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The Effect of Commercial Feeding Combined with Cassava Leaf Meal on the Growth of Tawes Fish (*Barbonymus gonionotus*)

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ABSTRACT

Tawes fish is one of the fish that has the potential to be cultivated because it has a fairly good prospect and is favored by the community. Feed becomes one of the important components of fish growth. The slow growth of tawes fish is an obstacle for farmers and is the cause of the high cost of feed production. Therefore, it is necessary to have alternative forage feed to help accelerate the growth of tawes fish such as cassava leaves. This study aims to determine the optimum level of adding cassava leaf meal to feed on the growth rate of tawes. The method used in this research is an experimental method using Complete Randomized Design (RAL), which consists of 5 treatments and 4 repeats. The treatment used was (A) without cassava leaf flour (control), (B) cassava leaf flour by 10%, (C) cassava leaf flour by 15%, (D) cassava leaf flour by 20%, (E) cassava leaf flour by 25%. The test fish used is tawes fish with a length of 5-7 cm and a weight of 7-8 g. The container used is hapa with a size of 1 x 1 x 1 m as many as 20 pieces with a density of 20 fish per treatment and a duration of maintenance for 40 days. The amount of feed given is as much as 5% of fish biomass. The observed length and weight data were analyzed using the Analysis of Variance (ANOVA) with a confidence level of 95%, if there is a noticeable difference, the Duncan multiple distance test is carried out. The results showed that giving cassava leaf meal at a dose of 10% in feed gave the best results with the highest daily growth rate of 57.00 ± 21.7% with a feed conversion ratio of 2.2 ± 0.5 and the highest survival of 90.0 ± 14.4% in tawes.

Keyword: *fish tawes, ingots, optimal rate, alternative feed.*

1. INTRODUCTION

Tawes fish is one type of freshwater fish that has important economic value and potential for cultivation. This fish has a protein content of 13% and Omega-3 fatty acids of 1.5/100 grams, and is liked by the public because it has chewy meat and little fat (Islama et al., 2020). In addition, the price of tawes fish can be affordable by the community (Diana and Safutra, 2018). Tawes fish production in 2021 in West Java province reached 81,028,735 tons (KKP Statistics Data Center, 2021).

Fish feed is one of the factors that play an important role in the process of fish growth. Fish growth can run optimally if the amount of feed, feed quality and nutritional content are met properly (Zaenuri, 2013). Feed efficiency is an important indicator as an effort that can be done in the cultivation process. One of the efforts to improve feed efficiency is by adding commercial feed. According to Iskandar et al. (2021), the use of forage feed can increase feed efficiency, namely cassava leaf flour which is expected to accelerate the growth process in tawes.

Cassava leaves are a biological resource that has the potential as raw material for fish feed. Based on Polewangi et al. (2015), feed given cassava leaf flour contains a fairly high nutritional value reaching 29% and in terms of ingredients it is easy to obtain. Cassava leaves are a biological resource that has the potential as raw material for fish feed. These leaves have a fairly high nutritional content, namely dry matter 23.36%, crude protein 29%, crude fiber 19.06%, fat 9.41%, extract material without nitrogen (BETN) 34.08%, and ash 8.83% (Mulyasari, 2011). According to Samsugiantini (2006), cassava leaves contain flavonoids that are useful for increasing appetite. In addition, cassava leaves also contain vitamins A, B1 and C which are quite high and contain calcium, phosphorus, and iron (Mulyasari, 2011).

The main obstacle in the use of cassava leaf flour is the high content of crude fiber. According to Lestari &; Cinnawara (2022), one of the efforts that can be made to facilitate the overhaul of fibrous feed carbohydrate components is by siege.

The identification of the problem in this study is the extent of the effect of adding cassava leaf meal in feed on increasing the growth rate and daily feed consumption of tawes.

2. RESEARCH METHOD

This research was carried out from April to May 2023 at the Kawungsari Fisheries Group, Kertayasa Village, Cijulang District, Pangandaran Regency. Fish fry are obtained from aquaculture groups in Kertayasa Village, then tawes fish will be studied with several parameter methods, namely, daily growth rate, feed conversion ratio, survival, and water quality. The materials used in the study were: Tawes fish fry with a size of 5-7 cm with a weight of 4-5 g, cassava leaf flour with a total of 1 kg, PF1000 commercial feed as much as 5 kg, and Progol. The method used in this research is an experimental method using Complete Randomized Design (RAL) with five treatments and four repeats in each treatment, namely:

Conduct A : Commercial feed without addition of singkong leaf flour as a control.
Behaviour B : Commercial feed with the addition of 10% flour cassava leaves.
Behaviour C : Commercial feed with the addition of 15% flour cassava leaves.
Behaviour D : Commercial feed with the addition of 20% flour cassava leaves.
E Behaviour : Commercial feed with the addition of 25% flour cassava leaves.

3. DATA ANALYSIS

3.1 Daily Growth Rate

The calculation of the daily growth rate uses the formula proposed by Hariati (1989) with the following formula:

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

Information:
SGR = Survival Growth Rate (%)
Wt = Average weight of fish at the end of rearing (tail)
W0 = Average weight of fish at the beginning of rearing (tail)
t = Length of maintenance time (days)

3.2 Feed Conversion Rate

The calculation of feed conversion ratio can be calculated using the Effendi equation (1997) with the following formula:

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

Information:
FCR = Feed Conversion Ratio
Wo = Weight of test fish at the beginning of the study (g)
Wt = Weight of test fish at the end of the study (g)
D = Weight of fish killed during rearing (g)
F = Amount of feed given (g)

3.3 Survival

The survival calculation can be calculated using the equation of Effendi (1997)) with the following formula:

$$SR = \frac{Nt}{No} \times 100\%$$

Information:
SR = Survival Rate (%)
Nt = Number of fish alive at the end of rearing (tails)
No = Number of fish at the beginning of rearing (tail)

4. RESULT AND DISCUSION

4.1 Daily Growth Rate

The daily growth rate is the percentage difference between the final weight and the initial weight of the fish divided by the length of rearing. The results of observing the daily growth rate of tawes after treatment for 40 days are presented in Figure 1.

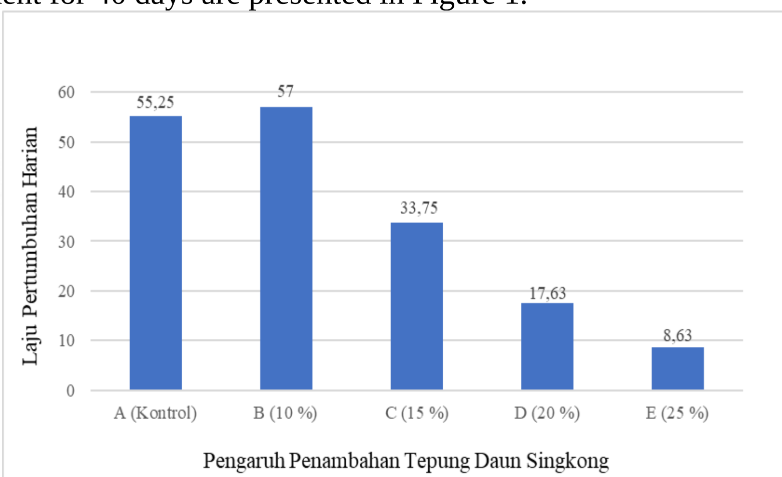

Figure 1. Daily Growth Rate Graph

Based on the results of observations conducted for 40 days, it shows that the growth rate value is in the range of 8.63% - 57.00%. The daily growth rate with the highest value was in treatment B, namely with the addition of cassava leaf flour to feed as much as 10%, which was 57.00 ± 21.7%, and the lowest daily growth rate occurred in treatment E with the addition of cassava leaf flour 25% to feed, which was 8.63 ± 21.7%. The results of the ANOVA test fingerprint analysis showed that the treatment gave a real difference to the growth of tawes fish weight, so it was continued with the results of the Duncan test at a confidence level of 95%.

The best daily growth rate value occurred in treatment B with the addition of cassava leaf flour to feed as much as 10% of feed, which was 57.00 ± 21.7%. Treatment E gets the lowest results, according to the statement by Nurul *et al*. (2021) feeding cassava leaf meal more than 10% is not good for fish growth, this is reinforced according to Mathius (2001) stated that, cassava leaves have limiting factors, namely anti-nutritional substances in cassava leaves such as the presence of tannin and cyanide compounds (HCN) that can limit the body of fish to consume feed, this will have a negative impact on fish growth. Cassava leaf meal is a feed ingredient that can potentially be fish feed that can help growth and become an alternative feed if used with the right dose.

4.2 Feed Conversion Rate

Feed makes up the bulk of production costs and is thought to also be a determining factor in the economic value of fish farming. The feed conversion ratio is also defined as the ratio of the amount of feed needed to produce 1 kg of farmed fish meat. The lower the value of the conversion ratio of feed to meat produced, the better the value of the feed conversion ratio and vice versa as presented in Figure 2.

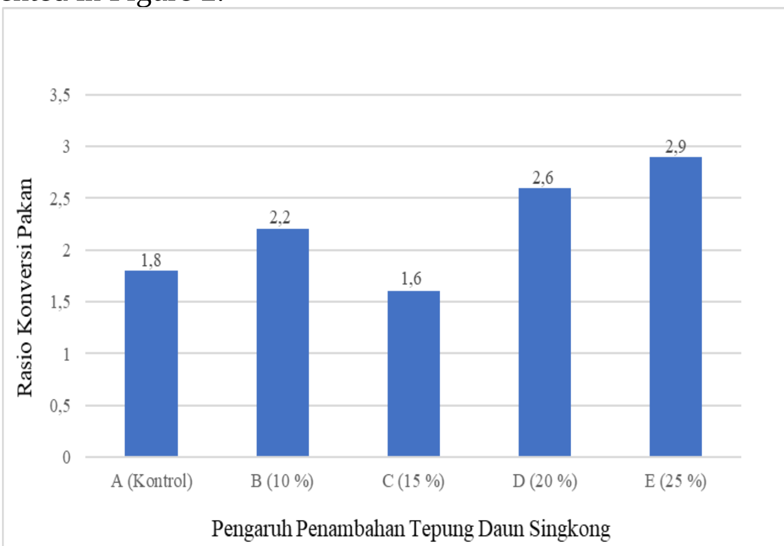

Figure 2. Feed Conversion Rate Graph

Based on the results of observations made for 40 days, the results of the feed conversion ratio value were in the range of 1.6 – 2.9, the highest feed ratio was in treatment E with the addition of cassava leaf meal 25% feed which was 2.9 ± 0.5 and the lowest feed conversion value was in treatment C with the addition of cassava leaf feed 15% feed which was 1.6 ± 0.5. According to Widyastuti (2010) the smaller the value of the feed conversion ratio means the higher quality feed, this shows that the amount of feed consumed is greater the remaining feed, this happens in treatment E with the highest feed conversion ratio value, the main factor of this is the provision of excess cassava leaf meal and resulting in a decrease in fish consumption, Because in cassava leaves there are tannins or cellulose substances that are still not decomposed, then these factors become an obstacle to the process of absorption of nutrients in the intestine and difficult to digest by fish, besides that the tannin content can also cause a bitter taste and tend to decrease the level of consumption in fish. The appropriate dose is given in treatment C with the addition of cassava leaf flour as much as 15% to the feed of 1.6 ± 0.5 and the value is fairly low. Giving the appropriate dose can have an important effect on the growth rate of fish, because the level of fish consumption becomes high. The value of the feed conversion ratio is still considered efficient if it is less than 3, while the value obtained at 5 treatments is below 3 so it is still efficient.
According to Pratiwi *et al*. (2021) Fish maintenance in open ponds is one of the factors that affect fish growth, the availability of natural foods such as phytoplankton into natural food in addition to eating commercial feed and cassava leaf meal. The habit of eating tawes fish in their natural habitat is in rivers with fast currents, which are eaten by fish can be phytoplankton, zooplankton, and benthos. According to Handajani and Wahyu (2010) to find out the eating habits of fish such as herbivores, omnivores and carnivores can be seen from the intestinal tract of these fish. The intestines of tawes fish are relatively longer and can be classified as

herbivorous fish. Herbivorous fish species have a gut length several times the length of their body so that the position of the intestine is circular – circumference inside the fish's stomach (Aida, 2011).

4.3 Survival Rate

According to Effendie (2002), survival is a comparative value between the number of initial fish at the time of stocking expressed in the form of percent where the greater the percentage value indicates the more fish that live during rearing. The results of observations of the survival of tawes fish after treatment for 40 days are presented in Figure 3.

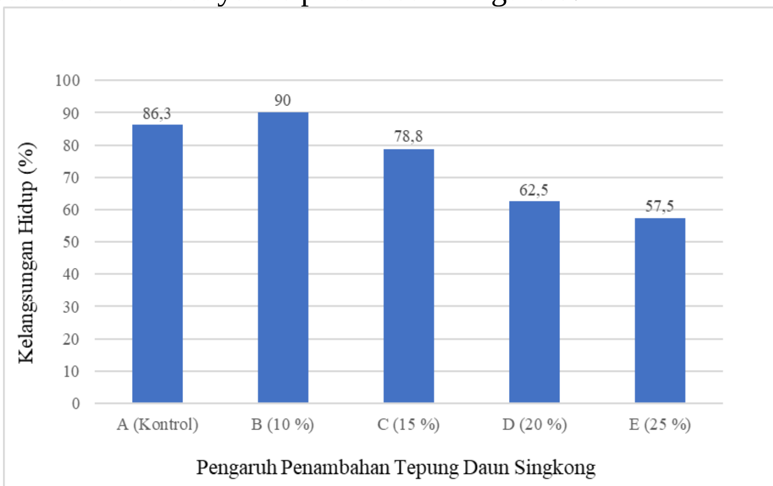

Figure 3. Survival Chart

Based on the results of observations conducted for 40 days, it shows the survival rate of tawes fish is in the range of 57.5 – 90.0%. The highest survival value occurred in treatment B with the addition of cassava leaf flour to feed as much as 10% of feed, which was 90.0 ± 14.4%, this was due to the effect of giving cassava leaf flour with a good dose. According to Irianto (2005) feeding with sufficient and balanced nutrient content will affect the health and survival of fish. In the flour content, cassava leaves have several vitamins that can support the growth system in fish. The lowest survival rate occurred in treatment E, which was 57.5 ± 14.4%. According to Yulianto (2006), survival is influenced by internal and external factors where factors from within are factors from the individual fish and factors from outside are factors influenced by feed quality and water quality. The difference in survival scores in tawes fish is thought to be due to the addition of cassava leaf flour with different doses can be seen in Figure 3. In treatment B, C and D the survival rate of tawes fish is greater than treatment E, it is suspected that the feed content in treatment B, C and D is sufficient and balanced. The difference in life graduation rate is also thought to be caused by dosing from cassava leaf flour and the remaining feed that is not eaten then becomes a faeces, this can affect water quality. According to Watanabe (1988), that survival apart from treatment factors and water quality, can be influenced by biotic and abiotic factors. Biotic factors consist of age and the ability of fish to adapt to the environment, while abiotic factors include the availability of food and the quality of living media water.

4.6 Water Quality

Water quality is one of the most important parameters in aquaculture activities, there are two factors that play a role in reducing water quality, namely external and internal factors. These two factors are very related and closely related, because if the water put into the pond is water that has been polluted or the water quality is poor, the growth of fish will decrease / be inhibited. Water used in aquaculture activities must meet quality standards so that farmed fish can live and develop properly. The results of water quality measurements for tawes fry during rearing are presented in Table 1.

Table 1. Water Quality Measurement Results

Parameter	Range Value	Quality Standards
Temperature (°C)	25 – 29	25-30°C (SNI 1999)
pH	8,1 – 8,5	6,5 - 8,5 (SNI 1999)
DO (mg/L)	6,9 – 8,9	± 5 mg/L (Novrianto *et al*., 2019)

Based on the results of observations made for 40 days with different treatments have values that are not much different. As a result of measurements, the temperature range at hapa is in the range of 25 – 29 °C. The temperature range is still in the range of temperature quality standards for stocking seeds, according to SNI (1999) which is in the range of 25 – 30 °C. Temperatures that do not meet quality standards can interfere with the growth and survival of tawes fish that are kept, this is reinforced according to Novrianto et al. (2019) that tawes fish live in habitats with an ideal temperature range of 20 – 33 ° C, so that temperature is included with good temperature criteria for the growth of tawes. Temperature also has an inverse relationship with DO (dissolved oxygen) or dissolved oxygen levels (Nasrul 2018).

The results of DO measurements show results that are in the range of 6.9 – 8.9 mg / L. According to Novrianto et al. (2019) that good fish maintenance is carried out in water that has dissolved oxygen levels of 5 – 10 mg / L. The highest DO result measurement is 8.9 mg / L, this happens because observations are made in open pools so that the resulting DO value is quite high. High levels of dissolved oxygen are caused by low temperature levels, conversely, the higher the temperature, the lower the dissolved oxygen. This can be caused because increasing water temperature will reduce the ability of water to bind oxygen, so the level of oxygen saturation in the water will also decrease. In addition, the presence of aquatic plants or the number of phytoplankton in water is also a major factor in high levels of dissolved oxygen in water. In addition, the weather at the time of sampling also affects the measurement results of abiotic factors (Wardany and Kurniawan, 2014).

The results of pH measurements show in the range of 8.1 – 8.5, this pH range is still in the range of pH quality standards according to SNI (1999) which is in the range of 6.5 – 8.5. pH values that do not meet quality standards can interfere with the growth and survival of tawes fish that are kept. According to Willem (2019), a pH range of less than 4 and more than 11 can cause death in fish. High pH values can inhibit growth and increase the amount of ammonia in the water which can be toxic to fish and Acidity (pH) that is not optimal can cause fish stress, susceptible to disease, and low productivity and growth.

5. CONCLUSION

Based on the results of the discussion above, it can be concluded that the provision of cassava leaf meal added to the feed obtained the best results of 10% feed which resulted in the highest daily growth rate of 57.00 ± 21.7% with a feed conversion ratio of 2.2 ± 0.5 and the highest survival of 90.0 ± 14.4% in tawes.

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