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Feed Additive Vegetable Oil, Addition to Commercial Feed on the Feed Efficiency and Fat Content of Red Tilapia (*Oreochromis Niloticus*)

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ABSTRACT: This study aims to determine the effect of conventional vegetable oil as feed additive, according to soybean oil, coconut oil, corn oil, and the effect of feed efficiency, feed conversion ratio (FCR) and fat content of red tilapia. Feeding trial in this study had used Completely randomized design (CRD), with 4 treatments and repeated 4 times. Red tilapia as much as 160 used initial weight of 25-40g/head, kept in an aquarium with a volume of 20 dm^3 with density 2 ind./L, and fed a pelleted with addition vegetable oil for 40 days. The results showed that there was a significant difference($p<0.05$) in Feed Efficiency (FE), and Feed Conversion Ratio (FCR). The highest EPP value in treatment addition soybean oil 4% was 66.06% (P<.05), and then treatment corn oil (47.28%), while the control treatment not addition of vegetable oil gave FE as much as 46.70%, and coconut oil was 39.60%. The best FCR value in treatment addition soybean oil 4% as much as 1.52 (P<0.05%), while feed additive corn oil was 2.23, control was 2.17, and coconut oil was 2.27. Feeding with the addition of 4% soybean oil was the best treatment for growth, while the addition of coconut oil and corn oil increased the fat content of fish descriptively compared to without the addition of oil.

KEYWORDS: Red Tilapia, Soybean Oil, Coconut Oil, Corn Oil, Fat

I. INTRODUCTION

aOne of the fishing communities Indonesia which has a bright prospect to be developed is tilapia (*Oreochromis niloticus*) which has been known long known, relatively fast growing and have a good response to environment so it is very easy to cultivated [1]. In terms of eating habits, tilapia is an all-eating fish (omnivorous) so easy to give additional feed. The crude protein requirement of red tilapia ranges from 25-35 percent. The fatty acid requirement of tilapia, according to [2] is from unsaturated fatty acids of the omega 6 group, which is as much as 0.5-1 percent. Materials that contain lots of fatty acids, both saturated and unsaturated, one of which is PUFA omega 6 are from seeds and vegetable plants. PUFA is one type of essential fat, because the body cannot synthesize it while the body needs PUFA for normal growth and function of all tissues. Apart from being an easily available source, there are also various commercial sources of vegetable fats, such as coconut oil, corn oil, and soybean oil. In addition, fat in feed also provides essential fatty acids (EPA) needed for growth, normal development and helps the absorption of various types of fat-soluble vitamins [3]. According to [4], lack of essential fatty acids will result in decreased growth rate, decreased feed efficiency, increased feed conversion ratio, increased mortality or mortality.

World vegetable oil consumption in 2011-2012 reached ± 150 million tons. 114.2 million tons are used in the food sector and 35.8 million tons in the non-food sector [5]. Vegetable oils can be better absorbed by fish body tissues and can also affect fish growth, feed efficiency, and also fat content in fish. Various methods in making feed, one of which is by adding vegetable oil to meet the fat needs of red tilapia. Fat is one of the energy sources that must be available in feed. Determination of the source of fat in the feed is important in terms of the efficiency of the feed used. Oil is a source of fat that is still widely used in feed. Different types of oil have different effects on fish. This study aims to determine the effect of adding vegetable oil (soybean oil, coconut oil, corn oil) in feed to feed efficiency, feed conversion ratio, and fat content of red tilapia, the oil was chosen because it is easier to obtain in the market and also contains fatty acids. which is quite high.

II. MATERIALS AND METHODS

This research was conducted from February 2022 to March 2022 in Aquaculture Laboratory Faculty of Fisheries and Marine Sciences, Padjadjaran University, Indonesia. The research used was experimental with a Completely Randomized Design (CRD). Treatment A: Control (without the addition oil), Treatment B: Addition of 4% soybean oil, Treatment C: Addition of 4% coconut oil, and Treatment D: Addition of 4% corn oil

Parameters feed efficiency and feed conversion ratio were tested using analysis of variance/F test and further tests using Duncan's test to see the effect of treatment on each parameter to be tested, at a 95% confidence level. Fat content parameters were analysed descriptively.

A. *Research Procedure*

Preparation of research tools begins with cleaning the aquarium and checking equipment for adding oil to fish feed. Aquarium rinsed with water, then dried and labelled according to treatment. Addition of oil to fish feed by providing soybean oil, coconut oil, corn oil and commercial pellets, the pellets are then mixed with carboxy-methyl cellulose (CMC) feed adhesive is then dried in the sun or in the oven. The test fish used in this study was Red Tilapia, sized 12-14 cm with an average weight of 40.41 ± 0.43 g/head .10The fish are adapted to the new environment first and the feed will be given in a tank with a volume of 20 litters. Then transferred to the rearing container as many as 15 test fish per fibres tub with a volume of 240 litters which had previously been weighed. Feeding as much as 3% of fish biomass was carried out at 08:00 West Indonesian time and 16:00 West Indonesian time. Siphoning is carried out every day, while water changes are carried out 4 times a day as much as 35% of water with water that has been deposited first. Maintenance was carried out for 40 days of observation. At the beginning and end of rearing several fish samples were taken for proximate analysis.

B. *Research Parameters*

Feed Efficiency

The formula used to calculate feed efficiency by [6] :

$$\text{EP} = \frac{(Wt + D) - Wo}{F} x\ 100\%$$

Information:

EP = Feed efficiency (%)

Wt = Final fish weight (g)

Wo = Initial fish weight (g)

D = Dead fish weight (g)

F = Amount of feed consumed (g)

Feed Conversion Ratio

The feed conversion ratio of red tilapia seeds was measured based on the feed conversion ratio formula developed by Kamaruddin (2005):

$$\text{FCR} = \frac{F}{(Wt + D) - Wo}$$

Information:

FCR = Feed Conversion Ratio (%)

Wt = Final fish weight (g)

Wo = Initial fish weight (g)

D = Dead fish weight (g)

F = Amount of feed consumed (g)

C. Data analysis

The data obtained were then tabulated and analyzed using variance analysis (ANOVA) to determine the effect of each treatment. If there were differences between treatments then Duncan's multiple distance test was carried out with a confidence level of 5% [8].

III. RESULTS AND DISCUSSION

A. Feed Efficiency

The efficiency of the use of feed by fish shows the value (percentage) of food that can be utilized by the animal's body [9]. The efficiency of feeding is directly proportional to the addition of body weight, so the higher the value of feeding efficiency means the more efficient the fish use the feed consumed for growth [10]. The feed can be said to be good if the feeding efficiency value is more than 50% or even close to 100% [11].

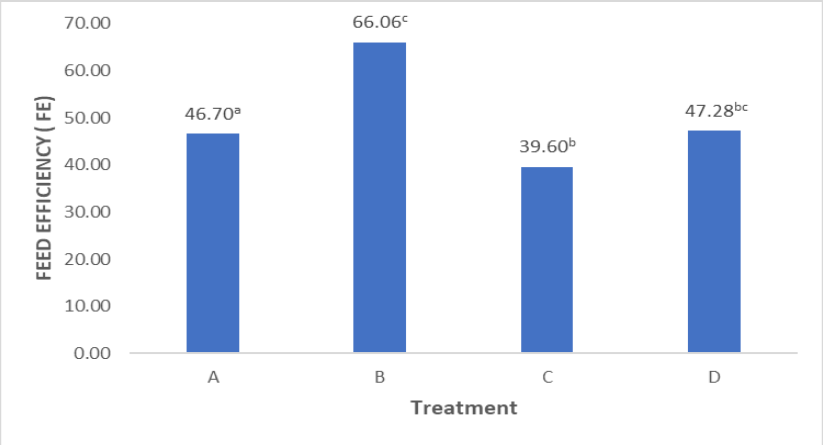

Figure. 1 Diagram of Feed Efficiency

The efficiency value of adding vegetable oil to red tilapia obtained the highest value in Treatment B (soybean oil) with a value of 66.06% followed by treatment D (corn oil) with a value of 47.28%, then followed by treatment A (control) with a value of 46.70% and the lowest was followed by treatment C (coconut oil) with a value of 39.60%. This shows that the adaptation of feed with the addition of soybean oil is getting better by red tilapia during rearing. This can also be because the addition of soybean oil to commercial feed can be digested well by red tilapia, so that even in addition to 4% levels it can increase the growth of red tilapia.

Feed utilization efficiency is the ratio between body weight gain and the amount of feed given during maintenance [12]. Feed efficiency value in each treatment during the research only treatment b classified good (66.06%). Treatment with the addition of vegetable oil showed an increase and decrease in several weeks of maintenance, which was directly proportional to the higher specific growth rate according to the treatment. According to [13], that one of the indicators used to assess the level of efficiency of feed given to fish is feed digestibility. This markedly reduced digestibility of saturated fats could explain the absence of higher levels of saturated fatty acids in the liver, lipid droplets in enterocytes and muscle of fish fed diet could be due to the lower fat digestibility of this diet. The use of coconut oil, was decrease feed efficiency. (39.60%). A decrease in the ratio of polyunsaturated/saturated fatty acids in the diet lead to a reduction of the apparent digestibility not only of saturated fats but also of other fatty acids[14].

B. Feed Conversion Ratio

Based on the results of research on red tilapia seeds during the 40-day rearing period, it was found that differences in the addition of soybean oil, coconut oil, and corn oil to commercial pellets resulted in differences in the FCR value in each treatment, along with the FCR value in each treatment.

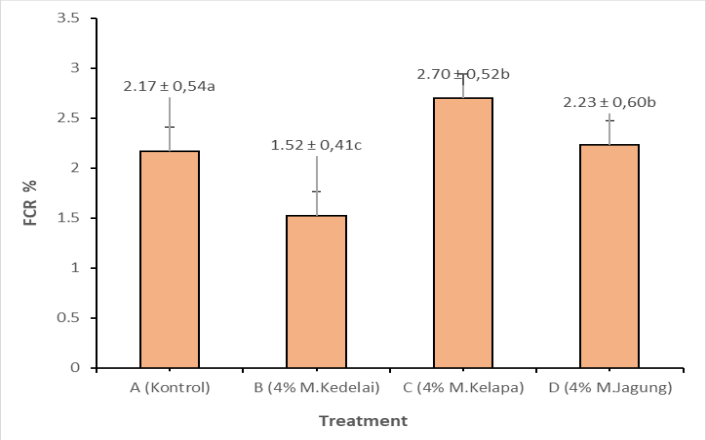

Figure. 2 Diagram of Feed Conversion Ratio

The results of the calculation of data analysis show that the value with the lowest treatment is treatment B, the highest treatment is A. The figure also shows that the FCR value in treatment B looks lower than the other treatments, which is 1.52% and the highest FCR value is by treatment C (control) of 2.70%, followed by treatment D at 2.23% and then treatment A by 2.17%. In soybean oil the saturated fatty acid content ranges from 15% while for corn oil it ranges from 13% and for coconut oil it ranges from 90% [15]. This can make the FCR value of coconut oil high compared to soybean and corn oil, because according to [16], fat digestibility in fish increases according to the decrease in the melting point of the fat in question, for example with an increase in unsaturated fatty acids and also in accordance with the opinion of [5]. That fat digestibility is influenced by the level of fat saturation which is generally fish. It is easier to digest unsaturated fats so that saturated fats are said to have low digestibility for fish.

It can be concluded that the addition of vegetable oil at a dose of 4% is still accepted by the body of the red tilapia, where the fat retention in red tilapia in this study can store and utilize fat in the feed that has been added with oil. Fat retention in fish indicates the ability of fish to store and utilize fat in feed [17]. Fat retention is also related to the levels of carbohydrates and fats in the feed as a source of energy for the fish. Fat is stored as a reserve for long-term energy needs during periods of activity or during periods without food and energy [18].

C. Crud Protein and Crude Fat Content in Fish Meat

The following is the result of the proximate analysis crude protein and crude fat, of meat fish of Red Tilapia at the end of the study, the treatment without the addition of 4% coconut oil, corn oil and without the addition of oil (control).

Table 1. Proximate Analysis

NO	Treatments	Moisture %	Crude Protein %	Crude Fat%
1	A : Control, without feed additive	76.90	18.84	8.75
2	B : Feed additive soybean oil	80.72	17.00	8.20
3	C ; Feed additive coconut oil	80.59	16.95	9.25
4	D ; Feed additive corn oil	80.42	16.49	6.36

The results of the proximate test showed an increase in fat content in red tilapia through the addition of fish oil to the feed for 40 days of rearing. The fat content of red tilapia in treatments A, C, and D was 8.75%, 9.25%, 6.36%. The difference between the addition of oil and the control treatment affects the fat content of red tilapia at the end of the study

Meanwhile, the water content in red tilapia after rearing ended in treatments A, C, and D was 76.90%, 80.59, 80.42% the results were not much different (P>0.05). According [19], stated that red fish meat has a low protein content, but a higher water content. White fish meat has high protein content and low water content. Red tilapia has a meat color that tends to be whiter than other fish that have a higher protein content. Higher water content will also show the texture of fish meat, according to [20]yah et al (2019), the higher the water content in the material, the softer the texture, on the contrary, if the water content in the material is a little, it will be harder.

Protein levels in red tilapia in treatments A, C, D were 18.84%, 16.95%, 16.49%. In the results of this study, there was no significant difference in the protein content of red tilapia. The level of digestibility of each content in the feed source will affect the content of the fish. The fatty acids contained in the fat used, contribute to fish metabolism which can affect protein. The results of research conducted by [21] showed that protein retention is a parameter to show the contribution of protein consumed in the feed to the increase in body protein. Meanwhile, the addition of vegetable oil to feed containing fatty acids has an effect on protein levels in fish, which is also supported by the research of [22] ,feeding with fatty acid content in meat Caranx sp. fish affects its protein digestibility. One of the functions of protein, namely as a source of energy, has been fully fulfilled through existing fat.

CONCLUSIONS

Result of variance test on feed efficiency and the feed conversion rate of tilapia feed reared with the addition of soybean oil to the feed gave a good value with the value of feed efficiency (66.06%) and the value of feed conversion rate (1.52) on red tilapia. The addition of 4% vegetable oil to commercial feeds increases the fat content of red tilapia meat.

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