

Utilization of alternative ingredients as combination feed on the growth of catfish (Clarias sp.)

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Utilization of alternative ingredients as combination feed on the growth of catfish (*Clarias* sp.)

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Abstract. This study aims to determine the effect of using alternative ingredients as a combination feed on the growth of catfish. This research was conducted in October - November 2020 which took place at the Laboratory of the Experimental Pond of the Departemen of Aquaculture, Sriwijaya University. The test fish used were catfish seeds measuring 5 - 6 cm. The study was designed with an experimental method in the form of a completely randomized design (CRD). The treatment to be used is a combination of commercial feed with alternative feed as many as 5 treatments with 3 replications, P0: commercial feed 100%, P1: combination of commercial feed 25% and alternative feed 75%, P2: combination of commercial feed 50% and alternative feed 50%, P3: combination of 75% commercial feed and alternative feed 25%, and P4: alternative feed 100%. Based on the results obtained, it shows that the use of alternative feed as a combination of feed has no significant effect on growth, feed efficiency and survival of catfish. The use of alternative feed as a combination feed of 50% (P2) has an effect on the growth and feed efficiency which is high in catfish of catfish. The growth of absolute length, absolute weight, and efficiency of fish feed produced were 1.67 cm, 4.20 grams, and 53.25%.

1. Introduction

Catfish (*Clarias* sp.) Is one of the aquaculture products which has high economic value. Catfish production has increased in 2017. Catfish production in 2016 amounted to 873,716 tons and in 2017 amounted to 1,857,900 tons [1]. The high rate of domestic consumption and the opening of the export market share ensures that this freshwater fish commodity is a very promising contributor to foreign exchange. This catfishes the demand for fish to always increase from time to time along with the increase in population [2]. Feed is one of the important elements in aquaculture activities that support the growth and survival of cultivated fish. Feed in cultivation activities is generally artificial feed which takes up about 60-70% of the total production costs incurred. One of the efforts to reduce dependence on artificial feed in catfish farming is by using alternative ingredients as additional feed. Alternative ingredients that can be used as feed must have several conditions, including local based, easy to obtain, low price and sufficient nutritional content [3].

The use of alternative ingredients as a combination feed can increase fish growth including Lemna perpusilla for tilapia by 25% [4], earthworms for catfish by 75% [5], golden snails for tilapia by 25% [6], quail dung on catfish by 30% [7], trash fish and bran in baung fish by 75% [8]. Bran and tofu dregs are alternatives that can be used because of their abundance. The nutritional content of the bran is 12.9% crude protein, 13% fat and 11.4% crude fiber [9], while tofu pulp contains 21.23-26.60% protein, 19.00-



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41.3 carbohydrates, %, fat 16.22 - 18.3%, crude fiber 29.59%, ash content 5.45%, water 9.84% [10]. The use of bran and tofu dregs as additional feed has been carried out including milkfish with a concentration of 40% and 45% which can increase the growth rate and feed efficiency [12], the combination of 75% tofu pulp and 25% tapioca flour gives the best results in catfish [11]. The use of tofu dregs in feed also has an effect on the growth of tilapia [12] and goldfish (*Cyprinus carpio* L.) [13].

The use of bran as feed has disadvantages, including high crude fiber content. Therefore, it is necessary to carry out fermentation to increase the nutrient content of the bran. Utilization of bran fermented with tofu dregs combined with artificial feed as much as 25%: 75% produces the best growth in catfish [14]. Fermentation aims to simplify complex compounds to be simpler and improve the quality of the ingredients so that they can improve feed digestibility and fish growth. Provision of fermented bran with a dose of 100 ml / 250-liter bread yeast on catfish rearing media resulted in the highest growth [15]. However, the use of fermented tofu dregs bran as additional feed for catfish has not been used. Therefore, it is necessary to conduct research on the use of bran fermented with tofu dregs as catfish feed (*Clarias* sp.).

2. Experimental

2.1. Place and Time

This research was conducted at the Laboratory of the Experimental Pond of the Departemen of Aquaculture, Sriwijaya University, South Sumatera from October to November 2020.

2.2. Tools and Materials

The tools to be used include waring with a size of 50 x 50 x 50 cm, a basin, a scale, a thermometer, a pH meter, a DO meter, a sieve, a pelletizer, a water pump, an aeration blower, an aeration hose, an aeration stone, a blender. While the materials to be used include catfish seeds with an average length of 5-7 cm, bran, tofu pulp, artificial feed.

3. Methodology

3.1 Method

3.1.1. Preparation of maintenance containers

The maintenance containers used were in the form of a 50x50x50 cm³ waring with a volume of 75 L of water installed in a concrete pool. Before use, the concrete pond is cleaned and then aerated and a net covering is installed at the top to prevent fish jumping out of and entering predators. Each waring is given a treatment code.

3.1.2. Alternative feed fermentation

Before fermentation, the bran is sieved so that the size is homogeneous, while the tofu dregs are first squeezed and then dried then mashed using a blender and sieved. The fine bran is mixed with tofu dregs in a ratio of 9: 1 and added enough water and stirred until homogeneous [16]. The mixture is then covered with plastic and left in a closed and dark room for 3 days. The fermentation product is then printed and dried and then stored in a closed container and protected from direct sunlight. The results of proximate feed can be seen in Table 1.

3.1.3. Fish Maintenance

The catfish used was stocked as much as 30 fish/m² which had previously been adapted to feed for 7 days. During the maintenance, the fish were fed in each rearing vessel as much as 5% of the fish body weight, with a frequency of three times a day at 8.00 am, 1.00 pm and 6.00 pm. Alternative feed is given early after 12 hour and then given artificial feed. Fish were reared for 28 days with sampling every 7 days. The water quality parameters observed were temperature, pH, and DO. Temperature and pH measurements were carried out every day while DO measurements were carried out at the beginning, middle and end of maintenance.

Table 1. Feed proximate

Proximate	Alternative feed	Commercial feed
Protein (%)	8,08	33,56
Fat (%)	15,61	5,73
BETN ¹ (%)	54,28	48,80
Crude (%)	13,02	2,15
Ash (%)	9,01	9,77
GE ² (kkal/kg)	3756,81	3972,70

Description: 1BETN: extract material without nitrogen; 2GE: gross energy calculated based on 1 g protein= 5,6 kkal; 1 g (BETN)= 4,1 kkal; 1 g fat= 9,4 kkal (NRC, 1993)

3.1.4. Parameters

3.1.4.1. Growth

Absolute Length Growth

The absolute length growth during maintenance is calculated using the formula as follows:

$$L = L_t - L_0$$

Information:

L = absolute length growth of fish (cm)

L_t = Length of fish at the end of maintenance (cm)

L₀ = Length of fish at the beginning of rearing (cm)

Absolute Weight Growth

The absolute weight growth during maintenance is calculated using the formula, as follows:

$$W = W_t - W_0$$

Information:

W = absolute growth of reared fish (g)

W_t = weight of fish at the end of rearing (g)

W₀ = Fish weight at the beginning of rearing (g)

3.1.4.2. Specific Growth Rate

The specific growth rate during maintenance is calculated using the formula, as follows:

$$SGR = \frac{\ln W_t - \ln W_0}{t} \times 100\%$$

Information:

W_t = weight of fish at the end of rearing (g)

W₀ = Fish weight at the beginning of rearing (g)

t = Time (days)

3.1.4.3. Feed Efficiency

Feed efficiency is calculated using the following formula:

$$EP = \frac{(W_t - W_d) - W_0}{F} \times 100\%$$

Information:

EP = Feed efficiency (%)

W_t = final weight of fish biomass (g)

W₀ = initial weight of fish biomass (g)

W_d = Weight of dead fish (g)

F = weight of feed given (g)

3.1.4.4. Survival Rate

The percentage of survival rate can be calculated using the formula, as follows:

$$SR = \frac{N_t}{N_0} \times 100\%$$

Information;

SR = Survival Rate (%)

N₀ = Number of fish at the beginning of maintenance (tail)

N_t = Number of fish at the end of maintenance (tail)

3.1.4.5. Water quality

Water quality parameters measured are temperature and pH. Measurement of temperature and pH of maintenance water is carried out every morning.

3.1.4.6. Data analysis

Data on growth, feed efficiency and continuity were processed using analysis of variance. If there is a significant effect, the LSD test is carried out with a confidence level of 95%. Meanwhile, water quality data were analyzed descriptively.

4. Result and Discussion

4.1. Result

4.1.1. Absolute length growth

The absolute length growth of the catfish in 28 days culture is shown in figure 1.

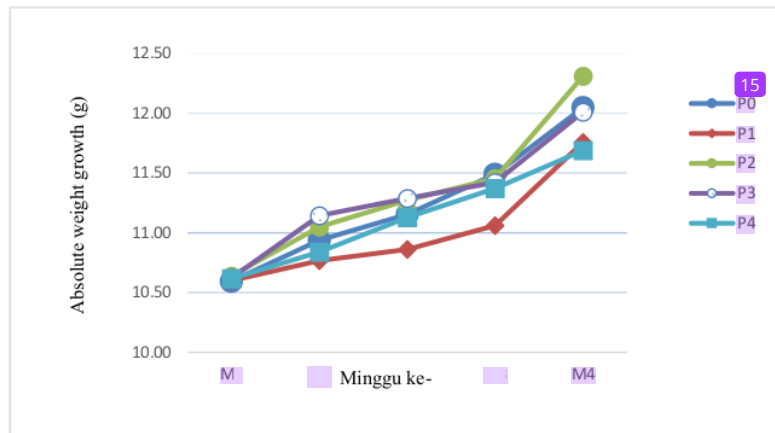


Figure 1. The absolute length growth rate of catfish in 28 days of culture

The use of alternative ingredients as combination feed resulted in absolute weight growth which was not significantly different from the control treatment (without the use of alternative ingredients as combination feed). However, the highest absolute length growth value was found in treatment P2 of 1.67 cm, while the lowest absolute length growth was found in treatment P4 of 1.07 cm

4.1.2. Absolute weight growth

The absolute weight growth of the catfish in 28 days culture is shown in figure 2.

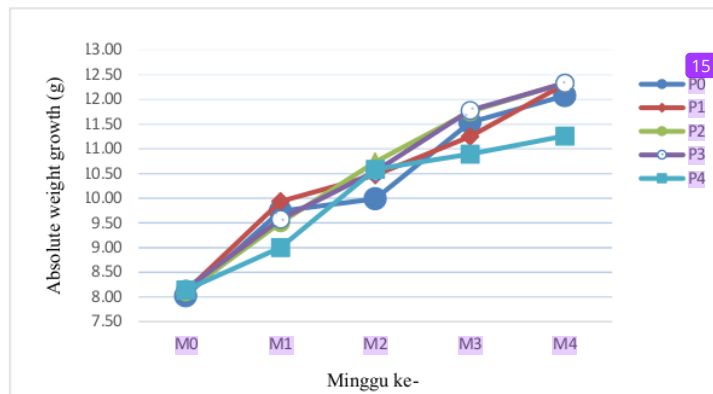


Figure 2. The absolute weight growth rate of catfish in 28 days of culture

Based on the results of the study showed that all fish growth occurred in all treatments each week. The use of alternative ingredients as combination feed resulted in absolute weight growth which was not significantly different from the control treatment (without the use of alternative ingredients as combination feed). However, the highest absolute weight growth value was found in treatment P2 of 4.23 grams, while the lowest absolute weight growth was in treatment P4 of 3.12 grams.

4.1.3. Specific Growth Rate

The specific growth rate of the catfish in 28 days culture is shown in figure 3.

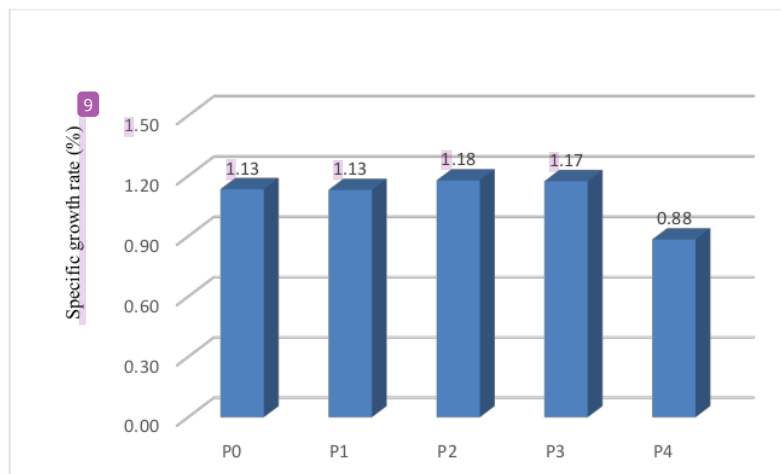


Figure 3. The specific growth rate of catfish in 28 days of culture

The use of alternative ingredients as combination feed resulted in an effect that was not significantly different from the control treatment (without the use of alternative ingredients as combination feed) on the specific growth rate. However, the highest specific growth rate value was found in treatment P2 which was 1.18% / day, while the lowest specific growth rate was found in treatment P4 which was 0.88% / day. The specific growth rate of fish in each treatment can be seen in Figure 3.

4.1.4 Feed Efficiency

Feed Efficiency of the catfish in 28 days culture is shown in figure 4.

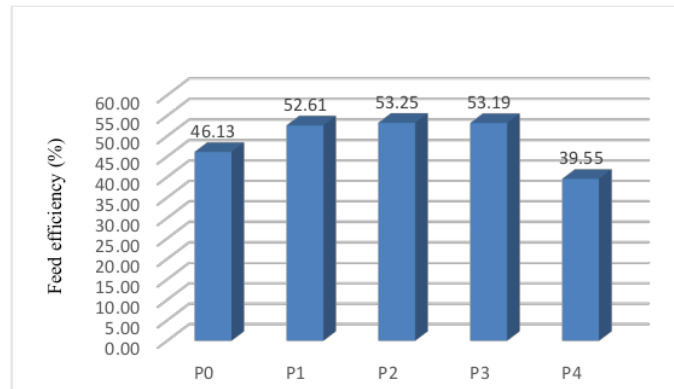


Figure 4. Feed efficiency of catfish in 28 days of culture

10

Based on the results of the study showed that all the use of alternative ingredients as combination feed had no significant effect on the control treatment (without the use of alternative ingredients as combination feed) on feed efficiency. However, the highest feed efficiency value was found in treatment P2 which was 53.25% while the lowest feed efficiency was found in treatment P4 which was 39.55%.

5

4.1.5. Survival Rate

The survival rate of the catfish in 28 days culture is shown in figure 5.

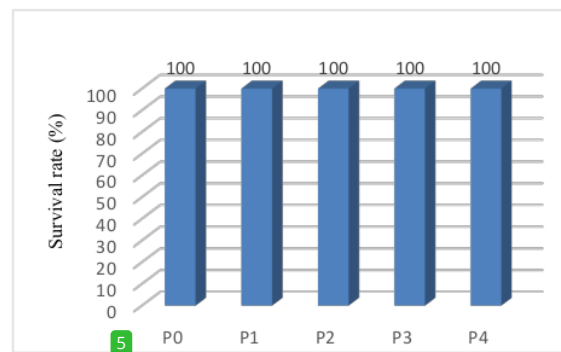


Figure 5. The survival rate of catfish in 28 days of culture

5

The results showed that the survival rate of catfish in each treatment was not significantly different from the survival value in all treatments of 100%.

4.1.6. Water quality

Water temperature and pH of catfish culture in 28 days are shown in table 1. The water temperature, pH, and DO of all treatments is in the normal range.

Table 2. The water temperature and pH of the catfish culture

Water quality	Result
Temp (°C)	26,4 -29,7
pH	6,3-7,2
DO	3,2-5,6

4.2. Discussion

The results showed that the fish treated with alternative ingredients as combination feed had high growth over than the fish that were not treated with alternative ingredients as combination feed (control) or use of 100% alternative feed. The highest absolute length growth value was found in treatment P2 of 1.67 cm, while the lowest absolute length growth was found in treatment P4 of 1.07 cm. So is with the results of the absolute weight growth. The absolute weight growth value was found in treatment P2 of 4.23 grams, while the lowest absolute weight growth was in treatment P4 of 3.12 grams. It is suspected that alternative feed combined with commercial feed still meets the nutritional needs of catfish. According to Effendi [17], growth is an increase in length and weight over time. The factors that affect growth are heredity, age, parasites, food, and water temperature.

The alternative feed used in the form of bran and tofu dregs has sufficient nutritional content, namely 12.9% crude protein, 13% fat and 11.4% crude fiber for bran [9] and 21.23-26.60% protein, carbohydrates 19.00- 41.3%, 16.22 - 18.3% fat, 29.59% crude fiber, 5.45% ash content, 9.84% water for tofu dreg [11]. The use of alternative feed can be used as a combination feed of catfish up to a limit of 50%. The use of alternative feed as a combination feed of more than 50% or 100% alternative feed results in low growth of catfish. This is because the content of alternative feeds alone is not sufficient for the nutritional needs of catfish so that the resulting growth is low. Based on the proximate results of the feed carried out, the protein content of alternative feeds was 8.08%, while the protein requirement for catfish was 30%. Based on Iskandar [18], good feed protein content for catfish feed is 20-30% and carbohydrates 15-20%. Not only that, the level of palatability of fish to alternative feeds was also lacking, because alternative feeds only consisted of bran and fish. tofu dregs, without any other additives such as attractants that can increase fish palatability to feed.

The low level of palatability is indicated by how slow the feed is to which the fish can respond. An attractant that causes stimulation in fish by the senses in the form of taste, smell, and texture of feed. The attractant contained in the feed as a signal to aquatic animals, so that fish can recognize pellets as a food source [19]. The value of feed efficiency is obtained from the comparison of the total weight of the fish with the amount of feed consumed during the maintenance period. The value of feed efficiency is large, indicating the more efficient fish use the feed consumed for growth. Based on the results of the study showed that the highest feed efficiency value was found in treatment P2 which was 53.25% while the lowest feed efficiency was found in treatment P4 which was 39.55%. According to Ahmadi [20], feed efficiency is said to be good when it is in the value of 50% -100%. According to Andisan [21] the higher the feed efficiency value, the more maximum the feed is used for fish. One of the causes of the difference in the level of feed efficiency is influenced by the content and characteristics of the feed. Thus, the use of alternative feeds is able to produce the highest feed efficiency value at a combination of 50% feed.

The use of alternative feeds of more than 50% results in lower feed efficiency because of the alternative feed more than 50% is thought to have low digestibility. This is because the alternative ingredients in the form of bran and tofu dregs are vegetable feeds contain high crude fiber. Crude fiber content in alternative feed is 13,02% An increase in crude fiber content in the composition of the feed can reduce nutrient digestibility [22]. Feed that contains high crude fiber provides a low feed efficiency value. The use of local raw materials resulted in low feed efficiency values for catfish due to the high crude fiber content [23]. The feed should contain as much as 3-5% fiber is generally obtained from plant materials [24].

The survival rate of catfish in each treatment was not significantly different from the survival value in all treatments of 100%. This proves that the use of alternative ingredients as a combination feed does not affect the survival of catfish. Fish survival is influenced by various factors including water quality (dissolved oxygen, ammonia, temperature, and pH), age of fish, environment, health condition of fish, and feed [25]. Water quality is one of the main environmental factors that can optimize the growth of fish in aquaculture containers. Temperature can affect the life activities of organisms such as fish appetite. If the temperature increases, it will increase the intake of food by the fish and the decrease in temperature causes the digestive and metabolic processes to run slowly and pH values that can interfere with fish life are too low (very acidic) and too high (very alkaline) pH values [1]. Based on the water quality that has been measured during field practice activities, it is known that the temperature obtained during maintenance reaches 29.7°C and the pH reaches 7.2. Based on BSN [26], the optimal temperature for catfish is 25-30°C and according to BSN [27], the optimum pH range for catfish growth ranges from 6-8. So, during temperature maintenance activities and within catfish tolerance, catfish grow well.

5. Conclusion

The use of alternative feed as a combination feed of 50% (P2) has an effect on the growth and feed efficiency which is high in catfish of catfish. The growth of absolute length, absolute weight, and efficiency of fish feed produced were 1.67 cm, 4.20 grams, and 53.25%.

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