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Potential economic feasibility of suweg flour production as a high carbohydrate food ingredient

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ABSTRACT

Tubers are high-carbohydrate food ingredients that are widely available in Indonesia. However, not all tubers in Indonesia are used and developed optimally. Suweg is a tuber plant that can grow in yards or fields without special maintenance. Some farmers in Java, Sumatra, and Eastern Indonesia already know Suweg. Suweg is a very potential source of food. Suweg has prospects to be developed into tuber flour and starch. Suweg, which belongs to the taro tribe, is being looked at by several groups in the food and health supplement industry as a raw material because of its nutritional content. In this study, tubers of suweg were processed into intermediate products in the form of suweg flour using a modified salt solution immersion method and fermentation using a lactic acid bakery starter (BAL). The resulting suweg flour is brownish-white powder, clean from other impurities, with a distinctive suweg odor and a slightly characteristic suweg taste and passes through an 80-mesh sieve. The economic simulation results in producing 85.8 kg of suweg flour for 1 month packaged in 1 kg obtained a base price of Rp. 4,290,000, R/C ratio of 1.3, BEP volume of 39.55 packages, BEP price of Rp. 1,977,660.
Keywords: tubers, suweg flour, intermediate products, lactic acid bacteria

INTRODUCTION

Suweg (*Amorphopallus campanulatus BI*) is a tuber plant. Suweg is a plant that is easy to find when the rainy season ends. This plant is one of the native plants of the Southeast Asian region. Its habitat is land, often found in forest yards of moist fields that grow wild. Suweg has flowers with a distinctive color. From the flower part, it is said that this plant has a close kinship with the giant carrion flower. However, the lower part of the suweg plant is not the main part of obtaining nutrients from nature.

Suweg is a plant belonging to the Amorphophallus clan and is still closely related to the giant corpse flower (*Amorphophallus titanium)* and iles-iles (*Amorphophallus muelleri*). Suweg tuber has great potential to be used as a food diversification ingredient in the future because its starch content is approximately 18.44% and is low. Glycemic Index, so it is very safe for diabetics, and the ability of suweg plants to survive living under the shade so that they can be planted side by side with tall plants. Exploration and Identification of Morphological Characteristics of Suweg Plants (*Amorphophallus campanulatus BI*) in East Java. Bachelor thesis, Brawjaya University. Plants and suweg tubers are shown in Figure 1

Suweg plants are wild plants and grow well in places that are moist and protected from sunlight. Suweg plants grow a lot in the forest and are tubers that can live in the shade of tall forest plants without being maintained and cared for continuously and are relatively resistant to disease. The size of the suweg tuber can reach a diameter of 40 cm. The shape is flat and round, the diameter of the tuber height can reach 30 cm, and the tuber weighs approximately 5 kg. Suweg flour is a polysaccharide that contains very low calories, which is very good as a source of dietary fiber. The application of porang flour in food production is very broad because it provides many benefits, one of which is as a functional food source (Purwani et al., 2021).

Suweg is a local food ingredient containing high carbohydrates, 80-85%. Apart from that, swung has other advantages, namely low Glycemic Index (GI) (36) and high fiber 13.71% (Utami et al., 2021). Many products from various research results have been developed from suweg flour. According to

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Anjali, who conducted research on suweg flour supplementation in cake making, the addition of 30% had a higher acceptability score (Purwani et al., 2021). Suweg tubers have good prospects as a source of carbohydrate food to be developed in Indonesia. Apart from being easy to obtain, this plant can also produce carbohydrates and a high yield rate (Satriawan & Suwardji, 2023).

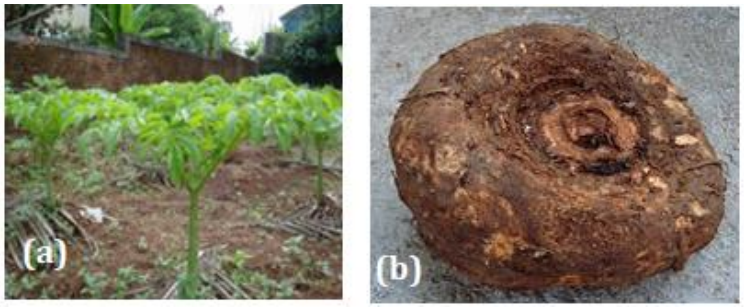

Figure 1. Plants and suweg tubers in Indonesia. (a) Suweg Plant and (b) Suweg Tubers

Until now, Indonesian people only recognize certain types of plants as sources of carbohydrates, such as rice, corn, and tubers. Not all tubers have been utilized and developed. Suweg, as one type of tuber, has the potential to be developed as an alternative carbohydrate source besides rice. Where 80-85% of the main content of suweg is carbohydrates, the nutrients in suweg tubers can be seen in Table 1.

Table 1. Nutritional Value of Suweg in 100 g Ingredients.

Content	Amount
Water	82 g
Vitamin B1	0.07 g
Calorie	69 kcal
Protein	1.0 g
Fat	0.1 g
Carbohydrate	15.7 g
Calcium	62 mg
Phosphor	41 mg
Iron	4.2 mg

Source: (Faridah, 2005).

According to Pitojo (2007), the physical properties of sewage tuber flour include smooth, grayish-white, or brownish-brown. The color of suweg tuber flour is less white than wheat flour, tapioca flour, or breadfruit flour. The brownish color of suweg flour is due to the browning reaction during the stripping of the tuber so that the chips are not white. Suweg flour is unlike wheat flour, which has a lot of gluten. However, suweg flour can be used as a substitute for wheat or other flour. The composition of suweg flour can be seen in Table 2.

Table 2. The Composition of Suweg Flour.

Flour Value Component	Suweg Tuber	Wheat Flour
Water Content (%)	4.47	7.800
Ash Content (%)	4.60	0.520
Fat Content (%)	0.28	0.900
Protein Content (%)	7.20	8.000
Crude Fiber Content (%)	523	0.430
Carbohydrate Content (%)	83.18	82.350

Source: (Faridah, 2005).

Based on the characteristics of suweg flour above, the carbohydrate content can be improved, referring to the research results of Wanita & Wisnu (2013) who examined the process of making cassava flour with a fermentation process with the help of lactic acid bacteria (LAB). Lactic acid bacteria are

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gram-positive bacteria that produce lactic acid by fermenting carbohydrates. During the fermentation process, lactic acid bacteria can improve product quality with the metabolites produced during the fermentation process. Lactic acid bacteria can also extend the shelf life and inhibit microbial growth. In addition, lactic acid bacteria also form flour aroma and provide the desired color and texture to fermented food products (Syahputri et al., 2016).

Our research aims to learn the process of making suweg flour using the lactic acid bacteria (LAB) fermentation process. The resulting product is expected to have quality color, odor, and taste and a longer storage period. In addition, this research seeks to increase the use and economic value of suweg tubers.

RESEARCH METHOD

Materials

Making suweg flour: the process of making suweg flour: Suweg tubers that are optimally cooked, after stripping, washing with running water, size reduction/peeling, soaking in 3% salt solution for 20 minutes, washing with water clean, drain and dry, sun or cabinet dry dryer, milling, 100 mesh sifting, and finally it becomes suweg tuber flour.

Methods

Making suweg flour was carried out with several trials, namely the manufacture of tubers with solution soaking treatment salt 3% and by modifying the method of making mocaf flour results in the research of Wanita & Wisnu (2013), namely using a Lactic acid bacterial starter (LAB) with the starter product name Bimo-CF with free replications. The details of making suweg flour are as follows:

1. Ingredients: 1 kg suweg tuber, 3 g salt/liter of soaking water, and starter BAL 0.1 g/liter of soaking water.
2. Tools: knife, cutting board, basin, measuring cup, grinder, slicer, spinner, hand gloves, rubber gloves, scales, and sieve.
3. Work Procedures: the working procedure for making suweg flour: suweg tubers that are already cooked optimally, after striping, washing with running water, reducing the size/shredding, soaking in 3% salt solution for 20 minutes, clean water washing, draining, and drying, light drying sun or cabinet dryer, milling, 100 mesh sieving, and finally so suweg tuber flour.

RESULT AND DISCUSSION

Suweg tubers are processed into suweg flour with a modified method of salt solution immersion and fermentation using a lactic acid bacteria (LAB) starter. The manufacture of suweg flour processed by salt solution immersion and lactic acid bacteria fermentation provides brighter color, less pungent odor, and more acceptable taste than suweg flour on the market. The results of processing suweg chips and suweg flour are shown in Figures 2a and 2b. The observation results of suweg flour using lactic acid bacteria fermentation (2c.i) look brighter when compared to suweg flour on the market (2.c.ii), but the brightness of wheat flour (2.c.iii) is higher than suweg flour.

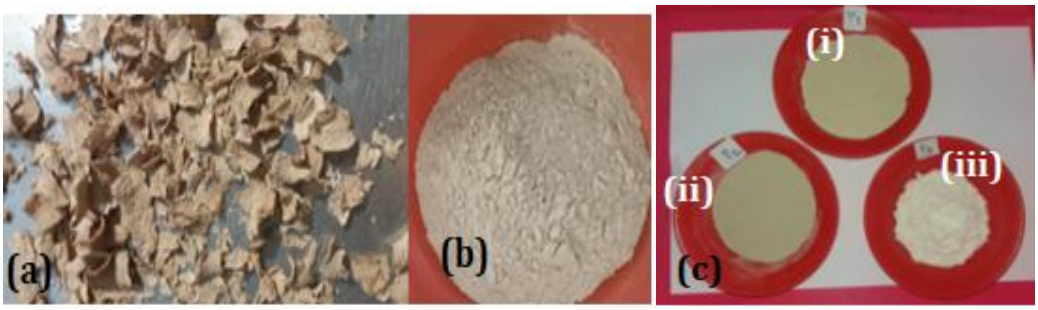

Figure 2. Processing of suweg tubers into chips and suweg flour. Chips from suweg tubers (a), suweg flour with fermentation process (b), and color comparison between fermented suweg flour (c.i), market suweg flour (c.ii) and wheat flour (c.iii).

Based on observations, odor, color, and taste between the three flour samples (2c), lactic acid fermented suweg flour has some characteristics of brighter color, less pungent odor, and more

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acceptable taste compared to suweg flour on the market. According to research conducted by Yulianto et al. (2023) it shows that cookies are made from The raw mixture of suweg flour and arrowroot flour, which has the potential as a food ingredient hypoglycemic and is good for use as a diet tool to maintain stability or even lower blood glucose content. The characteristics of suweg flour processed by salt solution soaking method and lactic acid bacteria fermentation are presented in Table 3.

Table 3. Suweg Tuber Flour Observation.

Observation Type	Observation Result
Form	Powder
Smell	Suweg smell
Color	Brownish white
Taste	A bit suweg smell
Novel Object	None
Insects (Stradia)	None
Smoothness	Fine (under 80 mesh)

One of the important parameters in making suweg flour is yield. Yield is the ratio between the dry percentage value (output) to the wet value (harvest) expressed in percent. The yield can be calculated for each stage of the suweg flour-making process. This is important to know because it can be used to determine the efficiency of the process. The yield of suweg flour from the three trials can be seen in Table 4.

Table 4. The Yield of Suweg Flour using Salt Solution Soaking Method and *Lactic Acid Bacteria.*

No.	Tuber Weight	Suweg Tuber	Wheat Flour
1.	1 Kg	108 g	10.8 %
2.	1 Kg	127.2 g	12.72 %
3.	1 Kg	117.1 g	11.71 %
	Average	117.43 g	11.743 %

The yield of suweg flour of 11.743% follows the research results of (Hasbullah & Umiyati, 2017a, 2017b), which show that suweg flour ranges from 11.01 - 23.2%. Assuming the production capacity is 30 kg per day and the number of working days is 26 days per month, then the economic analysis of suweg flour production is presented in Table 5.

Table 5. Production Cost of Making Suweg Flour.

No	Description	Volume	Unit	Unit Price (Rp)	Number of Days	Total (Rp)
	Variable cost (Rp. 2,457,000) = VC					
1	Variable cost per total production/month is 2,340,400 / 85.8 = Rp. 28,636.36 = v					
	Suweg tuber	30	kg	3000/kg	26	2,340,000
	Salt	900	g	3 /g	26	70,200
	Stater LAB	30	g	60 /g	26	46,800
2	Fixed cost (Rp. 845.000) = FC					
	Labor	1	People per day	30,000 / ppd	26	780,000
	Tool rental	1	day	1000 / day	26	26,000
	Electricity/power	1	day	1000 / day	26	26,000
	water	1	day	1000 / day	26	26,000
3	Total production cost (FC + WC)					3,302,000

The total monthly production is 85.8 kg packed with flour weight per package of 1 kg. So, the total production per month is 85.8 packages. Percentage profit is set at 30%. Thus, the cost of goods, selling can be calculated.

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Table 6. Business Feasibility Analysis of Suweg Flour Production.

Analysis	Formula	Percentage of result % ± SD or SE
Total Production cost (1)	Table V	3,302,000
Total production/month (2)	assumption	85.8 Packs
% Profit (3)	assumption	30 %
Base fare (4)	(4) = (1) / (2)	38,485 /pack
Selling price (5)	(5) = (4) + (3) x (4)	50,030.30 rounded into Rp. 50,000 /pack
Income total (6)	(6) = (2) x (5)	4,290,000 /month
Profit (7)	(7) = (6) – (1)	988,000 /month
Ratio R/C (8)	(8) = (6) / (1)	1.30
BEP Volume (10)	(10) = Q / [(5) –(v)]	39.55 /pack
BEP Cost (11)	(11) = (1) / [1 – v / (5)]	1,977,660 /pack

Based on the results of the economic analysis, it is known that the selling price of suweg flour is Rp. 50,000/kg. The selling price of suweg flour is almost 5 times that of wheat flour because production is carried out on a small scale, and the yield is relatively low. Based on the R / C value, a value of 1.3 is obtained, which means that this business is feasible to continue.

CONCLUSION

Suweg tubers can be used as an alternative food source by making flour and other processed products. Utilizing suweg tubers in flour can maintain the quality and extend the shelf life of suweg tubers. Using lactic acid bacteria in the suweg flour production process provides many advantages, such as a brighter color, a more acceptable taste, and the distinctive aroma of suweg tubers is maintained. One use of suweg tuber flour is as a raw material for healthy snacks. The R / C (Revenue Cost Ratio) analysis results are 1.3, so this business is feasible to continue.

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