International Journal of Design & Nature and Ecodynamics
Vol. 18, No. 3, June, 2023, pp. 719-725
Journal homepage: http://iieta.org/journals/ijdne

Optimization and Marketing Analysis of Low-Oxalate Beneng Taro Flour (*Xanthosoma undipes* K. Koch) in Gluten-Free Noodles

Suherna[1*], Karmelia Nurrohmah[1], Tubagus Bahtiar Rusbana[1], Zulfatun Najah[1], Winda Haliza[2]

[1] Faculty of Agriculture, Universitas Sultan Ageng Tirtayasa, City of Serang 42172, Indonesia
[2] Balai Besar Penelitian dan Pengembangan Pascapanen Pertanian, Bogor 16122, Indonesia

Corresponding Author Email: suherna.untirta@gmail.com

https://doi.org/10.18280/ijdne.180325

Received: 11 April 2023
Accepted: 30 May 2023

Keywords:
optimization, low-oxalate, sensory, small businesses, physical and chemical properties, commercialization, taro flour, beneng

ABSTRACT

The purpose of this study was to analyze the optimization and marketing analysis of Low Oxalate Taro Bread Flour (*Xanthosoma undipes* K. Koch) in Gluten Free Noodles. This experimental research was conducted from April to May 2022 at the Laboratory of the Indonesian Center for Agricultural Postharvest Research and Development, Bogor. Making gluten-free Taro beneng noodles was then analyzed for physical and chemical properties as well as sensory analysis. Then continued to the marketing analysis stage of gluten-free taro noodles using a WEB-based GIS approach. The research findings revealed that both Formula A and Formula B of taro beneng noodles met the moisture content requirements for dry noodles according to SNI 8217-2015. Formula A had higher ash and protein content, while Formula B had higher carbohydrate and dietary fiber content. Additionally, Formula A exhibited higher levels of oxalic acid and calcium oxalate compared to Formula B. Moreover, Formula B demonstrated lower cooking loss and shorter cooking time than Formula A. The hedonic test results indicated that both Formula A and Formula B of beneng taro noodles were generally well-liked by the participants. The average ratings for color, aroma, texture, and overall preference fell within the range of "like" to "rather like". The research findings suggest that both Formula A and Formula B of taro beneng noodles were generally well-liked by the participants, with similar ratings for color, aroma, texture, and overall preference.

1. INTRODUCTION

Taro beneng *(Xanthosoma undipes* K. Koch*)* is a potential local commodity from Banten Province, Pandeglan Regency. Taro Beneng has great potential to be developed as a local food source because of the product's large size, high protein content, and attractive yellow color are the characteristics of Taro Beneng [1]. A business development strategy can be carried out with an aggressive strategy by increasing sales to increase profits by increasing access to a wider market. Processed products of taro beneng that have been produced in Pandeglang Regency are taro beneng flour, taro beneng chips, taro beneng brownies, taro beneng donuts, taro beneng choco chips, taro beneng getuk, pabulon pastries and dried beneng taro [2].

Taro beneng has the potential as a local food ingredient to replace rice and wheat flour and can be used as a variety of flour-based products [3]. Current taro products in the Pandeglang district face limitations that our research seeks to overcome, namely lack of diversity and innovation in available taro products, which limits consumer choice and impedes the market growth. Beneng taro flour produced by farmers is still of poor quality. The color is unattractive (brown) and still contains high oxalates. The oxalate content in taro beneng is around 6,178 mg/100g [4]. While the threshold for oxalate that does not cause itching is 71 mg/100g taro [5]. This shows that the oxalate contained in taro beneng far exceeds the body's acceptance threshold for oxalate so as not to cause itching.

Several studies have been conducted in an effort to produce high-quality taro flour by reducing oxalate and increasing the brightness of the color of taro beneng flour. In this study, the researchers used a solution of sodium chloride and sodium metabisulfite as a soaking solution for translucent taro, which aims to produce taro flour that is low in oxalate and has a bright color. Meanwhile, to find the optimal time for reducing oxalate content, the researchers used several variations of heating time, namely 30, 60, 90, 120, 150, and 180 minutes. Taro beneng flour, with the best characteristics in this study, needs to be applied to food products to optimize the utilization of beneng taro. One food product that matches the characteristics of beneng taro flour is noodles. This product was chosen because, for the people of Indonesia, noodles have become the main food ingredient after rice.

Actually, the focus of our research is on how to create and develop a formula to produce gluten-free noodles using low-oxalate beneng taro flour as one of the main ingredients.

2. METHOD

This research was divided into 2 stages: the manufacture of gluten-free taro noodles and continued to the marketing analysis stage of gluten-free taro noodles using a WEB-based GIS approach.

2.1 Making taro beneng noodles gluten free

2.1.1 Material

This experimental research was conducted from April to May 2022 at the Laboratory of the Indonesian Center for Agricultural Postharvest Research and Development, Bogor. The material used in this study was beneng taro aged 10-12 months and weighing 2.4-15 kg from Juhut Village, Pandeglang Regency.

2.1.2 Making beneng taro flour

Slices that had been dried were then subjected to a grinding process using a grinder machine to become small grains. Next, the sieving process was carried out with a size of 100 mesh. The refined taro beneng flour was stored in plastic clips according to each code to maintain the quality of the flour until the analysis was carried out.

The type of soaking solution has an effect on the physicochemical characteristics of beneng taro flour. Sequential soaking in a 10% NaCl solution and 500 ppm Sodium Metabisulfite solution can increase yield, whiteness index, expansion index, solubility index, amylose content, and total carotenoid content in the flour. Additionally, it can decrease oxalate acid content, calcium oxalate content, moisture content, and ash content. Slices that had been dried were then subjected to a grinding process using a grinder machine to become small grains. Next, the sieving process was carried out with a size of 100 mesh. The refined taro beneng flour was stored in plastic clips according to each code to maintain the quality of the flour until the analysis was carried out.

2.1.3 Making gluten-free noodles

Based on the Bayesian method in previous studies, it was found that the best flour was flour treated with sequential immersion in 10% NaCl + 500 ppm Sodium Metabisulfite solution with heating for 150 minutes. Researchers carried out various formulations with trial and error and obtained 2 formulations which according to researchers may be continued for further analysis, namely formulas A and B with the composition shown in Table 1.

Table 1. Formulation of gluten-free noodles

Composition	Formula A	Formula B
Beneng taro flour	62%	40%
Tapioca	21%	35%
Corn starch	14%	22%
Xanthan Gum	3%	3%

The initial stage of making gluten-free noodles, following the recipe from the Postharvest Processing Laboratory, is to weigh the ingredients according to the requirements. Then, all the ingredients are mixed and stirred until homogeneous. After that, the dough is placed in a cloth sieve and steamed for 20 minutes. The noodle strands are then extruded using an automatic extruder and dried in a cabinet oven at a temperature of 60℃ for 2-3 hours (Figure 1).

2.1.4 Analysis of physical and chemical characteristics of beneng taro noodles

Analysis of physical and chemical characteristics, namely color, water absorption by the AACC 66-507 method, elasticity, cooking time, cooking loss by the AACC 66-507 method, moisture content by the gravimetric method [6], Ash Content by Dry Ashing Method [6], Protein Content Kjehdahl Method (Modification) [6], Fat Content by Soxhlet Method (SNI 01-2891-1992), Carbohydrate Content was according to by Difference Method [7], Content of Starch, Crude Fiber (SNI 7622-2011), Food Fiber by Enzymatic Method [7].

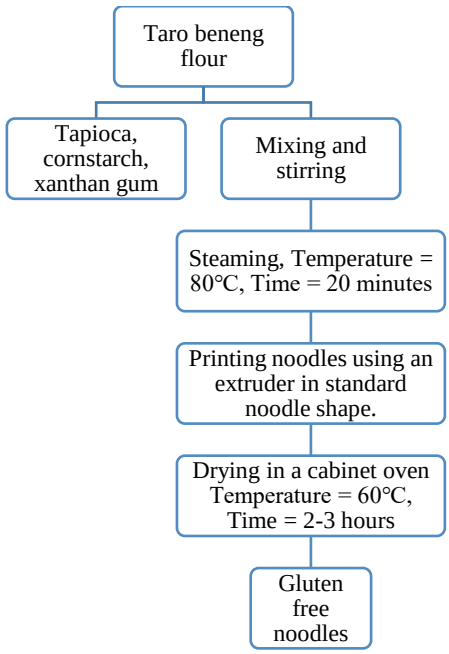

Figure 1. Making gluten free noodles

2.1.5 Sensory analysis

The hedonic organoleptic test was carried out using the BSN method (2006) based on SNI 01-2346-2006 regarding sensory testing standards. This test aimed to determine consumer preferences and opinions regarding beneng taro noodle products. About thirty panelists in the Postharvest Center, Bogor, carried out this preference level test. The panelists would be given technical guidance on scoring the organoleptic test questionnaire sheet, which included five parameters (taste, color, aroma, texture, and overall) with a scale of 1-7.

2.2 Marketing analysis of beneng taro processing

This research method was a descriptive method with a quantitative approach. The population in this study were business actors/sellers of taro beneng in Pandeglang Regency. The sampling technique was total sampling. The tools or software used were laptops, GPS, cameras/mobile phones, and ArcGIS software. The research materials were the Administrative Map of Pandeglang Regency, Map of Pandeglang Regency, and Map of RTRW of Pandeglang Regency. The data collected in this study were: 1) Spatial data in the form of online maps from Google Maps and the results of field survey coordinates from GPS locations of talas beneng producers/sellers; 2) The non-spatial data used was primary data (field survey) including Company Name, Company Address, Type of Taro Yarn Products being sold. For data processing, namely merging spatial and non-spatial data into a database and designing a WEB-based GIS.

Data analysis was to create an information system with features to assist the community in promoting, marketing, and distributing talas beneng business actors in Pandeglang Regency using WebGIS.

3. RESULTS AND DISCUSSION

3.1 Test results of chemical properties of beneng taro noodles

Based on the trials (trial and error) that have been carried out, 2 formulations of noodles were obtained, namely Formula A (62% taro flour) and Formula B (40% taro flour). The materials used to manufacture gluten-free noodles in this study were beneng taro flour, tapioca, cornstarch, and xanthan gum. According to Risti and Rahayuni [8] tapioca flour has thickening characteristics and functions as a binder in the dough, while cornstarch has the characteristics of softening the dough. Tapioca flour and cornstarch have physicochemical characteristics close to wheat flour, such as granule size, amylose, amylopectin content, and gelation temperature. The addition of tapioca flour and cornstarch are expected to form a good gluten-free noodle texture. According to Jarnsuwan and Thongngam [9], adding xanthan gum to manufacture dry noodles can improve rehydration and texture. The results of testing the chemical properties of taro beneng noodles can be seen in Table 2. This test was carried out to determine which formulation could produce taro beneng noodles with the best chemical characteristics.

Table 2. Average results of testing the chemical properties of beneng taro noodles

Parameter	Beneng Taro Noodles	
	Formula A (62% beneng taro flour)	**Formula B (40% beneng taro flour)**
Water content (%)	9.8023 ± 0.45	9.7582 ± 0.34
Ash content (%)	0.9579 ± 0.05	0.5466 ± 0.01
Protein (%)	2.9722 ± 0.13	2.3647 ± 0.10
Fat (%)	0.3743 ± 0.05	0.2626 ± 0.2
Carbohydrate (%)	86.1331 ± 0.06	88.6824 ± 0.09
Crude Fiber (%)	4.5791 ± 0.09	3.2921 ± 0.08
Dietary Fiber (%)	32.2508 ± 3.97	48.3216 ± 3.72
Total Starch (%)	56.4598 ± 0.17	58.2376 ± 0.15
Oxalic acid (ppm)	1481.8 ± 4.93	956.0 ± 4.08
Calcium Oxalate (ppm)	355.3 ± 2.88	229.2 ± 2.87

The water content in a noodle product is expected not to be high. This is because products with high water content will affect the quality of these noodle products. Winarno (2004) explains that the water content of the product affects acceptability, freshness, and durability [10]. The analysis of water content showed that the taro beneng noodles of Formula A contained more water than Formula B, namely 9.8% and 9.7%, respectively. Based on SNI 8217-2015 regarding dry noodles, the maximum moisture content of noodle products that go through the drying process is 13%. These results indicate that the taro beneng noodles Formula A and B have fulfilled the SNI requirements for dry noodle water content.

The ash content illustrates the content of inorganic substances in the material because, during the combustion process, organic substances will be destroyed by fire, while inorganic substances will not. This inorganic substance is a mineral, so it can be said that the higher the value of the ash content of a material, the higher the mineral content in it. Table 2 shows that taro beneng noodles Formula A has a higher ash content than Formula B. This is because as the substitution of taro beneng flour increases, the proportion of ash content in noodles is higher. After all, taro beneng flour itself is rich in minerals. Based on the SNI for dry noodles, the acid-insoluble ash content in noodle products that go through the drying process is a maximum of 0.1%. These results indicate that the taro beneng noodles Formulas A and B do not meet the SNI requirements for dry noodle ash content.

Based on the results of the analysis, it is known that the protein content of taro beneng noodles ranges from 2.36-2.97%. Taro beneng noodles Formula A has a higher protein content than Formula B. This is because as the substitution of taro beneng flour increases, the proportion of protein in the noodles also increases. Taro beneng noodles have a rougher texture and break easily compared to wheat flour noodles with higher gluten content. Gluten consists of glutenin and gliadin; if dehydrated, glutenin will cause the dough to become strong, and gliadin will cause the dough to become rigid and elastic [11].

The analysis showed that Formula A taro noodles' fat content was higher than Formula B's. This was due to the small substitution of taro flour in Formula B, causing the proportion of Fat in the noodles to be lower because the taro flour itself had a low-fat content. The fat content in dry noodles is not determined by the quality requirements in SNI 8217-2015. Based on the calculation results, it is known that the carbohydrate content in Formula B beneng taro noodles, is greater than in Formula A. This is because Formula B contains more Starch (tapioca and cornstarch) than flour, causing the proportion of carbohydrates in noodles to be higher. The high content of carbohydrates in taro beneng noodles shows that the main content of taro beneng noodles is carbohydrates. The carbohydrate content in dry noodles is not determined by the quality requirements in SNI 8217-2015.

Crude fiber is the residue of foodstuffs after being treated with boiling acids and alkalis. Crude fiber consists of cellulose with little lignin and pentosan. Based on the analysis, Formula A has a higher crude fiber content than Formula B. This is because as the substitution of taro beneng flour increases, the proportion of crude fiber in noodles is higher because taro beneng flour has a high content. The fiber content for dry noodles is not determined by the quality requirements in SNI 8217-2015.

Analysis of food fiber content by the enzymatic method is the determination of food fiber content using enzymes that are adjusted according to the conditions in the body. These enzymes include termamyl (heat-resistant α-amylase), protease, and amyloglucosidase. Based on the results of the analysis, it is known that the taro beneng noodles Formula B has more dietary fiber than Formula A. This is presumably due to the influence of the higher proportion of tapioca and cornstarch, thus increasing dietary fiber content in noodles Formula B. The dietary fiber content for noodles' dry quality requirements is not specified in SNI 8217-2015. Based on the results of the analysis, it is known that the starch content in Formula B beneng taro noodles is greater than in Formula A. This is presumably due to the influence of the higher proportion of tapioca and cornstarch, thus increasing the total starch content of Formula B beneng taro noodles. The starch content for dry noodles is not determined by the quality requirements in SNI 8217-2015.

The resulting beneng taro noodles still contain oxalic acid and calcium oxalate. Based on the results of the analysis, it was found that Formula noodle A contained 1481 ppm of oxalic acid and 355 ppm of calcium oxalate, while formula noodle B contained 956 ppm of oxalic acid and 229 ppm of calcium oxalate. These data indicate that the oxalate content

of the taro beneng noodles of Formula A is greater than that of Formula B. This is because as the substitution of taro beneng flour increases, the oxalate content in the noodles is higher. However, based on the results of the sensory test of taro beneng noodles, the panelists did not feel itchy in either Formula A or B, so it can be concluded that taro beneng noodles can be consumed even though they still contain oxalate.

3.2 Results of physical properties test of beneng taro noodles

The results of testing the physical properties of taro beneng noodles can be seen in Table 3. This test was carried out to determine the formulation that could produce taro beneng noodles with the best physical characteristics.

Based on the results of the color measurements presented in Table 3, the L value of Formula A (71.74) is lower than that of Formula B (75.965), so the brightness level of Formula B is higher than that of Formula A. Then the range of colors a and b on both beneng taro noodles have a positive value; this shows that beneng taro noodles tend to be red and yellow. Formula A has higher a and b values (4.65 and 10.31) than Formula B (4.26 and 9.46). This shows that Formula A noodles have a higher intensity of red and yellow colors compared to Formula B. This difference in intensity is thought to be due to the influence of the carotene content in beneng taro flour, so the greater the number of substitutions of beneng taro flour in noodles, the higher the intensity of the red and yellow colors. If seen based on the level of yellowness (b value), it can be said that the carotene in the noodles can still be maintained even though it has been oxidized during the drying process.

Table 3. Average test results for the physical characteristics of beneng taro noodles

Parameter	Beneng Taro Noodles	
	Formula A (62% beneng taro flour)	**Formula B (40% beneng taro flour)**
Color		
- Value L	71.74 ± 0.94	75.965 ± 0.70
- Value a	4.65 ± 0.84	4.76 ± 0.53
- Value b	10.31 ± 0.66	9.46 ± 0.94
- Hue	65.84 ± 1.54	63.20 ± 1.08
- C	11.31 ± 0.95	10.59 ± 0.75
Water Absorbency (%)	116.9901 ± 0.19	119.1962 ± 0.36
Elasticity (%)	24.43 ± 0.21	21.94 ± 0.42
Cooking Loss (%)	17.83 ± 0.54	15.89 ± 0.28
Cooking Time (minutes)	11.50 ± 0.07	11.375 ± 0.10

Water absorption is the maximum ability of a product to absorb water during cooking. The analysis showed that the taro beneng noodles of Formula B had a higher water absorption (119.19%) than Formula A (116.99%). This is presumably due to the higher proportions of tapioca and cornstarch, thus affecting the increase in water absorption in the noodles. Water absorption is affected by the amylose content contained in the food [12]. Amylose is a starch fraction that plays a role in absorbing water. The low amylose content in beneng taro flour causes the hydrogen bonds to weaken and cannot hold water optimally [13]. The elasticity of noodles is closely related to the gluten protein content. The absence of gluten content in beneng taro noodles causes the inter-starch granules to become loose and compact so that the dough becomes easier to pull and break, as it is known that in making dough, gluten is useful for binding and making the dough elastic so that it is easy to form [14]. Formula A (24.43%) is more elastic than Formula B (21.94%). This is because the paste profile produced by these two formulas is different. Formula A, with a composition of 62% taro flour, 21% tapioca, 14% cornstarch, and 3% xanthan gum, is thought to produce a more compact dough, or it can be said that the mixing process between the components is successful, so that the resulting noodles are more elastic than Formula B.

Cooking loss is a noodle parameter related to the number of solids lost or dissolved when cooked. The desired cooking loss value is relatively low. A low cooking loss value indicates that the noodles have a firm and homogeneous texture with good quality [15]. Noodle Formula B has a lower cooking loss value compared to Formula A. In Formula A, the starch composition is 38%, while in Formula B the starch composition is 60%; with a large amount of starch composition in Formula B, it is suspected that the bonds between starch granules are more compact and not easily lost or dissolved during the cooking process.

Cooking time is the total time required for dried noodles to absorb water again to become supple and elastic. Overcooked and undercooked noodles can be prevented during cooking if you know the optimum cooking time. The optimum cooking time for beneng taro noodles is determined by boiling the noodles in boiling water, and the time is calculated from the time they are added until the noodles are completely cooked and ready to be consumed. Cooked taro beneng noodles are springy and not hard; if you cut them in the middle, there is no white dough. Based on the analysis results, it is known that the cooking time for Formula A noodles is longer than Formula B. This is because as the substitution of taro beneng flour increases, the ability to penetrate water into the noodles decreases [16].

3.3 Sensory properties of beneng taro noodles

Sensory assessment of beneng taro noodles, which include color, aroma, taste, texture, and overall parameters, can be seen in Table 4.

Table 4. Mean sensory test results for beneng taro noodles

Parameter	Beneng Taro Noodles		T-Test
	Formula A (62% beneng taro flour)	**Formula B (40% beneng taro flour)**	
Color	4.9	5.1	P > 0.05
Aroma	5.5	5.5	P > 0.05
Flavor	5.9	6.0	P > 0.05
Texture	5.1	5.9	P > 0.05
Whole	5.6	5.9	P > 0.05

Color is the first parameter that determines consumer acceptance of a product. The color contained in foodstuffs can be caused by several sources, namely the presence of pigments, Maillard reactions, caramelization, and mixing additives [10]. The results of the hedonic test (favorability test) based on the color parameters of beneng taro noodles range from 3-6 (rather dislike to like), with an average value of Formula A noodles is 4.9 (neutral) and an average Formula B which is 5.1 (rather like). The higher the percentage of the addition of beneng taro flour to the noodles, the darker the product's color produced,

so the panelists did not like it. The noodles that the Indonesian people like are yellow with a distinctive shape in the form of long twists [17]. This is because, in general, the noodles often found are bright yellow noodles, so when you see dark noodles, it will lower your level of liking for them.

Aroma is an important factor for consumers in choosing their preferred food product. Winarno states that in many cases, the delicacy is determined by the aroma or smell of the food [10]. The results of the hedonic test (favorability test) based on the parameters of the aroma of beneng taro noodles ranged from 3-7 (rather dislike to really like), with the average value of Formula noodles A and B of 5.5 (rather like). The value of the panelist's acceptance of the two noodles was not significantly different, and this was because the aroma of the taro beneng noodles produced did not have a distinctive aroma, so they were acceptable to the panelists. Taste is one factor influencing a person's acceptance of food. Panelist acceptance of taste is influenced by several factors, including chemical compounds, temperature and concentration, and other flavor components [10]. The results of the hedonic test (liking test) based on the parameters of the taste of beneng taro noodles ranged from 5-7 (rather like to really like), with the average value of Formula A noodles being 5.9 (rather liking) and the average value of Formula B being 6 (Like). Adding beneng taro flour to the noodles gives the resulting noodles a distinctive flavor and is rarely felt by many panelists, so the panelists do not like noodles with more beneng taro flour. This is in accordance with the sensory testing results that Formula B noodles (40% taro flour) are preferable to Formula A (62% taro flour) based on taste parameters.

The results of the hedonic test (liking test) based on texture parameters of beneng taro noodles range from 4-7 (neutral to very like), with an average value of Formula A which is 5.1 (likes) and the average value of Formula noodles B which is 5.9 (likes). Panelists like noodles with a texture that is not easily broken (elastic) and slightly chewy. The texture of the noodles decreased as the composition of beneng taro flour increased. This is because beneng taro flour does not contain gluten. Gluten is very influential in the formation of the noodle structure; the lower the gluten content in the dough, the lower the ability of the dough to have elastic properties and a continuous structure, so that the resulting noodles break easily and lower the panelist's assessment of the noodle texture [18].

The hedonic test results for the overall preference for beneng taro noodles ranged from 47 (neutral to very like), with the average value of Formula noodle A being 5.6 (like) and the average value of Formula noodle B being 5.9 (like). The increasing percentage of the addition of beneng taro flour caused a decrease in the panelist's score on the overall preference for noodles. The panelist's overall preference for beneng taro noodles was influenced by the color, aroma, taste, and texture.

3.4 Marketing of processed taro beneng

Figure 2 and 3 presents a mapping of beneng taro production in Pandeglang Regency, Banten Province. This mapping highlights the presence of eight prominent business profiles and sellers of beneng taro in the area. These include Bumi Pangan Lokal, Rumah produksi tepung talas beneng, KWT Melati, Kelompok Tani Mandiri, Campaka sakti, Gabungan Kelompok Tani, Rumah produksi tepung talas beneng, and Rumah Beneng. Each of these entities contributes to the local production and distribution of beneng taro. As for processed food, namely raw materials from beneng taro flour and analog rice from beneng taro, beneng taro noodles, beneng taro crackers, and beneng taro brownies.

Other research results show that Taro was intensively cultivated in Banten, West Java, and South Sulawesi provinces, for fresh and processed products. The respondents agreed with taro as a prospective adaptive crop to climate change of both drought and excess precipitation. There are some issues in biodiversity conservation, crop improvement, link-match industry, and stakeholder capacity building for competitive, quality, quantity, and sustainable production, as future works in the taro value chain in Indonesia [19]. Other studies indicate that the strong demand for beneng products demonstrates its comparative and competitive advantage over other varieties of taro. Presently, beneng has a viable market for export to various countries. The demand for fresh tubers, flour, and dried leaves is estimated at 60-80 tons, 200 tons, and 300 tons per month, respectively. Our research findings indicate that beneng plants have the potential to yield approximately 10-15 kg of fresh tubers per plant or around 100-150 tons per hectare, while dried leaves can amount to approximately 2 kg per plant or around 20 tons per hectare. The total growth period for beneng plants ranges from 8 to 12 months. To bridge the gap between the demand and supply of beneng products, there is a need for expanding beneng cultivation by optimizing the available arable land in the Gunung Karang area and its surroundings [20].

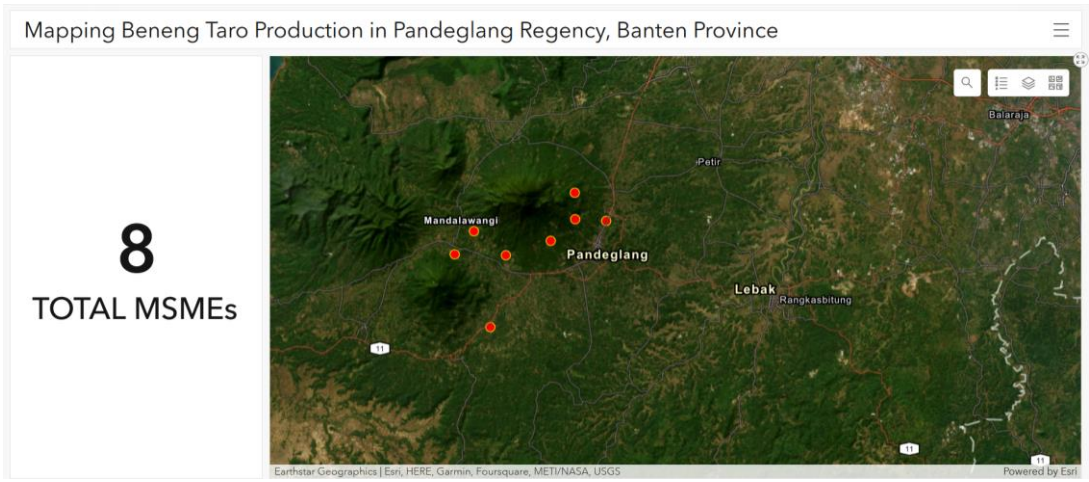

Figure 2. Mapping beneng taro production in Pandeglang Regency, Banten Province

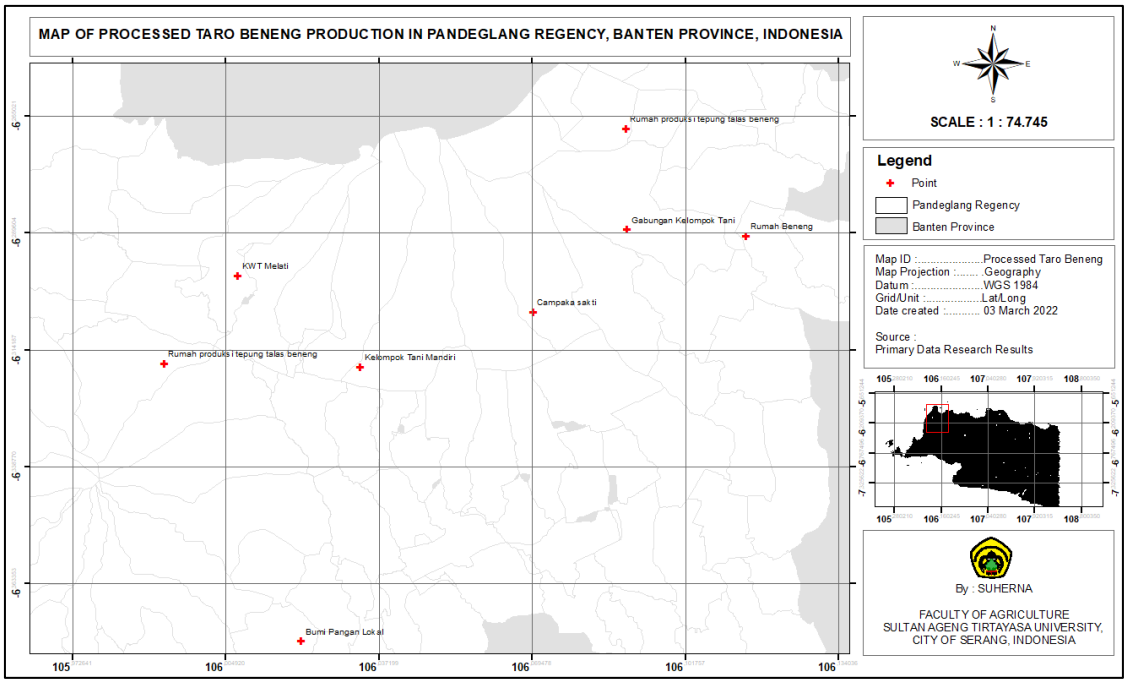

Figure 3. Map of processed taro beneng production

Table 5 shows that 8 UMKM (Micro, Small and Medium Enterprises/MSME) that process and sell raw and processed taro beneng in Pandeglang Regency are marketed to outside areas such as Bogor, Jakarta, Bekasi, Depok, Tangerang, Semarang, Pekanbaru, and Banjarmasin. However, several obstacles are faced by UMKM/MSMEs in sustaining this taro business. The entrepreneurial spirit that is still weak is characterized by relying on government assistance to continue the taro beneng business. Business management is still lacking, sanitation is not appropriate enough in the production process, the accounting process is weak, and also most do not have a business profile.

Table 5. Business profile/seller of beneng taro

No	MSME	Address	Product
1	Bumi Pangan Lokal	Kp. Salawi palanjar	Various processed beneng taro
2	Rumah produksi tepung talas beneng	Desa Cikoneng	Taro beneng flour
3	KWT Melati	Pasir Buluh Desa Cikoneng	Taro beneng flour
4	Kelompok Tani Mandiri	Desa campaka	Clear Taro Processing
5	Campaka sakti	Kampung cempaka	Nursery center
6	Gabungan Kelompok Tani	Kampung Kadu Kebo	Beneng garden
7	Rumah produksi tepung talas beneng	Gunung Karang	Beneng Taro Flour
8	Rumah Beneng	Pasir Waru Kadumerak	Beneng flour

To address these challenges and improve the marketing of taro products, the following strategies can be implemented: 1. Entrepreneurial Capacity Building: Provide training and workshops to enhance the entrepreneurial skills of taro business owners. 2. Quality Control and Sanitation: Implement strict quality control measures and ensure proper sanitation practices in the production process. 3. Packaging and Branding: Improve the packaging of taro products to attract customers and differentiate them from competitors. Design eye-catching and informative packaging that reflects the quality and uniqueness of the products. 4. Supply Chain Management: Enhance the efficiency of the supply chain to ensure timely delivery of taro products. Strengthen relationships with suppliers to ensure a steady and reliable supply of raw materials. Establish partnerships with distributors or retailers to expand the market reach and ensure product availability in targeted areas. 5. Market Research and Promotion: Conduct market research to identify target markets, consumer preferences, and trends related to taro products. Develop targeted marketing strategies to reach potential customers, both locally and in the identified outside areas. Utilize various marketing channels, such as social media, websites, and local marketplaces, to promote taro products and increase their visibility. 6. Collaboration and Networking: Encourage collaboration among taro businesses to leverage collective resources and expertise.

By implementing these strategies, taro businesses can overcome the identified challenges and improve their market position. The improvements in noodle production, packaging, supply chain management, and marketing efforts will contribute to increased competitiveness, customer satisfaction, and the overall success of the taro business sector.

4. CONCLUSIONS

Taro beneng noodles with a composition of 40% taro beneng flour (Formula B) had the best characteristics based on parameters of oxalate, total starch, dietary fiber, color, water absorption, cooking loss, and cooking time. Based on sensory testing of beneng taro noodles, it was found that Formulations A and B were acceptable to panelists based on color, aroma, taste, texture, and overall parameters. Then, it was obtained 8 small and medium business actors who produced processed food based on taro beneng.

REFERENCES

[1] Wahjusaputri, S., Fitriani, S., Bunyamin, B. (2018). Budidaya talas beneng menuju industri kreatif bagi kelompok tani desa juhut, kec. karang tanjung, banten. Prosiding Konferensi Nasional Pengabdian Kepada Masyarakat dan Corporate Social Responsibility (PKM-CSR), 1: 1468-1478.

[2] Yani, A., Rawiniwati, W. (2021). Potensi Pangan Lokal Berbasis Talas Beneng dan Prospek Pengembangannya. Universitas Nasional, Jakarta. http://repository.unas.ac.id/4355/1/Laporan%20Penelitian%20Kompetitif%20talas%20beneng%20%282021%29.pdf.

[3] Muttakin, S., Muharfiza, L.S. (2015). Reduksi kadar oksalat pada talas lokal Banten melalui perendaman dalam air garam. Prosiding Seminar Nasional Masyarakat Biodiversitas Indonesia, 1(7): 1707-1710. https://doi.org/10.13057/psnmbi/m010732

[4] Lestari, S., Susilawati, P.N. (2015). Uji organoleptik mi basah berbahan dasar tepung talas beneng (Xantoshoma undipes) untuk meningkatkan nilai tambah bahan pangan lokal Banten. In Prosiding Seminar Nasional Masyarakat Biodiversitas Indonesia, 1(4): 941-946. https://doi.org/10.13057/psnmbi/m010451

[5] Sefa-Dedeh, S., Agyir-Sackey, E.K. (2004). Chemical composition and the effect of processing on oxalate content of cocoyam *Xanthosoma sagittifolium and Colocasia esculenta* cormels. Food Chemistry, 85(4): 479-487. https://doi.org/10.1016/S0308-8146(02)00244-3

[6] Association of Official Analytical Chemists. (2005). Official Method of Analysis of the Association of Official Analitycal Chemists 18th Ed. Association of Official Analytical Chemists.

[7] Cunniff, P. (1995). Official Methods of Analysis of AOAC International, 16th ed. Washington, DC: Association of Official Analytical Chemists.

[8] Risti, Y., Rahayuni, A. (2013). Pengaruh penambahan telur terhadap kadar protein, serat, tingkat kekenyalan dan penerimaan mie basah bebas gluten berbahan baku tepung komposit.(Tepung komposit: tepung mocaf, tapioka dan maizena). Journal of Nutrition College, 2(4): 696-703. https://doi.org/10.14710/jnc.v2i4.3833

[9] Jarnsuwan, S., Thongngam, M. (2012). Effects of hydrocolloids on microstructure and textural characteristics of instant noodles. Asian Journal of Food and Agro-Industry, 5(6): 485-492.

[10] Winarno. (2004). Kimia Pangan dan Gizi. Jakarta: Gramedia Pustaka Utam.

[11] Barak, S., Mudgil, D., Khatkar, B.S. (2013). Relationship of gliadin and glutenin proteins with dough rheology, flour pasting and bread making performance of wheat varieties. LWT-Food Science and Technology, 51(1): 211-217. https://doi.org/10.1016/j.lwt.2012.09.011

[12] Yang, Z., Hao, H., Wu, Y., Liu, Y., Ouyang, J. (2021). Influence of moisture and amylose on the physicochemical properties of rice starch during heat treatment. International Journal of Biological Macromolecules, 168: 656-662. https://doi.org/10.1016/j.ijbiomac.2020.11.122

[13] Alam, N.A.N., Nurhaeni, N. (2008). Komposisi kimia dan sifat fungsional pati jagung berbagai varietas yang diekstrak dengan pelarut natrium bikarbonat. Agroland: Jurnal Ilmu-ilmu Pertanian, 15(2): 89-94.

[14] Muthoharoh, D.F., sutrisno, A. (2017). The making of gluten-free bread of arrowroot flour, rice flour, and corn flour (study of glucomannan concentration and proofing time). Jurnal Pangan dan Agroindustri, 5(2): 34-44. https://jpa.ub.ac.id/index.php/jpa/article/view/528/385.

[15] Subarna, Muhandri, T., Nurtama, B., Sima Firlieyanti, A. (2012). Quality improvement of dried corn noodle through the optimization of processing conditions and addition of monoglyceride. Jurnal Teknologi dan Industri Pangan, 23(2): 146-152. https://doi.org/10.6066/jtip.2012.23.2.146.

[16] Yadav, B.S., Yadav, R.B., Kumari, M., Khatkar, B.S. (2014). Studies on suitability of wheat flour blends with sweet potato, colocasia and water chestnut flours for noodle making. LWT-Food Science and Technology, 57(1): 352-358. https://doi.org/10.1016/j.lwt.2013.12.042

[17] Setyaningrum, A.W., Marsono, Y. (1998). Pengkayaan Vitamin A dan Vitamin E dalam Pembuatan Mie Instan Menggunakan Minyak Sawit Merah. Kumpulan Penelitian Terbaik Bogasari 1998-2001.

[18] Biyumna, U.L., Windrati, W.S., Diniyah, N. (2017). Karakteristik mie kering terbuat dari tepung sukun (Artocarpus altilis) dan penambahan telur. Jurnal Agroteknologi, 11(1): 23-34. https://doi.org/10.19184/j-agt.v11i1.5440

[19] Maretta, D., Helianti, I., Santosa, E. (2021). Current status of taro (Colocasia esculenta) utilization as local food diversification toward climate resilience in Indonesia. In IOP Conference Series: Earth and Environmental Science, 913(1): 012027. https://doi.org/10.1088/1755-1315/913/1/012027

[20] Yursak, Z., Hidayah, I., Saryoko, A., Kurniawati, S., Ripasonah, O., Susilawati, P.N. (2021). Morphological characterization and development potential of beneng variety (*Xanthosoma undipes* K. Koch) Pandeglang-Banten. In IOP Conference Series: Earth and Environmental Science, 715(1): 012022. https://doi.org/10.1088/1755-1315/715/1/012022