

# Different Concentrations Of Cassava Flour (*Manihot utilisima*) And Wheat Flour On The Physicochemistry And Organoleptic Quality Of High-Fiber Steamed Brownies

Nikolaus Gabriel Susanto<sup>1</sup>, Fadjar Kurnia Hartati<sup>2\*</sup>

Food Technology Department, Faculty of Agriculture, Dr. Soetomo University, Surabaya, Indonesia

Author Email: [nikogabriel10900@gmail.com](mailto:nikogabriel10900@gmail.com)<sup>1</sup>, [fadjar.kurnia@unitomo.ac.id](mailto:fadjar.kurnia@unitomo.ac.id)<sup>2\*</sup>

Orcid: <https://orcid.org/0000-0002-9039-2161><sup>2\*</sup>

**Abstract.** At present, the level of public consumption of wheat flour is increasing but the production of wheat in Indonesia is very minimal so Indonesia still expects imports from several countries. Meanwhile, the use of low-fiber wheat flour can increase peoples consumption in excess, so it can increase excess calorie levels in the body which can trigger obesity. Therefore, it necessary to substitute local-based flour such as cassava flour to reduce wheat flour consumption and increase fiber content in the resulting product. This study aims to determine the effect of different concentrations of wheat flour and cassava flour and determine the right concentration on the chemical and organoleptic quality of steamed brownies as high fiber food. The research method used a research design using a 1-factor Completely Randomized Design (CRD) with 4 treatments and 3 replications. Chemical quality analysis on steamed brownies, namely water content, crude fiber content, and calories. The organoleptic test is color, aroma, taste, and tenderness. The results showed that between different proportions of wheat flour and cassava flour had a significant effect on crude fiber content and very significant effect on calorie content. Based on the determination of all research parameters, it shows that formulation 3 with 60 grams wheat flour and 40 grams cassava flour is the best treatment with a result value (NH) 0.692 with parameter criteria in the form crude fiber content 22.9%, calorie content 6.74 cal, moisture content 19.04%, tenderness 3.68 (like), color 3.96 (like), taste 3.78 (like), and aroma 3.89 (like).

**Keywords:** Cassava Flour, Low Calorie, Steamed Brownies, Wheat Flour

## 1 Introduction

Wheat flour is one of the flours that is often used in making *brownies*. Wheat flour is made from mashed wheat grains. According to Verem *et al.*, (2021) wheat flour contains 67.67% carbohydrates, 10.24% protein, 1.52% fat, 5.60% ash content, 10.20% water content, 2.05% crude fiber and calories of 328.40 kcal/100mg [1]. At present, the level of public consumption of wheat flour is increasing but wheat production in Indonesia is very minimal for the manufacture of wheat flour so that Indonesia still expects imports from several countries. However, this imported flour has an unstable price and often increases. Therefore, it is necessary to substitute locally-based flour to reduce wheat flour consumption. According to the Central Statistics Agency (BPS) in 2022, the average per capita consumption of wheat flour in Indonesia as of 2022 is 2.75 kg. Cassava flour is one of the flours based on local ingredients that can be used in replacing the use of wheat flour.

Cassava is one type of tuber that is found in Indonesia. According to Sandia *et al.*, (2019) cassava contains calories of 146 calories per 100 g and dietary fiber of 13.72 g per 100 g. Cassava is one of the local foods low in protein and has almost the same characteristics as wheat flour, so cassava flour can be used as a substitute or substitute for wheat flour in the manufacture of cake and bakery products, one of which is *brownies* [2]. In addition, the use of cassava can also be used as a diet food because it has high fiber so that individual consumption of food can be limited and can reduce excess calorie levels in the body. Therefore, it is hoped that the use of cassava-based flour can be utilized properly by the community in order to maintain a healthy lifestyle. This is because the use of wheat flour that is low in fiber can increase excessive public consumption, so that it can increase excessive calorie and protein levels in the body which can trigger obesity.

Overweight and obesity are popular symptoms and diseases in the community because of unhealthy lifestyles and not paying attention to diet. Indonesia is one of the countries with high rates of overweight and obesity. Based

on data from Riskesda in 2023, people who are overweight or overweight at the age of >18 years old are around 21.8% and obese people in Indonesia reach 15.3%. This disease can be caused by the tendency of people to consume food without paying attention to the content of the food. In addition, the high rate of overweight and obesity sufferers in Indonesia is caused by people being indifferent to a good diet and adequate exercise. One of the popular foods and much loved by the people of Indonesia with high calorie content is *brownies*.

*Brownies* are one type of flour-based chocolate cake that has a dense texture, not too fluffy, good aroma and attractive color. *Brownies* are products that can be processed through steaming and baking using an oven [3], [4]. *Brownies* have a dense texture and are not too fluffy because the manufacturing process does not require gluten [5]. So that in making *brownies* can use various types of flour other than wheat flour. The use of varied flour in making *brownies* has led to the development of various variations of *brownies* on the market ranging from taste, aroma, color and texture. This causes an economic increase in *brownies* and can be used by the community as an income field.

Based on the results of research from Amalia *et al.*, (2021) that steamed *brownies* can be made by substituting taro flour and steamed purple sweet potato flour (*talahibu*) to meet the energy needs of pregnant women [6]. In addition, according to research by Lubis *et al.*, (2021) that the substitution of reading fruit flour and potato starch can improve the quality and characteristics of the *brownies* produced [5]. Meanwhile, in Priyanti and Kurnianingsih's (2022) research, the use of sorghum flour and cassava flour can increase panelists' acceptance of *brownies* [7]. Based on the previous description, a study was conducted entitled "Different Proportions of Wheat Flour and Cassava Flour (*Manihot utilisima*) to the Chemical and Organoleptic Quality of Steamed *Brownies*" as a research update to produce high-fiber *brownies* that are safe for consumption for people and people with obesity or obesity.

## 2 Method

The method used in this study is in the form of laboratory experimental research. Where, researchers directly conduct experiments in the laboratory to obtain optimal final results and can minimize independent variables that can affect the final results of the tests studied [6].

### 2.1 Tool

The tools used in making steamed *brownies* are basins, *brownie* molds, stoves, bowls, *mixers*, aluminum packers, steamers, plates, spoons, spatulas, scales, tissues, and containers.

Tools used for chemical analysis include *bomb calorimeters*, bulbs, *aluminum cups*, *porcelain dishes*, *bucher funnels*, *desiccators*, *erlenmeyers*, *beakers*, hot plates, *moisture analyzers*, ovens, volume pipettes, and analytical scales.

### 2.2 Material

The ingredients used in making steamed *brownies* are Koepoe-Koepoe brand baking powder, Tulip brand chocolate bars (DCC), Tulip brand chocolate powder, Gulaku brand granulated sugar, Blueband brand margarine, Koepoe-Koepoe brand TBM, chicken eggs, cassava flour, blue triangle brand wheat flour, and vanilla brand Koepoe-Koepoe.

The materials used for chemical analysis were aquades, 96% alcohol, filter paper, labels, sulfuric acid solution (H<sub>2</sub>SO<sub>4</sub>), sodium hydroxide (NaOH) solution, and panellist containers.

### 2.3 Research Design

The research design used in this study was a Complete Randomized Design (RAL) consisting of 4 treatments and 3 repetitions of the proportion of wheat flour and cassava flour to produce high-fiber steamed *brownie* products. The treatment to be used, namely:

P1 = 100 gram wheat flour : 0 gram cassava flour

P2 = 70 gram wheat flour : 30 gram cassava flour

P3 = 60 gram wheat flour : 40 gram cassava flour

P4 = 50 gram wheat flour : 50 gram cassava flour

## 2.4 Research Procedure

The procedure for making high-fiber steamed brownies from wheat flour and cassava flour is as follows

### 1. Material Preparation

First of all, wheat flour and cassava flour were weighed according to the treatment, namely 100 g: 0 g, 70 g: 30 g, 60 g: 40 g, and 50 g: 50 g. After that, other ingredients were weighed in the form of granulated sugar as much as 100 g, eggs as much as 80 g, baking powder as much as 1 g, vanilla 1 g, TBM 2 g, margarine as much as 125 g, chocolate bars (DCC) as much as 25 g, and chocolate powder as much as 25 g.

### 2. Mixing Ingredients

In the first stage, granulated sugar, eggs, TBM, and baking powder are mixed until fluffy. Then, flour is added according to the treatment. After that, add vanilla and cocoa powder and mix again until smooth. Next, the margarine and chocolate bars (DCC) are steamed until melted, then put in the flour mixture dough and homogenized again until smooth.

### 3. Steaming of dough

On a brownie steaming baking sheet, first smear with margarine to taste. Next, add the brownie dough that has been homogenized in the previous stage. After that, the brownie dough is steamed for 30 minutes using the stove.

### 4. Brownies

The steamed brownies resulting from the steaming process are then packed in airtight containers. *Brownies* are further tested for chemical, physical, and organoleptic tests.

## 3 Results and Discussion

### 3.1 Water Content

Water is one component that is widely contained in a foodstuff. Moisture content parameters have a great influence in determining the quality of a food product. The higher the water content contained, the lower the quality of a product because it is easier for a microorganism to multiply [8]. The principle of moisture content testing is to heat treat samples with high temperatures until a constant weight is obtained. In foods that have a strong water binding, it will contain a lot of water content, and vice versa. The moisture content test results of steamed brownies can be seen in Table 1.

**Table 1.** Steamed brownie moisture test results

No	Sample Code	Deuteronomy			Total (%)	Average (%)
		1	2	3		
1	P1	22,15	16,83	22,93	61,91	20,63
2	P2	20,33	21,25	19,28	60,86	20,28
3	P3	19,3	18,2	19,63	57,13	19,04
4	P4	18,6	14,99	18,91	52,5	17,5

The test result data for the moisture content of high-fiber steamed brownies ranged from 17.5%-20.63%. The lowest water content results were obtained in *P4* treatment brownies using 50 grams of wheat flour and 50 grams of cassava flour, while the highest water content results were obtained in *P1* treatment brownies using 100 grams of wheat flour. The more cassava flour is added, the use of wheat flour will decrease so that the water content can decrease.

Based on the ANOVA results, it showed that the proportion of wheat flour and cassava flour had no real effect (sig. 0.312) at the level of 5% ( $p < 0.05$ ) on the results of testing the moisture content of the steamed brownies produced. The results obtained showed that there was a decrease in the percentage of moisture content along with the reduction in the use of wheat flour. This is because wheat flour has a high starch and protein content with properties that can bind water well so that the more the use of wheat flour, the water that can be tied to food will decrease so that the water content in *brownies* decreases [9]. Therefore, in the control treatment with the use of wheat flour as much as 100 grams has the highest water content because it uses wheat flour with the most composition. This is in accordance with the research of Siswanto *et al.*, (2015) that wheat flour has high levels of starch and protein with strong properties in absorbing water [10].

### 3.2 Rough Fiber Content

Fiber is a component of carbohydrates that cannot be digested by the body. This test aims to determine the crude fiber content from the use of peanut flour and dragon fruit peel flour in the cookies produced. The principle of testing fiber content is by hydrolyzing samples using strong acids and dilute strong acids so that substances other than fiber will dissolve [11]. The results of the recap of the crude fiber content test of high-fiber steamed brownies can be seen in Table 2.

**Table 2.** Results of testing the rate of coarse fibers of steamed brownies

No	Sample Code	Deuteronomy			Total (%)	Average (%)
		1	2	3		
1	P1	19,24	17,49	21,76	58,49	19,49 <sup>a</sup>
2	P2	22,56	22,5	20,62	65,68	21,89 <sup>ab</sup>
3	P3	23,36	22,26	23,09	68,71	22,90 <sup>ab</sup>
4	P4	22,96	25,75	23,55	72,26	24,08 <sup>b</sup>
KK Value = 6,52 % (BNJ, $\alpha=5\%$ )						

Description: The letter behind the number with the same notation on the average shows no difference in the BNJ test  $\leq 5-10\%$

The test result data for the crude fiber content of high-fiber steamed brownies ranged from 19.49%-24.08%. The lowest crude fiber content results were obtained in P1 treatment brownies using 100 grams of wheat flour, while the highest crude fiber content results were obtained in P4 treatment brownies using 50 grams of wheat flour and 50 grams of cassava flour. The more cassava flour is added, the use of wheat flour will decrease so that fiber content can increase.

Based on the ANOVA results, it shows that the proportion of wheat flour and cassava flour has a significant effect (sig. 0.024) at the level of 5% ( $p < 0.05$ ) on the test results of the crude fiber content of steamed brownies produced. Then, based on the results of BNJ's further test with a level of 5%, it was found that steamed brownies using control treatment with a composition of 100 grams of wheat flour were very different from steamed brownies using 50 grams of wheat flour and 50 grams of cassava flour. The results obtained showed that there was an increase in the percentage of crude fiber content in steamed brownies using 50 grams of wheat flour and 50 grams of cassava flour. This is because cassava flour has a higher fiber content than wheat flour, which is 13.72 g / 100 grams [12]. Therefore, the more the proportion of cassava flour used, the higher the fiber content produced. This is in accordance with Pulungan's (2013) research that cassava flour substitution can increase the fiber content in the steamed brownies produced [13].

### 3.3 Calorie Content

Calories are the amount of energy contained in a food product that serves as a source of energy for the body. Calorie content parameters can affect glycemic index levels in the body which can trigger an increase in human blood sugar levels. Calorie content has a relationship that is directly proportional to fat content. Where, fat is one of the major energy contributors in the body. The principle of testing calorie levels using a bomb calorimeter is to burn biomass samples and then measure the combustion effect that occurs [14]. The results of the recap of testing the calorie content of high-fiber steamed brownies can be seen in Table 3.

**Table 3.** Steamed Brownies Calorie Rate Test Results

No	Sample Code	Deuteronomy			Total (cal)	Average (cal)
		1	2	3		
1	P1	9,63	8,67	8,97	21,21	9,00 <sup>c</sup>
2	P2	7,43	7,1	7,91	22,44	7,48 <sup>b</sup>
3	P3	7,56	7,18	5,48	20,22	6,74 <sup>b</sup>
4	P4	4,12	4,88	5,37	14,37	4,79 <sup>a</sup>
KK Value = 9,88% (BNJ, $\alpha=5\%$ )						

Description: The letter behind the number with the same notation on the average shows no difference in the BNJ test  $\leq 5-10\%$

Data on calorie testing results of high-fiber steamed brownies ranged from 4.79 cal-9 cal. The lowest caloric results were obtained in P4 treatment brownies using 50 grams of wheat flour and 50 grams of cassava flour,

while the highest caloric results were obtained in P1 treatment brownies using 100 grams of wheat flour. The more cassava flour is added, the use of wheat flour will decrease so that calorie levels can decrease.

Based on the ANOVA results, it shows that the proportion of wheat flour and cassava flour is very different (sig. 0.000) at the level of 5% ( $p < 0.05$ ) from the results of testing the calorie content of steamed brownies produced. Then, based on the results of Duncan's further test with a level of 5%, it was found that steamed brownies using control treatment with a composition of 100 grams of wheat flour were very different from steamed brownies using 50 grams of wheat flour and 50 grams of cassava flour. The results obtained showed that there was a decrease in the percentage of calorie content in steamed brownies using 50 grams of wheat flour and 50 grams of cassava flour. The more use of cassava flour, the calorie levels produced will decrease. This is because cassava flour has a lower calorie content than wheat flour, which is around 146 cal / 100 g [2]. Therefore, steamed brownies produced with a larger proportion of cassava flour will reduce the calorie content of the brownies. This is in accordance with Pulungan (2013) research that cassava brownies have a lower calorie content than brownies made from wheat flour [13].

### 3.4 Organoleptic

#### 3.4.1 Taste

Taste is one of the sensory test parameters that determines the panelists' preference for the quality of the brownies produced and can be tested using the taste buds. In general, the resulting brownie flavor is sweet chocolate due to the use of additional ingredients such as chocolate bars, sugar, and other additives.

Data from the study of high-fiber steamed brownies ranged from 3.69-3.83. The lowest steamed brownie flavor organoleptic results were obtained in P4 treatment with the use of 50 grams of wheat flour and 50 grams of cassava flour, while the highest organoleptic results of steamed brownie flavor were obtained in P1 treatment with the use of 100 grams of wheat flour. Organoleptic results of the taste parameters of steamed brownies as high-fiber foods can be seen in Figure 1.

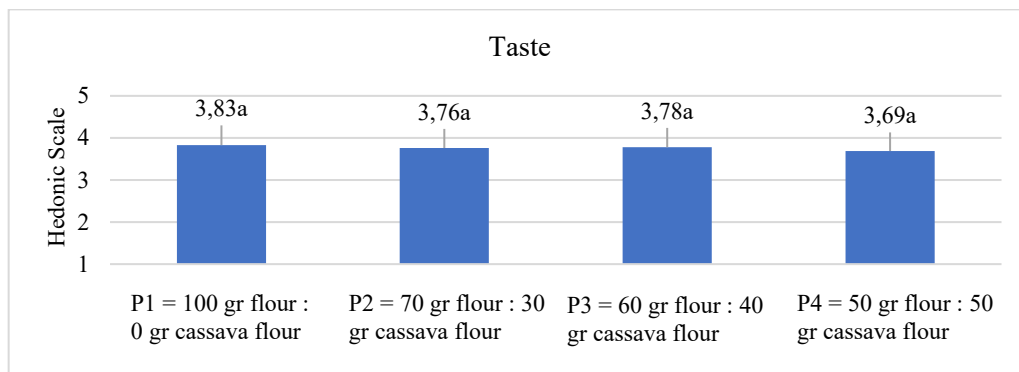


Figure 1. Organoleptic value of steamed brownie flavor

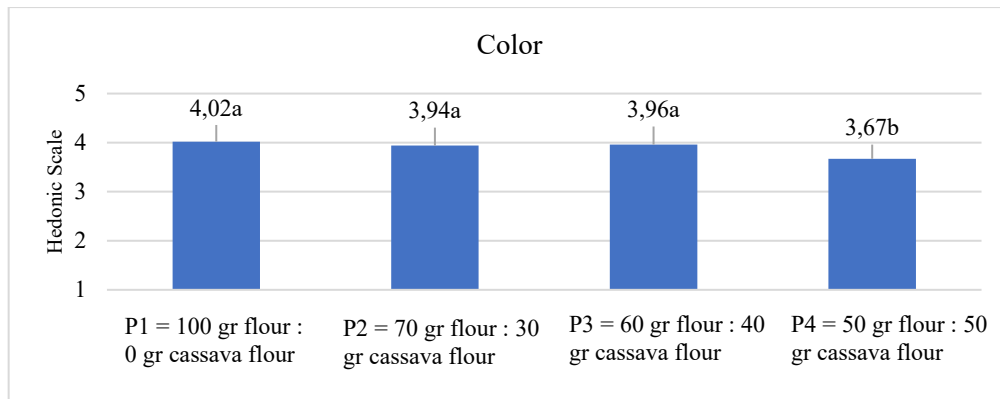
Based on the results of ANOVA showed that the combination of wheat flour and cassava flour in making steamed brownies had no real effect (sig. 0.000) at the level of 5% ( $p < 0.05$ ) on the taste of the resulting steamed brownies. The results obtained showed that steamed brownies using 100 g wheat flour had the highest value of 3.83 (like) with a sweet taste typical of brownies, while steamed brownies using 50 g wheat flour and 50 g cassava flour had the lowest value of 3.69 (like) with a less sweet taste. The use of cassava flour decreased the taste assessment by the panelists. This is because the addition of cassava flour can give cassava a distinctive taste to brownies so that panelists tend to prefer brownies with control treatment [13]. Therefore, the resulting steamed brownies have a fairly strong cassava flavor. This is in accordance with Yuniarti and Dwiani's (2021) research that the addition of cassava flour can reduce the taste of brownies because it can cause a distinctive cassava flavor [15].

#### 3.4.2 Color

Color is one of the sensory test parameters that determines the panelists' preference for the appearance of the resulting brownies that can be seen using the eyes. In general, the brownie color produced is brown due to the use of chocolate powder and chocolate bars.

Data from the study of high-fiber steamed brownies ranged from 3.67-4.02. The lowest organoleptic results of steamed brownie color were obtained in P4 treatment with the use of 50 grams of wheat flour and 50 grams of cassava flour, while the highest organoleptic results of steamed brownie color were obtained in P1 treatment with

the use of 100 grams of wheat flour. Organoleptic results of the color parameters of steamed brownies as high-fiber foods can be seen in Figure 2.



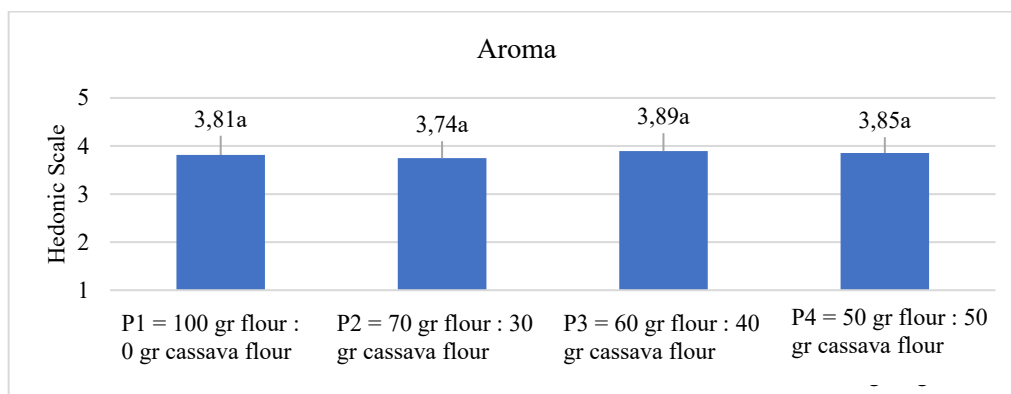
**Figure 2.** Organoleptic Value of Steamed Brownie Color

Based on the results of ANOVA shows that the combination of wheat flour and cassava flour in making steamed brownies has a significant effect (sig. 0.000) at the level of 5% ( $p < 0.05$ ) on the color of the steamed brownies produced. Then, based on the hedonic scale that has been converted, it is known that steamed brownies with control treatment have different values from steamed brownies that use various proportions of flour. The results obtained showed that steamed brownies using 100 grams of wheat flour had the highest value of 4.02 (likes) with a typical brownie brown color, while steamed brownies using 50 grams of wheat flour and 50 grams of cassava flour had the lowest value of 3.67 (likes) with a faded brown color. The less the use of wheat flour, the brownies produced will fade. This is because wheat flour has a higher amino acid content than cassava flour so that the maillard reaction that occurs during the steaming process will be faster [16]. This can lead to more brown pigment in brownies with the use of wheat flour in high proportions. Therefore, panelists tend to like brownies with the use of wheat flour in a larger composition. This is in accordance with Pangestika and Srimati's (2021) research that during the cake steaming process, a maillard reaction will occur which can form a brown pigment so that the resulting color becomes a distinctive brown [17].

### 3.4.3 Aroma

Aroma is one of the sensory test parameters that determines the panelists' preference for the quality of the brownies produced and can be tested using the sense of smell.

Data from the study of high-fiber steamed brownies ranged from 3.74-3.89. The lowest organoleptic results of steamed brownie aroma were obtained in P2 treatment with the use of 70 grams of wheat flour and 30 grams of cassava flour, while the highest organoleptic results of steamed brownie aroma were obtained in P3 treatment with the use of 60 grams of wheat flour and 40 grams of cassava flour. Organoleptic results on the aroma parameters of steamed brownies as high-fiber foods can be seen in Figure 3.



**Figure 3.** Nilai Organoleptik Aroma Brownies Kukus

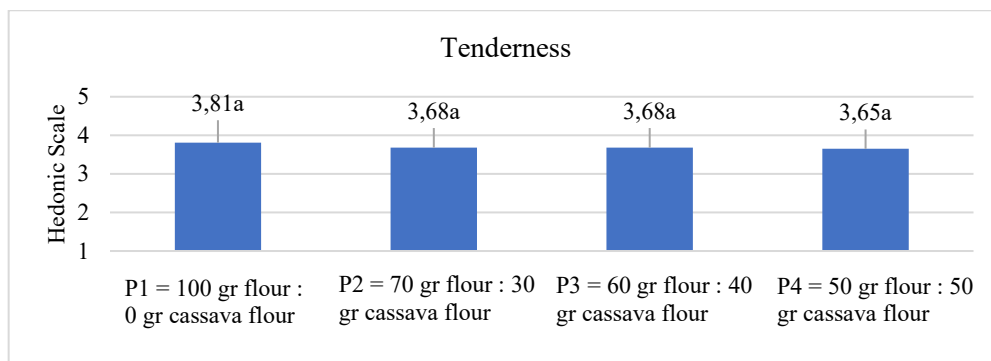
Based on ANOVA results, it shows that the combination of wheat flour and cassava flour in making steamed brownies has no real effect (sig. 0.000) at the level of 5% ( $p < 0.05$ ) on the aroma of steamed brownies produced.

The results obtained showed that steamed brownies using 60 grams of wheat flour and 40 grams of cassava flour had the highest value of 3.89 (likes) with a sweet brownie distinctive chocolate aroma, while steamed brownies using 70 grams of wheat flour and 30 grams of cassava flour had the lowest value of 3.74 (likes) with a distinctive brownie chocolate aroma which is pretty sweet. This is due to the use of brownie additives in the form of chocolate bars and chocolate powder which can give a distinctive aroma to brownies, where during the steaming process will evaporate volatile compounds in these ingredients so that they can mask the aroma of the flour used and can cause a distinctive sweet aroma in brownies [18]. Therefore, the resulting brownies have a sweet aroma peculiar to chocolate. This is in accordance with Fatimah's (2016) research that the use of chocolate powder and chocolate bars can affect the aroma of brownies produced [19].

### 3.4.3 Tenderness

Tenderness is one of the sensory test parameters that determines the panelists' preference for the softness and tenderness of the brownies produced.

Data from the study of high-fiber steamed brownies ranged from 3.65-3.81. The lowest organoleptic results of steamed brownie texture were obtained in P4 treatment with the use of 50 grams of wheat flour and 50 grams of cassava flour, while the highest organoleptic results of steamed brownie texture were obtained in P1 treatment with the use of 100 grams of wheat flour. Organoleptic results on the tenderness parameters of steamed brownies as high-fiber food can be seen in Figure 4.



**Figure 4.** Organoleptic Value of Steamed Brownie Tenderness

Based on the results of ANOVA showed that the combination of wheat flour and cassava flour in making steamed brownies had no significant effect (sig. 0.000) at the level of 5% ( $p < 0.05$ ) on the texture of the steamed brownies produced. The results obtained showed that steamed brownies using 100 grams of wheat flour had the highest value of 3.81 (likes) with a soft texture, while steamed brownies using 50 grams of wheat flour and 50 grams of cassava flour had the lowest value of 3.65 (likes) with a rather dense texture. This is because wheat flour has a higher gluten content than cassava flour, where the gluten has the property of trapping air and forming a good texture in brownies so that the brownies become softer [20]. Therefore, panelists tend to prefer brownies with a composition of using more wheat flour. This is in accordance with the research of Siswanto et al., (2015) that the gluten content in wheat flour can form a good texture by producing air cavities that can soften the texture of brownies.

### 3.5 Effectiveness Test

The effectiveness test aims to determine the main factors in a study and to determine the relationship or significance to the test parameters used. Based on the results of effectiveness tests on all research parameters including chemical tests and organoleptic tests (can be seen in Appendix 22) that formulation 3 with the use of 60 grams of wheat flour and 40 grams of cassava flour has the highest NH value. The average NH value in all research parameters of the effectiveness test can be seen in Table 4.

**Table 4.** The Value of the Test Results of the Effectiveness of Research Variables

Parameter	Weight	Weight Value	NH Formula Value			
			P1	P2	P3	P4
Rought fiber content	9	0,15	0	0,075	0,12	0,15
Calory content	9	0,15	0,15	0,105	0,09	0

Water content	8	0,13	0,13	0,117	0,104	0
Tenderness	8	0,13	0,13	0,078	0,078	0
Color	7	0,11	0,11	0,088	0,1	0
Taste	7	0,11	0,11	0,088	0,1	0
Aroma	6	0,1	0,05	0	0,1	0,08
Total	59	1	0,68	0,551	0,692*	0,23

Description: \* is the best treatment because it has the highest yield value

Based on the determination of the effectiveness test on all research parameters attached to (Appendix 22) shows that formulation 3 (P3) with the use of wheat flour as much as 60 grams and cassava flour as much as 40 grams is the best treatment with a yield value (NH) of 0.692 with parameters criteria of crude fiber content of 22.9%, calorie content of 6.74 cal, water content of 19.04%, tenderness is 3.68 (likes), color is 3.96 (likes), taste is 3.78 (likes), and aroma is 3.89 (likes).

## 4 Conclusion

The results showed that different proportions of wheat flour and cassava flour had a real effect on crude fiber content, had a very real effect on calorie content and did not differ significantly on the moisture content of *steamed brownies* produced in this study.

Based on the determination of effectiveness tests on all research parameters, it shows that formulation 3 with the use of 60 grams of wheat flour and 40 grams of cassava flour is the best treatment with a yield value (NH) of 0.692 with parameter criteria in the form of crude fiber content of 22.9%, calorie content of 6.74 cal, water content of 19.04%, tenderness of 3.68 (like), color of 3.96 (like), taste is 3.78 (likes), and aroma is 3.89 (likes).

## References

- [1] T. B. Verem, I. B. Dooshima, E. M. Ojoutu, O. O. Owolabi, and A. Onigbajumo, "Proximate, Chemical and Functional Properties of Wheat, Soy and Moringa Leaf Composite Flours," *Agric. Sci.*, vol. 12, no. 01, pp. 18–38, 2021, doi: 10.4236/as.2021.121003.
- [2] P. Sikha Amalia Sandia *et al.*, "Peningkatan Kesejahteraan Masyarakat Melalui Pelatihan Pengolahan Singkong dalam Pembuatan Kue di Dusun Kayoman Serut Gedangsari Gunungkidul," *Pros. Konf. Pengabd. Masy.*, vol. 1, no. 1, pp. 109–112, Mar. 2019.
- [3] T. Mulyadi, W. Adi Putra, and F. Silitonga, "Mutu Brownies Menjadi Peluang Usaha Rumahan," *J. Cafe.*, vol. 3, no. 2, pp. 51–68, Jul. 2022, doi: 10.51742/akuntansi.v3i2.627.
- [4] S. A. Prayitno, R. Tjiptaningdyah, and F. K. Hartati, "Sifat Kimia dan Organoleptik Brownies Kukus dari Proporsi Tepung Mocaf dan Terigu," *J. Teknol. Dan Ind. Pertan. Indones.*, vol. 10, no. 1, pp. 21–27, Apr. 2018, doi: 10.17969/jtipi.v10i1.10162.
- [5] D. R. K. Lubis, M. Nurminah, and R. J. Nainggolan, "Physicochemical and sensory characteristics of brownies from composite flour (modified breadfruit, purple sweet potato, saga seeds, and mocaf)," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 713, no. 1, p. 012037, Mar. 2021, doi: 10.1088/1755-1315/713/1/012037.
- [6] I. P. Amalia, H. Winarsi, and G. R. Ramadhan, "Pengembangan Brownies Kukus Tepung Talas- Kecambah Kacang Hijau Dan Ubi Ungu Kukus (Talahibu) Untuk Ibu Hamil Kurang Energi Kronik," *J. Gizi Dan Pangan Soedirman*, vol. 5, no. 2, pp. 48–62, 2021, doi: <https://doi.org/10.20884/1.jgipas.2021.5.2.4281>.
- [7] E. Priyanti and K. Kurnianingsih, "Pengaruh Komposisi Tepung Sorgum dan Cassava flour terhadap Penerimaan Brownies Muffin," *J. Teknol. Busana Dan Boga*, vol. 10, no. 1, pp. 38–43, Jun. 2022, doi: 10.15294/teknobuga.v10i1.31479.
- [8] A. Daud, S. Suriati, and N. Nuzulyanti, "Kajian Penerapan Faktor yang Mempengaruhi Akurasi Penentuan Kadar Air Metode Thermogravimetri," *J. Online Politek. Pertan. Negeri Pangkajene Kepul.*, vol. 24, no. 2, pp. 11–16, Jan. 2020, doi: 10.51978/jlpp.v24i2.79.
- [9] G. Sumardana, H. Syam, and A. Sukainah, "Substitusi Tepung Bonggol Pisang Pada Mie Basah Dengan Penambahan Kulit Buah Naga (*Hylocereus Undaatus*)," *J. Pendidik. Teknol. Pertan.*, vol. 3, no. 1, pp. 145–157, Apr. 2017, doi: 10.26858/jtp.v3i0.5714.
- [10] V. Siswanto, A. M. Sutedja, and Y. Marsono, "Karakteristik Cookies Dengan Variasi Terigu Dan Tepung Pisang Tanduk Pregelatinisasi," *J. Teknol. Pangan Dan Gizi*, vol. 14, no. 1, pp. 17–21, 2015, doi: <https://doi.org/10.33508/jtpg.v14i1.1513>.
- [11] P. M. J. Tuapattinaya, "Pengaruh Lama Penyimpanan Terhadap Kandungan Serat Kasar Tepung Biji Lamun (*Enhalus Acoroides*), Serta Implikasinya Bagi Pembelajaran Masyarakat Di Pulau Osil Kabupaten Seram Bagian Barat," *J. Biol. Sci. Educ.*, vol. 5, no. 2, pp. 46–55, 2016, doi: 10.33477/bs.v5i1.484.



- [12] L. C. Soedirga, M. Cornelia, and J. M. T. Boulevard, "Analisis Kadar Air, Kadar Serat, Dan Rendemen Cassava flour Dengan Menggunakan Berbagai Metode Pengeringan," *J. Sains Dan Teknol.*, vol. 2, no. 2, pp. 8–18, 2018.
- [13] E. N. Pulungan, A. Siagian, and E. Nasution, "Uji Daya Terima Dan Nilai Gizi Brownies Singkong," *Repos. Institusi Univ. Sumat. Utara*, 2013, [Online]. Available: <http://repositori.usu.ac.id/handle/123456789/16539>
- [14] Departemen Fisika Fakultas MIPA Universitas Padjadjaran and O. Nurhilal, "Desain Kalorimeter Bomb Biomassa dengan Metode Oksigen Dinamik," *J. Ilmu Dan Inov. Fis.*, vol. 1, no. 2, pp. 105–111, Jul. 2017, doi: 10.24198/jiif.v1i02.15355.
- [15] N. L. P. S. Yuniartini and A. Dwiani, "Mutu Organoleptik Brownies Panggang Yang Terbuat Dari Wheat flour, Mocaf Dan Tepung Kelor," *J. Agrotek Ummat*, vol. 8, no. 1, p. 54, Apr. 2021, doi: 10.31764/jau.v8i1.5973.
- [16] S. Agustini, G. Priyanto, and B. Hamzah, "Pengaruh Lama Pengukusan Terhadap Kualitas Sensoris Kue Delapan Jam," *J. Din. Penelit. Ind.*, vol. 25, no. 2, pp. 79–88, 2014, doi: <http://dx.doi.org/10.28959/jdpi.v25i2.513>.
- [17] A. I. Pangestika and M. Srimati, "Pemanfaatan Kulit Pisang Kepok (*Musa paradisiaca*) dalam Pembuatan Bolu Kukus," *Nutri-Sains J. Gizi Pangan Dan Apl.*, vol. 4, no. 1, pp. 39–50, May 2021, doi: 10.21580/ns.2020.4.1.4132.
- [18] Lestari, Rindang Puji, "Sifat Fisik, Kimia Dan Kesukaan Kue Brownies Uwi Ungu Dengan Variasi Penambahan Kacang Hijau Dan Waktu Pengukusan," *EPrint Mercubuana Yogya*, Mar. 2021.
- [19] S. Fatimah, "Pengaruh Substitusi Tepung Buah Bogem (*Sonneratia caseolaris*) dan Teknik Pemasakan terhadap Sifat Organoleptik Brownies," *E-J. Boga*, vol. 5, no. 1, pp. 201–210, 2016.
- [20] F. Kusnandar, H. Danniswara, and A. Sutriyono, "Pengaruh Komposisi Kimia dan Sifat Reologi Wheat flour terhadap Mutu Roti Manis," *J. Mutu Pangan Indones. J. Food Qual.*, vol. 9, no. 2, pp. 67–75, Oct. 2022, doi: 10.29244/jmpi.2022.9.2.67.