

The Addition of Crude Fish Oil in Feed to Improvement of the Content Triglycerides and Oleic Acid in Mudcrab Meat (*Scylla Serrata*)

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ABSTRACT

Mudcrab (*Scylla serrata*) is one of fishery resources, which economic value is high and can be potentially cultivated. Some of fatty acids are found in the body or in the feed, especially those, which are combined into one complex compound of triglycerides. Omega-9 functions to reduce the cholesterol level and triglyceride can reduce the stimulation of clotting grains of red blood cells and reduce the blood pressure, preventing any hardenings of the arteries, as well as retarding the growth of cancer cells. One of the ingredients, which can increase the level of Omega-9 in the mudcrab meat is Crude Fish Oil (CFO), derived from *Sardinella Lemuru*. The purpose of this research is to determine the addition of CFO on trash fish feed to decrease triglycerides and increase the content of oleic acid in the mudcrab meat. In this research, the doses of CFO added in trash fish feed are: treatment of P0 (0%), P1 (2%), P2 (4%), P3 (6%) and P4 (8%). The results shows that the addition of CFO on the feed provides a significantly different effect ($P < 0.05$) toward the content of triglycerides in the mudcrab, while the content of omega 9 is not significantly different ($P > 0.05$). The lowest content of triglycerides in the mudcrab lowest is in treatment P₄ of 8% CFO, which is significantly different from other treatments. The low content of oleic fatty acid is in the control treatment, which is not significantly different from other treatments.

KEYWORDS: Crude fish oil, Oleic acid, Triglycerides, *Scylla serrata*

INTRODUCTION

Mudcrab (*Scylla serrata*) is one of fishery resources, which economic value is high and can be potentially cultivated. Mudcrab has potential in market which is quite commercial, both in the country and abroad ^[1]. The demand of crabs continuously increases due to the savory taste of the meat, which also contains high nutrition. Based on the results of the proximate analysis, mudcrab contains 67.5% protein and 0.9% fat ^[2]. Some of fatty acids are found in the body or in the feed, especially those, which are combined into one complex compound of triglycerides. Triglycerides compile many lipids, contained in the food, as well as in the body, and also contain short chain of fatty acids which turn into liquid at low temperature ^[3]. The high level of triglycerides causes the increasing risk of cardiovascular disease.

People who have high triglyceride level also often have high level of LDL cholesterol and low HDL cholesterol. The elevation of triglyceride level also makes LDL cholesterol turn into toxic to the wall of arteries and reduce the beneficial effects of HDL^[4]. Oleic acid is one of the derivatives of Omega-9 fatty acid.

One of the ingredients which can increase the level of Omega-9 in the mudcrab meat is Crude Fish Oil that derived from lemuru. Crude Fish Oil (CFO) contains omega-9, which functions to reduce the cholesterol level and triglyceride can reduce the stimulation of clotting grains of red blood cells and reduce the blood pressure, preventing any hardenings of the arteries, as well as retarding the growth of cancer cells ^[5]. Research in the use of Crude Fish Oil in mudcrab to increase the level of Omega-9 has not been done. Therefore the research requires to be done, especially on the effect of Crude Fish Oil in the crab's feed toward the contents of triglycerides and oleic acid in the mudcrab meat (*Scylla serrata*).

MATERIALS AND METHODS

Materials

The equipment used in this study includes 60 pieces of aquarium, penyipon hose, aerator, aeration hose, airstone, aerator, large plastic tub, measuring cup, analytical scale, pH meter, thermometer, DO meter and ammonia test kit. Animal used in the research is mud crab (*Scylla serrata*), weighed 100-150 grams per crab, with total numbers of 60 crabs. The crabs were obtained from Laguna Fish Markiet, Surabaya.

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The maintenance media used in this study is the brackish water with a volume of 2.5 liter per aquarium, which has size 25x20x30 cm³. The feed used in the research are trash fish mixed with crude fish oil.

Procedures

The equipment includes aquariums, plastic barrels and basins. Those tools were washed by using soap, and then rinsed by chlorine, rinsed again, and dried. The dried aquarium were filled with brackish water in each tank. Reservoir was filled with water and then aerated. The mudcrabs were put into the aquarium. The mudcrab were fasted for one day to eliminate the influence of the feed given earlier. The feed used in this research was trash fish because they are cheap, abundant and low cholesterol. Crude Fish Oil and binder in the form of tapioca starch were added in appropriate doses into the trash fish feed. The trash fish feed which had been added with CFO were aerated for about 5-10 minutes before they were given to the mudcrab. After 30 days of maintenance, the content of oleic acid and triglycerides in the mudcrab meat was taken and analyzed by applying gas chromatography-mass spectrometry or GC-MS method by using chromatograph Shimadzu QP2010. The analysis was conducted in the chemical laboratory of ULP of Airlangga University, while the analysis of triglycerides was conducted in the Laboratory of Physiology, Molecular Physiology Division of Brawijaya University.

Research Parameter

The treatment in this study consist of P₀ : Control, P₁ : Addition of CFO 2%, P₂. Addition of CFO 4%, P₃ : Addition of CFO 6%, P₄: Addition of CFO 8%. The main parameter in this research is the content of triglycerides and oleic acid in the mudcrab meat. The cholesterol content can be determined by using a spectrophotometer method at the beginning and the end of the study. The supporting parameters are temperature, salinity, oxygen content, ammonia content and pH of the water. The design used in this research is Completely Randomized Design (CRD). The research consists of five treatments with four replications. The data were analyzed by using Analysis of Variance, followed by by using Duncan's Multiple Range Test [6].

RESULTS AND DISCUSSION

Triglycerides

The result of the content of triglycerides in the meat of mudcrab (*Scylla serrata*) showed significant differences. The calculation triglyceride's content in the mud crabs' meat can be seen in Table 1.

Table 1. The average content of triglycerides in the mud crabs' meat

Treatment	Triglycerides content (mmol/L) ± SD	Transformation ($\sqrt{y} + 0.5$) ± SD
P ₀	1.054 ^d ± 0.0248	1.246 ± 0.0248
P ₁	0.545 ^c ± 0.074	1.020 ± 0.074
P ₂	0.088 ^a ± 0.043	0.766 ± 0.043
P ₃	0.333 ^b ± 0.008	0.912 ± 0.008
P ₄	0.191 ^{ab} ± 0.097	0.827 ± 0.097

The mudcrab which are fed trash fish with no addition of CFO or treatment P₀ contained 1.054 mmol/L triglycerides, while the mudcrab which are fed trash fish with addition of CFO in treatment P₁ (CFO 2%) contained 0.545 mmol/L, treatment P₂ (CFO 4 %) contained 0.088 mmol/L, treatment P₃ (CFO 6%) contained 0.333 mmol/L, treatment P₄ (CFO 8%) contained 0.191 mmol/L. The highest content of triglycerides in the mud crab meat is in the treatment P₀ (CFO 0%), while the lowest triglyceride P₂ (CFO 4%). Analysis of Variance results showed significant different effect ($p < 0.05$) in triglyceride content, which is decreasing in the mud crab. The highest content occurs in treatment P₀.

Triglyceride content is at the lowest in treatment P₂, but it has no significant difference with P₄. Treatment E does not have a significant difference with P₃. Triglycerides are the primary fat in the food. Triglyceride levels that exceed the normal portion will increase the concentration of very low density lipoprotein (VLDL) which may then increase the risk of plaque deposits in the arteries, increase blood pressure and heart attack [7]. The decrease of triglyceride content in mudcrab meat is due to the effects of the omega 3 addition in the feed. Omega-3 fatty acids in the form of EPA (*Eicosa Pentaenoic Acid*) and DHA (*Docosa Hexaenoic Acid*) by dose of 3- 4 g/day is found to have an effect in decreasing triglycerides. Omega-3 can lower lipid levels (cholesterol) in the blood serum, which is by inhibiting the formation of proteins and triglycerides and increasing HDL content [9]. The decrease of triglyceride content on mud crab meat is also closely related to the increase in the HDL content of mudcrab meat. According to research conducted by [4], the addition of CFO by dose of 4-8% can increase the content of HDL in mudcrab.

Oleic acid

The results showed that the content value of Oleic Acid of mudcrab ranged between 18.52 –32.30 %. Average data of oleic acid content in mudcrab is showed in Table 2.

Table 2. Average data of oleic acid level in mudcrab

Treatment	Oleat acid contain (%)± SD	Transformation $\sqrt{y} \pm SD$
P ₀	32.30 ± 10.78	5.61 ± 1.06
P ₁	20.31 ± 8.12	4.43 ± 0.91
P ₂	24.03 ± 13.38	4.73 ± 1.47
P ₃	18.52 ± 5.55	4.30 ± 0.65
P ₄	28.25 ± 6.80	5.30 ± 0.60

Analysis of Variance showed no significant effect ($p < 0.05$) to the increasing level of oleic acid in the mudcrab. The results show that different concentration of CFO addition does not significantly influence the content value of oleic acid in each treatment. It is predicted that mudcrab utilizes polyunsaturated fat acids as an energy source and is used to lower the cholesterol level of mudcrab. The availability of polyunsaturated fat acids decreased during the period of growth and development, which may indicate that the crabs utilize fat acids as an energy source. The final results from the breakdown of food lipids are fat acids and glycerol. Fatty acids undergo esterification process of forming esters with glycerol into triglycerides as energy reserves. Oxidized fat acids go through beta oxidation and produce acetyl CoA which then joins the acetyl CoA resulted from the metabolism of carbohydrates and protein, and enter the citric acid cycle to produce energy^[10].

Oleic acid is grouped in a fat acid group MUFA (*mono unsaturated fatty acids*). These fat acids have the structure of 18: 1 with molecular formula: $\text{CH}_3(\text{CH}_2)_7\text{C}=\text{C}(\text{CH}_2)_7\text{COOH}$, and belong in class of omega-9 because they have a double bond at position 9 from the end of chain^[11]. Omega 9 fatty acids or oleic acid has a large configuration of trans cis. The existence of the location of double bonds in the fatty acids chemical structure results in disparities configuration cis and trans forms. When double carbon bond is located on the same side with the hydrogen group then it is called a cis configuration. If double carbon bond is located in opposite side then it is called a trans configuration^[12]. Oleic acid has a greater cis configuration that can inhibit cholesterol in the intestine. Cis configuration can inhibit the absorption of cholesterol in the intestine and the structure is more stable so it is not easily oxidized^[13].

CONCLUSION

The addition of crude fish oil doses of 2-8% in the feed can decrease triglyceride and increased oleic acid content in mudcrab meat.

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