The Utilization of Flower Crab (*Portunus Pelagicus*) Shell as Pasta Flavor

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Abstract. The results of flower crab shell waste processing are known to contain high nutritional value, especially in calcium and phosphorus. Nutritional content found in flower crab shell waste is very potential for the body when processed into food additives. It is not yet known whether the waste can produce flower crab flavor. The purpose of this study is to find out the potential of flower crab shell as a pasta flavor. This study used a Completely Randomized Design (CRD) experiment with 5 treatments of adding sugar palm flour as a binding agent, namely cornstarch : sugar palm flour = 0 : 0; cornstarch : sugar palm flour = 2.5 : 2.5; cornstarch : sugar palm flour = 5 : 5; cornstarch : sugar palm flour = 7.5 : 7.5; cornstarch : sugar palm flour = 10 : 10. The best protein content is in the addition of 10% sugar palm flour, namely at 137.62%. The results of fat level show that the fat level of the flower crab shell pasta flavor has decreased and the best treatment is in the addition of 10% flour, which is at 0.73%. The best water content is found in the addition of 10% flour, namely at 81.935%. The average result of the best appearance on the addition of 2.5% flour is 5.78, which shows the neutral level of the panelists' preference for the appearance of the flower crab shell pasta flavor. The parameters of aroma, taste and texture show that the panelists are neutral on the flavor aroma.

Keyword. Flower crab shell, flavor.

1. Introduction
Flower crab is an Indonesian fishery commodity that is widely cultivated for its egg and meat to be processed into canned or other processed products to meet the demands of foreign and domestic markets. Flower crab is also a fishery product with high economic value. The flower crab-importing country in Indonesia is America with up to 60% of the total catch (Sambhas, 2010).

As the demand for flower crab exports increases, the produced waste also increases. Flower crab with a weight of 100-350 grams will produce flower crab shell waste ranging from 51-150 grams, because a flower crab produces process waste, namely 57% of flower crab shells, 20% of remaining stew water and 3% of body reject (Multazam, 2002). The increasing amount of waste can increase pollution in the environment if shell waste, body reject, and remaining stew water are not processed, especially in the flower crab shells which have the highest waste level.

With the higher amount of flower crab shell waste and the high prices of flower crab meat, the innovation of the utilization of flower crab shells as flower crab flavors as a substitute for the consumption of flower crab meat is made. The results of flower crab shell waste processing are known to contain high nutritional value, especially in calcium and phosphorus contents. Calcium is a macromineral needed by the body in the amount of 100 mg per day. Calcium also functions to form bones and teeth, regulate blood clotting and muscle reactions, and grow the body. Nutritional content
contained in flower crab shell waste is very potential for the body when processed into food additives (Rochimah, 2005). The research aims to find out the potential of the flower crab shell as a pasta flavor.

2. Methodology

2.1. Research tools
The tools needed in making flower crab flavors are beaker glass, analytical scales (Mettler Toledo), gloves, masks, thermometers, stirrers, and filters. The tools used in the analysis are vacuum ovens (Memmert vacuum ovens), filter paper, aluminum dishes, laboratory flask (Pyrex), evaporating dish (PRC), pipette, furnace (Muffle Furnaces F6010), Erlenmeyer tube (Pyrex), magnetic stirrer, burette, centrifuge (Centrifuge Gemmy PLC-05), Soxhlet (Iwaki) extraction tool, measuring cylinder (Pyrex), and Kjedahl Flask (Pyrex).

2.2. Research material
The material used is fresh flower crab shell waste obtained from PT. Phillips Indonesian Seafood, Kenjeran, Surabaya, sugar palm flour, cornstarch and water. Material for proximate testing includes concentrated H\textsubscript{2}SO\textsubscript{4}, Kjeldahl tablet, 40% NaOH, boric acid, and 0.1 N HCl.

2.3. Research design
This research is an experimental research. The experimental research basically aims to test the relationship between a cause and a result. This study used a Completely Randomized Design (CRD) experiment with 5 treatments, namely cornstarch : sugar palm flour = 0 : 0; cornstarch : sugar palm flour = 2.5 : 2.5; cornstarch : sugar palm flour = 5 : 5; cornstarch : sugar palm flour = 7.5 : 7.5; cornstarch : sugar palm flour = 10 : 10, which refers to previous studies conducted by Mulyadi et al. (2013).

2.4. Work procedure of pasta flavor making
The making of flower crab shell extract began with cleaning the remaining meat attached to the flower crab shell. After that, size reduction was conducted by pounding it to increase the surface area. Furthermore, washing was conducted with water flowing on the shell three times. Next, the shell was added with water with a ratio of 1:2 for shells : water. The shell was then boiled at a temperature of 85-100°C for 30 minutes, then let sit until it went cold. It was the filtered and removed from the waste. At this point, the extract of flower crab shell extract was obtained.

For the first pasta flavor making, 100 ml of flower crab shell filtrate was prepared, then heated and added with emulsifier according to the treatment. P0 with the addition of cornstarch and 0% sugar palm flour, addition of 2.5% cornstarch and sugar palm flour. Addition of cornstarch and 5% sugar palm flour. Addition of 7.5% cornstarch and sugar palm flour. Addition of 10% cornstarch and palm flour. It was then mixed and stirred until it became thick and was left at a room temperature to cool.

2.5. Proximate testing
2.5.1. Protein content
Protein testing was carried out by weighing the sample; 0.1 gram of flavor sample was put into the Kjeldahl flask then 2.5 ml of concentrated H\textsubscript{2}SO\textsubscript{4} and the kjeldahl tablet were added. The sample was then boiled until it looked clear (about 1-1.5 hours), cooled and transferred to a distillation device. Then it was rinsed with water for 5-6 times with distilled water (20 ml) and the rinse water was put in a container located under the condenser with the condenser tip submerged in it.

Distillation tube was added with 5 ml of 40% NaOH solution. The liquid in the end of the condenser was collected with 125 ml Erlenmeyer containing boric acid solution and 3 drops of indicator (0.2% methyl red in alcohol and 0.2% methylene blue in alcohols in a ratio of 2:3) placed under the condenser. Distillation was carried out until approximately 200 ml of distillation was obtained, mixed with 10 ml boric acid and an indicator in Erlenmeyer. Distillation was then titrated by using 0.1 N HCl until the color changed to red.
2.5.2. Fat content
A sample of 0.5 gram flavor flower crab shell pasta was weighed and wrapped with filter paper placed on a soxhlet extraction device mounted on top of the condenser and fat flask below it. Hexane solvents were poured into a fat flask to taste based on size of the soxhlet used, then reflux was carried out for at least 16 hours until the solvent dropped and returned to the fat flask. The fat flask containing the extracted fat was then dried in an oven at 105°C for 5 hours, then cooled in a desiccator for 20-30 minutes and weighed.

2.5.3. Water content
The empty dish to be used was previously dried at a temperature of 105-110°C for 10 minutes, then cooled in a desiccator for 30 minutes and weighed. Two grams of sample was weighed and placed in a dish then heated in an oven for 3-4 hours at 105-110°C. The dish was then cooled in a desiccator and reweighed after it was cold.

2.5.4. Hedonic testing
In this study, a preference test was conducted which serves to determine the preferences of a product. In the scoring test, an assessment of sensory quality is given in a quality level. The aim is to give a certain value or score to a characteristic. The panelists used in this study are 30 untrained panelists consisting of a group of students from Universitas Airlangga’s Fisheries Product Technology Study Program. The flavor product will be tested by giving a code, then the panelist was asked to give an assessment which includes appearance, aroma, taste, and texture with the following criteria: 9 = extremely like; 8 = very like; 7 = like; 6 = rather like; 5 = neutral; 4 = rather dislike; 3 = dislike = 2 = very dislike; 1 = extremely dislike (Ferazuma et al., 2011).

2.6. Data analysis
Data from the results of testing of protein, fat, and water obtained from the study results were analyzed using ANOVA (Analysis of Variance) to determine whether or not there were differences in the results of the test method. Data from the analysis results will be continued with Duncan’s Multiple Distance Test (Kusriningrum, 2008), while the hedonic test was analyzed using the Kruskal Wallis Test.

3. Result and discussion
3.1. Result
3.1.1. Proximate value

| Treatment | Protein ± SD | Fat ± SD | Water ± SD |
|-----------|-------------|---------|------------|
| 0%        | 73.330° ± 3.067 | 2.330° ± 0.201 | 98.782° ± 0.005 |
| 2.5%      | 81.670° ± 1.976 | 1.670° ± 0.161 | 93.762° ± 0.135 |
| 5%        | 91.190° ± 1.216 | 1.120° ± 0.073 | 88.552° ± 0.228 |
| 7.5%      | 115.000° ± 0.979 | 0.950° ± 0.101 | 86.965° ± 0.158 |
| 10%       | 137.620° ± 0.934 | 0.730° ± 0.058 | 81.935° ± 1.270 |

The notation indicated by different superscript letters in the same column shows that the comparison between treatments has a significant difference (P<0.05).

The results of protein content analysis using variance showed that the addition of cornstarch and sugar palm flour at different concentrations on the flavor of flower crab shell pasta have a significantly different effect (P<0.05). The average result of flavor protein content of flower crab shell pasta sees an increase. The best protein content is in the addition of 10% flour, namely at 137.62%.

The results of analysis of fat content by using variance show that the addition of cornstarch and sugar palm flour at different concentrations on the flavor of flower crab shell pasta has a significantly
different effect (P<0.05). The results of fat content shown in the table show that the fat content of the flower crab shell pasta decreases and the best treatment is in the addition of 10% flour, which is at 0.73%.

The results of water content analysis using variance show that the addition of cornstarch and sugar palm flour at different concentrations in the flavor of the flower crab shell pasta had a significantly different effect (P<0.05). Based on the average score, water content on the flavor of the flower crab shell pasta sees a decrease. The best water content is found in the addition of 10% flour, namely at 81.935%.

3.1.2. Hedonic value
The results of the analysis show that the flavor, taste, and texture parameters significantly affect the flower crab shell pasta flavor (P<0.05), while the appearance parameters do not significantly affect the flavor of the flower crab shell pasta (P>0.05).

The average results of the best appearance on the addition of flour 2.5% is 5.78, which shows the neutral level of the panelists' preference for the appearance of the flower crab shell pasta flavor. The best aroma average parameter is found in 2.5% flour addition which is at 5.66, showing that the panelists are neutral to the flavor aroma. The best average number of taste parameters is in the addition of flour by 5%, namely at 5.37, indicating that the panelists are neutral to the flavor aroma. Whereas the best average texture parameter is in 5% flour addition, namely at 5.76 which also shows that the panelists are neutral towards the flower crab pasta flavor.

3.2. Discussion
Flavor is a food additive that can provide and reinforce the taste in a food (Meiyani, 2014). According to Apriyantono (2004), flavor is one of the attributes of food or food products that plays an important role in the acceptance or rejection of a food or drink by consumers. The main component in the flavor is protein content. The higher the protein content in the flavor, the better the flavor produced.

Protein content is the most important parameter in this study because the main component contained in flavor is protein. Proteins are macromolecules composed of amino acid base materials (Katili, 2009). Proteins are found in the living systems of all organisms, one of which is in flower crabs which have high protein content.

The protein content in the flavor of the flower crab shell pasta increases between treatments with the addition of cornstarch and sugar palm flour. It is known that the addition of 10% flour, the highest protein content which becomes the best treatment is at 137.6% and the lowest protein content in the addition of flour is 0% at 73.3%. This is due to the addition of cornstarch and sugar palm to the treatment. Cornstarch and sugar palm are also known to contain protein, although not as much as in flower crabs. Protein itself is a component of flavor formation where the presence of protein is very important in the making of flavor.

The fat content in flavor is also an important parameter of its existence. However, the fat content in flavor is not as much as the protein content. From the average results of the study, it can be seen that the value of fat content in flower crab flavor decreases between treatments. The highest fat content is 2.3% and the lowest is 0.7%. A decrease in fat content can be caused by binding of fat by adding flour to the flavor. According to Shih (2011), the use of flour can reduce oil absorption because a gelatinized granulated starch can hold water in the mixture so as to avoid evaporation of water in food and the penetration of oil into food decreases.

Water content is an important parameter in food ingredients. This is because the influence of water content is very important in the durability of a food because water content affects physical properties, namely organoleptic, chemical properties, and decay by microorganisms (Dien et al., 2018).

The results of the pasta flavor water content show that the more addition of cornstarch, the lower the value of the moisture content. This is because the addition of flour binds the water so it becomes a gel. According to Rahmi et al. (2018), based on the results of the analysis of natural flavoring pasta
products during storage at room temperature, the average value of water content is higher, ranging from 63.5 to 74.5%.

Hedonic test is a subjective test to determine the level of acceptance of a product, especially food products to assess whether a product can be accepted or rejected to be produced (Meiyani, 2014). This study used four hedonic test parameters, namely appearance, aroma, taste, and texture. Hedonic testing was conducted by filling out a score sheet that has a hedonic scale ranged from extremely dislike to extremely like.

Aroma is one parameter that determines the good taste of a food (Suharso, 2006). According to Hadayani et al. (2014), aroma is a smell sensation caused by chemical stimuli, volatile compounds which are smelled by olfactory nerves in the nasal cavity when food enters the mouth. According to Meiyani (2014), in the food industry the test of aroma is the most important sensory test because it can provide an assessment of its production.

The results of the study on the hedonic test of the flower crab shell pasta flavor aroma show the highest value at 2.5% flour addition which is 5.67 and the lowest in the addition of 10% flour which is 5.16, meaning that more additions of corn flour and sugar palm reduce the aroma of flower crab contained. The decrease in the flower crab aroma contained in the flavor is caused by the flavor water filtrate absorbed by flour.

Taste is a psychological suggestion to food that determines the value of satisfaction of the person who eats it (Susilo). Taste is one of the important parameters in consumer acceptance of food. The hedonic test of taste is conducted by tasting food using the senses of the tongue which will be stimulated by the papilla on the tongue.

In the hedonic test the taste of flower crab flavor, the highest average value of 5% flour addition which is 5.38 and the lowest average value of 10% flour addition is 4.92. This can be concluded that the addition of cornstarch and sugar palm flour which increasingly causes a taste that is not liked by the panelists. Because the real taste of the flower crab itself tends to be savory. According to Winarno (2004), savory flavor can be caused by the presence of free amino acids forming flavors such as glycine, alanine, lysine, especially glutamate acid can cause delicious taste. With the increased addition of cornstarch and palm sugar, the resulting flavor is increasingly bland.

The appearance of a product is an initial assessment by the panelist in testing and is a benchmark for consumers' preferences. Poor appearance is sometimes judged that other parameters also follow. The parameters of the appearance are color and shape.

The average result of the best appearance was on 2.5% flour addition, which was 5.78 while the lowest was on 10% flour addition which was 5.38. The more flour added to the flavor of the flower crab shell pasta has an impact on the level of preference of the panelists to decline. The more addition of cornstarch and sugar palm flour appearance decreases due to the color of the flavor which tends to be darker (cloudy) so that the panelists do not like the appearance of the flavor of the flower crab paste.

Texture is the nature of a material or product that can be felt through the touch of skin or taste buds (Azizah, 2018). In testing the flavor texture of the flower crab shell paste is done with a touch of the skin. The senses of touch used are two fingers, the thumb and index finger.

The average results of the hedonic test for texture parameters shows the best average for 5% flour addition, which is at 5.77, and the lowest average for 0% flour addition, which is at 4.76. This is because the lowest value is not added to the flour so that the flavor is liquid and at the highest value, the flavor is strong due to the addition of cornstarch and sugar palm flour. Flavor strength is caused by starch content in cornstarch and sugar palm flour (Azizah, 2018). The more flour added, the flavor texture of the flower crab paste is getting tougher so the panelists do not like it.

4. Conclusion
Based on the results of research, flower crab shells can be used as a pasta flavor with the addition of cornstarch and sugar palm flour as emulsifiers.
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