

# Acceptability of Pipi Shellfish (*Plebidonaxdeltoides*) Sausages as High-Protein Food

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**Abstract**— Indonesia has quite large marine resources so it is necessary to diversify processed sausage products by utilizing shellfish as its raw material. This study aimed to analyze the acceptability of pipi shellfish (*Plebidonaxdeltoides*) sausage as a high protein food. This study used a Complete Random Design with three treatments and three repetitions. The consumer acceptance was carried out by 50 teenagers, high school students in Ambon city, Indonesia (27 girls and 23 boys), aged between 16-19 years, and average age between  $17,5 \pm 0,91$  years. The consumer test was carried out in an individual sensory booth in 3 (three) sessions: tasting sausage formula (1), tasting sausage formula (2), and tasting sausage formula (3) with a 10-minute break between them. During the process, participants were required to fill out a hedonic test questionnaire, asking about their preferences in color, aroma, taste, and texture of the sausage using a 7-point hedonic scale (1 “Dislike very much” to 7 “Like very much”). The data then were analyzed by Friedman test at 95% confidence level. The average consumer acceptance was between “like slightly” to “like moderate”. The statistical test showed that there was an effect of the proportion of the pipi shellfish on the acceptability of the color, aroma, taste, and texture of the pipi shellfish sausages. The most preferred acceptability of the pipi shellfish sausages was found in the formulation of pipi shellfish sausages with the proportion of 90% pipi shellfish and 10% tapioca flour.

**Keywords:** Acceptability, sausages, pipi shellfish

## 1. Introduction

Maluku is one of the provinces in the eastern part of Indonesia with an archipelago surrounded by sea water, covering 92.4 % (658,294.69 km<sup>2</sup>) of the total area of the whole Maluku. Therefore, this condition brings a big chance to develop a large marine product business. One of the marine potentials in Maluku is ‘shellfish’, which in 2018 was produced up to 1.182,71 tons (Luhur& Yusuf, 2017; KKP, 2018).

Pipi shellfish (*Plebidonaxdeltoides*) is one of the sources of animal protein consumed by many people as it is easy to get. Pipi shellfish or *Pelbidonaxis* found on sandy beaches in tidal areas. They live in sand with a depth of approximately 100 ml. Based on proximate analysis, it is known that the nutritional content of pipi shellfish consists of 79.49% water, 2.96% ash, 0.86% fat, 0.42% carbohydrates, and 13.19% protein.

In the East Seram Regency, precisely on the Geser Island, people usually cooked pipishellfishes by frying them or stir-frying them. Therefore, to utilize and process the shellfish as a processed seafood product can increase its economic value. More innovations on processing this marine product need to be developed, one of which is processing it into sausages.

Sausages are processed-food made from meat (beef, chicken, fish) which has been chopped and then mashed and seasoned, and put in a machete-shaped round casing in the form of animal intestines or

artificial wrapping, cooked and uncooked, smoked and unsmoked (Asyngari et al., 2017). Sausage is an oil-in-water emulsion product with protein as the emulsifying agent. In general, sausages are made from beef, chicken and pork. Considering that Indonesia's fishery resources are quite large, it is necessary to think about diversifying processed sausage products by utilizing shellfish as the raw material (Wau et al., 2010) .

In Indonesia, many sausages products are served as snacks. Sausages in Indonesia are 'ready-to-eat' food made of processed meat such as chicken and beef. The taste of the savory sausage is much liked by children, teenagers and adults. The sausages that are widely available in the market today are beef sausages and chicken sausages which are quite expensive (Sidu, et al., 2018)

Many researches have been done on marine product commodities, such as 'Cakalang fish' sausages (Sidu et al., 2018), 'Gabus fish' sausages (Iqbal et al., 2015), 'Mackerel fish' sausages (Nalendrya et al., 2016), and 'Catfish' sausages (Nisa&KrisnaWardani, 2016). Unfortunately, no research has been conducted regarding pipishellfishes as the main raw material for sausages, so this study aims to analyze the acceptability of pipishellfishes (*PlebidonaxDeltoides*) sausages as a high protein food.

## 2. Materials and Methods

The making of pipi shellfish formula (*PlebidonaxDeltoides*) used experimental design (Completely Randomized Design), consisted of three treatments and three repetitions method design, was used in this research. The main ingredients used were pipishellfishes meat and tapioca flour. This researched was administered in Oktober 2020 at the Nutrition Laboratory of the Health Polytechnic of the Ministry of Health Maluku.

### Materials and Ingredients

The ingredients used for sausages manufacture are pipishellfishes, tapioca flour, eggs, cooking oil, shallots, garlic, pepper powder, salt and sugar. The sausage casing is made of a special plastic which is safe for food production. The ingredients used for making sausages in different proportions has its each formulation.

Table 1. Ingredients used for of sausages from pipishellfishes

Material	F1	F2	F3
Pipishellfishes (g)	240	300	360
Tapioca flour (g)	160	100	40
Egg (g)	60	60	60
Shallot (g)	50	50	50
Garlic (g)	25	25	25
Pepper (g)	5	5	5
Sugar (g)	5	5	5
Salt (g)	5	5	5
Ice cubes (g)	100	100	100

### Procedures for making Pipishellfishes Sausages

1. Clean the pipishellfishes, soak them in lime juice for 10 minutes. Then, wash them clean
2. Weigh them separately into 240gr, 300gr and 360gr
3. Weigh the tapioca flour into 160gr, 100gr, and 40gr
4. Weigh 60 gr eggs, 10% ice cubes, 6% shallots, 3% garlic, 1% pepper, 1% sugar, and 1.5% salt.

5. Grind the pipishellfishs with a food processor and add the ice cubes, tapioca flour, eggs and seasonings
6. Put each sausage mixture into the casing
7. Fill it tightly and tie the top and bottom ends using twine
8. Bring the water to a boil, reduce the heat, place the sausages in the boiling water, boil for 30-45 minutes at 100 °C

**Consumer Test**

The consumer test was taken by fifty high school students in Ambon City (27 girls and 23 boys), aged between 16 – 19 years, average age 17,5 ± 0.91 years. The consumer test was carried out in an individual sensory booth, consisted of 3 sessions: tasting the sausage formula 1, tasting the sausage formula 2, and tasting the sausage formula 3, with a 10-minute break between them. During the test, participants were required to fill out a hedonic test questionnaire asking about their preferences from the color, aroma, taste and texture of the sausage using a 7-point hedonic scale from 1, “Dislike very much” to 7, “Like very much”.

**Statistical Analysis**

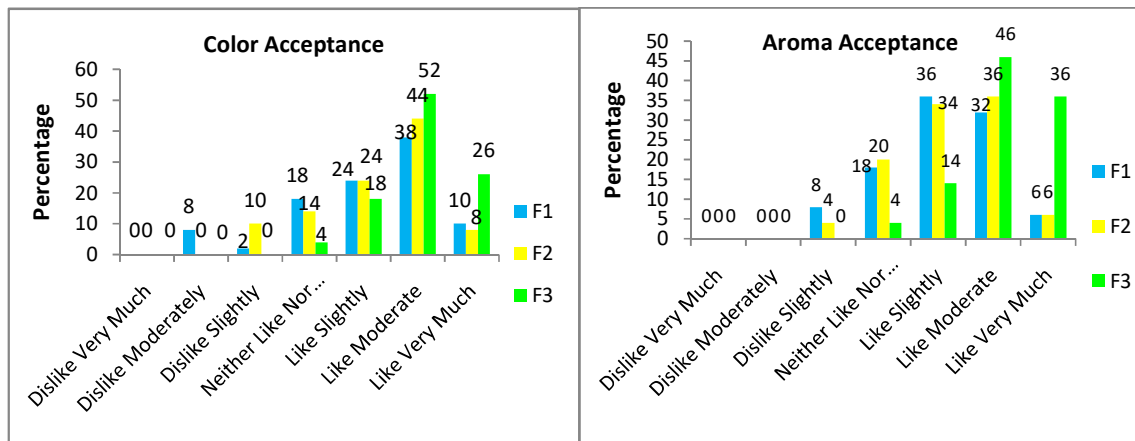
The data were collected using an organoleptic test formed by 50 semi-trained panelists. The data then were compiled and analyzed descriptively based on the percentages. Friedman test was run at 95% and then followed by the *Wilcoxon test* to see differences and relationships between treatments.

**3. Results**

Organoleptic test of pipi shellfish sausages aimed to get an overview of consumer preferences for the color, aroma, taste and texture produced.

**3.1 Acceptability of Color, Aroma, Taste and Texture of Pipi shellfish Sausage**

Based on the results of the consumer tests, it showed that most consumers liked the color, aroma, taste and texture of ‘Formula 3’. Formula 3 showed 90% formulation, the highest proportion of pipishellfishs and was preferred by consumers. The higher the proportion of the pipishellfishs, the higher the level of consumer preference for the color, aroma, taste and texture of the sausage.



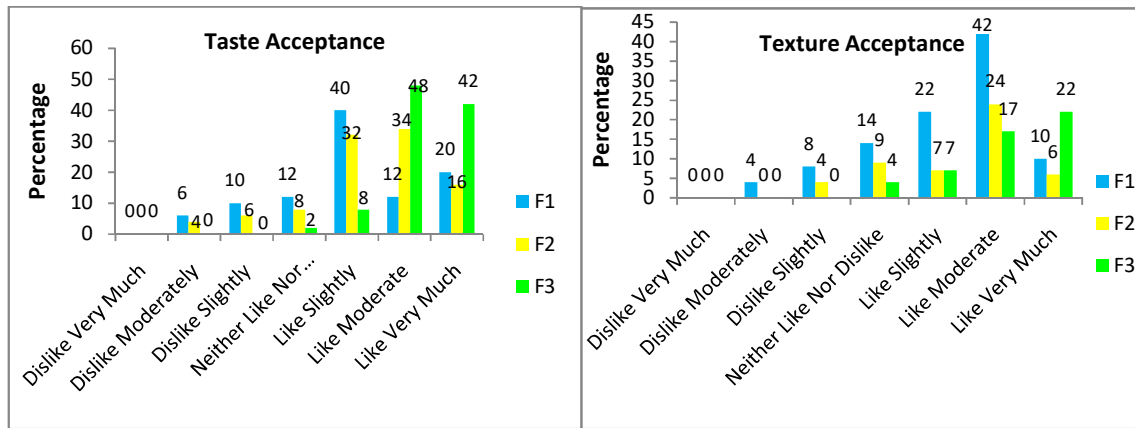


Figure 1. The results of consumer tests on the color, aroma, taste and texture of pipi shellfish sausage

3.2 Average Acceptability of Pipi shellfish Sausage

Table 2. Average Acceptability of Pipi shellfish Sausage

Formula	Color	Aroma	Taste	Texture	Total
F1	5,12 ± 1,33 <sup>a</sup>	5,10 ± 1,04 <sup>a</sup>	5,02 ± 1,42 <sup>a</sup>	5,20 ± 1,28 <sup>a</sup>	20,44 ± 3,24 <sup>a</sup>
F2	5,24 ± 1,09 <sup>a</sup>	5,20 ± 0,97	5,34 ± 1,26 <sup>a</sup>	5,38 ± 1,16 <sup>a</sup>	21,16 ± 2,87 <sup>a</sup>
F3	6,00 ± 0,78 <sup>b</sup>	6,14 ± 0,81 <sup>b</sup>	6,30 ± 0,71 <sup>b</sup>	6,14 ± 0,95 <sup>b</sup>	24,58 ± 1,57 <sup>b</sup>
P	0,000*	0,000*	0,000*	0,000*	0,000*

Note: \*significant p <0.05

Similar superscript on similar variable showed no difference

Based on the Friedman test, it was found that the proportion of pipishellfishes was significantly different (p<0.000). The hedonic average value of color ranged from 5,12 (like slightly) to 6.00 (like moderate). The highest color hedonic value was found in F3 (90% pipishellfishes) and the lowest was F1 (60% pipishellfishes). Further tests with Wilcoxon showed that F1 was different from F3 and F2 was different from F3. The average value of hedonic aroma ranged from 5,10 (like slightly) to 6.14 (like moderate). The highest hedonic aroma value was found in F3 (90% pipishellfishes) and the lowest in F1 (60% pipishellfishes). Further tests with Wilcoxon showed that F1 was different from F3 and F2 was different from F3. The hedonic mean value of taste ranged from 5,02 (like slightly) to 6.30 (like moderate). The highest taste hedonic value was found in F3 (90% pipishellfishes) and the lowest in F1 (60% pipishellfishes). Further tests with Wilcoxon showed that F1 was different from F3 and F2 was different from F3. Texture hedonic average values ranged from 5,20 (like slightly) to 6,14 (like moderate). The highest textured hedonic value was found in F3 (90% pipishellfishes) and the lowest was in F1 (60% pipishellfishes). Further tests with Wilcoxon showed that F1 was different from F3 and F2 was different from F3.

## 4. Discussion

Testing the acceptability of the formulation of pipi shellfish sausages with the hedonic test aimed to get an overview of consumer preferences of the color, aroma, taste and texture of the sausages. Sensory evaluation is very important for determining product quality and plays many roles in predicting consumer acceptance of pipi shellfish sausages as it is influenced by both product sensory characteristics and by human-related factors. It relies on the ethical aspects, political values, and ecological well-being that are involved in production. Meanwhile, it also could act as a driver or a barrier to product acceptance (Fiorentini et al., 2020) (Cruz-López et al., 2022). According to Kim et al. (2016), the average preference score could be considered as an appropriate way to determine consumer perception and/or acceptance as an overall understanding, in relation to the sample.

Sensory studies, using a variety of approaches and based on the sense organs, offered details about the nature of a product and the level of consumer acceptance of the product. Consumer tests determined whether consumers liked, accepted, or preferred a product over others (Mongi&Gomezulu, 2022).

Figure 1 showed that pipi shellfish sausages with 3 kinds of different proportions have varied ratings resulting from consumer assessments on the level of preference for color, aroma, taste, and texture. Consumer acceptance of the color of pipi shellfish sausages was mostly between like moderate to like very much. Some consumers' acceptance of aroma, taste, and texture was between like slightly to like very much.

Colour is one aspect that becomes a parameter of acceptance of food products. If the appearance of the color looked attractive, it would increase the tendency of consumers to like it (Priyanto&Djajati, 2020). Consumer acceptance of the color of pipi shellfish sausages was highest in F3, with 90% pipishellfishes and 10% tapioca flour. The color of the pipi shellfish sausage is influenced by the color of the pipi shellfish and tapioca flour so that the color of the sausage produced is white to slightly brown.

The brown color produced in sausages occurred due to an enzymatic browning reaction during food processing which caused by oxidative activities such as phenylation, polyphenolics and catecholates which later catalyzed the oxidation of phenolic compounds into ketones (Muchtadi et al., 2019). Apart from the enzymatic browning reaction, this color was also caused by a non-enzymatic reaction known as the 'Maillard' reaction during steaming and the heat generated when mixing complementary ingredients such as flour, eggs, pepper, salt, sugar, etc. The Maillard reaction was a reaction between carbohydrates, especially reducing sugars, and primary amine groups. Color development increased with increasing temperature and heating time (Hustiany, 2016).

Aroma is an integral part of the taste and general acceptance of a food before it is put in the mouth. Therefore, this parameter is very important when testing the acceptability of food formula. Aroma was generally considered to consist of volatile components that were perceived in the nose, either through the nostrils (*orthonasally*) or from inside the mouth (*retronasally*) (Muhimbula et al., 2011). The aroma produced by the pipi shellfish sausage is a distinctive aroma of pipi shellfish. This is not a 'fishy' aroma, due its cleaning process, as the pipishellfishes were soaked in lime juice for 10 minutes.

Taste is the tongue's response to stimuli provided by a food. Panelists' acceptance of taste was influenced by several factors, including chemical compounds, temperature, concentration, and interactions with other flavor components (Winarno, 2008). The taste of the sausage is influenced by the composition of the white pipishellfishes meat and the spices added. The more pipishellfishes meat is

added, the more savory the taste will be. This was presumably due to the protein content in the sausage so that during the steaming process, the protein hydrolyzed into amino acids and one of the amino acids, namely glutamic acid, could cause a savory taste in sausages (Nurjuliani et al., 2022).

Texture is a sensory property of the product related to the level of fineness of the ingredients used in research on making 'IkanNila' sausage. The sense that played a role in the organoleptic test for texture specifications was the sense of touch (Winarno, 2008). Texture was determined by the composition of the sausage ingredients, the homogenization conditions and the processing process (Ismanto et al., 2020). The texture produced by the pipi shellfish sausage is chewy. The elasticity is formed during cooking, where the protein will experience denaturation and the molecules will expand. This condition resulted in the reactive group on the polypeptide chain being opened and then re-binding occurred on the same or adjacent reactive group (Winarno, 2008)

Statistical test results showed a significant effect of the proportion of pipishellfishes on the acceptance of color, aroma, taste and texture of the sausage ( $p < 0.000$ ). Wilcoxon's follow-up test showed that formula 1 was different from formula 3 and formula 2 was different from formula 3. The evaluation results showed that the highest level of preference in the color, aroma, taste and texture tests was obtained in pipishellfishes sausage products with code F3, namely the proportion between pipishellfishes and tapioca flour of 90%:10% (w/w). It has the most preferred characteristics compared to the other proportions.

The high consumer acceptance of pipishellfishes sausage was likely due to its strong sensory characteristics, which were important for the quality and acceptability of the final product (Mihafu et al., 2020). Hidayat et al. (2018) also reported that the addition of protein to sausages significantly increased the acceptability of sausages to consumers.

## 5. Conclusion

The most preferred acceptability of the pipi shellfish sausages from the aspects of color, aroma, taste, and texture is found in the formulation of pipi shellfish sausages with the proportion of 90% pipishellfishes and 10% tapioca flour. The results obtained from this research show quite good results. The sensory tests produce 'like moderate' hedonic colors, aroma, taste, and texture.

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