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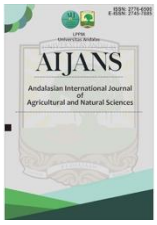

Article

CHARACTERISTICS OF INSTANT STEAMED SPONGE CAKE FLOUR FROM BLENDING PURPLE SWEET POTATO FLOUR (Ipomoea Batatas Var Ayumurasaki), MUNG BEAN FLOUR (Vigna Radiata) AND CORN FLOUR (Zea Mays)

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Abstract

This research aims to get the best formulation which liked by panelist by considering the chemical characteristics from blending of purple sweet potato flour, mung bean flour and corn flour. This research has done at laboratory of agricultural technology, Andalas University, Padang on October until November 2021. The research has used Completely Randomized Design with 5 treatment and 3 repitition. Anlysis of data use Analysis of Varian (ANOVA), obvious difference result will be continued with Duncan's New Multiple Range (DMRT) at 5% obvious level. Some treatment are blending purple sweet potato flour, mung bean flour and corn flour they are A (40% : 60%), B (40% :50% : 10%), C (40%: 40% : 20%), D (40% : 30% : 20% and E (40% : 20% : 40%). The research result indicate that blending of purple sweet potato flour, mung bean flour and corn flour is obvious significantly influenced to some analysis of water, ash, fat, protein,carbohidrate,antioxidan activity, water activity, crude fiber instant steamed sponge cake flour.

INTRODUCTION

Steamed sponge or cake based on flour (wheat flour) whose manufacturing process is steamed and has a sweet taste. The main ingredient in the manufacture of steamed sponge that is commonly used is wheat flour. Indonesian people are the users of wheat flour in large quantities because many food industries use wheat flour as a basic ingredient. This means that the need for wheat flour is increasing so that it can result in higher import activity and value. While in Indonesia many local natural resources have high nutritional value and can be produced to reduce the use of wheat flour. Various types of tubers and seeds have the potential to meet nutrients and increase the variety of various food products including purple sweet potatoes, green beans, and corn.

Purple sweet potatoes are one of the varieties of sweet potatoes that are widely found in Indonesia. According to [1] Indonesia produces purple sweet potatoes per hectare, one of which is in the West Sumatra area, which is 29.4 quintals per hectare. Therefore, purple sweet potatoes are very easy to find in the market at a fairly cheap price and also have the nutritional content needed by the body such as fiber, B vitamins, vitamin C, carbohydrates, and anthocyanins, so it has the potential to be developed into raw materials for various processed foods. Purple sweet potatoes have almost the same content as wheat flour. Wheat

flour contains amylose of 28% and amylopectin of 72%. Purple sweet potato flour contains 24.79% amylose and 49.78% amylopectin, so purple sweet potatoes have the potential to reduce the use of wheat flour [2].

Purple sweet potatoes also have the potential to be used as a source of natural dyes and antioxidants in foods due to the high anthocyanins they contain. Purple sweet potatoes have a low protein content, the protein content in purple sweet potato flour can be increased by the addition of green beans.

According to [3] green beans have a protein content of 20-25% with the highest amino acid content, namely leucine (12.90%), and the lowest is found in the amino acid methionine (0.84%) and carbohydrate content of more than 55% and fiber 4.1 grams so that it can be used in the substitution of wheat flour-based products.

Instant flour for steamed sponge is instant -made flour in which it has contained a mixture of ingredients in the manufacture of steamed sponge such as flour, sugar, vanilla, milk powder, and developers that have been mixed in such a way in the form of powder in accordance with the formulation that has been determined so that in making steamed sponge is easier and practical [4].

Mixing purple sweet potato flour and green bean flour produced by steamed sponge produced by laguna is very pronounced. With cornmeal enhancers, the laguna is reduced. Based on the background above, the author is interested in conducting research with the title Characteristics of Instant Flour For Steamed Steamed Sponge Based on Purple Sweet Potato Flour (Ipomoea batatas var ayumurasaki), Green Bean Flour (Vigna radiata) and Corn Meal (Zea mays)..

EXPERIMENTAL SECTION

Materials

The ingredients used in the manufacture of purple sweet potato flour, green beans, and corn are obtained from the Padang City area and additional ingredients in the manufacture of instant-made flour such as vanilla, skim milk, baking powder, and others. The chemicals used for the analysis of the nutritional content of instant-made flour such as K2SO4, CuSO2H2O, NaOH, H 3BO3, HCl, hexane, selenium mix, H2SO4, Alcohol, methanol, BaCl2, H2O and other ingredients.

Instrumentation

The tools used in the process of making flour are instant to make steamed sponges from purple sweet potatoes, green beans, and corn, namely blenders, knives, plastic containers, 80 mesh sieves, cabinet dryers, ovens, scales, and tools for the analysis of raw materials consisting of aluminum cups, ovens, cyclotorial cups, furnaces, Kjeldahl pumpkins, hot plates, filter paper, soxhlet extraction tools, fat pumpkins, Erlenmeyer, measuring flask, test tube, measuring cup, Erlenmeyer, Aw meter and spectrophotometer.

Procedure

Purple Sweet Potato Flour Making [5]

Purple sweet potatoes are decorated, then peeled purple sweet potatoes are cleaned, then weighed as much as 4 kg and sliced thinly with a size of 1-3 mm. Then the slices are put in the oven at 60 °C for a time of 18 hours. Dried purple sweet potato chips are then ground or ground. The grind results are sifted with a sieve of 80 mesh.

Green Bean Flour Making [6]

Green bean seeds are decorated, then weighed. Then the green beans are soaked in a basin of water in a ratio of 4 times more than the number of green beans for 12 hours. Soaked green beans are twisted and discarded skin. Green bean seeds that have been twisted oven at a temperature of 60 °C for 8 hours. Dried green beans are ground until smooth and sifted with a sieve of 80 mesh.

Corn Meal Making

Corn kernels are further distorted soaked using 5% betel lime water for ±48 hours to separate the corn from the ari skin. Furthermore, flat corn or corn kernels are dried in the oven at a temperature of 50 °C for 24 hours. Then the dried corn cheeks that have been cleaned the arena skin is ground with a blender. Cornstarch is then sifted using a sieve of 80 mesh.

Making Instant flour steamed

Sweet potato flour, green beans, and corn are mixed according to the predetermined formula. Auxiliary ingredients or additives such as developers, vanilla, and milk powder are added to the mixture of purple sweet potato flour, green bean flour, and cornmeal. All ingredients are mixed until homogeneous. Packaging is carried out and closed tightly.

Making Steamed Sponges

The first stage of margarine is melted and cooled. Then the eggs and refined sugar are mixed until fluffy for approximately ± 15 minutes at high speed. After that put the steamed sponge flour, mixer ± 3 minutes. Then put margarine that has been melted until evenly after that pour the dough into a baking sheet that has been smeared with margarine and steamed for ± 25 minutes.

RESULT AND DISCUSSION

RESULTS AND DISCUSSION

Raw Material Analysisahan Baku

The results of chemical analysis on raw materials can be seen in table 1.

Table 1. Results of Chemical Analysis Raw Materials Instant Flour to Process Brownies

Materials	Flour Purple yam	Flour Green Beans	Flour Corn
Water Content (%)	4,7	7,5	5,2
Ash Content (%)	2	3	1
Antioxidant (%)	84,50	22,72	3,15
Protein (%)	2,74	19,84	8,8

The water content of the analysis of green bean flour and cornmeal ranges from 7.5% and 5.2%. The results of the analysis are in accordance with [7] green bean flour and [8] cornmeal, the maximum moisture content ranges from 10%. Low water content will extend the shelf life of flour, as it can slow down the growth of microorganisms. The ash content of purple sweet potato flour obtained ranges from 2%. The ash content of green bean flour obtained ranges from 3%. The ash content in cornstarch based on [8] is a maximum of 1.5% while the analysis of the results of the study obtained a result of 1%.

The results of the antioxidant analysis of purple sweet potato flour at a concentration of 1000 ppm by 84.50%, green bean flour at a concentration of 1000 ppm by 22.72, and cornmeal at a concentration of 1000 ppm by 3.15%.

The results of the analysis of sweet potato protein levels obtained were 2.74%, the results of the analysis in the study conducted were not much different from the research of [9] the protein content obtained from the study was 2.79%. The protein content of green beans obtained is 19.84%, while according to [10] the protein content of green bean flour is 19.09%. The protein content of cornstarch obtained from this study was 8.8%. Protein analysis conducted by the Health Team of the Asgar Organization, 2014 cornmeal protein by 9.2%.

Analysis of The Chemical Properties of Instant to-Process Flour

Water Content

The results of the analysis of moisture content in steamed sponge instant flour for this exercise can be seen in Table 2 below.

Table 2. Average Value Of Oil Instant Flour Moisture Content Analysis

Treatment (Purple Sweet Potato Flour: Green Bean Flour : Flour Corn)	Moisture Content Value (%) (Average ± SD)
A = 40% : 60% : 0 %	9,25 ± 0,25 a
B = 40% : 50% : 10 %	8,50± 0,00 b
C = 40% : 40% : 20%	7,92 ± 0,63 b

D = 40% : 30% : 30%	7,71 ± 0,00	c
E = 40% : 20% : 40%	6,25 ± 0,25 a	d
CV : 4,45%		

Description : The numbers on the same column are followed by unequal lowercase letters, differing markedly on a level 5% Duncan's New Multiple Range Test (DNMRT)

The results of the variety fingerprint at the level of 5% show that the mixing of purple sweet potato flour, green bean flour, and cornstarch has a real different influence on the water content of flour instant for a steamed sponge. The highest water content obtained in product A is 9.25% and the lowest water content obtained in treatment E is 6.25%. The water content of instant -to-steamed sponge flour is comparable to green tea cookies premix flour which ranges from 8.53-to 9.12% [11]. The average content instant -to-process flour water produced is still in accordance with SNI, which is a maximum of 14.5%. This can also be seen from the results of raw material tests, green bean flour has the highest moisture content compared to other flours. The less the use of green bean flour the water content of instant-to-exercise flour decreases. The quality of the flour can be seen from the water content in it. The lower the water content of the flour, the better the quality of the flour produced, and vice versa.

Ash Content

The results of the analysis of ash levels in steamed sponge flour this exercise can be seen in table 3 below.

Table 3. Average Value Analysis of The Ash Content of Steamed Sponge Instant Flour for Exercise

Treatment (Purple Sweet Potato Flour: Green Bean Flour: flour corn)	Ash Content Value (%) (Average ± SD)
A = 40% : 60% : 0 %	3,25 ± 0,00 a
B = 40% : 50% : 10 %	2,50 ± 0,25 b
C = 40% : 40% : 20%	1,75 ± 0,25 c
D = 40% : 30% : 30%	1,25 ± 0,25 d
E = 40% : 20% : 40%	0,75 ± 0,00 e
CV : 11,77%	

Description : The numbers on the same column are followed by unequal lowercase letters, differing markedly on a level 5% *Duncan's New Multiple Range Test (DNMRT)*

The results of the variety fingerprint at the level of 5% that can be seen in Table 3 show that the mixing of purple sweet potato flour, green bean flour, and cornflour in the manufacture of instant flour for steamed sponges have a real different influence on the content of instant flour ash for the steamed sponge. The resulting instant flour has an ash content ranging from 3.25% - to 0.75%. The highest ash content is obtained in treatment A and the lowest ash content is in treatment E.. This can also be seen from the results of raw material tests, green bean flour has a higher ash content compared to other flours. The less the use of green bean flour content of instant flour ash decreases. The combustion or ignition process aims to burn or eliminate the content of organic substances in the material, while inorganic substances or mineral residues are expressed as ash

levels. Most foods are about 96% made up of organic matter and water, the rest is made up of minerals. Mineral elements are also known as inorganic substances or ash levels.

Protein Levels

The results of the analysis of protein levels in steamed sponge instant flour for this exercise can be seen in Table 4 below.

Table 4. Average Value Analysis of Protein Content of Steamed Sponge Instant Flour for Exercise

Treatment (Purple Sweet Potato Flour: Green Bean Flour Flour Corn)	Moisture Content Value (%) (Average ± SD)
A = 40% : 60% : 0 %	13,38 ± 0,10 a
B = 40% : 50% : 10 %	12,38± 0,07 b
C = 40% : 40% : 20%	11,33± 0,16 c
D = 40% : 30% : 30%	10,18± 0,11 d
E = 40% : 20% : 40%	08,74 ± 0,10 e
CV : 1,06%	

Description : The numbers on the same column are followed by unequal lowercase letters, differing markedly on a level 5% *Duncan's New Multiple Range Test (DNMRT)*

The results of the various prints showed that the formulation of purple sweet potato flour, green bean flour, and cornflour had a real effect on the protein content of instant flour for the steamed sponge. In the results of raw material tests, green bean flour has a higher protein content compared to other flours, the less the use of green bean flour content of instant -to-process flour protein decreases. The content of steamed flour instant -made protein depending on each formulation of purple sweet potato flour, green bean flour, and cornmeal ranges between 8.74% and 13.38%. The highest protein content is found in treatment A with a ratio of purple sweet potato flour, green bean flour, and corn 40%: 60%: 0, and the lowest in treatment E with a ratio of 40%: 20%:40%. The results of calculating the estimated protein content by summing the protein content of each flour used are lower than the results of laboratory analysis. This is due to the addition of milk in instant process flour that also contains protein.

Fat Content

The results of the analysis of fat content in this instant exercise flour can be seen in table 5 below.

Table 5. Average Value Of Analysis of instant Exercise Flour Fat Content

Treatment (Purple Sweet Potato Flour: Green Bean Flour: flour corn)	Fat Content Value (%) (Average ± SD)
A = 40% : 60% : 0 %	1,32 ± 0,21 a
B = 40% : 50% : 10 %	1,89 ± 0,13 b
C = 40% : 40% : 20%	2,13 ± 0,21 b
D = 40% : 30% : 30%	2,48 ± 0,12 c
E = 40% : 20% : 40%	2,54 ± 0,12 c
CV : 7,94%	

Description : The numbers on the same column are followed by unequal lowercase letters, differing markedly on a level 5% *Duncan's New Multiple Range Test (DNMRT).*

Based on the results of table 5 shows that the comparison of purple sweet potato flour, green bean flour, and cornstarch differs statistically markedly at a level of 5% to the fat content of the instant flour for steamed sponge produced. It can be seen that the result of the resulting content instant exercise flour fat ranges from 1.32% - to 2.54%. According to [13], the fat content of cornstarch is 3.9%. The fat content of green bean flour according to [12] is 1-1.2%, while the fat content of purple sweet potato flour according to [9] is 0.81%. The higher the addition of cornstarch, the more fat content in the instant flour for the steamed sponge. This is because the fat content of corn flour is higher in fat content compared to green bean flour and purple sweet potato flour.

Carbohydrate Levels

The results of the analysis of carbohydrates in instant flour can be seen in Table 6 below.

Table 6. Average Value of instant Exercise Flour Carbohydrate Analysis

Treatment (Purple Sweet Potato Flour: Green Bean Flour : flour corn)	Carbohydrate Content Value (%) (Average ± SD)
A = 40% : 60% : 0 %	72,80 ± 0,27 a
B = 40% : 50% : 10 %	74,73 ± 0,18 b
C = 40% : 40% : 20%	76,65 ± 0,19 c
D = 40% : 30% : 30%	78,87 ± 0,,52 d
E = 40% : 20% : 40%	81,72 ± 0,20 e
CV : 1,24%	

Description : The numbers on the same column are followed by unequal lowercase letters, differing markedly on a level 5% *Duncan's New Multiple Range Test (DNMRT)*

Based on the results of table 6 shows that the comparison of purple sweet potato flour, green bean flour, and cornmeal differs statistically markedly at a level of 5% to the carbohydrate content instant steamed flour produced. It can be seen that the result of the resulting content of instant flour fat ranges from 72.80% - to 81.72%. The increase in the carbohydrate content of instant steamed flour is suspected to come from the content of raw materials, the carbohydrate content of purple sweet potato flour by 83.81% [9], green bean flour carbohydrates by 68.78% [14] and cornmeal carbohydrate content of 73.7% [13]. So that the higher the use of cornstarch, the higher the carbohydrate content of the instant flour. The highest carbohydrate content is found in purple sweet potato flour. According to [15], Sweet potatoes are a good source of energy in the form of carbohydrates.

Crude Fiber Content

The results of the analysis of coarse fiber levels in this instant flour can be seen in Table 7 below.

Table 7. Average Value Analysis of The Content of Coarse Fiber Of instant Flour

Treatment (Purple Sweet Potato Flour: Green Bean Flour: flour corn)	Rough Fiber Content Value (%) (Average ± SD)
A = 40% : 60%	3,72 ± 0,10 a

B = 40% : 50% : 10 %	3,89 ± 0,15 b
C = 40% : 40% : 20%	3,95 ± 0,18 bc
D = 40% : 30% : 30%	4,06 ± 0,10 c
E = 40% : 20% : 40%	4,56 ± 0,20 d
CV : 4,96%	

Description : The numbers on the same column are followed by unequal lowercase letters, differing markedly on a level 5% *Duncan's New Multiple Range Test (DNMRT)*

Based on the results of table 7 shows that the comparison of purple sweet potato flour, green bean flour, and cornstarch differs statistically markedly at a level of 5% to the crude fiber content of the instant flour for steamed sponge produced. Table 20 shows the highest crude fiber content in product E with a treatment of 40%: 20%: 40% with a rough fiber content of 4.56% and product A with a treatment of 40%: 60% is the product with the lowest coarse fiber with coarse fiber content 3.72%. According to [14] green, bean flour has a rough fiber content of 6.9%, while the rough fiber content of cornmeal according to [16] is 9.03%. The rough fiber content of corn flour is higher than that of green bean flour, so the more addition of cornflour, the higher the coarse fiber content in instant flour produced.

Antioxidant Activity

The results of the analysis of the antioxidant activity in this instant exercise flour can be seen in the following table 8.

Table 8. Average Value Of Antioxidant Activity Analysis of instant Flour

Treatment (Purple Sweet Potato Flour: Green Bean Flour: flour corn)	Antioxidant Activity Value (%) (Average ± SD)
A = 40% : 60% : 0 %	57,31 ± 0,44 a
B = 40% : 50% : 10 %	54,06 ± 0,19 b
C = 40% : 40% : 20%	53,74 ± 0,26 b
D = 40% : 30% : 30%	52,79 ± 0,61 c
E = 40% : 20% : 40%	48,35 ± 0,51 d
CV : 0,86 %	

Description : The numbers on the same column are followed by unequal lowercase letters, differing markedly on a level 5% *Duncan's New Multiple Range Test (DNMRT)*

Based on the results of table 8 show that the mixing of purple sweet potato flour, green bean flour, and cornmeal in making instant flour for steamed sponges have a real different influence on the antioxidant activity of steamed sponges instant flour for processing. The antioxidant activity of instant steamed flour is ranging from 57.31% - to 48.09%. The highest antioxidant activity is obtained in product A with a treatment of 40%: 60% and the lowest activity is found in product E with a treatment of 40%: 20%: 40%. The antioxidant content is obtained from the addition of purple sweet potato flour. The type of antioxidant found in purple sweet potatoes is anthocyanins. All treatments will give the same impact on purple sweet potatoes because the treatment for purple sweet potato flour is all the same, which gives a difference are the antioxidants contained by green bean flour and cornstarch.

Value aw

The results of the analysis of aw values on this instant flour can be seen in table below.

Table 9. Average Value Analysis of the aw value of instant Flour.

Treatment (Purple Sweet Potato Flour: Green Bean Flour: flour corn)	Values a_w (Average ± SD)
A = 40% : 60% : 0 %	0,442 ± 0,00 a
B = 40% : 50% : 10 %	0,434 ± 0,00 b
C = 40% : 40% : 20%	0,432 ± 0,00 b
D = 40% : 30% : 30%	0,428 ± 0,00 c
E = 40% : 20% : 40%	0,420 ± 0,00 d
CV : 0,86 %	

Description : The numbers on the same column are followed by unequal lowercase letters, differing markedly on a level 5% *Duncan's New Multiple Range Test (DNMRT)*

Based on the results of table 9 shows that the antioxidant activity produced ranges from 0.420-to 0.442. The highest aw rate is found in product A with a treatment of 40%: 60% and the lowest is found in product B with a treatment of 40%: 20%: 40%. The aw value is directly proportional to the water content the higher the water content, the higher the aw value. Based on the moisture content obtained by each treatment, the moisture content will be low if the addition of cornflour is more and more, meaning that the aw value will be higher if the addition of cornmeal is more and more. The value of aw is very related to the shelf life of the product. The higher the value of aw, the greater the risk of foodstuffs, because the chances of damage due to microbial activity increase [17].

CONCLUSION

Stabilizers in the form of CMC, gum arabic and lecithin at concentrations of 0%, 0.3%, 0.5%, 0.7% and 0.9% to the emprit ginger extract tempe beverage had a significantly different effect on Sig. <0.05 to viscosity (gum arabic 0.9%), stability (CMC 0.7%), protein content (lecithin 0.9%), pH value (gum arabic 0.7%), and total dissolved solids (gum arabic 0.7% but had no significant effect on ash content. In addition, the treatment of tempe extract with ginger extract which produced the best characteristics was seen from the analysis of the decision-making system using MADM.

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