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*Research Article*

# Physical Characteristics of Processed Food Meatballs Based on Mussels (*Anadara granosa*)

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## ABSTRACT

**Abstract:** Seafood is great for consumption by various age groups because it is rich in protein, fat, vitamins and minerals. One of the seafood that is often used by the community is shellfish. Mussels (*Anadara granosa*) is a type of shellfish commonly eaten by Asian people because it has economic value and excellent nutritional content for consumption, especially a source of protein and minerals. One of the processed forms of mussels is meatball. The purpose of the study was to determine the results of physical quality (organoleptic and pH), chemical quality (fat and protein) in mussels meatballs (*Anadara granosa*). This types of research carried out quantitative research using descriptive. The test parameters are organoleptic test, pH test, protein content test using the biuret method and fat content test using the soxhletation method. The results of the organoleptic test showed a green-black color, a normal smell typical of meat, a normal taste for meatballs, a chewy texture and a pH of 6.807. The results of the protein content test in mussel meatballs were 2.972% and the fat content test had a level of 9.1186%. Based on the physical tests, mussels meatballs meet the criteria.

**Keywords**: mussels meatballs; physical characteristics; protein content test

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# INTRODUCTION

Indonesia which is a maritime country with abundant marine products makes its people like to eat marine products or what is known as seafood. Seafood is great for consumption by different age groups because it is rich in proteins, fats, vitamins, and also minerals. Included seafood are fish, oysters, and mussels. A report by the Ministry of Marine Affairs and Fisheries (KKP) shows that the national fish consumption rate in 2020 was 56.39 kg/capita. This figure is up 3.47% compared to the previous year which was 54.5 kg/capita. Maluku is recorded as the province with the highest amount of fish consumption in Indonesia in 2020, which is 72.76 kg/capita. Southeast Sulawesi is in the next position with total fish consumption of 71.13 kg/capita.

Mussels are aquatic animals that belong to soft-bodied animals (*mollusks*) (Prasojo et al. 2012). One of the types of mussels that are suitable for consumption and most often consumed one of them is the blood mussel (*Anadara granosa*). Blood mussels are a type of mussels that is commonly eaten by Asian people because it has economic value and nutritional content that is very good for consumption, especially sources of protein and minerals. It is called a blood mussels because it produces hemoglobin in the red liquid it produces. The nutritional content of mussels (*Anadara granosa*) consists of a water content of 81.82%, an ash content of 2.0%, fat of 0.60%, carbohydrates of 3.75% and protein 11.84% (Anggo 2017) . In addition, mussel meat is rich in omega-3 and omega-6 fatty acids, and contains energy of 59 kilocalories (Yaghubi et al. 2021).

Proteins are involved in the immune system as antibodies, the control system in the form of hormones, as a storage component (in seeds) and also in the transport of nutrients. As one of the sources of nutrition, protein acts as a source of amino acids for organisms that are not able to form amino acids (Rijal 2011). Nationally, the average protein consumption of the Indonesian population is 62.1 grams per day or 13.3 percent of the total energy consumption (Riskedas 2010).

Foodstuffs that contain enough protein, usually also contain fat. Lipids or fats are organic compounds that are widely found in tissue cells, insoluble in water, soluble in non-polar solvents such as (ether, chloroform, and benzene). Lipids are nonpolar or hydrophobic. The main constituents of lipids are triglycerides, which are glycerol esters with three fatty acids that can be of various types. In terms of nutrition, fatty acids contain high energy (produce a lot of ATP). Therefore the need for fat in food is necessary. Unsaturated fatty acids are considered to be of better nutritional value because they are reactive and are antioxidants in the body (Mamuaja 2017). The function of lipids/fats is as a source of energy, a source of cell

growth, supporting brain function, helping the absorption of vitamins, constituting the structure of cell membranes, energy reserves, food storage, and transport, hormones and vitamins and as a protective skin component of the cell wall (Mamuaja 2017). Nationally, the average fat consumption of the population in Indonesia is 47.2 grams or 25.6 percent of the total energy consumption (Riskesdas 2010).

The high exploitation carried out by the community of mussels to meet market demand (society) as a fulfillment of animal protein needs that have high nutritional value and economic value, will certainly have implications for their survival in the future (Nuraini, Zulfikar, and Said 2014). So far, people have only used mussels meat which is considered to have economic value by boiling and peeling and then directly marketed (Fitriah, 2018). As an alternative to processed food from mussels, namely in the form of processed meatballs. According to Rosmawati (2013), high nutritional content, high availability and delicious taste causing this commodity to be widely liked by the people of Indonesia. Blood mussels are presented in different types processed, but most Indonesians start each process by boiling it first.

Meatballs are processed meat products, namely the meat has been mashed first and mixed with spices, flour, and then shaped like small balls and then boiled in hot water (Chakim, Dwiloka, and Kusrahayu 2013). Based on the high level of consumption of mussels and meatballs in the community, accompanied by nutritional values such as fats and proteins needed by the body. Therefore, researchers are interested in creating and analyzing the protein and fat content in blood mussel meatballs. So the author conducted a study with the title "Physical Characteristics of Chemical Processed Meatballs Made from Mussels (*Anadara granosa*)". The variable used in this study is a single variable, namely the physical characteristics of processed meatballs made from basic mussels (*Anadara granosa*).

## MATERIALS AND METHODS

### Material

The ingredients used are mussels (*Anadara granosa*) from traditional market of Klaten region, copper (II) sulfate ($CuSO_4$. $5H_2O$), potassium sodium tarterate ($KN_4C_4H_4O_6$. $4H_2O$), aquades, sodium hydroxide 10%, bovine serum albumin, biuret reagent, crystalline ammonium sulfate, daphar acetate, HCl 25%, water, boiling stone, hexane solution, buffer solution 7. The tools used are food choppers, containers/basins, spoons, pots, kitchen scales, knives, cutting boards, vegetable spoons, meatball spoons, stoves, UV-Vis spectrophotometers (Riptor single beam),

measuring flask, cuvette, beaker cup, measuring cup, drip pipette, stirring rod, glass funnel, vortex, centrifuges, micropipettes, analytical scales, oven, watch glass, filter paper, water bath, mortar, pH meter, magnetic stirrer.

**Method**

The implementation stage of this research includes the manufacture of processed blood mussel meatballs. After making blood mussel meatballs, physics tests are carried out which include organoleptic tests and pH tests on blood mussel meatballs. After that, chemical tests were carried out which included fat tests using the sociletation method and protein tests with UV-Vis spectrophotometer instruments, data analysis was carried out using univariate analysis and presented in the form of tables and narratives.

## RESULT

**Organoleptic Test**

Organoleptic test of blood mussel meatballs which includes grading the color, smell, taste and texture of blood mussel meatballs. The results of organoleptic tests can be seen in table 1.

**Table 1.** Organoleptic Test of Blood Mussel Meatballs

| Organoleptic Test | Result |
|---|---|
| Colour | Blackish-green |
| Smell | Normal |
| Flavor | Normal |
| Texture | Chewy |

Based on the data above, it shows that the results of the physics test of blood mussel meatballs have a color blackish-green, as well as the smell, taste and texture are normal like meatballs in general.

**pH test**

The pH test is carried out to determine the level of acidity or alkalinity. The results of the pH test can be seen in table 2.

**Table 2.** pH Test The Mussel Meatballs

| Test | Result |
|---|---|
| pH | 6.807 |

Based on the data above, it shows that the pH results of mussels meatballs have a pH of 6.807.

**Protein Content Test**

Protein test using biuret method with UV-Vis spectrophotometer instrument. The results of determining protein and fat levels can be seen in table 3.

**Table 3.** Protein Content Test the Mussel Meatballs

| Test | Content (%) |
|---|---|
| Protein | 2.972 |

Based on the data above, it shows that the protein content obtained from the standard curve equation is y = 6.74x + 0.1431 with a wavelength o f 542 nm, the level obtained is 2.972%.

**Fat Content Test**

Test the fat content using the soxletation method. The results of fat levels can be seen in table.

**Tabel 4.** Fat Content Test Of MusselsEatballs

| Test | Content (%) |
|---|---|
| Fat | 9.1186 |

Based on the data above, it shows the results of mussels meatball fat levels of 9.1186%.

## DISCUSSION

The study was conducted with samples of mussels meatballs. A total of 250 grams of mussels are washed under running water, clean the shell thoroughly. Soak the clams with hot water and supplemented with 2 limes for 30 minutes. The addition of lime fruit *(Citrus aurantifolia*) aims to eliminate fishy odors in foods emanating from the sea (seafood) (Hudaya 2010). Then boil until the shell is open and add 1 ginger segment and 3 pressed lemongrass sticks, 7 pieces of purut orange leaves, 7 pieces of bay leaf to the stew. After the shell opens, drain and cool. Take the mussels meat and puree it using a food processor. Add 5 grams of salt, 3 grams of garlic, 1 gram of pepper, 35 grams of ice cubes, and 200 grams of tapioca flour, little by little. Stir until smooth. Then shape the dough into meatball rounds. Boil the meatballs in boiling water until cooked, as indicated by meatballs floating on the surface of the water. Remove the cooked meatballs, then drain and cool.

Organoleptic tests are performed by sensory tests. Organoleptic testing is a way of testing using the human senses (taste) as the main tool to assess quality fishery products that have undergone a processing process

(Badan Standarisasi Nasional 2014). Organoleptic tests are carried out with four parameters, namely color, aroma, taste and texture because the level of consumer liking for a product is influenced by color, aroma, taste, and oral stimulation (Laksmi 2012).

The texture of a material is one of the physical properties of food is an important factor. This has a relationship with the taste at the time of chewing the ingredient, the taste of the food ingredients. Actually consists of three components, namely smell, taste, and oral stimulation. The texture of mussels meatballs is chewy (Badan Standarisasi Nasional 2014).

Taste is the most important factor in determining the decision for consumers to accept or reject a food product (Soekarto 2012). The taste parameters of mussels meatballs indicate that the normal taste is typical of meatballs (Badan Standarisasi Nasional 2014).

Color is an important quality, visually the color of a food is considered nutritious, delicious and the texture is good if the color has a color that deviates from what it should be, the product is considered not good (Prabandari 2011). Color testing of mussels meatballs showed a blackish-green color.

Aroma is an odor that arises due to chemical stimuli smelled by the sense of smell, namely the nose when food enters the body (Widyastuti, Ayu, and Wardana 2018) The results of odor testing showed that mussels meatballs smelled normally typical of meat (Badan Standarisasi Nasional 2014).

pH testing is carried out with a pH meter tool. The pH value is an important indicator of meat quality by paying attention to technological quality and the influence of the quality of fresh meat. Observation of the pH is important to make because its changes affect the quality of the meatballs produced. The pH value obtained is 6.807. This shows that the pH value obtained meets the limit of food standards according to SNI, which ranges from 6-7 (Montolalu et al. 2017).

Determination of protein levels is carried out by the biuret method. The biuret method is based on the principle of substances containing two or more peptide bonds can form purple-colored complexes with Cu salts in alkaline solutions (Purnama, Retnaningsih, and Aprianti 2019). Sample preparation is carried out with a sample to which aquadest is added. The addition of aquades is aimed at diluting the sample. Then strain to take the filtrate of the sample used in the measurement of levels. At the measurement of levels, the sample is added with ammonium sulfate. The purpose of adding ammonium sulfate is to saturate the sample solution. After that the protein settles, separate it by centrifugation until 2 layers are obtained, namely the upper layer (the precipitating protein) and the lower layer (ammonium sulfate salt solution). The use of centrifugation serves to

separate substances with greater and smaller densities. Then 1 mg of precipitating protein is added with 10 ml of acetic buffer solution as a buffer solution to maintain the pH of the sample solution to remain in an acidic atmosphere at the time of analysis. Take a solution of 0.25 ml and add the biuret solution until 10 ml is stirred using a vortex. The purpose is to mix the solution present in the test tube. After that it is allowed to stand for 10 minutes the solution changes color to a blue tint. Color formation is due to the presence of a complex of $Cu^{+}$ ions with protein peptide bonds. Before determining the protein content, the determination of the maximum wavelength and the determination of the standard curve are first carried out. The determination of the maximum wavelength aims to be able to provide the sensitivity of samples containing glycethyrisid to the maximum, form a linear absorption curve and produce fairly constant results if repeated measurements are carried out. The wavelength seen from 540-560 nm with an interval of 2 nm so that the maximum wavelength of 542 nm is obtained. Furthermore, the determination of the standard curve was carried out using 5 concentration series, namely 0.5%, 1%, 1.5%, 2% and 2.5% so that the equation of the curve y = 6.74x + 0.1431 with an R2 value of 0.9701 was obtained. These results show that this value is quite good because a good R2 value is close to the number 1 (Diaman 2016). Determination of the protein content obtained by 2.972%.

The results show that the protein content obtained has not met the standard of good meatballs according to (Badan Standarisasi Nasional 2014), which is at least 11%. The decrease in sample levels is due to the boiling process. According to Rijal (2011) boiling time can reduce protein levels in mussels (*Anadara granosa)* because the boiling process that is too long can destroy the proteins possessed by mussels so that it can reduce the protein levels. Most globular proteins are easily denatured. If the bonds that make up the configuration of the molecule are broken, the molecule will expand. There are two kinds of denaturation, the development of polypeptides and the breakdown of proteins into smaller units without the accompanying development of molecules. The occurrence of these two types of denaturation depends on the state of the molecule. What happens in polypeptide chains, the bonds affected by this denaturation process are hydrogen bonds, hydrophobic bonds and bonds. Meanwhile, the determination of fat levels uses the soxhletation method. Extraction with a soxhlet tool is an efficient and effective extraction method to determine the oil or fat content of a material, because the solvent used can be recovered and the time used for extraction is relatively short (Sahriawati and Daud 2016).

This extraction process lasted for 3 hours with 3 repeat cycles in this study, this was done so that there was fat contained in the fat flask. Before

testing the fat flask is carried out first in the oven at a temperature of 105º C. The purpose of such heating is to sterilize the fat flask. The base flask is cooled in a dry cabinet for 15 minutes. The purpose of cooling for 15 minutes on the desiccator is to balance the object with the controlled air so that errors caused by weighing water together with the object can be avoided. The solvent used in this study is hexane because the solvent is recommended by SNI 01-2891- 1992 for food and beverage test. In addition, hexane is part of the anhydrous solvent. Anhydrous solvents are completely water-free solvents. This is so that water-soluble materials are not extracted and are counted as fats and the activeness of the solvent is not reduced (Saputri, Ulfa, and Utami 2020). In the last stage of fat content testing, it is to weigh the flask with a fat sample that has been accumulated to a constant weight. Determination of the level obtained in mussels meatballs by 9.1186%. Meanwhile, the fat content in fresh mussels is 0.60%. Excess fat consumption can lead to obesity, blockage of blood vessels due to a lot of fat that accumulates inside the walls of blood vessels. The accumulated fat can be cholesterol. As a result, cholesterol will be high, become hypertension (high blood pressure), coronary heart disease, and stroke. High fat also has implications with breast, colon, and prostate cancers (Devi 2010). The nutritional content of mussels *(Anadara granosa)* protein is 11.84%, fat is 0.60% and carbohydrates are 3.75% (Anggo 2017), the limit in consuming virgin mussels is adjusted to the needs per individual.

Based on the research of (Nur Alam, Sumardianto, and Purnamayati 2021), petis of mussels *(Anadara granosa)* provide test results of protein levels of 3.22%, carbohydrate content of 79.93%, fat content of 1.26%. This is influenced by the length of heating when boiling blood mussels, which is 120 minutes.

## CONCLUSIONS

Based on the research that has been carried out, it can be concluded that: Based on physical tests, mussels meatballs meet the criteria and chemical test results, namely protein levels of 2.972% and fat levels of 9.1186%.

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## CONFLICT OF INTEREST

The authors have no competing interests

## AUTHOR CONTRIBUTIONS

YDR analyzed and interpreted the data. MAN performed contributor in writing the manuscript. WAS analyzed sample and looking for reference. All authors read and approved the final manuscript. Authorship must be limited to those who have contributed substantially to the work reported.

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## ETHICAL ISSUES

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