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Substitution Of Garut Tumber Flour (*Maranta arundinacea* L.) In The Production of Savory Pao To Increase Local Food Potential

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ABSTRACT

The use of arrowroot tubers as local food is still not optimal even though they have potential as a substitute for wheat flour in various processed products. This research aims to: (1) Find the right recipe for Savory Pao; (2) Determine the form of packaging and labels for Savory Pao; (3) Knowing the level of people's liking for Savory Pao (4) Knowing the composition and nutritional content of Savory Pao; (5) Determine the selling price and BEP on Savory Pao. The research uses the Research and Development (R&D) method with the 4D development model (Define, Design, Develop, Disseminate). The research period starts from January 2025 to July 2026 at the Catering Laboratory, Campus II, Faculty of Vocational Studies, Yogyakarta State University and the Agricultural Product Analysis Laboratory, Faculty of Agriculture, Riau University. The results showed that: (1) The best formula was obtained with 20% arrowroot tuber flour substitution; (2) The packaging used is plastic mica measuring 16×10×6 cm with a capacity of 60 grams (2 pieces) and is labeled; (3) The average sensory test result is 4.6 (like very much) and it is concluded that the product can be accepted by the public; (4) Information on the nutritional value of every 30 grams containing total energy of 82,935 kcal, fat energy of 25 kcal, fat 3 grams, protein 3 grams, carbohydrates 11 grams, and fiber 0.2 grams; (5) Selling price IDR 13,000 with a mark up of 50% and unit BEP of 7 boxes and currency BEP IDR 86,826.

Keywords:

bakpao, savory pao, arrowroot tubers, arrowroot tuber flour, mackerel

Pemanfaatan umbi garut sebagai pangan lokal masih belum optimal meskipun memiliki potensi sebagai bahan substitusi tepung terigu pada berbagai produk olahan. Penelitian ini bertujuan untuk: (1) Menemukan resep yang tepat untuk Savory Pao; (2) Menentukan bentuk kemasan dan label pada Savory Pao; (3) Mengetahui tingkat kesukaan masyarakat terhadap Savory Pao (4) Mengetahui komposisi dan kandungan gizi pada Savory Pao; (5) Menentukan harga jual dan BEP pada Savory Pao. Penelitian menggunakan metode Research and Development (R&D) dengan model pengembangan 4D (Define, Design, Develop, Disseminate). Waktu penelitian dimulai pada Januari 2025 sampai Juli 2026 di Laboratorium Boga Kampus II, Fakultas Vokasi, Universitas Negeri Yogyakarta dan Laboratorium Analisis Hasil Pertanian, Fakultas Pertanian, Universitas Riau. Hasil menunjukkan bahwa: (1) Formula terbaik diperoleh dengan substitusi tepung umbi garut 20%; (2) Kemasan yang digunakan berupa mika plastik ukuran 16×10×6 cm kapasitas 60 gram (2 pieces) dan diberi label; (3) Rata-rata hasil uji sensoris sebesar 4,6 (sangat suka) dan disimpulkan produk dapat diterima oleh masyarakat; (4) Informasi Nilai Gizi setiap 30 gram mengandung energi total 82,935 kkal, energi lemak sebesar 25 kkal, lemak 3 gram, protein 3 gram, karbohidrat 11 gram, dan serat 0,2 gram; (5) Harga jual Rp13.000 dengan mark up 50% dan BEP unit sebanyak 7 box serta BEP mata uang Rp86.826.

1. Introduction

The local food developed in Indonesia is quite diverse and has not been utilized optimally to fulfill nutritional needs. Indonesia is known for its abundant natural resource potential, one of which is tuber plants. However, the use of minor tubers as food has not been developed optimally. People still consider minor tubers as traditional food which can only be prepared simply, such as boiling [1].

One local food that has high nutritional value and can be processed into food is arrowroot tubers. Arrowroot tubers are a food commodity that is currently being developed and processed into various kinds of food [2]. Arrowroot tubers contain quite a lot of dietary fiber which can help the health of the digestive system. Its high starch content and gluten-free nature means it can be used as an alternative for people with gluten intolerance [3]. Arrowroot tubers will be processed into flour to facilitate their use in innovation. The process of processing arrowroot tubers into flour can extend the shelf life, increase economic value, and make processing easier. The use of arrowroot flour in making buns has the potential to increase product value and people's interest in consuming food based on local ingredients [4].

Bakpao is divided into two flavors: sweet and savory. Bakpao is a food that is quite easy to find on the market, but the bakpao sold only prioritizes macronutrients. Micronutrients such as fiber can be added in making bakpao. To improve nutritional quality, bakpao is filled with sauteed mackerel due to its good nutritional content, relatively affordable price, easy availability, and savory taste. Fresh mackerel contains 17 types of amino acids, consisting of 79 essential amino acids and 8 non-essential amino acids [5]. Mackerel is a source of high animal protein, omega-3, omega-6 fatty acids, vitamins and minerals so it has the potential to be used as a highly nutritious food ingredient [6].

This is because fiber is one of the nutritional components needed by the body. Along with the increasing need for food that is not only filling but also healthy, innovation in making buns has emerged in terms of ingredients and contents. One of them is by substituting wheat flour using local food ingredients, such as arrowroot tuber flour. Bakpao was chosen as a development product because it is quite widely known and has the potential to be accepted by the public.

Generally, the basic ingredient for making buns is wheat flour. As time goes by and changes in people's consumption patterns, the use of minor tubers is decreasing and being replaced by various modern wheat flour-based food products that do not originate from Indonesia [1]. This will have an impact on national food security. As an effort to diversify food, arrowroot tubers were chosen as a local food ingredient which is used as a substitute for wheat flour in processed products, including buns.

Based on these problems, this research aims to: 1) Find the right recipe for Savory Pao; (2) Determine the form of packaging and labels for Savory Pao; (3) Knowing the level of people's liking for Savory Pao (4) Knowing the composition and nutritional content of Savory Pao; (5) Determine the selling price and BEP on Savory Pao

2. Method

The method used in this research is the Research and Development (R&D) method with a 4D development model (define, design, develop and disseminate). The research location is the Catering Laboratory, Campus II, Faculty of Vocational Studies, Yogyakarta State University. The place for the proximate test is the Agricultural Product Analysis Laboratory, Faculty of Agriculture, Riau University. The define stage aims to analyze one best reference recipe from three selected recipes used as a control in product development. The design stage was the development of three arrowroot starch substitution formulations (20%, 40% and 60%). The develop stage is a validation process for selected reference and development recipes to evaluate and determine Savory Pao

packaging. The disseminate stage aims to test wide-scale liking of Savory Pao using 60 untrained panelists.

Analysis of sensory and preference test data using quantitative descriptive methods using a five-point hedonic scale, consisting of strongly dislike, dislike, somewhat like, like and very like. Statistical analysis uses a paired sample t-test with a significance level of 5%.

3. Results & Discussion

3.1 Results

a. Define Stage

The first stage of this research is the define stage. This stage focuses on identifying the product concept and determining the reference recipe for product development. All three recipes will be produced and evaluated with sensory assessments based on color, aroma, taste, texture and overall properties. The best recipe will be selected as a reference recipe for further development. The selected recipes for this stage are presented in table 1.

Table 1. Bakpao Recipe

Ingredients	R1	R2	R3
Medium protein wheat flour	250 g	500 g	600 g
Low protein wheat flour			
Granulated Sugar	10 g	100 g	200 g
White Butter	6 g	50 g	50 g
Yeast	10 g	11 g	11 g
<i>Baking Powder</i>	1 g	2 g	2 g
Ice water	120 ml	250 ml	500 ml
Salt	1 g	3 g	2 g
Tuna fish		200 g	
Chicken meat			250 g
Beef	300 gr		
Onion	10 g	-	-
Garlic	-	8 g	
Shallots	10 g	10 g	5 g
Red chili	-	8 g	
Ginger	-	2 g	-
Chives	5 g	-	-
Oyster sauce	16 g	-	9 g
Soy sauce	2 g	-	-
Pepper	1 g	2 g	1 g
Salt		5 g	
Granulated sugar	5 g	8 g	-
Sweet soy sauce	3 g	-	3 g
Kaffir lime leaves	-	1 g	-
Lemongrass	-	10 g	-
Basil leaves	-	30 gr	-

Source: (R1) Job sheet UNY (2022) [7], (R2) Buku Resep Pastry & Bakery Bakpao [8], (R3) Buku Resep Character Pao Charpao [9].

Table 1 presents three different recipe formulations. These differences affect the characteristics of the final product, particularly its color, aroma, taste, and texture. Sensory testing of these recipes was conducted. The sensory evaluation results are presented in Table 2.

Table 2. Characteristics of Reference Products

Characteristic	R1	R2	R3
Shape	Round	Round	Round
Size	5 cm diameter	5 cm diameter	5 cm diameter
Color	Creamy white	Creamy white	Creamy white
Aroma	Flour and yeast aroma	Flour and yeast aroma	Flour and yeast aroma
Taste	Savory, slightly fish	Savory	Savory
Texture	Soft	Soft, fluffy	A bit hard

Based on the sensory test results, recipe 2 showed better results compared to recipes 1 and 3. Recipe 2 produced bakpao with the desired taste, namely savory, and a good texture, namely soft and tender. The sensory test results table is presented in Table 3.

Table 3. Sensory Test Results of the Define Stage

Sensory Parameters	Average Value		
	R 1	R 2	R 3
Shape	3.6	4	3.3
Size	3.6	4	4.3
Color	3.6	4.3	4
Aroma	3.6	4	4
Taste	3.6	3.6	3.6
Texture	3	4.5	3.6
Overall Properties	3.1	4.5	3.6
Average	3.5	4.1	3.8

Based on the assessment, recipe 2 received the highest score for shape (4), size (4), color (4.3), aroma (4), texture (4.5), and overall properties (4.5). By considering the evaluation results, recipe 2 was chosen as the reference recipe for the next stage.

b. Design Stage

At this stage, the percentage of wheat flour substitution with arrowroot flour was determined. The variations in substitution percentages used in making bakpao were formula I at 20%, formula II at 40%, and formula III at 60%. This percentage comparison was intended to determine the best addition of arrowroot flour. The determination of the arrowroot flour substitution percentage interval in this study was based on several previous research journals. One of them was by the journal by Ira Handayani & Izzul Azmi Shofura (2022), which stated that a percentage of 20% produced a good shape, taste, and texture of bakpao, namely soft, tender, and hollow. At this stage, the tuna filling was also substituted with mackerel. The formulations developed at the design stage are presented in Table 4.

Table 4. Savory Pao Formula Design

Ingredients	Recipe Reference	Development		
		FI (20 %)	FII (40 %)	FIII (60 %)
Wheat flour (g)	500	400	300	200
Arrowroot flour (g)	0	100	200	300
Granulated sugar (g)	100	100	100	100
White butter (g)	50	50	6	6
Yeast (g)	11	11	10	10
Baking powder (g)	2	2	2	2
Salt	3	3	3	3
Ice water (ml)	250	250	250	250
Mackerel (g)	200	200	200	200
Garlic (g)	8	8	8	8
Shallots (g)	10	10	10	10
Red chilies (g)	8	8	8	8
Ginger (g)	2	2	2	2
Pepper (g)	2	2	2	2
Salt (g)	5	5	5	5
Granulated sugar (g)	8	8	8	8
Kaffir lime leaves (g)	1	1	1	1
Lemongrass (g)	10	10	10	10
Basil leaves (g)	30	30	30	30

Table 5. Characteristics of Reference and Development Products

Characteristic	Recipe Reference	Development		
		FI (20%)	FII (40%)	FIII (60%)
Shape	Round	Round	Round	Round
Size	Diameter 5 cm	Diameter 5 cm	Diameter 5 cm	Diameter 5 cm
Color	Creamy white	Creamy white	Creamy white, slightly yellow	Creamy white yellow
Aroma	Flour and yeast	Flour, yeast, special fish	Flour, yeast, special fish	Musty arrowroot flour
Taste	Savory	Tasty	Savory	Savory
Texture	Soft and tender	Soft, soft with a slightly rough texture	Dense, somewhat rough	Dense, coarse

Based on the results of sensory evaluation with the substitution of arrowroot tuber flour, each formulation produces differences in shape, size, color, aroma, taste and texture.

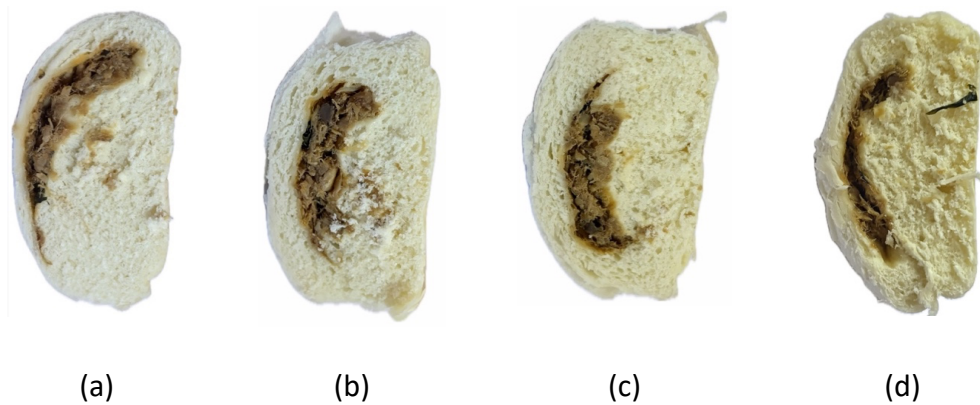


Figure 1. Design Stage Documentation, (a) reference, (b) Substitution 20%, (c) Substitution 40%, (d) Substitution 60%.

Sensory testing was conducted on the reference product and three development formulas. The average results of the sensory testing assessments at the design stage are presented in Table 8.

Table 6. Sensory Test Results of the Design Stage

Parameters Sensory	Recipe Reference	Development		
		F I (20%)	F II (40%)	F III (60%)
Shape	3.3	4.6	3.3	3.3
Size	3.6	4.3	3.6	4
Color	3.6	4	4	4.6
Aroma	3.6	3.6	3.6	4
Taste	3.3	4.3	3.3	3
Texture	2.3	3.6	3.3	3.3
Overall	3	4.6	4	3.3
Mean	3.2	4.1	3.5	3.6

Based on the Savory Pao trial results presented in the table, the three formulas show different sensory characteristics. The formula with 20% substitution of arrowroot tuber flour gave the best results in terms of color, aroma, taste and texture. The results of the liking test analysis show that formula II and formula III have a lower level of acceptance compared to formula I. This is because the characteristics of the product produced are not optimal in terms of taste, aroma and texture. Therefore, it can be concluded that formula I with 20% substitution of arrowroot tuber flour is the best and most suitable formulation to be applied to the Savory Pao product. Next, the selected formula will be used in the development stage to process product refinement and validation

c. Develop Stage

At the develop stage, the development recipe that has been selected is then continued to the validation test stage. This activity involves lecturers as experts in the culinary field who have competencies in accordance with the products being developed. Improvements are made based on input and suggestions from experts until a product is obtained that meets the expected criteria.

Table 7. Results of Validation I Sensory Test

Sensory Parameters	Reference Products	Development Products
Shape	4	4.3
Size	4.3	4.3
Color	3.6	4.3
Aroma	3.6	4.3
Taste	3.6	3
Texture	3.6	4.3
Overall nature	4	3.6
Presentation	4.6	4.6
Packaging	4.6	4
Average	4	4.1

Based on the average results of sensory tests, it shows that the development product has quite good quality. However, in terms of taste and packaging, it still has a lower value than the reference product. There are several inputs from validators, namely adding spices and seasonings to reduce the fishy aroma of the fish. Therefore, improvements were made through validation test II to perfect the product characteristics, so that they met the expected criteria. The average results of the validation test assessment II are presented in Table 8.

Table 8. Results of Validation Sensory Test II

Sensory Parameters	Reference Products	Development Products
Shape	4	4.3
Size	4.3	4.3
Color	3.6	4.3
Aroma	3.6	4.3
Taste	3.6	4.5
Texture	3.6	4.3
Overall nature	4	4.3
Presentation	4.6	4.6
Packaging	4.6	4.6
Average	4	4.4

Based on the results of the phase II validation test, it shows that the development product has improved in aspects that previously needed to be improved. Overall, the product obtained good assessment results and met the expected criteria, so it was declared suitable to proceed to the acceptance test stage or wider scale test.

Savory Pao is packaged using plastic mica with a size of 16x10,6 cm and contains two buns weighing 60 grams. The packaging also includes a product label. The label is an identity and product information medium. The label contains various information such as product name, composition, net weight, production address, and information on the product's nutritional value. Savory Pao packaging can be seen in Figure 2.



Figure 2. Savory Pao Packaging Designs (a) Savory Pao Packaging, (b) Savory Pao Label

d. Disseminate Stage

At the disseminate stage, a product liking level test is carried out based on its sensory characteristics. This testing was carried out by distributing reference products and development products to 60 untrained panelists from the general public. During testing, panelists are asked to observe and taste the product, then assess the characteristics including aspects of color, aroma, taste, texture and quality. The test results are then analyzed to determine the difference in acceptance levels between the two products. The results of the liking test analysis are presented as follows.

Table 9. Paired Sample t-Test Results for Reference and Development Products

Characteristics	Reference	Development	P-Value	Information
Taste	4.45±0.69	4.68±0.53	0.009	Significant
Aroma	4.27±0.79	4.47±0.62	0.013	Significant
Texture	4.26±0.79	4.47±0.62	0.015	Significant
Packaging	4.26±0.79	4.43±0.69	0.000	Significant
Color	4.41±0.61	4.67±0.47	0.007	Significant
Overall nature	4.37±0.55	4.71±0.45	0.000	Significant

a. Nutritional Composition and Nutritional Information

Based on the results of nutritional analysis, every 30 grams of Savory Pao contains a total of 82,935 kcal of energy, 25 kcal of fat energy, 3 grams of fat, 3 grams of protein, 11 grams of carbohydrates and 0.2 grams of fiber. The nutritional composition of the product is influenced by the substitution of arrowroot tuber flour and mackerel filling. Arrowroot tuber flour plays a role in analyzing dietary fiber, and mackerel acts as a source of protein. Nutrient content analysis was carried out at the Agricultural Products Analysis Laboratory, Faculty of Agriculture, Riau University. Proximate test results for reference and development products are presented in Table 10.

Table 10. Proximate test results of reference and development products

Sample Code	Types of Analysis	Analysis Results		Mean
		Test 1	Test 2	
Reference	Protein (%)	8.77	8.91	8.84
	Carbohydrates (%)	35.82	35.75	35.79
	Fat (%)	9.50	9.67	9.59
	Fiber (%)	0.64	0.62	0.63
	Water (%)	28.56	28.70	28.63
	Ash (%)	0.73	0.71	0.72
Development Sample Code	Protein (%)	8.30	8.45	8.38
	Carbohydrates (%)	37.25	37.19	37.22
	Fat (%)	10.51	10.38	10.45
	Fiber (%)	0.68	0.65	0.67
	Water (%)	29.35	29.42	29.39
	Ash (%)	0.86	0.85	0.86

Based on the results of proximate analysis of the Savory Pao product, it was concluded that Savory Pao, which was the result of development by substituting arrowroot tuber flour, experienced changes in nutritional composition. Protein content is 8.38%, carbohydrates 37.22%, fat 10.45%, fiber 0.67%, water 29.39%, and ash 0.86%. Compared with the reference product, Savory Pao experienced an increase in carbohydrate, fat, fiber, water and ash levels, while protein content experienced a slight decrease. The increase in carbohydrate levels is thought to be because arrowroot tuber flour contains quite high amounts of starch and dietary fiber. The increase in fiber content shows that arrowroot tuber flour is able to increase the nutritional value of the product, especially in the aspect of dietary fiber content. Meanwhile, the decrease in protein content shows that arrowroot tuber flour has a lower protein content. Nutritional Value Information stipulated by BPOM Regulation Number 26 of 2021 is presented in Table 11 [10].

Table 11. Nutritional Value Information

INFORMASI NILAI GIZI			
Serving Size 30 grams			
Number of servings per package		2	
AMOUNT PER SERVING			
Total energy		82.935 kcal	
Fat energy		25 kcal	
			%AKG*
Fat	3 g	5%	
Protein	3 g	4%	
Carbohydrates 11 g 3%			
Fiber	0.2 g	1%	
*Percent AKG based on energy needs is 2150 kcal.			
Your energy needs may be higher or lower			

Based on the calculation of nutritional value information, it can be concluded that the Savory Pao product with a serving size of 30 grams, with a total of 2 servings contains Energy of 82,935 kcal, Protein 3 grams (RDA 4%), Fat 3 grams (RDA 5%), Carbohydrates 11 grams (RDA 3%), Fiber 0.2 grams (RDA 1%).

e. Selling Price and BEP

Based on the results of calculations that have been carried out, the total production cost of Savory Pao is IDR 85,257 with a selling price of IDR 13,000 per package with a 50% mark-up. Profits will be achieved on unit BEP of 7 boxes and currency BEP of IDR 86,826. A comparison of Savory Pao prices on the market is presented in Table 12.

Table 12. Savory Pao Price Comparison

Name	Amount	Weight (g)	Price
Papao Bakpao	2 pieces	40-60	IDR19.000
Bakpao Imperial Kitchen	2 pieces	30-45	IDR21.900
Bakpao Chik Yen	2 pieces	60	IDR25.000
Savory Pao	2 pieces	60	IDR13.000

Based on the price comparison that has been carried out, the price of Savory Pao is relatively lower compared to several bakpao variants. Apart from that, Savory Pao also has added value in the form of using arrowroot tuber flour and fish as filling which can increase the nutritional value of the product. Therefore, Savory Pao has the potential to be accepted by consumers in terms of price and innovation in local raw materials.

3.2 Discussions

The research and development of Savory Pao products through arrowroot flour substitution and mackerel filling substitution was carried out through four main stages: define, design, develop, and disseminate, with each stage providing important findings that support the success of product development. The define stage began with the identification of product concepts and determination of reference recipes through sensory testing of three different formulations (R1, R2, and R3), where the results showed that although all three recipes produced relatively similar physical characteristics in terms of round shape, 5 cm diameter, and creamy white color, significant differences were observed in taste and texture aspects [11]. Recipe 2 demonstrated the best performance with the highest average score of 4.1 compared to R1 (3.5) and R3 (3.8), with its superiority lying in the soft and fluffy texture and optimal savory taste, which was supported by the balanced composition of ingredients, particularly the use of 500 g of medium protein wheat flour with appropriate proportions of leavening agents [12]. Recipe 1 showed the lowest score in texture (3.0) and overall properties (3.1) due to suboptimal tuna filling ingredients and unbalanced ingredient proportions, while Recipe 3, despite having a better score than R1 (3.8), was still inferior to R2 due to its somewhat hard texture likely caused by excessive wheat flour (600 g) with disproportionate water content (500 ml) [13]. Based on these results, Recipe 2 was selected as the reference recipe for the next development stage, which is consistent with the principle of food product development that emphasizes consumer acceptance of primary sensory attributes, especially taste and texture [14].

In the design stage, substitution of wheat flour with arrowroot flour was carried out at three different levels: 20% (FI), 40% (FII), and 60% (FIII), along with substitution of tuna filling with mackerel, where the sensory test results showed that the formulation with 20% substitution (FI) provided the best results with an average score of 4.1, higher than the reference recipe (3.2), FII (3.5), and FIII (3.6) [15]. FI excelled in aspects of shape (4.6), size (4.3), taste (4.3), and overall

properties (4.6), with the resulting texture being soft with slight roughness that was still acceptable to panelists, which according to research, arrowroot flour substitution at the 20% level is capable of producing bakpao with good shape, taste, and texture, namely soft, tender, and hollow [16]. This is attributed to the characteristics of arrowroot flour which has low amylose and high amylopectin content, thereby producing more stable gels and soft textures [17]. Conversely, FII (40%) and FIII (60%) showed decreased quality in texture and aroma aspects, with textures becoming dense and coarse and the emergence of a musty arrowroot flour aroma in FIII, a phenomenon caused by the high starch content and low gluten in arrowroot flour [18]. Gluten is the protein responsible for dough elasticity and development, and substitution of arrowroot flour at high levels causes a significant decrease in gluten content, preventing the dough from developing optimally and resulting in a dense texture, while the musty aroma indicates that arrowroot flour has a less neutral flavor character when used in large quantities [19]. Based on these results, FI with 20% arrowroot tuber flour substitution was selected as the best formulation for the subsequent development stage.

The develop stage involved product validation by experts through two stages of validation testing, where Validation I results showed that the development product had quite good quality with an average score of 4.1 compared to the reference product (4.0), but two aspects still needed improvement, namely taste (score 3.0) and packaging (score 4.0) [20]. The validators provided input to add spices and seasonings to reduce the fishy aroma of the mackerel, and after improvements were made, Validation II showed significant improvement in all aspects, with the average score of the development product reaching 4.4 compared to the reference product (4.0) [21]. The taste aspect increased from 3.0 to 4.5 and packaging from 4.0 to 4.6, indicating that the addition of spices such as garlic, shallots, and herbs (lemongrass, kaffir lime leaves, basil leaves) was effective in covering the fishy aroma and taste of mackerel [22]. This is supported by research showing that the use of spices in fish processing can function as natural deodorizers that suppress fishy odors through carbonyl compound reactions with amine groups in fish [23]. The Savory Pao packaging was designed using mica plastic measuring 16 x 10.6 cm containing 2 pieces of bakpao weighing 60 grams, complete with a label containing product information such as name, composition, net weight, production address, and nutritional value information, which is in accordance with BPOM Regulation Number 31 of 2018 concerning Processed Food Labels which requires the inclusion of nutritional value information for certain processed food products [24].

In the disseminate stage, a hedonic test was conducted on 60 untrained panelists from the general public, and the paired sample t-test results showed that the development product had higher average values compared to the reference product for all tested parameters [25]. Statistical analysis showed significant differences ($p < 0.05$) for all sensory characteristics, namely taste ($p = 0.009$), aroma ($p = 0.013$), texture ($p = 0.015$), packaging ($p = 0.000$), color ($p = 0.007$), and overall properties ($p = 0.000$), indicating that the development product was significantly more preferred by panelists compared to the reference product [26]. The highest average scores for the development product were achieved by overall properties (4.71), followed by taste (4.68), color (4.67), aroma (4.47), texture (4.47), and packaging (4.43), and the high level of panelist acceptance of the development product indicates that 20% arrowroot flour substitution and mackerel filling can improve the sensory quality of the product [27]. Proximate test results showed changes in nutritional composition in the development product compared to the reference product, with the development product containing protein 8.38%, carbohydrates 37.22%, fat 10.45%, fiber 0.67%, water 29.39%, and ash 0.86% [28]. There was an increase in carbohydrate content from 35.79% to 37.22%, fat from 9.59% to 10.45%, fiber from 0.63% to 0.67%, water from 28.63% to 29.39%, and ash from 0.72% to 0.86%, while protein content decreased from 8.84% to 8.38% [29]. The increase

in carbohydrate and fiber content is caused by the high starch and dietary fiber content in arrowroot flour, which contains amylose around 18-22% and amylopectin 78-82% with quite high dietary fiber content, and the increase in fiber content (from 0.63% to 0.67%) shows that arrowroot flour is able to increase the nutritional value of the product, especially in the aspect of dietary fiber content which is beneficial for digestive health [30]. The decrease in protein content is caused by the lower protein content of arrowroot flour (around 0.5-1.5%) compared to medium protein wheat flour (10-11.5%), but this decrease is still within acceptable limits and can be compensated by the protein content from mackerel filling [31]. Based on BPOM Regulation Number 26 of 2021 concerning Nutritional Values on Processed Food Labels, Savory Pao products with a serving size of 30 grams (2 servings per package) contain energy 82,935 kcal, protein 3 grams (4% RDA), fat 3 grams (5% RDA), carbohydrates 11 grams (3% RDA), and fiber 0.2 grams (1% RDA), and this nutritional value information is important to help consumers choose food products that suit their nutritional needs [32].

Based on the calculation, the total production cost of Savory Pao is Rp 85,257 with a selling price of Rp 13,000 per package (50% mark-up), with the break-even point (BEP) achieved at the sale of 7 boxes (unit BEP) with a sales value of Rp 86,826 (currency BEP) [33]. Price comparison with similar products on the market shows that Savory Pao has a relatively lower price, where Papao Bakpao is sold for Rp 19,000 for 2 pieces (40-60 g), Bakpao Imperial Kitchen Rp 21,900 for 2 pieces (30-45 g), and Bakpao Chik Yen Rp 25,000 for 2 pieces (60 g), while Savory Pao offers a more competitive price (Rp 13,000 for 2 pieces at 60 g) with added value in the form of using local raw materials (arrowroot flour) and fish filling that increases nutritional value [34]. The competitive advantage of Savory Pao lies not only in the more affordable price but also in the innovation of using arrowroot tuber flour as a fiber source and mackerel as a protein source, which is in line with current consumer trends that increasingly pay attention to health aspects and functional value of food products [35]. Food diversification based on local raw materials also supports food security programs and increases the added value of local agricultural products, and overall, the development of Savory Pao with arrowroot tuber flour substitution and mackerel filling has succeeded in producing a superior product from various aspects [36]. The 20% arrowroot flour substitution level has proven capable of producing products with better sensory characteristics, increased nutritional value (especially fiber), competitive prices, and high levels of consumer acceptance, thus this product has good commercial potential and can become a healthy food product alternative based on local raw materials [37].

4. Conclusions

Based on research that has been carried out by researchers in the process of making Savory Pao products, analysis and information data can provide the following conclusions.

1. The correct recipe for making Savory Pao uses a substitution of 20% arrowroot flour and 80% wheat flour.
2. The Savory Pao packaging uses mica measuring 16'10'6 cm with a clear lid containing 2 Savory Pao pieces with a total weight of 60 grams, equipped with a label containing the product name, image, composition, nutritional value information, net weight and production address.
3. Based on the results of the paired T test, the level of liking for Savory Pao in the aspects of taste, aroma, texture, packaging, color and overall characteristics shows significant differences (significantly different) between the reference product and the development product.

4. Information on the nutritional value of Savory Pao per 30 gram serving has an energy content of 82,935 kcal, fat energy of 25 kcal, fat 3 grams (RDA 5%), protein 3 grams (RDA 4%), carbohydrates 11 grams (RDA 3%), and fiber 0.2 grams (RDA 1%).
5. The selling price of Savory Pao is IDR 13,000 per package (2 pieces) with a total weight of 60 grams. BEP per unit is 7 boxes with BEP rupiah of IDR 86,826.

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