Utilization of Papaya Stem (Carica papaya L.) as a Nutritious Noodle Halal Product for National Food Security

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Keywords: Papaya Stem (*Carica Papaya L.*), Food Security, Nutritious Noodles, Halal Products.

Abstract: Indonesia has a variety of natural resources, one of which is papaya. Papaya stems contain carbohydrates, fiber, protein, and water content. The lack of utilization of papaya stems makes it a plantation waste because it is only left to rot. Coupled with the current state of national food security is worrying. Based on this, it was found that the innovation of using papaya stems (*Carica papaya* L.) into nutritious noodles for the sake of national food security. This innovation work aims to find out how to make noodles, noodle quality, nutritional content, and business opportunities. The procedure for this innovation of papaya stem noodles begins with observation, followed by product manufacture, organoleptic testing, nutritional content testing in the BARISTAN Surabaya laboratory, SWOT business opportunity analysis, and financial analysis. The results of the organoleptic test showed that the respondents stated that the noodles had a savory taste, flat shape, yellowish color, and smelled like noodles in general. The results of the laboratory showed that noodles contained 9.99% protein, 74.14% carbohydrates, and 0.75% fat. SWOT analysis business opportunities obtained the strength (strength) of easily obtained materials, weaknesses (weaknesses) limitations of production equipment, opportunities (opportunity) interest in the consumption of Indonesian noodles are high and become new innovations, as well as threats (threats) many noodle competitors. Financial calculations obtained a fairly large profit and the results of the BEP of capital will be covered in 2,5 months of production.

1 INTRODUCTION

The variety of food products as basic needs in Indonesia continues to grow. Substitute foods began to appear. Indonesia as a country that has the fourth largest population in the world has a high need for food consumption for its people. Food products that continue to grow in Indonesia are noodles. Although most of the main staple foods in Indonesia are rice, noodles are one of the most popular substitute staple foods that have a high carbohydrate source. Indonesian people like various types of noodles, especially instant noodles. The growth rate of instant noodle production in Indonesia reaches the number of million packs (portions) Indonesia occupies the second position in the number of consumption of instant noodles in the world as shown in table 1.

Table 1: Consumption of Instant Noodles in the World in 2017-2021

No.	Country/ Region	Consumption of Instant Noodles per Year (Million Serving)				
		2017	2018	2019	2020	2021
1.	China/ Hong Kong	38,960	40,250	41,450	46,360	43,990
2.	Indonesia	12,620	12,540	12,520	12,640	13,270
3.	Vietnamese	5.060	5,200	5.440	7.030	8,560
4.	India	5.420	6.060	6,730	6,730	7,560
5.	Japan	5,660	5780	5,630	5,970	5.850

(World Instant Noodles Association, 2022)

Indonesia is the world's second largest instant noodle consumer after China. According to World Instant Noodles Association (2022) stated that the consumption of instant noodles in Indonesia in 2021 will reach 13.27 million packs. This experienced a growth of 5.15% compared to 2017, which was 12.62 million packs. In addition to processed noodle products, Indonesia also has extraordinary food commodities in fruits, such as bananas, papayas, oranges, mangoes, avocados, and pineapples.

Indonesia has a fruit commodity that is quite abundant and always available in every season is papaya. Papaya (*Carica papaya* L.) is one of the most widely cultivated plants and is often found in people's yards. Papaya plants have many benefits ranging from fruit, leaves, stems, and tree trunks. Papaya production in East Java from year to year continues to increase. According to (Badan Pusat Statistika, 2022) stated that, in 2017 papaya fruit production in Indonesia was 241,537 tons and increased in 2022 by 253,700 tons. This figure is likely to continue to grow from year to year because papaya cultivation is easy and very suitable for the climate in Indonesia.

Table 2: Papaya Production Statistics in East Java in 2017-2021

Papaya Production in East Java	
Year	**Quantity (Tons)**
2017	241,537
2018	262.160
2019	284.485
2020	227,711
2021	253,700

(Badan Pusat Statistika, 2022)

The stem of the papaya plant (*Carica papaya* L.) is tubular with a round diameter with a hollow center and is not woody and green in color, the surface of the stem showing traces of leaf stalks. Generally, this plant is single-trunked with the direction of growing stems perpendicular to the top and contains a lot of sap and water in every part, including the stems. Papaya stems contain 13.01% carbohydrates; fiber content 8.72%; 0.53% protein; water content 24.20%; 0.73% ash content and 65.06 cal energy which is important for body metabolism and has the potential to be a source of nutritious food (Stephen et al., 2013). While the mineral content possessed by papaya stems has high levels, among others, in potassium with levels of 68.00 mg/100g, while Na and P with levels of 37.30 mg/100g and 38.36 mg/100g. On the other hand, the levels of Ca and Mg were at levels of 10.25mg/100g and 2.73mg/100g. Then the papaya stem vitamin C (*Carica papaya* L.) has a fairly high level of 7.2 mg/100g, and can be said to be a source of antioxidants (Stephen et al., 2013).

Papaya is classified as a plant that bears fruit throughout the season. After the first harvest, the papaya tree will continue to bear fruit until the age of 4 years. After 4 years the fruit production will decrease so the garden must be rejuvenated. Rejuvenation is done by cutting down trees that are no longer productive and replacing them with new plants. The rest of the papaya trees as a result of garden rejuvenation are only left to accumulate and rot in the garden area without any special treatment and decompose by themselves. If the area of papaya planting increases, the number of replanted trees will increase and can cause new problems in the form of papaya tree waste. It is feared that large amounts of waste will cause odors and provoke various diseases.

With the abundance of commodities and their impacts. Various efforts to find other food ingredients as a substitute for wheat flour continue to be made to reduce the consumption of wheat flour, especially in the manufacture of noodles. Utilization of local commodities, especially papaya stems to make papaya stem flour is intended to make flour as a substitute for wheat flour. In addition, papaya stem flour has similar properties with wheat flour (texture, aroma and color), so it is assumed that it has the potential to be a substitute for wheat flour in the manufacture of dry noodles. Dry noodles are noodles that have been dried until the water content reaches 8-10% (Astawan, 2000).

According to UU No. 7 of 1996 the definition of food security is "a condition where there is sufficient food supply for households as measured by food sufficiency in quantity and quality, as well as guarantees for safety, equitable distribution, and purchasing ability", then reaffirmed in PP No. 68 of 2002 that food security is a momentum for fulfilling food for households with equitable, safe, and sufficient food availability in terms of quantity and quality (Niko, 2019). Noodle products can be one of the foods that can increase national food security. Noodles contain carbohydrates, proteins, and fats that are sufficient to increase nutrition in the human body.

Based on the description above, the researcher aims to utilize papaya stems (*Carica papaya* L.) into nutritious noodles for the sake of Indonesian food

security. The utilization is supported by test results in the form of nutritional content, organoleptic, SWOT, and financial.

2 METHODS

Types of research
This research includes experimental research, which seeks to explain how a process occurs or simple research procedures supported by in-depth analysis. This study uses a quantitative approach. Quantitative method is a research method that focuses on positivistic (Sugiyono, 2008).

Papaya Stem Noodle Making Procedure
The procedure for making papaya stem noodles (*Carica papaya* L.) consists of several stages, namely:

a. Preparation of Tools and Materials
The tools used are such as: rectangular pans, basins, spoons, scales, noodle mills, knives, blenders, and ovens. While the ingredients used are: kg of papaya stems, 1 egg, salt, and enough water.

b. Making Papaya Stem Flour
Papaya stems are washed and cut into small pieces. Cut papaya stems soaked in salt water for 5 minutes. Drain the papaya stem pieces and dry them in the sun to dry. The dried papaya stems are then mashed using a blender until they become coarse flour and sieved with a fine cloth (± 70 mesh). Papaya stem fine flour is stored and ready to use.

c. Papaya Stem Noodle Making
Papaya stem flour is mixed with other ingredients such as: water, salt, and eggs to make noodle dough. The dough is then molded using a manual milling tool according to the desired size. The finished noodles are ready to be cooked directly. However, these noodles can also be turned into dry noodles and marketed after going through the drying process in the oven and packaging the container.

Data collection technique
The data collection technique in this study aims to find primary and secondary data with the following details:

a. Primary data
Primary data collection consists of nutritional content and organoleptic data as shown in table 3.

Table 3: Primary Data and Collection Methods

No.	Data Type	Method	Source
1.	Nutritional content of papaya stem noodles - Protein - Carbohydrates - Fat	 Kjeldahl Luff Schrool Direct extraction	BARISTAN Surabaya (2021)
2.	Oganoleptic data such as: shape, smell, taste, and color	Questionnaire	Sugiyono (2008)

The data is supported by the collection of observational data, in the form of prices of goods and production equipment, as well as the condition of product opportunities in the market. The data is used for SWOT and financial analysis.

b. Secondary Data
Secondary data collection was carried out as a support for primary data and contained relevant theories about papaya stem noodles. Secondary data can come from journals, books, and news to support the research discussion.

Data analysis technique
The data analysis technique in this study uses four analytical tests that function to conclude the results, as follows:

a. Nutrient content
The gizi content test is a test for carbohydrate, protein, and fat content at the Surabaya Industrial Standardization and Research Institute.

b. Organoleptic
Organoleptic testing is a test based on the sensing process consisting of aspects of taste, smell, and color. Respondents amounted to 44 people, from the population in the city of Surabaya. Calculation of the number of samples is based on the following slovin formula:

$$n = \frac{N}{N.d^2 + 1} \quad (1)$$

Information:
N = number of samples (people)
N = total population of Surabaya City (people)
d2 = the specified precision, which is 15%

c. SWOT Business Opportunity
It is a predictive test of strength, weakness, opportunity, and threats of papaya stem noodle (*Carica papaya* L.) product.

d. Financial
Financial testing is a test of calculating investment prices, fixed costs, operational costs, to BEP predictions and profits if papaya stem noodles (*Carica papaya* L.) are produced and marketed.

3 RESULTS

Nutritional Content of Papaya Stem Noodles
The nutritional content of papaya stem noodles was obtained based on the test results report at BARISTAN Surabaya No. 2430/21/LHU/1/V/2021 as shown in table 4.

Table 4: Nutritional Content of Papaya Stem Noodles

No.	Parameter	Unit	Test results	Test Method
1.	Protein	%	9.99	Kjeldahl
2.	Carbohydrate	%	74.14	Luff Schrool
3.	Fat	%	0.75	Direct extraction

Based on table 4, the nutritional content of papaya stem noodles is 9.99% protein, 74.14% carbohydrate, and 0.75% fat.

Organoleptic Test Results
The results of the organoleptic test consist of aspects of taste, shape, color, and smell. The results of the organoleptic test are shown in Figures 1 to 4.

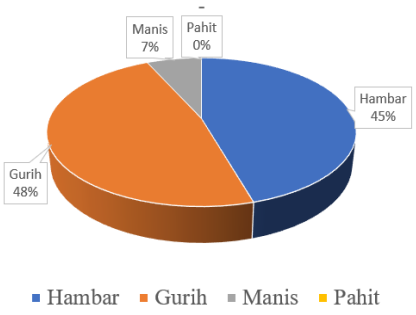

Figure 1: Organolepric Test Results of Papaya Stem Noodles Aspects of Taste

Based on Figure 1, the results of the organoleptic test of papaya stem noodles were 48% savory, 45% bland, 7% sweet, and 0% bitter.

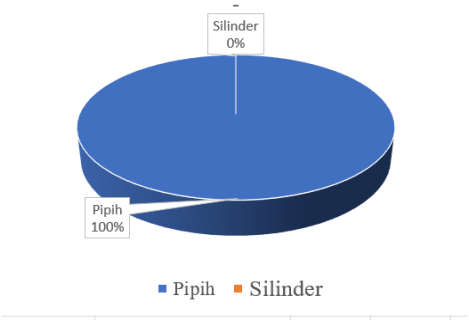

Figure 2: Organolepric Test Results of Papaya Stem Noodles Aspects of Shape

Based on Figure 2, the results of the organoleptic test of papaya stem noodles in the aspect of shape are 100% flat and 0% cylindrical.

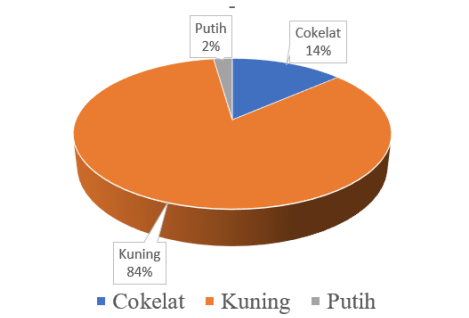

Figure 3: Organolepric Test Results of Papaya Stem Noodles Color Aspect

Based on Figure 3, the results of the organoleptic test of papaya stem noodles in the color aspect were 84% yellow, 14% brown, and 2% white.

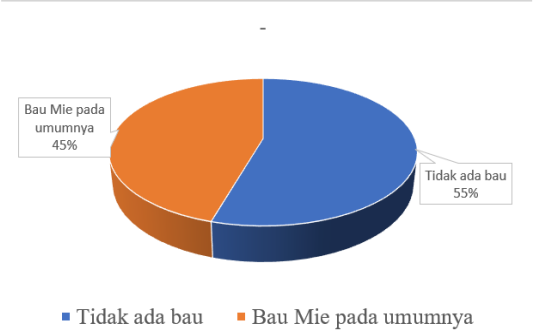

Figure 4: Results of Organolepric Tests of Papaya Stem Noodles Odor Aspect

Based on Figure 4, the results of the organoleptic test of papaya stem noodles with an odor aspect of 55% no odor and 45% odor of noodles in general.

SWOT Analysis Results

The results of the SWOT test analysis consist of Strength (S), Weakness (W), Opportunity (O), and Threats (T). The results of the papaya stem noodle SWOT test are in table 5.

Table 5: SWOT Analysis Results

Strength	Weakness
1. Raw materials are easy to obtain and available all year round. 2. Simple tools and manufacturing methods. 3. The product contains high carbohydrates and protein, and is low in fat.	1. The product is not durable. 2. Limited tools during production.
Opportunity	**Threats**
1. Public interest in noodle consumption is very high. 2. Papaya stems are rarely used and are more often considered to be waste. 3. New ideas and related ideas have not yet been used to utilize papaya plant stems to make noodle products.	1. Many competitors by making the latest product innovations, quality, and more diverse flavors. 2. More aggressive promotion of similar companies.

Financial Analysis Results

The results of the financial analysis consist of the calculation of investment costs, fixed costs, variable costs, operational costs, and BEP (Break Even Point). The results of the financial analysis of papaya stem noodles with small-scale production are in table 6.

No	Fee Type	Information	Price
1.	Investment Cost:	(ongoing)	
	a. Noodle mill	3 units	Rp. 390,000
	b. Knife	6 units	Rp. 60,000
	c. Oven	3 units	Rp. 750,000
	d. Blender	3 units	Rp. 600,000
Total Price of Investment Fee			**Rp. 1,800,000**
2.	Fixed cost:	(a month)	
	a. Employee	2 persons	Rp. 3,000,000
	salary	1 unit	Rp. 1,000,000
	b. Rent		
Total Fixed Cost Price			**Rp. 4,000,000**
3.	Variable Cost:	(24 days/month)	
	a. Papaya stem	Rp. 0/day	Rp. 0
	b. Egg (1 kg)	Rp. 16,000/day	Rp. 384,000
	c. Salt (2 packs)	Rp. 4,000/day	Rp. 96,000
	d. Water (2 gallons)	Rp. 8.000/day	Rp. 192,000
Total Variable Cost Price			**Rp. 672,000**

Income Per Month, if 1 product is sold at a price of Rp. 2.500 is equal to:
= Rp. 3,000 x 75 products x 24 days
= Rp. 5,400,000/month.

So, the profit per month is:
= Total Revenue – Total Operating Cost (Fixed + Variable)
= Rp. 5,400,000 – (Rp. 4,000,000 + Rp. 672,000)
= Rp. 728.000

Therefore, the return on capital for the production of this papaya stem noodle product is as long as:
= Total Investment : Total Profit
= Rp. 1,800,000 : Rp. 728.000/month
= 2.5 months (Initial Capital BEP)

4 DISCUSSIONS

Papaya stems are selected that are good (good condition) and old (no longer produced). Then, the stems of the papaya plant are washed thoroughly. Papaya stems are cut into pieces, only the inside is taken, while the outside is removed. After that, the papaya plant stems are soaked in salt water for 5 minutes. Then, the papaya plant stems are dried. The dried papaya stems are then ground using a blender. After grinding, the papaya plant stems were sieved using a fine cloth (± 70 mesh).

The second stage is to make noodles from papaya plant stem flour. The flour is mixed with other ingredients such as eggs and salt. Then the ingredients are kneaded with the addition of water little by little until it becomes a smooth dough. Next, the dough is put into a noodle mold to be made into noodle sheets. At this stage, oil is smeared which aims to reduce the level of stickiness between the resulting noodle strands. Then the noodles are dried using the oven.

Figure 5. Papaya Stem Noodle Products

The data shows that noodles from papaya stems contain 9.99% protein, 74.14% carbohydrates, and 0.75% fat. This shows that the nutritional content of noodles can be said to be quite high and allows it to be used as an alternative food ingredient to replace rice. In addition, the texture of the noodles after being boiled is chewy, supple, and the taste is bland, but savory. Noodles from papaya plant stems also do not use preservatives so they are safe for consumption.

Physical testing of the product was carried out by means of organoleptic tests, namely tests based on the sensing process to 44 respondents from the results of calculating the Slovin formula with the Surabaya population and an error rate of 15%. The test results consist of aspects of shape, taste, smell, and color. The results of the organoleptic test of papaya stem noodles were 48% savory, 45% bland, 7% sweet, and 0% bitter. The results of the organoleptic test of papaya stem noodles in the aspect of shape are 100% flat and 0% cylindrical. The results of the organoleptic test of papaya stem noodles in the color aspect were 84% yellow, 14% brown, and 2% white. The results of the organoleptic test of papaya stem noodles with an odor aspect of 55% no odor and 45% odor of noodles in general

In seeing business opportunities for noodle products from papaya stems, a SWOT analysis is used. In the SWOT analysis technique, you can plan strategies that aim to evaluate the strengths, weaknesses, opportunities, and threats of a business venture.

Based on the SWOT relationship analysis, the possible strategies to overcome the weakness of noodle products include:

a. To overcome non-durable noodle products, it can be overcome by airtight packaging and put in the refrigerator so that the product is more durable.
b. Product packaging is made attractive so that consumers want to buy.
c. Provide innovation and varied flavors to attract consumer interest.
d. Promote noodle products on social media.
e. Holding discounts on certain days to attract consumers.

5 CONCLUSIONS

Based on the results and discussion, it was concluded that papaya stem noodles have nutritional contentof 9.99% protein, 74.14% carbohydrates, and 0.75% fat. The organoleptic test obtained the dominant result of savory taste, flat shape, yellow color, and odorless. Papaya stem noodles (*Carica papaya* L.) have the opportunity to compete in the market, with financial calculations obtained the BEP value 2.5 months after the first production.

Suggestions are needed for further observation and development to improve the quality of the papaya stem noodles produced, especially in terms of taste.

6 ACKNOWLEDGEMENTS

Thanks to family, supervisors, and colleagues who have helped the research from beginning to end, so that this research can run well and smoothly.

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