The effect of feeding with the addition of activated charcoal on feed conversion and survival of Juvenile Giant Trevally (Caranxignobilis)

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Abstract. The study of the effect of feeding with the addition of activated charcoal on feed conversion ratio and survival of juvenile Giant Trevally (Caranxignobilis) was carried out in May to August 2018. This study consisted of 5 treatments and 4 replications. Feed is treated with the addition of activated charcoal of different types, namely coconut shell activated charcoal, mangrove wood activated charcoal, rice husk activated charcoal, and palm shell activated charcoal. Addition of activated charcoal in feed at each treatment as much as 2%. Feed was given twice a day in at-satiation for 42 days. The results showed that feeding with the addition of activated rice charcoal had a very good effect on feed conversion. There was no significant difference between the treatments of activated charcoal on the survival of the juvenile Giant Trevally. The survival rate was around 88.33% - 96.67%.

1. Introduction

Giant Trevally (Caranxignobilis) is one of the types of consumption fish that people love. This reef fish is generally obtained from the catch of fishermen because it has not been much developed in the cultivation business. One of the causes of the limitation of aquaculture is the high cost of feed because commercial feed is not yet available. During this time the feed given is a type of consumption fish that is chopped in accordance with the mouth opening of a fish known as crumb fish. [1] In addition to crumb fish, there are many artificial feeds that are made and formulated according to the nutritional requirements for fish growth better than crumb fish. Artificial feed has several advantages because it can be mixed and made according to nutritional needs, can be stored in a longer time and storage is simpler and more hygienic. Fish feed needs are based on nutrient content. Feed given as far as possible
is well formulated so that it can improve survival, growth and do not contain polluted substances that can cause health problems for fish.

A good feed contains enough nutrients and able to be utilized by the body of the fish properly. This is influenced by the absorption of nutrients from the digestive tract into the body's cells. Indicator of feed utilization can be shown by the value of feed conversion which can affect the efficiency of feed consumed. A low feed conversion ratio value indicates that the feed used for growth is more efficient. A good feed conversion ratio is determined by the amount of feed availability (nutrients) absorbed through the digestive tract. Nutrient uptake is influenced by the digestibility of feed. Because of this type of feed and its processing affect the digestibility of the feed which designates the quality of feed absorption from the digestive tract to the body's cells. The good quality food is if it has digestibility and absorbs good nutrients. Efforts to improve the quality of feed for aquaculture fish continue to be improved. Various natural ingredients are used in feed formulations, one of which is activated charcoal as a non-nutritional ingredient is added to the feed formulation with the aim of improving feed quality. [2] The addition of additives in the feed can affect feed digestibility. [3] The addition of 2% bamboo activated charcoal in tilapia food can increase survival, digestibility, decrease feed conversion, and follow good growth.

Activated charcoal can be obtained from various sources in the environment even from household and factory waste, such as rice husks, coconut shell, palm kernel shell, and others. These wastes have not been much processed and used as supplementary ingredients in fish feed formulations, therefore it is needed the studies in a scientific study.

2. Materials and Methods

2.1. Research Tools and Materials

The tools used were plastic containers, pipes, aerators, pH meters, DO meters, mixers, pellet presses, analytical scales, 1000 ml Erlenmeyer, 1000 ml measuring flask, 100 ml measuring cup, spatula, magnetic stirrer, hot plate, Furnace.

The materials used were juvenile Giant Trevally, rebon shrimp flour, rice flour, soy flour, corn flour, fish meal, blood meal, CaCO3, L-lysine, L-tryptophan, DL-methionine, coconut shell activated charcoal, mangrove wood activated charcoal, rice husk activated charcoal, palm kernel activated charcoal, filter paper, aluminium foil, distilled water and 0.2 M citric acid.

2.2. Experimental design

This study used a Completely Randomized Design (CRD) with 5 treatments and 4 replications. Treatments of feed with the addition of 2% activated charcoal were:

A = Feed that does not have activated charcoal
B = Feed containing coconut shell activated charcoal
C = Feed containing mangrove wood activated charcoal
D = Feed containing rice husk activated charcoal
E = Feed containing palm kernel shell activated charcoal

Juveniles Giant Trevally were placed in 20 containers. Each container was placed with 15 juveniles of Giant Trevally with a length of 7.5 - 9 cm. Juvenile Giant Trevally were cultivated for 42 days. Feeding was carried out twice a day by ad-satiation, which was in the morning at 7.00 - 8.30 and in the afternoon at 16.30 - 18.00.

2.3. Research Parameters

The research parameters were the feed conversion ratio (FCR) and the survival rate of Juvenile Giant Trevally.
2.4. Data Analysis

Data were analyzed using SPSS, the One Way ANOVA (Analysis of Variant) test, then there were differences among treatments at a significant level of 5% so the analysis continued with Duncan Test to determine the treatment groups that had significant differences.

3. Results and Discussion

3.1. Feed Conversion Ratio (FCR)

Feed conversion ratio is the ratio of dry weight of feed consumed and fish weight gain. The use of feed can be known by calculating the value of the Feed Conversion Ratio (FCR), by comparing the amount of feed given to the amount of weight gain of fish. Fish need enough food to support the growth, development and survival. Feed conversion ratio values of this study are presented in the form of the histogram shown in Figure 1.

![Figure 1](image)

**Figure 1.** Histogram of the average value of the feed conversion ratio of Juvenile Giant Trevally feed (*Caranxignobilis*) during cultivation in treatment A (feed without the addition of activated charcoal), B (feed with the addition of coconut shell activated charcoal), C (feed with the addition of mangrove wood activated charcoal), D (feed with the addition of rice husk activated charcoal), E (feed with the addition of palm kernel shell activated charcoal).

Figure 1 described that the addition of activated charcoal in the feed has an effect on the conversion ratio of the juvenile Giant Trevally feed. Rice husk activated charcoal got the lowest feed conversion ratio value, so that rice husk activated charcoal was considered the most effective in influencing the function of optimal nutrient absorption. The results of further statistical tests showed that rice husk activated charcoal was significantly different from mangrove wood activated charcoal while palm kernel shell activated charcoal was not significantly different from coconut shell activated charcoal.

The addition of rice husk activated charcoal to the feed got the best value on the feed conversion ratio, this showed that the utilization of feed nutrition by the fish body occurs well, the fish body was able to use small amounts of feed to increase its body weight. [4] the smaller the feed conversion value, the better the feed quality, and vice versa if the feed conversion value is high, the feed used is of low quality. [5] Rice husk activated charcoal can increase the digestibility of feed and nutrient absorption which can lead to better feed conversion. [6] Chicken fed with activated charcoal powder from wood vinegar compounds at a dose of 1% can reduce feed conversion ratio. [7] In this regard, activated charcoal can normalize the intestinal cell membrane by reducing the gas pressure in the intestine and absorbing toxins found throughout the intestine, so that the absorption of nutrients can take place optimally. [3] The use of activated charcoal in catfish feed can absorb ammonia and
nitrogen; remove poisons and impurities in the digestive tract so that it can activate intestinal function properly.

The advantage of rice husk activated charcoal in improving intestinal function on digestibility and nutrient absorption has to do with carbon composition and surface area. [8] The total carbon content of rice husk activated charcoal ranges from 85-95%, so that the quality of the adsorbent of activated rice husk charcoal is better. Activated charcoal which has a large surface area can support the adsorption function. The more surface area of activated charcoal, the more the number of pores, the better the adsorption speeds.

### 3.2. Survival

Survival is the percentage of organisms that live at the end of cultivation from the stocking density at the early of cultivation. The survival value of this study was presented in Figure 2.

![Figure 2](image-url)

**Figure 2.** Histogram of the survival value of Juvenile Giant Trevally (*Caranxignobilis*) during cultivation. A (feed without the addition of activated charcoal), B (feed with the addition of coconut shell activated charcoal), C (feed with the addition of mangrove wood activated charcoal), D (feed with the addition of rice husk activated charcoal), E (feed with the addition of Palm kernel shell activated charcoal).

Figure 2 showed that the averagesurvival value of juvenile Giant Trevally for 42 days cultivation ranged from 88.33% – 96.67%. The results of variance analysis showed that the addition of activated charcoal to feed did not affect the survival of the juvenile Giant Trevally. Generally the average survival is classified in the high category. The high survival value is suspected because fish are able to adapt to feed containing activated charcoal. [9] Fish that are able to use food optimally will be able to utilize metabolic products for growth and survival. Besides that water quality also affects the survival. The average water quality during the cultivation of juvenile Giant Trevally was 28ºC, pH 6–8, dissolved oxygen 6 ppm and salinity was 28 ppt. [10] Giant Trevally can live well in water temperatures at 28 - 30ºC and salinity was 24 - 30 ppt. Moreover, [11] revealed that Giant Trevally can live in the salinity range of 15-30 ppt.

Fish health also affected the survival of fish; healthy fish certainly has a high survival. Addition of activated charcoal in feed is assumenced can make healthy fish. [12] Activated charcoal that enters the fish's digestive tract is able to absorb toxins and toxins that interfere with fish's health. Catfish that were given activated rice husk charcoal as much as 2.5-57.5% can increase the survival of catfish.
4. Conclusions
The results of the study concluded that addition of activated charcoal to feed can affect the feed conversion ratio of juvenile Giant Trevally but did not significantly affect the survival rate. Survival of Juvenile Giant Trevally was included in the high category, ranging from 88.33% – 96.67%. The addition of activated charcoal from rice husk had a better effect on feed conversion, compared to coconut shell activated charcoal, palm kernel shells and mangrove wood.

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