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To cite this article: R Ningsih et al 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **236** 012127

View the [article online](https://iopscience.iop.org/article/10.1088/1755-1315/236/1/012127) for updates and enhancements.
The Effect of Maltodextrin Concentration on the Characteristics of Snappers’ (Lutjanus sp.) Peptone

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Abstract. Indonesia has diverse fishery resources; there are many commodities that need to be developed and processed into products with high selling value, such as snappers (Lutjanus sp.) hydrolyzed into peptone products. Peptone is easily bound to water when exposed to air, so that it affects the storage period of the peptone. This study aims to determine the effect of adding maltodextrin as a coating agent in the manufacture of peptone powder. This study used three different concentrations with three replications (triplo). The results showed that there was an effect on the peptone content of powder with different concentration; the greater the maltodextrin concentration used, the less total nitrogen produced. Based on this research, it is suggested to do further research on the use of pure enzyme at the time of hydrolysis and testing of amino acid type, white degrees, and degree of hydrolysis.

Keywords: Lutjanus sp., Peptone, Hydrolysis of Protein, Maltodextrin.

1. Introduction

1.1. Background

Indonesia has variable fishery resources; there are many commodities that need to be developed and processed into products with high selling value, one of them is snappers. Snapper fisheries saw an increase from 2006 to 2010 (Sulistianto, 2013). Snappers have 20.55% protein content (Jacoeb et al., 2013). Snappers can be developed into a product with high selling value such as peptone, a soluble protein found in high-protein raw materials such as fish, fish waste, soybean meal (Pantaya et al., 2016; Fitra, 2013). Peptone is a protein hydrolysate product with important economic value in the fishery industry (Nurhayati et al., 2013), which is imported to Indonesia with a very high price (Barokah, 2014). Peptone is used as a nitrogen source for microorganisms (Wijayanti, 2009).

Peptone is easily bound to water when exposed to air, affecting the storage period of peptone, thus it is necessary to have a modification in the making of fish peptone, namely microencapsulation technology. Microencapsulation is a technique of coating liquids, solids, or gases with a thin layer of protective material that functions during storage period. Ozkan and Bilek (2014) stated that microencapsulation is a technology used as the protector and stabilizer in the core material. The microencapsulation technique uses coating material such as maltodextrin, gelatin, sodium caseinate, and arab gum (Yuliani, et al., 2007). Maltodextrin is effective for protection of materials encapsulated from oxidation. Meltodextrin has the advantage of being easily soluble in cold water, rapid dispersion,
and high solubility (Srihari et al., 2010).

1.2. Aim and benefit
This study aims to learn the effect of concentration of maltodextrin on the characteristics of snappers’ (Lutjanus sp.) peptone, thus providing scientific information to the students, researchers, and community about the effect of maltodextrin concentration on the characteristics of snappers’ (Lutjanus sp.) peptone.

2. Materials and method
2.1. Place and time of the study
This study was conducted from February to April 2017 at a dry Laboratory of Faculty of Fisheries and Marine, Universitas Airlangga, Surabaya and Process Engineering Laboratory, Faculty of Agricultural Technology, Universitas Gadjah Mada, Yogyakarta.

2.2. Tools and materials
The tools and materials used in this study are Labplant SD-05 spray dryer, HH-6 thermostat water bath, hot plate, magnetic stirer, HAHN SHIN HS-3000 vacuum pump, snappers (Lutjanus sp.), papain enzyme, maltodextrin, aquades, and Whatman paper No. 42.

2.3. Work procedure
Snappers (Lutjanus sp.) were obtained from Pabean market, Surabaya in the amount of 6 kg. Their scales and stomach contents were removed and their meat was taken. After that, they were mashed by food processor. Mashed snapper’s (Lutjanus sp.) meat was then weighed. Snapper’s (Lutjanus sp.) peptone was produced using 0.3% enzyme concentration and hydrolyzed at a temperature of 60°C for 5 (five) hours using waterbath. The use of temperature and time of hydrolysis referred to Astuti (2014). After the hydrolysis process, sample of the results was inactivated by enzyme at a temperature of 85°C for 15 minutes. The sample solution was filtered with filter paper and then the fat was separated using n-hexan. The peptone liquid obtained was then mixed with the coating material, the maltodextrin, at different concentrations: 1%; 2%; and 3% with a ratio of 1:3 referring to Barokah’s (2014) study. Liquid peptone and coating material was homogenized, then dried by using spray dryer. The peptone powder produced was then tested for its solubility in water, calculation of yield (rendemen), and total nitrogen.

2.4. Data analysis
Analysis of microencapsulation characteristics of peptone from snapper (Lutjanus sp.) with different concentrations of maltodextrin was conducted using descriptive method. Nazir (2011) argued that the descriptive method is a method that describes something in systematical, factual, and accurate manner based on facts, natures, and relationship between those phenomena. The collected data includes the amount of yield, solubility in water, and total nitrogen. The testing results were then compared with commercial peptone (Oxoid branded peptone).

3. Results and discussion
Snappers (Lutjanus sp.) were obtained from Pabean market, Surabaya. Characterization of snappers was conducted before they were used as raw material of peptone production. The characterization included testing of protein content, water content and pH. The results can be seen in Table 1. The constituent components of snapper were used as raw materials of snapper’s (Lutjanus sp.) peptone production.

Table 1. Constituent components of snappers as raw materials of snapper’s (Lutjanus sp.) peptone production.
Snapper (*Lutjanus* sp.) was characterized in three components, namely protein content, water content, and pH. Snapper’s (*Lutjanus* sp.) peptone, having given maltodextrin with different concentrations, was characterized for its total nitrogen, solubility in water, water content and yield. The results can be seen in Table 2. The comparison between snapper’s peptone characteristics, *Oxoid* commercial peptone, and peptone of microencapsulated rotten side catch (HTS)

**Table 2.** Comparison between snapper’s peptone characteristics, *Oxoid* commercial peptone, and peptone of microencapsulated rotten side catch (HTS).

| Concentration | Peptone of Microencapsulated Rotten HTS (1) | *Oxoid* Peptone (2) |
|---------------|-------------------------------------------|-------------------|
| 1%            | 38.31 ± 0.76 26.75 ± 0.35 20.41 ± 0.12 | 67.29             |
| 2%            | 67.29         |                   |
| 3%            | 67.29         |                   |
| Total Nitrogen (%) | 6.13± 0.12 4.28± 0.05 3.26± 0.01 | 10.05 13.90 |
| Solubility (%) | 95.33 ± 1.68 96.45 ± 1.25 95.03 ± 1.62 | 98.87 99.00 |
| Water Content (%) | 7.99 ± 0.65 6.55 ± 0.44 6.76 ± 0.60 | 6.28 - |
| Yield (%) | 2.04 2.5 1.2 | 16.6 - |

Jacoeb et al. (2013) stated that the protein content of snapper is 20.55% and different chemical compositions in fish may be influenced by several factors, such as environment, species, habitat, age, and food availability. Snapper’s (*Lutjanus* sp.) peptone is produced by using papain enzyme with 0.3% concentration, hydrolyzed for 5 hours at a temperature of 60°C. Fitra (2013) stated that the 0.3% papain enzyme concentration with 5-hour hydrolysis is the optimum condition of hydrolysis.

Snapper’s peptone has low protein content compared to the protein content of peptone from microencapsulated rotten side catch (HTS) and *Oxoid* commercial peptone. It may be affected by protein content of the raw materials (Saputra and Nurhayati, 2013). Protein content in raw materials that is used may also be affected by the quality of fish feed. Fish feed quality depends on the amount of available food substances used in the feed. Identifying the quality of digestible fish feed by measuring feed’s efficiency for the fish is done by looking at its digestibility (Agustono, 2014). Fish feed can also be substituted by *lamtoro* leaves fermented with 6% probiotics, which enhances crude protein (Putri et al., 2012). Wijayanti et al. (2015) asserted that protein contained in hydrolysate products is soluble protein, so that the protein produced from snapper’s peptone is lower than rotten HTS peptone and commercial peptone since the protein content of the raw material is also low. Decreased protein content may be influenced of incomplete hydrolysis process. Astuti (2014) argued that high protein content in peptone is the result of breaking down protein binding into a simpler element in hydrolysis process.

Low protein content affects the total nitrogen in snapper’s peptone. The total nitrogen of snapper’s peptone is lower than commercial peptone. Laoli (2015) stated that the higher the protein content in raw materials used, the higher nitrogen produced, since nitrogen is an element of protein. The
decreased protein content is along with the addition of maltodextrin concentration. Snapper’s peptone solubility is quite high, but still lower than rotten HTS peptone and has not met the quality of Oxoid commercial peptone. Maltodextrin concentration of 2% results in the highest solubility in water compared to 1% and 2% concentration. Yuliawaty et al. (2015) claimed that high solubility is a result of hydroxyl group in maltodextrin that will interact with water. The existence groups with high load in amino acid causes these groups to become soluble in polar solvent such as water and ethanol (Rodwell et al. in Barokah, 2014). The use of 2% concentration results in lower protein content and total nitrogen than that of 1% concentration, but with high solubility. It occurs due to the water-soluble amino acid group. Maltodextrin binds water-soluble protein, and with the presence of maltodextrin, protein will be bound despite only a small amount of it will be soluble (Yuliawaty et al., 2015). Nurhayati et al. (2013) claimed that the higher peptone’s solubility in water the better it will be, since solubility can determine peptone’s quality as bacterial growth medium in microbiology (Vazquez et al., 2004).

Maltodextrin concentration also has impacts on snapper’s peptone yield. Fish peptone can be used as an alternative to commercial peptone since the yield produced has good quality (Vasquez et al., 2009). Adding maltodextrin can also affect the yield resulted; scientifically, the higher the concentration used, the higher yield generated since maltodextrin acts as the coat of this material, namely peptone. However, the study shows fluctuated results. The use of 3% maltodextrin results in low yield and low total nitrogen. Thus, it can be concluded that the more concentration generated, the less total nitrogen and yield produced.

4. Conclusion and suggestion

4.1. Conclusion

According to the study, it can be concluded that the more maltodextrin concentration used in the making of snapper’s peptone, the less protein content and total nitrogen produced. The results of total nitrogen, respectively, are as follows: 1%, 2%, and 3% result in 6.13±0.12, 4.28±0.05, and 3.26±0.01. Results of peptone solubility are respectively 1%, 2%, and 3% result in 95.33 % ± 1.68, 96.45 % ± 1.25, and 95.03% ± 1.62. The highest solubility is due to the hydroxyl group contained in the maltodextrin that will interact with water. The existence groups with high load in amino acid causes these groups to become soluble in polar solvent such as water and ethanol. The use of 3% maltodextrin results in low yield and low total nitrogen. Thus, it can be concluded that the more concentration generated, the less total nitrogen and yield produced.

4.2. Suggestion

Further studies are needed to identify the potential of snapper’s peptone as a source of nitrogen in microbial growth. Also, analysis of types of amino acid, white degrees, salinity, chemical and physical characteristics is also necessary.

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