	1,83 b
C = 70:30	1,95 c
D = 60:40	2,04 d
E = 50:50	2,11 e

KK: 3,93 %

Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DNNMRT follow-up test at the level of $\alpha = 0.01$.

Biscuit ash content ranged from 1.70 to 2.11%. The more the use of stone banana flour and the less purple rice flour in making biscuits, the higher the ash content of the biscuits. This is because banana stone flour has high minerals causing the ash content to increase. Ash content is known as mineral elements or organic substances [27].

The highest ash content of biscuits was found in treatment E (comparison of purple rice flour with banana stone flour 50:50) that is, 2.11%, while the lowest ash content was in treatment A (comparison of purple rice flour with banana stone flour 90:10) that is, 1.70%. The less the use of purple rice flour and the more banana stone flour, the ash content will increase, and vice versa.

Biscuit ash content for all treatments has met the Indonesian National Standard [28] at least 1.6%. This is because banana stone flour has a higher ash content than purple rice flour. The ash content of banana stone flour is 5.3% [9], while the ash content of rice flour is 1.0 [21].

Ash is one of the components in foodstuffs. This component consists of minerals such as potassium, phosphorus, sodium, and copper. In the body, these are mineral elements that combine with organic substance or free ions, in the body the mineral elements function as building blocks and regulators. The number of minerals in the body must be within optimal limits [29]. The more use of stone banana flour, the higher the ash content of the biscuits. So that biscuits that use a lot of stone banana flour contain higher minerals.

Fat Content

The analysis of diversity showed that the ratio of purple rice flour and stone banana flour was very significant ($p < 0.01$) in the fat content of the biscuits produced. Based on the further test of DNNMRT at the level of $\alpha = 0.01$, all treatments showed a very significant difference in the fat content of the biscuits. The average fat content of biscuits is presented in Table 5.

Table 5 Average fat content of biscuits

Comparison of purple rice flour with stone banana flour (%)	Fat level (%)
A = 90:10	16,66 a
B = 80:20	19,19 b
C = 70:30	21,18 c
D = 60:40	23,10 d
E = 50:50	25,18 e

KK: 1,24%

Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DNNMRT follow-up test at the level of $\alpha = 0.01$.

Biscuit fat content ranged from 16.66-25.18%. The more addition of stone banana flour in the manufacture of biscuits, the higher the fat content. This is because the fat content of stone banana flour is higher than purple rice flour. The highest fat content was found in treatment E (comparison of purple rice flour with banana stone flour 50:50), which was 25.18%. While the lowest fat content value was found in treatment A (comparison of purple rice flour with stone banana flour 90:10), which was 16.66%. The less the use of purple rice flour and the more banana stone flour, the fat content will decrease, and vice versa.

The fat content of the biscuits produced for all treatments was above the maximum limit of fat content in the Indonesian National Standard [28], which is a minimum of 9.5%. This is because the fat in biscuits is also obtained from butter, eggs, and cream milk which is added to the biscuit dough formulation [30] and banana stone flour has a higher fat content than purple rice flour. The fat content of stone banana flour is 0.6% [9]. In

Protein Levels

The analysis of diversity showed that the comparison of purple rice flour and stone banana flour showed a very significant difference ($p < 0.01$) in the protein content of the biscuits produced. Based on the further test of DNNMRT at the level of $\alpha = 0.01$, all treatments showed a very significant difference in the protein content of biscuits. The average protein content of biscuits is presented in Table 7.

Table 7 Average protein content of biscuits

Comparison of purple rice flour with stone banana flour (%)	Protein level (%)
A = 90:10	7,78 a
B = 80:20	6,75 d
C = 70:30	5,59 c
D = 60:40	5,00 b
E = 50:50	4,72 a

KK: 5,11 %

Note: The numbers in the same column followed by different lowercase letters show a significant difference in the DNNMRT follow-up test at the level of $\alpha = 0.01$.

Comment [A14]: What is the standard treatment?

Comment [A15]: What is KK?

Comment [A16]: You can link the biscuit further to discuss the moisture content.

Comment [A17]: etc.

Biscuit protein content ranged from 4.72-7.78%. The more use of purple rice flour in making biscuits, the higher the protein content of the biscuits produced. This is because banana stone flour contains low protein, the highest protein content of biscuits is found in treatment A (comparison of purple rice flour with banana stone flour 90:10) that is, 7.78%, while the lowest protein content is in treatment E (comparison of purple rice flour with stone banana flour 50:50) that is, 4.72%. The less the use of purple rice flour and the more banana stone flour, the fewer protein levels will decrease, and vice versa.

The protein content of the biscuits produced for all treatments did not meet the Indonesian National Standard [23] which was 9%. This was because purple rice flour had a higher protein content than stone banana flour. The protein content of rice flour is 7.59% [8], while the stone banana flour is 4.3% [9]. The more use of purple rice flour in the manufacture of biscuits, the higher the protein content of the biscuits.

Antioxidant Activity

The analysis of diversity showed that the comparison of purple rice flour and stone banana flour showed no significant difference ($p > 0.01$) in the antioxidant content of the biscuits produced. The average antioxidant content of biscuits is presented in Table 8.

Table 8 Average antioxidant content of biscuits

Comparison of purple rice flour with stone banana flour (%)	Antioxidant Activity (%)
A= 90:10	83,83
B= 80:20	80,00
C= 70:30	70,66
D= 60:40	61,83
E= 50:50	55,83
KK: 9%	

The antioxidant activity levels of biscuits ranged from 55.83-83.83%. The less use of stone banana flour in the manufacture of biscuits, the higher the antioxidant content of the biscuits produced. The increase in the addition of purple rice flour in the manufacture of biscuits causes the antioxidant activity to increase. This is because purple rice flour contains 67.64% antioxidant compounds [24]. As a comparison of antioxidants that have been studied by [25] showed levels of antioxidant activity in brown rice flour. The highest content of antioxidant activity of the two varieties was Mandi Handayani variety brown rice flour, which ranged from 92,286-92,272%, while for the Sageng Handayani variety it ranged from 79,207-88,570%.

The highest antioxidant levels of biscuits were found in treatment A (comparison of purple rice flour with banana stone flour 90:10), that is, 83.83%, while the lowest antioxidant levels were found in treatment E (comparison of purple rice flour with stone banana flour 50:50) that is, 55.83%. The less the use of purple rice flour and the more banana stone flour, the antioxidant activity will decrease, and vice versa.

For antioxidant activity, it is not written in the SNI for biscuits, because antioxidants are very important to examine to determine the antioxidant content of the mixture of purple rice flour and stone banana flour in biscuits. This purple rice flour can be an alternative food with antioxidant compounds that are good for the body. The antioxidant activity will also be higher for biscuits with more purple rice flour content. The antioxidant activity of biscuits produced for all treatments was 70.83%. According to [24]. The level of antioxidant activity in purple rice is 67.64%.

Carbohydrate Levels

The results of the analysis of diversity showed that the ratio of purple rice flour and stone banana flour showed a very significant difference ($p < 0.01$) in the carbohydrate content of the biscuits produced. Based on the further test of DNNRT at the level of 0.01, all treatments showed a very significant difference in the carbohydrate content of biscuits. The average carbohydrate content of biscuits is presented in Table 9.

Table 9 Average carbohydrate content of biscuits

Comparison of purple rice flour with stone banana flour (%)	Carbohydrate levels (%)
A= 90:10	71,72 a
B= 80:20	69,28 b

C= 70:30	66,91 c
D= 60:40	64,27 d
E= 50:50	61,49 e
KK: 2,33%	

Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DNNRT follow-up test at the level of $\alpha = 0.01$.

The carbohydrate content of biscuits ranged from 61.49-71.72%. The more the use of stone banana flour in making biscuits, the lower the carbohydrate content produced. This is because purple rice flour contains high carbohydrates compared to stone banana flour. The highest carbohydrate content of biscuits was found in treatment A (comparison of purple rice flour with banana stone flour 90:10) that is, 71.72%, while the lowest carbohydrate content was found in treatment E (comparison of purple rice flour with banana stone flour 50:50), namely, 61.49%. The less the use of purple rice flour and the more banana stone flour, the carbohydrate content will decrease, and vice versa.

This study's results follow the statement above that biscuits with purple rice flour contain more carbohydrates so that the carbohydrate content will be higher. The carbohydrate content of biscuits produced for treatment A has met the Indonesian National Standard [23] for biscuits, which is at least 70%.

This value is slightly below the minimum SNI limit for biscuits which stipulates the minimum carbohydrate content of biscuits is 70%. The carbohydrate content of stone banana flour is indeed lower, namely 47.6-49.8% [9]. Although the stone banana flour biscuits have not reached the minimum carbohydrate content limit in [23] biscuits. Carbohydrates are the main source of calories for humans. Carbohydrates also play a role in determining the characteristics of food ingredients, such as taste, color, and texture. In addition, carbohydrates are useful in the body to prevent the breakdown of excessive body protein, and loss of minerals and help fat and protein metabolism [26].

Organoleptic Test

The organoleptic test was carried out through sensory assessment, namely by tasting the taste, and aroma, and observing the texture, and color of the biscuit. The test was carried out through biscuits made according to the treatment formulation. By being tested by 25 untrained panelists.

a. Flavor

Taste is the most important parameter in consumer acceptance of a product. Taste differs from smell and involves the five senses of the tongue. Taste can be influenced by several factors, namely chemical compounds, temperature, concentration, and interaction with other flavor components [26]. Panelists' assessment data on the taste of biscuits are presented in table 10.

Table 10 Biscuit taste test value

Comparison of purple rice flour with stone banana flour (%)	Flavor value (%)	Description	Note
A= 90 : 10	3,56	do not like (artless)	Note
B= 80 : 20	4,38	kinda like (kinda banana)	taste
C= 70 : 30	4,24	like (flavor banana)	accor
D= 60 : 40	5	like (flavor banana)	se
E= 50 : 50	5,60	Suka (flavor banana)	ind-

7 = very much like; 6 = very much like; 5 = like; 4 = somewhat like; 3 = do not like; 2 = do not like very much; 1 = very much do not like

Table 10 shows that the panelists' highest assessment of the biscuit taste was found in treatment E (comparison of purple rice flour with banana stone flour 50:50), which was 5.60% (like). The panelists' lowest assessment of the biscuit taste was in treatment A (comparison of purple rice flour with banana stone flour 90:10) which was 3.56% (didn't like it).

The data obtained showed that the higher the addition of purple rice flour, the panelist acceptance rate decreased. This is because purple rice flour has a slightly bland taste that affects the taste of the biscuit. The taste of the biscuits can come from the addition of stone banana flour and other additives. However, from the panelists' acceptance data, it can be concluded that the panelists have accepted the mixing of purple rice flour

Comment (A18): Openly, at least 10 panelis for acceptance test

Comment (A19): Please correct the panelists' name in the description. Score of 6 and 7 is unclear

with stone banana flour have accepted the mixing of purple rice flour with stone banana flour on a scale of 5 to 5:60, which means that the panelists already like the taste of the biscuits.

Food products in general, do not have only one taste but a combination of various integrated flavors. Taste is the perception of taste buds, including salty, sweet, sour, and bitter tastes caused by substances dissolved in the mouth [37].

b. Aroma

[36] states that the five senses of smell much influence aroma. In general, there are four types of odors that can be received by the nose: fragrant, sour, rancid, and charred.

The aroma also determines the delicacy of food products and taste, which consists of three components: small, taste, and stimulation [38]. Panelists' assessment data on the aroma of biscuits are presented in Table 11.

Table 11 Biscuit aroma test value

Comparison of purple rice flour with stone banana flour (%)	Aroma Value (%)	Description
A = 90 : 10	3,52	do not like (not typical)
B = 80 : 20	3,88	do not like (not typical)
C = 70 : 30	4,44	kinda like (kinda banana)
D = 60 : 40	4,84	kinda like (kinda banana)
E = 50 : 50	5,44	like (typical banana aroma)

Notes: taste scores include 7 = very much like; 6 = very much like; 5 = like; 4 = somewhat like; 3 = do not like; 2 = do not like very much; 1 = very much do not like

Table 11 shows that the panelists' highest assessment of the biscuit aroma was found in treatment E (comparison of purple rice flour with banana stone flour 50:50), which was 5.44% (like). In contrast, the panelists' lowest assessment of the biscuit aroma was in treatment A (comparison of purple rice flour with banana stone flour 90:10), which was 3.52% (didn't like it).

The addition of purple rice flour resulted in lower aroma reception. This is because purple rice flour itself does not have a strong aroma. The aroma contained in the biscuits comes from raw materials and other additives during baking.

c. Texture

The appearance of food is primarily determined by the water content, fat content, and number of carbohydrates and proteins. Texture changes can be caused by loss of water or fat content, leakage of emulsions, and protein hydrolysis [39]. Panelists' assessment data on biscuit texture are presented in Table 12.

Table 12 Value of biscuit texture test

Comparison of purple rice flour with stone banana flour (%)	Texture Value (%)	Description
A = 90 : 10	3,52	do not like (rough)
B = 80 : 20	3,96	do not like (rough)
C = 70 : 30	4,48	kinda like (rather rough)
D = 60 : 40	5,20	like (gentle)
E = 50 : 50	5,52	like (gentle)

s include 7 = very much like; 6 = very much like; 5 = like; 4 = somewhat like; 3 = do not like; 2 = do not like very much; 1 = very much do not like

Table 12 shows that the highest assessment of biscuit texture was found in treatment E (comparison of purple rice flour and banana stone flour 50:50), which was 5.52% (like), while the biscuit texture was found in treatment A (comparison of purple rice flour and stone banana flour 90:10), which is 3.52% (dislike), means that the panelists' acceptance rate is on a scale of dislike to like.

The higher the use of stone banana flour, the softer the resulting product and the higher the panelist acceptance rate. The low level of panelist acceptance of treatment A (comparison of purple rice flour and banana stone flour 90:10) was due to the addition of purple rice flour. The biscuits would become hard or solid. The texture of food is largely determined by the content of water, fat, protein, and carbohydrates. The texture is

a sensation of pressure that can be observed with the mouth (when biting, chewing, and swallowing). Texture sensing varies, including wetness, dryness, hardness, smoothness, roughness, and oily [40].

d. Color

According to [41], color is important in meeting human tastes. Color assessment is done by observing the product directly with the sense of sight of each panelist. Panelists' assessment data on the color of biscuits are presented in Table 13.

Table 13 Nilai uji warna biscuit

Comparison of purple rice flour with stone banana flour (%)	Color Value (%)	Description
A = 90 : 10	3,84	do not like (light yellow)
B = 80 : 20	4,16	kinda like (yellow)
C = 70 : 30	4,52	kinda like (yellow)
D = 60 : 40	5,08	like (dark yellow)
E = 50 : 50	5,52	like (dark yellow)

Notes: taste scores include 7 = very much like; 6 = very much like; 5 = like; 4 = somewhat like; 3 = do not like; 2 = do not like very much; 1 = very much do not like

Table 13 shows that the highest assessment of the color of the biscuits was found in treatment E (comparison of purple rice flour and 50:50 banana stone flour), which was 5.52% (like). Because the dark yellow color is more attractive to the panelists. While the lowest assessment was found in treatment A (comparison of purple rice flour and banana stone flour 90:10), which was 3.84% (didn't like it). Because the color of light skin is less attractive to panelists.

Color assessment is done by direct visual observation of the product with the sense of sight of each panelist. Determining the quality of a product depends on many factors, but before other factors are tested and analyzed, the color factor visually appears first in determining panelists' acceptance of the product [36].

CONCLUSION

A comparison of purple rice flour and banana stone flour on the quality of antioxidant-rich biscuits had a very significant effect on water content, ash content, crude fiber content, fat content, protein content, and carbohydrate content and had no significant effect on antioxidant activity. In treatment E (comparison of purple rice flour and stone banana flour 50:50) with 5.64% water content, 2.11% ash content, 25 % fat content, 17.5 % crude fiber content, 4.72% protein content, 55.83% antioxidant activity, and 61.49% carbohydrates content. It is recommended that the community and biscuit entrepreneurs develop antioxidant-rich biscuit products using purple rice flour and stone banana flour to reduce the use of wheat flour.

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The authors declare no conflict of interest.

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This article does not contain any studies that would require an ethical statement.

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kepada editor ▾

Dear Peter Zajac
Editor-In-Chief
Potravinarstvo Slovak Journal of Food Sciences

Sincerely, replied to the email dated January 26, 2023, herewith it was sent as the fix is attached.

Thank you.


Regards,
I Ketut Budaraga

Satu lampiran • Dipindai dengan Gmail



Bukti pengiriman perbaikan ke 2 :

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Study of biscuit quality with the addition of plantain flour and purple rice flour as a replacement for wheat flour

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ABSTRACT
Biscuits are wheat flour-based manufactured food products. Another option is to locate a flour substitute, such as plantain flour or purple rice. The purpose of this study is to establish the ideal ratio of purple rice flour and plantain flour based on the quality attributes of biscuits. This study employed a one-factor, Completely Randomized Design (CRD) with five treatment levels and three replications. The observational data were analyzed using ANOVA with the SNK-RT further test at a 5% significant level. The treatment in this study compared purple rice flour and plantain flour in the preparation of biscuits. The ratio of purple rice flour to plantain flour was significantly (p < 0.05) either on water content (5.96%), ash content (2.1%), fat content (25.18%), crude fiber content (1.85%), protein content (4.72%), and carbohydrate content (61.49%), but no significant effect (p > 0.10) on antioxidant activity (55.83%). Except for protein, all treatments met the SNI requirements for biscuit quality. Based on the organoleptic test of taste, aroma, texture, and color preferred by panelists with scores of A (80-100) 3.22%, B (60-80) 3.97%, C (40-60) 4.42%, D (20-40) 5.03%, and (0-20) 5.52% were obtained. The best quality biscuits were in treatment B (comparison of purple rice flour and plantain flour 50:50).

Keywords: biscuit, flour, rice, plantain, addition

INTRODUCTION
Biscuits are wheat flour-based manufactured food products. According to [1] biscuits are items made by baking dough made from wheat flour with or without the use of approved food additives. Biscuits are a type of snack that is commonly enjoyed in the kitchen. This is a dry product with a low water content. According to [2] based on industry associations data, biscuit consumption is expected to rise by 15-45% in 2023, owing to an increase in domestic consumption. Biscuits are enjoyed by people of all ages, including infants and adults, although in varying forms [3].
The majority of biscuits on the market are made with wheat flour as the primary ingredient. Biscuits are made with wheat flour that has a low protein level. Non-wheat flour is now being researched for usage in the production of biscuits, particularly gluten-free biscuits [4]. As a result, several efforts are being undertaken to replace wheat flour with flour derived from local resources, such as tubers, seeds, and fruits, one of which being purple rice and plantains.
Rice (*Oryza sativa* L.) is a type of food crop grown in underdeveloped nations as a staple diet or source of carbohydrates [5]. Rice comes in many different kinds, including white rice, brown rice, black rice, and purple rice.
Purple rice with colored grains has long been a unique and traditional dish in many cultures for dessert and for medicinal purposes [6]. Today, the benefits of pigmented rice are generally known, and it is employed in commercial food products as well as dietary supplements, cosmetics, and medications [7]. Colored rice is

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high in phenolic compounds. Flavonoid chemicals are one type of phenolic compound that has antioxidant properties [8].
Because wheat flour is used as the principal basic ingredient in many processed food products in Indonesia, the country's reliance on wheat flour imports is growing. This can be decreased by using locally grown foods such as plantains. One of the rice plantains is the plantain (*Oryza sativa*), which is a good [9]. While the plantain plant (*Oryza sativa*) has numerous advantages, one of which is that its sap contains antioxidant chemicals, one of which can lessen the incidence of Alzheimer's [10]. Plantains have a rather high starch content, over 90% [11]. Plantain is used for processing into flour due to its high starch content. When the flour is not mature and the skin color is still green due to the high starch and non-starch polysaccharides, plantain can be used as flour [12]. The benefit of processing into flour is that it has a longer shelf life and is more practical when used to produce other food products. Plantain and seeds have a relatively high mineral content (zinc), including calcium, magnesium, potassium, sodium, manganese, and phosphorus [13].

Scientific hypothesis
This research investigated the effect of utilizing plantain flour as an alternative raw material to wheat flour in the production of biscuits. The addition of plantain flour will greatly reduce reliance on wheat flour while also enhancing the economic worth of plantain. It can also determine the influence of the ratio of purple rice flour to plantain flour on the quality of biscuits and the comparison of purple rice flour and plantain flour in manufacturing biscuits that consumers enjoy.
This hypothesis is supported by research conducted by [9] on the ratio of wheat flour (35% plantain flour) which is the most preferred by the panelist, and it is also known that the resistant starch content of plantain flour is higher (39.35%) than other types of bananas, implying that plantain has a great opportunity to be processed into functional products, one of which is the production of biscuits.

MATERIAL AND METHODOLOGY
Samples
This study was conducted at Ekaflora University's Agricultural Product Technology Laboratory in Padang. The study was carried out during March and April of 2021. Purple rice from Kecamatan Katang Padang Pariaman City, and plantains from Pasar Raya Padang City were the main raw materials used in this study. The researcher developed their own purple rice flour and plantain flour.
Chemicals
ROFA Laboratorium Centre provided all reagents, which were of analytical grade (Indonesia): (1) Protein analysis, 1.2% concentrated sulfuric acid (H₂SO₄) and Aquades, 30% NaOH (Solutio Inductio), Methyl red 0.2%, Methyl blue 0.1%, potassium meta. H₂PO₄ 0.1N are the materials for chemical analysis; (2) The content analysis using o-benamide (3) Crude fiber content, ethanol, sulfuric acid (H₂SO₄), 1.25% NaOH, and 10% potassium sulfate analysis (K₂SO₄); (4) DPPH 45 ppm antioxidant test in methanol. Sugar, starch, cellulose, hemicellulose, lignin, pectin, protein, mineral, ash, fiber, starch, protein, starch, and vanilla are also included.
Animals and Biological Material
Animal and special biological materials were not used in this research.
Instruments
All tools were of analytical grade and were purchased from ROFA Laboratorium Centre (Indonesia). The tools for chemical analysis (1) protein analysis, 500 ml distilled flask, distillation apparatus, 50 ml buret, 5 ml measuring pipette, 250 ml Erlenmeyer, dropper pipette, 250 ml beaker, and fume hood; (2) Antioxidant test, UV-VIS spectrophotometer; (3) Organoleptic test by 30 untrained panelists after being chosen through discrimination, descriptive and affective tests.
Laboratory Methods
In this investigation, the treatments were the following ratios of purple rice flour to plantain flour (%): A = 90:10, B = 80:20, C = 70:30, D = 60:40, E = 50:50. The recipe for purple rice flour and plantain flour biscuits refers to [14] in [15].
Description of the Experiment
Sample preparation: The sample preparation of making biscuit can be seen in the following table.

Table 1 Standard Formulations for making biscuits	
No	Percentage (%)
1	Flour
2	Fat

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Table 2 Biscuit formulation in 100 g of ingredients							
No	Material type	Unit	Treatment				
			A	B	C	D	E
1	Purple rice flour	g	90	80	70	60	50
2	Plantain flour	g	10	20	30	40	50
3	Egg yolk	g	40	40	40	40	40
4	Honey	g	20	20	20	20	20
5	Margarine	g	20	20	20	20	20
6	Skimmed Milk	g	20	20	20	20	20
7	Baking soda	g	0.4	0.4	0.4	0.4	0.4
8	Salt	g	0.4	0.4	0.4	0.4	0.4

Source: [14] in [15]

Table 2 shows the ingredients formulation for the production of biscuits.

Table 2 Biscuit formulation in 100 g of ingredients

No	Material type	Unit	Treatment				
			A	B	C	D	E
1	Purple rice flour	g	90	80	70	60	50
2	Plantain flour	g	10	20	30	40	50
3	Egg yolk	g	40	40	40	40	40
4	Honey	g	20	20	20	20	20
5	Margarine	g	20	20	20	20	20
6	Skimmed Milk	g	20	20	20	20	20
7	Baking soda	g	0.4	0.4	0.4	0.4	0.4
8	Salt	g	0.4	0.4	0.4	0.4	0.4

Source: [14] in [16]

Number of samples analyzed: We analyzed Purple rice flour 150 g, Plantain flour 150 g, Egg yolk 100 g, Honey 100 g, Margarine 100 g, Skimmed Milk 100 g, Baking soda 1 g, and Salt 2 samples.
Number of repeated analyses: All measurements of instrument readings were performed five times.
Number of experiment replication: The number of replications of each experiment to determine one value was three times.
Design of the experiment: The researcher made the biscuits themselves:
a. Production of modified rice flour [17]:
• Purple rice washed with running water
• Drain and dry in the sun for 3 hours
• Smoothing with a blender and then sifting 60 mesh
• Sieve purple rice flour
b. Production of modified plantain flour [6]:
• Plantains
• Peeling the plantain skin and then soaking it in citric acid for 5 minutes
• Washing with clean water
• Slicing plantains and then drying in the sun for 7 hours for 3 days
• Smoothing with a blender and then sifting 60 mesh
• Sieve plantain flour
c. Biscuit making [14] in [15]:
• Mixing
• Mixing
• Purple rice flour and plantain flour according to the treatment, baking soda, skim milk, and salt was mixed using a high-speed mixer for 2 minutes
• This dough with a thickness of 2 cm
• Printing with a diameter of 3 cm
• Baking in the oven (150°C, = 10 minutes)
• Biscuits
Observations were made on the nutritional content of biscuits, namely: water content [18], protein content [18], ash content [18], crude fiber content [18], fat content [18], antioxidant with DPPH method [19] and organoleptic test [20].

Statistical Analysis

Microsoft Excel and SPSS Version 24 produced the statistical data analysis. The design used in this study was a one-factor Simple Completely Randomized Block Design with 4 replications. Observational data were analyzed using Analysis of Variance (ANOVA) and Duncan's New Multiple Range Test (Duncan) statistical test at a 1% significance level. The data from research were entered into SPSS 24.0 (SPSS Analysis Package) and then the data were evaluated by using ANOVA (Analysis of Variance) and the Tukey-Kramer test to determine the significant differences.

RESULTS AND DISCUSSION

Water Content

The study of diversity revealed that the water level of the produced biscuits differed considerably (p < 0.01) depending on the ratio of purple rice flour to plain flour. Based on the further DNDQRT test at the level of $\alpha = 0.01$, all treatments demonstrated a very substantial difference in the water content of the biscuits. Table 3 shows the average water content of biscuits.

Table 3 Average water content of biscuits

Comparison of purple rice flour with plain flour (%)	Water Content (%)	Standard Deviation
A = 90:10	5.01 a	.02592
B = 80:20	4.70 b	.02012
C = 70:30	4.35 c	.01528
D = 60:40	3.82 d	.02081
E = 50:50	3.58 e	.04041

KK: 3.68 %
Note: The numbers in the same column followed by different lowercase letters show a significant difference in the DNDQRT follow-up test at the level of $\alpha = 0.01$. KK: is coefficient of diversity.

The biscuits' water content ranged from 3.58 to 5.01%. The water content of the biscuits revealed a decrease in yield while increasing the amount of plain flour. Plain flour has a low water content since biscuits are baked at 150°C to allow the baking process to evaporate and limit the quantity of water in the biscuits dough [21]. Treatment A (90:10 comparison of purple rice flour and plain flour) had the highest water level of 5.01%. Treatment E (50:50 comparison of purple rice flour and plain flour) had the lowest water level of 3.58%. The water content will decrease if less purple rice flour is used and more plain flour is used, and vice versa.

According to [22], rice flour has a water content of 13%, while plain flour has a water content of 7.48% [9]. According to the research, the more plain flour used in the making of biscuits, the lower the water content of the biscuits. Except for treatment A, which did not meet the Indonesian National Standard [23] for biscuits, the water level of the biscuits produced was a maximum of 5%.

The water content of each treatment varies because the relationship of water in food ingredients varies; the water content in food can be divided into bound water and free water [24]. The amylose concentration and cooking temperature of rice needs after water absorption [25]. Rice (non-waxy rice) is classified into three types based on its amylose content: low amylose (0-8%), medium amylose (9-25%), and high amylose (> 25%) (Ammala, et al. 1976). If the amylose concentration is low, water absorption and swelling will rise in temperature exceeding 65°C [26].

Ash Level

The diversity analysis revealed that the ratio of purple rice flour to plain flour had a significant (p < 0.01) effect on the ash content of the final biscuits. Based on the DNDQRT additional test, all treatments revealed a very significant difference in the ash content of the biscuits at the level of $\alpha = 0.01$. Table 4 shows the average ash content of biscuits.

Table 4 Average ash content of biscuits

Comparison of purple rice flour with plain flour (%)	Ash content (%)	Standard Deviation
A = 90:10	1.70 a	.01125
B = 80:20	1.83 b	.03512
C = 70:30	1.95 c	.01155
D = 60:40	2.04 d	.02369
E = 50:50	2.11 e	.05196

KK: 3.33 %
Note: The numbers in the same column followed by different lowercase letters show a significant difference in the DNDQRT follow-up test at the level of $\alpha = 0.01$. KK: is coefficient of diversity.

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Comparison of purple rice flour with plain flour (%)

Comparison of purple rice flour with plain flour (%)	Crode Fiber Content (%)	Standard Deviation
A = 90:10	8.38 a	18743
B = 80:20	10.08 b	02317
C = 70:30	12.74 c	00000
D = 60:40	14.50 d	00000
E = 50:50	17.85 e	06277

KK: 4.91 %
Note: The numbers in the same column followed by different lowercase letters show a significant difference in the DNDQRT follow-up test at the level of $\alpha = 0.01$. KK: is coefficient of diversity.

The ash content of biscuits ranged from 1.70 to 2.11%. The higher the ash content of the biscuits, the more plain flour is used and the less purple rice flour is used. This is due to the high mineral concentration of plain flour, which causes the ash content to rise. Ash is classified as a mineral element or an organic compound [27].

The maximum ash level of biscuits was discovered in treatment E (50:50 comparison of purple rice flour with plain flour), which was 2.11%, while the lowest ash content was observed in treatment A (90:10 comparison of purple rice flour with plain flour), which was 1.70%. The ash content rises as less purple rice flour is used and more plain flour is used, and vice versa.

All treatments had biscuit ash content of at least 1.4%, which met the Indonesian National Standard [23]. This is because plain flour has more ash than purple rice flour. Plain flour has an ash content of 0.7% [9] whereas rice flour has an ash content of 10 [22].

Food has an set of nutrients Minerals such as potassium, phosphorus, sodium, and copper make up this component. Mineral elements in the body combine with organic molecules or the non-mineral elements in the body operate as building blocks and regulators. The mineral content of the body must be within ideal ranges [28]. The higher the ash content of the biscuits, the more plain flour is used. As a result, biscuits made with a lot of plain flour have more minerals.

Fat Content

The diversity analysis revealed that the ratio of purple rice flour to plain flour was very significant (p < 0.01) in the fat content of the manufactured biscuits. Based on the DNDQRT additional test, all treatments revealed a very significant difference in the fat content of the biscuits at the level of $\alpha = 0.01$. Table 5 shows the average fat content of biscuits.

Table 5 Average fat content of biscuits

Comparison of purple rice flour with plain flour (%)	Fat level (%)	Standard Deviation
A = 90:10	14.65 a	.10321
B = 80:20	19.19 b	.02887
C = 70:30	21.18 c	.00000
D = 60:40	23.10 d	.00000
E = 50:50	29.18 e	.47620

KK: 1.24 %
Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DNDQRT follow-up test at the level of $\alpha = 0.01$. KK: is coefficient of diversity.

The fat content of biscuits ranged from 14.65 to 29.18%. The more plain flour used in the production of biscuits, the higher the fat content. This is because plain flour has a larger fat content than purple rice flour. Treatment E (50:50 comparison of purple rice flour and plain flour) had the highest fat content (29.18%). Treatment A (comparison of purple rice flour with plain flour 90:10) had the lowest fat content value of 14.65%. The less purple rice flour is used, the more plain flour is used, the lower the fat level, and vice versa.

The fat content of all treatments' biscuits exceeded the maximum fat content limit in the Indonesian National Standard [23], which is a minimum of 9.2%. This is due to the fact that the fat in biscuits is obtained via the addition of butter, egg, and sweet milk to the flour dough formulation [30], and plain flour has a large fat content than purple rice flour. Plain flour has a fat content of 6.8% [9]. Rice flour, on the other

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hand, has a fat content of 0.5% [31]. This statement follows the finding that increasing the use of purple rice flour in the production of biscuits reduces the fat level of the product.

Crode Fiber Content

The diversity analysis revealed that the ratio of purple rice flour to plain flour had a highly significant (p < 0.01) variation in the crude fiber content of the biscuits prepared. Based on the DNDQRT additional test, all treatments revealed a very significant difference in the crude fiber content of the biscuits at the level of $\alpha = 0.01$. Table 6 shows the average crude fiber content of biscuits.

Table 6 Average content of crude fiber of biscuits

Comparison of purple rice flour with plain flour (%)	Crode Fiber Content (%)	Standard Deviation
A = 90:10	8.38 a	18743
B = 80:20	10.08 b	02317
C = 70:30	12.74 c	00000
D = 60:40	14.50 d	00000
E = 50:50	17.85 e	06277

KK: 4.91 %
Note: The numbers in the same column followed by different lowercase letters show a significant difference in the DNDQRT follow-up test at the level of $\alpha = 0.01$. KK: is coefficient of diversity.

Biscuits had a crude fiber content ranging from 8.38 to 17.85%. The more plain flour is used to make biscuits, the higher the crude fiber content. This is because plain flour contains more crude fiber than purple rice flour. The maximum crude fiber content of biscuits was discovered in treatment E (50:50 comparison of purple rice flour and plain flour), which was 17.85%, while the lowest crude fiber content was identified in treatment A (90:10 comparison of purple rice flour and plain flour), which was 8.38%. This assertion is based on the study's findings that crude fiber contents are inversely related to water content; the higher the water content, the lower the water content produced, and vice versa, the higher the crude fiber content, the higher the water content produced. The less purple rice flour and plain flour used, the higher the crude fiber content and vice versa.

The crude fiber content of biscuits produced for all treatments exceeded the 5.5% maximum allowed in the Indonesian National Standard [23]. This is because plain flour contains more crude fiber than purple rice flour. Plain flour has 13.1% crude fiber [9]. The more plain flour is used in the production of biscuits, the higher the crude fiber content of the biscuits. Crude fiber is made up of cellulose, pectin, starch, and other ingredients. This crude fiber component has no nutritional value but is critical in facilitating the digestion process in the body [32].

Protein Levels

The study of diversity revealed that the protein composition of the biscuits made differed significantly (p < 0.01) between purple rice flour and plain flour. Based on a subsequent DNDQRT test at the threshold of $\alpha = 0.01$, all treatments exhibited a very significant difference in the bicuprotein content. Table 7 shows the average protein content of biscuits.

Table 7 Average protein content of biscuits

Comparison of purple rice flour with plain flour (%)	Protein level (%)	Standard Deviation
A = 90:10	7.78 a	14634
B = 80:20	6.75 b	00000
C = 70:30	5.59 c	14634
D = 60:40	5.00 d	00000
E = 50:50	4.72 e	14634

KK: 1.14 %
Note: The numbers in the same column followed by different lowercase letters show a significant difference in the DNDQRT follow-up test at the level of $\alpha = 0.01$. KK: is coefficient of diversity.

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The protein content of biscuits ranged from 4.72 to 7.78%. The more purple rice flour used in the production of biscuits, the higher the protein level of the biscuits produced. This is due to the low protein content of plain flour, the highest protein content of biscuits is found in treatment A (comparison of purple rice flour with plain flour 90:10), which is 7.78%, while the lowest protein content is found in treatment E (comparison of purple rice flour with plain flour 50:50), which is 4.72%. The less purple rice flour used and the more plain flour is used, the lower the protein content, and vice versa.

The protein level of all treatments' biscuits did not match the Indonesian National Standard [23], which was 9%. This was due to the increased protein content of purple rice flour than plain flour. Rice flour has a protein content of 1.9% [33], while plain flour has a protein content of 6.4% [9]. The more purple rice flour used in biscuit production, the higher the protein level of the biscuits.

Antioxidant Activity

The diversity analysis revealed that there was no significant difference (p > 0.01) in the antioxidant content of the biscuits formed when purple rice flour was compared to plain flour. Table 8 shows the average antioxidant content of biscuits.

Table 8 Average antioxidant content of biscuits

Comparison of purple rice flour with plain flour (%)	Antioxidant Activity	Standard Deviation
A = 90:10	85.83	10.40833
B = 80:20	80.00	14.30900
C = 70:30	70.66	19.50214
D = 60:40	61.83	5.77350
E = 50:50	55.83	33869

KK: 9%
Note: The numbers in the same column followed by different lowercase letters show a significant difference in the DNDQRT follow-up test at the level of $\alpha = 0.01$. KK: is coefficient of diversity.

Biscuit antioxidant activity levels ranged from 55.83 to 85.83%. The less plain flour used in biscuit production, the higher the antioxidant level of the biscuits produced. The increased usage of purple rice flour in the production of biscuits raises the antioxidant activity. This is due to the presence of 1.64% antioxidant chemicals in purple rice flour [34]. In a comparison of antioxidants studied by [35], levels of antioxidant chemicals in brown rice flour were found. The Madak Handayani variety brown rice flour had the highest antioxidant activity concentration of the two types, ranging from 92.336 to 92.972%, whereas the Segway Handayani variety had a range of 79.207 to 89.870%.

Treatment A (comparison of purple rice flour with plain flour 90:10) had the greatest antioxidant levels of biscuits, at 85.83%, while treatment E (comparison of purple rice flour with plain flour 50:50) had the lowest antioxidant level, at 55.83%. The antioxidant activity decrease as purple rice flour is used less and plain flour is used more, and vice versa.

If it is not specified, the SNI for biscuits for antioxidant activity because antioxidants are very important to investigate to establish the antioxidant content of the kind of purple rice flour and plain flour biscuits. This purple rice flour contains antioxidant chemicals that are beneficial to the body. The antioxidant activity of biscuits containing more purple rice flour will likewise be enhanced. The antioxidant activity of all biscuit treatments was 70.85%, as stated by [34]. Purple rice has a level of antioxidant activity of 47.84%.

Carbohydrate Levels

According to the results of the diversity study, the ratio of purple rice flour to plain flour made a very significant difference (p < 0.01) in the carbohydrate content of the biscuits created. Based on the DNDQRT additional test at the level of $\alpha = 0.01$, all treatments exhibited a very significant variation in biscuit carbohydrate content. Table 9 shows the average carbohydrate content of biscuits.

Table 9 Average carbohydrate content of biscuits

Comparison of purple rice flour with plain flour (%)	Carbohydrate level (%)	Standard Deviation
A = 90:10	71.72 a	72738

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B = 80:20	69.28 b	07693
C = 70:30	66.91 c	12186
D = 60:40	64.27 d	01155
E = 50:50	61.49 e	03512

KK: 2.38 %
Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DNDQRT follow-up test at the level of $\alpha = 0.01$. KK: is coefficient of diversity.

Biscuit carbohydrate content ranged from 61.49 to 71.72%. The more plain flour used in biscuit baking, the lower the carbohydrate content produced. This is due to the fact that purple rice flour has more carbs than plain flour. Treatment A (comparison of purple rice flour with plain flour 90:10) had the highest carbohydrate amount (71.72%), whereas treatment E (comparison of purple rice flour with plain flour 50:50) had the lowest carbohydrate content (61.49%). The carbohydrate amount will decrease as less purple rice flour is used and more plain flour is used, and vice versa.

The findings of this study support the assertion above that biscuits made with purple rice flour contain more carbohydrates, resulting in a greater carbohydrate content. The carbohydrate content of biscuits prepared for treatment A was at least 70% of the Indonesian National Standard [23] for biscuits.

This figure is slightly lower than the minimum SNI standard for biscuits, which specifies a minimum carbohydrate content of 70%. Plain flour has a reduced carbohydrate percentage, namely 47.6-49.5% [9]. Despite the fact that plain flour biscuits did not meet the minimum carbohydrate content limit in [23] biscuits. Humans get the majority of their calories from carbohydrates. Carbohydrates also influence the properties of food items such as flavor, color, and texture. Furthermore, carbohydrates are beneficial to the body because they inhibit the breakdown of excess body protein, mineral ions, and aid in the fat and protein metabolism [36].

Organoleptic Test

The organoleptic test was performed using sensory assessment, which included sampling the taste and aroma of the biscuits as well as analyzing its texture and color. The test was conducted using biscuits prepared according to the treatment formulation. By being part of the test by 30 untrained panellists.

a. Flavor

The most essential factor in consumer acceptance of a product is its taste. Taste is distinct from smell in that it involves all five senses of the tongue. Several elements can influence taste, including chemical substances, temperature, concentration, and interaction with other flavor components [36]. Table 10 displays the panellists' ratings on the flavor of the biscuits.

Table 10 Biscuit taste test result

Comparison of purple rice flour with plain flour (%)	Flavor value (%)	Description
A = 90:10	3.58	different (neutral)
B = 80:20	4.83	somewhat similar (almost like banana)
C = 70:30	4.24	somewhat similar (almost like banana)
D = 60:40	5	similar (banana flavor)
E = 50:50	5.60	similar (banana flavor)

Note: taste scores include 1 = very much similar, 2 = very similar, 3 = similar, 4 = somewhat similar, 5 = different, 2 = very different, 1 = very much different.

Table 10 demonstrates that treatment E (50:50 comparison of purple rice flour and plain flour) received the highest rating from the panellists for biscuit taste, with 5.60% (similar). The panellists' lowest rating of the biscuit taste was 3.58% (different) in treatment A (comparison of purple rice flour with plain flour 90:10).

The data gathered revealed that the higher the addition of purple rice flour, the lower the panellist acceptance rate. This is due to the slightly bad flavor of purple rice flour, which affects the taste of the biscuit. The addition of plain flour and other ingredients is required to improve the taste of the biscuits. However, based on the panellist's acceptance data, it can be determined that the panellists have accepted the combination of purple rice flour with plain flour since a total of 5 to 6, indicating that panellists already enjoy the taste of the cookies.

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Food products, in general, do not have a single flavor, but rather a blend of several integrated flavors. Taste is the sensation of salty, sweet, sour, or bitter flavors caused by substances dissolved in the tongue [37].

b. Aroma

According to [38], the five senses of smell have a large influence on taste. These are four types of aroma that also have other aromas: sour, metallic and bitter. The score also influences the delivery and taste of products, which consist of chemical, smell, and stimulation [38]. Table 11 displays the panellists' ratings on the scent of biscuits.

Table 11 Biscuit scent test result

Comparison of purple rice flour with plain flour (%)	Aroma Value(%)	Description
A = 90:10	3.58	different (not typical banana aroma)
B = 80:20	3.88	different (not typical banana aroma)
C = 70:30	4.44	somewhat similar (almost like banana)
D = 60:40	4.84	somewhat similar (almost like banana)
E = 50:50	5.44	similar (banana aroma)

Note: taste scores include 1 = very much similar, 2 = very similar, 3 = similar, 4 = somewhat similar, 5 = different, 2 = very different, 1 = very much different.

Table 11 demonstrates that treatment E (50:50 comparison of purple rice flour and plain flour) received the highest rating from the panellists for biscuit scent, with 5.44% (similar). The panellists' lowest estimate of the biscuit scent was 3.58% (different) in treatment A (comparison of purple rice flour with plain flour 90:10).

The inclusion of purple rice flour decreased fragrance intensity. This is due to the fact that purple rice flour does not have a significant scent. The aroma of the biscuits is derived from minerals and other additives used during baking.

c. Texture

The weight quantity, fat content, and number of carbohydrates and proteins all influence the appearance of meals. Texture changes can be induced by water or fat content loss, emulsion breakdown, or protein hydrolysis [39]. Table 12 displays the panellists' ratings of biscuit texture.

Table 12 Value of biscuit texture test

Comparison of purple rice flour with plain flour (%)	Texture Value(%)	Description
A = 90:10	2.32	different (rough)
B = 80:20	3.96	different (rough)
C = 70:30	4.48	somewhat similar (rather rough)
D = 60:40	5.20	similar (soft)
E = 50:50	5.52	similar (soft)

Note: taste scores include 1 = very much similar, 2 = very similar, 3 = similar, 4 = somewhat similar, 5 = different, 2 = very different, 1 = very much different.

Table 12 shows that treatment E (comparison of purple rice flour and plain flour 50:50) had the greatest rating for biscuit texture, 5.52% (similar), whereas treatment A received the lowest rating for biscuit texture (comparison of purple rice flour and plain flour 90:10). The panellists' acceptance rating is 3.24% (distlike) on a scale of dislike to like (90:10).

The more plain flour used, the other the finished product and the greater the panellist acceptance rate. The addition of purple rice flour was responsible for the low level of panellist acceptance of treatment A (comparison of purple rice flour and plain flour 90:10). The biscuits would be harder or soilder. The water, fat, protein, and carbohydrate content of food heavily influences its texture. The texture is a physical sensation that can be felt with the mouth (when biting, crushing, and swallowing). Textures sensation detect wetness, dryness, hardness, smoothness, roughness, and oiliness [40].

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d. Color
Color is vital in fulfilling human taste, according to [41]. Color assessment is done by examining the product finished using each panellist's sense of sight. Table 13 shows the panellist's ratings of the five of biscuits.

Table 13 Nilai uji warna biskuit

Comparison of purple rice flour with plain rice flour (%)	Color Value	Description
A = 90 : 10	4,64	do not like (light yellow)
B = 80 : 20	4,16	kinda like (yellow)
C = 70 : 30	4,52	kinda like (yellow)
D = 60 : 40	5,08	like (dark yellow)
E = 50 : 50	5,52	like (dark yellow)

Notes: rate scores include * = very much similar, 0 = very similar, 1 = similar, 4 = somewhat similar, 5 = different, 2 = very different.

Table 13 demonstrates that treatment B (comparison of purple rice flour and 50:50 plain rice flour) received the highest color assessment of 4,16. Similarly, because the panellists find the dark yellow color more appealing. Treatment A (comparison of purple rice flour and plain rice flour 90:10) received the lowest rating of 3,64. Different because panellists find it light color to be less appealing. Color evaluation is accomplished through direct visual inspection of the product with each panellist's sense of sight. Many elements influence a product's quality, but before other factors are examined and assessed, the color component visually emerges first in deciding panellist's acceptability of the product [45].

CONCLUSION

A comparison of purple rice flour and plain rice flour on the quality of antioxidant-rich biscuits revealed that purple rice flour had a very significant effect on water content, ash content, crude fiber content, the content, protein content, and carbohydrate content but had no effect on antioxidant activity. Treatment B has 1,54% water content, 2,11% ash content, 25% fat content, 17% crude fiber content, 4,17% protein content, 55,81% antioxidant activity, and 41,48% carbohydrate content (comparison of purple rice flour and plain rice flour 50:50). To limit the consumption of wheat flour, it is suggested that the community and biscuit entrepreneurs develop antioxidant-rich biscuit goods using purple rice flour and plain rice flour.

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This article does not contain any studies that would require an ethical statement.

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Observations were made on the minimum content of biscuits, namely water content (1) protein content (14) ash content (11) crude fiber content (13) and content (10) antioxidant with DPPH method (19) and organoleptic test (2)

Statistical Analysis

Microware Excel and SPSS Verina 24 produced the statistical data analysis. The design used in this study was one-way completely randomized design (CRD) with 3 treatment levels and 3 replications. Observational data were analyzed using Analysis of Variance (ANOVA) and Duncan's New Multiple Range Test (DNDMRT) with a significance level. The data from this research were entered into SPSS 24.0. (SPSS Analytic Platform) and the data were evaluated using ANOVA (Analysis of Variance) and the Tukey-Kramer test to determine the significant differences.

RESULTS AND DISCUSSION

Water Content

The study of diversity revealed that the water level of the produced biscuits differed considerably (p < 0.01) depending on the ratio of purple rice flour to plain rice flour. Based on the further DNDMRT test at the level of $\alpha = 0.01$, all treatments demonstrated a very significant difference in the water content of the biscuits. Table 3 shows the average water content of biscuits.

Table 3 Average water content of biscuits

Table with 3 columns: Comparison of purple rice flour with plain rice flour (Water Content (%)), Water Content (%), Standard Deviation. Rows A-E show values for different flour ratios.

Note: The numbers in the same column followed by different lowercase letters show a significant difference in the DNDMRT follow-up test at the level of $\alpha = 0.01$. ICC is a coefficient of diversity.

The biscuits' water content ranged from 3.3 to 5.01%. The water content of the biscuits revealed a decrease in yield while increasing the amount of purple rice flour. Plain rice flour has a low water content since biscuits are baked at 120°C to allow the baking process to evaporate and limit the quantity of water in the biscuits dough (21). Treatment A (90:10) composition of purple rice flour and plain rice flour had the lowest water content of 3.33%. Treatment B (80:20) composition of purple rice flour and plain rice flour had the lowest water level of 3.59%. The water content will decrease if less purple rice flour is used and more plain rice flour is used, and vice versa. According to (21) rice flour has a water content of 13%, while plain rice flour has a water content of 4.49% (9). According to the research, the more plain rice flour is used in the making of biscuits, the lower the water content of the biscuits. Except for treatment A, which did not meet the Indonesian National Standard (23) for biscuits, the water level of the biscuits produced was a maximum of 5%.

The water content of each treatment varies because the relationship of water (each treatment's water content) varies because the water's relationship to food ingredients varies; the water content in food can be divided into bound water and free water (24). The amylose concentration and cooking temperature of rice leads after water absorption (25). Rice (non-starchy) is classified into three types based on its amylose content: low amylose (20%), medium amylose (20-25%), and high amylose (2 25%) (Aminati, et al 37). This amylose concentration in low, water absorption and swelling will rise in temperature exceeding 40°C (26).

Ash Level

The diversity analysis revealed that the ratio of purple rice flour to plain rice flour had a significant effect on the ash content of the biscuits. Based on the DNDMRT additional test, all treatments revealed a very significant difference in the ash content of the biscuits at the level of $\alpha = 0.01$. Table 4 shows the average ash content of biscuits.

Table 4 Average ash content of biscuits

Table with 3 columns: Comparison of purple rice flour with plain rice flour (Ash content (%)), Ash content (%), Standard Deviation. Rows A-E show values for different flour ratios.

Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DNDMRT follow-up test at the level of $\alpha = 0.01$. ICC is a coefficient of diversity.

The ash content of biscuits ranged from 1.70 to 2.11%. The higher the ash content of the biscuits, the more plain rice flour is used and the less purple rice flour is used. This is due to the high mineral content of plain rice flour which causes the ash content to rise. Ash is classified as an inorganic element or an organic compound (27).

The maximum ash level of biscuits was discovered in treatment E (50:50) composition of purple rice flour with plain rice flour, which was 2.11%, while the lowest ash content was observed in treatment A (90:10) composition of purple rice flour with plain rice flour, which was 1.70%. The ash content varies in less purple rice flour is used and more plain rice flour is used, and vice versa. All treatments had biscuits ash content of at least 1.4%, which meets the Indonesian National Standard (23) This is because plain rice flour has more ash than purple rice flour. Plain rice flour has an ash content of 5.74 (9), while rice flour has an ash content of 1.0 (21).

Food has an ash of inorganic. Mineral elements are composed of phosphorus, sodium, and copper make up this component. Mineral elements in the body combine with organic molecules to form mineral elements that can be used as building blocks and repair. The mineral content of the body's mineral content must be within a certain range (28). The higher the ash content of the biscuits, the more plain rice flour is used. As a result, biscuits made with a lot of plain rice flour have more minerals.

Fat Content

The diversity analysis revealed that the ratio of purple rice flour to plain rice flour was very significant (p < 0.01) in the fat content of the manufactured biscuits. Based on the DNDMRT additional test at the level of $\alpha = 0.01$, all treatments exhibited a very significant difference in the fat content of the biscuits at the level of $\alpha = 0.01$. Table 5 shows the average fat content of biscuits.

Table 5 Average fat content of biscuits

Table with 3 columns: Comparison of purple rice flour with plain rice flour (Fat level (%)), Fat level (%), Standard Deviation. Rows A-E show values for different flour ratios.

Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DNDMRT follow-up test at the level of $\alpha = 0.01$. ICC is a coefficient of diversity.

The fat content of biscuits ranged from 16.64% to 21.38%. The more plain rice flour is used in the production of biscuits, the higher the fat content. This is because plain rice flour has a larger fat content than purple rice flour. Treatment E (50:50) composition of purple rice flour and plain rice flour had the

highest fat content (21.38%). Treatment A (composition of purple rice flour with plain rice flour 90:10) had the lowest fat content value of 16.64%. The less purple rice flour used and the more plain rice flour used, the lower the fat level, and vice versa.

The fat content of all treatments' biscuits exceeded the maximum fat content limit in the Indonesian National Standard (23), which is a minimum of 8.5%. This is due to the fact that the fat in biscuits is obtained via the addition of butter, eggs, and cream milk to the biscuits dough formulation (24) and plain rice flour has a large amount of fat compared to purple rice flour. Plain rice flour has a fat content of 16.94 (9). Rice flour has a fat content of 1.4% (21). The fat content of purple rice flour has a fat content of 1.5% (21). This statement follows the findings that increasing the use of purple rice flour in the production of biscuits reduces the fat level of the product.

Crude Fiber Content

The diversity analysis revealed that the ratio of purple rice flour to plain rice flour had a highly significant (p < 0.01) variation in the crude fiber content of the biscuits prepared. Based on the DNDMRT additional test, all treatments revealed a very significant difference in the crude fiber content of the biscuits at the level of $\alpha = 0.01$. Table 6 shows the average crude fiber content of biscuits.

Table 6 Average content of crude fiber of biscuits

Table with 3 columns: Comparison of purple rice flour with plain rice flour (Crude Fiber Content (%)), Crude Fiber Content (%), Standard Deviation. Rows A-E show values for different flour ratios.

Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DNDMRT follow-up test at the level of $\alpha = 0.01$. ICC is a coefficient of diversity.

Biscuits had a crude fiber content ranging from 1.8 to 1.85%. The more plain rice flour is used in making biscuits, the higher the crude fiber content. This is because plain rice flour contains more crude fiber than purple rice flour. The maximum crude fiber content of biscuits was discovered in treatment E (50:50) composition of purple rice flour and plain rice flour, which was 1.85%, while the lowest crude fiber content was identified in treatment A (90:10) composition of purple rice flour and plain rice flour, which was 1.83%. This assertion is based on the study's findings that crude fiber content is inversely related to water content; the higher the crude fiber content, the lower the water content produced, and vice versa, and the higher the crude fiber content, the higher the water content produced. The less purple rice flour is used, the higher the crude fiber content, and vice versa.

The crude fiber content of biscuits produced by all treatments exceeded the 0.5% minimum allowed by the Indonesian National Standard (23). This is because plain rice flour contains more crude fiber than purple rice flour. Plain rice flour has 1.74% crude fiber (9). The more plain rice flour is used in the production of biscuits, the higher the crude fiber content of the biscuits. Crude fibers are made up of cellulose, pectin, and lignin. This crude fiber component has no nutritional value but is critical in facilitating the digestion process in the body (21).

Protein Levels

The study of diversity revealed that the protein composition of the biscuits varied significantly (p < 0.01) between purple rice flour and plain rice flour. Based on the DNDMRT additional test at the level of $\alpha = 0.01$, all treatments exhibited a very significant difference in biscuit protein content. Table 7 shows the average protein content of biscuits.

Table 7 Average protein content of biscuits

Table with 3 columns: Comparison of purple rice flour with plain rice flour (Protein level (%)), Protein level (%), Standard Deviation. Rows A-E show values for different flour ratios.

The diversity analysis revealed that there was a significant difference (p < 0.05) in the antioxidant content of the biscuits formed when purple rice flour was compared to plain rice flour. Table 8 shows the average antioxidant content of biscuits.

Table 8 Average antioxidant content of biscuits

Table with 3 columns: Comparison of purple rice flour with plain rice flour (Antioxidant Activity), Antioxidant Activity, Standard Deviation. Rows A-E show values for different flour ratios.

Note: The numbers in the same column followed by different lowercase letters show a significant difference in the DNDMRT follow-up test at the level of $\alpha = 0.01$. ICC is a coefficient of diversity.

The protein content of biscuits ranged from 4.72 to 7.18%. The more purple rice flour used in the production of biscuits, the higher the protein level of the biscuits produced. This is due to the low protein content of plain rice flour, the higher protein content of biscuits is found in treatment A (composition of purple rice flour and plain rice flour 90:10), which is 7.18%, while the lowest protein content is found in treatment E (composition of purple rice flour and plain rice flour 50:50), which is 4.72%. The less purple rice flour used and the more plain rice flour used, the lower the protein content, and vice versa.

The protein level of all treatments did not meet the Indonesian National Standard (23), which is 6% (9). This was due to the increased protein content of purple rice flour than plain rice flour. Rice flour has a protein content of 7.59% (9), while plain rice flour has a protein content of 4.9% (9). The more purple rice flour is used in biscuit production, the higher the protein level of the biscuits.

Antioxidant Activity

The diversity analysis revealed that there was a significant difference (p < 0.05) in the antioxidant content of the biscuits formed when purple rice flour was compared to plain rice flour. Table 8 shows the average antioxidant content of biscuits.

Biscuit antioxidant activity (in μmol) ranged from 23.53 to 31.78%. The less plain rice flour used in biscuit production, the higher the antioxidant level of the biscuits produced. The increased usage of purple rice flour in the production of biscuits raises the antioxidant activity. This is due to the presence of 87.64% antioxidant chemicals in purple rice flour (24). In a comparison of antioxidant levels by (25) levels of antioxidant activity in brown rice flour were found. The highest antioxidant activity level was found in the highest antioxidant activity composition of the two types, ranging from 92.284 to 276.72%, whereas the highest antioxidant activity was found in a range of 207 to 38.10%.

Treatment A (composition of purple rice flour with plain rice flour 90:10) had the greatest antioxidant level of biscuits, at 31.78%, while treatment E (composition of purple rice flour with plain rice flour 50:50) had the lowest antioxidant level, at 23.53%. The antioxidant activity decreases as purple rice flour is used less and plain rice flour is used more, and vice versa.

It is not specified in the SNI for biscuits for antioxidant activity because antioxidants are very important to investigate to establish the antioxidant content of the biscuits of purple rice flour and plain rice flour in biscuits. This purple rice flour contains antioxidant chemicals that are beneficial to the body. The antioxidant activity of biscuits containing more purple rice flour will be more beneficial. The antioxidant activity of all biscuits was more 70.83%, as stated by (24). Purple rice flour has a level of antioxidant activity of 87.64%.

Carbohydrate Levels

According to the results of the diversity study the ratio of purple rice flour to plain rice flour made a very significant difference (p < 0.01) in the carbohydrate content of the biscuits. Based on the DNDMRT additional test at the level of $\alpha = 0.01$, all treatments exhibited a very significant variation in carbohydrate content. Table 9 shows the average carbohydrate content of biscuits.

Table 9 Average carbohydrate content of biscuits

Table with 3 columns: Comparison of purple rice flour with plain rice flour (Carbohydrate levels (%)), Carbohydrate levels (%), Standard Deviation. Rows A-E show values for different flour ratios.

Note: The numbers in the same column followed by different lowercase letters show a very significant difference in the DNDMRT follow-up test at the level of $\alpha = 0.01$. ICC is a coefficient of diversity.

Biscuit carbohydrate content ranged from 61.49 to 71.72%. The more plain rice flour used in biscuit making, the lower the carbohydrate content produced. This is due to the fact that purple rice flour has one of the highest carbohydrate levels. Treatment A (composition of purple rice flour and plain rice flour 90:10) had the highest carbohydrate amount (71.72%), whereas treatment E (composition of purple rice flour with plain rice flour 50:50) had the lowest carbohydrate content (61.49%). The carbohydrate amount will decrease as less purple rice flour is used and more plain rice flour is used, and vice versa.

The findings of this study support the assertion above that biscuits made with purple rice flour contain less carbohydrates, resulting in a greater carbohydrate content. The carbohydrate content of biscuits prepared for treatment A was at least 70% of the Indonesian National Standard (23) for biscuits.

This figure is slightly lower than the minimum SNI standard for biscuits, which specifies a minimum carbohydrate content of 70%. Plain rice flour has a reduced carbohydrate percentage, namely 61.4-49.9% (9). Despite the fact that plain rice flour contains more carbohydrates than purple rice flour, it does not meet the minimum carbohydrate content (at least 70%) biscuits. However, the majority of fat calories from carbohydrates. Carbohydrates also influence the properties of food items such as flavor, color, and texture. Furthermore, carbohydrates are beneficial to the body because they stabilize the body's energy levels, maintain blood sugar, and aid in fat and protein metabolism (24).

Organoleptic Test

The organoleptic test was performed using sensory assessment, which included sampling the taste and aroma of the biscuits as well as analyzing their texture and color. The test was conducted using biscuits prepared according to the treatment formulations. By being put on the test by 30 untrained panellists.

a. Flavor

The most essential factor in consumer acceptance of a product is its taste. Taste is distinct from smell in that it involves five senses of the tongue. Sensory elements can influence taste, including chemical substances, temperature, concentration, and consistency with the odor component (26). Table 10 displays the panellists' ratings on the flavor of biscuits.

Table 10 Biscuit sensory test value

Table with 3 columns: Comparison of purple rice flour with plain rice flour (Flavor value (%)), Flavor value (%), Description. Rows A-E show values for different flour ratios.

Note: taste scores include: 1 = very much similar, 2 = very similar, 3 = similar, 4 = somewhat similar, 5 = different, 6 = very different, 7 = very much different.

Table 10 demonstrates that treatment E (50:50) composition of purple rice flour and plain rice flour received the highest rating from the panellists for biscuits taste, with 4.44 (similar). The panellists' lowest ratings of the biscuits were 3.56 (different) in treatment A (composition of purple rice flour with plain rice flour 90:10).

The data gathered revealed that the higher the addition of purple rice flour, the lower the panellists' acceptance rate. This is due to the slightly bland flavor of purple rice flour, which affects the biscuits' flavor. However, based on the panellists' responses, it can be determined that the panellists are aware of the combination of purple rice flour with plain rice flour as a result of 1 to 5, indicating that the panellists already enjoy the taste of the biscuits.

Food products, in general, do not have a single flavor, but rather a blend of several ingredients. Taste is the sensation of salty, sour, sweet, or bitter flavors caused by substances dissolved in the tongue (27).

b. Aroma

According to (26), the five senses of smell have a large influence on people's infatuation. Since the five types of aromas that the nose may detect: aromatic, sour, rancid, and bitter. The test also influences the overall sensory evaluation of biscuits, including taste, texture, and appearance (28). Table 11 displays the panellists' ratings on the odor of biscuits.

Table 11 Biscuit sensory test value

Table with 3 columns: Comparison of purple rice flour with plain rice flour (Aroma Value(%)), Aroma Value(%), Description. Rows A-E show values for different flour ratios.

Note: taste scores include: 1 = very much similar, 2 = very similar, 3 = similar, 4 = somewhat similar, 5 = different, 6 = very different, 7 = very much different.

Table 11 demonstrates that treatment E (50:50) composition of purple rice flour and plain rice flour received the highest rating from the panellists for biscuits odor, with 4.44 (similar). The panellists' lowest ratings of the biscuits were 3.56 (different) in treatment A (composition of purple rice flour with plain rice flour 90:10).

The addition of purple rice flour decreased acceptance. This is due to the fact that purple rice flour does not have a significant odor. The aroma of the biscuits is derived from rice materials and other additives used during baking.

c. Texture

The taste quality, the content, and number of carbohydrates and protein all influence the appearance of mass. Texture changes can be induced by water or the content ions, including breakdown or protein hydrolysis (29). Table 12 displays the panellists' ratings on the texture of biscuits.

Table 12 Value of biscuit texture test

Table with 3 columns: Comparison of purple rice flour with plain rice flour (Texture Value(%)), Texture Value(%), Description. Rows A-E show values for different flour ratios.

Note: taste scores include: 1 = very much similar, 2 = very similar, 3 = similar, 4 = somewhat similar, 5 = different, 6 = very different, 7 = very much different.

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IKETUT BUDARAGA
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Dear doc. ing. Peter Zajác, PhD.
Editor-In-Chief
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With respect, replying to the email dated January 31, 2023, herewith sent the correction as attached.
Regarding my name, I Ketut Budaraga, "I" is the regular part of my name (Not an abbreviation). In Bali (Indonesia) naming tradition, "I" indicates male, and "Ni" indicates female.
Thus the information that can be conveyed, thank you for your attention.

Regards,
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Pada tanggal Sel, 31 Jan 2023 pukul 22.37 IKETUT BUDARAGA
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Jawaban author revisi 3

Study of biscuit quality with the addition of plantain flour and purple rice flour as a replacement for wheat flour

I Kena Bularega, Amriana, Yolan Novera

ABSTRACT

Biscuits are wheat flour-based manufactured food products. Another option is to locate a flour substitute, such as plantain flour or purple rice. The purpose of this study is to establish the ideal ratio of purple rice flour and plantain flour based on the quality attributes of biscuits. This study employed a one-factor, Completely Randomized Design (CRD) with five treatment levels and three replications. The observational data were analyzed using ANOVA with the DNNRT further test at a 5% significant level. The treatment in this study compared purple rice flour and plantain flour in the preparation of biscuits. The ratio of purple rice flour to plantain flour had a very significant (p<0.01) effect on water content (5.54%), ash content (2.11%), fat content (23.18%), crude fiber content (17.85%), protein content (4.72%), and carbohydrate content (61.49%), but no significant effect (p>0.01) on antioxidant activity (55.83%). Except for protein, all treatments meet the SNTs requirements for biscuit quality. Based on the organoleptic test of taste, aroma, texture, and color preferred by panelist with score of A (00-10) 3.52%, B (10-20) 3.97%, C (20-30) 4.42%, D (40-50) 5.03%, and E (50-60) 5.22% were obtained. The best-quality biscuits were in treatment E (comparison of purple rice flour and plantain flour 50:50).

Keywords: biscuit, flour, rice, plantain, addition

INTRODUCTION

Biscuits are wheat flour-based manufactured food products. According to [1] biscuits are items made by baking dough made from wheat flour with or without the use of approved food additives. Biscuits are a type of snack that is commonly enjoyed in this society. This is a dry product with a low water content. According to [2], based on industry association data, biscuit consumption is expected to rise by 55-58% in 2012, owing to an increase in domestic consumption. Biscuits are enjoyed by people of all ages, including infants and adults, although in varying forms [3].

The majority of biscuits on the market are made with wheat flour as the primary ingredient. Biscuits are made with wheat flour that has a low protein level. Non-wheat flour is now being researched for usage in the production of biscuits, particularly gluten-free biscuits [4]. As a result, several efforts are being undertaken to replace wheat flour with flour derived from local resources, such as tubers, seeds, and fruits, one of which being purple rice and plantain flour [5].

Rice (*Oryza sativa* L.) is a staple food crop grown in underdeveloped nations as a staple diet or source of carbohydrates [6]. Rice comes in many different kinds, including white rice, brown rice, black rice, and purple rice, brown, black, and purple [7].

Purple rice with colored grains has long been a unique and traditional dish in many cultures for dietary and medicinal purposes [8]. Today, the benefits of pigmented rice are generally known, and it is employed in commercial food production as well as dietary supplements, cosmetics, and medications [7]. Coloured rice is

high in phenolic compounds. Flavonoid chemicals are one type of phenolic compound that has antioxidant properties [8].

Because wheat flour is used as the principal basic ingredient in many processed food products in Indonesia, the country's reliance on wheat flour imports is growing. This can be decreased by using locally grown foods such as plantain flour. One of the wild plantain flours is the plantain flour (Oryza sativa), which is diploid [9]. While the plantain flour (Oryza sativa) has numerous advantages, one of which is that it contains antioxidant chemicals, one of which can lessen the incidence of Alzheimer's [10]. Plantain flour has a rather high starch content, over 90% [11]. Plantain flour is suited for processing into flour due to its high starch content. When the fruits are mature and the plantain is still green due to the high starch and non-starch polysaccharides, plantain flour can be used as flour [12]. The benefit of processing into flour is that it has a longer shelf life and is more practical when used to produce other food products. Plantain flour and seeds have a relatively high mineral content (in ppm), including calcium, magnesium, potassium, sodium, manganese, and phosphorus [13].

Scientific hypothesis

This research investigated the effect of utilizing plantain flour as an alternative raw material to wheat flour in the production of biscuits. The addition of plantain flour will greatly reduce reliance on wheat flour while also enhancing the economic worth of plantain flour. It can also determine the influence of the ratio of purple rice flour to plantain flour on the quality of biscuits and decomposition of purple rice flour and plantain flour in manufacturing biscuits that consumers enjoy.

This hypothesis is supported by research conducted by [9] on the ratio of wheat flour (50% plantain flour) which is the most preferred by the panelists, and it is also known that the resistant starch content of plantain flour is higher (39.35%) than other types of bananas, implying that plantain flour has a great opportunity to be processed into functional products, one of which is the production of biscuits.

MATERIAL AND METHODOLOGY

Samples

This study was conducted at Eka's University's Agricultural Product Technology Laboratory in Padang. The study was carried out during March and April of 2021. Purple rice from Kentangin Kasang, Padang Pariaman City, and plantain flour from Pasar Raya Padang City were the main raw materials used in this study. The researchers developed their own purple rice flour and plantain flour.

Chemicals

ROFA Laboratorium Centre provided all reagents, which were of analytical grade (Indonesia). (1) Protein analysis: 1.25% concentrated sulfuric acid (H₂SO₄) and Aquades; 30% of NaOH; Methyl Indicator, Methyl red 0.2%, Methyl blue 0.2%, selenium mix, H₂BO₃, H₂CO₃, 0.1N are the materials for chemical analysis. (2) Fat content analysis using benzene (3) Crude fiber content, ethanol, sulfuric acid (H₂SO₄), 1.25% NaOH, and 10% potassium sulfate analysis (K₂SO₄) (4) DPPH 45 ppm antioxidant test in methanol. Scales, stove, cauldrons, basins, trays, spoons, sieves, mixers, knives, blenders, sieves, ovens, mixers, cake pans, and moulds are all needed to make biscuits. Margarine, egg, honey, skim milk, salt, and vanilla are also included. Animals and biological materials were not used in this research.

Instruments

All tools were of analytical grade and were purchased from ROFA Laboratorium Centre (Indonesia). The tools for chemical analysis are: (1) protein analysis, 500 ml Kjeldahl flask, distillation apparatus, 50 ml buret, 5 ml measuring pipette, 50 ml Erlenmeyer, dropper pipette, 250 ml beaker, and flame hood. (2) Antioxidant test, UV-VIS spectrophotometer. (3) Organoleptic test by 30 untrained panelists after being chosen through discrimination, descriptive and affective tests.

Laboratory Methods

In this investigation, the treatments were the following ratios of purple rice flour to plantain flour (%). A = 20:80, B = 30:70, C = 40:60, D = 50:50. The recipe for purple rice flour and plantain flour biscuits refers to [14] in [15].

Description of the Experiment

Sample preparation: The sample preparation of making biscuits can be seen in the following table [16].

Table 1 Standard Formulations for making biscuits

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The most essential factor in consumer acceptance of a product is its taste. Taste is distinct from smell in that it involves all five senses of the tongue. Several elements can influence taste, including chemical substances, temperature, concentration, and interaction with other flavor components [36]. Table 10 displays the panellist ratings on the flavor of biscuits.

Table 10 Comparison of purple rice flour with plain wheat flour (4%)

Flavor value (%)	Description
A = 90 : 10	3,56 different (straw)
B = 80 : 20	4,38 somewhat similar (almost like banana)
C = 70 : 30	4,24 somewhat similar (almost like banana)
D = 60 : 40	3,90 similar (banana flavor)
E = 50 : 50	3,80 similar (banana flavor)

Note: taste scores include 7 = very much similar, 6 = very similar, 5 = similar, 4 = somewhat similar, 3 = different, 2 = very different, 1 = very much different.

Table 10 demonstrates that treatment E (50:50 comparison of purple rice flour and plain wheat flour) received the highest rating from the panellists for biscuit taste, with 5.60% (similar). The panellist's lowest rating of the biscuit taste was 3.56% (different) in treatment A (comparison of purple rice flour with plain wheat flour 90:10).

The data gathered revealed that the higher the addition of purple rice flour, the lower the panellist acceptance rate. This is due to the slightly bland flavor of purple rice flour, which affects the sense of the sweet biscuit taste. The addition of plain wheat flour and other ingredients can improve the taste of the biscuits. However, based on the panellist's acceptance data, it can be determined that the panellists have accepted the combination of purple rice flour with plain wheat flour on a scale of 5 to 5.60, indicating that the panellists already enjoy the taste of the cookies.

Food products, in general, do not have a single flavor, but rather a blend of several integrated flavors. Taste is the sensation of salty, sweet, sour, or bitter flavors created by substances dissolved in the tongue [37].

b. Aroma

According to [36], the five senses of smell have a large influence on gastronomy influence. There are four types of aromas that the nose may detect: aromatic, sour, rancid, and burnt. The scent also influences the sensory and food products, which are processed products, delicacy and taste consisting of three components: smell, taste, and stimulation [38]. Table 11 displays the panellist ratings on the scent of biscuits.

Table 11 Biscuit aroma test value

Comparison of purple rice flour with plain wheat flour (%)	Aroma Value (%)	Description
A = 90 : 10	3,85 different (not typical banana aroma)	
B = 80 : 20	4,38 different (not typical banana aroma)	
C = 70 : 30	4,44 somewhat similar (almost like banana)	
D = 60 : 40	4,24 somewhat similar (almost like banana)	
E = 50 : 50	4,44 similar (banana aroma)	

Note: taste scores include 7 = very much similar, 6 = very similar, 5 = similar, 4 = somewhat similar, 3 = different, 2 = very different, 1 = very much different.

Table 11 demonstrates that treatment E (50:50 comparison of purple rice flour and plain wheat flour) received the highest rating from the panellists for biscuit scent, with 5.44% (similar). The panellist's lowest estimate of the biscuit scent was 3.85% (different) in treatment A (comparison of purple rice flour with plain wheat flour 90:10).

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The inclusion of purple rice flour decreased fragrance reception. This is due to the fact that purple rice flour does not have a significant scent. The aroma of the biscuits is derived from raw materials and other additives used during baking.

c. Texture

The water quantity, fat content, and number of carbohydrates and proteins all influence the appearance of meals. Texture changes can be induced by water or fat content loss, emulsion breakdown, or protein hydrolysis [39]. Table 12 displays the panellist ratings of biscuit texture.

Table 12 Values of biscuit texture

Comparison of purple rice flour with plain wheat flour (%)	Texture Value (%)	Description
A = 90 : 10	3,52 different (rough)	
B = 80 : 20	3,96 different (rough)	
C = 70 : 30	4,48 somewhat similar (rather rough)	
D = 60 : 40	5,20 similar (soft)	
E = 50 : 50	5,52 similar (soft)	

Note: taste scores include 7 = very much similar, 6 = very similar, 5 = similar, 4 = somewhat similar, 3 = different, 2 = very different, 1 = very much different.

Table 12 shows that treatment E (comparison of purple rice flour and plain wheat flour 50:50) had the greatest rating for biscuit texture, 5.52% (similar), whereas treatment A received the lowest rating for biscuit texture (comparison of purple rice flour and plain wheat flour) 3.52% (dislike) on a scale of dislike to like (90:10).

The more plain wheat flour used, the softer the finished product and the greater the panellist acceptance rate. The addition of purple rice flour was responsible for the low level of panellist acceptance of treatment A (comparison of purple rice flour and plain wheat flour 90:10). The biscuits would harder or solidify. The water, fat, protein, and carbohydrate content of food heavily influences its texture. The texture is a prerequisite that can affect with the mouth (when biting, chewing, and swallowing). Texture among can detectiveness, dryness, hardness, smoothness, roughness, and oiliness [40].

d. Color

Color is vital in fulfilling human taste, according to [41]. Color assessment is done by examining the product firsthand until each panellist's sense of sight. Table 13 shows the panellist ratings of the hue of biscuits.

Table 13 Hue of biscuits

Comparison of purple rice flour with plain wheat flour (%)	Color Value (%)	Description
A = 90 : 10	1,64 do not like (light yellow)	
B = 80 : 20	2,16 kinda like (yellow)	
C = 70 : 30	2,16 kinda like (yellow)	
D = 60 : 40	2,90 like (dark yellow)	
E = 50 : 50	3,52 like (dark yellow)	

Note: taste scores include 7 = very much similar, 6 = very similar, 5 = similar, 4 = somewhat similar, 3 = different, 2 = very different, 1 = very much different.

Table 13 demonstrates that treatment E (comparison of purple rice flour and 50:50 plain wheat flour) received the highest color assessment of 5.52% (similar). Because the panellist find the dark yellow color most appealing. Treatment A (comparison of purple rice flour and plain wheat flour 90:10) received the lowest rating of 1.64% (dislike). Because panellist find light skin to be less appealing.

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Color evaluation is accomplished through direct visual inspection of the product with each panellist's sense of sight. Many elements influence a product's quality, but before other factors are examined and assessed, the color component visually engages first in deciding panellist acceptability of the product [36].



CONCLUSION

A comparison of purple rice flour and plain wheat flour on the quality of antioxidant-rich biscuits revealed that purple rice flour had a very significant effect on water content, ash content, crude fiber content, fat content, protein content, and moisture content, but before other factors are examined and assessed, the color component visually engages first in deciding panellist acceptability of the product [36].

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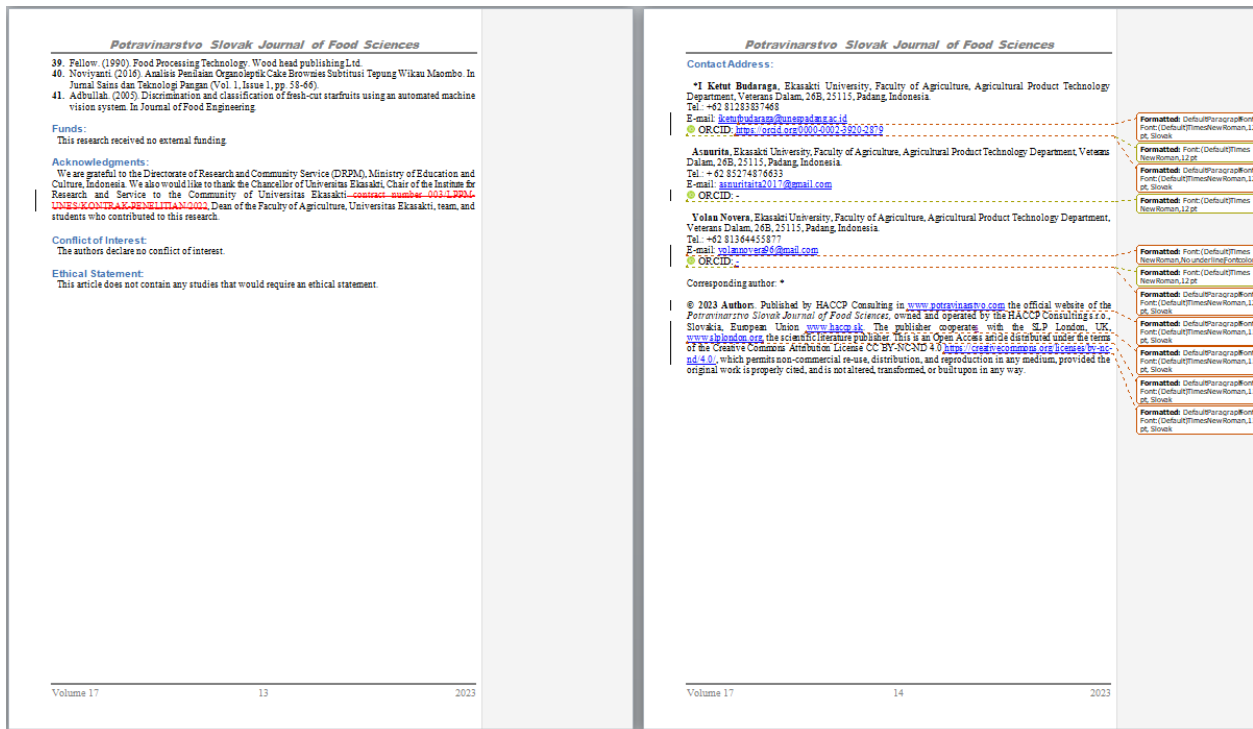
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kepada Ph.D. ▾

Jum, 3 Feb 16.43 (15 jam yang lalu) ☆ ↶ ⋮

Dear Jozef Čapla Ph.D.
Potravinarstvo Slovak Journal of Food Sciences

With respect, answering the email sent on January 31, 2023 and invoice no. 2023011, together with proof of deposit of 800 euros as attached. That being said, thank you for your attention.
Regards,
I Ketut Budaraga

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📅 Tanggal Transaksi	3 February 2023	💰 Nominal Debet	800,00 EUR
📄 Tipe Biaya	OUR	💰 Nominal Biaya	34,65 EUR
🏠 Jenis Pembayaran	ACCOUNT	💰 Total Debet	834,65 EUR
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