Characterization of Dry Noodles with Additional of Pedada (Sonneratia caseolaris) Mangrove Flour as Alternative Food Resource

F Muhammad\textsuperscript{1}, S Andriyono\textsuperscript{2,3}, D Y Pujiastuti\textsuperscript{2}

\textsuperscript{1}Study Program of Fisheries Product Technology, Faculty of Fisheries and Marine, Universitas Airlangga, Surabaya 60115 Indonesia
\textsuperscript{2}Department of Marine, Faculty of Fisheries and Marine, Universitas Airlangga, Surabaya 60115 Indonesia
\textsuperscript{3}Corresponding author: sapto.andriyono@fpk.unair.ac.id

Abstract. Pedada fruit has a nutritional content that can be used as a food source because it contains high carbohydrates, but this fruit is easily spoiled because of the water content, which reaches 79%. Therefore, apple mangrove processing into flour to increase added value, one of the product is ingredient of the dried noodles. The purpose of this study was to investigate the nutritional content and panelist preference of dry noodles with addition of mangrove apple (Sonneratia caseolaris) flour with various concentrations. The research method used was experimental with a completely randomized design (CRD) as an experimental design. The treatment used was the substitution of mangrove apple powder (Sonneratia caseolaris), which is P0 (0%), P1 (5%) P2 (10%), and P3 (15%). The main parameter observed was the fibre content of dry noodles. The supporting parameters observed were proximate and organoleptic of dry noodle products. Data analysis used One Way Analysis of Variance (ANOVA) and followed by the further test of Least Significant Difference (LSD) 95%. The results showed that increasing the concentration of apple mangrove fruit flour (Sonneratia caseolaris) could increase the fiber content of dry noodles.

1. Introduction
Mangrove ecosystem is a type of forest that grows in low tide areas (especially protected beaches, lagoons, estuaries) that are inundated when the tide is high and are free from protection at low tide, whose plant communities are salt tolerant [1]. Ecologically, mangroves have many functions as a producer of a number of detritus, trap sediment, protect the coast from the waves of sea water, as well as absorb heavy metals and pesticides that make up the sea. In addition, mangroves are also to be developed into local food sources [2] one type of mangrove that has the potential to become a food source is the pedada type (Sonneratia caseolaris).

Pedada fruit (Sonneratia caseolaris) is a type of mangrove plant located along muddy beaches with low salinity [3]. Pedada fruit has a sour taste and has a very distinctive aroma which is the main attraction of the fruit [4]. The use of pedada fruit until now has not been maximized and is popular in the community because there is still a lack of public knowledge about pedada fruit and the sour taste of pedada fruit...
causes people to tend to like it less [5]. The nutritional content contained in pedada fruit (*Sonneratia caseolaris*) can be used as a food source [6].

Pedada flesh (*Sonneratia caseolaris*) has a high nutritional content and can be used as a food source. Based on research by Hamsah [7], the nutritional content of pedada fruit is water content (wb) 79.86%, ash content (db) 7.08%, fat content (db) 1.42%, protein content (db) 6.24%, and carbohydrate content (db) 65.12%. The nutritional content of 100 g of fruit is vitamin A 221.97 IU, vitamin B 5.04 mg, vitamin B2 7.65 mg and vitamin C 56.74 mg [8]. Pedada fruit (*Sonneratia caseolaris*) has a very high water content reaching 79%, this causes the pedada fruit to rot easily [9]. So it needs to be processed so that the pedada fruit can be used as a food source. One of the efforts in utilizing pedada fruit is to process it into flour in order to increase shelf life and can be used as an additional ingredient in making noodles.

Noodles are one of the most popular dishes in Asia, one of which is in Indonesia [10]. In Indonesia, noodles are favored by various groups, from children to the elderly, the reason being that noodles have a delicious, practical and filling taste [11]. Dry noodles are dry food products made from wheat flour with the addition of other permitted food ingredients, in the typical form of noodles [12]. Dry noodles are one type of food made from processed flour that is often consumed by most people, both as breakfast food and as a snack [13].

So far, the manufacture of dry noodles can also be added other than sago flour as a substitute for wheat flour [13]. Therefore, it is necessary to conduct research on the characterization of dry noodles with the substitution of pedada mangrove fruit flour in order to determine the effect of adding the best mangrove flour on dry noodle products. So that this research can increase the diversity of processed pedada fruit flour and can increase public understanding in utilizing non-timber products from the mangrove ecosystem.

2. Material and Method

The study was conducted using a completely randomized design (CRD) with one factor and was repeated five times with one control. These factors are the ratio of the use of wheat flour and fruit flour which includes P0 (100% wheat flour), P1 (95% wheat flour and 5% fruit flour), P2 (90% wheat flour and 10% fruit flour), and P3 (85% wheat flour and 15% pedada fruit flour).

2.1 Production of Pedada Flour

The pedada fruit is cleaned and peeled. Peeled pedada fruit was boiled until it becomes pulp. Then the pulp was filtered to separate the seeds from the pulp. Then the pulp was dried in the sun until it dries like a sheet. Then the dried sheets were ground into powder.

2.2 Production of Dry Noodles

Pedada fruit flour and wheat flour formulations were added with 2% table salt, 1% sodium tripolyphosphate. Egg 15% and water 40%, then the dough is stirred until smooth. Then the dough is formed into sheets and milled with a noodle mold which is then steamed for 10 minutes at a temperature of 100 degrees Celsius, then cooled for 5 minutes. After cooling, the noodles are dried in the oven for 14 hours at 55°C.
Table 1. Production of Dry Noodle Formula.

| Ingredients        | Ingredients Weight |
|--------------------|--------------------|
|                    | P0     | P1     | P2     | P3     |
| Flour (%)          | 100    | 95     | 90     | 85     |
| Pedada Flour (%)   | 0      | 5      | 10     | 15     |
| Egg (g)            | 15     | 15     | 15     | 15     |
| Salt (g)           | 2      | 2      | 2      | 2      |
| Sodium Triphosphate (g) | 1  | 1      | 1      | 1      |

2.3 Proximate Analysis

The proximate test method is carried out by referring to research from Andarwulan [14] the following are the steps for proximate analysis.

2.3.1. Water Content.
Evaporating dish was dried in an oven for 15 minutes at 105°C and then cooled in a desiccator for 30 minutes. Then the dried evaporating dish (A) and the sample (B) were weighed respectively. Then the sample on the dish was dried in an oven for 8 hours at 105°C (C) and then cooled in a desiccator for 30 minutes. The cooled samples were weighed 2 to 3 times to get constant weight by using the equation (1):

\[
\text{% Water Content} = \frac{(C - A)}{B} \times 100 \tag{1}
\]

2.3.2. Ash Content.
The evaporating dish was dried in an oven at 105°C for 1 hour, after that, it was cooled in a desiccator and then weighed (W1). A total of 3 grams of the sample were weighed (W2) then put into the crucible cup and put into a furnace, burned at a temperature of 525°C for 3 hours. Then cooled in a desiccator for 1 hour and weighed (W3).

\[
\text{Ash content} = \frac{W_3 - W_1}{W_2} \times 100\% \tag{2}
\]

2.3.3. Fat Content.
The evaporating dish was heated in an oven at 105°C for 1 hour, then cooled in a desiccator and then the aluminum cup was weighed (Wa). Weigh 2 g of sample (Wb) and put it in lead then cover with cotton. The lead containing the sample was put into Soxtec, then turned on the tool and heated to a temperature of 135°C and water was flowed. Lead is placed in a rinsing position. After the temperature reaches 135°C (temperature has normalized), input the aluminum cup containing 70 ml of petroleum benzene into the soxtec, then press the start button to start with the boiling position, carried out for 20 minutes, then in the rinsing position for 40 minutes, then recovery 10 minutes with the position of the Soxtec faucet opened. The aluminum cup is then placed in the oven at 135°C for 2 hours, then cooled in a desiccator and weighed (We).

\[
\text{Fat content} = \frac{W_c - W_a}{W_b} \times 100\% \tag{3}
\]

2.3.4. Protein Content.
First, weigh 1 g of the sample and then put it into the digestion tubes straight where the catalyst (1.5 g K2SO4 and 7.5 mg MgSO4) is added and 6 ml of H2SO4 (P) is added. The sample was destroyed at 415°C for 1 hour until the liquid became clear (greenish). Then the sample was cooled and 30 ml of distilled water was added slowly. The sample was transferred to distillation and a 125 ml Erlenmeyer was prepared which already contained 25 ml of H3BO3 solution, 7 ml of methylene red and 10 ml of bromine cresol green. The tip of the condenser must be submerged under a 4% H3BO3 solution. Then 30 ml of 40% NaOH solution was added into the Erlenmeyer and distilled for 3-5 minutes. The condenser tube was
rinsed with water and accommodated in the same Erlenmeyer. Then titrate with 0.1 N HCl until a pink color change occurs.

\[
\% N = \frac{\text{Titrant vol. (ml)} - \text{Blank vol. (ml)} \times \text{Normality} \times 14.007 \times 100}{\text{Sample weight (mg)}}
\]  

(4)

% Protein = % N x Conversion Factor (6.25)  

(5)

Where 14.007 is relative atom mass of Nitrogen.

2.3.5. Carbohydrate Content.
Carbohydrates content can be calculated by the difference between 100% and the following percentages:

\[
\% \text{ Carbohydrate content} = 100\% - (\text{protein} + \text{fat} + \text{water} + \text{ash})\%
\]

2.3.6. Fiber Content.
The fiber content test was carried out by referring to research from Bawias and Sumarni (2019). The sample was weighed as much as 1 gram, then put into a 250 mL beaker and added 50 mL of 0.3 N H2SO4 and then heated at 70°C for 1 hour. Then 25 ml of 1.5 N NaOH was added and heated for 30 minutes at 70°C. Then the solution was filtered using a Buchner funnel. During filtration, the precipitate was washed successively with sufficient hot water, 50 ml of 0.3 N H2SO4, and 25 ml of acetone. Then the filter paper containing the residue was put into a dish and dried in the oven for 1 hour at a temperature of 105°C. Then cooled and weighed.

\[
\text{Fiber content (\%) } = \frac{b-a}{x} \times 100 \%
\]

(6)

**Description:**  
\( b = \text{filter paper weight + sample after heated} \)  
\( a = \text{filter paper weight} \)  
\( x = \text{sample weight} \)

2.3.7. Organoleptic Test.
The organoleptic test was carried out with a hedonic test (likes) with a hedonic scale range of 9 scales covering color, aroma, taste, and texture. Organoleptic testing was carried out by scoring method with 30 untrained panelists. The noodles will be served cooked and ready to be consumed after being boiled in boiling water (100°C) until cooked. Panelists will be given 4 types of noodles with one control treatment and three with pedada flour substitution treatment, each of which has been coded. The following is a table of rating scales for the color, aroma, taste, and texture.

2.3.8. Data Analysis.
The research data obtained will be analyzed using ANOVA (Analysis of Variance) 1 factor to determine whether or not there are differences in the results of the test treatment. If the treatment shows significant results, the calculation is continued with the Least Significant Difference (BNT) further test at 95% accuracy.

3. Results and Discussion

3.1. Proximate Analysis
The proximate test aims to determine the chemical content of dry noodle products consisting of water, protein, fat, carbohydrates and ash content. The water content test was carried out to determine the water content contained in dry noodles. The value of the moisture content of dry noodles with pedada fruit flour substitution was tested from the control treatment (P0) to P1, P2, P3 which ranged from 2.32%, 2.25%, 2.21%, and 1.95%. Based on the quality requirements of dry noodles SNI SNI 8217 – 2015 (BSN 2015) (Table 1), the water content requirements for quality I dry noodles are a maximum of 8% and for quality II
a maximum of 13%. Thus, the water content of dry noodles in all treatments met the quality requirements of dry noodles based on the Indonesian National Standard (SNI) quality I.

The requirement for protein value in quality I dry noodles is a minimum of 11% and for quality II a minimum of 8%. Dry noodles with control treatments (P0), P2, and P3 meet the requirements of dry noodles with Indonesian national standards of quality I because each of the results values are 11.23%, 12.95%, 11.48%, but for dry noodles P1 only meets SNI quality II because of its protein content of 10.75%. Thus, the protein content of dry noodles has met the characteristics of the quality requirements of dry noodles based on the Indonesian National Standard (SNI).

Fat plays a very important role in human nutrition because it is a source of energy, and can improve taste, texture and as a source of vitamins A, D, E and K [13]. Fat content in dry noodles can be influenced by the fat content in wheat flour and pedada fruit flour, while the fat content in wheat flour is 1.3% (Directorate of Nutrition. Ministry of Health RI, 2010) and the fat content in pedada fruit flour is 1, 08% [15].

The results of dry noodle carbohydrates in this study have a high carbohydrate content. This is because the ingredients used such as wheat flour and pedada fruit flour contain high carbohydrates. The carbohydrate content in wheat flour is 77.3% and the carbohydrate content of pedada fruit flour is 82.29% [7]. In addition, carbohydrates are calculated using the by difference method, so that the nutritional value of each different food ingredient will affect the amount of carbohydrate content [16].

The results of the proximate test products are shown in Table 2.

### Table 2. Results of proximate analysis of dry noodle

| Chemical Composition | Treatment |
|---------------------|-----------|
|                     | P0 | P1 | P2 | P3 |
| Water Content       | 2.32% | 2.25% | 2.21% | 1.95% |
| Protein             | 11.23% | 10.75% | 12.95% | 11.48% |
| Fat                 | 0.60% | 0.43% | 0.69% | 0.34% |
| Carbohydrate        | 83.67% | 83.93% | 81.35% | 83.27% |
| Ash content         | 2.18% | 2.64% | 2.82% | 2.96% |

#### 3.2. Fiber Content

The fiber content of dry noodles in this study showed that the higher the proportion of wheat flour, the higher the fiber content. The highest fiber content was owned by P3 by using pedada fruit flour as much as 15% and getting an average fiber value of 2.044% while the lowest fiber content was owned by P0 treatment which did not use pedada flour at all by getting the average fiber value by 0.384%. This could be due to the higher fiber content of pedada mangrove flour than wheat flour. A’in, et al [17] stated that the content of flour produced from mangrove fruit has a high fiber content reaching 35.35%. According to Rahman, et al. [6] pedada fruit contains a lot of carbohydrates but mostly consists of fiber. Pedada flour contains 64.41% fiber, 53.9% water insoluble fiber and 9.8% water soluble fiber.
3.3. Organoleptic Test

The level of panelists' acceptance of the dry noodle taste decreased with the increase in the substitution concentration of pedada fruit flour because pedada fruit as a raw material for pedada fruit flour has a sour taste. According to Wiratno, et al. [5] the sour taste of pedada fruit causes people to tend to like it less. However, the panelists' level of preference for the taste of noodles showed neutral to moderately like, therefore dry noodles with pedada fruit flour substitution were still acceptable based on the panelists' preference level.

The value of the panelists' preference for the aroma of noodles decreased along with the increase in the substitution concentration of pedada fruit flour because the distinctive aroma of pedada fruit on the noodles was more pronounced. Hamsah [7] stated that the pedada fruit has a distinctive aroma so that it can be an attraction for the fruit. Based on the average value of the panelists' preference level on the aroma parameter, dry noodles with the substitution of pedada fruit flour are still acceptable because the value of the preference level shows neutral to somewhat like.

The panelists' preference for noodle color increased from P0 to P2, but decreased at P3. This is due to the increase in substitution concentration of pedada fruit flour which makes the resulting noodle color darker. Pedada fruit flour has a darker color (brown white) than wheat flour (white), so the more concentration of pedada fruit flour used results in the final result of dry noodles getting darker (brown white). Wheat flour has a white degree of 82.17% while the whiteness of pedada fruit flour is 34.83%. So the higher the concentration of pedada fruit flour will produce darker dry noodles.

The highest average value of texture results is P1 with a value of 7.13 and the lowest value is P3 with an average value of 6.3. The value of the level of preference for the texture of the noodles decreased from P2 and P3 due to the increase in the composition of the added pedada fruit flour. This is because the fruit flour pedada does not have gluten. Gluten is very influential in the formation of the noodle structure, with the lower the gluten in the dough, the lower the ability of the dough to have elastic properties and continuous structure, so that the resulting noodles break easily [12].

### Table 3. Average Organoleptic Test Results

| Parameter | Treatment | P0          | P1          | P2          | P3          |
|-----------|-----------|-------------|-------------|-------------|-------------|
| Taste     |           | 6.83±1.34a  | 6.4±1.27a   | 5.93±1.5b   | 5.26±1.87b  |
| Aroma     |           | 6.46±1.47a  | 6.16±1.28a  | 5.76±1.40a  | 5.63±1.47a  |
| Color     |           | 6.9±1.37a   | 7.06±1.2a   | 7.1±0.95a   | 6.6±1.52a   |
| Texture   |           | 7.03±1.51a  | 7.13±1.07a  | 6.43±1.22a  | 6.3±1.39a   |

4. Conclusions

The addition of pedada fruit flour (Sonneratia caseolaris) increased the fiber content of dry noodles. The addition of pedada fruit flour (Sonneratia caseolaris) based on the ANOVA test had a significant effect (p<0.05) on the organoleptic value of the taste parameters and did not significantly affect the organoleptic value of the aroma, texture, and color parameters. Based on the results of the proximate test, dry noodles with treatments P0, P1, P2 and P3 have met the characteristics of the quality requirements of dry noodles according to the Indonesian National Standard (SNI).

5. References

[1] Asyiawati Y, Akliyah L S 2014 Jurnal Perencanaan Wilayah dan Kota 14
[2] Silalahi E S P, Utomo B, Yunasfi Y 2016 Peronema Forestry Science Journal 5 52-63
[3] Verawati N, Selvianti I, Kalsum S U 2017 Teknologi Pangan: Media Informasi dan Komunikasi Ilmiah Teknologi Pertanian 8 115-26
[4] Noor Y R, Khazali M, Suryadiputra I N N 2006 Panduan Pengenalan Mangrove Di Indonesia
6. Acknowledgements
The author gives thanks for this work being supported by Faculty of fisheries and marine, Universitas Airlangga. The author extends thanks to Mr. Sapto Andriyono and Mrs. Dwi Yuli Pujiastuti for supporting author to finish the research.