Original Research Article

The Effect of Giving Lamtoro Leaf Meal (*Leucaena leucocephala*) with Different Concentrations in Feed on the Growth and Survival Rate of Tilapia (*Oreochromis niloticus*)

ABSTRACT

This research aims to determine the effect of adding lamtoro leaf flour to feed at different levels on the growth and survival of tilapia (*Oreochromis niloticus*). The test fish seeds used were relatively the same, namely approximately ± 5-8 cm, obtained from one of the members of the fish cultivator group in Kertayasa Village, Pangandaran. The containers used in this research were 12 with a net size of 1x1x1m^3. The density of tilapia seeds during the research was 20 fish/plot with the amount of feed provided being 5% of the fish biomass. The method used in this research was an experimental method using a Completely Randomized Design (CRD) with 4 treatments and 3 replications. The treatments used were (A) without giving lamtoro leaf flour (control), (B) giving 5% lamtoro leaf flour, (C) giving 10% lamtoro leaf flour and (D) giving 15% lamtoro leaf flour. This research was carried out for 40 days starting in May-June 2023, taking place in Kertayasa Village, Cijulang District, Pangandaran Regency. Parameters observed included absolute weight growth, feed conversion ratio (FCR) and survival rate (SR). The results showed that giving lamtoro leaf flour to feed had a significant effect ($P<0.05$) on absolute weight growth with the highest treatment being treatment C (10% lamtoro leaf flour) at 20 g, but no significant effect ($P>0.05$) to the value of feed conversion ratio and survival rate.

Keywords: Tilapia fish, Lamtoro leaf meal, Fish growth

1. INTRODUCTION

Fisheries cultivation is a business activity in breeding or developing a fishery commodity that has a selling value in order to make a profit from the results of the cultivation. Cultivation activities are also one of the main activities carried out by Indonesian people. This is because the national potential for cultivation land is estimated at 17.92 million ha, consisting of the potential for freshwater cultivation at 2.83 million ha, brackish water cultivation at 2.96 million and marine cultivation at 12.12 million ha [4]. Freshwater aquaculture has great potential in increasing community income and welfare. One type of freshwater fish that is popular for cultivation is tilapia. Tilapia fish production continues to increase, namely in 2015 it reached 1,084,281 tons, in 2016 production was 1,114,156 tons and in 2017 it reached 1,288,733 tons [15].

The availability of feed in cultivation activities also influences the growth and survival of fish. However, on the other hand, feed makes the largest contribution, namely (60% - 70%) of total production costs [19]. So the main problem in tilapia cultivation is the high price of feed which is caused by the high price of imported fish feed raw materials [21]. This causes a shift in the choice of feed raw materials from animal to vegetable by utilizing plants available in nature. One of the vegetable ingredients that can be used as a source of protein is lamtoroleaves .Lamtoro leaves (*Leucaena leucocephala*) are an alternative feed ingredient as a source of carbohydrates which are abundant in nature. This plant tends to be easy to find, because this plant grows wild in yards or fields and has not been utilized optimally.

Lamtoro leaves can be used as a source of vegetable protein because they contain 27.89% protein, 8.73% crude fat, 19.13% crude fiber, 11.33% ash and 33.12% nitrogen-free extract (BETN) [12]. However, the use of lamtoro leaves as fish feed is limited due to the high crude fiber content and anti-nutrient substances. According to [6] lamtoro leaves contain 12.56% cellulose, 8.34% hemicellulose, 4.5% tannin and 2.2% mimosine. Therefore, the use of feed ingredients that have a high crude fiber value and anti-nutrient content contained in lamtoro leaves must be processed first.

Processing methods that can be applied to reduce and eliminate anti-nutrient content are physical and mechanical processing methods. The physical and mechanical processing methods that are easy and cheap are drying, chopping or cutting, soaking, boiling and withering [20]. This research aims to determine the effect of lamtoro leaf flour in feed at different levels on the growth and survival of tilapia.

2. MATERIAL AND METHODS

This research was carried out for 40 days starting in May-June 2023, taking place in Kertayasa Village, Cijulang District, Pangandaran Regency. The fish used were tilapia (*Oreochromis niloticus*) with relatively the same size, namely ± 5-8 cm, obtained from one of the members of the fish cultivator group in Kertayasa Village, Pangandaran. The method used in this research was an experimental method using a Completely Randomized Design (CRD) consisting of 4 treatments and 3 replications, with the number of fish in each experimental unit being 20 tilapia. The treatment given was giving lamtoro leaf flour to artificial feed at different levels, namely as follows:

Treatment A: Commercial feed without giving lamtoro leaf flour (control)
Treatment B: Commercial feed with the addition of 5% lamtoro leaf flour
Treatment C: Commercial feed with the addition of 10% lamtoro leaf flour
Treatment D: Commercial feed with the addition of 15% lamtoro leaf flour

The maintenance container used is a hapa with a total of 12 plots and each plot measures 1x1x1m^3. The acclimatization process is carried out for 7 days with the aim of ensuring that the fish can adapt to the new environment so that it does not cause stress and ensure that the test fish are healthy. The feeding method is carried out (ad satiation), which is a feeding technique according to the consumption and needs of the fish. Meanwhile, the amount of feed given is 5% of the fish biomass and the frequency of feeding is twice a day, namely at 08.00 and 16.00 WIB. Measuring observation parameters, namely growth in length and weight as well as water quality which includes temperature, dissolved oxygen and pH, is carried out every ten days.

Parameters

1) Absolute Weight Growth
   Absolute weight growth in fish according to [10], is expressed using the following formula:

$$W = W_t - W_o$$

   Description :
   W = Growth rate (g)
   W_t= the average weight of fish at the end of the study (g)
   W_o = the average weight of fish at the start of study (g)

2) Feed Conversion Ratio (FCR)
   Calculating the efficiency of feed used according to [9] can use the following formula:

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

   Description :
   FCR = Feed conversion ratio
   F = amount of feed given during research (g)
   W_t = biomass at the end of research (g)
   W_o = biomass at the beginning of research (g)
   D = the weight of dead fish during research (g)

3) Survival Rate (SR)
   Survival rate can be calculated by calculating the total number of fish alive at the end of treatment using the formula according to [9], as follows:

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

   Description :
   SR = Survival rate (%)

N_t = number of live fish at end of observation (tail)
N_0 = number of live fish at the beginning of observation (tail)

The data obtained from this research was then tested using statistical and descriptive analysis. Statistical analysis using Analysis of Variance (ANOVA) analysis of variance, the data measured were absolute weight growth rate, feed conversion ratio and fish survival. If the results of the statistical analysis show a significantly different effect, then proceed with the Duncan test to determine the differences between each treatment.

3. RESULT AND DISCUSSION

3.1 Absolute Weight Growth

Absolute weight growth is the difference between the total body weight of the fish at the end of the study minus the initial weight of the study [18]. The highest absolute weight growth of tilapia was found in treatment C (10% lamtoro leaf flour) which was 20 g, followed by treatment D (15% lamtoro leaf flour) around 17.40 g, then treatment B (5% lamtoro leaf flour) around 16.77 g and the lowest was in control treatment A (control) at 16.10 g. Based on the results of observations, the absolute weight growth value of tilapia can be seen in Figure 1.

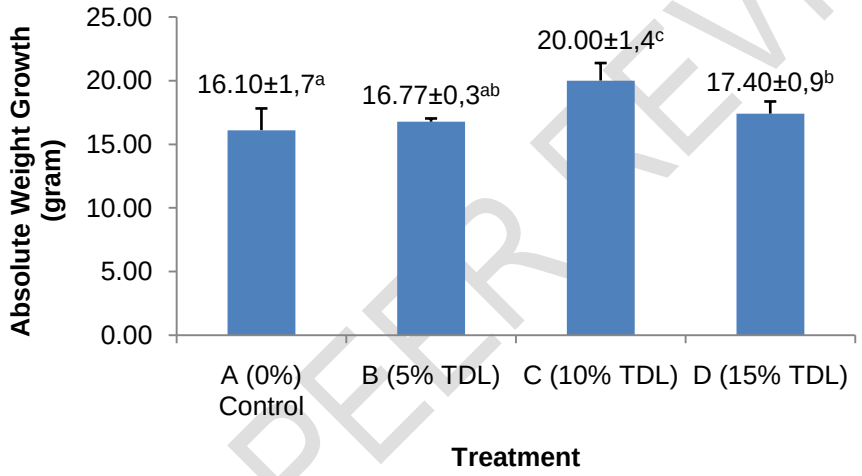

Figure 1.Absolute Weight Growth Graphic

Based on the graph above, it shows that the average value of the absolute weight growth rate for each treatment is higher than the control treatment. This shows that adding lamtoro leaf flour to feed can increase growth. This is thought to be because lamtoro leaves contain quite high protein and physical processing is carried out, namely heating and flouring to reduce the crude fiber content and anti-nutrients in lamtoro leaves so that the protein is easily absorbed by the tilapia's body. Based on research by [3] stated that the crude fiber content in lamtoro leaves in mash form is 11.25% so it can still be tolerated by tilapia. The crude fiber content of 8% -12% in feed is generally tolerated by fish so that it does not interfere with the digestive process and absorption of nutrients, however, a higher crude fiber content causes a decrease in growth [14]. Therefore, the crude fiber content and anti-nutrients in the lamtoro leaf flour used during the research can still be tolerated by tilapia. In accordance with [11] which states that lamtoro leaves show positive results on growth performance and have high nutrition so they can be included in animal feed including fish, feeding catfish shows its suitability at the 20% level without any nutrient impact on growth.

In treatment D (15% lamtoro leaf flour) there was a decrease in the average absolute weight growth of tilapia. It is suspected that the level of lamtoro leaf flour given was too high, thus affecting the palatability of the feed, considering that lamtoro leaf flour has a quite bitter taste. Apart from that, it is also suspected that the anti-nutrient content in lamtoro leaf flour affects the digestive system of tilapia. This is in accordance with the statement [13] which states that anti-nutrient substances such as tannin and mimosine can interfere with nutrient absorption in the digestive tract. The results of the ANOVA test showed that administration of lamtoro leaf flour at different levels had a significant effect ($P<0.05$) on the absolute weight growth of tilapia.

3.2 Food Conversion Ratio (FCR)

Food Conversion Ratio (FCR) is a comparison between the amount of feed given to the weight of the fish produced [8]. The results of observing the feed conversion ratio in tilapia during the research can be seen in Figure 2.

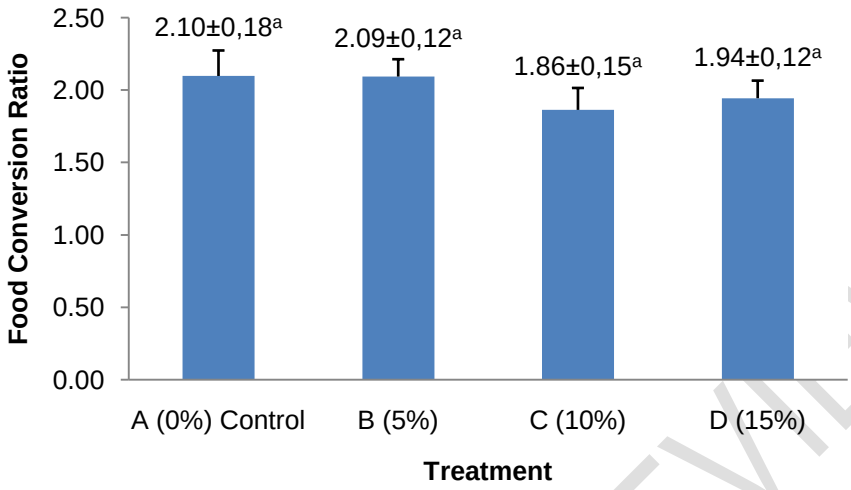

Figure 2.Feed Conversion Ratio Graphic

Based on the graph above, it shows that the average value of feed conversion (FCR) for tilapia in treatment A (control) was 2.10, followed by treatment B (5% lamtoro leaf meal) at 2.09, treatment C (10% leaf meal) was 1.86 and treatment D (15% lamtoro leaf flour) was 1.94. The feed conversion value during the research showed that the best FCR value was found in treatment C (10% lamtoro leaf meal) because it had the lowest FCR among the other treatments. This shows that feeding 1.86 kg produces fish weighing 1 kg. According to [16] the feed conversion ratio (FCR) value for fish generally ranges from 1.5–2.5.

Based on the results of research that has been carried out, it shows that the addition of lamtoro leaf flour to feed at levels of 0%, 5%, 10% and 15% did not have a significant effect (P>0.05) on the FCR value of fish during the research. The fish feed conversion ratio value during the research with the addition of lamtoro leaf flour to the feed can reduce the FCR value, making the treatment more efficient. In accordance with the statement of [2] who stated that the lower the FCR value, the more efficient the fish is in utilizing the food consumed for growth. The FCR value during the research showed that the addition of lamtoro leaf flour to the feed was good for the conversion value of fish feed. Factors that can influence the feed conversion ratio value are density, species, age of the animal group, weight of each individual, water temperature and method of feeding which includes quantity, quality and frequency of feeding [7].

3.3 Survival Rate (SR)

Survival Rate (SR) is the ratio of the number of fish that live to the number of fish that die from the beginning to the end of the study [17]. The results of observations of the survival rate of tilapia can be seen in Figure 3.

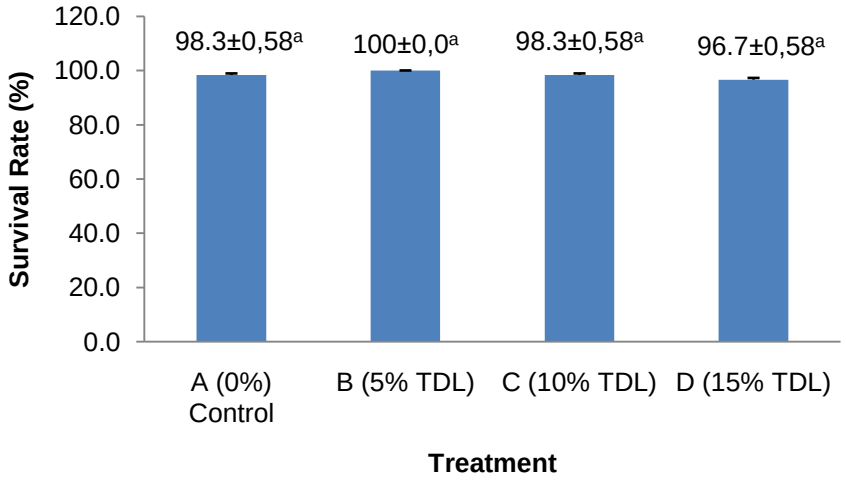

Figure 3.Survival Rate Graphic

The survival percentage of tilapia fish in treatment A (control) was 98.3%, while treatment B (5% lamtoro leaf flour) was 100%, treatment C (10% lamtoro leaf flour) was 98.3% and in treatment D (15% lamtoro leaf flour) amounted to 96.7%. In general, the survival value of tilapia for all treatments was relatively high. According to [1], the fish survival rate is good, with an average value ranging from 73.5–86.0%. The factors that influence fish survival are feeding, stocking density, disease and water quality which include temperature, pH, dissolved oxygen, ammonia and nitrite levels [5]. The results of the ANOVA test showed that giving lamtoro leaf flour at different levels in the feed had no significant effect (P>0.05) on the survival of tilapia fish.

4. CONCLUSION

Based on the results and discussion, it can be concluded that giving lamtoro leaf flour to feed has an influence on absolute weight growth (P<0.05) but has no effect (P>0.05) on the feed conversion ratio and survival of tilapia. The best treatment was treatment C (10% lamtoro leaf flour) with absolute weight growth of 20 g, feed conversion ratio of 1.86 and survival of 98.3%.

REFERENCE

1. Andriyan, M. F., Rahmaningsih, S., & Firmani, U. 2018. The Effect of Salinity on the Survival Rate and Blood Profile of Tilapia (*Oreochromis niloticus*) Given a Combination of Feed and Noni Fruit (*Morindacitriffolia* L.). Pantura Fisheries Journal (JPP), 1(1), 1.
2. Ardita, N., Budiharjo, A., Lusi, S., & Sari, A. 2015. Growth and feed conversion ratio of tilapia (*Oreochromis niloticus*) with the addition of prebiotics. Biotechnology, 12(1), 16–21.
3. Argadyasto, D., Retnani, Y., &Diapari, D. 2015. Physical processing of lamtoro leaves in the form of mash, pellets and wafers on sheep performance. Forage Bulletin, 102(1), 19–26.
4. Arrazy, M., &Primadini, R. 2021. Potential of the Fisheries Subsector in Provinces in Indonesia. Journal of National Development Economics, 14(1), 1–13.
5. Arzad, M., Ratna, R., &Fahrizal, A. 2019. The Effect of Stocking Density on the Growth of Tilapia (*Oreochromis niloticus*) in an Aquaponic System. Median: Journal of the Exact Sciences, 11(2), 39–47. https://doi.org/10.33506/md.v11i2.503
6. Bairagi, A., Ghosh, K. S., Sen, S. K., & Ray, A. K. 2004. Evaluation of the nutritive value of *Leucaena leucocephala* leaf meal, inoculated with fish intestinal bacteria *Bacillus subtilis* and *Bacillus circulans* in formulated diets for rohu, Labeorohita (Hamilton) fingerlings. Aquaculture Research, 35: 436 – 446
7. Barrow, P. A and Hardy. 2001. Probiotics for Chickens. In: Probiotics the Scientific Basis. R. Filler (Ed).Chapman and Hall. London
8. Christin, Y., Restu, W., Raka, G., & Kartika, A. 2021. Growth Rate of Tilapia (*Oreochromis niloticus*) in Three Different Recirculation Systems. Current Trends in Aquatic Science IV, 127(2), 122–127.
9. Effendi, M. I. 1997. Fisheries Biology. Yogyakarta: Nusatama Library Foundation.
10. Effendie, M.I. 2002. Fisheries Biology. Nusatama Library Foundation, Yogyakarta.

11. Haetami, K., Abun, & Shafa, B. R. 2022. Potential Use of Ipil-Ipil (*Leucaena leucocephala Lam*.) As Fish Feed Ingredient: A Mini-review. Asian Journal of Fisheries and Aquatic Research, 19(3), 43–47. https://doi.org/10.9734/ajfar/2022/v19i330478
12. Handayani, T., Titik, S., &Subandiyono. 2017. USE OF FERMENTED LAMTORO LEAF FLOUR (*Leucaena leucocephala*) IN ARTIFICIAL FEED FOR GROWTH OF CARP (*Cyprinus carpio*) SEEDS. Journal of Aquaculture Management and Technology, 6(4), 226–335.
13. Hertrampf, J., & Piedad-Pascual, F. 2000. Handbook on Ingredients for Aquaculture feeds. Dordrecht: Kluwer Academic Publishers.
14. Iskandar, A.S. 2011. The Effect of Providing Artificial Feed with Different Protein Content on the Growth and Protein Retention of Pasupati Patin Seeds. Thesis. Faculty of Fisheries and Marine Sciences. Padjajaran University. 18 pp
15. Ministry of Fisheries and Maritime Affairs. 2020. Center for Data, Statistics and Information.
16. Mokoginta, L. F., HengkySinjal, N. P. L. P., Pelle, W. E., &Solang, J. 2022. Growth and survival of Tilapia (Oreochromis niloticus) fed commercial feed with the addition of Effective Microorganism-4. EJournal of Aquaculture, 10(2), 166–176.
17. Mulqan, M., Afdhal El Rahimi, S., &Dewiyanti, I. 2017. The Growth and Survival rates of Juvenile Tilapia (*Oreochromis niloticus*) in Aquaponics Systems with Different Plants Species. Unsyiah Maritime and Fisheries Student Scientific Journal, 2(1), 183–193.
18. Ni Luh Ayu Gita Astriani, I Wayan Arthana, Gde Raka Angga Kartika. 2019. Potential of Household Scale Probiotics to Increase the Growth Rate of Tilapia (*Oreochromis niloticus*). Current Trends in Aquatic Science II(2), 33-39
19. Nurhayati, &Nazlia, S. 2019. FERMENTED Gliricidiasepium LEAVE POWDER EVALUATION ON NILE TILAPIA GROWTH PERFORMANCE. Scientific Journal of Ocean Aquatics, 3(1), 6–11
20. Yanuartono, Nururrozi, A., Indarjulianto, S., Purnamaningsih, H., & Raharjo, S. 2019. Traditional methods of processing feed ingredients to reduce the content of anti-nutritional factors: a brief review. 19(2), 97–107.
21. Zidni, I., Iskandar, Y. Andriani. 2016. Fermentation of Lemna sp. As a fish feed ingredient to increase the supply of animal protein sources for the community. Proceedings of the National Seminar. Faculty of Fisheries and Marine Sciences, Padjadjaran University