

Characteristics of Maco Fish (*Leiognathidae Spelendes*) Using Coconut Shell Liquid Smoke as A Natural Preservative

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Abstract. The goal of this study is to determine the effect of purple sweet potato flour and potato starch on the quality of steamed brownies, as well as the optimal amount of purple sweet potato flour and potato flour to add in order to achieve consumer quality standards for brownies. This is in accordance with sustainable food innovation, which provides food security and nutrition while taking into account economic, social, and environmental factors, such as enhancing the nutritional value of food products by sourcing alternative ingredients. In this study, a completely randomized design (CRD) with 5 treatment levels and 3 replications was used. The observational data was examined using ANOVA, and DNMRT was assessed at a 1% significance level. Purple sweet potato flour was compared to potato flour A=100:0, B=70:30, C=50:50, D=30:70, and E=0:100 in this study. The water content, ash content, fat content, total sugar content, and antioxidant activity of steamed brownies produced from purple sweet potato flour and potato flour were shown to be significant. According to the results of organoleptic and physicochemical tests, the steamed brownies made from purple sweet potato flour and potato flour had the highest water content (27.14%), ash content (1.23%), fat content (22.13%), total sugar content (4.17%), and antioxidant activity (60.33%).
Keywords: Characteristics, Brownies, Purple Sweet Potato Flour, Potato Flour

1 Introduction

Brownies are a gastronomic treat that Indonesians are well-versed in. Brownies are oven-baked chocolate cakes made from showy batters of flour, oil, eggs, sugar, and chocolate [1,2]. Brownies are prepared in two ways: fried and steamed, and the qualities of steamed brownies differ [3,4]. Brownies have a fragile texture and a lot of water [5].

The structure of a brownies is the same as a cake [6], that is, when it is cut, the pore uniformity of the crumbs is visible and when eaten, it feels soft, and moist and produces a good taste [7]. Unlike traditional snacks or cakes which on average only last a day and then spoil, brownies can last up to two or even three days without preservatives [8,9].

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Flour is a popular raw component in brownies [10,11]. Because brownies do not require optimal development, they are created with low-protein flour [12]. Nowadays, Because of the variety of food processing, brownies are no longer made only from flour [13]. Cornmeal, purple sweet potato flour, and root starch can all be used in place of the basic brownie ingredients [14]. When making brownies, substituting vital components can increase nutritional value or provide [15] benefits that wheat does not. As a result, locating a source of local raw materials capable of replacing flour and reducing flour consumption is critical. This also in linear with the Sustainable Development Goals (SDGs), sustainable consumption and production is about promoting sustainable resource efficiency for a better quality of life for all. Its implementation helps to strengthen economic competitiveness by using alternative ingredient that can make brownies healthier and more affordable. [16].

There are lots of alternative ingredients for wheat flour in making brownies, it can also be made from other grains, like oats and rye, or even made from alternative ingredients, like almonds, potatoes, and coconut. Cooking and baking with these other flours can be just as good, it can even be healthier. Potatoes and yams are two native products that can be utilized as raw material for brownies , Sweet potato (*Ipomoea batatas* L.) is the first substitution ingredient ; it is the fourth source of carbohydrates after rice, corn, and cassava [17]. Purple sweet potatoes provide a high concentration of carbs, minerals, and vitamins. 100g fresh purple sweet potatoes contain 50-81g water, 8-29g starch, 1-2g protein, 0.1-0.2g fat, 55mg calcium, 0.7mg iron, 51mg phosphorus, and 0.01-0.69mg vitamin A [18]. Purple sweet potatoes have a high vitamin A concentration, which is approximately 2.5 times the adult minimum daily need [19]. The usage of yams as a carbohydrate component in the diet is still consistent with efforts to improve people's diets [20]. Purple sweet potatoes that have been processed into wheat flour are semi-finished products created by crushing the purple sweet potatoes and drying and crushing (milling) them at a high level [21]. It can be used in place of flour and has a fineness of 100 mesh and a long shelf life, lowering wheat imports and enhancing the value of yams [22, 23].

Potato is the second substitution ingredient. It contains minerals such as phosphate, iron, calcium, vitamin B, vitamin C, and a trace of vitamin A [24]. Potatoes, based on their nutritional content, can be treated so that they are not readily damaged, and one of them is utilized as flour. Potato flour has a higher viscosity and swelling capacity (starch heating temperature) than other flours such as wheat flour, maize flour, and tapioca flour [25]. Potato starch has a yellowish-white hue, a smooth texture, a slightly sweet taste, a strong potato scent, and a dry mouthfeel [26].

According to Nindyarani et.al., potatoes have a high water content, approximately 80%. As a result, raw potatoes are perishable and must be stored and handled carefully. Processing these tubers into brownies, potato chips, crackers, flour, and starch is an attempt to increase their utility [27]. Sani et.al, in an experimental study of processing steamed brownies made from purple sweet potato flour said that the quality of steamed purple sweet potato flour brownies seen from the texture aspect was in the good category, which had a soft and porous texture, the quality of steamed purple sweet potato flour brownies was seen from the taste aspect is in the good category by having a sweet and distinctive taste of purple sweet potato [28]. Putra et.al. further observed the fulfilment of SDGs in Innovative and creative sweet potato processing training provides partners regarding new insights and knowledge in the form of other preparations with the main ingredient sweet potato. The large number of main raw materials, namely sweet potatoes in the village, this training will be beneficial for the partners. In addition, with more business, processed sweet potatoes can become a new trading product for villagers [29].

The sensory properties will then be used to assess the acceptability of purple sweet potato flour for the production of various processed meals, notably snack foods such as snack snacks or brownies. Brownies were chosen because they are easy to produce and are unaffected by the presence and role of gluten, which is only found in flour. As a result, attempts to increase the use of purple sweet potato flour in brownie recipes may be made [28].

Mixing, soaking or dipping, injecting, mixing liquid smoke in boiling water, and spraying are all methods for applying liquid smoke to foods. In processed items, blending procedures are widely utilized, and tastes are added in variable proportions [29]. The current research has been focused on processed sweet potato products in general, not just brownies, and the fulfillment of SDGs from the use of sweet potatoes and potatoes as an alternative ingredient to wheat flour in making brownies. As a result, the purpose of this study was to determine how sweet potato flour and potato starch affected the quality of steamed brownies, as well as how much sweet potato flour and potato starch to use to meet the requirements.

2 Materials and methods

2.1 Materials and tools

Sweet potato flour, Granola Potato, argarine, Chicken Egg Yellow, Floured Sugar, Whole Milk, Salt, Chocolate Bar, Baking Soda, and Liquid Vanilla are the ingredients for steamed brownies. Concentrated sulfuric acid, boric acid, selenium mixture, distilled water, sodium hydroxide, methyl red and blue, Phenolphthalein, and n-Hexane are also necessary for chemical and sensory investigation. (1) water content analysis, using a furnace (Memmert), porcelain crucible (Crucible), Erlenmeyer (Pyrex), and an analytical balance (Shimadzu), (2) ash analysis, using a cup (crucible), desiccator (vacuum glass), crucible tongue, furnace (carbolite), spirit lamp, wire mesh, and (3) total sugar content test analysis, which includes the following items: a test tube (pyrex), a volumetric flask, a dropper, a stirrer, a heater, a recirculation device, and a burette. (4) fat analysis tools, such as a socket, an electric heater (maspion), filter paper, a grease bottle, a desiccator, a volumetric flask, a crucible, and a micropipette.

2.2 Research design

A completely randomized design (CRD) with 5 treatments and 3 replications was used in this investigation. At a significance level of 1%, the obtained data were statistically assessed using variable analysis (ANOVA) and Duncan's New Multiple Range Test (DNMRT) advanced tests. In this study, the treatments were the percent (%) ratios of purple sweet potato flour and potato starch, which were A = (0:100), B = (30:70), C = (50:50), D = (70:30), and E = (100:0). The operation was repeated three times.

2.3 Procedure for making potato starch [27]

The prepared potatoes are thoroughly washed to eliminate dirt and foreign things clinging to the potatoes, then peeled, and the potatoes are immersed in water for 30 minutes to brown. After soaking, washed the potatoes again with running water to remove the dirt and clean them, cut the potatoes into dice with a thickness of 1 cm using a knife and ruler, blended the potatoes until smooth without using water for 1 minute, then transferred the

potatoes to a larger container. Then immersed for 30 minutes in distilled liquid smoke at a concentration of 1% to remove the browning on the potatoes. Next, squeezed the dregs with a filter cloth until the starch and water were separated from the liquid smoke immersion with deposited for 2 hours, then separated the starch from the liquid smoke immersion with deposited for 1 hour, then discarded the liquid smoke immersion water slowly so that the starch was not mixed again, dried the pulp and starch in the sun for 3 days, then weighed 2kg potato pulp and 500g starch.

2.4 Procedure for making steamed brownies [30]

The process began by cooking brownies, steamed 50 g of chocolate bar and 50 g of margarine in the same container. Added 0.3 g of salt when it had melted. Mixed until smooth. Made a container to beat the eggs in. Combined one egg and 45 floured sugars in a mixing bowl and whisked until frothy. Slowly combined melted chocolate and butter with 34 g melted milk. Mixed until smooth. Then, gradually added a 34 g blend of purple sweet potato flour and rice cake flour. Stirred until completely smooth. Formed the dough into a 15 x 10 x 4 cm (W x H x H cm) rectangle. Greased the saucepan ahead of time with margarine. Steamed for 20 minutes, or until done.

2.5 Analysis

Water content [31], ash content [31] (AOAC, 1995), fat content [31], total sugar content [32], and antioxidant test results [33] were all observed in this study. And sensory evaluations (color, texture, taste, and scent) [34].

3 Results and discussion

The data from the observations is statistically evaluated using analysis of variance (ANOVA). If F counts in the F table, Duncan's New Multiple Range Test (DNMRT) continues at the 1% level. The findings and explanation of the average water content, ash content, fat content, total sugar content test, antioxidant activity test, and sensory test are shown in Table 1.

Table 1. Average water content, ash content, fat content, total sugar content test, antioxidant test levels

Treatment	Water content (%)	Ash content %	Fat content %	Total Sugar Content %	Antioxidant Activity %
A (0:100)	30,88 a	0,87 a	26,59 a	2,69 a	18,45 a
B (30:70)	28,35 b	0,57 b	24,37 b	3,06 b	29,15 b
C (50:50)	27,14 c	0,40 c	22,13 c	4,98 c	60,33 c
D (70:30)	25,40 d	0,31 d	20,31 d	4,17 d	65,33 d
E (100:0)	22,70 e	0,23 e	17,22 e	4,06 e	86,37 e
KK (%)	1,01	2,14	0,9	0,31	6,83

Description: Different lowercase letters are placed after identical numbers in the same column to denote significant differences in the effect as determined by the DNMRT test at the 1% level.

3.1 Water content

According to the diversity study, the water content of steamed brownies made using purple sweet potato flour and potato flour differed significantly. According to research findings

with varied water contents, Table 1 shows the average water content of each purple sweet potato flour and potato starch treatment. Treatment E had the least amount of water, whereas Treatment A had the most. Variations in water content were caused by differences in the proportions of purple sweet potato flour and wheat flour in each treatment, with the predominance of purple sweet potato flour leading to a decrease in water content since purple sweet potato flour is extremely dry. This is consistent with the findings of the study [28].

Water content in purple potato flour ranges from 7.03 to 7.47%. Given that the flour is extremely dry and has a water percentage as low as 10.92%, this demonstrates its high quality. [35]. The results of this experiment showed that adding purple sweet potato flour reduced the water content of brownies made with wheat flour and white sweet potato flour. This is in line with research [36] showing that decreasing the water content of brownies by using purple sweet potato flour. Because it can absorb large amounts of water and has a higher water content than dried purple sweet potato flour, this drop affects the capacity of purple sweet potato flour to bind water molecules in potato flour. This is as a result of the quick reduction. [37].

Purple sweet potato flour and potato flour were used to calculate the water content of cooked brownies [38]. The measured water level of 22.70-30.88% shows that the steamed brownies meet the SNI 01-3840-1995 sweet bread quality standards of up to 40%. [39].

3.2 Ash content

According to the diversity study, the ash content of steamed brownies made with potato flour and purple sweet potato flour differed significantly in terms of their qualities. The typical ash content of steamed brownies is 0.23 to 0.78%, as shown in Table 1. The ash content of steamed brownies decreases with the amount of purple sweet potato flour used to make the brownies. This is as a result of sweet potato flour's lower mineral content when compared to potato flour. The highest ash concentration in grilled brownies was found in Treatment A (comparison of purple potato flour and potato flour 0: 100), at 0.87%. The least amount of ash was present in Process E (comparison of purple potato flour and potato flour 100: 0), at 0.23%.

Treatments A, B, C, D, and E all decreased the amount of ash in the purple sweet potato and potato flour brownies, according to an analysis of the data. The ash concentration varies depending on how sweet potato flour, sweet potato flour, and potato starch are processed, and it decreases when more sweet potato flour is added. This is comparable to studies that indicated that purple sweet potato flour had an ash percentage of 1.49% while potato flour had an ash content that ranged from 3.60 to 4.39% [25], [35]. This is as a result of sweet potato flour's lower mineral content when compared to potato flour. Between purple sweet potato flour and potato flour, there was a significant variation in the amount of minerals.

3.3 Fat content

The results of the diversification study show that there are substantial differences in the fat content between steamed brownies made with purple sweet potato flour and those made with potato flour. The maximum fat content for steaming brownies in Treatment A is 26.59%, as shown in Table 1. Contrarily, Treatment E had the least amount of fat (17.22%). With a sweet potato flour to potato starch ratio of 0: 100 used to make steamed brownies, treatment A's difference in fat content was greater than that of treatments B, C, D, and E. There is more potato starch present when there is a larger fat content. This demonstrates

that reducing the amount of fat in brownies by using more purple sweet potato flour. Because potato starch has less fat than purple potato starch, this is the case. While potato flour had a fat level of 17.22%, purple sweet potato flour had a fat percentage of 26.59% [41]. The obtained fat content is up to 3% higher than the SNI 01-3840-1995 quality standard for sweet bread [39]. Due to the high-fat ingredients chocolate bars and potato flour, brownies have a high fat content. These two elements are absent from the sweet bread. As a result, the brownies' fat content is far higher than the maximum allowed by SNI for sweet bread. Margarine and other extra ingredients are used to make brownies.

3.4 Total sugar content

The results of the diversity study show that the characteristics of steamed brownies, such as the difference between purple sweet potato flour and potato flour, significantly affect the amount of sugar in each batch. Table 1 compares the effects of purple sweet potato flour and potato flour and shows the total sugar content of steamed brownies. According to the findings, treatment C (50:50) had the highest total sugar content, at 4.98%. The lowest total sugar concentration was found in treatment A (0: 100), where it was 2.69%. Due to the impact of increasing sugar levels, steaming brownies now contain more sugar overall. Sweet potato flour, this is because the purple sweet potato flour has a high total sugar index even though the potato starch reduced where the sugar content was high. Despite the fact that potato starch decreased in areas where its sugar content was high [39]. The total sugar content in each treatment was within 8% of what was required by SNI for sweet bread. The total sugar level of steamed brownies is increased by the inclusion of additional ingredients like refined sugar, full milk, and candy bars.

3.5 Antioxidant activity

The diversity analysis revealed that there was a substantial difference in antioxidant activity between brownies made with potato flour and steamed purple potato flour. Table 2 displays how the ratio of purple sweet potato starch to potato starch affects the antioxidant activity of steamed brownies. The maximum antioxidant activity was seen in Treatment E (100: 0), at 86.37%. The lowest antioxidant, with Treatment A (0: 100), was found to be 18.45%. Because purple potato flour has a higher antioxidant content than potato flour when making steamed brownies, using more of it boosts antioxidant activity. Purple sweet potatoes have 59.25% more antioxidant activity than potato flour, which has 17.24% more antioxidants [41]. Antioxidant activity is a metric that can represent a dietary ingredient's proportion or its potential to block free radicals [42]. Purple sweet potatoes include anthocyanin, which serves as an antioxidant by suppressing the oxidative process in the body. Purple sweet potato flour brownies contain more antioxidant activity than regular potato flour brownies. The larger the percentage of purple potato flour, the more antioxidant-rich the brownies [43].

3.6 Sensory test

Steamed brownies made with sweet potato and potato flour were examined for texture, color, and flavor as part of the sensory evaluation. Steamed brownies that were inspected in

accordance with the treatment were used for this experiment. The tests involved 30 untrained individuals.

Table 2. Recapitulation of organoleptic test values of steamed brownies

Treatment (%)	Score				Mean	description
	Aroma	Color	Taste	Texture		
A	5,93	5,97	5,94	5,53	5,84	Like
B	6,66	6,35	6,52	6,01	6,39	Much like
C	7,00	7,00	7,00	7,00	7	Strongly like
D	6,51	6,50	6,39	5,80	6,3	Much like
E	5,94	5,90	5,91	5,47	5,81	Like

Notes: taste scores include 7 = strongly like 6 = much like 5 = like 4 = somewhat like 3 = dislike 2 = much dislike 1 = strongly dislike

3.6.1 Textures

The panelists' evaluations of the steamed brownies produced with purple sweet potato flour and potato flour are shown in Table 2. The texture rating for Treatment E (100: 0) was 5.47 (like), which was the lowest. Steamed brownies have a thick texture because to the use of sugar and eggs. It is asserted that its emulsifying, softening, and binding properties affect texture [16]. Due to the use of purple sweet potato flour as a binder, it is applicable. This is due to the low binding force of potato starch. The water content of food items interacts with the water content of dough. The binder's job is to promote emulsion stability, prevent shrinkage during cooking, provide a bright color, boost product elasticity, form a fine texture, and attract water to the dough.

3.6.2 Colors

The highest color rating of steamed brownies found in Treatment C (50:50), 7.00 (strongly like), is shown in Table 2. Treatment E (100: 0) had the lowest texture rating of 5.90 (like). Brownish black is the hue of the brownie. The major ingredients, wheat and chocolate, impact the hue. Color is determined by each participant visually inspecting the goods with their own eyes. Color considerations are the first visual criteria in assessing product acceptability by a subject that will appear before other factors are examined and analyzed in establishing product quality.

3.6.3 Tastes

The highest taste rating of steamed brownies reported at Treatment C (50:50), 7.00 (strongly like), is shown in Table 2. Treatment E (100: 0) had the lowest texture score of 5.91 (like). This is due to the fact that potato flour and purple potato flour have differing amounts of carbohydrate, fat, and protein. Carbohydrates such as glucose, sucrose, and starch can improve the taste of foods. Sucrose imparts a sweet taste, while starch imparts a distinct taste [44]. The intensity of the odor varies from person to person, and while diverse tastes can be distinguished, persons in the food sector have distinct tastes. Taste testing is vital since it determines whether the product has a distinct purple potato or potato taste. [45]

4 Conclusion

Water, ash, and lipid content were significantly affected by the use of purple sweet potato flour (*Ipomoea batatas* Poirot) and potato flour (*Solanum tuberosum* L.). Based on findings of total sugar content, antioxidant, and sensory activity, as well as sensory and physicochemical testing, the maximum amount of flour purple sweet potato and potato flour enables customers to brownies with water content treatment C. A combination of ash (1.23%), fat (22.13%), total sugar (4.17%), and antioxidant (60.33%) was added to meet the preferred quality standards (27, 14%). The suggestions for further study can be focused on the antimicrobial testing, heavy metals and the shelf life of the resulting bronzing products.

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