Utilization of herbal supplements on feed on growth and survival rate of catfish (Clarias sp.)

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Abstract. The feed is one of the most important factors in the growth and survival of fish. One of the efforts made to increase the growth and survival of fish is the provision of herbal supplements in fish feed. The research aim is to provide information about the utilization of herbal supplements on the growth and survival of catfish (Clarias sp). This research has been carried out from July to August 2020 at Bandar Agung Lahat Village, South Sumatera. Catfish rearing containers use two waring units placed in concrete ponds with two treatment that P0: control (without herbal supplements) and P1: utilization of herbal supplements and. The data taken includes absolute growth and absolute length, survival, feed efficiency, and water quality. The utilization of herbal supplements has a good effect on fish growth, feed efficiency, and survival rate. Maintenance of P0 (control) resulted in an absolute weight of 9.79 grams, an absolute length of 6.3 cm, the survival of 85.15%, feed efficiency of 107.89% while maintenance of P1 with the utilization of herbal supplements resulted in an absolute weight of 14.17 grams, an absolute length 7.8 cm, survival 98.57%, feed efficiency 161.170%.

1. Introduction

Catfish (Clarias sp.) is a type of freshwater fish that has economic value and is very easy to cultivate. Catfish has several advantages, such as being able to be maintained more easily, being able to be kept in a narrow space, and being able to live in an unfavorable environment. Besides, catfish has a taste of meat that is quite tasty and contains high nutrition so that it is very much in demand by the community so that catfish farming continues to increase along with the increasing public demand [1]. The growth and high survival rate of catfish is an indicator of success in cultivation so that catfish production increases. One of the factors supporting this success is to feed. The feed is one of the most important factors in the growth and survival of fish. The utilization of feed by fish is strongly influenced by the quality of feed both in terms of nutritional content and feed digestibility. Quality feed, apart from acting as the main energy source, is also expected to increase the digestibility of fish so that growth can be optimal [2]. The provision of herbal supplements in feed can increase the body's resistance to disease, save on feed use and increase the appetite for fish and improve the digestive system [3].

Herbal supplements are made by utilizing ingredients of natural origin so that production costs are affordable. Herbs are plants or plants that have high value in medicine. The utilization of herbs is now widely used, because this natural ingredient is more economical, easy to obtain, and has no side effects. Herbal supplements for fish are made from plants such as turmeric, kencur, and ginger which
contain the main active substance called curcumin. The curcumin content in turmeric functions as an antioxidant and can increase palatability [4].

Information about the use of the herbal supplements has been widely published in the public, such as the addition of ginger, turmeric, kencur, and ginger extracts to catfish [5]. According to Syawal [6], giving herbal supplements in the form of kencur, ginger, turmeric with a fermentation process in feed can stimulate the appetite of catfish, increase fish immunity to disease and reduce stress levels of fish against environmental changes. Samsundari [7] reports that curcuma in feed can accelerate gastric emptying, causing hunger and stimulating appetite so that it can accelerate the growth of koi fish. Therefore it is necessary to research the utilization of herbal supplements on the growth and survival of catfish (Clarias sp.).

2. Experimental

2.1. Place and Time
This research was conducted in Bandar Agung, Lahat District, Lahat Regency, South Sumatra from July to August 2020.

2.2. Tools and Materials
The tools used include a concrete pool, jerry cans, a scale, a ruler, a thermometer, and styrofoam. While the materials used include catfish seeds 5-7 cm in size, 30% commercial protein pellets, turmeric, tamarind, kencur, rice, ginger, molasses, commercial probiotics, and water.

2.3 Method
2.3.1. Preparation of maintenance containers
The maintenance container uses a concrete pool measuring 3.5x2.5x0.8 m³ which is divided into 2 parts with a waring barrier. Where one part is used as a control fish rearing container and the other part is used as treatment fish. Before using the pool, it is cleaned first by brushing and then rinsing with water, then filled with water as high as 0.5 m and left for 24 hours before use.

2.3.2. Making Herbal Supplements
The herbal ingredients are turmeric, kencur, ginger, tamarind each 100 g which have been cleaned then boiled with 1L of water to boil, then remove and chill. Herbal supplements are made by mixing all the ingredients consisting of boiled turmeric water with tamarind, kencur boiled water with 100 g of refined rice (rice flour), boiled water for ginger, 175 ml of molasses then stirring so that they are mixed. After that, it is fermented by adding 50 ml of commercial probiotics containing bacteria from the Lactobacillus genus and homogenized. The herbal supplement mixture is then stored in a jerry can and tightly closed. The herbal supplements are stored for 10 days, and once a day the lid of the jerry can be opened so that the steam inside the jerry can escape. After 10 days, the herbal supplement is ready for use. Herbal supplements can be stored for up to a month.

2.3.3. Addition of Herbal Supplements to Feed
There are two treatments, P0: control (without the addition of herbal supplements) and P1: treatment with the addition of herbal supplements. The addition of herbal supplements by mixing herbal supplements is done by mixing 200 ml of herbal supplements into a basin containing 1 kg of pellets and stirring until homogeneous. The result of the mixing is then aerated until it dries and then the pellets are stored in a tightly closed container. The addition of herbal supplements to feed is only done at the beginning of maintenance and can be done again if the feed runs out.

2.3.4. Fish Maintenance
The stocking density of fish used is 350 fish/m³. Before stocking, catfish were acclimatized and then adapted to commercial feed for 10 days. After that, the fish were weighed and measured as many as 30
fish in length. Before being given treated feed, the fish have fast first. The feed that has been added with herbal supplements is given to catfish on the 11th day [8]. The amount of feed given is 5% of the biomass. The time of feeding is 3 times, that is 07.00 am, 12.00 am and 5.00 pm. Fish rearing will be carried out for 30 days and sampling is every week. Fish weights and lengths are weighed at baseline after adaptation, at sampling, and harvest.

2.4. Parameters

2.4.1. 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)
\( L_0 \) = 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)
\( W_0 \) = Fish weight at the beginning of rearing (g)

2.4.2. 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)
\( W_0 \) = Fish weight at the beginning of rearing (g)
\( t \) = Time (days)

2.4.3. 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)
\( W_0 \) = initial weight of fish biomass (g)
\( W_d \) = Weight of dead fish (g)
\( F \) = weight of feed given (g)

2.4.4. 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 (%)
\( N_0 \) = Number of fish at the beginning of maintenance (tail)
\( N_t \) = Number of fish at the end of maintenance (tail)
2.4.5. Water quality
Water quality parameters measured are temperature and pH. Measurement of temperature and pH of maintenance water is carried out every morning.

2.4.6. Data analysis
Growth data, feed efficiency, survival, and water quality obtained will then be processed using Microsoft Excel and analyzed descriptively and supported by literature.

3. Results and discussion

3.1 Results

3.1.1. 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.](image)

The absolute length growth of P0 reaches 6.3 cm while P1 7.8 cm. The results showed that the fish treated with herbal supplements had a high absolute length growth than the fish that were not treated with herbal supplements.

3.1.2. 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](image)
The absolute weight growth of P0 reaches 9.79 g while P1 14.17 g. The results showed that the fish treated with herbal supplements had a high absolute weight growth than the fish that were not treated with herbal supplements.

3.1.3. 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](image)

The specific growth rate of P0 reaches 6.57% while P1 7.60%. The results showed that the fish treated with herbal supplements had a high specific growth rate than the fish that were not treated with herbal supplements.

3.1.4 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](image)

The feed efficiency of P0 reaches 108.89% while P1 161.17 %. The results showed that the fish treated with herbal supplements had a high feed efficiency than the fish that were not treated with herbal supplements.

3.1.5. 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

The survival rate of P0 reaches 85.15% while P1 98.57%. The results showed that the fish treated with herbal supplements had a high survival rate than the fish that were not treated with herbal supplements.

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

| Water quality | Result |
|---------------|--------|
| Temp (°C)     | 26.4 - 29.7 |
| pH            | 6.3 - 7.2  |

3.2. Discussion
The results showed that the fish treated with herbal supplements had high growth over the fish that were not treated with herbal supplements. According to Yuwono [9], increased feed consumption provides an adequate supply of nutrients to meet increased metabolic needs during periods of rapid growth. According to Effendi [10], growth is an increase in length and weight over time. The factors that affect growth are heredity, age, parasites, food, and water temperature. The absolute length growth of 7.8 cm and the absolute weight growth of 14.17 g. The resulting growth value is high. Taqwa [11] reported that the growth of catfish fed with local raw materials resulted in an absolute length growth of 3.83 cm and an absolute weight growth of 9.94 g.

The high growth in the use of herbal supplements in feed is due to the feed added with herbal supplements consisting of turmeric, ginger, kencur, commercial probiotics, molasses, rice, tamarind contains many metabolites that act as antioxidants and maintain fish health by increasing immunity and appetite. fish [12]. The herbal ingredients used in this field practice are fermented using probiotics that contain lactobacillus bacteria which can change the compounds in the herbal ingredients, making them easier to absorb. The fermentation process causes the hydrolysis of complex compounds to make them easier to absorb [12]. Not only that, the fermentation process also produces a distinctive aroma that can increase the palatability of fish to feed [13]. The feed efficiency of those given herbal supplements was 161.17%, while the control commercial feed without the addition of herbal supplements was 108.89%. According to Winarti [14], the factors that influence the high value of feed efficiency are thought to increase the digestibility of feed protein. Herbal supplements fermented with probiotics are thought to
still contain active bacteria and yeast so that when added to the feed, herbal supplements can remodel complex compounds in the feed into simple compounds. The process of breaking down bacteria and yeast may make the feed which is given additional herbal supplements can be utilized by the fish body efficiently and effectively for growth [15].

The feed efficiency value reaching 100% indicates that the addition of herbal supplements in feed can result in increased feed efficiency than no addition of herbal supplements. According to Purnomo [16], herbal sources added to feed can be converted as a source of energy to produce large amounts of protein biomass and can be utilized by fish with high protein. The survival percentage of catfish with the addition of herbal supplements is higher than control. 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 [17]. The provision of herbal supplements can increase the immunity of catfish so that the fish become healthier, as shown by the high consumption of feed each day. According to Syawal [6] giving herbal supplements mixed with feed can stimulate fish development and reduce mortality. Death in control was caused by stocking density because it affected energy utilization and was a stress factor due to increased interaction between fish.

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 [18]. 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 [19], the optimal temperature for catfish is 25-30°C and according to BSN [20], the optimum pH range for catfish growth ranges from 6-8. So, during temperature maintenance activities and within catfish tolerance, catfish grow well.

4. Conclusion
The utilization of herbal supplements has a good effect on fish growth, feed efficiency, and survival rate. Maintenance of P0 (control) resulted in an absolute weight of 9.79 grams, an absolute length of 6.3 cm, the survival of 85.15%, feed efficiency of 107.89% while maintenance with the addition of herbal supplements resulted in an absolute weight of 14.17 grams, absolute length 7.8 cm, survival 98.57%, feed efficiency 161.170%.

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