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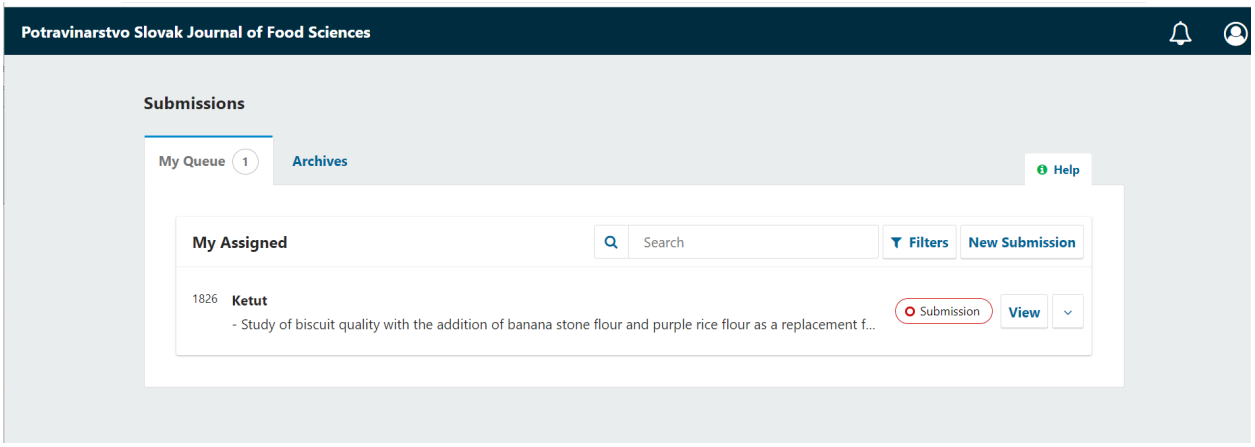

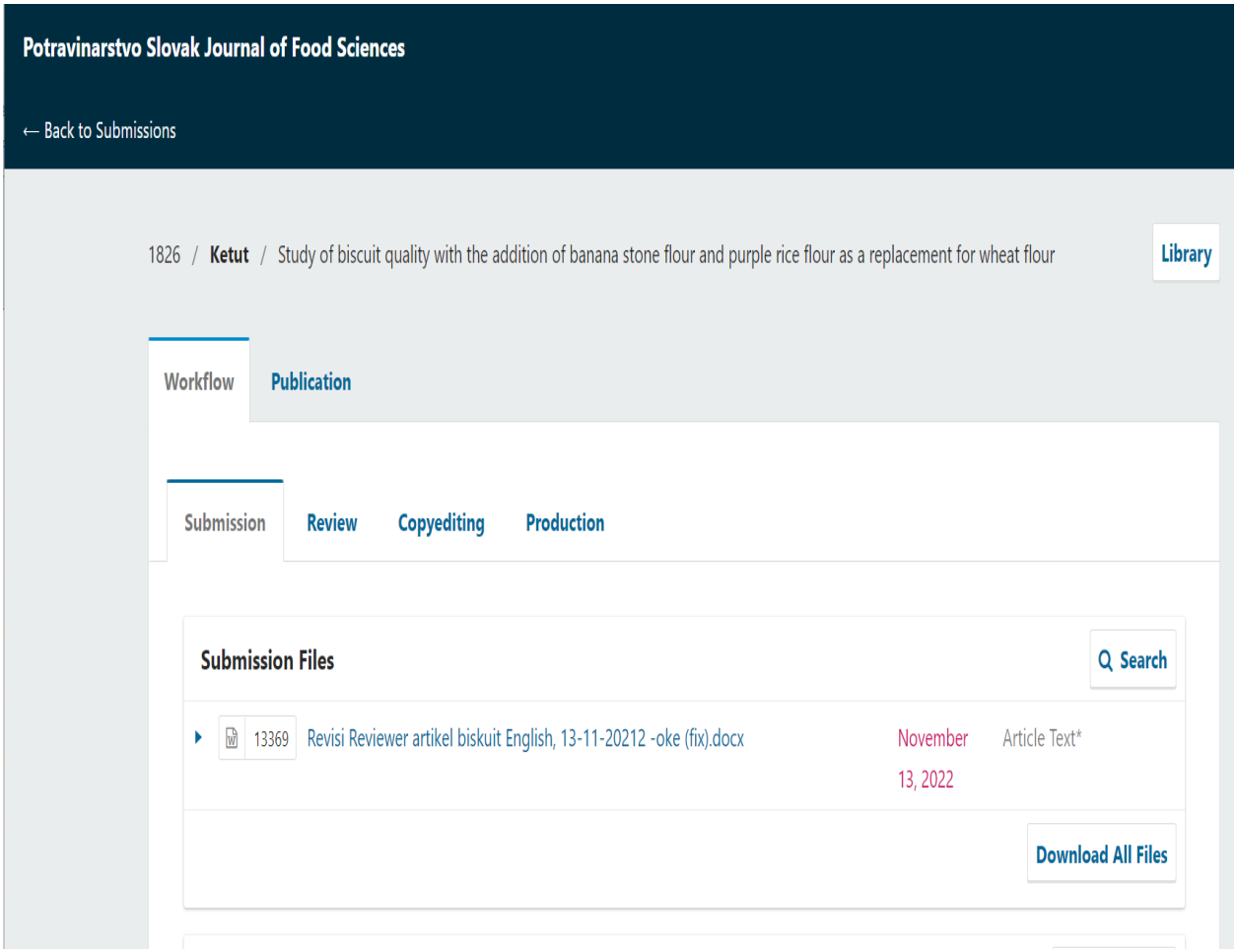

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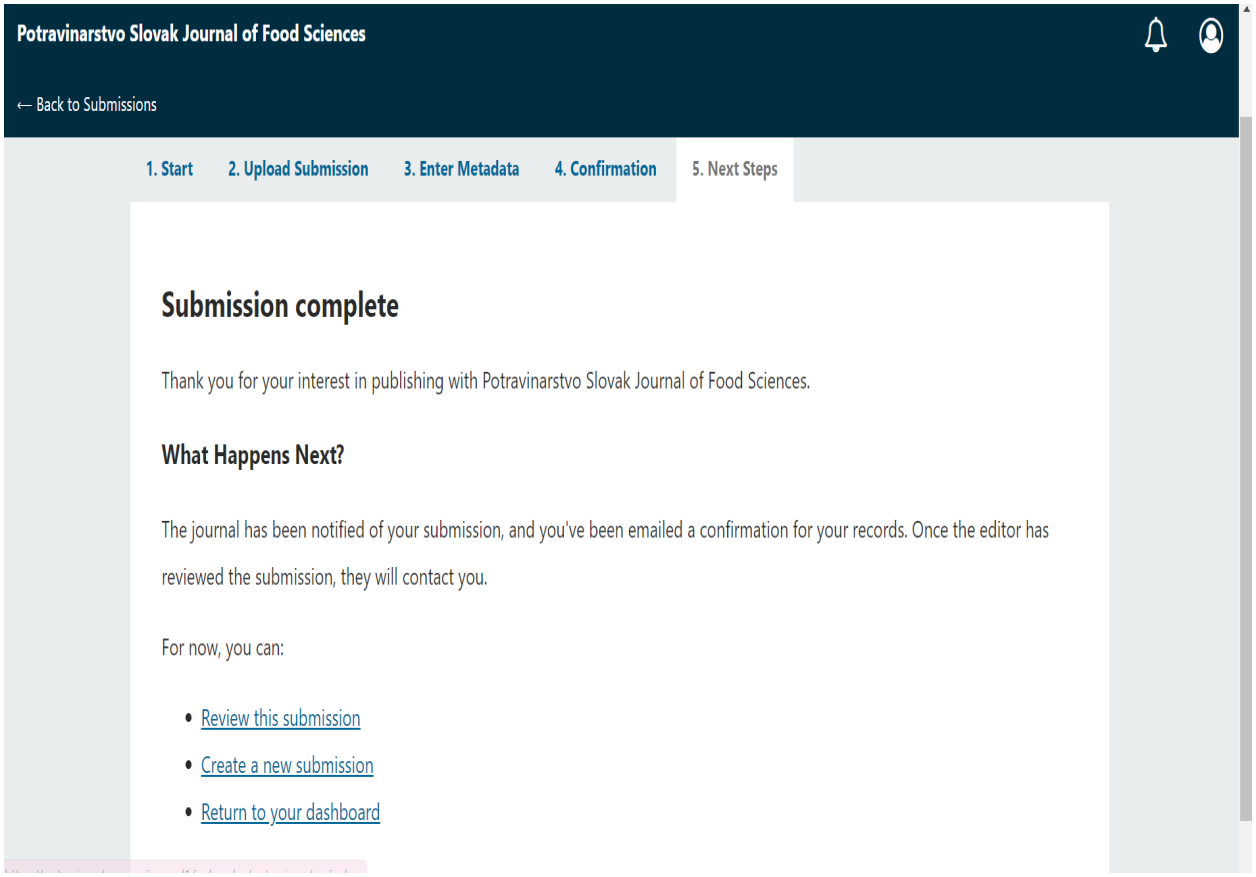

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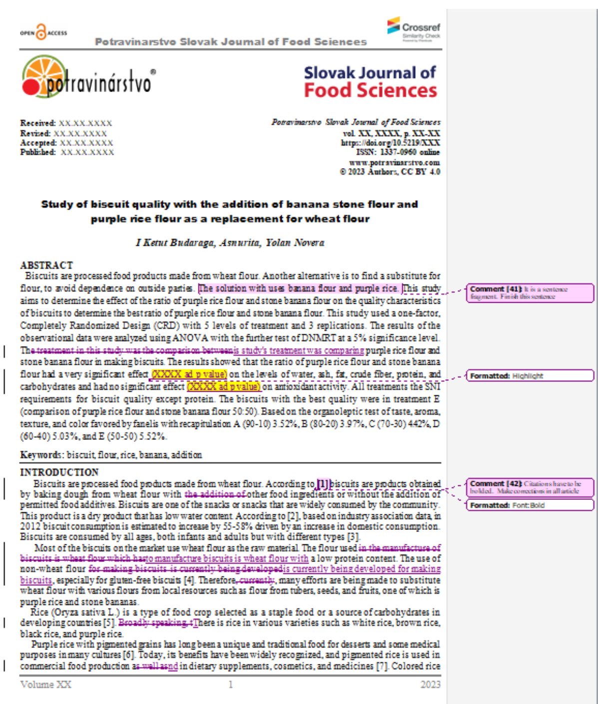

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Study of biscuit quality with the addition of banana stone flour and purple rice flour as a replacement for wheat flour

I Ketut Budaraga, Asnurita, Yolan Novera

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 solution with uses 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 DNMRT at a 5% significance level. Th~~e treatment in this study was the comparison between~~is 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 (XXXX ad p value) on the levels of water, ash, fat, crude fiber, protein, and carbohydrates and had no significant effect (XXXX ad p value) 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 fanelis with recapitulation A (90-10) 3.52%, B (80-20) 3.97%, C (70-30) 442%, 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 ~~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 55-58% 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 has~~to manufacture biscuits is wheat flour with a low protein content. The use of non-wheat flour ~~for making biscuits is currently being developed~~is 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 flours from local resources such as flour from tubers, 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]. ~~Broadly speaking, t~~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 a~~s well as~~nd in dietary supplements, cosmetics, and medicines [7]. Colored rice

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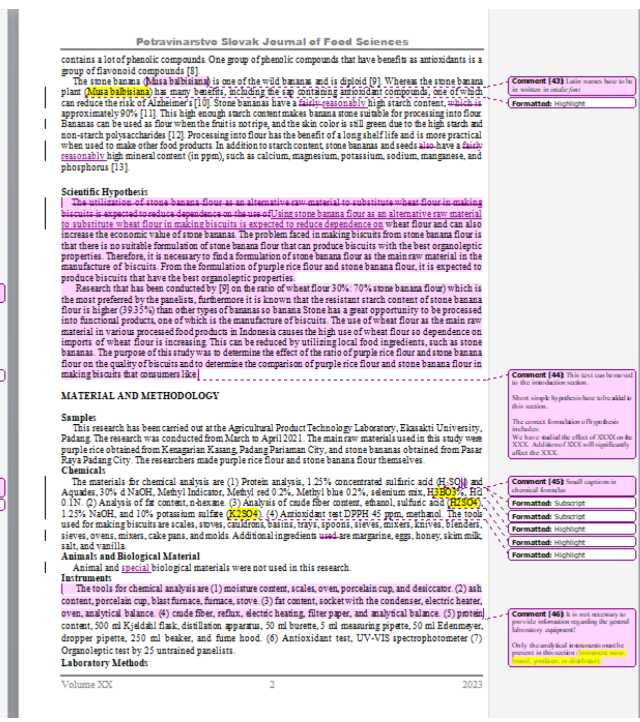

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contains a lot of phenolic compounds. One group of phenolic compounds that have benefits as antioxidants is a group of flavonoid compounds [8].

The stone banana (Musa balbisiana) is one of the wild bananas and is diploid [9]. Whereas the stone banana plant (Musa balbisiana) has many benefits, including the sap containing antioxidant compounds, one of which can reduce the risk of Alzheimer's [10]. Stone bananas have a ~~fairly~~ reasonably high starch content, ~~which is~~ 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 seeds ~~also~~ have a ~~fairly~~ reasonably high mineral content (in ppm), such as calcium, magnesium, potassium, sodium, manganese, and phosphorus [13].

Scientific Hypothesis

~~The utilization of stone banana flour as an alternative raw material to substitute wheat flour in making biscuits is expected to reduce dependence on the use of~~Using stone banana flour as an alternative raw material to substitute wheat flour in making biscuits is expected to reduce dependence on wheat flour and can also increase the economic value of stone bananas. The problem faced in making biscuits from stone banana flour is that there is no suitable formulation of stone banana flour that can produce biscuits with the best organoleptic properties. Therefore, it is necessary to find a formulation of stone banana flour as the main raw material in the manufacture of biscuits. From the formulation of purple rice flour and stone banana flour, it is expected to produce biscuits that have the best organoleptic properties.

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 (39.35%) 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. 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 purpose of this study was to 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.

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 Kenagarian Kasang, Padang Pariaman 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) Protein analysis, 1.25% concentrated sulfuric acid (H_2SO_4) and Aquades, 30% d NaOH, Methyl Indicator, Methyl red 0.2%, Methyl blue 0.2%, selenium mix, H3BO3%, Hcl 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) Antioxidant test DPPH 45 ppm, methanol. The tools used for making biscuits are scales, stoves, cauldrons, basins, trays, spoons, sieves, mixers, knives, blenders, sieves, ovens, mixers, cake pans, and molds. Additional ingredients ~~used~~ are margarine, eggs, honey, skim milk, salt, and vanilla.

Animals and Biological Material

Animal 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 Edenmeyer, dropper pipette, 250 ml beaker, and fume hood. (6) Antioxidant test, UV-VIS spectrophotometer (7) Organoleptic test by 25 untrained panelists.

Laboratory Methods

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The correct formulation of hypothesis includes:
We have studied the effect of XXXX on the XXX. Addition of XXX will significantly affect the XXX.

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Only the analytical instruments must be present in this section (Instrument name, brand, producer, or distributor).

[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	0,4	0,4	0,4	0,4	0,4

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 eggs, powdered sugar, margarine, skim milk, baking soda, and salt.]

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 replication: 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
- 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

c. 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
- Thin 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 Analytics 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 results of the analysis of diversity showed that the ratio of purple rice flour to stone banana flour was varyanalysis 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 DNMRT at the level of = 0.01 that, 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	3,56	e

KK: 3,86 %

Note: The numbers in the same column followed by different lowercase letters show a very significant the 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 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%) (Arraudo, et al 1976). At temperatures above 650°CC 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 that, 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 the 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 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] which is 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 [22].

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 that, 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 the difference in the DNMRT 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 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, 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]. While In contrast, the fat content in rice flour is 0.5% [31]. This statement is followingfollows 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 that, 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 (%)	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

KK: 4,91 %

Note: The numbers in the same column followed by different lowercase letters show a very significant the 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 banana stone flour 50:50) that is, 17.85%, while the lowest crude fiber content was found in treatment A (comparison of purple rice flour with banana stone 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 banana stone flour, thpurple 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, pentose, and other components. This component of crude fiber has no nutritional value but is very important to facilitatein 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. Basedon the

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Comment [49]: This is a sample preparation chapter. You have provided information where you bought raw materials, but this chapter should be how the samples are prepared?

You can add information regarding biscuit formulation to this chapter.

Comment [410]: It is not common to use term very significant.

Correct terms are:
Significant
Not significant

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further test of DNMRT at the level of = 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	e
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 very significant the difference in the DNMRT follow-up test at the level of α = 0, 01.

Comment [412]: Significant difference

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% [33], while the stone banana flour is 4.8% [9]. The more use of purple rice flour in the manufacture of biscuits, the higher the protein content of the biscuits.

Antioxidant Activity

The results of 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 (%)	Antioksidant Aktivity (%)
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
KK: 9%	

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 87.64% antioxidant compounds [34]. 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 92,286–92.972%, while for the Segreng Handayani variety it ranged from 79.207–89.870%.

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 that contains with antioxidant compounds that are good for the body. For biscuits with more purple rice flour content, the antioxidant activity will also be higherThe antioxidant activity will also be hither 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 87.64%.

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 DNMRT at the level of = 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 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: 2,58%		

Note: The numbers in the same column followed by different lowercase letters show a very significant the difference in the DNMRT follow-up test at the level of α = 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 study are followingis study's results follow the statement above that biscuits with purple rice flour contain more carbohydrates, so 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 been able to reach the minimum limit of carbohydrate contentreached 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 panellists.

a. Flavor

Taste is the most important parameter in consumer acceptance of a product. Taste is differentdiffers from the 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]. Panellists' 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	like (flavor banana)
E = 50 : 50	5,60	Suka (flavor banana)

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 10 shows that the panellists' 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 panellist 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 panelistspanelists have accepted the mixing of purple rice flour 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 panellists 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 which includes, including salty, sweet, sour, and bitter tastes caused by substances dissolved in the mouth [37].

b. Aroma

[36] states that aroma is much influenced by the five senses of smellthe five senses of smell much influence aroma. 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 delicacy of food products, as well as taste which consists of three components, namely and taste, which consists of three components smell, 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	3,36	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)

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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 panellists' 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 contrast, the panellists' lowest assessment of the biscuit aroma was in treatment A (comparison of purple rice flour with banana stone flour 90:10), which was 3.36% (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 largelyprimarily 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, breakage of emulsions, and protein hydrolysis [39]. Panellists' 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)

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 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% (liked), 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).which, means that the panellists' acceptance rate is on a scale of dislike to like.

The higher the level of use of stone banana flour, the softer the resulting product, and the higher the panellist acceptance rate. The low level of panellist 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 roleis important in meeting human tastes. Color assessment is done by observing the product directly with the sense of sight of each panellist. Panellists' assessment data on the color of biscuits are presented in Table 13.

Tabel 13 Nilai uji warna biskuit

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 panellists. 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 skin is less attractive to panelists.

Color assessment is done by direct visual observation of the product with the sense of sight of each panellist. 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 panellists' 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. is in treatment E (comparison of purple rice flour and stone banana flour 50:50), with 3.56% 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% carbohydrate content. It is recommended so 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.

REFERENCES

1. [Wijaya H. 2010 *Kajian Teknisi Standar Nasional Indonesia Bisbuit* SNI 01-2973-1992
2. Saksono, 2012. *Pasar Bisbuit Diproyeksi Tumbuh 8% Didorong Konsumsi*. http://www.indonesiafinancetoday.com. Diunduh 5 Agustus 2013.
3. Sari, O.F. 2013. *Formula Bisbuit Kaya Protein Berbasis Spirulina Dan Kerusakan Mikrobiologis Selama Penyimpanan*. SKRIPSI Program Studi Teknologi Hasil Perairan Fakultas Perikanan dan Ilmu Kelautan IPB. BOGOR.
4. Aninomous, 2012. Green Education Centre. *http://buddaya-sorgum.html* Diakses tanggal 22 Desember 2020.
5. Bhattacharjee, P., Singhal, R. S. and Kulkarni, P. R. 2002. 'Basmati rice: A review', *International Journal of Food Science and Technology*, 37(1), pp. 1–12. doi: 10.1046/j.1365-2621.2002.00541.x.
6. Rerkasem, *et al.* 2015. *"Effect Of Polishing Time On Distribution Of Monomeric Anthocyanin, Iron And Zinc Content In Different Grain Layers Of Four Thai Purple Rice Varieties"*, *International Journal of Agriculture and Biology*, 17(4), pp. 828–832. doi: 10.17957/IJAB/14.0012.
7. Sukhonthara, *et al.* 2009 *"Characterization Of Volatile Aroma Compounds From Red And Black Rice Bran Brans"*, *Journal of Oleo Science*, 58(3), pp. 155–161. doi: 10.5650/jos.58.155.
8. Pietta P.G., 2000. *Flavonoids as Antioxidants*, J. Nat. Prod., 63(7), 1035-1042
9. Musita, N. 2014. *"Pemanfaatan Tepung Pisang Batu (Musa Balbisiana Colla) Pada Pembuatan Kue Brownies The Utilization Of Musa Balbisiana Banana Flour In Brownies"*, *Jurnal Riset Industri*, 8(3), pp. 171–178.
10. Pothavorn, *et al.* 2010. *Sep phytochemical compositions of some bananas in Thailand*, *J. Agric. Food Chem*, (58), p. 8782–8787.
11. Gutierrez, 2007. *Delivering pro-poor water and sanitation services: The technical and political challenges in Malawi and Zambia*. *Geoforum*, 38(5), 886-900.
12. Perez et al. 2005. *Partial Characterization of Banana Starches Oxidized by Different Levels of Sodium Hypochlorite*. Carbohydrate Polymers 62:50-56.
13. Endra, *et al* 2006 *Analisis Proksimat dan Komposisi Asam amino Buah Pisang Batu (Musa Balbisiana Colla) (Tugas Akhir)*. *Departemen Kimia*, Fakultas Matematika dan Ilmu Pengetahuan Alam. Institut Pertanian Bogor. Bogor.
14. Manley D. 2000. *Technology of biscuits, crackers, and cookies third edition*. Woodhead Publishing Limited, England
15. Marwah. 2018. *Kualitas fisiko kimia bisbuit pada berbagai komposisi tepung terigu, tepung dengke dan tepung sagu [skripsi]*. Fakultas Peternakan Universitas Hasanuddin.
16. Wally 2012 *Kajian formulasi tepung pisang batu (Musa balbisiana Colla) dan tepung terigu dalam pembuatan bisbuit coklat*. Universitas Lampung.
17. Mahmud, Y. *et al.* 2014. *keragaman angronomis beberapa varietas unggul baru tanaman padi (Oriza sativa L.) pada model pengolahan tanaman terpadu*. Jurnal Ilmiah Solusi. 1 (1): 1-10.
18. AOAC. 2005. *"Physical, chemical and sensory properties of brownies substituted with sweet potato flour (Ipomoea batatas L.) with the addition of black cumin oil (Nigella sativa L.)"*, in *IOP Conference Series: Earth and Environmental Science*. DOI: 10.1088/1755-1315/102/1/012084.
19. Molyneux, P. 2004. *"The Use of the Stable Free Radical Diphenylpicryl-hydrazyl (DPPH) for Estimating Antioxidant Activity"*, *SongKlanakarin Journal of Science and Technology*, 26(2), pp. 211–219. DOI: 10.1287/isre.6.2.144.
20. Neswati, F Azimadan Ropanti. 2014. *The Addition (Brassica oleracea var italica) to Increase The Functional Propertis of Ice Cream*. Faculty of Agricultural Technology. Andalas University. Padang. *Journal* of Nutrition 13 940 : 196-203.
21. Nurdjanah *et al.* 2011. *Karakteristik Cokiat Dari Campuran Tepung Pisang Batu (Musa Balbisiana) Dan Tepung Terigu Pada Berbagai Tingkat Substitusi*. Jurnal Teknologi dan Industri Hasil Pertanian Volume 16, No.1
22. SNI (Standar Nasional Indonesia) 3549-2009 2009. *tentang Tepung Beras. Badan Standarisasi Nasional*. Jakarta.

23. SNI 01-2973-2011 2011. *Kajian teknis standar nasional Indonesia bisbuit Badan Standardisasi Nasional*
24. Yuliyana, *et al.* 2014. *Pengaruh Substitusi Tepung Terigu Dengan Tepung Pisang Kapok (Musa Paradisiacal Formatypica) Terhadap Karakteristik Mie Kering Yang Dihasilkan*. Jurnal teknologi pertanian. Universitas islam Indragiri. Vol 3, no 1
25. Lee, et al 1995. *Physicochemical properties of Calcium-Fortified Rice*. *Cereal Chemistry* 72: 352-355.
26. Arraullo *et al.* 1976. *Rice postharvest technology*. International Development Research Centre, Ottawa.
27. Lii, *et al* (1996). Effect of Amylose Content on the Rheological Property of Rice Starch. Cereal Chemistry 73: 415-420.
28. SNI 01-3751-2009 2009 *"SNI 01-3751-2009: Tepung Terigu Sebagai Bahan Makanan"*
29. Nurhayati *et al.*, 2014. *Teknologi Mutu Pisang Dengan Sistem Spray Drying Untuk Bisbuit*. Jurnal dinamika penelitian industri Vol 25 No. 1
30. Zaddana, *et al.* 2018. Aktivitas Antioksidan Dan Kandungan Serat Pangan Biskuit Campuran Bekatul Beras Merah (*Oriza Glaberrima*) Dan Ubi Jalar Ungu (*Ipomoea Batatas*). Fitofarmaka jurnal farmasi. Vol. 8, No. 2
31. Riganakos KA, dan Kontominas MG. 1995. *Effect Of Heat Treatment On Moisture Sorption Behavior of Wheat Flours Using A Hygrometric Technique*. Dev Food Sci 37(C): 995–1005. DOI: 10.1016/S0167-4501(06)80212-8
32. Hermayanti., Yeni., dan Eli Gusti. 2006. *Modul Analisa Proksimat. SMAK 3 Padang. Padang.*
33. Tuankotta et al. 2015. *Perbandingan Kadar Protein Pada Tepung Beras Putih (Oryza Sativa L.), Tepung Beras Ketan (Oryza Sativa L. Glutinosa), Dan Tepung Sagu (Mestroxylon Sagu Rottb.) Dengan Menggunakan Metode Kjeldahl*. Universitas Islam Bandung.
34. Budaraga IK, Salihat RA. (2020). *Antioxidant Activity Of "Broken Skin" Purple Rice, "Skinned" Purple Rice, And Purple Rice Sum Organically Cultivated In Indonesia*. Int J Adv Sci Eng Inf Technol 10(5): 2132–2137. DOI: 10.18517/ijaseit.10.5.9634
35. Indriyani *et al.*, 2013. *Karakteristik Fisik, Kimia Dan Sifat Organoleptik Tepung Beras Merah Berdasarkan Variasi Lama Pengeringan*. *Jurnal Pangan dan Gizi Vol.04 No.08*
36. Winarno F G. 2004. *Kimia Pangan Dan Gizi. Gramedia*. Pustaka utama. Jakarta
37. Setyaningsih, *et al.* 2010. *Analisis Sensori Untuk Industri Pangan Dan Agro*. Penerbit IPB Press. Kampus IPB Taman Kencana Bogor. Bogor
38. Winarno F G. 2008. *Kimia Pangan dan Gizi*. Jakarta : PT Gramedia Pustaka Utama
39. Pallow. 1990. *Food Processing Technology*. Wood head publishing Ltd., Cambridge. New York.
40. Noviyanti, *et al.* 2016. *Analisis Penilaian Organoleptik Cake Brownies Substitusi Tepung Wikau Maombo*. Jurnal Sains dan Teknologi Pangan. 1. 1 : 58-66.
41. Adbullah, *et al.* 2005. *Discrimination and classification of fresh-cut starfruit using an automated machine vision system*. *Journal of Food Engineering*]

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Address	Komplek Puskud Minang Blok E/1 Kelurahan Koto Panjang Ikur Koto Kec Koto Tangah Kota Padang Provinsi Sumatera Barat
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THE REVIEWER NOMINATION

Reviewer 1

Name and surname	Amiza Mat Amin
Organization	Universiti Malaysia Terengganu
Expertise	Food Chemistry
E-mail:	ama@umt.edu.my

Reviewer 2

Name and surname	Aslihan Demirdöven
Organization	Gaziosmanpasa University
Expertise	Food Engineering
E-mail:	aslihan.demirdoven@gop.edu.tr

Reviewer 3

Name and surname	Filli Pratama
Organization	Sriwijaya University
Expertise	Rice Food Science
E-mail:	unsri.ac.id

Reviewer 4

Name and surname	Fitriyono Ayustaningwarno
Organization	Diponegoro University
Expertise	Food and Nutrition

E-mail:	fk.undip.ac.id

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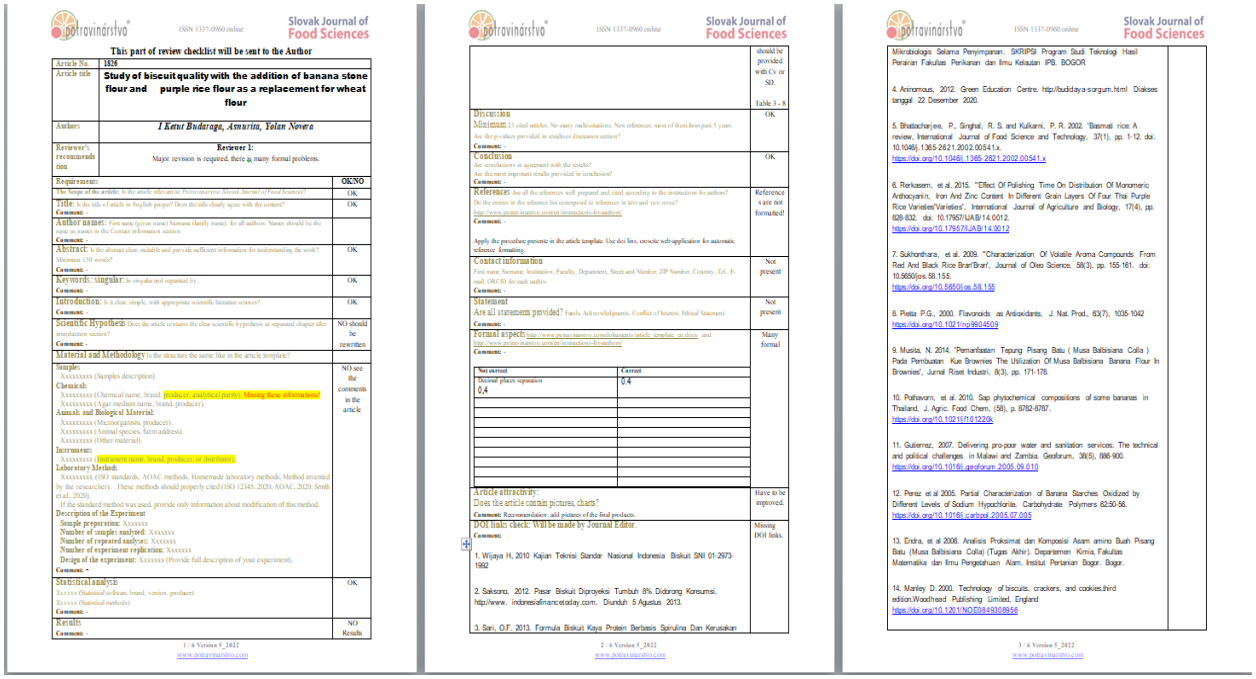

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Article No.	1820
Article title	**Study of biscuit quality with the addition of banana stone flour and purple rice flour as a replacement for wheat flour**
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	should be provided with Cv or SD. Table 3 - 8
Discussion **Minimum** 25 cited articles. No many multi-citations. New references, most of them from past 5 years. Are the p-values provided in results or discussion section? **Comment:** -	OK
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1. Wijaya H, 2010 Kajian Teknisi Standar Nasional Indonesia Biskuit SNI 01-2973-1992

2. Saksono, 2012. Pasar Biskuit Diproyeksi Tumbuh 8% Didorong Konsumsi. http//www. indonesiafinancetoday.com. Diunduh 5 Agustus 2013.

3. Sari, O.F. 2013. Formula Biskuit Kaya Protein Berbasis Spirulina Dan Kerusakan

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Mikrobiologis Selama Penyimpanan. SKRIPSI Program Studi Teknologi Hasil Perairan Fakultas Perikanan dan Ilmu Kelautan IPB. BOGOR

4. Aninomous, 2012. Green Education Centre. http//budidaya-sorgum.html Diakses tanggal 22 Desember 2020.

5. Bhattacharjee, P., Singhal, R. S. and Kulkarni, P. R. 2002. "Basmati rice: A review, International Journal of Food Science and Technology, 37(1), pp. 1-12. doi: 10.1046/j.1365-2621.2002.00541.x. https://doi.org/10.1046/j.1365-2621.2002.00541.x

6. Rerkasem, et al. 2015. "Effect Of Polishing Time On Distribution Of Monomeric Anthocyanin, Iron And Zinc Content In Different Grain Layers Of Four Thai Purple Rice Varieties'Varieties', International Journal of Agriculture and Biology, 17(4), pp. 626-632. doi: 10.17957/IJAB/14.0012. https://doi.org/10.17957/IJAB/14.0012

7. Sukhonthara, et al. 2009. "Characterization Of Volatile Aroma Compounds From Red And Black Rice Bran'Bran', Journal of Oleo Science, 58(3), pp. 155-161. doi: 10.5650/jos.58.155. https://doi.org/10.5650/jos.58.155

8. Pietta P.G., 2000. Flavonoids as Antioxidants, J. Nat. Prod., 63(7), 1035-1042 https://doi.org/10.1021/np9904509

9. Musita, N. 2014. "Pemanfaatan Tepung Pisang Batu (Musa Balbisiana Colla) Pada Pembuatan Kue Brownies The Utilization Of Musa Balbisiana Banana Flour In Brownies", Jurnal Riset Industri, 8(3), pp. 171-178.

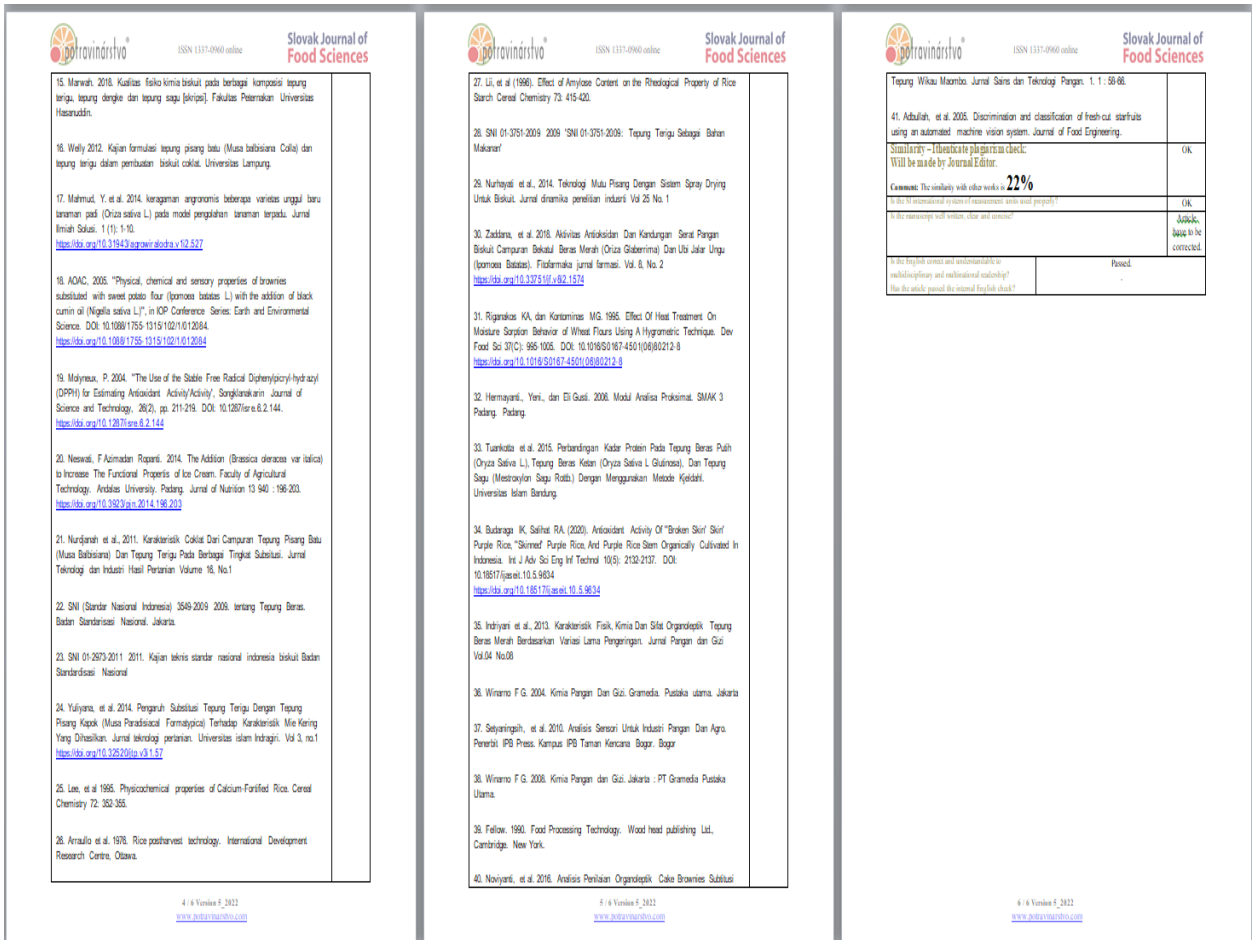
10. Pothavorn, et al. 2010. Sap phytochemical compositions of some bananas in Thailand. J. Agric. Food Chem., (58), p. 8782-8787. https://doi.org/10.1021/jf101220k

11. Gutierrez, 2007. Delivering pro-poor water and sanitation services: The technical and political challenges in Malawi and Zambia. Geoforum, 38(5), 886-900. https://doi.org/10.1016/j.geoforum.2006.09.010

12. Perez et al 2005. Partial Characterization of Banana Starches Oxidized by Different Levels of Sodium Hypochlorite. Carbohydrate Polymers 62:50-56. https://doi.org/10.1016/j.carbpol.2005.07.005

13. Endra, et al 2006. Analisis Proksimat dan Komposisi Asam amino Buah Pisang Batu (Musa Balbisiana Colla) (Tugas Akhir). Departemen Kimia, Fakultas Matematika dan Ilmu Pengetahuam Alam. Institut Pertanian Bogor. Bogor.

14. Manley D. 2000. Technology of biscuits, crackers, and cookies.third edition.Woodhead Publishing Limited, England https://doi.org/10.1201/NOE0849309856



15. Marwah. 2018. Kualitas fisiko kimia biskuit pada berbagai komposisi tepung terigu, tepung dengke dan tepung sagu [skripsi]. Fakultas Peternakan Universitas Hasanuddin.

16. Welly 2012. Kajian formulasi tepung pisang batu (Musa balbisiana Colla) dan tepung terigu dalam pembuatan biskuit coklat. Universitas Lampung.

17. Mahmud, Y. et al. 2014. keragaman angronomis beberapa varietas unggul baru tanaman padi (Oriza sativa L.) pada model pengolahan tanaman terpadu. Jurnal Ilmiah Solusi. 1 (1): 1-10.
https://doi.org/10.31943/agrowirelodra.v1i2.527

18. AOAC. 2005. "Physical, chemical and sensory properties of brownies substituted with sweet potato flour (Ipomoea batatas L.) with the addition of black cumin oil (Nigella sativa L.)", in IOP Conference Series: Earth and Environmental Science. DOI: 10.1088/1755-1315/102/1/012064.
https://doi.org/10.1088/1755-1315/102/1/012064

19. Molyneux, P. 2004. "The Use of the Stable Free Radical Diphenylpicryl-hydrazyl (DPPH) for Estimating Antioxidant Activity'Activity', Songklanakarin Journal of Science and Technology, 26(2), pp. 211-219. DOI: 10.1287/isre.6.2.144.
https://doi.org/10.1287/isre.6.2.144

20. Neswati, F Azimadan Ropanti. 2014. The Addition (Brassica oleracea var italica) to Increase The Functional Properis of Ice Cream. Faculty of Agricultural Technology. Andalas University. Padang. Jurnal of Nutrition 13 940 : 196-203.
https://doi.org/10.3923/jn.2014.196.203

21. Nurdjanah et al., 2011. Karakteristik Coklat Dari Campuran Tepung Pisang Batu (Musa Balbisiana) Dan Tepung Terigu Pada Berbagai Tingkat Substitusi. Jurnal Teknologi dan Industri Hasil Pertanian Volume 16, No.1

22. SNI (Standar Nasional Indonesia) 3549-2009 2009. tentang Tepung Beras. Badan Standarisasi Nasional. Jakarta.

23. SNI 01-2973-2011 2011. Kajian teknis standar nasional indonesia biskuit Badan Standardisasi Nasional

24. Yuliyana, et al. 2014. Pengaruh Substitusi Tepung Terigu Dengan Tepung Pisang Kepok (Musa Paradisiacal Formatypica) Terhadap Karakteristik Mie Kering Yang Dihasilkan. Jurnal teknologi pertanian. Universitas islam Indragiri. Vol 3, no.1
https://doi.org/10.32520/itp.v3i1.57

25. Lee, et al 1995. Physicochemical properties of Calcium-Fortified Rice. Cereal Chemistry 72: 352-355.

26. Arraullo et al. 1976. Rice postharvest technology. International Development Research Centre, Ottawa.

27. Lii, et al (1996). Effect of Amylose Content on the Rheological Property of Rice Starch Cereal Chemistry 73: 415-420.

28. SNI 01-3751-2009 2009 'SNI 01-3751-2009: Tepung Terigu Sebagai Bahan Makanan'

29. Nurhayati et al., 2014. Teknologi Mutu Pisang Dengan Sistem Spray Drying Untuk Biskuit. Jurnal dinamika penelitian industri Vol 25 No. 1

30. Zaddana, et al. 2018. Aktivitas Antioksidan Dan Kandungan Serat Pangan Biskuit Campuran Bekatul Beras Merah (Oriza Glaberrima) Dan Ubi Jalar Ungu (Ipomoea Batatas). Fitoformaka jurnal farmasi. Vol. 8, No. 2
https://doi.org/10.33751/jf.v8i2.1574

31. Riganakos KA, dan Kontominas MG. 1995. Effect Of Heat Treatment On Moisture Sorption Behavior of Wheat Flours Using A Hygrometric Technique. Dev Food Sci 37(C): 995-1005. DOI: 10.1016/S0167-4501(06)80212-8
https://doi.org/10.1016/S0167-4501(06)80212-8

32. Hermayanti., Yeni., dan Eli Gusti. 2006. Modul Analisa Proksimat. SMAK 3 Padang. Padang.

33. Tuankotta et al., 2015. Perbandingan Kadar Protein Pada Tepung Beras Putih (Oryza Sativa L.), Tepung Beras Ketan (Oryza Sativa L. Glutinosa), Dan Tepung Sagu (Mestroxylon Sagu Rottb.) Dengan Menggunakan Metode Kjeldahl. Universitas Islam Bandung.

34. Budaraga IK, Salihat RA. (2020). Antioxidant Activity Of "Broken Skin' Skin' Purple Rice, "Skinned' Purple Rice, And Purple Rice Stem Organically Cultivated In Indonesia. Int J Adv Sci Eng Inf Technol 10(5): 2132-2137. DOI: 10.18517/ijaseit.10.5.9834
https://doi.org/10.18517/ijaseit.10.5.9834

35. Indriyani et al., 2013. Karakteristik Fisik, Kimia Dan Sifat Organoleptik Tepung Beras Merah Berdasarkan Variasi Lama Pengeringan. Jurnal Pangan dan Gizi Vol.04 No.08

36. Winarno F G. 2004. Kimia Pangan Dan Gizi. Gramedia. Pustaka utama. Jakarta

37. Setyaningsih, et al. 2010. Analisis Sensori Untuk Industri Pangan Dan Agro. Penerbit IPB Press. Kampus IPB Taman Kencana Bogor. Bogor

38. Winarno F G. 2008. Kimia Pangan dan Gizi. Jakarta : PT Gramedia Pustaka Utama.

39. Fellow. 1990. Food Processing Technology. Wood head publishing Ltd., Cambridge. New York.

40. Noviyanti, et al. 2016. Analisis Penilaian Organoleptik Cake Brownies Substitusi

Tepung Wikau Maombo. Jurnal Sains dan Teknologi Pangan. 1. 1 : 58-66.

41. Abdullah, et al. 2005. Discrimination and classification of fresh-cut starfruits using an automated machine vision system. Journal of Food Engineering.

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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 Budaraga, Amurita, Yolan 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 DNMRT 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 (3.56%), ash content (2.11%), fat content (25.18%), 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 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 panelis with recapitulation A (90-10) 3.52%, B (80-20) 3.97%, C (70-30) 4.43%, 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 but with different types [3].

Most of the biscuits on the market use wheat flour as the raw 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 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]. 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].

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 [9]. Whereas the stone banana plant (*Musa balbisiana*) 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 80% [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 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 to 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 (39.33%) 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

The 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 Kenagarian Kuang, 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 (H_2SO_4) and Aquades, 30% d NaOH, Methyl Indicator, Methyl red 0.2%, Methyl blue 0.2%, selenium mix, H_3BO_3%, Hcl 0.1N. (2) Analysis of fat content, n-hexane. (3) Analysis of crude fiber content, ethanol, sulfuric acid (H_2SO_4), 1.25% NaOH, and 10% potassium sulfate (K_2SO_4). (4) Antioxidant test DPPH 45 ppm, methanol. The tools used for making biscuits are scales, stoves, cauldrons, basins, trays, spoons, sieves, mixers, knives, blenders, sieves, ovens, mixers, cake pans, and molds. Additional ingredients are margarine, eggs, honey, skim 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, distillation apparatus, 50 ml burette, 5 ml measuring pipette, 50 ml Erlenmeyer, dropper 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 tabel.

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	0.4	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 replication: 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
- 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

c. 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
- Thin 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 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 data from this research were 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 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 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 (%)	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
KK: 3,86 %		

Note: The numbers in the same column followed by different lowercase letters show a significant the 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 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%) (Arraullo, et al 1976). At temperatures above 650°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 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 (%)	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 the 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 is 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 [22].

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 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 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 the difference in the DNMRT 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 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, 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

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 ($p<0.01$) 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 (%)	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
KK: 4,91 %		

Note: The numbers in the same column followed by different lowercase letters show a very significant the 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 banana stone flour 50:50) that is, 17.85%, while the lowest crude fiber content was found in treatment A (comparison of purple rice flour with banana stone 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 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 13.73% [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, pentose, and other components. This component of crude fiber has no nutritional value but is very important in facilitating the digestive process in the body [32].

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 DNMRT at the level of = 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	e
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 DNMRT 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% [33], while the stone banana flour is 4.8% [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 (%)	Antioksidant Aktivity (%)
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
KK: 9%	

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 compounds [34]. 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 92,286–92.972%, while for the Segreng Handayani variety it ranged from 79.207–89.870%.

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 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 [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 DNMRT 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: 2,58%	

Note: The numbers in the same column followed by different lowercase letters show a very significant the difference in the DNMRT 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 [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 panellists.

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 [36]. Panellists' assessment data onthe 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	like (flavor banana)
E = 50 : 50	5,60	Suka (flavor banana)

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 10 shows that the panellists' 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 panellist 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 panellists have accepted the mixing of purple rice flour

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 panellists 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: smell, 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	3,36	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 panellists' 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 panellists' lowest assessment of the biscuit aroma was in treatment A (comparison of purple rice flour with banana stone flour 90:10), which was 3.36% (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, breakage of emulsions, and protein hydrolysis [39]. Panellists' 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)

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 12 shows that the highest assesament of biscuit texture was found in treatment E (comparison of purple rice flour and banana stone flour 50:50), which was 5.52% (liked), 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 panellists' 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 panellist acceptance rate. The low level of panellist 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 panellist. Panellists' assesament data on the color of biscuits are presented in Table 13.

Tabel 13 Nilai uji warna biskuit

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 assesament 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 panellists. 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 skin is less attractive to panelists.

Color assessment is done by direct visual observation of the product with the sense of sight of each panellist. 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 panellists' 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. is in treatment E (comparison of purple rice flour and stone banana flour 50:50) with 3.56% water content, 2.11% ash content, 25.% fat content, 17.% crude fiber content, 4.72% protein content, 55.83% 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.

REFERENCES

1. Wijaya H. (2010). Kajian Teknisi Standar Nasional Indonesia Biskuit. SNI 01-2973-1992
2. Saksono. (2013, Agust 5). Pasar Biskuit Diproyeksi Tumbuh 8% Didorong Konsumsi. In Indonesia Finance Today. http://www. indonesiafinancetoday.com.
3. Sari, O.F. (2013). Formula Biskuit Kaya Protein Berbasis Spirulina Dan Kerusakan Mikrobiologis Selama Penyimpanan. Skripsi Program Studi Teknologi Hasil Perairan Fakultas Perikanan dan Ilmu Kelautan IPB. Bogor
4. Anonymous. (2021, Desember 22). Green Education Centre. In Budidaya Sorgum. http://budidaya-sorgum.html.
5. Bhattacharjee, P., Singhal, R. S. & Kulkarni, P. R. (2002). Basmati rice: A review. In International Journal of Food Science and Technology (Vol 37, Issue 1, pp. 1–12). https://doi:10.1046/j.1365-2621.2002.00541.
6. Rerkasem. (2015). Effect Of Polishing Time On Distribution Of Monomeric Anthocyanin, Iron And Zinc Content In Different Grain Layers Of Four Thai Purple Rice Varieties. In International Journal of Agriculture and Biology (Vol. 17, Issue 4, pp. 828–832). https://doi:10.17957/IJAB/14.0012.
7. Sukhonthara. (2009). Characterization of Volatile Aroma Compounds From Red and Black Rice Bran. In Journal of Oleo Science (Vol. 58, Issue 3, pp. 155–161). https://doi:10.5650/jos.58.155.
8. Pietta P.G., (2000). Flavonoids as Antioxidants. In J. Nat. Prod. (Vol. 63, Issue 7, pp. 1035-1042). https://doi.org/10.1021/np9904509
9. Musita, N. (2014). Pemanfaatan Tepung Pisang Batu (*Musa Balbisiana Colla*) Pada Pembuatan Kue

Brownies The Utilization Of Musa Balbisiana Banana Flour In Brownies. In Jurnal Riset Industri (Vol. 8, Issue 3, pp. 171–178).
10. Pothavorn. (2010). Sap phytochemical compositions of some bananas in Thailand. In J. Agric. Food Chem (Vol. 58, Issue 1, pp. 8782–8787). https://doi.org/10.1021/jf101220k
11. Gutierrez. (2007). Delivering pro-poor water and sanitation services: The technical and political challenges in Malawi and Zambia. In Geoforum (Vol. 38, Issue 5, pp. 886-900). https://doi.org/10.1016/j.geoforum.2005.09.010
12. Perez. (2005). Partial Characterization of Banana Starches Oxidized by Different Levels of Sodium Hypochlorite. In Carbohydrate Polymers (Vol. 62, Issue 1, pp. 50-56). https://doi.org/10.1016/j.carbpol.2005.07.005
13. Endra. (2006). Analisis Proksimat dan Komposisi Asam amino Buah Pisang Batu (Musa Balbisiana Colla). Fakultas Matematika dan Ilmu Pengetahuan Alam. Institut Pertanian Bogor.
14. Manley, D. (2000). Technology of biscuits, crackers, and cookies.third edition.Woodhead Publishing Limited. https://doi.org/10.1201/NOE0849308956
15. Marwah. (2018). Kualitas fisiko kimia biskuit pada berbagai komposisi tepung terigu, tepung dengke dan tepung sagu. Universitas Hasanuddin.
16. Welly. (2012). Kajian formulasi tepung pisang batu (Musa balbisiana Colla) dan tepung terigu dalam pembuatan biskuit coklat. Universitas Lampung.
17. Mahmud, Y. (2014). keragaman angronomis beberapa varietas unggul baru tanaman padi (Oriza sativa L.) pada model pengolahan tanaman terpadu. In Jurnal Ilmiah Solusi (Vol. 1, Issue 1, pp. 1-10). https://doi.org/10.31943/agrowiralodra.v1i2.527
18. AOAC. (2005). 'Physical, chemical and sensory properties of brownies substituted with sweet potato flour (Ipomoea batatas L.) with the addition of black cumin oil (Nigella sativa L.). In IOP Conference Series: Earth and Environmental Science. https://doi.org/10.1088/1755-1315/102/1/012084
19. Molyneux, P. (2004). The Use of the Stable Free Radical Diphenylpicryl-hydrazyl (DPPH) for Estimating Antioxidant Activity. In Songklanakarin Journal of Science and Technology (Vol. 26, Issue 2, pp. 211–219). https://doi.org/10.1287/isre.6.2.144
20. Neswati, F. & Ropanti, A. (2014). The Addition (Brassica oleracea var italica) to Increase The Functional Propertis of Ice Cream. In Jurnal of Nutrition (Vol. 13, Issue 940, pp. 196-203). https://doi.org/10.3923/pjn.2014.196.203
21. Nurdjanah. (2011). Karakteristik Coklat Dari Campuran Tepung Pisang Batu (Musa Balbisiana) Dan Tepung Terigu Pada Berbagai Tingkat Subsitusi. In Jurnal Teknologi dan Industri Hasil Pertanian (Vol 16, Issue 1)
22. Badan Standarisasi Nasional. (2009). SNI (Standar Nasional Indonesia) 3549-2009 tentang Tepung Beras.
23. Badan Standarisasi Nasional. (2011). SNI 01-2973-2011. Kajian teknis standar nasional indonesia biskuit.
24. Yuliyana. (2014). Pengaruh Substitusi Tepung Terigu Dengan Tepung Pisang Kapok (Musa Paradisiacal Formatypica) Terhadap Karakteristik Mie Kering Yang Dihasilkan. In Jurnal teknologi pertanian. (Vol. 3, Issue 1). https://doi.org/10.32520/jtp.v3i1.57
25. Lee. (1995). Physicochemical properties of Calcium-Fortified Rice. In Cereal Chemistry (Vol. 72, Issue 1, pp. 352-355).
26. Arraullo. (1976). Rice postharvest technology. International Development Research Centre.
27. Lii. (1996). Effect of Amylose Content on the Rheological Property of Rice Starch Cereal. In Chemistry (Vol. 73, Issue 1, pp. 415-420).
28. Badan Standarisasi Nasional. (2009). SNI 01-3751-2009. Tepung Terigu Sebagai Bahan Makanan.
29. Nurhayati. (2014). Teknologi Mutu Pisang Dengan Sistem Spray Drying Untuk Biskuit. In Jurnal dinamika penelitian indusrti (Vol. 25, Issue 1).
30. Zaddana. (2018). Aktivitas Antioksidan Dan Kandungan Serat Pangan Biskuit Campuran Bekatul Beras Merah (Oriza Glaberrima) Dan Ubi Jalar Ungu (Ipomoea Batatas). In Fitofarmaka jurnal farmasi (Vol. 8, Issue 2). https://doi.org/10.33751/jf.v8i2.1574
31. Riganakos, K.A. & Kontominas, M.G. (1995). Effect Of Heat Treatment On Moisture Sorption Behavior of Wheat Flours Using A Hygrometric Technique. In Dev Food Sci (Vol. 37, Issue C, pp. 995–1005). https://doi.org/10.1016/S0167-4501(06)80212-8
32. Hermayanti. Y. & Gusti, E. (2006). Modul Analisa Proksimat. SMAK 3 Padang.
33. Tuankotta. (2015). Perbandingan Kadar Protein Pada Tepung Beras Putih (Oryza Sativa L.), Tepung Beras Ketan (Oryza Sativa L Glutinosa), Dan Tepung Sagu (Mestroxylon Sagu Rottb.) Dengan Menggunakan Metode Kjeldahl. Universitas Islam Bandung.

34. Budaraga, I.K., & Salihat, R.A. (2020). Antioxidant Activity Of 'Broken Skin' Purple Rice, 'Skinned' Purple Rice, And Purple Rice Stem Organically Cultivated In Indonesia. In Int J Adv Sci Eng Inf Technol (Vol. 10, Issue 5, pp. 2132–2137). https://doi.org/10.18517/ijaseit.10.5.9634
35. Indriyani. (2013). Karakteristik Fisik, Kimia Dan Sifat Organoleptik Tepung Beras Merah Berdasarkan Variasi Lama Pengeringan. In Jurnal Pangan dan Gizi (Vol. 4, Issue 8).
36. Winarno, F.G. (2004). Kimia Pangan Dan Gizi. Gramedia Pustaka Utama.
37. Setyaningsih. (2010). Analisis Sensori Untuk Industri Pangan Dan Agro. Penerbit IPB Press.
38. Winarno, F.G. (2008). Kimia Pangan dan Gizi. PT Gramedia Pustaka Utama.
39. Fellow. (1990). Food Processing Technology. Wood head publishing Ltd.
40. Noviyanti. (2016). Analisis Penilaian Organoleptik Cake Brownies Subtitusi Tepung Wikau Maombo. In Jurnal Sains dan Teknologi Pangan (Vol. 1, Issue 1, pp. 58-66).
41. Adbullah. (2005). Discrimination and classification of fresh-cut starfruits using an automated machine vision system. In Journal of Food Engineering.

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Contact Address:
***I Ketut Budaraga**, Ekasakti University, Faculty of Agriculture, Agricultural Product Technology Department, Veterans Dalam, 26B, 25115, Padang, Indonesia.
Tel.: +62 81283837468
E-mail: iketutbudaraga@unespadang.ac.id
ORCID: https://orcid.org/0000-0002-3920-2879
Asnurita, Ekasakti University, Faculty of Agriculture, Agricultural Product Technology Department, Veterans Dalam, 26B, 25115, Padang, Indonesia.
Tel.: + 62 85274876633
E-mail: asnuritaita2017@gmail.com
ORCID: -
Yolan Novera, Ekasakti University, Faculty of Agriculture, Agricultural Product Technology Department, Veterans Dalam, 26B, 25115, Padang, Indonesia.
Tel.: +62 81364455877
E-mail: yolannovera96@mail.com
ORCID: -

Corresponding author: *iketutbudaraga@unespadang.ac.id

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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 Budaraga
Address	Komplek Puskud Minang Blok E/1 Kelurahan Koto Panjang Ikur Koto Kec Koto Tangah Kota Padang Provinsi Sumatera Barat
E-mail:	iketutbudaraga@unespadang.ac.id
Your bank account No.:	Bank BRI 5476-01-001870-537
SWIFT code:	BRINIDJA058
Preferred Payment method (PayPal, Bank Transfer):	Bank Transfer

THE REVIEWER NOMINATION

Reviewer 1

Name and surname	Amiza Mat Amin
Organization	Universiti Malaysia Terengganu
Expertise	Food Chemistry
E-mail:	ama@umt.edu.my

Reviewer 2

Name and surname	Aslıhan Demirdöven
Organization	Gaziosmanpasa University
Expertise	Food Engineering
E-mail:	aslihan.demirdoven@gop.edu.tr

Reviewer 3

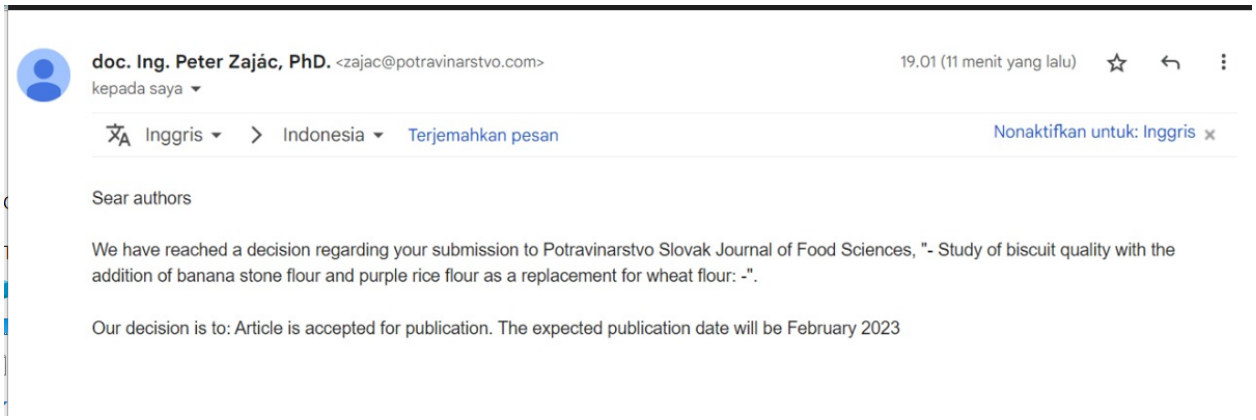
Name and surname	Filli Pratama
Organization	Sriwijaya University
Expertise	Rice Food Science
E-mail:	unsri.ac.id

Reviewer 4

Name and surname	Fitriyono Ayustaningwarno
Organization	Diponegoro University
Expertise	Food and Nutrition

E-mail:	fk.undip.ac.id

Berita accepted dengan perbaikan tanggal 26-1-2023



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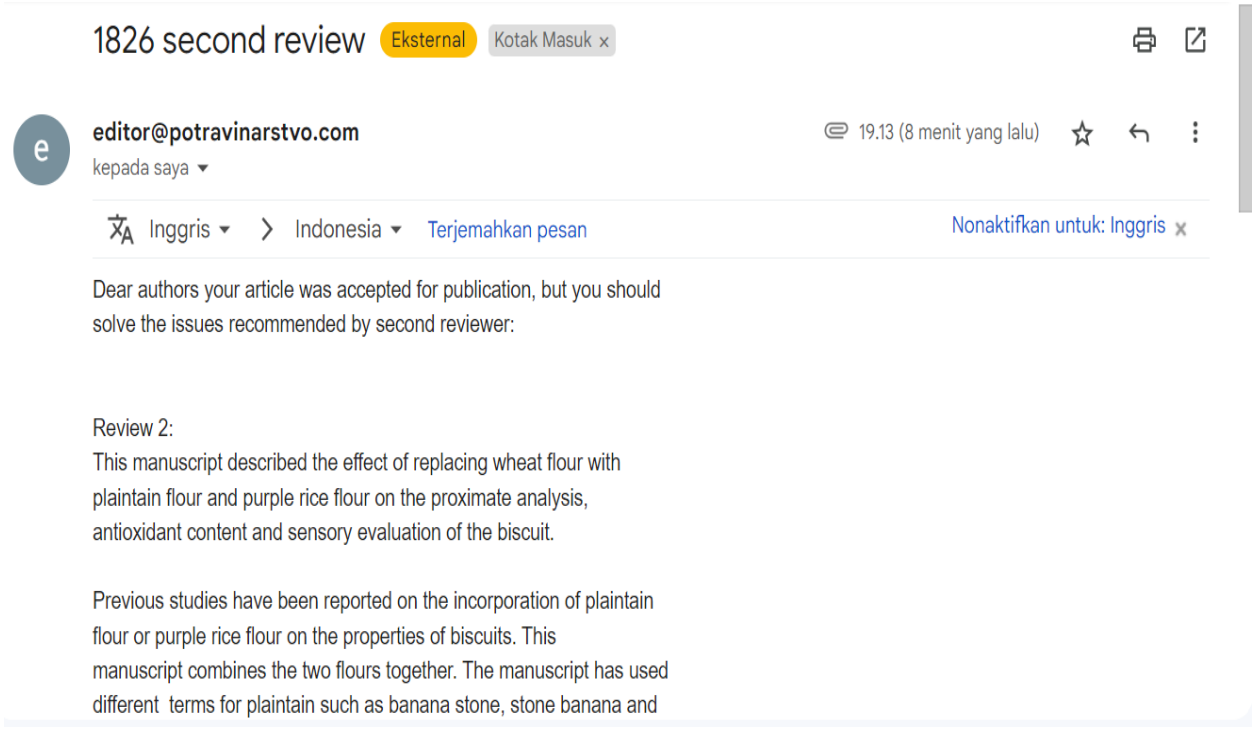

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Dear authors your article was accepted for publication, but you should solve the issues recommended by second reviewer:

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 plaintain throghout 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
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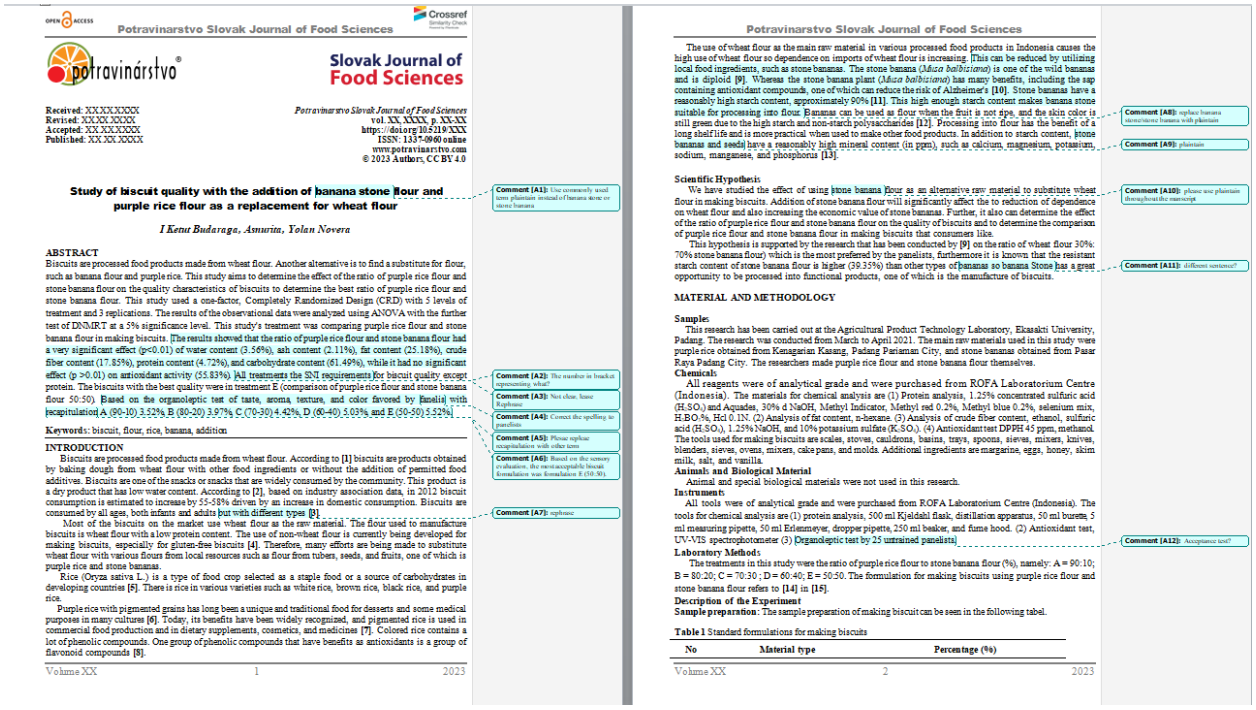
Bukti review 2



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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 Budaraga, Asmurita, Yolan 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 DNMRT 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 (3.56%), ash content (2.11%), fat content (25.18%), 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 (35.83%). 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 panelis 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%.

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 but with different types [3].

Most of the biscuits on the market use wheat flour as the raw 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 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]. 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].

Comment [A1]: Use commonly used term plaintain instead of banana stone or stone banana

Comment [A2]: The number in bracket representing what?

Comment [A3]: Not clear, Issue Rephrase

Comment [A4]: Correct the spelling to panellists

Comment [A5]: Please rephrase recapitulation with other term

Comment [A6]: Based on the sensory evaluation, the most acceptable biscuit formulation was formulation E (50:50).

Comment [A7]: rephrase

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 [9]. Whereas the stone banana plant (*Musa balbisiana*) 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 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 to 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 (39.35%) 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, Eksakti University, Padang. The research was conducted from March to April 2021. The main raw materials used in this study were purple rice obtained from Kenagarian Kasang, 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 (H_2SO_4) and Aquades, 30% d NaOH, Methyl Indicator, Methyl red 0.2%, Methyl blue 0.2%, selenium mix, H_3BO_3%, Hcl 0.1N. (2) Analysis of fat content, n-hexane. (3) Analysis of crude fiber content, ethanol, sulfuric acid (H_2SO_4), 1.25% NaOH, and 10% potassium sulfate (K_2SO_4). (4) Antioxidant test DPPH 45 ppm, methanol. The tools used for making biscuits are scales, stoves, cauldrons, basins, trays, spoons, sieves, mixers, knives, blenders, sieves, ovens, mixers, cake pans, and molds. Additional ingredients are margarine, eggs, honey, skim 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, distillation apparatus, 50 ml buretts, 5 ml measuring pipette, 50 ml Erlenmeyer, dropper 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 tabel.

Table 1 Standard formulations for making biscuits

No	Material type	Percentage (%)

Comment [A8]: replace banana stone/stone banana with plaintain

Comment [A9]: plaintain

Comment [A10]: please use plaintain throughout the manscript

Comment [A11]: different sentence?

Comment [A12]: Acceptance test?

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	80	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 replication: 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
- 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 jock banana flour

c. 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
- 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]: Use plaintain not ash 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 were analyzed using Analysis of Variance (ANOVA) and Duncan's New Multiple Range Test (DNMRT) advanced test at a 5% significance level. The data from this research were 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 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 (%)	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
KK: 3,86 %		

Note: The numbers in the same column followed by different lowercase letters show a significant the difference in the DNMRT follow-up test at the level of α = 0,01.

Comment [A14]: Where is the standard deviation?

Comment [A15]: What is KK?

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 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%) (Arraullo, et al 1976). At temperatures above 850°C water absorption and swelling will increase if the amylose content is low **[26]**.

Comment [A16]: You can bake the biscuit further to decrease the moisture content

Comment [A17]: 65oC

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 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 (%)	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 the difference in the DNMRT follow-up test at the level of α = 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 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 **[22]**.

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 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 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 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 the difference in the DNMRT follow-up test at the level of α = 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 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, 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

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 ($p<0.01$) 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 (%)	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
KK: 4,91 %		

Note: The numbers in the same column followed by different lowercase letters show a very significant the difference in the DNMRT follow-up test at the level of α = 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 banana stone flour 50:50) that is, 17.85%, while the lowest crude fiber content was found in treatment A (comparison of purple rice flour with banana stone 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 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, pentose, and other components. This component of crude fiber has no nutritional value but is very important in facilitating the digestive process in the body **[32]**.

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 DNMRT at the level of = 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 DNMRT follow-up test at the level of α = 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% [32], while the stone banana flour is 4.8% [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 (%)	Antioksidant Aktivity (%)
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
KK: 9%	

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 compounds [34]. 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 92,286–92.972%, while for the Segreng Handayani variety it ranged from 79.207–89.870%.

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 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 [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 DNMRT 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: 2,58%		

Note: The numbers in the same column followed by different lowercase letters show a very significant the difference in the DNMRT follow-up test at the level of = 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 [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 panellists

Comment [A18]: Optionally, at least 30 panels for acceptance test

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 [36]. Panellists' 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	like (flavor banana)
E = 50 : 50	5,60	Suka (flavor banana)

Note: 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

Comment [A19]: Please correct the translation error in the description Score of 6 and 7 is similar

Table 10 shows that the panellists' 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 panellists' 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 panellist 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 panellists have accepted the mixing of purple rice flour

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 panellists 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: smell, 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	3,36	do not like (nottypical)
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 panellists' 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 panellists' lowest assessment of the biscuit aroma was in treatment A (comparison of purple rice flour with banana stone flour 90:10), which was 3.36% (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, breakage of emulsions, and protein hydrolysis **[39]**. Panellists' 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)

Note s: taste score 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% (liked), 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 panellists' 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 panellist acceptance rate. The low level of panellist 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 panellist. Panellists' assessment data on the color of biscuits are presented in Table 13.

Tabel 13 Nilai uji warna biskuit

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 panellists. 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 skin is less attractive to panelists.

Color assessment is done by direct visual observation of the product with the sense of sight of each panellist. 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 panellists' 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. Is in treatment E (comparison of purple rice flour and stone banana flour 50:50) with 3.56% water content, 2.11% ash content, 25 % fat content, 17.% crude fiber content, 4.72% protein content, 55.83% 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.

Comment [A20]: Please rephrase the sentence

REFERENCES

1. Wijaya H. (2010). Kajian Teknisi Standar Nasional Indonesia Biskuit. SNI 01-2973-1992
2. Saksono. (2013, Agust 5). Pasar Biskuit Diproyeksi Tumbuh 8% Didorong Konsumsi. In Indonesia Finance Today. http://www. indonesiafinancetoday.com.
3. Sari, O.F. (2013). Formula Biskuit Kaya Protein Berbasis Spirulina Dan Kerusakan Mikrobiologis Selama Penyimpanan. Skripsi Program Studi Teknologi Hasil Perairan Fakultas Perikanan dan Ilmu Kelautan IPB. Bogor.
4. Anonymous. (2021, Desember 22). Green Education Centre. In Budidaya Sorgum. http://budidaya-sorgum.html.
5. Bhattacharjee, P., Singhal, R. S. & Kulkarni, P. R. (2002). Basmati rice: A review. In International Journal of Food Science and Technology (Vol. 37, Issue 1, pp. 1–12). https://doi:10.1046/j.1365-2621.2002.00541.
6. Rerkasem. (2015). Effect Of Polishing Time On Distribution Of Monomeric Anthocyanin, Iron And Zinc Content In Different Grain Layers Of Four Thai Purple Rice Varieties. In International Journal of Agriculture and Biology (Vol. 17, Issue 4, pp. 828–832). https://doi:10.17957/IJAB/14.0012.
7. Sukhonthara. (2009). Characterization of Volatile Aroma Compounds From Red and Black Rice Bran. In Journal of Oleo Science (Vol. 58, Issue 3, pp. 155–161). https://doi:10.5650/jos.58.155.
8. Pietta P.G., (2000). Flavonoids as Antioxidants. In J. Nat. Prod. (Vol. 63, Issue 7, pp. 1035-1042). https://doi.org/10.1021/np9904509
9. Musita, N. (2014). Pemanfaatan Tepung Pisang Batu (*Musa Balbisiana Colla*) Pada Pembuatan Kue

Brownies The Utilization Of Musa Balbisiana Banana Flour In Brownies. In Jurnal Riset Industri (Vol. 8, Issue 3, pp. 171–178).
10. Pothavorn. (2010). Sap phytochemical compositions of some bananas in Thailand. In J. Agric. Food Chem (Vol. 58, Issue 1, pp. 8782–8787). https://doi.org/10.1021/jf101220k
11. Gutierrez. (2007). Delivering pro-poor water and sanitation services: The technical and political challenges in Malawi and Zambia. In Geoforum (Vol. 38, Issue 5, pp. 886-900). https://doi.org/10.1016/j.geoforum.2005.09.010
12. Perez. (2005). Partial Characterization of Banana Starches Oxidized by Different Levels of Sodium Hypochlorite. In Carbohydrate Polymers (Vol. 62, Issue 1, pp. 50-56). https://doi.org/10.1016/j.carbpol.2005.07.005
13. Endra. (2006). Analisis Proksimat dan Komposisi Asam amino Buah Pisang Batu (Musa Balbisiana Colla). Fakultas Matematika dan Ilmu Pengetahuan Alam. Institut Pertanian Bogor.
14. Manley, D. (2000). Technology of biscuits, crackers, and cookies third edition. Woodhead Publishing Limited. https://doi.org/10.1201/9781439830956
15. Marwah. (2018). Kualitas fasiko kimia biskuit pada berbagai komposisi tepung terigu, tepung dengke dan tepung sagu. Universitas Hasanuddin.
16. Welly. (2012). Kajian formulasi tepung pisang batu (Musa balbisiana Colla) dan tepung terigu dalam pembuatan biskuit coklat. Universitas Lampung.
17. Mahmud, Y. (2014). keragaman angronomis beberapa varietas unggul baru tanaman padi (Oriza sativa L.) pada model pengolahan tanaman terpadu. In Jurnal Ilmiah Solusi (Vol. 1, Issue 1, pp. 1-10). https://doi.org/10.31943/agrovivalodra.v1i2.527
18. AOAC. (2005). 'Physical, chemical and sensory properties of brownies substituted with sweet potato flour (Ipomoea batatas L.) with the addition of black cumin oil (Nigella sativa L.). In IOP Conference Series: Earth and Environmental Science. https://doi.org/10.1088/1755-1315/102/1/012084
19. Molyneux, P. (2004). The Use of the Stable Free Radical Diphenylpicryl-hydrazyl (DPPH) for Estimating Antioxidant Activity. In Songklanakarin Journal of Science and Technology (Vol. 26, Issue 2, pp. 211–219). https://doi.org/10.1287/isre.6.2.144
20. Neswati, F. & Ropianti, A. (2014). The Addition (Brassica oleracea var italica) to Increase The Functional Propertis of Ice Cream. In Jurnal of Nutrition (Vol. 13, Issue 940, pp. 196-203). https://doi.org/10.3923/pjn.2014.196.203
21. Nurdjanah. (2011). Karakteristik Cokiat Dari Campuran Tepung Pisang Batu (Musa Balbisiana) Dan Tepung Terigu Pada Berbagai Tingkat Subsitusi. In Jurnal Teknologi dan Industri Hasil Pertanian (Vol. 16, Issue 1)
22. Badan Standarisasi Nasional. (2009). SNI (Standar Nasional Indonesia) 3549-2009 tentang Tepung Beras.
23. Badan Standarisasi Nasional. (2011). SNI 01-2973-2011. Kajian teknis standar nasional indonesia biskuit.
24. Yuliyana. (2014). Pengaruh Substitusi Tepung Terigu Dengan Tepung Pisang Kapok (Musa Paradisiacal Formatypica) Terhadap Karakteristik Mie Kering Yang Dihasilkan. In Jurnal teknologi pertanian. (Vol. 3, Issue 1). https://doi.org/10.32520/itp.v3i1.57
25. Lee. (1995). Physicochemical properties of Calcium-Fortified Rice. In Cereal Chemistry (Vol. 72, Issue 1, pp. 352-355).
26. Arraullo. (1976). Rice postharvest technology. International Development Research Centre.
27. Lii. (1996). Effect of Amylose Content on the Rheological Property of Rice Starch Cereal. In Chemistry (Vol. 73, Issue 1, pp. 415-420).
28. Badan Standarisasi Nasional. (2009). SNI 01-3751-2009. Tepung Terigu Sebagai Bahan Makanan.
29. Nurhayati. (2014). Teknologi Mutu Pisang Dengan Sistem Spray Drying Untuk Biskuit. In Jurnal dinamika penelitian industri (Vol. 25, Issue 1).
30. Zaddana. (2018). Aktivitas Antioksidan Dan Kandungan Serat Pangan Biskuit Campuran Bekatul Beras Merah (Oriza Glaberrima) Dan Ubi Jalar Ungu (Ipomoea Batatas). In Fitofarmaka Jurnal farmasi (Vol. 8, Issue 2). https://doi.org/10.33751/jf.v8i2.1574
31. Riganakos, K.A. & Kontominas, M.G. (1995). Effect Of Heat Treatment On Moisture Sorption Behavior of Wheat Flours Using A Hygrometric Technique. In Dev Food Sci (Vol. 37, Issue C, pp. 995–1005). https://doi.org/10.1016/S0167-4501(06)80212-8
32. Hermayanti. Y. & Gusti, E. (2006). Modul Analisa Proksimat. SMAK 3 Padang.
33. Tumkiotta. (2015). Perbandingan Kadar Protein Pada Tepung Beras Putih (Oryza Sativa L.), Tepung Beras Ketan (Oryza Sativa L. Glutinosa), Dan Tepung Sagu (Mestroxylon Sagu Rottb.) Dengan Menggunakan Metode Kjeldahl. Universitas Islam Bandung.

34. Budaraga, I.K, & Salihat, R.A. (2020). Antioxidant Activity Of 'Broken Skin' Purple Rice, 'Skinned' Puple Rice, And Purple Rice Stem Organically Cultivated In Indonesia. In Int J Adv Sci Eng Inf Technol (Vol. 10, Issue 5, pp. 2132–2137). https://doi.org/10.18517/ijaseit.10.5.9634
35. Indriyani. (2013). Karakteristik Fisik, Kimia Dan Sifat Organoleptik Tepung Beras Merah Berdasarkan Variasi Lama Pengeringan. In Jurnal Pangan dan Gizi (Vol. 4, Issue 8).
36. Winarno, F.G. (2004). Kimia Pangan Dan Gizi. Gramedia Pustaka Utama.
37. Setyaningsih. (2010). Analisis Sensori Untuk Industri Pangan Dan Agro. Penerbit IPB Press.
38. Winarno, F.G. (2008). Kimia Pangan dan Gizi. PT Gramedia Pustaka Utama.
39. Fellow. (1999). Food Processing Technology. Wood head publishing Ltd.
40. Noviyanti. (2016). Analisis Penilaian Organoleptik Cake Brownies Subtitusi Tepung Wikau Maombo. In Jurnal Saina dan Teknologi Pangan (Vol. 1, Issue 1, pp. 58-66).
41. Adbullah. (2005). Discrimination and classification of fresh-cut starfruits using an automated machine vision system. In Journal of Food Engineering.

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Contact Address:
***I Ketut Budaraga**, Ekasakti University, Faculty of Agriculture, Agricultural Product Technology Department, Veterans Dalam, 26B, 25115, Padang, Indonesia.
Tel.: +62 81283837468
E-mail: iketutbudaraga@unespadang.ac.id
ORCID: https://orcid.org/0000-0002-3920-2879

Asnurita, Ekasakti University, Faculty of Agriculture, Agricultural Product Technology Department, Veterans Dalam, 26B, 25115, Padang, Indonesia.
Tel.: + 62 85274876633
E-mail: asnuritasta2017@gmail.com
ORCID: -

Yolan Novera, Ekasakti University, Faculty of Agriculture, Agricultural Product Technology Department, Veterans Dalam, 26B, 25115, Padang, Indonesia.
Tel.: +62 81364455877
E-mail: yolannovera96@gmail.com
ORCID: -

Corresponding author: *iketutbudaraga@unespadang.ac.id

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

Thank you.

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I Ketut Budaraga

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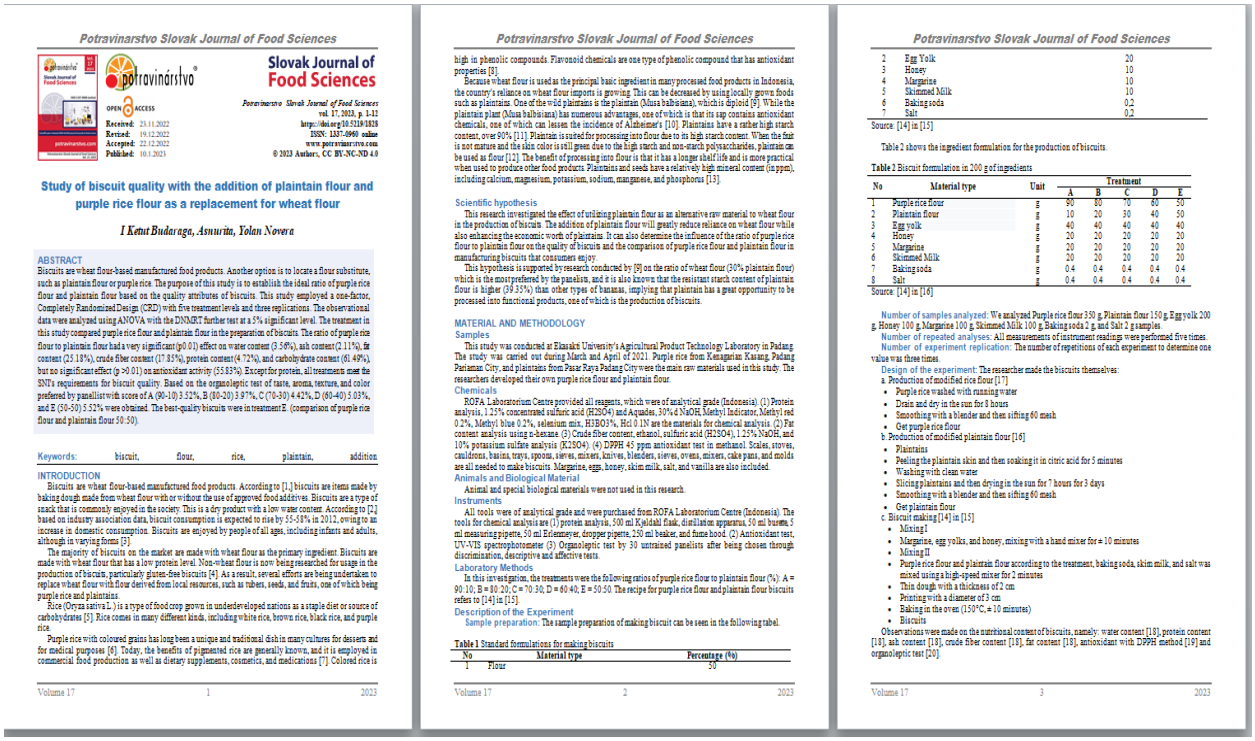

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Study of biscuit quality with the addition of plaintain flour and purple rice flour as a replacement for wheat flour

I Ketut Budaraga, Asmurita, Tolan Novera

ABSTRACT
Biscuits are wheat flour-based manufactured food products. Another option is to locate a flour substitute, such as plaintain flour or purple rice. The purpose of this study is to establish the ideal ratio of purple rice flour and plaintain 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 DNMRT further test at a 5% significant level. The treatment in this study compared purple rice flour and plaintain flour in the preparation of biscuits. The ratio of purple rice flour to plaintain flour had a very significant ($p0.01$) effect on water content (3.58%), 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 SNI's requirements for biscuit quality. Based on the organoleptic test of taste, aroma, texture, and color preferred by panellist with score of A (80-100) 3.52%, B (80-20) 3.97%, C (70-30) 4.42%, D (60-40) 5.03%, and E (50-50) 5.52% were obtained. The best-quality biscuits were in treatment E. (comparison of purple rice flour and plaintain flour 50:50).

Keywords: biscuit, flour, rice, plaintain, 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 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 plaintains.

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 coloured grains has long been a unique and traditional dish in many cultures for desserts and for medical purposes [6]. 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]. Colored 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 plaintains. One of the wild plaintains is the plaintain (Musa balbisiana), which is diploid [9]. While the plaintain plant (Musa balbisiana) has numerous advantages, one of which is that its sap contains antioxidant chemicals, one of which can lessen the incidence of Alzheimer's [10]. Plaintains have a rather high starch content, over 90% [11]. Plaintain is suited for processing into flour due to its high starch content. When the fruit is not mature and the skin color is still green due to the high starch and non-starch polysaccharides, plaintain 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. Plaintains 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 plaintain flour as an alternative raw material to wheat flour in the production of biscuits. The addition of plaintain flour will greatly reduce reliance on wheat flour while also enhancing the economic worth of plaintains. It can also determine the influence of the ratio of purple rice flour to plaintain flour on the quality of biscuits and the comparison of purple rice flour and plaintain flour in manufacturing biscuits that consumers enjoy.

This hypothesis is supported by research conducted by [9] on the ratio of wheat flour (30% plaintain flour) which is the most preferred by the panelists, and it is also known that the resistant starch content of plaintain flour is higher (59.35%) than other types of bananas, implying that plaintain 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 Ekasakti University's Agricultural Product Technology Laboratory in Padang. The study was carried out during March and April of 2021. Purple rice from Kesagarian Kasang, Padang Pariaman City, and plaintains from Pasar Raya Padang City were the main raw materials used in this study. The researchers developed their own purple rice flour and plaintain flour.

Chemicals
ROFA Laboratorium Centre provided all reagents, which were of analytical grade (Indonesia). (1) Protein analysis, 1.25% concentrated sulfuric acid (H_2SO_4) and Aquades, 30% d NaOH, Methyl Indicator, Methyl red 0.2%, Methyl blue 0.2%, selenium mix, H_3BO_3%, Hcl 0.1N are the materials for chemical analysis. (2) Fat content analysis using n-hexane. (3) Crude fiber content, ethanol, sulfuric acid (H_2SO_4), 1.25% NaOH, and 10% potassium sulfate analysis (K_2SO_4). (4) DPPH 45 ppm antioxidant test in methanol. Scales, stoves, cauldrons, basins, trays, spoons, sieves, mixers, knives, blenders, sieves, ovens, mixers, cake pans, and molds are all needed to make biscuits. Margarine, eggs, honey, skim milk, salt, 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 are (1) protein analysis, 500 ml Kjeldahl flask, distillation apparatus, 50 ml burets, 5 ml measuring pipette, 50 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 plaintain flour (%): A = 90:10, B = 80:20, C = 70:30, D = 60:40, E = 50:50. The recipe for purple rice flour and plaintain 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 tabel.

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]

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

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	Plaintain 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 350 g, Plaintain 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.
Number of repeated analyses: All measurements of instrument readings were performed five times.
Number of experiment replication: The number of repetitions 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 8 hours
- Smoothing with a blender and then sifting 60 mesh
- Get purple rice flour

b. Production of modified plaintain flour [16]
- Plaintains
- Peeling the plaintain skin and then soaking it in citric acid for 5 minutes
- Washing with clean water
- Slicing plaintains and then drying in the sun for 7 hours for 3 days
- Smoothing with a blender and then sifting 60 mesh
- Get plaintain flour

c. 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 plaintain 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

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 34 produced the statistical data 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 were analyzed using Analysis of Variance (ANOVA) and Duncan's New Multiple Range Test (DNMRT) advanced test at a 5% significance level. The data from this research were 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 significant differences.

RESULTS AND DISCUSSION

Water Content

The study of diversity revealed that the water level of the produced biscuits differed considerably ($p0.01$) depending on the ratio of purple rice flour to plaintain flour. Based on the further DNMRT test at the level of = 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 plaintain flour (%)	Water Content (%)		Standard Deviation
A = 90:10	5,01	a	.05292
B = 80:20	4,70	b	.02082
C = 70:30	4,35	c	.01528
D = 60:40	3,82	d	.02082
E = 50:50	3,56	e	.04041

KK: 3,86 %

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

The biscuits' water content ranged from 3.56 to 5.01%. The water content of the biscuits revealed a decrease in yield while increasing the amount of plaintain flour. Plaintain flour has a low water content since biscuits are baked at 150oC to allow the baking process to evaporate and limit the quantity of water in the biscuit dough [21]. Treatment A (90:10 comparison of purple rice flour and plaintain flour) had the highest water content of 5.01%. Treatment E (50:50 comparison of purple rice flour and plaintain flour) had the lowest water level of 3.56%. The water content will decrease if less purple rice flour is used and more plaintain flour is used, and vice versa.

According to [22], rice flour has a water content of 13%, while plaintain flour has a water content of 7.46% [9]. According to the research, the more plaintain 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 soaking temperature of rice seeds alter water absorption [25]. Rice (non-waxy rice) is classified into three types based on its amylose content: low amylose (20%), medium amylose (20-25%), and high amylose (> 25%). (Aramillo, et al 1976). If the amylose concentration is low, water absorption and swelling will rise at temperatures exceeding 65°C [26].

Ash Level

The diversity analysis revealed that the ratio of purple rice flour to plaintain flour had a significant ($p0.01$) effect on the ash content of the final biscuits. Based on the DNMRT additional test, all treatments revealed a very significant difference in the ash content of the biscuits at the level of = 0.01. Table 4 shows the average ash content of biscuits.

Table 4 Average ash content of biscuits

Comparison of purple rice flour with	Ash content (%)		Standard Deviation
A = 90:10	1,70	a	.01155
B = 80:20	1,83	b	.03512
C = 70:30	1,95	c	.01155
D = 60:40	2,04	d	.02309
E = 50:50	2,11	e	.05196

KK: 3,93 %

Note: The numbers in the same column followed by different lowercase letters show a very significant the difference in the DNMRT follow-up test at the level of = 0,05. 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 plaintain flour is used and the less purple rice flour is used. This is due to the high mineral concentration of plaintain flour, which causes the ash content to rise. Ash is classified as a mineral element or an orgmic compound [27].

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

All treatments had biscuit ash content of at least 1.6%, which met the Indonesian National Standard [28]. This is because plaintain flour has more ash than purple rice flour. Plaintain flour has an ash content of 5.3% [9], whereas rice flour has an ash content of 1.0 [22].

Food has ash as one of its constituents. Minerals such as potassium, phosphorus, sodium, and copper make up this component. Mineral elements in the body combine with organic molecules or free ions; mineral elements in the body operate as building blocks and regulators. The mineral content of the body must be within ideal ranges [29]. The higher the ash content of the biscuits, the more plaintain flour is used. As a result, biscuits made with a lot of plaintain flour have more minerals.

Fat Content

The diversity analysis revealed that the ratio of purple rice flour to plaintain flour was very significant ($p0.01$) in the fat content of the manufactured biscuits. Based on the DNMRT additional test, all treatments revealed a very significant difference in the fat content of the biscuits at the level of = 0.01. Table 5 shows the average ash content of biscuits.

Table 5 Average fat content of biscuits

Comparison of purple rice flour with plaintain flour (%)	Fat level (%)		Standard Deviation
A = 90:10	16,66	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	25,18	e	.47920

KK: 1,24%

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

The fat content of biscuits ranged from 16.66% to 25.18%. The more plaintain flour used in the production of biscuits, the higher the fat content. This is because plaintain flour has a larger fat content than purple rice flour. Treatment E (50:50 comparison of purple rice flour and plaintain flour) had the highest fat content (25.18%). Treatment A (comparison of purple rice flour with plaintain flour 90:10) had the lowest fat content value of 16.66%. The less purple rice flour used and the more plaintain 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 9.5%. This is due to the fact that the fat in biscuits is obtained via the addition of butter, eggs, and cream milk to the biscuit dough formulation [30], and plaintain flour has a larger fat content than purple rice flour. Plaintain flour has a fat content of 0.6% [9]. Rice flour, on the other hand, has a fat content of 0.5% [31]. 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 plaintain flour had a highly significant ($p0.01$) variation in the crude fiber content of the biscuits prepared. Based on the DNMRT additional test, all treatments revealed a very significant difference in the crude fiber content of the biscuits at the level of = 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 plaintain flour (%)	Crude Fiber Content (%)		Standard Deviation
A = 90:10	8,38	a	.16743
B = 80:20	10,08	b	.02517
C = 70:30	12,74	c	.00000
D = 60:40	14,50	d	.00000
E = 50:50	17,85	e	.00577

KK: 4,91 %

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

Biscuits had a crude fiber content ranging from 8.38 to 17.85%. The more plaintain flour is used to make biscuits, the higher the crude fiber content. This is because plaintain 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 plaintain flour), which was 17.85%, while the lowest crude fiber content was identified in treatment A (90:10 comparison of purple rice flour and plaintain flour), which was 8.38%. 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, the higher the crude fiber content, the higher the water content produced. The less purple rice flour and plaintain flour used, the higher the crude fiber content, and vice versa.

The crude fiber content of biscuits produced for all treatments exceeded the 0.5% maximum allowed in the Indonesian National Standard [23]. This is because plaintain flour contains more crude fiber than purple rice flour. Plaintain flour has 13.71% crude fiber [9]. The more plaintain flour is used in the production of biscuits, the higher the crude fiber content of the biscuits. Crude fiber is made up of cellulose, pentose, 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 ($p0.01$) between purple rice flour and plaintain flour. Based on a subsequent DNMRT test at the threshold of = 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

Comparison of purple rice flour with plaintain flour (%)	Protein level (%)		Standard Deviation
A = 90:10	7,78	e	.14434
B = 80:20	6,75	d	.00000
C = 70:30	5,59	c	.14434
D = 60:40	5,00	b	.00000
E = 50:50	4,72	a	.14434

KK: 5,11 %

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

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 plaintain flour; the highest protein content of biscuits is found in treatment A (comparison of purple rice flour with plaintain flour 90:10), which is 7.78%, while the lowest protein content is found in treatment E (comparison of purple rice flour with plaintain flour 50:50), which is 4.72%. The less purple rice flour used and the more plaintain flour used, the lower the protein contents, 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 plaintain flour. Rice flour has a protein content of 7.59% [33], while plaintain flour has a protein content of 4.8% [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 plaintain flour. Table 8 shows the average antioxidant content of biscuits.

Table 8 Average antioxidant content of biscuits

Comparison of purple rice flour with plaintain flour (%)	Antioksidant Aktivity	Standard Deviation
A = 90:10	85,83	10.40833
B = 80:20	80,00	14.30909
C = 70:30	70,66	19.50214
D = 60:40	61,83	5.77350
E = 50:50	55,83	.28868

KK: 9%

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

Biscuit antioxidant activity levels ranged from 55.83 to 85.83%. The less plaintain 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 67.64% antioxidant chemicals in purple rice flour [34]. In a comparison of antioxidants studied by [35], levels of antioxidant activity in brown rice flour were found. The Mandel Handayani variety brown rice flour had the highest antioxidant activity concentration of the two types, ranging from 92.286 to 92.972%, whereas the Segeng Handayani variety had a range of 79.207 to 89.870%.

Treatment A (comparison of purple rice flour with plaintain flour 90:10) had the greatest antioxidant levels of biscuits, at 85.83%, while treatment E (compare of purple rice flour with plaintain flour 50:50) had the lowest antioxidant levels, at 55.83%. The antioxidant activity decreases as purple rice flour is used less and plaintain 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 blend of purple rice flour and plaintain 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 likewise be enhanced. The antioxidant activity of all biscuit treatments was 70.83% as stated by [34]. Purple rice has a level of antioxidant activity of 67.64%.

Carbohydrate Levels

According to the results of the diversity study, the ratio of purple rice flour to plaintain flour made a very significant difference ($p 0.01$) in the carbohydrate content of the biscuits created. Based on the DNMRT additional test at the level of = 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 plaintain flour (%)	Carbohydrate levels (%)		Standard Deviation
A = 90:10	71,72	a	.72728
B = 80:20	69,28	b	.07937
C = 70:30	66,91	c	.12166
D = 60:40	64,27	d	.01155
E = 50:50	61,49	e	.03512

KK: 2,58%

Note: The numbers in the same column followed by different lowercase letters show a very significant the difference in the DNMRT follow-up test at the level of = 0,01. KK is coefficient of diversity.

Biscuit carbohydrate content ranged from 61.49 to 71.72%. The more plaintain 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 plaintain flour. Treatment A (comparison of purple rice flour with plaintain flour 90:10) had the highest carbohydrate amount (71.72%), whereas treatment E (comparison of purple rice flour with plaintain flour 50:50) had the lowest carbohydrate content (61.49%). The carbohydrate amount will decrease as less purple rice flour is used and more plaintain 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%. Plaintain flour has a reduced carbohydrate percentage, namely 47.6-49.8% [9]. Despite the fact that plaintain flour biscuits did not meet the minimum carbohydrate content level 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 loss, and aid in fat and protein metabolism [36].

Organoleptic Test

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

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 biscuits.

Table 10 Biscuit taste test value

Comparison of purple rice flour with plaintain flour (%)	Flavor value (%)	Description
A = 90 : 10	3,56	different (tasteless)
B = 80 : 20	4,88	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)

Notes: 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 plaintain flour) received the highest rating from the panelists for biscuit taste, with 5.60% (similar). The panelists' lowest rating of the biscuit taste was 3.56% (different) in treatment A (comparison of purple rice flour with plaintain 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 taste of the biscuit. The addition of plaintain flour and other ingredients can improve the taste of the biscuits. However, based on the panelists' acceptance data, it can be determined that the panelists have accepted the combination of purple rice flour with plaintain flour on a scale of 5 to 5.60, indicating that the panelists 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 scent. There are four types of aromas that the nose may detect: aromatic, sour, rancid, and burnt. The scent also influences the delicacy and taste of food products, which consists of three components: smell, taste, and stimulation [38]. Table 11 displays the panelists' ratings on the scent of biscuits.

Table 11 Biscuit aroma test value

Comparison of purple rice flour with plaintain flour (%)	Aroma Value(%)	Description
A = 90 : 10	3,36	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)

Notes: 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 plaintain flour) received the highest rating from the panelists for biscuit scent, with 5.44% (similar). The panellists' lowest estimate of the biscuit scent was 3.36% (different) in treatment A (comparison of purple rice flour with plaintain flour 90:10).

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 panellists' ratings of biscuit texture.

Table 12 Value of biscuit texture test

Comparison of purple rice flour with plaintain 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)

Notes: 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 plaintain 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 plaintain flour). The panellists' acceptance rating is 3.52% (dislike) on a scale of dislike to like (90:10).

The more plaintain 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 plaintain flour 90:10). The biscuits would harden or solidify. The water, fat, protein, and carbohydrate content of food heavily influences its texture. The texture is a pressure sensation that can be felt with the mouth (when biting, chewing, and swallowing). Texture sensing can detect wetness, dryness, hardness, smoothness, roughness, and oiliness [40].

d. Color

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

Tabel 13 Nilai uji warna biskuit

Comparison of purple rice flour with plaintain 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 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 plaintain flour) received the highest color assessment of 5.52%. (similar). Because the panelists find the dark yellow color more appealing. Treatment A (comparison of purple rice flour and plaintain flour 90:10) received the lowest rating of 3.64% (different). Because panelists find light skin 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 panellists' acceptability of the product [36].

CONCLUSION

A comparison of purple rice flour and plaintain 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 carbohydrate content but had no effect on antioxidant activity. Treatment E has 3.56% 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% carbohydrate content (comparison of purple rice flour and plaintain 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 plaintain flour.

REFERENCES

1. Wijaya H. (2010). Kajian Teknisi Standar Nasional Indonesia Biskuit. SNI 01-2973-1992
2. Saksono. (2013, Agust 5). Pasar Biskuit Diproyeksi Tumbuh 8% Didorong Konsumsi. In Indonesia Finance Today. http://www. indonesiafinancetoday.com.
3. Sari, O.F. (2013). Formula Biskuit Kaya Protein Berbasis Spirulina Dan Kerusakan Mikrobiologis Selama Penyimpanan. Skripsi Program Studi Teknologi Hasil Perairan Fakultas Perikanan dan Ilmu Kelautan IPB. Bogor
4. Anonymous. (2021, Desember 22). Green Education Centre. In Budidaya Sorgum. http://budidaya-sorgum.html.
5. Bhattacharjee, P., Singhal, R. S. & Kulkarni, P. R. (2002). Basmati rice: A review. In International Journal of Food Science and Technology (Vol 37, Issue 1, pp. 1–12). https://doi:10.1046/j.1365-2621.2002.00541.
6. Rerkasem. (2015). Effect Of Polishing Time On Distribution Of Monomeric Anthocyanin, Iron And Zinc Content In Different Grain Layers Of Four Thai Purple Rice Varieties. In International Journal of Agriculture and Biology (Vol. 17, Issue 4, pp. 828–832). https://doi:10.17957/IJAB/14.0012.
7. Sukhonthara. (2009). Characterization of Volatile Aroma Compounds From Red and Black Rice Bran. In Journal of Oleo Science (Vol. 58, Issue 3, pp. 155–161). https://doi:10.5650/jos.58.155.
8. Pietta P.G., (2000). Flavonoids as Antioxidants. In J. Nat. Prod. (Vol. 63, Issue 7, pp. 1035-1042). https://doi.org/10.1021/np9904509
9. Musita, N. (2014). Pemanfaatan Tepung Pisang Batu (*Musa Balbisiana Colla*) Pada Pembuatan Kue Brownies The Utilization Of Musa Balbisiana Banana Flour In Brownies. In Jurnal Riset Industri (Vol. 8, Issue 3, pp. 171–178).
10. Pothavorn. (2010). Sap phytochemical compositions of some bananas in Thailand. In J. Agric. Food Chem (Vol. 58, Issue 1, pp. 8782–8787). https://doi.org/10.1021/jf101220k

11. Gutierrez. (2007). Delivering pro-poor water and sanitation services: The technical and political challenges in Malawi and Zambia. In Geoforum (Vol. 38, Issue 5, pp. 886-900). https://doi.org/10.1016/j.geoforum.2005.09.010
12. Perez. (2005). Partial Characterization of Banana Starches Oxidized by Different Levels of Sodium Hypochlorite. In Carbohydrate Polymers (Vol. 62, Issue 1, pp. 50-56). https://doi.org/10.1016/j.carbpol.2005.07.005
13. Endra. (2006). Analisis Proksimat dan Komposisi Asam amino Buah Pisang Batu (Musa Balbisiana Colla). Fakultas Matematika dan Ilmu Pengetahuan Alam. Institut Pertanian Bogor.
14. Manley, D. (2000). Technology of biscuits, crackers, and cookies.third edition.Woodhead Publishing Limited. https://doi.org/10.1201/NOE0849308956
15. Marwah. (2018). Kualitas fisiko kimia biskuit pada berbagai komposisi tepung terigu, tepung dengke dan tepung sagu. Universitas Hasanuddin.
16. Welly. (2012). Kajian formulasi tepung pisang batu (Musa balbisiana Colla) dan tepung terigu dalam pembuatan biskuit coklat. Universitas Lampung.
17. Mahmud, Y. (2014). keragaman angronomis beberapa varietas unggul baru tanaman padi (Oriza sativa L.) pada model pengolahan tanaman terpadu. In Jurnal Ilmiah Solusi (Vol. 1, Issue 1, pp. 1-10). https://doi.org/10.31943/agrowiralodra.v1i2.527
18. AOAC. (2005). 'Physical, chemical and sensory properties of brownies substituted with sweet potato flour (Ipomoea batatas L.) with the addition of black cumin oil (Nigella sativa L.). In IOP Conference Series: Earth and Environmental Science. https://doi.org/10.1088/1755-1315/102/1/012084
19. Molyneux, P. (2004). The Use of the Stable Free Radical Diphenylpicryl-hydrazyl (DPPH) for Estimating Antioxidant Activity. In Songklanakarin Journal of Science and Technology (Vol. 26, Issue 2, pp. 211–219). https://doi.org/10.1287/isre.6.2.144
20. Neswati, F. & Ropanti, A. (2014). The Addition (Brassica oleracea var italica) to Increase The Functional Propertis of Ice Cream. In Jurnal of Nutrition (Vol. 13, Issue 940, pp. 196-203). https://doi.org/10.3923/pjn.2014.196.203
21. Nurdjanah. (2011). Karakteristik Coklat Dari Campuran Tepung Pisang Batu (Musa Balbisiana) Dan Tepung Terigu Pada Berbagai Tingkat Subsitusi. In Jurnal Teknologi dan Industri Hasil Pertanian (Vol. 16, Issue 1)
22. Badan Standarisasi Nasional. (2009). SNI (Standar Nasional Indonesia) 3549-2009 tentang Tepung Beras.
23. Badan Standarisasi Nasional. (2011). SNI 01-2973-2011. Kajian teknis standar nasional indonesia biskuit.
24. Yuliyana. (2014). Pengaruh Substitusi Tepung Terigu Dengan Tepung Pisang Kapok (Musa Paradisiacal Formatypica) Terhadap Karakteristik Mie Kering Yang Dihasilkan. In Jurnal teknologi pertanian. (Vol. 3, Issue 1). https://doi.org/10.32520/jtp.v3i1.57
25. Lee. (1995). Physicochemical properties of Calcium-Fortified Rice. In Cereal Chemistry (Vol. 72, Issue 1, pp. 352-355).
26. Arraullo. (1976). Rice postharvest technology. International Development Research Centre.
27. Lii. (1996). Effect of Amylose Content on the Rheological Property of Rice Starch Cereal. In Chemistry (Vol. 73, Issue 1, pp. 415-420).
28. Badan Standarisasi Nasional. (2009). SNI 01-3751-2009. Tepung Terigu Sebagai Bahan Makanan.
29. Nurhayati. (2014). Teknologi Mutu Pisang Dengan Sistem Spray Drying Untuk Biskuit. In Jurnal dinamika penelitian indusrti (Vol. 25, Issue 1).
30. Zaddana. (2018). Aktivitas Antioksidan Dan Kandungan Serat Pangan Biskuit Campuran Bekatul Beras Merah (Oriza Glaberrima) Dan Ubi Jalar Ungu (Ipomoea Batatas). In Fitofarmaka jurnal farmasi (Vol. 8, Issue 2). https://doi.org/10.33751/jf.v8i2.1574
31. Riganakos, K.A. & Kontominas, M.G. (1995). Effect Of Heat Treatment On Water Sorption Behavior of Wheat Flours Using A Hygrometric Technique. In Dev Food Sci (Vol. 37, Issue C, pp. 995–1005). https://doi.org/10.1016/S0167-4501(06)80212-8
32. Hermayanti. Y. & Gusti, E. (2006). Modul Analisa Proksimat. SMAK 3 Padang.
33. Tuankotta. (2015). Perbandingan Kadar Protein Pada Tepung Beras Putih (Oryza Sativa L.), Tepung Beras Ketan (Oryza Sativa L Glutinosa), Dan Tepung Sagu (Mestroxylon Sagu Rottb.) Dengan Menggunakan Metode Kjeldahl. Universitas Islam Bandung.
34. Budaraga, I.K, & Salihat, R.A. (2020). Antioxidant Activity Of 'Broken Skin' Purple Rice, 'Skinned' Puple Rice, And Purple Rice Stem Organically Cultivated In Indonesia. In Int J Adv Sci Eng Inf Technol (Vol. 10, Issue 5, pp. 2132–2137). https://doi.org/10.18517/ijaseit.10.5.9634
35. Indriyani. (2013). Karakteristik Fisik, Kimia Dan Sifat Organoleptik Tepung Beras Merah Berdasarkan Variasi Lama Pengeringan. In Jurnal Pangan dan Gizi (Vol. 4, Issue 8).

36. Winarno, F.G. (2004). Kimia Pangan Dan Gizi. Gramedia Pustaka Utama.
37. Setyaningsih. (2010). Analisis Sensori Untuk Industri Pangan Dan Agro. Penerbit IPB Press.
38. Winarno, F.G. (2008). Kimia Pangan dan Gizi. PT Gramedia Pustaka Utama.
39. Fellow. (1990). Food Processing Technology. Wood head publishing Ltd.
40. Noviyanti. (2016). Analisis Penilaian Organoleptik Cake Brownies Subtitusi Tepung Wikau Maombo. In Jurnal Sains dan Teknologi Pangan (Vol. 1, Issue 1, pp. 58-66).
41. Adbullah. (2005). Discrimination and classification of fresh-cut starfruits using an automated machine vision system. In Journal of Food Engineering.

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Conflict of Interest:

The authors declare no conflict of interest.

Ethical Statement:

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

Contact Address:

***I Ketut Budaraga**, Ekasakti University, Faculty of Agriculture, Agricultural Product Technology Department, Veterans Dalam, 26B, 25115, Padang, Indonesia.
Tel.: +62 81283837468
E-mail: iketutbudaraga@unespadang.ac.id
ORCID: https://orcid.org/0000-0002-3920-2879

Asnurita, Ekasakti University, Faculty of Agriculture, Agricultural Product Technology Department, Veterans Dalam, 26B, 25115, Padang, Indonesia.
Tel.: + 62 85274876633
E-mail: asnuritaita2017@gmail.com
ORCID: -

Yolan Novera, Ekasakti University, Faculty of Agriculture, Agricultural Product Technology Department, Veterans Dalam, 26B, 25115, Padang, Indonesia.
Tel.: +62 81364455877
E-mail: yolannovera96@gmail.com
ORCID: -

Corresponding author: *

Permintaan Revisi ke ketiga oleh editor, 30-1-2023

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Dear Dr. Budaraga

Thank you for your corrections. We have checkec your article and we are asking you to:

- check the english corrections we made
- Question regarding your name: I Ketut Budaraga. What does it mean I, is it regular part of your name or abbreviation of your name?
- tables: there are numbers with too many decimal places... please round them to two decimal places
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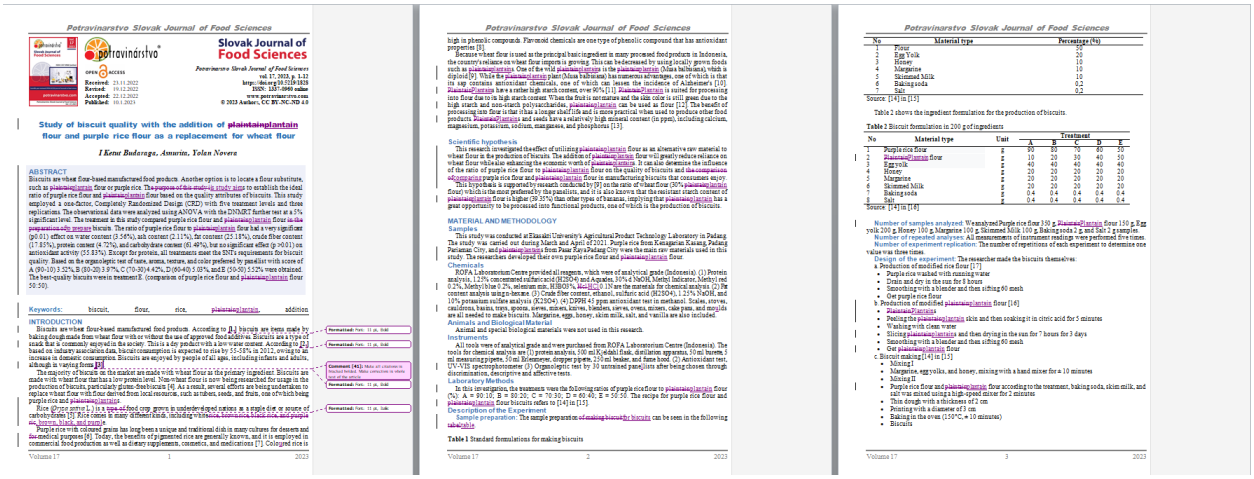
- citations in bracket have to be bolded
- some text in the article has gray background, there should be no background...

Peter Zajac

Bukti review 3



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 34 produced the statistical data 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 were analyzed using Analysis of Variance (ANOVA) and Duncan's New Multiple Range Test (DNMRT) advanced test at a 5% significance level. The data from this research were entered into SPSS 26.0. (SPSS Analytics Partner) and then 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 plantain flour. Based on the further DNMRT test at the level of = 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 plantain flour (%)	Water Content (%)		Standard Deviation
A = 90:10	5.01	a	0.05292
B = 80:20	4.70	b	0.02082
C = 70:30	4.35	c	0.01528
D = 60:40	3.82	d	0.02082
E = 50:50	3.56	e	0.04041
KK: 3.86 %			

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

The biscuits' water content ranged from 3.56 to 5.01%. The water content of the biscuits revealed a decrease in yield while increasing the amount of plantain flour. Plantain flour has a low water content since biscuits are baked at 150oC to allow the baking process to evaporate and limit the quantity of water in the biscuit dough [21]. Treatment A (90:10 comparison of purple rice flour and plantain flour) had the highest water content of 5.01%. Treatment E (50:50 comparison of purple rice flour and plantain flour) had the lowest water level of 3.56%. The water content will decrease if less purple rice flour is used and more plantain flour is used, and vice versa.

According to [22], rice flour has a water content of 13%, while plantain flour has a water content of 7.46% [9]. According to the research, the more plantain flour used in making 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%.

Each treatment's water content varies because the water's relationship in food ingredients varies; the water content in food can be divided into bound water and free water [24]. The amylose concentration and soaking temperature of rice seeds alter water absorption [25]. Rice (non-waxy rice) is classified into three types based on its amylose content: low amylose (20%), medium amylose (20-25%), and high amylose (> 25%). (Arraullo, et al 1976). If the amylose concentration is low, water absorption and swelling will rise at temperatures exceeding 65°C [26].

Ash Level

The diversity analysis revealed that the ratio of purple rice flour to plantain flour had a significant (p0.01) effect on the ash content of the final biscuits. Based on the DNMRT additional test, all treatments revealed a very significant difference in the ash content of the biscuits at the level of = 0.01. Table 4 shows the average ash content of biscuits.

Table 4 Average ash content of biscuits

Comparison of purple rice flour with plantain flour (%)	Ash content (%)		Standard Deviation
A = 90:10	1.70	a	0.01155
B = 80:20	1.83	b	0.03512
C = 70:30	1.95	c	0.01155
D = 60:40	2.04	d	0.02309
E = 50:50	2.11	e	0.05196
KK: 3.93 %			

Note: The numbers in the same column followed by different lowercase letters show a very significant the difference in the DNMRT follow-up test at the level of $\alpha = 0.05$. 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 plantain flour is used and the less purple rice flour is used. This is due to the high mineral concentration of plantain 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 plantain flour), which was 2.11%, while the lowest ash content was observed in treatment A (90:10 comparison of purple rice flour with plantain flour), which was 1.70%. The ash content rises as less purple rice flour is used and more plantain flour is used, and vice versa.

All treatments had biscuit ash content of at least 1.6%, which met the Indonesian National Standard [28]. This is because plantain flour has more ash than purple rice flour. Plantain flour has an ash content of 5.3% [9], whereas rice flour has an ash content of 1.0 [22].

Food has ash as one of its constituents. Minerals such as potassium, phosphorus, sodium, and copper make up this component. Mineral elements in the body combine with organic molecules or free ions; mineral elements operate as building blocks and regulators. The body's mineral content must be within ideal ranges [29]. The higher the ash content of the biscuits, the more plantain flour is used. As a result, biscuits made with a lot of plantain flour have more minerals.

Fat Content

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

Table 5 Average fat content of biscuits

Comparison of purple rice flour with plantain flour (%)	Fat level (%)		Standard Deviation
A = 90:10	16.66	a	0.10321
B = 80:20	19.19	b	0.02887
C = 70:30	21.18	c	0.00000
D = 60:40	23.10	d	0.00000
E = 50:50	25.18	e	0.47920
KK: 1.24%			

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

The fat content of biscuits ranged from 16.66% to 25.18%. The more plantain flour used in the production of biscuits, the higher the fat content. This is because plantain flour has a larger fat content than purple rice flour. Treatment E (50:50 comparison of purple rice flour and plantain flour) had the

highest fat content (25.18%). Treatment A (comparison of purple rice flour with plantain flour 90:10) had the lowest fat content value of 16.66%. The less purple rice flour used and the more plantain 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 9.5%. This is because the fat in biscuits is obtained via the addition of butter, eggs, and cream milk to the biscuit dough formulation [30], and plantain flour has a larger fat content than purple rice flour. Plantain flour has a fat content of 0.6% [9]. On the other hand, rice flour has a fat content of 0.5% [31]. 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 plantain flour had a highly significant (p0.01) variation in the crude fiber content of the biscuits prepared. Based on the DNMRT additional test, all treatments revealed a very significant difference in the crude fiber content of the biscuits at the level of = 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 plantain flour (%)	Crude Fiber Content (%)		Standard Deviation
A = 90:10	8.38	a	0.16743
B = 80:20	10.08	b	0.02517
C = 70:30	12.74	c	0.00000
D = 60:40	14.50	d	0.00000
E = 50:50	17.85	e	0.00577
KK: 4.91 %			

Note: The numbers in the same column followed by different lowercase letters show a very significant the difference in the DNMRT 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 plantain flour is used to make biscuits, the higher the crude fiber content. This is because plantain 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 plantain flour), which was 17.85%, while the lowest crude fiber content was identified in treatment A (90:10 comparison of purple rice flour and plantain flour), which was 8.38%. 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, the higher the crude fiber content, the higher the water content produced. The less purple rice flour and plantain flour used, the higher the crude fiber content, and vice versa.

The crude fiber content of biscuits produced for all treatments exceeded the 0.5% maximum allowed in the Indonesian National Standard [23]. This is because plantain flour contains more crude fiber than purple rice flour. Plantain flour has 13.71% crude fiber [9]. The more plantain flour is used in the production of biscuits, the higher the crude fiber content of the biscuits. Crude fiber is made up of cellulose, pentose, 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 plantain flour. Based on a subsequent DNMRT test at the threshold of = 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

Comparison of purple rice flour with plantain flour (%)	Protein level (%)		Standard Deviation
A = 90:10	7.78	e	0.14434
B = 80:20	6.75	d	0.00000
C = 70:30	5.59	c	0.14434
D = 60:40	5.00	b	0.00000
E = 50:50	4.72	a	0.14434
KK: 5.11 %			

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

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 plantain flour; the highest protein content of biscuits is found in treatment A (comparison of purple rice flour with plantain flour 90:10), which is 7.78%, while the lowest protein content is found in treatment E (comparison of purple rice flour with plantain flour 50:50), which is 4.72%. The less purple rice flour used and the more plantain flour used, the lower the protein contents, 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 plantain flour. Rice flour has a protein content of 7.59% [33], while plantain flour has a protein content of 4.8% [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 plantain flour. Table 8 shows the average antioxidant content of biscuits.

Table 8 Average antioxidant content of biscuits

Comparison of purple rice flour with plantain flour (%)	Antioxidant Activity	Standard Deviation
A = 90:10	85.83	10.40833
B = 80:20	80.00	14.30909
C = 70:30	70.66	19.50214
D = 60:40	61.83	5.77350
E = 50:50	55.83	0.28868
KK: 9%		

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

Biscuit antioxidant activity levels ranged from 55.83 to 85.83%. The less plantain 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 67.64% antioxidant chemicals in purple rice flour [34]. In a comparison of antioxidants studied by [35], levels of antioxidant activity in brown rice flour were found. The Mandel Handayani variety brown rice flour had the highest antioxidant activity concentration of the two types, ranging from 92,286 to 92.972%, whereas the Segreng Handayani variety had a range of 79.207 to 89.870%.

Treatment A (comparison of purple rice flour with plantain flour 90:10) had the greatest antioxidant levels of biscuits, at 85.83%, while treatment E (compare of purple rice flour with plantain flour 50:50) had the lowest antioxidant levels, at 55.83%. The antioxidant activity decreases as purple rice flour is used less and plantain 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 blend of purple rice flour and plantain 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 likewise be enhanced. The antioxidant activity of all biscuit treatments was 70.83%. as stated by [34]. Purple rice has a level of antioxidant activity of 67.64%.

Carbohydrate Levels

According to the results of the diversity study, the ratio of purple rice flour to plantain flour made a very significant difference (p 0.01) in the carbohydrate content of the biscuits created. Based on the DNMRT additional test at the level of = 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 plantain flour (%)	Carbohydrate levels (%)		Standard Deviation
A = 90:10	71.72	a	0.72728
B = 80:20	69.28	b	0.07937
C = 70:30	66.91	c	0.12166
D = 60:40	64.27	d	0.01155
E = 50:50	61.49	e	0.03512
KK: 2.58%			

Note: The numbers in the same column followed by different lowercase letters show a very significant the difference in the DNMRT 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 plantain 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 plantain flour. Treatment A (comparison of purple rice flour with plantain flour 90:10) had the highest carbohydrate amount (71.72%), whereas treatment E (comparison of purple rice flour with plantain flour 50:50) had the lowest carbohydrate content (61.49%). The carbohydrate amount will decrease as less purple rice flour is used and more plantain 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%. Plantain flour has a reduced carbohydrate percentage, namely 47.6-49.8% [9]. Even though plantain flour biscuits did not meet the minimum carbohydrate content level 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 in the body because they inhibit the breakdown of excess body protein, mineral loss, and aid in fat and protein metabolism [36].

Organoleptic Test

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

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 biscuits.

Table 10 Biscuit taste test value

Comparison of purple rice flour with plantain flour (%)	Flavor value (%)	Description
A = 90 : 10	3.56	different (tasteless)
B = 80 : 20	4.88	somewhat similar (almost like banana)
C = 70 : 30	4.24	somewhat similar (almost like banana)
D = 60 : 40	5.00	similar (banana flavor)
E = 50 : 50	5.60	similar (banana flavor)

Notes: 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 plantain flour) received the highest rating from the panelists for biscuit taste, with 5.60% (similar). The panelists' lowest rating of the biscuit taste was 3.56% (different) in treatment A (comparison of purple rice flour with plantain 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 biscuit taste. The addition of plantain flour and other ingredients can improve the taste of the biscuits. However, based on the panelists' acceptance data, it can be determined that the panellists have accepted the combination of purple rice flour with plantain 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 greatly influence scent. There are four types of aromas that the nose may detect: aromatic, sour, rancid, and burnt. The scent also influences food products' delicacy and taste, consisting of three components: smell, taste, and stimulation [38]. Table 11 displays the panellists' ratings on the scent of biscuits.

Table 11 Biscuit aroma test value

Comparison of purple rice flour with plantain flour (%)	Aroma Value(%)	Description
A = 90 : 10	3.36	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)

Notes: 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 plantain flour) received the highest rating from the panelists for biscuit scent, with 5.44%. (similar). The panellists' lowest estimate of the biscuit scent was 3.36% (different) in treatment A (comparison of purple rice flour with plantain flour 90:10).

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 panellists' ratings of biscuit texture.

Table 12 Value of biscuit texture test

Comparison of purple rice flour with plantain 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)

Notes: 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 ~~plaintain~~plantain 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 ~~plaintain~~plantain flour). The panellists' acceptance rating is 3.52% (dislike) on a scale of dislike to like (90:10).

The more ~~plaintain~~plantain 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 ~~plaintain~~plantain flour 90:10). The biscuits would harden or solidify. The water, fat, protein, and carbohydrate content of food heavily influences its texture. The texture is a pressure sensation that can be felt with the mouth (when biting, chewing, and swallowing). Texture sensing can detect wetness, dryness, hardness, smoothness, roughness, and oiliness [40].

d. Color

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

Tabel 13 Nilai uji warna biskuit

Comparison of purple rice flour with ~~plaintain~~plantain 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 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 ~~plaintain~~plantain flour) received the highest color assessment of 5.52% (similar). Because the panelists find the dark yellow color more appealing. Treatment A (comparison of purple rice flour and ~~plaintain~~plantain flour 90:10) received the lowest rating of 3.64% (different). Because panelists find light skin 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 panellists' acceptability of the product [36].

XXXXXX Add picture of the final product

CONCLUSION

A comparison of purple rice flour and ~~plaintain~~plantain 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~~significant effect on water, ash, crude fibre, fat, protein, and carbohydrate content but had no effect on antioxidant activity. Treatment E has 3.56% 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% carbohydrate content (comparison of purple rice flour and ~~plaintain~~plantain 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 ~~plaintain~~plantain flour.

REFERENCES

1. Wijaya H. (2010). Kajian Teknisi Standar Nasional Indonesia Biskuit. SNI 01-2973-1992
2. Saksono. (2013, Agust 5). Pasar Biskuit Diproyeksi Tumbuh 8% Didorong Konsumsi. In Indonesia Finance Today. http://www. indonesiafinancetoday.com.
3. Sari, O.F. (2013). Formula Biskuit Kaya Protein Berbasis Spirulina Dan Kerusakan Mikrobiologis Selama Penyimpanan. Skripsi Program Studi Teknologi Hasil Perairan Fakultas Perikanan dan Ilmu Kelautan IPB. Bogor

4. Anonymous. (2021, Desember 22). Green Education Centre. In Budidaya Sorgum. http://budidaya-sorgum.html.
5. Bhattacharjee, P., Singhal, R. S. & Kulkarni, P. R. (2002). Basmati rice: A review. In International Journal of Food Science and Technology (Vol. 37, Issue 1, pp. 1–12). https://doi:10.1046/j.1365-2621.2002.00541.
6. Rerkasem. (2015). Effect Of Polishing Time On Distribution Of Monomeric Anthocyanin, Iron And Zinc Content In Different Grain Layers Of Four Thai Purple Rice Varieties. In International Journal of Agriculture and Biology (Vol. 17, Issue 4, pp. 828–832). https://doi:10.17957/IJAB/14.0012.
7. Sukhonthara. (2009). Characterization of Volatile Aroma Compounds From Red and Black Rice Bran. In Journal of Oleo Science (Vol. 58, Issue 3, pp. 155–161). https://doi:10.5650/jos.58.155.
8. Pietta P.G., (2000). Flavonoids as Antioxidants. In J. Nat. Prod. (Vol. 63, Issue 7, pp. 1035-1042). https://doi.org/10.1021/np9904509
9. Musita, N. (2014). Pemanfaatan Tepung Pisang Batu (*Musa Balbisiana Colla*) Pada Pembuatan Kue Brownies The Utilization Of Musa Balbisiana Banana Flour In Brownies. In Jurnal Riset Industri (Vol. 8, Issue 3, pp. 171–178).
10. Pothavorn. (2010). Sap phytochemical compositions of some bananas in Thailand. In J. Agric. Food Chem (Vol. 58, Issue 1, pp. 8782–8787). https://doi.org/10.1021/jf101220k
11. Gutierrez. (2007). Delivering pro-poor water and sanitation services: The technical and political challenges in Malawi and Zambia. In Geoforum (Vol. 38, Issue 5, pp. 886-900). https://doi.org/10.1016/j.geoforum.2005.09.010
12. Perez. (2005). Partial Characterization of Banana Starches Oxidized by Different Levels of Sodium Hypochlorite. In Carbohydrate Polymers (Vol. 62, Issue 1, pp. 50-56). https://doi.org/10.1016/j.carbpol.2005.07.005
13. Endra. (2006). Analisis Proksimat dan Komposisi Asam amino Buah Pisang Batu (Musa Balbisiana Colla). Fakultas Matematika dan Ilmu Pengetahuan Alam. Institut Pertanian Bogor.
14. Manley, D. (2000). Technology of biscuits, crackers, and cookies.third edition.Woodhead Publishing Limited. https://doi.org/10.1201/NOE0849308956
15. Marwah. (2018). Kualitas fisiko kimia biskuit pada berbagai komposisi tepung terigu, tepung dengke dan tepung sagu. Universitas Hasanuddin.
16. Welly. (2012). Kajian formulasi tepung pisang batu (Musa balbisiana Colla) dan tepung terigu dalam pembuatan biskuit coklat. Universitas Lampung.
17. Mahmud, Y. (2014). keragaman angronomis beberapa varietas unggul baru tanaman padi (Oriza sativa L.) pada model pengolahan tanaman terpadu. In Jurnal Ilmiah Solusi (Vol. 1, Issue 1, pp. 1-10). https://doi.org/10.31943/agrowiralodra.v1i2.527
18. AOAC. (2005). 'Physical, chemical and sensory properties of brownies substituted with sweet potato flour (Ipomoea batatas L.) with the addition of black cumin oil (Nigella sativa L.). In IOP Conference Series: Earth and Environmental Science. https://doi.org/10.1088/1755-1315/102/1/012084
19. Molyneux, P. (2004). The Use of the Stable Free Radical Diphenylpicryl-hydrazyl (DPPH) for Estimating Antioxidant Activity. In Songklanakarin Journal of Science and Technology (Vol. 26, Issue 2, pp. 211–219). https://doi.org/10.1287/isre.6.2.144
20. Neswati, F. & Ropanti, A. (2014). The Addition (Brassica oleracea var italica) to Increase The Functional Propertis of Ice Cream. In Jurnal of Nutrition (Vol. 13, Issue 940, pp. 196-203). https://doi.org/10.3923/pjn.2014.196.203
21. Nurdjanah. (2011). Karakteristik Coklat Dari Campuran Tepung Pisang Batu (Musa Balbisiana) Dan Tepung Terigu Pada Berbagai Tingkat Subsitusi. In Jurnal Teknologi dan Industri Hasil Pertanian (Vol. 16, Issue 1)
22. Badan Standarisasi Nasional. (2009). SNI (Standar Nasional Indonesia) 3549-2009 tentang Tepung Beras.
23. Badan Standarisasi Nasional. (2011). SNI 01-2973-2011. Kajian teknis standar nasional indonesia biskuit.
24. Yuliyana (2014). Pengaruh Substitusi Tepung Terigu Dengan Tepung Pisang Kapok (Musa Paradisiacal Formatypica) Terhadap Karakteristik Mie Kering Yang Dihasilkan. In Jurnal teknologi pertanian. (Vol. 3, Issue 1). https://doi.org/10.32520/jtp.v3i1.57
25. Lee. (1995). Physicochemical properties of Calcium-Fortified Rice. In Cereal Chemistry (Vol. 72, Issue 1, pp. 352-355).
26. Arraullo. (1976). Rice postharvest technology. International Development Research Centre.
27. Lii. (1996). Effect of Amylose Content on the Rheological Property of Rice Starch Cereal. In Chemistry (Vol. 73, Issue 1, pp. 415-420).
28. Badan Standarisasi Nasional. (2009). SNI 01-3751-2009. Tepung Terigu Sebagai Bahan Makanan.

29. Nurhayati. (2014). Teknologi Mutu Pisang Dengan Sistem Spray Drying Untuk Biskuit. In Jurnal dinamika penelitian indusrti (Vol. 25, Issue 1).
30. Zaddana. (2018). Aktivitas Antioksidan Dan Kandungan Serat Pangan Biskuit Campuran Bekatul Beras Merah (Oriza Glaberrima) Dan Ubi Jalar Ungu (Ipomoea Batatas). In Fitofarmaka jurnal farmasi (Vol. 8, Issue 2). https://doi.org/10.33751/jf.v8i2.1574
31. Riganakos, K.A. & Kontominas, M.G. (1995). Effect Of Heat Treatment On Water Sorption Behavior of Wheat Flours Using A Hygrometric Technique. In Dev Food Sci (Vol. 37, Issue C, pp. 995–1005). https://doi.org/10.1016/S0167-4501(06)80212-8
32. Hermayanti. Y. & Gusti, E. (2006). Modul Analisa Proksimat. SMAK 3 Padang.
33. Tuankotta. (2015). Perbandingan Kadar Protein Pada Tepung Beras Putih (Oryza Sativa L.), Tepung Beras Ketan (Oryza Sativa L Glutinosa), Dan Tepung Sagu (Mestroxylon Sagu Rottb.) Dengan Menggunakan Metode Kjeldahl. Universitas Islam Bandung.
34. Budaraga, I.K, & Salihat, R.A. (2020). Antioxidant Activity Of 'Broken Skin' Purple Rice, 'Skinned' Purple Rice, And Purple Rice Stem Organically Cultivated In Indonesia. In Int J Adv Sci Eng Inf Technol (Vol. 10, Issue 5, pp. 2132–2137). https://doi.org/10.18517/ijaseit.10.5.9634
35. Indriyani. (2013). Karakteristik Fisik, Kimia Dan Sifat Organoleptik Tepung Beras Merah Berdasarkan Variasi Lama Pengeringan. In Jurnal Pangan dan Gizi (Vol. 4, Issue 8).
36. Winarno, F.G. (2004). Kimia Pangan Dan Gizi. Gramedia Pustaka Utama.
37. Setyaningsih. (2010). Analisis Sensori Untuk Industri Pangan Dan Agro. Penerbit IPB Press.
38. Winarno, F.G. (2008). Kimia Pangan dan Gizi. PT Gramedia Pustaka Utama.
39. Fellow. (1990). Food Processing Technology. Wood head publishing Ltd.
40. Noviyanti. (2016). Analisis Penilaian Organoleptik Cake Brownies Subtitusi Tepung Wikau Maombo. In Jurnal Sains dan Teknologi Pangan (Vol. 1, Issue 1, pp. 58-66).
41. Adbullah. (2005). Discrimination and classification of fresh-cut starfruits using an automated machine vision system. In Journal of Food Engineering.

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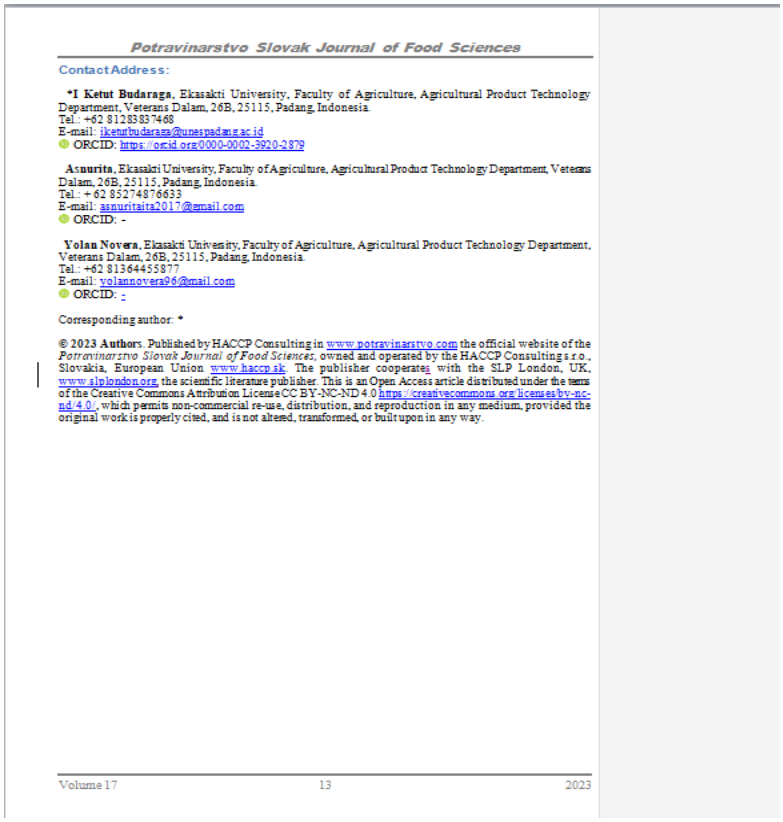
The authors declare no conflict of interest.

Ethical Statement:

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



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Contact Address:

***I Ketut Budaraga**, Ekasakti University, Faculty of Agriculture, Agricultural Product Technology Department, Veterans Dalam, 26B, 25115, Padang, Indonesia.
Tel.: +62 81283837468
E-mail: iketurbudaraga@unespadang.ac.id
ORCID: https://orcid.org/0000-0002-3920-2879

Asnurita, Ekasakti University, Faculty of Agriculture, Agricultural Product Technology Department, Veterans Dalam, 26B, 25115, Padang, Indonesia.
Tel.: + 62 85274876633
E-mail: asnuritaita2017@gmail.com
ORCID: -

Yolan Novera, Ekasakti University, Faculty of Agriculture, Agricultural Product Technology Department, Veterans Dalam, 26B, 25115, Padang, Indonesia.
Tel.: +62 81364455877
E-mail: yolannovera96@gmail.com
ORCID: -

Corresponding author: *

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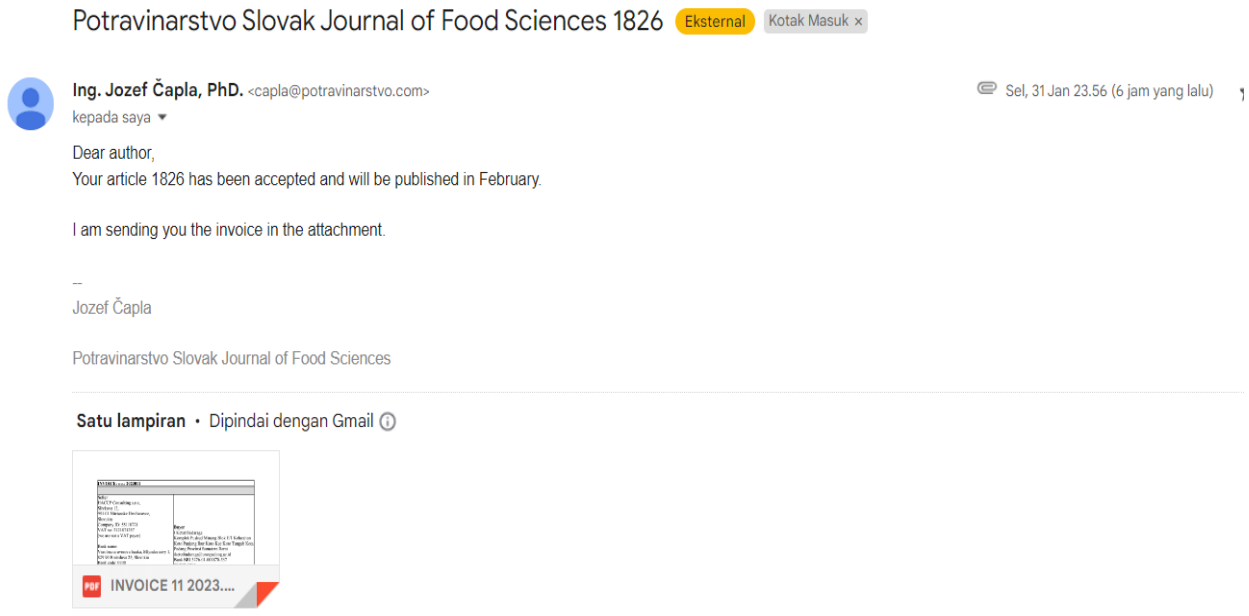

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IKETUT BUDARAGA 06.05 (0 menit yang lalu)
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Dear doc. ing. Peter Zajác, PhD.
Editor-In-Chief
Potravinarstvo Slovak Journal of Food Sciences

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,

I Ketut Budaraga

Pada tanggal Sel, 31 Jan 2023 pukul 22.37 IKETUT BUDARAGA <iketutbudaraga@unespadang.ac.id> menulis:

...

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

I Ketut Budaraga, Asnurita, Yolan Novera

ABSTRACT

Biscuits are wheat flour-based manufactured food products. Another option is to locate a flour substitute, such as ~~plaintain~~plantain flour or purple rice. The ~~purpose of this study~~ is study aims to establish the ideal ratio of purple rice flour and ~~plaintain~~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 DNMRT further test at a 5% significant level. The treatment in this study compared purple rice flour and ~~plaintain~~plantain flour ~~in the preparation of~~to prepare biscuits. The ratio of purple rice flour to ~~plaintain~~plantain flour had a very significant ($p<0.01$) effect on water content (3.56%), ash content (2.11%), fat content (25.18%), 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 SNI's requirements for biscuit quality. Based on the organoleptic test of taste, aroma, texture, and color preferred by panellist with score of A (90-100) 3.52%, B (80-20) 3.97%, C (70-80) 4.42%, D (60-40) 5.03%, and E (50-50) 5.52% were obtained. The best-quality biscuits were in treatment E. (comparison of purple rice flour and ~~plaintain~~plantain flour 50:50).

Keywords: biscuit, flour, rice, ~~plaintain~~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 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 ~~plaintain~~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, brown, black, and purple.

Purple rice with coloured grains has long been a unique and traditional dish in many cultures for desserts and ~~for~~-medical purposes [6]. 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 ~~plaintain~~plantains. One of the wild ~~plaintain~~plantains is the ~~plaintain~~plantain (Musa balbisiana), which is diploid [9]. While the ~~plaintain~~plantain plant (Musa balbisiana) has numerous advantages, one of which is that its sap contains antioxidant chemicals, one of which can lessen the incidence of Alzheimer's [10]. ~~Plaintain~~Plantains have a rather high starch content, over 90% [11]. ~~Plaintain~~Plantain is suited for processing into flour due to its high starch content. When the fruit is not mature and the skin color is still green due to the high starch and non-starch polysaccharides, ~~plaintain~~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. ~~Plaintain~~Plantains 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 ~~plaintain~~plantain flour as an alternative raw material to wheat flour in the production of biscuits. The addition of ~~plaintain~~plantain flour will greatly reduce reliance on wheat flour while also enhancing the economic worth of ~~plaintain~~plantains. It can also determine the influence of the ratio of purple rice flour to ~~plaintain~~plantain flour on the quality of biscuits and ~~the comparison of~~comparing purple rice flour and ~~plaintain~~plantain flour in manufacturing biscuits that consumers enjoy.

This hypothesis is supposed by research conducted by [9] on the ratio of wheat flour (30% ~~plaintain~~plantain flour) which is the most preferred by the panelists, and it is also known that the resistant starch content of ~~plaintain~~plantain flour is higher (39.35%) than other types of bananas, implying that ~~plaintain~~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 Eksakti University's Agricultural Product Technology Laboratory in Padang. The study was carried out during March and April of 2021. Purple rice from Kenagarian Kasang, Padang Pariaman City, and ~~plaintain~~plantains from Pasar Raya Padang City were the main raw materials used in this study. The researchers developed their own purple rice flour and ~~plaintain~~plantain flour.

Chemicals

ROFA Laboratorium Centre provided all reagents, which were of analytical grade (Indonesia). (1). Protein analysis, 1.25% concentrated sulfuric acid (H_2SO_4) and Aquades, 30% d NaOH, Methyl Indicator, Methyl red 0.2%, Methyl blue 0.2%, selenium mix, H_3BO_3%, ~~Hcl~~HCl 0.1N are the materials for chemical analysis. (2). Fat content analysis using n-hexane. (3.) Crude fiber content, ethanol, sulfuric acid (H_2SO_4), 1.25% NaOH, and 10% potassium sulfate analysis (K_2SO_4). (4.) DPPH 45 ppm antioxidant test in methanol. Scales, stoves, cauldrons, basins, trays, spoons, sieves, mixers, knives, blenders, sieves, ovens, mixers, cake pans, and moulds are all needed to make biscuits. Margarine, eggs, honey, skim milk, salt, 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 are, (1). protein analysis, 500 ml Kjeldahl flask, distillation apparatus, 50 ml burette, 5 ml measuring pipette, 50 ml Erlenmeyer, dropper pipette, 250 ml beaker, and fume hood. (2.) Antioxidant test, UV-VIS spectrophotometer. (3). Organoleptic test by 30 untrained panellists 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 ~~plaintain~~plantain flour (%): A = 90:10; B = 80:20; C = 70:30; D = 60:40; E = 50:50. The recipe for purple rice flour and ~~plaintain~~plantain flour biscuits refers to [14] in [15].

Description of the Experiment

Sample preparation: The sample preparation ~~of making biscuit~~for biscuits can be seen in the following ~~tabl~~table.

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]

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

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	PlaintainPlantain 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 350 g, PlaintainPlantain 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.
Number of repeated analyses: All measurements of instrument readings were performed five times.
Number of experiment replication: The number of repetitions 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 8 hours
- Smoothing with a blender and then sifting 60 mesh
- Get purple rice flour

b. Production of modified plaintainplantain flour [16]
- PlaintainPlantains
- Peeling the plaintainplantain skin and then soaking it in citric acid for 5 minutes
- Washing with clean water
- Slicing plaintainplantains and then drying in the sun for 7 hours for 3 days
- Smoothing with a blender and then sifting 60 mesh
- Get plaintainplantain flour

c. 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 plaintainplantain 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

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 34 produced the statistical data 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 were analyzed using Analysis of Variance (ANOVA) and Duncan's New Multiple Range Test (DNMRT) advanced test at a 5% significance level. The data from this research were 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 significant differences.

RESULTS AND DISCUSSION

Water Content

The study of diversity revealed that the water level of the produced biscuits differed considerably ($p \leq 0.01$) depending on the ratio of purple rice flour to plaintainplantain flour. Based on the further DNMRT test at the level of = 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 plaintainplantain flour (%)	Water Content (%)		Standard Deviation
A = 90:10	5,01	a	0.05292
B = 80:20	4,70	b	0.02082
C = 70:30	4,35	c	0.0153801
D = 60:40	3,82	d	0.02082
E = 50:50	3,56	e	0.04041

KK 3,86 %

Note: The numbers in the same column followed by different lowercase letters show a significant the difference in the DNMRT follow-up test at the level of α = 0,01. KK is the coefficient of diversity.

The biscuits' water content ranged from 3.56 to 5.01%. The water content of the biscuits revealed a decrease in yield while increasing the amount of plaintainplantain flour. PlaintainPlantain flour has a low water content since biscuits are baked at 150oC to allow the baking process to evaporate and limit the quantity of water in the biscuit dough [21]. Treatment A (90:10 comparison of purple rice flour and plaintainplantain flour) had the highest water content of 5.01%. Treatment E (50:50 comparison of purple rice flour and plaintainplantain flour) had the lowest water level of 3.56%. The water content will decrease if less purple rice flour is used and more plaintainplantain flour is used, and vice versa.

According to [22], rice flour has a water content of 13%, while plaintainplantain flour has a water content of 74% [9]. According to the research, the more plaintainplantain flour used in the making of making 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 rich treatment's water content varies because the water's relationship in food ingredients varies, the water content in food can be divided into bound water and free water [24]. The amylose concentration and soaking temperature of rice seeds alter water absorption [25]. Rice (non-waxy rice) is classified into three types based on its amylose content: low amylose (20%), medium amylose (20-25%), and high amylose (> 25%) (Armullo, et al 1976). If the amylose concentration is low, water absorption and swelling will rise at temperatures exceeding 65°C [26].

Ash Level

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

Table 4 Average ash content of biscuits

Comparison of purple rice flour with plaintainplantain flour (%)	Ash content (%)		Standard Deviation
A = 90:10	1,70	a	0.01155
B = 80:20	1,83	b	0.0251661
C = 70:30	1,95	c	0.01155
D = 60:40	2,04	d	0.02309
E = 50:50	2,11	e	0.05196

KK 3,93 %

Note: The numbers in the same column followed by different lowercase letters show a very significant the difference in the DNMRT follow-up test at the level of □ = 0,05. 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 plaintainplantain flour is used and the less purple rice flour is used. This is due to the high mineral concentration of plaintainplantain 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 plaintainplantain flour), which was 2.11%, while the lowest ash content was observed in treatment A (90:10 comparison of purple rice flour with plaintainplantain flour), which was 1.70%. The ash content rises as less purple rice flour is used and more plaintainplantain flour is used, and vice versa.

All treatments had biscuit ash content of at least 1.6%, which met the Indonesian National Standard [28]. This is because plaintainplantain flour has more ash than purple rice flour. PlaintainPlantain flour has an ash content of 5.3% [9], whereas rice flour has an ash content of 1.0 [22].

Food has ash as one of its constituents. Minerals such as potassium, phosphorus, sodium, and copper make up this component. Mineral elements in the body combine with organic molecules or free ions; mineral elements in the body operate as building blocks and regulators. The mineral content of the bodybody's mineral content must be within ideal ranges [29]. The higher the ash content of the biscuits, the more plaintainplantain flour is used. As a result, biscuits made with a lot of plaintainplantain flour have more minerals.

Fat Content

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

Table 5 Average fat content of biscuits

Comparison of purple rice flour with plaintainplantain flour (%)	Fat level (%)		Standard Deviation
A = 90:10	16,66	a	0.10231
B = 80:20	19,19	b	0.0251661
C = 70:30	21,18	c	0.00000
D = 60:40	23,10	d	0.00000
E = 50:50	25,18	e	0.0230940

KK 1,24%

Note: The numbers in the same column followed by different lowercase letters show a very significant the difference in the DNMRT follow-up test at the level of α = 0,01. KK is coefficient of diversity.

The fat content of biscuits ranged from 16.66% to 25.18%. The more plaintainplantain flour used in the production of biscuits, the higher the fat content. This is because plaintainplantain flour has a larger fat content than purple rice flour. Treatment E (50:50 comparison of purple rice flour and

plaintainplantain flour) had the highest fat content (25.18%). Treatment A (comparison of purple rice flour with plaintainplantain flour 90:10) had the lowest fat content value of 16.66%. The less purple rice flour used and the more plaintainplantain 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 9.5%. This is due to the fact thatbecause the fat in biscuits is obtained via the addition of butter, eggs, and cream milk to the biscuit dough formulation [30], and plaintainplantain flour has a larger fat content than purple rice flour. PlaintainPlantain flour has a fat content of 0.6% [9]. Rice flour, on the other hand, rice flour has a fat content of 0.5% [31]. 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 plaintainplantain flour had a highly significant ($p \leq 0.01$) variation in the crude fiber content of the biscuits prepared. Based on the DNMRT additional test, all treatments revealed a very significant difference in the crude fiber content of the biscuits at the level of = 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 plaintainplantain flour (%)	Crude Fiber Content (%)		Standard Deviation
A = 90:10	8,38	a	0.04583
B = 80:20	10,08	b	0.0251661
C = 70:30	12,74	c	0.00000
D = 60:40	14,50	d	0.00000
E = 50:50	17,85	e	0.0057721

KK 4,91 %

Note: The numbers in the same column followed by different lowercase letters show a very significant the difference in the DNMRT follow-up test at the level of α = 0,01. KK is coefficient of diversity.

Biscuits had a crude fiber content ranging from 8.38 to 17.85%. The more plaintainplantain flour is used to make biscuits, the higher the crude fiber content. This is because plaintainplantain 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 plaintainplantain flour), which was 17.85%, while the lowest crude fiber content was identified in treatment A (90:10 comparison of purple rice flour and plaintainplantain flour), which was 8.38%. 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, the higher the crude fiber content, the higher the water content produced. The less purple rice flour and plaintainplantain flour used, the higher the crude fiber content, and vice versa.

The crude fiber content of biscuits produced for all treatments exceeded the 0.5% maximum allowed in the Indonesian National Standard [23]. This is because plaintainplantain flour contains more crude fiber than purple rice flour. PlaintainPlantain flour has 13.71% crude fiber [9]. The more plaintainplantain flour is used in the production of biscuits, the higher the crude fiber content of the biscuits. Crude fiber is made up of cellulose, pentose, 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 ($p \leq 0.01$) between purple rice flour and plaintainplantain flour. Based on a subsequent DNMRT test at the threshold of = 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

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 biscuits.

Table 10 Biscuit taste test value

Comparison of purple rice flour with ~~plaintain~~plantain flour (%)	Flavor value (%)	Description
A = 90 : 10	3.56	different (tasteless)
B = 80 : 20	4.88	somewhat similar (almost like banana)
C = 70 : 30	4.24	somewhat similar (almost like banana)
D = 60 : 40	5.00	similar (banana flavor)
E = 50 : 50	5.60	similar (banana flavor)

Notes: 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 ~~plaintain~~plantain flour) received the highest rating from the panelists for biscuit taste, with 5.60%. (similar). The panelists' lowest rating of the biscuit taste was 3.56% (different) in treatment A (comparison of purple rice flour with ~~plaintain~~plantain 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 ~~taste of the biscuit~~biscuit taste. The addition of ~~plaintain~~plantain flour and other ingredients can improve the taste of the biscuits. However, based on the panelists' acceptance data, it can be determined that the panellists have accepted the combination of purple rice flour with ~~plaintain~~plantain 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~~greatly influence scent. There are four types of aromas that the nose may detect: aromatic, sour, rancid, and burnt. The scent also influences ~~the delicacy and taste of food products, which consists~~food products' delicacy and taste, consisting of three components: smell, taste, and stimulation [38]. Table 11 displays the panellists' ratings on the scent of biscuits.

Table 11 Biscuit aroma test value

Comparison of purple rice flour with ~~plaintain~~plantain flour (%)	Aroma Value(%)	Description
A = 90 : 10	3.36	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)

Notes: 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 ~~plaintain~~plantain flour) received the highest rating from the panelists for biscuit scent, with 5.44%. (similar). The panellists' lowest estimate of the biscuit scent was 3.36% (different) in treatment A (comparison of purple rice flour with ~~plaintain~~plantain flour 90:10).

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 panellists' ratings of biscuit texture.

Table 12 Value of biscuit texture test

Comparison of purple rice flour with ~~plaintain~~plantain 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)

Notes: 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 ~~plaintain~~plantain 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 ~~plaintain~~plantain flour). The panellists' acceptance rating is 3.52% (dislike) on a scale of dislike to like (90:10).

The more ~~plaintain~~plantain 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 ~~plaintain~~plantain flour 90:10). The biscuits would harden or solidify. The water, fat, protein, and carbohydrate content of food heavily influences its texture. The texture is a pressure sensation that can be felt with the mouth (when biting, chewing, and swallowing). Texture sensing can detect wetness, dryness, hardness, smoothness, roughness, and oiliness [40].

d. Color

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

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

Tabel 13 Nilai uji warna biskuit

Comparison of purple rice flour with ~~plaintain~~plantain 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 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 ~~plaintain~~plantain flour) received the highest color assessment of 5.52%. (similar). Because the panelists find the dark yellow color more appealing. Treatment A (comparison of purple rice flour and ~~plaintain~~plantain flour 90:10) received the lowest rating of 3.64% (different). Because panelists find light skin 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 panellists' acceptability of the product [36].

~~XXXXXX Add picture of the~~Figure 1 Final product of biscuit

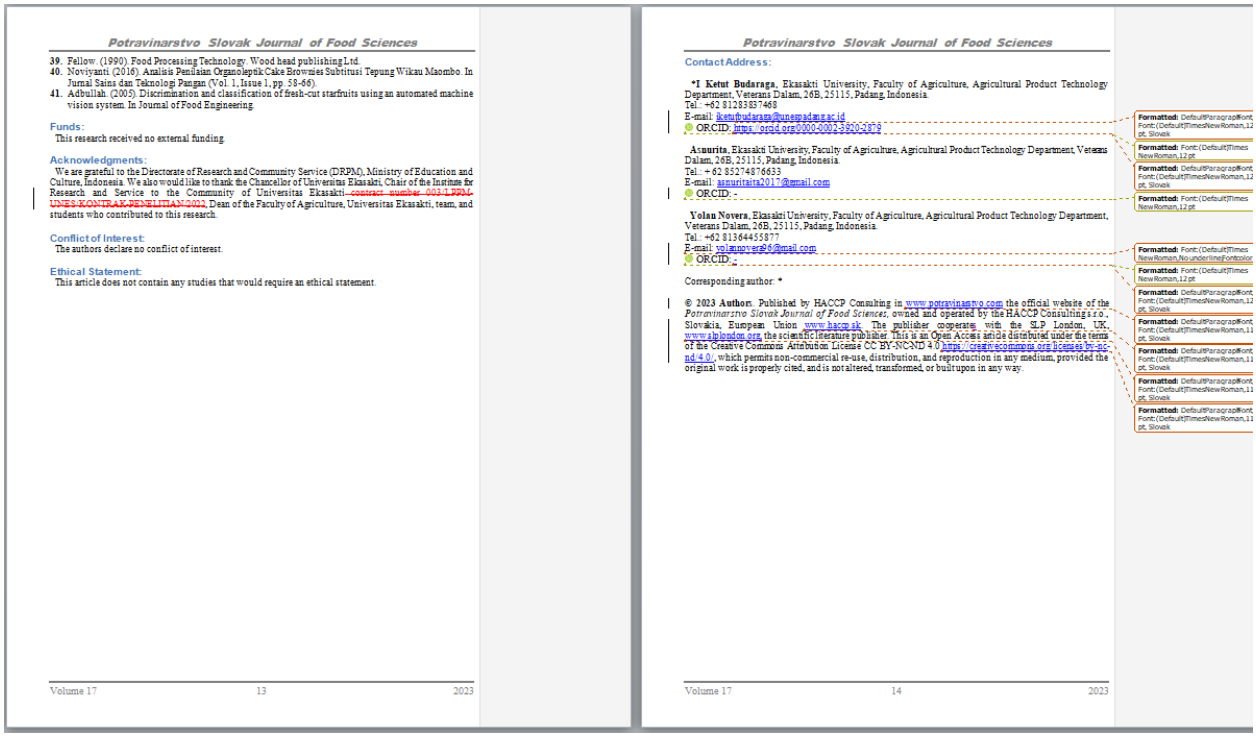
CONCLUSION

A comparison of purple rice flour and ~~plaintain~~plantain 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~~significant effect on water, ash, crude fibre, fat, protein, and carbohydrate content but had no effect on antioxidant activity. Treatment E has 3.56% 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% carbohydrate content (comparison of purple rice flour and ~~plaintain~~plantain 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 ~~plaintain~~plantain flour.

REFERENCES

1. Wijaya H. (2010). Kajian Teknisi Standar Nasional Indonesia Biskuit. SNI 01-2973-1992
2. Saksono. (2013, Agust 5). Pasar Biskuit Diproyeksi Tumbuh 8% Didorong Konsumsi. In Indonesia Finance Today. http://www. indonesiafinancetoday.com.
3. Sari, O.F. (2013). Formula Biskuit Kaya Protein Berbasis Spirulina Dan Kerusakan Mikrobiologis Selama Penyimpanan. Skripsi Program Studi Teknologi Hasil Perairan Fakultas Perikanan dan Ilmu Kelautan IPB. Bogor
4. Anonymous. (2021, Desember 22). Green Education Centre. In Budidaya Sorgum. http://budidaya-sorgum.html.
5. Bhattacharjee, P., Singhal, R. S. & Kulkarni, P. R. (2002). Basmati rice: A review. In International Journal of Food Science and Technology (Vol. 37, Issue 1, pp. 1–12). https://doi:10.1046/j.1365-2621.2002.00541.
6. Rerkasem. (2015). Effect Of Polishing Time On Distribution Of Monomeric Anthocyanin, Iron And Zinc Content In Different Grain Layers Of Four Thai Purple Rice Varieties. In International Journal of Agriculture and Biology (Vol. 17, Issue 4, pp. 828–832). https://doi:10.17957/IJAB/14.0012.
7. Sukhonthara. (2009). Characterization of Volatile Aroma Compounds From Red and Black Rice Bran. In Journal of Oleo Science (Vol. 58, Issue 3, pp. 155–161). https://doi:10.5650/jos.58.155.
8. Pietta P.G., (2000). Flavonoids as Antioxidants. In J. Nat. Prod. (Vol. 63, Issue 7, pp. 1035-1042). https://doi.org/10.1021/np9904509
9. Musita, N. (2014). Pemanfaatan Tepung Pisang Batu (*Musa Balbisiana Colla*) Pada Pembuatan Kue Brownies The Utilization Of Musa Balbisiana Banana Flour In Brownies. In Jurnal Riset Industri (Vol. 8, Issue 3, pp. 171–178).
10. Pothavorn. (2010). Sap phytochemical compositions of some bananas in Thailand. In J. Agric. Food Chem (Vol. 58, Issue 1, pp. 8782–8787). https://doi.org/10.1021/jf101220k
11. Gutierrez. (2007). Delivering pro-poor water and sanitation services: The technical and political challenges in Malawi and Zambia. In Geoforum (Vol. 38, Issue 5, pp. 886-900). https://doi.org/10.1016/j.geoforum.2005.09.010

12. Perez. (2005). Partial Characterization of Banana Starches Oxidized by Different Levels of Sodium Hypochlorite. In Carbohydrate Polymers (Vol. 62, Issue 1, pp. 50-56). https://doi.org/10.1016/j.carbpol.2005.07.005
13. Endra. (2006). Analisis Proksimat dan Komposisi Asam amino Buah Pisang Batu (Musa Balbisiana Colla). Fakultas Matematika dan Ilmu Pengetahuan Alam. Institut Pertanian Bogor.
14. Manley, D. (2000). Technology of biscuits, crackers, and cookies third edition.Woodhead Publishing Limited. https://doi.org/10.1201/NOE0849308956
15. Marwah. (2018). Kualitas fisiko kimia biskuit pada berbagai komposisi tepung terigu, tepung dengke dan tepung sagu. Universitas Hasanuddin.
16. Welly. (2012). Kajian formulasi tepung pisang batu (Musa balbisiana Colla) dan tepung terigu dalam pembuatan biskuit coklat. Universitas Lampung.
17. Mahmud, Y. (2014). keragaman angronomis beberapa varietas unggul baru tanaman padi (Oriza sativa L.) pada model pengolahan tanaman terpadu. In Jurnal Ilmiah Solusi (Vol. 1, Issue 1, pp. 1-10). https://doi.org/10.31943/agrowiralodra.v1i2.527
18. AOAC. (2005). 'Physical, chemical and sensory properties of brownies substituted with sweet potato flour (Ipomoea batatas L.) with the addition of black cumin oil (Nigella sativa L.). In IOP Conference Series: Earth and Environmental Science. https://doi.org/10.1088/1755-1315/102/1/012084
19. Molyneux, P. (2004). The Use of the Stable Free Radical Diphenylpicryl-hydrazyl (DPPH) for Estimating Antioxidant Activity. In Songklanakarin Journal of Science and Technology (Vol. 26, Issue 2, pp. 211–219). https://doi.org/10.1287/isre.6.2.144
20. Neswati, F. & Ropanti, A. (2014). The Addition (Brassica oleracea var italica) to Increase The Functional Propertis of Ice Cream. In Jurnal of Nutrition (Vol. 13, Issue 940, pp. 196-203). https://doi.org/10.3923/pjn.2014.196.203
21. Nurdjanah. (2011). Karakteristik Coklat Dari Campuran Tepung Pisang Batu (Musa Balbisiana) Dan Tepung Terigu Pada Berbagai Tingkat Subsitusi. In Jurnal Teknologi dan Industri Hasil Pertanian (Vol. 16, Issue 1)
22. Badan Standarisasi Nasional. (2009). SNI (Standar Nasional Indonesia) 3549-2009 tentang Tepung Beras.
23. Badan Standarisasi Nasional. (2011). SNI 01-2973-2011. Kajian teknis standar nasional indonesia biskuit.
24. Yuliyana. (2014). Pengaruh Substitusi Tepung Terigu Dengan Tepung Pisang Kapok (Musa Paradisiacal Formatypica) Terhadap Karakteristik Mie Kering Yang Dihasilkan. In Jurnal teknologi pertanian. (Vol. 3, Issue 1). https://doi.org/10.32520/jtp.v3i1.57
25. Lee. (1995). Physicochemical properties of Calcium-Fortified Rice. In Cereal Chemistry (Vol. 72, Issue 1, pp. 352-355).
26. Arraullo. (1976). Rice postharvest technology. International Development Research Centre.
27. Lii. (1996). Effect of Amylose Content on the Rheological Property of Rice Starch Cereal. In Chemistry (Vol. 73, Issue 1, pp. 415-420).
28. Badan Standarisasi Nasional. (2009). SNI 01-3751-2009. Tepung Terigu Sebagai Bahan Makanan.
29. Nurhayati. (2014). Teknologi Mutu Pisang Dengan Sistem Spray Drying Untuk Biskuit. In Jurnal dinamika penelitian indusrti (Vol. 25, Issue 1).
30. Zaddana. (2018). Aktivitas Antioksidan Dan Kandungan Serat Pangan Biskuit Campuran Bekatul Beras Merah (Oriza Glaberrima) Dan Ubi Jalar Ungu (Ipomoea Batatas). In Fitofarmaka jurnal farmasi (Vol. 8, Issue 2). https://doi.org/10.33751/jf.v8i2.1574
31. Riganakos, K.A. & Kontominas, M.G. (1995). Effect Of Heat Treatment On Water Sorption Behavior of Wheat Flours Using A Hygrometric Technique. In Dev Food Sci (Vol. 37, Issue C, pp. 995–1005). https://doi.org/10.1016/S0167-4501(06)80212-8
32. Hermayanti. Y. & Gusti, E. (2006). Modul Analisa Proksimat. SMAK 3 Padang.
33. Tuankotta. (2015). Perbandingan Kadar Protein Pada Tepung Beras Putih (Oryza Sativa L.), Tepung Beras Ketan (Oryza Sativa L Glutinosa), Dan Tepung Sagu (Mestroxylon Sagu Rottb.) Dengan Menggunakan Metode Kjeldahl. Universitas Islam Bandung.
34. Budaraga, I.K, & Salihat, R.A. (2020). Antioxidant Activity Of 'Broken Skin' Purple Rice, 'Skinned' Purple Rice, And Purple Rice Stem Organically Cultivated In Indonesia. In Int J Adv Sci Eng Inf Technol (Vol. 10, Issue 5, pp. 2132–2137). https://doi.org/10.18517/ijaseit.10.5.9634
35. Indriyani. (2013). Karakteristik Fisik, Kimia Dan Sifat Organoleptik Tepung Beras Merah Berdasarkan Variasi Lama Pengeringan. In Jurnal Pangan dan Gizi (Vol. 4, Issue 8).
36. Winarno, F.G. (2004). Kimia Pangan Dan Gizi. Gramedia Pustaka Utama.
37. Setyaningsih. (2010). Analisis Sensori Untuk Industri Pangan Dan Agro. Penerbit IPB Press.
38. Winarno, F.G. (2008). Kimia Pangan dan Gizi. PT Gramedia Pustaka Utama.



39. Fellow. (1990). Food Processing Technology: Wood head publishing Ltd.
40. Noviyanti. (2016). Analisis Penilaian Organoleptik Cake Brownies Subtitusi Tepung Wikau Maombo. In Jurnal Sains dan Teknologi Pangan (Vol. 1, Issue 1, pp. 58-66).
41. Adbullah. (2005). Discrimination and classification of fresh-cut starfruits using an automated machine vision system. In Journal of Food Engineering.

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Contact Address:

***I Ketut Budaraga**, Eksakti University, Faculty of Agriculture, Agricultural Product Technology Department, Veterans Dalam, 26B, 25115, Padang, Indonesia.
Tel.: +62 8128387468
E-mail: iketutbudaraga@unespadang.ac.id
ORCID: https://orcid.org/0000-0002-3920-2878

Asnurita, Eksakti University, Faculty of Agriculture, Agricultural Product Technology Department, Veterans Dalam, 26B, 25115, Padang, Indonesia.
Tel.: +62 85274876633
E-mail: asnuritaita2017@gmail.com
ORCID: -

Yolan Novera, Eksakti University, Faculty of Agriculture, Agricultural Product Technology Department, Veterans Dalam, 26B, 25115, Padang, Indonesia.
Tel.: +62 81364455877
E-mail: yolannovera96@gmail.com
ORCID: -

Corresponding author: *

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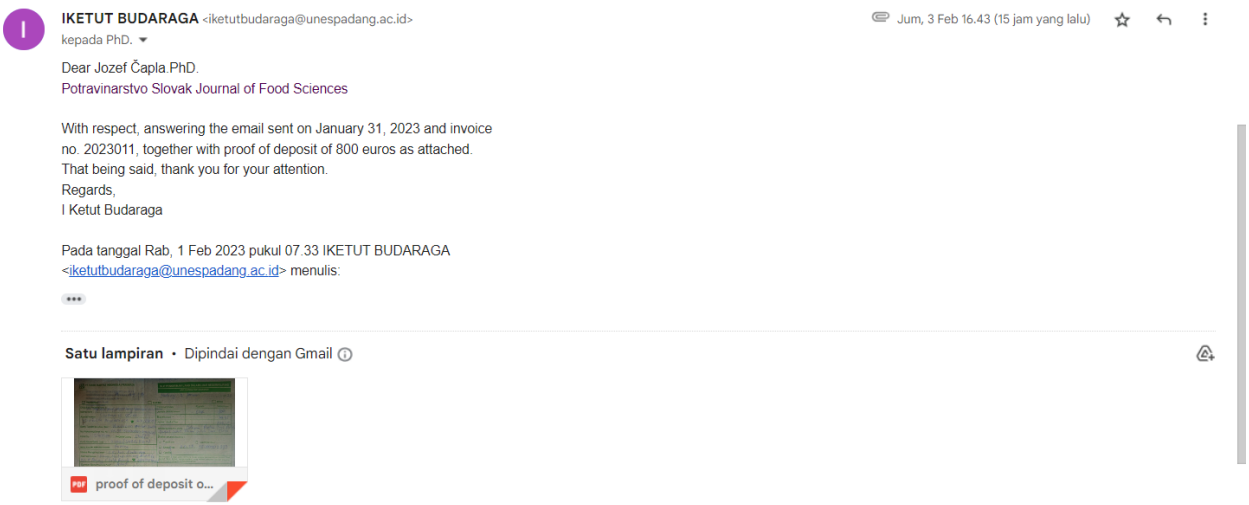

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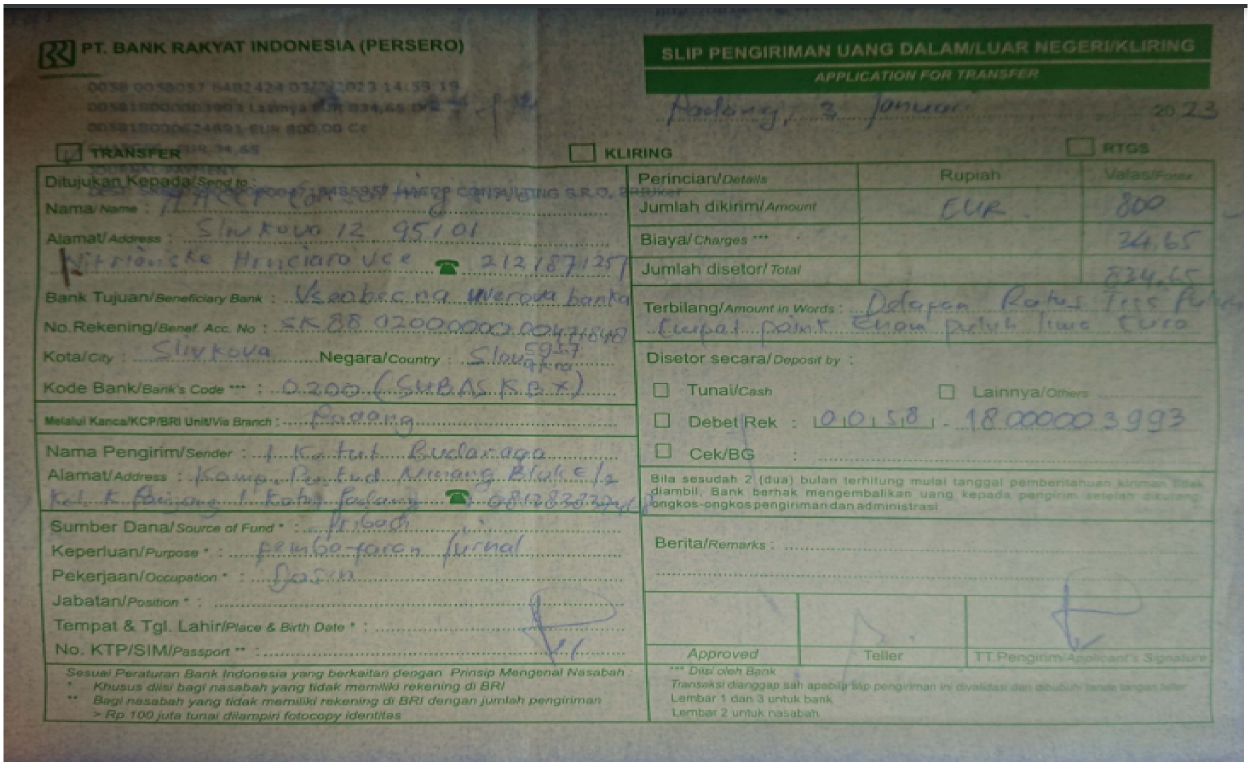

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Biaya/*Charges* ***		34.65
Jumlah disetor/*Total*		834.65

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☐ Debet Rek : 0058 - 18000003993
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DETAIL TRANSAKSI

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Tipe Biaya	OUR	Nominal Biaya	34,65 EUR
Jenis Pembayaran	ACCOUNT	Total Debet	834,65 EUR
Rekening Sumber	XXXX 03993		
Nama Rekening	Lainnya		
Nominal Transaksi	800,00 EUR		

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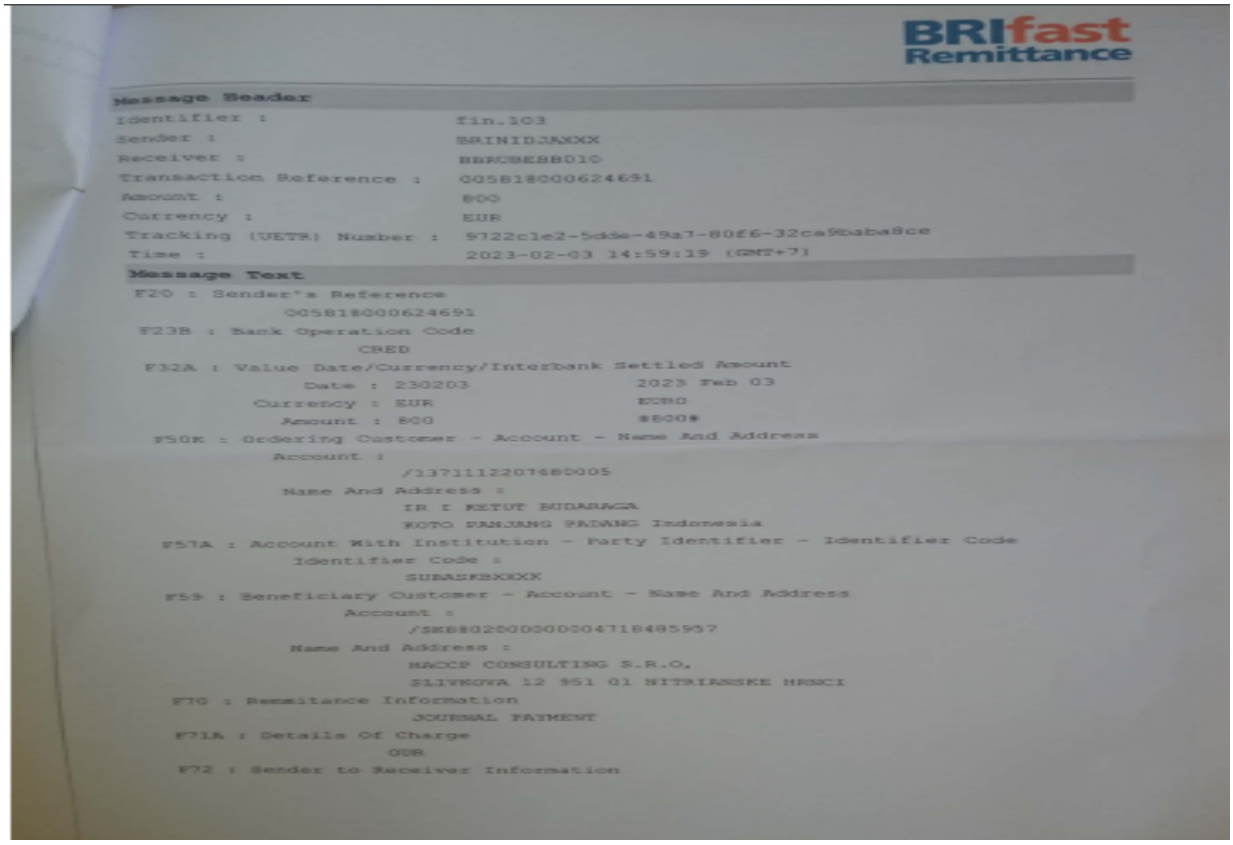

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Message Text

:20 : Sender's Reference
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:23B : Bank Operation Code
CRED
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Date : 230203 2023 Feb 03
Currency : EUR EURO
Amount : 800 *800*
:50K : Ordering Customer - Account - Name And Address
Account :
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Name And Address :
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KOTO PANJANG PADANG Indonesia
:57A : Account With Institution - Party Identifier - Identifier Code
Identifier Code :
SUBASKBXXXX
:59 : Beneficiary Customer - Account - Name And Address
Account :
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Name And Address :
HACCP CONSULTING S.R.O.
SLIVKOVA 12 951 01 NITRIANSKE HRNCI
:70 : Remittance Information
JOURNAL PAYMENT
:71A : Details Of Charge
OUR
:72 : Sender to Receiver Information

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